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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/944,836	07/17/2013	Christopher J. Rennie	5611-1-CIP-5

CONFIRMATION NO. 3020

PUBLICATION NOTICE

19152
Concaten, Inc.
24918 Genesee Trail Road
Golden, CO 80401

OC000000075413680

Title: Maintenance Decision Support System and Method for Vehicular and Roadside Applications

Publication No.US-2015-0145705-A9
Publication Date:05/28/2015

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Office of Public Records. The Office of Public Records can be reached by telephone at (703) 308-9726 or (800) 972-6382, by facsimile at (703) 305-8759, by mail addressed to the United States Patent and Trademark Office, Office of Public Records, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently http://pair.uspto.gov/. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Office of Data Managment, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/944,836	05/19/2015	9035755	5611-1-CIP-5	3020

19152 7590 04/29/2015

Concaten, Inc.
24918 Genesee Trail Road
Golden, CO 80401

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 0 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

Concaten, Inc., Golden, CO, Assignee (with 37 CFR 1.172 Interest);
Christopher J. Rennie, Seattle, WA;
Kevin K. Groeneweg, Golden, CO;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/944,836	07/17/2013	Christopher J. Rennie	5611-1-CIP-5	3020

19152 7590 04/27/2015

Concaten, Inc.
24918 Genesee Trail Road
Golden, CO 80401

EXAMINER	
LAU, HOI CHING	

ART UNIT	PAPER NUMBER
2682	

MAIL DATE	DELIVERY MODE
04/27/2015	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Supplemental Notice of Allowability	Application No. 13/944,836	Applicant(s) RENNIE ET AL.	
	Examiner HOI LAU	Art Unit 2682	AIA (First Inventor to File) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *RCE filed December 04, 2014 and Statement under 37 CFR 1.55 or 1.78 for AIA transition filed April 10, 2015*.

   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on_____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☒ The allowed claim(s) is/are *1-20*. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov .

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some *c) ☐ None of the:

   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.

   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
5. ☐ Examiner's Amendment/Comment
6. ☒ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/HOI LAU/
Primary Examiner, Art Unit 2682

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after allowance or after an Office action under *Ex Parte Quayle*, 25 USPQ 74, 453 O.G. 213 (Comm'r Pat. 1935). Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, prosecution in this application has been reopened pursuant to 37 CFR 1.114. Applicant's submission filed on December 04, 2014 has been entered.

1. Claims 1-20 are allowed.

Response to Amendment

The Application Data Sheet (ADS) submitted on August 11, 2014 was filed and is being considered by the examiner.

Allowable Subject Matter

2. The following is an examiner's statement of reasons for allowance:

Prior art made of record fails to teach,

Regarding Claim 1,

A method, comprising:

(a) receiving from a plurality of snow maintenance vehicles a plurality of sets of collected information, each of the sets of collected information comprising a snow maintenance vehicle physical location and at least one of weather and road conditions in an area of the respective snow maintenance vehicle;

(b) processing, by a server, the received sets of collected information to (i) provide a map associated with a physical location of a selected snow maintenance vehicle and (ii) determine an instruction for the selected snow maintenance vehicle

(c)

providing the map and the instruction to a user; and

(d)

wherein the following is true:

(dl)

the sets of collected information are sent to a data scrubbing server that identifies bad sets of collected information, said bad sets of collected information containing information that is incomplete or inaccurate, and wherein the data scrubbing server corrects or deletes the bad sets of collected information before forwarding the sets of collected information to the server for processing; and

(d2) the sets of collected information are directed through one or more auxiliary servers before the sets of collected information are sent to the server for processing.

Regarding Claim 11,

A system, comprising:

a server operable to:

(**a) receive from a plurality of snow maintenance vehicles, a plurality of sets of collected information, each of the sets of collected information comprising a snow maintenance vehicle physical location and at least one of weather and road conditions in an area of the respective snow maintenance vehicle;**

(b) process the received sets of collected information:

(i) to provide a map associated with a physical location of a selected snow maintenance vehicle;

(ii) to determine an instruction for the selected snow maintenance vehicle;

(c) provide the map and the instruction to a user; and

(d)

wherein the following is true:

(dl) the sets of collected information are sent to a data scrubbing server that identifies bad sets of collected information, said bad sets of collected information containing information that is incomplete or inaccurate, and wherein the data scrubbing server corrects or deletes the bad sets of collected

information before forwarding the sets of collected information to the server for processing; and

(d2) the sets of collected information are directed through one or more auxiliary servers before the sets of collected information are sent to the server for processing

The examiner found no suggestions or motivations to combine similar teachings from prior art made of record to overcome the limitations as discussed above.

3. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to HOI LAU whose telephone number is (571)272-8547. The examiner can normally be reached on M- F 8:30am - 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, George Bugg can be reached on (571)272-2998. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Hoi C Lau/
Primary Examiner, Art Unit 2682

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13944836	RENNIE ET AL.
	Examiner	Art Unit
	HOI LAU	2682

CPC- SEARCHED

Symbol	Date	Examiner
G08G 1/096775	4/20/2014	HCL
G08G 1/0104	4/20/2014	HCL
G08G 1/0962	4/20/2014	HCL
G08G 1/096716	4/20/2014	HCL
G08G 1/096741	4/20/2014	HCL
H04W 4/02	4/20/2014	HCL
H04W 64/00	4/20/2014	HCL
G08B 21/00	4/20/2014	HCL

CPC COMBINATION SETS - SEARCHED

Symbol	Date	Examiner

US CLASSIFICATION SEARCHED

Class	Subclass	Date	Examiner
340	426.16,995.1,905,436,573.4,426.19,438,539.13,995.13	4/20/2014	HCL
342	357.07	4/20/2014	HCL
701	32.1,129.19	4/20/2014	HCL
239	172	4/20/2014	HCL
345	156	4/20/2014	HCL

SEARCH NOTES

Search Notes	Date	Examiner
inventor search	10/6/13	HCL
east search	10/6/13	HCL
update east search	4/20/2014	HCL

INTERFERENCE SEARCH

US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
340	905,539.13,995.13	4/20/2014	HCL
701	31.1,32.7,29.1	4/20/2014	HCL

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13944836	RENNIE ET AL.
	Examiner	**Art Unit**
	HOI LAU	2682

CPC						
Symbol					**Type**	**Version**
G08G		1	/	20	F	2013-01-01
G08G		1	/	017	I	2013-01-01
H04L		67	/	125	I	2013-01-01
H04L		67	/	12	I	2013-01-01
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CPC Combination Sets							
Symbol					**Type**	**Set**	**Ranking**	**Version**
			/					
			/					

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	20	
/HOI LAU/ Primary Examiner.Art Unit 2682	04/23/2015	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	8

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13944836	RENNIE ET AL.
	Examiner	**Art Unit**
	HOI LAU	2682

US ORIGINAL CLASSIFICATION						INTERNATIONAL CLASSIFICATION										
CLASS	SUBCLASS					CLAIMED						NON-CLAIMED				
340	426.16					B	6	0	R	25 / 10 (2013.0)						
CROSS REFERENCE(S)																
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)															
340	539.13	995.13	905													
701	32.7	29.1	32.1													

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	20	
/HOI LAU/ Primary Examiner.Art Unit 2682	04/23/2015	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	8

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13944836	RENNIE ET AL.
	Examiner	**Art Unit**
	HOI LAU	2682

☒ **Claims renumbered in the same order as presented by applicant** ☐ **CPA** ☐ **T.D.** ☐ **R.1.47**

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 20	
/HOI LAU/ Primary Examiner.Art Unit 2682 (Primary Examiner)	04/23/2015 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 8

Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

Change(s) made to document,
/C.S./
2/24/2015

Complete if Known	
Application Number	13/944836
Filing Date	07/17/2013
First Named Inventor	Christopher J. Rennie
Art Unit	2612
Examiner Name	Hoi Ching Lau
Attorney Docket Number	5611-1-CIP-5

Sheet	6	of	20

	141	6631322	10/01/03	Arthur et al.	
	142	6640187	10/28/03	Chenault et al.	
	143	6650252	11/01/03	Miller, Jr.	
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	145	6700493	3/2/2004	Robinson	
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	149	6745153	06/01/04	White et al.	
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	154	7373152	~~10/14/04~~	OESTERLING	May 13, 2008
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	157	6919821	07/19/05	Smith	
	158	6950022	09/01/05	Breed	
	159	6952181	10/04/05	Karr et al.	
	160	6977597	12/20/05	Doherty	
	161	6981047	12/27/05	Hanson et al.	
	162	6986033	01/17/06	Lowry et al.	
	163	7027915	04/01/06	Craine	
	164	7062274	06/13/06	Shell et al.	
	165	7064657	06/20/06	Becker et al.	
	166	7085382	08/01/06	Terao et al.	
	167	7092803	08/15/06	Kapolka et al.	
	168	7117075	10/03/06	Larschan et al.	
	169	7164365	01/16/07	Doherty et al.	
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	171	7421334	09/02/08	Dahlgren et al.	
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	176	2008/0251614	10/16/08	Doherty et al.	

Examiner Signature	/Hoi Lau/	Date Considered	12/23/2014

*EXAMINER: Initial if reference is considered, whether or not citation is in conformance and not considered. Include copy of this form with next communication to applicant.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /H.L./

Substitute for form 1449A/PTO

Change(s) applied to document
/C.S./
2/24/2015

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

Complete if Known	
Application Number	13/944836
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First Named Inventor	Christopher J. Rennie
Art Unit	2612
Examiner Name	Hoi Ching Lau
Attorney Docket Number	5611-1-CIP-5

Sheet	3	of	20

	69	5343744	09/06/94	Ammann	
	70	5366039	11/22/94	Sawada	
	71	~~5389727~~ 5,386,727	02/07/95	Searle	
	72	5416475	05/16/95	Tolbert et al.	
	73	5416476	05/16/95	Rendon	
	74	5439312	08/08/95	Marcato	
	75	5447272	09/05/95	Ask	
	76	5449049	09/12/95	Every	
	77	5452966	09/26/95	Swisher, Jr.	
	78	5469371	11/21/95	Bass	
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	81	5521594	05/28/96	Fukushima	
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	96	5928504	07/27/99	Hembre et al.	
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	98	5931882	08/03/99	Fick et al.	
	99	5947391	09/07/99	Beck et al.	
	100	5947931	09/07/99	Bierman	
	101	5952585	09/14/99	Huber et al.	
	102	5955973	09/21/99	Anderson	
	103	5957621	09/28/99	Clark, Jr. et al.	
	104	6012012	01/01/00	Fleck et al.	

Examiner Signature	/Hoi Lau/	Date Considered	12/23/2014

*EXAMINER: Initial if reference is considered, whether or not citation is in conformance and not considered. Include copy of this form with next communication to applicant.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /H.L./

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

Concaten, Inc.
24918 Genesee Trail Road
Golden, CO 80401

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/944836	07/17/2013	Christopher J. Rennie	5611-1-CIP-5	3020

TITLE OF INVENTION:

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0	$0	$480	04/16/2015

EXAMINER	ART UNIT	CLASS-SUBCLASS

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 Carl A. Hjort, III
2
3

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE	(B) RESIDENCE: (CITY and STATE OR COUNTRY)
Concaten, Inc.	Golden, CO

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ■ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

☑ Issue Fee

☐ Publication Fee (No small entity discount permitted)

☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**

☐ A check is enclosed.

☑ Payment by credit card. Form PTO-2038 is attached.

☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)

☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27.

☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature /CAH/ Date 04/16/2015

Typed or printed name Carl A. Hjort, III Registration No. 56934

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

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The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No.:	13/944836	Art Unit:	2682
Inventor:	Rennie	Confirmation No.:	3020
Filed:	July 17, 2013	Examiner:	Lau
Docket No.:	5611-1-CIP-5		
For:	MAINTENANCE DECISION SUPPORT SYSTEM AND METHOD FOR VEHICULAR AND ROADSIDE APPLICATIONS		**COMMENTS ON STATEMENT OF REASONS FOR ALLOWANCE**

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Honorable Sir:

The Applicant respectfully requests entry of the following Comments on the Statement of Reasons for Allowance.

COMMENTS ON STATEMENT OF REASONS FOR ALLOWANCE

The Applicant objects to the Statement of Reasons for Allowance in the present matter because the record of the examination as a whole makes clear the reasons for patentability. *See* 37 CFR § 1.104. Moreover, the Applicant submits that the Examiner's recitation in the Statement of Reasons for Allowance does not add any substance to the file history but merely places unwarranted interpretations, not expressed by the Applicant, on the claims.

The Applicant respectfully submits the following as an acceptable Statement of the Reasons for Allowance.

REASONS FOR ALLOWANCE

The primary reason for the patentability of the claims is:

Prior art does not teach or suggest method, comprising:

(a) receiving from a plurality of snow maintenance vehicles a plurality of sets of collected information, each of the sets of collected information comprising a snow maintenance vehicle physical location and at least one of weather and road conditions in an area of the respective snow maintenance vehicle;

(b) processing, by a server, the received sets of collected information to (i) provide a map associated with a physical location of a selected snow maintenance vehicle and (ii) determine an instruction for the selected snow maintenance vehicle;

(c) providing the map and the instruction to a user; and

(d) wherein the following is true:

(d1) the sets of collected information are sent to a data scrubbing server that identifies bad sets of collected information, said bad sets of collected information containing information that is incomplete or inaccurate, and wherein the data scrubbing server

corrects or deletes the bad sets of collected information before forwarding the sets of collected information to the server for processing; and

(d2) the sets of collected information are directed through one or more auxiliary servers before the sets of collected information are sent to the server for processing.

Prior art does not teach or suggest a system, comprising:

a server operable to:

(a) receive from a plurality of snow maintenance vehicles, a plurality of sets of collected information, each of the sets of collected information comprising a snow maintenance vehicle physical location and at least one of weather and road conditions in an area of the respective snow maintenance vehicle;

(b) process the received sets of collected information:

(i) to provide a map associated with a physical location of a selected snow maintenance vehicle;

(ii) to determine an instruction for the selected snow maintenance vehicle;

(c) provide the map and the instruction to a user; and

(d) wherein the following is true:

(d1) the sets of collected information are sent to a data scrubbing server that identifies bad sets of collected information, said bad sets of collected information containing information that is incomplete or inaccurate, and wherein the data scrubbing server corrects or deletes the bad sets of collected information before forwarding the sets of collected information to the server for processing; and

(d2) the sets of collected information are directed through one or more auxiliary servers before the sets of collected information are sent to the server for processing.

Respectfully submitted,

/CAH/

Date: 4/16/2015

Carl A. Hjort, III, Esq.
USPTO Reg. No. 56934
Concaten, Inc.
24918 Genesee Trail Road
Golden, Colorado 80401
Telephone: 303-725-4365

Electronic Patent Application Fee Transmittal

Application Number:	13944836
Filing Date:	17-Jul-2013
Title of Invention:	Maintenance Decision Support System and Method for Vehicular and Roadside Applications
First Named Inventor/Applicant Name:	Christopher J. Rennie
Filer:	Carl A. Hjort
Attorney Docket Number:	5611-1-CIP-5

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Utility Appl Issue Fee	2501	1	480	480

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**480**

Electronic Acknowledgement Receipt

EFS ID:	22086850
Application Number:	13944836
International Application Number:	
Confirmation Number:	3020
Title of Invention:	Maintenance Decision Support System and Method for Vehicular and Roadside Applications
First Named Inventor/Applicant Name:	Christopher J. Rennie
Customer Number:	19152
Filer:	Carl A. Hjort
Filer Authorized By:	
Attorney Docket Number:	5611-1-CIP-5
Receipt Date:	16-APR-2015
Filing Date:	17-JUL-2013
Time Stamp:	17:21:59
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$480
RAM confirmation Number	4057
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	ptol85b13944836.pdf	73308 286717ea59e46cbe96c18530bc36a441a185b2be	no	2
Warnings:					
Information:					
2	Miscellaneous Incoming Letter	CommentsReasonsAllowance.pdf	27098 6eb43672447c806d925580094cd21fb69d824bd8	no	4
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	30311 89fe1a3eb7e4d10e6557b6268802ba98983b9fbd	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	130717		

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
13/944,836	07/17/2013	2682	730	5611-1-CIP-5	20	2

CONFIRMATION NO. 3020

CORRECTED FILING RECEIPT

19152
Concaten, Inc.
24918 Genesee Trail Road
Golden, CO 80401



Date Mailed: 04/15/2015

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Christopher J. Rennie, Seattle, WA;
Kevin K. Groeneweg, Golden, CO;

Applicant(s)

Concaten, Inc., Golden, CO

Power of Attorney:
Carl Hjort III--56934

Domestic Priority data as claimed by applicant

This application is a CIP of 13/616,412 09/14/2012 PAT 8497769
which is a CON of 13/345,480 01/06/2012 PAT 8284037
which is a CON of 12/749,325 03/29/2010 PAT 8120473
which is a CON of 12/046,121 03/11/2008 PAT 7714705
which is a CON of 11/363,581 02/27/2006 PAT 7355509
which claims benefit of 60/656,650 02/25/2005

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

If Required, Foreign Filing License Granted: 08/02/2013
The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 13/944,836**
Projected Publication Date: 05/28/2015

Non-Publication Request: No

Early Publication Request: No
**** SMALL ENTITY ****
Title

Maintenance Decision Support System and Method for Vehicular and Roadside Applications

Preliminary Class

340

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: Yes

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

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This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

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The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit http://www.SelectUSA.gov or call +1-202-482-6800.

PATENT

Docket No.: 5611-1-CIP-5

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor: Christopher J. Rennie

Serial No.: 13/944836

Art Unit: 2682

Filed: July 17, 2013

Examiner: Hoi Ching Lau

Title: MAINTENANCE DECISION AND SUPPORT SYSTEM AND METHOD FOR VEHICULAR AND ROADSIDE APPLICATIONS

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

Honorable Sir:

This application: (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March16, 2013. This application should be examined under the first inventor to file provisions of the AIA.

Date: April 10, 2015

Respectfully submitted,

/CAH/

Carl A. Hjort, III, Esq.
ATTORNEY FOR APPLICANT
USPTO Reg. No. 56,934
Concaten, Inc.
24918 Genesee Trail Road
Golden, CO 80401
303-725-4365

Electronic Acknowledgement Receipt

EFS ID:	22033472
Application Number:	13944836
International Application Number:	
Confirmation Number:	3020
Title of Invention:	Maintenance Decision Support System and Method for Vehicular and Roadside Applications
First Named Inventor/Applicant Name:	Christopher J. Rennie
Customer Number:	19152
Filer:	Carl A. Hjort
Filer Authorized By:	
Attorney Docket Number:	5611-1-CIP-5
Receipt Date:	10-APR-2015
Filing Date:	17-JUL-2013
Time Stamp:	18:28:45
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	transmittal1.pdf	20501 4f2b80682a65c83e17483ddc83ed4c3f86e33af4	no	2

Warnings:	
Information:	

2	Application Data Sheet	correctedADS1.pdf	37115 40936fcacc2e9b6b5dc9b98b0c4548c745f7c44b	no	2
Warnings:					
Information:					
This is not an USPTO supplied ADS fillable form					
3	Make/Rescind AIA (First Inventor to File) 1.55/1.78 Stmnt	AIAtransitionstatement1.pdf	20128 a96e583323a6d5233f4a953c1e4dc5d680c14aba	no	1
Warnings:					
Information:					
		Total Files Size (in bytes):	77744		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PATENT

Docket No.: 5611-1-CIP-5

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor: Christopher J. Rennie

Serial No.: 13/944836

Art Unit: 2682

Filed: July 17, 2013

Examiner: Hoi Ching Lau

Title: MAINTENANCE DECISION AND SUPPORT SYSTEM AND METHOD FOR VEHICULAR AND ROADSIDE APPLICATIONS

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Transmittal Letter

Honorable Sir:

The Applicant hereby re-submits its Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications. This letter is also accompanied by a corrected Application Data Sheet (ADS). Pursuant to 37 C.F.R. 1.76, only those sections containing updated information are included in the attached corrected ADS, and information being changed is identified with underlining for insertions and strike-through for text removed. For the sake of completeness, the Applicant included the previously marked changes from the ADS filed on February 2, 2015 in the attached ADS. The corrected ADS also now also includes the Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications, with a check next to that

statement, noting that this application should be examined under the First Inventor to File system.

The issuance of a corrected Notice of Allowance, indicating that this application was examined under the First Inventor to File system is respectfully solicited. In the event the Office requires additional information regarding this filing, Office personnel are cordially invited to contact the undersigned at the telephone number listed below.

Date: April 10, 2015

Respectfully submitted,

/CAH/

Carl A. Hjort, III, Esq.
ATTORNEY FOR APPLICANT
USPTO Reg. No. 56,934
Concaten, Inc.
24918 Genesee Trail Road
Golden, CO 80401
303-725-4365

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	5611-1-CIP-5
	Application Number	13944836
Title of Invention	Maintenance Decision Support System and Method for Vehicular and Roadside Applications	

Domestic Benefit/ National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 C.F.R. 1.78

Prior Application Status	Patented				
Application Number	Continuity Type	Prior Application Number	Filing Date	Patent Number	Issue Date
13944836	Continuation -in-part of	13616412	2012-09-14	8497769	2013-07-30
Prior Application Status	~~Pending~~ Patented				
Application Number	Continuity Type	Prior Application Number	Filing Date	Patent Number	Issue Date
13616412	Continuation of	13345480	~~2013-01-06~~2012-01-06	8284037	2012-10-09
Prior Application Status		Patented			
Application Number	Continuity Type	Prior Application Number	Filing Date	Patent Number	Issue Date
13345480	Continuation of	12749325	2010-03-29	~~8284037~~ 8120473	~~2012-10-09~~2012-02-21
Prior Application Status	Patented				
Application Number	Continuity Type	Prior Application Number	Filing Date	Patent Number	Issue Date
12749325	Continuation of	12046121	2008-03-11	~~8120473~~ 7714705	~~2012-02-21~~ 2010-05-11
Prior Application Status	Patented				
Application Number	Continuity Type	Prior Application Number	Filing Date	Patent Number	Issue Date
12046121	Continuation of	11363581	2006-02-27	~~7714705~~ 7355509	~~2010-05-11~~ 2008-04-08
Prior Application Status	~~Patented~~ Expired				
Application Number	Continuity Type	Prior application Number	Filing date	~~Patent Number~~	~~Issue Date~~

11363581	Non provisional of	60656650	2005-02-25	~~7355509~~	~~2008-04-08~~

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

X	This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013. NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March16, 2013, will be examined under the first inventor to file provisions of the AIA.

Signature: /CAH/ **Date: 04/10/2015**

Name: Carl Hjort **Registration Number: 56934**

Office of Petitions: Routing Sheet



Application No.: 13/944,836

This application is being forwarded to your office for further processing. A decision has been rendered on a petition filed in this application.

- [x] **GRANTED**
- [ ] **DISMISSED**
- [ ] **DENIED**

Office of Petitions: Decision Count Sheet

Mailing Month

Application No. 13944836

13944836

For US serial numbers: enter number only, no slashes or commas. Ex: 10123456
For PCT: enter "51+single digit of year of filing+last 5 numbers", Ex. for PCT/US05/12345, enter 51512345

Deciding Official: BRINKLEY, SHERRY

Count (1) - Palm Credit 13/944,836

Decision: GRANT

FINANCE WORK NEEDED
☐ Select Check Box for YES

GRANT

Decision Type: 535 - 37 CFR 1.78(a)(3) & (a)(6) UNINTENTIONAL DELAY F

535

Notes:

Count (2)

Decision: n/a

FINANCE WORK NEEDED
☐ Select Check Box for YES

Decision Type: NONE

Notes:

Count (3)

Decision: n/a

FINANCE WORK NEEDED
☐ Select Check Box for YES

Decision Type: NONE

Notes:

Initials of Approving Official (if required)

If more than 3 decisions, attach 2nd count sheet & mark this box ☐

Printed on: *2/13/2015*

UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/944,836	07/17/2013	Christopher J. Rennie	5611-1-CIP-5	3020

19152 7590 02/18/2015

Concaten, Inc.
24918 Genesee Trail Road
Golden, CO 80401

EXAMINER	
LAU, HOI CHING	

ART UNIT	PAPER NUMBER
2682	

MAIL DATE	DELIVERY MODE
02/18/2015	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

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In re Application of	:	
Christopher J. Rennie, et al.	:	
Application No. 13/944,836	:	DECISION ON PETITION
Filed: July 17, 2013	:	UNDER 37 CFR 1.78(e)
Attorney Docket No.: 5611-1-CIP-5	:	

This is a decision in response to the renewed petition under 37 CFR 1.78(e), filed February 2, 2015, to accept an unintentionally delayed claim under 35 U.S.C. § 120 for the benefit of priority to the prior-filed nonprovisional application set forth in the concurrently filed Application Data Sheet (ADS).

The petition is **GRANTED.**

A petition for acceptance of a claim for late priority under 37 CFR § 1.78(e) is only applicable to those applications filed after the expiration of the period specified in 37 CFR § 1.78(d)(3). In addition, the petition under 37 CFR § 1.78(e) must be accompanied by:

(1) the reference required by 35 U.S.C. § 120 and 37 CFR § 1.78(d)(2) of the prior-filed application, which must be filed in an Application Data Sheet, unless previously submitted;
(2) the petition fee set forth in § 1.17(m); and
(3) a statement that the entire delay between the date the claim was due under 37 CFR § 1.78(d)(3) and the date the claim was filed was unintentional. The Director may require additional information where there is a question whether the delay was unintentional.

All the above requirements having been satisfied, the late claim for benefit of priority under 35 U.S.C. § 120 is accepted as being unintentionally delayed.

The granting of the petition to accept the delayed benefit claim to the prior-filed application under 37 CFR § 1.78(e) should not be construed as meaning that this application is entitled to the benefit of the filing date of the prior-filed applications. In order for this application to be entitled to the benefit of the prior-filed applications, all other requirements under 35 U.S.C. §120 and under 1.78 must be met. Similarly, the fact that the corrected Filing Receipt accompanying this decision on petition includes the prior-filed applications should not be construed as meaning that applicant is entitled to the claim for benefit of priority to the prior-filed applications noted thereon. Accordingly, the examiner will, in due course, consider this benefit claim and determine whether the application is entitled to the benefit of the earlier filing date.

A corrected Filing Receipt, which includes the priority claim to the prior-filed application, accompanies this decision on petition.

Any questions concerning this decision may be directed to the undersigned at (571) 272-3204.

This application is being referred to Technology Center Art Unit 2682 for consideration by the examiner of the claim under 35 U.S.C. § 120 of the prior-filed nonprovisional application. Thereafter, the application will be returned to the Office of Data Management to await a response to the Notice of Allowance mailed January 16, 2015.

/SDB/

Sherry D. Brinkley
Lead Paralegal Specialist
Office of Petitions

ATTACHMENT : Corrected Filing Receipt

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
13/944,836	07/17/2013	2682	730	5611-1-CIP-5	20	2

CONFIRMATION NO. 3020

CORRECTED FILING RECEIPT

19152
Concaten, Inc.
24918 Genesee Trail Road
Golden, CO 80401

OC00000007342854

Date Mailed: 02/13/2015

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Christopher J. Rennie, Seattle, WA;
Kevin K. Groeneweg, Golden, CO;

Applicant(s)

Concaten, Inc., Golden, CO

Power of Attorney:
Carl Hjort III--56934

Domestic Priority data as claimed by applicant

This application is a CIP of 13/616,412 09/14/2012 PAT 8497769
which is a CON of 13/345,480 01/06/2012 PAT 8284037
which is a CON of 12/749,325 03/29/2010 PAT 8120473
which is a CON of 12/046,121 03/11/2008 PAT 7714705
which is a CON of 11/363,581 02/27/2006 PAT 7355509
which claims benefit of 60/656,650 02/25/2005

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

If Required, Foreign Filing License Granted: 08/02/2013
The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 13/944,836**

Projected Publication Date: Not Applicable

Non-Publication Request: No

Early Publication Request: No
** **SMALL ENTITY** **
Title

Maintenance Decision Support System and Method for Vehicular and Roadside Applications

Preliminary Class

340

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

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The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/944,836	07/17/2013	Christopher J. Rennie	5611-1-CIP-5

CONFIRMATION NO. 3020

19152
Concaten, Inc.
24918 Genesee Trail Road
Golden, CO 80401

PUB REQUEST ACCEPTANCE LETTER

OC000000073441808

Date Mailed: 02/17/2015

NOTICE OF ACCEPTANCE OF PUBLICATION REQUEST

The request for voluntary publication, amended publication, early publication, redacted publication, republication, corrected publication or revised publication has been received for this application. The request, including payment of any necessary fee(s), is in compliance with 37 CFR 1.215, 1.217, 1.219 or 1.221.

The projected publication date is 05/28/2015.

/dterry/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

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Power of Attorney:
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Projected Publication Date: Not Applicable

Non-Publication Request: No

Early Publication Request: No
**** SMALL ENTITY ****
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NOT GRANTED

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PATENT

Docket No.: 5611-1-CIP-5

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor: Christopher J. Rennie

Serial No.: 13/944836

Art Unit: 2682

Filed: July 17, 2013

Examiner: Hoi Ching Lau

Title: MAINTENANCE DECISION AND SUPPORT SYSTEM AND METHOD FOR VEHICULAR AND ROADSIDE APPLICATIONS

Mail Stop: Petitions
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Renewed Petition to Accept an Unintentionally Delayed Claim Under 37 C.F.R. § 1.78

Honorable Sir:

The Applicant hereby renews its petition to the Commissioner of Patents under 37 C.F.R. § 1.78(d) to request acceptance of an unintentionally delayed corrected benefit claim under 35 U.S.C. § 120 for benefit of prior-filed nonprovisional applications. On December 3, 2014, the Office issued a decision dismissing the Applicant's previous Petition under 37 C.F.R. § 1.78. Therefore, this renewed petition is timely, as it is being filed within two (2) months from the date of that decision. To address the deficiency noted in the December 3, 2014 decision, the Applicant has provided a correctly marked-up ADS, shown additions with underlining and deletions with strike-through.

Pertinent Facts

1. The present application is a continuation-in-part of U.S. Application Serial No. 13/616,412, filed September 14, 2012, now U.S. Patent 8497769, which is a continuation of U.S. Application Serial No. 13/345,480, filed January 6, 2012, now U.S. Patent 8284037, which is a continuation of U.S. Application Ser. No. 12/749,325, filed March 29, 2010, now U.S. Patent 8120473, which is a continuation of U.S. Application Ser. No. 12/046,121, filed March 11, 2008, now U.S. Patent 7714705, which is a continuation of U.S. Application Ser. No. 11/363,581, filed February 27, 2006, now U.S. Patent 7355509, which claims the benefits of U.S. Provisional Application Ser. No. 60/656,650, filed February 25, 2005.

2. The above priority claim is correctly listed in the first paragraph of the specification of the present application.

3. The Applicant filed an Application Data Sheet (ADS) at the time of filing the present application on July 17, 2013. The ADS incorrectly omits the relationship of "continuation-in-part" of the present application to prior nonprovisional application 13/616,412. This omission was unintentional.

3. Applicant has acted diligently and without delay from the time the error was discovered until the filing of the present Petition and corrective ADS with appropriate mark-ups.

Discussion

I. Authority for Unintentional Delay in Claiming the Benefit of a Prior-Filed Nonprovisional Application Under 35 USC § 120 in the Present Application.

37 C.F.R. § 1.78 (d) provides:

> (d) Delayed claims under 35 U.S.C. 120, 121, or 365(c) for the benefit of a prior-filed nonprovisional application or international application. If the reference required by 35 U.S.C. 120 and paragraph (c)(2) of this section is presented after the time period provided by paragraph (c)(3) of this section, the claim under 35 U.S.C. 120, 121, or 365(c) for the benefit of a prior-filed copending nonprovisional application or international application designating the United States of America may be accepted if the reference identifying the prior-filed application by application number or international application number and international filing date was unintentionally delayed. A petition to accept an unintentionally delayed claim under 35 U.S.C. 120, 121, or 365(c) for the benefit of a prior-filed application must be accompanied by: (1) The reference required by 35 U.S.C. 120 and paragraph (c)(2) of this section to the prior-filed application, unless previously submitted;
> (2) The surcharge set forth in § 1.17(t); and
> (3) A statement that the entire delay between the date the benefit claim was due under paragraph (c)(3) of this section and the date the benefit claim was filed was unintentional. The Director may require additional information where there is a question whether the delay was unintentional.

II. Accompanying Document

The present Petition is accompanied by a corrected Application Data Sheet (ADS) to correct the benefit claim listed therein. Pursuant to 37 C.F.R. 1.76, only those sections containing updated information are included in the attached corrected ADS, and information being changed is identified with underlining for insertions and strike-through for text removed.

III. Fee

The fee for the present Petition, pursuant to 37 C.F.R. § 1.17 (t), was paid on August 11, 2014, through the USPTO's EFS system.

IV. Statement Regarding Unintentional Delay

The entire delay between the date an ADS containing the correct priority benefit claim was due under 37 C.F.R. § 1.78 and the date the ADS containing the correct priority benefit claim was filed was unintentional.

Conclusion

The grant of the present Petition to accept the unintentionally delayed benefit claim under 35 USC § 120 is respectfully solicited. In the event the Office requires additional information regarding this Petition, Office personnel are cordially invited to contact the undersigned at the telephone number listed below.

Date: February 2, 2015

Respectfully submitted,

/CAH/

Carl A. Hjort, III, Esq.
ATTORNEY FOR APPLICANT
USPTO Reg. No. 56,934
Concaten, Inc.
24918 Genesee Trail Road
Golden, CO 80401
303-725-4365

Carl A. Hjort, III, Esq.
Concaten, Inc.
24918 Genesee Trail Road
Golden, CO 80401
303-725-4365

February 2, 2015

Mail Stop Petitions
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450
Attn: Sherry D. Brinkley

In re: Renewed Petition to Accept Unintentionally Delayed Priority Claim
US Serial No.: 13/944836
Title: Maintenance Decision Support System and Method for Vehicular and Roadside Applications
Filed: July 17, 2013

Dear Ms. Brinkley,

Thank you for the petition decision mailed on December 3, 2014 with respect to the above captioned matter. Please accept this renewed petition to accept the unintentionally delayed priority claim. To address the deficiency noted in your decision, I have enclosed a new corrected ADS, with information being changed identified with underlining for insertions and strike-through for text removed.

I believe this petition is now in condition for allowance, but if you should have any questions relative to this matter, you are cordially invited to contact me at the telephone number listed above.

Very Truly Yours,

s/Carl A. Hjort, III, Esq.

Enclosures

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	5611-1-CIP-5
	Application Number	13944836
Title of Invention	Maintenance Decision Support System and Method for Vehicular and Roadside Applications	

Domestic Benefit/ National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 C.F.R. 1.78

Prior Application Status	Patented				
Application Number	Continuity Type	Prior Application Number	Filing Date	Patent Number	Issue Date
13944836	Continuation -in-part of	13616412	2012-09-14	8497769	2013-07-30
Prior Application Status	~~Pending~~ Patented				
Application Number	Continuity Type	Prior Application Number	Filing Date	Patent Number	Issue Date
13616412	Continuation of	13345480	~~2013-01-06~~2012-01-06	8284037	2012-10-09
Prior Application Status		Patented			
Application Number	Continuity Type	Prior Application Number	Filing Date	Patent Number	Issue Date
13345480	Continuation of	12749325	2010-03-29	~~8284037~~ 8120473	~~2012-10-09~~2012-02-21
Prior Application Status	Patented				
Application Number	Continuity Type	Prior Application Number	Filing Date	Patent Number	Issue Date
12749325	Continuation of	12046121	2008-03-11	~~8120473~~ 7714705	~~2012-02-21~~ 2010-05-11
Prior Application Status	Patented				
Application Number	Continuity Type	Prior Application Number	Filing Date	Patent Number	Issue Date
12046121	Continuation of	11363581	2006-02-27	~~7714705~~ 7355509	~~2010-05-11~~ 2008-04-08
Prior Application Status	~~Patented~~ Expired				
Application Number	Continuity Type	Prior application Number	Filing date	~~Patent Number~~	~~Issue Date~~

11363581	Non provisional of	60656650	2005-02-25	~~7355509~~	~~2008-04-08~~

Signature: /CAH/ **Date: 02/01/2015**

Name: Carl Hjort **Registration Number: 56934**

Electronic Acknowledgement Receipt

EFS ID:	21367025
Application Number:	13944836
International Application Number:	
Confirmation Number:	3020
Title of Invention:	Maintenance Decision Support System and Method for Vehicular and Roadside Applications
First Named Inventor/Applicant Name:	Christopher J. Rennie
Customer Number:	19152
Filer:	Carl A. Hjort
Filer Authorized By:	
Attorney Docket Number:	5611-1-CIP-5
Receipt Date:	02-FEB-2015
Filing Date:	17-JUL-2013
Time Stamp:	02:30:52
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		RenewedPetition.pdf	33493 977f946ca400e8516232df40dd1d27edb29ee855	yes	5

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Petition for review by the Office of Petitions.	1	4
	Transmittal Letter	5	5

Warnings:					
Information:					
2	Application Data Sheet	correctedADS.pdf	34852 a886b5b7da861cd728eb3c1bef43cf441f9fc422	no	2
Warnings:					
Information:					
This is not an USPTO supplied ADS fillable form					
			Total Files Size (in bytes):	68345	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
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NOTICE OF ALLOWANCE AND FEE(S) DUE

19152 7590 01/16/2015

Concaten, Inc.
24918 Genesee Trail Road
Golden, CO 80401

EXAMINER
LAU, HOI CHING

ART UNIT	PAPER NUMBER
2682	

DATE MAILED: 01/16/2015

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/944,836	07/17/2013	Christopher J. Rennie	5611-1-CIP-5	3020

TITLE OF INVENTION: Maintenance Decision Support System and Method for Vehicular and Roadside Applications

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0	$480	$480	04/16/2015

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

19152 7590 01/16/2015
Concaten, Inc.
24918 Genesee Trail Road
Golden, CO 80401

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/944,836	07/17/2013	Christopher J. Rennie	5611-1-CIP-5	3020

TITLE OF INVENTION: Maintenance Decision Support System and Method for Vehicular and Roadside Applications

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0	$480	$480	04/16/2015

EXAMINER	ART UNIT	CLASS-SUBCLASS
LAU, HOI CHING	2682	340-426160

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.
1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. The following fee(s) are submitted:
❑ Issue Fee
❑ Publication Fee (No small entity discount permitted)
❑ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**
❑ A check is enclosed.
❑ Payment by credit card. Form PTO-2038 is attached.
❑ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
❑ Applicant certifying micro entity status. See 37 CFR 1.29
NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
❑ Applicant asserting small entity status. See 37 CFR 1.27
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
❑ Applicant changing to regular undiscounted fee status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

PTOL-85 Part B (10-13) Approved for use through 10/31/2013. OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/944,836	07/17/2013	Christopher J. Rennie	5611-1-CIP-5	3020

19152 7590 01/16/2015

Concaten, Inc.
24918 Genesee Trail Road
Golden, CO 80401

EXAMINER	
LAU, HOI CHING	

ART UNIT	PAPER NUMBER
2682	

DATE MAILED: 01/16/2015

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 13/944,836	Applicant(s) RENNIE ET AL.	
	Examiner HOI LAU	Art Unit 2682	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *RCE filed December 04, 2014*.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on_____.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are *1-20*. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov .
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some *c) ☐ None of the:
   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
5. ☐ Examiner's Amendment/Comment
6. ☒ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/HOI LAU/
Primary Examiner, Art Unit 2682

The present application is being examined under the pre-AIA first to invent provisions.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after allowance or after an Office action under *Ex Parte Quayle*, 25 USPQ 74, 453 O.G. 213 (Comm'r Pat. 1935). Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, prosecution in this application has been reopened pursuant to 37 CFR 1.114. Applicant's submission filed on December 04, 2014 has been entered.

1. Claims 1-20 are allowed.

Response to Amendment

The Application Data Sheet (ADS) submitted on August 11, 2014 was filed and is being considered by the examiner.

Allowable Subject Matter

2. The following is an examiner's statement of reasons for allowance:

Prior art made of record fails to teach,

Regarding Claim 1,

A method, comprising:

(a) receiving from a plurality of snow maintenance vehicles a plurality of sets of collected information, each of the sets of collected information comprising a snow maintenance vehicle physical location and at least one of weather and road conditions in an area of the respective snow maintenance vehicle;

(b) processing, by a server, the received sets of collected information to (i) provide a map associated with a physical location of a selected snow maintenance vehicle and (ii) determine an instruction for the selected snow maintenance vehicle

(c)

providing the map and the instruction to a user; and

(d)

wherein the following is true:

(dl)

the sets of collected information are sent to a data scrubbing server that identifies bad sets of collected information, said bad sets of collected information containing information that is incomplete or inaccurate, and wherein the data scrubbing server corrects or deletes the bad sets of collected information before forwarding the sets of collected information to the server for processing; and

(d2) the sets of collected information are directed through one or more auxiliary servers before the sets of collected information are sent to the server for processing.

Regarding Claim 11,

A system, comprising:

a server operable to:

(**a) receive from a plurality of snow maintenance vehicles, a plurality of sets of collected information, each of the sets of collected information comprising a snow maintenance vehicle physical location and at least one of weather and road conditions in an area of the respective snow maintenance vehicle;**

(b) process the received sets of collected information:

(i) to provide a map associated with a physical location of a selected snow maintenance vehicle;

(ii) to determine an instruction for the selected snow maintenance vehicle;

(c) provide the map and the instruction to a user; and

(d)

wherein the following is true:

(dl) the sets of collected information are sent to a data scrubbing server that identifies bad sets of collected information, said bad sets of collected information containing information that is incomplete or inaccurate, and wherein the data scrubbing server corrects or deletes the bad sets of collected

information before forwarding the sets of collected information to the server for processing; and

(d2) the sets of collected information are directed through one or more auxiliary servers before the sets of collected information are sent to the server for processing

The examiner found no suggestions or motivations to combine similar teachings from prior art made of record to overcome the limitations as discussed above.

3. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to HOI LAU whose telephone number is (571)272-8547. The examiner can normally be reached on M- F 8:30am - 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, George Bugg can be reached on (571)272-2998. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Hoi C Lau/
Primary Examiner, Art Unit 2682

PTO/SB/08a (01-10)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	13944836
Filing Date	2013-07-17
First Named Inventor	Christopher J. Rennie
Art Unit	2682
Examiner Name	Hoi Ching Lau
Attorney Docket Number	5611-1-CIP-5

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	4431867		1984-02-14	Heatherington	
	2	4440988		1984-04-03	Heatherington	
	3	4950913		1990-08-21	Kephart	
	4	5122959		1992-06-16	Nathanson	
	5	5272386		1993-12-21	Kephart	
	6	5563452		1996-10-08	Kephart	
	7	6466571		2002-10-15	Dynarski	
	8	7023825		2006-04-04	Haumont	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /H.L./

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	13944836
	Filing Date	2013-07-17
	First Named Inventor	Christopher J. Rennie
	Art Unit	2682
	Examiner Name	Hoi Ching Lau
	Attorney Docket Number	5611-1-CIP-5

	9	7211907		2007-05-01	Kephart	
	10	7620001		2009-11-17	Ganji	
	11	5699255		1997-12-16	Ellis	

If you wish to add additional U.S. Patent citation information please click the Add button. Add

U.S.PATENT APPLICATION PUBLICATIONS Remove

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20030028536		2006-02-06	Singh	

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FOREIGN PATENT DOCUMENTS Remove

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] ¡	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1	WO2001031488	WO		2002-01-24	Wells		☐

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NON-PATENT LITERATURE DOCUMENTS Remove

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1	MEYER, Benefit-Cost Assessment of Automatic Vehicle Location (AVL) in Highway Maintenance, August 2003 14 pages	☐

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /H.L./

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	13944836
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	Art Unit	2682
	Examiner Name	Hoi Ching Lau
	Attorney Docket Number	5611-1-CIP-5

	2	BISHOP, Arizona I-19 Wi-Fi Corridor: Assessment of Opportunities for Probe Data Operations, October 2005, 36 pages.	☐
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	13944836
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	First Named Inventor	Christopher J. Rennie
	Art Unit	2682
	Examiner Name	Hoi Ching Lau
	Attorney Docket Number	5611-1-CIP-5

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CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/CAH/	Date (YYYY-MM-DD)	2014-12-29
Name/Print	Carl A. Hjort, III	Registration Number	56934

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

Complete if Known	
Application Number	13/944836
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Art Unit	2612
Examiner Name	Hoi Ching Lau
Attorney Docket Number	5611-1-CIP-5

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U.S. PATENT DOCUMENTS					
Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code [2 (if known)]	Publication Date MM-DD-YYYY	Name of Patentee of Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
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Substitute for form 1449A/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				Application Number	13/944836
				Filing Date	07/17/2013
				First Named Inventor	Christopher J. Rennie
				Art Unit	2612
				Examiner Name	Hoi Ching Lau
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Examiner Signature	/Hoi Lau/	Date Considered	12/23/2014

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				Examiner Name	Hoi Ching Lau
Sheet	20	of	20	Attorney Docket Number	5611-1-CIP-5

	394	Background of the Invention for the above-captioned application (previously provided)

Examiner Signature	/Hoi Lau/	Date Considered	12/23/2014

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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13944836	RENNIE ET AL.
	Examiner	**Art Unit**
	HOI LAU	2682

CPC						
Symbol					**Type**	**Version**
G08G		1	/	20	F	2013-01-01
G08G		1	/	017	I	2013-01-01
H04L		67	/	125	I	2013-01-01
H04L		67	/	12	I	2013-01-01
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CPC Combination Sets							
Symbol					**Type**	**Set**	**Ranking**	**Version**
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NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	20	
/HOI LAU/ Primary Examiner.Art Unit 2682	12/15/2014	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	8

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13944836	RENNIE ET AL.
	Examiner	**Art Unit**
	HOI LAU	2682

US ORIGINAL CLASSIFICATION		INTERNATIONAL CLASSIFICATION	
CLASS	SUBCLASS	CLAIMED	NON-CLAIMED
340	426.16	B 6 0 R 25 / 10 (2013.0)	

CROSS REFERENCE(S)					
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)				
340	539.13	995.13	905		
701	32.7	29.1	32.1		

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	20	
/HOI LAU/ Primary Examiner.Art Unit 2682	12/15/2014	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	8

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13944836	RENNIE ET AL.
	Examiner	**Art Unit**
	HOI LAU	2682

☒ **Claims renumbered in the same order as presented by applicant** ☐ **CPA** ☐ **T.D.** ☐ **R.1.47**

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 20	
/HOI LAU/ Primary Examiner.Art Unit 2682 (Primary Examiner)	12/15/2014 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 8

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CONFIRMATION NO. 3020

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
13/944,836	07/17/2013 RULE	340	2682	5611-1-CIP-5

APPLICANTS

Concaten, Inc., Golden, CO, Assignee (with 37 CFR 1.172 Interest);

INVENTORS

Christopher J. Rennie, Seattle, WA;
Kevin K. Groeneweg, Golden, CO;

**** CONTINUING DATA ******************************\

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13944836	RENNIE ET AL.
	Examiner	Art Unit
	HOI LAU	2682

CPC- SEARCHED		
Symbol	Date	Examiner
G08G 1/096775	4/20/2014	HCL
G08G 1/0104	4/20/2014	HCL
G08G 1/0962	4/20/2014	HCL
G08G 1/096716	4/20/2014	HCL
G08G 1/096741	4/20/2014	HCL
H04W 4/02	4/20/2014	HCL
H04W 64/00	4/20/2014	HCL
G08B 21/00	4/20/2014	HCL

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
340	426.16,995.1,905,436,573.4,426.19,438,539.13,995.13	4/20/2014	HCL
342	357.07	4/20/2014	HCL
701	32.1,129.19	4/20/2014	HCL
239	172	4/20/2014	HCL
345	156	4/20/2014	HCL

SEARCH NOTES		
Search Notes	Date	Examiner
inventor search	10/6/13	HCL
east search	10/6/13	HCL
update east search	4/20/2014	HCL

INTERFERENCE SEARCH

US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
340	905,539.13,995.13	4/20/2014	HCL
701	31.1,32.7,29.1	4/20/2014	HCL

PTO/SB/08a (01-10)
Approved for use through 07/31/2012. OMB 0651-0031
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Application Number	13944836
Filing Date	2013-07-17
First Named Inventor	Christopher J. Rennie
Art Unit	2682
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U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	4431867		1984-02-14	Heatherington	
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	3	4950913		1990-08-21	Kephart	
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	Attorney Docket Number	5611-1-CIP-5

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	1	WO2001031488	WO		2002-01-24	Wells		☐

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Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
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	First Named Inventor	Christopher J. Rennie
	Art Unit	2682
	Examiner Name	Hoi Ching Lau
	Attorney Docket Number	5611-1-CIP-5

EXAMINER SIGNATURE			
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First Named Inventor	Christopher J. Rennie
Art Unit	2682
Examiner Name	Hoi Ching Lau
Attorney Docket Number	5611-1-CIP-5

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

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☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/CAH/	Date (YYYY-MM-DD)	2014-12-29
Name/Print	Carl A. Hjort, III	Registration Number	56934

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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EFS ID:	21069963
Application Number:	13944836
International Application Number:	
Confirmation Number:	3020
Title of Invention:	Maintenance Decision Support System and Method for Vehicular and Roadside Applications
First Named Inventor/Applicant Name:	Christopher J. Rennie
Customer Number:	19152
Filer:	Carl A. Hjort
Filer Authorized By:	
Attorney Docket Number:	5611-1-CIP-5
Receipt Date:	29-DEC-2014
Filing Date:	17-JUL-2013
Time Stamp:	02:41:06
Application Type:	Utility under 35 USC 111(a)

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3	Non Patent Literature	AFS0000001.pdf	2485849 2b48a99a043309390368748fbd4c3de8b1b0a00e	no	14
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4	Non Patent Literature	AFS0000015.pdf	3301988 0e5e5a610bcdd7230c7825df6039b8fbf9d2721c	no	36
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5	Non Patent Literature	AFS0000051.pdf	16491042 1a3f6c6778007b910bfe767311482d82377cc322	no	65
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6	Non Patent Literature	AFS0000116.pdf	6337546 cd30ad05bd2816cee2a3b3edda0bfa1c5ea0690b	no	7
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Warnings:					
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Information:					
9	Non Patent Literature	AFS0000812.pdf	3107048 3d62ffcff95ad646b1e73d6c9e619ea5abae04f3	no	5
Warnings:					
Information:					
10	Non Patent Literature	AFS0000817.pdf	8984825 fd6fe385f3afda9783a3678b8dc9f665dfc94c4a	no	15
Warnings:					
Information:					

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Warnings:	
Information:	
Total Files Size (in bytes):	56367226

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor: Christopher J. Rennie

Serial No.: 13/944836

Art Unit: 2681

Filed: July 17, 2013

Examiner: Hoi Ching Lau

Title: Maintenance Decision Support System and Method for Vehicular and Roadside Applications

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

INFORMATION DISCLOSURE STATEMENT

Honorable Sir:

The references cited on attached Form PTO-1449 are being called to the attention of the Examiner. Copies of the cited references have previously been supplied.

Submission of the above information is not intended as an admission that any item is citable under the statutes or rules to support a rejection, that any item disclosed represents analogous art, or that those skilled in the art would refer to or recognize the pertinence of any reference without the benefit of hindsight, nor should any inference be drawn as to the pertinence of the references based on the order in which they are presented. Submission of this statement should not be taken as an indication that a search has been conducted, or that no better art exists.

It is respectfully requested that the cited information be expressly considered during the prosecution of this application and the references made of record therein.

No fee is required for this filing.

If the Examiner should have any questions relative to this Information Disclosure Statement, he is cordially invited to contact the undersigned at the telephone number listed below.

Date: December 29, 2014

Respectfully submitted,

/CAH/

Carl A. Hjort, III, Esq.
ATTORNEY FOR APPLICANT
USPTO Reg. No. 56,934
Concaten, Inc.
24918 Genesee Trail Road
Golden, CO 80401
303-725-4365

Electronic Acknowledgement Receipt

EFS ID:	21069978
Application Number:	13944836
International Application Number:	
Confirmation Number:	3020
Title of Invention:	Maintenance Decision Support System and Method for Vehicular and Roadside Applications
First Named Inventor/Applicant Name:	Christopher J. Rennie
Customer Number:	19152
Filer:	Carl A. Hjort
Filer Authorized By:	
Attorney Docket Number:	5611-1-CIP-5
Receipt Date:	29-DEC-2014
Filing Date:	17-JUL-2013
Time Stamp:	02:51:32
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Non Patent Literature	AFS0000842.pdf	8049754 bb223a436a1f2526f6898ab4d3caf247d21766f7	no	55

Warnings:	
Information:	

2	Non Patent Literature	AFS0000897.pdf	6406297 413e86d2e611745df5822c48e845e492afeb5c58	no	8
Warnings:					
Information:					
3	Non Patent Literature	AFS0000905.pdf	22352865 a91579860497b9451dcf79f159d93fe6b070e685	no	72
Warnings:					
Information:					
4	Non Patent Literature	AFS0000977.pdf	5862253 4c8777f1ccb5eb0d34e7133d3d7f73369e116201	no	8
Warnings:					
Information:					
5	Non Patent Literature	AFS0000985.pdf	6568952 eb9cfea240a5db077884e215a187b990cd8c6ec5	no	16
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Information:					
6	Non Patent Literature	AFS0001737.pdf	2015869 241ee5d4d03b98513141e5264034a0c76ca5bd73	no	2
Warnings:					
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7	Non Patent Literature	AFS0001739.pdf	4528678 a04c19076313fec699bc4b14286cc37280a39455	no	12
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Information:					
8	Non Patent Literature	AFS0001751.pdf	1566030 ed7ee793f295dc8a9f5603b1ace8e50252f41a77	no	3
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9	Non Patent Literature	AFS0001754.pdf	4416990 04679fceaa8f56dd6d999313b9c312bad82517b7	no	12
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10	Non Patent Literature	AFS0001766.pdf	6902797 64e3fed1bab147437126c267b140ce08bfc23f2e	no	24
Warnings:					
Information:					

11	Non Patent Literature	AFS0001790.pdf	2137089 ab7357b80a497bc3b466633edfebffb88c305c00f	no	28
Warnings:					
Information:					
12	Non Patent Literature	AFS0001818.pdf	12203719 0938397ef83b7213889a246f41682240766f1d54	no	17
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The page size in the PDF is too large. The pages should be 8.5 x 11 or A4. If this PDF is submitted, the pages will be resized upon entry into the Image File Wrapper and may affect subsequent processing					
Information:					
13	Non Patent Literature	AFS0001835.pdf	25733125 6dd5a0da8c3114177af45466ded17b8e61401760	no	38
Warnings:					
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			Total Files Size (in bytes):	108744418	

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Electronic document/form generator

WO 2001031488 A3

Publication number	WO2001031488 A3
Publication type	Application
Application number	PCT/US2000/029762
Publication date	Jan 24, 2002
Filing date	Oct 27, 2000
Priority date	Oct 28, 1999
Also published as	WO2001031488A2
Inventors	Thomas O Wells, Eric K Yee
Applicant	B4Bpartner Inc, Thomas O Wells, Eric K Yee
Export Citation	BiBTeX, EndNote, RefMan

Classifications (6), Legal Events (8)

External Links: Patentscope, Espacenet

ABSTRACT

A faster and more efficient system and method is disclosed for electronically generating and signing documents, such as legal or financial documents, via the Internet or an Intranet. A question file and a template file are transmitted from a server to the user's browser when the user selects a specific form. Answers to such questions are inputted directly into the form as the user completes them and the user tabs to the next question without the user transmitting information to such server. The user can choose to electronically sign the document causing the system to associate the user's name, date and time at which the document was generated, a unique serial number and such other data with such document and present such data with the document when the system is requested to present such document. When the user generates the document, an answer file is sent to such server to generate the document.

CLASSIFICATIONS

International Classification	G06Q10/00, G06F17/24
Cooperative Classification	G06Q10/10, G06F17/243
European Classification	G06Q10/10, G06F17/24F

LEGAL EVENTS

Date	Code	Event	Description
Jul 30, 2004	NENP		**Ref country code:** JP
Mar 19, 2003	122		
Jan 24, 2002	AK		**Kind code of ref document:** A3 **Designated state(s):** AU CA CN JP MX RU US
Jan 24, 2002	AL		**Kind code of ref document:** A3 **Designated state(s):** AT BE CH CY DE DK ES FI FR GB GR IE IT LU MC NL PT SE
Oct 4, 2001	DFPE		
Jun 27, 2001	121		
May 3, 2001	AL		**Kind code of ref document:** A2 **Designated state(s):** AT BE CH CY DE DK ES FI FR GB GR IE IT LU MC NL PT SE
May 3, 2001	AK		**Kind code of ref document:** A2 **Designated state(s):** AU CA CN JP MX RU US

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AFS0002862

Electronic Acknowledgement Receipt

EFS ID:	21069987
Application Number:	13944836
International Application Number:	
Confirmation Number:	3020
Title of Invention:	Maintenance Decision Support System and Method for Vehicular and Roadside Applications
First Named Inventor/Applicant Name:	Christopher J. Rennie
Customer Number:	19152
Filer:	Carl A. Hjort
Filer Authorized By:	
Attorney Docket Number:	5611-1-CIP-5
Receipt Date:	29-DEC-2014
Filing Date:	17-JUL-2013
Time Stamp:	02:57:01
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Non Patent Literature	AFS0002243.pdf	20871413 bba1a8d2197476fde79ffe57c5454a75368d7e13	no	104

Warnings:	
Information:	

2	Non Patent Literature	AFS0002347.pdf	21154122 2d0ae97a9e4fd96e070b48594884d06822272aa1	no	125
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3	Non Patent Literature	AFS0002840.pdf	7424275 67be4480ded6199427adcfe62d17d657abe8a3ee	no	22
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Information:					
4	Foreign Reference	AFS0002862.pdf	619041 17f5ea82776cbc3d88c481f31188416623a185c7	no	1
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Information:					
			Total Files Size (in bytes):	50068851	

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Electronic Acknowledgement Receipt

EFS ID:	21077375
Application Number:	13944836
International Application Number:	
Confirmation Number:	3020
Title of Invention:	Maintenance Decision Support System and Method for Vehicular and Roadside Applications
First Named Inventor/Applicant Name:	Christopher J. Rennie
Customer Number:	19152
Filer:	Carl A. Hjort
Filer Authorized By:	
Attorney Docket Number:	5611-1-CIP-5
Receipt Date:	29-DEC-2014
Filing Date:	17-JUL-2013
Time Stamp:	15:57:04
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Non Patent Literature	AFS0001677c.pdf	5318681 1e0dd99e00fa7402187711c56b9f52a38d992ea3	no	60

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The page size in the PDF is too large. The pages should be 8.5 x 11 or A4. If this PDF is submitted, the pages will be resized upon entry into the Image File Wrapper and may affect subsequent processing

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2	Non Patent Literature	AFS0001873c.pdf	3311416 7683a8eb5a29fbd244717261b0126cf6c4b23f92	no	43
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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Electronic Acknowledgement Receipt

EFS ID:	21081842
Application Number:	13944836
International Application Number:	
Confirmation Number:	3020
Title of Invention:	Maintenance Decision Support System and Method for Vehicular and Roadside Applications
First Named Inventor/Applicant Name:	Christopher J. Rennie
Customer Number:	19152
Filer:	Carl A. Hjort
Filer Authorized By:	
Attorney Docket Number:	5611-1-CIP-5
Receipt Date:	29-DEC-2014
Filing Date:	17-JUL-2013
Time Stamp:	19:57:00
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
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Warnings:	
Information:	

2	Non Patent Literature	AFS0000136c12c.pdf	15075282 aad69b2504a6b72c43f06a5c05e7a011435568b4	no	113
Warnings:					
Information:					
3	Non Patent Literature	AFS0000136c21c.pdf	13269058 565ead43258a6a43b2071e2e43f7138bcd1e1fc2	no	113
Warnings:					
Information:					
4	Non Patent Literature	AFS0000136c22c.pdf	14229823 c15d30bea8e90ed1502c580f4622ec6b97b77c0e	no	112
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Information:					
5	Non Patent Literature	AFS0000136c31c.pdf	15882197 e1931efd503e4c683e75a29b0bf3a2bbc5195fb5	no	113
Warnings:					
Information:					
6	Non Patent Literature	AFS0000136c32c.pdf	14184640 88043f534e98f547e3ddc096c149639e8cb04ff7	no	113
Warnings:					
Information:					
		Total Files Size (in bytes):	89165363		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Doc code: RCEX
Doc description: Request for Continued Examination (RCE)

PTO/SB/30EFS (07-09)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL
(Submitted Only via EFS-Web)

Application Number	13944836	Filing Date	2013-07-17	Docket Number (if applicable)	5611-1-CIP-5	Art Unit	2682
First Named Inventor	Christopher J. Rennie			Examiner Name	Hoi Ching Lau		

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV

SUBMISSION REQUIRED UNDER 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

- ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____
- ☐ Other _____

☒ Enclosed

- ☐ Amendment/Reply
- ☐ Information Disclosure Statement (IDS)
- ☐ Affidavit(s)/ Declaration(s)
- ☒ Other A Statement Under 37 C.F.R. 1.55 or 1.78 for AIA Transition Applications

MISCELLANEOUS

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months _____ (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other _____

FEES

☒ **The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.**
The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No _____

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature

☐ Applicant Signature

PTO/SB/30EFS (07-09)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Signature of Registered U.S. Patent Practitioner			
Signature	/CAH/	Date (YYYY-MM-DD)	2014-12-05
Name	Carl A. Hjort, III	Registration Number	56934

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

PATENT

Docket No.: 5611-1-CIP-5

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor: Christopher J. Rennie

Serial No.: 13/944836

Art Unit: 2682

Filed: July 17, 2013

Examiner: Hoi Ching Lau

Title: MAINTENANCE DECISION AND SUPPORT SYSTEM AND METHOD FOR VEHICULAR AND ROADSIDE APPLICATIONS

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

Honorable Sir:

This application: (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March16, 2013. This application should be examined under the first inventor to file provisions of the AIA.

Date: December 4, 2014

Respectfully submitted,

/CAH/

Carl A. Hjort, III, Esq.
ATTORNEY FOR APPLICANT
USPTO Reg. No. 56,934
Concaten, Inc.
24918 Genesee Trail Road
Golden, CO 80401
303-725-4365

Electronic Patent Application Fee Transmittal

Application Number:	13944836
Filing Date:	17-Jul-2013
Title of Invention:	Maintenance Decision Support System and Method for Vehicular and Roadside Applications
First Named Inventor/Applicant Name:	Christopher J. Rennie
Filer:	Carl A. Hjort
Attorney Docket Number:	5611-1-CIP-5

Filed as Small Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Petition Fee-37CFR 1.17(h) (Group II)	2464	1	70	70
Request for Continued Examination	2801	1	600	600
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**670**

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

Decision Date : December 4, 2014

In re Application of :

Christopher Rennie

DECISION ON PETITION

UNDER CFR 1.313(c)(2)

Application No : 13944836

Filed : 17-Jul-2013

Attorney Docket No : 5611-1-CIP-5

This is an electronic decision on the petition under 37 CFR 1.313(c)(2), filed December 4, 2014, to withdraw the above-identified application from issue after payment of the issue fee.

The petition is **GRANTED.**

The above-identified application is withdrawn from issue for consideration of a submission under 37 CFR 1.114 (request for continued examination). See 37 CFR 1.313(c)(2).

Petitioner is advised that the issue fee paid in this application cannot be refunded. If, however, this application is again allowed, petitioner may request that it be applied towards the issue fee required by the new Notice of Allowance.

Telephone inquiries concerning this decision should be directed to the Patent Electronic Business Center (EBC) at 866-217-9197.

This application file is being referred to Technology Center AU 2682 for processing of the request for continuing examination under 37 CFR 1.114 .

Office of Petitions

Electronic Acknowledgement Receipt

EFS ID:	20872781
Application Number:	13944836
International Application Number:	
Confirmation Number:	3020
Title of Invention:	Maintenance Decision Support System and Method for Vehicular and Roadside Applications
First Named Inventor/Applicant Name:	Christopher J. Rennie
Customer Number:	19152
Filer:	Carl A. Hjort
Filer Authorized By:	
Attorney Docket Number:	5611-1-CIP-5
Receipt Date:	04-DEC-2014
Filing Date:	17-JUL-2013
Time Stamp:	20:12:32
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$670
RAM confirmation Number	6476
Deposit Account	
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)

1	Petition automatically granted by EFS	petition-request.pdf	31587 f9e8b0e5e8aca512f58da81e96c49e6edb8a681c	no	2
Warnings:					
Information:					
2	Request for Continued Examination (RCE)	sb0030e_fill.pdf	798022 eb932f1c540a476e025cac2966fbf16c624fe93a	no	3
Warnings:					
Information:					
3	Amendment Submitted/Entered with Filing of CPA/RCE	AIAtransitionstatement.pdf	20132 59ad70f2aafe92a749779f0e5b178e0eb38a102b	no	1
Warnings:					
Information:					
4	Fee Worksheet (SB06)	fee-info.pdf	31816 0b3121b3e8db4f35277b5f4a9fce8f2ab837fa7f	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	881557		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Doc Code: PET.AUTO Document Description: Petition automatically granted by EFS-Web	PTO/SB/140 U.S. Patent and Trademark Office Department of Commerce

Electronic Petition Request	**PETITION TO WITHDRAW AN APPLICATION FROM ISSUE AFTER PAYMENT OF THE ISSUE FEE UNDER 37 CFR 1.313(c)**
Application Number	13944836
Filing Date	17-Jul-2013
First Named Inventor	Christopher Rennie
Art Unit	2682
Examiner Name	HOI LAU
Attorney Docket Number	5611-1-CIP-5
Title	Maintenance Decision Support System and Method for Vehicular and Roadside Applications

An application may be withdrawn from issue for further action upon petition by the applicant. To request that the Office withdraw an application from issue, applicant must file a petition under this section including the fee set forth in § 1.17(h) and a showing of good and sufficient reasons why withdrawal of the application from issue is necessary.

APPLICANT HEREBY PETITIONS TO WITHDRAW THIS APPLICATION FROM ISSUE UNDER 37 CFR 1.313(c).

A grantable petition requires the following items:
(1) Petition fee; and
(2) One of the following reasons:
(a) Unpatentability of one or more claims, which must be accompanied by an unequivocal statement that one or more claims are unpatentable, an amendment to such claim or claims, and an explanation as to how the amendment causes such claim or claims to be patentable;
(b) Consideration of a request for continued examination in compliance with § 1.114 (for a utility or plant application only); or
(c) Express abandonment of the application. Such express abandonment may be in favor of a continuing application, but not a CPA under 37 CFR 1.53(d).

Petition Fee

◉	Small Entity
○	Micro Entity
○	Regular Undiscounted

Reason for withdrawal from issue

◯ One or more claims are unpatentable ◉ Consideration of a request for continued examination (RCE) (List of Required Documents and Fees) ◯ Applicant hereby expressly abandons the instant application (any attorney/agent signing for this reason must have power of attorney pursuant to 37 CFR 1.32(b)).
RCE request,submission, and fee. ☐ I certify, in accordance with 37 CFR 1.4(d)(4) that : The RCE request ,submission, and fee have already been filed in the above-identified application on ☒ Are attached.
THIS PORTION MUST BE COMPLETED BY THE SIGNATORY OR SIGNATORIES I certify, in accordance with 37 CFR 1.4(d)(4) that I am: ◉ An attorney or agent registered to practice before the Patent and Trademark Office who has been given power of attorney in this application. ◯ An attorney or agent registered to practice before the Patent and Trademark Office, acting in a representative capacity. ◯ A sole inventor ◯ A joint inventor; I certify that I am authorized to sign this submission on behalf of all of the inventors as evidenced by the power of attorney in the application ◯ A joint inventor; all of whom are signing this e-petition

Signature	/CAH/
Name	Carl A. Hjort III
Registration Number	56934

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/944,836	07/17/2013	Christopher J. Rennie	5611-1-CIP-5	3020

19152 7590 12/03/2014

Concaten, Inc.
24918 Genesee Trail Road
Golden, CO 80401

EXAMINER	
LAU, HOI CHING	

ART UNIT	PAPER NUMBER
2682	

MAIL DATE	DELIVERY MODE
12/03/2014	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

In re Application of	:	
Christopher J. Rennie, et al.	:	
Application No. 13/944,836	:	DECISION ON PETITION
Filed: July 17, 2013	:	UNDER 37 CFR 1.78(e)
Attorney Docket No.: 5611-1-CIP-5	:	

This is a decision on the petition, filed August 11, 2014, which is being treated under the provisions of 37 CFR § 1.78(e) to accept an unintentionally delayed claim under 35 U.S.C. § 120 for the benefit of priority to the prior-filed nonprovisional applications set forth in the concurrently filed Application Data Sheet (ADS).

The petition is **DISMISSED.**

A petition for acceptance of a claim for late priority under 37 CFR § 1.78(e) is only applicable to those applications filed after the expiration of the period specified in 37 CFR § 1.78(d)(3). In addition, the petition under 37 CFR § 1.78(e) must be accompanied by:

> **(1)** the reference required by 35 U.S.C. § 120 and 37 CFR § 1.78(d)(2) of the prior-filed application, which must be filed in an Application Data Sheet, unless previously submitted;
> **(2)** the petition fee set forth in § 1.17(m); and
> **(3)** a statement that the entire delay between the date the claim was due under 37 CFR § 1.78(d)(3) and the date the claim was filed was unintentional. The Director may require additional information where there is a question whether the delay was unintentional.

The petition does not comply with item (1).

In this regard, a proper Application Data Sheet (ADS) has not been submitted. The relevant portion of 37 CFR 1.76 reads:

> (c) *Correcting and updating an application datasheet.*
> * * *
> (2) An application data sheet providing corrected or updated information may include all of the sections listed in paragraph (b) of this section or only those sections containing updated information. The application data sheet must include the section headings listed in paragraph (b) of this section for each section included in the application data sheet, and must identify the information that is being changed, **with underlining for insertions, and strike-through or brackets for text removed**, except that identification of

> information being changed is not required for an application data sheet included with an initial submission under **35 U.S.C. 371**. Emphasis added

Before the petition under 37 CFR 1.78(e) can be granted, a renewed petition under 37 CFR 1.78(e) and an Application Data Sheet (complying with the provisions of and 37 CFR 1.76) to correct the above matter must be filed.

It is noted that the issue fee in this case was paid on July 23, 2014. Therefore, it is conceivable that the application will issue before either the filing or the granting of a renewed petition under 37 C.F.R. §1.78. In such case, submission of a certificate of correction including the required reference (along with the $100 fee under 37 CFR 1.20(a)) will be required as a condition for granting the petition under 37 C.F.R. §1.78.

Further correspondence with respect to this matter should be filed in TWO MONTHS and delivered through one of the following mediums:

By mail: Mail Stop PETITIONS
Commissioner for Patents
Post Office Box 1450
Alexandria, VA 22313-1450

By hand: Customer Service Window
Mail Stop Petitions
Randolph Building
401 Dulany Street
Alexandria, VA 22314

By fax: (571) 273-8300
ATTN: Office of Petitions

By internet: EFS-Web[1]

Any questions concerning this matter may be directed to the undersigned at (571) 272-3204.

/SDB/

Sherry D. Brinkley
Paralegal Specialist
Office of Petitions

[1] www.uspto.gov/ebc/efs_help.html (for help using EFS-Web call the Patent Electronic Business Center at (866) 217-9197)

Office of Petitions: Routing Sheet



Application No.: 13/944,836

This application is being forwarded to your office for further processing. A decision has been rendered on a petition filed in this application.

- [ ] **GRANTED**
- [x] **DISMISSED**
- [ ] **DENIED**

Office of Petitions: Decision Count Sheet

Mailing Month

Application No. 13944836

13944836

For US serial numbers: enter number only, no slashes or commas. Ex: 10123456
For PCT: enter "51+single digit of year of filing+last 5 numbers", Ex. for PCT/US05/12345, enter 51512345

Deciding Official: BRINKLEY, SHERRY

Count (1) - Palm Credit 13/944,836

Decision: DISMISSED

FINANCE WORK NEEDED
☐ Select Check Box for YES

DISMISSED

Decision Type: 535 - 37 CFR 1.78(a)(3) & (a)(6) UNINTENTIONAL DELAY F

535

Notes:

Count (2)

Decision: n/a

FINANCE WORK NEEDED
☐ Select Check Box for YES

Decision Type: NONE

Notes:

Count (3)

Decision: n/a

FINANCE WORK NEEDED
☐ Select Check Box for YES

Decision Type: NONE

Notes:

Initials of Approving Official (if required)

If more than 3 decisions, attach 2nd count sheet & mark this box ☐

Printed on: *12/2/2014*

PATENT

Docket No.: 5611-1-CIP-5

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor: Christopher J. Rennie

Serial No.: 13/944836

Art Unit: 2682

Filed: July 17, 2013

Examiner: Hoi Ching Lau

Title: MAINTENANCE DECISION AND SUPPORT SYSTEM AND METHOD FOR VEHICULAR AND ROADSIDE APPLICATIONS

Mail Stop: Petitions
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Petition to Accept an Unintentionally Delayed Claim Under 37 C.F.R. § 1.78

Honorable Sir:

In response to the Notice to File Corrected Application Parts[1] dated June 13, 2014, Applicant herby petitions under 37 C.F.R. § 1.78(d) to request acceptance of an unintentionally delayed corrected benefit claim under 35 U.S.C. § 120 for benefit of prior-filed nonprovisional applications.

[1] A copy of the Notice is included with this filing.

Pertinent Facts

1. The present application is a continuation-in-part of U.S. Application Serial No. 13/616,412, filed September 14, 2012, now U.S. Patent 8497769, which is a continuation of U.S. Application Serial No. 13/345,480, filed January 6, 2012, now U.S. Patent 8284037, which is a continuation of U.S. Application Ser. No. 12/749,325, filed March 29, 2010, now U.S. Patent 8120473, which is a continuation of U.S. Application Ser. No. 12/046,121, filed March 11, 2008, now U.S. Patent 7714705, which is a continuation of U.S. Application Ser. No. 11/363,581, filed February 27, 2006, now U.S. Patent 7355509, which claims the benefits of U.S. Provisional Application Ser. No. 60/656,650, filed February 25, 2005.

2. The above priority claim is correctly listed in the first paragraph of the specification of the present application.

3. The Applicant filed an Application Data Sheet (ADS) at the time of filing the present application on July 17, 2013. The ADS incorrectly omits the relationship of "continuation-in-part" of the present application to prior nonprovisional application 13/616,412. This omission was unintentional.

3. Applicant has acted diligently and without delay from the time the error was discovered until the filing of the present Petition and corrective ADS.

Discussion

I. Authority for Unintentional Delay in Claiming the Benefit of a Prior-Filed Nonprovisional Application Under 35 USC § 120 in the Present Application.

37 C.F.R. § 1.78 (d) provides:

> (d) Delayed claims under 35 U.S.C. 120, 121, or 365(c) for the benefit of a prior-filed nonprovisional application or international application. If the reference required by 35 U.S.C. 120 and paragraph (c)(2) of this section is presented after the time period provided by paragraph (c)(3) of this section, the claim under 35 U.S.C. 120, 121, or 365(c) for the benefit of a prior-filed copending nonprovisional application or international application designating the United States of America may be accepted if the reference identifying the prior-filed application by application number or international application number and international filing date was unintentionally delayed. A petition to accept an unintentionally delayed claim under 35 U.S.C. 120, 121, or 365(c) for the benefit of a prior-filed application must be accompanied by: (1) The reference required by 35 U.S.C. 120 and paragraph (c)(2) of this section to the prior-filed application, unless previously submitted;
> (2) The surcharge set forth in § 1.17(t); and
> (3) A statement that the entire delay between the date the benefit claim was due under paragraph (c)(3) of this section and the date the benefit claim was filed was unintentional. The Director may require additional information where there is a question whether the delay was unintentional.

II. Accompanying Document

The present Petition is accompanied by a corrected Application Data Sheet (ADS) to correct the benefit claim listed therein.

III. Fee

The fee for the present Petition, pursuant to 37 C.F.R. § 1.17 (t), was paid through the USPTO's EFS system at the time of filing this Petition.

IV. Statement Regarding Unintentional Delay

The entire delay between the date an ADS containing the correct priority benefit claim was due under 37 C.F.R. § 1.78 and the date the ADS containing the correct priority benefit claim was filed was unintentional.

Conclusion

The grant of the present Petition to accept the unintentionally delayed benefit claim under 35 USC § 120 is respectfully solicited. In the event the Office requires additional information regarding this Petition, Office personnel are cordially invited to contact the undersigned at the telephone number listed below.

Date: August 11, 2014

Respectfully submitted,

/CAH/

Carl A. Hjort, III, Esq.
ATTORNEY FOR APPLICANT
USPTO Reg. No. 56,934
Concaten, Inc.
24918 Genesee Trail Road
Golden, CO 80401
303-725-4365

PTO/AIA/14 (03-13)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	5611-1-CIP-5
	Application Number	
Title of Invention	Maintenance Decision Support System and Method for Vehicular and Roadside Applications	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Christopher	J.	Rennie	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

City	Seattle	State/Province	WA	Country of Residence i	US

Mailing Address of Inventor:

Address 1	3453 Walnut Ave. SW		
Address 2			
City	Seattle	State/Province	WA
Postal Code	98116	Country i	US

Inventor 2 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Kevin	K.	Groeneweg	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

City	Golden	State/Province	CO	Country of Residence i	US

Mailing Address of Inventor:

Address 1	24918 Genesee Trail Road		
Address 2			
City	Golden	State/Province	CO
Postal Code	80401	Country i	US

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

PTO/AIA/14 (03-13)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	5611-1-CIP-5
	Application Number	
Title of Invention	Maintenance Decision Support System and Method for Vehicular and Roadside Applications	

☐ **An Address is being provided for the correspondence Information of this application.**			
Customer Number	19152		
Email Address		Add Email	Remove Email

Application Information:

Title of the Invention	Maintenance Decision Support System and Method for Vehicular and Roadside Applications		
Attorney Docket Number	5611-1-CIP-5	**Small Entity Status Claimed**	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	14	**Suggested Figure for Publication (if any)**	

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	◉ Customer Number	○ US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	19152		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.

Prior Application Status	Patented	Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
13944836	Continuation in part of	13616412	2012-09-14	8497769	2013-07-30

Prior Application Status	Patented	Remove

PTO/AIA/14 (03-13)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	5611-1-CIP-5
	Application Number	
Title of Invention	Maintenance Decision Support System and Method for Vehicular and Roadside Applications	

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
13616412	Continuation of	13345480	2012-01-06	8284037	2012-10-09
Prior Application Status	Patented			Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
13345480	Continuation of	12749325	2010-03-29	8120473	2012-02-21
Prior Application Status	Patented			Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
12749325	Continuation of	12046121	2008-03-11	7714705	2010-05-11
Prior Application Status	Patented			Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
12046121	Continuation of	11363581	2006-02-27	7355509	2008-04-08
Prior Application Status	Expired			Remove	

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
11363581	non provisional of	60656650	2005-02-25

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button. Add

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(d). When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX) [i] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(h)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Remove

Application Number	Country [i]	Filing Date (YYYY-MM-DD)	Access Code [i] (if applicable)

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button. Add

PTO/AIA/14 (03-13)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	5611-1-CIP-5
	Application Number	
Title of Invention	Maintenance Decision Support System and Method for Vehicular and Roadside Applications	

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Authorization to Permit Access:

☐ Authorization to Permit Access to the Instant Application by the Participating Offices

If checked, the undersigned hereby grants the USPTO authority to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the World Intellectual Property Office (WIPO), and any other intellectual property offices in which a foreign application claiming priority to the instant patent application is filed access to the instant patent application. See 37 CFR 1.14(c) and (h). This box should not be checked if the applicant does not wish the EPO, JPO, KIPO, WIPO, or other intellectual property office in which a foreign application claiming priority to the instant patent application is filed to have access to the instant patent application.

In accordance with 37 CFR 1.14(h)(3), access will be provided to a copy of the instant patent application with respect to: 1) the instant patent application-as-filed; 2) any foreign application to which the instant patent application claims priority under 35 U.S.C. 119(a)-(d) if a copy of the foreign application that satisfies the certified copy requirement of 37 CFR 1.55 has been filed in the instant patent application; and 3) any U.S. application-as-filed from which benefit is sought in the instant patent application.

In accordance with 37 CFR 1.14(c), access may be provided to information concerning the date of filing this Authorization.

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

PTO/AIA/14 (03-13)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	5611-1-CIP-5
	Application Number	
Title of Invention	Maintenance Decision Support System and Method for Vehicular and Roadside Applications	

Applicant 1 Remove

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

(•) Assignee	( ) Legal Representative under 35 U.S.C. 117	( ) Joint Inventor
( ) Person to whom the inventor is obligated to assign.	( ) Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor :

If the Applicant is an Organization check here. [X]

Organization Name	Concaten, Inc.

Mailing Address Information:

Address 1	24918 Genesee Trail Road		
Address 2			
City	Golden	**State/Province**	CO
Country [i]	US	Postal Code	80401
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button. Add

Non-Applicant Assignee Information:

Providing assignment information in this section does not subsitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Assignee 1

Complete this section only if non-applicant assignee information is desired to be included on the patent application publication in accordance with 37 CFR 1.215(b). Do not include in this section an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest), as the patent application publication will include the name of the applicant(s).

Remove

If the Assignee is an Organization check here. [ ]

PTO/AIA/14 (03-13)
Approved for use through 01/31/2014. OMB 0651-0032
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	5611-1-CIP-5
	Application Number	
Title of Invention	Maintenance Decision Support System and Method for Vehicular and Roadside Applications	

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix

Mailing Address Information:

Address 1	
Address 2	

City		**State/Province**	
Country i		Postal Code	
Phone Number		Fax Number	
Email Address			

Additional Assignee Data may be generated within this form by selecting the Add button. Add

Remove

Signature:

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications

Signature	/CAH/			Date (YYYY-MM-DD)	2014-08-11
First Name	Carl	Last Name	Hjort	Registration Number	56934

Additional Signature may be generated within this form by selecting the Add button. Add

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

Application No. : 13944836
Applicant : Rennie
Filing Date : 07/17/2013
Date Mailed : 06/13/2014

NOTICE TO FILE CORRECTED APPLICATION PAPERS

Notice of Allowance Mailed

This application has been accorded an Allowance Date and is being prepared for issuance. The application, however, is incomplete for the reasons below.

Applicant is given two (2) months from the mail date of this Notice within which to respond. This time period for reply is extendable under 37 CFR 1.136(a) for only TWO additional MONTHS.

The application is not in compliance with 37 CFR 1.78, as indicated in the attachment. The consequences of failure to respond within the above-identified time period are set forth in the attachment.

Even if the Office has recognized a benefit claim and has entered it into the Office's database and included it on applicant's filing receipt, the benefit claim is not a proper benefit claim unless the reference in compliance with 37 CFR 1.78 is included, depending upon the application's filing date and as indicated in the attachment, in an application data sheet or in the first sentence(s) of the specification and all other requirements are met.

See attachment.

A copy of this notice MUST be returned with the reply. Please address response to "Mail Stop Issue Fee, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450".

/Janeen Saxer/
Publication Branch
Office of Data Management
(571) 272-4200

Application No. 13944836

APPLICATION FILED ON OR AFTER MARCH 16, 2013, NOT IN COMPLIANCE WITH 37 CFR 1.78

[X] The 37 CFR 1.78(c)(2) reference on the application data sheet does not indicate the relationship (continuation, division, continuation-in-part) to the prior U.S. nonprovisional application or international application designating the U.S. See document coded ADS dated 07/17/2013, listing application number(s) 13/616,412.

[ ] The 37 CFR 1.78(c)(2) reference on the application data sheet does not provide the U.S. nonprovisional application number (series code and serial number) or, with respect to an international PCT application designating the U.S., it provides the international application number or international filing date but not both. See document coded dated , in which the following is missing: .

[ ] The 37 CFR 1.78(c)(2) reference on the application data sheet shows an incorrect, incomplete, or illegible U.S. nonprovisional application number, international PCT application number, or international PCT filing date. See document coded dated , in which the following error was made: .

[ ] The 37 CFR 1.78(c)(2) reference to the prior U.S. nonprovisional application or international application designating the U.S. is not present on an application data sheet, thus removing the validating link under 35 U.S.C. 119(a)-(d) to a prior foreign application or under 35 U.S.C. 119(e) to a prior U.S. provisional application.

[ ] The 37 CFR 1.78(c)(2) reference to the prior U.S. nonprovisional application or international application designating the U.S. is not present on an application data sheet.

[ ] The 37 CFR 1.78(a)(3) reference to the prior U.S. provisional application is not present on an application data sheet.

[ ] The 37 CFR 1.78(a)(3) reference to the prior U.S. provisional application on an application data sheet does not provide the provisional application number (series code and serial number). See document coded dated , in which the following is missing: .

[ ] The 37 CFR 1.78(a)(3) reference to the prior U.S. provisional application on an application data sheet shows an incorrect, incomplete, or illegible U.S. provisional application number. See document coded dated , in which the following error was made: .

[ ] Other: .

HOW TO RESPOND

A proper response to this notice would include: (1) a corrected Application Data Sheet (ADS) pursuant to 37 CFR 1.76(c) which provides the benefit information from the attached filing receipt which would make the benefit information comply with 37 CFR 1.78(c)(2) or 37 CFR 1.78(a)(3) or (2) a petition filed pursuant to the provisions of 37 CFR 1.78(b) or 37 CFR 1.78(d) if the benefit information from the attached filing receipt does not accurately reflect the benefits under 35 U.S.C. 119(e), 120, 121 or 365(c) as claimed by applicant (a grantable petition would include a corrected ADS as required by 37 CFR 1.78(b)(1) or 37 CFR 1.78(d)(1)).

WARNING: If Applicant fails to timely submit a proper response, the benefit information will be deleted and the patent will be printed without the benefit information present.

Electronic Patent Application Fee Transmittal

Application Number:	13944836
Filing Date:	17-Jul-2013
Title of Invention:	Maintenance Decision Support System and Method for Vehicular and Roadside Applications
First Named Inventor/Applicant Name:	Christopher J. Rennie
Filer:	Carl A. Hjort
Attorney Docket Number:	5611-1-CIP-5

Filed as Small Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Pet. Delay Sub or Restore Priority-Claim	2454	1	850	850
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
			Total in USD ($)	**850**

Electronic Acknowledgement Receipt

EFS ID:	19836161
Application Number:	13944836
International Application Number:	
Confirmation Number:	3020
Title of Invention:	Maintenance Decision Support System and Method for Vehicular and Roadside Applications
First Named Inventor/Applicant Name:	Christopher J. Rennie
Customer Number:	19152
Filer:	Carl A. Hjort
Filer Authorized By:	
Attorney Docket Number:	5611-1-CIP-5
Receipt Date:	11-AUG-2014
Filing Date:	17-JUL-2013
Time Stamp:	19:36:58
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$850
RAM confirmation Number	6296
Deposit Account	
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)

1	Petition for review by the Office of Petitions.	Petition.pdf	29128 ec9169c78c392bc80f1bc130655a6241ff07dd63	no	4
Warnings:					
Information:					
2	Application Data Sheet	aia0014.pdf	1506007 964e27f53000e8ee4efd0562ddf1279e92e38f20	no	7
Warnings:					
Information:					
3	Miscellaneous Incoming Letter	notice.pdf	96968 8e2b8ceb344844dbae688a8ce5802d9b623d73ef	no	2
Warnings:					
Information:					
4	Fee Worksheet (SB06)	fee-info.pdf	30052 5008548ba3ee7c6600722514d83b852c18e92f4f	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	1662155		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

Concaten, Inc.
24918 Genesee Trail Road
Golden, CO 80401

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/944836	07/17/2013	Christopher J. Rennie	5611-1-CIP-5	3020

TITLE OF INVENTION:

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0	$0	$480	07/24/2014

EXAMINER	ART UNIT	CLASS-SUBCLASS

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 Carl A. Hjort, III

2 _____

3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: Concaten, Inc.

(B) RESIDENCE: (CITY and STATE OR COUNTRY): Golden, CO

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ■ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

☑ Issue Fee

☐ Publication Fee (No small entity discount permitted)

☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**

☐ A check is enclosed.

☑ Payment by credit card. Form PTO-2038 is attached.

☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)

☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27.

☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature /CAH/ Date 07/23/2014

Typed or printed name Carl A. Hjort, III Registration No. 56934

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

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The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal

Application Number:	13944836
Filing Date:	17-Jul-2013
Title of Invention:	Maintenance Decision Support System and Method for Vehicular and Roadside Applications
First Named Inventor/Applicant Name:	Christopher J. Rennie
Filer:	Carl A. Hjort
Attorney Docket Number:	5611-1-CIP-5

Filed as Small Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Utility Appl Issue Fee	2501	1	480	480
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
			Total in USD ($)	**480**

Electronic Acknowledgement Receipt

EFS ID:	19666800
Application Number:	13944836
International Application Number:	
Confirmation Number:	3020
Title of Invention:	Maintenance Decision Support System and Method for Vehicular and Roadside Applications
First Named Inventor/Applicant Name:	Christopher J. Rennie
Customer Number:	19152
Filer:	Carl A. Hjort
Filer Authorized By:	
Attorney Docket Number:	5611-1-CIP-5
Receipt Date:	23-JUL-2014
Filing Date:	17-JUL-2013
Time Stamp:	21:00:57
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$480
RAM confirmation Number	8868
Deposit Account	
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)

1	Issue Fee Payment (PTO-85B)	ptol85b13944836.pdf	73290 71e8cf8b91a3c76bbb469c11787737d6d4f15172	no	2
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30057 ab659453dcd279720a885a26a70eca5293f8f64d	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	103347	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/944,836	07/17/2013	Christopher J. Rennie	5611-1-CIP-5	3020

19152 7590 06/13/2014

Concaten, Inc.
24918 Genesee Trail Road
Golden, CO 80401

EXAMINER	
LAU, HOI CHING	
ART UNIT	**PAPER NUMBER**
2682	

MAIL DATE	DELIVERY MODE
06/13/2014	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

Application No. : 13944836
Applicant : Rennie
Filing Date : 07/17/2013
Date Mailed : 06/13/2014

NOTICE TO FILE CORRECTED APPLICATION PAPERS

Notice of Allowance Mailed

This application has been accorded an Allowance Date and is being prepared for issuance. The application, however, is incomplete for the reasons below.

Applicant is given two (2) months from the mail date of this Notice within which to respond. This time period for reply is extendable under 37 CFR 1.136(a) for only TWO additional MONTHS.

The application is not in compliance with 37 CFR 1.78, as indicated in the attachment. The consequences of failure to respond within the above-identified time period are set forth in the attachment.

Even if the Office has recognized a benefit claim and has entered it into the Office's database and included it on applicant's filing receipt, the benefit claim is not a proper benefit claim unless the reference in compliance with 37 CFR 1.78 is included, depending upon the application's filing date and as indicated in the attachment, in an application data sheet or in the first sentence(s) of the specification and all other requirements are met.

See attachment.

A copy of this notice MUST be returned with the reply. Please address response to "Mail Stop Issue Fee, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450".

/Janeen Saxer/
Publication Branch
Office of Data Management
(571) 272-4200

Application No. 13944836

APPLICATION FILED ON OR AFTER MARCH 16, 2013, NOT IN COMPLIANCE WITH 37 CFR 1.78

[X] The 37 CFR 1.78(c)(2) reference on the application data sheet does not indicate the relationship (continuation, division, continuation-in-part) to the prior U.S. nonprovisional application or international application designating the U.S. See document coded ADS dated 07/17/2013, listing application number(s) 13/616,412.

[ ] The 37 CFR 1.78(c)(2) reference on the application data sheet does not provide the U.S. nonprovisional application number (series code and serial number) or, with respect to an international PCT application designating the U.S., it provides the international application number or international filing date but not both. See document coded dated , in which the following is missing: .

[ ] The 37 CFR 1.78(c)(2) reference on the application data sheet shows an incorrect, incomplete, or illegible U.S. nonprovisional application number, international PCT application number, or international PCT filing date. See document coded dated , in which the following error was made: .

[ ] The 37 CFR 1.78(c)(2) reference to the prior U.S. nonprovisional application or international application designating the U.S. is not present on an application data sheet, thus removing the validating link under 35 U.S.C. 119(a)-(d) to a prior foreign application or under 35 U.S.C. 119(e) to a prior U.S. provisional application.

[ ] The 37 CFR 1.78(c)(2) reference to the prior U.S. nonprovisional application or international application designating the U.S. is not present on an application data sheet.

[ ] The 37 CFR 1.78(a)(3) reference to the prior U.S. provisional application is not present on an application data sheet.

[ ] The 37 CFR 1.78(a)(3) reference to the prior U.S. provisional application on an application data sheet does not provide the provisional application number (series code and serial number). See document coded dated , in which the following is missing: .

[ ] The 37 CFR 1.78(a)(3) reference to the prior U.S. provisional application on an application data sheet shows an incorrect, incomplete, or illegible U.S. provisional application number. See document coded dated , in which the following error was made: .

[ ] Other: .

HOW TO RESPOND

A proper response to this notice would include: (1) a corrected Application Data Sheet (ADS) pursuant to 37 CFR 1.76(c) which provides the benefit information from the attached filing receipt which would make the benefit information comply with 37 CFR 1.78(c)(2) or 37 CFR 1.78(a)(3) or (2) a petition filed pursuant to the provisions of 37 CFR 1.78(b) or 37 CFR 1.78(d) if the benefit information from the attached filing receipt does not accurately reflect the benefits under 35 U.S.C. 119(e), 120, 121 or 365(c) as claimed by applicant (a grantable petition would include a corrected ADS as required by 37 CFR 1.78(b)(1) or 37 CFR 1.78(d)(1)).

WARNING: If Applicant fails to timely submit a proper response, the benefit information will be deleted and the patent will be printed without the benefit information present.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
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Address: COMMISSIONER FOR PATENTS
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www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

19152 7590 04/24/2014

Concaten, Inc.
24918 Genesee Trail Road
Golden, CO 80401

EXAMINER
LAU, HOI CHING

ART UNIT	PAPER NUMBER
2682	

DATE MAILED: 04/24/2014

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/944,836	07/17/2013	Christopher J. Rennie	5611-1-CIP-5	3020

TITLE OF INVENTION: Maintenance Decision Support System and Method for Vehicular and Roadside Applications

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0	$0	$480	07/24/2014

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

19152 7590 04/24/2014
Concaten, Inc.
24918 Genesee Trail Road
Golden, CO 80401

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/944,836	07/17/2013	Christopher J. Rennie	5611-1-CIP-5	3020

TITLE OF INVENTION: Maintenance Decision Support System and Method for Vehicular and Roadside Applications

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0	$0	$480	07/24/2014

EXAMINER	ART UNIT	CLASS-SUBCLASS
LAU, HOI CHING	2682	340-426160

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
- ❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.
1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. The following fee(s) are submitted:
- ❑ Issue Fee
- ❑ Publication Fee (No small entity discount permitted)
- ❑ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**
- ❑ A check is enclosed.
- ❑ Payment by credit card. Form PTO-2038 is attached.
- ❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
- ❑ Applicant certifying micro entity status. See 37 CFR 1.29 — NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
- ❑ Applicant asserting small entity status. See 37 CFR 1.27 — NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
- ❑ Applicant changing to regular undiscounted fee status. — NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

PTOL-85 Part B (10-13) Approved for use through 10/31/2013. OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/944,836	07/17/2013	Christopher J. Rennie	5611-1-CIP-5	3020

19152 7590 04/24/2014

Concaten, Inc.
24918 Genesee Trail Road
Golden, CO 80401

EXAMINER	
LAU, HOI CHING	
ART UNIT	PAPER NUMBER
2682	

DATE MAILED: 04/24/2014

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)

(application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 0 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 0 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 13/944,836	Applicant(s) RENNIE ET AL.	
	Examiner HOI LAU	Art Unit 2682	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *amendment filed April 08, 2014*.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on_____.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are *1-20*. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov .
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some *c) ☐ None of the:
   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date 04/08/2014
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
5. ☐ Examiner's Amendment/Comment
6. ☒ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/HOI LAU/
Primary Examiner, Art Unit 2682

The present application is being examined under the pre-AIA first to invent provisions.

DETAILED ACTION

1. Claims 1-20 are allowed.

Allowable Subject Matter

2. The following is an examiner's statement of reasons for allowance:

Prior art made of record fails to teach,

Regarding Claim 1,

A method, comprising:

(a) receiving from a plurality of snow maintenance vehicles a plurality of sets of collected information, each of the sets of collected information comprising a snow maintenance vehicle physical location and at least one of weather and road conditions in an area of the respective snow maintenance vehicle;

(b) processing, by a server, the received sets of collected information to (i) provide a map associated with a physical location of a selected snow maintenance vehicle and (ii) determine an instruction for the selected snow maintenance vehicle

(c)

providing the map and the instruction to a user; and

(d)

wherein the following is true:

(dl)

the sets of collected information are sent to a data scrubbing server that identifies bad sets of collected information, said bad sets of collected information containing information that is incomplete or inaccurate, and wherein the data scrubbing server corrects or deletes the bad sets of collected information before forwarding the sets of collected information to the server for processing; and

(d2) the sets of collected information are directed through one or more auxiliary servers before the sets of collected information are sent to the server for processing.

Regarding Claim 11,

A system, comprising:

a server operable to:

(**a) receive from a plurality of snow maintenance vehicles, a plurality of sets of collected information, each of the sets of collected information comprising a snow maintenance vehicle physical location and at least one of weather and road conditions in an area of the respective snow maintenance vehicle;**

(b) process the received sets of collected information:

(i) to provide a map associated with a physical location of a selected snow maintenance vehicle;

(ii) to determine an instruction for the selected snow maintenance vehicle;

(c) provide the map and the instruction to a user; and

(d)

wherein the following is true:

(dl) the sets of collected information are sent to a data scrubbing server that identifies bad sets of collected information, said bad sets of collected information containing information that is incomplete or inaccurate, and wherein the data scrubbing server corrects or deletes the bad sets of collected information before forwarding the sets of collected information to the server for processing; and

(d2) the sets of collected information are directed through one or more auxiliary servers before the sets of collected information are sent to the server for processing

The examiner found no suggestions or motivations to combine similar teachings from prior art made of record to overcome the limitations as discussed above.

3. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to HOI LAU whose telephone number is (571)272-8547. The examiner can normally be reached on M- F 8:30am - 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, George Bugg can be reached on (571)272-2998. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Hoi C Lau/
Primary Examiner, Art Unit 2682

Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

Complete if Known	
Application Number	13/944836
Filing Date	07/17/2013
First Named Inventor	Christopher J. Rennie
Art Unit	2612
Examiner Name	Hoi Ching Lau
Attorney Docket Number	5611-1-CIP-5

Sheet	1	of	20

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code [2 (if known)]	Publication Date MM-DD-YYYY	Name of Patentee of Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	1	3160964	12/15/64	Boyer et al.	
	2	3344993	10/03/67	Wilder et al.	
	3	3420451	01/07/69	Kahlbacher	
	4	3459375	08/05/69	Goffin	
	5	3519169	07/07/70	Holland	
	6	3540655	11/17/70	Hinrichs	
	7	3559894	02/02/71	Murray et al.	
	8	3655130	04/11/72	Patrick	
	9	3776421	12/04/73	Harrison et al.	
	10	3776431	12/04/73	Riley	
	11	3856206	12/24/74	Bell et al.	
	12	3891979	06/24/75	Braun et al.	
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	394	Background of the Invention for the above-captioned application (previously provided)

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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	222	@ad<="20060227" and ((vehic$6 automobile) near10 (location position$6 track$6 locat$6) and (vehic$6 automobile) near15 (weather or road near3 condition) and map$6 near15 (vehic$6 automobile) near15 (location position$6) same (server network center central station (intelligent near3 Transportation near3 System) "its")).detd. not breed.inv.	US-PGPUB; USPAT	OR	ON	2014/04/20 15:21
L2	47	L1 and ((vehic$6 automobile) same ((sens$6 detect$6 collect$6 track$6) near5 (location$5 position$6) gps global near3 position$6) and (vehic$6 automobile) same (sens$6 detect$6 collect$6) near10 (weather road near5 condition snow$6 rain$6)).detd.	US-PGPUB; USPAT	OR	ON	2014/04/20 15:21
L10	65969	"8" and snow$6.detd.	US-PGPUB; USPAT	OR	ON	2014/04/20 15:39

EAST Search History (Interference)

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L5	24	L4 and ((vehic$6 automobile) same ((sens$6 detect$6 collect$6 track$6) near5 (location$5 position$6) gps global near3 position$6) and (vehic$6 automobile) same (sens$6 detect$6 collect$6) near10 (weather road near5 condition snow$6 rain$6)).detd.	USPAT; UPAD	OR	ON	2014/04/20 15:29
L6	29	@ad<="20060227" and (snow$3plow or snow$3plough or snow near3 (plough plow vehicle automobile)) same (location position$6 track$6 locat$6) and weather and map$6 and route	USPAT; UPAD	OR	ON	2014/04/20 15:29
L7	45	@ad<="20060227" and (snow$3plow or snow$3plough or snow near3 (plough plow vehicle automobile)) same (location position$6 track$6 locat$6) and weather and map	USPAT; UPAD	OR	ON	2014/04/20 15:29
L8	2692	@ad<="20060227" and (server network center central) and (snow$3plow or	USPAT; UPAD	OR	ON	2014/04/20 15:29

		snow$3plough or snow near3 (plough plow vehicle automobile))				
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L11	34727	"8" and snow$6.detd.	USPAT; UPAD	OR	ON	2014/04/20 15:39
L12	120	@ad<="20060227" and ((vehic$6 automobile) near10 (location position$6 track$6 locat$6) and (vehic$6 automobile) near15 (weather or road near3 condition) and map$6 near15 (vehic$6 automobile) near15 (location position$6) same (server network center central station)).detd. not breed.inv.	USPAT; UPAD	OR	ON	2014/04/20 15:39
L13	10	12 and ((vehic$6 automobile) near10 ((sens$6 detect$6 collect$6) near5 (location$5 position$6) gps global near3 position$6) and (vehic$6 automobile) near10 (sens$6 detect$6 collect$6) near5 (weather road near3 condition snow$6 rain$6)).detd.	USPAT; UPAD	OR	ON	2014/04/20 15:42
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L15	3	14 and ((vehic$6 automobile) near10 (location position$6 track$6 locat$6) and (vehic$6 automobile) near15 (weather or road near3 condition) and map$6 near15 (vehic$6 automobile) near15 (location position$6) same (server network center central station)).detd.	USPAT; UPAD	OR	ON	2014/04/20 15:43

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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13944836	RENNIE ET AL.
	Examiner	**Art Unit**
	HOI LAU	2682

CPC							
Symbol						**Type**	**Version**
G08G		1	/	096775		F	20130101
G08G		1	/	0104		I	20130101
G08G		1	/	0962		I	20130101
G08G		1	/	096716		I	20130101
G08G		1	/	096741		I	20130101
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CPC Combination Sets							
Symbol					**Type**	**Set**	**Ranking**	**Version**
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NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	20	
/HOI LAU/ Primary Examiner.Art Unit 2682	04/20/2014	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	8

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13944836	RENNIE ET AL.
	Examiner	**Art Unit**
	HOI LAU	2682

US ORIGINAL CLASSIFICATION		INTERNATIONAL CLASSIFICATION	
CLASS	SUBCLASS	CLAIMED	NON-CLAIMED
340	426.16	B 6 0 R 25 / 10 (2013.01.01)	

CROSS REFERENCE(S)					
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)				
340	539.13	995.13	905		
701	32.7	29.1	32.1		

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	20	
/HOI LAU/ Primary Examiner.Art Unit 2682	04/20/2014	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	8

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13944836	RENNIE ET AL.
	Examiner	**Art Unit**
	HOI LAU	2682

☒ **Claims renumbered in the same order as presented by applicant** ☐ **CPA** ☐ **T.D.** ☐ **R.1.47**

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 20	
/HOI LAU/ Primary Examiner.Art Unit 2682 (Primary Examiner)	04/20/2014 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 8

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13944836	RENNIE ET AL.
	Examiner	Art Unit
	HOI LAU	2682

CPC- SEARCHED

Symbol	Date	Examiner
G08G 1/096775	4/20/2014	HCL
G08G 1/0104	4/20/2014	HCL
G08G 1/0962	4/20/2014	HCL
G08G 1/096716	4/20/2014	HCL
G08G 1/096741	4/20/2014	HCL
H04W 4/02	4/20/2014	HCL
H04W 64/00	4/20/2014	HCL
G08B 21/00	4/20/2014	HCL

CPC COMBINATION SETS - SEARCHED

Symbol	Date	Examiner

US CLASSIFICATION SEARCHED

Class	Subclass	Date	Examiner
340	426.16,995.1,905,436,573.4,426.19,438,539.13,995.13	4/20/2014	HCL
342	357.07	4/20/2014	HCL
701	32.1,129.19	4/20/2014	HCL
239	172	4/20/2014	HCL
345	156	4/20/2014	HCL

SEARCH NOTES

Search Notes	Date	Examiner
inventor search	10/6/13	HCL
east search	10/6/13	HCL
update east search	4/20/2014	HCL

INTERFERENCE SEARCH

	/HOI LAU/ Primary Examiner.Art Unit 2682

US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
340	905,539.13,995.13	4/20/2014	HCL
701	31.1,32.7,29.1	4/20/2014	HCL

	/HOI LAU/ Primary Examiner.Art Unit 2682

PATENT

Docket No.: 5611-1-CIP-5

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor: Christopher J. Rennie

Serial No.: 13/944836

Art Unit: 2682

Filed: July 17, 2013

Examiner: Hoi Ching Lau

Title: MAINTENANCE DECISION AND SUPPORT SYSTEM AND METHOD FOR VEHICULAR AND ROADSIDE APPLICATIONS

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Amendment and Reply to Office Action

Honorable Sir:

This Reply is submitted in response to the Non-Final Office Action dated October 9, 2013, issued by the United States Patent and Trademark Office in connection with the above-identified patent application. The fee for a three-month extension of time accompanies this Reply.

Amendments to the Claims begin on page 3 of this Reply.

Remarks and Arguments begin on page 10 of this Reply.

In the Claims

The following listing of claims, as required by 37 CFR §1.121(c), replaces all prior version of the claims in the application. The amendments have been made to more clearly define the scope of what the Applicant intends to claim and no new matter has been added by way of the following amendments. A clean version of the claims is included in the Appendix to this Reply.

1. (currently amended) A method, comprising:

(a) receiving from a plurality of snow maintenance vehicles a plurality of sets of collected information, each of the sets of collected information comprising a snow maintenance vehicle physical location and at least one of weather and road conditions in an area of the respective snow maintenance vehicle;

(b) processing, by a server, the received sets of collected information to (i) provide a map associated with a physical location of a selected snow maintenance vehicle and (ii) determine an instruction for the selected snow maintenance vehicle ~~and/or route~~;

(c) providing the map and the instruction to a user; and

(d) wherein ~~at least one of~~ the following is true:

(d1) the sets of collected information are sent to a data scrubbing server that identifies bad sets of collected information, said bad sets of collected information containing information that is incomplete or inaccurate, and wherein the data scrubbing server corrects or deletes the bad sets of collected information before forwarding the sets of collected information to the server for processing; ~~or~~ and

(d2) the sets of collected information are directed through one or more auxiliary servers before the sets of collected information are sent to the server for processing.

2. (original) The method of claim 1, wherein the instruction comprises one or more of a dispatch command, an alarm based on a temporal trend in weather conditions, an alarm based on a difference in weather conditions, an alarm based on a temporal trend in

road conditions, an alarm based on a difference in road conditions, a snow plow setting, a mixture of materials being applied to a road surface, and an amount of materials being applied to the road surface.

3. (original) The method of claim 1 further comprising the steps of:

(1) determining, by at least one processor, that at least one of a received signal strength from a wireless network and a Quality of Service ("QoS") parameter is not acceptable;

(2) buffering, by the at least one processor, the collected information when the at least one of a received signal strength from a wireless network and a QoS parameter is not acceptable;

(3) when the at least one of a received signal strength from a wireless network and a QoS parameter is acceptable, sending, by the at least one processor, from an Internet Protocol ("IP") address of the of the at least one processor, and over a wireless network, the collected information and physical location to an electronic address associated with the server.

4. (original) The method of claim 1, wherein the user is an operator of the respective snow maintenance vehicle.

5. (original) The method of claim 4, wherein the instruction and the map are transmitted over a wireless network to a handheld device associated with the user.

6. (original) The method of claim 4, wherein the instruction is provided to the user orally via a radio signal.

7. (original) The method of claim 1, wherein the user is a supervisor not located in the respective snow maintenance vehicle.

8. (original) The method of claim 7, wherein the at least one of the map and the instruction are provided to the supervisor at a non-portable computer terminal.

9. (original) The method of claim 7, wherein the at least one of the map and the instruction are provided to the supervisor at a portable computer via a wireless signal.

10. (original) The method of claim 7, wherein the supervisor sends the at least one of the map and the instruction to the operator of the respective snow maintenance vehicle.

11. (currently amended) A system, comprising:

a server operable to:

(a) receive from a plurality of snow maintenance vehicles, a plurality of sets of collected information, each of the sets of collected information comprising a snow maintenance vehicle physical location and at least one of weather and road conditions in an area of the respective snow maintenance vehicle;

(b) process the received sets of collected information:

(i) to provide a map associated with a physical location of a selected snow maintenance vehicle;

(ii) to determine an instruction for the selected snow maintenance vehicle ~~and/or route~~;

(c) provide the map and the instruction to a user; and

(d) wherein ~~at least one of~~ the following is true:

(d1) the sets of collected information are sent to a data scrubbing server that identifies bad sets of collected information, said bad sets of collected information containing information that is incomplete or inaccurate, and wherein the data scrubbing server corrects or deletes the bad sets of collected information before forwarding the sets of collected information to the server for processing; ~~or~~ and

(d2) the sets of collected information are directed through one or more auxiliary servers before the sets of collected information are sent to the server for processing.

12. (original) The system of claim 11, wherein the instruction comprises one or more of a dispatch command, an alarm based on a temporal trend in weather conditions, an alarm based on a difference in weather conditions, an alarm based on a temporal trend in road conditions, an alarm based on a difference in road conditions, a snow plow setting, a mixture of materials to be applied to a road surface, and an amount of materials to be applied to the road surface.

13. (original) The system of claim 11 further comprising:

a processor operable to:

(1) determine that at least one of a received signal strength from a wireless network and a Quality of Service ("QoS") parameter is not acceptable;

(2) buffer the collected information when the at least one of a received signal strength from a wireless network and a QoS parameter is not acceptable;

(3) when the at least one of a received signal strength from a wireless network and a QoS parameter is acceptable, send, from an Internet Protocol ("IP") address of the of the processor, and over a wireless network, the collected information and physical location to an electronic address associated with the server.

14. (original) The system of claim 11, wherein the user is an operator of the respective snow maintenance vehicle.

15. (original) The system of claim 14, wherein the instruction and the map are transmitted over a wireless network to a handheld device associated with the user.

16. (original) The system of claim 14, wherein the instruction is provided to the user orally via a radio signal.

17. (original) The system of claim 11, wherein the user is a supervisor not located in the respective snow maintenance vehicle.

18. (original) The system of claim 17, wherein the at least one of the map and the instruction are provided to the supervisor at a non-portable computer terminal.

19. (original) The system of claim 17, wherein the at least one of the map and the instruction are provided to the supervisor at a portable computer via a wireless signal.

20. (original) The system of claim 17, wherein the supervisor sends the at least one of the map and the instruction to the operator of the respective snow maintenance vehicle.

Remarks

Claims 1-20 are pending in the instant application. Claims 3 and 13 are objected to. Claims 1, 2, 4-12 and 14-20 are rejected under 35 U.S.C. § 103. Claims 1 and 11 were also rejected under 35 U.S.C. § 112.

Applicant would initially like to thank the Examiner for indicating that claims 3 and 13 contain allowable subject matter. With this Reply, the Applicant has amended claims 1 and 11 to address the rejections under 35 U.S.C. § 112. With these amendments, it is also submitted that the obviousness rejections are improper because none of the references cited teach all the elements of the claimed invention. For these reasons, the Applicant respectfully requests that the rejection under 35 U.S.C. § 103 be withdrawn and the application proceed to allowance.

I. None of the References Teach the Use of Data-Scrubbing.

None of the Impson, Doherty or Endo references teach the use of data-scrubbing, which is a required element in both independent claims. Consequently, because the references do not teach all the elements of the claimed invention, the rejection under Section 103 must be withdrawn. It has long been recognized that the prior art must teach all of the limitations of the claim in order to form a proper basis for an obviousness rejection. As the Board recognized in *In re Wada and Murphy*, Appeal 2007-3733 (BPAI 2008) "[w]hen determining whether a claim is obvious, an examiner must make "a searching comparison of the claimed invention – *including all its limitations* – with the teaching of the prior art." *citing In re Ochiai*, 71 F.3d 1565, 1572 (Fed. Cir. 1995) (emphasis added). Thus, "obviousness requires a suggestion of all

limitations in a claim." *CFMT, Inc. v. Yieldup Intern. Corp.*, 349 F.3d 1333, 1342 (Fed. Cir. 2003) (*citing In re Royka*, 490 F.2d 981, 985 (CCPA 1974)).

The Office Action does not specifically identify any disclosure in the cited references that teaches the use of data scrubbing. For this reason alone, the rejection under Section 103 must be withdrawn. The citations of the Impson and Doherty references are mostly related to the on-board components of the claimed invention. Neither of these references includes any mention of the use of data scrubbing in connection with a system that sends road and weather data from snow plows to a central server and receives a map and instructions in the snow plows from the central server.

Similarly, the citation to the Endo reference contains no disclosure of the use of data scrubbing in that reference. That Endo does not teach the use of data-scrubbing is clear from a reading of the specification of this reference. The Examiner points to the discussion of paragraphs 99-104 as being the relevant disclosure of Endo. This discussion reads as follows:

> [0099] The information providing center 21 operates to collect content information necessary for the moving body 10, to record the same in the servers, retrieve the servers in response to the request of the user, to generate answer information and to return the answer information to the user through an optimum communication route.
>
> [0100] The first bidirectional communication terminal 200 is a unit for connecting communication line 20 and the information providing center 21 and is constituted by either by digital phone or by analogue phone. When constituting the first bidirectional communication terminal 200 by the analogue phone, the analogue signals are converted into digital signals by making use of a modem.
>
> [0101] The communication control unit 201 is a unit for

controlling data flow, transfers the request information transferred from the first bidirectional communication terminal 200 to the answer information generating unit 204, selects either the first bidirectional communication terminal 200 or the second bidirectional communication terminal 203 depending on the kinds of the answer information generated in the answer information generating unit 204 and transfers the answer information to the selected terminal and further performs communication interruption processing at the first bidirectional communication terminal 200.

[0102] The answer information generating unit 204 analyzes the contents of the request information, takes out necessary information from the content information server 205 and generates answer information as well as commands the communication control unit 201 a signal returning method depending on the kinds of the answer information. Further, the answer information generating unit 204 determines the position of the moving body 10 with reference to the current position information sent from the moving body 10, the estimated position of the moving body 10 outputted from the vehicle position estimation unit 206 or the position information of the base station to which the moving body 10 is connected through the communication line 20, and further determines a broadcasting station 22 which covers the position of the moving body 10 as its service area by retrieving the broadcasting station data server 208.

[0103] The content information server 205 is a unit which collects a variety of information including dynamic information and static information and stores the same. Although not illustrated in FIG. 5, the content information server 205 is connected such as exclusive line networks and internet for collecting external information and always stores the latest information.

[0104] The vehicle position estimation unit 206 operates to estimate a possible position of the moving body after a predetermined time has passed with reference to the current position information, the destination information, the via position information and the route information which are sent from the moving body 10. Further, for the estimation, the road information stored in the road network server 207, namely such as road link information and classified road information is used and the position of the moving body 10 is estimated based on average travelling time for the classified

> road. Further, through the use of traffic jam information stored in the content information server 205, a further accurate position estimation can be realized.

From this passage it is clear that the system of Endo does not contemplate the use of data scrubbing. Because none of the cited references teach the use of data scrubbing as required by the present claims, the Section 103 rejection based on these references is improper.

II. Conclusion

The rejection of the claims as being obvious over the cited references is improper and must be withdrawn because none of the cite references teach the use of data scrubbing. For these reasons, the Applicant respectfully requests that this Application proceed to allowance. If the Examiner should have any questions relative to this Reply, he is cordially invited to contact the undersigned at the telephone number listed below.

Date: April 8, 2014

Respectfully submitted,

/CAH/

Carl A. Hjort, III, Esq.
ATTORNEY FOR APPLICANT
USPTO Reg. No. 56,934
Concaten, Inc.
24918 Genesee Trail Road
Golden, CO 80401
303-725-4365

Appendix “A”- Clean Version of the Claims

1. A method, comprising:

(a) receiving from a plurality of snow maintenance vehicles a plurality of sets of collected information, each of the sets of collected information comprising a snow maintenance vehicle physical location and at least one of weather and road conditions in an area of the respective snow maintenance vehicle;

(b) processing, by a server, the received sets of collected information to (i) provide a map associated with a physical location of a selected snow maintenance vehicle and (ii) determine an instruction for the selected snow maintenance vehicle;

(c) providing the map and the instruction to a user; and

(d) wherein the following is true:

(d1) the sets of collected information are sent to a data scrubbing server that identifies bad sets of collected information, said bad sets of collected information containing information that is incomplete or inaccurate, and wherein the data scrubbing server corrects or deletes the bad sets of collected information before forwarding the sets of collected information to the server for processing; and

(d2) the sets of collected information are directed through one or more auxiliary servers before the sets of collected information are sent to the server for processing.

2. The method of claim 1, wherein the instruction comprises one or more of a dispatch command, an alarm based on a temporal trend in weather conditions, an alarm based

on a difference in weather conditions, an alarm based on a temporal trend in road conditions, an alarm based on a difference in road conditions, a snow plow setting, a mixture of materials being applied to a road surface, and an amount of materials being applied to the road surface.

3. The method of claim 1 further comprising the steps of:

(1) determining, by at least one processor, that at least one of a received signal strength from a wireless network and a Quality of Service ("QoS") parameter is not acceptable;

(2) buffering, by the at least one processor, the collected information when the at least one of a received signal strength from a wireless network and a QoS parameter is not acceptable;

(3) when the at least one of a received signal strength from a wireless network and a QoS parameter is acceptable, sending, by the at least one processor, from an Internet Protocol ("IP") address of the of the at least one processor, and over a wireless network, the collected information and physical location to an electronic address associated with the server.

4. The method of claim 1, wherein the user is an operator of the respective snow maintenance vehicle.

5. The method of claim 4, wherein the instruction and the map are transmitted over a wireless network to a handheld device associated with the user.

6. The method of claim 4, wherein the instruction is provided to the user orally via a radio signal.

7. The method of claim 1, wherein the user is a supervisor not located in the respective snow maintenance vehicle.

8. The method of claim 7, wherein the at least one of the map and the instruction are provided to the supervisor at a non-portable computer terminal.

9. The method of claim 7, wherein the at least one of the map and the instruction are provided to the supervisor at a portable computer via a wireless signal.

10. The method of claim 7, wherein the supervisor sends the at least one of the map and the instruction to the operator of the respective snow maintenance vehicle.

11. A system, comprising:

a server operable to:

(a) receive from a plurality of snow maintenance vehicles, a plurality of sets of collected information, each of the sets of collected information comprising a snow maintenance vehicle physical location and at least one of weather and road conditions in an area of the respective snow maintenance vehicle;

(b) process the received sets of collected information:

(i) to provide a map associated with a physical location of a selected snow maintenance vehicle;

(ii) to determine an instruction for the selected snow maintenance vehicle;

(c) provide the map and the instruction to a user; and

(d) wherein the following is true:

(d1) the sets of collected information are sent to a data scrubbing server that identifies bad sets of collected information, said bad sets of collected information containing information that is incomplete or inaccurate, and wherein the data scrubbing server corrects or deletes the bad sets of collected information before forwarding the sets of collected information to the server for processing; and

(d2) the sets of collected information are directed through one or more auxiliary servers before the sets of collected information are sent to the server for processing.

12. The system of claim 11, wherein the instruction comprises one or more of a dispatch command, an alarm based on a temporal trend in weather conditions, an alarm based on a difference in weather conditions, an alarm based on a temporal trend in road conditions, an alarm based on a difference in road conditions, a snow plow setting, a mixture of materials to be applied to a road surface, and an amount of materials to be applied to the road surface.

13. The system of claim 11 further comprising:

a processor operable to:

(1) determine that at least one of a received signal strength from a wireless network and a Quality of Service ("QoS") parameter is not acceptable;

(2) buffer the collected information when the at least one of a received signal strength from a wireless network and a QoS parameter is not acceptable;

(3) when the at least one of a received signal strength from a wireless network and a QoS parameter is acceptable, send, from an Internet Protocol ("IP") address of the of the processor, and over a wireless network, the collected information and physical location to an electronic address associated with the server.

14. The system of claim 11, wherein the user is an operator of the respective snow maintenance vehicle.

15. The system of claim 14, wherein the instruction and the map are transmitted over a wireless network to a handheld device associated with the user.

16. The system of claim 14, wherein the instruction is provided to the user orally via a radio signal.

17. The system of claim 11, wherein the user is a supervisor not located in the respective snow maintenance vehicle.

18. The system of claim 17, wherein the at least one of the map and the instruction are provided to the supervisor at a non-portable computer terminal.

19. The system of claim 17, wherein the at least one of the map and the instruction are provided to the supervisor at a portable computer via a wireless signal.

20. The system of claim 17, wherein the supervisor sends the at least one of the map and the instruction to the operator of the respective snow maintenance vehicle.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor: Christopher J. Rennie

Serial No.: 13/944836

Art Unit: 2681

Filed: July 17, 2013

Examiner: Hoi Ching Lau

Title: Maintenance Decision Support System and Method for Vehicular and Roadside Applications

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

INFORMATION DISCLOSURE STATEMENT

Honorable Sir:

The references cited on attached Form PTO-1449 are being called to the attention of the Examiner. Copies of the cited references have previously been supplied.

The Examiner's attention is drawn to the following related applications:

Serial No. 11/363581 filed 02/27/2006

Serial No. 12/046121 filed 03/11/2008

Serial No. 12/147837 filed 06/27/2008

Serial No. 12/347695 filed 12/31/2008

Serial No. 12/749325 filed 05/29/2010

Serial No. 13/345480 filed 01/06/2012

Submission of the above information is not intended as an admission that any item is citable under the statutes or rules to support a rejection, that any item disclosed represents analogous art, or that those skilled in the art would refer to or recognize the pertinence of any reference without the benefit of hindsight, nor should any inference be drawn as to the pertinence of the references based on the order in

which they are presented. Submission of this statement should not be taken as an indication that a search has been conducted, or that no better art exists.

It is respectfully requested that the cited information be expressly considered during the prosecution of this application and the references made of record therein.

The fee for filing this Information Disclosure Statement has been paid in the EFS system at the time of filing.

If the Examiner should have any questions relative to this Information Disclosure Statement, he is cordially invited to contact the undersigned at the telephone number listed below.

Date: April 8, 2014

Respectfully submitted,

/CAH/

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

Complete if Known	
Application Number	13/944836
Filing Date	07/17/2013
First Named Inventor	Christopher J. Rennie
Art Unit	2612
Examiner Name	Hoi Ching Lau
Attorney Docket Number	5611-1-CIP-5

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				Examiner Name	Hoi Ching Lau
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	394	Background of the Invention for the above-captioned application (previously provided)

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Electronic Patent Application Fee Transmittal

Application Number:	13944836
Filing Date:	17-Jul-2013
Title of Invention:	Maintenance Decision Support System and Method for Vehicular and Roadside Applications
First Named Inventor/Applicant Name:	Christopher J. Rennie
Filer:	Carl A. Hjort
Attorney Docket Number:	5611-1-CIP-5

Filed as Small Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Extension - 3 months with $0 paid	2253	1	700	700

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
Submission- Information Disclosure Stmt	2806	1	90	90
		Total in USD ($)		**790**

Electronic Acknowledgement Receipt

EFS ID:	18709331
Application Number:	13944836
International Application Number:	
Confirmation Number:	3020
Title of Invention:	Maintenance Decision Support System and Method for Vehicular and Roadside Applications
First Named Inventor/Applicant Name:	Christopher J. Rennie
Customer Number:	19152
Filer:	Carl A. Hjort
Filer Authorized By:	
Attorney Docket Number:	5611-1-CIP-5
Receipt Date:	08-APR-2014
Filing Date:	17-JUL-2013
Time Stamp:	18:48:07
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$790
RAM confirmation Number	5057
Deposit Account	
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)

1		Responseoa.pdf	49591 c48506f25cf1b0d6e4237e9aa6a196742f24a3b3	yes	20

Multipart Description/PDF files in .zip description		
Document Description	**Start**	**End**
Amendment/Req. Reconsideration-After Non-Final Reject	1	2
Claims	3	9
Applicant Arguments/Remarks Made in an Amendment	10	20

Warnings:					
Information:					
2	Transmittal Letter	IDStransmittal.pdf	22627 b6cceebc9cf357fb1c40b6e26fedba4a8c9ec748	no	2
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Information:					
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Information:					
This is not an USPTO supplied IDS fillable form					
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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (09-11)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 13/944,836	Filing Date 07/17/2013	☐ To be Mailed

ENTITY: ☐ LARGE ☒ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT

04/08/2014	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 20	Minus	** 20	= 0	X $40 =	0
Independent (37 CFR 1.16(h))	* 2	Minus	***3	= 0	X $210 =	0
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	0

AMENDMENT

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
/YUVANNA CHAPHIV/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/944,836	07/17/2013	Christopher J. Rennie	5611-1-CIP-5

CONFIRMATION NO. 3020

PUBLICATION NOTICE

19152
Concaten, Inc.
24918 Genesee Trail Road
Golden, CO 80401



Title: Maintenance Decision Support System and Method for Vehicular and Roadside Applications

Publication No.US-2013-0300589-A1
Publication Date:11/14/2013

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Office of Public Records. The Office of Public Records can be reached by telephone at (703) 308-9726 or (800) 972-6382, by facsimile at (703) 305-8759, by mail addressed to the United States Patent and Trademark Office, Office of Public Records, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently http://pair.uspto.gov/. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Office of Data Managment, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/944,836	07/17/2013	Christopher J. Rennie	5611-1-CIP-5	3020

19152 7590 10/09/2013

Concaten, Inc.
24918 Genesee Trail Road
Golden, CO 80401

EXAMINER	
LAU, HOI CHING	

ART UNIT	PAPER NUMBER
2682	

MAIL DATE	DELIVERY MODE
10/09/2013	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 13/944,836	Applicant(s) RENNIE ET AL.	
	Examiner HOI LAU	Art Unit 2682	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *7/17/13*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

5)☒ Claim(s) *1-20* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1,2,4-12 and 14-20* is/are rejected.

8)☒ Claim(s) *3 and 13* is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☒ The drawing(s) filed on *7/17/13* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some * c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *8/23/13*.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

The present application is being examined under the pre-AIA first to invent provisions.

DETAILED ACTION

1. Claims 1- 20 have been examined.

Information Disclosure Statement

2. The information disclosure statement filed August 23, 2013 fails to comply with the provisions of 37 CFR 1.97, 1.98 and MPEP § 609 because some of the NPL provided in the IDS are missing date information and therefore the Examiner cannot make the proper consideration. It has been placed in the application file, but the information referred to therein has not been considered as to the merits. Applicant is advised that the date of any re-submission of any item of information contained in this information disclosure statement or the submission of any missing element(s) will be the date of submission for purposes of determining compliance with the requirements based on the time of filing the statement, including all certification requirements for statements under 37 CFR 1.97(e). See MPEP § 609.05(a).

Claim Rejections - 35 USC § 112

The following is a quotation of 35 U.S.C. 112(b):
(b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:
The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 1-20 are rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention.

As per claims 1 and 11, the claim limitation "determine an instruction for the selected snow maintenance vehicle and/or route" is indefinite because a) it fails to specific point out if the claim subject matter should be read as "determine an instruction for the selected snow maintenance vehicle and/or determine an route" or determine an instruction for the selected snow maintenance vehicle and/or determine an instruction for route"?. b) In addition, it is not clear if the route is associated with the selected snow maintenance vehicle or a plurality of snow maintenance vehicles?

As per claims 2-10 and 12-20, they are rejected based on the dependency of claims 1 and 11.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-2, 4-5, 11-12,14-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Impson et al. (U.S. 2003/0187571) in view of Doherty et al. (U.S. 2004/0195357), further in view of Endo et al. (US 2002/0094825).

As per claim 1, Impson discloses a method, comprising:

(a) receiving from a plurality of vehicles (104 in view of the a plurality of mobile units) a plurality of sets of collected information, each of the sets of collected information comprising a vehicle physical location and at least one of weather and road conditions in an area of the respective vehicle;

(b) processing, by a server (108 in view of ITS network, roadway subsystem implementation and traffic management subsystem implementation), the received sets of collected information to (i) provide a map associated with a physical location of a selected vehicle (would have been obviously shown by the destination where the intended data to be received) and (ii) determine an instruction for the selected snow maintenance vehicle and/or route (position message); (c) providing the map and the instruction to a user (would have been obviously shown by the user of the mobile unit) [Fig. 1-2; 4-6; Para. 12; 33,41,46,50].

The invention of Impson does not explicitly mention the vehicles are a plurality of snow maintenance vehicles; wherein at least one of the following is "true: (dl) the sets of collected information are sent to a data scrubbing server that identities bad sets of collected information, said bad sets of collected information containing information that is incomplete or inaccurate, and wherein the data scrubbing server corrects or deletes the bad sets of collected information before forwarding the sets of collected information

to the server for processing; or (d2) the sets of collected information are directed through one or more auxiliary servers before the sets of collected information are sent to the server for processing.

In the analogues art, Dohertly shows a system comprises: a communication module in a snow maintenance vehicle, each maintenance vehicle also comprising a respective satellite location unit [GPS receiver] to provide a current maintenance vehicle location; a server [remote station with database] operable to communicate wirelessly with the communication module in each of the maintenance vehicle; obtain, for each maintenance vehicle, the current maintenance vehicle location, at least one of weather conditions and road conditions, and at least one of maintenance vehicle blade setting [blade controlling] and a mixture and amount of material being applied to a selected road surface; and provide, to each maintenance vehicle, at least one of instructions and alarms to at least one of the maintenance vehicle operator and an automated component in the maintenance vehicle; and at least one database operable to store, for each maintenance vehicle, respective information collected by the server (figure 1, 10; paragraphs 12-18, 31, 59-61, 78-83, 89-92).

In the analogous art of vehicle communication system, Endo shows at least one of vehicle is configured to collect position information and then transmit to a server, processing, by the server, the received collected information to determine an instruction for the selected vehicle wherein the collected information are directed through one or more auxiliary servers before the collected information are sent to the server for processing (Para. 99-104; Fig. 1,5).

It would have been obvious to one of ordinary skill in the art at the time of invention to modify the invention as suggested by Impson to include the snow maintenance vehicle and the associated data communication technique as suggested by Dohertly because it would provide an alternative implementation structure to enhance to similar communication method, in which would be an implementation of one known element in the art to yield a predictable result.

Also, it would have been obvious to one of ordinary skill in the art at the time of invention to modify the invention as suggested by the combined invention of Impson in view of Doherty to include the auxiliary server as suggested by Endo because it would provide additional information processing and storage power, thereby increasing the effectiveness of the method and the associated system.

As per claim 2, the invention of Impson would have been obviously show the instruction comprises one or more of a dispatch command, an alarm based on a temporal trend in weather conditions, an alarm based on a difference in weather conditions, an alarm based on a temporal trend in road conditions, an alarm based on a difference in road conditions, a snow plow setting, a mixture of materials being applied to a road surface, arid an amount of materials being applied to the road surface (Fig. 1-2; 4-6; Para. 12; 33,41,46,50).

As per claim 4, the invention of Impson would have been obviously show the user is an operator of the respective snow maintenance vehicle (the vehicle would be operated by a human operator).

As per claim 5, the invention of Impson would have been obviously show the instruction and the map are transmitted over a wireless network to a handheld device associated with the user (Official Notice: it is known in the art to use handheld device as a mobile device to user convenience).

As per claim 11-12,14-15, they correspond to claim 1-2, 4-5; they are therefore rejected for the similar reasons set forth.

5. Claims 7-10 and 17-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Impson et al. (U.S. 2003/0187571) in view of Doherty et al. (U.S. 2004/0195357), further in view of Endo et al. (US 2002/0094825), and Tummala (US 2006/0022846).

As per claims 7-10, 17-20, the combination does not explicitly mention the claim limitation as recited.

in analogous art, Tummala the user is a supervisor not located in the respective vehicle; wherein the vehicle related information are provided to the supervisor at a non-portable computer terminal or the supervisor sends the vehicle related information to the operator of the respective vehicle (Para. 46-47, 58-67, 72,80, 84-85, 94-103; Fig. 1).

It would have been obvious to one of ordinary skill in the art at the time of invention the machine that used by the supervisor as suggested by the combined invention could be either portable with wireless or non-portable computer based on the specific configuration or desire of the system.

It would have been obvious to one of ordinary skill in the art at the time of invention to modify the invention as suggested by the combined invention to include the supervisory system as suggested by Tummala because it would provide additional controlling to the system in order to control the information being communicated.

6. Claims 6 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Impson et al. (U.S. 2003/0187571) in view of Doherty et al. (U.S. 2004/0195357), further in view of Endo et al. (US 2002/0094825), and Gagnon (US 2004/0048598).

As per claims 6 and 16, the combination does not explicitly mention the claim limitation as recited.

In the analogous art of vehicle used under snow condition, Gagnon discloses a set of instruction are provided to the user orally via radio signal (Para. 59; abstract).

It would have been obvious to one of ordinary skill in the art at the time of invention to modify the invention as suggested by the combined invention to include voice radio as suggest by Gagnon such that the disclosed instruction and weather forecast could be communicated with the user by using voice radio because it would be an implementation of one known technique in the art to yield a predictable result. The specific type of information to be communicated would be an arbitrary design choice.

Allowable Subject Matter

7. Claims 3 and 13 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to HOI LAU whose telephone number is (571)272-8547. The examiner can normally be reached on M- F 8:30am - 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, George Bugg can be reached on (571)272-2998. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Hoi C Lau/
Primary Examiner, Art Unit 2682

Notice of References Cited	Application/Control No. 13/944,836	Applicant(s)/Patent Under Reexamination RENNIE ET AL.	
	Examiner HOI LAU	Art Unit 2682	Page 1 of 3

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-5,699,056 A	12-1997	Yoshida, Masato	340/905
*	B	US-5,904,296 A	05-1999	Doherty et al.	239/61
*	C	US-5,982,325 A	11-1999	Thornton et al.	342/357.31
*	D	US-6,009,374 A	12-1999	Urahashi, Kazuyoshi	701/36
*	E	US-6,173,904 B1	01-2001	Doherty et al.	239/1
*	F	US-2002/0094825 A1	07-2002	Endo et al.	455/456
*	G	US-2002/0156574 A1	10-2002	Fortin, Manon	701/213
*	H	US-2003/0051376 A1	03-2003	Lassonde et al.	37/348
*	I	US-2003/0130794 A1	07-2003	Miller et al.	701/301
*	J	US-2003/0154633 A1	08-2003	Lassonde, Jean-Philippe	37/219
*	K	US-2003/0187571 A1	10-2003	Impson et al.	701/117
*	L	US-2004/0048598 A1	03-2004	Gagnon, Marc D.	455/404.2
*	M	US-2004/0098227 A1	05-2004	Struck et al.	702/183

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
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	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Notice of References Cited	Application/Control No. 13/944,836	Applicant(s)/Patent Under Reexamination RENNIE ET AL.	
	Examiner HOI LAU	Art Unit 2682	Page 2 of 3

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-2004/0195357 A1	10-2004	Doherty et al.	239/172
*	B	US-2005/0086004 A1	04-2005	Smith, Michael R.	702/003
*	C	US-2005/0189432 A1	09-2005	Kime, James A.	239/001
*	D	US-6,938,829 B2	09-2005	Doherty et al.	239/1
*	E	US-2005/0221759 A1	10-2005	Spadafora et al.	455/041.2
*	F	US-2005/0246088 A1	11-2005	Doherty et al.	701/080
*	G	US-2006/0022846 A1	02-2006	Tummala, Pavani	340/995.1
*	H	US-2006/0074552 A1	04-2006	Naito et al.	701/211
*	I	US-2006/0149463 A1	07-2006	Machii et al.	701/209
*	J	US-2006/0235739 A1	10-2006	Levis et al.	705/009
*	K	US-2007/0067086 A1	03-2007	Rothschild, Leigh M.	701/093
*	L	US-7,197,320 B2	03-2007	Joseph, Joseph	455/456.1
*	M	US-2007/0139168 A1	06-2007	Rennie et al.	340/425.5

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
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Notice of References Cited	Application/Control No. 13/944,836	Applicant(s)/Patent Under Reexamination RENNIE ET AL.	
	Examiner HOI LAU	Art Unit 2682	Page 3 of 3

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-7,355,509 B2	04-2008	Rennie et al.	340/426.16
	B	US-			
	C	US-			
	D	US-			
	E	US-			
	F	US-			
	G	US-			
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	K	US-			
	L	US-			
	M	US-			

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	S					
	T					

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*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
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Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13944836	RENNIE ET AL.
	Examiner	**Art Unit**
	HOI LAU	2682

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	10/06/2013								
	1	✓								
	2	✓								
	3	O								
	4	✓								
	5	✓								
	6	✓								
	7	✓								
	8	✓								
	9	✓								
	10	✓								
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	12	✓								
	13	O								
	14	✓								
	15	✓								
	16	✓								
	17	✓								
	18	✓								
	19	✓								
	20	✓								

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L8	4	(("8284037") or ("8120473") or ("7714705") or ("7355509")).PN.	USPAT; USOCR	OR	OFF	2013/10/06 20:23
L9	1	L8 and supervisor.clm.	US-PGPUB; USPAT	OR	ON	2013/10/06 20:23
L10	2	(("20040048598") or ("20060022846")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2013/10/06 21:19
S1	3	"8284037"	USPAT	OR	OFF	2013/10/04 16:36
S2	3	"8284037"	USPAT	OR	OFF	2013/10/04 16:36
S3	4	(("8284037") or ("8120473") or ("7714705") or ("7355509")).PN.	USPAT; USOCR	OR	OFF	2013/10/04 16:38
S4	0	"7355509".pn. and snow near3 (vehicle automobile) and server	US-PGPUB; USPAT	OR	ON	2013/10/05 12:54
S5	0	"7355509".pn. and sserver	US-PGPUB; USPAT	OR	ON	2013/10/05 12:54
S6	1	"7355509".pn.	US-PGPUB; USPAT	OR	ON	2013/10/05 12:54
S7	4	(("8284037") or ("8120473") or ("7714705") or ("7355509")).PN.	USPAT; USOCR	OR	OFF	2013/10/05 12:55
S8	4	S7 and server	US-PGPUB; USPAT	OR	ON	2013/10/05 12:55
S9	2447	@ad<="20060227" and (server network center central) and snow near3 (vehicle automobile)	US-PGPUB; USPAT	OR	ON	2013/10/05 13:01
S10	3629	@ad<="20060227" and (server network center central) and (snow$3plow or snow$3plough or snow near3 (plough plow vehicle automobile))	US-PGPUB; USPAT	OR	ON	2013/10/05 13:07
S11	280	@ad<="20060227" and (server network center central) and (snow$3plow or snow$3plough or snow near3 (plough plow vehicle automobile)) same (location position$6 track$6 locat$6) and weather	US-PGPUB; USPAT	OR	ON	2013/10/05 13:08
S12	74	@ad<="20060227" and (snow$3plow or snow$3plough or snow near3 (plough plow vehicle automobile)) same (location position$6 track$6 locat$6) and weather and map	US-PGPUB; USPAT	OR	ON	2013/10/05 13:12
S13	51	@ad<="20060227" and (snow$3plow or snow$3plough or snow near3 (plough plow	US-PGPUB;	OR	ON	2013/10/05 13:12

		vehicle automobile)) same (location position$6 track$6 locat$6) and weather and map and route	USPAT			
S14	53	@ad<="20060227" and (snow$3plow or snow$3plough or snow near3 (plough plow vehicle automobile)) same (location position$6 track$6 locat$6) and weather and map$6 and route	US-PGPUB; USPAT	OR	ON	2013/10/05 13:12
S19	1	@ad<="20060227" and (snow$3plow or snow$3plough or snow near3 (plough plow vehicle automobile)) near10 (location position$6 track$6 locat$6) and (snow$3plow or snow$3plough or snow near3 (plough plow vehicle automobile)) near15 (weather or road near3 condition) and map$6 near15 (snow$3plow or snow$3plough or snow near3 (plough plow vehicle automobile)) near15 (location position$6)	US-PGPUB; USPAT	OR	ON	2013/10/05 15:03
S20	1	@ad<="20060227" and (snow$3plow or snow$3plough or snow near3 (plough plow vehicle automobile)) near10 (location position$6 track$6 locat$6) and (snow$3plow or snow$3plough or snow near3 (plough plow vehicle automobile)) near15 (weather or road near3 condition) and map$6 near15 (snow$3plow or snow$3plough or snow near3 (plough plow vehicle automobile))	US-PGPUB; USPAT	OR	ON	2013/10/05 15:05
S21	1	@ad<="20060227" and (snow$3plow or snow$3plough or snow near3 (plough plow vehicle automobile)) near10 (location position$6 track$6 locat$6) and (snow$3plow or snow$3plough or snow near3 (plough plow vehicle automobile)) near15 (weather or road near3 condition) and map$6 same (snow$3plow or snow$3plough or snow near3 (plough plow vehicle automobile))	US-PGPUB; USPAT	OR	ON	2013/10/05 15:06
S22	1101	@ad<="20060227" and (vehic$6 automobile) near10 (location position$6 track$6 locat$6) and (vehic$6 automobile) near15 (weather or road near3 condition) and map$6 near15 (vehic$6 automobile) near15 (location position$6)	US-PGPUB; USPAT	OR	ON	2013/10/05 15:07
S23	335	@ad<="20060227" and (vehic$6 automobile) near10 (location position$6 track$6 locat$6) and (vehic$6 automobile) near15 (weather or road near3 condition) and map$6 near15 (vehic$6 automobile) near15 (location position$6) same (server network center central)	US-PGPUB; USPAT	OR	ON	2013/10/05 15:08
S24	209	@ad<="20060227" and ((vehic$6 automobile) near10 (location position$6 track$6 locat$6) and (vehic$6 automobile) near15 (weather or road near3 condition) and map$6 near15 (vehic$6 automobile) near15 (location position$6) same (server network center central)).detd.	US-PGPUB; USPAT	OR	ON	2013/10/05 15:09
S25	66	S24 and snow	US-PGPUB; USPAT	OR	ON	2013/10/05 15:51
S26	74	S24 and snow$6	US-PGPUB;	OR	ON	2013/10/05 15:51

			USPAT			
S27	169	@ad<="20060227" and ((vehic$6 automobile) near10 (location position$6 track$6 locat$6) and (vehic$6 automobile) near15 (weather or road near3 condition) and map$6 near15 (vehic$6 automobile) near15 (location position$6) same (server network center central)).detd. not breed.inv.	US-PGPUB; USPAT	OR	ON	2013/10/05 15:52
S28	73	S24 and snow$6.detd.	US-PGPUB; USPAT	OR	ON	2013/10/05 15:53
S29	39	S27 and snow$6.detd.	US-PGPUB; USPAT	OR	ON	2013/10/05 15:53
S30	220	@ad<="20060227" and ((vehic$6 automobile) near10 (location position$6 track$6 locat$6) and (vehic$6 automobile) near15 (weather or road near3 condition) and map$6 near15 (vehic$6 automobile) near15 (location position$6) same (server network center central station)).detd. not breed.inv.	US-PGPUB; USPAT	OR	ON	2013/10/05 16:07
S31	41	S30 and snow$6.detd.	US-PGPUB; USPAT	OR	ON	2013/10/05 16:08
S32	209	S30 and (vehic$6 automobile) near10 ((sens$6 detect$6 collect$6) near5 (location$5 position$6) gps global near3 position$6)	US-PGPUB; USPAT	OR	ON	2013/10/05 16:43
S33	15	S30 and ((vehic$6 automobile) near10 ((sens$6 detect$6 collect$6) near5 (location$5 position$6) gps global near3 position$6) and (vehic$6 automobile) near10 (sens$6 detect$6 collect$6) near5 (weather road near3 condition snow$6 rain$6)).detd.	US-PGPUB; USPAT	OR	ON	2013/10/05 16:45
S34	220	@ad<="20060227" and ((vehic$6 automobile) near10 (location position$6 track$6 locat$6) and (vehic$6 automobile) near15 (weather or road near3 condition) and map$6 near15 (vehic$6 automobile) near15 (location position$6) same (server network center central station)).detd. not breed.inv.	US-PGPUB; USPAT	OR	ON	2013/10/05 22:34
S35	220	@ad<="20060227" and ((vehic$6 automobile) near10 (location position$6 track$6 locat$6) and (vehic$6 automobile) near15 (weather or road near3 condition) and map$6 near15 (vehic$6 automobile) near15 (location position$6) same (server network center central station)).detd. not breed.inv.	US-PGPUB; USPAT	OR	ON	2013/10/06 02:13
S36	45	S35 and ((vehic$6 automobile) same ((sens$6 detect$6 collect$6 track$6) near5 (location$5 position$6) gps global near3 position$6) and (vehic$6 automobile) same (sens$6 detect$6 collect$6) near10 (weather road near5 condition snow$6 rain$6)).detd.	US-PGPUB; USPAT	OR	ON	2013/10/06 02:13
S37	222	@ad<="20060227" and ((vehic$6 automobile) near10 (location position$6 track$6 locat$6) and (vehic$6 automobile) near15 (weather or road near3 condition) and map$6 near15 (vehic$6 automobile) near15 (location position$6) same (server network center central station (intelligent near3 Transportation	US-PGPUB; USPAT	OR	ON	2013/10/06 02:26

		near3 System) "its")).detd. not breed.inv.				
S38	47	S37 and ((vehic$6 automobile) same ((sens$6 detect$6 collect$6 track$6) near5 (location$5 position$6) gps global near3 position$6) and (vehic$6 automobile) same (sens$6 detect$6 collect$6) near10 (weather road near5 condition snow$6 rain$6)).detd.	US-PGPUB; USPAT	OR	ON	2013/10/06 02:28
S39	1	"5982325".pn.	US-PGPUB; USPAT	OR	ON	2013/10/06 17:03

EAST Search History (Interference)

< This search history is empty>

10/6/2013 9:24:54 PM
C:\ Users\ hlau\ Documents\ EAST\ Workspaces\ 13944836 a.wsp

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13944836	RENNIE ET AL.
	Examiner	Art Unit
	HOI LAU	2682

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
340	426.16,995.1,905,436,573.4,426.19,438,539.13,995.13	10/6/13	HCL
342	357.07	10/6/13	HCL
701	32.1,129.19	10/6/13	HCL
239	172	10/6/13	HCL
345	156	10/6/13	HCL

SEARCH NOTES		
Search Notes	Date	Examiner
inventor search	10/6/13	HCL
east search	10/6/13	HCL

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

	/HOI LAU/ Primary Examiner.Art Unit 2682

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

Complete if Known	
Application Number	13/944836
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Examiner Name	Hoi Ching Lau
Attorney Docket Number	5611-1-CIP-5

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U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code [2 (if known)]	Publication Date MM-DD-YYYY	Name of Patentee of Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	1	3160964	12/15/64	Boyer et al.	
	2	3344993	10/03/67	Wilder et al.	
	3	3420451	01/07/69	Kahlbacher	
	4	3459375	08/05/69	Goffin	
	5	3519169	07/07/70	Holland	
	6	3540655	11/17/70	Hinrichs	
	7	3569894	02/02/71	Murray et al.	
	8	3655130	04/11/72	Patrick	
	9	3776421	12/04/73	Harrison et al.	
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	32	4422562	12/27/83	Rawson	

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FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]; Number[4]; Kind Code[5] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
	197	CA 2233689	04/10/97	Kalbfleisch et al.		
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Examiner Signature	/Hoi Lau/	Date Considered	10/06/2013

*EXAMINER: Initial if reference is considered, whether or not citation is in conformance and not considered. Include copy of this form with next communication to applicant.

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Substitute for form 1449A/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				Application Number	13/944836
				Filing Date	07/17/2013
				First Named Inventor	Christopher J. Rennie
				Art Unit	2612
				Examiner Name	Hoi Ching Lau
Sheet	18	of	20	Attorney Docket Number	5611-1-CIP-5

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Examiner Signature	/Hoi Lau/	Date Considered	10/06/2013

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				First Named Inventor	Christopher J. Rennie
				Art Unit	2612
				Examiner Name	Hoi Ching Lau
Sheet	19	of	20	Attorney Docket Number	5611-1-CIP-5

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	393	Official Action for US Patent Application No. 12/046,121, mailed July 22, 2009 (Attorney's Reference No. 5611-1-CON)

Examiner Signature	/Hoi Lau/	Date Considered	10/06/2013

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				First Named Inventor	Christopher J. Rennie
				Art Unit	2612
				Examiner Name	Hoi Ching Lau
Sheet	20	of	20	Attorney Docket Number	5611-1-CIP-5

	204	~~Background of the Invention for the above captioned application (previously provided)~~

Examiner Signature	/Hoi Lau/	Date Considered	10/06/2013

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UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/944,836	07/17/2013	Christopher J. Rennie	5611-1-CIP-5

CONFIRMATION NO. 3020

POA ACCEPTANCE LETTER

19152
Concaten, Inc.
24918 Genesee Trail Road
Golden, CO 80401

OC000000063588118

Date Mailed: 09/06/2013

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 08/26/2013.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

/ttkim/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

PTO/SB/80 (11-08)
Approved for use through 11/30/2011. OMB 0651-0035
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POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(b).

I hereby appoint:

☐ Practitioners associated with the Customer Number:

OR

☑ Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number	Name	Registration Number
Carl A. Hjort, III	56934		

as attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignment documents attached to this form in accordance with 37 CFR 3.73(b).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(b) to:

☐ The address associated with Customer Number:

OR

☑ Firm or Individual Name	Concaten, Inc.				
Address	24918 Genesee Trail Road				
City	Golden	State	CO	Zip	80401
Country	USA				
Telephone	303-725-4365	Email	carl@iwapi.com		

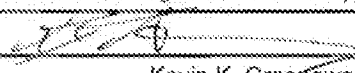
Assignee Name and Address:

Concaten, Inc.
24918 Genesee Trail Road
Golden, CO 80401

A copy of this form, together with a statement under 37 CFR 3.73(b) (Form PTO/SB/96 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(b) may be completed by one of the practitioners appointed in this form if the appointed practitioner is authorized to act on behalf of the assignee, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee

Signature		Date	8-11-11
Name	Kevin K. Groeneweg	Telephone	303-526-5995
Title	CEO		

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Electronic Acknowledgement Receipt

EFS ID:	16687980
Application Number:	13944836
International Application Number:	
Confirmation Number:	3020
Title of Invention:	Maintenance Decision Support System and Method for Vehicular and Roadside Applications
First Named Inventor/Applicant Name:	Christopher J. Rennie
Customer Number:	19152
Filer:	Carl A. Hjort
Filer Authorized By:	
Attorney Docket Number:	5611-1-CIP-5
Receipt Date:	26-AUG-2013
Filing Date:	17-JUL-2013
Time Stamp:	16:51:42
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Assignee showing of ownership per 37 CFR 3.73.	aia009613944836.pdf	118073 faa6d05f6a46507f296e96a013cdcf03910aaec5	no	3

Warnings:	
Information:	

2	Power of Attorney	POA1.pdf	232134 eca15497cd0113f1587477959c51090ef8c997de	no	1

Warnings:	
Information:	
Total Files Size (in bytes):	350207

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. OMB 0651-0031
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STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: Concaten, Inc.

Application No./Patent No.: 13/944836 Filed/Issue Date: July 17, 2013

Titled: Maintenance Decision Support System and Method for Vehicular and Roadside Applications

Concaten, Inc., a corporation

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☑ The assignee of the entire right, title, and interest.

2. ☐ An assignee of less than the entire right, title, and interest (check applicable box):

   ☐ The extent (by percentage) of its ownership interest is _____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.

   ☐ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

A. ☑ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel 031073, Frame 0871, or for which a copy thereof is attached.

B. ☐ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: _____ To: _____

   The document was recorded in the United States Patent and Trademark Office at

   Reel _____, Frame _____, or for which a copy thereof is attached.

2. From: _____ To: _____

   The document was recorded in the United States Patent and Trademark Office at

   Reel _____, Frame _____, or for which a copy thereof is attached.

This collection of information is required by37 CFR3.73(b). The information is required toobtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentialityis governed by35 U.S.C. 122and 37 CFR1.11 and1.14. Thiscollection is estimated to take 12 minutes to complete, including gathering, preparing, and submittingthe completed application form to the USPTO.Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent tothe Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS.**SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450**

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STATEMENT UNDER 37 CFR 3.73(c)

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6. From: _____ To: _____

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☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☑ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/CAH/	08/26/2013
Signature	Date
Carl A. Hjort, III	56934
Printed or Typed Name	Title or Registration Number

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that yoube given certain informationin connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, pleasebe advised that: (1) the general authority forthe collection of thisinformation is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and(3) the principal purpose forwhich the information isused by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent applicationor patent. If you do not furnish the requested information,the U.S. Patent and Trademark Office may not be able to process and/or examineyour submission,which may result in termination of proceedings or abandonment of the applicationor expiration of the patent.

The informationprovided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
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3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the informationin order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an InternationalApplication filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, arecord may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from thissystem of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

Complete if Known	
Application Number	13/944836
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Art Unit	2612
Examiner Name	Hoi Ching Lau
Attorney Docket Number	5611-1-CIP-5

Sheet	1	of	20

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code [2 (if known)]	Publication Date MM-DD-YYYY	Name of Patentee of Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	1	3160964	12/15/64	Boyer et al.	
	2	3344993	10/03/67	Wilder et al.	
	3	3420451	01/07/69	Kahlbacher	
	4	3459375	08/05/69	Goffin	
	5	3519169	07/07/70	Holland	
	6	3540655	11/17/70	Hinrichs	
	7	3569894	02/02/71	Murray et al.	
	8	3655130	04/11/72	Patrick	
	9	3776421	12/04/73	Harrison et al.	
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	11	3856206	12/24/74	Bell et al.	
	12	3891979	06/24/75	Braun et al.	
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	15	4077139	03/07/78	Fagervold et al.	
	16	4084748	04/18/78	Anderson et al.	
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	18	7084775	08/01/06	Smith	
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	20	7266703	09/11/07	Kabel et al.	
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	25	4234109	11/18/80	Goodhart	
	26	4260107	04/07/81	Jackson	
	27	4274091	06/16/81	Decker	
	28	4274901	06/23/81	Elber	
	29	4373668	02/15/83	Forbes et al.	
	30	4376007	03/08/83	Eigenmann	
	31	4391393	07/05/83	Filmyer	
	32	4422562	12/27/83	Rawson	

Examiner Signature		Date Considered	

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Art Unit	2612
Examiner Name	Hoi Ching Lau
Attorney Docket Number	5611-1-CIP-5

Sheet	2	of	20

	33	4442979	04/17/84	Kupper	
	34	4473319	09/25/84	Spangler	
	35	4491275	01/01/85	Holsworth	
	36	4492952	01/08/85	Miller	
	37	4503806	03/12/85	Prusak et al.	
	38	4523280	06/11/85	Bachman	
	39	4529336	07/16/85	Shinozaki et al.	
	40	4553702	11/19/85	Coffee et al.	
	41	4577781	03/25/86	Braun	
	42	4588127	05/13/86	Ehrat	
	43	4678056	07/07/87	Kobari et al.	
	44	4684062	08/04/87	Bagwell	
	45	4690553	09/01/87	Fukamizu et al.	
	46	4700223	10/13/87	Shoutaro et al.	
	47	4700895	10/20/87	Takata	
	48	4733760	03/29/88	Inagaki et al.	
	49	4768716	09/06/88	Buchanan, Jr. et al.	
	50	4803626	02/07/89	Bachman et al.	
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	60	5028017	07/02/91	Simmons et al.	
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Substitute for form 1449A/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				Application Number	13/944836
				Filing Date	07/17/2013
				First Named Inventor	Christopher J. Reanie
				Art Unit	2612
				Examiner Name	Hoi Ching Lau
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				First Named Inventor	Christopher J. Rennie
				Art Unit	2612
				Examiner Name	Hoi Ching Lau
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				Examiner Name	Hoi Ching Lau
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				Art Unit	2612
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Sheet	20	of	20	Attorney Docket Number	5611-1-CIP-5

	394	Background of the Invention for the above-captioned application (previously provided)

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor: Christopher J. Rennie

Serial No.: 13/944836

Art Unit: 2681

Filed: July 17, 2013

Examiner: Hoi Ching Lau

Title: Maintenance Decision Support System and Method for Vehicular and Roadside Applications

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

INFORMATION DISCLOSURE STATEMENT

Honorable Sir:

The references cited on attached Form PTO-1449 are being called to the attention of the Examiner. Copies of the cited references are being supplied herewith.

The Examiner's attention is drawn to the following related applications:

Serial No. 11/363581 filed 02/27/2006

Serial No. 12/046121 filed 03/11/2008

Serial No. 12/147837 filed 06/27/2008

Serial No. 12/347695 filed 12/31/2008

Serial No. 12/749325 filed 05/29/2010

Serial No. 13/345480 filed 01/06/2012

Submission of the above information is not intended as an admission that any item is citable under the statutes or rules to support a rejection, that any item disclosed represents analogous art, or that those skilled in the art would refer to or recognize the pertinence of any reference without the benefit of hindsight, nor should any inference be drawn as to the pertinence of the references based on the order in

which they are presented. Submission of this statement should not be taken as an indication that a search has been conducted, or that no better art exists.

It is respectfully requested that the cited information be expressly considered during the prosecution of this application and the references made of record therein.

The information disclosure statement transmitted herewith is being filed in accordance with 37 C.F.R. 1.97(b), as it is being filed before the issuance of the first office action on the merits. This information disclosure statement does not require a fee.

If the Examiner should have any questions relative to this Information Disclosure Statement, he is cordially invited to contact the undersigned at the telephone number listed below.

Date: August 23, 2013

Respectfully submitted,

/CAH/

Carl A. Hjort, III, Esq.
ATTORNEY FOR APPLICANT
USPTO Reg. No. 56,934
Concaten, Inc.
24918 Genesee Trail Road
Golden, CO 80401
303-725-4365

Electronic Acknowledgement Receipt

EFS ID:	16675936
Application Number:	13944836
International Application Number:	
Confirmation Number:	3020
Title of Invention:	Maintenance Decision Support System and Method for Vehicular and Roadside Applications
First Named Inventor/Applicant Name:	Christopher J. Rennie
Customer Number:	19152
Filer:	Carl A. Hjort
Filer Authorized By:	
Attorney Docket Number:	5611-1-CIP-5
Receipt Date:	23-AUG-2013
Filing Date:	17-JUL-2013
Time Stamp:	17:34:36
Application Type:	Utility under 35 USC 111(a)

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National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

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EFS ID:	16675998
Application Number:	13944836
International Application Number:	
Confirmation Number:	3020
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First Named Inventor/Applicant Name:	Christopher J. Rennie
Customer Number:	19152
Filer:	Carl A. Hjort
Filer Authorized By:	
Attorney Docket Number:	5611-1-CIP-5
Receipt Date:	23-AUG-2013
Filing Date:	17-JUL-2013
Time Stamp:	17:39:08
Application Type:	Utility under 35 USC 111(a)

Payment information:

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Application Number:	13944836
International Application Number:	
Confirmation Number:	3020
Title of Invention:	Maintenance Decision Support System and Method for Vehicular and Roadside Applications
First Named Inventor/Applicant Name:	Christopher J. Rennie
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Filer Authorized By:	
Attorney Docket Number:	5611-1-CIP-5
Receipt Date:	23-AUG-2013
Filing Date:	17-JUL-2013
Time Stamp:	17:47:33
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

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Application Number:	13944836
International Application Number:	
Confirmation Number:	3020
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First Named Inventor/Applicant Name:	Christopher J. Rennie
Customer Number:	19152
Filer:	Carl A. Hjort
Filer Authorized By:	
Attorney Docket Number:	5611-1-CIP-5
Receipt Date:	23-AUG-2013
Filing Date:	17-JUL-2013
Time Stamp:	17:51:50
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
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	Total Files Size (in bytes):	26333661	

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Electronic Acknowledgement Receipt

EFS ID:	16676324
Application Number:	13944836
International Application Number:	
Confirmation Number:	3020
Title of Invention:	Maintenance Decision Support System and Method for Vehicular and Roadside Applications
First Named Inventor/Applicant Name:	Christopher J. Rennie
Customer Number:	19152
Filer:	Carl A. Hjort
Filer Authorized By:	
Attorney Docket Number:	5611-1-CIP-5
Receipt Date:	23-AUG-2013
Filing Date:	17-JUL-2013
Time Stamp:	17:57:58
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
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New International Application Filed with the USPTO as a Receiving Office
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Electronic Acknowledgement Receipt

EFS ID:	16676416
Application Number:	13944836
International Application Number:	
Confirmation Number:	3020
Title of Invention:	Maintenance Decision Support System and Method for Vehicular and Roadside Applications
First Named Inventor/Applicant Name:	Christopher J. Rennie
Customer Number:	19152
Filer:	Carl A. Hjort
Filer Authorized By:	
Attorney Docket Number:	5611-1-CIP-5
Receipt Date:	23-AUG-2013
Filing Date:	17-JUL-2013
Time Stamp:	18:03:45
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

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New Applications Under 35 U.S.C. 111
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New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Electronic Acknowledgement Receipt

EFS ID:	16676513
Application Number:	13944836
International Application Number:	
Confirmation Number:	3020
Title of Invention:	Maintenance Decision Support System and Method for Vehicular and Roadside Applications
First Named Inventor/Applicant Name:	Christopher J. Rennie
Customer Number:	19152
Filer:	Carl A. Hjort
Filer Authorized By:	
Attorney Docket Number:	5611-1-CIP-5
Receipt Date:	23-AUG-2013
Filing Date:	17-JUL-2013
Time Stamp:	18:09:54
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

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New Applications Under 35 U.S.C. 111

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National Stage of an International Application under 35 U.S.C. 371

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New International Application Filed with the USPTO as a Receiving Office

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(19) Canadian Intellectual Property Office
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(11) CA 2 233 689 (13) C

(40) 30.11.2004
(43) 10.04.1997
(45) 30.11.2004

(12)

(21) 2 233 689

(22) 04.10.1996

(51) Int. Cl.6: B60Q 9/00, G01N 22/00, G01N 25/04, G01N 23/20, G01N 21/84

(85) 30.03.1998

(86) PCT/US96/015985

(87) WO97/013234

(30) 60/004,941 US 06.10.1995
08/660,232 US 07.06.1996

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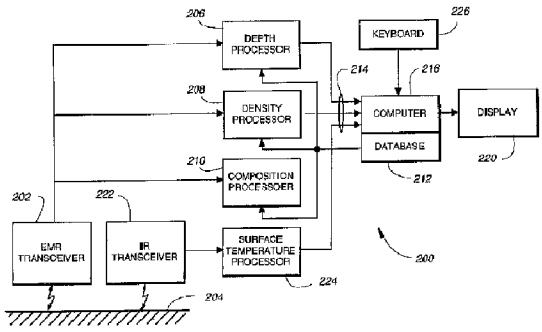
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(54) SYSTEME DE DETECTION DE L'ETAT D'UN MATERIAU DE REVETEMENT
(54) SURFACE MATERIAL AND CONDITION SENSING SYSTEM

(57)

A system and apparatus for detecting and evaluating surface conditions on a road surface from a moving vehicle. The system comprises a platform (12) which is mounted on a vehicle (10). The platform (12) is constructed to carry or have imbedded therein various sensors (18, 20, 22, and/or 24). These sensors (18, 20, 22, and/or 24) have access to the material to be sensed. These sensors (18, 20, 22, and/or 24) are connected, via a cable (30), to a display (28) which is capable of controlling, communicating with, and powering the sensors (18, 20, 22, and/or 24) as well as interpreting sensor data, and preferably includes display/input devices which can display information, accept outside input, store commands, and retrieve data.



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An agency of Industry Canada

CA 2233689 C 2004/11/30

(11)(21) 2 233 689

(12) BREVET CANADIEN
CANADIAN PATENT

(13) C

(86) Date de dépôt PCT/PCT Filing Date: 1996/10/04
(87) Date publication PCT/PCT Publication Date: 1997/04/10
(45) Date de délivrance/Issue Date: 2004/11/30
(85) Entrée phase nationale/National Entry: 1998/03/30
(86) N° demande PCT/PCT Application No.: US 1996/015985
(87) N° publication PCT/PCT Publication No.: 1997/013234
(30) Priorités/Priorities: 1995/10/06 (60/004,941) US; 1996/06/07 (08/660,232) US

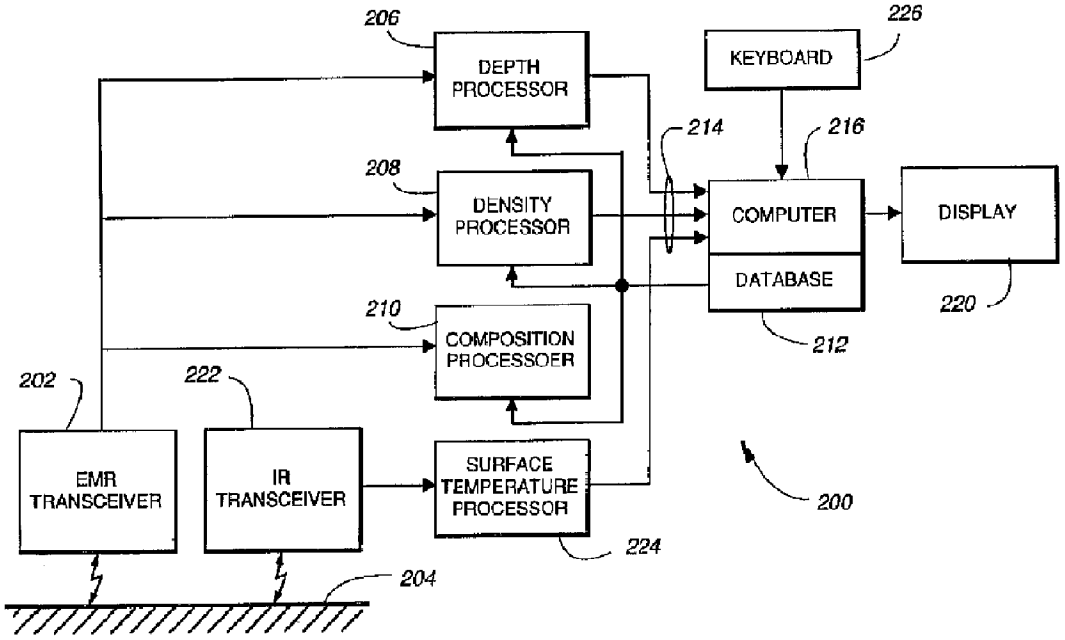
(51) Cl.Int.^{6}/Int.Cl.^{6} B60Q 9/00, G01N 21/84, G01N 23/20, G01N 25/04, G01N 22/00

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(54) Titre : SYSTEME DE DETECTION DE L'ETAT D'UN MATERIAU DE REVETEMENT
(54) Title: SURFACE MATERIAL AND CONDITION SENSING SYSTEM



(57) Abrégé/Abstract:
A system and apparatus for detecting and evaluating surface conditions on a road surface from a moving vehicle. The system comprises a platform (12) which is mounted on a vehicle (10). The platform (12) is constructed to carry or have imbedded therein various sensors (18, 20, 22, and/or 24). These sensors (18, 20, 22, and/or 24) have access to the material to be sensed. These sensors (18, 20, 22, and/or 24) are connected, via a cable (30), to a display (28) which is capable of controlling, communicating with, and powering the sensors (18, 20, 22, and/or 24) as well as interpreting sensor data, and preferably includes display/input devices which can display information, accept outside input, store commands, and retrieve data.

PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : G08G 1/09

A1

(11) International Publication Number: WO 97/13234

(43) International Publication Date: 10 April 1997 (10.04.97)

(21) International Application Number: PCT/US96/15985

(22) International Filing Date: 4 October 1996 (04.10.96)

(30) Priority Data:

60/004,941	6 October 1995 (06.10.95)	US
08/660,232	7 June 1996 (07.06.96)	US

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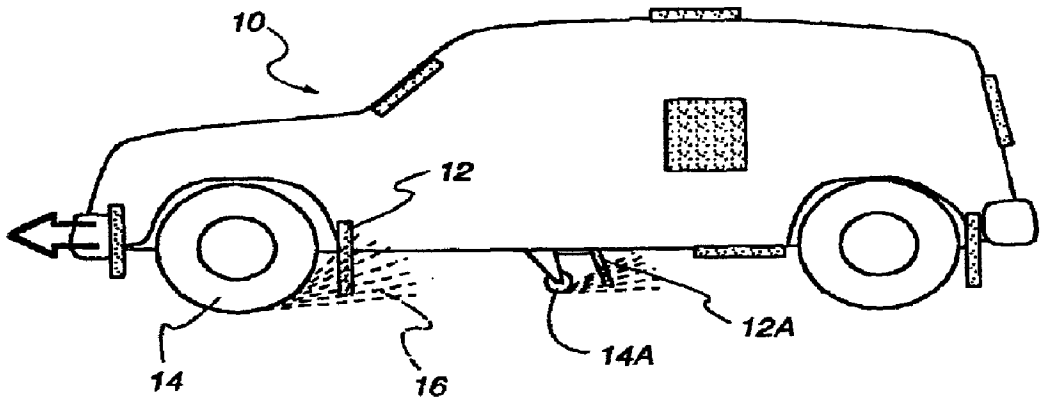
(72) Inventors: KALBFLEISCH, Charles, A.; 5 Deer Trail Road, Boulder, CO 80302 (US). KEATHLEY, Donald, P.; 5 Oxford Drive, Middlefield, CT 06455 (US). COLLINS, William, J.; 3053 S. Boston Court, Denver, CO 80231 (US).

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(81) Designated States: AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).

Published
With international search report.

(54) **Title:** SURFACE MATERIAL AND CONDITION SENSING SYSTEM



(57) **Abstract**

A system and apparatus for detecting and evaluating surface conditions on a road surface from a moving vehicle. The system comprises a platform (12) which is mounted on a vehicle (10). The platform (12) is constructed to carry or have imbedded therein various sensors (18, 20, 22, and/or 24). These sensors (18, 20, 22, and/or 24) have access to the material to be sensed. These sensors (18, 20, 22, and/or 24) are connected, via a cable (30), to a display (28) which is capable of controlling, communicating with, and powering the sensors (18, 20, 22, and/or 24) as well as interpreting sensor data, and preferably includes display/input devices which can display information, accept outside input, store commands, and retrieve data.

SURFACE MATERIAL AND CONDITION SENSING SYSTEM

BACKGROUND OF THE INVENTION

Field of the Invention

This invention generally relates to vehicle mounted sensor systems and more particularly to a system for determining characteristics of surface material related to adverse driving conditions from a vehicle.

Description of Related Art

A number of attempts have been made to sense the conditions of roadways, aircraft runways, and other surfaces for vehicular traffic, during changing adverse weather conditions. For example, it is known to place conductivity, temperature and other sensors either in the road surface or adjacent the road to monitor the temperature of the road surface and/or monitor whether there is ice forming on the surface. This information is fed to the center for control and dispatch of trucks to apply salt or sand or other deicing mixtures. At airports these types of warning systems are used to inform maintenance crews that the runways need to be treated or alert the staff that deicing procedures need to be implemented. Some conventional systems have a supply of chemicals and pumps beside the roadway to automatically spray the road when triggered by a sensor.

There is also a need for such a warning system

on road vehicles such as cars and trucks to detect pending adverse conditions. However, available mobile systems are limited to basic moisture detection and temperature monitoring systems. Some examples of such systems are disclosed in U.S. Patent Nos. 4,492,952 and 4,678,056. One particular system, disclosed in U.S. Patent No. 5,416,476, employs an infrared sensor which is mounted on the exterior of the vehicle and sends a signal to a microprocessor which then can display the temperature of the road surface. These systems are simplistic and do not tell the operator the critical information needed under all conditions, such as, at what temperature will the particular material actually on the road surface freeze? Therefore there is a need for a material sensing apparatus and system for determining when an actual liquid on a road surface will freeze and alerting the operator to such situations before they actually occur so that the operator can adjust driving techniques accordingly.

There is also a need for a mobile mounted sensing apparatus and system for use by road crews to evaluate existing material on a road surface in order to determine the amount of additional material to be applied to the surface in order to reduce the hazardous driving conditions.

SUMMARY OF THE INVENTION

The system in accordance with the present invention addresses the above described needs. It is thus an object of the present invention to provide a unique multipurpose system which includes a multipurpose sensor mounting platform accommodating a variety of sensors that enables the temporary use of materials such as rainwater and

road conditioning materials actually encountered on a road surface to determine the condition of the road surface. It is another object of the invention to provide a system for detecting the actual materials on a roadway. It is another object of the invention to provide a system for determining a characteristic such as friction coefficients or the actual freezing temperature of a material on a road surface regardless of the makeup of the material. It is a still further object of the present invention to provide a reliable display of information to the vehicle operator of actual and pending conditions of the road surface. It is a still further object of the invention to provide an apparatus for sensing actual road conditions that can function automatically or manually.

It is a still further object of the present invention to provide a system for remote sensing and evaluation of material present on a roadway surface which includes a means for extracting sufficient information to determine the characteristics of the composition of the surface material and utilizing user input information to calculate the amount of additional material to be applied to the road surface to minimize the development of adverse conditions.

One embodiment of the apparatus for sensing surface material condition in accordance with the present invention comprises a collection means for receiving material discharged, for example, from a vehicle wheel in contact with a roadway surface, at least one sensing means coupled to the collection means for detecting a characteristic of the received material such as friction coefficients, temperature, conductivity, and chemical concentrations and producing a corresponding signal, processing means

for converting the corresponding signal, and display means connected to the processing means for providing an indication of surface conditions based on the material characteristics.

The collection means may include a conventional mud flap located immediately behind a vehicle wheel so that a portion of any surface material that is picked up by the vehicle wheel and thrown against the flap may be collected. An alternative collection means is a scoop located in proximity of the wheel or adjacent the road surface to collect deposited surface material.

Another embodiment of the invention does not require a collection means, but instead, remotely senses directly the surface material characteristics such as temperature, conductivity, friction coefficients or chemical concentrations. This embodiment utilizes a sensor located on the undercarriage of the vehicle at a preferably fixed distance from the road surface which senses the surface temperature and at least one other unique surface material characteristic so that the specific material or materials can be identified, the composition determined, and freezing temperatures determined.

Another embodiment of the apparatus has a sensor mud flap which includes a channel leading into a detection chamber where liquid runoff from the wheel flap is periodically collected and then frozen. The freeze point is sensed along with the temperature of the collected material. This information is displayed to the operator of the vehicle. Once the freeze point is determined, the frozen material is thawed and discharged from the chamber so that a new sample may be collected and analyzed.

Another embodiment of the invention includes an endless belt of liquid absorbing material mounted to the flap. The endless belt collects and absorbs liquid collected by the flap, transports it to a collector which extracts the liquid from the belt and directs it to the sensor means which also can be a detection chamber where the chamber contents is frozen in order to sense the freeze point.

The sensing means may be a single sensor or a combination of several sensors to detect particular parameters of interest. The road conditions are primarily affected by changes in temperature and material concentrations. Therefore the sensing means may include resistance temperature detectors, thermocouple,. infrared temperature sensors, conductivity detectors, close proximity electromagnetic radiation (EMR) transmitters and detectors or transceivers, friction measurement devices, and other material analysis systems such as a spectrographic analysis system such as a mass spectrometer. In the latter case, the mass spectrometer or other material analysis device would preferably be mounted inside the vehicle, with a sample conveying means such as a belt or pump line directing the sample from the flap or other collection platform such as a scoop, etc. into the analysis device, e.g., the vaporizing chamber for the spectrometer. Alternatively, an ultra wide band doppler radar or any other suitable electromagnetic radiation (EMR) emission and detection technique may be used to remotely ascertain chemical and physical characteristics of the material on the roadway surface.

The processing means may include a microprocessor for converting sensed signals to display signals, store potential material data,

determining material identity and pertinent material characteristics, and includes power and signal transmission means.

The display means may be a panel with indicators of the freeze point, the ambient temperature, and connections to more detailed signal analysis equipment such as chart recorders, tape recording devices, or other processing equipment. The display means may also include alarms and inputs to automatic functions such as activating anti-lock brake systems, or transfers from two wheel to all-wheel drive systems, or activating chemical spreader control functions, etc.

These and other objects, features, and advantages of the system and apparatus of the present invention will become more apparent from a reading of the following detailed description when taken in conjunction with the accompanying drawing figures.

BRIEF DESCRIPTION OF THE DRAWING

Fig. 1 is a perspective schematic view of a sensor platform in accordance with a first embodiment of the invention.

Fig. 2 is a block diagram of the first embodiment of the system in accordance with the invention.

Fig. 3 is a schematic side view of a vehicle showing potential locations for the sensor platform in accordance with the present invention.

Fig. 4 is a partial side view of a second embodiment of a sensor platform of the present invention.

Fig. 5 is a perspective view of the second embodiment of the present invention.

Fig. 6 is a control block diagram of the second

embodiment of the present invention.

Fig. 7 is front view of the display panel in the second embodiment of the present invention.

Fig. 8 is a schematic side view of an alternative collection apparatus of a system in accordance with the present invention.

Fig. 9 is a block diagram of a remote sensing embodiment of the system in accordance with the present invention.

DETAILED DESCRIPTION OF THE INVENTION

First Embodiment

Referring now to Figs. 1 through 3, a first embodiment of the apparatus of the invention includes a platform 12 which is typically vertically mounted behind a vehicle wheel 14. This platform 12 replaces and also operates as a conventional mud flap on the vehicle 10.

As stated above, one of the objects of this invention is to provide a unique multi-purpose mounting platform 12, such as is shown in Fig. 1, that enables the temporary use of materials 16 which are typically discharged from a vehicle wheel/road surface interface to measure certain characteristics of the materials that have left a roadway surface (surface materials), and to also determine certain characteristics of the surface itself. The surface is most commonly a road or aircraft runway surface. Throughout this specification, use of the terms surface, road, roadway, or runway are interchangeable and are used to generally mean any surface upon which a vehicle is operated or is operable.

The manipulation of the characteristics of surface materials, for instance freezing the surface material, is one efficient and accurate way to

obtain information on the surface conditions as well as determine the conditions of loose surface material.

The characteristics to be measured may include but are not limited to:

1. Material volumetric buildup, such as snow, ice, liquid solution, i.e., depth of material on the surface.
2. Determination of the constituents of the chemical solutions and mixtures present, and characteristics of the solutions and mixtures, such as percent of a particular chemical in solution, the freezing point (temperature) of the solution, and the amount or percentage of a component in the solution and/or mixture.
3. Temperatures, both ambient and of the material solution or mixture sensed.

The methodology of determining the characteristics described above varies with the characteristic being tested. For example, the general type of material buildup may be measured via resistivity and/or conductivity in conjunction with temperature. The chemical composition of the material on the road surface may be determined by spectrographic techniques, or by evaluation of EMR reflections. The percent of chemical(s) in a solution that has built up on a road surface may be determined by measuring the resistivity and/or conductivity of the collected material covering the sensor or by evaluation of EMR reflections. The freeze point of the solution may be determined by a software comparison, such as a table look-up, when the material components are known. The ambient temperature is measured via a thermometer or thermocouple which could be remote from the

platform. The temperature of the solution/material buildup is measured by any known appropriate sensor means such as a thermometer, thermocouple or infrared sensor preferably mounted on the platform 12.

Alternatively, the freeze point of a solution can actually be determined by actually freezing the collected solution. The freeze point is determined by monitoring a property of the solution that indicates that the freezing temperature is reached, such as changes in electrical conductivity. This could eliminate the need for a look-up table.

The sensor platform 12 can be made of a thermoplastic material, or sensor flap material such as urethanes or teflon, and which preferably has the following characteristics:

- impact/abrasion resistant;
- low surface friction to maintain slipperiness to sheet the discharged material off of flap and sensor surface(s);
- pliable and flexible temperature range of plus 150 - minus 40 F degrees without melting or becoming brittle. Operating temperature of eighty degrees fahrenheit (80°F) to minus forty degrees fahrenheit (- 40°F); and
- capable of using all sides for mounting of sensors and to be formed in such a way as to make sure that sensed material will be directed to the various surfaces as needed.

The sensor platform or flap 12, shown in Fig. 1, illustrates a variety of sensors mounted on or within it to illustrate the various mounting configurations for the purpose of making measurements or sensing certain characteristics of the material that has left the road surface as a result of turbulence or surface discharge behind the

vehicle wheel.

The platform 12 is constructed to carry or have imbedded therein various sensors 18, 20, 22, and/or 24. These sensors, depending on their function, may protrude outside of or be recessed within the finished flap 12 so that they will be exposed to, or not exposed to, the material to be sensed, or will have access to the material to be sensed. As an alternative, the various sensors could be mounted with appropriate hardware onto an existing piece of flap material to achieve the same effect.

For example, sensors 18 and 20 may be a conductivity detector and/ or a resistance temperature detector (RTD) or a thermocouple (TC) which senses the temperature of the material on the surface of the flap 12 and the presence of conductive solutions in the material such as NaCl or KCl or $MgCl_2$ in order to determine the type of material buildup. The lead wires from the conductivity cell and/or the RTD or TC are either embedded in or mounted behind the flap 12 for protection from abrasion and moisture.

Sensor 22 may be a sensor such as an RTD or TC mounted within an aperture 26 in the flap 12. The aperture 26 permits the passing air flow behind the wheel 14 to blow clear and thus ensure that new material continuously passes the sensor location. Other sensor locations in the aperture 26 are shown in dashed lines. The aperture 26 may also be used to direct flow of material past a sensor such as an EMR device.

The sensor 22A may alternatively be embedded in the flap 12 with the tip projecting to the front surface of the flap 12 to accurately measure the captured material temperature.

Sensor 24 may be a RTD or TC mounted either

behind the flap 12 or embedded within it so as to be representative of the ambient temperature of the flap 12. Alternative sensor locations may be incorporated into the sides or top of the flap 12 as indicated by the "S" thereon.

The flap 12 is preferably mechanically attached to the vehicle 10. The sensor flap 12 is designed to temporarily "catch" the discharge material from the vehicle's wheel 14. Alternatively, a separate sensor wheel 14A may be provided as shown in Fig. 3, for producing material discharge to be collected by a flap 12A which carries the sensors for making the measurements concerning the surface that the vehicle is riding over as well as detecting any buildup that might be on the surface - even after the buildup has left the surface.

The incident spray material must not cling to the flap or plug any pass-through holes as new samples must periodically be measured/sensed. Therefore, proper material selection is an important consideration in this first embodiment.

The sensors are connected to an in-cab display and control panel 28 via a cable 30 as shown in Fig. 2. The control panel 28 is capable of controlling, communicating with, and powering the sensors as well as interpreting sensor data and preferably includes display/input devices which can display information, accept outside input, store commands, and retrieve data. Alarm and control functions are also displayed on this panel. For example, interpreted data could include a freeze point prediction or alert notice for the measured solution and/or material.

Second Embodiment

A second embodiment of the surface condition

sensing system in accordance with the invention is shown in Figs. 4-7. The system in accordance with the second embodiment is specifically directed to determining the freezing temperature of a surface material. It includes an apparatus 38 that collects material from the road surface into a chamber, freezes it, determines the freezing temperature, communicates the data appropriately to a display/control console, and then thaws the material, empties the chamber, and prepares for the next measurement cycle. The apparatus 38 is mounted in a location on the platform 12 as disclosed above.

The apparatus 38 associated with this system is seen in a side view in Fig. 4. The apparatus 38 comprises a support structure 40 made of any suitable material, for instance a laminate of a thermoplastic material and aluminum, and a capture and measurement portion 42 supported below and from the support structure 40. The capture portion 42 comprises an elongated chamber 44 having an open top end 46 and an open bottom end 48 generally having an elongated oval cross section. The open top end 46 is for receiving any surface material that collects above the top end 46 on the support structure 40.

The top end 46 and bottom end 48 of the chamber 44 are preferably made of a flexible material, such as plastic or rubber, which is preferably able to be selectively opened and pinched closed to allow material to flow in and out as desired. Selective opening and closing valve mechanisms 50 are mounted to the apparatus at the appropriate positions adjacent the upper and lower ends 46 and 48. When the bottom end 48 is closed and the top end 46 is open, collected material builds up in the chamber 44. When both ends are closed, the collected material is isolated. When both ends are

open, the collected material is discharged from the lower end 48.

Each of the opening and closing mechanisms 50 includes a pinch valve 52 and a solenoid 54. The top and bottom ends 46, 48 of the chamber 44 are selectively opened and closed by pinch-valves 52. When the upper solenoid 54 is energized, it extends a shaft 55 outward and pushes a first surface 56, engaging a flexible portion 58 of the chamber 44 adjacent the upper open end 46, from one side and drives the flexible portion 58 towards the other side, which is in contact with a stationary second surface 60. The open top end 46 of the chamber is thus pinched closed between the first and second surfaces 56 and 60, causing a preferably impermeable seal to be formed at the top end of the chamber. The bottom end 48 of the chamber 44 is closed in a similar manner using a second solenoid operated pinch valve 52.

The chamber 44 has a central portion 62 of a predetermined length and width between the selective opening and closing mechanisms 50. This portion 62 preferably has an elongated oval cross section and is made of a conductive material, such as copper. The central portion 62 of the chamber 44 comprising a conductive material is thermally coupled to opposing plates of a thermo-electric heater/cooler 64 which controls the temperature of the central conductive chamber 44 using, for example, the well known Peltier effect.

A heat sink 66 surrounds the chamber 44, preferably on all sides, along the length of the chamber 44 to facilitate the heating and cooling process as a result of the operation of the thermo-electric heater/cooler 64.

A liquid exiting aperture 68 is formed in the

chamber 44 above the first surface 56 to allow any surface material draining into the liquid capture gap 70 to exit the chamber 44 when the flexible portion 58 of the chamber 44 is closed during operation of the thermo-electric heater/cooler 64. The draining liquid flows down over the heat sinks 66, preferably thereby beneficially affecting the heat transfer capabilities of the heat sinks 66.

Operation

The operation of this second apparatus may be either automatic or manual. In automatic operation, the apparatus operates continuously or at a predetermined cycle frequency as determined by the user. In manual mode, the user actuates the apparatus each time road surface condition information is desired. This second embodiment of the road surface sensing system is used to collect surface material and accurately determine the freezing point of such material regardless of material composition.

The apparatus is positioned on the vehicle such that it is exposed to the spray of the surface material caused by the motion of the vehicle, as is schematically shown in Fig.3. The apparatus may be positioned behind front or rear wheels, or may optionally include a separate wheel or scoop device to pick up material from the road surface.

Referring now to the perspective view of the apparatus 42 in Fig. 5, when a measurement is to be taken, the bottom end 48 of the chamber 44 is closed. The surface material spray contacts the support structure 40, runs down the support structure 40 under the influence of gravity into the liquid capture gap 70. The surface material collects in the chamber 44 either for a programmable

predetermined period of time, preferably about 5 to 10 seconds, or until the appropriate liquid level is obtained, at which time the top end 46 is closed by closure of the upper pinch valve 52 to preclude entry of material that could contaminate the sample during measurement.

When a sufficient amount of surface material is collected in the chamber 44 and the upper pinch valve 52 is closed and the thermo-electric cooler 64 is activated to freeze the collected surface material. The electrical conductivity of the collected surface material is monitored in the chamber 44 during the cooling process to establish the freezing point of the surface material. This freezing point is communicated appropriately to the processor and display console 72, shown in Fig. 7.

After the freezing point is determined, the thermo-electric cooler 64 is activated to heat the conductive chamber portion 62 to melt the surface material. The bottom end 48 is then opened by de-energizing the lower pinch valve 52 to allow the surface material to exit the chamber 44. The process can then be repeated to obtain a new reading.

More particularly, referring to Fig. 6, and to Fig. 7, automatic operation of the apparatus in accordance with this embodiment of the invention proceeds as follows. The user places the automatic/manual selector switch 80 in the automatic position. When the switch 80 is placed in the automatic position, a signal 82 is sent to close the bottom valve and a signal 84 is provided to de-energize the upper solenoid valve 52 so that collected material may flow into the chamber 44. The control system then pauses for a predetermined amount of time, such as ten seconds, in block 86.

At the expiration of this wait period, a signal 88 is sent to close the upper valve 52 in order to isolate the sensing portion 62 of the chamber 44. Preferably, another programmable wait period 90 of a predetermined length of time is conducted after which the processor tests whether the contents of the central portion 62 of the chamber 44 is conductive. This test of conductivity 92 is necessary in order to sense whether there is any material collected in the chamber. If the material collected in the chamber is conductive, a signal 94 is sent to turn on the thermo-electric heater/cooler 64 in the cooling mode. Conductivity is continually monitored in block 96 to determine a significant change in conductivity, as the material in the central portion 62 of the chamber 44 is cooled, which indicates that the threshold to freezing has been reached. This threshold is normally indicated by a substantial change in magnitude of the conductivity signal. If the threshold of freezing is detected in block 96, the processor then sends a signal 98 to turn on the heater until it reaches a temperature substantially greater than the threshold, for example, about 50° Fahrenheit. When this temperature is reached, a control signal 100 is sent to de-energize both upper and lower solenoid valves 52 for a programmable period of time sufficient to permit the collected material to drain from the chamber 44, for example, ten seconds.

On the other hand, if, in block 96, no threshold crossing was sensed, an abort action display message signal 102 is displayed and the automatic process steps 80 through 96 are repeated.

Referring now to Fig. 7, the display console includes an on/off switch 104, a start switch 106, a purge switch 108, and a display 110. Manual

operation or automatic operation is selected by switch 80. When the manual operation is selected, the purge switch 108 may be pressed by the operator. This de-energizes both inlet and outlet valves 52, allowing any materials contained in the chamber 44 to be discharged. The start switch 106 is pressed and the automatic or manual control process shown in the flow chart in Fig. 6 is performed from block 82 through block 100. After the chamber temperature has reached 50° in block 100, the processor determines in block 112 whether switch 80 is in the automatic or manual position. If in the manual position, a signal is sent to leave both valves 52 open and await further manual instructions. If switch 80 is in the automatic position, however, the process is automatically directed to block 82 in which the bottom valve 52 is closed and the sample collection and evaluation process is repeated a programmable number of times.

Referring now to Fig. 8, the apparatus in accordance with the second embodiment may be modified to include a collection apparatus 120 that incorporates an endless belt 122. In operation, the endless belt 122 moves in the direction of the arrow 124. Road debris thrown up by the vehicle moves and impinges on belt 122 in the direction shown by arrow 126. The lower pulley 128 is preferably either hydraulic motor driven or electrically driven. The upper pulley 130 is preferably spring biased away from the motor driven pulley 128 to maintain tension on the belt 122. A collection hopper 132 is positioned below the motor driven pulley 128 and discharges into the open upper end 46 of the collection chamber 44 above described. A scraper 134 is positioned adjacent the front facing portion of the belt 122 before the belt 122

enters the hopper 132 so that as it enters the hopper 132, leaves and other solid debris may be scraped from the belt 122.

A pinch idler pulley 136 is mounted adjacent the motor driven pulley 128. As the belt moves around the pulleys counterclockwise as shown in Fig. 8, liquid picked up from the road is "squeegeed" into the hopper 132 as the belt 122 passes between idler pulley 136 and driven pulley 128. A spring-loaded clutch 138 may also be provided on the motor driven pulley so that the collection apparatus 120 does not operate while the central portion 62 of the collection chamber 44 is isolated.

Third Embodiment

A block diagram of a third embodiment of the sensing system in accordance with the present invention is illustrated in Fig. 9. This third embodiment is a completely remote sensing apparatus which is mounted on the vehicle. This system 200 includes at least one electromagnetic radiation transceiver 202 which emits a ultra-wide band (UWB) impulse radar. A very short electromagnetic impulse is propagated from transceiver 202 and echoes that reflect from the road surface 204 are evaluated. These reflected signals are set to a depth processor 206, a density processor 208, and at least a chemical composition processor 210. The EMR reflected pulse may be utilized directly by the depth processor 206 to determine the depth of any surface layer of material on the roadway. However, the density processor, and composition processors 208 and 210 rely also on input from a database 212 to determine, by comparison to peak height or phase shift of the reflected signal versus the incident signal, an output which is unique to a particular

chemical composition and density. Comparing these outputs to the database content produces or can result in quantitative density and composition information 214 which is, in turn, fed to computer 216 along with depth information 218.

The depth 218 is processed in the computer 216 to provide a display 220 with information necessary to determine what additional chemicals need to be deposited on the road surface in order to minimize the hazardous conditions. In addition, the computer 216 may provide a direct output to a control device for automatically dispensing the appropriate amounts of chemicals to the road surface as the vehicle drives by.

An infrared transceiver 222 is also mounted on the vehicle and is directed toward the road surface. The transceiver 222 provides an output to a road temperature processor 224 which in turn also feeds an output to the computer 216 indicative of the actual road surface temperature.

The apparatus 200, in accordance with the third embodiment of the present invention, may be compactly designed for unitary installation in the cab of a road maintenance vehicle, such as a salt truck, with the display 220 and a keyboard input device 226 integrated into the dashboard of the vehicle. The driver can then input to the computer 216 desired deicing concentrations or other desired input information. The computer 216 then can compare the actual composition and status of the material actually on the road and either display or automatically control the dispensing of additional chemicals to the road surface.

The apparatus and system in accordance with the present invention has been described with reference to particular embodiments thereof. Therefore, the

above description is by way of illustration and not by way of limitation. Accordingly, it is intended that all such alterations and variations and modifications to the embodiments are within the scope of the present invention as defined by the appended claims.

CLAIMS:

1. A system carried by a vehicle for remotely sensing at least one characteristic of a material deposited on a vehicle travel surface, said apparatus comprising:

an electromagnetic radiation transmitter mounted on said vehicle for transmitting a signal toward said material on said vehicle travel surface;

an electromagnetic radiation receiver mounted on said vehicle for receiving a first reflected signal from said vehicle travel surface and a second reflected signal from said deposited material on said vehicle travel surface;

at least one signal processor connected to said receiver for processing said first and second reflected signals and producing a depth output signal corresponding to the thickness of said deposited material;

a database containing information representing various characteristic values for potential deposited materials; and

a computer, connected to said processor and to said database for comparing said output signal to information in said database and generating a corresponding display signal.

2. The system according to claim 1 further comprising a second processor connected to said receiver and to said database for processing at least one of said reflected signals, comparing the reflected signal to said transmitted signal to determine a characteristic of said deposited material and comparing said characteristic to said information in said database to identify the composition of said deposited material and generate a composition output signal.

3. The system according to claim 2 further comprising a third processor connected to said receiver for comparing

said reflected and transmitted signals to determine the density of said deposited material and generating a density output signal.

4. The system according to claim 3 wherein said computer receives said density output signal, said composition output signal, and said depth output signal and calculates the amount of a user inputted composition needed to be applied to said vehicle travel surface to produce a desired composition on said surface.

5. The system according to claim 3 further comprising an infrared transceiver mounted on said vehicle connected to a temperature processor for generating an output signal to said computer corresponding to the temperature of said vehicle travel surface.

6. A system carried by a vehicle for remotely sensing at least one characteristic of a material deposited on a vehicle travel surface, said apparatus comprising:

an electromagnetic radiation transmitter mounted on said vehicle for transmitting a signal toward said material on said vehicle travel surface;

an electromagnetic radiation receiver mounted on said vehicle for receiving a first reflected signal from said vehicle travel surface and a second reflected signal from said deposited material on said vehicle travel surface;

at least one signal processor connected to said receiver for processing said first and second reflected signals and producing an output signal corresponding to at least one characteristic of said deposited material; and

a computer connected to said processor generating a corresponding display signal.

7. The system according to claim 6 further comprising a second signal processor connected to said receiver and to said computer for processing at least one of said reflected signals and comparing the reflected signal to said transmitted signal to identify the composition of said deposited material and generate a composition output signal.

8. The system according to claim 7 further comprising a third processor connected to said receiver. for comparing said reflected and transmitted signals to determine the density of said deposited material and generating a density output signal.

9. The system according to claim 8 wherein said computer receives said density output signal, said composition output signal, and calculates the amount of a user inputted composition needed to be applied to said vehicle travel surface to produce a desired composition on said surface.

10. The system according to claim 8 further comprising a temperature sensor mounted on said vehicle connected to a temperature processor for generating an output signal to said computer corresponding to the temperature of said vehicle travel surface.

11. A system carried by a vehicle for remotely sensing at least one characteristic of a material deposited on a vehicle travel surface, said apparatus comprising:

an electromagnetic radiation transmitter mounted on said vehicle for transmitting a signal toward said material on said vehicle travel surface;

an electromagnetic radiation receiver mounted on said vehicle for receiving a first reflected signal from said deposited material on said vehicle travel surface;

at least one signal processor connected to said receiver for processing said first reflected signal and producing an output signal corresponding to at least one characteristic of said deposited material; and

a second signal processor connected to said receiver for processing said first reflected signal and comparing the reflected signal to said transmitted signal to determine another characteristic of said deposited material.

12. The system according to claim 11 further comprising a temperature sensor mounted on said vehicle connected to a temperature processor for generating an output signal corresponding to the temperature of said vehicle travel surface.

13. The system according to claim 12 wherein one of said at least one signal processor and said second signal processor generates an output signal corresponding to the density of said deposited material.

14. The system according to claim 13 wherein said receiver receives a second reflected signal from said vehicle travel surface in order to generate an output corresponding to the depth of, said deposited material on said vehicle travel surface.

15. A system carried by a vehicle for remotely sensing at least one characteristic of a material deposited on a vehicle travel surface, said apparatus comprising:

an electromagnetic radiation transmitter mounted on said vehicle for transmitting a signal toward said material on said vehicle travel surface;

an electromagnetic radiation receiver mounted on said vehicle for receiving a first reflected signal from said vehicle travel surface and a second reflected signal

from said deposited material on said vehicle travel surface;

at least one signal processor connected to said receiver for processing said first and second reflected signals and producing a depth output signal corresponding to the thickness of said deposited material.

16. The system according to claim 15 further comprising a second processor connected to said receiver for processing at least one of said reflected signals, comparing the reflected signal to said transmitted signal to determine a characteristic of said deposited material and comparing said characteristic to said information in said database to identify the composition of said deposited material and generate a composition output signal.

17. The system according to claim 16 further comprising a third processor connected to said receiver for comparing said reflected and transmitted signals to determine the density of said deposited material and generating, a density output signal.

18. The system according to claim 17 further comprising a computer connected to said processors wherein said computer receives said density output signal, said composition output signal, and said depth output signal and calculates the amount of a user inputted composition needed to be applied to said vehicle travel surface to produce a desired composition on said surface.

19. The system according to claim 17 further comprising an infrared transceiver mounted on said vehicle connected to a temperature processor for generating an output signal to said computer corresponding to the temperature of said vehicle travel surface.

20. A system carried by a vehicle for remotely sensing at least one characteristic of a material deposited on a vehicle travel surface, said apparatus comprising:

an electromagnetic radiation transmitter mounted on said vehicle for transmitting a signal toward said material on said vehicle travel surface;

an electromagnetic radiation receiver mounted on said vehicle for receiving a first reflected signal from said vehicle travel surface and a second reflected signal from said deposited material on said vehicle travel surface;

at least one signal processor connected to said receiver for processing at least one of said first and second reflected signals and producing an output signal corresponding to at least one characteristic of said deposited material.

21. The system according to claim 20 further comprising a second processor connected to said receiver for processing at least one of said reflected signals, comparing the reflected signal to said transmitted signal to determine another characteristic of said deposited material and comparing said characteristics to identify the composition of said deposited material and generate a composition output signal.

22. The system according to claim 21 further comprising a third processor connected to said receiver for comparing said reflected and transmitted signals to determine the density of said deposited material and generating a density output signal.

23. The system according to claim 22 further comprising a computer connected to said processors wherein said computer receives said composition output signal and said density output signal and calculates the amount of a user inputted composition needed to be applied to said vehicle

travel surface to produce a desired composition on said surface.

24. The system according to claim 20 further comprising a temperature sensor mounted on said vehicle connected to a temperature processor for generating an output signal corresponding to the temperature of said vehicle travel surface.

25. The system according to claim 24 further comprising a second processor connected to said receiver for processing at least one of said reflected signals, comparing the reflected signal to said transmitted signal to determine another characteristic of said deposited material and comparing said characteristics to identify the composition of said deposited material and generate a composition output signal.

26. The system according to claim 25 wherein further comprising a computer connected to said temperature processor and composition processor output signals for determining a predicted freeze temperature of said deposited material on said vehicle travel surface.

27. The system according to claim 26 wherein said computer connected to said processors calculates the amount of a user inputted composition needed to be applied to said vehicle travel surface to produce a desired composition on said surface.

28. The system according to claim 27 wherein said computer generates a control output signal for automatic control of chemical addition to said vehicle travel surface.

29. A system carried by a vehicle for remotely sensing at least one characteristic of a material deposited on a vehicle travel surface, said apparatus comprising:

an electromagnetic radiation transmitter mounted on said vehicle for transmitting a signal toward said material on said vehicle travel surface;

an electromagnetic radiation receiver mounted on said vehicle for receiving a reflected signal from said deposited material on said vehicle travel surface;

at least one signal processor connected to said receiver for processing said reflected signal and producing an output signal corresponding to at least one characteristic of said deposited material;

a database containing information representing various characteristic values for potential deposited materials; and

a computer connected to said processor and to said database for comparing said output signal to information in said database and generating a corresponding display signal.

30. The system according to claim 29 further comprising an infrared sensor mounted on said vehicle connected to a temperature processor for generating an output signal to said computer corresponding to the temperature of said vehicle travel surface.

31. The system according to claim 29 further comprising a second signal processor connected to said receiver and to said database and to said computer for processing said reflected signal and comparing the reflected signal to said transmitted signal to determine another characteristic of said deposited material and comparing said characteristic to said information in said database to identify the composition of said deposited material and generate a composition output signal.

32. The system according to claim 31 wherein one of said processors generates an output signal corresponding to the density of said deposited material.

33. The system according to claim 32 wherein said computer receives said density output signal and said composition output signal and calculates the amount of a user inputted composition needed to be applied to said vehicle travel surface to produce a desired composition on said surface.

34. The system according to claim 29 further comprising a second signal processor connected to said receiver for processing said reflected signal and producing a depth output signal corresponding to the thickness of said deposited material.

35. The system according to claim 34 further comprising one of said at least one signal processor and said second signal processor comparing the reflected signal from said deposited material to said transmitted signal to said information in said database to identify the composition of said deposited material and generate a composition output signal.

36. The system according to claim 35 further comprising a third processor connected to said receiver for comparing said reflected and transmitted signals to determine the density of said deposited material and generating a density output signal.

37. The system according to claim 36 wherein said computer receives said density output signal, said composition output signal, and said depth output signal

and calculates the amount of a user inputted composition needed to be applied to said vehicle travel surface to produce a desired composition on said surface.

38. The system according to claim 37 wherein said computer generates a control output signal for automatic control of chemical addition to said vehicle travel surface.

39. The system according to claim 36 further comprising an infrared transceiver mounted on said vehicle connected to a temperature processor for generating an output signal to said computer corresponding to the temperature of said vehicle travel surface.

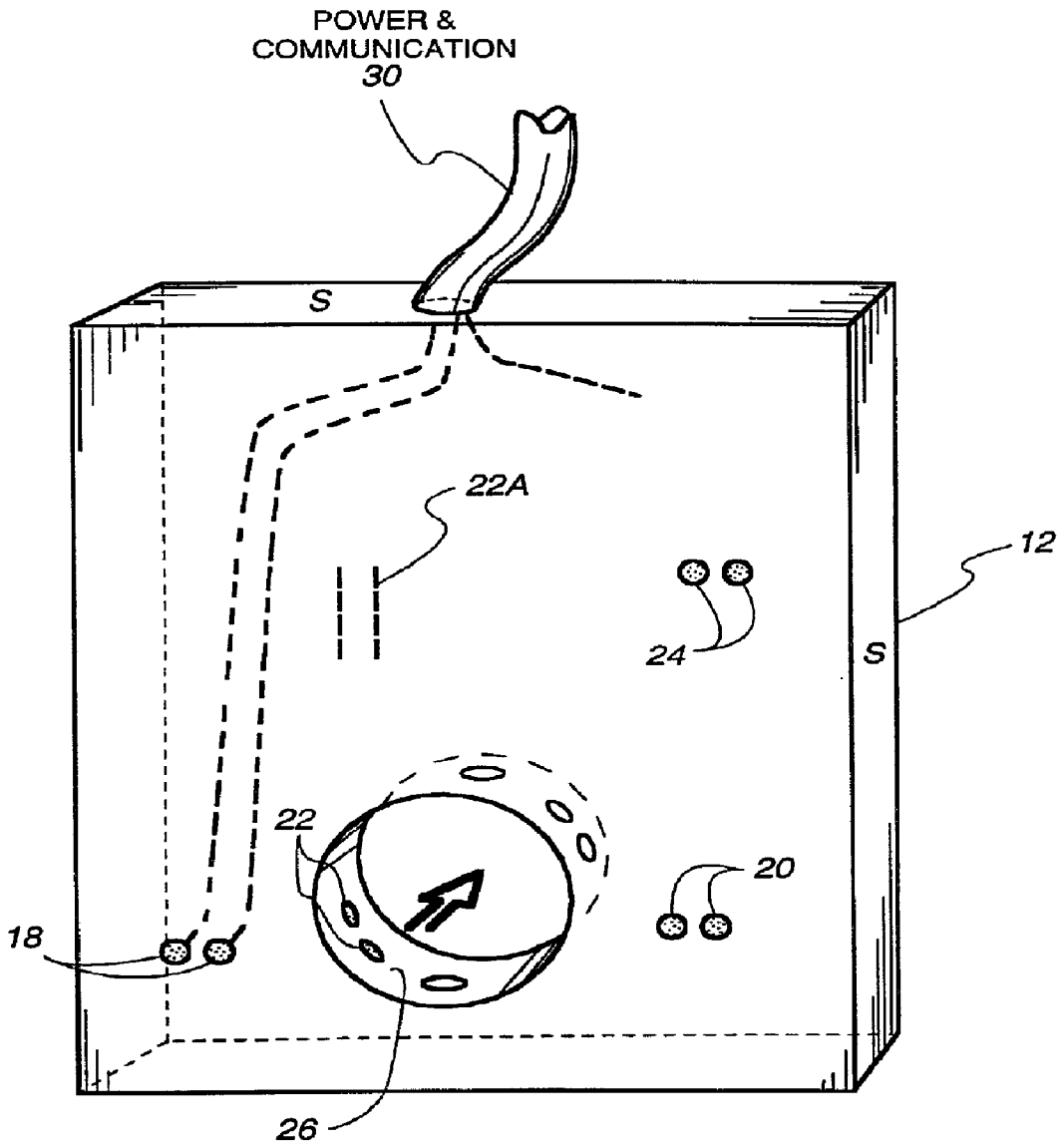


Fig. 1

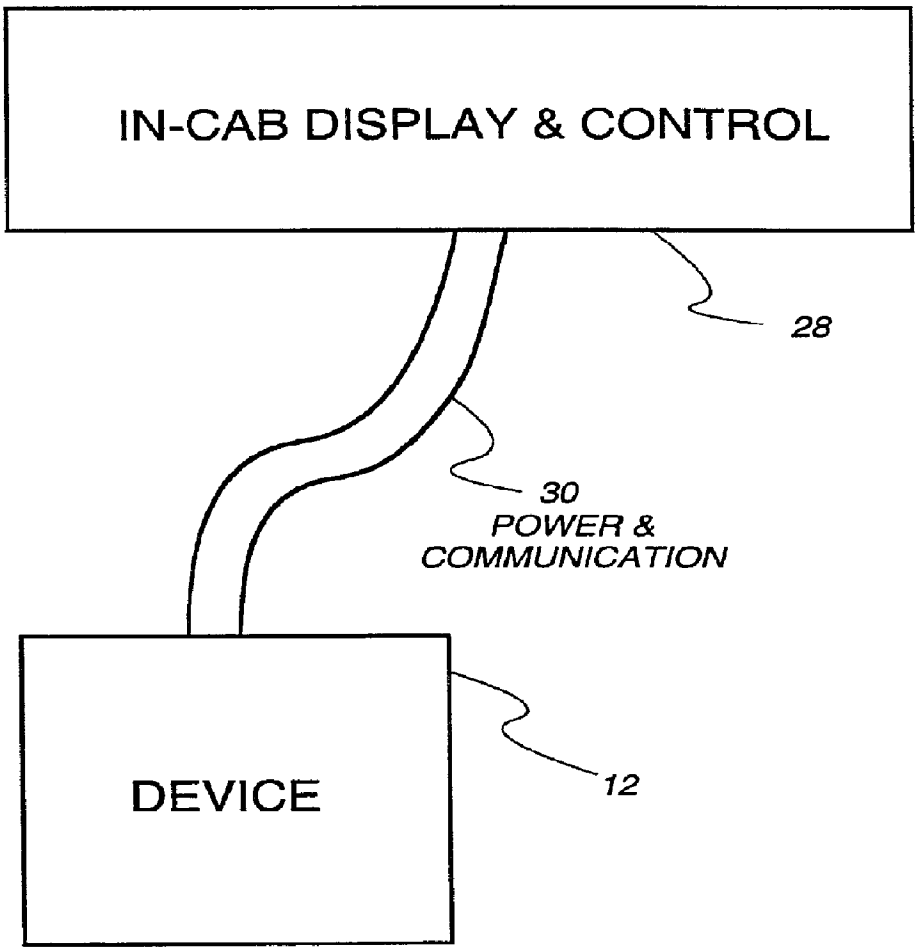


Fig. 2

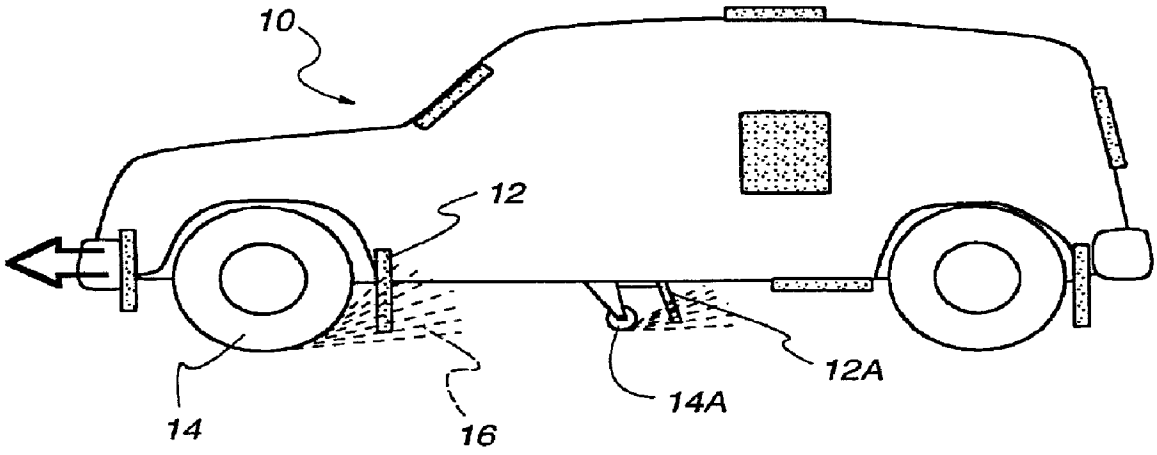


Fig. 3

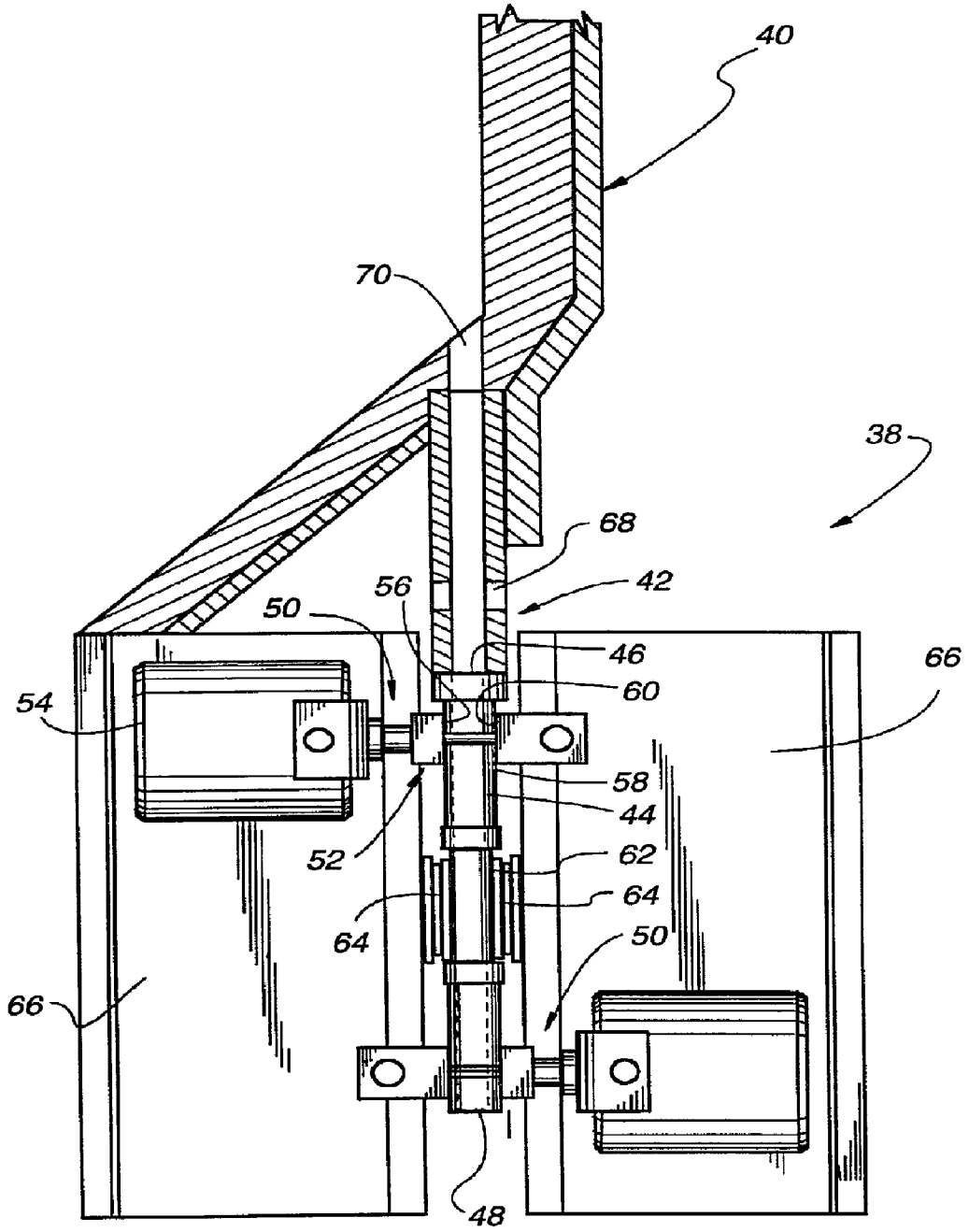


Fig. 4

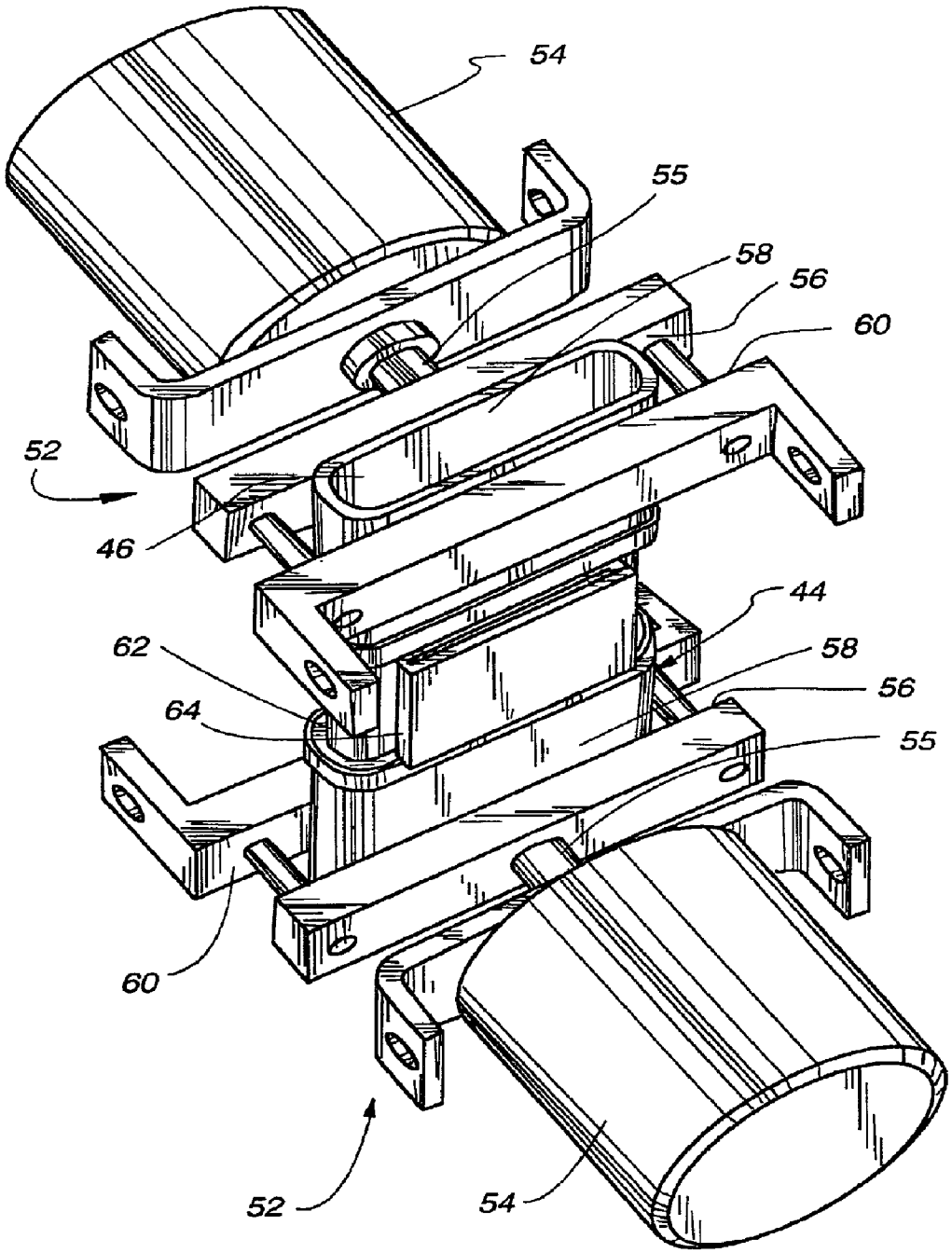


Fig. 5

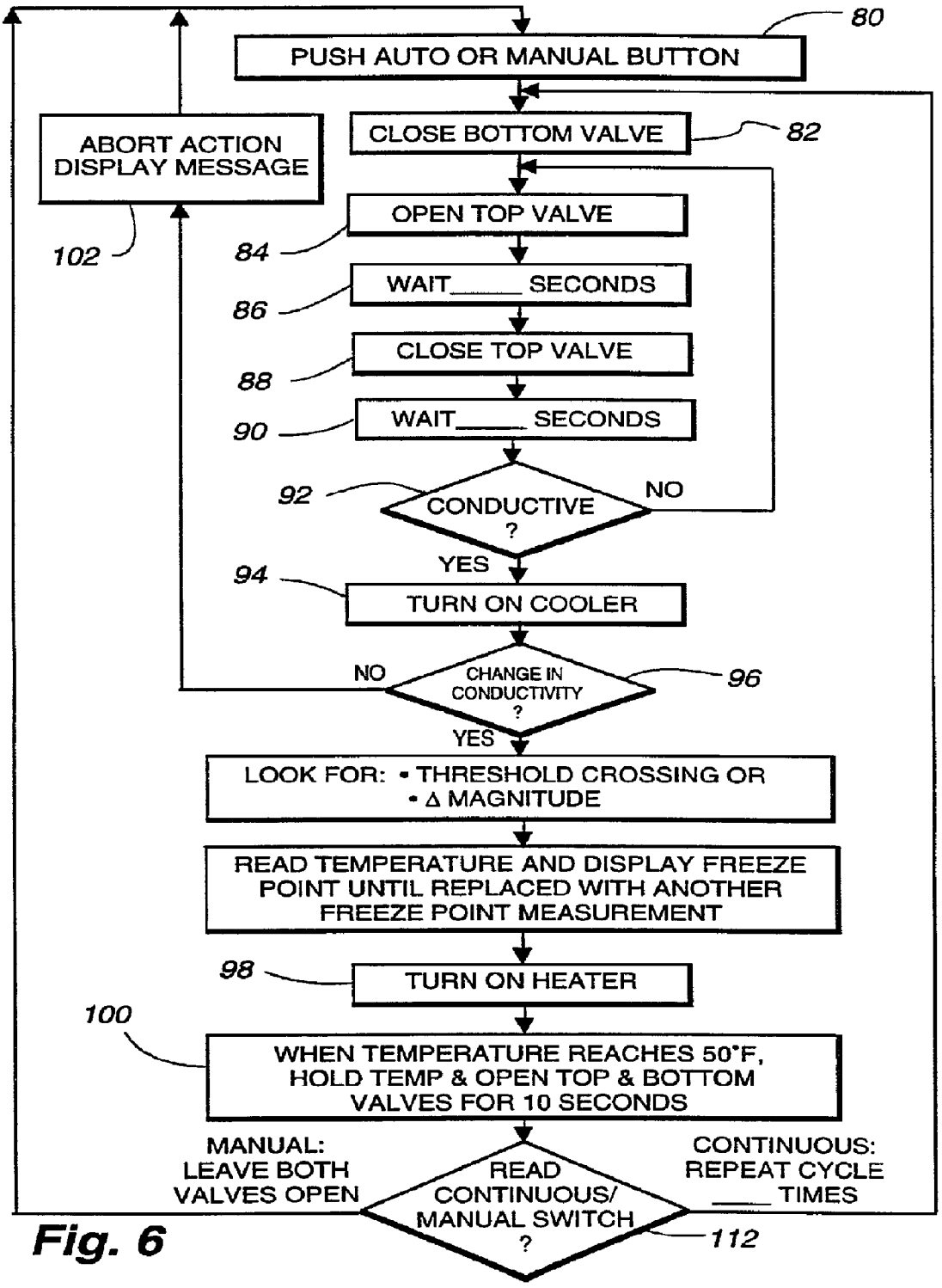

80
PUSH AUTO OR MANUAL BUTTON
CLOSE BOTTOM VALVE
82
ABORT ACTION DISPLAY MESSAGE
102
OPEN TOP VALVE
84
WAIT_____ SECONDS
86
CLOSE TOP VALVE
88
WAIT_____ SECONDS
90
92
CONDUCTIVE ?
NO
YES
94
TURN ON COOLER
NO
CHANGE IN CONDUCTIVITY ?
96
YES
LOOK FOR: • THRESHOLD CROSSING OR • Δ MAGNITUDE
READ TEMPERATURE AND DISPLAY FREEZE POINT UNTIL REPLACED WITH ANOTHER FREEZE POINT MEASUREMENT
98
TURN ON HEATER
100
WHEN TEMPERATURE REACHES 50°F, HOLD TEMP & OPEN TOP & BOTTOM VALVES FOR 10 SECONDS
MANUAL: LEAVE BOTH VALVES OPEN
READ CONTINUOUS/ MANUAL SWITCH ?
112
CONTINUOUS: REPEAT CYCLE ____ TIMES

Fig. 6

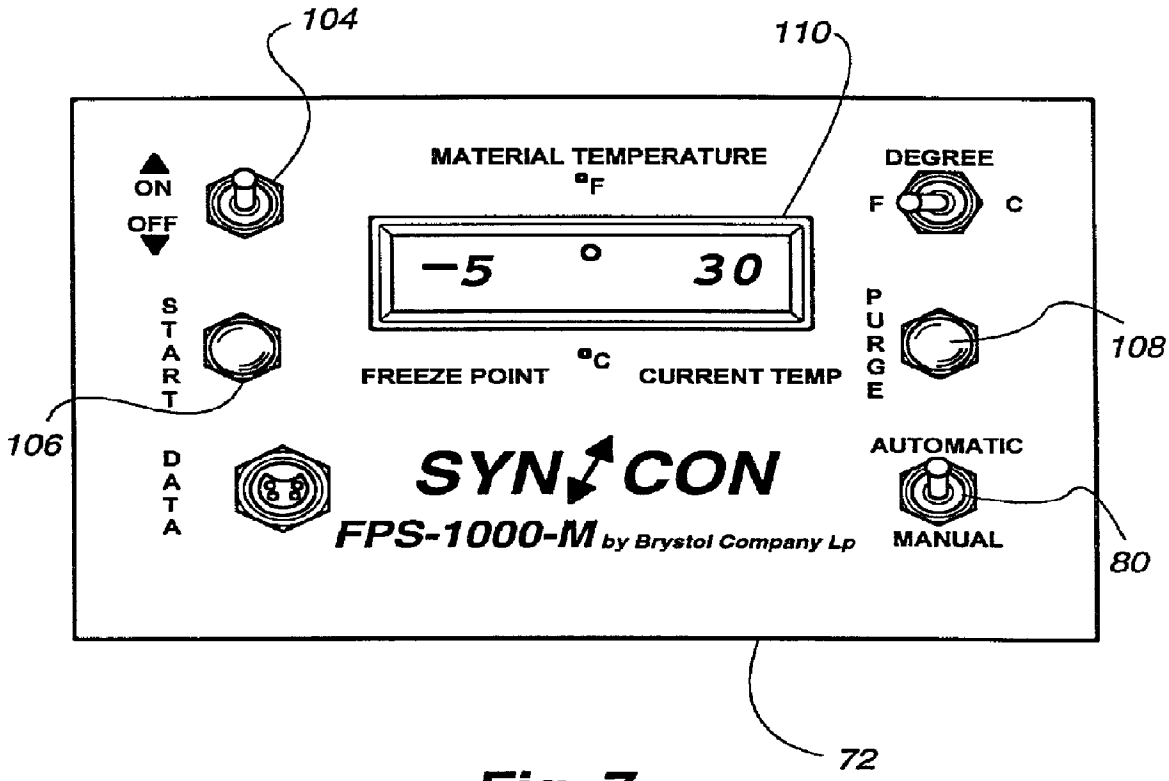

104
110
MATERIAL TEMPERATURE
°F
DEGREE
ON
OFF
F
C
-5
30
START
PURGE
108
FREEZE POINT
°C
CURRENT TEMP
106
DATA
SYNCON
AUTOMATIC
FPS-1000-M by Brystol Company Lp
MANUAL
80
72

Fig. 7

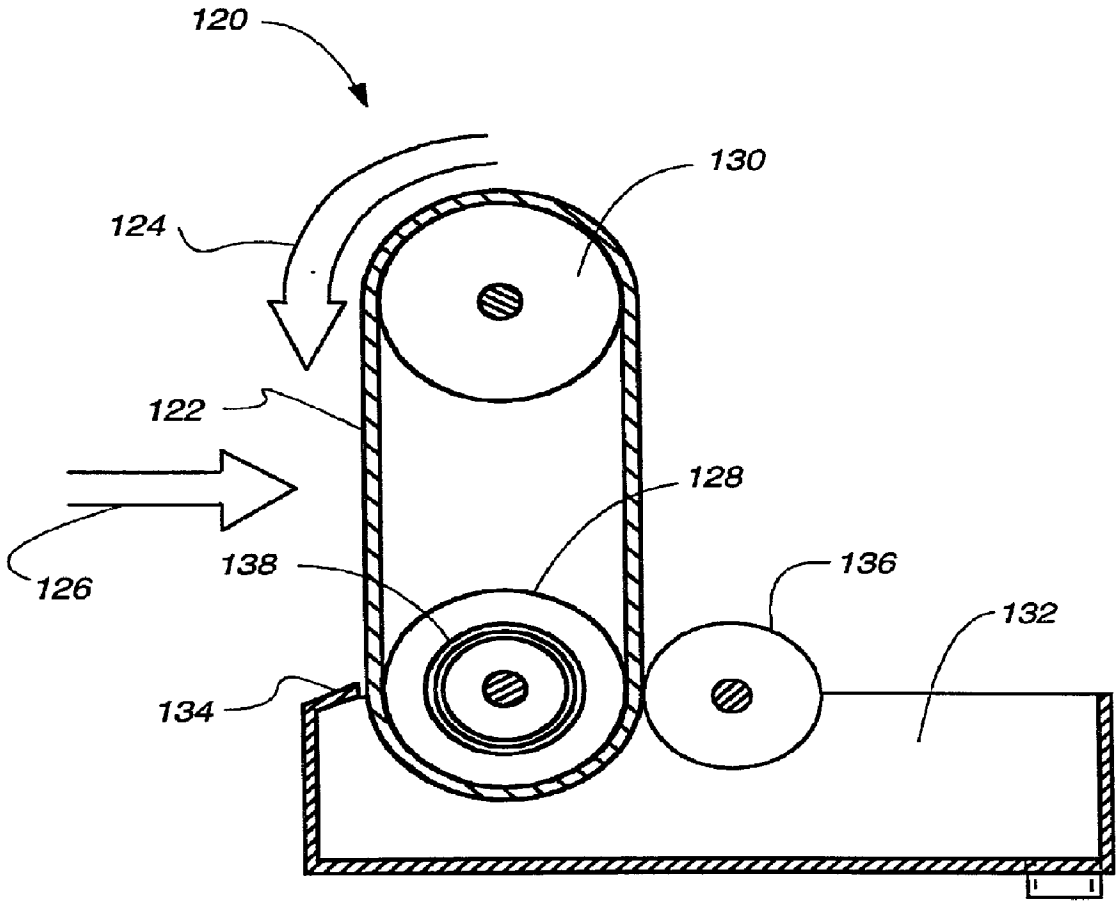


Fig. 8

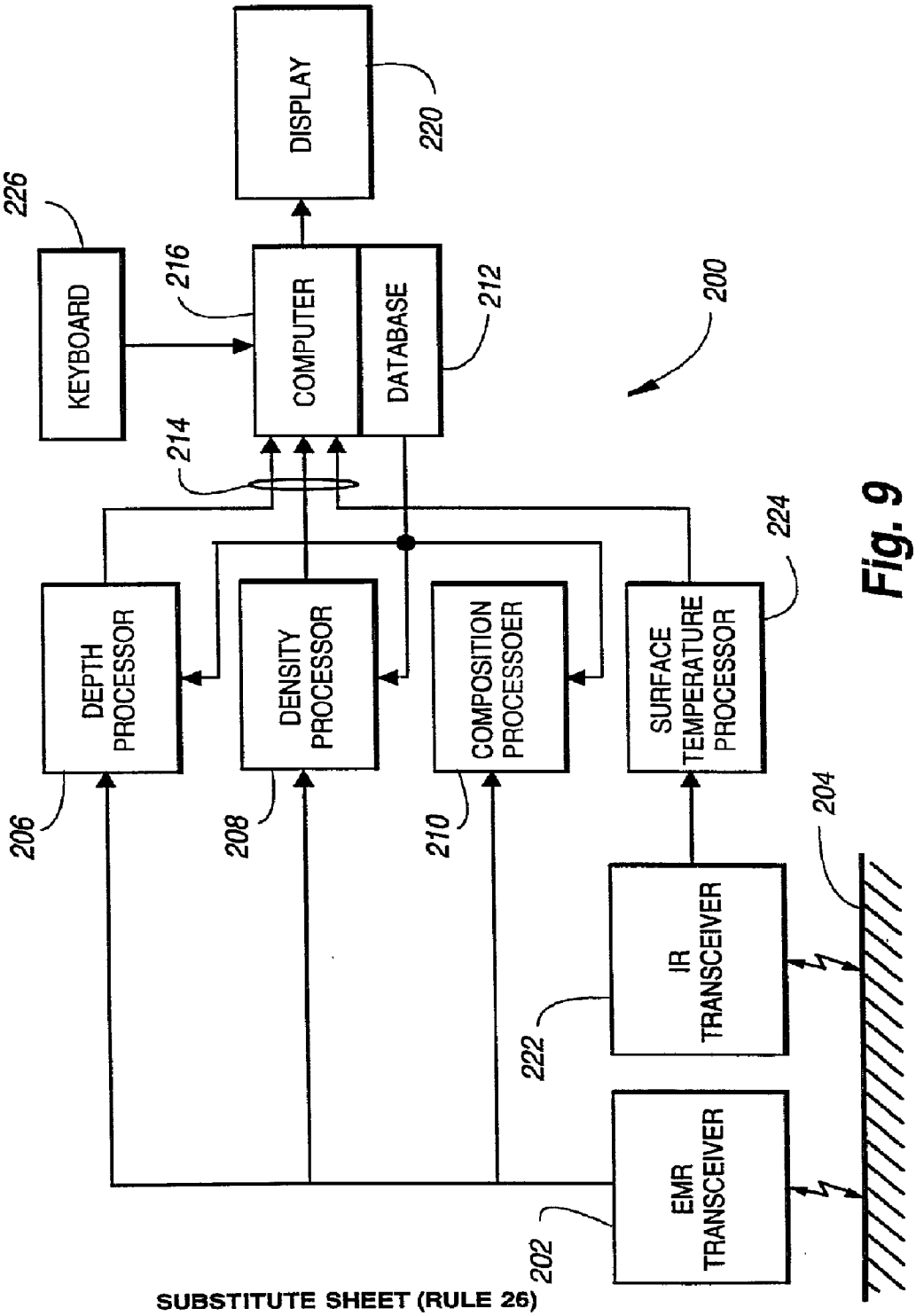

DISPLAY
220
226
KEYBOARD
216
COMPUTER
DATABASE
212
200
214
DEPTH PROCESSOR
DENSITY PROCESSOR
COMPOSITION PROCESSOER
SURFACE TEMPERATURE PROCESSOR
224
206
208
210
204
IR TRANSCEIVER
222
EMR TRANSCEIVER
202

Fig. 9

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(11) CA 2 272 541 (13) A1

(43) 28.05.1998

(12)

(21) 2 272 541

(22) 18.11.1997

(51) Int. Cl.[6]: A01G 025/09, A01C 017/00, A01C 019/00, A01C 023/00, A01C 003/06, A01C 007/06

(85) 20.05.1999

(86) PCT/US97/21144

(87) WO98/21937

(30) 60/031,036 US 18.11.1996
08/879,921 US 20.06.1997

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(54) APPARREIL ET SYSTEME D'APPLICATION SYNCHRONISEE D'UN OU PLUSIEURS MATERIAUX SUR UNE SURFACE A PARTIR D'UN VEHICULE ET COMMANDE D'UN DISPOSITIF DE DENEIGEMENT A POSITION VARIABLE MONTE SUR UN VEHICLE

(54) SYNCHRONIZED APPLICATION OF ONE OR MORE MATERIALS TO A SURFACE FROM A VEHICLE

(57)

An apparatus and system (42/200) is disclosed, preferably mounted on a service vehicle (40), for synchronized application of fluid materials, either solid (44) or liquid (57), to a vehicle travel surface in proportional amounts or spatially distributed proportions in response to user defined requirements and/or operation of a vehicle mounted component (70/91/114/216) in response to conditions encountered in real time. A first embodiment is a vehicle mounted apparatus and system (42) for coordinated application of a plurality of materials (44, 57) to a surface simultaneously and in desired proportions and/or widths automatically and/or selectively. A second embodiment includes a granular material distribution device (46) and includes a plurality of liquid spray headers (58/60/62) and pumping means (136/138/140). A third embodiment (200) includes an automated component control such as blade blocking plate (242) control based on sensed current surface condition information and current accurate location information as well as past operating history and predicted near term weather conditions.

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(12) (19) (CA) **Demande-Application**

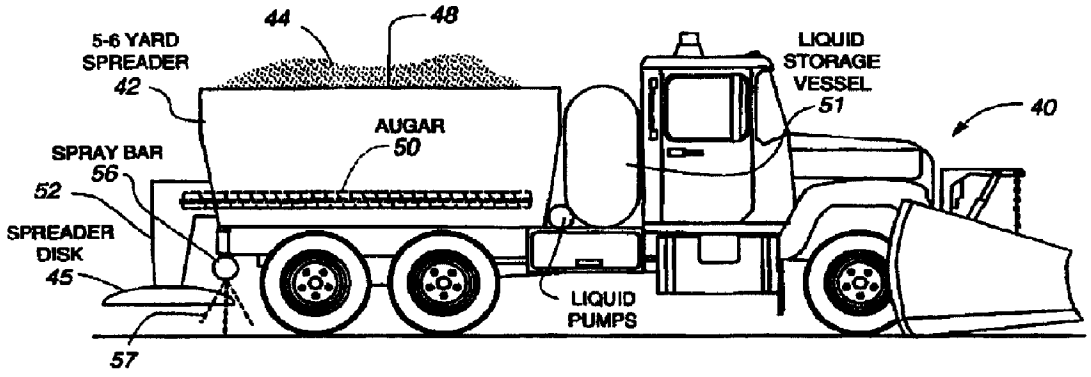
(21) (A1) **2,272,541**
(86) 1997/11/18
(87) 1998/05/28

(72) DOHERTY, John A., US
(72) KALBFLEISCH, Charles A., US
(71) DOHERTY, John A., US

(51) Int.Cl.[6] A01G 25/09, A01C 7/06, A01C 3/06, A01C 17/00, A01C 23/00, A01C 19/00
(30) 1996/11/18 (60/031,036) US
(30) 1997/06/20 (08/879,921) US

(54) **APPAREIL ET SYSTEME D'APPLICATION SYNCHRONISEE D'UN OU PLUSIEURS MATERIAUX SUR UNE SURFACE A PARTIR D'UN VEHICULE ET COMMANDE D'UN DISPOSITIF DE DENEIGEMENT A POSITION VARIABLE MONTE SUR UN VEHICLE**

(54) **SYNCHRONIZED APPLICATION OF ONE OR MORE MATERIALS TO A SURFACE FROM A VEHICLE**



(57) L'invention concerne un appareil et un système (42, 200), de préférence montés sur un véhicule de service (40), pour appliquer de façon synchronisée des matériaux fluides, qu'ils soient solides (44) ou liquides (57), sur une surface où circulent des véhicules, en quantités proportionnelles ou réparties dans l'espace en réponse aux exigences définies par les utilisateurs et/ou au fonctionnement d'un élément (70, 91, 114, 216)

(57) An apparatus and system (42/200) is disclosed, preferably mounted on a service vehicle (40), for synchronized application of fluid materials, either solid (44) or liquid (57), to a vehicle travel surface in proportional amounts or spatially distributed proportions in response to user defined requirements and/or operation of a vehicle mounted component (70/91/114/216) in response to conditions encountered in

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(21) (A1) **2,272,541**
(86) 1997/11/18
(87) 1998/05/28

monté sur ledit véhicule en réponse aux conditions rencontrées en temps réel. Un premier mode de réalisation présente un appareil monté sur ledit véhicule et un système (42) pour appliquer simultanément et de façon coordonnée plusieurs matériaux (55, 47) sur une surface, selon la quantité et/ou la largeur souhaitées, automatiquement et/ou sélectivement. Un deuxième mode de réalisation comprend un dispositif de répartition d'un matériau granuleux (46) et comporte plusieurs collecteurs de pulvérisation liquide (58, 60, 62) et plusieurs moyens de pompage (136, 138, 140). Un troisième mode de réalisation (200) de la présente invention concerne un appareil et un système pour commander de façon automatisée un élément, par exemple pour commander une plaque de blocage à lame (242), sur la base d'informations relatives à l'état détecté de ladite surface et d'informations précises relatives à la position actuelle dudit véhicule, ainsi qu'en fonction de l'historique du fonctionnement et des prévisions météorologiques à court terme.

real time. A first embodiment is a vehicle mounted apparatus and system (42) for coordinated application of a plurality of materials (44, 57) to a surface simultaneously and in desired proportions and/or widths automatically and/or selectively. A second embodiment includes a granular material distribution device (46) and includes a plurality of liquid spray headers (58/60/62) and pumping means (136/138/140). A third embodiment (200) includes an automated component control such as blade blocking plate (242) control based on sensed current surface condition information and current accurate location information as well as past operating history and predicted near term weather conditions.

PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 :		(11) International Publication Number:	WO 98/21937
A01G 25/09, A01C 3/06, 7/06, 17/00, 19/00, 23/00	A1	(43) International Publication Date:	28 May 1998 (28.05.98)

(21) International Application Number: PCT/US97/21144

(22) International Filing Date: 18 November 1997 (18.11.97)

(30) Priority Data:
60/031,036 18 November 1996 (18.11.96) US
08/879,921 20 June 1997 (20.06.97) US

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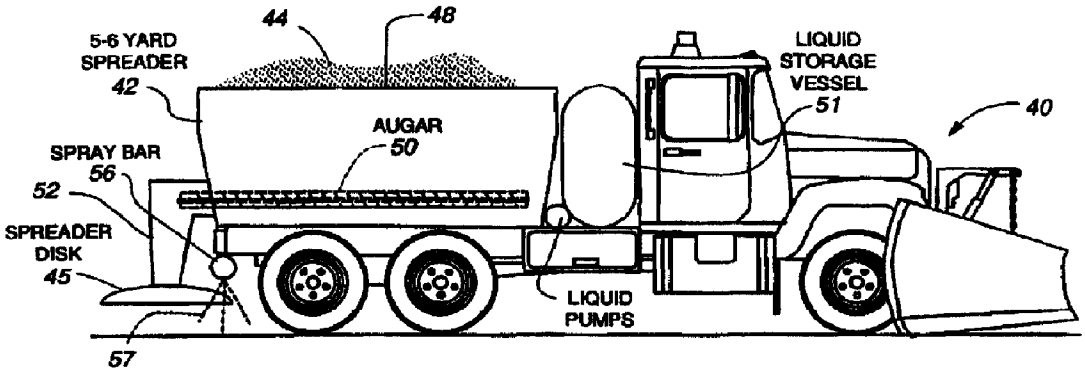
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(81) Designated States: CA, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
With international search report.
Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: SYNCHRONIZED APPLICATION OF ONE OR MORE MATERIALS TO A SURFACE FROM A VEHICLE



(57) Abstract

An apparatus and system (42/200) is disclosed, preferably mounted on a service vehicle (40), for synchronized application of fluid materials, either solid (44) or liquid (57), to a vehicle travel surface in proportional amounts or spatially distributed proportions in response to user defined requirements and/or operation of a vehicle mounted component (70/91/114/216) in response to conditions encountered in real time. A first embodiment is a vehicle mounted apparatus and system (42) for coordinated application of a plurality of materials (44, 57) to a surface simultaneously and in desired proportions and/or widths automatically and/or selectively. A second embodiment includes a granular material distribution device (46) and includes a plurality of liquid spray headers (58/60/62) and pumping means (136/138/140). A third embodiment (200) includes an automated component control such as blade blocking plate (242) control based on sensed current surface condition information and current accurate location information as well as past operating history and predicted near term weather conditions.

SYNCHRONIZED APPLICATION OF ONE OR MORE MATERIALS TO A SURFACE FROM A VEHICLE

CROSS REFERENCE TO RELATED APPLICATIONS

This application is a continuation-in-part of U.S. Patent Application Serial No. 08/783,556, filed January 14, 1997, which is a continuation of Application Serial No. 08/660,232, filed June 7, 1996 and now US Patent No. 5,619,193. This application also claims the benefit of U.S. Provisional Patent Application Serial Nos. 60/020,237, filed June 21, 1996 and 60/031,036, filed November 18, 1996.

BACKGROUND OF THE INVENTION

Field of the Invention:

This invention relates generally to surface conditioning vehicles such as those carrying material spreaders and/or snow removal devices, and more particularly relates to a new and improved apparatus for synchronized material spreading which indexes certain characteristics of a material delivery system such as the spread width of at least a second material in response to a change in the width of spread of a first, or triggering, material and automated control of surface conditioning equipment based on actual surface conditions.

Description of the Related Art:

Surface conditioning vehicles include material spreaders that are used in many applications. For example, they may be used to provide pesticide and fertilizer spreaders in agricultural applications, as well as vehicles for the control of ice and snow on roadways and may include snow plows, blowers, and material spreaders, alone or in combination. In either of these general applications, often it is desirable to spread more than one material simultaneously in either a synchronous or asynchronous manner in either a predetermined ratio or in random proportions to a surface.

The materials to be applied to a surface can be all liquids, all solids, or combinations thereof. Generally, these materials can be referred to materials A & B. The widths of the plurality of materials are manually controlled independently such that the user must decrease or increase the spread-width for each material separately.

For example, in a pre-wetting arrangement, both liquid and granular materials are typically dispersed by a common device such as a spinner disk. In this example, the quantity of liquid is small compared to the amount of granular material. Because of material characteristics, such as density, viscosity, granularity, and flowability, and desired driveability results it is sometimes advantageous to have a separate delivery system for each material. This liquid and granular combination also helps control the bounce and scatter of the granular materials.

In spreading materials on roadways and runways for the control of ice and snow, oftentimes both granular and liquid material are desired to be spread simultaneously. In many instances, each materia-l has its own delivery system. The operator sets the spread-width of the granular material and the spread-width of the liquid material independently of one another. In the event the width of the road changes, or the operator changes the width of spread for any of a variety of reasons, such as allowing a vehicle to pass, the operator must separately act to reduce the spread-width of the granular material and the spread-width of the liquid material.

The problem with the conventional material spreading systems resides in the difficulty in accurately adjusting the spread-width of each material, in addition to the time and attention it takes for the operator to modify the spread-width while driving the vehicle.

A similar problem exists for operators of surface conditioning vehicles which include snow plows and snow blowers, especially in residential areas. During heavy snow conditions, the conventional plows push the snow aside to one side or the other and thus can create a substantial pile of snow in front of driveways. This pile is often compacted and difficult to remove. A recent

solution to this problem has been to equip the vehicle with at least one hydraulically actuated discharge blocking plate on at least one of the ends of the snow blade. The vehicle operator may raise and lower these plates to close off the blade discharge path as the plow passes driveways or other features where snow discharge is undesirable. The drawback of this arrangement is that the system is manually controlled and thus requires constant operator vigilance and action to lower and raise the blocking plates.

It is against this background that the significant improvements and advancement of the present invention have taken place in the field of surface conditioning vehicles, and particularly material spreaders and snow removal controls.

SUMMARY OF THE INVENTION

The present invention comprises an apparatus mounted on a service vehicle for synchronized application of fluid materials, either solid or liquid, to a surface such as a runway or roadway in proportional amounts or spatially distributed proportions in response to user defined requirements and/or operation of a vehicle mounted component in response to conditions encountered in real time.

A first embodiment of the present invention is a vehicle mounted apparatus and system for coordinated application of a plurality of materials to a surface simultaneously and in desired proportions and/or widths automatically and/or selectively.

A second embodiment of the present invention is a vehicle mounted apparatus and system for coordinated application of a plurality of materials to a surface simultaneously and in desired proportions and/or widths automatically and/or selectively. The apparatus includes a granular material distribution device and includes a plurality of liquid spray headers and pumping means.

A third embodiment of the present invention is a vehicle mounted apparatus and system for automated coordinated application of a plurality of

materials to a surface as well as automated component control such as blade blocking plate control based on sensed current surface condition information and current accurate location information, preferably in conjunction with learned weather and surface conditions.

The first embodiment of the present invention comprises a vehicle mounted apparatus for dispensing one or more materials to a surface such as a roadway. The apparatus includes a control box and distribution means for coordinated dispensing one or more fluid materials (the slave material) in response to the dispensing rate or pattern of another fluid material (the triggering material). The fluid materials may be solids such as sand or salt granules or liquids of various types. The apparatus preferably includes a liquid supply tank, pump, and application spray header and a solid fluid material storage container or hopper, auger, and distribution means such as a spinner disk, and a control box operably connected to the pump and spray header, the spinner disk, and the auger motor.

The second embodiment of the present invention is similar to the first except that the system further includes a second spray bar for pre-wetting the granular material prior to the granular material being dispensed.

The third embodiment of the present invention incorporates an on board system for sensing and analyzing actual road surface conditions at the vehicle location and utilizes an on board computer and database to selectively manually or automatically control the application of spreader materials and/or certain operations of a vehicle preferably equipped with a snow plow or blower. The third embodiment includes Global Positioning System receivers and computer controlled reporting capabilities to update other mobile or stationary stations as well as permit the on board computer to receive current and store historical environmental condition data in a Geographical Information System format in order to automatically adjust material application compositions and rates to optimally condition the road surface and control snow plow or blower configurations.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a side view of a spreader vehicle incorporating the synchronized-width material spreader in accordance with a first embodiment of the present invention.

Fig. 2 is a rear-end view of a second embodiment of a vehicle including the synchronized-width material spreader of the present invention, illustrating a granular hopper, liquid storage tanks, spreader disk, and two liquid spray bars, one for pre-wetting and one for direct application.

Fig. 3 is a first embodiment of a control box for use in controlling the synchronized-width material spreader in accordance with the invention.

Fig. 4 is a second embodiment of a control box for controlling the operation of the synchronized-width material spreader in accordance with the invention.

Fig.5 is a third embodiment of a control box for use in operating the synchronized-width material spreader.

Fig. 6 is a schematic representing the operation of the synchronized-width material spreader, and illustrates an increase in the width of material spread using the synchronized-width material spreader of the present invention.

Fig. 7 is a schematic of the operation of the synchronized-width material spreader illustrating a decrease in the width of material spread.

Fig. 8 is a schematic of the hydraulic, electrical and material flow system utilized in operation of the synchronized-width material spreader.

Fig. 9 is a block diagram of a remote sensing system incorporated into an automatic control system in a third embodiment of the invention.

Fig. 10 is a block diagram of the automatic control system for the material spreader in accordance with the invention.

Fig. 11 is a schematic plan view of an adjustable snowplow assembly on a road service vehicle in accordance with the invention.

Fig. 12 is a schematic side view of the snowplow assembly shown in Fig. 11.

DETAILED DESCRIPTION OF THE INVENTION

Referring to Fig. 1, a snow plow vehicle 40 incorporating the synchronized-width material spreader system 42 in accordance with a first embodiment of the present invention is shown. The snow plow vehicle 40 includes a system for storing and spreading granular material, as well as a system for storing and spreading liquid material. While the vehicle could include multiple systems for storing and dispensing several individual types of fluid materials, for the purposes of clarity, the description herein is based on a vehicle having the capability of storing and dispensing only two different materials. In this particular example, there is one granular fluid material and one liquid fluid material. It is to be understood that there may be more than two materials as well as any combination of granular and/ or liquid materials.

Further, the synchronized-width material spreader of the present invention as described in this specification is used in the environment of controlling snow and ice on roadways for descriptive purposes only. The invention is applicable to many different uses, such as for crop fertilizing, ground conditioning during road construction, etc. It is to be understood that the synchronized spreader may equally well be utilized for these and other purposes where the distribution of two or more similar or dissimilar materials is desired.

The granular material 44 is typically dispensed from the truck 40 by use of a spinning disk 46, but may also be dispensed by other means such as gravity or air pressure. The granular material 44 is typically a granular chemical or abrasive material. The granular material 44 stored in the hopper 48 is conveyed, such as by an auger 50 to a chute 52 at the rear of the truck through which it falls into contact with the spinning spreader disk 46. In this example, the spreader disk 46 spins about its center generally vertical axis and imparts a tangential force to the granular material as it falls onto the disk. The granular material is spread or spewn over a path width, which is determined in

part by the speed of rotation of the spreader disk 46, and many other parameters, such as density of the material.

Rotation of the spreader disk 46 may be caused by any of a variety of means, including an electric motor, air pressure, or hydraulic pressure. Other dispensing mechanisms may also be used in place of the spreader disk 46. For example, two rotating belts that trap the material and sling it out behind the truck could also be used. Alternatively, the material could be propelled from the storage hopper or container out through an orifice via air pressure or through venturi action, for example. Any of such dispensing mechanisms may be used in the present invention.

The width of spread of the granular material 44, or liquid material 57, is measured in a direction transverse to the length of the vehicle 40, and is typically analogous to the width dimension of a road, upon which the vehicle 40 travels. For instance, in Fig. 2, the spreader disk 46 may deliver granular material in a path having an arc width equal to the width of the vehicle 40. The material can also be projected rearwardly (to facilitate a lower or zero-velocity impact with the ground), forwardly, or at any angle from the truck.

The liquid dispensing system utilized in the present invention may comprise a liquid storage vessel 54 positioned on the vehicle 40 behind the cab of the vehicle, in front of the hopper 48, as shown in Fig. 1. Alternatively, the liquid storage vessel 54 may essentially be bifurcated and positioned along the length of the vehicle on the outer sides of the granular hopper, as is shown in Fig. 2. Many other liquid tank positions could be utilized or the tanks could form part of the structural portion of the granular hopper 48 or a structural portion of the vehicle 40.

A spray bar 56 preferably extends laterally at the rear end of the vehicle 40 and is generally adjacent to the spreader disk 46, as is shown in Fig. 1. The spray bar 56 may also be formed by a vertical stack of smaller spray bars and nozzles. The spray bar 56 preferably may have side shooting extensions 60 and 62 attached at its opposite ends to allow liquid 57 to be sprayed at a greater width through the spray bar. The liquid spray 56 bar position may also be

locally or remotely variable so that it may extend at any angle from the truck, to create any number of orientations. For example, the spray bar may be vertically oriented for spraying roadside vegetation or shoulder areas. Figs. 1 and 2 illustrate a typical preferred transverse spray bar position for a flat road surface.

Liquid is preferably conveyed from the liquid storage vessel 54 to the spray bar 56 through conventional piping by means such as a positive displacement or centrifugal liquid pump which pumps the liquid material from the storage vessel to the spray bar, or by pressure means such as selectively pressurizing the liquid storage vessel itself, or by gravity feed, which would force the liquid through the piping to the spray bar 56.

In the preferred example illustrated in Fig. 2, the spray bar has a center portion 58 and two preferably remotely movable side spraying portions 60, 62. The spray bar 56 is essentially a tube which has nozzles or apertures 64 formed therein to allow the liquid flowing through the spray bar 56 to spray onto the road surface. The side spraying extensions 60, 62 are preferably rotatably attached at either end of the spray bar central portion 58 and are in fluid communication with the center portion 58 of the spray bar 56 in all positions when a single central pump is utilized. When separate pumps are utilized, the central portion 58 need not be in fluid communication with the end portions 60 and 62.

A series of remotely operable baffles or valves such as solenoid valves are positioned within the spray bar 56 adjacent to or as part of each nozzle 64 to facilitate changing the width of spray emanating from the spray bar 56. The width of spray can be controlled by either the operator or by automated control. The valves or flow restrictors such as baffles can optionally be placed at discreet positions along the length of the spray bar 56, and include positions in the left or right end portions 60, 62 of the spray bar 56. The valves, flow restrictors or baffles or other flow control devices could also be made to operably move along the length of the liquid spray bar 56 to provide virtually infinite width control.

The spread distance or spray path width of the liquid dispensing system for a given type of material depends upon the orientation of spray bar and /or nozzles, and both the pressure at which the liquid is forced through the pipe system and into the spray bar 56, and the selective activation of the valves or baffles found on or inside the spray bar 56. Typically the spray bar 56 receives fluid from the center piping connection such that any width control mechanism is necessarily positioned along the length of the spray bar relative to the location of the connection between the piping system and the spray bar.

The liquid can alternatively also be spread by means of a rotating disk (not shown), in which case the spray bar or set of spray bars are replaced with at least one rotating nozzle disk or set of disks, and the spread width of the liquid thus depends on the disk orientation and placement and speed of the rotating disk in an analogous fashion to the rotating disk 46 used with the granular material as well as the discharge pressure and orifice size. Other means of spreading the liquid material may also be utilized such as through a selectable set of variable orifice discharge nozzles and/or flow control valves mounted on the truck.

For ease of description in this specification, the center of the spread-width for the granular material 44 and the center of the spread-width for the liquid material 57 are positioned co-extensively with one another at the rear of the vehicle 40.

In general, the synchronized-width material spreader works, either manually or optionally automatically, to control the spread-width and direction of the second or nth material based on the change of spread-width of the trigger or first material. For instance, if the trigger or first material is the granular material 44 being spread at a predetermined rate, when the spread-width of the granular material increases by 50%, the synchronized-width material spreader system automatically increases the spread-width of the liquid material 57 by a predetermined percentage, in this example, 50%, to match the increased spread-width of the granular material 44. Likewise, if the granular material 44 decreases in spread-width by 50%, the synchronized-width material

spreader system automatically decreases the spread-width of the liquid material 57 by 50%.

A user selectable pre-set ratio selected from a range of ratios can also be maintained. For instance, if the liquid material spread width is selected to be two-thirds (66%) of the granular material spread width, then when the trigger material spread width is changed, either increased or decreased, the spread width of the other, or "slave" material is also changed to maintain the pre-selected ratio.

Also, a sliding scale or trigger/slave distribution arrangement based on a mathematical relationship may be used, e.g. based on certain characteristics of the multiple materials may be deployed such as, if trigger material spread width is "x" feet, then slave material would be "y" - for example 50% of x feet. This configuration may be desirable to compensate for differences in particle sizes, density, liquid viscosity, atomization particle sizes, bounce, etc. Therefore, as the trigger width changes from minimum to maximum, the slave material width, due to above mentioned characteristics could be varied, say, from 40% to 70% of trigger material spread-width. As another example, if the sliding scale ratio is 0.33, and the granular material spread width is increased by 6 feet, the liquid material is increased by only 2 feet (33%). Likewise, if the granular material spread width is decreased by 3 feet, the liquid material spread width is likewise decreased by 1 foot (33%). This capability is particularly useful where the trigger material may have one particle size and the slave may have a different particle size or mass, resulting in different roadway bouncing characteristics between the two materials, in order to have a desired uniform or non-uniform pattern of deposition on the roadway surface. This capability may also be advantageously employed when particle weight, particle size, density, liquid viscosity, atomization sizing, etc. behave differently, yielding other than uniform distributions when direct proportioning is utilized.

Such a sliding scale can also be implemented, whereby the change of the slave or following material (liquid in example above) is only increased or decreased a set percentage or fraction of the change in the trigger or primary

material (granular material in example above). Again, the ratio of slinging, propelling force could also change if the trigger was being sent, for example, 10 ft verses 50 ft. to achieve the same result. The change in material distribution may also be based on vehicle location, etc. For instance, the material distribution may be different for steep hills than on flat level roadway surfaces.

Using this inventive proportioning system of the invention, the operator can simply control, for example, the spread-width of each of the different materials being dispensed onto the road surface by controlling one trigger material or by having the width of the first material automatically changed based on vehicle location. Consequently, the operator need only actuate the width control system for the trigger material, and the operator does not have to separately and independently control the spread-width of the second or additional or nth material unless special circumstances warrant such control as it will automatically follow the trigger in accordance with the preset or preprogrammed proportions.

The synchronized-width material spreader apparatus is beneficial in many circumstances, such as where the roadway narrows, and the width of spread of the various materials must be adjusted to a chosen value for an extended period of time, and also where the width of spread need only be temporarily adjusted, such as where at least a second vehicle or obstacle passes relatively alongside the spreader vehicle 40.

For instance, automated control could be triggered by a stationary signal device adjacent to, in or on the roadway as part of an Intelligent Transportation System (ITS). Additionally, by use of Geographic Information System (GIS) data in conjunction with Global Positioning System (GPS) data, the precise vehicle location may be automatically determined and automated control initiated. The particular ratio, or scaling, between the spread widths can also be maintained, as described below.

A preferred methodology involves a control system having a microprocessor and associated software that can control the material spreader

to distribute both materials in such a fashion that a width-change in one material is driven by and/or sensed by the microprocessor, which then initiates a change in the drive mechanism for the width of the other, or second material (more than two materials could be controlled) so that the proportioning or width of both materials is synchronized and/or adjusted even though the materials leave their separate and distinct launching and/or propelling devices and travel through the air before landing on the road surface.

Other methods for coordinating a change in the width of one material with a like or predetermined (such as for scaling or ratios) change in the width of a second or nth material might include, singularly or in any combination, the following:

1. The synchronization/coordination in width of spread could be accomplished with electrical control devices such as relays or solid state switches in such a fashion that a change in one relay conditioned with the triggering material would initiate a change in a different relay coordinated with the second, or nth material that would increase or decrease the width of spread of the second or nth material by affecting the propelling means of the other second material or materials.

2. The change in the width of the second material could be implemented through the use of hydraulically actuated devices since the spreader disk, for example is typically operated by a hydraulic motor. The control hydraulic pressure in the trigger material delivery system could be sensed or utilized by the control system to thereby control, i.e. effect a change in the width of spread of the other material.

3. Optionally, the change of width could be accomplished with pneumatic air power in a manner similar to 2 above.

If only one material is being dispensed from the vehicle 40, obviously there would be no need for width coordination for the other materials. However, control of the application width is still very desirable in many circumstances. The application width of the one material may be controlled manually via the control box 70 or automatically in response to ITS sensor or

GPS signals or other sensory devices placed in, on, or near the roadway in order to optimally distribute the material to the roadway surface without over-dispensing or under-dispensing the material being deposited.

A proximity sensor can be utilized to control the synchronized-width material spreader system on the vehicle 40. The proximity sensor, of any known type, such as radar or optical, may be ground based, sub-surface based, aerial based, or vehicle mounted, and can be used from any location, either stationary or truck mounted, to detect the presence of the subject vehicle, or of an oncoming, approaching, or passing vehicle or stationary obstacle, and act through operable connection to the control system to modify the spread width and/or proportionality of the various materials. GPS signals may also be used in order to precisely fix the location of the vehicle 40 and compare previously stored environmental condition data at the vehicle's location with current conditions as is described more fully below.

The proximity sensor, if mounted on the truck, can be positioned at a variety of locations, most notably the front and rear of the vehicle, to sense the presence of oncoming and passing vehicles. As noted above, the proximity sensor or signal receiver can also be positioned in or on the ground, in the air or other location remote from the truck to send signals to the truck with the same result.

In addition, the global positioning system (GPS) receiver signal can be used as an input to the automatic control of the material spread width as well as for adjusting various material types and amounts, etc. being applied through the use of the control system. For instance, if the course on which the truck 40 is traveling has been determined and mapped in GIS format and stored in a computer database, for the optimal spread widths and material proportionality at different geographical features or locations, such as, without limitation, bridges and locations of differing road widths, then the control system can be triggered by the real-time GPS readings to adjust the spread width to the known optimal dimensions, deposit desired material types and amounts, etc at the appropriate locations.

While the synchronized-width material spreader 42 is described herein in use on a spreader system having a different dispensing system for each of the two different materials, the synchronized-width material spreader system can also be used and implemented with a spreader having a common launching mechanism, which is capable of differential launching speeds based on differing characteristics of the multiple materials so that both or all materials travel the desired distance. In this case, differential distances (absolute or percentages) would be selected according to the characteristics of the materials and the optimal dispensed mixture rates. Spreader system 42 can also be used in spreaders dispensing several different materials. Different materials will travel different distances with the same throwing power. Therefore, a calibration of the launching mechanism coupled with the various materials to be utilized will help increase the accuracy of the spread width.

As another example, where the ratio of spread widths is 1.5:1 between, for instance, but not limited to, granular and liquid materials, the granular (trigger) material would be spread at a distance of 9 feet, and the liquid would be spread at a distance of 6 feet. If the control system is actuated to reduce the spread width of the granular material to 6 feet, the liquid spread width would automatically be reduced to 4 feet to maintain the ratio to 1.5:1 between the granular and liquid spread widths. Alternatively, the spreader control system could allow the ratios to be reversed or adjusted as desired by the operator, other person, or automatically.

Referring to Fig. 3, a first embodiment of a control box 70 for use with the synchronized-width material spreader system 42 shown in Figs. 1 and 2 is shown. The control box 70 can be positioned adjacent the operator in the truck or integrated into the dashboard of the vehicle, and can be used by the operator to simply control the material or materials being dispensed from the vehicle, either manually or automatically. Alternatively, the control box could be at a position remote from the driver, or even the truck, to operate a slave unit and could be controlled by a third party or controller device, thus requiring the driver to simply drive, while the material dispensing system 42 is

controlled by a third party or remote computer via the slave unit mounted in the vehicle.

The first and second embodiments of the invention, shown in Figs. 1 and 2, contemplate controlling two materials, a granular material 44 and a liquid material 57, with the granular and liquid systems being analogous to those previously explained and described above. The same or a similar system, as described herein, could also be used to control more than two materials, whether they be liquids or granular materials and in any combination. The control box 70 in the embodiment shown in Fig. 3 contains a plurality of toggle switches 72, 74, 76, 78, and 92 as well as a plurality of fine-adjustment knobs 86, 88, and 90, each having a specific use. Master switch 72 is the master switch for the liquid spreading system. When the master switch 72 for the liquid spreading system is turned on, the liquid material control switches 74, 76 and 78 are enabled and can be operated. The toggle switch 74 is an on/off actuation switch device for controlling the liquid flowing through the left end 60 of the liquid spray bar 56, which is controlled by an associated left liquid valve 80 (shown schematically in Fig. 8). Once activated, the valve 80 could be proportionately controlled by the control box 70, as described further below. Switch 76 is an on/off toggle switch similar to switch 74, but instead is used to actuate the flow of liquid material through the center portion 58 of the liquid spray bar 56, and controls the center liquid valve 82 in the liquid dispensation system (see Fig. 8). Once activated, the valve 82 can be proportionately controlled by the control box 70. The switch 76 is an on/off toggle switch for actuating the flow of liquid through the right portion 62 of the liquid spray bar 56, and controls the right liquid valve 84 (see Fig. 8). Once activated, the valve 84 could be proportionately controlled by the control box 70. The position of the knob 86 controls the speed of rotation of the disk 46 which spreads the granular material 44 and is graduated between zero and 100% dry material spread-width. The control knob 88 controls the rate of flow of liquid through the liquid dispensing system (for instance, in gallons per lane mile). The control knob 90 controls the rate of granular material being

dispensed through the granular dispensing system (for instance pounds of material per lane mile). The ON/OFF master switch 92 controls the on/off status of the entire spreader system. The visual display screen 94 is used to indicate to the operator what the settings are.

In using the first embodiment of the control box as disclosed in Fig. 3, the granular material 44 is the trigger material from which the system triggers the liquid spread-width. The operator first turns on the spreader system by toggling the ON/OFF master switch 92 to ON. The operator then sets the rate of granular disbursement and the rate of liquid disbursement using the appropriate control knobs 88, 90, respectively. At this point, the operator is only engaging the dispensing system for dispensation of liquid material to the road surface. The switches 74, 76 and 78 are appropriately activated by the operator as desired. As shown in Fig. 3, all three switches are in the ON position. This results in liquid 57 being dispensed from the entire spray bar 56 through the left, center and right portions.

In operation, where the first embodiment of the control box shown in Fig. 3 is used, and the granular material 44 is considered as the trigger material off of which the spread width of the slave liquid material 57 is controlled, the operator modifies the width of the granular spread by adjusting the control knob K. Adjusting the K control knob causes a signal to be sent through the electrical lines to the disk valve 150 to allow more hydraulic fluid to flow through the motor 144 for the disk 46. Adjusting the granular knob 90 in turn causes a signal to be sent through the electrical lines to the auger valve 148 and allows more or less hydraulic fluid to flow through the motor 142 for the auger thus changing the rate at which the granular material is fed to the disk 46. This in turn changes the speed at which a disk spins, thus changing the granular spread width. As discussed, the change in granular width using the K control knob will be sensed and cause a change in liquid spray width.

Control knob 86 is shown positioned at approximately 30% of the maximum disk speed, to control the granular material spread-width. In this situation, both granular 44 and pre-wetting liquid 57 materials are being spread

by the disk 46, and the liquid material being spread by the spray bar. In the event that control knob 86 is rotated to 75% of maximum granular spread-width, software internal to the control box 70 controls the increase in disk 46 spinning speed, causing the granular material 44 to be spread to a greater width. Software internal to Box 70 simultaneously senses the selected increase in the granular spread-width and accordingly sends sufficient liquid material to the center, left and right spray bar portions 58, 60 and 62 to match the new width of the granular material being disbursed by the disk 46.

The nozzles 64 in the spray bar 56 can also be adjusted accordingly by the software controller to adjust their spread-widths appropriately. The operator can also shut down the left, right or center portions of the spray bar 56 and keep them from dispensing liquid 57 there through by operating the toggle switches 74, 76 or 78, respectively, manually. This would be effective for temporarily turning off, for instance, the liquid disbursement from the left spray bar portion 60 to allow an oncoming vehicle to pass the vehicle 40. In this example, if the liquid was the trigger material, this action would also typically automatically adjust the width of the nth material.

Turning now to Fig. 4, with the granular material 44 as the trigger material, a second embodiment of the control box 91 is disclosed. The control knob 93 controls the width of spread of any and all materials which are enabled. The Inhibit right control knob 95 will inhibit any enabled material from being spread to the right side of the carrier regardless of the spread-width selected on control knob 93. The control knob 98 controls the rate of liquid disbursement through the spray bar 56 to the road surface (for instance gallons per lane mile). The control knob 100 controls the rate of granular material 44 disbursement to the road surface (for instance pounds per lane mile). The granular material dispensing means and the liquid material dispensing means are controlled by each appropriate switch: center 102, 104; left 106, 108; and right 110, 112 on the control box 91. These switches allow the operator to selectively turn on and off as desired the spread of material in any of these regions.

Turning now to Fig. 5, a third embodiment of control box 114 is disclosed. The third embodiment of the control box includes a control knob 116 which controls the width of spread of any enabled materials, and an Inhibit Left control knob 118 and Inhibit Right control knob 120, a left 122, center 124 and right 126 liquid on/off toggle switch, and a single granular on/off toggle switch 128. A master control switch 130 allows the operator to turn the dispensing system on for granular material spreading only, liquid material spreading only, or a combination of granular and liquid material spreading.

As an example of the general operation of the synchronized-width material spreader, Fig. 6 discloses an increase in the spread-width of the liquid disbursement triggered by the increase of the granular spread-width. The synchronized-width material spreader system thus causes the liquid spread-width to automatically control the width of the granular spread-width. In Fig. 6A, the granular material is shown as being spread to a width of approximately eight feet by the spread disk, and the liquid is being spread to a width of approximately eight feet by the center portion of the liquid spray bar. In Fig. 6B the operator increases the granular material spread-width to 16 feet by appropriately modifying the K control knob setting, for instance in the first embodiment of the control box 70. The synchronized-width material spreader system 42, through the various sensing means employed therein, senses the increase in the spread-width of the granular material, and automatically increases the spread-width of the liquid material through the spray bar portions, in this instance by actuating the left and right portions of the liquid spray bar, which causes the liquid spread-width to match the granular spread width (Fig. 6C).

In Fig. 7, a decrease in the spread-width of the granular material, as triggered by the decrease in spread-width of the liquid material is shown. In Fig. 7A the spread-width of both the granular and liquid material is set at approximately 20 feet. The operator then actuates the control of the liquid disbursement to reduce the liquid spread-width to approximately eight feet without use of the side extension nozzles as shown in Fig. 7b. (Fig. 7b is

shown without the granular material distribution illustrated for clarity). The synchronized-width material spreader system, through the various sensor means employed therein accordingly reduces the spread-width of the granular material by, for instance, reducing the spin speed of the disk (Fig. 7c).

The width and direction of material spread off of a spinning disk 46 can be controlled by the point of impact of the granular material 44 as it strikes the disk 46. As is well known, if the disk 46 is moved with respect to the dispensing chute, or the chute is moved with respect to the spinning disk 46 so that the impact point is changed radially and/or circumferentially around the disk, the desired flow width and direction can be controlled.

Referring now to Fig. 8, a schematic diagram of the hydraulic fluid, liquid material and electrical control system is disclosed. The hydraulic system is a closed-loop system and comprises a hydraulic fluid reservoir 132 which provides a source for the hydraulic fluid 134 in the system and a repository for the return hydraulic fluid. The hydraulic fluid system controls the power setting on the various hydraulically driven liquid pumps, 136, 138 and 140, which control the amount of fluid flow through the nozzles as ultimately controlled by the operator through the control box. The hydraulic system also controls the power setting of the motor for the auger 142 which drives the auger 50 to move the granular material 44 to the disk 46, as well as the motor 144 driving the disk, which controls the spin speed of the disk, which ultimately controls the spread-width of the granular material 44. The hydraulic fluid flows through the various lines under pressure generated by the pump 146 and flows through the various liquid pumps as necessary, and recirculates to the hydraulic tank reservoir 132. The hydraulic fluid flows through the various lines under the pressure of the pump 146 to the motor for the auger 142 and the motor 144 for the disk, as determined by the settings on the control box 70. The hydraulic fluid also flows through the valves 148, 150 for the auger motor and the disk motor, respectively, the values being controlled by the control box 70 settings, and recirculates through a return line to the hydraulic reservoir 132.

The liquid material system includes a liquid storage reservoir 152, which stores the liquid for dispensing through the spray bar, a plurality of liquid lines connected from the storage reservoir 152 to communicate and be acted upon by the appropriate pump, such as LP_r, through a dedicated liquid valve 84 in line with the liquid material 57, at which point the liquid is diverted either back to the liquid storage reservoir, or to the liquid nozzle 158. Each of the left, center and right portions of the liquid spray bar have an associated pump, valve, and nozzle arranged as previously described. Alternatively, there could just be one liquid pump in the system. With only one pump in the system, appropriately controlled valves and sensors would provide feedback to control the liquid pump output volume to compensate for changes in demand based on user controlled valve operations and corresponding width of spread.

The electrical system is controlled by the control box (for instance, box 70) and communicates to the liquid valves for the left, center and right portions of the liquid spray bar, the liquid pumps 140, 138, and 136 associated with the left, center and right liquid spray bar portions (if separate pumps are provided), the valve 148 for the auger and the valve 150 for the disk, which control the hydraulic fluid flow to the motor auger 142 and the motor disk 144, respectively. The motor auger MA drives the auger to move the granular material to the spinning disk, the motor MD drives the spinning disk 46.

The optional flow meter 162 is designed to feed information regarding disk speed to a controller 160 which controls the liquid spray width. The liquid spray width is preferably varied by controller 160 as a result of sensing more or less hydraulic fluid flow from the pump 146 to the granular launching device for the trigger material, such as the spinner disk 46.

The software of the synchronized width material spreader system 42 senses the increase in spread width of the granular material 44 and sends the appropriate signal to the liquid valves and liquid pumps for each of the right center and left portions of the liquid boom 56 and allows more hydraulic fluid to drive the liquid pumps to pump the fluid through the boom at a higher pressure. The liquid valves, such as LV-R, also are opened or adjusted

accordingly to allow the liquid to flow at the appropriate rate and proportion through the valve and to the nozzle to accordingly increase the width of spread of the liquid dispensing. The liquid valves control the amount of liquid material 57 that flows back to the liquid storage reservoir 132 or to the nozzles on the spray bar 56, and when in combination with the increased pressure generated by the liquid pump can cause the liquid material to be sprayed over a greater width. The nozzles could also be adjustable to provide even a finer control of the liquid material spread-width. Reducing the spread-width of the liquid material as triggered by the granular material spread-width operates analogously. Of course, the spread-width of the granular material can be controlled as a slave with a trigger being the spread-width of the liquid material.

Referring now to Figs. 9 and 10, a block diagram of a remote surface condition sensing and control apparatus in a third embodiment of the invention is shown for providing real time surface condition information to the vehicle operator and to the on board computer 216 utilized to automatically control the material spread on the vehicle roadway surface. This third embodiment is a completely automatic sensing and material application apparatus 200 which is mounted on the vehicle 40. The local sensing portion is shown in Fig. 9. The control and remote component connections are shown in Fig. 10..The sensing portion of the system 200 includes at least one electromagnetic radiation transceiver 202 which emits a ultra-wide band (UWB) impulse radar. A very short electromagnetic (EMR) impulse is propagated from transceiver 202 and echoes that reflect from the road surface 204 and from material on the road surface are evaluated. These reflected signals are set to a depth processor 206, a density processor 208, and at least a chemical composition processor 210. The EMR reflected pulse may be utilized directly by the depth processor 206 to determine the depth of any surface layer of material on the roadway. However, the density processor, and composition processors 208 and 210 rely also on input from a database 212 to determine, by comparison to peak height or phase shift of the reflected signal versus the incident signal, an output which

is unique to a particular chemical composition and density. Comparing these outputs to the database content produces or can result in quantitative density and composition information 214 which is, in turn, fed to computer 216 along with depth information 218.

The depth 218 is processed in the computer 216 to provide a display 220 with information necessary to determine what additional chemicals need to be deposited on the road surface in order to minimize the hazardous conditions. In addition, the computer 216 may provide a direct output to a control device for automatically dispensing the appropriate amounts of chemicals to the road surface as the vehicle drives over the road surface.

An infrared transceiver 222 is also mounted on the vehicle and is directed toward the road surface. The transceiver 222 provides an output to a road temperature processor 224 which in turn also feeds an output to the computer 216 indicative of the actual road surface temperature.

The apparatus 200, in accordance with the third embodiment of the present invention, may be compactly designed for unitary installation in the cab of a road maintenance vehicle, such as a salt truck, with the display 220 and an input device 226 such as a keyboard integrated into the dashboard of the vehicle. The driver can then input to the computer 216 desired deicing concentrations or other desired input information. The computer 216 then can compare the actual composition and status of the material already on the road and preferably display this information for the operator to use in manually controlling application of chemicals and/or automatically control the dispensation of additional chemicals to the road surface. The automatic dispensing of chemicals may be automatically determined by the computer from a database of predetermined criteria for that location or calculated based on weather conditions, sensed road surface conditions, and the desired road surface conditions. The computer 216 also provides a running historical data input to the database 212 to track chemical application data at the particular location, whether the application be manual or automatically accomplished.

As is shown in Fig. 10, the computer 216 of the apparatus 200 also may be connected through a communication interface device such as a radio modem 230 to a remote computer/processor station 232. The apparatus preferably includes an on board Global Positioning System (GPS) receiver or a Differential Global Positioning System (DGPS) receiver 234 which provides accurate spacial position information for the vehicle 40 to the computer 216. The database 212 preferably includes a Geographical Information System (GIS) format database for the region in which the vehicle 40 is being operated. Together with the GPS coordinate information from the receiver 234 and the GIS database information in the database 212, the computer 216 constantly tracks the vehicle's position and stores sensed current road conditions, as above described, in the database 212. The computer 216 then compares the position with historical weather conditions and road surface conditions that have occurred at the vehicle's location which are stored in GIS format in the database 212. This position, past and current road condition information are then preferably compared with near term weather information relayed by the remote station 232, or provided directly by an on board weather data receiver, and balanced against the preprogrammed or predetermined desired requirements for the vehicle's location. The resulting difference information is then translated to compensatory surface application composition and distribution commands fed to the spreader system 42. The information is continually updated based on the most recent data as the vehicle 40 travels along its route.

The remote station 232 may be a stationary command/control station or may actually be one or more mobile stations connected via communication links in a network of other similar computers mounted in other service vehicles. The remote station 232, if stationary, may include a DGPS receiver 236 to provide reference GPS data signals to the computer 216 for very accurate DGPS position determinations. In addition, the remote station 232 and/or computer 216 may receive weather forecast data received from other sources such as the National Weather Service or private forecasting service via

receiver 238. This forecast information may be correlated and translated to the particular positional coordinates of the vehicle 40 in order to predict near term weather conditions and transmit this information to the computer 216 and also predict near term trouble spots in other locations. The computer 216 or remote computer 232 may then use this weather information in conjunction with a database or lookup table of action categories to adjust the application of chemicals to the road based on the current or predicted impending conditions in addition to application adjustments for actual real time road conditions as above described. The weather information may also be used to alert other vehicles and locations as to adverse conditions. The computer 216 preferably provides control functions which include automated control of the chemical spreader system 42 as has been described with reference to embodiments 1 and 2 above except that the proportioning controls are preferably automatically implemented rather than relying on the operator to manipulate the knobs and switches.

In addition, the computer 216 may also automatically control operation of a snow plow 240 mounted on the vehicle 40. For example, a snow plow 240, shown mounted on a vehicle 40 in a schematic plan view in Fig. 11, and, in a side view in Fig. 12, may be provided that has at least one movable side discharge blocking plate 242 which is power operated, either hydraulically, electrically, or pneumatically, to raise the blocking plate 242 to permit side discharge of snow or lowered to prevent discharge of snow as the vehicle 40 passes a feature such as a residential driveway. The plow 240 may also be fitted with at least one extensible blade 244, preferably on the opposite end of the plow 240 from that carrying the blocking plate 242 which can be automatically extended or retracted in width via a hydraulic cylinder 246 depending upon the lane width at a particular location. The extensible blade 244 may be horizontally translated back and forth to extend the blade or it may be pivotally connected to the plow 240 and rotated to extend the plow path. The plow 240 may be pivoted left or right or raised and lowered by multiple cylinders 247.

The remote computer 232 may be connected to other sources of data such as other computers via a data transfer device 252. Also, to provide local input, a keyboard 254 or other input device is preferably connected to the remote computer 232. Similarly a display 256 would be provided for the operator of the remote computer 232.

Since the position of driveways, intersections, lane widths, obstructions, etc. can be included in the GIS database stored in the computer 212, and the GPS receiver can provide accurate position information for the vehicle 40, the computer 216 can be easily programmed to lower the discharge blocking plates as the vehicle passes a driveway or extend or retract the blade or change its configuration as appropriate for the lane width on a particular stretch of roadway. Alternatively, during a first pass of the vehicle 40 past a driveway, the blade may be manually extended or retracted, or blocking plates lowered and raised, and the position information sensed and fed back to the database 212 so that the computer 216 can "learn" or cause these actions to automatically be performed during future passes.

The fluid control system for the plow 240 is conventional in design. It typically will include solenoid actuated four way valves that supply and relieve hydraulic or pneumatic pressure to and from the actuating cylinders 248 for the side blocking plates 242 and the cylinder 246 for the extensible blade 244 in accordance with manual control signals from the operator or automatic signals from the computer 216.

Position markers, such as a magnetic strip, may be provided along the roadway and a local position sensor 250 such as a magnetic pickup may be mounted on the vehicle 40 to provide local sensing input for the driveway or other obstacle position to trigger movement of the blocking plates 242 or changes in the blade width or reposition the blade to avoid obstacles. These local position markers and corresponding local position sensors 250 may also be used to temporarily change the spreader discharge configuration as a driveway or obstacle is passed, rather than utilizing GPS data. It should be understood that GPS data and GIS data may be combined with use of local

markers and local position sensors in a variety of combinations. For example, the use of local position markers and vehicle mounted sensors 250 may be particularly advantageously used during road construction activities to automatically override information provided by the GPS and GIS data. The computer 216 may be programmed to utilize the GPS and GIS data unless superseded by trigger of the local sensor 250 or superseding manual control by the operator.

Further, the computer 216 is preferably programmed utilizing well known decision making software techniques to compare the stored historical surface condition data and records of any remedial action previously taken during previous passes at the particular location, with current environmental forecast information, current road surface condition information, and past site specific environmental forecast data in order to predict present and future conditions at the current location. This process can be further enhanced by tracking on board the on board material contents and dispensing rates in order to predict when or if the truck 40 or an additional truck should return to the particular location. This information could then be relayed to the stationary remote location 232 or to another vehicle in the network (if the truck computers are so arranged) to forecast future service schedules.

In another, more localized application, the computer 216 can compare current road conditions through use of any of the sensing systems disclosed in U.S. Patent No. 5,619,193 and as shown in Fig. 9 along with on board monitoring of the spreader capabilities, the fluid materials on hand, the GPS signals, and weather information received from the remote computer 232 and continually provide the operator with direction as to whether to retrace his route to make additional applications to the roadway. This automated system can thus optimize application of granular and liquid conditioning materials throughout an adverse weather pattern or storm and tailor the application based on past actions and current surface conditions. For example, in spots where unusual winds are encountered or drifting occurs, additional material applications may be required. These areas are generally predictable such that

the database 212 will reflect these historical conditions therefore making the automatic control apparatus and system of the present invention particularly useful in consistently treating road surfaces in an optimum manner.

Finally, actual surface conditions and observations may also be inputted to the computer 216 via the keyboard 226 or other input device in those circumstances that are not predicted or need correction. An example of this situation might be where the traffic patterns at a particular location or along a particular route differ at different times. If the traffic is heavy, as during rush hour, more mixing on the surface of the applied chemicals and granular materials takes place and therefore a different application mixture might be more appropriate than the computer generated amounts and proportions. If the historical data at this location involved non rush hour circumstances, the predicted requirements may need to be corrected by the operator.

The apparatus and system in accordance with the present invention has been described with reference to particular embodiments thereof. These embodiments are shown by way of examples and not by way of limitation. There are many changes, alternatives, variations, and modifications to these embodiments that will be readily apparent to those skilled in the art. For example, additional sensors may be provided to the computer 216 in order to provide more up to date local information. For example, a wind speed and direction sensor, dew point indicator and/or temperature sensor may be provided on the vehicle 40 which the computer 216 can use to modify the weather data provided by the remote computer 232 in order to tailor application of materials more exactly to local conditions and requirements. Accordingly, it is intended that all such alterations and variations and modifications to the embodiments be included within the scope of the present invention as defined by the appended claims. All patents, patent applications, and other printed publications referred to herein are hereby incorporated by reference in their entirety.

CLAIMS

What is claimed is:

1. A synchronized-width fluid material spreading apparatus comprising:

a vehicle carrying at least one fluid material capable of being applied to a vehicle travel surface, said first material being carried in a container;

a first fluid material application device supported on said vehicle and communicating with said fluid material in said container; and

a control box coupled to said application device having at least one user actuatable control thereon for turning on said fluid material application device and remotely selecting, changing and regulating distribution of said fluid material on said vehicle travel service.

2. The apparatus according to claim 1 wherein said vehicle carries a second fluid material in a second container and a second application device coupled to said second container and to said control box for applying said second material to said vehicle travel service.

3. The apparatus according to claim 2 wherein said control box includes a control for adjusting application of said second material in response to said selecting, changing and regulating of distribution of said first fluid material.

4. The apparatus according to claim 3 wherein said control box includes a user selectable proportioning control device operably coupled to said second application device.

5. The apparatus according to claim 4 wherein said control box further comprises a user operable spread width control device coupled to said first material dispensing device for adjusting the width of application of said first material on said vehicle travel surface.

6. The apparatus according to claim 5 wherein said proportioning control is connected to said spread width control for said first fluid material operable to automatically adjust said second material spread width in response to the spread width of said first material.

7. A synchronized-width fluid material spreading system carried by a vehicle carrying at least a triggering fluid material capable of being applied to a vehicle travel surface and at least one slave fluid material carried on said vehicle capable of being applied to said vehicle travel surface, said system comprising:

a triggering fluid material application device supported on said vehicle and communicating with said fluid material;

at least one slave fluid material application device supported on said vehicle communicating with said slave fluid material and

a controller coupled to said triggering fluid application device and said slave fluid application device, said controller having at least one user actuatable control thereon for turning on said triggering and slave fluid material application devices and controlling application of said slave material in response to application of said triggering fluid material on said vehicle travel service.

8. The system according to claim 7 wherein said controller includes a user selectable volume proportioning control device operably coupled to slave application device.

9. The system according to claim 8 wherein said control box further comprises a user operable spread width control device coupled to said triggering material dispensing device for adjusting the width of application of said triggering material on said vehicle travel surface.

10. The system according to claim 9 wherein said proportioning control is connected to said spread width control for said triggering fluid

material operable to automatically adjust said slave material spread width in response to the spread width of said triggering material.

11. The system according to claim 7 wherein said controller further comprising a computer and a geographical information system database connected to said computer and a global positioning system receiver connected to said computer.

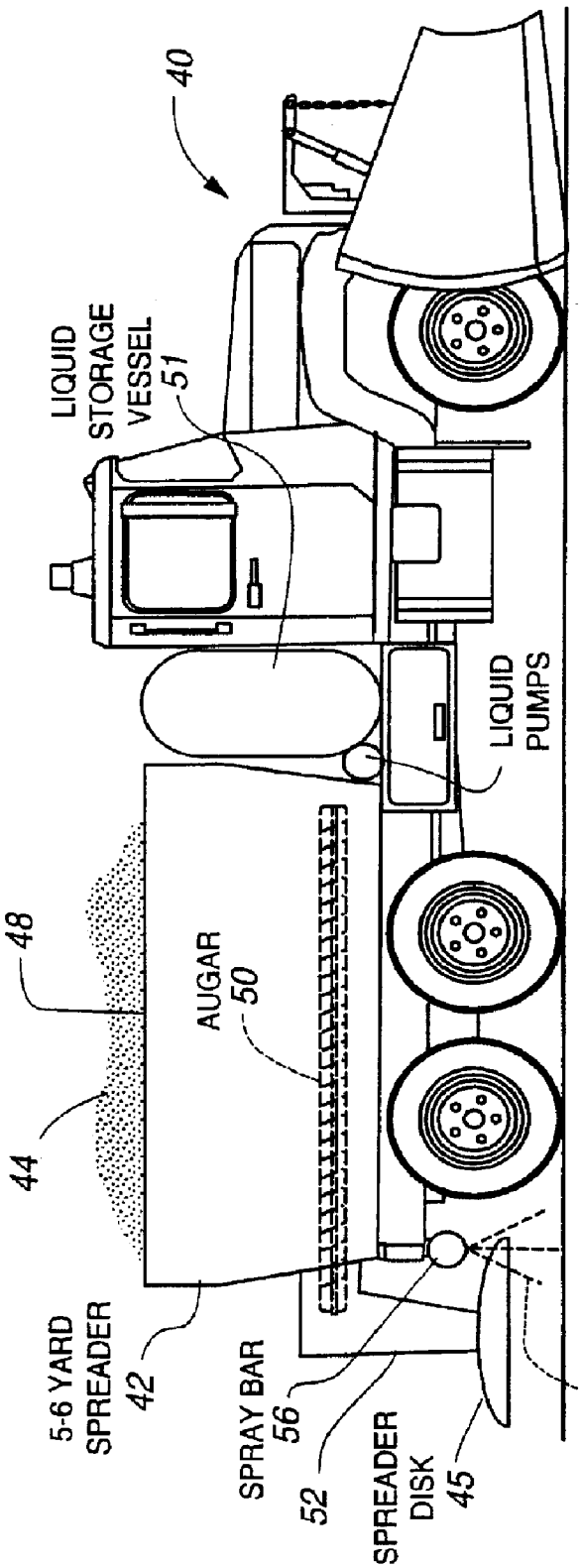

40
LIQUID STORAGE VESSEL 51
LIQUID PUMPS
48
AUGAR 50
44
5-6 YARD SPREADER 42
SPRAY BAR 56
52
SPREADER DISK 45
57

Fig. 1

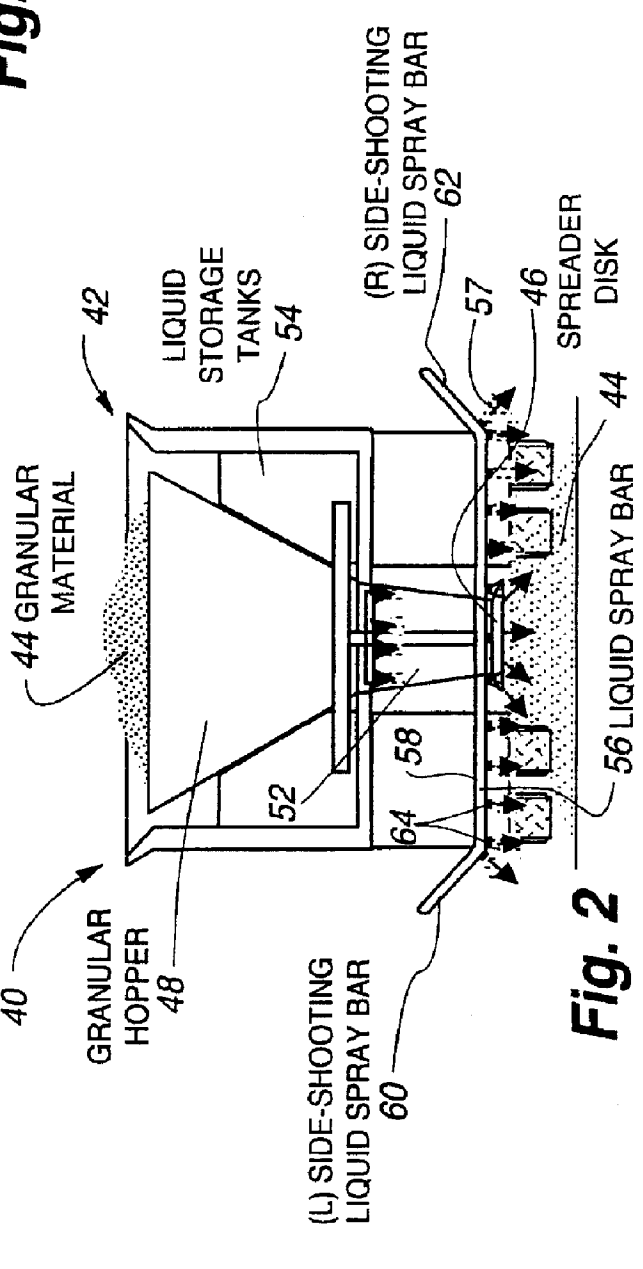

42
LIQUID STORAGE TANKS 54
(R) SIDE-SHOOTING LIQUID SPRAY BAR 62
57
46
SPREADER DISK
44
44 GRANULAR MATERIAL
56 LIQUID SPRAY BAR
58
52
64
40
GRANULAR HOPPER 48
(L) SIDE-SHOOTING LIQUID SPRAY BAR 60

Fig. 2

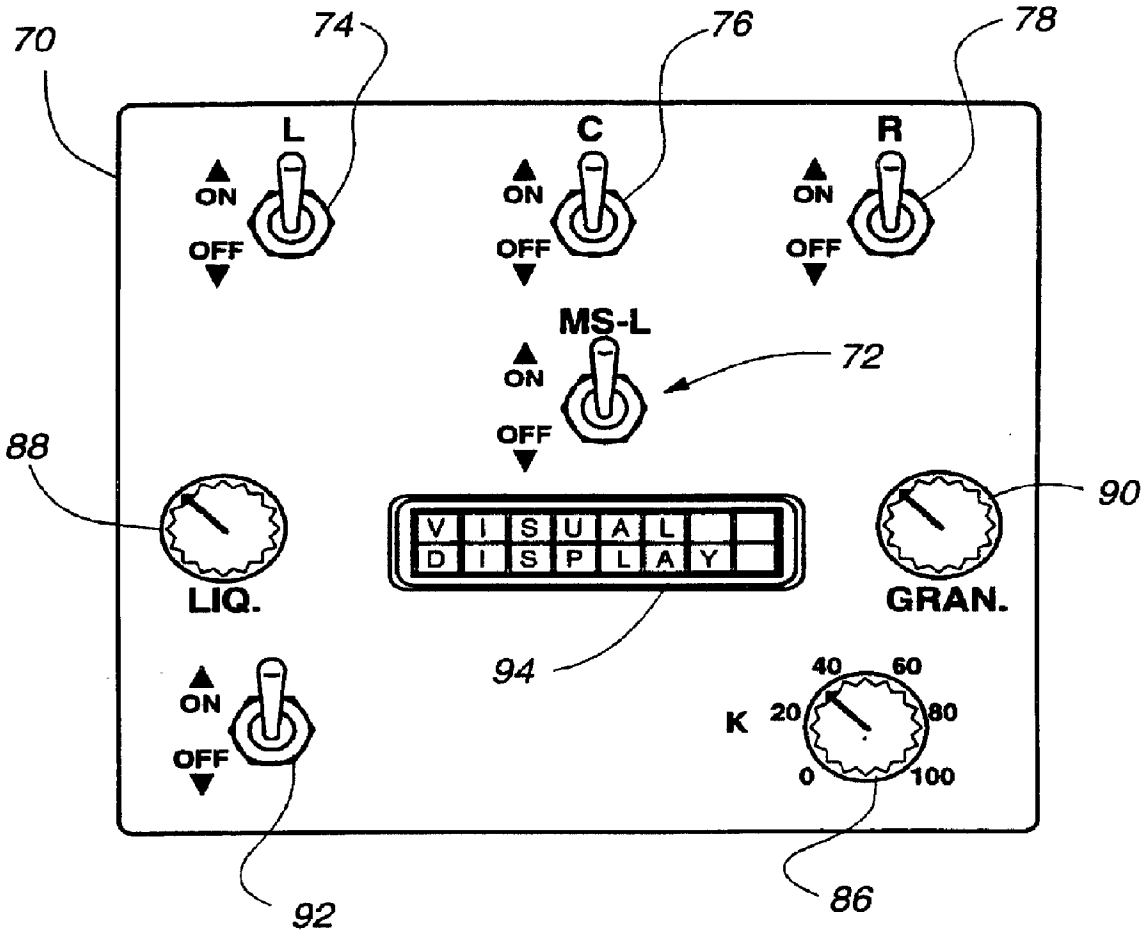

70
74
76
78
L
C
R
ON
OFF
MS-L
72
88
90
VISUAL
DISPLAY
LIQ.
GRAN.
94
40
60
K
20
80
0
100
92
86

FIG. 3

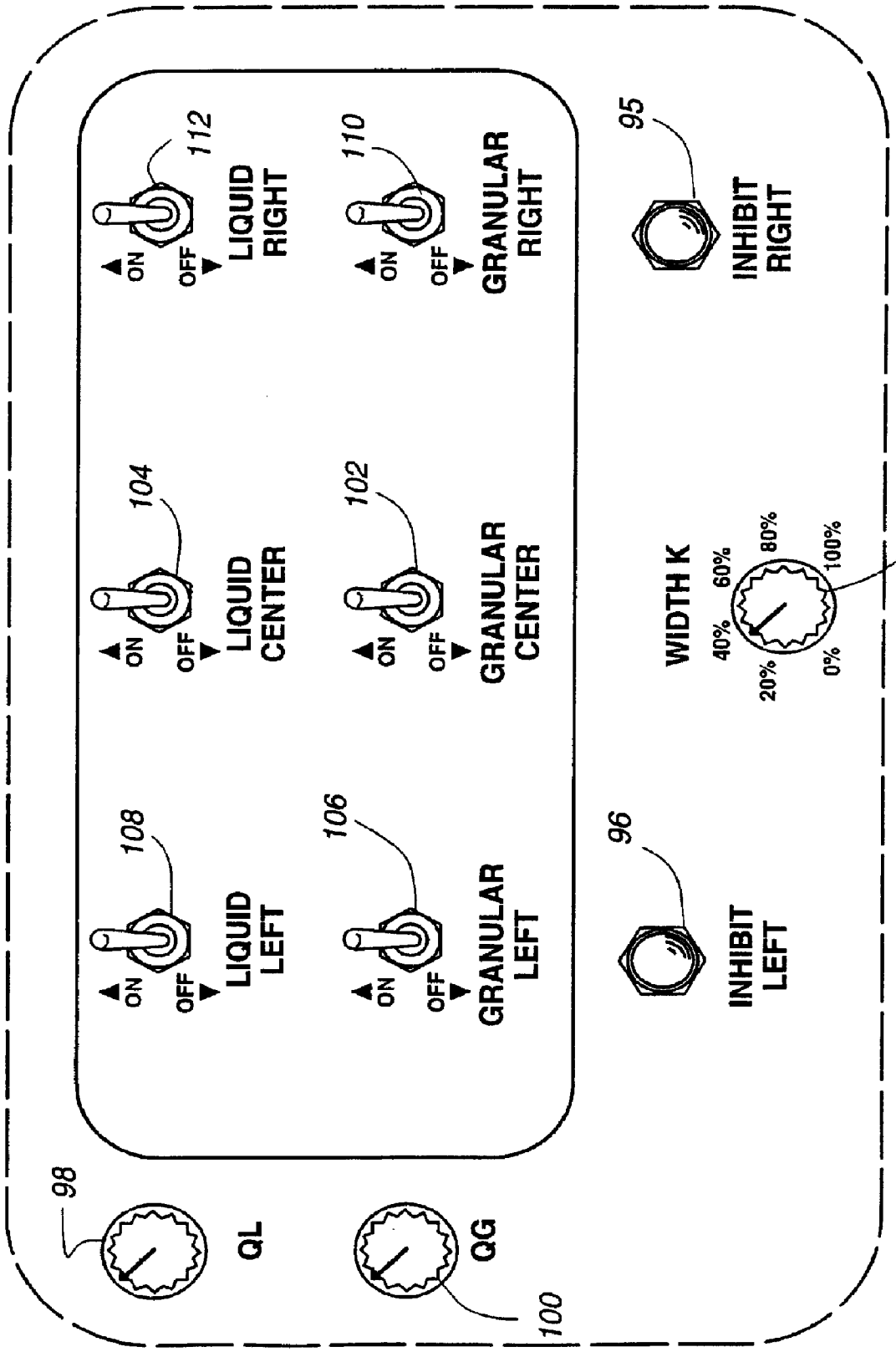

LIQUID RIGHT
GRANULAR RIGHT
INHIBIT RIGHT
LIQUID CENTER
GRANULAR CENTER
WIDTH K
LIQUID LEFT
GRANULAR LEFT
INHIBIT LEFT
QL
QG
ON
OFF
0%
20%
40%
60%
80%
100%
112
110
95
104
102
93
108
106
96
98
100

Fig. 4

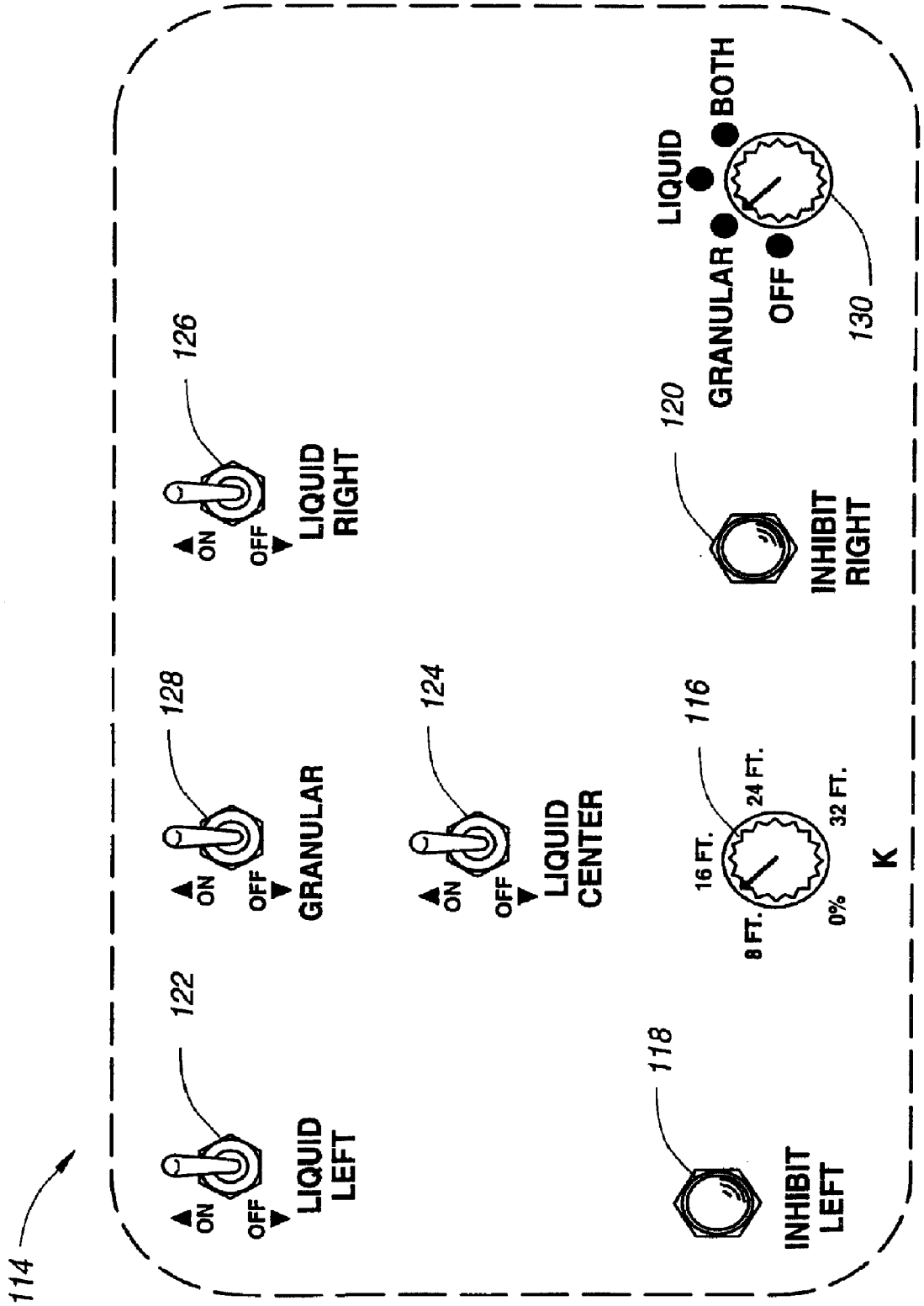

114
122
LIQUID LEFT
ON
OFF
128
GRANULAR
ON
OFF
124
LIQUID CENTER
ON
OFF
126
LIQUID RIGHT
ON
OFF
118
INHIBIT LEFT
116
16 FT.
24 FT.
8 FT.
32 FT.
0%
K
120
INHIBIT RIGHT
LIQUID
BOTH
GRANULAR
OFF
130

Fig. 5

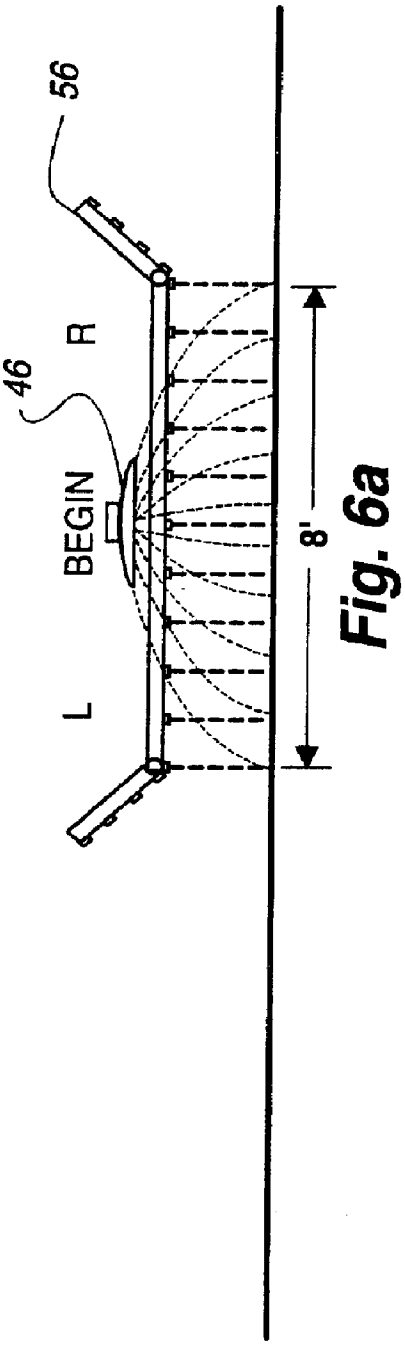


Fig. 6a

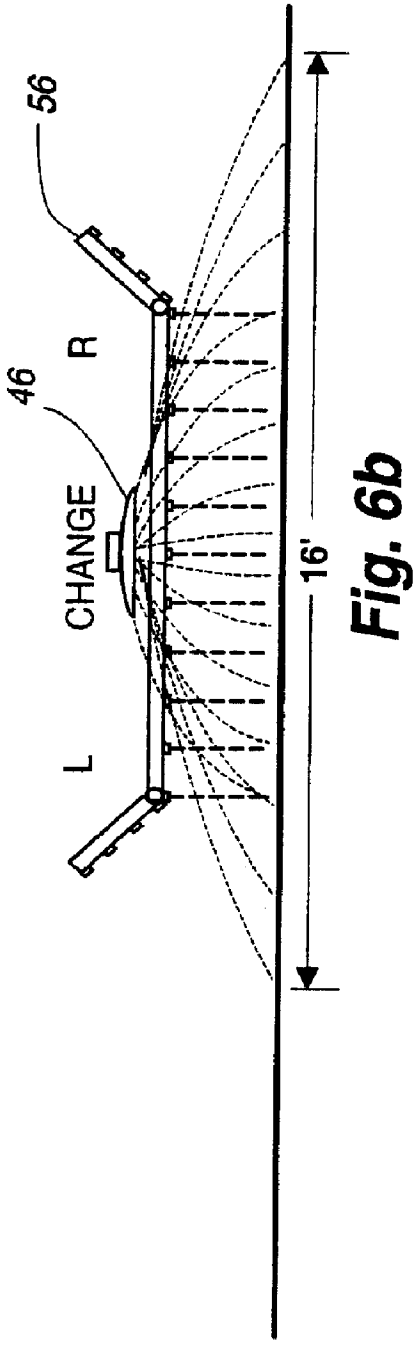


Fig. 6b

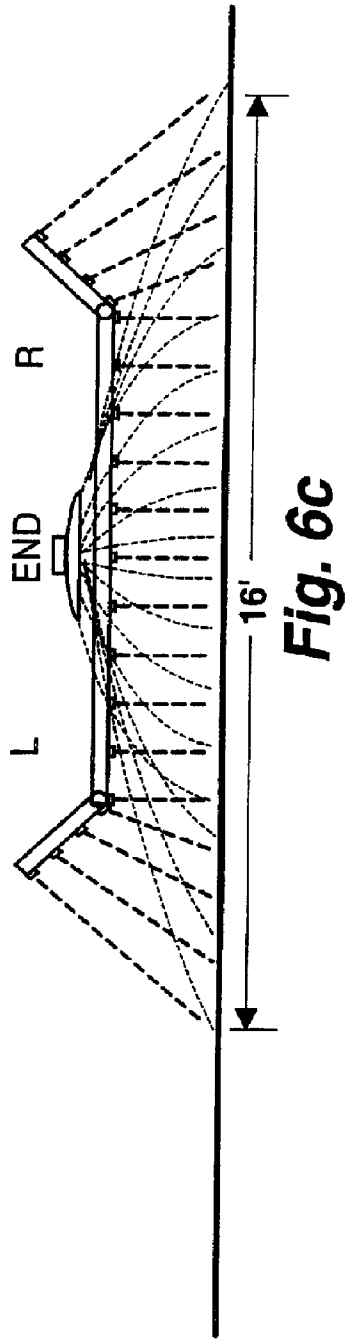


Fig. 6c

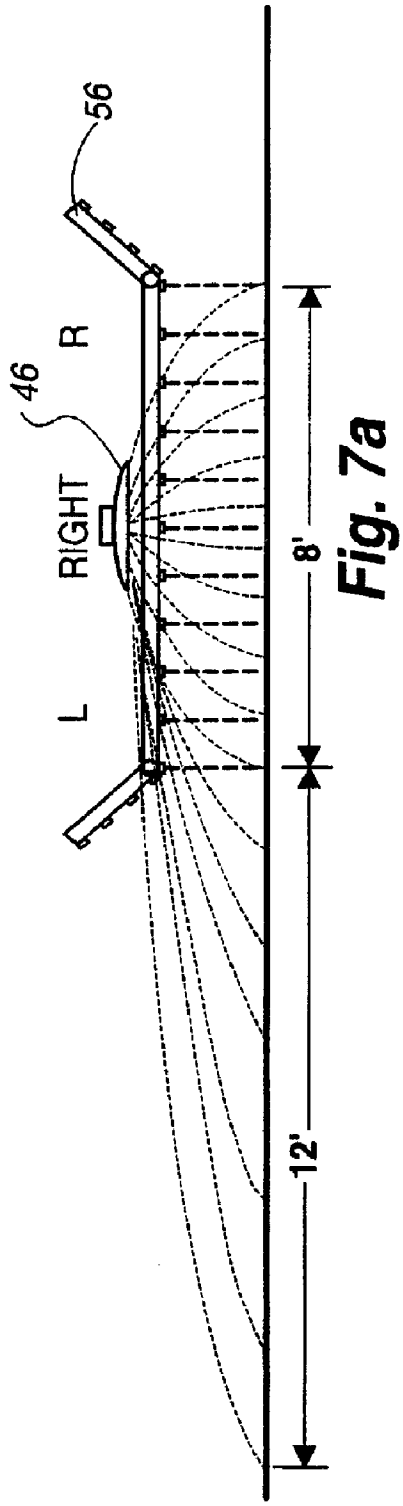


Fig. 7a

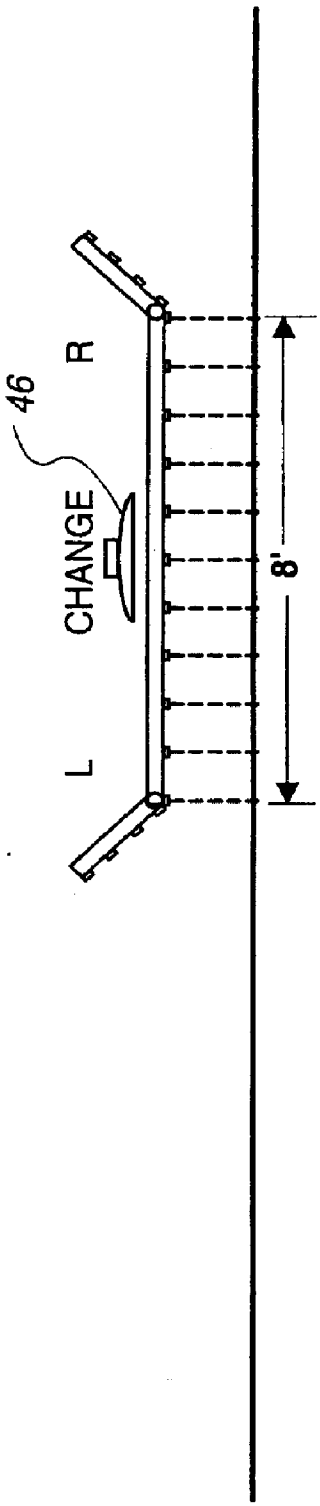


Fig. 7b

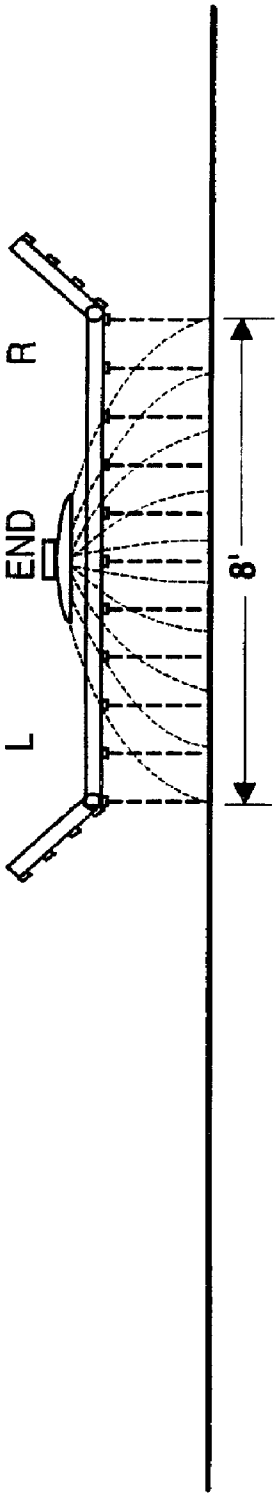


Fig. 7c

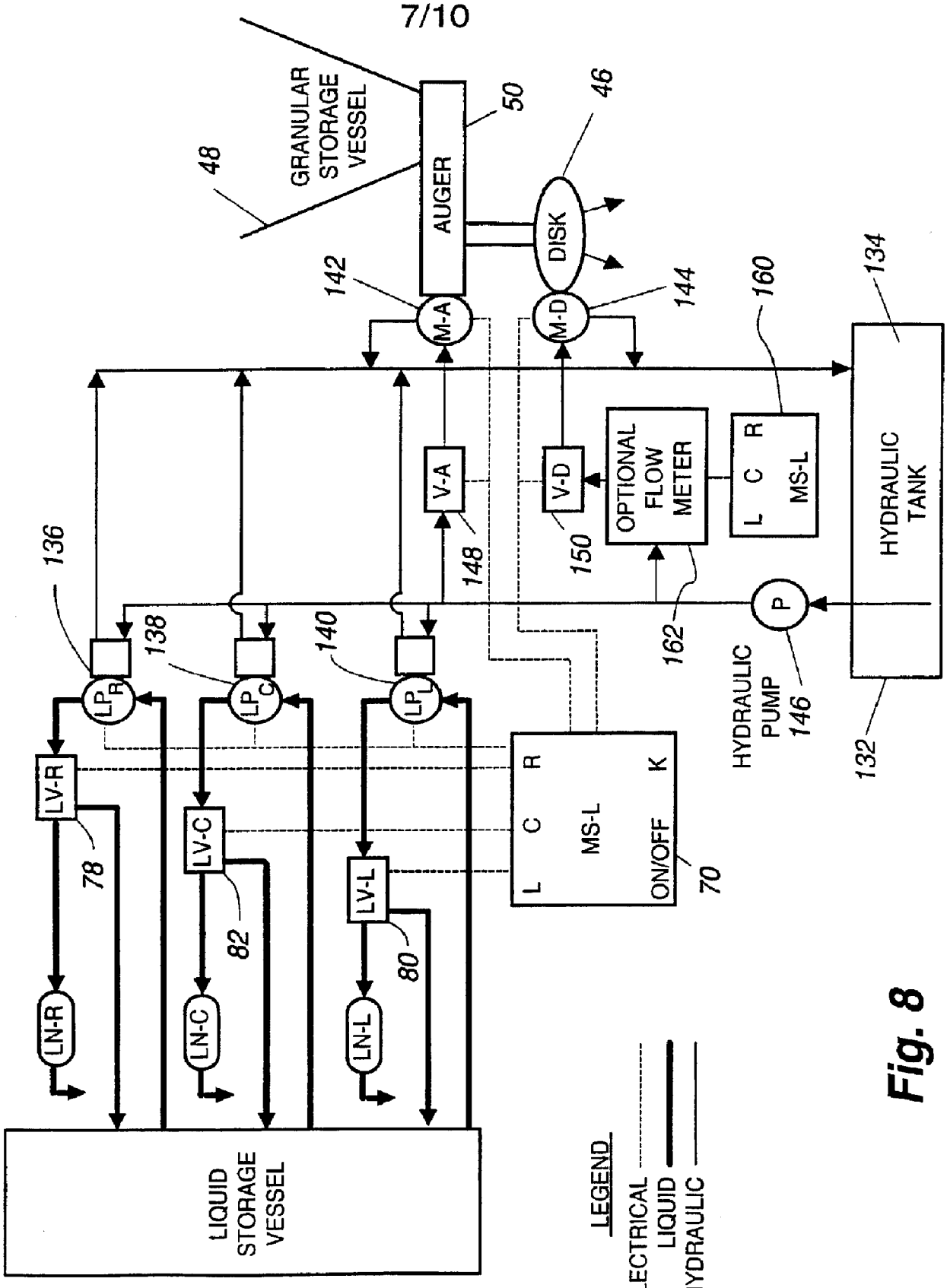

GRANULAR STORAGE VESSEL
48
AUGER
50
DISK
46
M-A
142
M-D
144
160
134
HYDRAULIC TANK
V-A
148
V-D
150
OPTIONAL FLOW METER
L C R MS-L
136
138
140
162
P
HYDRAULIC PUMP
146
132
LP R
LP C
LP L
L C R MS-L ON/OFF K
70
LV-R
LV-C
LV-L
78
82
80
LN-R
LN-C
LN-L
LIQUID STORAGE VESSEL
LEGEND
ELECTRICAL
LIQUID
HYDRAULIC

Fig. 8

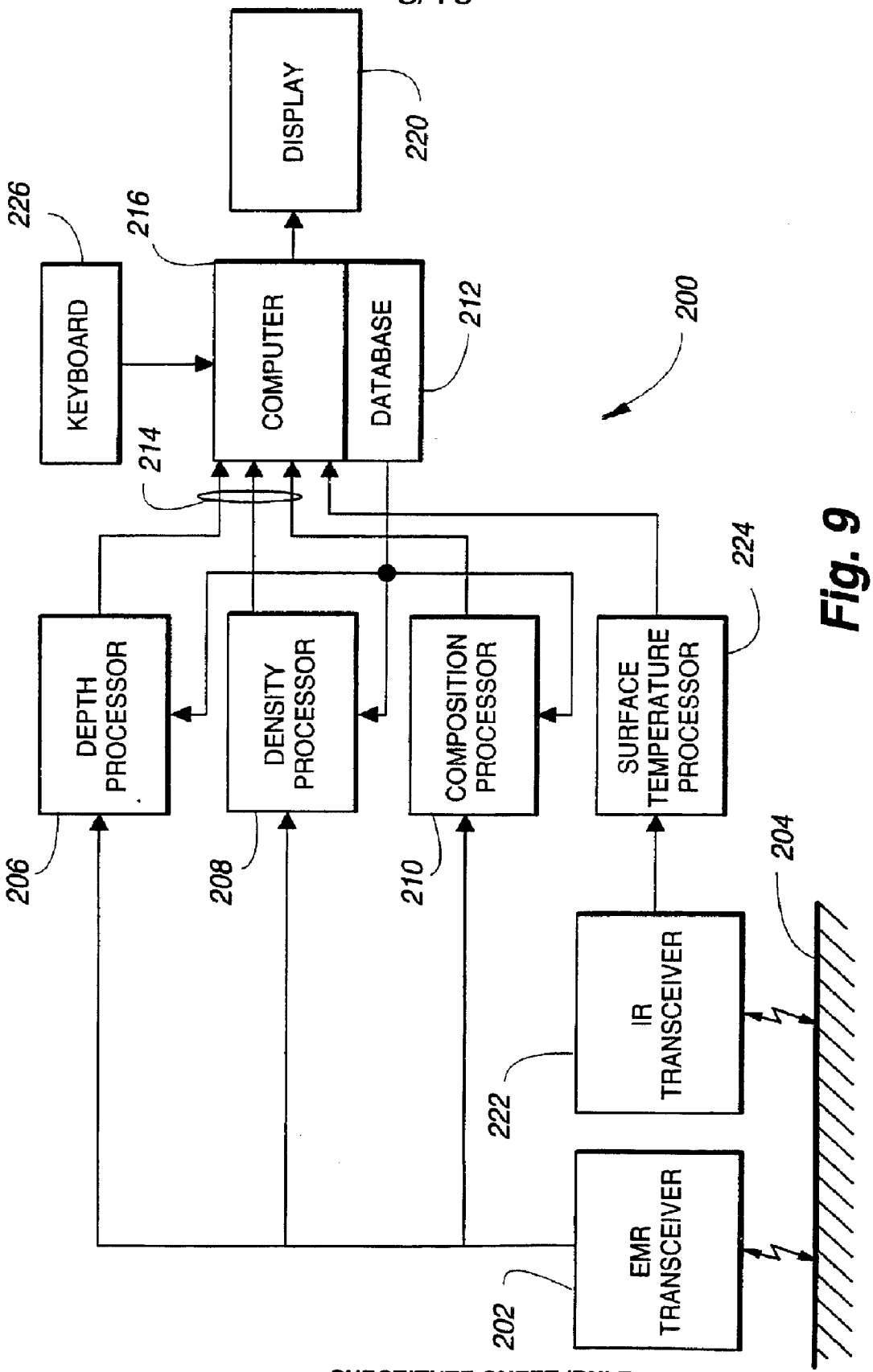

DISPLAY
220
226
216
KEYBOARD
COMPUTER
DATABASE
212
200
214
DEPTH PROCESSOR
DENSITY PROCESSOR
COMPOSITION PROCESSOR
SURFACE TEMPERATURE PROCESSOR
224
206
208
210
204
IR TRANSCEIVER
222
EMR TRANSCEIVER
202

Fig. 9

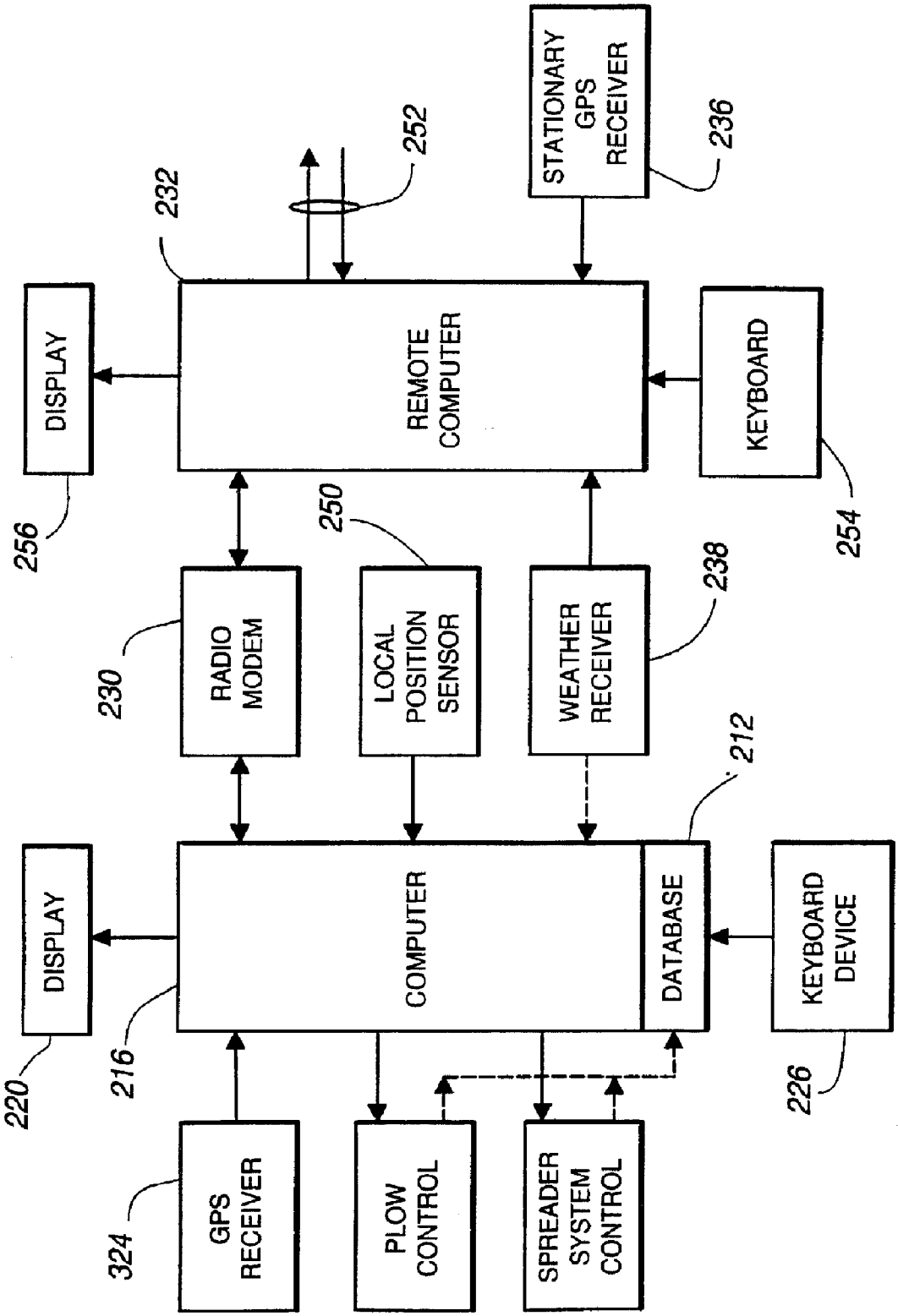

STATIONARY GPS RECEIVER
236
252
232
DISPLAY
REMOTE COMPUTER
KEYBOARD
256
250
254
RADIO MODEM
LOCAL POSITION SENSOR
WEATHER RECEIVER
238
230
212
DISPLAY
COMPUTER
DATABASE
KEYBOARD DEVICE
220
216
226
GPS RECEIVER
PLOW CONTROL
SPREADER SYSTEM CONTROL
324

Fig. 10

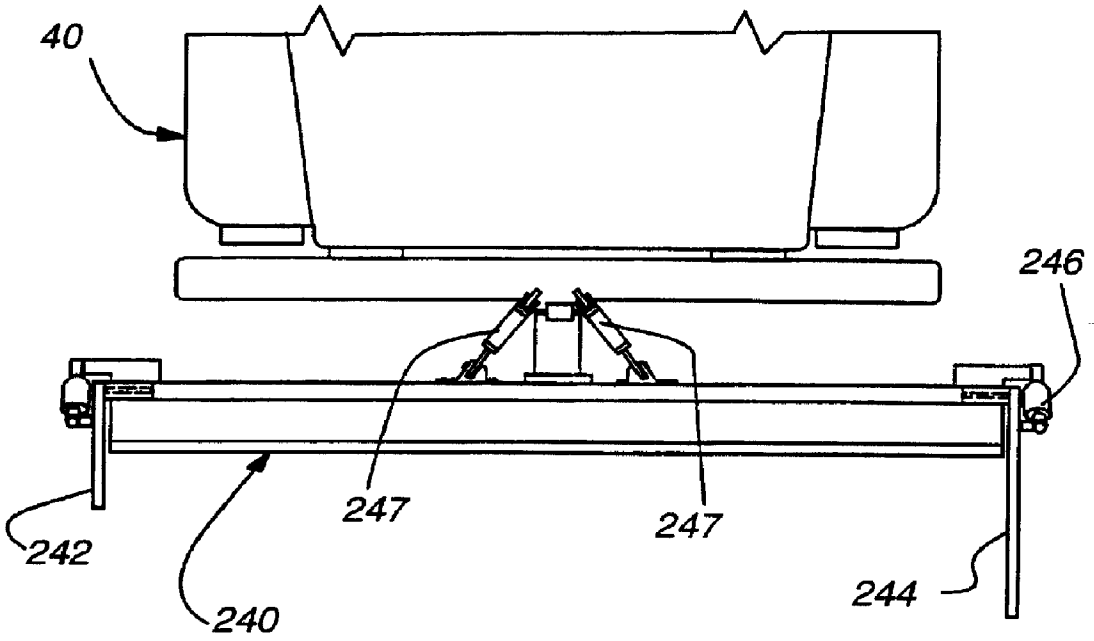


Fig. 11

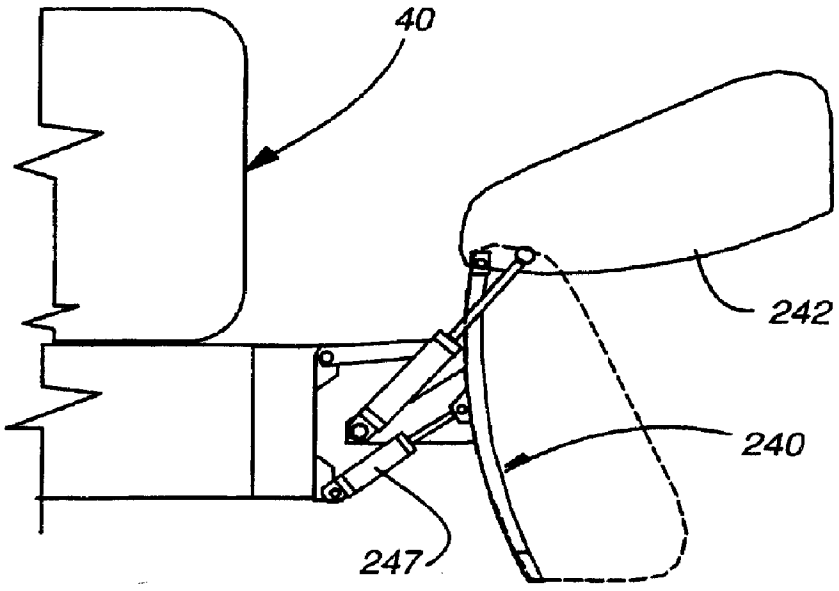


Fig. 12

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OTTAWA HULL K1A 0C9

(11) (C) **2,060,418**

(22) 1992/01/31

(43) 1993/08/01

(45) 1994/05/31

5,080,6/43

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(51) INTL.CL.[5] E01C-019/20

(19)(CA) **CANADIAN PATENT** (12)

(54) Apparatus for Spreading Granular and Liquid Materials

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Doherty, John A. , U.S.A.

(73) Same as inventor

(57) 22 Claims

2060418

CANADA

Apparatus for Spreading Granular and Liquid Materials

James J. Wise
John A. Doherty

ABSTRACT OF THE DISCLOSURE

A granular and liquid material spreading system mounted on a vehicle. Granular material is moved from a hopper to a delivery means using hydraulic pumps and motors. The hydraulic system also drives a liquid delivery system. A control system is provided to control the amount of granular material and liquid material applied to a surface. The feed rate of liquid delivery is dependent upon the feed rate of the granular material. The liquid feed rate may be changed within a predetermined range. The level of liquid may be sensed to disengage the liquid delivery system. Initiation of liquid delivery reduces the feed rate of granular material by a variably selected percentage.

PATENT

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APPARATUS FOR SPREADING GRANULAR AND LIQUID MATERIALS

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to apparatus for spreading granular and liquid materials on road surfaces. More particularly, the invention relates to a granular material spreader and liquid material dispenser mounted on a vehicle for the synchronous dispensing of solid and liquid thawing materials onto a road surface.

Description of the Prior Art

Spreader vehicles or spreader implements for distributing ice thawing and traction enhancing materials on roads are known. Such spreader vehicles have a granular material hopper and delivery system, and can include a liquid delivery system, wherein a gravity feed system or a liquid pump supplies thawing liquid from a

tank carried by the vehicle. A granular and liquid material spreader is shown in W. Küpper, United States Patent No. 4,442,979. The Küpper patent also shows synchronized delivery of both liquid and granular materials according to the speed of travel of the vehicle, an example of ground speed control. Küpper can deliver only liquid, only granular material or a combination of the two, all proportional to the speed of the vehicle.

Another spreader apparatus known in the art comprises a spreader for granular and liquid materials comprising a vehicle including a hydraulic system, a storage hopper mounted on said vehicle for containing granular material, a granular material delivery apparatus including a conveyor driven by said hydraulic system for moving the granular material from the hopper to a delivery position and means at said delivery position for receiving and distributing said granular material onto the roadway surface, a controller for controlling the speed of said conveyor, means for sensing conveyor speed and generating a conveyor speed signal, a liquid storage tank mounted on said vehicle, a liquid material delivery apparatus including a conduit for supplying liquid material from said tank to a delivery position and means at said delivery position for distributing said liquid. This apparatus has been sold and commercially distributed under the tradename EPOKE.

OBJECTS AND SUMMARY OF THE INVENTION

It is the principal object of the present invention to provide an improved control for synchronizing the feed rate of granular and liquid materials in a material spreader.

In accordance with the principal object of the invention, a vehicle has mounted thereon a granular material delivery system and a thawing liquid delivery system. The granular material, such as salt, gravel, sand and other materials can be used separately or in combination with the liquid, typically calcium chloride, for thawing road surfaces during winter months. A hydraulic system powers the delivery system's aggregate material conveyor to deliver the granular material from a hopper to a spinner, which distributes the granular material. The spinner is powered by the same hydraulic system, and together the hydraulic system, hopper, conveyor and spinner define the granular material delivery apparatus.

The liquid delivery system is mechanically, electronically or hydraulically connected to the granular delivery apparatus. A motor drives a liquid pump which pumps liquid from a tank to the dispenser nozzles. The feed rate control for the liquid delivery system is

interconnected to the feed rate control for the granular material delivery system for synchronous operation.

None, a portion or all of the hydraulic flow from the granular delivery apparatus may be fed to the motor that powers the liquid delivery system or, in some embodiments, returned to a hydraulic reservoir. In either event, the feed rate of the granular delivery system is proportionately changed or altered, depending upon the amount of hydraulic fluid flow to the granular delivery system. The amount of liquid delivered is proportional to the quantity of granular material delivered. The amount of hydraulic fluid flow to the granular delivery apparatus ranges from 0 to approximately 95 percent of the hydraulic fluid output of the vehicle hydraulic system depending on the embodiment chosen and the road conditions the operator of the vehicle may experience.

The flow of hydraulic fluid to the granular material conveyor is controlled by a ground speed sensitive controller. A vehicle speed sensor generates input signals which are proportional to the vehicle's speed. A conveyor speed sensor is used as an input for the ground speed control in a feedback control circuit to maintain the selected speed. In a conventional ground speed control this speed sensor input controls the speed of the aggregate material conveyor.

In the present invention the speed sensor and conveyor speed sensor signals are fed to a material

computer. The material computer, based on the selected amount of aggregate material, increases or decreases the amount of liquid applied. The material computer additionally receives the speed sensor and conveyor speed sensor signals and then either supplies adjusted signals to the ground speed computer to control conveyor speed or directly controls conveyor speed.

Where the granular material feed rate is otherwise reduced by the connection to and activation of the liquid delivery system, the operator still can vary the respective feed rates within a predetermined range. The operator can select the correct material mix to control road conditions.

Other aspects, features and details of the present invention can be more completely understood by reference to the following detailed description of the preferred embodiments, taken in conjunction with the drawings, and from the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a side elevational view of a vehicle carrying the granular and liquid material control device of the present invention.

Fig. 2 is a top plan view of the vehicle shown in Fig. 1.

Fig. 3 is a fragmentary schematic view showing a typical mechanical embodiment for connecting a conveyor

of a granular material delivery system to a liquid material delivery system.

Fig. 4 is a schematic view of the hydraulic system of the granular delivery system.

Fig. 5 is a block diagram of a first alternative hydraulic embodiment of the granular and liquid delivery system of the invention.

Fig. 6 is a schematic view of a second alternative hydraulic embodiment of the invention.

Fig. 7 is a schematic view of a third alternative hydraulic embodiment of the invention.

Fig. 8 is a schematic view of a fourth alternative hydraulic embodiment of the invention.

Fig. 9 is a schematic view of a fifth alternative hydraulic embodiment of the invention.

Fig. 10 is a schematic view of a sixth alternative hydraulic embodiment of the invention.

Fig. 11 is a diagrammatic representation of a control system embodying the present invention.

Figs. 12a, b and c are diagrams representing modification of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention is embodied in an improved synchronized control for a granular and liquid spreader 10 apparatus mounted on a vehicle 12 for spreading granular material 15 and a thawing liquid 17 onto a road surface 13 (Figs. 1-3). The granular material 15

may be salt, sand or gravel for traction, or any solid or aggregate material that may be spread onto the road 18. The liquid 17 may be calcium chloride, sodium chloride or other chloride compound liquid, as well as any other wetting or thawing agent. The granular material 15 and thawing liquid 17 are applied when the road 13 has ice or snow covering it which needs to be melted. These situations occur on public streets and highways as well as in and around public transportation areas such as airports.

The granular material 15 is carried in a hopper 14 or similar device mounted on the vehicle 12. The hopper 14 is opened to deposit the granular material 15 onto a conveyor 20, which moves the granular material 15 to a drop chute 19 at a delivery position where the granular material 15 falls onto a spinner 24. The spinner 24 is rotated by a spinner motor 22 to define delivery means for spreading the granular material 15 onto the road surface 13 (Fig 3).

The liquid 17 is stored in a tank 16 and pumped to nozzles 21 at the delivery position. The liquid may be applied either directly to the road or onto the spinner 24.

Conveyor 20 and the spinner 24 are driven by motors 26, 22 powered by the vehicle hydraulic system 28 (Fig 4). The hydraulic system 28 is conventional in the art and includes a power take off connection from the vehicle engine which drives a hydraulic pump 31. When the

hydraulic system 28 is turned on by a switch 33, hydraulic fluid is diverted as shown in Fig. 4, to hydraulic lines 27 and 29 connected to the spinner motor 22 and conveyor motor 26, respectively. Rotary valves 32 in lines 27 and 29 determine the amount of hydraulic fluid delivered. If the hydraulic system 28 is turned off at the switch 33, hydraulic fluid is returned to a fluid reservoir 34, through a by-pass line 30.

While the conveyor 20 is shown as an auger type conveyor, it could be a roller device or belt conveyor, depending upon the choice of the user. A granular material delivery system 23 (Figs. 5, 6) is comprised of the hydraulic system 28, the hopper 14, the conveyor 20 and the spinner 24.

A liquid delivery line 36 carries the liquid 17 from the storage tank 16 to one or more of the nozzles 21 which apply the liquid 17 under pressure to the falling granular material 15 generally at the spinner 24, or directly onto the roadway surface. In a manner known in the art, the area covered is determined by the rotational speed of the spinner 24, while the amount of granular material 15 dispensed is determined by the speed of the conveyor 20, the speed of the vehicle and mechanical considerations related to the hopper 14.

The liquid delivery system 25 includes, generally, the tank 16, the delivery lines 36, a liquid system motor 38, a liquid system pump 40, a liquid flow control valve 42, a flow meter 44 and the distribution

nozzles 21. (Figs. 5-8). The liquid delivery system 25 is interconnected to the granular material delivery system 23 to synchronize the feed rate of the liquid 17 to the granular material 15.

In the embodiment shown in Fig. 3, the liquid pump 40 of the liquid delivery system 25 is mechanically connected through a gear box 46 to a shaft of the conveyor 20. In the hydraulic embodiments of Figs. 5 through 10, the liquid system pump 40 is mechanically connected to a drive motor 38, which is in turn in fluid communication with the vehicle hydraulic system 28.

The liquid pump 40 partially determines the feed rate of the liquid 17 supplied to a liquid flow control valve 42, which determines the actual amount or feed rate of the liquid 17 delivered to the nozzles 21. The liquid flow control valve 42 either controls the liquid flow directly or recirculates a selected amount of the liquid 17 to the tank 16. Either way, the amount of liquid feed is infinitely variable over a given range. In the embodiments shown in Figs. 3 and 5 through 10, the liquid pump motor 38 (not shown in Fig. 3) and the liquid pump 40 are connected so that the feed rates of the granular material 15 and liquid 17 are likewise synchronous, depending upon the speed of the conveyor 20. Variation of liquid flow rate to granular flow rate is partially achieved by altering the amount of the liquid 17 returned to the tank 16 through the liquid flow control valve 42. Liquid flow is further affected by

diverting hydraulic fluid from the hydraulic system 28, as will be described in reference to the embodiments of Figs. 7 through 10.

Like parts retain the same numbers in the description of the following embodiments. Different embodiments of the liquid delivery system 25 and its connection to the granular delivery system 23 are shown in Figs. 3 and 5 through 10. In Figs. 5 through 10, the hydraulic lines connecting the spinner motor 22 and the spinner 24 to the remainder of the hydraulic system 28 are shown schematically for clarity. The embodiments of Figs. 5 and 6 are similar in that the hydraulic fluid is not diverted from the hydraulic system 28. In the embodiments shown in Figs. 7 and 8, a hydraulic fluid flow control valve 48 and a direction control valve 50 are upstream of the conveyor motor 26. Hydraulic fluid flow is diverted from the hydraulic system 28 through the flow control valve 48, at the discretion of the operator, to between 0 and approximately 95% of the total hydraulic fluid flow. This provides much greater flexibility in adjusting the granular material 15 usage to the temperature, wind, depth and types of precipitation.

In all embodiments of the liquid delivery system 25 the connection between the granular delivery system 23 and the pump 40 provides for synchronous delivery of liquid 17. The faster that granular material 15 is delivered by the granular delivery system 23, specifically the conveyor motor 26, the more rapid a rate

that liquid 17 is applied. This is necessary to keep the ratio of the liquid 17 to the granular material 15 constant, i.e., synchronous.

The entire liquid delivery system 25 can be removed from the spreader device 10 through quick release disconnects 52 and 54. The quick release disconnects 52 remove the liquid delivery system 25 from the hydraulic system 28 as will be described shortly. The quick release disconnects 54 allow the liquid delivery system 25 to be separated from the liquid tank 16 and the nozzles 21. Removal of the liquid delivery system 25 is provided so that testing, calibration, repair or even replacement can be accomplished in as quick and timely a manner as possible. While the liquid delivery system 25 is removed, the granular delivery system 23 is operable in a normal manner. The connections 52 of the embodiment of Figs 3 and 5 through 9 to the hydraulic system 28 are shown in Fig. 4.

The mechanical embodiment of Fig. 3 directly connects a rotating shaft of the conveyor 20 to the liquid system pump 40. (Figs. 3 and 4). The connection establishes a synchronous feed rate between the liquid 17 and the granular material 15. The liquid delivery system 25 of this embodiment is as discussed in reference to the embodiment of Fig. 5, which will now be described.

In the embodiment shown in Fig. 5, the hydraulic system 28 includes the hydraulic fluid tank 34 from which hydraulic fluid is delivered into the hydraulic fluid

lines 29 and 30. The liquid system motor 38 is connected to the hydraulic system 28 intermediate to the pump 31 and the separate conveyor motor 26 at quick release disconnects 52, 54. The hydraulic fluid flow in the line 29 is used by the motor 38 to establish a rotary motion to turn the pump 40 of the liquid delivery system 25. The hydraulic flow in the line 29 also powers the conveyor 20 through the separate conveyor motor 26.

Still referring to Fig. 5, the pump 40 is synchronized mechanically to the granular material delivery system 23. Liquid 17 from the liquid storage tank 16 is drawn through the delivery line 36 by the pump 40 and through a liquid direction control valve 58 either back to the storage tank 16 or to the flow control valve 42. If the liquid 17 is returned to the storage tank 16, no liquid 17 is applied to the granular material 15. If the liquid 17 passing through the direction control valve 58 is not returned to the tank 16, then adjustment of the flow control valve 42 determines how much of the liquid 17 is applied to the nozzles 21 and how much is returned to the tank 16. The flow control valve 42 therefore determines the amount of liquid 17 applied to the road 18 and adjusts, up or down, the ratio of feed rates of liquid 17 to the granular material 15 that is dictated by the interconnection between the pump 40 and the motor 38. The flow meter 44 measures the rate of flow of the liquid 17 so that the

ratio of liquid 17 to granular material 15 can be measured and analyzed at a later date.

In the embodiment shown in Fig. 6, using a hydraulic direction control valve 60, the granular material delivery system 23 selectively diverts a portion of the hydraulic flow away from the hydraulic system 28 to the liquid system motor 38 of the liquid delivery system 25. The conveyor motor 26 receives the fluid flow either directly or through the liquid system motor 38, mounted in line or in series with the conveyor motor 26, to turn the conveyor 20. In the first setting of the direction control valve 60, the liquid delivery system 25 is activated or on. In the second setting of the valve 60, only the operation of the separate conveyor motor 26 is selected. In that case, the liquid delivery system 25 is off. In a similar manner to that described with reference to Fig. 5, the direction control valve 60 and the liquid system motor 38 are inserted into the hydraulic line 29 intermediate to the pump 31 and the conveyor motor 26 at the quick release disconnects 52. The second setting of the direction control valve 60 requires a third quick release disconnect 52A to the hydraulic system 28. The quick release disconnect 52A interconnects the direction control valve 60 and the motor 26 (Fig. 4).

If the liquid delivery system 25 is on, i.e., motor 38 is activated by setting the direction control valve 60, then the pump 40 operates as previously

described forcing fluid through the flow control valve 42 and the flow meter 44 to the nozzles 21. A liquid level indicator 62 can be mounted in the liquid tank 16 selecting the first setting, to turn off the liquid delivery system 25 at the direction control valve 60, if the liquid 17 goes below a certain predetermined level.

In the embodiment shown in Fig. 7 the hydraulic direction control valve 50 is utilized in a first setting to solely direct fluid to the separate conveyor motor 26 or, through the hydraulic flow control valve 48, in a second setting directs fluid to the liquid system motor 38 and the conveyor motor 26. As has been discussed in other embodiments, if the separate conveyor motor 26 is selected by the direction control valve 50, the liquid delivery system 25 is shut off. If the flow control valve 48 is selected by the direction control valve 50, a selected constant percentage of the hydraulic fluid is available to operate the liquid system motor 38, with the balance operating the separate conveyor motor 26.

The diverted hydraulic fluid is returned to the reservoir 34. The percent of fluid diverted to the motor 38 is set at a constant but may be changed to any of an infinite number of settings over a range by the operator, altering the feed rate of the granular delivery system 23. The flow control valve 48 and direction control valve 50 thereby define diversion means for diverting hydraulic fluid from the granular material delivery system 23 to the liquid delivery system 25. The

direction control valve 50 is connected at the quick release disconnects 52 intermediate the pump 31 and the conveyor motor 26, defining the connection 56 to the hydraulic system 28 (Fig. 4).

As before, the liquid system motor 38 mechanically drives the pump 40, the liquid 17 is forced through the variable flow control valve 42 and the flow meter 44 to the nozzles 21. The level indicator 62 operates the direction control valve 50 to enable or disable the liquid delivery system 25, depending upon the level of liquid 17 in the tank 16.

In the embodiment shown in Fig. 8, a desired percentage of hydraulic fluid is diverted at the variable flow control valve 48 from hydraulic system 28 to the liquid delivery system 25. The direction control valve 50 may restore the diverted percentage of hydraulic fluid to the separate conveyor motor 26 or activate the liquid delivery system 25 by supplying the diverted hydraulic fluid to the liquid system motor 38. All of the hydraulic fluid is eventually returned to the hydraulic storage tank 34. The flow control valve 48 is again interconnected into the hydraulic line 29 at the quick release disconnects 52 (Fig. 4).

In the embodiment shown in Fig. 9, the feed rate of the liquid delivery system 25 is controlled entirely through the hydraulic system 28. This eliminates the need for the liquid flow control valve 42. Rather, the first and second variable control values 70 and 74, as

well as directional flow control valve 72, are placed in the hydraulic system 28 upstream of the liquid system motor 38.

In a manner analogous to the other embodiment, Fig. 9 shows a circuit in which hydraulic fluid is removed from the reservoir 34 and delivered into the hydraulic lines 30 under pressure imparted by the hydraulic pump 31. Hydraulic fluid passes through a direction control valve 72 downstream of the pump 31. As before, depending on the position of the direction flow control valve 72, the liquid delivery system 25 is either on or off. If the flow control valve 72 is set to turn the liquid delivery system 25 off, then all the hydraulic fluid is directed toward the conveyor motor 26 of the granular delivery system 23. If the direction flow control valve 72 is on, then the hydraulic fluid is directed through the first variable flow control valve 70, which sets the percentage of reduction as has been discussed with respect to Figs. 7 and 8. A percentage of hydraulic fluid is diverted to the liquid delivery system 25, and the remainder is used to drive the granular delivery system 23. Hydraulic fluid then passes through the second variable flow control valve 74. At the control valve 70, the feed rate of the liquid delivery system 25 is set. Depending on the setting of the second variable flow control valve 74, the liquid delivery system 25 operates at a full feed rate for the liquid 17 or at a lesser feed rate. In this manner, the

amount of hydraulic fluid supplied to the pump motor 38 controls the feed rate of the liquid 17, rather than the flow control valve 42 of the other alternative embodiments. As in the other embodiments, the liquid feed rate is constant within a range. As seen in Fig. 9, any excess hydraulic fluid is returned to the hydraulic system 28 and eventually to the reservoir 34.

It will be apparent to those of skill in the art that the position of the direction control valve 72 and the variable flow control valve 70 can be switched to achieve the identical operational result. A level indicator can be included to force the directional flow control valve 72 off.

In the embodiments of Figs. 7, 8, 9 and 10, the diversion means for diverting hydraulic fluid from the granular material delivery system 23 proportionately reduce the speed of the conveyor 20 by a percentage equal to the amount of fluid diverted away from the conveyor motor 26 to the reservoir 34. The feed rate of the granular delivery system 23 is reduced, and the amount of granular material 15 deposited on the road 13 is likewise reduced, while synchronous operation with the liquid delivery system 25 is maintained. If the diversion means is off, then the conveyor 20 returns to its previous operational speed. This is best seen in the following examples, which compare the embodiments of Figs. 3, 5 and 6, which do not reduce the feed rate of the granular

delivery system 23, to the embodiments of Figs. 7, 8 and 9, which do reduce the feed rate.

EXAMPLE 1

	FIG 3	FIG 5	FIG 6	FIG 7	FIG 8	FIG 9
Engine RPM	1000	1000	1000	1000	1000	1000
Inlet Hydraulic Fluid Flow in GPM	10	10	10	10	10	10
Hydraulic Fluid Diversion:						
Percent Diverted to Liquid Delivery System		N/A	N/A	N/A	30%	30%30%
Gallons Diverted to Liquid Delivery System		N/A	N/A	N/A	3	33
Conveyor Speed in RPM:						
Without Fluid Diversion		50	50	50	50	5050
With Fluid Diversion	50	50	50	35	35	35
Granular Material Usage:						
Salt - (lbs. Per Lane Mile)						
Without Fluid Diversion		400	400	400	400	400400
With Fluid Diversion	400	400	400	280	280	280
Salt Savings Due to Diversion During Liquid Application:		N/A	N/A	N/A	120	120120
Liquid Material Usage:						
Without Fluid Diversion		20	20	20	0	00
With Fluid Diversion	20	20	20	14	14	14
Liquid Savings Due to Diversion		N/A	N/A	N/A	6	66

EXAMPLE 2

	FIG 3	FIG 5	FIG 6	FIG 7	FIG 8	FIG 9
Engine RPM	2000	2000	2000	2000	2000	2000
Inlet Hydraulic Fluid Flow in GPM	20	20	20	20	20	20
Hydraulic Fluid Diversion:						
Percent Diverted to Liquid Delivery System		N/A	N/A	N/A	30%	30%30%
Gallons Diverted to Liquid Delivery System		N/A	N/A	N/A	6	66
Conveyor Speed in RPM:						
Without Fluid Diversion		100	100	100	100	100100
With Fluid Diversion	100	100	100	70	70	70
Granular Material Usage:						
Salt - (lbs. Per Lane Mile)						
Without Fluid Diversion		800	800	800	800	800800
With Fluid Diversion	800	800	800	560	560	560
Salt Savings Due to Diversion During Liquid Application:	N/A	N/A	N/A	240	240	240

Liquid Material Usage:						
Without Fluid Diversion		40	40	40	0	00
With Fluid Diversion	40	40	40	28	28	28
Liquid Savings Due to Diversion	N/A	N/A	N/A	12	12	12

The assumptions in the foregoing examples are a 30% reduction in conveyor speed due to diversion of fluid. It is also assumed that the ratio of the liquid 17 to the granular material (salt) 15 will be 5% by weight. Use of the embodiments of Figs. 7, 8 and 9 reduces use of salt 120 lbs. and liquid 6 gallons in Example 1. For Example 2, the reductions are 240 lbs. and 12 gallons.

Those of ordinary skill in the art will appreciate that reduction, or proportional change, of the feed rate of the granular delivery system 23 may result from other mechanical and electronic means. Specifically, the liquid feed rate could be measured electronically, and a signal proportional to the feed rate would proportionately open and close a valve (not shown) in the hydraulic system 28. The opening and closing of the valve would affect the amount of hydraulic fluid supplied to the conveyor motor 26, raising or lowering the feed rate of granular material.

In all of the embodiments discussed, reduction of the feed rate of the granular delivery system 23 resulted from diversion of hydraulic fluid to the liquid delivery system 25. It is also contemplated in the embodiment shown in Fig. 10 of the present invention to reduce the feed rate of the granular delivery system 23 by diverting

hydraulic fluid from the conveyor motor 26 in a proportional amount and returning the hydraulic fluid to the reservoir 34 rather than to the liquid delivery system 25. Such a diversion is accomplished by a variable flow control valve 82 and a direction control valve 80 similar to valves 48 and 50 described in reference to the embodiment shown in Fig. 7. The variable flow control valve 82 is placed in line so as to be upstream from the conveyor motor 26. A proportional amount of hydraulic fluid is thus directed to the liquid and conveyor motors 38 and 26 and the remaining and proportional amount of hydraulic fluid in the hydraulic system 28 is returned to the reservoir 34 by the variable flow control valve 82.

To achieve the desired reduction of the granular material feed rate, the variable flow control valve 82 returns the remaining proportional amount of the hydraulic fluid to the reservoir 34. The direction control valve 80 can be electronically connected as described previously to activate or deactivate the liquid delivery system 25. If the direction control valve 80 is set to direct fluid to the conveyor motor 26 only, no reduction in hydraulic flow, and, therefore, no reduction in granular material feed rate occurs nor is liquid added.

The liquid system motor 38 in the embodiment of Fig. 10 could be placed in series with the conveyor motor 26 on either side thereof. The only requirement is

that the liquid system motor 38 be downstream of the variable flow control 82. Other arrangements of the valves and motors will be apparent to those of ordinary skill in the art.

An improved control system 100 for the spreader is shown in Figs. 11, 12a, 12b and 12c. This control system 100 includes a material computer 102 which may either utilize the existing ground speed control 104 or replace it. Ground speed control is known in the prior art and is used to adjust the speed of the conveyor 20 according to the speed of travel of the vehicle 12 carrying the aggregate conveyor 20 and the actual conveyor speed. As shown in Figs. 11 and 12, the ground speed control 104 is incorporated into or associated with the material computer 102 of the improved delivery system 100.

As has been previously described generally, the vehicle hydraulic pump 31 (Fig. 11) pumps hydraulic fluid through a directional flow control valve 106 which directs hydraulic fluid to the conveyor motor 26, activating the delivery system, or diverts the hydraulic fluid to the reservoir 34. The flow of hydraulic fluid to the conveyor motor is sensed by a flow sensor 108 which generates a signal as a function of the conveyor speed and sends the signal as an input signal to the material computer 102.

Unlike the hydraulic and mechanical reduction delivery systems shown in Figs. 7-10, the improved embodiment shown in Fig. 11 controls the liquid material

feed rate electronically by programming the material computer 102 as a function of the granular material feed rate. The material computer sets the speed at which liquid pumps 40 are driven by a liquid system motor (not shown). For any given granular material feed rate, the liquid feed rate may be changed by manually setting the material computer 102. Upon activation of the material delivery system 100, the motor 26 drives the aggregate conveyor 20, which moves at a preselected or determined speed. A conveyor speed sensor 110 generates a signal which is directed to the computer 102 which in turn constantly adjusts the proportion of hydraulic fluid diverted by the control valve 106.

As determined by the speed of the conveyor 20, the material computer 102 controls the speed at which the pumps 40 feed the liquid 17 from the liquid supply tank 16 to the spray nozzles 21. The vehicle operator can vary within selected rates the amount at which the granular delivery system delivers aggregate material as in the previously described embodiments.

As shown in Fig. 12a, a vehicle speed sensor 112 generates a signal as a function of vehicle speed, which signal is fed directly to the material computer 102. The conveyor speed sensor 110 generates a signal as a function of the aggregate conveyor 20 speed, which signal is also fed to the material computer and optimally to the ground speed computer 104, in an optional feedback loop. Based on an already established granular feed reduction

rate selected at a liquid/solid control switch 114, the material computer 102 establishes an adjusted speed input signal which is transmitted to the ground speed computer 104 for controlling the speed of the aggregate conveyor 20. The material computer 100 further activates and controls the liquid material system by generating and transmitting a control signal thereto.

As shown in Fig. 12b, the vehicle speed sensor 112 generates a signal as a function of vehicle speed which signal is fed to the ground speed computer 104. The conveyor speed sensor 110 generates a signal which is transmitted to the material computer 102. An adjusted conveyor speed signal is developed by the material computer 102 and transmitted to the ground speed computer which effectively lowers the aggregate conveyor speed. The material computer also generates a signal which is used to activate and control the liquid delivery.

The modified control system shown in Fig. 12c is similar to that shown in Fig. 12b, with the exception that the ground speed computer 104 output signal is transmitted to the material computer 102, which then directly controls the speed of the aggregate conveyor 20 and liquid feed.

Although the invention has been described with a certain degree of particularity, the scope of the invention as defined in the appended claims.

CLAIMS

We claim:

1. In a synchronized granular and liquid spreader device mountable on a vehicle including a hydraulic system and comprising a storage hopper for containing granular material, a granular delivery system mounted on said vehicle for distributing granular material from said hopper, said hopper depositing said granular material onto conveyor means driven by said hydraulic system, said conveyor means moving the granular material to a delivery position, delivery means at said delivery position for receiving and distributing said granular material; a liquid storage tank, a liquid delivery system interconnected to said granular delivery system for supplying liquid material, means for selectively actuating said liquid delivery system for adding the liquid to the granular material generally at the delivery position; and control means for controlling the synchronous feed rate of the granular and liquid materials, the improvements in said control means comprising means for selectively setting the liquid feed rate within a range of feed rates, means for selectively setting the granular delivery system feed rate over a selected range of feed rates of granular material; means for maintaining a predetermined ratio of the feed rate of liquid material to the feed rate of granular material and means operative in response to actuation of said liquid

delivery system for reducing by a variably selected percentage the quantity of granular material delivered by said granular material delivery system while maintaining said predetermined ratio of the feed rates of delivery of liquid material and granular material.

2. The spreader device as defined in claim 1, wherein said control means further includes diversion means for diverting a selected percentage of hydraulic fluid from the hydraulic system of the granular delivery system to the liquid delivery system and thereby slowing the speed of said conveyor means and lowering the feed rate of the granular material.

3. The spreader device as defined in claim 1, wherein said control means further including liquid level indication means for sensing the level of liquid in the storage tank and if the liquid level is below a predetermined set value disengaging the liquid delivery system.

4. The spreader device as defined in claim 1, wherein said hydraulic system further includes:

a pump operated through a power take off from an engine mounted on said vehicle;

a liquid system motor operative on said pump and connected to a liquid system pump, said liquid system pump for moving the liquid from the storage tank to the delivery means; and

a separate conveyor motor for operating said conveyor.

5. The spreader device as defined in claim 4, wherein said liquid delivery system further includes a direction control valve downstream of said liquid pump and upstream of said flow control valve for returning the liquid to the storage tank or directing it through said flow control valve.

6. The spreader device as defined in claim 5, wherein said liquid delivery system further includes a flow meter to determine the rate of flow of the liquid.

7. The spreader device as defined in claim 1, wherein said hydraulic system further includes:

a pump operated through a power take off from an engine mounted on said vehicle;

a direction control valve for directing hydraulic fluid, which direction control valve in a first setting directs the fluid to operate a conveyor motor for driving the conveyor means or in a second setting directs the fluid to operate a pump motor of the liquid delivery system and the conveyor means.

8. The spreader device as defined in claim 7, wherein said liquid delivery system further includes liquid level indication means for selecting the first setting of said direction control valve if liquid in the storage tank falls below a preselected level.

9. The spreader device as defined in claim 8, wherein said liquid delivery system further includes a flow meter to determine the rate of flow of the liquid.

10. The spreader device as defined in claim 1, wherein said hydraulic system further includes:

a hydraulic pump operated through a power take off from an engine mounted on said vehicle; a liquid system motor operatively driven by said hydraulic pump and mechanically connected to a liquid system pump, said liquid system pump operative for moving the liquid from the storage tank to the delivery means; a separate conveyor motor operatively driven by said hydraulic pump for operating said conveyor; and the further improvement in said control means comprises a hydraulic direction control valve for directing hydraulic fluid, which direction control valve in a first setting directs the fluid to operate said conveyor motor for driving the conveyor means or in a second setting directs the hydraulic fluid to a second flow control valve, said second flow control valve operative for diverting a selected percentage of the fluid to said separate conveyor motor and the remaining percentage to said liquid system motor for driving said liquid delivery system thereby to alter the feed rate of the granular material by reducing the fluid which is available to the conveyor.

11. The spreader device as defined in claim 1, wherein said hydraulic system further includes:

a first hydraulic pump operated through a power takeoff from an engine mounted on said vehicle;

a liquid system motor operatively driven by said pump and connected to a liquid system pump, said liquid system operative pump for moving the liquid from the storage tank to the delivery means;

a separate conveyor motor operatively driven by said hydraulic pump for operating said conveyor; and the further improvement in said control means comprises

hydraulic flow control means including a direction flow control valve and a flow control valve mounted in line with said conveyor motor wherein said direction flow control valve directs all the hydraulic fluid from the first pump to the conveyor motor or to the flow control valve, said flow control valve directing a set portion of said hydraulic fluid to the conveyor motor and on activation of said liquid delivery system a remaining portion to the hydraulic reservoir, whereby the feed rate of the granular material delivery system is altered because of the reduced hydraulic fluid directed to the conveyor motor.

12. The spreader device as defined in claim 11, wherein said liquid delivery system further includes:

a flow meter to determine the rate of flow of the liquid.

13. In a synchronized granular and liquid spreader device mountable on a vehicle and comprising a granular delivery system mounted on said vehicle for distributing granular material from a hopper, said hopper depositing said granular material onto conveyor means driven by a

hydraulic system, said conveyor means for moving the granular material to a pre-selected delivery position at which delivery position delivery means receive and distribute said granular material; a liquid delivery system interconnected to said granular delivery system for a synchronous feed rate of the granular and liquid materials, said liquid delivery system for adding the liquid to the granular material generally at the delivery means; and control means for controlling the feed rate of the granular and liquid materials, the improvement in said control means comprising means for reducing by a selected percentage the feed rate of the granular delivery system upon activation of the liquid delivery system; and means for directly and proportionately changing the granular material feed rate as the liquid delivery feed rate is changed.

14. The spreader device as defined in claim 13, wherein the means for reducing the granular material feed rate includes means for sensing the commencement of liquid feed and means responsive to the sensing of commencement of liquid feed for adjustably controlling the conveyor means.

15. In an apparatus for the synchronized spreading of granular and liquid materials onto a surface and comprising a granular material delivery system including a hopper for containing granular material, a spreader for distributing the granular material onto a surface, a conveyor for conveying the granular material from said

hopper to said granular material spreader, a liquid material delivery system including a tank for containing liquid material, a spreader for distributing the liquid material onto said surface, a pump for pumping liquid material from said tank to said liquid material spreader, first means for driving said conveyor, second means for driving said pump, and means for controlling said first means and said second means, the improvement in said controlling means comprising means for controlling said first means and thereby the quantity per surface area of granular material to be applied to the surface, means for controlling said second means and thereby the amount of liquid per surface area applied to the surface as a function of the amount of granular material being applied to the surface and a selected ratio of liquid material to granular material, and means for variably controlling said first means in response to the activation of said second means, for reducing the quantity of granular material applied to the surface by a selected percentage of the material quantity applied prior to the activation of said second means.

16. In an apparatus for the synchronized spreading of granular and liquid materials onto a surface and comprising a granular material delivery system including a hopper for containing granular material, a spreader for distributing the granular material onto a surface, a conveyor for conveying the granular material from said hopper to said granular material spreader, a liquid

material delivery system including a tank for containing liquid material, a spreader for distributing the liquid material onto said surface, a pump for pumping liquid material from said tank to said liquid material spreader, a first motor for driving said conveyor, a second motor for driving said pump, and means for controlling said first and second motors, the improvement in said controlling means comprising means for controlling said first motor as a function of a predetermined amount of granular material to be applied to the surface, means for adjustably controlling said second motor as a function of the amount of granular material to be applied to the surface and a selected ratio of liquid material to granular material, and means for variably controlling said first motor in response to the activation of said second motor for reducing the quantity of granular material applied to the surface by a selected percentage of the material quantity applied prior to the activation of said second motor.

17. In an apparatus for the synchronized spreading of granular and liquid materials onto a surface and comprising a granular material delivery system including a hopper for containing granular material, a spreader for distributing the granular material onto a surface, a conveyor for conveying the granular material from said hopper to said granular material spreader, a liquid material delivery system including a tank for containing liquid material, a spreader for distributing the liquid

material onto said surface, a pump for pumping liquid material from said tank to said liquid material spreader, a first fluid pressure motor for driving said conveyor, a second fluid pressure motor for driving said pump, a pressure fluid pump for delivering pressure fluid to said first and second fluid pressure motors, and means for controlling the flow of pressure fluid to said first and second fluid pressure motors, the improvement in said controlling means comprising means for proportioning the flow of pressure fluid to said first and second fluid pressure motors as a function of a selected amount of granular material to be applied to the surface and a selected ratio of granular material to liquid material to be applied to the surface, and means for variably controlling said first fluid pressure motor in response to the activation of said second fluid pressure motor for reducing the quantity of granular material applied to the surface by a selected percentage of the material quantity applied prior to the activation of said second fluid pressure motor.

18. A spreader for granular and liquid materials comprising a vehicle including a hydraulic system, a storage hopper mounted on said vehicle for containing granular material, a granular material delivery apparatus including a conveyor driven by said hydraulic system for moving the granular material from the hopper to a delivery position and means at said delivery position for receiving and distributing said granular material onto

the roadway surface, a controller for controlling the speed of said conveyor, means for sensing conveyor speed and generating a conveyor speed signal, a liquid storage tank mounted on said vehicle, a liquid material delivery apparatus including a conduit for supplying liquid material from said tank to a delivery position and means at said delivery position for distributing said liquid, wherein the improvement comprises a material computer for controlling the feed rates of the granular and liquid materials, said material computer receiving said conveyor speed signal and generating first and second signals as a function of said sensed conveyor speed, said first signal being directed by said material computer to said controller for controlling the delivery of said granular material and said second signal being directed by said material computer to said liquid delivery apparatus for controlling the delivery of liquid thereby, means for selectively generating a third signal to said material computer to actuate said liquid delivery apparatus, said third signal generating means including means for selectively presetting the rate of liquid delivery, said material computer selectively setting the liquid material feed rate within a selected range of feed rates, said material computer selectively setting the granular material feed rate within a selected range of feed rates, said material computer being operative to maintain a predetermined ratio of said feed rate of liquid material to said feed rate of granular material, and said material

computer being operative in response to actuation of said liquid material delivery apparatus for reducing by a variably selected percentage the quantity of granular material delivered by said granular material delivery apparatus while maintaining said predetermined ratio of the feed rates of delivery of liquid and granular materials.

19. A spreader for granular and liquid materials comprising a vehicle including a hydraulic system, a storage hopper mounted on said vehicle for containing granular material, means for sensing vehicle speed and generating a vehicle speed signal, a granular material delivery apparatus including a conveyor controlled by said ground speed computer and driven by said hydraulic system for moving the granular material from the hopper to a delivery position and means at said delivery position for receiving and distributing said granular material onto the roadway surface, a ground speed computer for controlling said granular material delivery apparatus, means for sensing conveyor speed and generating a conveyor speed signal, a liquid storage tank mounted on said vehicle, and a liquid material delivery apparatus including a conduit for supplying liquid material from said tank to a delivery position and means at said delivery position for distributing said liquid, wherein the improvement comprises a material computer for controlling the feed rates of the granular and liquid materials, said material computer receiving said vehicle

speed signal and generating a first signal as a function of said sensed vehicle speed, said material computer receiving said conveyor speed signal and generating a second signal as a function of said sensed conveyor speed, said first signal being directed by said material computer to said ground speed computer for controlling the delivery of said granular material and said second signal being directed by said material computer to said liquid delivery apparatus for controlling the delivery of liquid thereby, means for selectively generating a third signal to said material computer to actuate said liquid delivery apparatus, said third signal generating means including means for selectively presetting the rate of liquid delivery, said material computer selectively setting the liquid material feed rate within a selected range of feed rates, said material computer selectively setting the granular material feed rate within a selected range of feed rates, said material computer being operative to maintain a predetermined ratio of said feed rate of liquid material to said feed rate of granular material, and said material computer being operative in response to actuation of said liquid material delivery apparatus for reducing by a variably selected percentage the quantity of granular material delivered by said granular material delivery apparatus while maintaining said predetermined ratio of the feed rates of delivery of liquid and granular materials.

20. A spreader for granular and liquid materials comprising a vehicle including a hydraulic system, a storage hopper mounted on said vehicle for containing granular material, means for sensing vehicle speed and generating a vehicle speed signal, a granular material delivery apparatus including a conveyor controlled by said ground speed computer and driven by said hydraulic system for moving the granular material from the hopper to a delivery position and means at said delivery position for receiving and distributing said granular material onto the roadway surface, a ground speed computer for controlling said granular material delivery apparatus, means for sensing conveyor speed and generating a conveyor speed signal, a liquid storage tank mounted on said vehicle, and a liquid material delivery apparatus including a conduit for supplying liquid material from said tank to a delivery position and means at said delivery position for distributing said liquid, wherein the improvement comprises a material computer for controlling the feed rates of the granular and liquid materials, said material computer receiving said vehicle speed signal and generating a first signal as a function of said sensed vehicle speed, said material computer receiving said conveyor speed signal and generating a second signal as a function of said sensed conveyor speed, said first signal being directed by said material computer to said ground speed computer for controlling the delivery of said granular material and said second

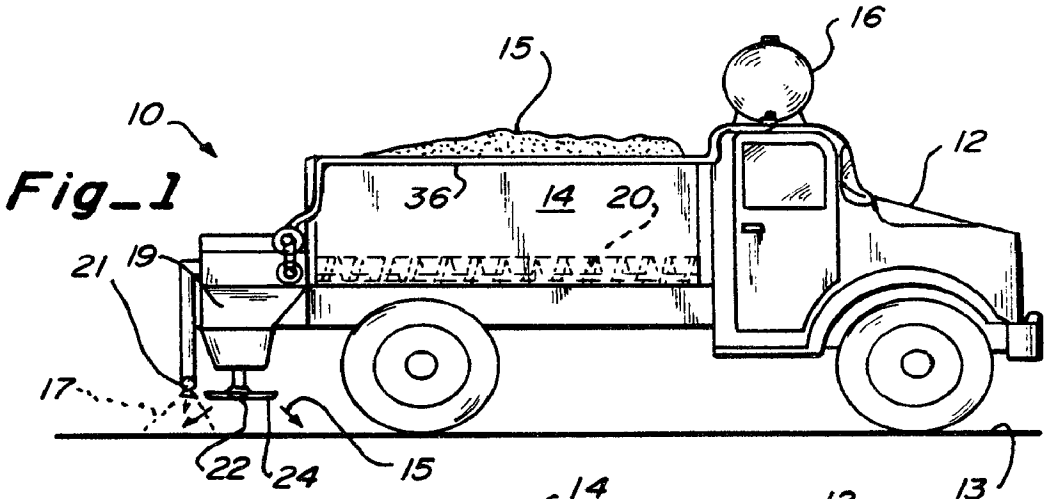
signal being directed by said material computer to said liquid delivery apparatus for controlling the delivery of liquid thereby, said material computer selectively setting the liquid material feed rate within a selected range of feed rates, said material computer selectively setting the granular material feed rate within a selected range of feed rates, said material computer being operative to maintain a predetermined ratio of said feed rate of liquid material to said feed rate of granular material, and said material computer being operative in response to actuation of said liquid material delivery apparatus for reducing by a variably selected percentage the quantity of granular material delivered by said granular material delivery apparatus while maintaining said predetermined ratio of the feed rates of delivery of liquid and granular materials.

21. A spreader as defined in claim 20 wherein the improvement further comprises means for selectively generating a third signal to said material computer to actuate said liquid delivery apparatus.

22. A spreader as defined in claim 21 wherein said third signal generating means includes means for selecting the rate of liquid delivery.



Fig_1



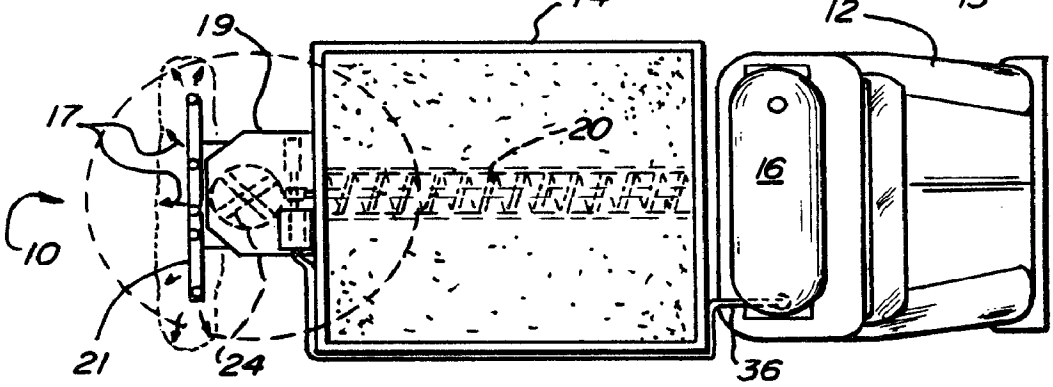


Fig_2

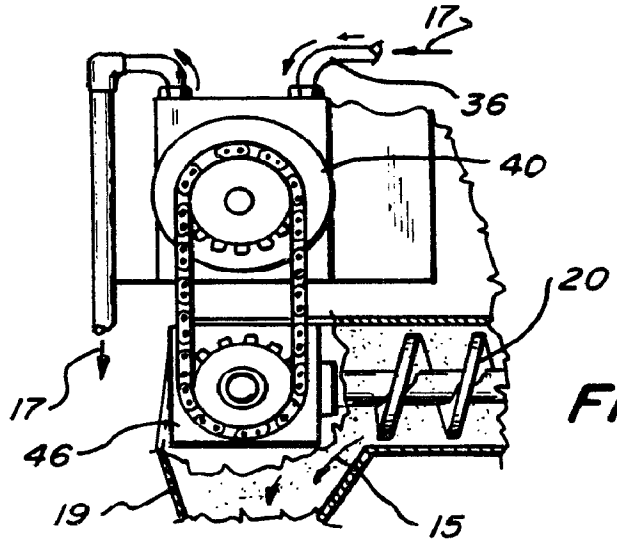


Fig_3

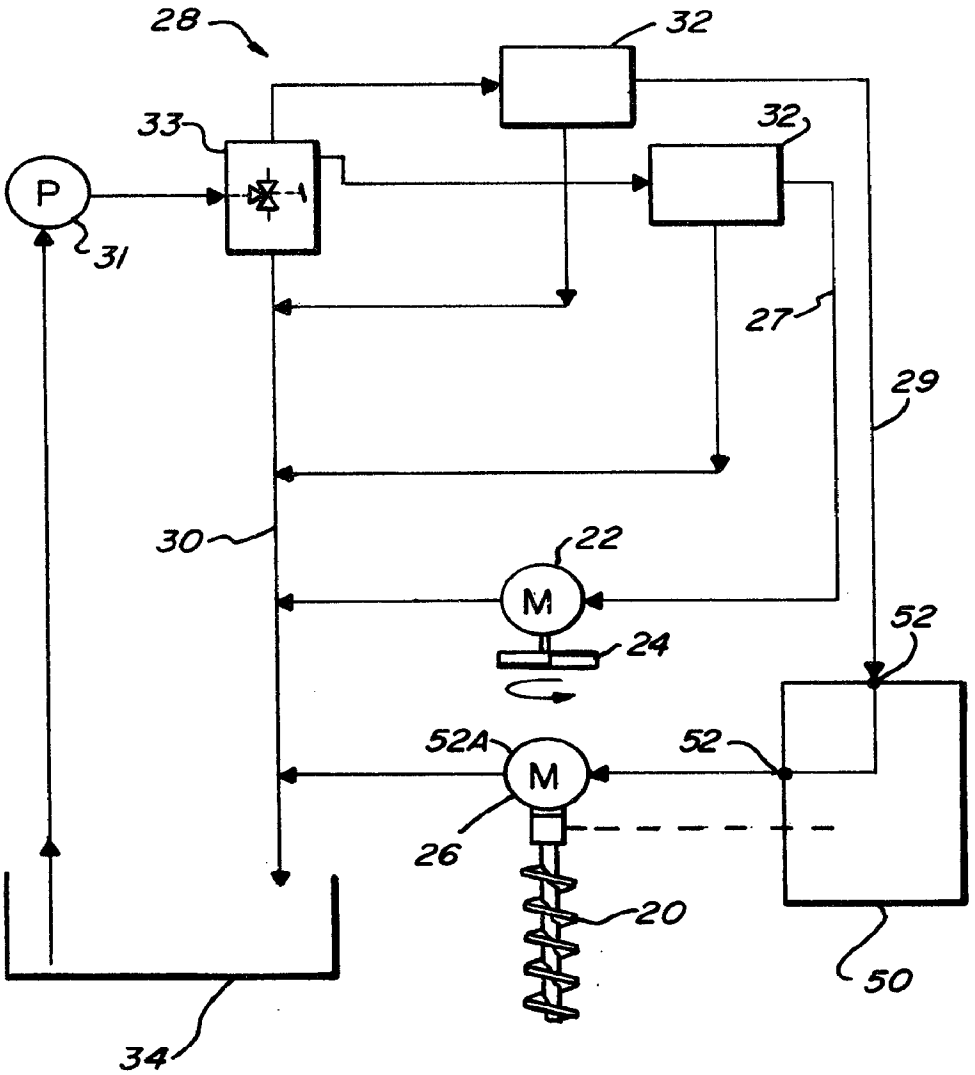


Fig_4

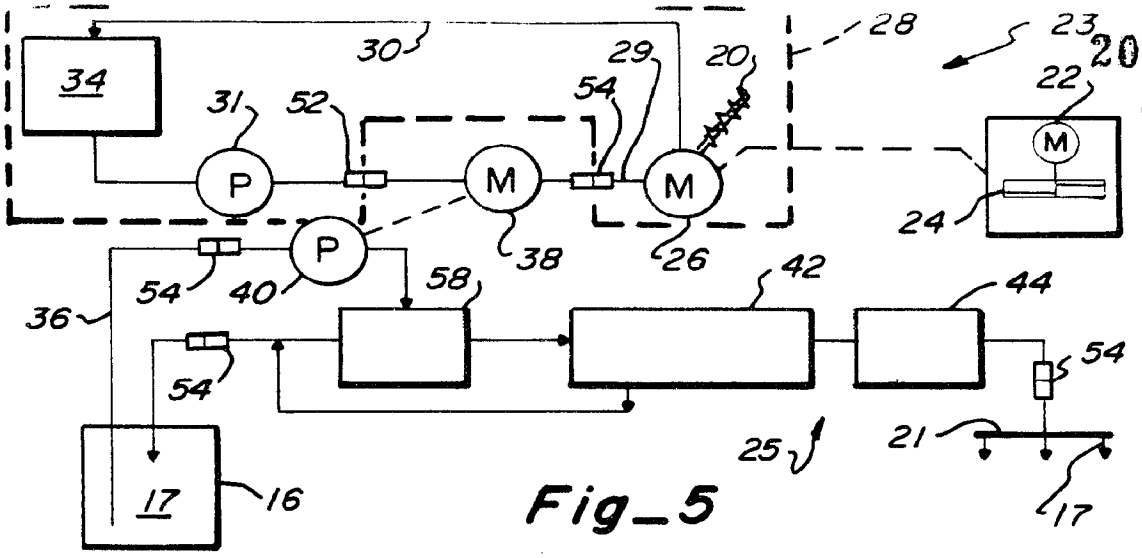

34
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28
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29
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22
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Fig_5

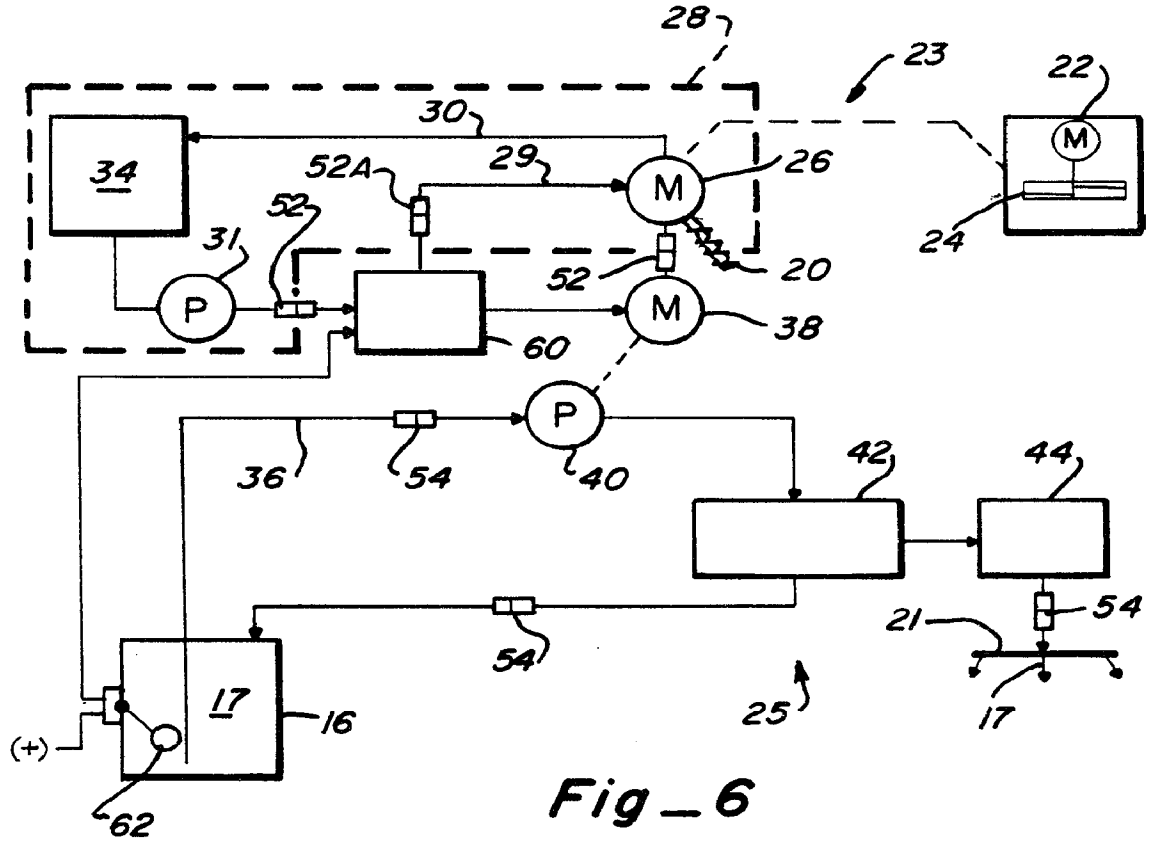

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Fig_6

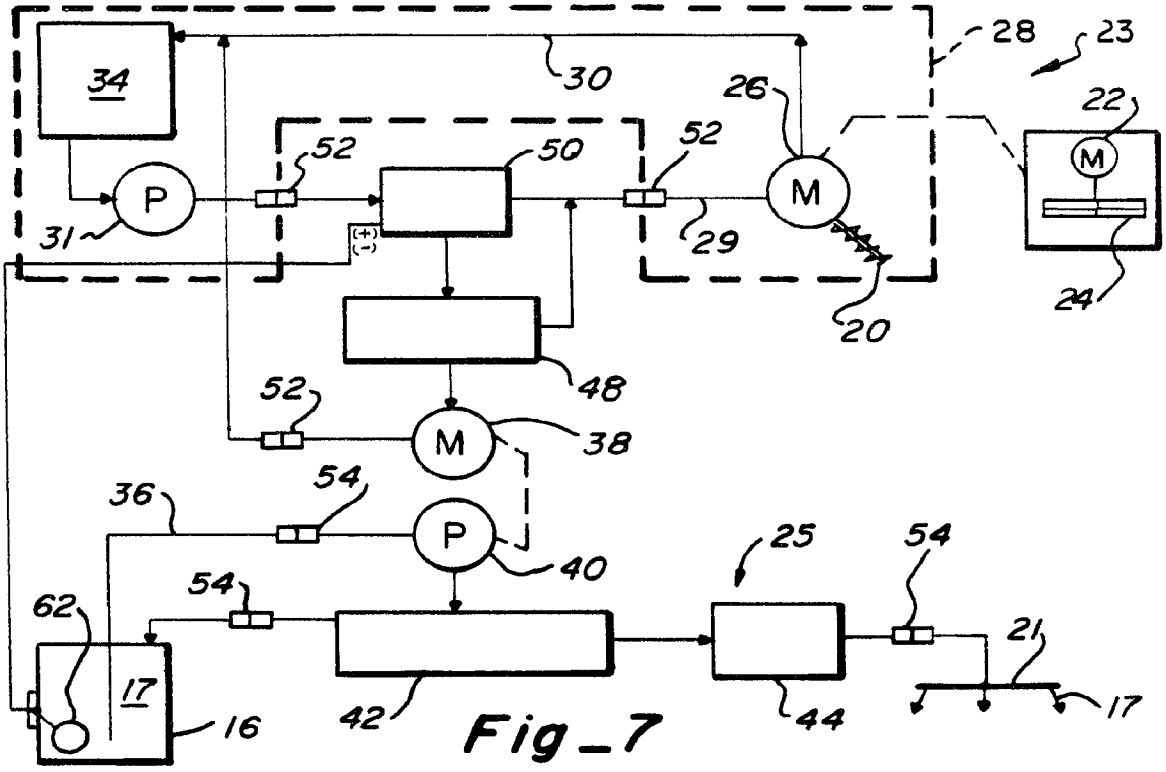

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Fig_7

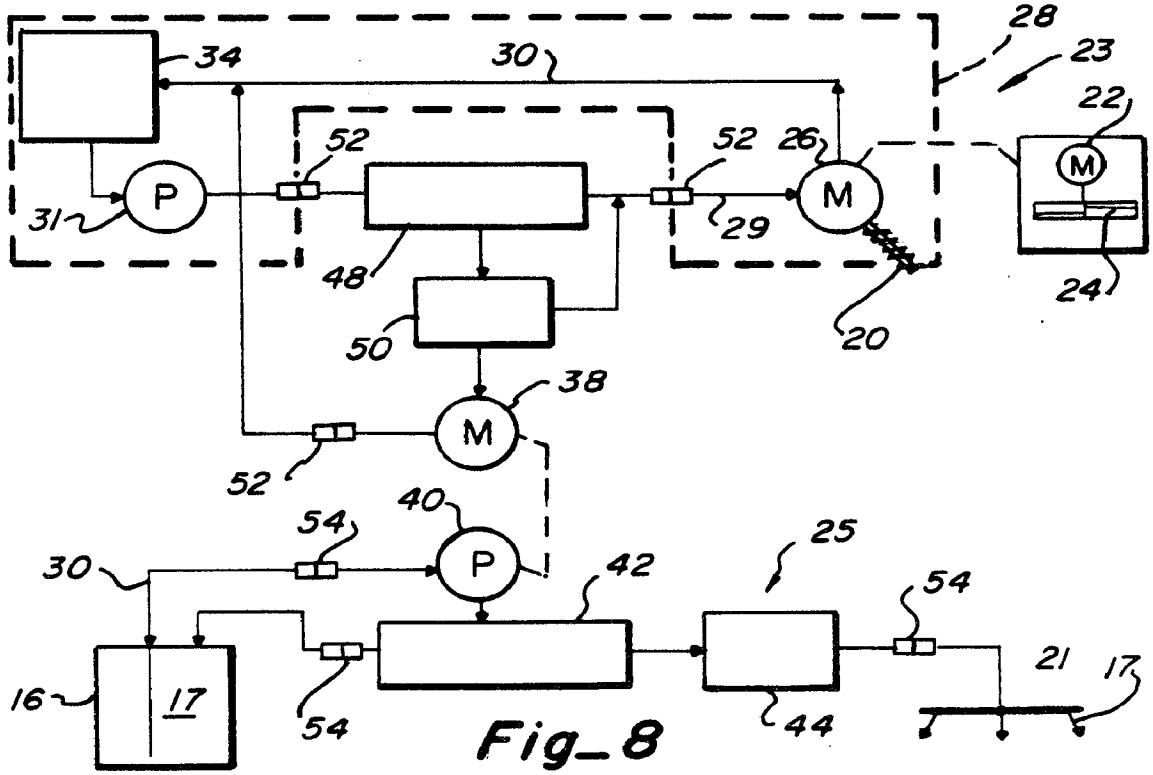

28
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M
P
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29
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P
25
30
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16
17
54
21
17
44

Fig_8

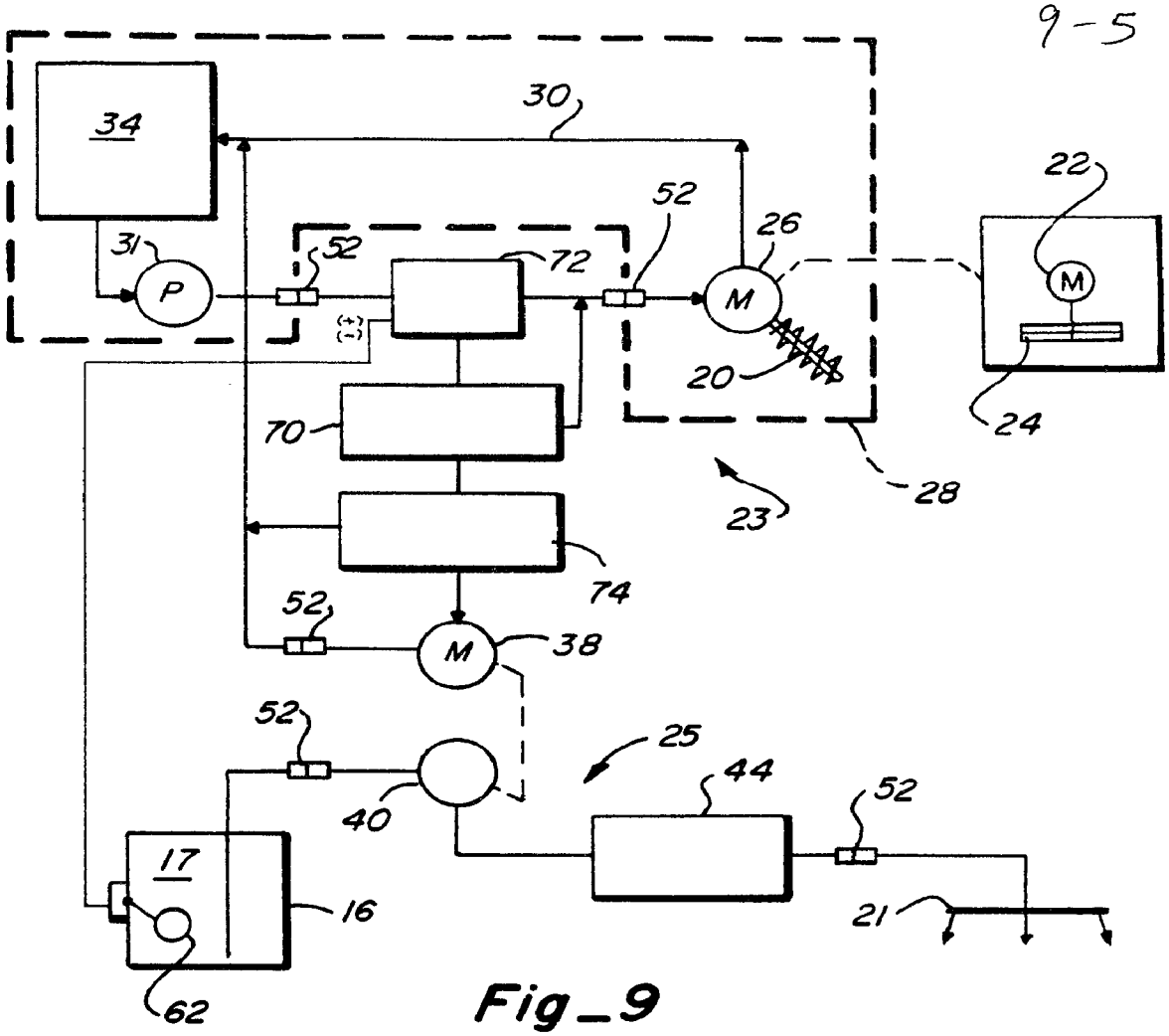

34
30
22
52
26
31
52
72
P
M
M
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24
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23
74
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M
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52
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16
21
62

Fig_9

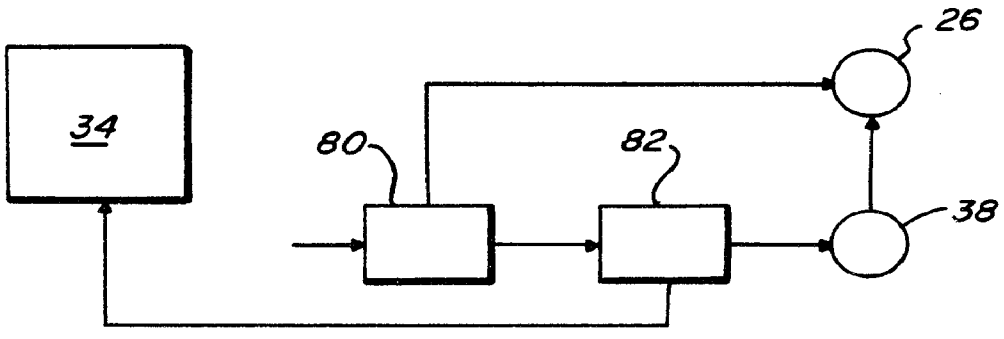

26
34
80
82
38

Fig_10

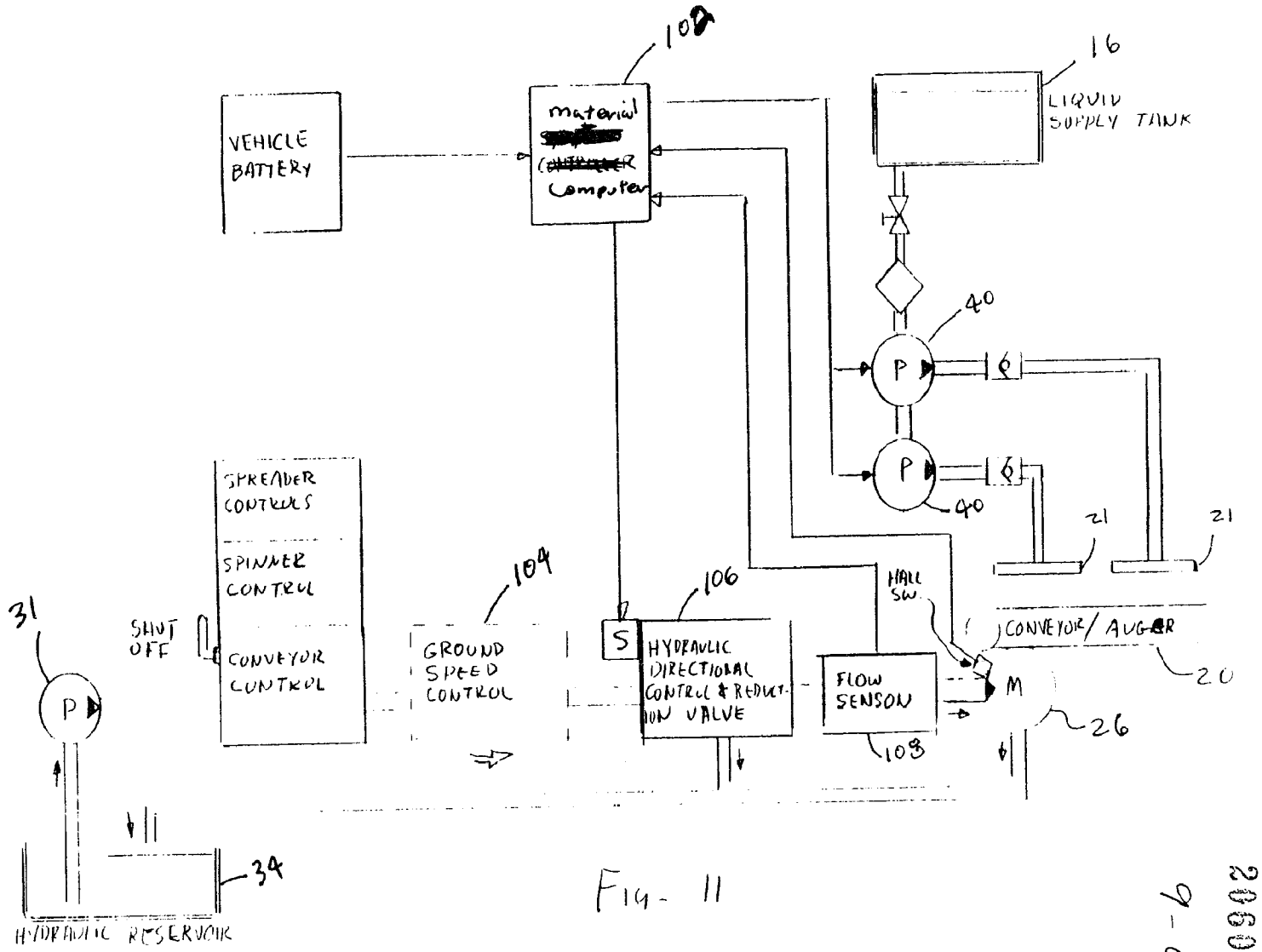


FIG. 11

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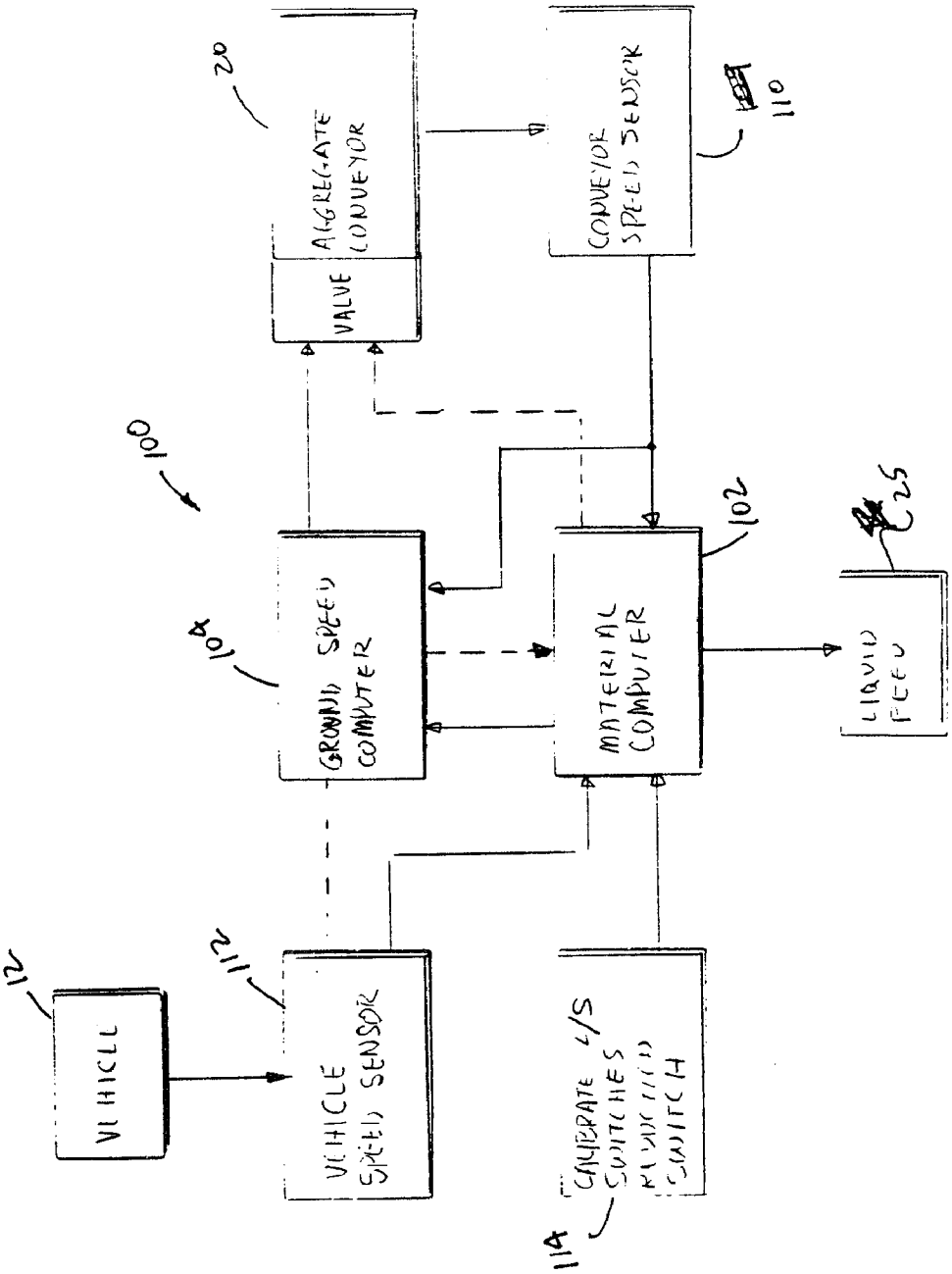

20
AGGREGATE CONVEYOR
VALVE
CONVEYOR SPEED SENSOR
110
100
102
104
GROUND SPEED COMPUTER
MATERIAL COMPUTER
25
LIQUID FEED
12
VEHICLE
111
VEHICLE SPEED SENSOR
114
CALIBRATE

Fig - 12a

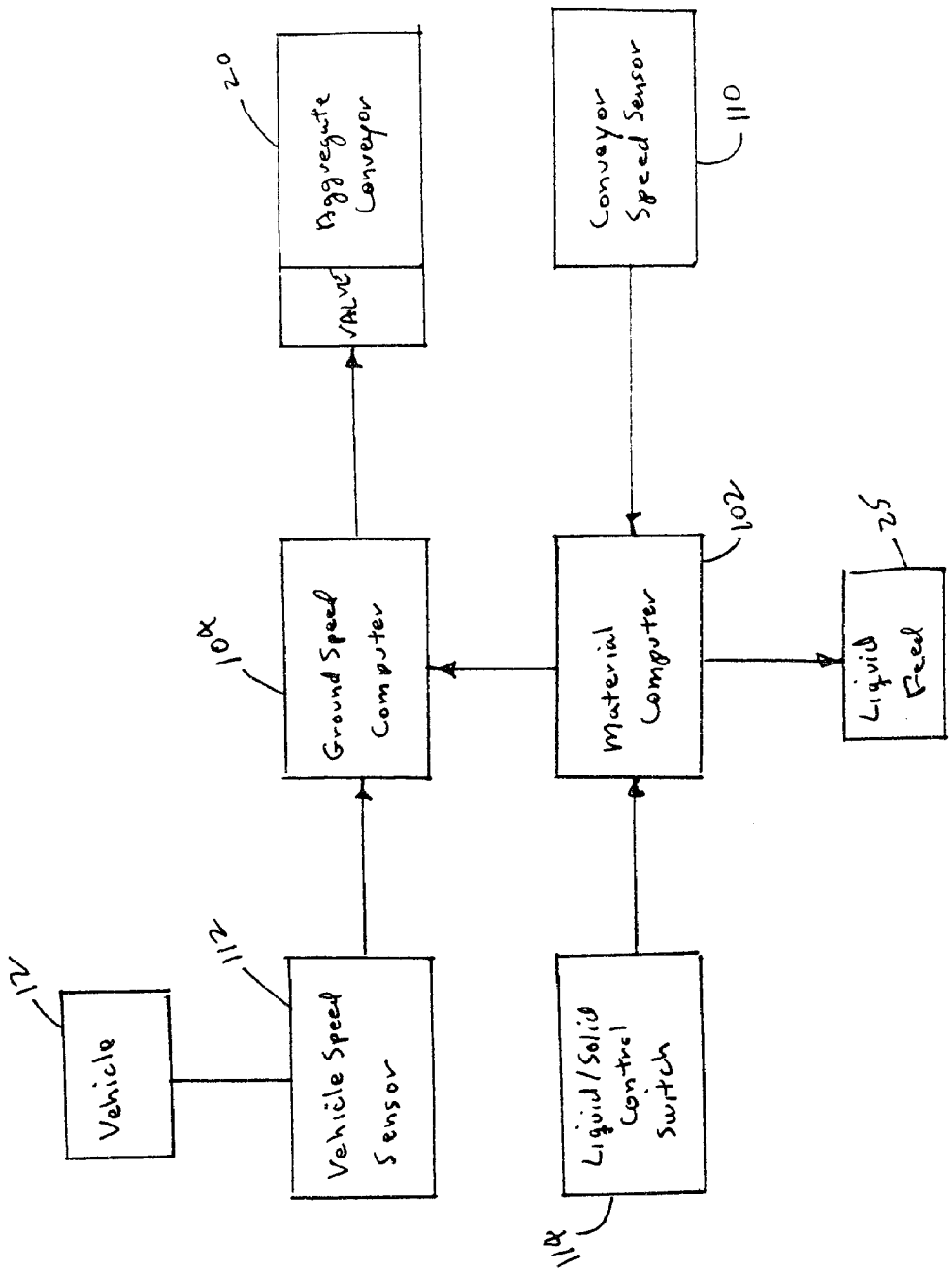

Aggregate Conveyor
20
Valve
Conveyor Speed Sensor
110
Ground Speed Computer
104
Material Computer
102
Liquid Feed
25
Vehicle
12
Vehicle Speed Sensor
112
Liquid/Solid Control Switch
114

Fig. 12b

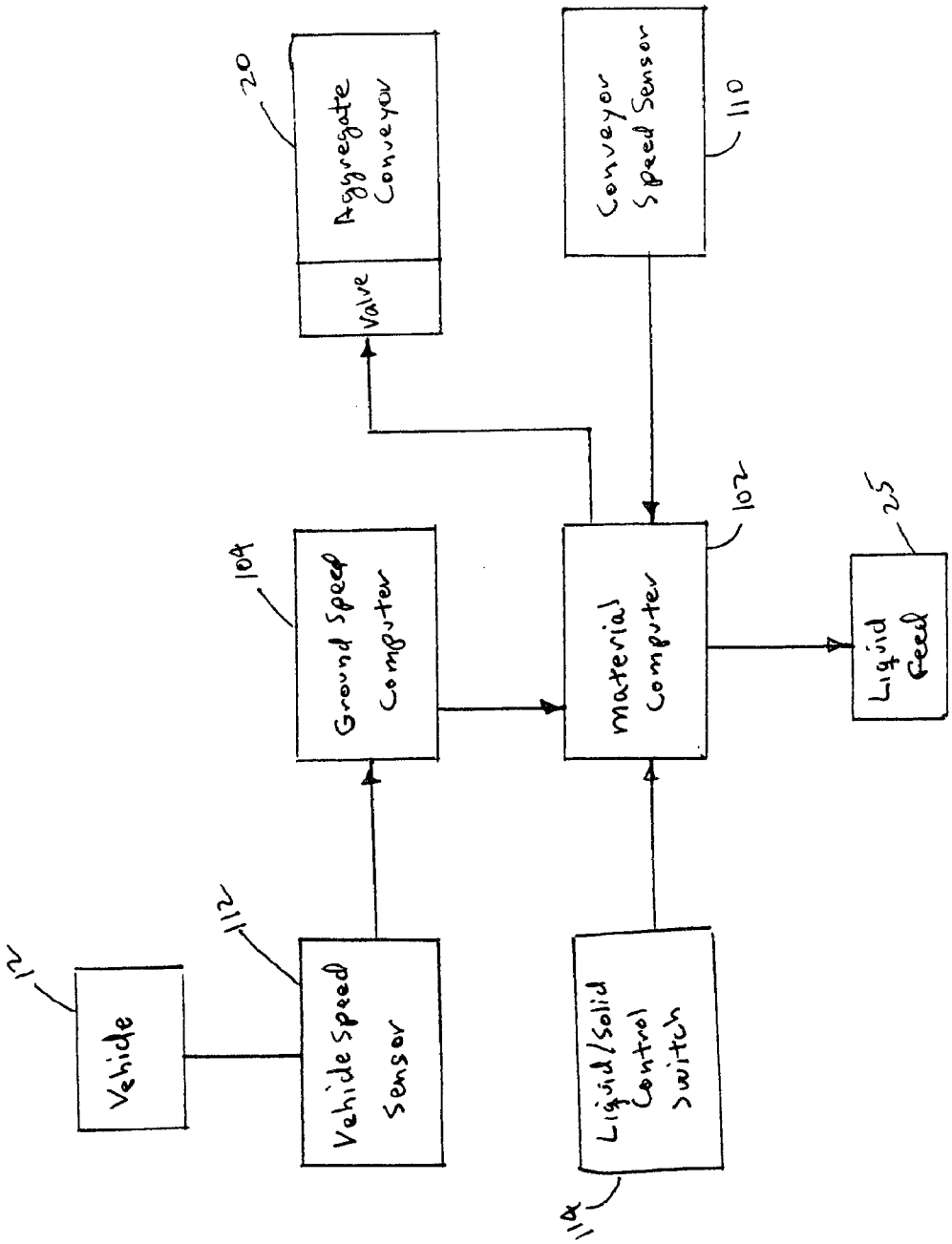

Aggregate Conveyor
Valve
20
Conveyor Speed Sensor
110
Ground Speed Computer
104
Material Computer
102
Liquid Feed
25
Vehicle
21
Vehicle Speed Sensor
112
Liquid/Solid Control Switch
114

Fig. 12

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Result Page

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Mobile Streuvorrichtung, in particular to litters of salt on driving or going courses
Often it is required, grit, to scatter in particular salt on driving or going courses with adverse weather conditions approximately with strong wind, if the driving or going courses and ice held free of snow smooth with large cold to become to be supposed. Then the grit becomes when falling down the strewing vehicle already blows, and if it lies on the smooth roadway, it is blown more other by the wind and by over the roadway driving cars to the side thrown.

This drawback has one by the fact to already repair attempted that one has the grit in aqueous solution by means of blowing up cars on the road sprayed. If the aqueous solution is relatively weak, then this method becomes uneconomic by the large amounts of the water which can be transported. Used one strong concentrated solutions, then exists the risk the fact that these already crystallize in the storage container or however at the nozzles and thus the outlet nozzles clogs. One has also a strong hygroscopic grit, e.g. Calcium chloride, used, for itself alone or with sodium chloride mixed, whereby the large water connection of the strewn good one holds this on the roadway. Calcium chloride is however relative expensively, in addition however brings the hygroscopic characteristic such good difficulties with the storage and in the spreading equipment, which are hardly to be avoided.

top Streuvorrichtungen for salt and other grit work ordinary with a grit distributor in form of a discharge roller, a centrifuge plate or a fan.

The invention relates to a mobile Streuvorrichtung, in particular to litters of salt on driving or going courses, with which the grit from a storage container is scattered to a grit distributor carried and by this.

Erfindungsgemäss ist mit der Streuvorrichtung ein Wasserbehälter verbunden, von dem aus das Wasser zu einem Wasserverteiler gelangt, der es in das aus dem Vorratsbehälter ausgetretene Streugut, dessen Teilchen einander mindestens grösstenteils nicht mehr berühren, vor dem Ausstreuen oder während des Ausstreuens einbringt.

If e.g. aus einem Streugutbehälter ein Streugutstrom durch einen Schacht fliesst, und das aus dem Schacht austretende Streugut auf einen als Streugutvertei ler dienenden, rotierenden Verteilerteller fällt, der es auf die Fahr- oder Gehbahn schleudert, berühren die Teilchen des Streugutes einander nach dem Ausströmen aus dem Schacht nicht mehr, und das Wasser kann in das Streugut, das aus dem Schacht ausgeströmt ist, unmittelbar nach der Schachtaustrittsöffnung oder in das Streugut auf dem Schleuderteller oder in das von diesem weggeschleuderte und noch nicht auf die Fahr- oder Gehbahn gefallene Streugut eingebracht werden.Würde das Wasser jedoch innerhalb des Streugut-Vorratsbehälters in das Streugut oder innerhalb des Schachtes in den Streugutstrom eingebracht, wo die Teilchen noch dicht aneinander anliegen, so käme es unvermeidlich zur Klumpenbildung und es würde weder ein störungsfreier Betrieb der Streuvorrichtung gewährleistet noch eine befriedigende Streuwirkung erzielt.

The humidification of the grit can by Auftropfen or Aufsprühen of the water on the distributed and/or.

falling down grit take place. When using the new EN Streu-Vorrichtung exists the possibility that the Srtugut before its distribution is by means of the Streuggutverteilers perfect drying, it can thus on the one hand drying stored and on the other hand drying into the storage container of the fahrbahren Streuvorrichtung introduced become, whereby its pourability obtained remains. Since the water becomes only introduced after the distribution of the grit, exists furthermore hardly the risk of clumping, because the distributed grit, as soon as it is moistened with water, falls down already, if it becomes not even only moistened during falling down.

The water can become on the grit distributor applied. So it can down-run in form or several water jets on the grit distributor, e.g. on a centrifuge plate serving as grit distributors. The movement of the centrifuge plate can serve for the distribution of the water and simultaneous for the contact of the water with the grit.

This embodiment is in the production very simple and has a large working reliability, because no narrow outlet nozzles for

the water are required, which can clog light according to experience by Unreinigkeiten. The water can become at the rotary shaft or also in the distance of it on the centrifuge plate passed.

If the water is injected into the grit falling from the grit distributor, then one must in addition narrow water exhaust nozzles use, however the risk of clumping is complete excluded thereby. In order to ensure in this case as intense a contact of the water with the falling down grit as possible, a centrifuge plate can eject the grit in form of a grit cone, whose cone coat cuts the cone coat of the spraying cone of the water in the acute angle, so that the grit and the water put as far a path as possible back common when falling down as grit distributors, that the possibility of the attachment of the water to the grit enlarged.

With use of a rotating roller as grit distributors the sprays of the water can become against the broad side of the falling Streugutschleiers sprayed.

To the distribution and/or. Atomization of the water actual bekannnte elastic or inelastic tubes with atomization openings or atomization nozzles used can become, especially elastic openable distributor nozzles can be mounted at the manifolds. In simplest manner one knows an hose from elastic material use, into which sets of holes are in-stung, as they are in similar manner for example known of water sprinklers for gardens.

Ordinary one will not be the amount of water discharged in the unit time the proportional grit quantity discharged in the unit time, as it is usually desired. It is therefore convenient to couple the dosage for the yield of the grit with the dosage for the yield of the water e.g. over both dosage devices a common shaft. The grit, like with most Streuvorrichtungen, can become over a conveyor belt or a screw discharged, which become driven by a rotating shaft. The delivery rate discharged in the unit time is proportional thereby the approximate speed of the rotie renden shaft. If the dosage of the grit quantity of preferably automatic over the speed this shaft made can become, thereby a dosage of the discharged amount of water coupled, by one an actual known dosage pump, e.g. a hose pump, from this shaft propels. By the fact ensured becomes that the humidification of the grit is always uniform. Such a coupling is in particular light possible if the required water pressure becomes generated by a pressure pump.

One can produce however the water pressure also by subjecting the water reservoir with compressed air. With favorable design of the nozzles the hydrostatic pressure of the water can already be sufficient with corresponding high assembly of the water reservoir, in order to cause the exit of the water.

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The grit distributor, thus for example the centrifuge plate or the rotating roller, can exhibit a surface of hydrophobic material or consist also whole of such material. In addition materials have themselves such as polyethylene, in particular however fluoridated plastic, e.g. Polytetrafluoroethylene or Polytrifiuormonochloräthylen as suitable proved. By the fact effected becomes that the adhesion of the grit and the water and/or. the water grit mixture on the grit distributor is extremely small, so that hydroextracting briskly made, before the grit which can be hydroextracted can lumps form or at the grit distributor settle.

With external temperatures the bottom freezing point is it convenient, in the store of water container for the humidification of the grit water with lowered freezing point, e.g. salt-offset waters to carry in order to avoid disturbances by ice formation.

In the images some embodiments of the invention are schematically illustrated and appended described, without the invention should be however limited on this embodiment.

Fig. 1 shows a Streuvorrichtung with a centrifuge plate, on which the water runs,
Fig. 2 an apparatus likewise with a centrifuge plate, whereby however the water becomes sprayed on the grit already falling down,
Fig. 3 an apparatus with a rotating roller, becomes sprayed with which the water on the falling down Streugutschleier.

From a storage container the grit arrives over conveyor means, e.g. a controlled conveyor belt, into a shaft 1, by which it falls on a centrifuge plate 2, which becomes by means of the shaft 3 in rotation offset.

The centrifuge plate is provided in conventional manner with centrifuge sheet metals 4.

The water flows from a storage container, if it is to become passed in the distance of the rotary shaft 9 on the centrifuge plate, by the tube 5 into an annular withdrawal pipe 6, which is provided with discharge openings 7, by which the water jets 8 on the centrifuge plate 2 flows. The tube 5 can be advanced however also to immediate to the rotary shaft 9, to the water then to the Schleudertel more ler down-run.

With in Fig. to 2 illustrated apparatus the grit of a storage container 10 by a conveyor belt 11 outward carried, where it becomes 12 distributed when falling down the conveyor belt a grain stream it is arrived, at 13 centrifuge plates 14 propelled by the shaft, where it fine distributed and, in the cross section seen, when Streugutsehleier falls down in form of a grit cone 15.

The water arrived of a storage container 16 by a tube 17 into a hose pump 18, which consists in known manner of an elastic hose 19 and a drive shaft 20, by which 21 rollers 22 against the hose 19 rotatable at arms press, which is 23 supported against a wall. By the variation option of the rotational speed of the shaft 20 the discharged amount of water can be proportioned.

From the hose pump 18 the water arrives by the tube 24 into the ring line 25, from that it by nozzles 26 in by the hose pump 28 metered
Quantity as spraying cone 27 withdraws. As in Fig. , the jacket 28 of the grit cone 15 with that forms 2 shown
Jacket 29 of the spraying cone 27 an acute angle, so that a wide range is 30 present, in which the grit pellets with the water droplets and unite with one another thereby light can overlap.

With in Fig. 3 illustrated apparatus becomes just like with Fig. and arrives to 2 the grit from a storage container out-carried then at a rotating roller 31, of which it falls down in form grit of a veil 32.

The water becomes similar of a storage container, as with Fig. 2, by a tube 33 a manifold 34 passed, in which distributor nozzles 35 are, by which the water in sprays 36 against the Streugutschleier 32 sprayed becomes. Below the manifold 34 thus a mixture 37 of grit grains and water droplets falls down, whereby both can unite during the case with one another.

Such a moistened grit became by the humidification so heavy that it cannot be blown on the one hand so light by the wind, on the other hand the effected humidification that the grit pleased on the roadway sticks immediately also to a dry or frozen-over roadway, whereby it can serve its purpose to take to the roadway the smooth one.

The novel apparatus knows not only to litters of salt on roadways, but also for other strewing purposes, so e.g. to litters of artificial fertilizer the used will, in order to prevent that the powdery, light artificial fertilizer is blown when scattering.

CLAIM I
Fahrbahre Streuvorrichtung, in particular to litters of salt on driving or going courses, with which the grit from a storage container is scattered to a grit distributor carried and by this, characterised in that with the Streuvorrichtung a water reservoir (16) connected arrived, of from the water at a water distributor (7, 26, 35), for that it into the grit withdrawn from the storage container (12, 32), its to particles each other at least to a large extent any longer not to affect, before scattering or during scattering brings in.

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UNTERANSPRÜCHE
1. Apparatus after claim I, characterised in that the water (8) on the Streugutvertei (2, 4) applied becomes more ler.

2. Apparatus after claim I, characterised in that the water (27, 36) is injected into the grit falling from the grit distributors (11, 31) (12, 32).

3. Apparatus after Unteranspruch 2, with a centrifuge plate as grit distributor, characterized by a coaxial collar water spray nozzles (26), arranged to the centrifuge plate (2), which are directed toward of generatrices of a cone enclosing the centrifuge plate, in order to spray the water on the grit (15), away-hurled by the centrifuge plate.

4. Apparatus after claim I, with a rotating roller as grit distributor, characterized by to the roller (31) a parallel row water spray nozzles (35), in order to spray the water on the grit (32), falling down from the roller.

5. Apparatus after claim I, characterised in that to the distribution and/or. Atomization of the water of 8, 27, 36) elastic or inelastic tubes (6, 25, 34) with atomization openings (7, 26, 35), e.g.

Spray nozzles, serve.

6. Apparatus after Unteranspruch 5, characterised in that at the manifolds (6, 25, 34) elastic openable distributor nozzles (7, 26, 35) mounted are.

7. Apparatus after claim I, characterised in that the metering device for the yield of the grit (12, 32) with the metering device for the yield of the water (8, 27, 36) coupled is, e.g. over both metering devices a common shaft.

8. Apparatus after claim I, characterised in that of the grit distributors (2, 14, 31) a surface from hydrophobic material, like Poly ethylen, or from fluoridated plastics e.g. Polytetrafluoroethylene or Polytrifluormonochloräthylen, exhibits.

CLAIM II
Method to the operation of the apparatus after claim I, characterised in that the water its freezing point disparaging addition added becomes.

** WARNING ** end DESC field could overlap beginning CLMS **.

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CLAIM II
Method to the operation of the apparatus after claim I, characterised in that the water its freezing point disparaging addition added becomes.

SCHWEIZERISCHE EIDGENOSSENSCHAFT

EIDGENÖSSISCHES AMT FÜR GEISTIGES EIGENTUM

V

Internationale Klassifikation: E 01 h 10/00

Gesuchsnummer: 10488/68

Anmeldungsdatum: 12. Juli 1968, 19 Uhr

Priorität: Bundesrepublik Deutschland, 14. Juli 1967 (U 5715/19c Gbm)

Patent erteilt: 30. November 1971

Patentschrift veröffentlicht: 14. Januar 1972

HAUPTPATENT

Dipl.-Chem. Helmut Ulrich, München-Allach (Bundesrepublik Deutschland)

Fahrbare Streuvorrichtung, insbesondere zum Streuen von Salz auf Fahr- oder Gehbahnen

Dipl.-Chem. Helmut Ulrich, München-Allach (Bundesrepublik Deutschland), ist als Erfinder genannt worden

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Oft ist es erforderlich, Streugut, insbesondere Salz auf Fahr- oder Gehbahnen bei ungünstigen Wetterverhältnissen auszustreuen, etwa bei starkem Wind, wenn die bei grosser Kälte glatten Fahr- oder Gehbahnen eis- und schneefrei gehalten werden sollen. Dann wird das Streugut bereits beim Herunterfallen vom Streufahrzeug verweht, und wenn es auf der glatten Fahrbahn liegt, wird es vom Wind weiter verweht und von über die Fahrbahn fahrenden Fahrzeugen zur Seite geschleudert.

Diesen Nachteil hat man bereits dadurch zu beheben versucht, dass man das Streugut in wässriger Lösung mittels Sprengwagen auf die Strasse versprüht hat. Ist die wässrige Lösung verhältnismässig schwach, so wird dieses Verfahren durch die grossen Mengen des zu transportierenden Wassers unwirtschaftlich. Verwendet man stark konzentrierte Lösungen, so besteht die Gefahr, dass diese bereits im Vorratsbehälter oder aber an den Düsen auskristallisieren und dadurch die Austrittsdüsen verstopfen. Man hat auch ein stark hygroskopisches Streugut, z.B. Kalziumchlorid, benutzt, für sich allein oder mit Natriumchlorid gemischt, wobei die grosse Wasserbindung des gestreuten Gutes dieses auf der Fahrbahn festhält. Kalziumchlorid ist jedoch relativ teuer, ausserdem aber bringt die hygroskopische Eigenschaft eines solchen Gutes Schwierigkeiten bei der Lagerung und im Streugerät, die kaum zu vermeiden sind.

Streuvorrichtungen für Salz und anderes Streugut arbeiten gewöhnlich mit einem Streugutverteiler in Form einer Austragswalze, eines Schleudertellers oder eines Gebläses.

Die Erfindung betrifft eine fahrbare Streuvorrichtung, insbesondere zum Streuen von Salz auf Fahr- oder Gehbahnen, bei welcher das Streugut aus einem Vorratsbehälter an einen Streugutverteiler befördert und von diesem ausgestreut wird.

Erfindungsgemäss ist mit der Streuvorrichtung ein Wasserbehälter verbunden, von dem aus das Wasser zu einem Wasserverteiler gelangt, der es in das aus dem Vorratsbehälter ausgetretene Streugut, dessen Teilchen einander mindestens grösstenteils nicht mehr berühren,

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vor dem Ausstreuen oder während des Ausstreuens einbringt.

Wenn z.B. aus einem Streugutbehälter ein Streugutstrom durch einen Schacht fliesst, und das aus dem Schacht austretende Streugut auf einen als Streugutverteiler dienenden, rotierenden Verteilerteller fällt, der es auf die Fahr- oder Gehbahn schleudert, berühren die Teilchen des Streugutes einander nach dem Ausströmen aus dem Schacht nicht mehr, und das Wasser kann in das Streugut, das aus dem Schacht ausgeströmt ist, unmittelbar nach der Schachtaustrittsöffnung oder in das Streugut auf dem Schleuderteller oder in das von diesem weggeschleuderte und noch nicht auf die Fahr- oder Gehbahn gefallene Streugut eingebracht werden. Würde das Wasser jedoch innerhalb des Streugut-Vorratsbehälters in das Streugut oder innerhalb des Schachtes in den Streugutstrom eingebracht, wo die Teilchen noch dicht aneinander anliegen, so käme es unvermeidlich zur Klumpenbildung und es würde weder ein störungsfreier Betrieb der Streuvorrichtung gewährleistet noch eine befriedigende Streuwirkung erzielt.

Die Befeuchtung des Streugutes kann durch Auftropfen oder Aufsprühen des Wassers auf das verteilte bzw. herabfallende Streugut erfolgen. Bei Benutzung der neuen Streu-Vorrichtung besteht die Möglichkeit, dass das Srtugut vor seiner Verteilung mittels des Streuggutverteilers vollkommen trocken ist, es kann also einerseits trocken gelagert und andererseits trocken in den Vorratsbehälter der fahrbahren Streuvorrichtung eingebracht werden, wodurch seine Rieselfähigkeit erhalten bleibt. Da das Wasser erst nach der Verteilung des Streugutes eingebracht wird, besteht ferner kaum die Gefahr der Verklumpung, weil das verteilte Streugut, sobald es mit Wasser befeuchtet ist, bereits herabfällt, wenn es nicht sogar erst während des Herabfallens befeuchtet wird.

Das Wasser kann auf den Streugutverteiler selbst aufgebracht werden. So kann es in Form eines oder mehrerer Wasserstrahlen auf den Streugutverteiler herunterlaufen, z.B. auf einen als Streugutverteiler dienenden Schleuderteller. Dabei kann die Bewegung des Schleudertellers selbst zur Verteilung des Wassers und gleichzeitig

zur Berührung des Wassers mit dem Streugut dienen. Diese Ausführungsform ist in der Herstellung sehr einfach und hat eine grosse Betriebssicherheit, weil keine engen Austrittsdüsen für das Wasser erforderlich sind, die erfahrungsgemäss leicht durch Unreinigkeiten verstopfen können. Das Wasser kann an der Rotationswelle oder auch im Abstand von ihr auf den Schleuderteller geleitet werden.

Wenn das Wasser in das vom Streugutverteiler fallende Streugut eingesprüht wird, so muss man dazu zwar enge Wasseraustrittsdüsen benutzen, jedoch ist die Gefahr der Verklumpung dabei völlig ausgeschlossen. Um in diesem Fall eine möglichst intensive Berührung des Wassers mit dem herabfallenden Streugut zu gewährleisten, kann ein Schleuderteller als Streugutverteiler das Streugut in Form eines Streugutkegels auswerfen, dessen Kegelmantel den Kegelmantel des Sprühkegels des Wassers im spitzen Winkel schneidet, so dass das Streugut und das Wasser beim Herabfallen einen möglichst weiten Weg gemeinsam zurücklegen, der die Möglichkeit der Anlagerung des Wassers an das Streugut vergrössert.

Bei Verwendung einer rotierenden Walze als Streugutverteiler können die Sprühstrahlen des Wassers gegen die Breitseite des fallenden Streugutschleiers gesprüht werden.

Zur Verteilung bzw. Zerstäubung des Wassers können an sich bekannnte elastische oder unelastische Rohre mit Zerstäubungsöffnungen oder Zerstäubungsdüsen benutzt werden, insbesondere können an den Verteilerrohren elastische selbstöffnende Verteilerdüsen angebracht sein. In einfachster Weise kann man einen Schlauch aus gummielastischem Material benutzen, in den Lochreihen eingestochen sind, wie sie in ähnlicher Weise beispielsweise von Wassersprengern für Gärten bekannt sind.

Gewöhnlich wird die in der Zeiteinheit ausgebrachte Wassermenge nicht proportional der in der Zeiteinheit ausgebrachte Streugutmenge sein, wie es meist erwünscht ist. Es ist deshalb zweckmässig, die Dosierung für die Ausbringung des Streugutes mit der Dosierung für die Ausbringung des Wassers zu koppeln, z.B. über eine beiden Dosierungsvorrichtungen gemeinsame Welle. Dabei kann das Streugut, wie bei den meisten Streuvorrichtungen, über ein Förderband oder eine Förderschnecke ausgebracht werden, die durch eine rotierende Welle angetrieben werden. Die in der Zeiteinheit ausgebrachte Fördermenge ist dabei ungefähr der Drehzahl der rotierenden Welle proportional. Wenn die Dosierung der Streugutmenge vorzugsweise automatisch über die Drehzahl dieser Welle erfolgt, kann damit eine Dosierung der ausgebrachten Wassermenge gekoppelt werden, indem man eine an sich bekannte Dosierungspumpe, z.B. eine Schlauchpumpe, von dieser Welle her antreibt. Dadurch wird gewährleistet, dass die Befeuchtung des Streugutes immer gleichmässig ist. Eine solche Koppelung ist insbesondere dann leicht möglich, wenn der erforderliche Wasserdruck durch eine Druckpumpe erzeugt wird.

Man kann jedoch den Wasserdruck auch durch Beaufschlagen des Wasserbehälters mit Druckluft erzeugen. Bei günstiger Gestaltung der Düsen kann der hydrostatische Druck des Wassers bei entsprechend hoher Montage des Wasserbehälters bereits genügen, um den Austritt des Wassers zu bewirken.

Der Streugutverteiler, also beispielsweise der Schleuderteller oder die rotierende Walze, kann eine Oberfläche aus wasserabweisendem Material aufweisen oder auch ganz aus solchem Material bestehen. Dazu haben sich Materialien wie Polyäthylen, insbesondere aber fluorierter Kunststoff, z.B. Polytetrafluoräthylen oder Polytrifluormonochloräthylen als geeignet erwiesen. Dadurch wird bewirkt, dass das Haftvermögen des Streugutes und des Wassers bzw. des Wasser-Streugutgemisches auf dem Streugutverteiler äusserst gering ist, so dass das Abschleudern zügig erfolgt, bevor das abzuschleudernde Streugut Klumpen bilden oder sich an dem Streugutverteiler festsetzen kann.

Bei Aussentemperaturen unter dem Gefrierpunkt ist es zweckmässig, in dem Wasservorratsbehälter zur Befeuchtung des Streugutes Wasser mit herabgesetztem Gefrierpunkt, z.B. salzversetztes Wasser, mitzuführen, um Störungen durch Eisbildung zu vermeiden.

In den Abbildungen sind einige Ausführungsbeispiele der Erfindung schematisch dargestellt und nachstehend beschrieben, ohne dass die Erfindung jedoch auf diese Ausführungsform beschränkt sein soll.

Fig. 1 zeigt eine Streuvorrichtung mit einem Schleuderteller, auf den das Wasser läuft,

Fig. 2 eine Vorrichtung ebenfalls mit einem Schleuderteller, wobei jedoch das Wasser auf das bereits herabfallende Streugut gesprüht wird,

Fig. 3 eine Vorrichtung mit einer rotierenden Walze, bei der das Wasser auf den herabfallenden Streugutschleier gesprüht wird.

Von einem Vorratsbehälter gelangt das Streugut über eine Fördereinrichtung, z.B. ein gesteuertes Förderband, in einen Schacht 1, durch den es auf einen Schleuderteller 2 fällt, der mittels der Welle 3 in Drehung versetzt wird. Der Schleuderteller ist in üblicher Weise mit Schleuderblechen 4 versehen.

Das Wasser fliesst von einem Vorratsbehälter, wenn es im Abstand von der Rotationswelle 9 auf den Schleuderteller geleitet werden soll, durch das Rohr 5 in ein ringförmiges Austrittsrohr 6, das mit Austrittsöffnungen 7 versehen ist, durch welche die Wasserstrahlen 8 auf den Schleuderteller 2 fliessen. Das Rohr 5 kann jedoch auch bis unmittelbar an die Rotationswelle 9 herangeführt werden, an der das Wasser dann zum Schleuderteller herunterläuft.

Bei der in Fig. 2 dargestellten Vorrichtung wird das Streugut von einem Vorratsbehälter 10 durch ein Förderband 11 nach aussen befördert, wo es beim Herabfallen von dem Förderband zu einem Körnerstrom 12 verteilt wird, der auf den von der Welle 13 angetriebenen Schleuderteller 14 gelangt, wo er fein verteilt und, im Querschnitt gesehen, als Streugutschleier in Form eines Streugutkegels 15 herabfällt.

Das Wasser gelangt von einem Vorratsbehälter 16 durch ein Rohr 17 in eine Schlauchpumpe 18, die in bekannter Weise aus einem elastischen Schlauch 19 und einer Antriebswelle 20 besteht, durch welche an Armen 21 drehbare Walzen 22 gegen den Schlauch 19 drücken, der gegen eine Wand 23 abgestützt ist. Durch die Variationsmöglichkeit der Rotationsgeschwindigkeit der Welle 20 lässt sich die ausgebrachte Wassermenge dosieren.

Von der Schlauchpumpe 18 gelangt das Wasser durch das Rohr 24 in die Ringleitung 25, aus der es durch Düsen 26 in einer durch die Schlauchpumpe 28 dosierten Menge als Sprühkegel 27 austritt. Wie in Fig. 2 dargestellt, bildet der Mantel 28 des Streugutkegels 15 mit dem Mantel 29 des Sprühkegels 27 einen spitzen Winkel, so dass ein grosser Bereich 30 vorhanden ist, in welchem sich die Streugutkörnchen mit den Wassertröpfchen überschneiden und sich dadurch leicht miteinander vereinigen können.

Bei der in Fig. 3 dargestellten Vorrichtung wird ebenso wie bei Fig. 2 das Streugut aus einem Vorratsbehälter herausbefördert und gelangt dann auf eine rotierende Walze 31, von welcher es in Form eines Streugutschleiers 32 herabfällt.

Das Wasser wird von einem Vorratsbehälter, ähnlich wie bei Fig. 2, durch ein Rohr 33 zu einem Verteilerrohr 34 geleitet, in welchem sich Verteilerdüsen 35 befinden, durch welche das Wasser in Sprühstrahlen 36 gegen den Streugutschleier 32 gesprüht wird. Unterhalb des Verteilerrohres 34 fällt also ein Gemisch 37 von Streugutkörnern und Wassertröpfchen herab, wobei sich beide während des Falles miteinander vereinigen können.

Das derart befeuchtete Streugut ist durch die Befeuchtung so schwer geworden, dass es einerseits nicht so leicht durch den Wind verweht werden kann, andererseits bewirkt die Befeuchtung, dass das auf die Fahrbahn gefallene Streugut sofort auch an einer trockenen oder vereisten Fahrbahn haftet, wodurch es seinen Zweck erfüllen kann, der Fahrbahn die Glätte zu nehmen.

Die neue Vorrichtung kann nicht nur zum Streuen von Salz auf Fahrbahnen, sondern auch für andere Streuzwecke, so z.B. zum Streuen von Kunstdünger verwendet werden, um zu verhindern, dass der staubförmige, leichte Kunstdünger beim Ausstreuen verweht wird.

PATENTANSPRUCH I

Fahrbahre Streuvorrichtung, insbesondere zum Streuen von Salz auf Fahr- oder Gehbahnen, bei welcher das Streugut aus einem Vorratsbehälter an einen Streugutverteiler befördert und von diesem ausgestreut wird, dadurch gekennzeichnet, dass mit der Streuvorrichtung ein Wasserbehälter (16) verbunden ist, von dem aus das Wasser zu einem Wasserverteiler (7, 26, 35) gelangt, der es in das aus dem Vorratsbehälter ausgetretene Streugut (12, 32), dessen Teilchen einander mindestens grösstenteils nicht mehr berühren, vor dem Ausstreuen oder während des Ausstreuens einbringt.

UNTERANSPRÜCHE

1. Vorrichtung nach Patentanspruch I, dadurch gekennzeichnet, dass das Wasser (8) auf den Streugutverteiler (2, 4) aufgebracht wird.

2. Vorrichtung nach Patentanspruch I, dadurch gekennzeichnet, dass das Wasser (27, 36) in das vom Streugutverteiler (11, 31) fallende Streugut (12, 32) eingesprüht wird.

3. Vorrichtung nach Unteranspruch 2, mit einem Schleuderteller als Streugutverteiler, gekennzeichnet durch einen koaxial zum Schleuderteller (2) angeordneten Kranz Wassersprühdüsen (26), die in Richtung von Mantellinien eines den Schleuderteller umschliessenden Kegels gerichtet sind, um das Wasser auf das vom Schleuderteller weggeschleuderte Streugut (15) zu sprühen.

4. Vorrichtung nach Patentanspruch I, mit einer rotierenden Walze als Streugutverteiler, gekennzeichnet durch eine zur Walze (31) parallele Reihe Wassersprühdüsen (35), um das Wasser auf das von der Walze herabfallende Streugut (32) zu sprühen.

5. Vorrichtung nach Patentanspruch I, dadurch gekennzeichnet, dass zur Verteilung bzw. Zerstäubung des Wassers 8, 27, 36) elastische oder unelastische Rohre (6, 25, 34) mit Zerstäubungsöffnungen (7, 26, 35), z.B. Zerstäuberdüsen, dienen.

6. Vorrichtung nach Unteranspruch 5, dadurch gekennzeichnet, dass an den Verteilerrohren (6, 25, 34) elastische selbstöffnende Verteilerdüsen (7, 26, 35) angebracht sind.

7. Vorrichtung nach Patentanspruch I, dadurch gekennzeichnet, dass die Dosiereinrichtung für die Ausbringung des Streugutes (12, 32) mit der Dosiereinrichtung für die Ausbringung des Wassers (8, 27, 36) gekoppelt ist, z.B. über eine beiden Dosiereinrichtungen gemeinsame Welle.

8. Vorrichtung nach Patentanspruch I, dadurch gekennzeichnet, dass der Streugutverteiler (2, 14, 31) eine Oberfläche aus wasserabweisendem Material, wie Polyäthylen, oder aus fluorierten Kunststoffen z.B. Polytetrafluoräthylen oder Polytrifluormonochloräthylen, aufweist.

PATENTANSPRUCH II

Verfahren zum Betrieb der Vorrichtung nach Patentanspruch I, dadurch gekennzeichnet, dass dem Wasser ein dessen Gefrierpunkt herabsetzender Zusatz zugesetzt wird.

Dipl.-Chem. Helmut Ulrich
Vertreter: Hartmut Keller, Bern

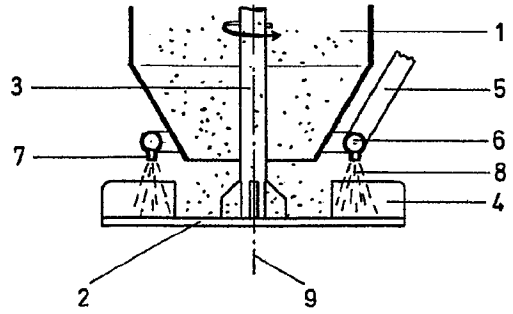


FIG. 1

FIG. 2

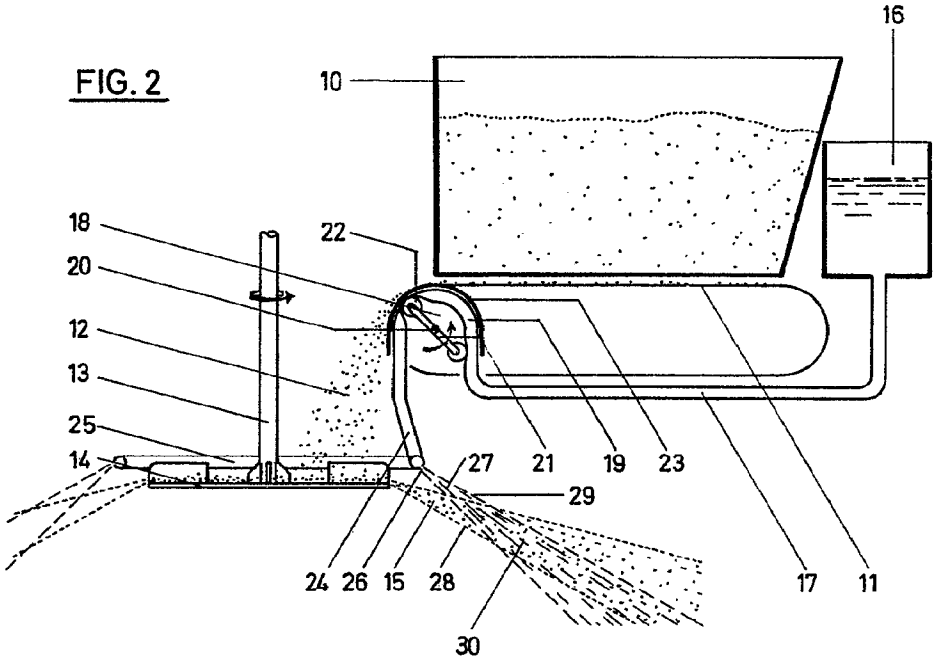
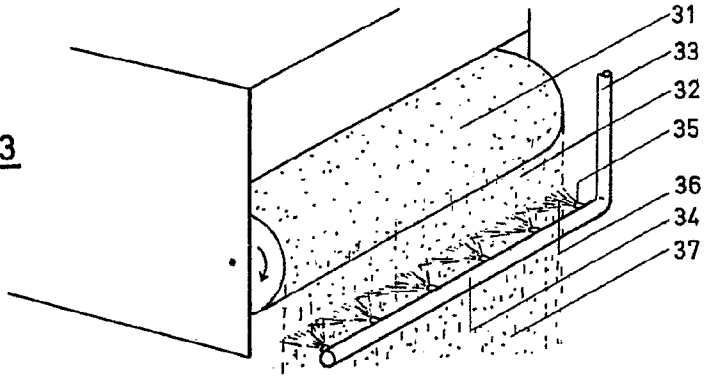


FIG.3



Universal mobile/stationary station for automatic strewing, spraying and sprinkling of traffic areas as well as for energy generation

Publication number: DE3506229 (A1)
Publication date: 1986-08-28
Inventor(s): BLASCHKE RICHARD DR ING [DE] +
Applicant(s): BLASCHKE RICHARD DR ING H C +
Classification:
- international: ***E01H10/00;*** **E01H10/00**; (IPC1-7): E01H10/00
- European: E01H10/00C; E01H10/00D
Application number: DE19853506229 19850222
Priority number(s): DE19853506229 19850222

Abstract of **DE 3506229 (A1)**

The invention relates to a universal mobile/stationary station for automatic strewing, spraying and sprinkling of traffic areas, as well as for energy generation. Can be used for motorways, roads, bridges, rising and falling sections, pavements, parking areas and lay-bys, drives, runways, airports, agricultural surfaces as well as for ice and snow prevention. In the case of weather conditions with ice and snow on motorways and roads, to prevent these an automatically controlled, autonomous as well as section-covering mobile and stationary station for roadway strewing, keeping clean dirtied travel ways, shoulders, is necessary. This station, unoccupied by personnel, determines, according to the weather conditions, the use and performs the same (strewing/spraying of the traffic ways), if necessary, autonomously.

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(19) BUNDESREPUBLIK DEUTSCHLAND

DEUTSCHES PATENTAMT

(12) **Offenlegungsschrift**

(11) **DE 3506229 A1**

(51) Int. Cl. 4:
E01H 10/00

(21) Aktenzeichen: P 35 06 229.0
(22) Anmeldetag: 22. 2. 85
(43) Offenlegungstag: 28. 8. 86

DE 3506229 A1

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(72) Erfinder:
gleich Anmelder

(54) Universale mobile-stationäre Station für automatische Bestreuung, Besprühung und Berieselung von Verkehrsflächen sowie für Energieerzeugung

Die Erfindung betrifft eine universale mobile-stationäre Station für automatische Bestreuung, Besprühung und Berieselung von Verkehrsflächen, sowie für Energieerzeugung. Anwendbar für Autobahnen, Straßen, Brücken, Steig- und Gefällestrecken, Gehwege, Park- und Rastplätze, Einfahrten, Landebahnen, Flugplätze, landwirtschaftliche Flächen sowie für Eis- und Schneeverhinderung.
Bei Witterungsverhältnissen mit Eis und Schnee auf Autobahnen und Straßen ist für dessen Verhinderung eine automatisch gesteuerte, selbständige sowie streckenabfahrende mobile und stationäre Station für Fahrbahnbestreuung, Reinhaltung verschmutzter Fahrwege, Randstreifen, erforderlich. Diese personell unbesetzte Station bestimmt entsprechend den Witterungsverhältnissen den Einsatz und führt diesen (Bestreuung/Besprühung der Vekehrsbahnen), wenn erforderlich, selbständig aus.

DE 3506229 A1

PATENTANSPRÜCHE

Oberbegriff:

1. Universale mobile-stationäre Station für automatische Bestreuung, Besprühung, Berieselung von Verkehrsflächen sowie für Energieerzeugung.

Kennzeichnender Teil:

Dadurch gekennzeichnet, daß die mobile-stationäre Station aus einem kombinierten fahrbaren, rollenden, gleitenden, ziehenden, schiebenden Rahmengestell und mehreren Anlagenteilen, Vorrichtungen, Systemen wie Rädersystem, Rollsystem, Gleitsystem, Seilzugsystem, Antriebsübertragungsvorrichtung, Bremsvorrichtung, Antriebssysteme: Elektromotor, Generator, Antriebsbatterie, Kraftstoffverbrennungsmotor, Anlaßvorrichtung, Kraftstofffülltank, Füllbehälter-Streu-/Sprühmittel, Streuvorrichtung, Sprühvorrichtung, Druckluftsystem, Ansteuerungsteil, Funkempfangssystem, Beleuchtungssystem, Stromabnehmerschleifsystem, Antriebskoppelvorrichtung, die je für sich hergestellt sind und jeweils ein bestimmter Teil der auszuführenden Funktion hervorrufen, zusammengesetzt ist.

Oberbegriff des Unteranspruchs:

2. Universale mobile-stationäre Station nach Anspruch 1.

Kennzeichnender Teil des Unteranspruchs:

Dadurch gekennzeichnet, daß die universale mobile-stationäre Station auf ein Fahrschienensystem oder Gleitschienensystem oder Rollenbandsystem-Rollenbandfördersystem mit oder ohne Antrieb des Rollenbandsystems aufgesetzt ist und dadurch entsprechend der Antriebsmöglichkeiten bewegt werden.

Stand der Technik:

Zur Beseitigung von Schnee und Eis auf Verkehrsbahnen werden derzeit personell besetzte Streu- und Räumungsfahrzeuge eingesetzt. Außerdem werden durch Sprühdüsensysteme, welche stationär versetzt sind, Besprühungen auf Fahrbahnen beschränkt vorgenommen.

Kritik des Standes der Technik:

Die bisherigen technischen Einrichtungen, wie Streu- und Räumungsfahrzeuge, können nur personell besetzt und verkehrsabhängig zum Einsatz kommen. Die angewendeten Sprühanlagen sind, bedingt durch das Drucksystem, nur strekkenabschnittsweise versetzt einsetzbar. Dadurch ist keine gleichmäßige Besprühung gewährleistet.

Aufgabe:

Der Erfindung liegt die Aufgabe zugrunde, durch eine universale, mobile-stationäre Station automatisch gesteuerte personell unbesetzte mobile Streustation für selbständige Bestreuungen/Besprühungen von Verkehrsflächen, Fahrwege in Längsrichtungen, Querrichtungen, Steigungen, Gefälle, Brücken, Fahrstrecken, Entfernungen, unabhängig abzufahren oder stationär gleichmäßige Beschichtungen von Streu- oder Sprühmittel aller Art kontrollierend auf den Verkehrsflächen aufzutragen oder zu beseitigen.

Ferner zusätzlich im Aussetzbetrieb durch Fremdantrieb, Selbstantrieb oder Antriebe über Abstreifsysteme, welche fahrbahnbündig in der Fahrbahndecke eingebaut sind und von den verkehrenden Fahrzeugen überfahren angetrieben werden und dadurch Streuvorrichtungen zu bewegen oder eingebaute Generatoren anzutreifen zwecks Erzeugung von Energie.

Lösung:

Die Aufgabe wird erfingungsgemäß dadurch gelöst, daß die universale mobile-stationäre Station für automatische Bestreuung, Besprühung und Berieselung von Verkehrsflächen sowie für Energieerzeugung aus einer kombinierten, fahrbaren, rollenden, gleitenden Rahmengestell-Station, welche mit oder ohne Profilräder-systeme als 2-Rad- oder 4-Rad-System oder andere Räder-, Roll-, Gleit- oder Zugsysteme zusammengesetzt ist.

Die fahrbare, rollende, gleitende Rahmengestell-Station wird auf ein 1- oder 2gleisiges Fahrschienenstrangsystem, oder entsprechend der Ausführung des Rahmenstestells auf ein angetriebenes bzw. nicht angetriebenes Rollenband-

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system, Rollenförderband oder auf ein Fahrbahnstreifen- oder Gleitschienensystem, aufgesetzt. An den Längsseiten der Fahrbahnrichtungen sind sie seitlich, bei Autobahnen an den Mittelseiten, etwa in Höhe der Leitplanken oder über den Leitplanken als zusammengesetzte Station angebracht. Bei der Ausführung des Fahrschienenstrangsystems ist das Fahrschienengleis als profilverzahnter Schienenstrang ausgestattet. Dadurch ist eine betriebs- sowie unfallsichere Fortbewegung der angetriebenen Station bei Steigungen und Gefällestrecken sowie bei Beschleunigung und Abbremsung gewährleistet.

Der Antrieb der Profilräder oder andere Rädersysteme für die Fortbewegung der mobilen Station erfolgt über Getriebe oder direkt auf eine Antriebsvorrichtung. Auf dem fahrbahren Grundgestell sind die Einrichtungen wie Sprühbehälter, Streumittelbehälter sowie die Funktionen der Streu- und Sprühvorrichtungen - wie Streuteller oder andere Vorrichtungen - montiert. Weiterhin befinden sich hier die Anlagenteile der Antriebssysteme für die Fortbewegung der Station, wie Antriebsmotor, Elektromotor, Generator oder Kraftstoffverbrennungsmotor oder andere Antriebssysteme. Für die Bewegung der Streu- bzw. Sprüheinrichtung sind getrennte Antriebssysteme wie Elektromotor oder Drucklufteinrichtung montiert.

Die Energieversorgung für Elektro-Antriebssysteme erfolgt über Eigenversorgung durch eine eingebaute, mitgeführte Antriebsbatterie (ähnlich wie bei Elektrofahrzeugen) oder über eingespeiste Netzenergie, wobei der Energieabgriff bei fahrbarem Betrieb der Station für den Antriebsmotor und Antriebssysteme der Bestreuvorrichtung über ein integriertes Schleifschienenstromsystem erfolgt.

Weiterhin ist die Station so ausgelegt, daß die Fortbewegung über einen Seilzug mittels Seiltrommelwinden, welche beiderseitig in Längsrichtung der Fahrbahnstrecke am Start und Ziel montiert sind, möglich ist. Mittels dieses Seilwindenbetriebs (elektrisch oder anders versorgt angetrieben), wird die Streu- und Besprühstation wechselseitig auf der zu bestreuenden bzw. besprühenden Fahrbahnstrecke hin- und zurückgezogen.

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Bei den Ausführungen mit Seilzug bzw. angetriebenen Rollenbandsystem entfallen die Bordantriebssysteme bzw. Motore für den erforderlichen Antrieb der Station. Die Bewegungsfunktionen der Streu- und Besprühungsvorrichtungen werden dann über ein eingespeistes Stromschienensystem oder über eine eingebaute, mitgeführte Batterie oder Druckluftsystem versorgt. Bei Ausführung durch Seilzugantrieb kann die Station auch ohne Radsystem am Rahmengestell mit ausgeführter Gleitkufenschiene als Schlitten auf einem Rollenbandsystem oder auf einem Gleitsystem, 1kufig oder mehrkufig gleitend ausgeführt, betrieben werden.

Ebenfalls kann die Fortbewegung durch Magnetsystem-Liniarsystem mit entsprechenden Fahrschienensystem als optimal für die Streu-/Sprühstation sowie für Personenbeförderung mit entsprechender Ausstattung der Station als Fahrkabine betrieben werden.

Bei stationärem Betrieb erfolgt der Antrieb für die aufgebauten Bordsysteme der Station zur Eis- und Schneeverhinderung für die Fahrbahnbestreuung- bzw. -besprühung über in der Fahrbahn eingebaute, fahrbahnbündige Energiestreif-Antriebssysteme. Diese sind als Scheibe, Schwelle Walze, Rollen oder Vorrichtungen aller Art ausgeführt, werden von verkehrenden Fahrzeugen überrollt, überglitten, überfahren, gedrückt, geschoben oder sonstwie bewegt oder routiert und liefern dadurch Antriebsenergie. Mittels einer Übertragungseinrichtung mit oder ohne Aufladung der Schwungmasse über Antriebswelle oder Vorrichtungen mit oder ohne Getriebe wird diese an die stationäre Station angekoppelt. Dadurch werden die Bestreuungssysteme, Vorrichtungen wie Teller oder andere Vorrichtungen, angetrieben und somit die Fahrbahnbestreuung automatisch ausgeführt. Im Außenbetrieb wird ein in der Station eingebauter Generator über das gleiche Antriebssystem angetrieben zwecks Erzeugung von Energie für Fahrbahnbeheizung oder andere Verwendungs-Nutzung.

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Eerzielbare Vorteile:

Die mit der Erfindung erzielbaren Vorteile bestehen insbesondere darin daß es möglich ist, Bestreuungen/Besprühungen auf Verkehrswegen bzw. Strecken aller Art entfernungsunabhängig durch gesteuerte Schaltbefehle automatisch, ohne personelle Besetzung kontrollierend ausführen zu lassen bzw. im Aussetzbetrieb Energie zu gewinnen sowie zu erzeugen. Ferner kann die Station für Wartungsarbeiten oder Rettung bei Verkehrsunfällen, für Personen oder Materialbeförderung sowie bei verstopften Autobahnen problemlos genutzt werden.

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Spreading vehicle with distribution device for thawing materials

Publication number: DE3712452 (A1)
Publication date: 1988-11-24
Inventor(s): PIETSCH PETER DIPL ING [DE] +
Applicant(s): PIETSCH MAX KG GMBH & CO [DE] +
Classification:
- international: ***A01M9/00; E01H10/00;*** **A01M9/00; E01H10/00;** (IPC1-7): E01H10/00
- European: A01M9/00D; E01H10/00D
Application number: DE19873712452 19870411
Priority number(s): DE19873712452 19870411; DE19863623352 19860711

Abstract of **DE 3712452 (A1)**

For a spreading vehicle with a device for distributing liquid and granulated thawing materials on the ground, provision is made, in order to improve the distribution process, for a throwing container which is combined with a spreading plate known per se. Both spreading devices are equipped with a common drive.

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(19) BUNDESREPUBLIK DEUTSCHLAND

DEUTSCHES PATENTAMT

(12) **Offenlegungsschrift**

(11) **DE 37 12 452 A1**

(51) Int. Cl. 4: **E01H 10/00**

(21) Aktenzeichen: P 37 12 452.8
(22) Anmeldetag: 11. 4. 87
(43) Offenlegungstag: 24. 11. 88

Behördeneigentum

DE 37 12 452 A1

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(61) Zusatz zu: P 36 23 352.8

(72) Erfinder:
Pietsch, Peter, Dipl.-Ing., 3000 Hannover, DE

Prüfungsantrag gem. § 44 PatG ist gestellt

(54) Streufahrzeug mit Verteilereinrichtung für Taustoffe

Für ein Streufahrzeug mit einer Einrichtung zum Verteilen von flüssigen und granulierten Taustoffen auf dem Boden ist zur Verbesserung des Verteilungsvorganges ein Schleuderbehälter vorgesehen, der mit einem an sich bekannten Streuteller kombiniert ist. Beide Streuvorrichtungen sind mit einem gemeinsamen Antrieb versehen.

DE 37 12 452 A1

Patentansprüche

1. Streufahrzeug mit einer Einrichtung zum Verteilen von Streugut auf Bodenflächen, insbesondere für flüssige und granulierte Taustoffe sowie für Gemische von flüssigen und granulierten Taustoffen, bestehend aus einem Vorratsbehälter und einer oder mehreren Streuvorrichtungen für das aus dem Vorratsbehälter entnommene Streugut, bei welchen um eine vertikale Achse rotierende Schleuderrohre vorgesehen sind, deren radial inneren Enden das Streugut aus dem Vorratsbehälter zugeführt wird, nach Patent ... (Patentanmeldung P 36 23 353.8), **dadurch gekennzeichnet,** daß die Schleuderrohre (4) mit einem an sich bekannten Streuteller (5) kombiniert und beide Streuvorrichtungen mit einem gemeinsamen Antrieb versehen sind.

2. Streufahrzeug nach Anspruch 1, dadurch gekennzeichnet, daß der Streuteller (5) von den Schleuderrohren (4) getragen wird und mit diesen fest verbunden, beispielsweise verschraubt ist.

3. Streufahrzeug nach einem der Ansprüche 1 oder 2, dadurch gekennzeichnet, daß dem Streuteller (5) eine Erstzuleitung (20) für granulierte Taustoffe und den Schleuderrohren (4) eine zweite Zuleitung (18) für flüssige Taustoffe zugeordnet ist.

Beschreibung

Die Erfindung betrifft ein Streufahrzeug mit einer Einrichtung zum Verteilen von Streugut auf Bodenflächen, insbesondere für flüssige und granulierte Taustoffe sowie für Gemische von flüssigen und granulierten Taustoffen, bestehend aus einem Vorratsbehälter und einer oder mehreren Streuvorrichtungen für das aus dem Vorratsbehälter entnommene Streugut, bei welchen um eine vertikale Achse rotierende Schleuderrohre vorgesehen sind, deren radial inneren Enden das Streugut aus dem Vorratsbehälter zugeführt wird, nach Patent ... (Patentanmeldung P 36 23 352.8).

Der Erfindung nach dem Hauptpatent liegt die Aufgabe zu Grunde, ein Streufahrzeug mit einer Verteilereinrichtung nach dem einleitend genannten Gattungsbegriff so zu gestalten, daß mit einem geringen technischen Aufwand sowohl flüssige als auch granulierte Taustoffe und Gemische von beiden über große Streubreiten ausgetragen werden können. Es hat sich gezeigt, daß mit den als Lösung vorgesehenen Schleuderrohren gute Ergebnisse erzielt werden konnten.

Ziel der vorliegenden Zusatzerfindung ist es, die Verteilung der flüssigen und granulierten Taustoffe noch zu verbessern.

Insbesondere soll erreicht werden, daß ein wechselweises Austragen von Granulat und flüssigen Taustoffen möglich ist, ohne daß es hierfür eines Zeitaufwandes für das Umschalten von einer Streugutart zur anderen bedarf. Die Erfindung als Lösung dieser Aufgabe zeichnet sich dadurch aus, daß die Schleuderrohre mit einem an sich bekannten Streuteller kombiniert und beide Streuvorrichtungen mit einem gemeinsamen Antrieb versehen sind.

Eine besonders technisch einfache Gestaltung wird bei einer Anordnung des Streutellers auf den Schleuderrohren erreicht. Der Streuteller wird quasi von den Schleuderrohren getragen. Er ist mit diesen fest verbunden, beispielsweise verschraubt. Von weiterem Vorteil ist die Anordnung von separaten Zuführleitungen für die einzelnen Streugutarten. So kann der Streuteller eine erste Zuleitung für granulierte Taustoffe aufweisen, während den Schleuderrohren eine zweite Zuleitung für flüssige Taustoffe zugeordnet ist.

Mit der erfindungsgemäßen Einrichtung kann beispielsweise im Bereich korrosionsgefährdeter Objekte — hierzu zählen Brücken und andere tragende Bauelemente — der die granulierten Taustoffe verteilende Streuteller abgeschaltet und flüssiger oder nur gering korrosiver Taustoff, beispielsweise flüssiger Harnstoff, durch das Inbetriebsetzen der Schleuderrohre ausgetragen werden. Außerdem können gleichzeitig körniges Streusalz und Flüssigsalz gleichzeitig ausgetragen werden, was zu einer Feuchtsalzverteilung führt und vielfach gewünscht wird. Der wechselweise Einsatz des Streutellers und der Schleuderrohre wird lediglich durch wechselweises Zuführen oder Unterbrechen der Zufuhr der jeweiligen Taustoffe erreicht. Mit der technisch unkomplizierten Gestaltung des Erfindungsgegenstandes wird also eine bedeutende Wirkung erzielt.

In der Zeichnung ist ein Ausführungsbeispiel des Erfindungsgegenstandes im Längsschnitt dargestellt und nachstehend erläutert.

Die Gesamteinrichtung **1** zum Verteilen von granulierten und flüssigen Taustoffen besteht aus einem rohrförmigen Schleuderbehälter **2**, der in das untere Ende eines stationären Rohrstutzens **3** hineingreift. Von dem Schleuderbehälter **2** erstrecken sich radial gerichtete Schleuderrohre **4**. Oberhalb der Schleuderrohre ist ein Streuteller **5** angeordnet und mit diesen beispielsweise durch Schrauben **6** fest verbunden. Auf der Oberseite des Streutellers sind übliche Leitbleche **7** angeordnet. Oberhalb des Streutellers ist eine ebenfalls übliche Haube **8** als Streuschutz angeordnet. Sie wird durch Verstrebungsrohre **9** in Verbindung mit Ausfachungsblechen **10** von dem stationären Rohrstutzen **3** getragen. Der stationäre Rohrstutzen selbst kann mit Hilfe von Flanscheisen **11** am Streufahrzeug befestigt werden.

Der stationäre Rohrstutzen **3** und der in diesen hineingreifende, rotierende Schleuderbehälter **2** werden von einer Antriebswelle **12** durchsetzt. Sie endet in einer buchsenförmigen Rohrnabe **13** und ist mit dieser beispielsweise durch einen Keil **14** drehfest verbunden. Das äußerste Ende der Antriebswelle trägt einen Schraubzapfen **15** und eine Sicherungsschraube **16**. Die das Drehmoment von der Welle auf den rohrförmigen Schleuderbehälter **2** übertragende Nabe **13** ist mit diesem verschweißt.

Über eine Öffnung **17** im stationären Rohrstutzen **3** und eine daran ansetzende Zuführleitung **18** können flüssige Taustoffe in den rotierenden Schleuderbehälter **2** und von dort zu den Schleuderrohren **4** gelangen. Diese greifen mit ihren inneren Enden in entsprechende Mantelöffnungen **19** des Schleuderbehälters. Eine zweite Zuführleitung **20** ermöglicht die Zuführung granulierter Taustoffe auf den Schleuderteller. Mit **21** ist eine zwischen dem rotierenden rohrförmigen Schleuderbehälter **2** und dem stationären Rohrstutzen **3** angeordnete Dichtung bezeichnet. Mit nicht dargestellten vom Fahrer des Streufahrzeuges steuerbaren Absperrorganen können die Zuführleitungen **18** verschlossen oder geöffnet werden.

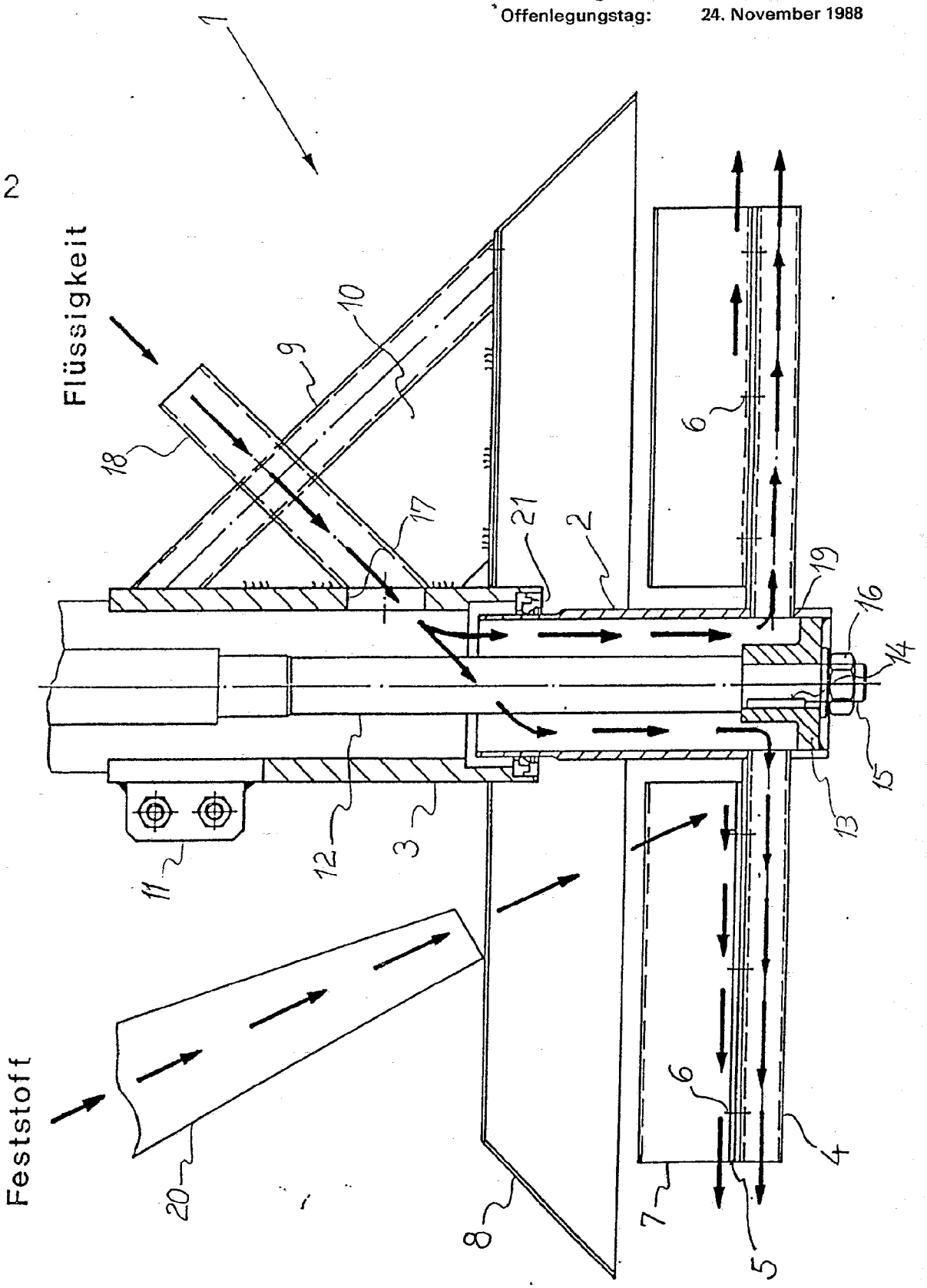
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Fig. : 6 : 11

Nummer: 37 12 452
Int. Cl.4: E 01 H 10/00
Anmeldetag: 11. April 1987
Offenlegungstag: 24. November 1988

3712452



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The invention refers to a spreader, as well for solid, granular or pulverulent products, as for liquid products, such as salt in grains or a calcium chloride solution, as that is now frequently used on the roads in order to cancel or to prevent the effects of freezing.

To date, for spreading of solid products, it is known to use a storage hopper to open sky, with, with its base, a carpet without fine or a chute containing a Archimedes' screw, to ensure the transport of the product towards the inlet of a pipe in which the product falls until on a plate located under the extended one of this pipe and rotated so that, under the effect of the centrifugal force, the product is driven out while being distributed on a certain sector.

Such an installation can unfortunately be used only for solid products, for which the flow can regulated title by action on the number of revolutions of the screw of transport or on the speed in advance of the carpet without fine, the width of the web of spreading being regulated by modification of the point of fall of the products on the plate and by modification number of revolutions of this plate.

Indeed, for the liquid products, this installation cannot, directly, title used.

For the spreading of these liquid products, it is not known to use a plate of spreading but on the other hand one is useful oneself of a series of nozzles of projection carried by fold transverse beam and connected to a control pinch on a tight cistern.

Such an installation, cannot unfortunately, directly, be appropriate for the spreading of solid products.

It results from it that in spite of the high coft of each one of these hardwares it is required to lay out a' the time of a spreader of solid products, for example from salt, and of a spreader of liquid products, for example of Si, calcium chloride solution one wants to be able épandre the product in his physical form the best suitable one to reach the purpose attached it be-with-dfre either cancelling, or to prevent the effects of freezing, for rerrer: ire the higher quoted example.

A result which the invention aims at obtaining is a spreader suitable directly with the distribution so much of solid, granular or pulverulent products, which liquid products.

For this purpose, the invention has as an object a spreader characterized in that it includes/understands a closed hopper with its upper part to carry out a tight tank, the base of this hopper presenting a chute in which a Archimedes' screw is laid out moults in soft rotation so as to move the product with épandre towards the end of the chute to which a pipe reserving is connected a wide passage for the fall of the product on a plate of spreading, on the aforementioned pipe being mounted a gate valve, upstream of which is pricked, on this pipe, a control in derivation of lower dimension whose exit port leads to the plate of spreading and of which the bypass section is controlled by a valve.

The invention will be so included/understood using made description ciaprès, as nonrestrictive example, the Ci-annexed drawing which represents, schematically, the spreader seen of profile.

This spreader includes/understands a frame I capable to be mounted on different tractor drawn or self-propel vehicles, of suitable tonnage.

On this blackcurrant T a hopper 2 is attached formant a tight tank grtce with its plate 3 of upper closing in which are practised two closed openings 4 of sealing manner by two covers 5.

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The base of hopper 2 with the shape of a chute O in which a screw is laid out of Àrchimède 7, with or without axis, with constant or variable step.

This screw 7, particularly intended to lead the solid products to the end of chute 6 to which a pipe 8 is connected, is driven in rotation thanks to an hydraulic motor 9 by the iater- médiaire of reducing fixed speed 10.

So, inter alia, to be able to vary the flow of the screw celleci can be rotated at adjustable speed. For this purpose, its hydraulic motor 9 is supplied via a divider of flow 11.

An heat engine 12 distance between centres one assembles 13 including/understanding an hydraulic pump with its reserve, its valve of safety, its filter etc...

It is this unit 13 which, via the divider of flow 11, supplies hydraulic motor 9.

gous pipe 8, in which fall the solid products, is laid out a plate of spreading 14 with blades 15 blocked in rotation around its axis 16 by an hydraulic motor 17 and this, at variable speed, thanks to its connection with aforementioned unit 13 via a second divider of flow 18.

On this pipe 8 is mounted a gate valve 19, with manual order, allowing the complete occlusion of the aforesaid pipe 8.

On this same pipe 8, upstream of this gate valve, a control in derivation 20 is pricked whose exit port is also located above the plate of spreading 14.

The bypass section of this control in derivation 20 is controlled by a valve 21 ordered by piston of piloting 22 fed into fluid hydraulic by the unit 13 pennies the control of a third divider of flow 23.

Above the plate of spreading 14 is mounted, of known manner, an housing 24.

For solid materials, such as for example of salt, the operation of the spreader is the following one:
The gate valve 19 is open. The Archimedes' screw 7 brings solid materials towards chute 8 and the plate of spreading 14.

Hydraulic motor 9 from reducing the 10 of screw 7 is supplied by the divider of flow It which makes it possible to obtain diffrrentes number of revolutions and, consequently, different material flows on the plate of spreading the 14, following proportioning envisaged by the user.

The plate 14 is helped by hydraulic motor 17 supplied with the divider of flow 18, which makes it possible to obtain different spraying widths, these feeders being a function of the centrifugal force and thus number of revolutions.

For liquid solutions, such as for example of calcium chloride, the operation of ltépandeuse is the following one
The gate valve 19 is closed. The Archimedes' screw 7 can between involved to act as agitator, which avoids the formation éventlwlle dép8ts. Control in derivation 20 directs the solution towards valve 21 to opening contrtlée by the piston of piloting 22, actuated by the divider of flow 23. One can open valve 21 more or less and consequently obtain various proportionings.

Âvec such an installation it is possible to order remotely the épan- dage using a can located in the cab of the vehicle from where 1 ' one will be able - to increase or decrease the solid material flow - to increase or decrease the flow of the liquid solutions to vary the spraying width - and same contr8ler the good operation of the heat engine while envisaging for this purpose of the witnesses lumineuf.

In the example describes above, it was specified that the rdduc- tor speed 10 was planned for a fixed report/ratio of reduction.

In an alternative of realization, this reducing makes it possible to obtain several reports/ratios of reduction and particularly a very large speed of the screw in order to increase the agitation of liquid primarily at the time of the cleaning and the rinsing of the bottom of the hopper.

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EEVENDICAgIONS

I - Spreader, as well for solid, granular or pulverulent products, as for liquid products, characterized in that it includes/understands a closed hopper with its upper part to carry out a tight tank, the base of this hopper presenting a chute in which is laid out a screw of Àrchimède moults in soft rotation so as to move the product with épandre towards the end of the chute to which a pipe reserving is connected a wide passage for the fall of the product on a plate of spreading, on the aforementioned pipe being mounted a gate valve, upstream of which is pricked, on this pipe, a control in derivation of lower dimension of which the orifice of extended leads to the plate of spreading and whose bypass section is controlled by a valve.

II - Spreader according to claim I characterized in that the valve of control of section FD passage of control in derivation is controlled by a piston supplied with fluid hydraulic through a divider of flow.

III - roandeuse according to claim I characterized in that the Archimedes' screw is driven in rotation by an hydraulic motor via reducing.

IV - Spreader according to characterized claim III N what the reducing one is of a type allowing several reports/ratios of reduction in order to actuate the screw with +rès large speed to create an agitation particularly during washing of the hopper.

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INSTITUT NATIONAL
DE LA PROPRIÉTÉ INDUSTRIELLE

PARIS

(11) N° de publication : **2.229.812**
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(21) *N° d'enregistrement national* **73.18620**
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DEMANDE DE BREVET D'INVENTION

1re PUBLICATION

(22) Date de dépôt ..... 17 mai 1973, à 17 h 10 mn.
(41) Date de la mise à la disposition du public de la demande..... B.O.P.I. — «Listes» n. 50 du 13-12-1974.

(51) Classification internationale (Int. Cl.) **E 01 c 19/20; B 05 c 5/02.**

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(54) **Épandeuse.**

(72) Invention de :

(33) (32) (31) Priorité conventionnelle :

2229812

L'invention se rapporte à une épandeuse, tant pour produits solides, granuleux ou pulvérulents, que pour produits liquides, tels que du sel en grains ou une solution de chlorure de calcium, comme cela est maintenant fréquemment utilisé sur les routes en vue d'annuler ou de prévenir les effets du gel.

A ce jour, pour l'épandage de produits solides, il est connu d'utiliser une trémie de stockage à ciel ouvert, avec, à sa base, un tapis sans fin ou une goulotte contenant une vis d'Archimède, pour assurer le transport du produit vers l'entrée d'une tubulure dans laquelle le produit chute jusque sur un plateau situé sous la sortie de cette tubulure et entraîné en rotation afin que, sous l'effet de la force centrifuge, le produit soit chassé tout en étant réparti sur un certain secteur.

Une telle installation ne peut malheureusement être utilisée que pour des produits solides, pour lesquels le débit peut être réglé par action sur la vitesse de rotation de la vis de transport ou sur la vitesse d'avance du tapis sans fin, la largeur de la bande d'épandage étant réglée par modification du point de chute des produits sur le plateau et par modification de la vitesse de rotation de ce plateau.

En effet, pour les produits liquides, cette installation ne peut, directement, être utilisée.

Pour l'épandage de ces produits liquides, il n'est pas connu d'utiliser un plateau d'épandage mais par contre on se sert d'une série de buses de projection portées par une poutre transversale et raccordées à une conduite piquée sur une citerne étanche.

Une telle installation, ne peut malheureusement, directement, convenir pour l'épandage de produits solides.

Il en résulte que malgré le coût élevé de chacun de ces matériels il est nécessaire de disposer à la fois d'une épandeuse de produits solides, par exemple de sel, et d'une épandeuse de produits liquides, par exemple de solution de chlorure de calcium, si l'on veut pouvoir épandre le produit dans sa forme physique la mieux appropriée pour atteindre le but fixé c'est-à-dire soit annuler, soit prévenir les effets du gel, pour reprendre l'exemple cité plus haut.

Un résultat que vise à obtenir l'invention est une épandeuse convenant directement à la distribution tant de produits solides,

granuleux ou pulvérulents, que de produits liquides.

A cet effet, l'invention a pour objet une épandeuse caractérisée en ce qu'elle comprend une trémie fermée à sa partie supérieure pour réaliser un réservoir étanche, la base de cette trémie présentant une goulotte dans laquelle est disposée une vis d'Archimède mue en rotation de manière à tendre à déplacer le produit à épandre vers l'extrémité de la goulotte à laquelle est raccordée une tubulure réservant un large passage pour la chute du produit sur un plateau d'épandage, sur la dite tubulure étant montée une vanne d'arrêt, en amont de laquelle est piquée, sur cette tubulure, une conduite en dérivation de plus faible dimension dont l'orifice de sortie débouche sur le plateau d'épandage et dont la section de passage est contrôlée par une vanne.

L'invention sera bien comprise à l'aide de la description ci-après faite, à titre d'exemple non limitatif, en regard du dessin ci-annexé qui représente, schématiquement, l'épandeuse vue de profil.

Cette épandeuse comprend un châssis 1 susceptible d'être monté sur différents véhicules tractés ou automoteurs, de tonnage approprié.

Sur ce châssis 1 est fixée une trémie 2 formant un réservoir étanche grâce à sa plaque 3 de fermeture supérieure dans laquelle sont pratiquées deux ouvertures 4 fermées de manière étanche par deux couvercles 5.

La base de la trémie 2 a la forme d'une goulotte 6 dans laquelle est disposée une vis d'Archimède 7, avec ou sans axe, à pas constant ou variable.

Cette vis 7, destinée notamment à mener les produits solides à l'extrémité de la goulotte 6 à laquelle est raccordée une tubulure 8, est mue en rotation grâce à un moteur hydraulique 9 par l'intermédiaire d'un réducteur fixe de vitesse 10.

Afin, entre autres, de pouvoir varier le débit de la vis celle-ci peut être entraînée en rotation à vitesse réglable. A cet effet, son moteur hydraulique 9 est alimenté par l'intermédiaire d'un diviseur de débit 11.

Un moteur thermique 12 entraîne un ensemble 13 comprenant une pompe hydraulique avec son réservoir, son clapet de sécurité, son filtre etc...

C'est cet ensemble 13 qui, par l'intermédiaire du diviseur de débit 11, alimente le moteur hydraulique 9.

Sous la tubulure 8, dans laquelle chutent les produits solides, est disposé un plateau d'épandage 14 avec pales 15 entraîné en rotation autour de son axe 16 par un moteur hydraulique 17 et ce, à vitesse variable, grâce à son raccordement à l'ensemble 13 précité par l'intermédiaire d'un second diviseur de débit 18.

Sur cette tubulure 8 est montée une vanne d'arrêt 19, à commande manuelle, permettant l'occlusion complète de la dite tubulure 8.

Sur cette même tubulure 8, en amont de cette vanne d'arrêt, est piquée une conduite en dérivation 20 dont l'orifice de sortie est également situé au-dessus du plateau d'épandage 14.

La section de passage de cette conduite en dérivation 20 est contrôlée par une vanne 21 commandée par piston de pilotage 22 alimenté en fluide hydraulique par l'ensemble 13 sous le contrôle d'un troisième diviseur de débit 23.

Au-dessus du plateau d'épandage 14 est monté, de manière connue, un carter 24.

Pour des matériaux solides, comme par exemple du sel, le fonctionnement de l'épandeuse est le suivant :

La vanne d'arrêt 19 est ouverte. La vis d'Archimède 7 amène les matériaux solides vers la goulotte 8 et le plateau d'épandage 14. Le moteur hydraulique 9 du réducteur 10 de la vis 7 est alimenté par le diviseur de débit 11 qui permet d'obtenir différentes vitesses de rotation et, par conséquent, différents débits de matériaux sur le plateau d'épandage 14, suivant le dosage prévu par l'utilisateur. Le plateau 14 est entraîné par le moteur hydraulique 17 alimenté par le diviseur de débit 18, ce qui permet d'obtenir différentes largeurs d'épandage, ces largeurs étant fonction de la force centrifuge et donc de la vitesse de rotation.

Pour des solutions liquides, comme par exemple de chlorure de calcium, le fonctionnement de l'épandeuse est le suivant :

La vanne d'arrêt 19 est fermée. La vis d'Archimède 7 peut être entraînée pour faire office d'agitateur, ce qui évite la formation éventuelle de dépôts. La conduite en dérivation 20 dirige la solution vers la vanne 21 à ouverture contrôlée par le piston de pilotage 22, actionné par le diviseur de débit 23. On peut ouvrir plus

ou moins la vanne 21 et par conséquent obtenir divers dosages.

Avec une telle installation il est possible de commander l'épandage à distance à l'aide d'une boîte située dans la cabine du véhicule d'où l'ón pourra - augmenter ou diminuer le débit de matériaux solides - augmenter ou diminuer le débit des solutions liquides - varier la largeur d'épandage - et même contrôler le bon fonctionnement du moteur thermique en prévoyant à cet effet des témoins lumineux.

Dans l'exemple décrit ci-dessus, il a été précisé que le réducteur de vitesse 10 était prévu pour un rapport de réduction fixe. Dans une variante de réalisation, ce réducteur permet d'obtenir plusieurs rapports de réduction et notamment une très grande vitesse de la vis afin d'augmenter l'agitation du liquide principalement lors du nettoyage et du rinçage du fond de la trémie.

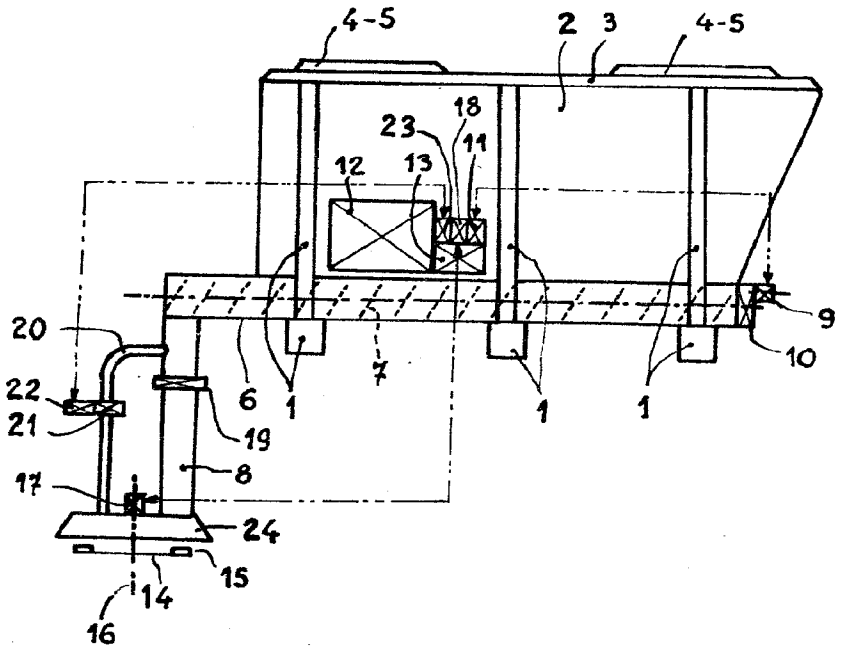
REVENDICATIONS

I - Epandeuse, tant pour produits solides, granuleux ou pulvérulents, que pour produits liquides, caractérisée en ce qu'elle comprend une trémie fermée à sa partie supérieure pour réaliser un réservoir étanche, la base de cette trémie présentant une goulotte dans laquelle est disposée une vis d'Archimède mue en rotation de manière à tendre à déplacer le produit à épandre vers l'extrémité de la goulotte à laquelle est raccordée une tubulure réservant un large passage pour la chute du produit sur un plateau d'épandage, sur la dite tubulure étant montée une vanne d'arrêt, en amont de laquelle est piquée, sur cette tubulure, une conduite en dérivation de plus faible dimension dont l'orifice de sortie débouche sur le plateau d'épandage et dont la section de passage est contrôlée par une vanne.

II - Epandeuse selon la revendication I caractérisée en ce que la vanne de contrôle de la section de passage de la conduite en dérivation est pilotée par un piston alimenté en fluide hydraulique au travers d'un diviseur de débit.

III - Epandeuse selon la revendication I caractérisée en ce que la vis d'Archimède est mue en rotation par un moteur hydraulique par l'intermédiaire d'un réducteur.

IV - Epandeuse selon la revendication III caractérisée en ce que le réducteur est d'un type permettant plusieurs rapports de réduction afin d'entraîner la vis à très grande vitesse pour créer une agitation notamment lors du lavage de la trémie.


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The main patent has as an object a spreader, as well for solid, granular or pulverulent products, as for liquid products, characterized in that it includes/understands a frame receiving a closed hopper with its upper part to build a tight tank, the base of this hopper presenting a chute in which is laid out a Archimedes' screw moults in soft rotation so as to move the product with épandre towards the extré- mite of the chute to which a pipe reserving is connected a wide passage for the fall of the product on a rotatable plate of spreading associated with the frame by a bssti, on the aforementioned pipe being mounted a gate valve, upstream of which is pricked, on this pipe, a control in derivation of lower dimension of which ltorifice of extended leads to the plate of spreading and whose bypass section is controlled by a valve.

According to advantageous modes' of realization, the valve of contr8le of the bypass section of control in derivation is controlled by a piston supplied with fluid hydraulic through a divider of flow, and the screw of Ârchimède is driven in rotation by an hydraulic motor via reducing, preferably of a type allowing several reports/ratios of reduction in order to entratner the screw at very large speed to create an agitation particularly during washing of the hopper.

The spreader thus designed, has given any satisfaction for spreading, indifferently, of solid products, granular or sweater vérulents, such of salt in grains and liquid products such as a calcium chloride solution as that is now frequently used on the roads in order to cancel or to prevent the effects of freezing.

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The purpose of the present certificate of addition is thus simply to still improve this spreader.

Indeed, in the spreader, according to the main patent, the liquid product supply is ensured by simple gravity, if that is appropriate perfectly for an actually liquid product, that cannot be enough If one wants to distribute a solution charged such as a piteous brine.

In addition, this spreader including/understanding only one central plate for ltépandage, if that were excellent to furnish an ordinary road, it is not mtme if one wants épandre product on embankments or the high one of a strongly rectified road, such as for example on a track of race, where the upper part cannot receive the product.

A result which the invention aims at obtaining is a spreader according to any of claims 1 to 4 of the main patent which is appropriate in more for spreading of the piteous products like for spreading on fill or road rectified and even on track of race.

Â this effect, the invention has as an object an aforementioned spreader of the type characterized particularly in what, on the conduit of derivation is inserted a pump actuated by a motor and ensuring the circulation of the liquid products and pattus.

the invention will be so included/understood using description made hereafter. As nonrestrictive example, compared to the Ci-annexed drawing which represents shématiquement
- figure 1, the spreader seen of profile
- figure 2, the spreader seen in end.

According to the main patent, this spreader includes/understands a chsss- located 1 capable among mounted on different tractor drawn or self-propel vehicles, of suitable tonnage.

On this frame 1 a hopper 2 is attached formant a tight tank thanks to its plate 3 of upper closing in which are practised two closed openings 4 of sealing manner by two covers 5.

the base of hopper 2 with the shape of a chute 6 in which a Archimedes' screw 7 is laid out, with or without axis, with constant or variable step.

This screw 7, particularly intended to lead the solid products to the end of chute 6 to which a pipe 8 is connected, is driven in rotation thanks to an hydraulic motor 9 via reducing fixed speed ruffle.

Affine, inter alia, to be able to vary the flow of the screw celleci can between rotated at adjustable speed. For this purpose, its hydraulic motor 9 is supplied via a divider of flow 11.

An heat engine 12 spirit a unit 19 including/understanding an hydraulic pump with its reserve, its valve of safety, its filter etc...

It is this unit 19 which, via the divider of flow 11, supplies hydraulic motor 9.

Under pipe 8, in which fall the solid products, a plate is laid out of spreading 14 with blades 15 entratné in rotation around its axis 16 by an hydraulic motor 17 and these at variable speed, thanks to its connection with aforementioned unit 13 via a second divider of flow 18.

On this pipe 8 is mounted a gate valve 19, with manual order, allowing the complete occlusion of the aforesaid the tubulure 8.

On this same pipe 8, upstream of this valve of arrdt, a control in derivation 20 is pricked whose 11 exit port is also located above the plate of spreading 14.

the bypass section of this control in derivation 20 is controlled by a valve 21 ordered by piston of piloting 22 fed into fluid hydraulic by the unit 19 pennies the central one of a third divider of flow 29.

Above the plate of spreading 14 is mounted, of known manner, an housing 24, associated frame 1 via a frame 25, (figure 2.)
dfin that such a spreader can moreover be appropriate to distribute products as well solid and liquid as pasty, according to an essential feature of the present invention, on the conduit of derivation 20 is inserted a volumetric pump 26, actuated by an hydraulic motor 27 at variable speed which is fed via a divider of flow 28.

So that this distribution can be done also on raised lateral parts, the such embankments or rectified parts of roads or tracks, the plate of spreading 14 and its oarter 24, are associated the frame via a cover of joint 29 making it possible to incline the plate of spreading

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Preferably, with-place to modify the device of spreading normally located in the ESA of the spreader, one envisages at least another plate 14 ' carried by a btti distinct 30 associated the frame on the with dimensions one of ltépandeuse.

Each additional plate 14 ' will preferably include/understand then its own hydraulic motor supplied with its own divider of flow, in order to be able to make function all the plates 14, 14 ' simultaneously or separately and at variable speeds.

LT food of plates 14,14 ' in product with épandre is then the same one as for the central plate 14 or reserved with the liquid or pasty products.

Conduits 20 of liquid or piteous product supply of each plate 14,14 ', also preferably carry their own volumetric pump 26 independent so as for the plates, to be able to function aimultanément or separately.

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REVENDICÂT IONS

1. spreader according to any of claims 1 to 4 of the main patent, i.e. particularly including/understanding a frame receiving a closed hopper with its upper part to build a tight tank, the base of this hopper presenting a chute in which is laid out a screw of & chimède moults in soft rotation so as to move the product with épandre towards the end of the chute to which a pipe reserving is connected a wide passage for the fall of the product on-a rotatable plate of spreading associated with the chassy by one beat, on the aforementioned pipe being mounted a gate valve, upstream of which is pricked, on this pipe, a control in derivation of lower dimension of which the orifice of extended leads to the plate of spreading and whose section bypass is controlled by a valve this spreader being a.c. R has C T E R I S G E in this ford, on the conduit of derivation is inserted a pump actuated by a motor and ensuring the circulation of the liquid products and pattus.

2. spreader according to claim 1 characterized in that the pump is a volumetric pump.

3. spreader according to any of claims 1 to 4 of the main patent, i.e. particularly including/understanding a frame receiving a closed hopper with its upper part to build a tight tank, the base of this hopper presenting a chute in which is laid out a Archimedes' screw moults in soft rotation so as to move the product with épandre towards the end of the chute to which is connected a pipe D serving a wide passage for the fall of the product on a rotatable plate of spreading, associated the chassy by a btti, on the aforementioned pipe being mounted a gate valve, upstream of which is pricked, on this pipe, a control in derivation of lower dimension of which ltorifice of extended leads to the plate of spreading and whose section bypass is controlled by a valve, this spreader being characterized in that it includes/understands at least a rotatable plate of spreading which is associated its frame via a cover of joint making it possible to incline the aforementioned rotatable plate.

top

4. Spreader according to claim 3 characterized in that each inclinable plate is an additional plate put in rotation by an independent motor and whose frame is associated the frame on c3té of the spreader.

5. Spreader according to the claim 3 or 4, characterized in that each plate is fed at least in liquid or pasty products like the main plate.

6. Spreader according to claim 1 or 4 characterized what the motor is an hydraulic motor supplied through a divider of flow which is own for him.

RÉPUBLIQUE FRANÇAISE

INSTITUT NATIONAL
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PARIS

(11) N° de publication : **2 378 132**
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A2

DEMANDE DE CERTIFICAT D'ADDITION

(21) N° 77 02082

Se référant : **au brevet d'invention n. 73.18620 du 17 mai 1973.**

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(54) **Epandeuse.**

(51) Classification internationale (Int. Cl.²). **E 01 C 19/20; B 05 C 5/02.**

(22) Date de dépôt ..... 20 janvier 1977, à 8 h 45 mn.

(33) (32) (31) Priorité revendiquée :

(41) Date de la mise à la disposition du public de la demande ..... B.O.P.I. — «Listes» n. 33 du 18-8-1978.

---

(71) Déposant : Société anonyme dite : LEBON & CIE, résidant en France.

(72) Invention de :

(73) Titulaire : *Idem* (71)

(74) Mandataire : Robert Ecrepont. Ingénieur-Conseil en Propriété Industrielle, 12, place Simon-Vollant, 59000 Lille.

Certificat(s) d'addition antérieur(s) :

2378132

Le brevet principal a pour objet une épandeuse, tant pour produits solides, granuleux ou pulvérulents, que pour produits liquides, caractérisée en ce qu'elle comprend un chassis recevant une trémie fermée à sa partie supérieure pour réaliser un réservoir étanche, la base de cette trémie présentant une goulotte dans laquelle est disposée une vis d'Archimède mue en rotation de manière à tendre à déplacer le produit à épandre vers l'extrémité de la goulotte à laquelle est raccordée une tubulure réservant un large passage pour la chute du produit sur un plateau rotatif d'épandage associé au chassis par un bâti, sur ladite tubulure étant montée une vanne d'arrêt, en amont de laquelle est piquée, sur cette tubulure, une conduite en dérivation de plus faible dimension dont l'orifice de sortie débouche sur le plateau d'épandage et dont la section de passage est contrôlée par une vanne.

Selon des modes avantageux de réalisation, la vanne de contrôle de la section de passage de la conduite en dérivation est pilotée par un piston alimenté en fluide hydraulique au travers d'un diviseur de débit, et la vis d'Archimède est mue en rotation par un moteur hydraulique par l'intermédiaire d'un réducteur, de préférence d'un type permettant plusieurs rapports de réduction afin d'entraîner la vis à très grande vitesse pour créer une agitation notamment lors du lavage de la trémie.

L'épandeuse ainsi conçue, a donné toute satisfaction pour l'épandage, indifféremment, de produits solides, granuleux ou pulvérulents, tels du sel en grains et de produits liquides tels qu'une solution de chlorure de calcium comme cela est maintenant fréquemment utilisé sur les routes en vue d'annuler ou de prévenir les effets du gel.

Le but du présent certificat d'addition est donc simplement de perfectionner encore cette épandeuse.

En effet, dans l'épandeuse, selon le brevet principal, l'alimentation en produit liquide est assurée par simple gravité, si cela convient parfaitement pour un produit réellement liquide, cela ne peut suffire si l'on veut distribuer une solution plus chargée telle qu'une saumure pâteuse.

Par ailleurs, cette épandeuse ne comprenant qu'un plateau central pour l'épandage, si cela était excellent pour garnir une route ordinaire, il n'en est pas de même si l'on veut épandre du produit sur des remblais ou sur le haut d'une route fortement redressée, comme par exemple sur une piste de course, où la partie supérieure ne peut recevoir le produit.

Un résultat que l'invention vise à obtenir est une épandeuse selon l'une quelconque des revendications 1 à 4 du brevet principal qui convienne en plus pour l'épandage des produits pâteux ainsi que pour l'épandage sur remblais ou sur route redressée voire même sur piste de course.

A cet effet, l'invention a pour objet une épandeuse du type précitée caractérisée notamment en ce que, sur la conduite de dérivation est intercalée une pompe actionnée par un moteur et assurant la circulation des produits liquides et pâteux.

L'invention sera bien comprise à l'aide de la description ci-après faite. A titre d'exemple non limitatif, en regard du dessin ci-annexé qui représente shématiquement :

- figure 1, l'épandeuse vue de profil
- figure 2, l'épandeuse vue en bout.

Selon le brevet principal, cette épandeuse comprend un châssis 1 susceptible d'être monté sur différents véhicules tractés ou automoteurs, de tonnage approprié.

Sur ce châssis 1 est fixée une trémie 2 formant un réservoir étanche grâce à sa plaque 3 de fermeture supérieure dans laquelle sont pratiquées deux ouvertures 4 fermées de manière étanche par deux couvercles 5.

La base de la trémie 2 a la forme d'une goulotte 6 dans laquelle est disposée une vis d'Archimède 7, avec ou sans axe, à pas constant ou variable.

Cette vis 7, destinée notamment à mener les produits solides à l'extrémité de la goulotte 6 à laquelle est raccordée une tubulure 8, est mue en rotation grâce à un moteur hydraulique 9 par l'intermédiaire d'un réducteur fixe de vitesse 10.

Afin, entre autres, de pouvoir varier le débit de la vis celle-ci peut être entraînée en rotation à vitesse réglable. A cet effet,

son moteur hydraulique 9 est alimenté par l'intermédiaire d'un diviseur de débit 11.

Un moteur thermique 12 entraîne un ensemble 13 comprenant une pompe hydraulique avec son réservoir, son clapet de sécurité, son filtre etc...

C'est cet ensemble 13 qui, par l'intermédiaire du diviseur de débit 11, alimente le moteur hydraulique 9.

Sous la tubulure 8, dans laquelle chutent les produits solides, est disposé un plateau d'épandage 14 avec pales 15 entraîné en rotation autour de son axe 16 par un moteur hydraulique 17 et ce, à vitesse variable, grâce à son raccordement à l'ensemble 13 précité par l'intermédiaire d'un second diviseur de débit 18.

Sur cette tubulure 8 est montée une vanne d'arrêt 19, à commande manuelle, permettant l'occlusion complète de la dite tubulure 8.

Sur cette même tubulure 8, en amont de cette vanne d'arrêt, est piquée une conduite en dérivation 20 dont l'orifice de sortie est également situé au-dessus du plateau d'épandage 14.

La section de passage de cette conduite en dérivation 20 est contrôlée par une vanne 21 commandée par piston de pilotage 22 alimenté en fluide hydraulique par l'ensemble 13 sous le contrôle d'un troisième diviseur de débit 23.

Au-dessus du plateau d'épandage 14 est monté, de manière connue, un carter 24, associé au chassis 1 par l'intermédiaire d'un bâti 25,(figure 2.)

Afin qu'une telle épandeuse puisse en plus convenir pour distribuer des produits tant solides et liquides que pâteux, selon une caractéristique essentielle de la présente invention, sur la conduite de dérivation 20 est intercalée une pompe volumétrique 26, actionnée par un moteur hydraulique 27 à vitesse variable qui est alimenté par l'intermédiaire d'un diviseur de débit 28.

Afin que cette distribution puisse se faire également sur des parties latérales surélevées, telles les remblais ou parties redressées de routes ou pistes, le plateau d'épandage 14 et son carter 24, sont associés au bâti par l'intermédiaire d'une chape d'articulation 29 permettant d'incliner le plateau d'épandage

De préférence, au lieu de modifier le dispositif d'épandage normalement situé dans l'axe de l'épandeuse, on prévoit au moins un autre plateau 14' porté par un bâti distinct 30 associé au chassis sur le côté de l'épandeuse.

Chaque plateau supplémentaire 14' comprendra avantageusement alors son propre moteur hydraulique alimenté par son propre diviseur de débit, afin de pouvoir faire fonctionner tous les plateaux 14, 14' simultanément ou séparément et à des vitesses variables.

L'alimentation des plateaux 14,14' en produit à épandre est alors la même que pour le plateau central 14 ou réservée aux produits liquides ou pâteux.

Les conduites 20 d'alimentation en produits liquides ou pâteux de chaque plateau 14,14', portent également de préférence leur propre pompe volumétrique 26 indépendante afin comme pour les plateaux, de pouvoir fonctionner simultanément ou séparément.

REVENDICATIONS

1. Epandeuse selon l'une quelconque des revendications 1 à 4 du brevet principal, c'est-à-dire comprenant notamment un chassis recevant une trémie fermée à sa partie supérieure pour réaliser un réservoir étanche, la base de cette trémie présentant une goulotte dans laquelle est disposée une vis d'Archimède mue en rotation de manière à tendre à déplacer le produit à épandre vers l'extrémité de la goulotte à laquelle est raccordée une tubulure réservant un large passage pour la chute du produit sur un plateau rotatif d'épandage associé au chassis par un bâti, sur la dite tubulure étant montée une vanne d'arrêt, en amont de laquelle est piquée, sur cette tubulure, une conduite en dérivation de plus faible dimension dont l'orifice de sortie débouche sur le plateau d'épandage et dont la section de passage est contrôlée par une vanne, cette épandeuse étant c a r a c t é r i s é e en ce que, sur la conduite de dérivation est intercalée une pompe actionnée par un moteur et assurant la circulation des produits liquides et pâteux.

2. Epandeuse selon la revendication 1 caractérisée en ce que la pompe est une pompe volumétrique.

3. Epandeuse selon l'une quelconque des revendications 1 à 4 du brevet principal, c'est-à-dire comprenant notamment un chassis recevant une trémie fermée à sa partie supérieure pour réaliser un réservoir étanche, la base de cette trémie présentant une goulotte dans laquelle est disposée une vis d'Archimède mue en rotation de manière à tendre à déplacer le produit à épandre vers l'extrémité de la goulotte à laquelle est raccordée une tubulure réservant un large passage pour la chute du produit sur un plateau rotatif d'épandage, associé au chassis par un bâti, sur la dite tubulure étant montée une vanne d'arrêt, en amont de laquelle est piquée, sur cette tubulure, une conduite en dérivation de plus faible dimension dont l'orifice de sortie débouche sur le plateau d'épandage et dont la section de passage est contrôlée par une vanne, cette épandeuse étant caractérisée en ce qu'elle

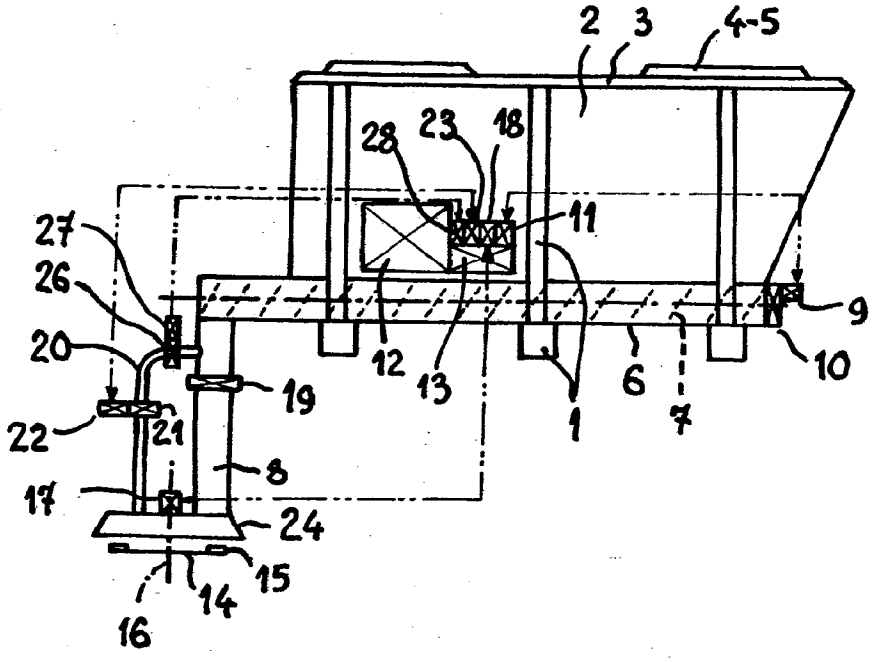
comprend au moins un plateau rotatif d'épandage qui est associé à son bâti par l'intermédiaire d'une chape d'articulation permettant d'incliner ledit plateau rotatif.

4. Epandeuse selon la revendication 3 caractérisée en ce que chaque plateau inclinable est un plateau supplémentaire mis en rotation par un moteur indépendant et dont le bâti est associé au chassis sur le côté de l'épandeuse.

5. Epandeuse selon la revendication 3 ou 4, caractérisée en ce que chaque plateau est alimenté au moins en produits liquides ou pâteux comme le plateau principal.

6. Epandeuse selon la revendication 1 ou 4 caractérisée en ce que le moteur est un moteur hydraulique alimenté au travers d'un diviseur de débit qui lui est propre.

Fig. 1


2
3
4-5
28
23
18
11
27
26
20
12
13
9
10
19
6
7
1
22
21
8
17
24
15
14
16

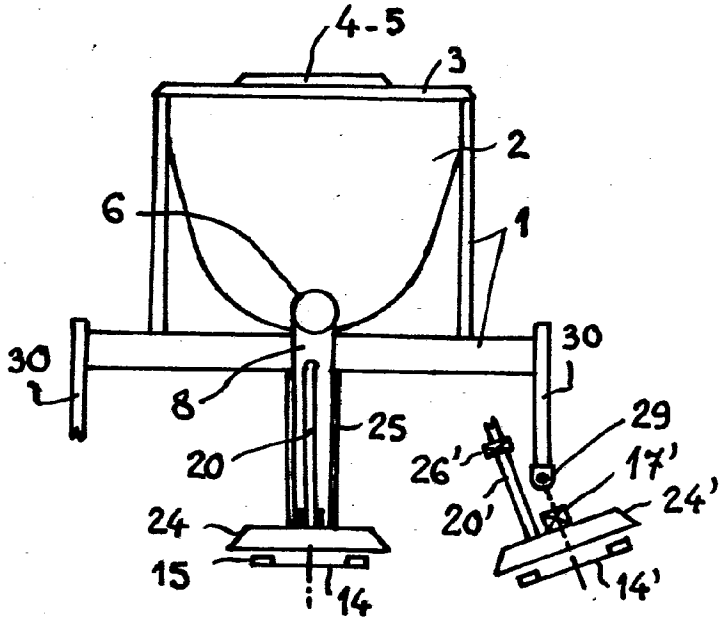

4-5
3
2
6
1
30
30
8
25
29
20
26'
17'
24'
20'
24
15
14
14'

Fig. 2

Device for analysing the surface condition of the ground for a moving object which can come into contact with this ground

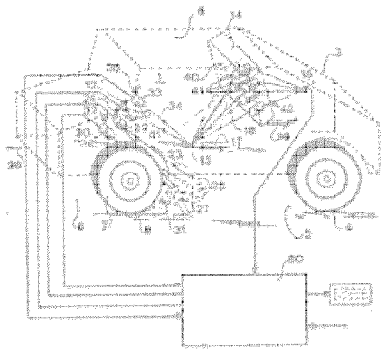
Publication number: FR2618543 (A1)
Publication date: 1989-01-27
Inventor(s): CLERC ALAIN +
Applicant(s): INRETS [FR] +
Classification:
- international: ***G01B11/30; G01N21/47; G01V8/02;*** **G01B11/30; G01N21/47; G01V8/00;** (IPC1-7): B60Q9/00; G01B11/30; G01N21/84; G01V9/04
- European: G01B11/30B; G01N21/47F; G01V8/02
Application number: FR19870010194 19870720
Priority number(s): FR19870010194 19870720

Also published as:
FR2618543 (B1)

Cited documents:
US4274091 (A)
EP0215948 (A1)
DE3023444 (A1)
JP60210706 (A)

Abstract of **FR 2618543 (A1)**

The present invention relates to devices making it possible to analyse the surface condition of the ground, from a moving object moving relative to this ground. The detector according to the invention is essentially characterised in that it comprises a source 10 of a beam 11 of radiation of the electromagnetic type, means 12 for attaching the source to the moving object 3, so as to direct the beam to a point 13 on the surface 6, a receiver 14 for receiving a beam 18 of the same type, this receiver being capable of delivering 15 signals representative of the received beam, means 16 for attaching the receiver to the moving object, so as to direct its reception axis substantially on to the point on the surface, and being capable of picking up at least a part of the beam reflected from this point, and means 60 for processing the signals which can be emitted by the receiver.; Application: analysis of the surface condition of a roadway from a vehicle, in order to discriminate between dry ground, wet ground, black ice etc.



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(19) RÉPUBLIQUE FRANÇAISE

INSTITUT NATIONAL
DE LA PROPRIÉTÉ INDUSTRIELLE

PARIS

(11) N° de publication : **2 618 543**
(à n'utiliser que pour les commandes de reproduction)

(21) N° d'enregistrement national : **87 10194**

(51) Int Cl⁴ : G 01 B 11/30; B 60 Q 9/00; G 01 V 9/04; G 01 N 21/84.

(12) DEMANDE DE BREVET D'INVENTION A1

(22) Date de dépôt : 20 juillet 1987.

(30) Priorité :

(43) Date de la mise à disposition du public de la demande : BOPI « Brevets » n° 4 du 27 janvier 1989.

(60) Références à d'autres documents nationaux apparentés :

(71) Demandeur(s) : *Institut National de Recherche sur les Transports et leur Sécurité I.N.R.E.T.S., Etablissement public à caractère administratif et technique.* — FR.

(72) Inventeur(s) : Alain Clerc.

(73) Titulaire(s) :

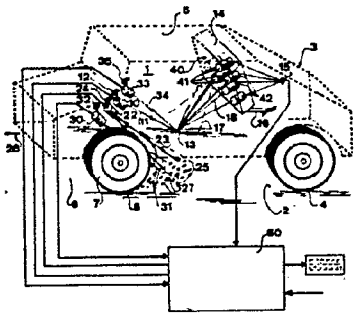
(74) Mandataire(s) : Abritt.

(54) Dispositif d'analyse de l'état de surface d'un sol pour mobile apte à prendre contact avec ce sol.

(57) La présente invention concerne les dispositifs permettant d'analyser l'état de surface d'un sol, à partir d'un mobile se déplaçant par rapport à ce sol.

Le détecteur selon l'invention se caractérise essentiellement par le fait qu'il comprend une source 10 d'un faisceau 11 de rayonnement de type électromagnétique, des moyens pour solidariser 12 la source avec le mobile 3, de façon à diriger le faisceau vers un point 13 de la surface 6, un récepteur 14 d'un faisceau 18 du même type, ce récepteur étant apte à délivrer 15 des signaux représentatifs du faisceau reçu, des moyens pour solidariser 16 le récepteur avec le mobile, de façon à diriger son axe de réception sensiblement sur le point de la surface, en étant apte à capter au moins une partie du faisceau réfléchi sur le point, et des moyens de traitement 60 des signaux aptes à être émis par le récepteur.

Application : analyse de l'état de surface d'une voie de circulation à partir d'un véhicule, pour discriminer les sols secs, humides, verglacés, etc.



FR 2 618 543 - A1

DISPOSITIF D'ANALYSE DE L'ETAT DE SURFACE D'UN SOL POUR MOBILE APTE A PRENDRE CONTACT AVEC CE SOL

La présente invention concerne les dispositifs aptes à être montés sur des mobiles comme, par exemple, des véhicules routiers, et permettant d'analyser l'état de surface du sol par rapport auquel ces mobiles sont amenés à se déplacer, et plus particulièrement ceux qui sont en contact avec le sol au moins en un point, par exemple par les pneumatiques.

Un nombre toujours croissant de véhicules circule sur les routes, en tous lieux et par tous les temps, ce qui entraîne d'importants risques d'accidents. Devant ce fait, certains responsables ont pensé à réaliser tout un réseau d'informations pour relier le maximum de ces véhicules entre eux, afin, d'une part, de mettre leur conducteur en connaissance de certains paramètres leur permettant d'adapter la qualité de leur conduite mais aussi, d'autre part, de pouvoir utiliser les véhicules eux-mêmes comme capteurs mobiles capables d'appréhender certains de ces paramètres. C'est ainsi, par exemple, que l'on a déjà réalisé des détecteurs de choc qui émettent des signaux hertziens lorsque le véhicule qu'ils équipent a été accidenté. Ce détecteur prévient alors les conducteurs des autres véhicules se dirigeant vers le lieu de l'accident, qui peuvent ainsi prendre toutes précautions utiles pour éviter, par exemple, de s'impliquer dans un autre accident. En effet, dans ce cas, la voie est généralement très encombrée et il y a donc un intérêt à ralentir et même, éventuellement, à changer d'itinéraire.

Dans cet objectif, un des paramètres qu'il est important de connaître est l'état de surface du sol, notamment pour savoir si le sol est sec, mouillé, verglacé, enneigé, etc, afin de pouvoir en déduire tout un ensemble d'informations contribuant à assurer de bonnes conditions de circulation sur une aire donnée. Plus particulièrement, il est important de pouvoir déterminer les endroits des routes qui sont verglacés car cet état est, en hiver, une cause prédominante d'accidents et il est presque impossible de prévoir avec certitude les endroits où les axes de circulation se trouvent dans cet état.

Dans ce cadre, la présente invention a pour but de réaliser un dispositif d'une structure simple et fiable qui puisse donner des résultats intéressants contribuant à assurer de bonnes conditions de circulation, notamment pour les véhicules automobiles.

Plus précisément, la présente invention a pour objet un dispositif d'analyse de l'état de surface d'un sol pour mobile apte à prendre contact avec ledit sol par au moins un point, caractérisé par le fait qu'il comprend :

- une première source d'un premier faisceau de rayonnement de type électromagnétique,
- des premiers moyens pour solidariser ladite source avec ledit mobile, de façon à diriger ledit faisceau vers un point de ladite surface,
- un premier récepteur d'un faisceau du même type, ledit récepteur étant apte à délivrer des premiers signaux représentatifs du faisceau reçu,
- des deuxièmes moyens pour solidariser ledit premier récepteur avec ledit mobile, de façon à diriger son axe de réception sensiblement sur ledit point de ladite surface, en étant apte à capter au moins une partie dudit faisceau réfléchi sur ledit point, et
- des premiers moyens de traitement desdits premiers signaux aptes à être émis par ledit premier récepteur.

D'autres caractéristiques et avantages de la présente invention apparaîtront au cours de la description suivante donnée en regard des dessins annexés à titre illustratif mais nullement limitatif dans lesquels :

- la figure 1 représente un schéma de principe d'un mode de réalisation d'un dispositif selon l'invention en application à l'équipement d'un véhicule du type automobile, et
- la figure 2 représente un détail de réalisation du dispositif selon la figure 1.

La figure 1 représente un dispositif 1 permettant d'analyser l'état de surface d'un sol 2 pour mobile 3 apte à prendre contact avec ce sol par au moins un point 4, par exemple un véhicule automobile 5 roulant sur une route 6, les points de contact 4, 8 étant ceux qui sont communs aux pneumatiques 7 et à la route 6.

Le dispositif 1 comprend une première source 10 d'un premier faisceau 11 de rayonnement de type électromagnétique. La source 10 est solidarisée au véhicule 5, par exemple sur le chassis, au moyen d'une patte 12, de façon à diriger le faisceau qu'elle émet vers un point 13 de la surface de la route 6. Le dispositif comporte aussi un premier récepteur 14 choisi pour pouvoir délivrer à sa sortie 15 des signaux, par exemple de type électrique, représentatifs des faisceaux qu'il reçoit. Ce récepteur 14 est lui aussi solidarisé au véhicule, par exemple au moyen d'une patte de fixation 16, de façon à diriger l'axe de son champ de réception 17 sensiblement sur le point 13 de la surface de la route 6, pour pouvoir capter au moins une partie 18 du faisceau 11 réfléchi sur la surface du sol au point 13. La sortie 15 de ce récepteur 14 est connectée à une entrée d'un organe de traitement 60 des signaux délivrés, afin de pouvoir les analyser, les comparer, etc., pour en déduire, comme il sera explicité ci-après, l'état de surface de la route.

Le dispositif comporte aussi, afin de pouvoir déterminer avec encore plus de précision l'état de surface de la route 6 et, éventuellement, lever certaines incertitudes, une deuxième source 22 d'un deuxième faisceau 23 de rayonnement électromagnétique, cette source 22 étant solidarisée au véhicule, par exemple, au moyen d'une patte 24, de façon à diriger le faisceau 23 qu'elle émet dans un volume 25 passant au voisinage du point de contact 8 du pneumatique 7 avec le sol 2, et avantageusement de façon que ce faisceau 23 passe juste derrière le point 8 du pneumatique, par rapport au sens normal de progression 26 du véhicule 5, pour pouvoir éclairer les projections 27 produites par ce pneumatique lorsqu'il roule sur une chaussée recouverte d'éléments de tous types, par exemple de l'eau, de la neige, des gravillons, du sable, etc. Ce faisceau 23 sera relativement fin et aura une certaine orientation, notamment par rapport au sol, pour ne capter que les projections 27, en éliminant les réflexions sur le sol pour ne pas risquer de les confondre avec ces projections. Par exemple, ce faisceau pourra être, si cela est possible, parallèle au sol, ou du moins de façon que son point d'intersection avec le sol soit situé le plus loin possible de l'endroit où se produisent généralement de telles projections.

Pour analyser la nature de ces projections, le dispositif comporte un deuxième récepteur 30 apte à capter une partie 31 du deuxième faisceau 23 renvoyée par ces projections 27, ce deuxième récepteur étant apte à délivrer à sa sortie des seconds signaux représentatifs de cette partie de faisceau 31. Bien entendu, ce récepteur 30 est aussi fixé sur le véhicule 5 au moyen, par exemple, d'une patte de fixation 32. Ces deuxièmes signaux sont ensuite envoyés dans un organe de traitement qui coopére avec le premier.

Le dispositif comporte aussi avantageusement, toujours dans le but de lever d'autres éventuelles indéterminations sur la nature de l'état de surface du sol, un troisième récepteur 33 de faisceau électromagnétique apte à émettre des troisièmes signaux représentatifs du faisceau reçu, ce troisième récepteur étant solidarisé au véhicule 5, par exemple par une patte 35, de façon à pouvoir capter au moins une partie 34 du premier faisceau 11 diffractée ou rétro-réfléchie par la surface du sol 2 au point 13. Les signaux délivrés par ce récepteur 33 sont envoyés à un troisième organe de traitement qui coopère avec les deux autres.

Dans un mode de réalisation avantageux, les trois organes de traitement sont réalisés par un même microprocesseur 60 ayant une programmation adaptée, comme il sera explicité ci-après.

Dans le mode de réalisation décrit donnant un maximun d'informations sous forme de signaux, le dispositif comporte donc trois récepteurs 14, 30, 33. Cependant, pour obtenir une meilleure analyse des faisceaux reçus, les récepteurs, et plus particulièrement le récepteur 14, sont constitués d'une pluralité de surfaces 40 sensibles au rayonnement électromagnétique émis par, notamment, la source 10. Ces surfaces sensibles 40 sont juxtaposées sur une surface de réception par exemple plane mais avantageusement courbe concave passant par l'ensemble des points images créés, cette surface pouvant même être formée par des éléments de surfaces planes répartis sur des courbes pour mieux recevoir les faisceaux, et ainsi traiter les signaux émis par ces récepteurs.

Dans la description donnée ci-avant, il est mentionné qu'il est utilisé un rayonnement électromagnétique. Dans le souci d'utiliser des éléments fiables et relativement peu onéreux, il est avantageux de choisir des sources de rayonnement de type optique.

Dans ce cas, les surfaces sensibles 40 de réception des faisceaux réfléchis ou diffractés sont constituées par des éléments optiques convergents 41 et par une pluralité de cellules photosensibles 42 placées au point de focalisation de ces éléments convergents 41, ces éléments optiques étant par exemple constitués par des lentilles convergentes.

Dans ce même cas de rayonnement optique, les éléments optiques peuvent être constitués par un objectif unique associé à une cible de réception du type vidéo disposée dans son plan de convergence, la cible étant alors analysée séquentiellement par surfaces élémentaires d'aire déterminée. A titre d'exemple de réalisation présentant un intérêt, tant sur le plan technique que sur le plan commercial, la cible est constituée par un système photosensible matriciel à transfert de charges.

Comme mentionné ci-dessus, quand le rayonnement est un rayonnement du type optique, les deux sources 10 et 22 sont avantageusement constituées, comme illustré sur la figure 2, par un générateur laser 50, par exemple un laser du type hélium-néon 51, comportant une fenêtre de sortie 52 par laquelle émerge un faisceau fin et peu divergent 59. Sur ce faisceau est disposé un séparateur 53, par exemple une lame partiellement réfléchissante et tranmissible 54, qui donne naissance à deux faisceaux distincts 55, 56 sur deux chemins optiques différents. Ces deux faisceaux constituent alors les deux faisceaux 11 et 23 définis ci-avant. Bien entendu, le séparateur peut éventuellement comprendre aussi des miroirs de renvoi permettant de diriger les deux faisceaux sur, comme décrit ci-avant, les différents points de la surface du sol, notamment 13 et 27. Un tel miroir ou lame réfléchissante a été illutrée en 57, en un seul exemplaire, et le faisceau 58 émis en sortie de cette lame constituant le faisceau illuminant les projections 27 peut éventuellement traverser un élément optique du type divergent, par exemple une lentille divergente, afin de donner au faisceau une largeur suffisante pour éclairer la quantité de projections nécessaire pour obtenir leur identification avec le plus de précision possible, tout en conservant une certaine finesse, pour éviter les inconvénients mentionnés ci-avant et discriminer les éventuelles réflexions parasites.

Le dispositif décrit ci-dessus fonctionne de la façon suivante:

Il est tout d'abord précisé que ce fonctionnement sera donné dans l'application à un véhicule automobile roulant sur une route couramment empruntée par de tels véhicules et dont la surface du sol est constituée d'un revêtement goudronné, le dispositif utilisant un rayonnement optique, par exemple dans le domaine du visible.

Si l'on considère que le véhicule roule sur cette route quand elle est sèche et non recouverte de gravillons, le faisceau 11 émis par la source 10 est presque totalement absorbé par le revêtement et les récepteurs 14, 30 et 33 ne reçoivent donc aucun signal puisque la surface ne réfléchit pas, ni ne diffracte puisqu'aucune projection ne se produit. L'absence de signal à la sortie des trois récepteurs est analysée par l'organe de traitement 60 qui, à sa sortie, définit l'état du sol comme celui d'un sol sec et non recouvert de gravillons ou analogue.

Dans le cas où le sol sec est recouvert, par exemple, de gravillons, le récepteur 30 reçoit en retour le faisceau 31 produit par réflexion et/ou diffraction du faisceau 23 sur ces particules, tandis que les deux autres récepteurs ne reçoivent aucun faisceau et ne délivrent à leur sortie aucun signal. L'organe de traitement permet donc, dans ce cas, d'analyser l'état de la route comme celui d'une route sèche mais gravillonneuse.

Si l'on considère que la route est mouillée, le récepteur 30 reçoit un faisceau dû à la diffraction sur les projections de gouttes d'eau produites par le pneumatique sur cette route mouillée. De plus, la surface au point 13 est recouverte d'eau, et cette eau se comporte presque comme une surface réfléchissante. Le récepteur 14 reçoit alors un faisceau relativement concentré, tandis que le récepteur 33 reçoit un faisceau d'intensité nulle ou de très faible amplitude. Les signaux délivrés à la sortie des récepteurs sont analysés par l'organe de traitement 60 qui informe que la surface du sol est mouillée.

Si l'on suppose que le sol est verglacé, la surface au point 13 se comporte comme une pluralité de surfaces réfléchissantes dans une répartition aléatoire due à la nature cristalline du verglas. Le récepteur 14 reçoit alors une pluralité de faisceaux répartis dans un relativement grand volume et la surface du récepteur impressionnée est

très large, ce qui permet de discriminer la réflexion dans le cas d'un sol mouillé de celle due à un sol verglacé. Le récepteur 30, lui, ne reçoit aucun faisceau car, généralement, un pneumatique roulant sur le verglas ne produit pas de projections. Quant au récepteur 33, il peut recevoir, par rétro-réflexion, un faisceau d'une intensité variable. Les signaux délivrés par les récepteurs sont analysés par l'organe de traitement 60 et permettent de qualifier le sol de "verglacé".

Il est, bien entendu, possible de déterminer d'autres états de surface du sol, par exemple une surface de sol recouverte de neige. En effet, la neige produit beaucoup plus de diffraction que l'eau, et presque autant que le verglas. Cette indétermination est facilement levée par le fait que, à la différence du verglas, le roulement d'un pneumatique sur la neige produit des projections. Dans ce cas, le récepteur 30 reçoit un faisceau relativement intense et délivre donc un signal qui est analysé par l'organe de traitement 60.

Il apparaît que le dispositif décrit ci-dessus permet d'analyser avec une assez bonne précision les différents états de surface des routes couramment empruntées par les véhicules automobiles. Il est donc concevable que l'organe de traitement 60 soit couplé à un émetteur, pour transmettre les résultats obtenus et les traiter au niveau d'une région entière donnée, et même d'un pays, ou plus. Il est évident que le réglage du dispositif et le programme de l'organe de traitement seront facilement élaborés par un homme de l'art connaissant les données explicitées ci-dessus, sans qu'il soit besoin de développer ici ces points-là.

REVENDICATIONS

1. Dispositif d'analyse de l'état de surface d'un sol (2) pour mobile (3) apte à prendre contact avec ledit sol par au moins un point (4,8), caractérisé par le fait qu'il comprend :

- une première source (10) d'un premier faisceau (11) de rayonnement de type électromagnétique,
- des premiers moyens pour solidariser (12) ladite source avec ledit mobile de façon à diriger ledit faisceau vers un point (13) de ladite surface,
- un premier récepteur (14) apte à recevoir un faisceau (18) du même type, ledit récepteur étant apte à délivrer (15) des premiers signaux représentatifs du faisceau reçu,
- des seconds moyens pour solidariser (16) ledit premier récepteur avec ledit mobile de façon à diriger l'axe de son champ de réception (17) sensiblement sur ledit point (13) de ladite surface (2), en étant apte à capter au moins une partie dudit faisceau réfléchi sur ledit point, et
- des premiers moyens de traitement (60) desdits premiers signaux aptes à être émis par ledit premier récepteur.

2. Dispositif selon la revendication 1, caractérisé par le fait qu'il comporte :

- une deuxième source (22) d'un deuxième faisceau (23) de rayonnement électromagnétique,
- des troisièmes moyens pour solidariser (24) ladite deuxième source de rayonnement sur ledit mobile de façon à diriger ledit deuxième faisceau dans un volume (25) passant au voisinage dudit point de contact (8),
- un deuxième récepteur (30) pour capter une partie (31) dudit deuxième faisceau (23) renvoyée par des particules (27) situées dans ledit volume (25), ledit deuxième récepteur étant apte à délivrer des deuxièmes signaux représentatifs de ladite partie de faisceau captée,
- des quatrièmes moyens pour solidariser (32) ledit deuxième récepteur (30) avec ledit mobile, de façon que ledit récepteur soit apte à capter ladite partie de faisceau renvoyée par les particules, et
- des deuxièmes moyens de traitement (60) desdits deuxièmes

signaux émis par ledit deuxième récepteur, coopérant avec lesdits premiers moyens de traitement (60).

3. Dispositif selon l'une des revendications 1 et 2, caractérisé par le fait qu'il comporte :

- un troisième récepteur (33) de faisceau de rayonnement électromagnétique, ledit troisième récepteur étant apte à émettre des troisièmes signaux représentatifs du faisceau reçu,

- des cinquièmes moyens pour solidariser (35) ledit troisième récepteur avec ledit mobile de façon à être apte à recevoir au moins une partie (34) dudit premier faisceau (11) après diffraction par la surface du sol (6) sur ledit point (13), et

- des troisièmes moyens de traitement (60) desdits troisièmes signaux, coopérant avec lesdits premiers et deuxièmes moyens de traitement.

4. Dispositif selon l'une des revendications précédentes, caractérisé par le fait qu'au moins un desdits récepteurs (14,30,33) comporte une pluralité de surfaces sensibles de réception (40), lesdites surfaces sensibles étant juxtaposées sur une surface de réception.

5. Dispositif selon la revendication 4, caractérisé par le fait que, ledit rayonnement électromagnétique étant un rayonnement optique, lesdites surfaces sensibles de réception (40) sont constituées par des éléments optiques de convergence et par une pluralitée de cellules photosensibles (42), lesdites cellules étant situées sensiblement au point de convergence desdits éléments optiques.

6. Dispositif selon la revendication 5, caractérisé par le fait que lesdits éléments optiques sont constitués par des lentilles convergentes.

7. Dispositif selon la revendication 5, caractérisé par le fait lesdits éléments optiques sont constitués par un objectif, une cible de réception vidéo disposée au plan de convergence dudit objectif et des moyens d'analyse séquentielle par surfaces élémentaires de ladite cible.

8. Dispositif selon la revendication 7, caractérisé par le fait que ladite cible est constituée par un système photosensible matriciel à transfert de charges.

9. Dispositif selon les revendications 2 et 5, caractérisé par le fait que les première (10) et seconde (22) sources sont constituées

par un générateur (51) de faisceau laser (59) et au moins un séparateur (53) du faisceau émis par ledit générateur pour donner naissance à deux faisceaux (55,56) sur deux chemins différents.

10. Dipositif selon les revendications 2 et 3, caractérisé par le fait que lesdits premier, deuxième et troisième moyens de traitement sont constitués par un microprocesseur (60).

2618543

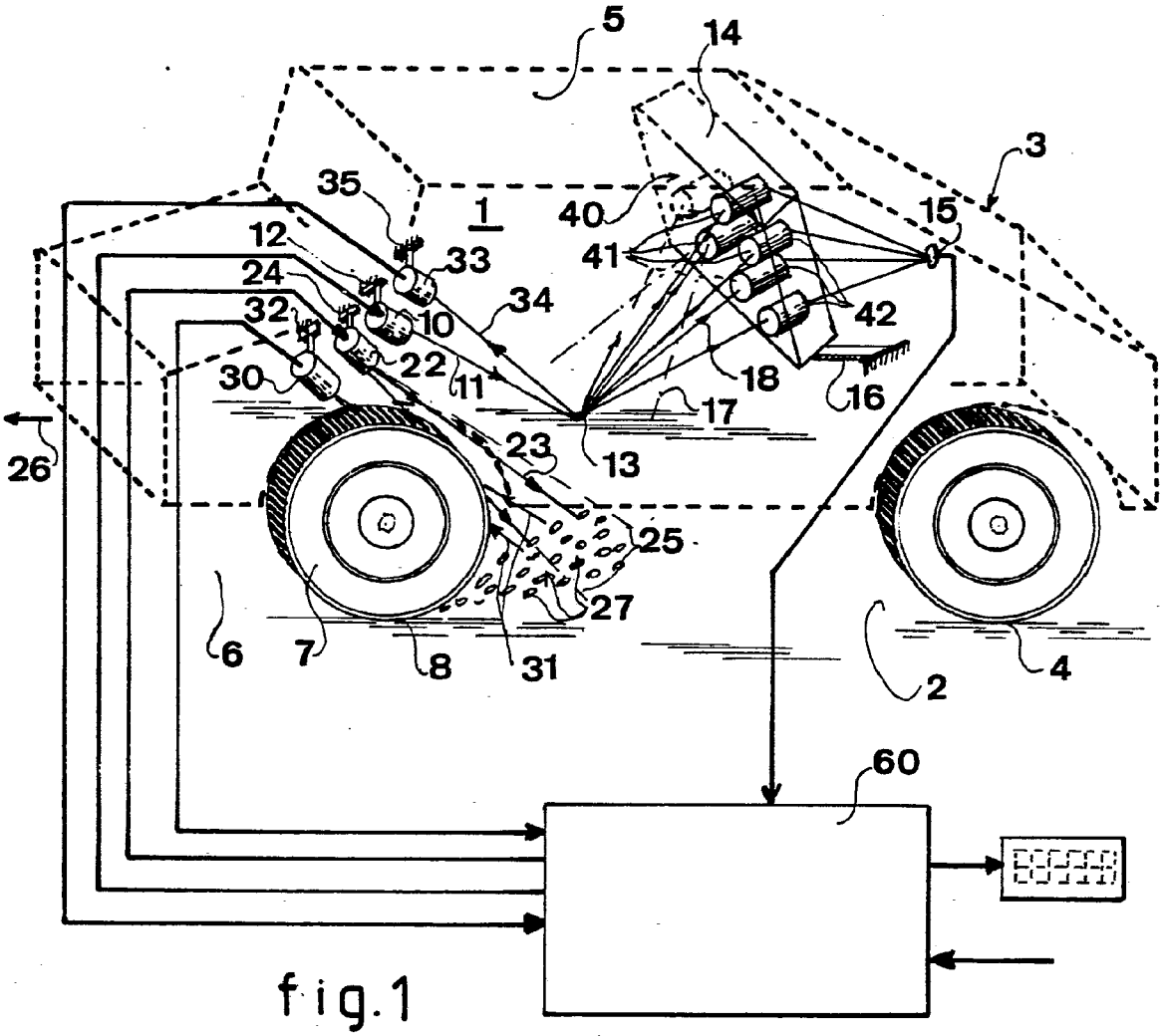


fig.1

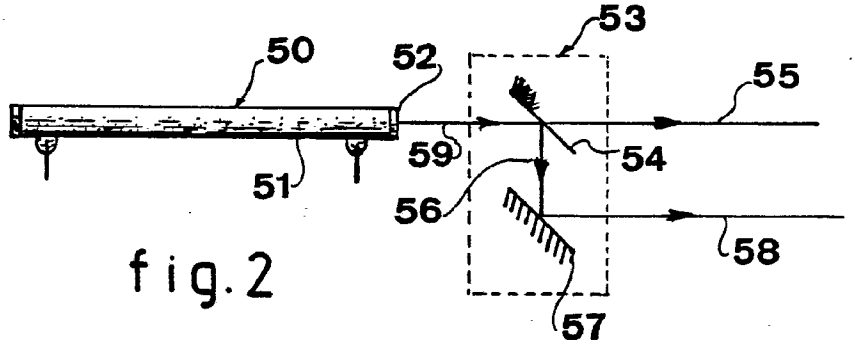


fig.2

Electronic Acknowledgement Receipt

EFS ID:	16676603
Application Number:	13944836
International Application Number:	
Confirmation Number:	3020
Title of Invention:	Maintenance Decision Support System and Method for Vehicular and Roadside Applications
First Named Inventor/Applicant Name:	Christopher J. Rennie
Customer Number:	19152
Filer:	Carl A. Hjort
Filer Authorized By:	
Attorney Docket Number:	5611-1-CIP-5
Receipt Date:	23-AUG-2013
Filing Date:	17-JUL-2013
Time Stamp:	18:15:16
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		1.pdf	22812635 6db57cf507a1dca7566eed4ca45587a33072bb1b	yes	396

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	Foreign Reference	43	86
	Foreign Reference	87	134
	Foreign Reference	135	142
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	Foreign Reference	165	175
	Foreign Reference	176	188
	Non Patent Literature	189	189
	Non Patent Literature	190	191
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	Non Patent Literature	284	285
	Non Patent Literature	286	289
	Non Patent Literature	290	292
	Non Patent Literature	293	293
	Non Patent Literature	294	295
	Non Patent Literature	296	302
	Non Patent Literature	303	394
	Non Patent Literature	395	396
Warnings:			

Information:	
Total Files Size (in bytes):	22812635

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Electronic Acknowledgement Receipt

EFS ID:	16676668
Application Number:	13944836
International Application Number:	
Confirmation Number:	3020
Title of Invention:	Maintenance Decision Support System and Method for Vehicular and Roadside Applications
First Named Inventor/Applicant Name:	Christopher J. Rennie
Customer Number:	19152
Filer:	Carl A. Hjort
Filer Authorized By:	
Attorney Docket Number:	5611-1-CIP-5
Receipt Date:	23-AUG-2013
Filing Date:	17-JUL-2013
Time Stamp:	18:19:52
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

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Warnings:	
Information:	

2		7.pdf	8491269 765c90fd8ad2da040d8e721078c0142cc854d44a	yes	156

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Non Patent Literature	23	146
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Warnings:

Information:

3		8.pdf	12201926 d422eb3dd2a1b37af3d710f64e4ce889d9543339	yes	150

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Warnings:

Information:

4		9.pdf	18813136 6c407f4fe7f97257beae92ed7f37fcaea9e90bf1	yes	144

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Non Patent Literature	121	144

Warnings:

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Total Files Size (in bytes):	44994813

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Electronic Acknowledgement Receipt

EFS ID:	16676759
Application Number:	13944836
International Application Number:	
Confirmation Number:	3020
Title of Invention:	Maintenance Decision Support System and Method for Vehicular and Roadside Applications
First Named Inventor/Applicant Name:	Christopher J. Rennie
Customer Number:	19152
Filer:	Carl A. Hjort
Filer Authorized By:	
Attorney Docket Number:	5611-1-CIP-5
Receipt Date:	23-AUG-2013
Filing Date:	17-JUL-2013
Time Stamp:	18:26:23
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

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	Non Patent Literature		23	46	
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Warnings:					
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2		2.pdf	17647243 7e7c3b72d76df6e6e19b0d120a9373c024e36f10	yes	218
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3		3.pdf	24917314 a4e6067244ddb6dd0c8559b82e8a8753ca1fd1ce	yes	335
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	Non Patent Literature		35	42	
	Non Patent Literature		43	52	
	Non Patent Literature		53	97	
	Non Patent Literature		98	245	
	Non Patent Literature		246	335	

Warnings:					
Information:					
4	Non Patent Literature	4.pdf	15184265 2ce33a8c4c4660376d5f658e98f6ce37c904c64d	no	170
Warnings:					
Information:					
5		5.pdf	145344 ca7006d87c2035e06834174de577e11752d71b83	yes	4

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Non Patent Literature	1	2
	Non Patent Literature	3	4

Warnings:	
Information:	
Total Files Size (in bytes):	65825544

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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US07/62751

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - G08B 1/08 (2007.01)
USPC - 340/539.22
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC(8) - G08B 1/08 (2007.01)
USPC - 340/425.5, 539.22

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
Patbase

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 6,330,499 B1 (CHOU et al) 11 December 2001 (11.12.2001) entire document	1, 3-7,10,12-16 --- 2,8-9,11,17-18
X --- Y	US 2004/0203436 A1 (OESTERLING) 14 October 2004 (14.10.2004) entire document	19-21 --- 8-9, 17-18
Y	US 5,844,473 A (KAMAN) 01 December 1998 (01.12.1998) entire document	2,11
A	US 6,429,773 B1 (SCHUYLER) 06 August 2002 (06.08.2002) entire document	1-21

☐ Further documents are listed in the continuation of Box C. ☐

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
28 September 2007	08 NOV 2007
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (April 2007)

CORRECTED

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To: DOUGLAS W. SWARTZ
SHERIDAN ROSS P.C.
1560 BROADWAY, SUITE 1200
DENVER, COLORADO 80202-5141

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing *(day/month/year)*	08 NOV 2007
Applicant's or agent's file reference: 5611-1-PCT	FOR FURTHER ACTION: See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US07/62751	23 February 2007	27 February 2006

International Patent Classification (IPC) or both national classification and IPC
IPC(8) - G08B 1/08 (2007.01)
USPC - 340/539.22

Applicant IWAPI INC.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/US	Date of completion of this opinion	Authorized officer:
Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	28 September 2007	Blaine Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US07/62751

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   [X] the international application in the language in which it was filed.

   [ ] a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

2. [ ] This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of:

   a. type of material

      [ ] a sequence listing

      [ ] table(s) related to the sequence listing

   b. format of material

      [ ] on paper

      [ ] in electronic form

   c. time of filing/furnishing

      [ ] contained in the international application as filed

      [ ] filed together with the international application in electronic form

      [ ] furnished subsequently to this Authority for the purposes of search

4. [ ] In addition, in the case that more than one version or copy of a sequence listing and/or table(s) relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US07/62751

Box No. V **Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	2,8-9,11,17-18	YES
	Claims	1,3-7,10,12-16,19-21	NO
Inventive step (IS)	Claims	None	YES
	Claims	1-21	NO
Industrial applicability (IA)	Claims	1-21	YES
	Claims	None	NO

2. Citations and explanations:

Claims 1, 3-7, 10 and 12-16 lack novelty under PCT Article 33(2) as being anticipated by Chou et al (US 6,330,499 B1; hereinafter Chou).

Referring to claims 1 and 10, Chou discloses a data collection and transmission system/method, comprising: at least one of a sensor and user interface operable to collect information regarding vehicle state and/or vehicle occupants (see col. 2 lines 30-37; note the vehicle health checkup); at least one slot operable to receive a selected network card, the at least one slot being configured to receive cards of multiple private and/or public networks (see col. 3 lines 33-41, note the interface); a plurality of sets of connection managers and monitors corresponding to different types and/or origins of network cards (see col. 6 lines 1-5; note the collecting of data), each set comprising at least one connection manager to interact with the corresponding network card in establishing a connection with the corresponding wireless network (see col. 2 lines 30-37, note the wireless link) and connection monitor to monitor a state of the connection and at least one of the connection manager and monitor of a first set being different than a corresponding at least one of the connection manager and monitor of a second set (see col. 4 lines 54-58, note the fault monitor); and a system manager operable to determine a type and/or origin of network card (see col. 4 lines 20-24, note the checking for the type) and select and cause execution of the corresponding connection manager and monitor set to set up a connection with the network corresponding to the determined type and/or origin of network card (see col. 4 lines 39-43, note the diagnostic services).

Referring to claims 3 and 12, Chou (as discussed in the lack of novelty of claims 1 and 10 above, respectively) discloses wherein the system manager determines the type and/or origin of network card by obtaining, from the selected network card, a cad vendor code and product identifier and wherein a selected slot can interchangeably receive cards of a number of different types and/or origins (see col. 4 lines 28 – 36, note the specification and model).

Referring to claims 4 and 13, Chou discloses wherein a plurality of data collection and transmission systems are located on board a plurality of vehicles, wherein the at least one sensor comprises a GPS module (see col. 2 lines 40-43, note the GPS module), wherein a remotely located data processing system receives the collected information via the network, wherein the processing system generates a spatial map comprising a plurality of icons showing the physical locations of each of the plurality of vehicles (see col. 9 lines 48-50, note the visual interface), wherein a color of each icon indicates a state of the associated vehicle, and wherein test information associated with each icon and depicted on and/or accessible through the icon indicates at least one of a direction of travel associated with the vehicle (see col. 3 lines 54-56, note the location sensing), a speed of the associated vehicle, a status of a GPS signal from the GPS module on board the associated vehicle, and a timestamp of a last data update received by the processing system from the data collection and transmission system on the associated vehicle (see col. 5 lines 1-6, note the timestamp).

Referring to claims 5 and 14, Chou discloses wherein the at least one sensor comprises a plurality of sensors, wherein the data collection and transmission system is a modem (see col. 5 lines 1-9, note the collecting), wherein the user interface is a graphical user interface (see col. 9, lines 23-25), the graphical user interface receiving commands and vehicle state information from the user (see col. 5 lines 33-24, note the user interface), presenting collected information to the user, and presenting operator instructions received from a remotely located server, to the vehicle user, (see col. 4 lines 47-50, note the description reported to the user) and wherein the system manager translates digital signals received from each sensor into a form determined by sensor type (see col. 4 lines 27-30, note the translation) and packetizes and forwards the translated and packetized digital signals to a remotely located server (see col. 5 lines 5-11, note the connection between server and vehicle), each of the packets comprising a data-type identifier and an identifier of at least one of the sending modem and a vehicle on which the sending modem is positioned (see col. 7 lines 36-40, note the data stream and coordinates that are sent).

Referring to claims 6 and 15, Chou discloses wherein the connection monitor is operable to determine if a state of a connection with a network and, when the connection is down and/or a state of health of the connection is unacceptable, reset the corresponding selected network card to reestablish the connection (see col. 9 lines 35-39, note the health checkup).

Referring to claims 7 and 16, Chou (as discussed in the lack of novelty of claims 6 and 15 above, respectively) discloses wherein the connection monitor resets the selected card by attempting a soft reset of the card (see col. 1 lines 42-53, note the communication unit); when the soft reset is unsuccessful, terminating a communication initiation application; and, after the communication initiation application is terminated, again attempting a soft reset of the card (see col. 6 lines 12-14).

(Cont. in Supplemental Box)

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US07/62751

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.
Continuation of:
Box No. V
2. Citations and explanations:

Referring to claims 7 and 16, Chou (as discussed in the lack of novelty of claims 6 and 15 above, respectively) discloses wherein the connection monitor resets tile selected card by attempting a soft reset of the card (see col. 1 lines 42-53, note the communication unit); when the soft reset is unsuccessful, terminating a communication initiation application; and, after the communication initiation application is terminated, again attempting a soft reset of the card (see col. 6 lines 12-14).

Claims 19-21 lack novelty under PCT Article 33(2) as being anticipated by Oesterling (US 2004/0203436 A1).

Referring to claim 19, Oesterling discloses a data collection and transmission method, comprising: collecting information regarding vehicle state and/or vehicle occupants (see par. 0017 note the vehicle and transmitting communications); establishing a first connection with a first network to transmit at least some of the collected information to a remote server via that network (see par. 0021 note the connection); thereafter determining at least one of a status and least one of the first connection; when the first connection is at least one of down and unhealthy (see par. 0030, note the quality measurements), requesting the removal of power to a selected wireless card positioned in a slot (see par. 0033, note the request); when the request is denied, terminating execution of a communication initiation application (see par. 0034); and after terminating execution of the communication initiation application, again requesting the removal of power to the selected wireless card (see par. 0033, note the request).

Referring to claim 20, Oesterling discloses further comprising: thereafter establishing a second connection with the first network and/or a second network (see par. 0022, note the connection).

Referring to claim 21, Oesterling discloses wherein the slot is configured to receive cards of multiple network and further comprising: determining a type and/or origin of the first network card (see par. 0027); and selecting, for the first network card and based on the determined type and/or origin, a set of a collection manager and a connection monitor from among a plurality of sets of connection managers and monitors corresponding to different types and/or origins of network cards (see par. 0029, note the monitoring), wherein the connection manager interacts with the corresponding network card in establishing a connection with the corresponding wireless network and the connection monitor monitors a state of the connection (see par. 0031, note level of radio service) and at least one of the connection managers of a first set being different than a corresponding at least one of the connection managers of a second set (see par. 0025, note the radio receivers).

Claims 2 and 11 lack an inventive step under PCT Article 33(3) as being obvious over Chou in view of Kaman (US 5,844,473 A).

Referring to claims 2 and 11, Chou (as discussed in the lack of novelty of claims 1 and 10 above, respectively) is silent on wherein the system is located in a vehicle, wherein the at least one sensor comprises a plurality of sensors, and wherein the plurality of sensors collect a plurality of the following information vehicle speed, vehicle acceleration, engine revolutions per- minute, engine temperature, engine oil pressure, fuel level, battery amperage, battery voltage, odometer setting, tire pressure, mileage per gallon, other onboard warning systems and sensors, weather conditions, road conditions, physical location, black position, black orientation, mixture and amount of material being applied to a selected surface, revolutions per minute of missing vessel, pumping pressure, video image of the vehicle's exterior environment, video image of the vehicles' interior, and airborne chemicals or particulates, radiation levels, friction measures, thermal and/ or infrared imaging, credit card receipts, passes, driver identifications, bar codes, receipts, remote databases, instructions, job tickets, directions and other information which can be displayed, sensed and/or input, manually or on an automated basis. However, in disclosing a vehicle data collection unit, Kaman teaches wherein the system is located in a vehicle, wherein the at least one sensor comprises a plurality of sensors, and wherein the plurality of sensors collect a plurality of the following information (see col. 2 lines 34-37; note the collection unit) vehicle speed, vehicle acceleration, engine revolutions per- minute, engine temperature, engine oil pressure, fuel level, battery amperage, battery voltage, odometer setting, tire pressure, mileage per gallon, other onboard warning systems and sensors, weather conditions, road conditions, physical location, black position, black orientation, mixture and amount of material being applied to a selected surface, revolutions per minute of missing vessel, pumping pressure, video image of the vehicle's exterior environment, video image of the vehicles' interior, and airborne chemicals or particulates, radiation levels, friction measures, thermal and/or infrared imaging, credit card receipts, passes, driver identifications, bar codes, receipts, remote databases, instructions, job tickets, directions and other information which can be displayed, sensed and/or input, manually or on an automated basis (see col. 6 lines 28-39; note the multiple sensors, including engine oil and battery sensors). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to include the system is located in a vehicle, wherein the at least one sensor comprises a plurality of sensors, and wherein the plurality of sensors collect a plurality of the following information vehicle speed, vehicle acceleration, engine revolutions per- minute, engine temperature, engine oil pressure, fuel level, battery amperage, battery voltage, odometer setting, tire pressure, mileage per gallon, other onboard warning systems and sensors, weather conditions, road conditions, physical location, black position, black orientation, mixture and amount of material being applied to a selected surface, revolutions per minute of missing vessel, pumping pressure, video image of the vehicle's exterior environment, video image of the vehicles' interior, and airborne chemicals or particulates, radiation levels, friction measures, thermal and/or infrared imaging, credit card receipts, passes, driver identifications, bar codes, receipts, remote databases, instructions, job tickets, directions and other information which can be displayed, sensed and/or input, manually or on an automated basis in the invention of Chou as taught by Kaman in order to record vehicle data in order to schedule maintenance operations based on the collected data (see Kaman col. 1 lines 36-50).

(Cont. in Next Supplemental Box)

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US07/62751

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.
Continuation of:
Previous Supplemental Box:

Claims 8-9 and 17-18 lack an inventive step under PCT Article 33(3) as being obvious over Chou in view of Oesterling.

Referring to claims 8 and 17, Chou (as discussed in the lack of novelty of claim 1 and 10 above, respectively) is silent on wherein the connection monitor is operable to terminate a connection when at least one of the following is true: a. a received signal strength for the connection is less than a selected threshold; and b. a Quality of Service parameter is less than a selected threshold. However, in disclosing a radio-frequency signal strength at a mobile vehicle, Oesterling teaches wherein the connection monitor is operable to terminate a connection when at least one of the following is true: a. a received signal strength for the connection is less than a selected threshold (see par. 0032, note the signal strength threshold); and b. a Quality of Service parameter is less than a selected threshold (see par. 0031, note the quality of service). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to include wherein the connection monitor is operable to terminate a connection when at least one of the following is true: a. a received signal strength for the connection is less than a selected threshold; and b. a Quality of Service parameter is less than a selected threshold in the invention of Chou as taught by Oesterling in order to detect areas of low or poor radio reception in a cost effective manner (see par. 0005).

Referring to claims 9 and 18, Chou (as discussed in the lack of inventive step of claim 8 and 17 above, respectively) is silent on when the at least one of (a) and (b) is true, the system manager attempts to establish a second connection with another network. However, in disclosing a radio-frequency signal strength at a mobile vehicle, Oesterling teaches when the at least one of (a) and (b) is true, the system manager attempts to establish a second connection with another network (see par. 0022, note the connection). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to include when the at least one of (a) and (b) is true, the system manager attempts to establish a second connection with another network in the invention of Chou as taught by Oesterling in order to facilitate connection to the network in case of poor network reception (see par. 0005).

Claims 1-21 meet the criteria set out in PCT Article 33(4), and thus have industrial applicability because the subject matter claimed can be made or used in industry.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44*bis*)

Applicant's or agent's file reference 5611-1-PCT	**FOR FURTHER ACTION**	See item 4 below
International application No. PCT/US2007/062751	International filing date *(day/month/year)* 23 February 2007 (23.02.2007)	Priority date *(day/month/year)* 27 February 2006 (27.02.2006)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant IWAPI INC.		

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 *bis*.1(a).

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

   In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

☒	Box No. I	Basis of the report
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44*bis*.3(c) and 93*bis*.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44*bis* .2).

	Date of issuance of this report 02 September 2008 (02.09.2008)
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer Yoshiko Kuwahara
Facsimile No. +41 22 338 82 70	e-mail: pt07.pct@wipo.int

Form PCT/IB/373 (January 2004)

Electronic Acknowledgement Receipt

EFS ID:	16676875
Application Number:	13944836
International Application Number:	
Confirmation Number:	3020
Title of Invention:	Maintenance Decision Support System and Method for Vehicular and Roadside Applications
First Named Inventor/Applicant Name:	Christopher J. Rennie
Customer Number:	19152
Filer:	Carl A. Hjort
Filer Authorized By:	
Attorney Docket Number:	5611-1-CIP-5
Receipt Date:	23-AUG-2013
Filing Date:	17-JUL-2013
Time Stamp:	18:34:56
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		9-174p.pdf	9716934 37aabf3ce9f4a438083ce33ce80a60116a53bd5e	yes	174

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	Non Patent Literature	174	174
Warnings:			

Information:					
2		10.pdf	11729358 84e321fa2dd2ab66d283d2eea4727ad7e9af6c2e	yes	176

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Non Patent Literature	134	134
Non Patent Literature	135	139
Non Patent Literature	140	140
Non Patent Literature	141	176

Warnings:	
Information:	
Total Files Size (in bytes):	21446292

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Electronic Acknowledgement Receipt

EFS ID:	16677036
Application Number:	13944836
International Application Number:	
Confirmation Number:	3020
Title of Invention:	Maintenance Decision Support System and Method for Vehicular and Roadside Applications
First Named Inventor/Applicant Name:	Christopher J. Rennie
Customer Number:	19152
Filer:	Carl A. Hjort
Filer Authorized By:	
Attorney Docket Number:	5611-1-CIP-5
Receipt Date:	23-AUG-2013
Filing Date:	17-JUL-2013
Time Stamp:	18:45:50
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
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	Non Patent Literature	11	12
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	Non Patent Literature	97	97
	Non Patent Literature	98	104
	Non Patent Literature	105	105

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Information:					
4		82.pdf	9998723 65651214d80dafbfe8bd8d13b40005b865d4d92d	yes	226

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Non Patent Literature	102	102
Non Patent Literature	103	150
Non Patent Literature	151	194
Non Patent Literature	195	195
Non Patent Literature	196	197
Non Patent Literature	198	198
Non Patent Literature	199	222
Non Patent Literature	223	226

Warnings:	
Information:	
Total Files Size (in bytes):	43245168

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PATENT ASSIGNMENT

Electronic Version v1.1
Stylesheet Version v1.1

SUBMISSION TYPE:	NEW ASSIGNMENT
NATURE OF CONVEYANCE:	ASSIGNMENT

CONVEYING PARTY DATA

Name	Execution Date
Kevin K Groeneweg	02/27/2006
Christopher J Rennie	02/27/2006

RECEIVING PARTY DATA

Name:	Concaten, Inc.
Street Address:	24918 Genesee Trail Road
City:	Golden
State/Country:	COLORADO
Postal Code:	80401

PROPERTY NUMBERS Total: 1

Property Type	Number
Application Number:	13944836

OP $40.00 13944836

CORRESPONDENCE DATA

Fax Number: 3035269959
Correspondence will be sent via US Mail when the fax attempt is unsuccessful.
Phone: 303-725-4365
Email: carl@iwapi.com
Correspondent Name: Carl A. Hjort, III
Address Line 1: 24918 Genesee Trail Road
Address Line 4: Golden, COLORADO 80401

ATTORNEY DOCKET NUMBER:	5611-1-CIP-5
NAME OF SUBMITTER:	Carl A. Hjort, III
Signature:	/CAH/
Date:	08/23/2013

	This document serves as an Oath/Declaration (37 CFR 1.63).

Total Attachments: 7
source=InventorIWAPIConcatenAssign#page1.tif
source=InventorIWAPIConcatenAssign#page2.tif
source=InventorIWAPIConcatenAssign#page3.tif
source=InventorIWAPIConcatenAssign#page4.tif
source=InventorIWAPIConcatenAssign#page5.tif
source=InventorIWAPIConcatenAssign#page6.tif
source=InventorIWAPIConcatenAssign#page7.tif

ASSIGNMENT

WHEREAS, we, Christopher J. Rennie of 3453 Walnut Avenue SW, Seattle, WA 98116 and Kevin K. Groeneweg of 346 S. Lamb Lane, Golden, CO 80401, have invented a certain new and useful invention entitled SMART MODEM DEVICE FOR VEHICULAR AND ROADSIDE APPLICATIONS, for which an application for Letters Patent of the United States has been prepared for filing, said application being identified as Attorney File No. 5611-1 and executed on even date herewith;

NOW THEREFORE, be it known that we, the said inventors, for and in consideration of certain good and valuable consideration, the sufficiency and receipt of which is hereby acknowledged, at the request of the assignee do sell, assign and transfer unto said assignee, IWAPI Inc., Colorado corporation having a place of business at 24918 Genesee Trail Road, Golden, CO 80401, its successors, legal representatives and assigns, the aforesaid application for the territory of the United States of America and all continuation, divisional, continuation-in-part and reissue applications, all patent applications in foreign countries, all applications pursuant to the Patent Cooperation Treaty, and all applications for extension filed or to be filed for the invention, and all Letters Patent, Invention Registrations, Utility Models, Extensions or Reissues and other patent rights, obtained for the invention in the United States or any other country; we also assign any right, title or interest in and to the invention which has not already been transferred to the assignee; we warrant that we have made no assignment of the invention, application or patent therefor to a party other than IWAPI Inc. and we are under no obligation to make any assignment of the invention, application, or patent therefor to any other party; and we further agree to cooperate with the assignee hereunder in the obtaining and sustaining of any and all such Letters Patent and in confirming assignee's exclusive ownership of the invention, but at the expense of said assignee.

The Commissioner of Patents is hereby authorized and requested to issue the Letters Patent solely in accordance with the terms of this Assignment, to IWAPI Inc., its successors, legal representatives and assigns, as the assignee of the entire right, title and interest therein.

IN WITNESS WHEREOF, the parties hereto have executed this Assignment as of the date indicated hereunder.

Date: 27 Feb 2006 By: _____
Christopher J. Rennie

Date: 27 Feb 2006 By: _____
Kevin K. Groeneweg

ASSIGNMENT OF PATENT RIGHTS

IWAPI Inc., a corporation duly organized under and pursuant to the laws of Delaware and having a principal office at 24918 Genesee Trail Rd, Golden, Colorado 80401 (herein referred to as "**ASSIGNOR**"), owned the entire right, title and interest in the patents ("Patents"), and/or the patent applications ("Patent Applications") set forth on the attached schedule, as well as all inventions disclosed in the Patents and Patent Applications (collectively, the "Patent Rights").

WHEREAS, Concaten Inc., a corporation duly organized under and pursuant to the laws of Delaware and having a principal office at 24918 Genesee Trail Rd, Golden, Colorado 80401 (herein referred to as "**ASSIGNEE**"), acquired, on or about May 7, 2010, the entire right, title, and interest in and to the Patent Rights worldwide;

WHEREAS, Assignor and Assignee desire to memorialize the above assignment of the Patents and Patent Applications for purposes of recording the assignment with the United States Patent and Trademark Office;

NOW, THEREFORE, in consideration of One Dollar ($1.00) and other good and sufficient consideration, the receipt of which is hereby acknowledged, the ASSIGNOR has sold, assigned, transferred and set over, unto the ASSIGNEE, its successors, legal representatives, and assigns the entire right, title, and interest in and to the Patent Rights, the right to file applications claiming priority to any such Patent Rights, and the right to sue for prior infringements of the Patent Rights including the right to recover and retain damages, including provisional or other royalties, the same to be held and enjoyed by the ASSIGNEE, for its own use and behalf and the use and behalf of its successors, legal representatives, and assigns, to the full end of the term or terms for which such Patent Rights may be granted;

ASSIGNOR, in consideration of One Dollar ($1.00) and other good and sufficient consideration, the receipt of which is hereby acknowledged, the ASSIGNOR hereby sells, assigns, transfers, and sets over, unto the ASSIGNEE, its successors, legal representatives, and assigns the entire right, title, and interest in and to any continuations, divisionals, continuation-in-part, reissues, reexaminations, extensions, substitutions, all foreign applications claiming priority to any such Patent Rights, the right to file applications claiming priority to any such Patent Rights, and the right to sue for prior infringements of the foregoing, including the right to recover and retain damages, including provisional or other royalties, the same to be held and enjoyed by the ASSIGNEE, for its own use and behalf and the use and behalf of its successors, legal representatives, and assigns, to the full end of the term or terms for which such Patent Rights may be granted;

At ASSIGNEE'S request and at ASSIGNEE'S sole cost and expense, ASSIGNOR, its successors, legal representatives, and assigns agree to sign all papers and documents, and do all acts reasonably required to be done to perfect and record the assignment contemplated herein.

[SIGNATURES ON FOLLOWING PAGE]

Date: 8/26/10 By: _____

Name: Kevin A. Goodwin
Title: CEO
Company: IWAPI Inc.

Date: 8/26/10 By: _____

Name: Dawn Van Velzen
Title: VP
Company: Concaten Inc.

Attachment 1- Schedule of Patents

Country	Patent Title	Status	App Date	Grant Date	Serial No Patent No
U.S.	Smart Modem Device for Vehicular and Roadside Applications	Issued	2/27/2006	4/8/2008	7,355,509
U.S.	Smart Modem Device for Vehicular and Roadside Applications	Issued	3/11/2008	5/11/2010	7,714,705
U.S.	Smart Modem Device for Vehicular and Roadside Applications	Pending	3/29/2010		12/749,325
PCT	Smart Modem Device for Vehicular and Roadside Applications	Published	2/23/2007		PCT/US07/62751
U.S.	Information Delivery and Maintenance System for Dynamically Generated and Updated Data Pertaining to Road Maintenance Vehicles and Other Related Information	Expired	6/29/2007		60/947,257
U.S.	Information Delivery and Maintenance System for Dynamically Generated and Updated Data Pertaining to Road Maintenance Vehicles and Other Related Information	Pending	6/27/2008		12/147,837
U.S.	Integrated Rail Efficiency & Safety Support System	Expired	1/3/2008		61/018,796

Country	Patent Title	Status	App. Date	Grant Date	Serial No. Patent No.
U.S.	Integrated Rail Efficiency & Safety Support System	Expired	2/22/2008		61/030,822
U.S.	Integrated Rail Efficiency & Safety Support System	Expired	12/23/2008		61/140,539
PCT	Integrated Rail Efficiency & Safety Support System	Published	12/31/2001		PCT/US08/88670
U.S.	Integrated Rail Efficiency & Safety Support System	Pending	12/31/2008		12/347,695
U.S.	Safety and Construction Trailer	Expired	8/25/2004		60/604,257
U.S.	Safety and Construction Trailer	Issued	8/23/2005	8/11/2009	7,572,022
U.S.	Safety and Construction Trailer	Pending	12/31/2008		12/347,458
U.S.	Safety and Construction Trailer	Pending	7/31/2009		12/533,931

Country	Patent Title	Status	App Date	Grant Date	Serial No./ Patent No.
U.S.	Mobile Barrier	Expired	6/13/2008		61/061,567
U.S.	Mobile Barrier	Expired	8/22/2008		61/091,246
U.S.	Mobile Barrier	Expired	12/16/2008		61/122,941
U.S.	Mobile Barrier	Pending	12/31/2008		12/347,467
PCT	Mobile Barrier	Published	12/31/2008		PCT/US08/88668
U.S.	Safety Trailer	Expired	2/27/2009		61/156,319
U.S.	Safety Trailer	Pending	2/26/2010		12/713,822
PCT	Safety Trailer	Published	2/26/2010		PCT/US1-/25613

Country	Patent Title	Status	App Date	Grant Date	Serial No. Patent No.
U.S.	Maintenance Decision Support System and Method	Expired	6/23/2009		61/269,418
U.S.	Maintenance Decision Support System and Method	Pending	6/2/2010		61/350,802
U.S.	Mobile Barrier	Pending	12/7/2009		61/267,335
U.S.	Mobile Barrier	Pending	7/29/2010		61/368,952

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
13/944,836	07/17/2013	2631	730	5611-1-CIP-5	20	2

CONFIRMATION NO. 3020

19152
Concaten, Inc.
24918 Genesee Trail Road
Golden, CO 80401

FILING RECEIPT

OC000000063016759

Date Mailed: 08/07/2013

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Christopher J. Rennie, Seattle, WA;
Kevin K. Groeneweg, Golden, CO;

Applicant(s)

Concaten, Inc., Golden, CO

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a CON of 13/345,480 01/06/2012 PAT 8284037 *
which is a CON of 12/749,325 03/29/2010 PAT 8120473
which is a CON of 12/046,121 03/11/2008 PAT 7714705
which is a CON of 11/363,581 02/27/2006 PAT 7355509
which claims benefit of 60/656,650 02/25/2005
(*)Data provided by applicant is not consistent with PTO records.

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

If Required, Foreign Filing License Granted: 08/02/2013
The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 13/944,836**
Projected Publication Date: 11/14/2013
Non-Publication Request: No

Early Publication Request: No
**** SMALL ENTITY ****
Title

Maintenance Decision Support System and Method for Vehicular and Roadside Applications

Preliminary Class

375

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit http://www.SelectUSA.gov or call +1-202-482-6800.

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 13/944,836

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	70		N/A	
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	300		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	360		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	20 minus 20 =	*	x 40 =	0.00	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	2 minus 3 =	*	x 210 =	0.00			
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			0.00			
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0.00			
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	730		TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

PTO/AIA/14 (03-13)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	5611-1-CIP-5
	Application Number	
Title of Invention	Maintenance Decision Support System and Method for Vehicular and Roadside Applications	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Christopher	J.	Rennie	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

City	Seattle	State/Province	WA	Country of Residence i	US

Mailing Address of Inventor:

Address 1	3453 Walnut Ave. SW		
Address 2			
City	Seattle	State/Province	WA
Postal Code	98116	Country i	US

Inventor 2 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Kevin	K.	Groeneweg	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

City	Golden	State/Province	CO	Country of Residence i	US

Mailing Address of Inventor:

Address 1	24918 Genesee Trail Road		
Address 2			
City	Golden	State/Province	CO
Postal Code	80401	Country i	US

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

PTO/AIA/14 (03-13)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	5611-1-CIP-5
	Application Number	
Title of Invention	Maintenance Decision Support System and Method for Vehicular and Roadside Applications	

☐ **An Address is being provided for the correspondence Information of this application.**			
Customer Number	19152		
Email Address		Add Email	Remove Email

Application Information:

Title of the Invention	Maintenance Decision Support System and Method for Vehicular and Roadside Applications		
Attorney Docket Number	5611-1-CIP-5	**Small Entity Status Claimed**	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	14	**Suggested Figure for Publication (if any)**	

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	◉ Customer Number	○ US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	19152		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
13616412	Continuation of	13345480	2013-01-06
Prior Application Status	Patented		Remove

PTO/AIA/14 (03-13)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	5611-1-CIP-5
	Application Number	
Title of Invention	Maintenance Decision Support System and Method for Vehicular and Roadside Applications	

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
13345480	Continuation of	12749325	2010-03-29	8284037	2012-10-09
Prior Application Status	Patented			Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
12749325	Continuation of	12046121	2008-03-11	8120473	2012-02-21
Prior Application Status	Patented			Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
12046121	Continuation of	11363581	2006-02-27	7714705	2010-05-11
Prior Application Status	Patented			Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
11363581	non provisional of	60656650	2005-02-25	7355509	2008-04-08
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button.				Add	

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(d). When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX) [i]the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(h)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Remove

Application Number	Country [i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button. Add

PTO/AIA/14 (03-13)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	5611-1-CIP-5
	Application Number	
Title of Invention	Maintenance Decision Support System and Method for Vehicular and Roadside Applications	

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Authorization to Permit Access:

☐ Authorization to Permit Access to the Instant Application by the Participating Offices

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	5611-1-CIP-5
	Application Number	
Title of Invention	Maintenance Decision Support System and Method for Vehicular and Roadside Applications	

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Maintenance Decision Support System and Method for Vehicular and Roadside Applications

CROSS REFERENCE TO RELATED APPLICATION

The present application is a continuation-in-part of U.S. Application Serial No. 13/616,412, filed September 14, 2012, which is a continuation of U.S. Application Serial No. 13/345,480, filed January 6, 2012, which is a continuation of U.S. Application Ser. No. 12/749,325, filed March 29, 2010, which is a continuation of U.S. Application Ser. No. 12/046,121, filed March 11, 2008, which is a continuation of U.S. Application Ser. No. 11/363,581, filed February 27, 2006, which claims the benefits of U.S. Provisional Application Ser. No. 60/656,650, filed February 25, 2005, having the same title, all of which are incorporated herein by this reference.

FIELD OF THE INVENTION

The invention relates generally to modems used in stationary and mobile applications and particularly to intelligent modems for collecting selected vehicular information.

BACKGROUND OF THE INVENTION

Modems today have changed little in the last 25 years. Typical modems offer little if any processing power and can only be used with a given technology, network or connection. The processing power, if any, is typically limited and of little practical use in many applications today. Such modems do not support full operating systems, and offer the user limited, if any, programming flexibility. Changes as simple as network password changes have required the modems to be uninstalled and sent to the manufacture for reprovisioning. Such modems are not SOAP XML Web Services compatible and cannot take data from a given data source and convert and send it in the now common XML format. They also are not modular--if any given component fails, if there is a change in communications carriers, or if a given communication carrier phases out one technology and migrates to another (as with the migration by the former ATT Wireless from CDPD to GPRS), the modem typically has to be replaced--they are not

modular in nature and given components cannot be easily and cheaply replaced. These limitations become especially acute and cost prohibitive in telemetric and other applications where the modem must operate without manual intervention and/or in series with other equipment which has no or limited processing power (i.e. other "dumb" devices). For whatever the reason, not the least of which is pricing pressures, much of the equipment used for example in industry, security, telemetric, and intelligent transportation systems, carry little onboard processing power and/or require a separate laptop or other computer to operate, download and/or forward the applicable information. The addition of such laptops and other external computers is generally either impractical (such as in unmanned and roadside applications) or cost prohibitive (generally doubling or more the cost of the modem itself). Furthermore, any given user may need connectivity for equipment located in different carrier service areas and/or with different types of connections (e.g. different wireless carriers, network connections, fiber connections, etc) and multiple types of data sources and inputs (multiple serial and USB inputs, as well as potentially video, sound, etc.). For national and international applications, and even applications on statewide and local levels, flexibility in communication options and data collection options is important, as is the ability of the user to program the modem, add network security, store and forward data, and transfer the information in XML format via SOAP XML Web Services and/or such other format as their systems require. The ability to receive and process dynamic instructions is also important but often missing or severely limited, and traditional modems do not enable the type of remote access and upgrades (complete operating systems and applications) that are necessary to collect data and/or communicate with disparate equipment in use today and newer equipment ever being developed and deployed.

Associated security measures further punctuate the need for greater flexibility and power in the modems. For example, dynamic IP addresses are being deployed in many contexts including by wireless commercial carriers in their 3G and beyond wireless data services. Dynamic IP's present a significant departure from the static IP's associated with historic poling practices and wireless CDPD functionality which had been the mainstay of wireless data collection prior to the advent of 3G functionality. Again, the ability to add intelligence to the modem, and to enable greater programming and application support

becomes important to enable the otherwise "dumb" devices to return their new IP addresses and thus facilitate remote access and/or to transmit data and information back on an automated push (instead of pull) basis. Therefore, a need exists for a more powerful and flexible modem device that can be more easily programmed, that carries greater processing and storage capabilities, that can take various data feeds, that does not require a separate laptop or other computer to function, and that can readily and interchangeably work with a variety of communication connections and options. A tremendous need exists for a new modem device with sufficient flexibility and power to be used with relative ease in the various situations.

SUMMARY OF THE INVENTION

These and other needs are addressed by the various embodiments and configurations of the present invention. The present invention is directed generally to collecting selected types of information in vehicular and roadside applications and transmitting at least some of the collected information to a remote server.

In a first embodiment of the invention, a data collection and transmission method is provided that includes the steps:

(a) a sensor and/or user interface collecting information regarding vehicle state and/or vehicle occupants;

(b) a slot receiving a selected private or public network card (or a commercial carrier or otherwise), the slot being configured to receive cards for multiple networks;

(c) determining a type (e.g., product identifier) and/or origin (e.g., vendor code) of the selected network card; and

(d) selecting, for the selected network card and based on the determined type and/or origin, a set of a connection manager and a connection monitor from among a number of sets of connection managers and monitors corresponding to different types and/or origins of network cards. The connection manager interacts with the corresponding network card in establishing a connection with the corresponding

wireless network, and the connection monitor monitors a state of the connection. The connection manager and/or monitor of a first set is different from a respective connection manager and/or monitor of a second set.

In another embodiment, a data collection and transmission method is provided that includes the steps:

(a) collecting information regarding vehicle state and/or vehicle occupants;

(b) establishing a first connection with a first network to transmit collected information to a remote server via that network;

(c) thereafter determining a status and/or health of the first connection;

(d) when the first connection is down and/or unhealthy, requesting the removal of power to a selected wireless card positioned in a slot;

(e) when the request is denied, terminating execution of a communication initiation application; and

(f) after terminating execution of the communication initiation application, again requesting the removal of power to the selected wireless card.

The present invention can provide a number of advantages depending on the particular configuration. For example, the invention can provide a powerful and flexible, hardened modem that, among other things, utilizes advances from the programming and computing component industries to create a modular modem that users can much more easily program and integrate into their networks, and which can be used interchangeably in fixed and mobile applications with a variety of data and communication alternatives.

A number of developments enable the advance in modem functionality, flexibility, modularity and capabilities, including:

(1) better and cheaper components which can be borrowed form other the computing and other industries (e.g., cheaper, faster and more efficient processors and mainboards, and off the shelf items such

as RAM, high capacity CF and/or HDD disks, wireless connection cards and other advances in communications equipment and functionality);

(2) a need for new, easier and more flexible programming, including support for full operating systems, applications and common languages; and

(3) a need for more connections and ports for much greater communication and data options and flexibility.

These and other advantages will be apparent from the disclosure of the invention(s) contained herein.

As used herein, "at least one", "one or more", and "and/or" are open-ended expressions that are both conjunctive and disjunctive in operation. For example, each of the expressions "at least one of A, B and C", "at least one of A, B, or C", "one or more of A, B, and C", "one or more of A, B, or C" and "A, B, and/or C" means A alone, B alone, C alone, A and B together, A and C together, B and C together, or A, B and C together.

The above-described embodiments and configurations are neither complete nor exhaustive. As will be appreciated, other embodiments of the invention are possible utilizing, alone or in combination, one or more of the features set forth above or described in detail below.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention can be more readily understood in conjunction with the accompanying drawings, in which:

FIG. 1 is the exterior of the Smart Modem Device or SMD case showing the primary rear connection ports (in standard AC power connection) according to an embodiment of the present invention;

FIG. 2 is the exterior of the case of FIG. 1 showing the front face and additional ports there located;

FIG. 3 shows the interior of the SMD with the cover removed (including DC module with voltage regulator and sequencer for automotive applications) according to an embodiment of the present invention;

FIG. 4 shows the interior of the SMD with the cover and top plate removed (including DC module with voltage regulator and sequencer for automotive applications) according to an embodiment of the present invention;

FIG. 5 shows the interior of the SMD with the cover, top plate and mainboard removed (in standard AC power configuration as in FIG. 1 above) according to an embodiment of the present invention;

FIG. 6 shows SMD as used in roadside application (using AC power and PCMCIA connection card specially modified for an external antenna) according to an embodiment of the present invention;

FIG. 7 is a block diagram depicting a network architecture according to an embodiment of the present invention;

FIG. 8 is a block diagram depicting a network architecture according to an embodiment of the present invention;

FIG. 9 is a block diagram depicting a network architecture according to an embodiment of the present invention;

FIG. 10 is a block diagram of the components of a modem system according to an embodiment of the present invention;

FIG. 11 is a flowchart depicting an operational mode of the modem system according to an embodiment of the present invention;

FIG. 12 is a flowchart depicting an operational mode of the modem system according to an embodiment of the present invention;

FIG. 13 is a set of data structures according to an embodiment of the present invention;

FIG. 14 depicts a map according to an embodiment of the present invention;

FIG. 15 depicts a snowplow according to an embodiment of the present invention; and

FIG. 16 depicts a block diagram of the components of a data collection system according to an embodiment of the present invention.

DETAILED DESCRIPTION

System Overview

In one embodiment, the smart modem system collects and transmits selected output information regarding a vehicle state and/or its occupant(s) and/or receives selected input information for use by the vehicle and/or its operator. "Vehicle state" refers to a condition, function, location, or operation of a vehicle or a component or accessory thereof. As shown in FIG. 7, first, second, . . . nth smart modem systems 700a-n are incorporated in a first, second, . . . nth vehicles 704a-n. Each of the smart modem systems is in communication with a wireless public or private network 708. The wireless network 708 is, in turn, in communication with an enterprise Local Area Network or LAN 710 that includes a firewall 712, first, second, . . . mth servers 716a-m and first, second, . . . mth databases 720a-m. The modem systems collect selected types of information and continually or periodically forward the information, via the network 708, to the enterprise network 710 for storage and processing. The stored and processed information can be accessed locally and directly by clients, such as PCs and laptops, internal to the enterprise network 710 or remotely by clients external to the enterprise network. The stored information is typically indexed by a unique SMD device name and corresponding vehicle name pairing. As will be appreciated, the multiple databases 720 a-m need not have a one-to-one correspondence with the servers 716 a-m, but may include more or fewer databases.

The vehicles can be motorized, such as commercial or private trucks and cars, or unmotorized, such as trailers (e.g., refrigerated trailers). Preferably, the vehicles have an on-board power source that is capable of powering the modem system and its peripheral devices, such as sensors. In one configuration, the vehicles are snowplows operated by a governmental entity (such as a municipality, city, county or state), concrete mixers, concrete pumpers, refrigerated trailers, semi trucks, busses, dump trucks, garbage trucks, delivery vehicles, maintenance vehicles, emergency vehicles, and the like.

The wireless network 708 can be any type of wireless service and/or air interface, such as Advanced Mobile Telephone Service or AMPS, Digital Advanced Mobile Telephone Service or D-AMPS, Digital Communication Service or DCS1800, Global System for Mobile Communications/General Packet Radio Service or GSM/GPSR, North American Digital Cellular, Personal Communications Services, Personal Digital Cellular, Total Access Communication System, High Speed Downlink Packet Access or HSDPA, Enhanced Data GSM Environment or EDGE, 1xRTT CDMA, CDMA2000, Evolution Data Optimized or EVDO, Digital Enhanced Network or iDEN, Specialized Mobile Radio or SMR, 802.11x, WiMAX or 802.16, and other public and private networks, with Frequency Division Multiple Access or FDMA, Time Division Multiple Access or TDMA, Code Division Multiple Access or CDMA, Cellular Digital Packet Data or CDPD, Wideband CDMA or WCDMA/UMTS, or others. The public or private network 708 can be either landline or wireless. Wireless networks can be operated by one or more private or public networks, including carriers, such as Sprint.TM., Nextel.TM., Verizon.TM., Cingular.TM., Alltel.TM., Western Wireless.TM., AT&T Wireless.TM., Unicell.TM., Westlink.TM. and others, as well as affiliates thereof. Bandwidth and/or transmission speeds, and/or the frequency and method of data transmissions, may be intentionally limited (by setting appropriate modem parameters) to qualify for favorable telemetry rates.

The information collected 1612 (FIG. 16) by the modem system 1600 (FIG. 16) can vary depending on the application. The information 1612 can include vehicle speed, vehicle acceleration, engine revolutions-per-minute, engine temperature, engine oil pressure, fuel level, battery amperage, battery voltage, odometer setting, tire pressure, mileage per gallon, other onboard warning systems and sensors, weather conditions (such as temperature, humidity, wind speed and direction, wind chill, raining, snowing, blowing snow, foggy, clear, overcast, etc.), road conditions (e.g., icy, slushy, snow-packed, frosty, wet, dry, etc.), physical location 1620 (FIG. 16) (e.g., Global Positioning System or GPS-based location), snow plow 1504 (FIG. 15)setting (e.g., snowplow position and orientation such as plow 1504 up or down and angle relative to the truck longitudinal axis), mixture and amount of material being applied by spreader 1508 to a selected surface (e.g., salt level, sand level, magnesium sulfate level, other

chemicals or materials, and combinations thereof), revolutions-per-minute of concrete mixing vessels, pumping pressure of concrete, video images of the vehicle's exterior environment or the vehicles' interior or exterior, audio of the vehicle's interior, airborne chemicals or particulates, radiation levels, friction measures, thermal and/or infrared imaging, credit card receipts, passes, driver identifications, bar codes, receipts, remote databases, instructions, job tickets, and directions and other information which can be displayed, sensed and/or input, manually or on an automated basis.

The information is typically converted into a selected form, packetized, and transmitted over the wireless network. The form of the information can be in accordance with any selected language, such as the eXtensible Markup Language or XML, the HyperText Markup Language or HTML, Remote Method Invocation or RMI, or Direct Socket Connections. The packets can be transported using any suitable protocol, such as the Transport Control Protocol/Internet Protocol suite of protocols, Simple Object Access Protocol, or User Datagram Protocol.

The enterprise network 710 can perform a variety of data processing functions. The network 710, for example, can compare information or a given sensed parameter to identify temporal trends or differences and, if necessary, generate appropriate alarms. The alarms can be logged internally and/or forwarded to the respective vehicle via the modem system. The vehicle operator and/or automated components thereof can then take appropriate remedial action to address the cause of the alarm. It can prepare selected reports on the information. It can log events. The enterprise network 710 can also provide communications to the modem system 1600. The communications can, for example, provide instructions 1624 to the vehicle operator, such as vehicle and/or ancillary device operation and dispatch commands, and/or to automated components of the vehicle itself to remotely control selected vehicle operations.

In one configuration, the data processing can provide a spatial map 1400 (FIG. 14) showing vehicle locations, vehicle operations, and other state information. For example and with reference to FIG. 14, the map 1400 can depict the location of each of a number of snowplow trucks 1500 (FIG. 15) using an icon 1404a-d denoting each truck. The icon 1404 color can be varied to indicate differing vehicle states.

For example, the color green indicates that the truck 1500 is active and working (e.g., blade down and/or spreading deicing materials), yellow that the truck 1500 is active but not working snow (e.g., not blading or spreading materials), red that the truck 1500 is stopped, and gray that the truck 1500 is off or out of range for at least a selected period of time. Text information 1408a-d can be depicted on the map adjacent to or associated with each icon 1404. The text information 1408 can describe selected state information associated with the truck 1500, such as a truck identifier 1412, direction of travel 1416, speed 1420, status of GPS signal 1424, and timestamp 1428 of last data update for the identified truck. The map 1400 can also depict, for a selected vehicle, a trace route over a selected period of time. A trace route indicates the path of travel of the vehicle over the selected time period.

FIG. 8 depicts an architecture according to another embodiment of the present invention. The architecture includes a first vehicle 800a including a first modem system 804a in communication with a first wireless network 808a, a second vehicle 800b including a second modem system 804b in communication with a second wireless network 808b, . . . and an nth vehicle 800n including an nth modem system 804n in communication with an nth wireless network 808n. Each network is typically operated separately by different entities or carriers. The vehicles are commonly operated by different business entities (e.g., are owned and operated by different companies). The first, second, . . . nth networks 808a-n are in turn in communication with a third party enterprise network 812, which provides contractual (fee-based) data storage and optionally processing services. The enterprise network 812 includes a LAN 816 interconnecting a firewall 820, a server farm or cluster of first, second, . . . nth servers 824a-n and one or a number of databases 828a-n. Each of the databases 828a-n is configured for a specific business entity operating one or more vehicles. In one configuration, the databases are replaced by a single database partitioned for each of the business entities. In any event, the information collected by the various modem systems is stored in the respective database or database partition. Data processing software customized for each entity can be resident in the enterprise network 812. Representatives of the independent entities can access, from a remote client, the data for which it has authorization, such as a PC or laptop.

In the above embodiments, the modem systems commonly include a smart modem device and peripherals thereof, such as a video monitor (e.g., a touchscreen), external GPS and connection antenna, and wired or wireless connections to internal vehicular components.

Smart Modem Device

In contrast to prior art in the field, the present invention can provide a powerful and flexible, hardened modem that, among other things, utilizes advances from the programming and computing component industries to create a modular modem that its users can much more easily program and integrate into new or existing networks, and which can be used interchangeably in fixed and mobile applications with a variety of data and communication alternatives.

This smart modem device (sometimes referred to "smart modem" or "smart device"--or "SMD" for short) can be built around ultra-compact and highly integrated mainboards and modern components originally developed in the computing, programming and other industries, including embedded high performance, low heat, ultra low power processors, replaceable RAM and Compact Flash (CF) memory, and various internal and external ports that can be used for communications and the transmission and/or receipt of information. Various modular options can also be added and incorporated at manufacture or in aftermarket, including additional memory, enhanced video cards, additional connections and inputs, additional memory, etc.

The SMD can incorporate full programming language support and be fully user programmable in various common languages such as Perl, Java, C variants, .NET and others. This programming flexibility can be used both for purposes of setting up and directing the transfer or receipt of data and information, as well as for the processing thereof, if and to the extent such field processing and/or translations are required in the field. In addition to interfacing in traditional standards such as ASCII, HEX and other formats, the SMD is fully SOAP XML Web Services compatible. In addition to the communications elements of the modem, users can run Linux, Microsoft and other programs to provide additional desired utility and functionality, such as for taking MPEG 4 or other video from the field, running applications

and peripheral services in the mobile or field environment, without the need for separate equipment such as laptops, computers or processors. The SMD can provide flexible modem functionality on a stand-alone basis. The SMD can be remotely access, upgraded and/or reconfigured if and as so necessary.

The SMD can anticipate and provide for interchangeable and upgradeable communications and data options through PCMCIA, CF, RJ-45, RS-232, USB and other connections. Wireless services, for example, can be used on one network in one part of a state, and on another network in another part of the state, with the simple interchange of a connection card in the PCMCIA (cardbus) in the back of the device, and a corresponding change in drivers for the new network and card. Other devices can be as easily changed to operate on network connections, fiber connections, wireless Ethernet connections and other alternatives. Such conversions, as well as simply the replacement of a damaged card or component, can be done at the nominal cost of that given card or component, rather than the replacement of the entire device.

The SMD can provide a powerful and flexible, hardened modem that, among other things, utilizes advances from the programming and computing component industries to create a modular modem that users can much more easily program and integrate into new networks, and which can be used interchangeably in fixed and mobile applications with a variety of data and communication alternatives. The flexibility, power and integrated modularity marry hardware and programming to provide a truly synergistic advance in the state of the art in modem technology, and associated applications of telemetry, data collection and communications. Without repeating what has already been said above (and incorporated herein), the device is below presented in its various component pieces. The modem preferably has a modular design, including both the hardware and software, as well as the interchangeable external components, including without limitation the various COM and data options with which it works (e.g., connection cards, land lines, GPS units, cameras and the various vehicles and field devices to which it is attached). Significantly, if any given component is damaged or destroyed, or otherwise made obsolete by advances in science and technology, such components can generally be replaced and upgraded for nominal cost and the device redeployed. The entire unit does not have to be replaced, and maintenance

and repairs for individual units (or planned groups of units) replace broad and expensive capital replacement programs as communication carriers migrate to ever new and improved communications options and services, or clients migrate to private or other public networks. Commercial connection cards for example can be swapped out, one for another, and often at no net upfront cost (after activation credit), by simply popping out the old PCMCIA card and popping in the new with the new connection driver. Mainboards can be replaced in nominal time and at low cost. Memory can be expanded for many GBs of additional storage at low cost. The device can be completely reprovisioned for use with new cameras or other equipment by simply downloading new files (remotely or on-site) or swapping out the internal CF for a new disk. Historic problems of replacing entire devices and incurring thousands (sometimes millions) of dollars of capital upgrade costs has been broken down and replaced with a more practical use and marriage of more sophisticated and flexible components from the fields of hardware, software and general design.

The following provides a more detailed discussion of the various components advantages, features and objects of the SMD.

Case size is currently primarily a size of the existing components and a trade-off in costs. Bigger becomes impractical. Smaller currently gets disproportionately expensive. With current component sizes and price points, we typically use cases such as the 2.5".times.8".times.10" Morex #3688 steel case 1 featured in the accompanying photos. It is anticipated that smaller cases will be usable as ever smaller components become more price competitive. While smaller cases can be used, a larger case can provide a bit extra room to work with, dissipate heat, add additional internal components when and as desired (e.g. additional internal memory 25 & 29), and yet is small enough to be collocated with other equipment in even larger or more protective cases such as NEMA 4 and other environmentally protective cases such as the roadside box shown in FIG. 6. Internally, the tray is modified to mount the internal CF 27a, 27b and 27c, the DC voltage regulator and sequencer for automotive applications 25 (if not otherwise incorporated directly into the power supply 42), and other items.

All Figures show the 2.5".times.8".times.10" Morex case configuration, though other cases can also be used. Any suitable case that can accommodate the following components can be used. FIGS. 3 and 4 show the embedded system in the case with integrated VIA mainboard and 1 GHz processor, 2 GB compact flash for programming and data storage, 256 MB of heat shielded RAM, and an ITPS DC module with voltage regulator and sequencer as used for automotive applications. Other mainboards and components could be substituted.

The SMD is designed for both fixed and mobile applications. AC/DC power is typically incorporated. Such power supplies are generally sourced from the applicable case manufacturer, as the Morex Procase power board shown in the accompanying photos 42, but any reliable power supply will do. A voltage regulator should be used with the power board for mobile applications. A combination regulator and sequencer is either incorporated into the power board 42 or separately collocated such as the ITSP regulator and sequencer from Mini-Box 25 is typically incorporated to provide key on/off functionality with delayed power-off for an orderly initiation of the shut-down of the device and whatever functionality is then active.

Any small form factor mainboard with appropriate connections can be used, such as the VIA MII mainboard shown in the accompanying FIGS. 1, 3 and 4, and items 2-10, 30, 35, and 38-39. For data, video and other inputs, connections should be provided for major connection types intended to be used, including currently and without limitation, multiple USB, 1394, RCA and Serial connection options 6, 10, 11, 13 and 39. For communications, connections or slots should be available for, among other things Ethernet, PCMCIA (cardbus) & CF 7, 8, 9 and 39. Multiple IDE slots 35a and 35b, at least one PCI slot 38, and at least one DIMM slot for standard RAM 36 should be included. Typically the mainboards would carry an embedded ultra low power, ultra low heat processor such as a 600 MHz or the 1 GHz VIA C3 37 and support standard RAM 36 of typically 256 MB or more (the VIA mainboard 30 supports up to 1 GB of RAM). It is important that the embedded system use a processor that is low power low heat, or heat buildup can become an issue in the tight enclosures involved in various applications such as shown in FIG. 6. Advance in the computer component industry in these regards, and processors in particular

(with significant advances in processing speeds with such ultra low power, ultra low heat processors as the C3 37) have made this advance in modem technology possible. Future mainboards can be even smaller, carry more or different ports and connections and even faster more efficient processing capabilities. In any event, the mainboard and associated faceplate (2 and 30) are inserted in and affixed to the applicable case. These "new" mainboards are substantially faster, and more modular and flexible, than mainboards found in traditional modems.

Any standard RAM 36 can be used. Typically, 256 MB or more of RAM is incorporated. In the accompanying FIG. 4, we are shown using 256 MB of heat shielded RAM from SuperTalent. The VIA mainboard 30, shown in the examples can support up to 1 GB of RAM. Additional RAM may be supported and used in the future. Such RAM can be used in either typical fashion (as most users use their PC--e.g. where operating files are primarily carried on separate memory such as an HDD drive or in this case CF 27c, and there is an ongoing interaction between the two) or in more specialized ways such as with special optical files or read only memory (ROM) where all operation code (operating files as well as application) are loaded into RAM on boot from the separate storage. In the later case for example, all operable code is bundled into one optical file or ROM, either of which can be loaded into and run from RAM once the device is powered up. Any malicious or accidental attempts to change or damage the operating code have but a temporary impact as the optical file will again and automatically reloaded in original form when the RAM next reads the file, such as on reboot or restart. In such cases, the RAM has to be larger than the combined files (ie. all programming and operating files). A fairly sophisticated application can run in this manner on less than 1 GB of RAM.

CF memory is typically used to get away from moving parts such as in HDD drives, and to provide a more hardened unit. Any CF can be used--the enclosed pictures show a 2 Gb CF card by SanDisk. While avoiding the moving parts of an HDD, the CF provides many of the benefit of solid state circuitry but with substantially more flexibility in terms of programmability and ease of use. An IDE to CF adaptor board 27b and shortened IDE cable 34 is used to integrate the CF memory with the mainboard 30 and associated functionality. Where, as with the VIA mainboard 30, an additional IDE slot is available,

additional internal CF or HDD storage capacity can be added. Removable external CF memory can also be used in the CF slot provided and accessible from the faceplate 9. If the user prefers, an HDD (typically 20 GB or higher) can be used in lieu of or addition to the internal CF. The SMD can also boot from other memory, including USB sticks, if desired or needed.

The importance of having various COM and data options cannot be overstated, and the SMD specifically provides as much flexibility as technology and available components allow in this regard. The SMD anticipates and provides for interchangeable and upgradeable communications and data options through PCMCIA, CF, RJ-45, RS-232, USB and other connections, e.g 6, 7, 8, 9, 10 and 11. Wireless services, for example, can be used on one network in one part of a state, and on another network in another part of the state, with the simple interchange of a connection card in the PCMCIA (cardbus) 8 in the back of the device, and a corresponding change in drivers for the new network and card. Other SMD's can be as easily changed to operate on network connections, fiber connections, wireless Ethernet connections 7 and other alternatives including dial-up land lines via a PCMCIA card 8. Such conversions, as well as simply the replacement of a damaged card or component, can be done at the nominal cost of that given card or component, rather than the replacement of an entire device, as has been necessary with traditional external modems which operate on only one network and incorporate limited if any processing capabilities.

In the context of PCMCIA and CF connection cards 8 (which themselves are sometimes referred to as NIC cards, modems or aircards), the SMD provides a host environment much like, but much more flexible and powerful than, the external modems which themselves incorporate modules comparable to that in the PCMCIA or CF connection cards but which have but limited processing power and are far less flexible in terms of overall programming, processing or network changes. Such external modems, once so manufactured, are typically only usable on the network for which they were designed. If for example, a user changes carriers, the external modem is of no use or value. If the carrier changes technology (such as CDPD to GPRS), the external modem is of no use or value. Conversely, the SMD allows for the easy and quick upgrade of technology by the change of the PCMCIA card, and/or the quick change to an entirely

different network or even to a fixed connection such as fiber, network, or wireless Ethernet where practical and available.

Programmability provides a new, significantly higher level of modem flexibility and performance. Typical modems offer little if any processing power and can only be used with a given technology, network or connection. The processing power, if any, is typically limited and of little practical use in many applications today. Such modems do not support full operating systems, and offer the user limited if any programming flexibility. Changes as simple as network password changes have required the modems to be uninstalled and sent to the manufacture for reprovisioning. Limitations with existing systems become especially acute and cost prohibitive in telemetric and other applications where the modem must operate without manual intervention and/or in series with other equipment which has no or limited processing power (i.e. other "dumb" devices). For whatever the reason, not the least of which is pricing pressures, much of the equipment used for example in industry, security, telemetric, and intelligent transportation systems, carry little onboard processing power and/or require a separate laptop or other computer to operate, download and/or forward the applicable information. The addition of such laptops and other external computers is generally either impractical (such as in unmanned and roadside applications) or cost prohibitive (generally doubling or more the cost of the modem itself). Furthermore, any given user may need connectivity for equipment located in different network service areas and/or with different types of connections (e.g. different wireless carriers, network connections, fiber connections, etc) and multiple types of data sources and inputs (multiple serial and USB inputs, as well as potentially video, sound, etc.). For national and international applications, and even applications on statewide and local levels, flexibility in communication and data collection options is important, as is the ability the user to program the modem, add network security, store and forward data, and to transfer the information in XML format via SOAP XML Web Services and/or such other format as their systems require.

The SMD incorporates full operating system and programming language support, by virtue of and with appropriate utilization of the above components. The SMD is fully user programmable in various

common languages such as Perl, Java, C variants, .NET and others. This programming flexibility can be used both for purposes of setting up and directing the transfer or receipt of data and information, as well as for the processing thereof, remote access to download or upgrade programming or reach remote sites and equipment, receive and post messages to remote users, enable remote users to interface with the office, the internet or other systems.

The ability of the SMD to receive and process dynamic instructions is beneficial but often missing or severely limited in traditional modems which enable this type of remote access, and cannot even carry full operating systems or common modern applications, let alone take, for example, a remote upgrade of touch screen menus used to collect mobile information or to communicate with a lot of the disparate equipment in use today and newer equipment ever being developed.

The SMD's expanded programmability and more powerful mainboard and components enable the modem to take, process, store and/or forward information as not otherwise possible. Traditional modems typically have been set up to simply establish a connection to forward or allow the polling of given data. Traditional modems were not designed to run today's operating systems or applications, or to really do more than rudimentary tasks. The traditional modem cannot provide the host environment necessary to support the varied drivers and software necessary to support for example the many peripheral devices being integrated today, including without limitation USB cameras, touch screen monitors, weather station components, travel time sensors, mobile sensors and data feeds, etc.

With the SMD, this is possible and more. Operating systems, applications, special or new drivers, etc. all can be loaded, programmed and reprogrammed, and even be remotely accessed and changed if necessary. Peripherals can be added which require associated software to run and operate--software that could not otherwise be loaded on traditional modems by the end user, if at all. Off-the-shelf software, custom applications, legacy interfaces, new interfaces, special security overlays, etc. could not be readily loaded on traditional modems by the end user, if at all. With SMD's, users can load Linux, Microsoft and other systems, programs, drivers, etc. . . . to provide additional desired utility and functionality, or to support the peripheral equipment to which the smart modem device is attached. Applications requiring

field processing, special drivers and/or software, such as for MPEG 4 video, barcode scanners, RFID sensors, work order forms, ERP systems, etc., can be integrated with the smart modem device without the need for separate laptops, computers or processors.

The programmability of the SMD contributes to the flexibility and modularity of the device, and in extending those benefits to the peripheral equipment with which the SMD is connected (eg. camera, gps, weather equipment, monitors, etc. . . . even the communication card or carrier itself). When a given component or peripheral fails or is otherwise replaced, a new component or peripheral (even an entirely different peripheral) can be attached and new drivers and associated software can be easily loaded. If there is a change in communications carriers, or if a given communication carrier phases out one technology and migrates to another (as with the migration by the former ATT Wireless from CDPD to GPRS), only the connection card and drivers need be replaced, not the entire smart modem device.

The above also enables the SMD to be fully SOAP XML Web Services compatible, unlike traditional modems. XML interfaces are becoming increasingly important in networking disparate equipment and systems, reducing network overhead, etc. In addition to interfacing with traditional formats such as ASCII, HEX and others, the SMD can provide full XML interfaces. The SMD, for example, can be easily loaded with JAVA and an associated application to receive data and forward it in XML in a SOAP XML Web Services compatible format. This capability and the ability to adapt and integrate with other and new services and formats will become especially important for deployments over time.

New and ever changing security requirements, changes in network connections and systems, authentication schemes (internal and carrier related), further punctuate the need for the enhanced programmability and capabilities of the SMD. As they evolve, such changes and overlays can be integrated and loaded, and later changed and updated as necessary, with relative ease. The SMD is programmable and reprogrammable. CF cards can be changed in the field to completely reprogram the device. Other security changes can be made by USB stick or remote access. In short, the SMD provides flexibility to grow and adjust with future needs and developments.

FIG. 9 depicts a signal flow diagram, FIG. 15 a snowplow, and FIG. 16 a modem-based system according to an embodiment of the present invention. The modem-based system 1600 comprises one or more network cards 904a-p, each plugged into a corresponding slot (not shown) of the modem or SMD 900, an antenna 906 for duplexed communications with a network, a GPS module 908 and corresponding antenna 912, a plurality of sensors 916a-q, a user interface 920, and the SMD 900.

The network cards 904a-p are provided by a wireless carrier or network administrator, and contain the logic and related parameters required for access to the corresponding network. Although multiple network cards are depicted, it is to be understood that the present invention includes an SMD configuration having only one slot, as shown in the SMD configuration discussed above. Each of the network cards is interchangeably received in each slot. Thus, cards from different networks or different types of cards from the same network can be placed in any of the slots. As will be appreciated, each card normally has an associated unique identifier (for example a ten digit number assigned to the card by the carrier). The card is typically activated by contacting the service provider or network administrator, or by doing an automated activation via an applicable web page.

The GPS module 908 can be any suitable GPS module, including the GPS module discussed previously. Typically, the GPS module forwards digital location signals (e.g., GPRMC NMEA sentences) to the SMD 900. The timing of the signals is typically controlled by the GPS module. A preferred GPS module 908 integrates the antenna 906 and GPS module 908 into a GPS puck positioned on the exterior of the vehicle. The GPS module can be plugged into various available ports on the SMD, including specially created ports such as a special five-pin DIN connection. The GPS module can also be separated from the antenna and collocated inside of the SMD.

The sensors 916 can be of a variety of types and monitor different parameters. The sensors, for example, can include temperature sensors (e.g., for ambient and engine temperatures), pressure gauges (e.g., for oil, fuel pressure, and/or cement pumping pressure), sensors for measuring the revolutions per minute of a motor, engine, or rotating member, speedometers, odometers, compass, and various other wired or wireless sensors and inputs from equipment on or near the vehicle. In one configuration, the

sensors include a still and/or motion video imaging device 1608 to provide still or full motion images to the remote server. In one configuration, the sensors 916 include a microphone to provide audio to the remote server. Analog-to-digital conversion is employed, as needed, to convert analog signals from sensors 916 to digital format.

The user interface 920 can include a variety of devices, such as a keyboard and/or monitor. The monitor is preferably a touchscreen. The monitor can provide the operator with various options to control operations of the vehicle (e.g., pumping speed, plow blade, bucket, or truck bed, mixture of materials to be applied to a surface, rpms of concrete mixer, and the like), provide data input regarding the vehicle state (e.g., snowplow is raised or lowered) or environmental conditions, transmit text messages to the remote server, receive text messages from the remote server, and views of the data transmitted and/or received.

The SMD 900 includes a number of internal logic modules for performing various operations. The connection managers 924a-x configure the SMD 900 as required by the particular network card 904 in the slot or otherwise selected by the user and interacts with the card to establish a communication session with the remote server. The connection monitors 928a-x monitor the health and/or state of the connection and, if the health is unacceptable (e.g., the connection has too much interference or the Quality of Service is unacceptable) or the link used by the connection is down, reestablishes the communication session by setting up another connection. Typically, a set formed by one connection manager and monitor corresponds to each type and/or origin of network card 904 used interchangeably in the slot(s). The system clock 936 is synchronized to a universal time clock and provides internal timing information to control SMD operations and timestamp collected data. The memory 940 is used during normal processing operations and as a buffer for data 1612 collected when the connection with the network is either unhealthy or down. Finally, the system manager 932 oversees operations of the SMD, identifies the types of digital incoming signals (e.g., by sensor 916 type) and, based on the type of incoming signal, translates the digital signals received from the sensors 916 to a selected language or format, packetizes the collected data 1612 with a data-type identifier included in the payload, and applies headers to the packets for

uploading onto the network, handles mail and messaging functions, includes drivers and programming for the user interface, performs remote system maintenance and troubleshooting functions, and other functions.

In one configuration, the manager 932 process multimedia information. For example, the manager 932 uses the following parameters to process video information: the URI address of the remote server, the imaging device name, time interval between snapshots, Boolean value for whether images should have a current date/time stamp, Boolean value for whether attachments should be sent as DIME or MIME attachments, temporary file storage location, and the name 1616 of the SMD 900 sending the video information. The name 1616 of the SMD 900 is used by the remote data processing network 710 to associate the received information with the corresponding vehicle; thus, the sending device name 1616 is selected to identify uniquely the SMD.

Operation of the Connection Manager and Monitor

The operation of the connection manager and monitor will now be described with reference to FIGS. 10-12.

FIG. 10 depicts the process used to establish a link or connection with a network using a selected network card 904. The process starts in step 1000 when the user inserts a network card into a slot.

In step 1004, the manager 932 identifies the card vendor code and product identifier. This is obtained by querying the card and/or by manual input such as via the touchscreen monitor.

In step 1008, the manager 932 selects the corresponding connection manager 924a-x and monitor 928a-x for the particular card type and vendor. This can be done by dynamically writing the appropriate connection manager 924a-x and monitor 928a-x, or by commenting out the unselected sets of connection manager 924a-x and monitor 928a-x, or by placing a character or symbol indicating nonexecutable comment text in front of the code associated with the unselected connection managers 924a-x and monitors 928a-x. The selected set of connection manager 924a-x and monitor 928a-x is not commented out.

In one configuration using a Linux operation system in the SMD, the connection manager 924a-x and connection monitor 928a-x are, collectively, formed by a number of daisy-chained files. In this configuration, the connection monitor 928a-x refers to the initialization file while the connection manager 924a-x refers to the chat script file, peers file, pap-secrets file, and ip-up.local file.

The initial file in the chain is the connection monitor 924a-x and is a file containing initialization information and script to perform various operations, including the next file in the file sequence. The file, for example, contains the logic of FIG. 11.

The next file in the chain is the peers file, which controls and configures (e.g., provides setup parameters for) a communications initiation application (not shown) of the operating system. The communication initiation application is preferably a part of the connection manager. The communications initiation application effects, after the link with the network is established, communication with other nodes via the network. As will be appreciated, in the Linux operating system the communications initiation application is known as the Point-to-Point Protocol Daemon or PPPD. PPP is the protocol used for establishing internet links over dial-up modems, DSL connections, and many other types of point-to-point links. The PPPD daemon works together with the kernel PPP driver to establish and maintain a PPP link with another system (called the peer) and to negotiate Internet Protocol (IP) addresses for each end of the link. PPPD can also authenticate the peer and/or supply authentication information to the peer. As will be appreciated, PPP can be used with other network protocols besides IP.

The communications initiation application controls the card and, inter alia, provides address information to the card. The peers file includes connection information to be used for the connection, such as the identity of the port (e.g., serial port name), the size of the window for used for input/output (e.g., desired baud rate for the serial device), whether the connection is to be persistent, the connect script used to connect the card, disconnect script used to disconnect the card, and other options such as default rate, speed, ttyname, crtscts, lock, mru, mtu, and passive.

The next file in the chain is the chat file, which contains the command set required, for the particular card vendor and type, to establish the connection. The command set typically is an ordered series of queries to the card and response definitions provided by the card in response to the queries.

The final file in the chain sequence is the pap-secrets file, which contains a username and password.

Another file in the sequence is the ip-up.local file, which, after the link is established with the network, is used by the modem to select a Domain Name Service or DNS server and, inter alia, starts a time synchronization sequence with a universal time server to maintain synchronization between the system clock 936 and universal time.

In step 1012, the manager 932 invokes the connection monitor, which in turn invokes the connection manager 924 to establish the connection with the network.

In step 1016, the card sets up the connection. Generally, the card receives an identifier or address (e.g., telephone number, ESN or other) from the communication initiation application. The identifier or address is associated with the card and informs the network that the card is associated with an authorized wireless device. In the configuration, the network sets up a serial connection with the SMD followed by a handshake and authentication procedure between the card and network. Other links are also possible. After the link is up, the network assigns an IP address to the SMD. As will be appreciated, certain networks, such as Sprint and Verizon, automatically assign and provide a link with a DNS server address while others, such as Cingular, fail to provide a link with a DNS server address. For the latter networks, the DNS server address is included in the connection manager files. Regarding authentication, some network services, such as Cingular, use the same username and password for a number of network cards of the same type. Others, such as Sprint, include the post-card-activation authentication information in the card itself, so non pap-secrets file is needed in the connection manager.

FIGS. 11 and 12 depict the operation of the connection monitor 928a-x after a link has been established.

The process starts with the establishment of a link in step 1100.

In decision diamond 1104, the connection monitor 928a-x determines whether or not the link is up. The performance of this step depends on the air interface used by the network. With most air interfaces such as the current CDMA services, the monitor 928a-x checks locally to determine if the monitor is up. If communication is lost with the network, the link is not up. In that event, the card automatically informs the manager 932 that the link is down. The system manager 932, in response, removes the file for the link. In the Linux operation system, the manager 932 removes a point-to-point protocol (ppp) link from the route file when it is informed that a link is disconnected. If there is a ppp entry in the route file, the link is still up. If there is no ppp entry in the route file, the link is down. The monitor 928 can thus determine readily whether or not the link is up.

With certain connection cards on the GPRS air interfaces, the card does not inform the manager that the link has been disconnected, and the ppp entry remains in the route file even when the link is down (the "ppp Exception"). In this case, the monitor functions differently and forwards a query (e.g., DNS lookup request) to the DNS server. If a response is received, the monitor knows that the link is still up. If no response is received from the DNS server, the monitor knows that the link is down.

If the link is up, the monitor proceeds to decision diamond 1116 and repeats the foregoing operation after a predetermined time interval.

If the link is down, the monitor proceeds to step 1108. In step 1108, the monitor determines if the connection manager (i.e., the communications initiation application [e.g., PPPD]) is running. Stated another way, the monitor determines whether the communications initiation application is configured for a persistent connection. When so configured, the communications initiation application will retry automatically to reestablish the connection with the network. Accordingly, when the communications initiation application is configured for a persistent connection the monitor proceeds to decision diamond 1116 as there is no need for it to effect reestablishment of the connection. When the communications initiation application is not configured for a persistent connection, the monitor proceeds to step 1120 in

which it resets the card and effects reestablishment of the connection. In one configuration, the monitor simulates user removal and reinsertion of the card into the slot.

FIG. 12 depicts, in more detail, the process of step 1120 in the case of the "ppp Exception" noted above, that is used to reset the card in the event of a lost link.

In step 1200, the monitor 928a-x performs a soft reset of the card. The soft reset is performed by the manager 932, which removes power to the slot and then reapplies it. Some cards, however, do not permit the manager to remove power from the slot.

In decision diamond 1204, the monitor 928a-x determines whether the manager 932 was successful in removing and reapplying power to the slot. When the soft reset has not been successful, the monitor 928a-x, in step 1208 shuts down the communications initiation application 930. Because the application is shut down during operation or "hard killed", the manager 932 removes remnants from the application's operation to ensure that the remnants do not interfere with the ensuing steps of the process.

After removal of the remnants, the monitor 928a-x, in step 1212, repeats the soft reset of the card.

When the soft reset is successful in decision diamond 1204 or after the soft reset of step 1212, the monitor 928a-x, in step 1216, provides the card attributes to the manager 932. Primarily, the attributes pertain to how the SMD 900 is to recognize the card, e.g., as a serial or Universal Serial Bus or USB device as the manager 932 will need to set up a serial or USB connection, as appropriate. The communications initiation application is configured for serial connections. When the card is a USB device, the manager 932 will recognize automatically the card as a USB device, and, when the card is a serial device, the manager 932 will recognize automatically the card as a serial device. So that the card will interface with the communications initiation application, the monitor 928a-x instructs the manager 932 to set the card attributes for a serial device. When the card is natively a serial device, the monitor 928a-x provides the manager 932 with a baud rate for the serial connection. There is no need to provide a baud rate when the card is natively a USB device as the baud rate for the connection with the USB card will be set automatically by the manager 932 at a sufficiently high rate.

The connection may be terminated voluntarily by the SMD 900 in response to a set of predetermined trigger events. One trigger event is a command by the user. Another trigger is when the received signal strength from the network falls below a selected threshold. Signal strength may be measured using the mechanisms currently used by cell phones to measure and report the signal strength to the user, even though the user has not yet placed a call. Yet another trigger is one or more selected quality of service (QoS) parameters falling below a corresponding predetermined threshold. Exemplary QoS parameters include packet loss, jitter, latency, etc. To prevent automatic reestablishment of the connection, the manager 932 can prevent the monitor 928 and communications initiation application from running. Alternatively, the manager 932 can permit the monitor 928 and communications initiation application to run in an attempt to reestablish the connection. Alternatively, the manager 932 can permit the monitor 928 and communications initiation application to run but select a different one of the cards (and a different network) for the connection attempt. In this alternative, the SMD 900 will move from network to network in response to variations in the health of the established link.

Data collection by the SMD 900 may be periodic or continuous. Periodic data collection may be based on one or more trigger events, such as the passage of a selected time interval, passage of a given number of data entries (either in total or sorted by parameter), detection of a change in one or more selected state parameters or variables, or receipt of a data transmission command by a user. When data collection is to be transmitted and the connection is either down or up but unhealthy, the SMD buffers the data in the memory 940 while the monitor 928 attempts to reestablish the connection with the same or a different network. When the connection is reestablished, the data is transmitted via the network to the remote server.

To conserve bandwidth, the manager may filter by a filter 1628 (FIG. 16) the collected data that is transmitted to the remote server. The data may be filtered on a number of criteria, such as duplication or type. Regarding duplication when the data has not changed since a prior transmission, the data would not have to be resent. Only data that has changed since the prior transmission could be resent. Regarding data type, certain types of data may be sent automatically to the remote server while other types of data

may only be sent in response to a trigger event, such as a change in the data or detection of an alarm condition of a vehicular state parameter, or a manual trigger via a touchscreen input.

A number of variations and modifications of the invention can be used. It would be possible to provide for some features of the invention without providing others.

For example in one alternative embodiment, the SMD 900 is configured for remote software upgrades, particularly for firmware. The software is not only that resident in the SMD 900 but also for an ancillary component, such as the sensors 916. The upgrade is normally started by the operator of the vehicle commanding the SMD 900, via the user interface 920, to initiate a software upgrade. The manager 932 contacts the remote server and checks for an appropriate upgrade. As part of the interaction, the manager 932 may need to provide authentication information, such as the name 1616 of the SMD 900, a username and a password, or an authentication code. If an upgrade is located, the SMD 900 pulls the upgrade from the server 824 via the selected network. The manager 932 then proceeds to install the upgrade on the respective SMD 900 or ancillary component.

In another alternative embodiment, the SMD 900 is configured to detect automatically a network card 904 based on vendor and type and select automatically the corresponding set of connection manager 924a-x and monitor 928a-x. When a card is inserted or otherwise selected by a user, the manager 932 accesses the vendor code and product identifier resident on the card and retrieves a lookup table, such as that depicted in FIG. 13, from memory 940. The manager 932 maps the vendor code and product identifier set received from the card to receive an identifier for the corresponding set of connection manager 924a-x and monitor 928a-x. In one configuration, the identifier is a memory address or pointer to one or more selected files in the corresponding set. Because in one configuration the connection manager 924a-x files are daisy-chained to the connection monitor 928a-x, the identifier can be a pointer or memory address of the connection monitor 928a-x only.

In another alternative embodiment, the SMD is used in stationary roadside applications to collect various types of information. For example, in one configuration, the data collected can be the speed, volume and/or occupancy of passing vehicles. In another configuration, vehicle identification

information, such as a license plate number or license plate image, can also be sent with the speed of the identified vehicle. In another embodiment, photos of mountain passes, intersections, or other locations can be periodically sent back to the server. The collected data is transmitted to a server of a central data processing facility. In this configuration, the SMD can be either connected to power or be collocated with an on board power source, which could be a generator or a solar powering array. The data may be transmitted wireles sly or over a fiber network to the central data processing facility.

In yet another alternative embodiment, the SMD uses operating systems other than Linux, such as a Microsoft ® operating system.

In yet another embodiment, dedicated hardware implementations including, but not limited to, Application Specific Integrated Circuits or ASICs, programmable logic arrays, and other hardware devices can likewise be constructed to implement the methods described herein. Furthermore, alternative software implementations including, but not limited to, distributed processing or component/object distributed processing, parallel processing, or virtual machine processing can also be constructed to implement the methods described herein.

In yet another embodiment, a data scrubbing server may be used. Data scrubbing is the process of detecting and correcting or removing corrupt or inaccurate records from a record set, table, or database. The term refers to identifying incomplete, incorrect, inaccurate or irrelevant parts of the data and then replacing, modifying, or deleting this dirty data. After scrubbing, a data set will be consistent with other similar data sets in the system. The inconsistencies detected or removed may have been originally caused by user entry errors, by corruption in transmission or storage, or by different data dictionary definitions of similar entities in different stores. The actual process of data scrubbing may involve removing typographical errors or validating and correcting values against a known list of entities. The validation may be strict (such as rejecting any address that does not have a valid postal code) or fuzzy (such as correcting records that partially match existing, known records).

Some data scrubbing solutions may scrub data by cross checking with a validated data set. Also data enhancement, where data is made more complete by adding related information, is a common data scrubbing practice. Data scrubbing may also involve activities such as harmonization of data. For example, harmonization of data may consist of harmonizing short codes (e.g. st, rd) to actual words (e.g. street, road).

When a data scrubbing server is used the sets of collected information are sent to the data scrubbing server that identifies bad sets of collected information by any of the processes listed above. Bad sets of collected information may contain information that is incomplete or inaccurate or defective in any of the ways listed above. The data scrubbing server may correct or delete or otherwise manipulate the bad sets of collected information before forwarding the sets of collected information to the server for further processing.

In yet another embodiment, the sets of collected information are directed through one or more auxiliary servers before the sets of collected information are sent to the server for further processing. These auxiliary servers may add data to the sets of collected information, copy the sets of collected information for other uses, use the sets of collected information for other processes before forwarding the data, or perform any other process on the data as would be recognized by one of ordinary skill in the art, or do nothing with the data except for re-forwarding it.

The present invention, in various embodiments, includes components, methods, processes, systems and/or apparatus substantially as depicted and described herein, including various embodiments, subcombinations, and subsets thereof. Those of skill in the art will understand how to make and use the present invention after understanding the present disclosure. The present invention, in various embodiments, includes providing devices and processes in the absence of items not depicted and/or described herein or in various embodiments hereof, including in the absence of such items as may have been used in previous devices or processes, e.g., for improving performance, achieving ease and\or reducing cost of implementation.

The foregoing discussion of the invention has been presented for purposes of illustration and description. The foregoing is not intended to limit the invention to the form or forms disclosed herein. In the foregoing Detailed Description for example, various features of the invention are grouped together in one or more embodiments for the purpose of streamlining the disclosure. This method of disclosure is not to be interpreted as reflecting an intention that the claimed invention requires more features than are expressly recited in each claim. Rather, as the following claims reflect, inventive aspects lie in less than all features of a single foregoing disclosed embodiment. Thus, the following claims are hereby incorporated into this Detailed Description, with each claim standing on its own as a separate preferred embodiment of the invention.

Moreover, though the description of the invention has included description of one or more embodiments and certain variations and modifications, other variations and modifications are within the scope of the invention, e.g., as may be within the skill and knowledge of those in the art, after understanding the present disclosure. It is intended to obtain rights which include alternative embodiments to the extent permitted, including alternate, interchangeable and/or equivalent structures, functions, ranges or steps to those claimed, whether or not such alternate, interchangeable and/or equivalent structures, functions, ranges or steps are disclosed herein, and without intending to publicly dedicate any patentable subject matter.

ABSTRACT

A method and system are provided in which maintenance vehicles collect information from sensors and operators, forward the collected information to a server, and, in response, receive maps and operator instructions.

1. A method, comprising:

(a) receiving from a plurality of snow maintenance vehicles a plurality of sets of collected information, each of the sets of collected information comprising a snow maintenance vehicle physical location and at least one of weather and road conditions in an area of the respective snow maintenance vehicle;

(b) processing, by a server, the received sets of collected information to (i) provide a map associated with a physical location of a selected snow maintenance vehicle and (ii) determine an instruction for the selected snow maintenance vehicle and/or route;

(c) providing the map and the instruction to a user; and

(d) wherein at least one of the following is true:

(d1) the sets of collected information are sent to a data scrubbing server that identifies bad sets of collected information, said bad sets of collected information containing information that is incomplete or inaccurate, and wherein the data scrubbing server corrects or deletes the bad sets of collected information before forwarding the sets of collected information to the server for processing; or

(d2) the sets of collected information are directed through one or more auxiliary servers before the sets of collected information are sent to the server for processing.

2. The method of claim 1, wherein the instruction comprises one or more of a dispatch command, an alarm based on a temporal trend in weather conditions, an alarm based on a difference in weather conditions, an alarm based on a temporal trend in road conditions, an alarm based on a difference in road conditions, a snow plow setting, a mixture of materials being applied to a road surface, and an amount of materials being applied to the road surface.

3. The method of claim 1 further comprising the steps of:

(1) determining, by at least one processor, that at least one of a received signal strength from a wireless network and a Quality of Service ("QoS") parameter is not acceptable;

(2) buffering, by the at least one processor, the collected information when the at least one of a received signal strength from a wireless network and a QoS parameter is not acceptable;

(3) when the at least one of a received signal strength from a wireless network and a QoS parameter is acceptable, sending, by the at least one processor, from an Internet Protocol ("IP") address of the of the at least one processor, and over a wireless network, the collected information and physical location to an electronic address associated with the server.

4. The method of claim 1, wherein the user is an operator of the respective snow maintenance vehicle.

5. The method of claim 4, wherein the instruction and the map are transmitted over a wireless network to a handheld device associated with the user.

6. The method of claim 4, wherein the instruction is provided to the user orally via a radio signal.

7. The method of claim 1, wherein the user is a supervisor not located in the respective snow maintenance vehicle.

8. The method of claim 7, wherein the at least one of the map and the instruction are provided to the supervisor at a non-portable computer terminal.

9. The method of claim 7, wherein the at least one of the map and the instruction are provided to the supervisor at a portable computer via a wireless signal.

10. The method of claim 7, wherein the supervisor sends the at least one of the map and the instruction to the operator of the respective snow maintenance vehicle.

11. A system, comprising:

a server operable to:

(a) receive from a plurality of snow maintenance vehicles, a plurality of sets of collected information, each of the sets of collected information comprising a snow maintenance vehicle physical location and at least one of weather and road conditions in an area of the respective snow maintenance vehicle;

(b) process the received sets of collected information:

(i) to provide a map associated with a physical location of a selected snow maintenance vehicle;

(ii) to determine an instruction for the selected snow maintenance vehicle and/or route;

(c) provide the map and the instruction to a user; and

(d) wherein at least one of the following is true:

(d1) the sets of collected information are sent to a data scrubbing server that identifies bad sets of collected information, said bad sets of collected information containing information that is incomplete or inaccurate, and wherein the data scrubbing server corrects or deletes the bad sets of collected information before forwarding the sets of collected information to the server for processing; or

(d2) the sets of collected information are directed through one or more auxiliary servers before the sets of collected information are sent to the server for processing.

12. The system of claim 11, wherein the instruction comprises one or more of a dispatch command, an alarm based on a temporal trend in weather conditions, an alarm based on a difference in weather conditions, an alarm based on a temporal trend in road conditions, an alarm based on a difference in road conditions, a snow plow setting, a mixture of materials to be applied to a road surface, and an amount of materials to be applied to the road surface.

13. The system of claim 11 further comprising:

a processor operable to:

(1) determine that at least one of a received signal strength from a wireless network and a Quality of Service ("QoS") parameter is not acceptable;

(2) buffer the collected information when the at least one of a received signal strength from a wireless network and a QoS parameter is not acceptable;

(3) when the at least one of a received signal strength from a wireless network and a QoS parameter is acceptable, send, from an Internet Protocol ("IP") address of the of the processor, and over a wireless network, the collected information and physical location to an electronic address associated with the server.

14. The system of claim 11, wherein the user is an operator of the respective snow maintenance vehicle.

15. The system of claim 14, wherein the instruction and the map are transmitted over a wireless network to a handheld device associated with the user.

16. The system of claim 14, wherein the instruction is provided to the user orally via a radio signal.

17. The system of claim 11, wherein the user is a supervisor not located in the respective snow maintenance vehicle.

18. The system of claim 17, wherein the at least one of the map and the instruction are provided to the supervisor at a non-portable computer terminal.

19. The system of claim 17, wherein the at least one of the map and the instruction are provided to the supervisor at a portable computer via a wireless signal.

20. The system of claim 17, wherein the supervisor sends the at least one of the map and the instruction to the operator of the respective snow maintenance vehicle.

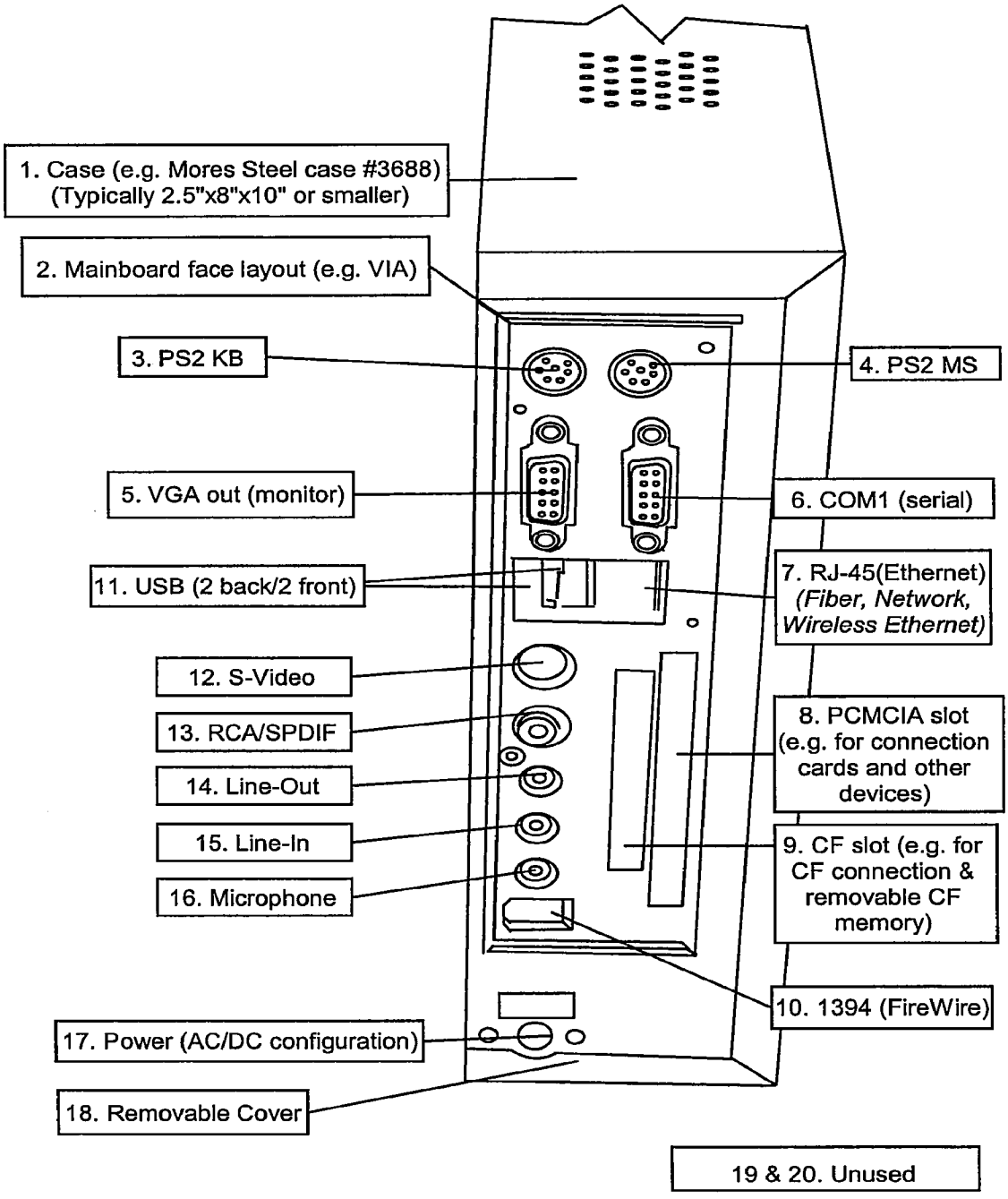

1. Case (e.g. Mores Steel case #3688)
(Typically 2.5"x8"x10" or smaller)
2. Mainboard face layout (e.g. VIA)
3. PS2 KB
4. PS2 MS
5. VGA out (monitor)
6. COM1 (serial)
11. USB (2 back/2 front)
7. RJ-45(Ethernet)
(Fiber, Network, Wireless Ethernet)
12. S-Video
13. RCA/SPDIF
14. Line-Out
15. Line-In
16. Microphone
8. PCMCIA slot
(e.g. for connection cards and other devices)
9. CF slot (e.g. for CF connection & removable CF memory)
10. 1394 (FireWire)
17. Power (AC/DC configuration)
18. Removable Cover
19 & 20. Unused

Fig.1

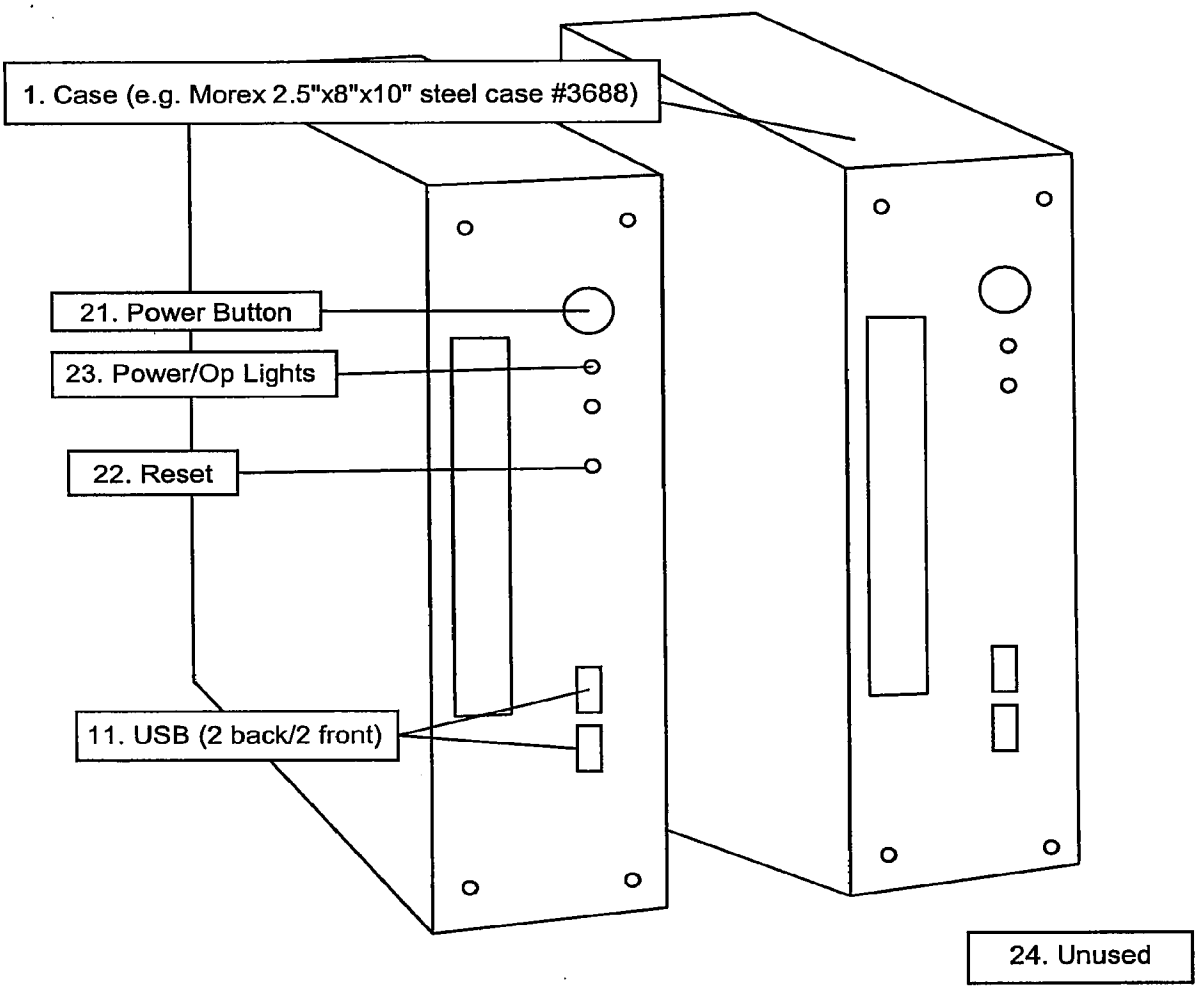
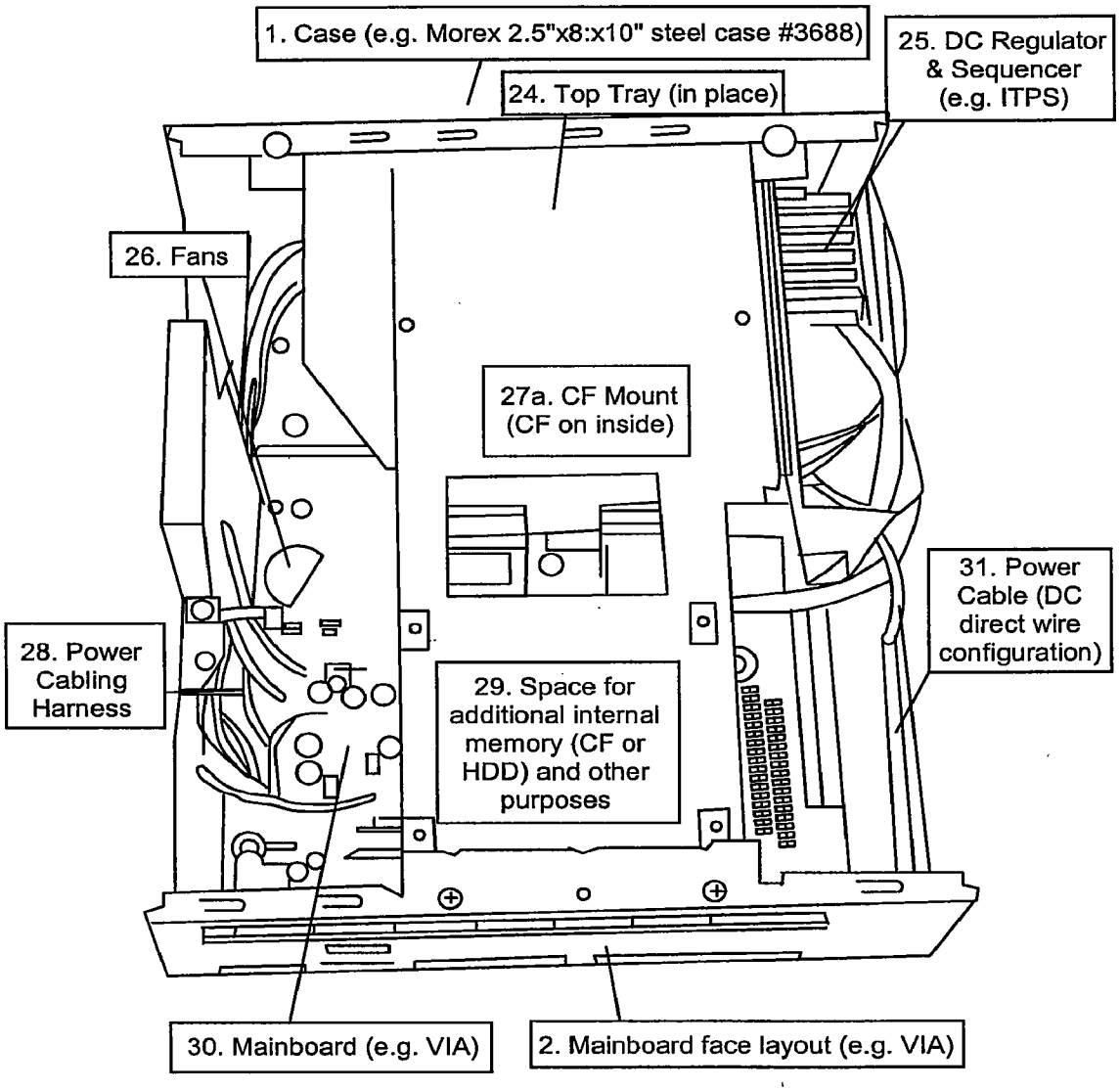

1. Case (e.g. Morex 2.5"x8"x10" steel case #3688)
21. Power Button
23. Power/Op Lights
22. Reset
11. USB (2 back/2 front)
24. Unused

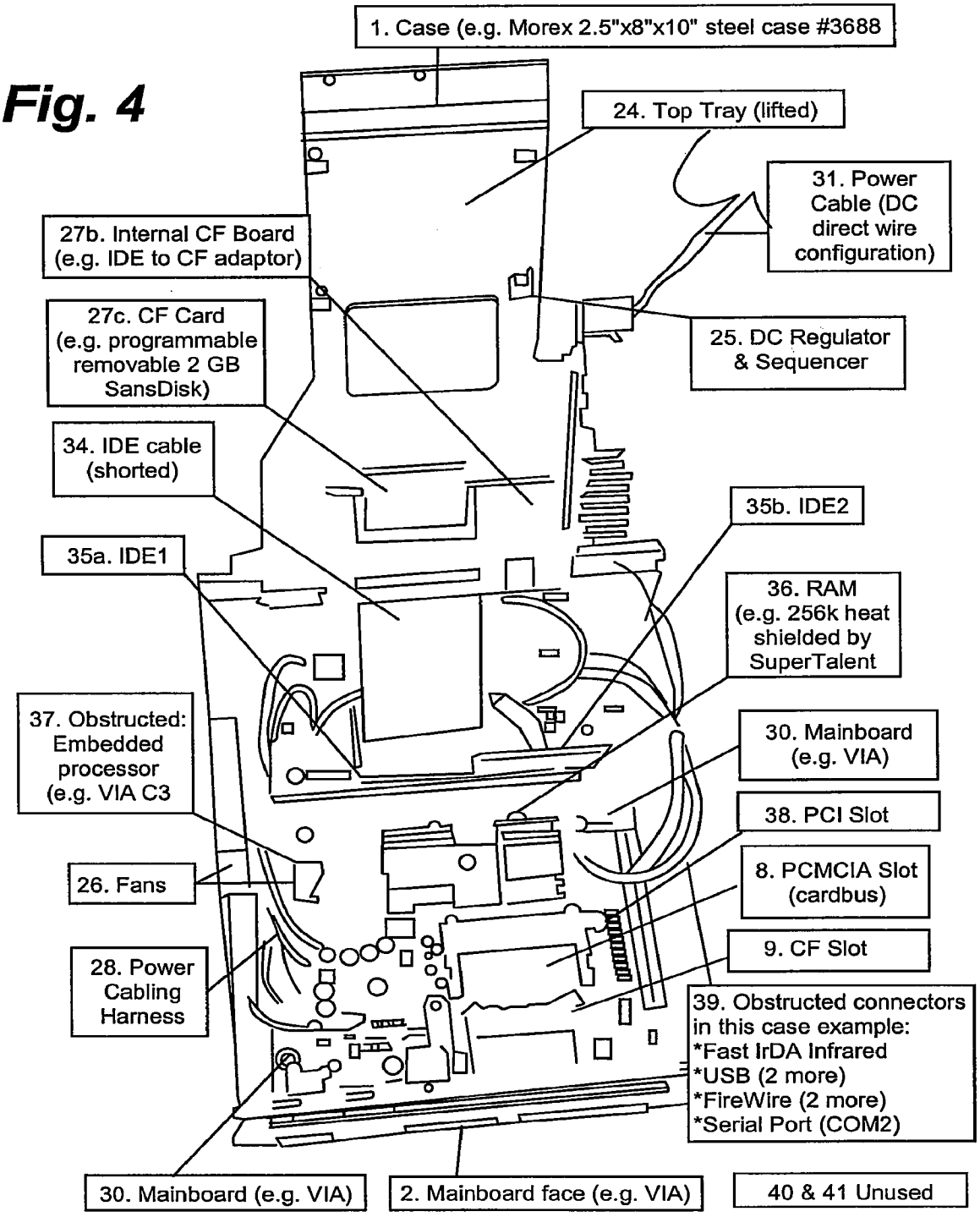
Fig. 2

Fig. 3



32 & 33 Unused

Fig. 4


1. Case (e.g. Morex 2.5"x8"x10" steel case #3688
24. Top Tray (lifted)
31. Power Cable (DC direct wire configuration)
27b. Internal CF Board (e.g. IDE to CF adaptor)
27c. CF Card (e.g. programmable removable 2 GB SansDisk)
25. DC Regulator & Sequencer
34. IDE cable (shorted)
35b. IDE2
35a. IDE1
36. RAM (e.g. 256k heat shielded by SuperTalent
37. Obstructed: Embedded processor (e.g. VIA C3
30. Mainboard (e.g. VIA)
38. PCI Slot
26. Fans
8. PCMCIA Slot (cardbus)
9. CF Slot
28. Power Cabling Harness
39. Obstructed connectors in this case example:
*Fast IrDA Infrared
*USB (2 more)
*FireWire (2 more)
*Serial Port (COM2)
30. Mainboard (e.g. VIA)
2. Mainboard face (e.g. VIA)
40 & 41 Unused

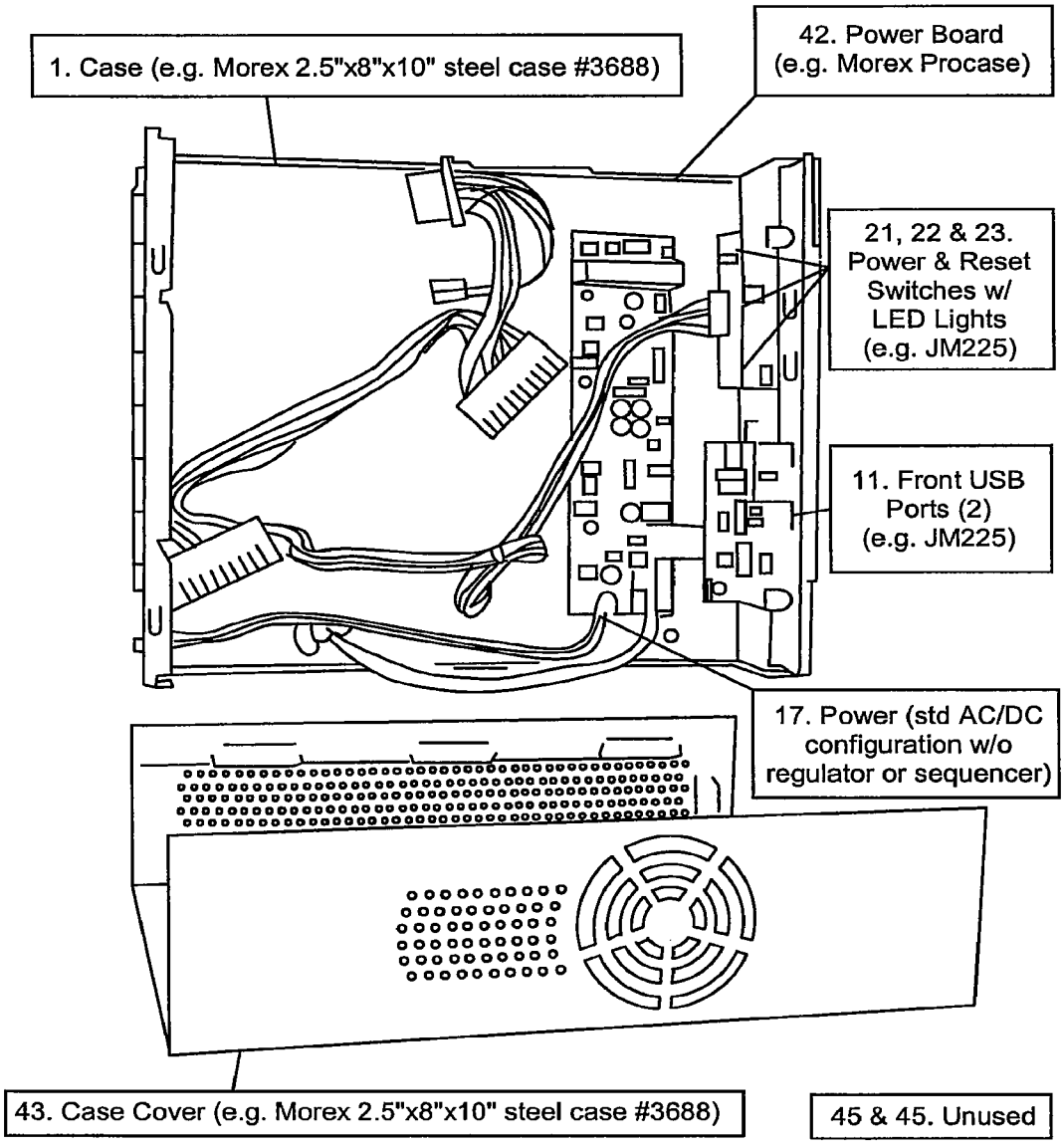
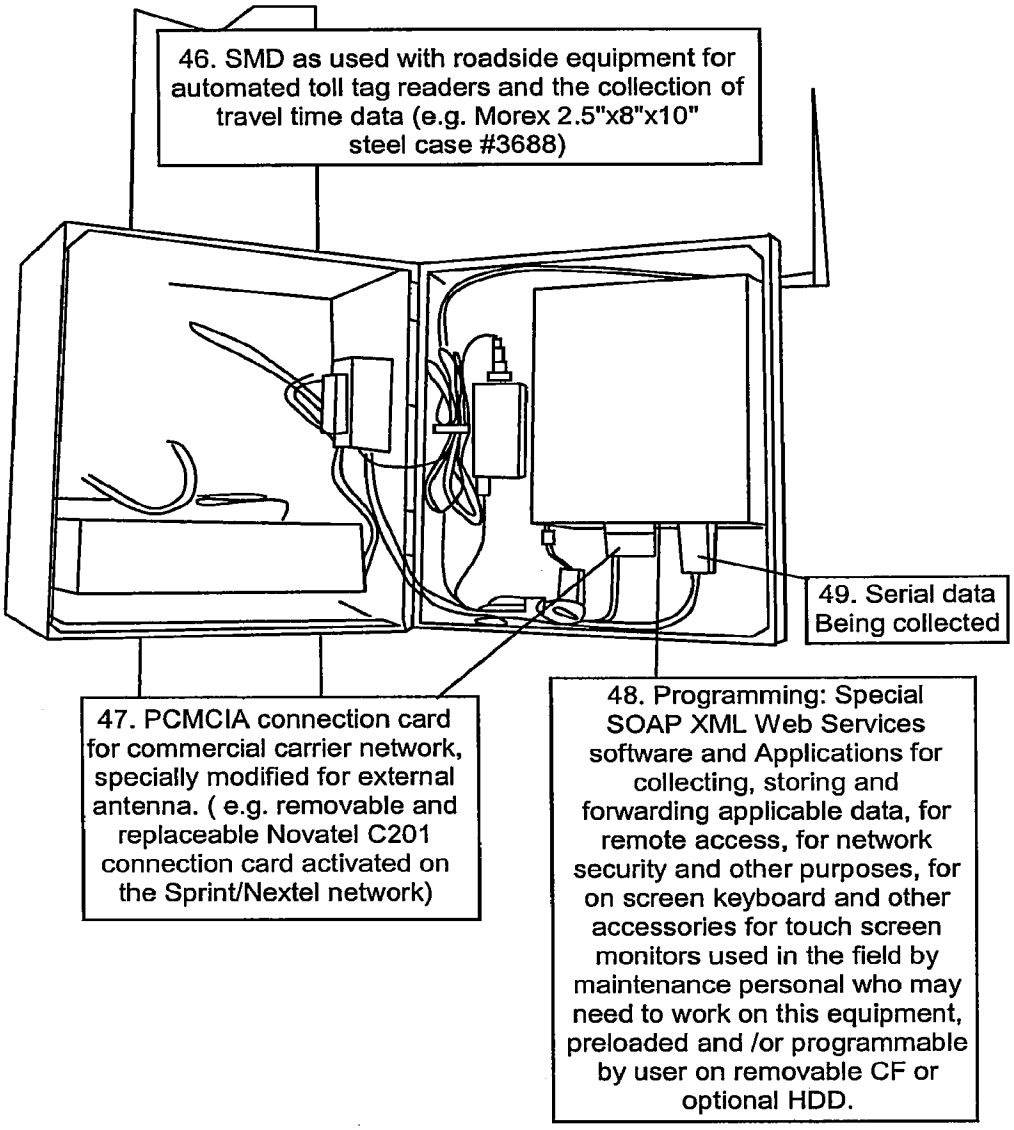

1. Case (e.g. Morex 2.5"x8"x10" steel case #3688)
42. Power Board (e.g. Morex Procase)
21, 22 & 23. Power & Reset Switches w/ LED Lights (e.g. JM225)
11. Front USB Ports (2) (e.g. JM225)
17. Power (std AC/DC configuration w/o regulator or sequencer)
43. Case Cover (e.g. Morex 2.5"x8"x10" steel case #3688)
45 & 45. Unused

Fig. 5

Fig. 6


46. SMD as used with roadside equipment for automated toll tag readers and the collection of travel time data (e.g. Morex 2.5"x8"x10" steel case #3688)
49. Serial data Being collected
47. PCMCIA connection card for commercial carrier network, specially modified for external antenna. (e.g. removable and replaceable Novatel C201 connection card activated on the Sprint/Nextel network)
48. Programming: Special SOAP XML Web Services software and Applications for collecting, storing and forwarding applicable data, for remote access, for network security and other purposes, for on screen keyboard and other accessories for touch screen monitors used in the field by maintenance personal who may need to work on this equipment, preloaded and /or programmable by user on removable CF or optional HDD.

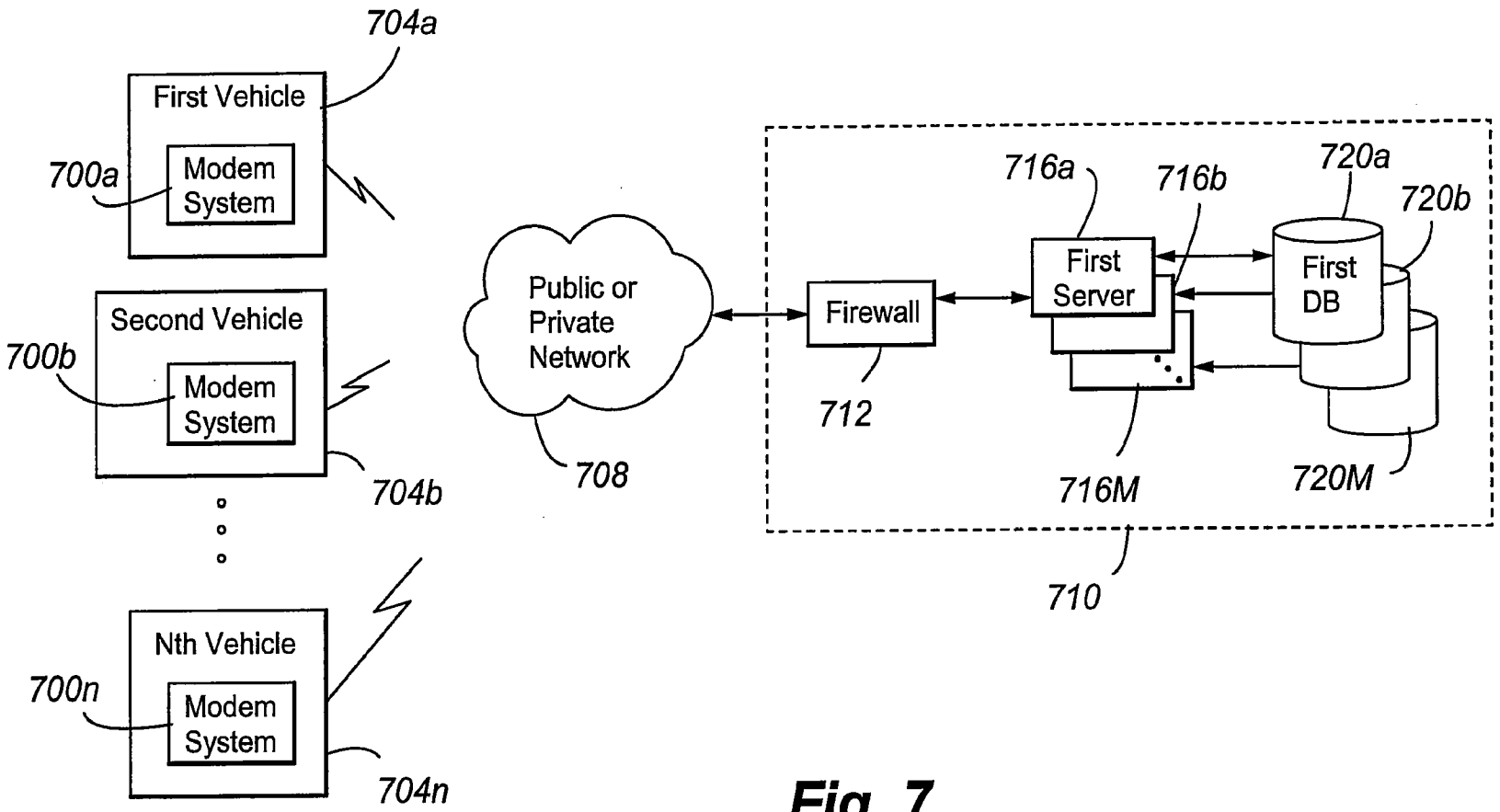

704a
First Vehicle
700a
Modem System
Second Vehicle
700b
Modem System
704b
Nth Vehicle
700n
Modem System
704n
Public or Private Network
708
Firewall
712
716a
716b
First Server
716M
720a
720b
First DB
720M
710

Fig. 7

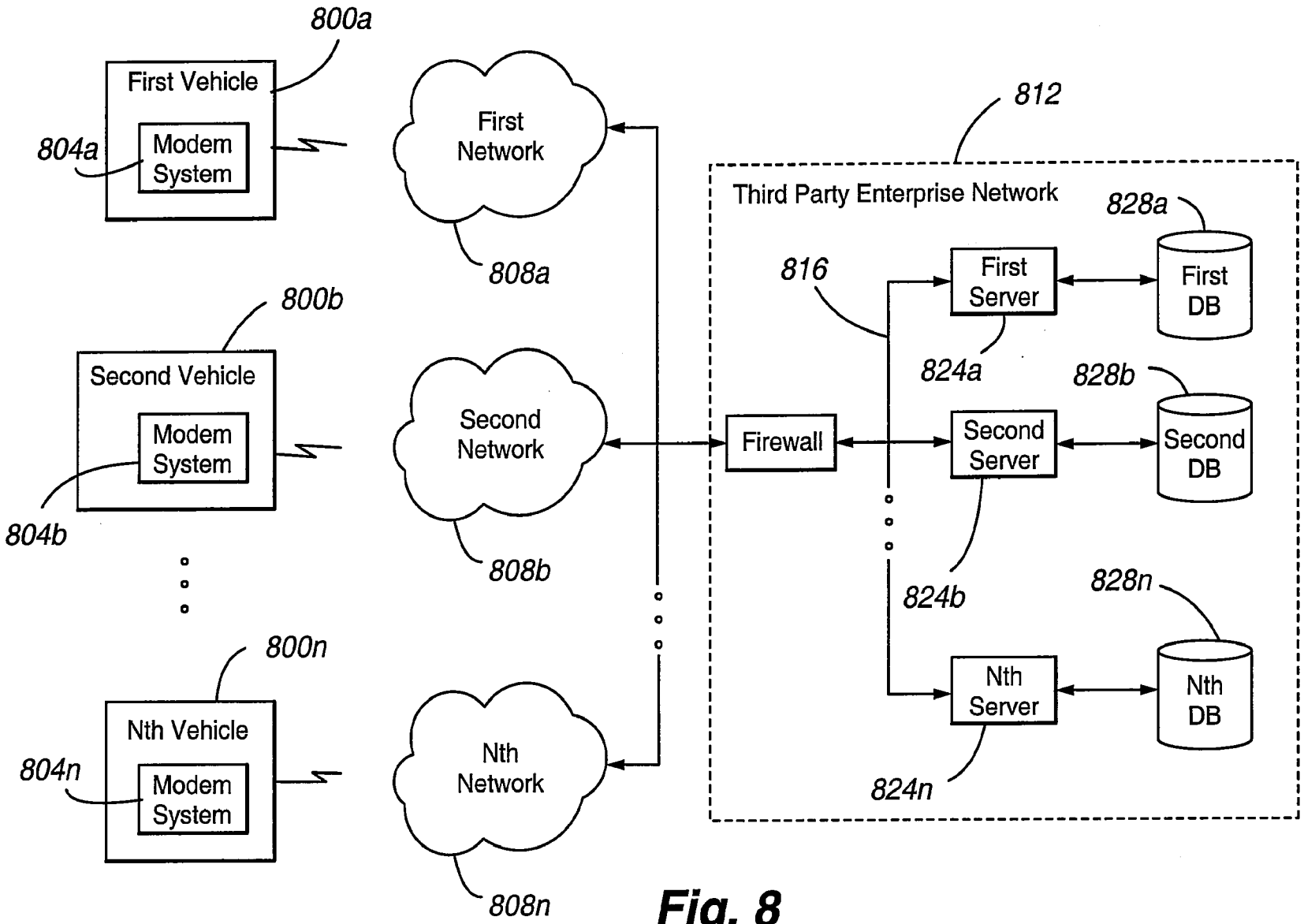

800a
First Vehicle
804a
Modem System
800b
Second Vehicle
804b
Modem System
800n
Nth Vehicle
804n
Modem System
First Network
808a
Second Network
808b
Nth Network
808n
812
Third Party Enterprise Network
816
Firewall
First Server
824a
Second Server
824b
Nth Server
824n
828a
First DB
828b
Second DB
828n
Nth DB

Fig. 8

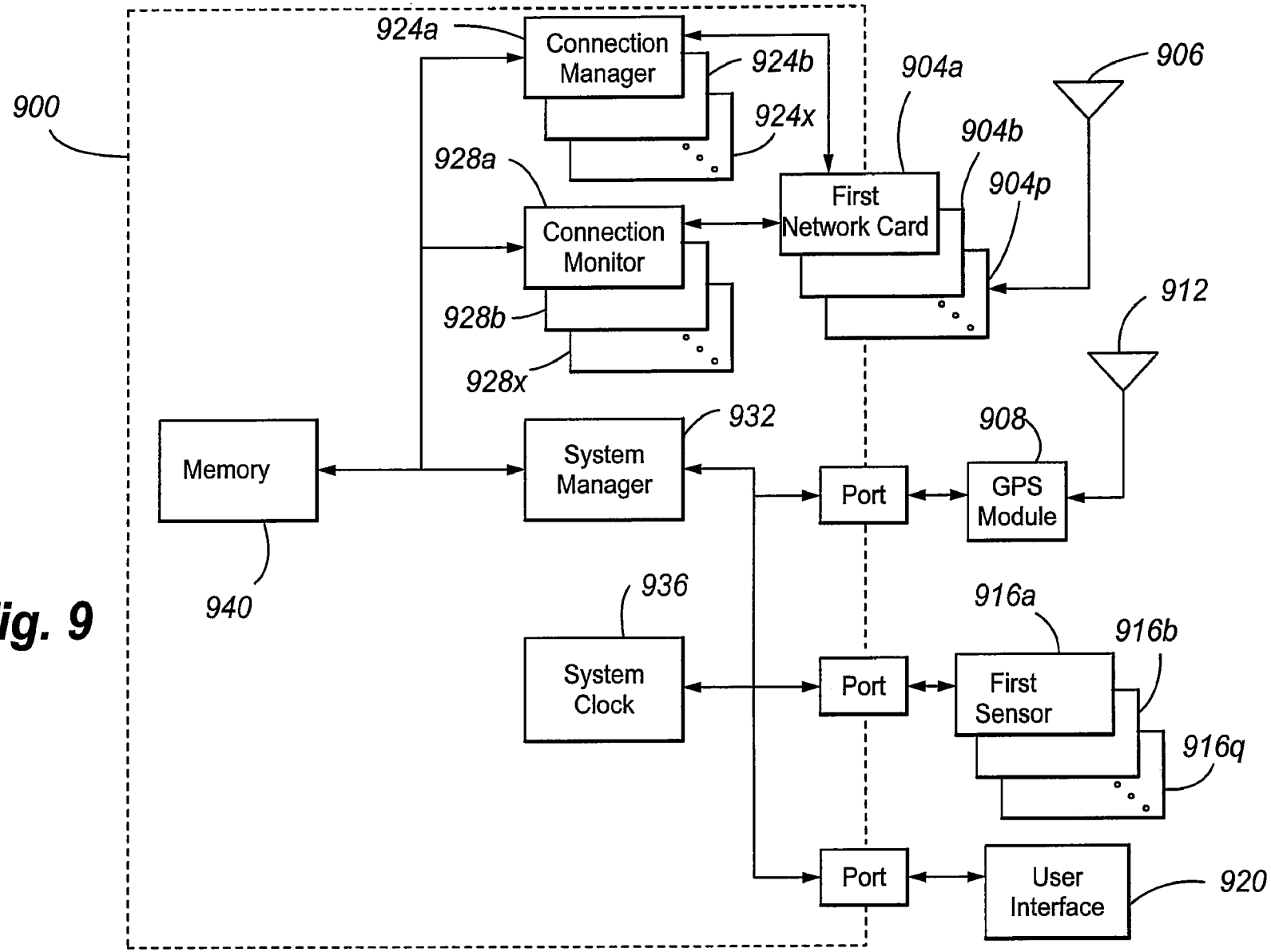

900
924a
Connection Manager
924b
924x
904a
906
904b
928a
First Network Card
904p
Connection Monitor
912
928b
928x
932
908
Memory
System Manager
Port
GPS Module
940
936
916a
916b
System Clock
Port
First Sensor
916q
Port
User Interface
920

Fig. 9

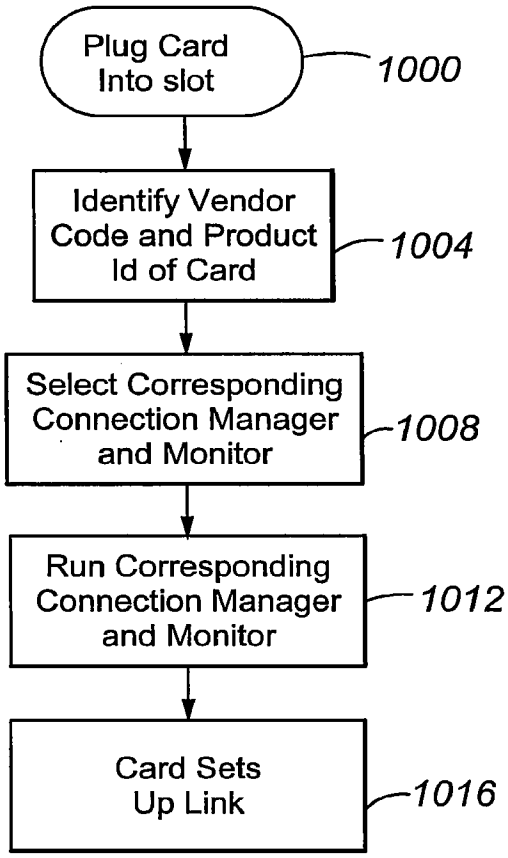


Fig. 10

Vendor Code	Product ID	Connection Monitor ID
AAAAA	llllll	aaaa
BBBBB	zzzzzz	bbbb
⋮	⋮	⋮
NNNNNN	xxxxxx	nnnn

Fig. 13

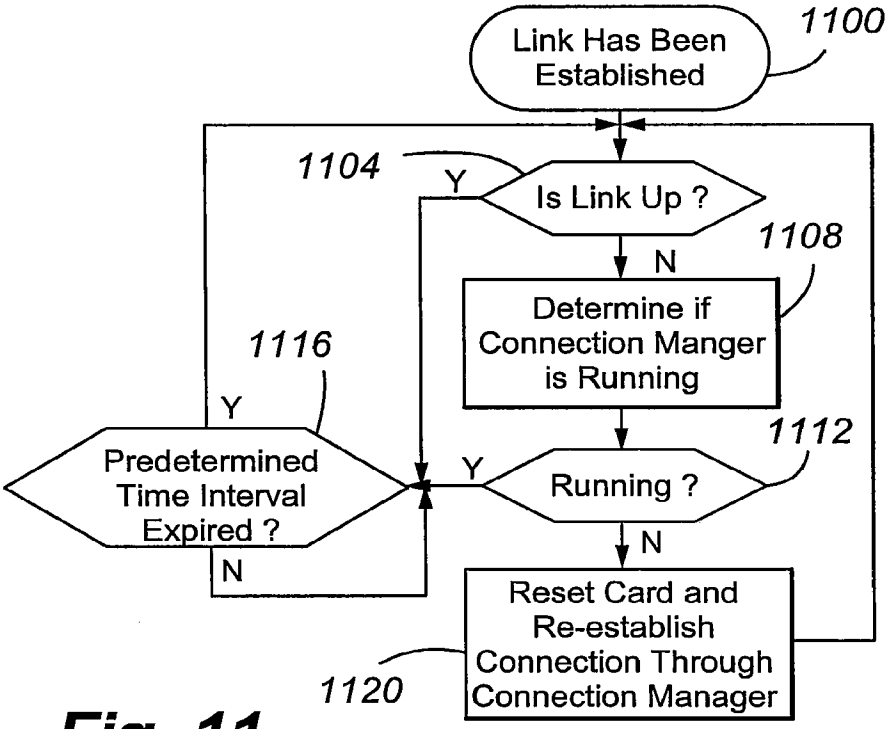

Link Has Been Established
1100
1104
Y
Is Link Up ?
N
1108
Determine if Connection Manger is Running
1116
Y
Predetermined Time Interval Expired ?
N
Y
Running ?
1112
N
Reset Card and Re-establish Connection Through Connection Manager
1120

Fig. 11

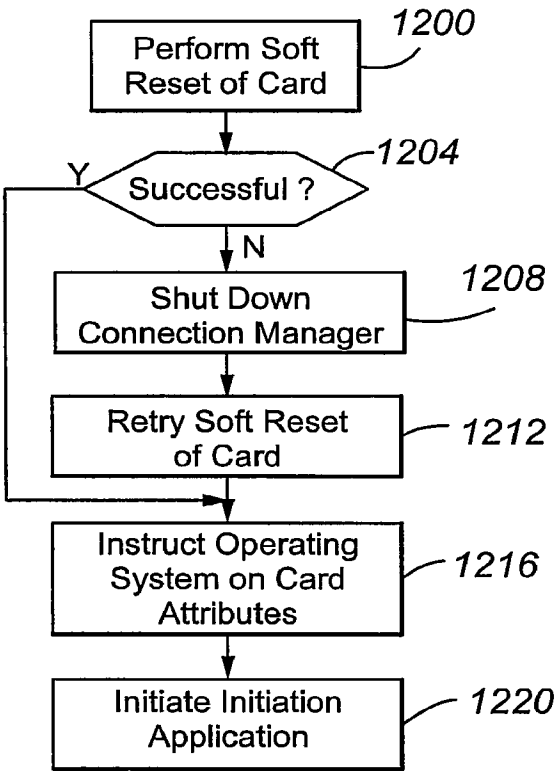

Perform Soft Reset of Card
1200
Y
Successful ?
1204
N
Shut Down Connection Manager
1208
Retry Soft Reset of Card
1212
Instruct Operating System on Card Attributes
1216
Initiate Initiation Application
1220

Fig. 12

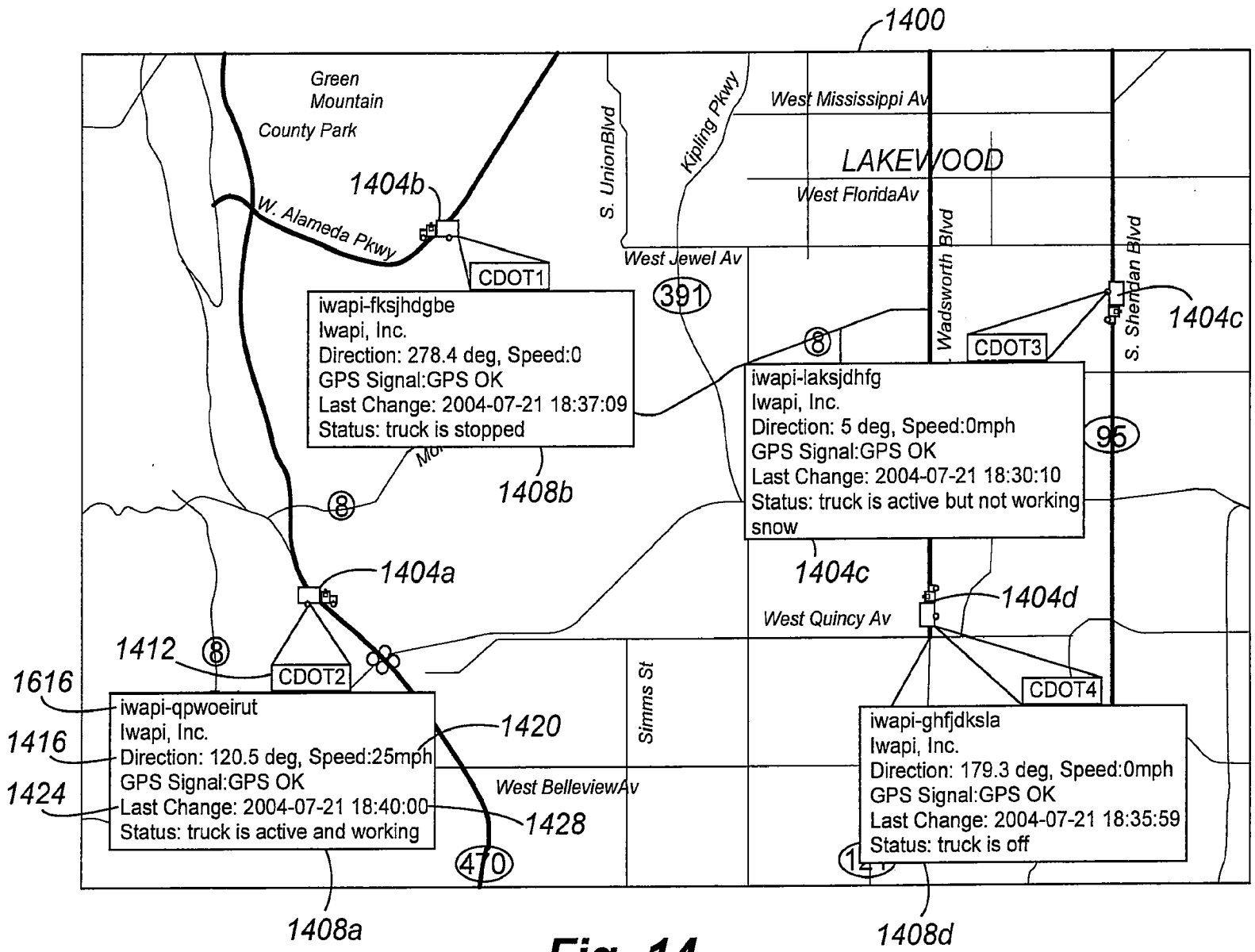

1400
Green
Mountain
County Park
W. Alameda Pkwy
S. UnionBlvd
Kipling Pkwy
West Mississippi Av
LAKEWOOD
West FloridaAv
Wadsworth Blvd
S. Sheridan Blvd
West Jewel Av
391
1404b
CDOT1
iwapi-fksjhdgbe
Iwapi, Inc.
Direction: 278.4 deg, Speed:0
GPS Signal:GPS OK
Last Change: 2004-07-21 18:37:09
Status: truck is stopped
1408b
1404c
CDOT3
iwapi-laksjdhfg
Iwapi, Inc.
Direction: 5 deg, Speed:0mph
GPS Signal:GPS OK
Last Change: 2004-07-21 18:30:10
Status: truck is active but not working
snow
1404c
1404a
1404d
West Quincy Av
1412
CDOT2
CDOT4
1616
1416
1424
iwapi-qpwoeirut
Iwapi, Inc.
Direction: 120.5 deg, Speed:25mph
GPS Signal:GPS OK
Last Change: 2004-07-21 18:40:00
Status: truck is active and working
1420
1428
Simms St
West BelleviewAv
iwapi-ghfjdksla
Iwapi, Inc.
Direction: 179.3 deg, Speed:0mph
GPS Signal:GPS OK
Last Change: 2004-07-21 18:35:59
Status: truck is off
470
1408a
1408d

Fig. 14

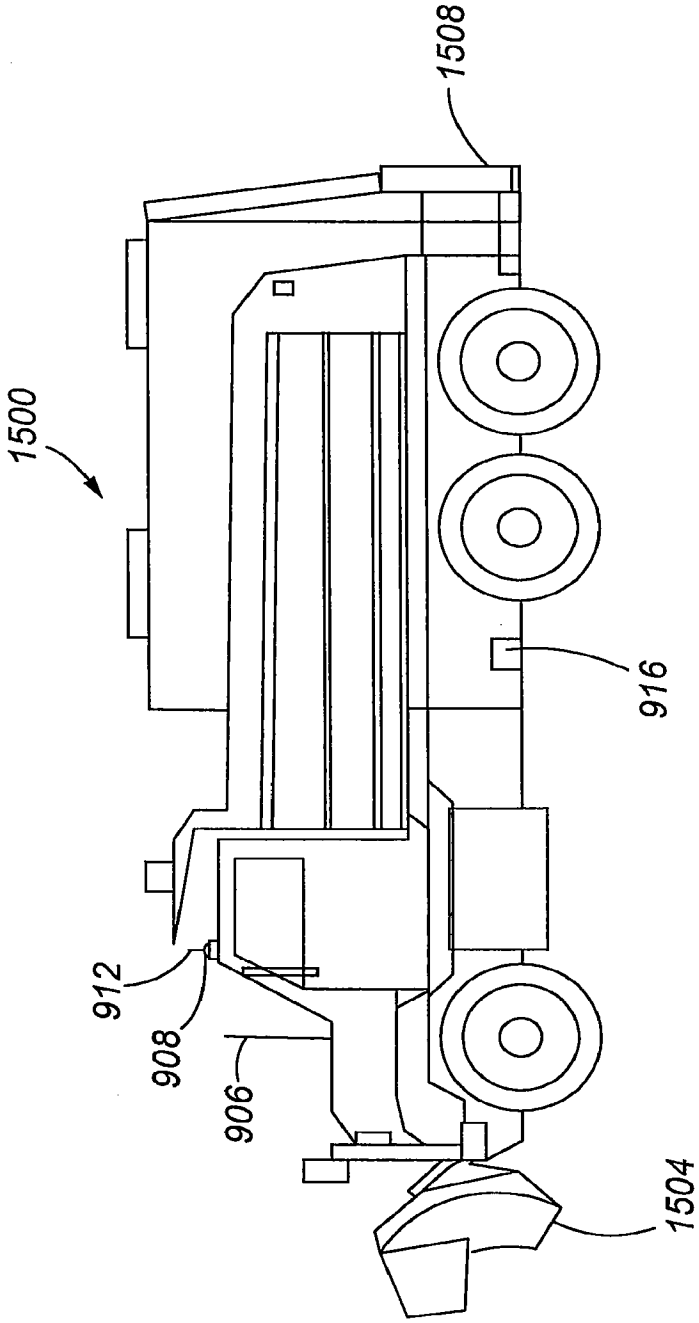


Fig. 15

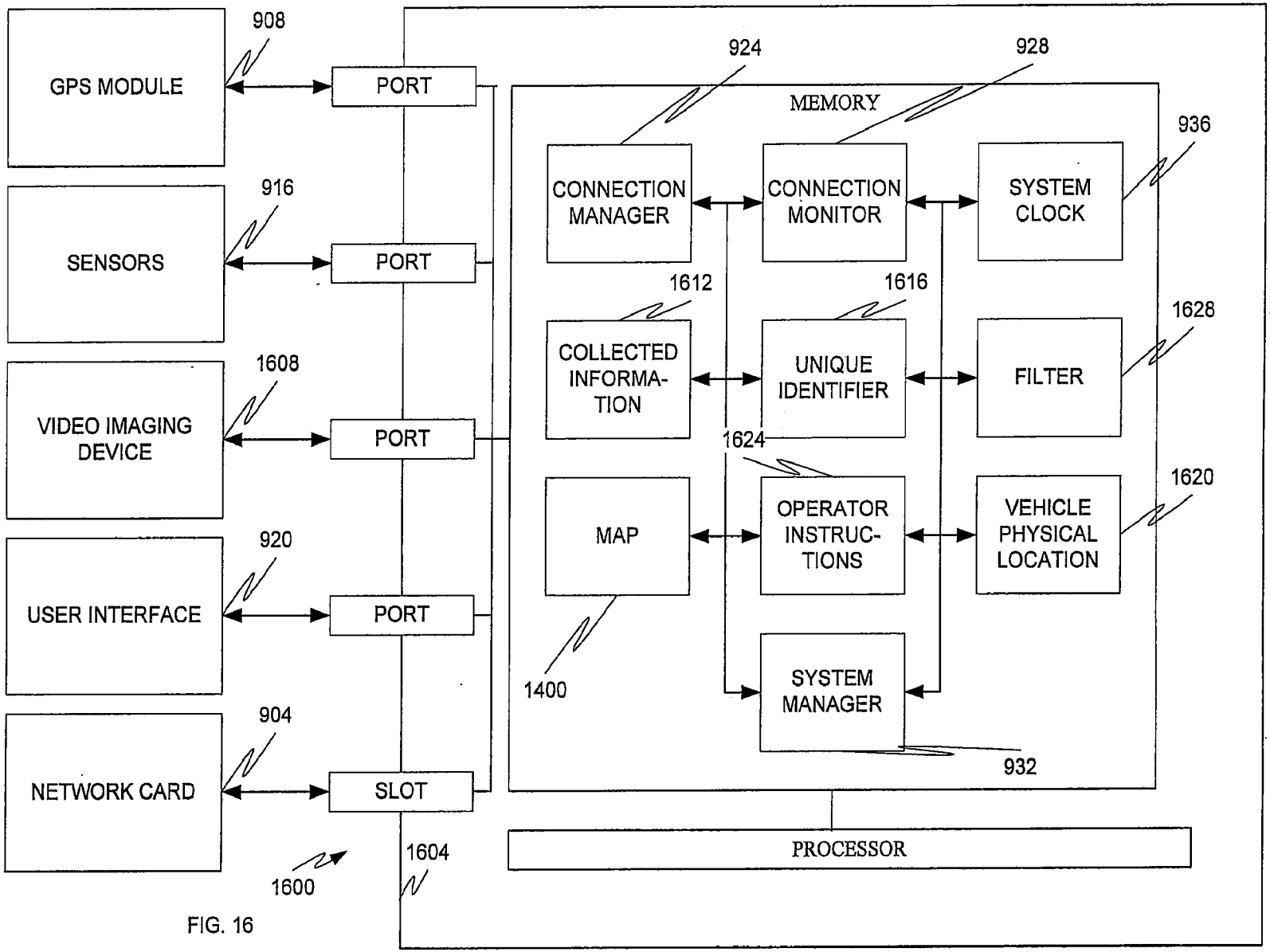

GPS MODULE
908
PORT
924
928
MEMORY
936
CONNECTION MANAGER
CONNECTION MONITOR
SYSTEM CLOCK
SENSORS
916
PORT
1612
1616
1628
COLLECTED INFORMA-TION
UNIQUE IDENTIFIER
FILTER
VIDEO IMAGING DEVICE
1608
PORT
1624
1620
MAP
OPERATOR INSTRUC-TIONS
VEHICLE PHYSICAL LOCATION
USER INTERFACE
920
PORT
1400
SYSTEM MANAGER
932
NETWORK CARD
904
SLOT
1604
PROCESSOR
1600

FIG. 16

RULE 63 (37 CFR § 1.63)
DECLARATION FOR PATENT APPLICATION
IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

We, Christopher J. Rennie and Kevin K. Groeneweg, as below named inventors, hereby declare that our residence, post office address and citizenship are as stated below next to our names, and we believe we are original, first and joint inventors of the subject matter which is claimed and for which a patent is sought on the invention entitled SMART MODEM DEVICE FOR VEHICULAR AND ROADSIDE APPLICATIONS, the specification of which is identified as Attorney File No. 5611-1 and attached hereto.

We hereby state that we have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above. We acknowledge the duty to disclose information which is material to patentability in accordance with 37 CFR 1.56(a) and (b) as set forth on the attached sheet indicated Page 3 hereof and which we have read.

We hereby claim priority benefits under 35 U.S.C. 119(e) of any provisional application(s) for patent listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in such prior applications in the manner provided by the first paragraph of 35 U.S.C. 112, we acknowledge the duty to disclose information material to patentability in accordance with 37 CFR 1.56(a) and (b) which occurred between the filing date(s) of the prior application(s) and the national or PCT international filing date of this application:

Provisional Application(s):

Application Serial No.	Filing Date	Status
60/656,650	February 25, 2005	Pending

We hereby claim foreign priority benefits under 35 U.S.C. 119/365 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s):

Number	Country	Filing Date dd/mm/yy	Priority Claimed	
			Yes	No
			☐	☐

We hereby claim the benefit under 35 U.S.C. 120/365 of all United States and PCT international applications listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in such prior applications in the manner provided by the first paragraph of 35 U.S.C. 112, we acknowledge the duty to disclose information material to patentability in accordance with 37 CFR 1.56(a)

and (b) which occurred between the filing date(s) of the prior application(s) and the national or PCT international filing date of this application:

PCT or U.S. Application(s):

Application Serial No.	Filing Date	Status (patented, pending, abandoned)

We hereby declare that all statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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*Complete Post Office Address in full if different from Residence, otherwise indicate that the Post Office Address is "Same as Residence."

(2) Inventor's Signature _____ Date 27 Feb 2006

Inventor's Name (typed): Kevin K. Groeneweg

Citizenship: USA

Residence: 346 S. Lamb Lane
Golden, CO 80401

Post Office Address*: Same as Residence

*Complete Post Office Address in full if different from Residence, otherwise indicate that the Post Office Address is "Same as Residence."

37 CFR §1.56(a) and (b)
DUTY TO DISCLOSE INFORMATION MATERIAL TO PATENTABILITY

(a) A patent by its very nature is affected with a public interest. The public interest is best served, and the most effective patent examination occurs when, at the time an application is being examined, the Office is aware of and evaluates the teachings of all information material to patentability. Each individual associated with the filing and prosecution of a patent application has a duty of candor and good faith in dealing with the Office, which includes a duty to disclose to the Office all information known to that individual to be material to patentability as defined in this section. The duty to disclose information exists with respect to each pending claim until the claim is cancelled or withdrawn from consideration, or the application becomes abandoned. Information material to the patentability of a claim that is cancelled or withdrawn from consideration need not be submitted if the information is not material to the patentability of any claim remaining under consideration in the application. There is no duty to submit information which is not material to the patentability of any existing claim. The duty to disclose all information known to be material to patentability is deemed to be satisfied if all information known to be material to patentability of any claim issued in a patent was cited by the Office or submitted to the Office in the manner prescribed by §§1.97(b)-(d) and 1.98. However, no patent will be granted on an application in connection with which fraud on the Office was practiced or attempted or the duty of disclosure was violated through bad faith or intentional misconduct. The Office encourages applicants to carefully examine:

(1) prior art cited in search reports of a foreign patent office in a counterpart application, and

(2) the closest information over which individuals associated with the filing or prosecution of a patent application believe any pending claim patentably defines, to make sure that any material information contained therein is disclosed to the Office.

(b) Under this section, information is material to patentability when it is not cumulative to information already of record or being made of record in the application, and

(1) It establishes, by itself or in combination with other information, a prima facie case of unpatentability of a claim; or

(2) It refutes, or is inconsistent with, a position the applicant takes in:

(i) Opposing an argument of unpatentability relied on by the Office, or

(ii) Asserting an argument of a patentability.

A prima facie case of unpatentability is established when the information compels a conclusion that a claim is unpatentable under the preponderance of evidence, burden-of-proof standard, giving each term in the claim its broadest reasonable construction consistent with the specification, and before any consideration is given to evidence which may be submitted in an attempt to establish a contrary conclusion of patentability.*

*Note, 37 CFR §1.97(h) states: "The filing of an information disclosure statement shall not be construed to be an admission that the information cited in the statement is, or is considered to be, material to patentability as defined in §1.56(b)."

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	Maintenance Decision Support System and Method for Vehicular and Roadside Applications
First Named Inventor/Applicant Name:	Christopher J. Rennie
Filer:	Carl A. Hjort
Attorney Docket Number:	5611-1-CIP-5

Filed as Small Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Utility filing Fee (Electronic filing)	4011	1	70	70
Utility Search Fee	2111	1	300	300
Utility Examination Fee	2311	1	360	360
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**730**

Electronic Acknowledgement Receipt

EFS ID:	16347459
Application Number:	13944836
International Application Number:	
Confirmation Number:	3020
Title of Invention:	Maintenance Decision Support System and Method for Vehicular and Roadside Applications
First Named Inventor/Applicant Name:	Christopher J. Rennie
Customer Number:	19152
Filer:	Carl A. Hjort
Filer Authorized By:	
Attorney Docket Number:	5611-1-CIP-5
Receipt Date:	17-JUL-2013
Filing Date:	
Time Stamp:	21:29:05
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$730
RAM confirmation Number	7575
Deposit Account	
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)

1	Application Data Sheet	aia0014.pdf	1505967 bfc75aed7b0ea08f94ad311e2d56490d8469906c	no	7
Warnings:					
Information:					
2		cip5spec.pdf	90919 0c94f0977eca88b0007ee2b84e5fbe0b8a62ccd1	yes	32

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Specification	1	31
	Abstract	32	32

Warnings:					
Information:					
3	Claims	cip5claims.pdf	23155 a5b0c5b5220b01fd2f448477ef20c1b1fe2f97cf	no	6
Warnings:					
Information:					
4	Drawings-only black and white line drawings	condrawings.pdf	297143 7bf85227d7c2430fbf104f697c3d6d0633abebb2	no	14
Warnings:					
Information:					
5	Oath or Declaration filed	Conoath.pdf	169061 da8072871b7e7ccb36ba1cbd70c3e9e22e172ec3	no	3
Warnings:					
Information:					
6	Fee Worksheet (SB06)	fee-info.pdf	32688 19dd5ad0381c64a8f069fc17365d115de17714e5	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	2118933	

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.