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United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/317,761	02/06/2018	9886877	DECL3007/TJM/TL	5434

23364 7590 01/17/2018
BACON & THOMAS, PLLC
625 SLATERS LANE
FOURTH FLOOR
ALEXANDRIA, VA 22314-1176

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):

BARCO N.V., Kortrijk, BELGIUM;
Tom DECLERCK, Meulebeke, BELGIUM;

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.

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)

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.

23364 7590 09/27/2017
BACON & THOMAS, PLLC
625 SLATERS LANE
FOURTH FLOOR
ALEXANDRIA, VA 22314-1176

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.
15/317,761	12/09/2016	Tom DECLERCK	DECL3007/TJM/TL	5434

TITLE OF INVENTION: ADJUSTABLE DISPLAY TILE FOR TILED DISPLAY

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$960	\$0	\$0	\$960	12/27/2017

EXAMINER	ART UNIT	CLASS-SUBCLASS
XAVIER, ANTONIO J	2623	345-001300

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 Bacon & Thomas, PLLC

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)

BARCO N.V.

KORTRIJK, BELGIUM

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 02-0200 (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
- ☐ Applicant asserting small entity status. See 37 CFR 1.27
- ☐ Applicant changing to regular undiscounted fee status.

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.

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.

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 /Thomas J. Moore/

Date December 22, 2017

Typed or printed name THOMAS J. MOORE

Registration No. 28,974

Electronic Patent Application Fee Transmittal

Application Number:	15317761			
Filing Date:	09-Dec-2016			
Title of Invention:	ADJUSTABLE DISPLAY TILE FOR TILED DISPLAY			
First Named Inventor/Applicant Name:	Tom DECLERCK			
Filer:	Thomas J. Moore/Kaitlyn Miller			
Attorney Docket Number:	DECL3007/TJM/TL			
Filed as Large Entity				
Filing Fees for U.S. National Stage under 35 USC 371				
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	1501	1	960	960

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				960

Electronic Acknowledgement Receipt

EFS ID:	31317995
Application Number:	15317761
International Application Number:	
Confirmation Number:	5434
Title of Invention:	ADJUSTABLE DISPLAY TILE FOR TILED DISPLAY
First Named Inventor/Applicant Name:	Tom DECLERCK
Customer Number:	23364
Filer:	Thomas J. Moore/Kaitlyn Miller
Filer Authorized By:	Thomas J. Moore
Attorney Docket Number:	DECL3007/TJM/TL
Receipt Date:	22-DEC-2017
Filing Date:	09-DEC-2016
Time Stamp:	11:51:25
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	\$960
RAM confirmation Number	122617INTEFSW00000156020200
Deposit Account	020200
Authorized User	Kaitlyn Miller

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

37 CFR 1.19 (Document supply fees)

37 CFR 1.20 (Post Issuance fees)

37 CFR 1.21 (Miscellaneous fees and charges)

37 CFR 1.492 (National application filing, search, and examination fees)

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)	DECL3007_IF.pdf	100178	no	1
			4ff2d5c563de6e602b760596eb09b725635084fe		

Warnings:

Information:

2	Fee Worksheet (SB06)	fee-info.pdf	30295	no	2
			4299b3a06bbdf075185ace737c289b1a5a50bfaa		

Warnings:

Information:

Total Files Size (in bytes):	130473
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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.



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NOTICE OF ALLOWANCE AND FEE(S) DUE

23364 7590 09/27/2017
BACON & THOMAS, PLLC
625 SLATERS LANE
FOURTH FLOOR
ALEXANDRIA, VA 22314-1176

EXAMINER

XAVIER, ANTONIO J

ART UNIT

PAPER NUMBER

2623

DATE MAILED: 09/27/2017

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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15/317,761

12/09/2016

Tom DECLERCK

DECL3007/TJM/TL

5434

TITLE OF INVENTION: ADJUSTABLE DISPLAY TILE FOR TILED DISPLAY

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$960	\$0	\$0	\$960	12/27/2017

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**

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

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23364 7590 09/27/2017
BACON & THOMAS, PLLC
625 SLATERS LANE
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Certificate of Mailing or Transmission

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/317,761	12/09/2016	Tom DECLERCK	DECL3007/TJM/TL	5434

TITLE OF INVENTION: ADJUSTABLE DISPLAY TILE FOR TILED DISPLAY

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$960	\$0	\$0	\$960	12/27/2017

EXAMINER	ART UNIT	CLASS-SUBCLASS
XAVIER, ANTONIO J	2623	345-001300

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363). <input type="checkbox"/> Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached. <input type="checkbox"/> "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, 1 _____ (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. 2 _____ 3 _____
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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
☐ Applicant asserting small entity status. See 37 CFR 1.27
☐ Applicant changing to regular undiscounted fee status.

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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. _____



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/317,761	12/09/2016	Tom DECLERCK	DECL3007/TJM/TL	5434

23364 7590 09/27/2017
BACON & THOMAS, PLLC
625 SLATERS LANE
FOURTH FLOOR
ALEXANDRIA, VA 22314-1176

EXAMINER

XAVIER, ANTONIO J

ART UNIT	PAPER NUMBER
----------	--------------

2623

DATE MAILED: 09/27/2017

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. 15/317,761	Applicant(s) DECLERCK, TOM	
	Examiner ANTONIO XAVIER	Art Unit 2623	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 9/7/17.
☐ 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 18,20-22 and 24-44. 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. <input type="checkbox"/> Notice of References Cited (PTO-892) | 5. <input type="checkbox"/> Examiner's Amendment/Comment |
| 2. <input type="checkbox"/> Information Disclosure Statements (PTO/SB/08),
Paper No./Mail Date _____ | 6. <input type="checkbox"/> Examiner's Statement of Reasons for Allowance |
| 3. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit
of Biological Material | 7. <input type="checkbox"/> Other _____. |
| 4. <input type="checkbox"/> Interview Summary (PTO-413),
Paper No./Mail Date _____. | |

/ANTONIO XAVIER/
Primary Examiner, Art Unit 2623

EAST Search History

EAST Search History (Prior Art)


Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	1	"15317761"	US-PGPUB; USPAT	ADJ	ON	2017/06/02 14:43
S2	5	((("DECLERCK") near3 ("Tom"))).INV.	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/02 14:47
S3	5	("20020122134" "5805117" "6150996" "6813853" "8384616").PN.	US-PGPUB; USPAT	ADJ	ON	2017/06/02 14:48
S4	489	G09F9/3026.cpc.	US-PGPUB; USPAT	ADJ	ON	2017/06/02 18:41
S5	2056	G09F9/33.cpc.	US-PGPUB; USPAT	ADJ	ON	2017/06/02 18:41
S6	5	((("DECLERCK") near3 ("Tom"))).INV.	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/03 16:00
S7	1	S6 AND (nominal)	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/03 16:00
S8	0	S6 AND (adjust\$3 means)	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/03 16:16
S9	0	S6 AND (adjusting means)	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/03 16:17
S10	0	S6 AND ("adjusting means")	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/03 16:17
S11	1	S6 AND (means)	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/03 16:17
S12	1	S6 AND ("means")	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/03 16:18
S13	3	S6 AND (adjusting)	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/03 16:19
S14	1	"5805117".pn.	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/03 17:01
S15	5	("20020122134" "5805117" "6150996" "6813853" "8384616").PN.	US-PGPUB; USPAT	ADJ	ON	2017/06/03 17:36
S16	1	S15 AND (LCD or liquid crystal)	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/03 17:36
S17	0	S16 AND (LED or OLED)	US-PGPUB; USPAT;	ADJ	ON	2017/06/03 17:37

			USOCR			
S18	137	(tile or modular) WITH display WITH (LED or OLED) WITH (LCD or liquid crystal)	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/03 17:43
S19	489	G09F9/3026.cpc.	US-PGPUB; USPAT	ADJ	ON	2017/06/03 17:43
S20	2056	G09F9/33.cpc.	US-PGPUB; USPAT	ADJ	ON	2017/06/03 17:43
S21	495	S19 or S20 AND S18	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/03 17:43
S22	15	(S19 or S20) AND S18	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/03 17:43
S23	1	S18 AND (adjust\$3 WITH geometry WITH tile)	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/03 17:45
S24	1	(S19 or S20) AND (adjust\$3 WITH geometry WITH tile)	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/03 17:45
S25	26	(S19 or S20) AND (adjust\$3 WITH tile)	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/03 17:46
S26	12	(S18) AND (adjust\$3 WITH tile)	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/03 17:46
S27	36	S25 or S26	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/03 17:46
S28	8	S27 AND seam	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/03 17:48
S29	0	"8384616".pn. AND (lcd or liquid crystal)	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/03 17:51

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L2	232	G09F9/3026.cpc.	USPAT	ADJ	ON	2017/09/20 12:35
L3	1025	G09F9/33.cpc.	USPAT	ADJ	ON	2017/09/20 12:35
L4	1133	I2 or I3	USPAT	ADJ	ON	2017/09/20 12:45
L5	1	I4 AND (carrier board).clm.	USPAT	ADJ	ON	2017/09/20 12:45
L6	366	(carrier board).clm.	USPAT	ADJ	ON	2017/09/20 12:58
L7	4	I6 AND (spacer AND distance).clm.	USPAT	ADJ	ON	2017/09/20 12:59


9/ 20/ 2017 12:59:38 PM
C:\Users\axavier\Desktop\axavier data files\EAST workspaces\15317761-Adjustable display tile.wsp

Issue Classification 	Application/Control No. 15317761	Applicant(s)/Patent Under Reexamination DECLERCK, TOM	
	Examiner ANTONIO XAVIER	Art Unit 2623	

CPC						
Symbol					Type	Version
G09F		9	/	3026	F	2013-01-01
G09F		9	/	33	I	2013-01-01
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CPC Combination Sets				
Symbol	Type	Set	Ranking	Version

NONE (Assistant Examiner) _____ (Date) _____		Total Claims Allowed: 25	
/ANTONIO XAVIER/ Primary Examiner.Art Unit 2623 (Primary Examiner) _____ (Date) _____		09/20/2017 O.G. Print Claim(s) 1	O.G. Print Figure 3

Issue Classification 	Application/Control No. 15317761	Applicant(s)/Patent Under Reexamination DECLERCK, TOM
	Examiner ANTONIO XAVIER	Art Unit 2623

<input type="checkbox"/> Claims renumbered in the same order as presented by applicant <input type="checkbox"/> CPA <input type="checkbox"/> T.D. <input type="checkbox"/> R.1.47															
Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
-	1	-	17	21	33										
-	2	1	18	22	34										
-	3	-	19	14	35										
-	4	2	20	23	36										
-	5	3	21	15	37										
-	6	4	22	24	38										
-	7	-	23	16	39										
-	8	5	24	25	40										
-	9	6	25	17	41										
-	10	7	26	18	42										
-	11	8	27	19	43										
-	12	9	28	10	44										
-	13	11	29												
-	14	12	30												
-	15	13	31												
-	16	20	32												

NONE	Total Claims Allowed: 25	
(Assistant Examiner)	(Date)	
/ANTONIO XAVIER/ Primary Examiner.Art Unit 2623	09/20/2017	O.G. Print Claim(s) 1
(Primary Examiner)	(Date)	O.G. Print Figure 3

Search Notes 	Application/Control No. 15317761	Applicant(s)/Patent Under Reexamination DECLERCK, TOM
	Examiner ANTONIO XAVIER	Art Unit 2623

CPC- SEARCHED		
Symbol	Date	Examiner
G09F9/3026 (text limited)	6/4/2017	AX
G09F9/33 (text limited)	6/4/2017	AX

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner


US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

SEARCH NOTES		
Search Notes	Date	Examiner
G09F9/3026 (text limited)	6/4/2017	AX
G09F9/33 (text limited)	6/4/2017	AX
Inventor	6/4/2017	AX
EAST	6/4/2017	AX
Updated EAST	9/20/2017	AX


INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
	Searched all listed above	9/20/2017	AX

	/ANTONIO XAVIER/ Primary Examiner.Art Unit 2623
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<i>Index of Claims</i> 	Application/Control No. 15317761	Applicant(s)/Patent Under Reexamination DECLERCK, TOM
	Examiner ANTONIO XAVIER	Art Unit 2623

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

<input type="checkbox"/> Claims renumbered in the same order as presented by applicant				<input type="checkbox"/> CPA				<input type="checkbox"/> T.D.				<input type="checkbox"/> R.1.47			
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Final	Original	06/04/2017	09/20/2017												
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22	34	✓	=												
14	35	✓	=												
23	36	✓	=												

<p align="center"><i>Index of Claims</i></p> 	Application/Control No. 15317761	Applicant(s)/Patent Under Reexamination DECLERCK, TOM
	Examiner ANTONIO XAVIER	Art Unit 2623

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

<input type="checkbox"/> Claims renumbered in the same order as presented by applicant				<input type="checkbox"/> CPA		<input type="checkbox"/> T.D.		<input type="checkbox"/> R.1.47	
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17	41	✓	=						
18	42	✓	=						
19	43	✓	=						
10	44	=	=						

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Application No.:	15/317,761	Confirm. No.:	5434
Filing Date:	December 9, 2016	Art Unit:	2623
First Inventor:	Tom DECLERCK	Customer No.:	23364
Attorney No.:	DECL3007/TJM/TL	Examiner:	Antonio J. Xavier
For:	ADJUSTABLE DISPLAY TILE FOR TILED DISPLAY		

REPLY UNDER 37 C.F.R. § 1.111 TO OFFICE ACTION
OF JUNE 8, 2017

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

Sir:

INTRODUCTORY COMMENTS

This is responsive to the Office Action dated June 8, 2017 in the above application.

In view of the following amendments and remarks, reconsideration of the application is respectfully requested.

AMENDMENT

Please amend the pending application in accordance with the following particulars.

In the Claims

The claims are amended as shown on the following pages under the heading LIST OF CURRENT CLAIMS. The list shows the status of all claims presently in the application and is intended to supersede all prior versions of the claims in the application. Any cancellation of claims is made without prejudice or disclaimer.

LIST OF CURRENT CLAIMS

1-17. (Canceled)

18. (Previously Presented) A display tile comprising a display board and a carrier board, LED's being mounted on a first face of the display board and the carrier board being for attachment to a frame, the display board and the carrier board being fastened together by the intermediary of a spacer and an adjusting means positioned between the spacer and the carrier board wherein the adjusting means engage in an opening in the carrier board, the adjusting means allowing a compensation of the tolerances affecting the position of the LED's with respect to the carrier board in a direction perpendicular to the carrier board whereby the compensation is obtained by the position of the adjusting means in their corresponding opening,

wherein the display board has LEDs and the distance between a first surface of the adjusting means and a first surface of the carrier board is set to the difference between a nominal distance and the sum of the distance between the tops of LEDs on the LED board and a second surface of the LED board, the length of the spacer, and the thickness of the carrier board, wherein the nominal distance is the distance between the top of the LEDs and the second surface of the carrier board or back of the carrier board.

19. (Cancelled)

20. (Previously Presented) The display tile according to claim 18, wherein a sidewall of the opening in the carrier board is perpendicular to the second surface of the carrier board.

21. (Previously Presented) The display tile according to claim 18, wherein a sidewall of the adjusting means is parallel to the sidewall of the opening in the carrier board.

22. (Previously Presented) The display tile according to claim 18, wherein the thickness of the adjusting means is less than the thickness of the carrier board.
23. (Cancelled)
24. (Previously Presented) The display tile according to claim 18, wherein the adjusting means is selected from:
being fastened to the carrier board by glue extending on a second surface and/or a sidewall of the adjusting means and a sidewall of the opening, and
having a first part that is a circular right cylinder with a first radius and a second part that is a circular right cylinder with a second radius smaller than the first radius.
25. (Previously Presented) The display tile according to claim 18, wherein a fastening means fastens the adjusting means to the spacer.
26. (Previously Presented) The display tile according to claim 25, wherein the fastening means is selected from going through an opening in the adjusting means, and being a screw.
27. (Previously Presented) The display tile according to claim 18, wherein a threaded extension extends from the first surface of the adjusting means and that the spacer has a matching threaded opening to receive the threaded extension.
28. (Previously Presented) The display tile according to claim 27, wherein the second surface of the adjusting means is a driving surface.
29. (Currently Amended) A method to adjust the distance between the tops of the LEDs on a first surface of a LED board on a display tile and the back surface of the carrier board of the display tile, the method comprising the steps:

positioning the tops of the LEDs on a LED board in a first reference plane,
aligning openings in the carrier board with spacers distributed on the LED board,
positioning a second surface of a carrier board in a second reference plane; a first surface of the carrier board facing a second surface of the LED board; the first and second reference planes being parallel and the distance between the first and second reference planes being equal to a desired nominal distance,

moving adjusting means in the openings until a first surface of each adjusting means contacts a spacer,

fastening each adjusting means to its corresponding spacer,

fastening the adjusting means to the carrier board,

wherein moving the adjusting means comprises changing the position of the adjusting means in the openings until the distance between the first surface of the adjusting means and the first surface of the carrier board is set to the difference between the nominal distance and the sum of the distance between the tops of LEDs on the LED board and a second surface of the LED board, the length of the spacer, and the thickness of the carrier board, and

wherein the desired nominal distance is the distance between the top of the LEDs and the second surface of the carrier board or back of the carrier board.

30. (Previously Presented) The method of claim 29, wherein glue is dispensed in the openings, on sidewalls of the openings and on a second surface of the adjusting means.

31. (Previously Presented) The method of claim 30, wherein the glue is allowed to harden, to set or to cure to fasten the adjusting means to the carrier board at the position where the adjusting means compensates for the tolerances affecting the position of the LEDs with respect to the carrier board in a direction perpendicular to the carrier board.

32. (Previously Presented) The method of claim 29, wherein the fixing of the distance between the top of the LEDs and the second surface of the carrier board is facilitated by using a jig manufactured with better tolerances than the LED board and the carrier board.

33. (Previously Presented) The method of claim 32, wherein the jig has a first surface or reference surface and sidewalls that extend from the first surface of the jig, the method further comprising if the tolerance on the thickness of the carrier board is sufficiently small to be neglected, the top of the sidewalls serves as a support or stop for the carrier board that is positioned in parallel with the reference surface.

34. (Previously Presented) The method of claim 33, wherein the LED board is positioned with the LEDs in contact with the reference surface.

35. (Currently Amended) The method of claim 30, wherein the height of the sidewalls is selected such that when the sidewalls are in contact with the carrier board, the distance between the second surface of the carrier board facing away from the reference surface and the reference surface is equal to the ~~nominal distance or~~ desired nominal distance between the tops of the LEDs on the LED board and the second surface of the carrier board.

36. (Previously Presented) The method of claim 29, wherein the position of the adjusting means in the opening of the carrier board is modified until a first surface of the adjusting means contacts the spacer and the adjusting means and the spacer are then fastened.

37. (Currently Amended) The method of claim 30, wherein the adjusting means and the spacer are fastened by glue being dispensed in the openings to fasten the adjusting means to the carrier board and to fix its position in the openings, thereby guaranteeing that when the carrier board and LED board are taken out of the jig, the distance between

the second surface of the carrier board and the tops of the LEDs is equal to the desired nominal ~~or desired~~ distance.

38. (Previously Presented) The method of claim 29, wherein the sidewalls of the jig are provided with a step.

39. (Currently Amended) The method of claim 30, wherein the distance between the top of the outermost part to which the sidewall extends and the reference surface in a direction perpendicular to the reference surface is made equal to the desired nominal ~~or desired~~ distance.

40. (Currently Amended) The method of claim 39, wherein the distance between the top of the innermost part of the sidewall and the reference surface is made less than the desired nominal ~~or desired~~ distance minus the nominal thickness of the carrier board.

41. (Previously Presented) The method of claim 30, wherein a flexible material is positioned between the top of the innermost part of the sidewall and the carrier board.

42. (Previously Presented) The method of claim 41, wherein the thickness of the flexible material is selected so that pressure applied to the carrier board makes the second surface of the carrier board flush or coplanar with the top of the outermost part of the sidewall of the jig.

43. (Currently Amended) The method of claim 42, wherein when the second surface of the carrier board is flush with the top of the outermost part of the sidewall of the jig, the distance between the tops of the LED and the second surface of the carrier board is made to be the desired nominal ~~or desired~~ distance.

44. (Previously Presented) A tiled display apparatus comprising a plurality of display tiles according to claim 18 fixed to a frame.

REMARKS

Reconsideration of the pending application is respectfully requested on the basis of the following particulars.

1. Claim Amendments

Claims 29, 35, 37, 39-40, and 43 are amended to overcome the Examiner's rejection under 35 U.S.C. § 112(b) or 35 U.S.C. § 112 (pre-AIA), second paragraph.

It is respectfully submitted that no new matter is added, since support for the amendments may be found, for example, at least on page 3, lines 8-9 and page 6, lines 3-5 of the accompanying description in the specification as originally filed.

Claim 23 is cancelled without prejudice or disclaimer.

Claims 18, 20-22, 24-28, 30-34, 36, 38, 41, 42, and 44 are left unchanged.

2. Rejection of claims 29-43 under 35 U.S.C. § 112(b) or 35 U.S.C. § 112 (pre-AIA), second paragraph, as being indefinite

Reconsideration of this rejection is requested, in view of the amendment to the claims, on the basis that the claims more clearly and unambiguously recite the subject matter for which protection is sought.

Specifically, claims 29, 35, 37, 39, 40, and 43 have been amended as suggested by the Examiner on pages 4-5 of the Office Action dated June 8, 2017. Since the skilled person would have clearly and unambiguously understood the features recited in the claims, the claims as amended are definite.

Accordingly, withdrawal of this rejection is respectfully requested.

3. Rejection of claim 23 under 35 U.S.C. § 103 as being unpatentable over U.S. patent 5,805,117 (*Mazurek*) in view of U.S. publication 2008/0266206 (*Nelson*)

This rejection is moot in view of the cancellation of claim 23.

Accordingly, withdrawal of this rejection is requested.

4. Allowable Subject Matter

Applicant is gratefully appreciative of the indication that claims 18, 20-22, 24-28, and 44 are allowed. It is Applicant's understanding that claims 29-43 recite allowable subject matter and would be allowable if amended to overcome the Examiner's indefiniteness rejection. In view of the amendments to the claims and comments herein, Applicant submits that the claims are now in condition for allowance.

5. Conclusion

As a result of the amendments to the claims and further in view of the foregoing remarks, it is respectfully submitted that the application is in condition for allowance. Accordingly, it is requested that the currently presented claims be approved and the application passed to issue.

Please charge any additional fees required or credit any overpayments in connection with this paper to Deposit Account No. 02-0200.

If any issues remain that may be resolved by a telephone or facsimile communication with the applicant's attorney, the examiner is invited to contact the undersigned at the numbers shown below.

BACON & THOMAS, PLLC
625 Slaters Lane, Fourth Floor
Alexandria, Virginia 22314-1176
Phone: (703) 683-0500
Facsimile: (703) 683-1080

Date: September 7, 2017

Respectfully submitted,

/Thomas J. Moore/

THOMAS J. MOORE
Attorney for Applicant
Registration No. 28,974

Electronic Acknowledgement Receipt

EFS ID:	30296052
Application Number:	15317761
International Application Number:	
Confirmation Number:	5434
Title of Invention:	ADJUSTABLE DISPLAY TILE FOR TILED DISPLAY
First Named Inventor/Applicant Name:	Tom DECLERCK
Customer Number:	23364
Filer:	Thomas J. Moore/Kaitlyn Miller
Filer Authorized By:	Thomas J. Moore
Attorney Docket Number:	DECL3007/TJM/TL
Receipt Date:	07-SEP-2017
Filing Date:	09-DEC-2016
Time Stamp:	14:43:04
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		DECL3007_nfoa_amnd_05SEP17.pdf	158616 99a5508696679d8162226983533f150875bd4b7b	yes	10

Multipart Description/PDF files in .zip description			
Document Description	Start	End	
Amendment/Req. Reconsideration-After Non-Final Reject	1	2	
Claims	3	8	
Applicant Arguments/Remarks Made in an Amendment	9	10	

Warnings:

Information:

Total Files Size (in bytes):	158616
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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.

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 15/317,761		Filing Date 12/09/2016		<input type="checkbox"/> To be Mailed	
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ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	NUMBER FILED	NUMBER EXTRA	RATE (\$)	FEE (\$)
<input type="checkbox"/> BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
<input type="checkbox"/> SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
<input type="checkbox"/> 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 \$ =	
<input type="checkbox"/> 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).	
<input type="checkbox"/> 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	(Column 1)	(Column 2)	(Column 3)	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)
09/07/2017	CLAIMS REMAINING AFTER AMENDMENT						
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	Independent (37 CFR 1.16(h))	* 3	Minus	***3	= 0	X \$420 =	0
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	<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
TOTAL ADD'L FEE						0	

AMENDMENT	(Column 1)	(Column 2)	(Column 3)	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)
	CLAIMS REMAINING AFTER AMENDMENT						
	Total (37 CFR 1.16(i))	*	Minus	**	=	X \$ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X \$ =	
	<input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))						
	<input type="checkbox"/> 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
LAWANDA MILTON

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.**

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

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 15/317,761	Filing Date 12/09/2016	<input type="checkbox"/> To be Mailed
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ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	NUMBER FILED	NUMBER EXTRA	RATE (\$)	FEE (\$)
<input type="checkbox"/> BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
<input type="checkbox"/> SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A	
<input type="checkbox"/> 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 \$ =	
<input type="checkbox"/> 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).			
<input type="checkbox"/> 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	(Column 1)	(Column 2)	(Column 3)	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)
	09/07/2017	CLAIMS REMAINING AFTER AMENDMENT					
	Total (37 CFR 1.16(i))	* 25	Minus	** 27	= 0	X \$80 =	0
	Independent (37 CFR 1.16(h))	* 2	Minus	***3	= 0	X \$420 =	0
	<input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))						
	<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
TOTAL ADD'L FEE						0	

AMENDMENT	(Column 1)	(Column 2)	(Column 3)	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)
		CLAIMS REMAINING AFTER AMENDMENT					
	Total (37 CFR 1.16(i))	*	Minus	**	=	X \$ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X \$ =	
	<input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))						
	<input type="checkbox"/> 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
DENISE HOPKINS

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 NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/317,761	12/09/2016	Tom DECLERCK	DECL3007/TJM/TL	5434

23364 7590 06/08/2017
BACON & THOMAS, PLLC
625 SLATERS LANE
FOURTH FLOOR
ALEXANDRIA, VA 22314-1176

EXAMINER

XAVIER, ANTONIO J

ART UNIT	PAPER NUMBER
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2623

NOTIFICATION DATE	DELIVERY MODE
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06/08/2017

ELECTRONIC

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.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

MAIL@BACONTHOMAS.COM

Office Action Summary	Application No. 15/317,761	Applicant(s) DECLERCK, TOM	
	Examiner ANTONIO XAVIER	Art Unit 2623	AIA (First Inventor to File) Status Yes

-- 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 MONTHS 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 3/30/17.
☐ 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) 18 and 20-44 is/are pending in the application.
5a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 6) ☒ Claim(s) 18,20-22,24-28 and 44 is/are allowed.
- 7) ☒ Claim(s) 23 and 29-43 is/are rejected.
- 8) ☐ Claim(s) _____ 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 12/9/16 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) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 3) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b)
Paper No(s)/Mail Date _____ | 4) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

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

In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

CLAIM INTERPRETATION

2. Examiner notes that the following limitations are being treated as proper invocations of means plus function language under 35 U.S.C. 112, sixth paragraph (emphasis added):

a. "adjusting means" (Claims 18, 23 and 29).

Since these claim limitations **invoke 35 U.S.C. 112(f) or 35 U.S.C. 112 (pre-AIA), sixth paragraph**, Claims 18, 23 and 29 are interpreted to cover the corresponding structure described in the specification that achieves the claimed function, and equivalents thereof.

A review of the specification shows that the following appears to be the corresponding structure described in the specification for the 35 U.S.C. 112(f) or 35 U.S.C. 112 (pre-AIA), sixth paragraph limitation:

(1) The adjusting means appears to include at least a first face 61 and a second face 62. The first face 61 and the second face 62 are preferably substantially parallel to each other. The adjusting means 6 has a third face 63 extending from the first face 61 to the second face 62. The third face is preferably perpendicular to the first face 61 and the second face 62. The adjusting means 6 is positioned in the opening 33 in the carrier board 3, the first face and second face 61 and 62 of adjusting means 6 being parallel to the first and second face 31 and 32 of the carrier board 3 (Figs. 2-9b and paragraphs [0057]-[0070] of the PG Pub as filed).

If applicant wishes to provide further explanation or dispute the examiner's interpretation of the corresponding structure, applicant must identify the corresponding structure with reference to the specification by page and line number, and to the drawing, if any, by reference characters in response to this Office action.

If applicant does **not** wish to have the claim limitation treated under 35 U.S.C. 112(f) or 35 U.S.C. 112 (pre-AIA), sixth paragraph, applicant may amend the claim so that it will clearly not invoke 35 U.S.C. 112(f) or 35 U.S.C. 112 (pre-AIA), sixth paragraph, or present a sufficient showing that the claim recites sufficient structure, material, or acts for performing the claimed function to preclude application of 35 U.S.C. 112(f) or 35 U.S.C. 112 (pre-AIA), sixth paragraph.

For more information, see MPEP § 2173 et seq. and *Supplementary Examination Guidelines for Determining Compliance with 35 U.S.C. § 112 and for Treatment of Related Issues in Patent Applications*, 76 FR 7162, 7167 (Feb. 9, 2011).

Claim Rejections - 35 USC § 112

3. 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.

4. Claims 29-43 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.

Claim 29 recites "the first and second reference planes being parallel and the distance between the first and second reference planes being equal to a desired nominal distance" (emphasis added).

Examiner notes the term "desired nominal distance" fails 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. The claim does not disclose what a nominal distance is or what would make a particular distance "desired" with respect to other distances. Although page 3, lines 8-9 and page 6, lines 3-5 of the specification as filed

Art Unit: 2623

disclose what Applicant intends the nominal distance to refer to, Applicant is reminded that limitations from the specification are not read into the claims (see MPEP 2111.01(II)).

In the interest of compact prosecution, Examiner suggests amending the claim language to include a similar "nominal distance" limitation as found at the end of Claim 18, including something with respect to the term "desired" or removing the term "desired" altogether.

Claims 30-43 are dependent on Claim 29 and rejected for substantially the same reasons, discussed above.

5. Claims 35, 37, 39, 40 and 43 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.

Claims 35, 37, 39 and 43 recite "equal to the nominal distance or desired distance" (emphasis added) and Claim 40 recites "less than the nominal or desired distance" (emphasis added).

As discussed above, the terms "nominal distance" and "desired distance" fail 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.

Furthermore, the claim limitations appear to indicate the nominal or desired distance are two separate values and contradict the original recitation in Claim 30 of a single "desired nominal distance" emphasis added).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claim 23 is/are rejected under 35 U.S.C. 103 as being unpatentable over Mazurek et al. (USPN 5,805,117) in view of Nelson et al. (USPN 2008/0266206).

With respect to Claim 23, Mazurek teaches **a display tile** (Figs. 1 and 21) **comprising a display board** (Fig. 21, item 100 and Col. 19, line 3) **and a carrier board** (Fig. 21, item 310 and Col. 19, line 4),

a first face of the display board and the carrier board being for attachment to a frame (Fig. 1, item 80 and Fig. 21 and Col. 6, line 7),

the display board and the carrier board being fastened together by the intermediary of a spacer (Fig. 21, item 1610 and Col. 19, lines 4-5) **and an adjusting means positioned between the spacer and the carrier board** (Fig. 21, item 1630 and

Art Unit: 2623

Col. 19, lines 6-9 teach a bushing as the adjusting means. Examiner notes the spacer slots into the bushing such that the bushing is between the spacer and board),

wherein the adjusting means engage in an opening in the carrier board (Fig. 21, item 1615 and Col. 19, line 7),

the adjusting means allowing a compensation of the tolerances affecting the position of the *display elements* with respect to the carrier board in a direction perpendicular to the carrier board (Fig. 21, item 1630 and Col. 19, lines 1-14 teach the bushing is part of the alignment device 320),

whereby the compensation is obtained by the position of the adjusting means in their corresponding opening (Fig. 21 and Col. 19, lines 1-14),

wherein the cross section of the adjusting means is selected from:

fitting in the opening (Fig. 21 and Col. 19, lines 11-14 teach the bushing fits in the opening. Although not expressly disclosed, Examiner notes in order for the bushing to fit in the opening the cross section has to be selected such that it also fits in the opening), **and**

having a first area in a first part of the adjusting means and a second area in a second part of the adjusting means.

However, Mazurek fails to expressly teach LED's being mounted on a first face of the display board and the carrier board being for attachment to a frame and the adjusting means allowing a compensation of the tolerances affecting the position of the LED's with respect to the carrier board in a direction perpendicular to the carrier board (emphasis added).

Nelson teaches known modular tiled displays can include LED elements (paragraph [0029]).

It would have been obvious to one of ordinary skill at the time to modify the display of Mazurek to include LED's instead of LCD elements. One of ordinary skill in the art would be motivated to make the aforementioned changes to provide an LED tiled display (Mazurek, Col. 25, lines 12-14 expressly suggest any other type of display may be used). Therefore, a person of ordinary skill in the art would have been motivated to combine the prior art to achieve the claimed invention and there would have been a reasonable expectation of success.

Allowable Subject Matter

8. Claims 18, 20-22, 24-28 and 44 are allowed.

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

The prior art of record teaches an adjusting means in conjunction with a display board and a carrier board (see at least Mazurek et al. USPN 5,805,117). However, the prior art of record fails to teach or suggest Applicant's specifically claimed distances with respect to the adjusting means.

Specifically, the prior art of record fails to teach or suggest "a display tile comprising a display board and a carrier board, LED's being mounted on a first face of the display board and the carrier board being for attachment to a frame, the display

Art Unit: 2623

board and the carrier board being fastened together by the intermediary of a spacer and an adjusting means positioned between the spacer and the carrier board wherein the adjusting means engage in an opening in the carrier board, the adjusting means allowing a compensation of the tolerances affecting the position of the LED's with respect to the carrier board in a direction perpendicular to the carrier board whereby the compensation is obtained by the position of the adjusting means in their corresponding opening, wherein the display board has LEDs and the distance between a first surface of the adjusting means and a first surface of the carrier board is set to the difference between a nominal distance and the sum of the distance between the tops of LEDs on the LED board and a second surface of the LED board, the length of the spacer, and the thickness of the carrier board, wherein the nominal distance is the distance between the top of the LEDs and the second surface of the carrier board or back of the carrier board" (Claim 18 – emphasis added).

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."

Claims 20-22, 24-28 and 44 are dependent on Claim 18 and allowable for substantially the same reasons, discussed above.

Pertinent Art

9. The prior art made of record and not relied upon is considered pertinent to

Applicant's disclosure:

- a. Declerck et al. (USPN 2010/0181456) teaches support structure for a display; and
- b. Gray et al. (USPN 2005/0005487) and Hochman et al. (USPN 8,840,284) teach modular displays include LED and LCD components.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ANTONIO XAVIER whose telephone number is (571)270-7688. The examiner can normally be reached on M-F 3:00pm-9:00pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amare Mengistu can be reached on 571-272-7674. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2623

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.

/ANTONIO XAVIER/
Primary Examiner, Art Unit 2623

Notice of References Cited	Application/Control No. 15/317,761		Applicant(s)/Patent Under Reexamination DECLERCK, TOM	
	Examiner ANTONIO XAVIER		Art Unit 2623	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-5,805,117 A	09-1998	Mazurek; Niel	G02F1/13336	248/919
*	B	US-2005/0005487 A1	01-2005	Gray, James Earl	G09F21/04	40/452
*	C	US-2008/0266206 A1	10-2008	Nelson; William R.	G09F9/33	345/1.3
*	D	US-2010/0181456 A1	07-2010	Declerck; Tom	G09F7/18	248/346.01
*	E	US-8,840,284 B1	09-2014	Hochman; Jeremy	H05K7/12	362/217.12
	F	US-				
	G	US-				
	H	US-				
	I	US-				
	J	US-				
	K	US-				
	L	US-				
	M	US-				

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
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	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.




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BIB DATA SHEET

CONFIRMATION NO. 5434

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.		
15/317,761	12/09/2016	345	2623	DECL3007/TJM/TL		
RULE						
APPLICANTS BARCO N.V., Kortrijk, BELGIUM; INVENTORS Tom DECLERCK, Meulebeke, BELGIUM; ** CONTINUING DATA ***** This application is a 371 of PCT/EP2015/063150 06/12/2015 ** FOREIGN APPLICATIONS ***** UNITED KINGDOM 1410637.1 06/13/2014 ** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** 01/12/2017						
Foreign Priority claimed <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No 35 USC 119(a-d) conditions met <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Verified and Acknowledged /ANTONIO J XAVIER/ Examiner's Signature		<input type="checkbox"/> Met after Allowance Initials	STATE OR COUNTRY BELGIUM	SHEETS DRAWINGS 9	TOTAL CLAIMS 27	INDEPENDENT CLAIMS 2
ADDRESS BACON & THOMAS, PLLC 625 SLATERS LANE FOURTH FLOOR ALEXANDRIA, VA 22314-1176 UNITED STATES						
TITLE ADJUSTABLE DISPLAY TILE FOR TILED DISPLAY						
FILING FEE RECEIVED 2040	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:			<input type="checkbox"/> All Fees <input type="checkbox"/> 1.16 Fees (Filing) <input type="checkbox"/> 1.17 Fees (Processing Ext. of time) <input type="checkbox"/> 1.18 Fees (Issue) <input type="checkbox"/> Other _____ <input type="checkbox"/> Credit		

Search Notes 	Application/Control No. 15317761	Applicant(s)/Patent Under Reexamination DECLERCK, TOM
	Examiner ANTONIO XAVIER	Art Unit 2623

CPC- SEARCHED		
Symbol	Date	Examiner
G09F9/3026 (text limited)	6/4/2017	AX
G09F9/33 (text limited)	6/4/2017	AX


CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES		
Search Notes	Date	Examiner
G09F9/3026 (text limited)	6/4/2017	AX
G09F9/33 (text limited)	6/4/2017	AX
Inventor	6/4/2017	AX
EAST	6/4/2017	AX


INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

	/ANTONIO XAVIER/ Primary Examiner.Art Unit 2623
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<i>Index of Claims</i> 	Application/Control No. 15317761	Applicant(s)/Patent Under Reexamination DECLERCK, TOM
	Examiner ANTONIO XAVIER	Art Unit 2623

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

<input type="checkbox"/> Claims renumbered in the same order as presented by applicant			<input type="checkbox"/> CPA			<input type="checkbox"/> T.D.			<input type="checkbox"/> R.1.47		
CLAIM		DATE									
Final	Original	06/04/2017									
	1	-									
	2	-									
	3	-									
	4	-									
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	34	✓									
	35	✓									
	36	✓									

<i>Index of Claims</i> 	Application/Control No. 15317761	Applicant(s)/Patent Under Reexamination DECLERCK, TOM
	Examiner ANTONIO XAVIER	Art Unit 2623

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

<input type="checkbox"/> Claims renumbered in the same order as presented by applicant <input type="checkbox"/> CPA <input type="checkbox"/> T.D. <input type="checkbox"/> R.1.47										
CLAIM		DATE								
Final	Original	06/04/2017								
	37	✓								
	38	✓								
	39	✓								
	40	✓								
	41	✓								
	42	✓								
	43	✓								
	44	=								

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	1	"15317761"	US-PGPUB; USPAT	ADJ	ON	2017/06/02 17:43
S2	5	((("DECLERCK") near3 ("Tom"))).INV.	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/02 17:47
S3	5	("20020122134" "5805117" "6150996" "6813853" "8384616").PN.	US-PGPUB; USPAT	ADJ	ON	2017/06/02 17:48
S4	489	G09F9/3026.cpc.	US-PGPUB; USPAT	ADJ	ON	2017/06/02 21:41
S5	2056	G09F9/33.cpc.	US-PGPUB; USPAT	ADJ	ON	2017/06/02 21:41
S6	5	((("DECLERCK") near3 ("Tom"))).INV.	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/03 19:00
S7	1	S6 AND (nominal)	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/03 19:00
S8	0	S6 AND (adjust\$3 means)	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/03 19:16
S9	0	S6 AND (adjusting means)	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/03 19:17
S10	0	S6 AND ("adjusting means")	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/03 19:17
S11	1	S6 AND (means)	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/03 19:17
S12	1	S6 AND ("means")	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/03 19:18
S13	3	S6 AND (adjusting)	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/03 19:19
S14	1	"5805117".pn.	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/03 20:01
S15	5	("20020122134" "5805117" "6150996" "6813853" "8384616").PN.	US-PGPUB; USPAT	ADJ	ON	2017/06/03 20:36
S16	1	S15 AND (LCD or liquid crystal)	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/03 20:36
S17	0	S16 AND (LED or OLED)	US-PGPUB; USPAT;	ADJ	ON	2017/06/03 20:37

			USOCR			
S18	137	(tile or modular) WITH display WITH (LED or OLED) WITH (LCD or liquid crystal)	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/03 20:43
S19	489	G09F9/3026.cpc.	US-PGPUB; USPAT	ADJ	ON	2017/06/03 20:43
S20	2056	G09F9/33.cpc.	US-PGPUB; USPAT	ADJ	ON	2017/06/03 20:43
S21	495	S19 or S20 AND S18	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/03 20:43
S22	15	(S19 or S20) AND S18	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/03 20:43
S23	1	S18 AND (adjust\$3 WITH geometry WITH tile)	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/03 20:45
S24	1	(S19 or S20) AND (adjust\$3 WITH geometry WITH tile)	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/03 20:45
S25	26	(S19 or S20) AND (adjust\$3 WITH tile)	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/03 20:46
S26	12	(S18) AND (adjust\$3 WITH tile)	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/03 20:46
S27	36	S25 or S26	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/03 20:46
S28	8	S27 AND seam	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/03 20:48
S29	0	"8384616".pn. AND (lcd or liquid crystal)	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/03 20:51

EAST Search History (Interference)

< This search history is empty >

6/ 4/ 2017 11:46:04 AM
C:\ Users\ axavier\ Desktop\ axavier data files\ EAST workspaces\ 15317761-Adjustable display tile.wsp

Doc code: IDS

PTO/SB/08a (01-10)

Doc description: Information Disclosure Statement (IDS) Filed

Approved for use through 07/31/2012. OMB 0651-0031

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		
	Filing Date		
	First Named Inventor	Tom DECLERCK	
	Art Unit		
	Examiner Name		
	Attorney Docket Number	DECL3007/TJM/TL	

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	8384616	B2	2013-02-26	ELLIOTT et al.	cited in specification	
	2	6150996	A	2000-11-21	NICHOLSON et al.	cited in ISR	
	3	6813853	B1	2004-11-09	TUCKER	cited in ISR	
	4	5805117	A	1998-09-08	MAZUREK et al.	cited in 2nd Written Opinion	
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	20020122134	A1	2002-09-05	KALUA	cited in ISR	
If you wish to add additional U.S. Published Application citation information please click the Add button.							Add

FOREIGN PATENT DOCUMENTS								Remove
Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ²ⁱ	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

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)

Application Number		
Filing Date		
First Named Inventor	Tom DECLERCK	
Art Unit		
Examiner Name		
Attorney Docket Number	DECL3007/TJM/TL	

1	201226214	CN	Y	2009-04-22	SHANGHAI GRAND CANYON OPTO TEC	cited in ISR, English machine translation	×
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If you wish to add additional Foreign Patent Document citation information please click the Add button

NON-PATENT LITERATURE DOCUMENTS

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	International Search Report (ISR) dated September 28, 2015, for PCT/EP2015/063150.	
	2	Written Opinion dated September 28, 2015, for PCT/EP2015/063150.	
	3	Second Written Opinion dated May 11, 2016, for PCT/EP2015/063150.	
	4	International Preliminary Report on Patentability (IPRP) dated September 26, 2016, for PCT/EP2015/063150.	

If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

Examiner Signature	/Antonio Xavier/	Date Considered	06/02/2017
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*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number		
Filing Date		
First Named Inventor	Tom DECLERCK	
Art Unit		
Examiner Name		
Attorney Docket Number	DECL3007/TJM/TL	

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	/Thomas J. Moore/	Date (YYYY-MM-DD)	2016-12-09
Name/Print	THOMAS J. MOORE	Registration Number	28974

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.**

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.



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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/317,761	12/09/2016	Tom DECLERCK	DECL3007/TJM/TL

CONFIRMATION NO. 5434

POA ACCEPTANCE LETTER

23364
BACON & THOMAS, PLLC
625 SLATERS LANE
FOURTH FLOOR
ALEXANDRIA, VA 22314-1176



Date Mailed: 05/25/2017

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 05/22/2017.

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.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at (571) 272-4000 or (571) 272-4200 or 1-888-786-0101.

/yfeferra/

**TRANSMITTAL FOR POWER OF ATTORNEY TO ONE
OR MORE REGISTERED PRACTITIONERS**

Application Number	15/317,761
Filing Date	December 9, 2016
First Named Inventor	Tom DECLERCK
Title	ADJUSTABLE DISPLAY TILE FOR TILED DISPLAY
Art Unit	2623
Examiner Name	Antonio J. Xavier
Attorney Docket	DECL3007/TJM/TL

Signature of Applicant or Patent Practitioner			
Signature	/Thomas J. Moore/	Date	May 22, 2017
Name	THOMAS J. MOORE	Telephone	703-683-0500
Registration number	28974		
<input checked="" type="checkbox"/> Total of 1 of forms are submitted.			

GENERAL POWER OF ATTORNEY BY APPLICANT

This power revokes any previous powers of attorney given in the above-identified patent application.

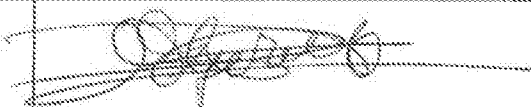
I (we) hereby appoint Practitioners associated with the following Customer Number as my/our attorney, and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A or equivalent):

Customer Number: 23364

Please recognize or change the correspondence address for the above-identified application to the address associated with the above-mentioned Customer Number.

I (we) am/are the Applicant Assignee or Person to Whom the Inventor is Under an Obligation to Assign. This revocation and appointment to the above-identified Practitioners is to the exclusion of the inventor(s).

Signature of Applicant for Patent

Signature			
Name	PETER GERETS	Date	11/02/2017
Title and Company	BARCO NV, VP Technology		

Electronic Acknowledgement Receipt

EFS ID:	29274755
Application Number:	15317761
International Application Number:	
Confirmation Number:	5434
Title of Invention:	ADJUSTABLE DISPLAY TILE FOR TILED DISPLAY
First Named Inventor/Applicant Name:	Tom DECLERCK
Customer Number:	23364
Filer:	Thomas J. Moore/Kaitlyn Miller
Filer Authorized By:	Thomas J. Moore
Attorney Docket Number:	DECL3007/TJM/TL
Receipt Date:	22-MAY-2017
Filing Date:	09-DEC-2016
Time Stamp:	15:19:01
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	GENERAL_POA_transmittal.pdf	251615	no	1
			b58a88dc2dc12c88df5e178cada4d26c04a c4791		

Warnings:

Information:					
2	Power of Attorney	Barco_General_POA_filing.pdf	163771	no	1
			67a9f7b51e2d9cddd913f2d0e1e51e4da58f6fc8		
Warnings:					
Information:					
Total Files Size (in bytes):			415386		
<p>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.</p> <p><u>New Applications Under 35 U.S.C. 111</u> 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.</p> <p><u>National Stage of an International Application under 35 U.S.C. 371</u> 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.</p> <p><u>New International Application Filed with the USPTO as a Receiving Office</u> 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.</p>					



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/317,761	12/09/2016	Tom DECLERCK	DECL3007/TJM/TL	5434
23364	7590	05/11/2017	EXAMINER	
BACON & THOMAS, PLLC			AWAD, AMR A	
625 SLATERS LANE			ART UNIT	
FOURTH FLOOR			PAPER NUMBER	
ALEXANDRIA, VA 22314-1176			2621	
			NOTIFICATION DATE	
			DELIVERY MODE	
			05/11/2017	
			ELECTRONIC	

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.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

MAIL@BACONTHOMAS.COM



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
DECLERCK, TOM**

Application No.: 15/317,761

Filed: December 09, 2016

Attorney Docket No.:

DECL3007/TJM/TL

**For: ADJUSTABLE DISPLAY TILE
FOR TILED DISPLAY**

**: DECISION ON REQUEST TO
: PARTICIPATE IN THE PATENT
: PROSECUTION HIGHWAY
: PROGRAM AND PETITION
: TO MAKE SPECIAL UNDER
: 37 CFR 1.102(a)**

This is a decision on the request to participate in the Patent Prosecution Highway (PPH) program and the petition under 37 CFR 1.102(a), filed March 30, 2017, to make the above-identified application special.

The request and petition are **GRANTED**.

DISCUSSION

A grantable request to participate in the PPH pilot program and petition to make special require:

1. The U.S. application for which participation in the Global/IP5 PPH pilot program is requested must have the same earliest date, whether this is the priority date or filing date, as that of a corresponding national or regional application filed with another Global/IP5 PPH participating office or a corresponding PCT international application for which one of the Global/IP5 PPH participating offices was the International Searching Authority (ISA) or the International Preliminary Examining Authority (IPEA).
2. Applicant must:
 - a. Ensure all the claims in the U.S. application must sufficiently correspond or be amended to sufficiently correspond to the allowable/patentable claim(s) in the corresponding Office of Earlier Examination (OEE) application and
 - b. Submit a claims correspondence table in English;
3. Examination of the U.S. application has not begun;
4. Applicant must submit:

Art Unit: OPET

- a. Documentation of prior office action:
 - i. a copy of the office action(s) just prior to the “Decision to Grant a Patent” from each of the Global/IP5 PPH participating office application(s) containing the allowable/patentable claim(s) or
 - ii. if the allowable/patentable claims(s) are from a “Notification of Reasons for Refusal” then the Notification of Reasons for Refusal or
 - iii. if the Global/IP5 PPH participating office application is a first action allowance then no office action from the Global/IP5 PPH participating office is necessary should be indicated on the request/petition form or
 - iv. the latest work product in the international phase of the OEE PCT application;
- b. An English language translation of the Global/IP5 PPH participating office action or work product from (4)(a)(i)-(ii) or (iv) above;

5. Applicant must submit:

- a. An IDS listing the documents cited by the Global/IP5 PPH participating office examiner in the Global/IP5 PPH participating office action or work product (unless already submitted in this application);
- b. Copies of the documents except U.S. patents or U.S. patent application publications (unless already submitted in this application).

The request to participate in the PPH pilot program and petition comply with the above requirements. Accordingly, the above-identified application has been accorded “special” status.

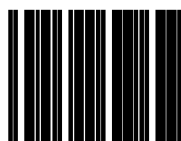
Telephone inquiries concerning this decision should be directed to Dale Hall at (571)272-3586.

All other inquiries concerning the examination or status of the application is accessible in the PAIR system at <http://portal.uspto.gov>.

This application will be forwarded to the examiner for action on the merits commensurate with this decision once this application’s formality reviews have been completed.

/Dale Hall/
Dale Hall
Paralegal Specialist
Office of Petitions

Office of Petitions: Routing Sheet



4 7 0 0

Application No.

This application is being forwarded to your office for further processing. A decision has been rendered on a petition filed in this application, as indicated below. For details of this decision, please see the document PET.OP.DEC filed on the same date as this document.

☒ **GRANTED**

☐ **DISMISSED**

☐ **DENIED**

Office of Petitions: Decision Count Sheet

Mailing Month

5

Application No.

15317761



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:

Hall, Dale

Count (1) - Palm Credit

15317761

Decision:

GRANT

FINANCE WORK NEEDED

☐ Select Check Box for YES

* G R A N T *

Decision Type:

652 - Petition to make special-PPH



* 6 5 2 *

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:

5/8/2017



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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
15/317,761	12/09/2016	Tom DECLERCK	DECL3007/TJM/TL

CONFIRMATION NO. 5434

PUBLICATION NOTICE



OC00000090958717

23364
BACON & THOMAS, PLLC
625 SLATERS LANE
FOURTH FLOOR
ALEXANDRIA, VA 22314-1176

Title:ADJUSTABLE DISPLAY TILE FOR TILED DISPLAY

Publication No.US-2017-0116895-A1

Publication Date:04/27/2017

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 (571) 272-3150 or (800) 972-6382, by facsimile at (571) 273-3250, 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 Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Application No.:	15/317,761	Confirm. No.:	5434
Filing Date:	December 9, 2016	Art Unit:	2621
First Inventor:	Tom DECLERCK	Customer No.:	23364
Attorney No.:	DECL3007/TJM/TL	Examiner:	Amr A. Awad
For:	ADJUSTABLE DISPLAY TILE FOR TILED DISPLAY		

**SECOND PRELIMINARY AMENDMENT
BEFORE EXAMINATION**

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

Sir:

INTRODUCTORY COMMENTS

This paper supplements the documents submitted to initiate national stage processing of the above-identified international patent application on December 9, 2016.

Before formal examination of the application on the merits, it is desired to amend the application in accordance with the following particulars.

Applicant submits a Patent Prosecution Highway (PPH) Request herewith.

AMENDMENTS

AMENDMENTS TO THE CLAIMS

The claims are amended as shown in the following pages under the heading “LIST OF CURRENT CLAIMS”. This listing of claims supersedes all prior listing of claims presented in this application, shows currently proposed amendments and shows the current status of all claims in the application.

LIST OF CURRENT CLAIMS

1-17. (Canceled)

18. (Currently Amended) A display tile comprising a display board and a carrier board, LED's being mounted on a first face of the display board and the carrier board being for attachment to a frame, the display board and the carrier board being fastened together by the intermediary of a spacer and an adjusting means positioned between the spacer and the carrier board wherein the adjusting means engage in an opening in the carrier board, the adjusting means allowing a compensation of the tolerances affecting the position of the LED's with respect to the carrier board in a direction perpendicular to the carrier board whereby the compensation is obtained by the position of the adjusting means in their corresponding opening.

wherein the display board has LEDs and the distance between a first surface of the adjusting means and a first surface of the carrier board is set to the difference between a nominal distance and the sum of the distance between the tops of LEDs on the LED board and a second surface of the LED board, the length of the spacer, and the thickness of the carrier board, wherein the nominal distance is the distance between the top of the LEDs and the second surface of the carrier board or back of the carrier board.

19. (Cancelled)

20. (Currently Amended) The display tile according to claim [[19]] 18, wherein a sidewall of the opening in the carrier board is perpendicular to the second surface of the carrier board.

21. (Previously Presented) The display tile according to claim 18, wherein a sidewall of the adjusting means is parallel to the sidewall of the opening in the carrier board.

22. (Previously Presented) The display tile according to claim 18, wherein the thickness of the adjusting means is less than the thickness of the carrier board.

23. (Currently Amended) ~~The display tile according to claim 18~~ A display tile comprising a display board and a carrier board, LED's being mounted on a first face of the display board and the carrier board being for attachment to a frame, the display board and the carrier board being fastened together by the intermediary of a spacer and an adjusting means positioned between the spacer and the carrier board wherein the adjusting means engage in an opening in the carrier board, the adjusting means allowing a compensation of the tolerances affecting the position of the LED's with respect to the carrier board in a direction perpendicular to the carrier board whereby the compensation is obtained by the position of the adjusting means in their corresponding opening,

wherein the cross section of the adjusting means is selected from:
fitting in the opening , and
having a first area in a first part of the adjusting means and a second area in a second part of the adjusting means.

24. (Previously Presented) The display tile according to claim 18, wherein the adjusting means is selected from:

being fastened to the carrier board by glue extending on a second surface and/or a sidewall of the adjusting means and a sidewall of the opening, and
having a first part that is a circular right cylinder with a first radius and a second part that is a circular right cylinder with a second radius smaller than the first radius.

25. (Previously Presented) The display tile according to claim 18, wherein a fastening means fastens the adjusting means to the spacer.

26. (Previously Presented) The display tile according to claim 25, wherein the fastening means is selected from going through an opening in the adjusting means, and being a screw.

27. (Currently amended) The display tile according to claim 18, wherein a threaded extension extends from ~~[[a]]~~ the first surface of the adjusting means and that the spacer has a matching threaded opening to receive the threaded extension.

28. (Previously Presented) The display tile according to claim 27, wherein the second surface of the adjusting means is a driving surface.

29. (Currently Amended) A method to adjust the distance between the tops of the LEDs on a first surface of a LED board on a display tile and the back surface of the carrier board of the display tile, the method comprising the steps:

positioning the tops of the LEDs on a LED board in a first reference plane,
aligning openings in the carrier board with spacers distributed on the LED board,
positioning a second surface of a carrier board in a second reference plane; a first surface of the carrier board facing a second surface of the LED board; the first and second reference planes being parallel and the distance between the first and second reference planes being equal to a desired nominal distance,

moving adjusting means in the openings until a first surface of each adjusting means contacts a spacer,

fastening each adjusting means to its corresponding spacer,

fastening the adjusting means to the carrier board,

wherein moving the adjusting means comprises changing the position of the adjusting means in the openings until the distance between the first surface of the adjusting means and the first surface of the carrier board is set to the difference between the nominal distance and the sum of the distance between the tops of LEDs on the LED board and a second surface of the LED board, the length of the spacer, and the thickness of the carrier board.

30. (Previously Presented) The method of claim 29, wherein glue is dispensed in the openings, on sidewalls of the openings and on a second surface of the adjusting means.

31. (Previously Presented) The method of claim 30, wherein the glue is allowed to harden, to set or to cure to fasten the adjusting means to the carrier board at the position where the adjusting means compensates for the tolerances affecting the position of the LEDs with respect to the carrier board in a direction perpendicular to the carrier board.

32. (Previously Presented) The method of claim 29, wherein the fixing of the distance between the top of the LEDs and the second surface of the carrier board is facilitated by using a jig manufactured with better tolerances than the LED board and the carrier board.

33. (Previously Presented) The method of claim 32, wherein the jig has a first surface or reference surface and sidewalls that extend from the first surface of the jig, the method further comprising if the tolerance on the thickness of the carrier board is sufficiently small to be neglected, the top of the sidewalls serves as a support or stop for the carrier board that is positioned in parallel with the reference surface.

34. (Previously Presented) The method of claim 33, wherein the LED board is positioned with the LEDs in contact with the reference surface.

35. (Previously Presented) The method of claim 30, wherein the height of the sidewalls is selected such that when the sidewalls are in contact with the carrier board, the distance between the second surface of the carrier board facing away from the reference surface and the reference surface is equal to the nominal distance or desired distance between the tops of the LEDs on the LED board and the second surface of the carrier board.

36. (Currently Amended) The method of claim 29, ~~wherein the position of the adjusting means in the openings of the carrier board is modified until a first surface of the adjusting means contacts the spacer, or~~ wherein the position of the adjusting means in the opening of the carrier board is modified until a first surface of the adjusting means contacts the spacer and the adjusting means and the spacer are then fastened.

37. (Previously Presented) The method of claim 30, wherein the adjusting means and the spacer are fastened by glue being dispensed in the openings to fasten the adjusting means to the carrier board and to fix its position in the openings, thereby guaranteeing that when the carrier board and LED board are taken out of the jig, the distance between the second surface of the carrier board and the tops of the LEDs is equal to the nominal or desired distance.

38. (Previously Presented) The method of claim 29, wherein the sidewalls of the jig are provided with a step.

39. (Previously Presented) The method of claim 30, wherein the distance between the top of the outermost part to which the sidewall extends and the reference surface in a direction perpendicular to the reference surface is made equal to the nominal or desired distance.

40. (Previously Presented) The method of claim 39, wherein the distance between the top of the innermost part of the sidewall and the reference surface is made less than the nominal or desired distance minus the nominal thickness of the carrier board.

41. (Previously Presented) The method of claim 30, wherein a flexible material is positioned between the top of the innermost part of the sidewall and the carrier board.

42. (Previously Presented) The method of claim 41, wherein the thickness of the flexible material is selected so that pressure applied to the carrier board makes the second surface of the carrier board flush or coplanar with the top of the outermost part of the sidewall of the jig.

43. (Previously Presented) The method of claim 42, wherein when the second surface of the carrier board is flush with the top of the outermost part of the sidewall of the jig, the distance between the tops of the LED and the second surface of the carrier board is made to be the nominal or desired distance.

44. (Previously Presented) A tiled display apparatus comprising a plurality of display tiles according to claim 18 fixed to a frame.

REMARKS

The amendment of claims 18, 23, 27, 29 and 36, is supported by now canceled claim 19, and the specification as filed.

Examination of the application as amended is respectfully requested.

Please charge any additional fees required or credit any overpayments in connection with this paper to Deposit Account No. 02-0200.

If any issues remain that may be resolved by a telephone or facsimile communication with the applicant's attorney, the examiner is invited to contact the undersigned at the numbers shown below.

Respectfully submitted,
BACON & THOMAS, PLLC

/Thomas J. Moore/

THOMAS J. MOORE
Attorney for Applicant
Registration No. 28,974

Dated: March 30, 2017

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REQUEST FOR PARTICIPATION IN THE GLOBAL/IP5 PATENT PROSECUTION HIGHWAY (PPH) PILOT PROGRAM IN THE USPTO

Application No.:	15/317,761	First Named Inventor:	Tom DECLERCK
Filing Date:	December 9, 2016	Attorney Docket No.:	DECL3007/TJM/TL
Title of the Invention:	ADJUSTABLE DISPLAY TILE FOR TILED DISPLAY		
THIS REQUEST FOR PARTICIPATION IN THE PPH PILOT PROGRAM ALONG WITH THE REQUIRED DOCUMENTS MUST BE SUBMITTED VIA EFS-WEB. INFORMATION REGARDING EFS-WEB IS AVAILABLE AT HTTP://WWW.USPTO.GOV/PATENTS-APPLICATION-PROCESS/FILING-ONLINE/ABOUT-EFS-WEB.			
APPLICANT HEREBY REQUESTS PARTICIPATION IN THE PATENT PROSECUTION HIGHWAY (PPH) PILOT PROGRAM AND PETITIONS TO MAKE THE ABOVE-IDENTIFIED APPLICATION SPECIAL UNDER THE PPH PILOT PROGRAM.			
Office of earlier examination (OEE): European Patent Office (EPO) OEE application number: <u>PCT/EP2015/063150</u> Both the OEE application and the above-identified U.S. application have the following earliest date (filing or priority date): <u>June 13, 2014</u> Type of OEE work product relied upon: Written Opinion of the International Preliminary Examination Authority (WO/IPEA) Mailing date of OEE work product: <u>September 26, 2016</u>			
Supporting Documents One or more of the required documents below may be available electronically from the Dossier Access System or PATENTSCOPE (see https://www.jpo.go.jp/ppph-portal/filewrapper.htm). If the applicant requests the USPTO to attempt to obtain a document electronically and such attempt is unsuccessful, the applicant will be required to supply the document. Accordingly, to avoid dismissal of the initial PPH request and potential denial of participation in the PPH program, the applicant should verify that the document is actually available via the Dossier Access System or PATENTSCOPE before requesting retrieval. If the applicant is unable to verify availability, then the applicant should submit the document with the PPH request.			
1. OEE Work Product and Translation A copy of the OEE work product and translation if not already in English: <div style="margin-top: 10px;"> <input type="checkbox"/> Attached <input checked="" type="checkbox"/> Previously submitted <input type="checkbox"/> Not required because the decision to grant a patent was the first office action <input type="checkbox"/> Applicant requests the USPTO to attempt to obtain the document(s) from the Dossier Access System or PATENTSCOPE </div>			
2. References Cited in OEE Work Product A listing of references cited in the OEE work product and document copies (except U.S. patents and U.S. published patent applications): <div style="margin-top: 10px;"> <input type="checkbox"/> Attached <input checked="" type="checkbox"/> Previously Submitted <input type="checkbox"/> Not required because no references were cited in the OEE work product <input type="checkbox"/> Applicant requests the USPTO to attempt to obtain the document(s) from the Dossier Access System or PATENTSCOPE </div>			

[Page 1 of 2]

This collection of information is required by 35 U.S.C. 119, 37 CFR 1.55, and 37 CFR 1.102(d). 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 2 hours 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.

REQUEST FOR PARTICIPATION IN THE GLOBAL/IP5 PPH PILOT PROGRAM IN THE USPTO
(continued)

Application No.:	15/317,761	First Named Inventor:	Tom DECLERCK
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3. Claims Correspondence Certification Statement

All of the claims in this application sufficiently correspond to the patentable/allowable claims in the OEE application.

4. Claims Correspondence Table

[illegible]

Signature	/Thomas J. Moore/	Date	March 30, 2017
Name (Print/Typed)	THOMAS J. MOORE	Registration Number	28974

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:

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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.
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Electronic Acknowledgement Receipt

EFS ID:	28788573
Application Number:	15317761
International Application Number:	
Confirmation Number:	5434
Title of Invention:	ADJUSTABLE DISPLAY TILE FOR TILED DISPLAY
First Named Inventor/Applicant Name:	Tom DECLERCK
Customer Number:	23364
Filer:	Thomas J. Moore/Kaitlyn Miller
Filer Authorized By:	Thomas J. Moore
Attorney Docket Number:	DECL3007/TJM/TL
Receipt Date:	30-MAR-2017
Filing Date:	09-DEC-2016
Time Stamp:	15:58:12
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		DECL3007_2nd_Prelim_Amend _29MAR17.pdf	149930 7b578847fb340caff8ab7e7d132a7536193e0583	yes	7

Multipart Description/PDF files in .zip description							
Document Description			Start	End			
Preliminary Amendment			1	1			
Claims			2	6			
Applicant Arguments/Remarks Made in an Amendment			7	7			
Warnings:							
Information:							
2	Petition to make special under Patent Prosecution Hwy	DECL3007_PPH_Rqst_form1.pdf	205844	no	3		
			bff8a908670168361591d8e975d29d0c2ca1ef4				
Warnings:							
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Total Files Size (in bytes):			355774				
<p>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.</p> <p><u>New Applications Under 35 U.S.C. 111</u> 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.</p> <p><u>National Stage of an International Application under 35 U.S.C. 371</u> 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.</p> <p><u>New International Application Filed with the USPTO as a Receiving Office</u> 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.</p>							

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 15/317,761	Filing Date 12/09/2016	<input type="checkbox"/> To be Mailed
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ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO**APPLICATION AS FILED – PART I**

(Column 1)

(Column 2)

FOR	NUMBER FILED	NUMBER EXTRA	RATE (\$)	FEE (\$)
<input type="checkbox"/> BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
<input type="checkbox"/> SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A	
<input type="checkbox"/> 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 \$ =	
<input type="checkbox"/> 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).			
<input type="checkbox"/> 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

(Column 1)

(Column 2)

(Column 3)

AMENDMENT	03/30/2017	CLAIMS REMAINING AFTER AMENDMENT	Minus	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)
	Total (37 CFR 1.16(i))	* 26	Minus	** 27	= 0	X \$80 =	0
	Independent (37 CFR 1.16(h))	* 3	Minus	***3	= 0	X \$420 =	0
	<input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))						
	<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	0

(Column 1)

(Column 2)

(Column 3)

AMENDMENT	CLAIMS REMAINING AFTER AMENDMENT	Minus	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X \$ =
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X \$ =
	<input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))					
	<input type="checkbox"/> 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
KIM WATSON

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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U.S. APPLICATION NUMBER NO.	FIRST NAMED INVENTOR	ATTY. DOCKET NO.
15/317,761	Tom DECLERCK	DECL3007/TJM/TL

23364
BACON & THOMAS, PLLC
625 SLATERS LANE
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ALEXANDRIA, VA 22314-1176

INTERNATIONAL APPLICATION NO.	
PCT/EP2015/063150	
I.A. FILING DATE	PRIORITY DATE
06/12/2015	06/13/2014

CONFIRMATION NO. 5434
371 ACCEPTANCE LETTER



OC000000088491773

Date Mailed: 01/17/2017

NOTICE OF ACCEPTANCE OF APPLICATION UNDER 35 U.S.C 371 AND 37 CFR 1.495

The applicant is hereby advised that the United States Patent and Trademark Office, in its capacity as a Designated / Elected Office (37 CFR 1.495), has ACCEPTED the above identified international application for national patentability examination in the United States Patent and Trademark Office.

The United States Application Number assigned to the application is shown above. A Filing Receipt will be issued for the present application in due course. **THE DATE APPEARING ON THE FILING RECEIPT AS THE "FILING DATE or 371(c) DATE" IS THE DATE ON WHICH THE LAST OF THE 35 U.S.C. 371 (c)(1) and (c)(2) REQUIREMENTS HAS BEEN RECEIVED IN THE OFFICE. THIS DATE IS SHOWN BELOW.** The filing date of the above identified application is the international filing date of the international application (Article 11(3) and 35 U.S.C. 363)

12/09/2016
DATE OF RECEIPT OF 35 U.S.C.
371(c)(1) and (c)(2) REQUIREMENTS

The following items have been received:

- Copy of the International Application filed on 12/09/2016
- Copy of the International Search Report filed on 12/09/2016
- Copy of IPE Report filed on 12/09/2016
- Preliminary Amendments filed on 12/09/2016
- Information Disclosure Statements filed on 12/09/2016
- Inventor's Oath or Declaration filed on 12/09/2016
- Request for Immediate Examination filed on 12/09/2016
- U.S. Basic National Fees filed on 12/09/2016
- Authorize Access to Search Results filed on 12/09/2016
- Priority Documents filed on 12/09/2016
- Authorization to Permit Access filed on 12/09/2016
- Application Data Sheet (37 CFR 1.76) filed on 12/09/2016

Applicant is reminded that any communications to the United States Patent and Trademark Office must be mailed to the address given in the heading and include the U.S. application no. shown above (37 CFR 1.5)

JUELETHIA A PALMER

Telephone: (571) 272-9050



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
15/317,761	12/09/2016		2040	DECL3007/TJM/TL	27	2

CONFIRMATION NO. 5434

FILING RECEIPT



0000000088491772

23364
BACON & THOMAS, PLLC
625 SLATERS LANE
FOURTH FLOOR
ALEXANDRIA, VA 22314-1176

Date Mailed: 01/17/2017

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)

Tom DECLERCK, Meulebeke, BELGIUM;

Applicant(s)

BARCO N.V., Kortrijk, BELGIUM;

Assignment For Published Patent Application

BARCO N.V., Kortrijk, BELGIUM

Power of Attorney: The patent practitioners associated with Customer Number 23364

Domestic Priority data as claimed by applicant

This application is a 371 of PCT/EP2015/063150 06/12/2015

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.)

UNITED KINGDOM 1410637.1 06/13/2014 No Access Code Provided

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 01/12/2017

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/317,761**

Projected Publication Date: 04/27/2017

Non-Publication Request: No

Early Publication Request: No

Title

ADJUSTABLE DISPLAY TILE FOR TILED DISPLAY

Preliminary Class

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 Assets Control, 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
15/317,761

APPLICATION AS FILED - PART I

(Column 1)		(Column 2)	SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE(\$)	FEE(\$)		RATE(\$)	FEE(\$)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	280
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A			N/A	480
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	720
TOTAL CLAIMS (37 CFR 1.16(j))	27 minus 20 =	*			OR	x 80 =	560
INDEPENDENT CLAIMS (37 CFR 1.16(h))	2 minus 3 =	*				x 420 =	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			TOTAL	2040

APPLICATION AS AMENDED - PART II

(Column 1)		(Column 2)	(Column 3)	SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)
Total (37 CFR 1.16(i))	*	Minus	**	=		OR	x	=
Independent (37 CFR 1.16(h))	*	Minus	***	=		OR	x	=
Application Size Fee (37 CFR 1.16(s))						OR		
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						OR		
				TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

(Column 1)		(Column 2)	(Column 3)	SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)
Total (37 CFR 1.16(i))	*	Minus	**	=		OR	x	=
Independent (37 CFR 1.16(h))	*	Minus	***	=		OR	x	=
Application Size Fee (37 CFR 1.16(s))						OR		
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.

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A SUBMISSION UNDER 35 U.S.C. 371		Attorney Docket No. DECL3007/TJM/TL
		U.S. Application No. (if known, see 37 CFR 1.5)
International Application No. PCT/EP2015/063150	International Filing Date June 12, 2015	Priority Date Claimed June 13, 2014
Title of Invention ADJUSTABLE DISPLAY TILE FOR TILED DISPLAY		
First Named Inventor Tom DECLERCK		
<p>Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information.</p> <ol style="list-style-type: none"> 1. <input checked="" type="checkbox"/> This is an express request to begin national examination procedures (35 U.S.C. 371(f)). NOTE: The express request under 35 U.S.C. 371(f) will not be effective unless the requirements under 35 U.S.C. 371(c)(1), (2), and (4) for payment of the basic national fee, copy of the International Application and English translation thereof (if required), and the oath or declaration of the inventor(s) have been received. 2. <input checked="" type="checkbox"/> A copy of the International Application (35 U.S.C. 371(c)(2)) is attached hereto (not required if the International Application was previously communicated by the International Bureau or was filed in the United States Receiving Office (RO/US)). 3. An English language translation of the International Application (35 U.S.C. 371(c)(2)) <ol style="list-style-type: none"> a. <input type="checkbox"/> is attached hereto. b. <input type="checkbox"/> has been previously submitted under 35 U.S.C. 154(d)(4). 4. An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)) <ol style="list-style-type: none"> a. <input checked="" type="checkbox"/> is attached. b. <input checked="" type="checkbox"/> was previously filed in the international phase under PCT Rule 4.17(iv). <p>Items 5 to 8 below concern amendments made in the international phase.</p> <p><u>PCT Article 19 and 34 amendments</u></p> <ol style="list-style-type: none"> 5. <input type="checkbox"/> Amendments to the claims under PCT Article 19 are attached (not required if communicated by the International Bureau) (35 U.S.C. 371(c)(3)). 6. <input type="checkbox"/> English translation of the PCT Article 19 amendment is attached (35 U.S.C. 371(c)(3)). 7. <input type="checkbox"/> English translation of annexes (Article 19 and/or 34 amendments only) of the International Preliminary Examination Report is attached (35 U.S.C. 371(c)(5)). <p><u>Cancellation of amendments made in the international phase</u></p> <ol style="list-style-type: none"> 8a. <input checked="" type="checkbox"/> Do not enter the amendment made in the international phase under PCT Article 19. 8b. <input checked="" type="checkbox"/> Do not enter the amendment made in the international phase under PCT Article 34. <p>NOTE: A proper amendment made in English under Article 19 or 34 will be entered in the U.S. national phase application absent a clear instruction from applicant not to enter the amendment(s).</p> <p>The following items 9 to 17 concern a document(s) or information included.</p> <ol style="list-style-type: none"> 9. <input checked="" type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98. 10. <input checked="" type="checkbox"/> A preliminary amendment. 11. <input checked="" type="checkbox"/> An Application Data Sheet under 37 CFR 1.76. 12. <input type="checkbox"/> A substitute specification. NOTE: A substitute specification cannot include claims. See 37 CFR 1.125(b). 13. <input type="checkbox"/> A power of attorney and/or change of address letter. 14. <input type="checkbox"/> A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.3 and 37 CFR 1.821-1.825. 15. <input type="checkbox"/> Assignment papers (cover sheet and document(s)). Name of Assignee: _____ 16. <input type="checkbox"/> 37 CFR 3.73(c) Statement (when there is an Assignee). _____ 		

This collection of information is required by 37 CFR 1.414 and 1.491-1.492. 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 15 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: Mail Stop PCT, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 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.

U.S. APPLN. No. (if known – see 37 CFR 1.5)	INTERNATIONAL APPLICATION No. PCT/EP2015/063150	ATTORNEY DOCKET No. DECL3007/TJM/TL
17. <input type="checkbox"/> Other items or information:		
The following fees have been submitted.		CALCULATIONS PTO USE ONLY
18. <input checked="" type="checkbox"/> Basic national fee (37 CFR 1.492(a)) \$280		\$ 280.00
19. <input checked="" type="checkbox"/> Examination fee (37 CFR 1.492(c)) If the written opinion prepared by ISA/US or the international preliminary examination report prepared by IPEA/US indicates all claims satisfy provisions of PCT Article 33(1)-(4) \$0 All other situations \$720		\$ 720.00
20. <input checked="" type="checkbox"/> Search fee (37 CFR 1.492(b)) If the written opinion prepared by ISA/US or the international preliminary examination report prepared by IPEA/US indicates all claims satisfy provisions of PCT Article 33(1)-(4) \$0 Search fee (37 CFR 1.445(a)(2)) has been paid on the international application to the USPTO as an International Searching Authority \$120 International Search Report prepared by an ISA other than the US and provided to the Office or previously communicated to the US by the IB \$480 All other situations \$600		\$ 480.00
TOTAL OF 18, 19, and 20 =		\$ 1480.00
<input type="checkbox"/> Additional fee for specification and drawings filed in paper over 100 sheets (excluding sequence listing in compliance with 37 CFR 1.821(c) or (e) in an electronic medium or computer program listing in an electronic medium) (37 CFR 1.492(j)). Fee for each additional 50 sheets of paper or fraction thereof \$400		
Total Sheets	Extra Sheets	Number of each addition 50 or fraction thereof (round up to a whole number)
32 - 100 =	/ 50 =	x \$400
		\$
Surcharge of \$140.00 for furnishing any of the search fee, examination fee, or the oath or declaration after the date of commencement of the national stage (37 CFR 1.492(h)).		\$
CLAIMS	NUMBER FILED	NUMBER EXTRA
Total claims	27 - 20 =	7
Independent claims	2 - 3 =	x \$420
MULTIPLE DEPENDENT CLAIM(S) (if applicable)		+ \$780
Processing fee of \$140.00 for furnishing the English translation later than 30 months from the earliest claimed priority date (37 CFR 1.492(i)).		\$
TOTAL OF ABOVE CALCULATIONS =		\$ 2040.00
<input type="checkbox"/> Applicant asserts small entity status. See 37 CFR 1.27. Fees above are reduced by 1/2.		
<input type="checkbox"/> Applicant certifies micro entity status. See 37 CFR 1.29. Fees above are reduced by 3/4. Applicant must attach form PTO/SB/15A or B or equivalent.		
TOTAL NATIONAL FEE =		\$ 2040.00
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property.		\$
TOTAL FEES ENCLOSED =		\$ 2040.00
		Amount to be refunded:
		\$
		Amount to be charged:
		\$

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- a. ☐ A check in the amount of \$ _____ to cover the above fees is enclosed.
- b. ☐ Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees.
- c. ☒ The Director is hereby authorized to charge additional fees which may be required, or credit any overpayment, to Deposit Account No. 02-0200 as follows:
- i. ☒ any required fee.
- ii. ☐ any required fee except for excess claims fees required under 37 CFR 1.492(d) and (e) and multiple dependent claim fee required under 37 CFR 1.492(f).
- d. ☐ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038. The PTO-2038 should only be mailed or faxed to the USPTO. However, when paying the basic national fee, the PTO-2038 may NOT be faxed to the USPTO.

ADVISORY: If filing by EFS-Web, do NOT attach the PTO-2038 form as a PDF along with your EFS-Web submission. Please be advised that this is not recommended and by doing so your credit card information may be displayed via PAIR. To protect your information, it is recommended to pay fees online by using the electronic payment method.

NOTE: Where an appropriate time limit under 37 CFR 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the International Application to pending status.

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 1: 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.

NOTE 2: A U.S. national stage application may not claim priority to the international application of which it is the national phase. The filing date of a U.S. national stage application is the international filing date. See 35 U.S.C. 363.

Correspondence Address

- ☒ The address associated with Customer Number: 23364 OR ☐ Correspondence address below

Name					
Address					
City		State		Zip Code	
Country				Telephone	
Email					

Signature	/Thomas J. Moore/	Date	December 9, 2016
Name (Print/Type)	THOMAS J. MOORE	Registration No. (Attorney/Agent)	28,974

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.

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	DECL3007/TJM/TL
		Application Number	
Title of Invention	ADJUSTABLE DISPLAY TILE FOR TILED DISPLAY		
<p>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.</p> <p>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.</p>			

Secrecy Order 37 CFR 5.2:

<input type="checkbox"/>	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.)
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Inventor Information:

Inventor	1				Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Tom		DECLERCK		
Residence Information (Select One) US Residency • Non US Residency Active US Military Service					
City	Meulebeke		Country of Residence ⁱ	BE	
Mailing Address of Inventor:					
Address 1	Heulbosstraat 4				
Address 2					
City	Meulebeke		State/Province		
Postal Code	B-8760		Country ⁱ	BE	
All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the Add button.					

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a).			
<input type="checkbox"/> An Address is being provided for the correspondence Information of this application.			
Customer Number	23364		
Email Address	mail@baconthomas.com	Add Email	Remove Email

Application Information:

Title of the Invention	ADJUSTABLE DISPLAY TILE FOR TILED DISPLAY		
Attorney Docket Number	DECL3007/TJM/TL	Small Entity Status Claimed	<input type="checkbox"/>
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	9	Suggested Figure for Publication (if any)	

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	DECL3007/TJM/TL
		Application Number	
Title of Invention	ADJUSTABLE DISPLAY TILE FOR TILED DISPLAY		

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

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:	<input checked="" type="radio"/> Customer Number	US Patent Practitioner	<input type="radio"/> Limited Recognition (37 CFR 11.9)
Customer Number	23364		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim 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.

When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending	Remove	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	a 371 of international	PCT/EP2015/063150	2015-06-12
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the Add button.			Add

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	DECL3007/TJM/TL
		Application Number	
Title of Invention	ADJUSTABLE DISPLAY TILE FOR TILED DISPLAY		

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. 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(i)(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).

Application Number	Country ⁱ	Filing Date (YYYY-MM-DD)	Access Code ⁱ (if applicable)
1410637.1	GB	2014-06-13	

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

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.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	DECL3007/TJM/TL
		Application Number	
Title of Invention	ADJUSTABLE DISPLAY TILE FOR TILED DISPLAY		

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is 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 State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	DECL3007/TJM/TL
		Application Number	
Title of Invention	ADJUSTABLE DISPLAY TILE FOR TILED DISPLAY		

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.

Applicant	1		Remove
<p>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.</p> <p style="text-align: right;">Clear</p>			
<input checked="" type="radio"/> 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:			
<div style="border: 1px solid black; height: 20px; width: 100%;"></div>			
Name of the Deceased or Legally Incapacitated Inventor: <div style="border: 1px solid black; height: 20px; width: 100%;"></div>			
If the Applicant is an Organization check here. <input checked="" type="checkbox"/>			
Organization Name	BARCO N.V.		
Mailing Address Information For Applicant:			
Address 1	President Kennedypark 35		
Address 2			
City	Kortrijk	State/Province	
Country	BE	Postal Code	B-8500
Phone Number		Fax Number	
Email Address			
Additional Applicant Data may be generated within this form by selecting the Add button. Add			

Assignee Information including Non-Applicant Assignee 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.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	DECL3007/TJM/TL
		Application Number	
Title of Invention	ADJUSTABLE DISPLAY TILE FOR TILED DISPLAY		

Assignee	1		
Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.			
Remove			
If the Assignee or Non-Applicant Assignee is an Organization check here. <input checked="" type="checkbox"/>			
Organization Name	BARCO N.V.		
Mailing Address Information For Assignee including Non-Applicant Assignee:			
Address 1	President Kennedypark 35		
Address 2			
City	Kortrijk	State/Province	
Country i	BE	Postal Code	B-8500
Phone Number		Fax Number	
Email Address			
Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button. Add			

Signature:[Remove](#)

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). However, if this Application Data Sheet is submitted with the **INITIAL** filing of the application and either box A or B is **not** checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Thomas J. Moore/		Date (YYYY-MM-DD)	2016-12-09
First Name	THOMAS	Last Name	MOORE	Registration Number
				28974
Additional Signature may be generated within this form by selecting the Add button. Add				

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	DECL3007/TJM/TL
		Application Number	
Title of Invention	ADJUSTABLE DISPLAY TILE FOR TILED DISPLAY		

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.

Box No. VIII (iv) DECLARATION: INVENTORSHIP (only for the purposes of the designation of the United States of America)

The declaration must conform to the following standardized wording provided for in Section 214; see Notes to Boxes Nos. VIII, VIII (i) to (v) (in general) and the specific Notes to Box No. VIII (iv). If this Box is not used, this sheet should not be included in the request.

**Declaration of inventorship (Rules 4.17(iv) and 51 bis.1(a)(iv))
for the purposes of the designation of the United States of America:**

I hereby declare that I believe I am the original inventor or an original joint inventor of a claimed invention in the application.

This declaration is directed to the international application of which it forms a part (if filing declaration with application).

This declaration is directed to international application No. PCT/ EP2015/063150 (if furnishing declaration pursuant to Rule 26ter).

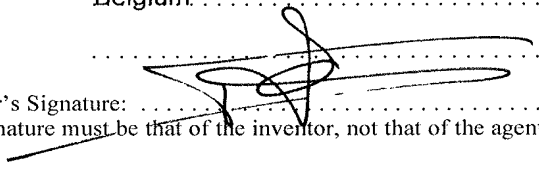
I hereby declare that the above-identified international application was made or authorized to be made by me.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

Name: DECLERCK, Tom

Residence: Meulebeke, Belgium
(city and either US state, if applicable, or country)

Mailing Address: Heulbosstraat 4
B-8760 Meulebeke
Belgium

Inventor's Signature: 
(The signature must be that of the inventor, not that of the agent)

Date: 15/06/2015

Name:

Residence:
(city and either US state, if applicable, or country)

Mailing Address:

Inventor's Signature:
(The signature must be that of the inventor, not that of the agent)

Date:

Name:

Residence:
(city and either US state, if applicable, or country)

Mailing Address:

Inventor's Signature:
(The signature must be that of the inventor, not that of the agent)

Date:

☐ This declaration is continued on the following sheet, "Continuation of Box No. VIII (iv)".

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		
	Filing Date		
	First Named Inventor	Tom DECLERCK	
	Art Unit		
	Examiner Name		
	Attorney Docket Number	DECL3007/TJM/TL	

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	8384616	B2	2013-02-26	ELLIOTT et al.	cited in specification	
	2	6150996	A	2000-11-21	NICHOLSON et al.	cited in ISR	
	3	6813853	B1	2004-11-09	TUCKER	cited in ISR	
	4	5805117	A	1998-09-08	MAZUREK et al.	cited in 2nd Written Opinion	
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	20020122134	A1	2002-09-05	KALUA	cited in ISR	
If you wish to add additional U.S. Published Application citation information please click the Add button.							Add

FOREIGN PATENT DOCUMENTS								Remove
Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ²ⁱ	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

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number		
Filing Date		
First Named Inventor	Tom DECLERCK	
Art Unit		
Examiner Name		
Attorney Docket Number	DECL3007/TJM/TL	

1	201226214	CN	Y	2009-04-22	SHANGHAI GRAND CANYON OPTO TEC	cited in ISR, English machine translation	×
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If you wish to add additional Foreign Patent Document citation information please click the Add button

NON-PATENT LITERATURE DOCUMENTS

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	International Search Report (ISR) dated September 28, 2015, for PCT/EP2015/063150.	
	2	Written Opinion dated September 28, 2015, for PCT/EP2015/063150.	
	3	Second Written Opinion dated May 11, 2016, for PCT/EP2015/063150.	
	4	International Preliminary Report on Patentability (IPRP) dated September 26, 2016, for PCT/EP2015/063150.	

If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

Examiner Signature		Date Considered	
--------------------	--	-----------------	--

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number	
Filing Date	
First Named Inventor	Tom DECLERCK
Art Unit	
Examiner Name	
Attorney Docket Number	DECL3007/TJM/TL

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	/Thomas J. Moore/	Date (YYYY-MM-DD)	2016-12-09
Name/Print	THOMAS J. MOORE	Registration Number	28974

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.**

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 COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

PCT

To:
 IPLodge BVBA
 Technologielaan 9
 3001 Heverlee
 BELGIQUE

NOTIFICATION OF TRANSMITTAL OF
 THE INTERNATIONAL SEARCH REPORT AND
 THE WRITTEN OPINION OF THE INTERNATIONAL
 SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

Date of mailing (day/month/year)		28 September 2015 (28-09-2015)
Applicant's or agent's file reference BAR2309PCT	FOR FURTHER ACTION See paragraphs 1 and 4 below	
International application No. PCT/EP2015/063150	International filing date (day/month/year)	12 June 2015 (12-06-2015)
Applicant BARCO N.V.		

1. ☒ The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

Filing of amendments and statement under Article 19:

The applicant is entitled, if he so wishes, to amend the claims of the International Application (see Rule 46):

When? The time limit for filing such amendments is normally two months from the date of transmittal of the International Search Report.

How? Directly to the International Bureau of WIPO, 34 chemin des Colombettes
 1211 Geneva 20, Switzerland, Fascimile No.: (41-22) 338.82.70

For more detailed instructions, see PCT Applicant's Guide, International Phase, paragraphs 9.004 - 9.011.

2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.

3. ☐ **With regard to any protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

- ☐ the protest together with the decision thereon has been transmitted to the International Bureau together with any applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.
☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. Reminders

The applicant may **submit comments on an informal basis on the written opinion of the International Searching Authority** to the International Bureau. These comments will be made available to the public after international publication. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established.

Shortly after the expiration of **18 months from the priority date, the international application will be published** by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau before the completion of the technical preparations for international publication (Rules 90*bis*.1 and 90*bis*.3).

Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for **entry into the national phase** before those designated Offices. In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months. For details about the applicable time limits, Office by Office, see www.wipo.int/pct/en/texts/time_limits.html and the *PCT Applicant's Guide, National Chapters*.

Within **19 months from the priority date, the applicant may request that a supplementary international search be carried out** by a different International Searching Authority that offers this service (Rule 45*bis*.1). The procedure for requesting supplementary international search is described in the *PCT Applicant's Guide, International Phase, paragraphs 8.006-8.032*.

Name and mailing address of the International Searching Authority



European Patent Office, P.B. 5818 Patentlaan 2
 NL-2280 HV Rijswijk
 Tel. (+31-70) 340-2040
 Fax: (+31-70) 340-3016

Authorized officer

DUPERRON, Nathalie
 Tel: +31 (0)70 340-4428

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference BAR2309PCT	FOR FURTHER ACTION see Form PCT/ISA/220 as well as, where applicable, item 5 below.	
International application No. PCT/EP2015/063150	International filing date (<i>day/month/year</i>) 12 June 2015 (12-06-2015)	(Earliest) Priority Date (<i>day/month/year</i>) 13 June 2014 (13-06-2014)
Applicant BARCO N.V.		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 5 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the **language**, the international search was carried out on the basis of:

- ☒ 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))

b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6*bis*(a)).

c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ **Certain claims were found unsearchable** (See Box No. II)

3. ☐ **Unity of invention is lacking** (see Box No III)

4. With regard to the **title**,

- ☒ the text is approved as submitted by the applicant
- ☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

- ☐ the text is approved as submitted by the applicant
- ☒ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority

6. With regard to the **drawings**,

- a. the figure of the **drawings** to be published with the abstract is Figure No. 1
- ☒ as suggested by the applicant
- ☐ as selected by this Authority, because the applicant failed to suggest a figure
- ☐ as selected by this Authority, because this figure better characterizes the invention
- b. ☐ none of the figures is to be published with the abstract

Box No. IV Text of the abstract (Continuation of item 5 of the first sheet)**Adjustable Display Tile for Tiled Display**

The invention relates to a display tile comprising a display board (1) and a carrier board (3) fastened together by the intermediary of a spacer (7) and an adjusting means positioned between the spacer (7) and the carrier board (3) whereby the adjusting means engage in an opening in the carrier board (3).

The invention further relates to methods to adjust the distance between the top of a LED (2) on a first surface (11) of a LED board on a display tile and the back surface (32) of the carrier board of the display tile.

Fig. 1

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2015/063150

A. CLASSIFICATION OF SUBJECT MATTER

INV. G09F9/302 G09F9/33
ADD.

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)
G09F

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)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	US 2002/122134 A1 (KALUA KEVIN A [US]) 5 September 2002 (2002-09-05) paragraphs [0001], [0008], [0042], [0043], [0045], [0047], [0048], [0058] - [0060] figures 1-26 -----	1,2,4,5, 9-17 3,6-8
X A	US 6 150 996 A (NICHOLSON TIMOTHY J [US] ET AL) 21 November 2000 (2000-11-21) column 2, lines 53-62 column 5, line 57 - column 6, line 14 column 6, lines 32-43 column 8, lines 13-30 column 9, lines 1-16 column 11, lines 38-47 figures 1-40 ----- -/--	1-5,7, 16,17 6,8-15

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* 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

18 September 2015

Date of mailing of the international search report

28/09/2015

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Zanna, Argini

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2015/063150

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 813 853 B1 (TUCKER WAYNE R [US]) 9 November 2004 (2004-11-09)	1,4,5,9, 11-13,17
A	column 4, line 47 - column 5, line 9 column 7, line 56 - column 9, line 24 figures 1-11	2,3,6-8, 10,14-16
A	----- CN 201 226 214 Y (SHANGHAI DAXIAGU OPTO ELEC SCI&TECHN C) 22 April 2009 (2009-04-22) abstract; figures 1-8B -----	1-17

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2015/063150

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 2002122134	A1	05-09-2002	NONE	
US 6150996	A	21-11-2000	NONE	
US 6813853	B1	09-11-2004	NONE	
CN 201226214	Y	22-04-2009	NONE	

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

To:

see form PCT/ISA/220

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/EP2015/063150

International filing date (day/month/year)
12.06.2015

Priority date (day/month/year)
13.06.2014

International Patent Classification (IPC) or both national classification and IPC
INV. G09F9/302 G09F9/33

Applicant
BARCO N.V.

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 43bis.1(a)(i) with regard to novelty, inventive step and 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 usually 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 66.1bis(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.

Name and mailing address of the ISA:



European Patent Office
P.B. 5818 Patentlaan 2
NL-2280 HV Rijswijk - Pays Bas
Tel. +31 70 340 - 2040
Fax: +31 70 340 - 3016

Date of completion of
this opinion

see form
PCT/ISA/210

Authorized Officer

Zanna, Argini

Telephone No. +31 70 340-0



Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:
 - ☒ 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 43bis.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 sequence listing:
 - a. ☐ forming part of the international application as filed:
 - ☐ in the form of an Annex C/ST.25 text file.
 - ☐ on paper or in the form of an image file.
 - b. ☐ furnished together with the international application under PCT Rule 13ter.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.
 - c. ☐ furnished subsequent to the international filing date for the purposes of international search only:
 - ☐ in the form of an Annex C/ST.25 text file (Rule 13ter.1(a)).
 - ☐ on paper or in the form of an image file (Rule 13ter.1(b) and Administrative Instructions, Section 713).
4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of 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/EP2015/063150

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	<u>6, 8</u>
	No: Claims	<u>1-5, 7, 9-17</u>
Inventive step (IS)	Yes: Claims	
	No: Claims	<u>1-17</u>
Industrial applicability (IA)	Yes: Claims	<u>1-17</u>
	No: Claims	

2. Citations and explanations

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Reference is made to the following documents:

- D1 US 2002/122134 A1 (KALUA KEVIN A [US]) 5 September 2002
(2002-09-05)
- D2 US 6 150 996 A (NICHOLSON TIMOTHY J [US] ET AL) 21 November
2000 (2000-11-21)
- D3 US 6 813 853 B1 (TUCKER WAYNE R [US]) 9 November 2004
(2004-11-09)
- D4 CN 201 226 214 Y (SHANGHAI DAXIAGU OPTO ELEC SCI&TECHN C)
22 April 2009 (2009-04-22)

2. Independent claim 1

The present application does not meet the criteria of Article 33(2) PCT, because the subject-matter of claim 1 is not new.

2.1. Document D1 discloses:

A display tile (31, paragraph [0043]) comprising a display board (91 at the left, figure 18; 91 in paragraph [0060]; 81 in paragraph [0047]*) and a carrier board (61, figure 18; paragraph [0045]),

the carrier board being for attachment to a frame (paragraph [0042]),

the display board and the carrier board being fastened together by the intermediary of a spacer (153, figures 17 and 18; paragraph [0059]) and an adjusting means (147, figures 17 and 18; paragraph [0060]) positioned between the spacer and the carrier board (figures 17 and 18)

wherein the adjusting means engage in an opening in the carrier board (64, figure 18; paragraph [0060]),

the adjusting means being for adjusting a relative position of the display board with respect to the carrier board (paragraphs [0058] and [0060]).

**It is apparent that in D1 there is an inconsistency between the reference sign for the LED board in the figures and in the description. In any case, the two boards 81 and 91 of document D1 can be regarded as being one board that corresponds to the said display board of claim 1.*

2.2. Document D2 discloses:

A display tile (2, figure 1; column 5, line 60) comprising a display board (12, column 8, line 14) and a carrier board (14, figures 17 and 18; column 8, line 15),

the carrier board being for attachment to a frame (figures 4-8; column 6, lines 32-43),

the display board and the carrier board being fastened together by the intermediary of a spacer (142 together with 144, figures 17-19; column 9, line 2) and an adjusting means (143, figure 17; column 9, lines 10-11) positioned between the spacer and the carrier board (figure 17)

wherein the adjusting means engage in an opening in the carrier board (figure 17),

the adjusting means being for adjusting a relative position of the display board with respect to the carrier board (column 11, lines 38-47).

2.3. The subject-matter of claim 1 is, therefore, not new.

3. Independent claim 16

The present application does not meet the criteria of Article 33(2) PCT, because the subject-matter of claim 16 is not new. In so far as this claim can be understood (see point VIII below), document D1 discloses:

A method to adjust the distance between the tops of the LEDs on a first surface of a LED board on a display tile and the back surface of the carrier board of the display tile (paragraphs [0058] and [0060]), the method comprising the steps:

- positioning the tops of the LEDs on a LED board in a first reference plane (83, 81, figure 18; paragraph [0047]),
- aligning openings in the carrier board with spacers distributed on the LED board (figure 18; paragraph [0060]),
- positioning a second surface of a carrier board in a second reference plane; a first surface of the carrier board facing a second surface of the LED board; the first and second reference planes being parallel and the distance between the first and second reference planes being equal to a nominal distance (paragraph [0047]),
- moving adjusting means in the openings until a first surface of each adjusting means contacts a spacer (paragraph [0047]),
- fastening each adjusting means to its corresponding spacer (paragraph [0060]),
- fastening the adjusting means to the carrier board (paragraph [0060]).

The subject-matter of claim 16 is, therefore, not new.

4. Dependent claims 2-15 and 17

Dependent claims 2-15 and 17 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty and/or inventive step.

4.1. Claim 2

The subject-matter of claim 2 is disclosed in document D1 (see paragraphs [0008], [0058] and [0060]) and is, therefore, not new.

4.2. Claim 3

The subject-matter of claim 3 is disclosed in document D2 (see the corresponding lengths in figure 17) and is, therefore, not new.

4.3. Claims 4 and 5

The subject-matter of claims 4 and 5 is disclosed in document D1 (see figure 18) and is, therefore, not new.

4.4. Claim 6

In claim 6 a slight constructional change in the display tile of claim 1 is defined which comes within the scope of the customary practice followed by persons skilled in the art, especially as the advantages thus achieved can readily be foreseen. Consequently, the subject-matter of claim 6 also lacks an inventive step.

4.5. Claim 7

The subject-matter of claim 7 is disclosed in document D2 (see figure 17) and is, therefore, not new.

4.6. Claim 8

In claim 8 a slight constructional change in the display tile of claim 1 is defined which comes within the scope of the customary practice followed by persons skilled in the art, especially as the advantages thus achieved can readily be foreseen. Consequently, the subject-matter of claim 8 also lacks an inventive step.

4.7. Claims 9-15 and 17

Document D1 discloses:

claims 9 and 10: see figures 17 and 18; paragraph [0058]

claims 11-13; see 142, figures 17 and 18; paragraph [0058]

claims 14 and 15: see figures 17 and 18; paragraphs [0058] and [0059],
where:

- 142 together with 147 is the adjusting means

- 146 is the threaded extension of the adjusting means
- 159 is the matching threaded opening of the spacer
- 143 is the driving surface of the adjusting means

claim 17: see paragraph [0042]

The subject-matter of claims 9-15 and 17 is, therefore not new.

Re Item VIII

Certain observations on the international application

The application does not meet the requirements of Article 6 PCT, because claims 3 and 6 are not clear.

1. The relative term "nominal distance" used in **claims 3 and 16** has no well-recognized meaning and leaves the reader in doubt as to the meaning of the technical feature to which it refers, thereby rendering the definition of the subject-matter of said claims unclear, Article 6 PCT.

2. Although independent **claim 16** is worded as a method claim, it refers to the use of the apparatus of claim 1. Additionally, the claims 1 and 16 are not clear and concise in the sense of Article 6 PCT, because method claim 16 does not include a reference to apparatus of claim 1. Claim 16 should, therefore, refer to claim 1, in order to avoid unnecessary repetition of the features of claim 1 and make it clear that the claims are unitary and concise.

PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

IPLodge BVBA
Technologielaan 9
3001 Heverlee
BELGIQUE

PCT

WRITTEN OPINION OF THE
INTERNATIONAL PRELIMINARY
EXAMINING AUTHORITY
(PCT Rule 66)

Date of mailing (day/month/year)	11.05.2016
-------------------------------------	------------

Applicant's or agent's file reference
BAR2309PCT

REPLY DUE
within 2 month(s) from the above date of mailing

International application No.
PCT/EP2015/063150

International filing date (day/month/year)
12.06.2015

Priority date (day/month/year)
13.06.2014

International Patent Classification (IPC) or both national classification and IPC
INV. G09F9/302

Applicant
Barco NV

1. ☒ The written opinion established by the International Searching Authority:
☒ is ☐ is not
considered to be a written opinion of the International Preliminary Examining Authority.
2. This second 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 66.2(a)(ii) 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
3. The applicant is hereby **invited to reply** to this opinion.
When? See the time limit indicated above. The applicant may, before the expiration of that time limit, request this Authority to grant an extension, see Rule 66.2(e).
How? By submitting a written reply, accompanied, where appropriate, by amendments, according to Rule 66.3. For the form and the language of the amendments, see Rules 55.3 and 66.8.
Also: For the examiner's obligation to consider amendments and/or arguments, see Rule 66.4bis. For an informal communication with the examiner, see Rule 66.6. For an additional opportunity to submit amendments, see Rule 66.4.

If no reply is filed, the international preliminary examination report will be established on the basis of this opinion.
4. The final date by which the international preliminary report on patentability (Chapter II of the PCT) must be established according to Rule 69.2 is: 13.10.2016

Name and mailing address of the international preliminary examining authority:



European Patent Office P.B. 5818 Patentlaan 2
NL-2280 HV Rijswijk - Pays Bas
Tel. +31 70 340 - 2040
Fax: +31 70 340 - 3016

Authorized Officer

Zanna, Argini

Telephone No. +31 70 340-9945



**WRITTEN OPINION OF THE INTERNATIONAL
PRELIMINARY EXAMINING AUTHORITY**

International application No.
PCT/EP2015/063150

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:
- ☒ 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 (under Rules 12.3(a) and 23.1(b)).
 - ☐ publication of the international application (under Rule 12.4(a))
 - ☐ international preliminary examination (under Rules 55.2(a) and/or 55.3(a) and (b))
2. With regard to the elements of the international application, this opinion has been established on the basis of
(*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article
14 are referred to in this opinion as "originally filed"*):

Description, Pages

1-23 as originally filed

Claims, Numbers

1-17 filed with the demand for preliminary international examination

Drawings, Sheets

1/9-9/9 as originally filed

- ☐ a sequence listing - see Supplemental Box Relating to Sequence Listing.
3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
4. ☐ This opinion has been established as if (some of) the amendments listed below had not been made, since
either they are considered to go beyond the disclosure as filed, or they were not accompanied by a
letter indicating the basis for the amendments in the application as filed, as indicated in the Supplemental
Box (Rules 70.2(c) and (c-bis)):
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
5. ☐ 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 66.1(d-bis)).
 - ☐ without taking into account the **rectification of an obvious mistake** authorized by or notified to this
Authority under Rule 91 (Rule 66.4bis).

**WRITTEN OPINION OF THE INTERNATIONAL
PRELIMINARY EXAMINING AUTHORITY**

International application No.
PCT/EP2015/063150

6. ☐ Supplementary international search report(s) from Authority(ies) have been received and taken into account in drawing up this opinion (Rule 45*bis*.8(b) and (c)).

Box No. V Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	No:	Claims	1-7, 9-17
Inventive step (IS)	No:	Claims	1-17
Industrial applicability (IA)	No:	Claims	

2. Citations and explanations:

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Reference is made to the following documents:

- D1 US 2002/122134 A1 (KALUA KEVIN A [US]) 5 September 2002
(2002-09-05)
- D2 US 6 150 996 A (NICHOLSON TIMOTHY J [US] ET AL) 21 November
2000 (2000-11-21)
- D3 US 6 813 853 B1 (TUCKER WAYNE R [US]) 9 November 2004
(2004-11-09)
- D4 CN 201 226 214 Y (SHANGHAI DAXIAGU OPTO ELEC SCI&TECHN C)
22 April 2009 (2009-04-22)

The following document was not cited in the international search report. A copy of the document is appended hereto.

- D5 US 5 805 117 A (MAZUREK NIEL [US] ET AL) 8 September 1998
(1998-09-08)

2. Independent claim 1

Notwithstanding the lack of clarity mentioned in point VIII below, the present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claim 1 is not new in the sense of Article 33(2) PCT.

2.1. Document D1 discloses:

A display tile (31, paragraph [0043]) comprising a display board (91 at the left, figure 18; 91 in paragraph [0060]; 81 in paragraph [0047]^{2.1.1.)} and a carrier board (61, figure 18; paragraph [0045]),
the carrier board being for attachment to a frame (paragraphs [0042] and [0043]),

the display board and the carrier board being fastened together by the intermediary of a spacer (153, figures 17 and 18; paragraph [0059]) and an adjusting means (147, figures 17 and 18; paragraph [0060]) positioned between the spacer and the carrier board (figures 17 and 18)

wherein the adjusting means engage in an opening in the carrier board (64, figure 18; paragraph [0060]),

the adjusting means allowing a compensation of tolerances affecting the position of the LEDs with respect to the carrier board in a direction perpendicular to the carrier board (paragraphs [0015], [0058] and [0060]^{2.1.2.}).

Notes:

2.1.1. It is apparent that in D1 there is an inconsistency between the reference sign for the LED board in the figures and in the description. In any case, the two boards 81 and 91 in figure 18 of document D1 can be regarded as being one board that corresponds to the said display board of claim 1.

2.1.2. A document takes away the novelty of any claimed subject-matter derivable directly and unambiguously from that document including any features implicit to a person skilled in the art in what is expressly mentioned in the document.

In this case, D1 clearly mentions the need of having a "uniform spacing between the strongback and the LED circuit board" (lines 10-12 of paragraph [0060]) and that "the shank may translate freely through the hole 150 (line 16 of paragraph [0058]). Hence the fact that a screw can be fixed tightly or loosely to a respective female connecting compartment (the bore 159 in figure 17 of D1), in order to achieve uniform spacing, is regarded as an implicit feature of the screw.

The subject-matter of claim 1 is, therefore, not new over D1 (Article 33(2) PCT).

2.2. It is to be noted that the subject-matter of claim 1 is also disclosed in document D2 (see figures 1, 17, 18, 33 and 34; column 8, lines 13-30; column 9, lines 1-16; column 11, lines 38-47; column 18, lines 33-48).

2.3. Additionally, D5 discloses a liquid crystal display tile with the features of claim 1 (see figures 1 and 21; column 18, line 49 - column 19, line 40).

3. Independent claim 16

The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claim 16 is not new in the sense of Article 33(2) PCT.

3.1. Document D1 discloses:

A method to adjust the distance between the tops of the LEDs on a first surface of a LED board on a display tile and the back surface of the carrier board of the display tile (paragraphs [0058] and [0060]), the method comprising the steps:

- positioning the tops of the LEDs on a LED board in a first reference plane (83, 81, figure 18; paragraph [0047]),
- aligning openings in the carrier board with spacers distributed on the LED board (figure 18; paragraph [0060]),
- positioning a second surface of a carrier board in a second reference plane; a first surface of the carrier board facing a second surface of the LED board; the first and second reference planes being parallel and the distance between the first and second reference planes being equal to a nominal distance (paragraph [0047]),
- moving adjusting means in the openings until a first surface of each adjusting means contacts a spacer (paragraph [0047]),
- fastening each adjusting means to its corresponding spacer (paragraph [0060]),
- fastening the adjusting means to the carrier board (paragraph [0060]).

The subject-matter of claim 16 is, therefore, not new over D1 (Article 33(2) PCT).

3.2. It is to be noted that document D5 discloses a method to adjust the distance between a liquid crystal display board and a carrier board on a display tile (see figures 1 and 21; column 18, line 49 - column 19, line 40).

4. Dependent claims 2-15 and 17

Dependent claims 2-15 and 17 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty and/or inventive step.

4.1. Claims 2-7, 9-15 and 17

The subject-matter of claims 2-7, 9-15 and 17 is disclosed in the following documents:

claim 2: see D1; paragraphs [0008], [0058] and [0060]

claim 3: see the corresponding lengths in figure 17 of D2

claims 4 and 5: see D1; figure 18

claim 6: see D2; figure 33

claim 7: see D2; figure 17

claims 9 and 10: see D1; figures 17 and 18; paragraph [0058]

claims 11-13: see D1; 142, figures 17 and 18; paragraph [0058]

claims 14 and 15: see D1; figures 17 and 18; paragraphs [0058] and [0059],
where:

- 142 together with 147 is the adjusting means
- 146 is the threaded extension of the adjusting means
- 159 is the matching threaded opening of the spacer
- 143 is the driving surface of the adjusting means

claim 17: see D1; paragraph [0042]

4.2. Claim 8

In claim 8 a slight constructional change in the display tile of claim 1 is defined which comes within the scope of the customary practice followed by persons skilled in the art, especially as the advantages thus achieved can readily be foreseen. Consequently, the subject-matter of claim 8 also lacks an inventive step.

Re Item VIII

Certain observations on the international application

The application does not meet the requirements of Article 6 PCT, because **claims 1, 3 and 16** are not clear.

1. The term "the position of the LEDs" used in **claim 1** is vague and unclear and leaves the reader in doubt as to the meaning of the technical feature to which it refers, thereby rendering the definition of the subject-matter of said claim unclear, Article 6 PCT. In particular, said LEDs are not mentioned before in the claim and claim 1 fails to disclose their exact location on the display tile.

2. In addition, claim 1 does not meet the requirements of Article 6 PCT because the matter for which protection is sought is not clearly defined. The claim attempts to define the subject-matter in terms of the result to be achieved, which merely amounts to a statement of the underlying problem, without providing the technical features necessary for achieving this result (see "the adjusting means allowing a compensation of the tolerances affecting the position of the LEDs with respect to the carrier board in a direction perpendicular to the carrier board").

3. The relative term "nominal distance" used in **claims 3 and 16** is vague, unclear and has no well-recognized meaning, leaving the reader in doubt as to the meaning of the technical feature to which it refers, thereby rendering the definition of the subject-matter of said claims unclear, Article 6 PCT. It is not clear to the reader of the claims which exactly is this distance.

PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:
IPLodge BVBA Technologielaan 9 3001 Heverlee BELGIQUE

PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY (PCT Rule 71.1)

Applicant's or agent's file reference BAR2309PCT		IMPORTANT NOTIFICATION	
International application No. PCT/EP2015/063150	International filing date (day/month/year) 12.06.2015	Priority date (day/month/year) 13.06.2014	
Applicant Barco NV			

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary report on patentability and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary report on patentability. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

The applicant's attention is drawn to Article 33(5), which provides that the criteria of novelty, inventive step and industrial applicability described in Article 33(2) to (4) merely serve the purposes of international preliminary examination and that "any Contracting State may apply additional or different criteria for the purposes of deciding whether, in that State, the claimed inventions is patentable or not" (see also Article 27(5)). Such additional criteria may relate, for example, to exemptions from patentability, requirements for enabling disclosure, clarity and support for the claims.

Name and mailing address of the international preliminary examining authority:  European Patent Office P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Fax: +31 70 340 - 3016	Authorized Officer Gehl, Patrick Tel. +31 70 340-2553	
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PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference BAR2309PCT	FOR FURTHER ACTION		See Form PCT/IPEA/416
International application No. PCT/EP2015/063150	International filing date (<i>day/month/year</i>) 12.06.2015	Priority date (<i>day/month/year</i>) 13.06.2014	
International Patent Classification (IPC) or national classification and IPC INV. G09F9/302			
Applicant Barco NV			
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of <u>9</u> sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p style="margin-left: 20px;">a. <input checked="" type="checkbox"/> (<i>sent to the applicant and to the International Bureau</i>) a total of <u>15</u> sheets, as follows:</p> <p style="margin-left: 40px;"><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and/or sheets containing rectifications authorized by this Authority, unless those sheets were superseded or cancelled, and any accompanying letters (see Rules 46.5, 66.8, 70.16, 91.2, and Section 607 of the Administrative Instructions).</p> <p style="margin-left: 40px;"><input type="checkbox"/> sheets containing rectifications, where the decision was made by this Authority not to take them into account because they were not authorized by or notified to this Authority at the time when this Authority began to draw up this report, and any accompanying letters (Rules 66.4bis, 70.2(e), 70.16 and 91.2).</p> <p style="margin-left: 40px;"><input type="checkbox"/> superseded sheets and any accompanying letters, where this Authority either considers that the superseding sheets contain an amendment that goes beyond the disclosure in the international application as filed, or the superseding sheets were not accompanied by a letter indicating the basis for the amendments in the application as filed, as indicated in item 4 of Box No. I and the Supplemental Box (see Rule 70.16(b)).</p> <p style="margin-left: 20px;">b. <input type="checkbox"/> (<i>sent to the International Bureau only</i>) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing, in the form of an Annex C/ST.25 text file, as indicated in the Supplemental Box Relating to Sequence Listing (see paragraph 3ter of Annex C of the Administrative Instructions).</p>			
<p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the report</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input type="checkbox"/> Box No. VIII Certain observations on the international application</p>			
Date of submission of the demand 07.04.2016		Date of completion of this report 26.09.2016	
Name and mailing address of the international preliminary examining authority:  European Patent Office P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Fax: +31 70 340 - 3016		Authorized officer Zanna, Argini Telephone No. +31 70 340-9945	



**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/EP2015/063150

Box No. I Basis of the report

1. With regard to the **language**, this report is based on
- ☒ 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 (under Rules 12.3(a) and 23.1(b))
 - ☐ publication of the international application (under Rule 12.4(a))
 - ☐ international preliminary examination (under Rules 55.2(a) and/or 55.3(a) and (b))
2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

Description, Pages

1-23 as originally filed

Claims, Numbers

1-17 filed with the letter of

05-07-2016

Drawings, Sheets

1/9-9/9 as originally filed

- ☐ a sequence listing - see Supplemental Box Relating to Sequence Listing.
3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since either they are considered to go beyond the disclosure as filed, or they were not accompanied by a letter indicating the basis for the amendments in the application as filed, as indicated in the Supplemental Box (Rules 70.2(c) and (c-bis)):
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
5. ☐ This report has been established:
- ☐ taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rules 66.1(d-bis) and 70.2(e)).
 - ☐ without taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91(Rules 66.4bis and 70.2(e)).

**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/EP2015/063150

6. ☒ With regard to top-up searches (Rules 66.1 *ter* and 70.2(f)):
- ☒ A top-up search was carried out by this Authority on 09.09.2016 (all discovered documents are listed in the Supplemental Box Relating to Top-up Search).
 - ☐ Additional relevant documents have been discovered during the top-up search.
 - ☐ No top-up search was carried out by this Authority because it would serve no useful purpose.
7. ☐ Supplementary international search report(s) from Authority(ies) has/have been received and taken into account in establishing this report (Rule 45bis.8(b) and (c)).

* If item 4 applies, some or all of those sheets may be marked "superseded".

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	<u>1-17</u>
	No: Claims	
Inventive step (IS)	Yes: Claims	<u>3, 6-10, 14, 15</u>
	No: Claims	<u>1, 2, 4, 5, 11-13, 16, 17</u>
Industrial applicability (IA)	Yes: Claims	<u>1-17</u>
	No: Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Reference is made to the following documents:

- D1 US 2002/122134 A1 (KALUA KEVIN A [US]) 5 September 2002
(2002-09-05)
- D2 US 6 150 996 A (NICHOLSON TIMOTHY J [US] ET AL) 21 November
2000 (2000-11-21)
- D3 US 6 813 853 B1 (TUCKER WAYNE R [US]) 9 November 2004
(2004-11-09)
- D4 CN 201 226 214 Y (SHANGHAI DAXIAGU OPTO ELEC SCI&TECHN C)
22 April 2009 (2009-04-22)
- D5 US 5 805 117 A (MAZUREK NIEL [US] ET AL) 8 September 1998
(1998-09-08)

2. Initial remarks

The Applicant's arguments in her letters were taken into consideration and the following remarks are made:

(a) Concerning document D1:

Document D1 was initially regarded as disclosing all the features of claim 1 (see Written Opinion of the International Searching Authority).

The Applicant disagreed that the threaded assembly of D1 ("standoff" 147 in figures 17 and 18) is an adjusting means. She argued that the component 147 of D1 is a fixing means (see Applicant's letter dated 07-04-2016, section III. Novelty).

The examiner underlined that the standoff 147 in figure 18 of D1 may "establish a uniform spacing between the strongback and the LED circuit board" (see paragraph [0060], lines 10-12 of D1) and "the shank may translate freely through the hole 150" (line 16 of paragraph [0058] of D1). Hence, the fact that a screw can be fixed

tightly or loosely to a respective female connecting compartment (the bore 159 in figure 17 of D1), in order to achieve uniform spacing, was regarded as an implicit feature of the screw.

The Applicant stated that there is no indication in D1 of a compensation of "the tolerances affecting the position of the LEDs with respect to the carrier board". Additionally, she explained that "in LED display devices it is important to have a fixed and tight connection between the display board and the carrier board, in order to avoid undesired effects" and, therefore, D1 cannot be regarded as implicitly disclosing a tightening/loosening screw (see Applicant's letter dated 05-07-2016, pages 3 and 4).

The International Preliminary Examining Authority agrees with the Applicant's reasoning that document D1 does not explicitly disclose all the features of claim 1. In particular, the standoff 147 in figure 18 of D1 may "establish a uniform spacing between the strongback and the LED circuit board" (see paragraph [0060], lines 10-12), but does not have an adjusting function as such, i.e. does not explicitly allow the compensation of the tolerances affecting the position of the LEDs with respect to the carrier board.

(b) Concerning document D2:

Document D2 was also initially regarded as disclosing all the features of claim 1 (see Written Opinion of the International Searching Authority).

The Applicant in her letter dated 07-04-2016 (see section III. Novelty) stated that D2 does not disclose any adjusting means.

Having followed the same way of thinking as in (a) above, the Examiner was still of the opinion that D2 discloses an adjusting means (see in particular reference number 143 in figure 19).

The Applicant in her letter dated 05-07-2016 argued that each mounting screw of D2 (i) "is a single solid piece and, therefore, there is no disclosure of particular items like spacers and adjusting means" and (ii) is used to attach a display module to a mounting track and not to a back cover.

The International Preliminary Examining Authority agrees with the Applicant's reasoning that document D2 describes a mechanism to attach a display module to a mounting track (14, figures 8, 10, 17; column 11, lines 38-42). Consequently,

document D2 does not disclose a carrier board and does not mention the problem of adjusting the distance between the LED board and the carrier board (or, at least, the mounting track).

(c) Given the above, documents D1 and D2 are discarded. However, D5 is still relevant and becomes the closest prior art to the subject-matter claimed in the present application.

3. Independent claim 1

The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claim 1 does not involve an inventive step in the sense of Article 33(3) PCT.

Document D5 is regarded as being the prior art closest to the subject-matter of claim 1, and discloses:

A display tile (100, figures 1 and 21; column 6, lines 7-8) comprising a display board (100, figure 21; column 19, line 3) and a carrier board (310, figure 21; column 19, line 4),

~~LED's being mounted on a first face of the display board~~ *the display board being a liquid crystal display module* (column 1, lines 10-12)

and the carrier board being for attachment to a frame (80, figure 1; column 6, line 7),

the display board and the carrier board being fastened together by the intermediary of a spacer (1610, figure 21; column 19, lines 4-5) and an adjusting means (1630, figure 21; column 19, line 8*) positioned between the spacer and the carrier board (figure 21; column 19, lines 6-9**)

wherein the adjusting means engage in an opening in the carrier board (1615, figure 21; column 19, line 7),

the adjusting means allowing a compensation of the tolerances affecting the position of the ~~LED's~~ *LCD display board* with respect to the carrier board in a direction perpendicular to the carrier board (the adjusting means 1630 is part of the "alignment device 320", see column 19, lines 1-14*)

whereby the compensation is obtained by the position of the adjusting means in their corresponding opening (figure 21; column 19, lines 1-14).

Notes:

*The bushing 1630 of D5 is part of the "alignment device 320" (see column 18, lines 49-57). The alignment device 320 allows a compensation of the tolerances affecting the position of the display board with respect to the carrier board in three orthogonal directions (see figures 21 and 22), *including* the direction which is perpendicular to the base plate (Z-direction in figure 21; column 19, lines 9-11).

**The spacer (post 1610) is positioned inside a hollow adjusting means (bushing 1630) and the adjusting means are positioned inside a hole in the carrier board (hole 1615 of the base plate 310). Starting from the centre of the spacer (axis of the cylinder) and moving radially, the following are found: the spacer, the adjusting means and the carrier board. The adjusting means is, therefore, indeed explicitly *between* the spacer and the carrier board.

The subject-matter of claim 1 therefore differs from this known display tile in that it comprises an LED display module.

It is however generally known to the person skilled in the art that an LED display is an equivalent to the LCD display of D5 and can be interchanged with that feature where circumstances make it desirable.

Claim 1 of the present application cannot be considered to involve an inventive step (Article 33(3) PCT).

4. Independent claim 16

The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claim 1 does not involve an inventive step in the sense of Article 33(3) PCT.

Based on the argumentation for claim 1 above, document D5 is regarded as being the prior art closest to the subject-matter of claim 16, and discloses:

A method to adjust the distance between the ~~tops of the LEDs on a~~ first surface of a ~~LED an LCD~~ board on a display tile and the back surface of the carrier board of the display tile (column 18, lines 49-53), the method comprising the steps:

- positioning the ~~tops of the LEDs~~ *first surface* on a ~~LED an LCD~~ board in a first reference plane (bottom surface of 100, figure 21),
- aligning openings in the carrier board (1615, figure 21; column 19, line 7) with spacers distributed on the ~~LED LCD~~ board (1610, figure 21; column 19, lines 4-5),
- positioning a second surface of the carrier board in a second reference plane (top surface of 310, figure 21); a first surface of the carrier board facing a second surface of the ~~LED LCD~~ board (figure 21); the first and second reference planes being parallel and the distance between the first and the second reference planes being equal to a desired nominal distance (figure 21; column 18; lines 49-53*),
- moving adjusting means in the openings until a first surface of each adjusting means contacts a spacer (move of the adjusting means 1630 in the Z-direction around the spacer 1610; figure 21; column 19, lines 9-11),
- fastening each adjusting means to its corresponding spacer (column 19, lines 6-9**),
- fastening the adjusting means to the carrier board (column 19, lines 41-43***).

Notes:

*It is apparent that the concept "alignment" includes the concept of having a desired relative position of two or more compartments. In this case, the device 320 of D5 is an "alignment device" that allows alignment in three orthogonal directions, including the Z-direction as explained above (see pont 3.).

**Document D5 discloses that the spacer 1610 is slidably mounted to the alignment device 320 by -among others- a screw 1640. It is apparent that the compartments 1610 and 1630 are fastened with the help of this screw. In other words, without the screw, the spacer 1610 and the adjusting means 1630 would not be in contact.

***The adjusting means 1630 is fastened to the carrier board with the help of the other compartments of the alignment device 320, as shown in figure 21.

The subject-matter of claim 16 therefore differs from this known method in that the display tile comprises an LED display module.

It is however generally known to the person skilled in the art that an LED display is an equivalent to the LCD display of D5 and can be interchanged with that feature where circumstances make it desirable.

Claim 16 of the present application cannot be considered to involve an inventive step (Article 33(3) PCT).

5. Dependent claims 2, 4, 5, 11-13 and 17 (negative assessment)

Dependent claims 2-15 do not appear to contain any additional features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of inventive step. In particular:

claim 2: The subject-matter of claim 2 does not add any further features to the subject-matter of claim 1. The reasoning in point 3. above applies for claim 2.

claims 4, 5: see D5; figure 21

claims 11-13: see D5; 1640, figure 21

claim 17: see D5; 100, figures 1 and 21; column 6, lines 7-8

6. Dependent claims 3, 6-10, 14 and 15 (positive assessment)

The combination of the features of dependent claims 3, 6-10, 14 and 15 seems to be not known, neither rendered obvious, from the available prior art.

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— PROTECTING INNOVATION —

VIA EP[®] ONLINE FILING

5 April 2016

European Patent Office
International Searching Authority

Mr. A. Zanna (Examiner)

Patentlaan 2
2280 HV Rijswijk
The Netherlands

Your Ref.

-

Our Ref.

BAR2309PCT

Subject

International patent application PCT/EP2015/063150

Filing date: 12 June 2015

Applicant: Barco N.V.

Title: "Adjustable display tile for tiled display"

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To the Written Opinion dated 28 September 2015

Dear Mr. Zanna,

Please find enclosed the Demand form PCT/IPEA/401.

I. Amendments and support

Claim 1 has been amended by replacing the feature "being for adjusting a relative position of the display board (1) with respect to the carrier board (3)" by "allowing a compensation of the tolerances affecting the position of the LED's with respect to the carrier board (3) in a direction perpendicular to the carrier board".

This amendment is based on the description, page 6, lines 12-15.

All other claims are maintained as originally filed.

The amendments in claim 1 being disclosed in the application as filed, the amendments are not going beyond the disclosure in the international application as filed and the requirements of Art 34 (2), (b) PCT are met.

II. Clarity

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— PROTECTING INNOVATION —

In point VIII, 1 of the Written Opinion, a clarity objection is raised against the use of the term "nominal distance" in claims 3 and 16 because this term "has no well-recognized meaning". The definition of the term "nominal distance" can be found in the description, e.g. page 3, lines 8-9 or page 6, lines 3-6.

Further, in point VIII, 2 of the Written Opinion, a clarity objection is raised against claim 16. It is asserted that this claim "is worded as a method claim" but "it refers to the use of the apparatus of claim 1".

Applicant respectfully disagrees. Indeed, claim 16 is drafted as a claim describing a method for adjusting the distance between the tops of the LEDs on a first surface of a LED board on a display tile and the back surface of the carrier board (3) of the display tile. Claim 16 contains no indication of using the apparatus of claim 1.

The Art. 6 PCT objection, raised under point VIII of the Written Opinion is thus no longer valid.

III. Novelty

D1 discloses a modular video display including a plurality of video image units. Each unit (31) comprises i.a. a strongback (Fig. 18:61), a LED circuit board (81) having a number of LED's (83) and a front panel (37). The strongback (61) and the LED circuit board (81) are secured to the front panel (37) by threaded assemblies (141). Each threaded assembly comprises i.a. a standoff 147 which "establishes a uniform spacing between the strongback (61) and the LED circuit board (81)". According to D1, the threaded assembly is a fixing means and not an adjusting means. D1 does not provide any means allowing a compensation of the tolerances affecting the position of the LED's (in the invention the position of the tops of the LED's with respect to the carrier board, corresponding to the strongback in D1). There is not even a mentioning in D1 of the distance between the top of the LED's and the back of the strongback.

Thus, amended claim 1 is novel over D1.

D2 discloses a message sign system comprising a number of modules. Each module (12) comprises i.a. a mounting rack (Fig. 17: 14), a circuit board (20) having a number of LED's (Fig. 14, 74) and a translucent cover (112). The modules (12) are mechanically mounted on the mounting rack using mounting screws (160) and standoffs (134). The standoffs (134) extend between the circuit board (20) and the translucent cover (112) (see col. 9, lines 1- 16). The distance between mounting rack (14) and the circuit board (20) is fixed by the dimensions of a neck (Fig. 19:143) and the dimensions of a shoulder (143), both parts of the standoff and there is no adjusting means provided in D2 that allow a compensation of a variation of said distance. There is surely no indication in D2 of a compensation the tolerances affecting the position of the LED's with respect to the mounting rack (the carrier board in the invention).

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— PROTECTING INNOVATION —

Thus amended claim 1 is clearly novel over D2.

All other claims being dependent claims, they are also novel over the cited prior art.

IV. Inventive step

None of the cited documents include a hint or an indication towards the essential features of claim 1 (adjusting means allowing a compensation of the tolerances affecting the position of the LED's with respect to the carrier board). The cited documents do not even mention the distance between (the top of) the LED's and the carrier board.

Claim 1 and claim 16 are thus inventive over the cited prior art.

All other claims being dependent claims, they can be considered to meet the PCT-requirements concerning inventive step.

V. Final remarks

The three criteria referred to in Article 33 (1) PCT now being satisfied and the application meeting the requirements of Article 6 PCT, the Examiner is respectfully requested to issue a positive IPRP on the basis of the new set of claims.

We request that the filing of documents relating to any other formal matter be delayed until the national phases.

Thank you.

Very truly yours

Ariane Bird
the Representative

encl.: - amended claims 1-17, clean version
- amended claims 1-17, version showing amendments
- Demand form PCT/IPEA/401

IPLODGE

— PROTECTING INNOVATION —

VIA EPO ONLINE FILING

05/07/2016

European Patent Office
International Preliminary Examining Authority

Mr. A. Zanna (Examiner)

Patentlaan 2
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The Netherlands

Your Ref. -

Our Ref. BAR2309PCT

Subject International patent application PCT/EP2015/063150

Filing date: 12 June 2015

Applicant: Barco NV

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To the second Written Opinion dated 11 May 2016

Dear Mr. Zanna,

We herewith enclose without prejudice amended claims 1 – 17.

Reference is made to the following documents:

D1: US 2002/122134

D2: US 6 150 996

D5: US 5 805 117

I. Amendments and possible extension of subject-matter

Claim on file 1 has been amended by adding the following features:

- "LED's (2) being mounted on a first face of the display board" (this addition is based on the description, page 10, lines 1-6);
- "whereby the compensation is obtained by the position of the adjusting means in their corresponding opening (33)" (this addition is based on the description, page 13, lines 11-26).

In claim on file 3 the feature "wherein the nominal distance (D0) is the distance between the top of the LEDs and the second surface (32) or back of the carrier board (3)" has been added (based on the description page 3, lines 8-9).

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— PROTECTING INNOVATION —

In claim on file 16, the word "desired" has been inserted before "nominal distance" (based on the description, e.g. page 13, lines 11-26 or page 5, lines 25 -28).

All other claims are maintained as originally filed.

The amendments in claims 1, 3 and 16 being disclosed in the application as filed, the amendments do not go beyond the disclosure in the international application as filed and the requirements of Art 34 (2), (b) PCT are met.

II. Clarity

In point VIII, 1 of the Written Opinion, a clarity objection is raised against the use in claim 1 of the term "the position of the LEDs", in particular because the LEDs are not mentioned before in the claim (antecedent basis) and because claim 1 fails to disclose the exact location of the LEDs. The clarity requirement is met by the amendment of claim 1 "LED's (2) being mounted on a first face of the display board".

In point VIII, 2 of the Written Opinion, a further clarity objection is raised in relation with claim 1 because it is alleged that the matter for which protection is sought is not clearly defined, in particular because the claim is attempting to define the subject-matter in terms of the result to be achieved without providing the technical features necessary for achieving for this result. By adding the amendment relating to the position of the adjusting means within the openings, this clarity requirement is met.

In point VIII, 3 of the Written Opinion, a further clarity objection is raised in relation with the term "nominal distance" claims 3 and 16. Claims 3 and 16 have been amended in order to avoid any possible lack of clarity.

It is therefore respectfully requested to withdraw the Article 6 PCT objections, raised under point VIII of the Written Opinion.

III. Novelty

Amended claim 1 reads:

"A display tile comprising a display board (1) and a carrier board (3), LED's (2) being mounted on a first face of the display board and the carrier board being for attachment to a frame, a. the display board (1) and the carrier board (3) being fastened together by the intermediary of a spacer (7) and an adjusting means (6) positioned between the spacer and the carrier board

IPLUDGE

— PROTECTING INNOVATION —

b. wherein the adjusting means engage in an opening (33) in the carrier board,
c. the adjusting means allowing a compensation of the tolerances affecting the position of the LED's with respect to the carrier board (3) in a direction perpendicular to the carrier board
d. whereby the compensation is obtained by the position of the adjusting means (6) in their corresponding opening (33)."

Novelty of claim 1 over D1

Without acquiescing to the arguments presented by the Examiner, according to the analysis made in the W.O., the following correspondences are alleged between the parts of the video display, illustrated in figures 17 and 18 of D1 and the parts of the present invention:

standoff (spacer) 153 corresponds to the spacer in claim 1;

standoff 147 corresponds to the adjusting means in claim 1 (see Note below);

LED circuit board 91 (corrected into 81) corresponds to the display board of claim 1;

strongback 61 corresponds to the carrier board in claim 1;

opening 64 in strongback 61 corresponds to opening 33 in the carrier board of claim 1.

Note: Applicant cannot agree to the alleged equivalence between the standoff 147 in D1 and the adjusting means in claim 1. Indeed, standoff 147 has not the slightest adjusting capacity; it has a fixed length and builds, together with standoff 153, a single spacer. However, in order to assess the novelty of claim 1 over D1 and as a pure mental exercise, it is supposed that standoff 147 constitutes an adjusting means.

Applying the correspondences above to the video display of D1: the adjusting means 147 are not engaging in the opening 64 of the carrier board. Feature b above is thus not disclosed in D1.

Feature c above is also not disclosed in D1 because, as mentioned in the Written Opinion, the goal of the standoff 147 is to establish "a uniform spacing between the strongback and the LED circuit board", there is no indication in D1 of a compensation of "the tolerances affecting the position of the LED's with respect to the carrier board (3) in a direction perpendicular to the carrier board".

D1 mentions the spacing between the strongback and the LED circuit board and not the tolerances affecting the position of the LEDs with respect to the carrier board. The disclosure in D1 is thus different from the object of feature c.

On the same point, it is asserted in the Written Opinion that: "the fact that a screw can be fixed tightly or loosely to a respective female connecting compartment (the bore 159 in figure 17 of D1), in order to achieve uniform spacing, is regarded as an implicit feature of the screw". Applicant cannot agree with this assertion. Indeed, in LED display devices it is important to have a fixed and tight connection between, on one hand, the display board and, on the other hand, the carrier board in order to avoid

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undesired effects. This can be illustrated by the explanation given in col. 19, lines 15- 26 of D5 where special compression devices are provided in order to maintain "alignment of the display module when the tiled display system is subject to shock or vibration". A screw, loosely connected to its female counterpart, would in reality deteriorate the functioning of the display system.

In case this argument with respect to the screw is maintained, Applicant requests, respectfully, that the Examiner provides a document stating the use of a loosely fixed screw as a means for compensating distance tolerances in display systems.

Applicant submits that feature c above is also not disclosed in D1.

Feature d above relating to the position of the adjusting means in the opening cannot be disclosed in D1 because in this document standoff 147 is even not partially located in the opening 64. According to figure 17, this standoff is provided with a collar 148, preventing the standoff to enter the opening 64. This collar is necessary to guarantee the "uniform spacing between the strongback and the LED circuit board".

As a general conclusion, and even supposing that standoff 147 constitutes an adjusting means (*quod non*) it can thus be said that amended claim 1 is novel over D1.

Novelty of claim 1 over D2

In D2, figure 17, display modules (12), including a translucent cover (112) are mounted on a mounting track (14) using mounting screws (160). The mounting screws extends from the cover face (148) and threadably engages a selfclenching fastener (210), located in the mounting track. Each mounting screw is single solid piece so that there is no disclosure of particular items like spacers and adjusting means. Because there is no disclosure of any spacer or adjusting means, features a to d of claim 1 cannot be disclosed in D2.

Novelty of claim 1 over D5

Figure 21 of D5 shows an alignment device (320) utilized in attaching a display module (100) to a base plate (310). The pixels (Fig. 20A, 1310) of the display modules (100) must be substantially in alignment with the mask openings (1538) of the global mask (1530; see col. 18, 39 -43). The alignment device (320) permits the realignment of the display module (100; col. 18, 49-50). The alignment itself consists thus essentially of a movement of the display module in the plane of this module, parallel to the plane of the base plate and not a movement in a direction perpendicular to the base plate. The alignment is obtained by the use of vertical and horizontal screw assemblies (fig. 22, 1730 and 1740; col. 19, 41-54). It may be worthwhile to note that by "vertical" is meant a direction in the plane of the display module, any movement in a direction perpendicular to the base plate being

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made impossible by the presence of compression devices (1650; col. 19, 15-17).

Looking for a possible analogy between the device, shown in Fig. 21 of D5 and the arrangement of claim 1, the following correspondences can be made:

display module 100 with the display board of claim 1;

base plate 310 with the carrier board of claim 1;

post 1610 with the spacer of claim 1;

hole 1615 and the opening of claim 1.

Note:

In D5, the bushing is not an adjusting means, it **allows** (together with post 1610) the adjusting by the screw assemblies (1730, 1740), which are the only adjusting means provided in D5.

The following differences exist between the alignment device of D5 and the arrangement of claim 1:

- in D5, the bushing (1630) is not positioned between the post (1610) and the base plate (310); the bushing is positioned around the post; thus feature a of claim 1 is not disclosed in D5;
- the bushing (1630) does not allow a compensation of the tolerances affecting the position of the LEDs with respect to the base plate (310) in a direction perpendicular to the base plate; the distance between the LEDs and the base plate, measured in a direction perpendicular to the base plate is fixed and determined by the thickness of the display board and the small platforms underneath the compression devices; feature c of claim 1 is thus also not disclosed by D5;
- the position of bushing 1630 within hole 1615 compensates the changes of the position of the LEDs in a plane parallel to the base plate and not in a direction perpendicular to the base plate; feature d of claim 1 is also not disclosed in D5.

Claim 1 is thus also novel over D5.

Claim 1 being novel over all cited documents, claim 1 is novel over the prior art.

Claim 16 reads as follows:

"A method to adjust the distance between the tops of the LEDs (2) on a first surface of a LED board on a display tile and the back surface (32) of the carrier board (3) of the display tile, the method comprising the steps:

- e. positioning the tops of the LEDs (2) on a LED board (1) in a first reference plane (101),
- f. aligning openings (33, 33b...) in the carrier board with spacers (7, 7b...) distributed on the LED board (1),
- g. positioning a second surface of a carrier board (3) in a second reference plane (104); a first surface

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(1 1) of the carrier board facing a second surface of the LED board (1); the first and second reference planes being parallel and the distance between the first and second reference planes being equal to a desired nominal distance (D0),

h. moving adjusting means (6, 6b...) in the openings (33, 33b) until a first surface (61 , 61 b ...) of each adjusting means contacts a spacer (7, 7b),

i. fastening each adjusting means to its corresponding spacer,

j. fastening the adjusting means (6, 6b) to the carrier board (3)."

Novelty of claim 16 over D1

It has to be underlined that the object of the method described in claim 16 is "to adjust the distance between the tops of the LEDs (2) on a first surface of a LED board on a display tile and the back surface (32) of the carrier board (3) of the display tile". There is no mentioning of such adjusting in any of the cited documents.

At least features h, i and j above are not disclosed in D1 because adjusting means (even supposing they are present, *quod non*) are not moved in openings and D1 does not provide any adjusting means.

Claim 16 is thus novel over D1.

Novelty of claim 16 over D5

In D5 the base plate (310) is positioned at a given distance from the display module and not at a given distance from the plane, containing the tops of the LEDs (the first reference plane in claim 16). Feature g is thus not disclosed in D5.

In D5, the only adjusting means are the screw assemblies 1730 and 1740 and these assemblies are adjusting in a plane parallel with the plane of the base plate. These screw assemblies are not moved in the hole 1615 so that feature h is not disclosed either in D5. Features i and j are also not disclosed in D5.

It can thus be concluded that claim 16 is novel over D5.

Claim 16 being novel over all cited documents, claim 16 is novel over the prior art.

All other claims being dependent claims, they are also novel over the prior art.

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IV. Inventive step

When assessing the inventive step of claim 1, it is proposed to take D1 as the closest prior art. D1 discloses a LED circuit board, mounted on a strongback. The distance between the LED circuit board and the strongback is fixed and determined by the dimensions of a standoff 147 (paragraph [0060]: "The standoff 147 establishes a uniform spacing between the strongback and the LED circuit board"). The technical problem with the arrangement of D1 lies in the absence of any possibility of compensating for differences in the position of the tops of the LEDs because the tops of the LEDs of different tiles are not necessarily lying in a same reference plane. Such differences may lead to visual artefacts (see the description, page 1, 24-26). They are due to unavoidable differences between the dimensions of LEDs or of boards belonging to different production lots. The technical problem is solved by the combined features b, c and d, mentioned above.

The prior art does not contain any indication of such a combination of features and also not a hint pointing at such a combination.

Claim 1 is thus inventive over the prior art.

Taking again D1 as closest prior art when assessing the inventiveness of claim 16, the problem raised when applying D1 lies in the fact that D1 does not allow to adjust the distance between the a first surface containing the tops of the LEDs and the strongback (in reality, D1 does not allow any adjusting of distances in a direction, perpendicular to the plane of the strongback). This problem is solved by providing method steps h, i and j above.

The prior art does not contain any combination of these steps h, i and j.

Claim 16 is thus also inventive over the prior art.

All other claims being dependent claims, they can be considered to meet the PCT requirements concerning inventive step.

V. Conclusion

In view of the above we respectfully request to issue a positive IPRP under Art. 35 PCT.

Should the Examiner disagree with any of the comments above, the Examiner is cordially invited to contact our firm by telephone in accordance with Rule 66 PCT.

Thank you.

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Very truly yours,

Ariane Bird

European patent attorney

Encl. : - amended claims 1- 17, clean version

- amended claims 1- 17, version showing amendments

Amended Claims (clean version)

1. A display tile comprising a display board (1) and a carrier board (3),
5 LED's (2) being mounted on a first face of the display board and the carrier
board being for attachment to a frame, the display board (1) and the carrier
board (3) being fastened together by the intermediary of a spacer (7) and an
adjusting means (6) positioned between the spacer and the carrier board
wherein the adjusting means engage in an opening (33) in the carrier board,
10 the adjusting means allowing a compensation of the tolerances affecting the
position of the LED's with respect to the carrier board (3) in a direction
perpendicular to the carrier board whereby the compensation is obtained by
the position of the adjusting means (6) in their corresponding opening (33).
- 15 2. A display tile according to claim 1 wherein the display board (3) has
LEDs (2) and the adjusting means is for adjusting a relative position of the
tops of the LEDs (2) with respect to a carrier board (3).
- 20 3. A display tile according to claim 1 or 2 wherein the display board (3) has
LEDs (2) and the distance between a first surface (61) of the adjusting
means and a first surface (31) of the carrier board is set to the difference
between a nominal distance (D0) and the sum of the distance between the
tops of LEDs (2) on the LED board (1) and a second surface (12) of the
LED board, the length of the spacer (7) and the thickness of the carrier board
25 (3), wherein the nominal distance (D0) is the distance between the top of the
LEDs and the second surface (32) or back of the carrier board (3).

4. A display tile according to any of the preceding claims wherein a sidewall (34) of the opening (33) in the carrier board (3) is perpendicular to the second surface (32) of the carrier board (3).

5

5. A display tile according to any of the preceding claims wherein a sidewall (63) of the adjusting means (6) is parallel to the sidewall (34) of the opening (33) in the carrier board.

10 6. A display tile according to any of the preceding claims wherein the thickness of the adjusting means (6) is less than the thickness of the carrier board (3).

15 7. A display tile according to any of the preceding claims wherein the cross section of the adjusting means (6) fits in the opening (33).

20 8. A display tile according to any of the preceding claims wherein the adjusting means (6) is fastened to the carrier board by glue (9) extending on a second surface (62) and/or a sidewall (63) of the adjusting means (6) and a sidewall (34) of the opening (33).

9. A display tile according to any of the preceding claims wherein the cross section of the adjusting means has a first area in a first part of the adjusting means and a second area in a second part of the adjusting means.

25

10. A display tile according to claim 9 wherein the adjusting means has a

first part that is a circular right cylinder with a first radius and a second part that is a circular right cylinder with a second radius smaller than the first radius.

5 11. A display tile according to any of the preceding claims wherein a fastening means (8) fastens the adjusting means (6) to the spacer (7).

12. A display tile according to claim 11 wherein the fastening means (8) goes through an opening (64) in the adjusting means (6).

10

13. A display tile according to claim 12 wherein the fastening means (8) is a screw.

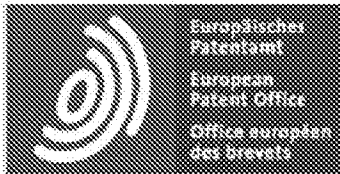
14. A display tile according to any of claims 1 to 11 wherein a threaded
15 extension extends from a first surface (61) of the adjusting means (6) and that the spacer (7) has a matching threaded opening to receive the threaded extension.

15. A display tile according to claim 14 wherein the second surface (62) of
20 the adjusting means is a driving surface.

16. A method to adjust the distance between the tops of the LEDs (2) on a first surface of a LED board on a display tile and the back surface (32) of the carrier board (3) of the display tile, the method comprising the steps:
25 - positioning the tops of the LEDs (2) on a LED board (1) in a first reference plane (101),

- aligning openings (33, 33b...) in the carrier board with spacers (7, 7b...) distributed on the LED board (1),
- positioning a second surface of a carrier board (3) in a second reference plane (104); a first surface (1 1) of the carrier board facing a second surface of the LED board (1); the first and second reference planes being parallel and the distance between the first and second reference planes being equal to a desired nominal distance (D0),
- moving adjusting means (6, 6b...) in the openings (33, 33b) until a first surface (61 , 61 b ...) of each adjusting means contacts a spacer (7, 7b),
- 10 - fastening each adjusting means to its corresponding spacer,
- fastening the adjusting means (6, 6b) to the carrier board (3).

17. A tiled display apparatus comprising a plurality of display tiles according to any of the claims 1 to 15 fixed to a frame.



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DESCRIPTION CN201226214

[0001]

TECHNICAL FIELD

[0002]

The utility model relates to the field of LED display, and more particularly to a thin structure, size and high precision, manufacturing process simplification, easy disassembly, the surface flatness good new outdoor LED display structure.

[0003]

Background technique

[0004]

Existing LED display, LED display installed especially for outdoor use, usually by a number of LED display units put together, in the prior art, LED display units are often manufactured using sheet metal box structure, and Manufacturing with sheet metal casing larger size sheet, complex process, dimensions difficult to ensure accuracy, a direct impact on the LED display when the whole unit mounting surface flatness and alignment of joints straight.

Moreover, in the prior art, a fixed outdoor LED display cabinet structure are in the back of the box operation, which makes the overall structural design of the display when you must allow the operator at the back out of the space and personnel import and export, which limits the minimum thickness of the outdoor LED display makes

outdoor LED display works at the installation site selection, design and construction of fixed support structure, cost and coordination LED display with its attached buildings etc., there are a series of problems.

[0005]

Utility Model Content

[0006]

The utility model aims to solve the prior art outdoor LED display cabinet manufacturing process complexity, high cost, surface-mount flatness is difficult to control, and on-site installation support structures and complex problems and to provide a new structure of the LED display, technical solutions which uses are described below.

[0007]

Novel structure for a LED display comprising at least one LED display unit, wherein each corner of the LED display unit are fixed to the inner frame or frame profiles slidable slider or non-slidably mounting connector.

Among them, the 4 sides of the frame has dovetail grooves on both sides of the profile has a dovetail groove.

Wherein the profile through its ends slide within the framework of the dovetail slot slides.

Wherein a mounting connection profiles on the slider.

Wherein the slider is provided on the mounting screw connection.

Which, LED display unit to the main support structure backplane, backplane central feature qualifying waterproof seat back has four corners through holes in the ram, the front backplane installation from outside to inside in turn mask, LED light board and plastic frame, also provided between the plastic frame and the rear plate on the back of waterproof silicone pad, backplane mounted waterproof box.

Waterproof box includes a box body and a cover, waterproof box built-in power and control circuit boards.

Aviation connector receptacle provided in the lower part of the waterproof case.

Also the power supply fixed L piece fixed to the top of the water inside the cartridge.

[0008]

The utility model LED display unit is mounted to a mounting plate formed by a profile frame, mounting the connecting member connecting the LED display unit can slide in the dovetail slot profile, to fine tune the position of the LED display unit.

This design ensures that the LED display surface flatness of the display unit together such consistency and split seams.

Since the LED display unit connected to each other without a fixed relationship, each display unit can be individually removable from the front, LED display structure can be made thin and light, help to reduce the construction cost of LED display engineering can be more flexible and convenient to choose LED display screen installation site, the location, but also conducive to improving the appearance of the LED display attached thereto coordination of the building.

[0009]

Brief Description

[0010]

Figure 1 is an embodiment of the present utility model is an exploded view of the LED display unit;

[0011]

Figure 2 is a cross-sectional view of the unit of the present practical embodiment of the new LED display;

[0012]

Figure 3 is a utility model in a sectional view of the embodiment of the first profile 14;

[0013]

Figure 4 is an embodiment of the present utility model is the first installation of the connector 16, the first slider 15 connected to the 14 on the first profile schematic;

[0014]

Figure 5 is a new example of the utility-sectional view of the second profile 17;

[0015]

Figure 6 is an embodiment of the present utility model is a schematic view of the second slider 18 on the second profile 17 slides;

[0016]

7 is a schematic plate frame 200 of the present embodiment, the utility model;

[0017]

7A is a schematic view of A-A to 7 in FIG;

[0018]

7B is a schematic diagram of the area of 7 B;

[0019]

7C is a schematic view of area C of Figure 7;

[0020]

Figure 8 is an embodiment of the present utility model, an LED display unit 100 is mounted on a plate frame schematic 200 in;

[0021]

8A is a schematic diagram in FIG. 8 A-A direction in FIG;

[0022]

8B is a schematic diagram in Figure 8 B-B direction.

[0023]

Meaning the main components

[0024]

1 mask 2 LED light board 3 plastic frame

[0025]

4 waterproof silicone pad 5 6 qualifying waterproof seat back

[0026]

7 air connector socket 8 control board cassette 9

[0027]

10 Power 11 Power 12 fixed L sheet cover

[0028]

13 through hole 14 of the first profile 15 column first slider

[0029]

16 connected to the first mounting member 17 of the second profile 18 of the second slider

[0030]

19 second mount connector 20 fourth slider 21 third slider

[0031]

22 fastening screw

[0032]

100 LED display unit plate frame 200

[0033]

141 171 first dovetail second dovetail slots

[0034]

172 Third dovetail groove

[0035]

DETAILED DESCRIPTION

[0036]

Now based on the drawings of the utility model for further description.

[0037]

Example

[0038]

First, see Figure 1, the utility model LED display unit 100 is made of square metal plates 5 based backplane support structure 5 is provided with a central outlet waterproof back seat 6, provided the four corners of the backplane 5 four through holes 13 column.

5 back positive from outside to inside in turn installed mask 1, LED light panels 2 and 3 plastic frame, plastic frame also has a waterproof silicone pad 4 between 3 and 5 backplane.

LED light board 2 loaded plastic frame 3 after the surface of the LED light board 2 poured waterproof glue, and then install a mask on its surface, a mask to protect LED, waterproof glue to prevent loss and aesthetic effect 1 onwards.

5 is mounted on the back of the backplane waterproof box.

Waterproof box includes a box body 8 and the housing 12, 11 and a waterproof box built-in power control circuit board 9.

[0039]

Figure 2 is a cross-sectional view of the utility model LED display unit.

You can clearly see the connection between the various components of the display unit from FIG.

Back 5 front panel control signal LED lights and power lines 2 leads from the outlet 6 to waterproof seat inside the waterproof box, respectively, with waterproof inner box control circuit board 9 and the power supply 11 is connected.

Air connector socket LED display unit 7 is total and outlet 100, which is provided in the lower part of the waterproof case.

There are 10 power supply 11 is fixed to the inside of the top power waterproof box fixed L sheet.

[0040]

The utility model plate frame 200 assembly consists of two sections together.

Figure 3 is a sectional view of the first profile 14.

Figure 4 is the first installation of the connector assembly 16 and 14 of the first profile.

As can be seen from Figure 4, the profile 14 is designed with a first dovetail groove 141, the first slider 15 mounted on a first dovetail groove 141, connecting the first mounting member 16 is fixed to the first slider 15, which may vary with the first A slider 15 in a first dovetail slide 141, when the first slider 15 is slid to the right position, the first slider 15 to the ends of the screw is screwed into the screw to secure the first mounting member 16 is connected to an appropriate position.

Connecting section of the first mounting member 16 is "T" shape, which is fixed to the top side of the first slider 15, the other side of the four corners there are four holes.

[0041]

Figure 5 is a sectional view of the second profile 17 and second profile sides 17 each have a pair of second dovetail groove 171 and a pair of third dovetail groove 172.

Figure 6 is a schematic diagram of the second dovetail groove 171 of the second profile 17 of the second slider 18 is installed.

The second slider 18 is also slidable in a second dovetail groove 171 of the second profile 17, when slid into the proper position, the screw holes on the second slider 18 is screwed into the screw 16 to fix the second slider in the appropriate location.

[0042]

7 is a schematic of the utility model plate frame 200, wherein the intensity relative to the first profile 14 of the second profile 17 constitute a large four-sided plate frame 200.

See Figure 7A, a schematic diagram 200 which AA direction in which the third slider 21 is slidable in the pallet in Figure 7 in a third dovetail groove 172 of the second profile 17, see FIG. 7C same time, the first profile 14 is fixed to one end over a third slider 21, at both ends of the third slider 21 also has screw holes for screwing.

See Figure shown, the two second profile 17 at the abutment with the L-shaped second mounting coupling 19 fixed connection 7B.

Fourth slider 20 is also mounted on the second profile 171 second dovetail slots 17, its role and the role of the second slider 18 is the same, but also for the LED display unit 100 is fixed.

Because the fourth slider 20 is mounted on the four corners of the pallet 200, is to avoid the second profile 17 and the second mounting connector mounting hole 19 is connected with the fourth slider 20 relative to the second slider 18 is designed to be short.

Fourth slider 20 provided with two holes, one for mounting the LED display unit 100, a screw for screwing to fix its position.

[0043]

Figure 8 is the utility model in the LED display unit 100 is mounted on the board schematic 200 aircraft.

LED display unit 100 is mounted from the front plate frame 200.

Please refer to FIGS. 8A and shown in conjunction, LED display unit 100 is a through hole through which the corners of the column 13 of the first alignment plate rack mounting coupling 200. Figure 8B 16, the second slider 18, the fourth side slider holes 20, and then from the front of the LED display unit 100 is screwed into the fastening screw 22. when four fastening screw 22 is tightened after the LED display 100 can be firmly fixed on the plate holder 200 units.

[0044]

With the above described embodiments of the LED display structure has the following advantages:

[0045]

1, the main support structure for the LED display unit back plates made from a piece of metal with a plastic frame for receiving the LED board Glue, waterproof silicone mat and receiving power and control circuit boards and other measures to provide a waterproof box enough rain performance.

Backplane available CNC punch out precise mounting holes, shape milling Milling available, compared to the prior art commonly used in the manufacture of thin sheet metal box structure, simple process, a substantial increase in production efficiency, low cost, and can significantly improve manufacturing precision.

[0046]

2, LED display unit is mounted to an assembly formed by the profile of the pallet, the pallet of LED display mounting unit provides an ideal base level, connection fittings installed LED display unit can be found in the profile of the dovetail slot sliding, to fine tune the position of the LED display unit.

The above measures, to ensure that the LED display surface flatness of the display unit together such consistency and split seams.

[0047]

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3, LED display unit connected to each other no fixed relationship between each display unit can be individually removable from the front, so you do not leave space for operation and maintenance and personnel import and export in the back of the LED display, LED display structure can be made thin very beneficial to reduce construction costs LED display engineering can be more flexible and convenient to choose LED display installation site, the location, but also conducive to improving the appearance of the LED display attached thereto coordination of the building.

CLAIMS CN201226214

[0001]

The new structure for a LED display comprising at least one LED display unit, wherein each corner LED display unit are fixed to the frame or within the framework of the profile is slidably mounting a slider or non-slip coupling.

[0002]

LED 1 according to the new structure of the display as claimed in claim, characterized in that the surface of both sides of the frame 4 are dovetail grooves, the profile has a dovetail groove.

[0003]

LED 1 according to the new structure as claimed in claim display, characterized in that the profile is at both ends thereof by the slider within the framework of the dovetail slot slides.

[0004]

LED 1 new structure as claimed in claim display, characterized in that a mounting coupling profiles on the slider.

[0005]

The new structure LED 1 display as claimed in claim, characterized in that the slider is provided on the mounting screw connection.

[0006]

LED 5 new structure as claimed in claim display, characterized in that the angle of the LED display unit 4 is provided with a through hole.

[0007]

Any one of said display LED 1-8 new structure as claimed in claim wherein, LED display unit main supporting structure backplate, the backplate has a central water outlet seat, with the four corners of the backplane front four through holes in the ram, backplane installation from outside to inside in turn mask, also has the back waterproof silicone pad, the backplane is mounted between the LED light panels waterproof box and plastic frame, plastic frame and back.

[0008]

LED 7 new structure as claimed in claim display, characterized in that the waterproof box includes a box body and a cover, waterproof box built-in power and control circuit boards.

[0009]

LED 7 according to the new structure of the display as claimed in claim, characterized in that the air connector receptacle provided in the lower portion of the waterproof box.

[0010]

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LED 7 according to the new structure of the display as claimed in claim, characterized in that the power supply as well as fixed sheet L is fixed to the top of the power supply inside the waterproof box.

Abstract CN201226214 (Y)

The utility model relates to a novel structure of an LED display screen. LED display units are assembled on a grillage which is assembled by profiles, and assembling connectors which are connected with the LED display units can slide in the dovetail grooves of the profiles in order to finely adjust the positions of the LED display units. The design can ensure the consistency of the surface planeness and assembling joints of the display screen assembled by the LED display units. Since the LED display units are not firmly connected with one another, each LED display unit can be independently disassembled from the front side, and the structure of the LED display screen can be light and thin, as a result, the construction cost of an LED display screen project can be reduced, the installation place and position of the LED display screen can be more flexibly and conveniently selected, and in addition, the harmony between the appearance of the LED display screen and a building fitted with the LED display screen can be improved.

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[51] Int. Cl.

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H05K 5/00 (2006.01)



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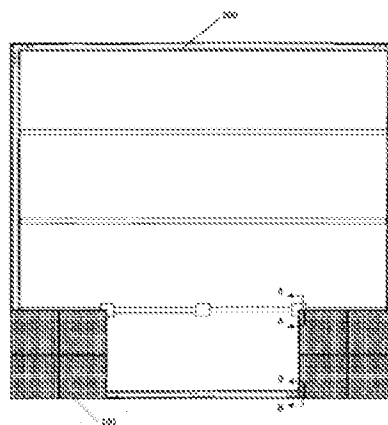
权利要求书 1 页 说明书 5 页 附图 8 页

[54] 实用新型名称

一种 LED 显示屏的新型结构

[57] 摘要

本实用新型 LED 显示单元安装到一个由型材装配而成的板架上，连接 LED 显示单元的安装连接件可以在型材的燕尾槽中滑动，以微调 LED 显示单元的位置。这样的设计可确保 LED 显示单元拼合成的显示屏的表面平整度和拼合接缝的一致性。由于 LED 显示单元相互间无连接固定关系，各显示单元均可单独从正面拆装，LED 显示屏结构可以做得轻薄，有利于降低 LED 显示屏工程的建造成本，可以更灵活方便地选择 LED 显示屏的安装场地、位置，也有利于改进 LED 显示屏外观与其附着建筑物的协调性。



1、一种LED显示屏的新型结构，其至少包含一LED显示单元，其特征在于，LED显示单元的每个角均固定在框架或框架内型材上可滑动的滑块或不可滑动的安装连接件上。

2、如权利要求1所述的LED显示屏的新型结构，其特征在于，所述框架的4面均有燕尾槽，所述型材的两面有燕尾槽。

3、如权利要求1所述的LED显示屏的新型结构，其特征在于，所述型材是通过其两端的滑块在框架内的燕尾槽中滑动的。

4、如权利要求1所述的LED显示屏的新型结构，其特征在于，型材上的滑块上设有安装连接件。

5、如权利要求1所述的LED显示屏的新型结构，其特征在于，所述滑块、安装连接件上设有螺孔。

6、如权利要求5所述的LED显示屏的新型结构，其特征在于，LED显示单元的4角设有通孔。

7、如权利要求1-6任意一项所述的LED显示屏的新型结构，其特征在于，LED显示单元以背板为主支撑结构，背板的中央设有出线防水座，背板的四角设有4个通孔立柱，背板的正面由外而内依次安装面罩、LED灯板和塑胶框架，塑胶框架和背板之间还设有防水硅胶垫，背板的背面安装有防水盒。

8、如权利要求7所述的LED显示屏的新型结构，其特征在于，防水盒包括盒体和外罩，防水盒内置电源和控制电路板。

9、如权利要求7所述的LED显示屏的新型结构，其特征在于，航空连接器插座设于所述防水盒的下部。

10、如权利要求7所述的LED显示屏的新型结构，其特征在于，还有电源固定L片将电源固定于所述防水盒内部的上方。

一种 LED 显示屏的新型结构

技术领域

本实用新型涉及 LED 显示领域，尤其涉及一种结构轻薄、外形尺寸精度高、制造工艺简化、拆装简便、表面平整度好的新型户外 LED 显示屏结构。

背景技术

现有的 LED 显示屏，特别是安装在户外使用的 LED 显示屏，通常由很多个 LED 显示单元拼合而成，在现有技术中，LED 显示单元往往采用钣金工艺制造的箱体结构，而用钣金工艺制造较大尺寸的薄板箱体，工艺复杂，外形尺寸精度难以保证，直接影响了 LED 显示屏整体安装时表面平整度和单元间接缝的对齐平直。而且，在的现有技术中，户外 LED 显示屏箱体结构的安装固定均是在箱体背面操作的，这使得在设计显示屏的整体结构时必须在背面留出足够操作人员进出的空间和人员进出口，这就限制了户外型 LED 显示屏的最小厚度，使得户外型 LED 显示屏工程在安装场地的选择、支撑固定结构的设计施工、工程造价、LED 显示屏与其附着建筑物的协调性等方面均存在着一系列问题。

实用新型内容

本实用新型的目的在于解决现有技术中户外型 LED 显示屏箱体制造工艺复杂，成本高，表面安装平整度难以控制，以及现场安装支撑结构复杂等问题，提供一种 LED 显示屏的新型结构，其采用的技术方案如下所述。

一种 LED 显示屏的新型结构，其至少包含一 LED 显示单元，其中，LED 显示单元的每个角均固定在框架或框架内型材上可滑动的滑块或不可滑动的安装连接件上。其中，所述框架的 4 面均有燕尾槽，所述型材的两面有燕尾槽。其中，所述型材是通过其两端的滑块在框架内的燕尾槽中滑

动的。其中，型材上的滑块上设有安装连接件。其中，所述滑块、安装连接件上设有螺孔。其中，LED显示单元以背板为主支撑结构，背板的中央设有出线防水座，背板的四角设有4个通孔立柱，背板的正面由外而内依次安装面罩、LED灯板和塑胶框架，塑胶框架和背板之间还设有防水硅胶垫，背板的背面安装有防水盒。防水盒包括盒体和外罩，防水盒内置电源和控制电路板。航空连接器插座设于所述防水盒的下部。还有电源固定L片将电源固定于所述防水盒内部的上方。

本实用新型LED显示单元安装到一个由型材装配而成的板架上，连接LED显示单元的安装连接件可以在型材的燕尾槽中滑动，以微调LED显示单元的位置。这样的设计可确保LED显示单元拼合成的显示屏的表面平整度和拼合接缝的一致性。由于LED显示单元相互间无连接固定关系，各显示单元均可单独从正面拆装，LED显示屏结构可以做得轻薄，有利于降低LED显示屏工程的建造成本，可以更灵活方便地选择LED显示屏的安装场地、位置，也有利于改进LED显示屏外观与其附着建筑物的协调性。

附图说明

图1是本实用新型实施例中LED显示单元的爆炸图；

图2是本实用新型实施例中LED显示单元的剖视图；

图3是本实用新型实施例中第一型材14的截面图；

图4是本实用新型实施例中第一安装连接件16、第一滑块15在第一型材14上的连接示意图；

图5是本实用新型实施例中第二型材17的截面图；

图6是本实用新型实施例中第二滑块18在第二型材17上滑动的示意图；

图7是本实用新型实施例中板架200的示意图；

图7A是图7中A-A向的示意图；

图7B是图7中区域B的示意图；

图7C是图7中区域C的示意图；

图 8 是本实用新型实施例中 LED 显示单元 100 安装在板架 200 上的示意图;

图 8A 是图 8 中 A-A 向的示意图;

图 8B 是图 8 中 B-B 向的示意图。

主要部件含义

1 面罩	2 LED 灯板	3 塑胶框架
4 防水硅胶垫	5 背板	6 出线防水座
7 航空连接器插座	8 箱体	9 控制电路板
10 电源固定 L 片	11 电源	12 外罩
13 通孔立柱	14 第一型材	15 第一滑块
16 第一安装连接件	17 第二型材	18 第二滑块
19 第二安装连接件	20 第四滑块	21 第三滑块
22 紧固螺杆		
100 LED 显示单元	200 板架	
141 第一燕尾槽	171 第二燕尾槽	
172 第三燕尾槽		

具体实施方式

现依据附图, 对本实用新型做进一步的描述。

实施例

首先请参见图 1 所示, 本实用新型的 LED 显示单元 100 以金属平板制成的方形背板 5 为主支撑结构, 背板 5 的中央设有出线防水座 6, 背板 5 的四角设有 4 个通孔立柱 13。背板 5 的正面由外而内依次安装面罩 1、LED 灯板 2 和塑胶框架 3, 塑胶框架 3 和背板 5 之间还设有防水硅胶垫 4。LED 灯板 2 装入塑胶框架 3 后, 在 LED 灯板 2 的表面灌入防水胶, 然后在其表面安装面罩 1, 面罩 1 起保护 LED、防止防水胶脱落和美观的作用。背板 5 的背面安装有防水盒。防水盒包括箱体 8 和外罩 12, 防水盒内置电源 11

和控制电路板 9。

图 2 是本实用新型 LED 显示单元的剖视图。从图 2 可以清楚地看到显示单元的各个零部件的连接关系。背板 5 正面的 LED 灯板 2 的控制信号线和电源线从出线防水座 6 引出到所述防水盒内部，分别与防水盒内部的控制电路板 9 和电源 11 连接。航空连接器插座 7 是 LED 显示单元 100 的总出线口，其设于所述防水盒的下部。还有电源固定 L 片 10 将电源 11 固定于所述防水盒内部的上方。

本实用新型的板架 200 由两种型材装配而成。图 3 是第一型材 14 的截面图。图 4 是第一安装连接件 16 与第一型材 14 的装配图。从图 4 可看出，型材 14 设计有第一燕尾槽 141，第一滑块 15 装在第一燕尾槽 141 中，第一安装连接件 16 固定在第一滑块 15 上，其可随第一滑块 15 在第一燕尾槽 141 中滑动，当第一滑块 15 滑动到恰当位置时，可向第一滑块 15 两端的螺孔拧入螺杆，以固定第一安装连接件 16 于适当的位置。第一安装连接件 16 的截面为“T”形，其一面固定于第一滑块 15 之上，另一面的 4 角有 4 个螺孔。

图 5 是第二型材 17 的截面图，第二型材 17 的四面分别具有一对第二燕尾槽 171 及一对第三燕尾槽 172。图 6 是第二型材 17 的第二燕尾槽 171 中安装第二滑块 18 的示意图。第二滑块 18 也可在第二型材 17 的第二燕尾槽 171 中滑动，当滑动到恰当位置后，可在第二滑块 18 上的螺孔拧入螺杆，以固定第二滑块 18 于适当的位置。

图 7 是本实用新型中板架 200 的示意图，其中强度相对第一型材 14 较大的第二型材 17 构成板架 200 的四边。请参见图 7A，其为图 7 中板架 200 在 A-A 向的示意图，其中第三滑块 21 可在第二型材 17 的第三燕尾槽 172 内滑动，请同时参见图 7C 所示，第一型材 14 的一端固定于一个第三滑块 21 之上，第三滑块 21 的两端同样有螺孔供螺杆拧入。请参见图 7B 所示，两根第二型材 17 在对接处用 L 形的第二安装连接件 19 连接固定。第四滑块 20 也安装在第二型材 17 的第二燕尾槽 171 中，其作用与第二滑块 18 的作用相同，也是用于 LED 固定显示单元 100。因第四滑块 20 安装在板

架 200 的四角处, 为避开第二型材 17 与第二安装连接件 19 连接用的安装孔, 第四滑块 20 相对第二滑块 18 设计得较短。第四滑块 20 上设有两个螺孔, 一个用于安装 LED 显示单元 100, 一个用于拧入螺杆以固定其位置。

图 8 是本实用新型中 LED 显示单元 100 安装到板架 200 上的示意图。LED 显示单元 100 从板架 200 的正面安装。请结合参阅图 8A 及图 8B 所示, LED 显示单元 100 是通过其四角上的通孔立柱 13 对准板架 200 上的第一安装连接件 16、第二滑块 18、第四面滑块 20 上的螺孔, 然后从 LED 显示单元 100 的正面拧入紧固螺杆 22, 当四个紧固螺杆 22 拧紧后可以将 LED 显示单元 100 牢固地固定在板架 200 上。

采用上述实施例所描述的 LED 显示屏结构, 其具有如下的优点:

1、LED 显示单元的主体支撑结构为一块金属平板制成的背板, 用对容置 LED 灯板的塑胶框架灌胶、防水硅胶垫以及容置电源和控制电路板的防水盒等措施来提供足够的防雨性能。背板可用数控冲床冲出精确的安装孔位, 外形可用铣床铣边, 相比较于现有技术所常用的钣金工艺制造的薄板箱体结构, 工艺简单、生产效率大幅提高, 成本低, 并能显著地提高制造精度。

2、LED 显示单元安装到一个由型材装配而成的板架上, 该板架为 LED 显示单元的安装提供了一个理想的基准面, 连接 LED 显示单元的安装连接件可以在型材的燕尾槽中滑动, 以微调 LED 显示单元的位置。以上措施, 可确保 LED 显示单元拼合成的显示屏的表面平整度和拼合接缝的一致性。

3、LED 显示单元相互间无连接固定关系, 各显示单元均可单独从正面拆装, 这样就不必在 LED 显示屏的背面留出操作维护空间和人员进出口, LED 显示屏结构可以做得轻薄, 十分有利于降低 LED 显示屏工程的建造成本, 可以更灵活方便地选择 LED 显示屏的安装场地、位置, 也有利于改进 LED 显示屏外观与其附着建筑物的协调性。

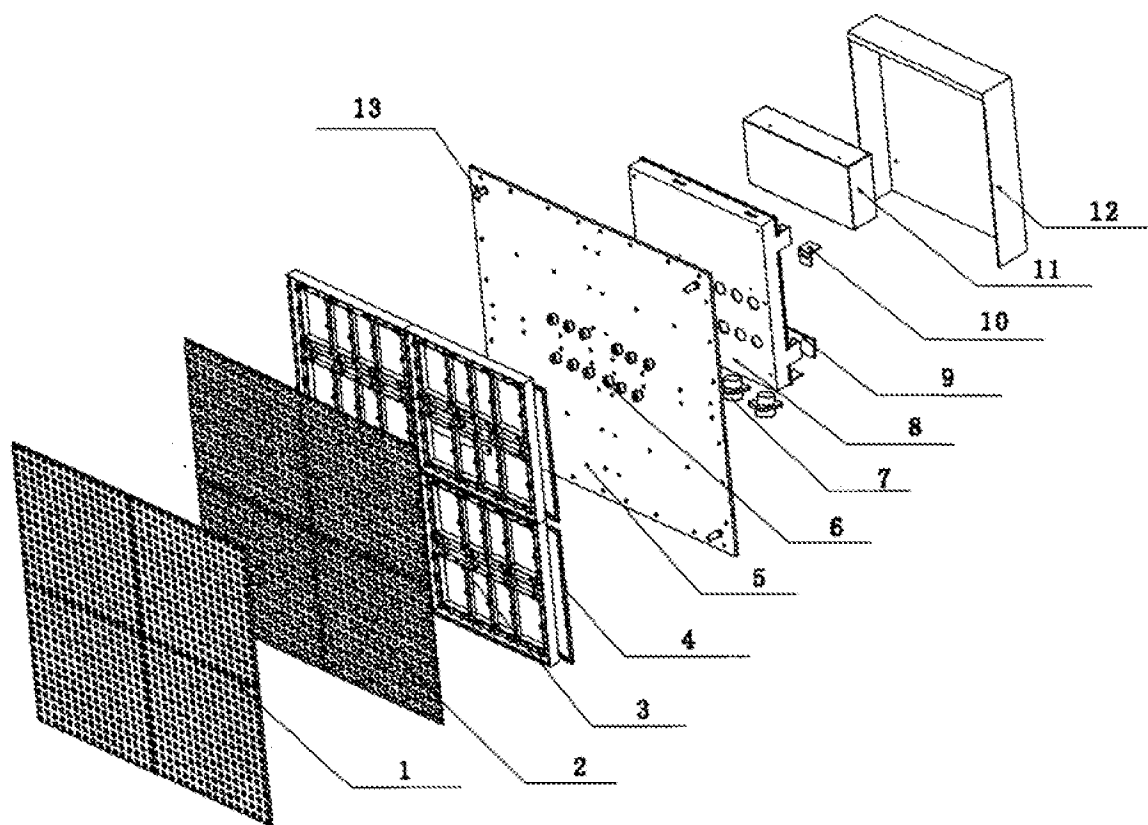
100

图 1

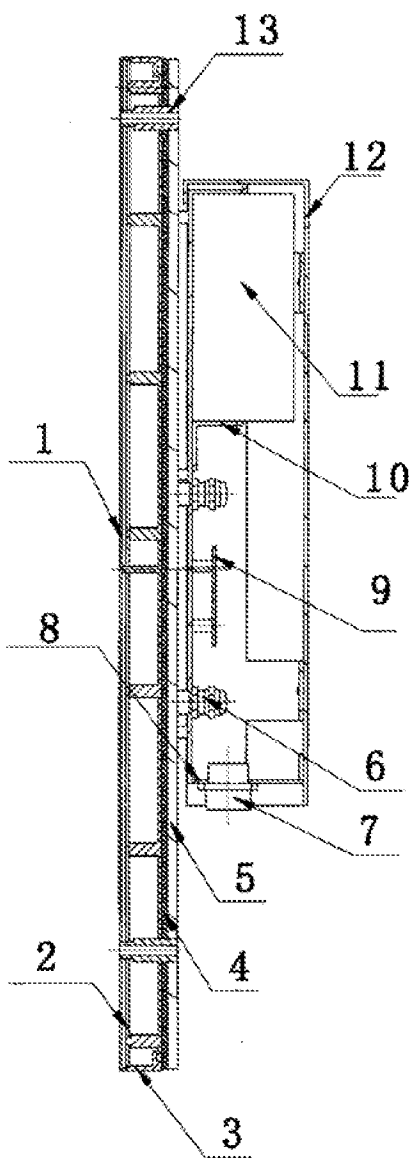


图 2

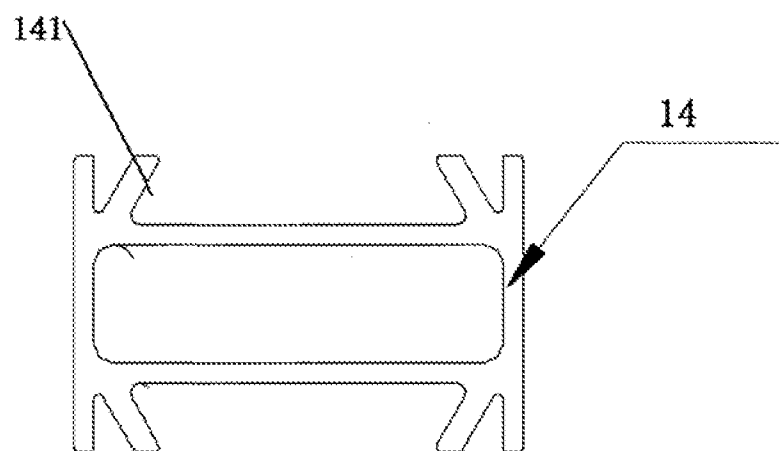


图 3

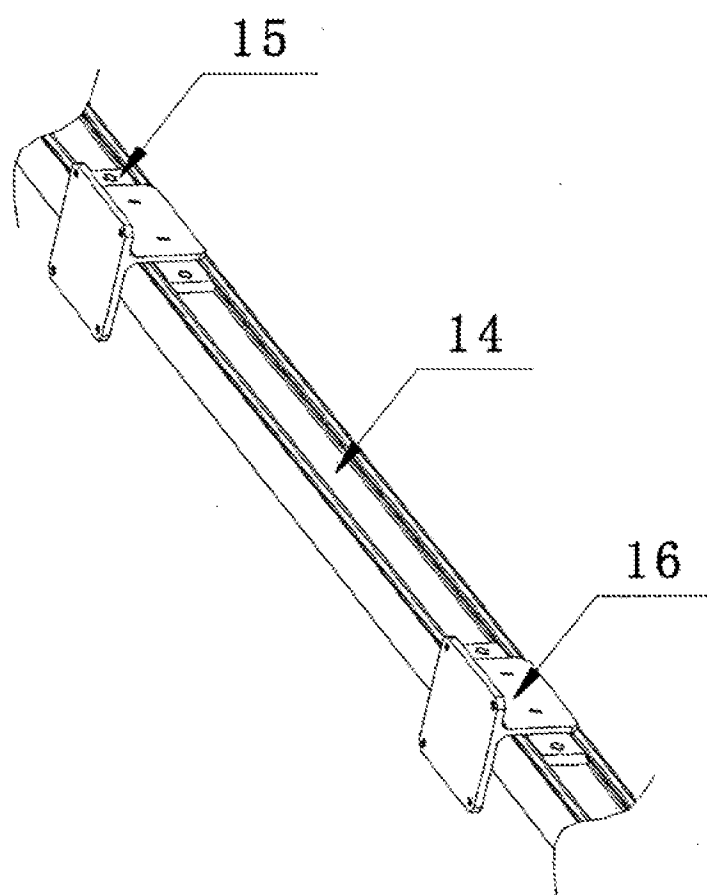


图 4

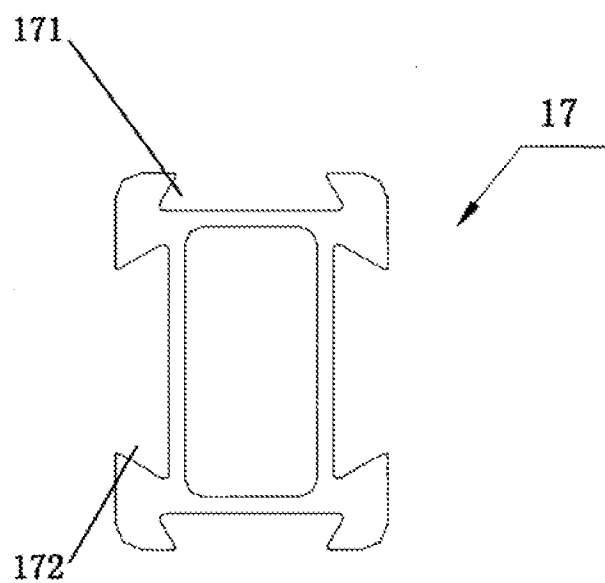


图 5

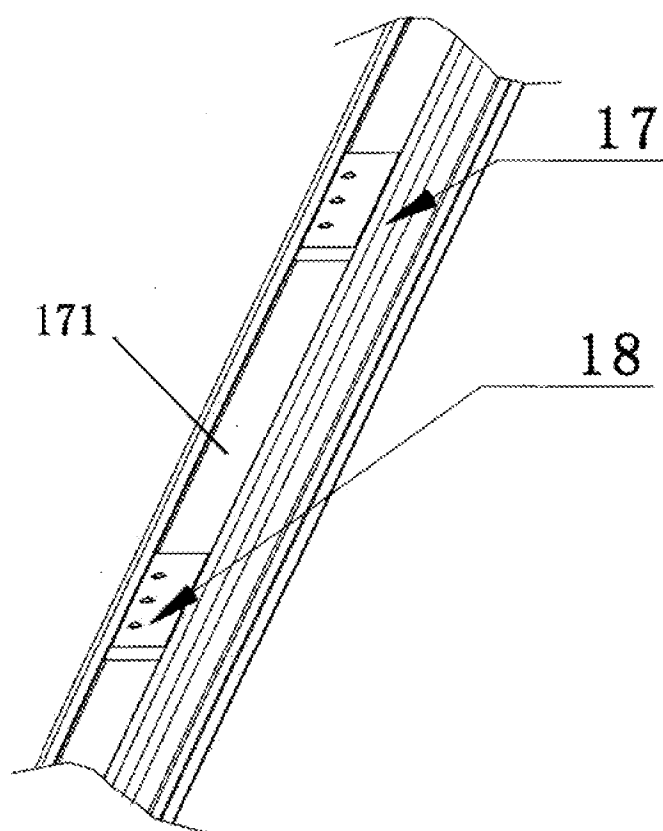


图 6

200

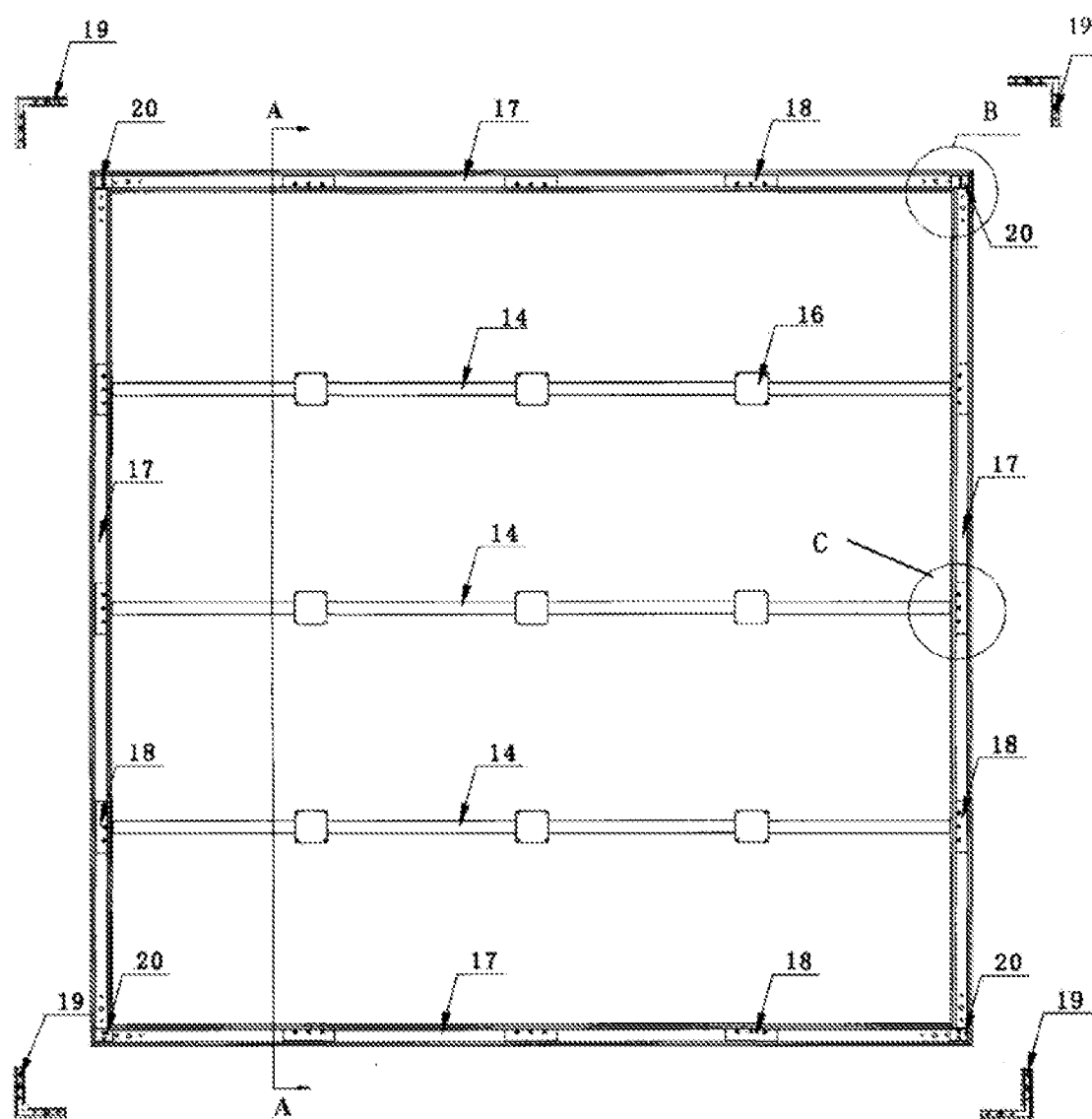


图 7

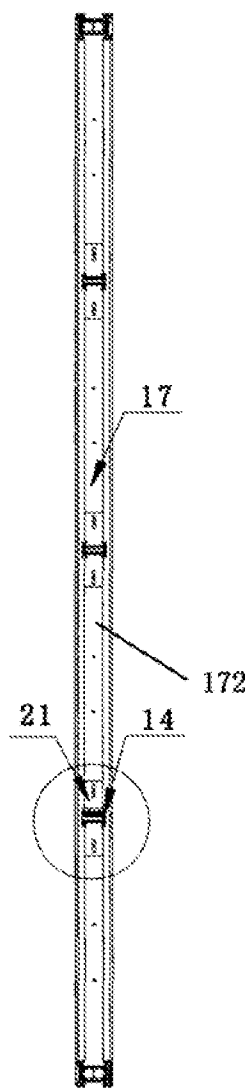


图 7A

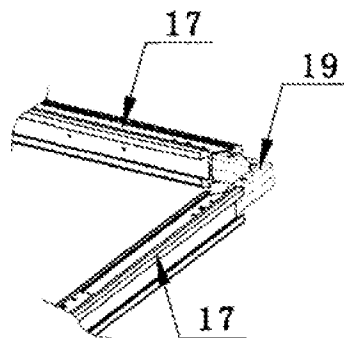


图 7B

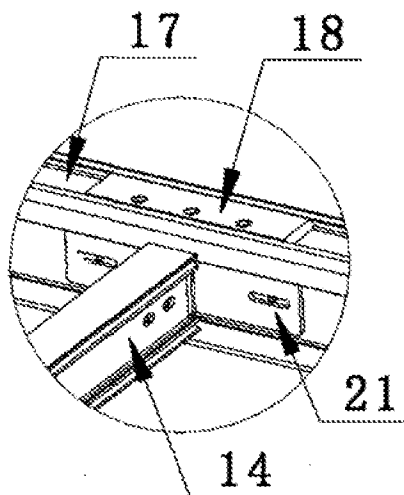


图 7C

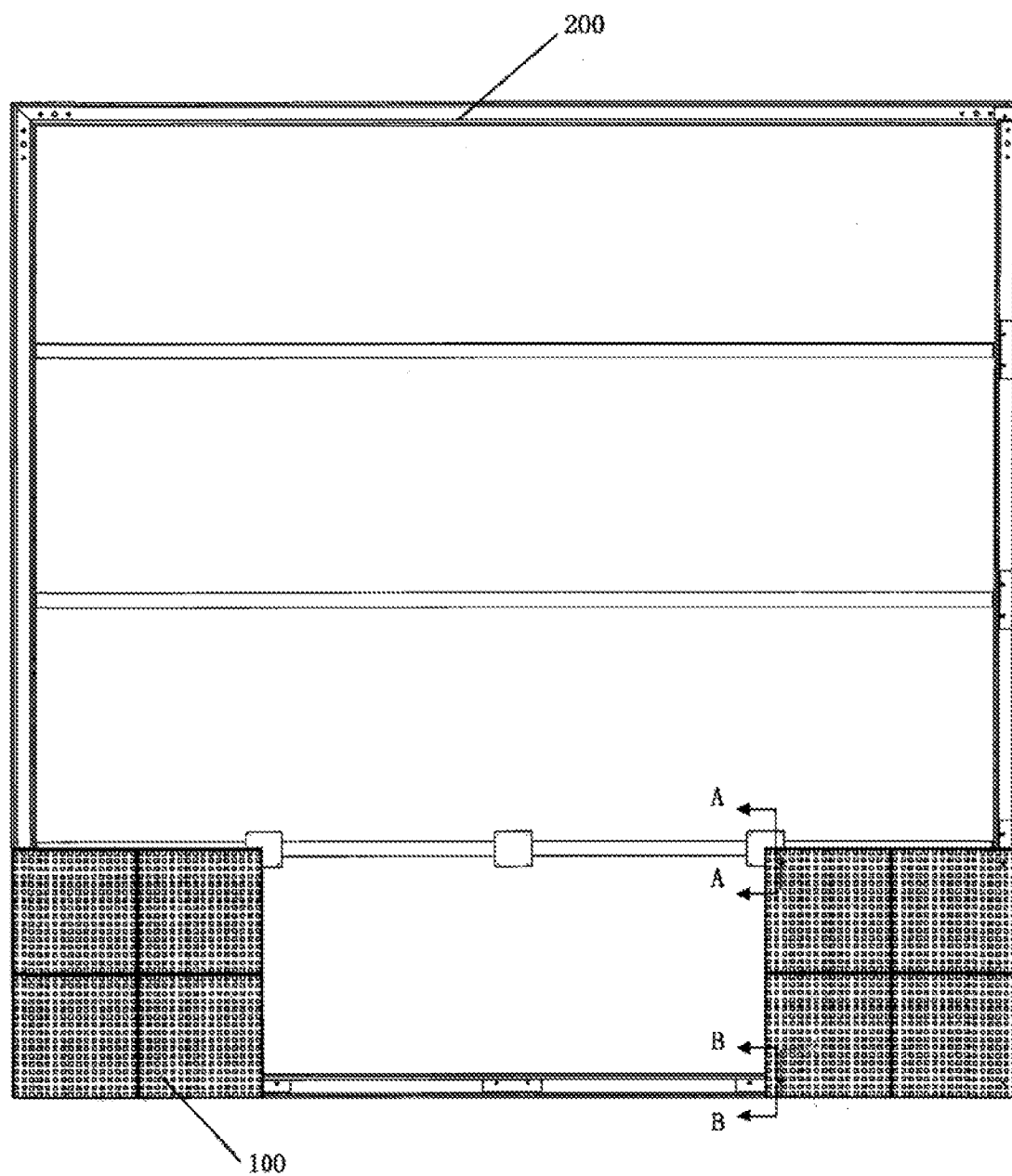


图 8

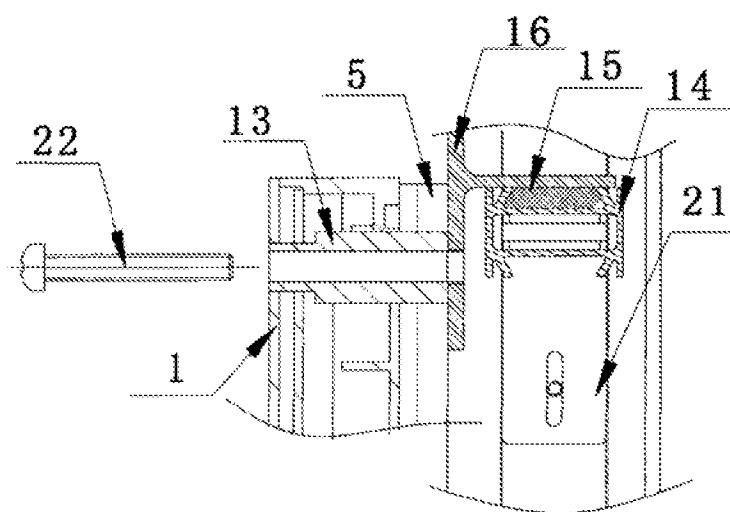


图 8A

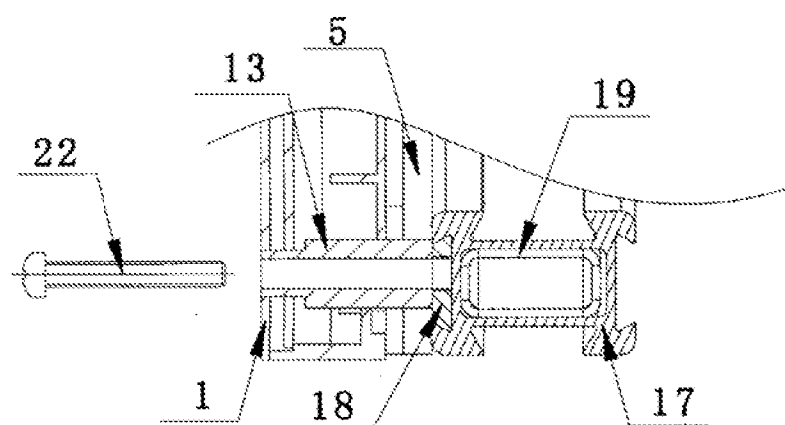


图 8B

REMARKS

Examination of the application as amended is respectfully requested.

Respectfully submitted,
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LIST OF CURRENT CLAIMS

1-17. (Canceled)

18. (New) A display tile comprising a display board and a carrier board, LED's being mounted on a first face of the display board and the carrier board being for attachment to a frame, the display board and the carrier board being fastened together by the intermediary of a spacer and an adjusting means positioned between the spacer and the carrier board wherein the adjusting means engage in an opening in the carrier board, the adjusting means allowing a compensation of the tolerances affecting the position of the LED's with respect to the carrier board in a direction perpendicular to the carrier board whereby the compensation is obtained by the position of the adjusting means in their corresponding opening.

19. (New) The display tile according to claim 18 wherein the display board has LEDs selected from:

wherein the adjusting means is for adjusting a relative position of the tops of the LEDs with respect to a carrier board, and

wherein the distance between a first surface of the adjusting means and a first surface of the carrier board is set to the difference between a nominal distance and the sum of the distance between the tops of LEDs on the LED board and a second surface of the LED board, the length of the spacer and the thickness of the carrier board, wherein the nominal distance is the distance between the top of the LEDs and the second surface of the carrier board or back of the carrier board.

20. (New) The display tile according to claim 19, wherein a sidewall of the opening in the carrier board is perpendicular to the second surface of the carrier board.

21. (New) The display tile according to claim 18, wherein a sidewall of the adjusting means is parallel to the sidewall of the opening in the carrier board.

22. (New) The display tile according to claim 18, wherein the thickness of the adjusting means is less than the thickness of the carrier board.

23. (New) The display tile according to claim 18, wherein the cross section of the adjusting means is selected from:

fitting in the opening , and

having a first area in a first part of the adjusting means and a second area in a second part of the adjusting means.

24. (New) The display tile according to claim 18, wherein the adjusting means is selected from:

being fastened to the carrier board by glue extending on a second surface and/or a sidewall of the adjusting means and a sidewall of the opening, and

having a first part that is a circular right cylinder with a first radius and a second part that is a circular right cylinder with a second radius smaller than the first radius.

25. (New) The display tile according to claim 18, wherein a fastening means fastens the adjusting means to the spacer.

26. (New) The display tile according to claim 25, wherein the fastening means is selected from going through an opening in the adjusting means, and being a screw.

27. (New) The display tile according to claim 18, wherein a threaded extension extends from a first surface of the adjusting means and that the spacer has a matching threaded opening to receive the threaded extension.

28. (New) The display tile according to claim 27, wherein the second surface of the adjusting means is a driving surface.

29. (New) A method to adjust the distance between the tops of the LEDs on a first surface of a LED board on a display tile and the back surface of the carrier board of the display tile, the method comprising the steps:

positioning the tops of the LEDs on a LED board in a first reference plane,

aligning openings in the carrier board with spacers distributed on the LED board ,

positioning a second surface of a carrier board in a second reference plane; a first surface of the carrier board facing a second surface of the LED board; the first and second reference

planes being parallel and the distance between the first and second reference planes being equal to a desired nominal distance,

moving adjusting means in the openings until a first surface of each adjusting means contacts a spacer,

fastening each adjusting means to its corresponding spacer,

fastening the adjusting means to the carrier board.

30. (New) The method of claim 29, wherein glue is dispensed in the openings, on sidewalls of the openings and on a second surface of the adjusting means.

31. (New) The method of claim 30, wherein the glue is allowed to harden, to set or to cure to fasten the adjusting means to the carrier board at the position where the adjusting means compensates for the tolerances affecting the position of the LEDs with respect to the carrier board in a direction perpendicular to the carrier board.

32. (New) The method of claim 29, wherein the fixing of the distance between the top of the LEDs and the second surface of the carrier board is facilitated by using a jig manufactured with better tolerances than the LED board and the carrier board.

33. (New) The method of claim 32, wherein the jig has a first surface or reference surface and sidewalls that extend from the first surface of the jig, the method further comprising if the tolerance on the thickness of the carrier board is sufficiently small to be neglected, the top of the sidewalls serves as a support or stop for the carrier board that is positioned in parallel with the reference surface.

34. (New) The method of claim 33, wherein the LED board is positioned with the LEDs in contact with the reference surface.

35. (New) The method of claim 30, wherein the height of the sidewalls is selected such that when the sidewalls are in contact with the carrier board, the distance between the second surface of the carrier board facing away from the reference surface and the reference surface is equal to the nominal distance or desired distance between the tops of the LEDs on the LED board and the second surface of the carrier board.

36. (New) The method of claim 29, wherein the position of the adjusting means in the openings of the carrier board is modified until a first surface of the adjusting means contacts the spacer, or

wherein the position of the adjusting means in the opening of the carrier board is modified until a first surface of the adjusting means contacts the spacer and the adjusting means and the spacer are then fastened.

37. (New) The method of claim 30, wherein the adjusting means and the spacer are fastened by glue being dispensed in the openings to fasten the adjusting means to the carrier board and to fix its position in the openings, thereby guaranteeing that when the carrier board and LED board are taken out of the jig, the distance between the second surface of the carrier board and the tops of the LEDs is equal to the nominal or desired distance.

38. (New) The method of claim 29, wherein the sidewalls of the jig are provided with a step.

39. (New) The method of claim 30, wherein the distance between the top of the outermost part to which the sidewall extends and the reference surface in a direction perpendicular to the reference surface is made equal to the nominal or desired distance.

40. (New) The method of claim 39, wherein the distance between the top of the innermost part of the sidewall and the reference surface is made less than the nominal or desired distance minus the nominal thickness of the carrier board.

41. (New) The method of claim 30, wherein a flexible material is positioned between the top of the innermost part of the sidewall and the carrier board.

42. (New) The method of claim 41, wherein the thickness of the flexible material is selected so that pressure applied to the carrier board makes the second surface of the carrier board flush or coplanar with the top of the outermost part of the sidewall of the jig.

43. (New) The method of claim 42, wherein when the second surface of the carrier board is flush with the top of the outermost part of the sidewall of the jig, the distance between the tops of the LED and the second surface of the carrier board is made to be the nominal or desired distance.

44. (New) A tiled display apparatus comprising a plurality of display tiles according to claim 18 fixed to a frame.

AMENDMENTS TO THE SPECIFICATION

Page 1, please remove the heading before the first paragraph as follows:

~~Field of the Invention~~

Page 1, line 7, please amend the heading as follows:

Background of the Invention

Page 8, line 4, please amend the heading as follows:

Brief description of the Drawings ~~figures~~

Page 9, line 12, please amend the heading as follows:

~~Description of embodiments~~ Detailed Description of the Invention

AMENDMENTS TO THE ABSTRACT

Amend the Abstract, as seen in the following marked-up Abstract, a clean copy of which follows on the following page:

~~The invention relates to a~~ A display tile ~~comprising~~ including a display board (1) and a carrier board (3) fastened together by the intermediary of a spacer (7) and an adjusting means positioned between the spacer (7) and the carrier board, (3) ~~whereby~~ the The adjusting means engage in an opening in the carrier board (3). ~~The invention further relates to~~ Also methods to adjust the distance between the top of a LED (2) on a first surface (11) of a LED board on a display tile and the back surface (32) of the carrier board of the display tile.

ABSTRACT

A display tile including a display board and a carrier board fastened together by the intermediary of a spacer and an adjusting means positioned between the spacer and the carrier board. The adjusting means engage in an opening in the carrier board. Also methods to adjust the distance between the top of a LED on a first surface of a LED board on a display tile and the back surface of the carrier board of the display tile.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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Attorney Docket: DECL3007/TJM/TL

Inventor: Tom DECLERCK

For: ADJUSTABLE DISPLAY TILE FOR TILED DISPLAY

PRELIMINARY AMENDMENT BEFORE EXAMINATION

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

Sir:

INTRODUCTORY COMMENTS

This paper accompanies documents submitted to initiate national stage processing of the above-identified international patent application.

Before calculating the filing fee and before formal examination of the application on the merits, it is desired to amend the application in accordance with the following particulars.

AMENDMENTS

AMENDMENTS TO THE ABSTRACT

The abstract is amended as shown on a following page under the heading “AMENDMENTS TO THE ABSTRACT”.

AMENDMENTS TO THE SPECIFICATION

The specification is amended as shown on a following page under the heading “AMENDMENTS TO THE SPECIFICATION”.

AMENDMENTS TO THE CLAIMS

The claims are amended as shown in the following pages under the heading “LIST OF CURRENT CLAIMS”. This listing of claims supersedes all prior listing of claims presented in this application, shows currently proposed amendments and shows the current status of all claims in the application.

The amendments to the claims of this application, which originated in a foreign country, are submitted before examination on the merits and are not intended to have a narrowing effect for the purpose of patentability, but rather are made for one or more of the following reasons: (i) to remove drawing reference numerals unnecessary under U.S. practice; (ii) to remove or reduce multiple dependent claims to reduce the filing fee; (iii) to revise the original language originating in a foreign country to better conform to customary English usage and style for U.S. patent claiming; (iv) to revise original non-U.S. claim terminology into more appropriate English claim terms having a scope of meaning consistent with the original intended language in preparation for U.S. examination; (v) to remove limitations having an effect in a foreign country which is different and unintended under U.S. practice (i.e., changing “consisting of” to “comprising”); (vi) to remove or amend original claim language that could be regarded as alternative expressions that are acceptable under foreign patent practice but possibly subject to objection under U.S. practice, typically having a broadening or neutral effect in the amended claim; and/or (vii) to improve the clarity or meaning of the original language.

In the case of amendments effectively changing an original claim element expressed as a “means plus function” that could raise a presumption of claim expression under 35 U.S.C. 112, 6th paragraph to a structural expression or to an expression removing the presumption of a “means-plus-function” statement, it is not intended to narrow the claim so amended for purposes of patentability, but rather to place the claim in a form considered to be intended by the applicant from a foreign country where claim limitations described in terms of means-plus-function do not have the same effect as under U.S. practice. Thus, such amendments are intended to establish a full range of equivalents to the claim elements so amended under the U.S. doctrine of equivalents and beyond the range associated with “means-plus-function” expressions according to 35 U.S.C. 112, 6th paragraph, just as if the claim so amended was presented originally in its amended form.

All rights are reserved to the original disclosed and claimed subject matter and any cancellation of claims is made without prejudice or disclaimer.

Fig. 1

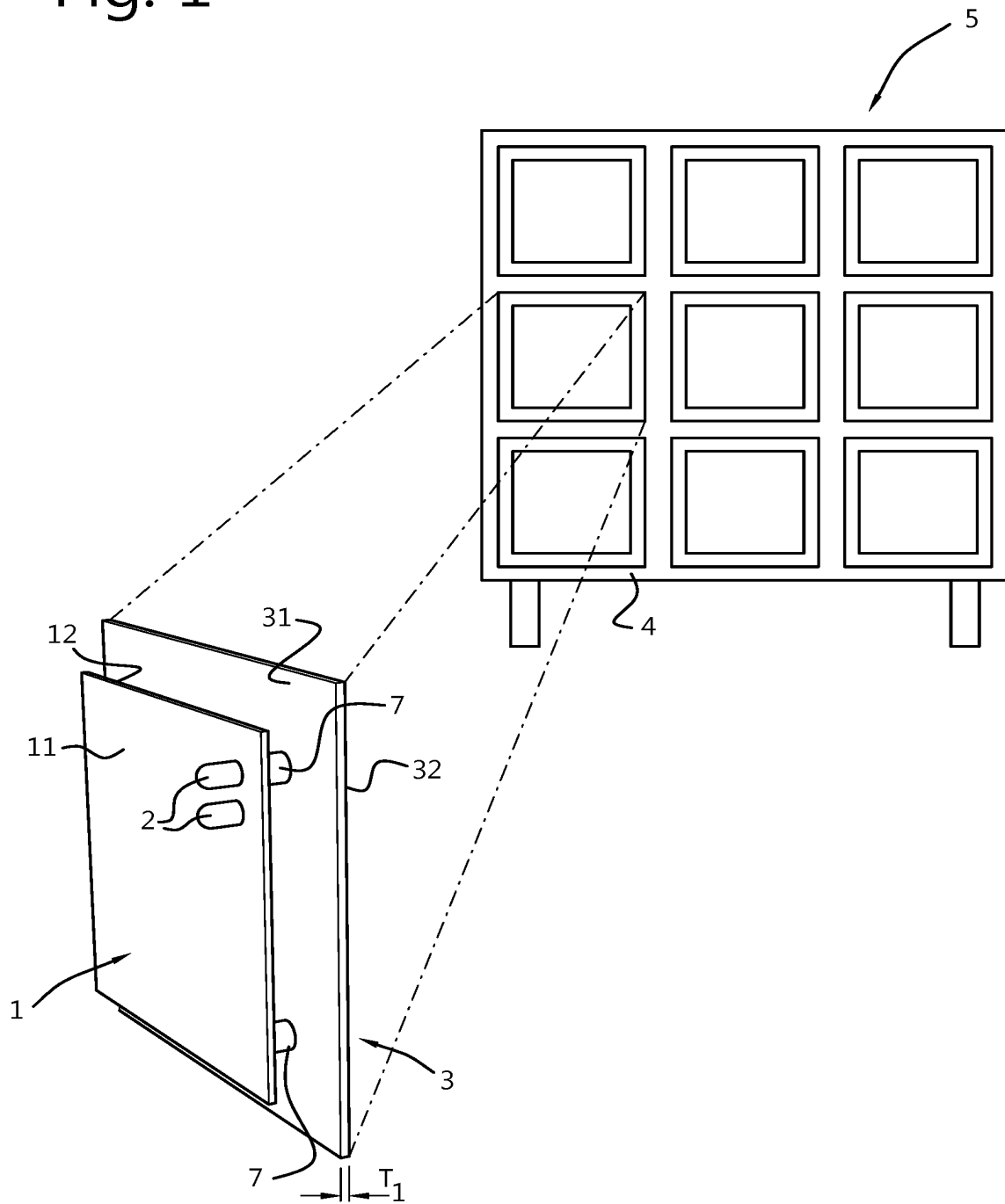


Fig. 2

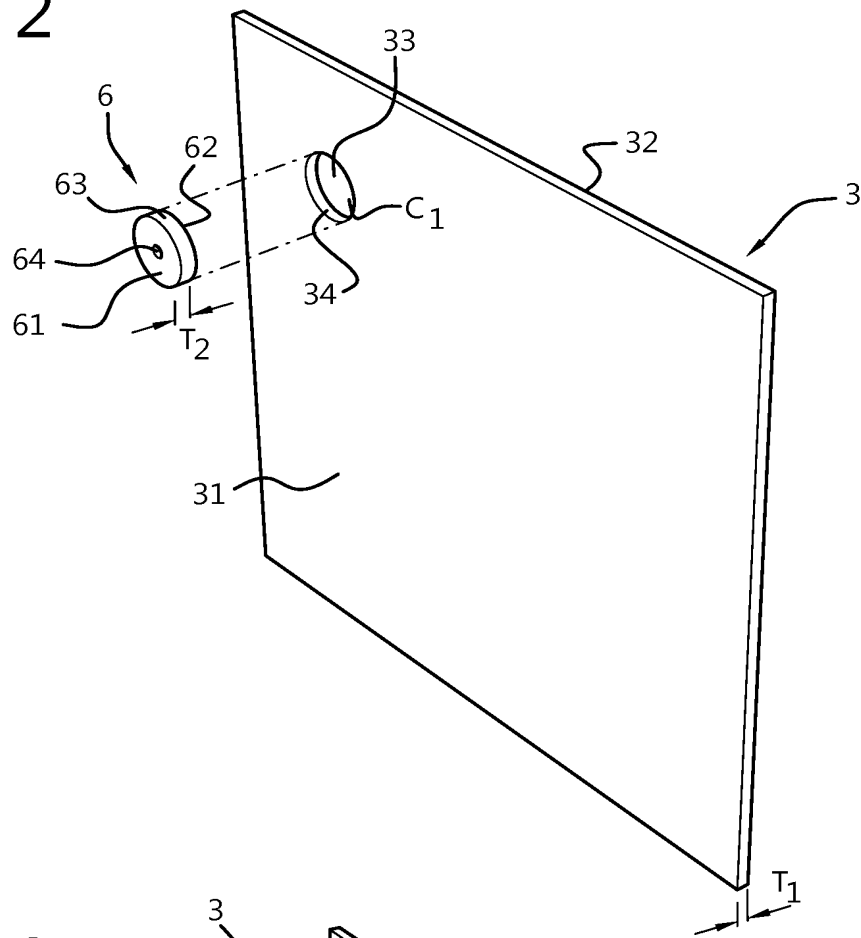


Fig. 3

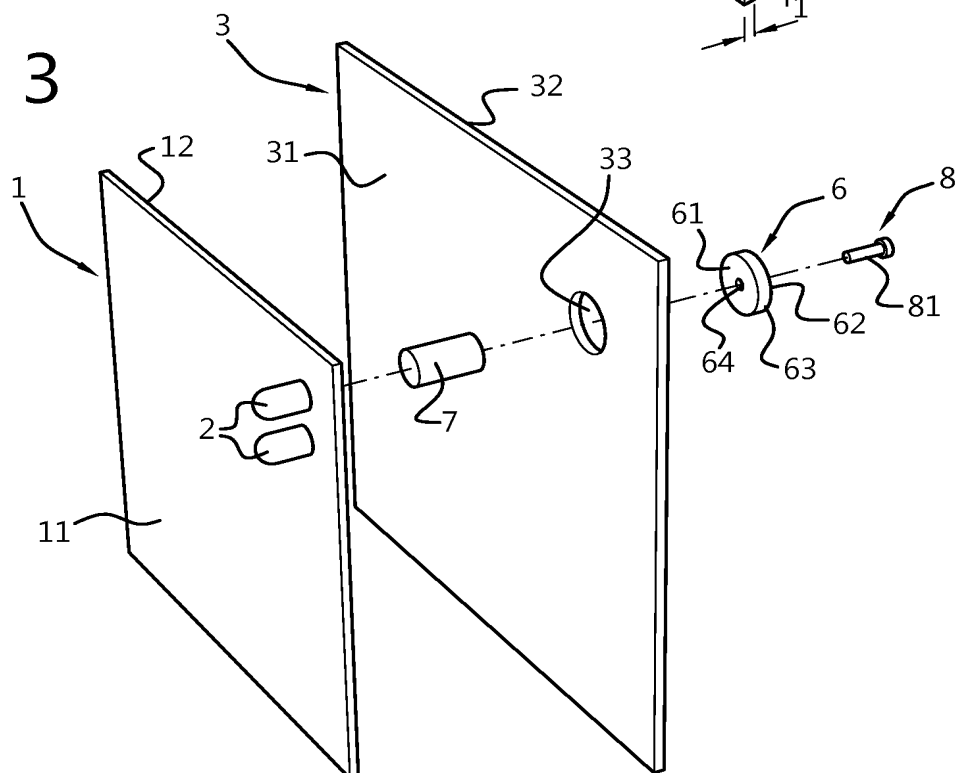


Fig. 4

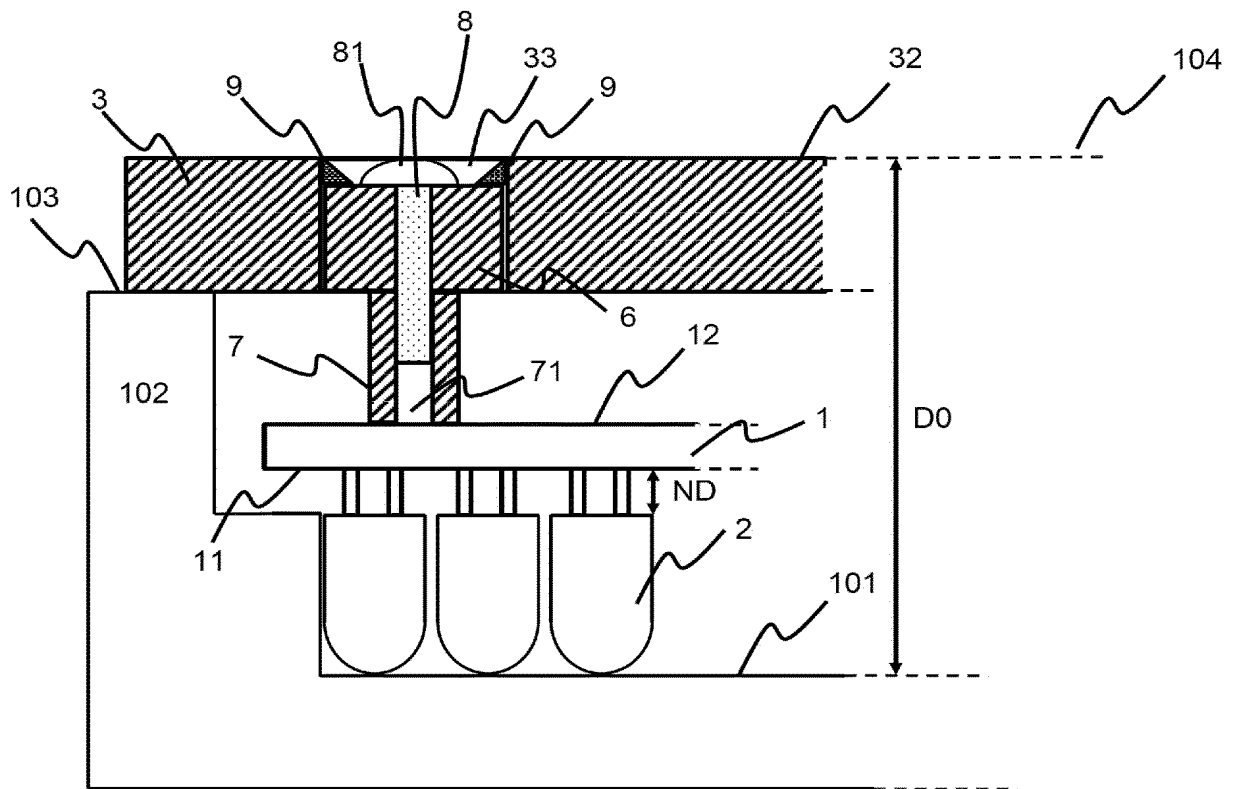


Fig. 5a

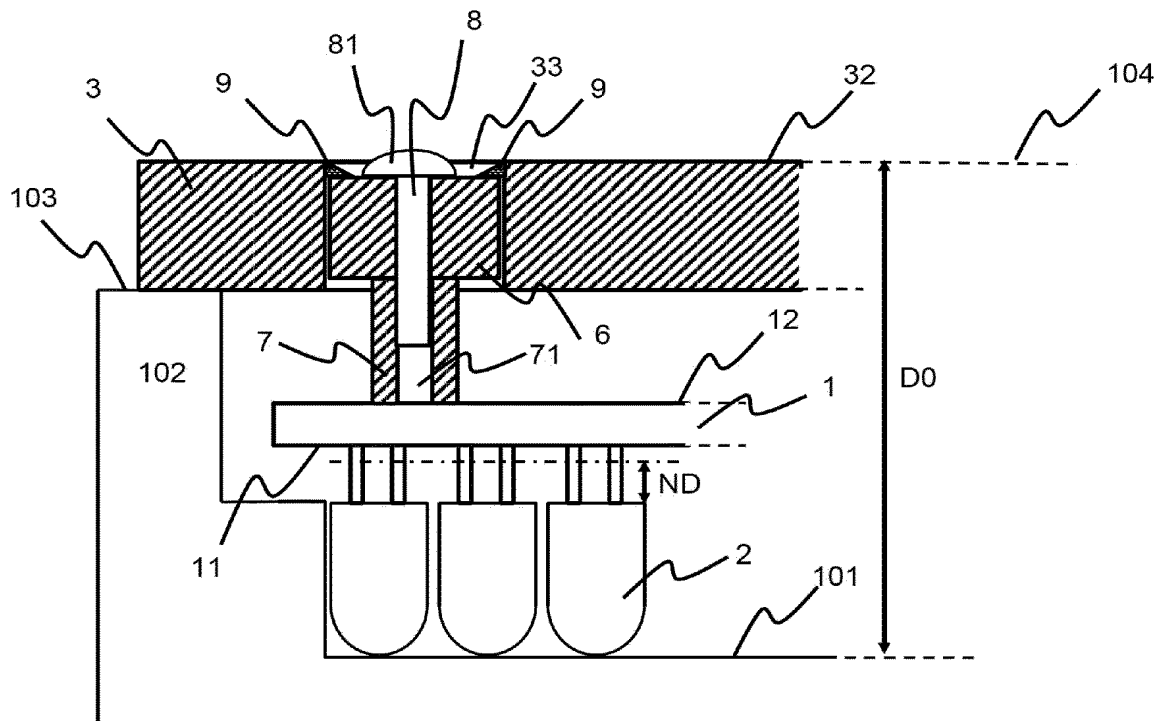


Fig. 5b

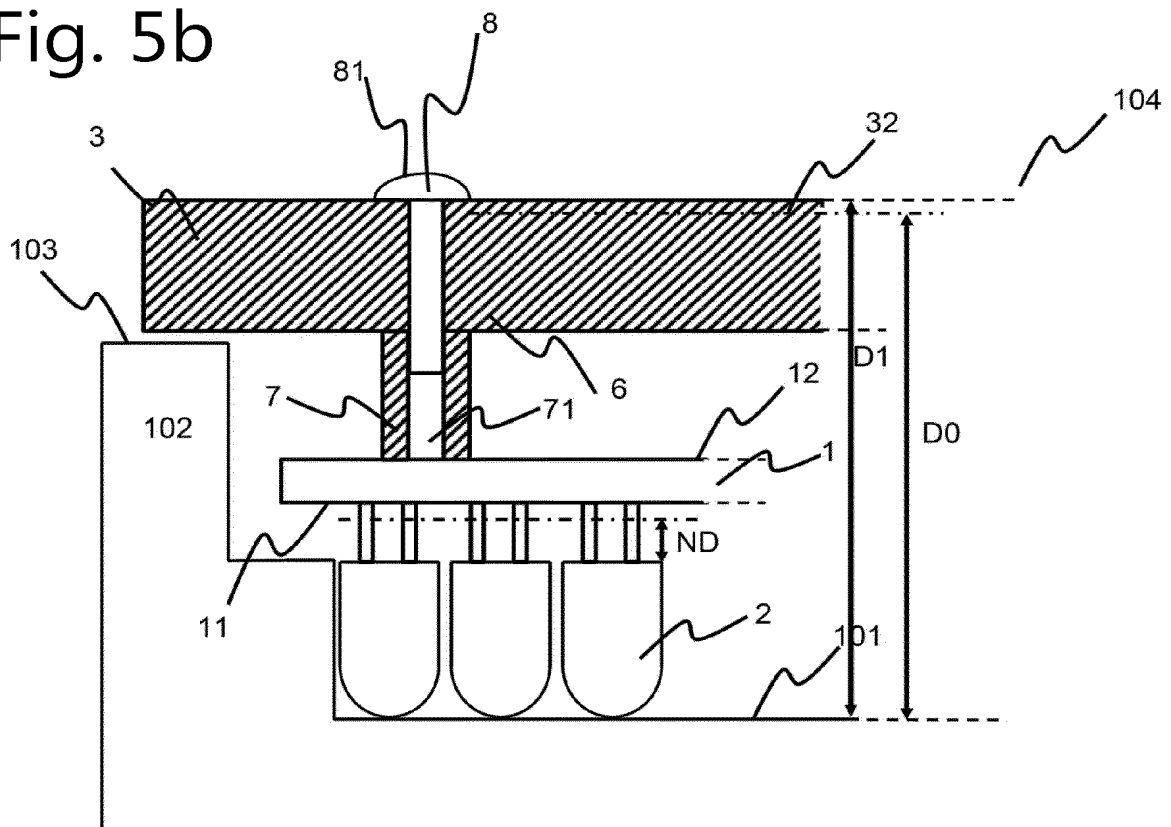


Fig. 6a

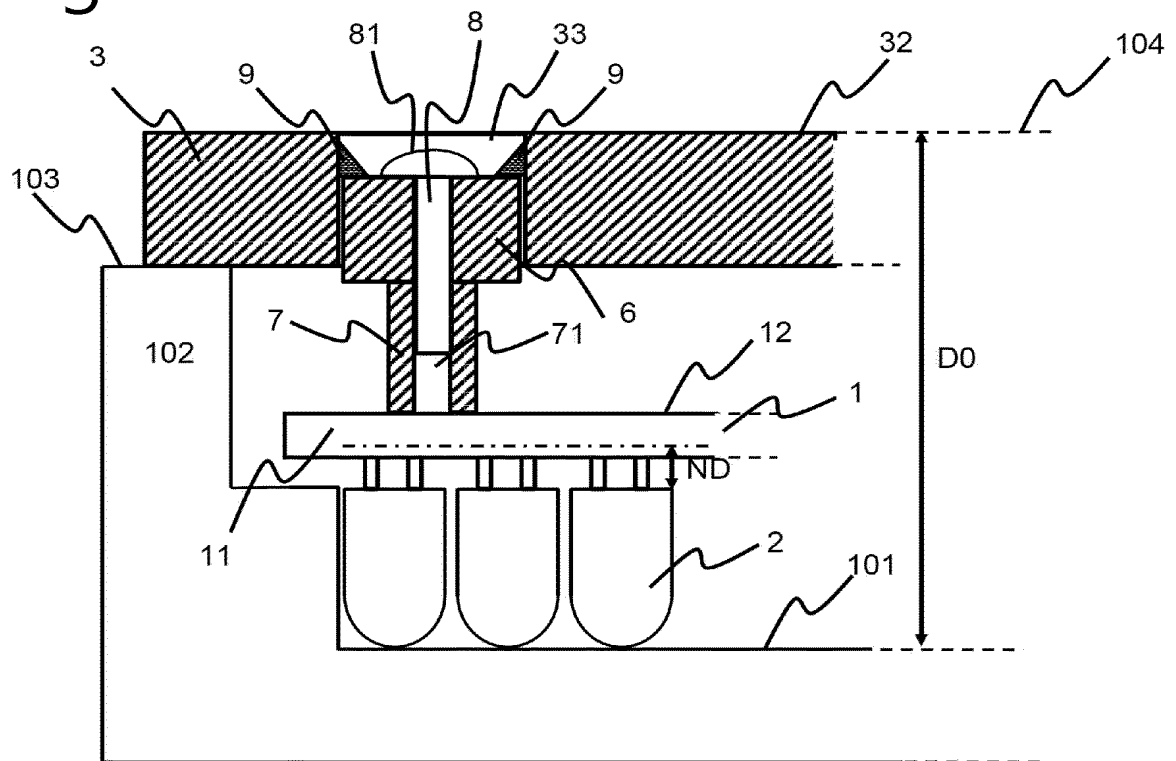


Fig. 6b

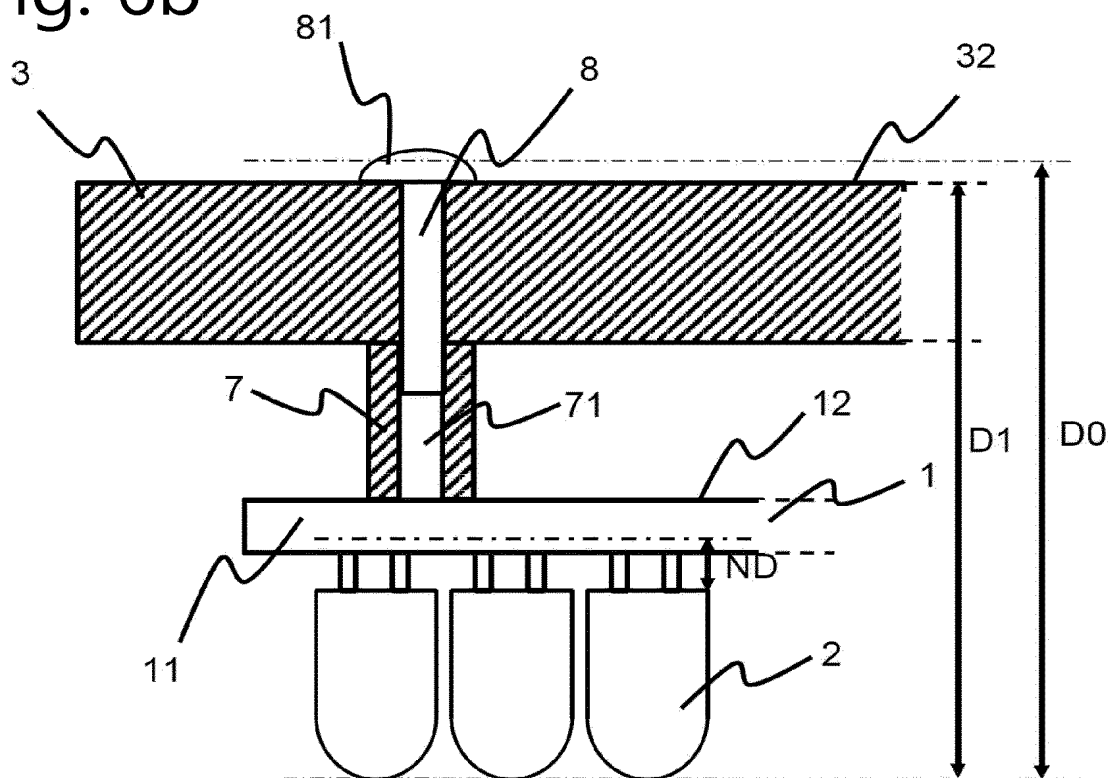


Fig. 7a

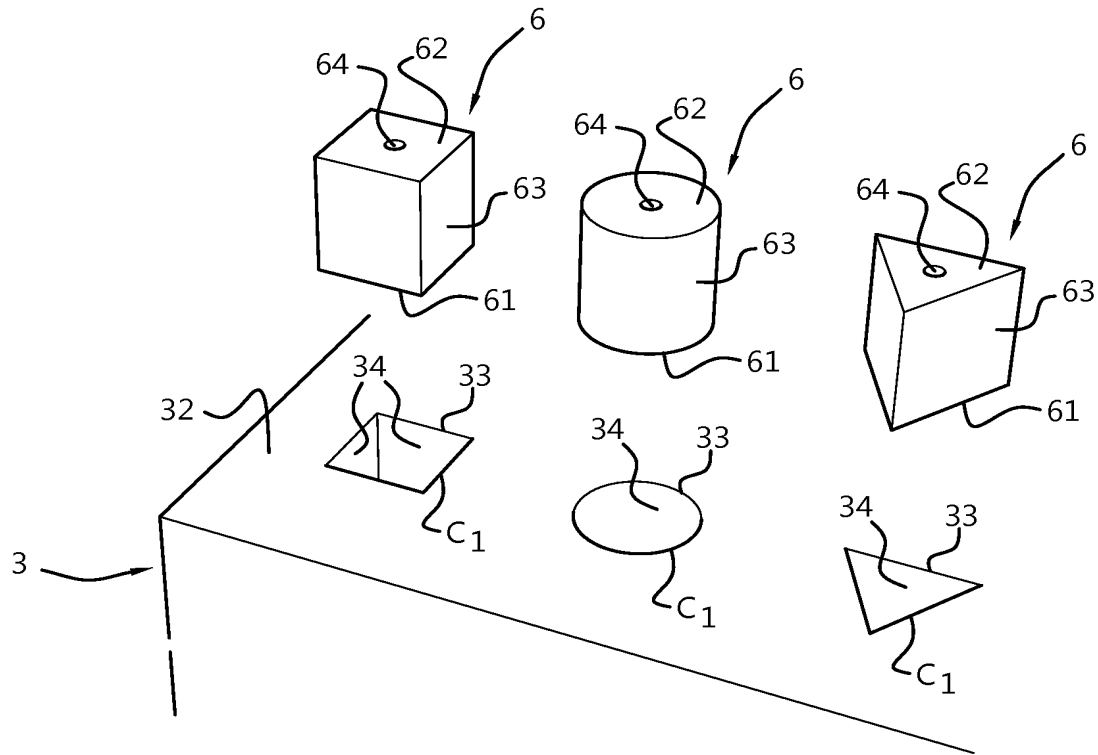


Fig. 7b

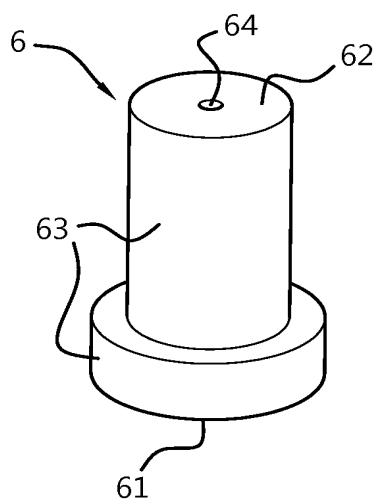


Fig. 7c

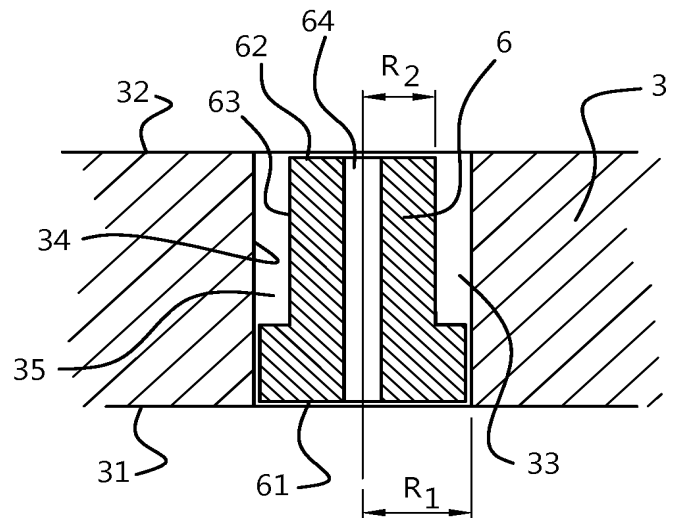


Fig. 8a

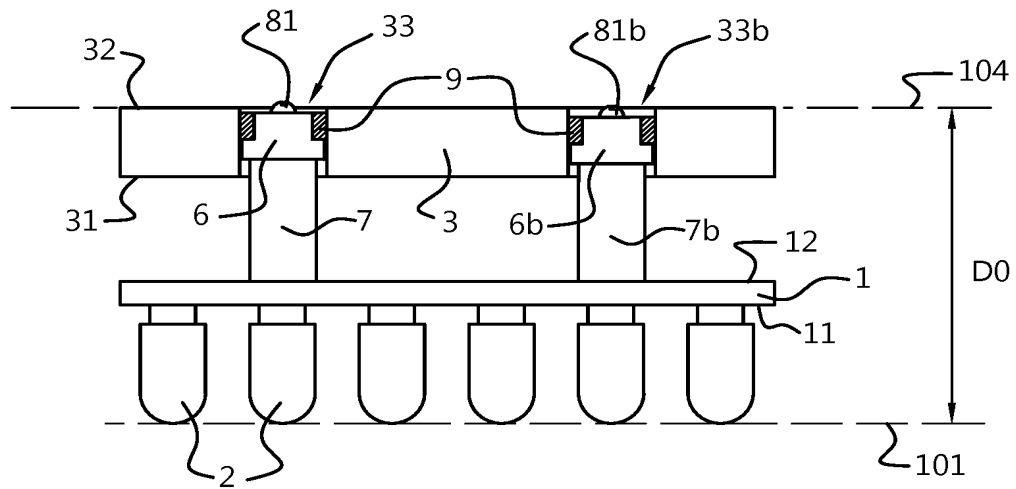


Fig. 8b

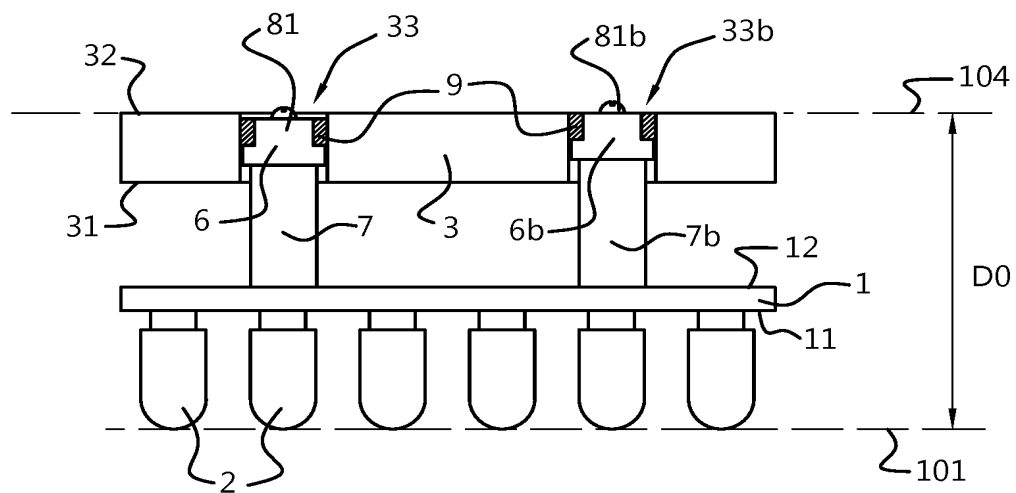


Fig. 8c

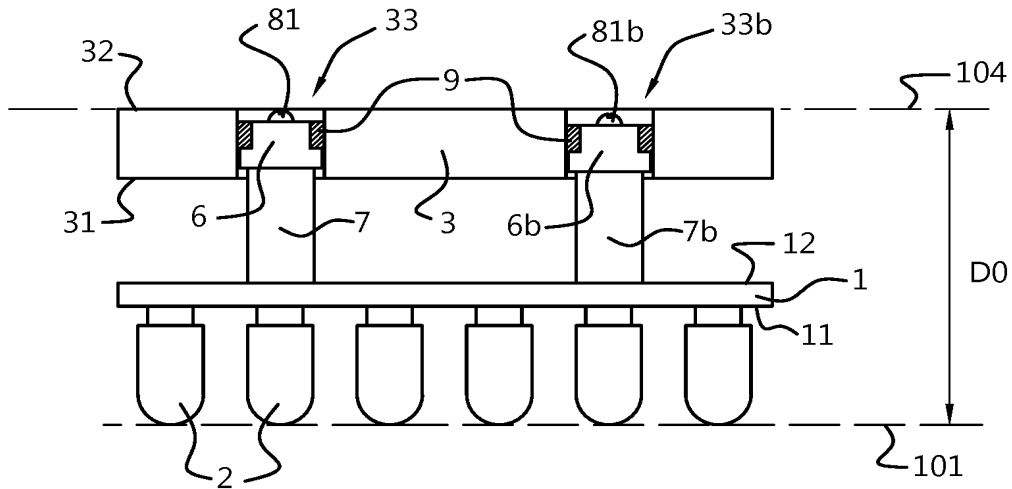


Fig. 9a

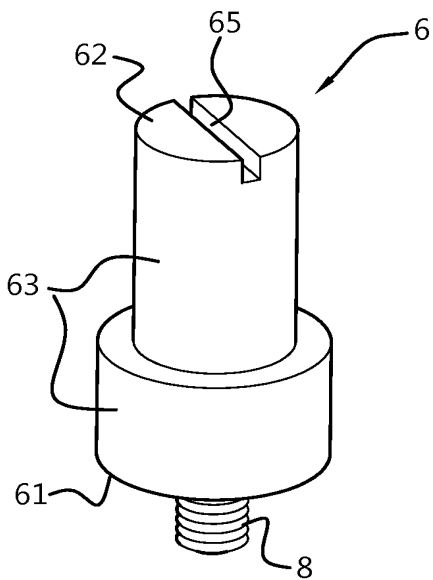


Fig. 9b

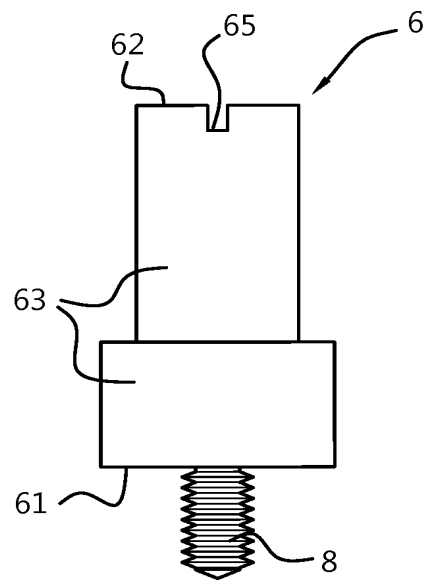
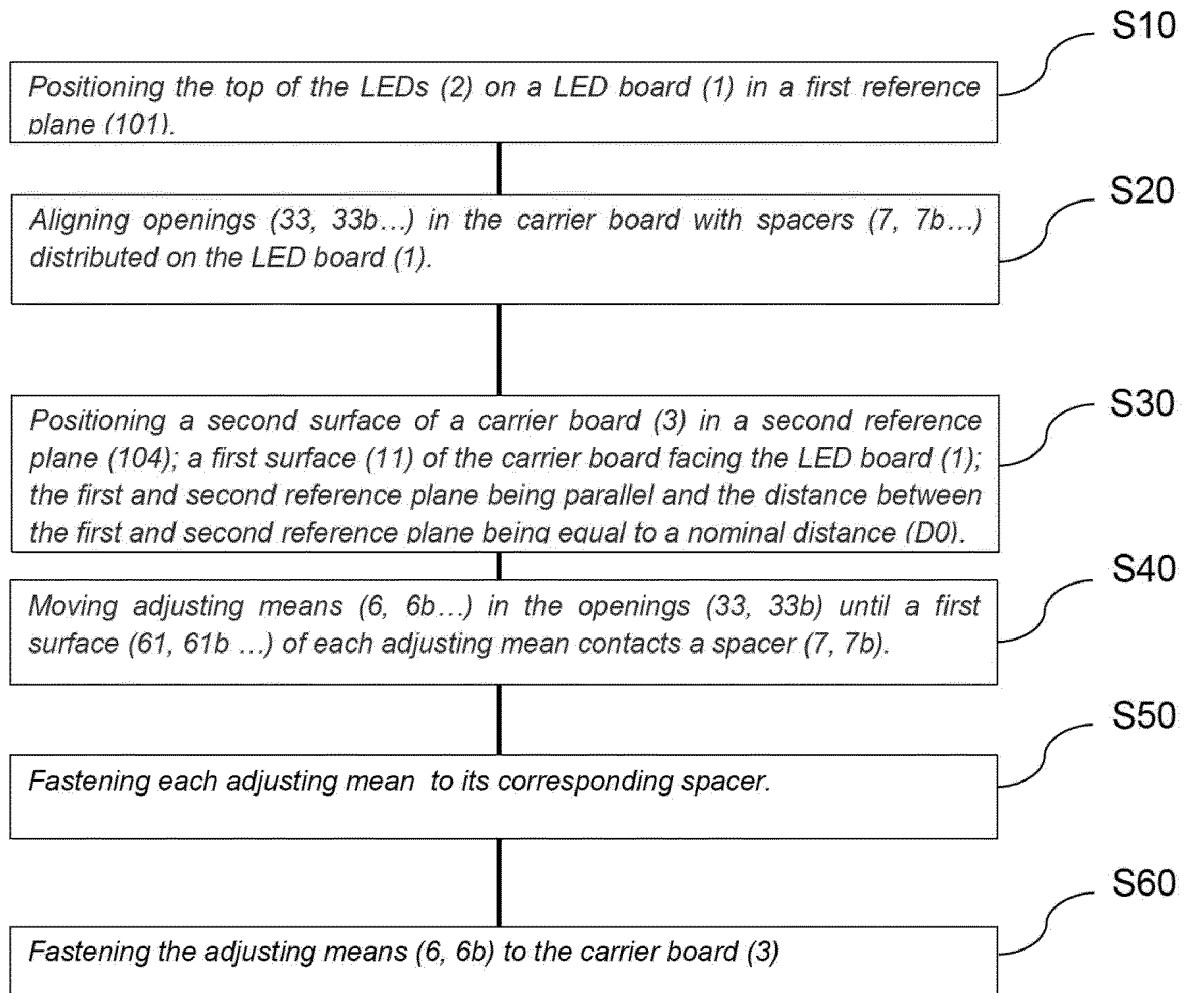


Fig. 10



Claims.

1. A display tile comprising a display board (1) and a carrier board (3), the carrier board being for attachment to a frame, the display board (1) and the carrier board (3) being fastened together by the intermediary of a spacer (7) and an adjusting means (6) positioned between the spacer and the carrier board wherein the adjusting means engage in an opening (33) in the carrier board, the adjusting means being for adjusting a relative position of the display board (1) with respect to the carrier board (3).
2. A display tile according to claim 1 wherein the display board (3) has LEDs (2) and the adjusting means is for adjusting a relative position of the tops of the LEDs (2) with respect to a carrier board (3).
3. A display tile according to claim 1 or 2 wherein the display board (3) has LEDs (2) and the distance between a first surface (61) of the adjusting means and a first surface (31) of the carrier board is set to the difference between a nominal distance (D0) and the sum of the distance between the tops of LEDs (2) on the LED board (1) and a second surface (12) of the LED board, the length of the spacer (7) and the thickness of the carrier board (3).
4. A display tile according to any of the preceding claims wherein a sidewall (34) of the opening (33) in the carrier board (3) is perpendicular to the second surface (32) of the carrier board (3).
5. A display tile according to any of the preceding claims wherein a sidewall (63) of the adjusting means (6) is parallel to the sidewall (34) of the opening (33) in the carrier board.
6. A display tile according to any of the preceding claims wherein the thickness of the adjusting means (6) is less than the thickness of the

carrier board (3).

- 5
7. A display tile according to any of the preceding claims wherein the cross section of the adjusting means (6) fits in the opening (33).
8. A display tile according to any of the preceding claims wherein the adjusting means (6) is fastened to the carrier board by glue (9) extending on a second surface (62) and/or a sidewall (63) of the adjusting means (6) and a sidewall (34) of the opening (33).
- 10
9. A display tile according to any of the preceding claims wherein the cross section of the adjusting means has a first area in a first part of the adjusting means and a second area in a second part of the adjusting means.
- 15
10. A display tile according to claim 9 wherein the adjusting means has a first part that is a circular right cylinder with a first radius and a second part that is a circular right cylinder with a second radius smaller than the first radius.
- 20
11. A display tile according to any of the preceding claims wherein a fastening means (8) fastens the adjusting means (6) to the spacer (7).
12. A display tile according to claim 11 wherein the fastening means (8) goes through an opening (64) in the adjusting means (6).
- 25
13. A display tile according to claim 12 wherein the fastening means (8) is a screw.
- 30
14. A display tile according to any of claims 1 to 11 wherein a threaded extension extends from a first surface (61) of the adjusting means (6) and that the spacer (7) has a matching threaded opening to receive the

threaded extension.

15. A display tile according to claim 14 wherein the second surface (62) of the adjusting means is a driving surface.

5

16. A method to adjust the distance between the tops of the LEDs (2) on a first surface of a LED board on a display tile and the back surface (32) of the carrier board (3) of the display tile, the method comprising the steps:

- 10 - positioning the tops of the LEDs (2) on a LED board (1) in a first reference plane (101),
- aligning openings (33, 33b...) in the carrier board with spacers (7, 7b...) distributed on the LED board (1),
- positioning a second surface of a carrier board (3) in a second
15 reference plane (104); a first surface (11) of the carrier board facing a second surface of the LED board (1); the first and second reference planes being parallel and the distance between the first and second reference planes being equal to a nominal distance (D0),
- 20 - moving adjusting means (6, 6b...) in the openings (33, 33b) until a first surface (61, 61b ...) of each adjusting means contacts a spacer (7, 7b),
- fastening each adjusting means to its corresponding spacer,
- fastening the adjusting means (6, 6b) to the carrier board (3).

25

17. A tiled display apparatus comprising a plurality of display tiles according to any of the claims 1 to 15 fixed to a frame.

Adjustable Display Tile for Tiled Display

Field of the Invention

The present invention pertains to the field of display apparatus, and in particular to a display tile, a tiled display apparatus comprising same, an apparatus for
5 adjusting the geometry of a display tile, a method for adjusting the geometry of a display tile and a jig to facilitate the method for adjusting.

Background

The regularity of the seam existing between display tiles in a tiled display is important to avoid visual artefacts. The regularity of the seam is a function of
10 the alignment of the display tile. Technique and apparatuses to align display tiles in tiled display are known in the art. For instance, US8,384,616B2 describes how clips and receptacles are used to align adjacent display tiles with a high accuracy.

These and similar tile alignment techniques suppose that the LED themselves
15 are properly aligned with the tile itself.

The LEDs are soldered to a LED board and the LED board is fastened to a carrier board. Aligning the LED board and the carrier board is usually done by means of one or more reference pin(s). The reference pin(s) is/are used to align the LED board with references (e.g. a corner) of the carrier board.
20 Unfortunately, there are tolerances on the position of the LEDs with respect to the LED board on which they are soldered and therefore, aligning the LED board perfectly with the carrier board by means of reference pins on the LED board does not mean that the LED themselves will be perfectly aligned with the carrier board. As a result, even if adjacent LED tiles are perfectly aligned, the
25 relative position of the LEDs on different LED tiles may vary across a tiled display, thereby introducing visual artefacts.

Another problem not addressed by the clips and receptacles used in the prior art is the “z-coordinate” or position of the LED in a direction perpendicular to the plane of the LED board. Variation of the z position of the LED from tile to tile is

the source of visual artefacts when the direction of a viewer's gaze is not along the normal to the plane of a tiled display.

What is needed is a solution to adjust the distance between the top of the LEDs on the LED board and a reference, e.g. the back surface of the carrier board.

- 5 It is known in the art to adjust the distance between two objects fastened together with e.g. screws and bolts by adding washers between the two objects. The problem with this technique is that varying the distance between two objects is only possible by multiples of the thickness of the washers if off-the shelf washers are used or that the washers have to be machined for every LED
10 board in function of the actual distance between the LED and the LED board. This is neither practical nor economical.

Summary of the Invention.

- A display tile according to the invention comprises a display board (1) and a carrier board (3) fastened together by the intermediary of a spacer (7) and an
15 adjusting means (6) positioned between the spacer and the carrier board. The adjusting means (6) engages in an opening (33) in the carrier board. The adjusting means is for adjusting the distance between the display board and the carrier board, e.g. between the tops of LEDs on the display board (called the LED board) and the carrier board.

- 20 It is an advantage of the present invention that adjusting the relative position of LEDs on a LED board with respect to a carrier board will improve the alignment of tiles in tiled displays. Another advantage is that the seam between tiles will be as regular as possible, thereby avoiding the introduction of misalignments and their associated visual artefacts. These advantages can each or both be
25 achieved without having to machine components specific to a LED board in function of the distance between the LEDs and the LED board.

- The position of the adjusting means in the opening is changed until the distance between a first surface (61) of the adjusting means and a first surface (31) of
30 the carrier board is the difference between a nominal distance (D0) and the sum

of the distance between the top of LEDs (2) on the LED board (1) and a second surface (12) of the LED board, the length of the spacer (7) and the thickness of the carrier board (3). In other words, the distance between a first surface (61) of the adjusting means (6) and a first surface (31) of the carrier board (3) is equal to:

$D0 - (\text{distance between the top of the LEDs and a second surface of the LED board}) - (\text{length of the spacer}) - (\text{thickness of the carrier board}).$

The nominal distance D0 is the desired distance between the top of the LEDs and the second surface (32) or back of the carrier board (3).

It is an advantage of that aspect of the invention that the position of the tops of the LEDs on the LED board with respect to the carrier board, and in particular a second face or back face of the carrier board will be determined with higher precision than if the distance of the LED board and the carrier board were only determined by spacers of fixed dimensions positioned between the LED board and the carrier board. Embodiments of the invention can allow the realization of tiled displays where the tops of the LEDs across the tiled display are substantially in the same plane thereby avoiding visual artefacts.

In another aspect of the invention, a sidewall (34) of the opening (33) in the carrier board can be perpendicular to the second surface (32) of the carrier board (3).

Furthermore, the sidewall (63) of adjusting means (6) can be parallel to the sidewall (34) of the opening (33) in the carrier board.

It is an advantage of that aspect of the invention that it will be easier to change the position of the adjusting means and to fasten it to the spacer from the back of the display tile.

In another aspect of the invention, the cross section of the adjusting means (6) fits in the opening (33). In other words, the distance between the sidewall of the opening and the sidewall of the adjusting means is less than e.g. 5% or less

than e.g. 1% of a lateral dimension of the opening. In particular, the distance between the sidewall of the opening and the sidewall of the adjusting means can be small enough to introduce some friction between the sidewall of the opening and the adjusting means without making movement of the adjusting means in the opening impossible when e.g. a force of e.g. 1N or between 1 and 10N or between 10 and 100N is applied on the adjusting means in a direction perpendicular to the second surface of the carrier board.

It is an advantage of that aspect of the invention that the movement of the adjusting means in the opening will be substantially restricted except in a direction perpendicular to (the second surface of) the carrier board thereby simplifying the task of the technician adjusting the relative position of the LED board and the carrier board. Furthermore, if the distance between the sidewall of the adjusting means and the sidewall of the opening is limited, it will be easier to dispense glue without spilling it beyond the adjusting means before it has hardened, or set or has been cured, in particular when the perpendicular to the carrier board is parallel to the local acceleration of gravitation, i.e. when the second face of the carrier board is facing "up".

In another aspect of the invention, the adjusting means (6) is fastened to the carrier board by glue dispensed on the second surface (62) of the adjusting means and the sidewall (34) of the opening (33).

It is an advantage of this aspect of the invention that it is possible to easily fix the distance between the top of the LED and the second surface of the carrier board of the display tile with a minimum of operations.

In a further aspect of the invention, the cross section of the adjusting means in the opening varies in a direction perpendicular to the carrier board. The distance between the sidewall of the adjusting means can for instance be greater in the upper part of the adjusting means (i.e. the part of the adjusting means closest to the second surface of the carrier board when the adjusting means is in the opening) than in the lower part of the adjusting means.

It is an advantage of this aspect of the invention that it will be easier to dispense glue on part of the sidewall of the adjusting means, thereby improving the fastening of the adjusting means to the carrier board.

- 5 In a further aspect of the invention, a fastening means 8 fastens the adjusting means to the spacer.

The fastening means can go through an opening in the adjusting means before mating with the spacer.

The fastening means can for instance be a screw.

- 10 In an alternative aspect of the invention, the fastening means 8 is an integral part of the adjusting means. The fastening means can be a threaded extension that extends from the first surface of the adjusting means in a direction perpendicular to that surface of the adjusting means to mate with a threaded opening in the spacer. The second surface of the adjusting means can then be
15 a driving surface, i.e. it can be slotted, the slot (65) allowing interaction of the second surface (62) with a tool like a screwdriver.

It is an advantage of that aspect of the invention that it will further limit the number of operations required to fasten the adjusting means to the spacer.

- According to an aspect of the invention, there is provided a method to adjust the
20 distance between the tops of the LEDs on a display tile and the back surface of the carrier board of the display tile. It is an advantage of the proposed method that it will compensate for the tolerances affecting the position of the LEDs, the thickness of the LED board, the length of the spacers and the thickness of the carrier board.

- 25 The LED board and the carrier board can be positioned parallel to each other (the first surface of the carrier board facing the second surface of the LED board), the distance between the tops of the LEDs and the second surface or back surface of the carrier board being taken equal to the desired distance. In other words, the tops of the LEDs on the LED board are positioned in a first

reference plane; the second surface of the carrier board is positioned in a second reference plane parallel to the first plane, the second surface of the carrier board facing away from the LED board; the distance between the first reference plane and the second reference plane being the desired or nominal distance between the tops of the LEDs and the second surface of the carrier board. The opening(s) in the carrier board aligned with the spacer(s) on the LED board.

The adjusting means is moved in the opening in the carrier board until a first surface of the adjusting means contacts the spacer.

The adjusting means and the spacer are fastened together. Glue is dispensed in the opening on the sidewall of the opening and on a second surface of the adjusting means. The glue is then allowed to harden, to set or to cure to fasten the adjusting means to the carrier board at the position where the adjusting means compensates for the tolerances affecting the position of the LEDs with respect to the carrier board in a direction perpendicular to the carrier board.

Fixing the distance between the top of the LEDs and the second surface of the carrier board can be facilitated by using a jig manufactured with better tolerances than the LED board and the carrier board.

The jig has a first surface or reference surface. Sidewalls extend from the first surface of the jig. If the tolerance on the thickness of the carrier board is sufficiently small to be neglected, the top of the sidewalls serves as support or stop for the carrier board that is positioned in parallel with the reference surface. The LED board is positioned with the LEDs in contact with the reference surface.

The height of the sidewalls can be chosen such that when the sidewalls are in contact with the carrier board, the distance between the second surface of the carrier board (facing away from the reference surface) and the reference surface is equal to the nominal distance or desired distance between the tops of the LEDs on the LED board and the second surface of the carrier board. The position of the adjusting means in the opening of the carrier board is modified

until a first surface of the adjusting means contacts the spacer. The adjusting means and the spacer are then fastened. Glue is dispensed in the opening to fasten the adjusting means to the carrier board and to fix its position in the opening, thereby guaranteeing that when the carrier board and LED board are taken out of the jig, the distance between the second surface of the carrier board and the tops of the LEDs is equal to the nominal or desired distance.

If the tolerances on the thickness of the carrier board cannot be neglected, the sidewalls of the jig preferably have a step. The distance between the top of the outermost part to which the sidewall extends and the reference surface (in a direction perpendicular to the reference surface) is equal to the nominal or desired distance. The distance between the top of the innermost part of the sidewall and the reference surface is less than the nominal or desired distance minus the nominal thickness of the carrier board.

A flexible material (like e.g. elastomer, rubber, such as silicone rubber, or a foam such as polyurethane foam) is positioned between the top of the innermost part of the sidewall and the carrier board. The thickness of the flexible material is chosen so that pressure must be applied to the carrier board to make the second surface of the carrier board flush or coplanar with the top of the outermost part of the sidewall of the jig. When the second surface of the carrier board is flush with the top of the outermost part of the sidewall of the jig, the distance between the tops of the LED and the second surface of the carrier board is the nominal or desired distance. The position of the adjusting means in the opening of the carrier board is modified until a first surface of the adjusting means contacts the spacer. The adjusting means and the spacer are then fastened. Glue is dispensed in the opening to fasten the adjusting means to the carrier board and to fix its position in the opening, thereby guaranteeing that when the carrier board and LED board are taken out of the jig, the distance between the second surface of the carrier board and the tops of the LEDs is equal to the nominal or desired distance.

The present invention in other aspects relates to a display apparatus, a tiled display apparatus comprising display tiles, an apparatus for adjusting the

geometry of a display tile, to a jig to facilitate the method for adjusting a relative position of the display board with respect to the carrier board.

Brief description of the figures.

- 5 Figure 1 shows a perspective view of a display tile according to an embodiment of the invention.

Figure 2 shows a perspective view of the carrier board and the adjusting means according to an embodiment of the invention.

- 10 Figure 3 shows an exploded view of a display tile according to an embodiment of the invention.

Figure 4 shows a cross section of a display tile according to an embodiment of the invention by a plane perpendicular to the display tile when the tolerances are negligible.

- 15 Figure 5a shows a cross section of a display tile according to an embodiment of the invention when the top of the LED is farther away from the first surface **11** of LED board **1** than nominal.

Figure 5b shows a cross section of a display tile when the top of the LED is farther away from the first surface **11** of LED board **1** than nominal and not compensated for.

- 20 Figure 6a shows a cross section of a display tile according to an embodiment of the invention when the top of the LED is closer the first surface **11** of LED board **1** than nominal

Figure 6b shows a cross section of a display tile when the top of the LED is closer the first surface **11** of LED board **1** than nominal is not compensated for.

- 25 Figure 7a shows examples of geometries for the adjusting means **6** and the opening **33** according to an embodiment of the invention.

Figures 7b and 7c show an example of adjusting means **6** where the cross

sections in a first part and a second part of the adjusting means are different according to an embodiment of the invention.

Figures 8a, 8b and 8c show a cross section of a display tile according to embodiments of the invention where the adjusting means 6 and 6b compensate
5 for an irregular LED board, spacers 7 and 7b of different lengths and an irregular carrier board respectively.

Figure 9 shows a perspective view and a cross section of an example of adjusting means with an integral fastening means according to an embodiment of the invention.

10 Figure 10 shows an example of method to adjust a display tile according to an embodiment of the invention.

Description of embodiments.

The present invention will be described with respect to particular embodiments and with reference to certain drawings but the invention is not limited thereto but
15 only by the claims. The drawings described are only schematic and are non-limiting. In the drawings, the size of some of the elements may be exaggerated and not drawn on scale for illustrative purposes. The dimensions and the relative dimensions do not correspond to actual reductions to practice of the invention.

20

While the description will be done for a LED display, the invention also applies to display tile where an image forming element (e.g. a liquid crystal panel) or a set of image forming elements (e.g. OLED) on a display board must be aligned with a carrier board. In the following any reference to LED (light emitting diode)
25 can be replaced with OLED (organic light emitting diode). In the following a display board will be described with reference to an LED display, and hence the display board will be called LED board, as an example. However, the display board is not limited to an LED board but includes other types of boards such as display boards with OLED emitters.

30

A LED board **1** consists of a printed circuit board (PCB) bearing electrically conducting tracks e.g. copper tracks that connects Light Emitting Diodes **2** (LED) to various electronic components (like e. g. current drivers, power supply contacts etc...). As seen on figure 1, The LED board **1** has a first face **11** and a
5 second face **12** that are parallel. The LEDs are mounted on the first face **11** of the LED board. The tolerance on the vertical position of the LED **2** with respect to the first face **11** is the same for all LEDs mounted on the same LED board **1**. The LEDs can be surface mount devices or through-hole devices.

The LED board **1** is fastened to a carrier board **3**. The carrier board **3** will be the
10 mechanical interface between the LED board and a support structure **4** of a tiled display **5**.

The carrier board **3** has a first face **31** and a second face **32**. The first face **31** and the second face **32** are substantially parallel to each other. The distance between the first face **31** and the second face **32** is the thickness T1 of the
15 carrier board **3**. The first face **31** (the front or front face of the carrier board **3**) will be closest to the LED board **1** when the LED board **1** and the carrier board **3** are assembled. The second face **32** (the back or back face of the carrier board **3**) will be closest to the support structure **4** when the LED board **1** and its associated carrier board **3** are fastened to the support structure **4**.

20 The carrier board **3** has at least one opening **33** extending from the first face **31** to the second face **32**. The opening **33** has sidewalls **34** that are preferably perpendicular to the first face **31** and the second face **32** of the carrier board **3**. The intersection of the sidewalls **34** and the first face **31** is a curve C1. C1 is preferably a circle but other curves such as arcuate are possible.

25 An adjusting means **6** has a first face **61** and a second face **62**. The first face **61** and the second face **62** are preferably substantially parallel to each other. The adjusting means **6** has a third face **63** extending from the first face **61** to the second face **62**. The third face is preferably perpendicular to the first face **61** and the second face **62**. The adjusting means **6** is positioned in the opening **33**
30 in the carrier board **3**, the first face and second face **61** and **62** of adjusting

- means **6** being parallel to the first and second face **31** and **32** of the carrier board **3**. For instance, if the opening **33** is cylindrical and the curve C1 is a circle of radius R1 as on figure 2, the cross section of the adjusting means **6** is preferably a circle C2 with a radius R2 equal to or slightly smaller than the radius R1. Other cross sections are possible for the adjusting means **6**, some examples of which are given on figure **7a** where the curve C1 is a curve or a square. In some cases it may be advantageous that the thickness T2 of the adjusting means **6** is less than the thickness T1 of the carrier board **3** (in particular at the level of the opening **33**).
- 10 The cross section of the adjusting means **6** by a plane parallel to first face **61** can vary from the first surface **61** to the second surface **62**. In particular, the cross section of adjusting means **6** can decrease close to the second surface. In particular as illustrated on figures 7b and 7c, the cross section can have an area equal to that of the first surface **61** in a first part of the adjusting means close to first surface **61** and can have a second area less than the area of surface **61** in a second part of the adjusting means adjacent to surface **62**. If the opening **33** determines a circle in the second surface **32** of the carrier board **3**, the adjusting means can for instance be the combination of two circular right cylinders: a first cylinder of radius R3 (not shown – slightly smaller than R1) in a first part delimited on one side by the first surface **61** and a second cylinder of radius R2 in a second part delimited on one side by the second surface **62**.
- 25 The space **35** between the sidewall **34** of the opening **3** and the sidewall **63** of the adjusting means **6** along the second part of the adjusting means **6** is thereby larger and it is easier to dispense glue in the space **35** to fasten the adjusting means to the carrier board **3**. At the same time, the first part of the adjusting means will prevent the glue from spilling onto the spacer and the LED board. It is advantageous to have a space **35** between to dispense glue on both a portion of the sidewall **34** of the opening **33** and a portion of the sidewall **63** of the adjusting means **6**. Indeed, by increasing the surface glued, the fastening of the adjusting means **6** to the carrier board **3** is improved.
- 30

At least one spacer **7** is fastened to the second face **12** of the LED board **1**. The

position of the spacer **7** corresponds to the position of the opening **33** in the carrier board **3** when the LED board **1** is positioned parallel to the carrier board **3**, the second face **12** of the LED board **1** facing the first face **31** of the carrier board **3**. The length of spacer **7** on different LED boards is less variable than
5 the distance D1 between the top of LED **2** and the first face **11** of LED board **1** on different LED boards. The spacer **7** is usually cylindrical and is of the female type, i.e. it has an opening that can accommodate a fastening element **8**.

At least one fastening element **8** is used to fasten the carrier board **3** to the LED board **1**. The fastening element **8** is for instance a screw that fits in the opening
10 **71** of the spacer **7**.

As seen on figure 3, the fastening element **8** goes through an opening **64** of adjusting means **6** from the second face **62** to the first face **61**, preferably perpendicularly to the faces **61** and **62**. The opening **64** is preferably unthreaded, the fastening element **8** can move through it without excessive
15 resistance.

A head **81** of fastening element will stop the progression of fastening element **8** through adjusting means **6**. For instance, if the fastening element **8** is a screw, the head of the screw will press against the second face **62** of the adjusting means **6** and stop the progression of the screw **8** even if a force is exerted on
20 the screw.

As the screw **8** is screwed in the female spacer **7**; the screw **8** moves closer to the second face **12** of LED board **1**. The screw **8** has a length such that it can be screwed in the spacer **7** until the first face **61** of adjusting means **6** is in contact with spacer **7**. For instance, the length L1 of the screw **8** is less than the
25 thickness T2 of the adjusting means **6** and the length L2 of the female opening of the spacer **7** combined ($L1 < T2 + L2$). When the screw **8** cannot go any deeper into the spacer **7**, the adjusting means **6** is fastened to the carrier board **3**. This can be done by dispensing glue **9** inside the opening **33**, preferably from the second surface **32**, the glue **9** contacting at least the second surface **62** of
30 adjusting means **6** and the sidewall **34** of the opening **33** in the carrier board **3**.

Depending on the cross section of adjusting means 6, the glue may go deeper into the opening **33** and contact the sidewalls **63** of adjusting means 6.

Alternatively, the opening **64** of adjusting means 6 can be threaded and the spacer **7** can have a male threaded part **72** instead of a threaded opening **71**.

- 5 Adjusting means 6 is screwed over the male threaded part **72** until it cannot slide any further into the opening **33**. Glue **9** is then dispensed in the opening **33** on the sidewall **34** and the second face **62** of adjusting means 6 to fasten the carrier board **3** and the adjusting means 6 together.

- The glue **9** is chosen in function of the material of the carrier board **3** and the
10 adjusting means 6. The glue **9** is preferably a fast curing glue.

- There is preferably more than one spacer **7** distributed evenly across the second face **12** of the LED board **1**. For each spacer **7b**, there will be a corresponding opening **33b** in the carrier board **3** and a corresponding adjusting means **6b**. The position in an opening **33b** of the adjusting means **6b**
15 associated with a particular spacer **7b** can be the same for all the openings and their associated adjusting means. This will be the case if the thickness of the LED board **1**, the thickness of the carrier board **3** is constant across the board and the length of the spacers **7**, **7b**... is the same for spacer **7**, **7b**...

- If the thickness of the LED board **1** and/or the carrier board **3** is not constant
20 across the board and/or the length of the spacers is not the same for the spacers **7**, **7b** ... due to tolerances, the position of adjusting means **6**, **6b**... in their corresponding opening **33**, **33b**...can be different. This is illustrated on figure 8a (thickness of the LED board not constant across the board), figure 8b (spacers **7** and **7b** have different lengths) and figure 8c (thickness of the carrier
25 board not constant across the board). The adjusting means **6** can thus compensate for tolerances affecting different components of the display tile.

- The area of opening **33** in the carrier board **3** is preferably larger than the area of a cross section of the spacer **7** by a plane parallel to the first and second faces of the carrier board. This is to ensure that the spacer **7** can penetrate the
30 opening **33** if made necessary by the tolerance on the position of the LED **2** with

respect to the first surface **11** of the LED board **1**.

Alternatively to a screw, the fastening means **8** can be an integral part of the adjusting means **6**. As illustrated on figure 9, the fastening means **8** can be a threaded extension that extends from the first surface **61** of the adjusting means **6** in a direction perpendicular to that surface of the adjusting means **6** to mate with a threaded opening in the spacer **7**. The second surface **62** of the adjusting means can then be a driving surface, i.e. it can be slotted, a slot **65** in second surface **62** allowing interaction of the second surface **62** with a tool like a screwdriver.

- 10 Alignment of the LEDs **2** with carrier board **3** can be facilitated by the use of a jig **10**.

The jig has at least a first "bottom" part **10A**. The bottom part **10A** has a first surface **101**. The first surface **101** has an area sufficient to accommodate all the LED on the LED board **1**.

- 15 The jig can have a second "top" part **10B**. The top part **10B** will help position the carrier board with respect to the LED board **1**.

- The bottom part **10A** has sidewalls **102** extending above its first surface **101**. The rim of the first surface **31** of the carrier board **3** can contact a surface **103** of the sidewalls **102**. The distance between the first surface **101** of the bottom part **10A** and the second surface **32** of the carrier board **3** corresponds to the desired distance **D0** between the tops of the LED **2** on the LED board **1** and the second surface **32** of the carrier board **3**. In this first embodiment of the jig **10**, the distance between the surface **103** and the first surface **101** is equal to the nominal distance **D0** minus the thickness of the carrier board **3**.

- 25 In general, when the tolerance on the thickness of the carrier board is not negligible, a second embodiment of the jig **10** is used wherein the sidewalls **102** have a second surface **104** along an outer edge of the sidewalls **102**. The second surface **104** is parallel to the first surface **101** (the reference surface). The distance between the second surface **104** and the first surface **101** is equal

to the nominal distance D0 desired between the top of the LEDs **2** and the second surface **32** of the carrier board **3**. In this case, the distance between the surface **103** and the first surface **101** is less than the nominal distance D0 minus the nominal thickness of the carrier board **3**.

- 5 An elastic material **105** like e.g. elastomer or rubber covers the surface **103** of the sidewalls. The thickness of the elastic material **105** is determined in function of its elasticity, the distance between the first surface **103** and the second surface **104** and the nominal thickness of the carrier board **3**. Once positioned in the jig, the carrier board **3** is in contact with the elastic material **105** and a
- 10 force is applied on one or more points of the second surface **32** of the carrier board **3** to bring the second surface **32** of the carrier board at the same level as the second surface **104** of the sidewall **102**. This is evaluated in first instance at the periphery of the carrier board **3**. Alternatively, a top part **10B** of the jig **10** is fastened to the bottom part **10A** of the jig by means of e.g. screws. Pressure is
- 15 applied to the carrier board either directly by the top part or by means of screws fitting in threaded openings in the top part. Once the second surface **32** of the carrier board **3** is flush with the second surface **104** of the sidewalls, the distance between the top of the LEDs **2** (in contact with the reference surface **101**) and the second surface **32** of the carrier board **3** is equal to the nominal or
- 20 desired distance. Openings in the top part **10B** of the jig permit access to the openings **33**, **33b** ... in the carrier board **3**.

The method of assembling the LED board **1** to the carrier board **3** in order to obtain the desired distance between the top of the LED **2** and the second surface **32** of the carrier board **3** will now be detailed. An example of the method

25 is given on figure 10.

In a first step S10 the tops of LEDs **2** on the LED board **1** are positioned in a first reference plane **101**.

With help of the jig **10**, this is done by positioning the LED board **1** on the bottom part **10A** of the JIG **10** with the tops of LEDs **2** in contact with the first

30 surface **101**.

In a second step S20, the openings (33, 33b ...) in the carrier board are aligned with the spacers (7, 7b ...).

In a third step S30, the second surface **32** of the carrier board **3** is positioned in a second reference plane **104**; the first surface **31** of the carrier board **3** facing
5 the second surface **12** of the LED board. The first and second reference planes are parallel and the distance between the first and second reference plane is equal to a nominal distance D0.

When using the first embodiment of the jig, positioning the second surface **32** of the carrier board in the second reference plane in step S20 is done by bringing
10 the first surface **31** of the carrier board in contact with the surface **103** of the sidewall **102**.

When using the second embodiment of the jig **10**, the first surface **31** of the carrier board **3** is brought into contact with the elastic material **105** and pressure is applied to the carrier board until the second surface **32** of the carrier board in
15 the second reference plane corresponding to the second surface **104** of the sidewall **102** of the jig.

Steps 20 and 30 can be interchanged. For instance when only part 10A is used, the carrier board can first be positioned on the surface 103 to be at the correct distance and then slid in the plane of surface 103 to align openings 33, 33b ...
20 with the corresponding spacers 7, 7b ...

In a fourth step S40, an adjusting means **6** is positioned in the opening **33** and moved in the opening in a direction perpendicular to the second surface **32** until a first surface **61** of the adjusting means contacts a spacer **7**. This operation is repeated for every spacer **7** that can be accessed by an opening **33** in the
25 carrier board.

In a fifth step S50, the adjusting means **6** is fastened to the spacer **7**. This operation is repeated for every spacer **7** that can be accessed by an opening **33** in the carrier board.

When using e.g. a screw **8** to fasten the adjusting means **6** to the spacer **7**, the

opening **71** in the spacer **7** and the opening **64** in adjusting means **6** are aligned. Screw **8** is engaged in opening **64** and screwed in threaded opening **71** of the spacer **7** until the head **81** of screw **8** contacts the second surface **62** of adjusting means **6** and presses adjusting means **6** against the spacer **7**.

- 5 In a sixth step S60, the adjusting means **6** is fastened to the carrier board **3**. This can be done by dispensing glue **9** in the opening **33** of the carrier board. The operation is repeated for each spacer on the LED board **1** facing an opening in the carrier board **3**.

The distance between the tops of the LEDs and the second face of the carrier
10 board is now fixed and equal to D0.

Alternatively, step S50 and step S60 can be interchanged. In particular, when the fastening means **8** is an integral part of the adjusting means as is the case on figure 9; the first surface **61** of the adjusting means **6** will come in contact with the spacer **7** after the fastening means **8** is completely engaged in the
15 threaded opening of spacer **7**. In other words, the first surface **61** will contact the spacer **7** as a result of fastening the adjusting means **6** to the spacer **7**.

If glue is used to fasten the adjusting means to the carrier board and if a screw going through an opening **64** of the adjusting means is used to fasten the adjusting means and the spacer, it may be advantageous to fasten the adjusting
20 means and the spacer before dispensing the glue. Indeed, in that case, the opening **64** being then obstructed by the screw **8**, the glue **9** will not spill into the opening **64**.

Figure 4 to Figure 6 show three typical situations and the resulting position of the adjusting means **6** to fasten LED board **1** to carrier board **3**.

- 25 In figure 4, the tops of the LEDs **2** are at a nominal distance from the first surface **11** of LED board **1**.

In Figure 5a, the tops of the LEDs **2** are farther away from the first surface **11** of LED board **1** than nominal (nominal distance between the LED body and the LED board is figured as ND on figures 4 to 6b).

If nothing were done about it (as on figure 5b), where the carrier board and the LED board are fastened together without the help of adjusting means 6, fastening the LED board **1** to the carrier board **3** without the adjusting means 6 would lead to a distance D1 between the back of the carrier board **3** and the tops of LEDs **2** larger than the desired distance D0.

The difference between D1 and D0 can be compensated for by the adjusting means 6 as follows: the spacer **7** can enter the opening **33**; and the adjusting means 6 sliding into opening **33** follows the spacer **7** thereby compensating for the difference between the actual and nominal position of the LED **2** above the first surface **12** of the LED board. The position of adjusting means **6** is fixed with glue and the distance between the top of the LED **2** and the back **32** of the carrier board **3** is the desired D0.

In Figure 6a, the tops of the LEDs **2** are closer to the first surface **11** of LED board **1** than a nominal distance.

If nothing were done about it as on figure 6b, fastening the LED board **1** to the carrier board **3** without the adjusting means **6** would lead to a distance D1 between the back of the carrier board **3** and the top of LED **2** smaller than the desired distance D0.

The difference between D1 and D0 can be compensated for by the adjusting means **6** as follows: the spacer **7** does not intersect the plane of the first surface **31** of the carrier board **3** and the adjusting means 6 comes partially out of opening **33** (the first surface **61** is below the first surface **31**) and stops when it contacts the spacer **7** compensating for the difference between the actual and nominal position of the LED **2** above the first surface **12** of the LED board. The position of adjusting means 6 is fixed with glue and the distance between the top of the LED **2** and the back of the carrier board **3** is the desired D0.

The LED board **1** can warp during manufacturing or manipulation. To compensate for this, pressure can be applied at several points of the second surface **12** of LED board **1** when it is positioned in a jig **10**.

The top part **10B** of the jig **10** is fastened to the bottom part **10A** e.g. by means of screws. At least one threaded component **11** e.g. screws with a blunt end can be screwed through threaded openings in the top part **10B** and pass through openings in the carrier board **3**. The blunt ends **110** of the threaded components

5 **11** straighten a warped LED board by applying pressure on at least one point of the LED board **1** and preferably 4 non collinear points of the second surface **12** of the LED board **1**.



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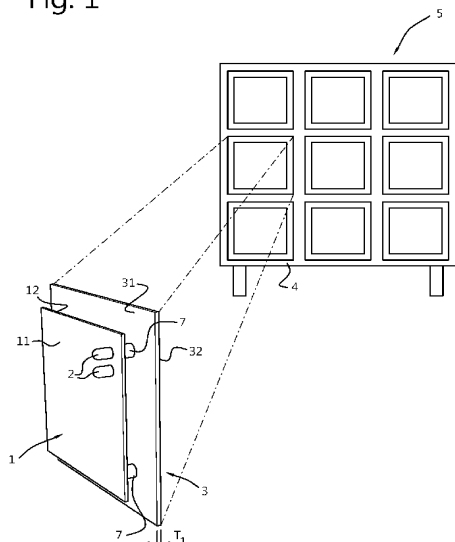
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(54) **Title:** ADJUSTABLE DISPLAY TILE FOR TILED DISPLAY

Fig. 1



(57) **Abstract:** The invention relates to a display tile comprising a display board (1) and a carrier board (3) fastened together by the intermediary of a spacer (7) and an adjusting means positioned between the spacer (7) and the carrier board (3) whereby the adjusting means engage in an opening in the carrier board (3). The invention further relates to methods to adjust the distance between the top of a LED (2) on a first surface (11) of a LED board on a display tile and the back surface (32) of the carrier board of the display tile.

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1	Transmittal of New Application	DECL3007_Natl_Stg_AppTrans.pdf	220736	no	4
			6ebaeeb2870c8a58dc39ca2ed9bdca24c13fdbbc		
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2	Application Data Sheet	DECL3007_ADS_AIA.pdf	1822844	no	8
			9f47665f176dd8e084424d6ac8f228d82822c8bb		
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6	Non Patent Literature	WrittenOpinion_28SEP15.pdf	573539	no	8
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8	Non Patent Literature	IPRP_26SEP16.pdf	1044799	no	25
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10		DECL3007_PreliminaryAmend.pdf	202345	yes	11
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11		IntlApp_WO2015189377.pdf	1320862	yes	32
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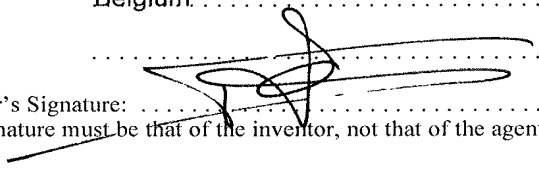
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(The signature must be that of the inventor, not that of the agent)

Date: 15/06/2015

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Inventor's Signature:
(The signature must be that of the inventor, not that of the agent)

Date:

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Application number: 1410637.1

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Concept House
Cardiff Road
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South Wales
NP10 8QQ

Application number

1. Your reference	BAR1654GB		
2. Full name, address and postcode of the applicant or of each applicant	Barco N.V. President Kennedypark 35 Kortrijk B-8500 Belgium		
Patents ADP number (if you know it)	08182594001		
3. Title of the invention	Adjustable Display Tile for Tiled Display		
4. Name of your agent (if you have one)	IPLodge bvba		
"Address for service" to which all correspondence should be sent. This may be in the European Economic area or Channel Islands (see warning note below) (including the postcode)	IPLodge bvba Technologielaan 9 Heverlee B-3001 Belgium		
Patents ADP number (if you know it)	11008463001		
5. Priority declaration: Are you claiming priority from one or more earlier-filed patent applications? If so, please give details of the application(s)			
Country	Application number	Date of filing	PDAS Access Code
6. Divisionals etc: Is this application a divisional application, or being made following resolution of an entitlement dispute about an earlier application. If so, please give the application number and filing date of the earlier application	Number of earlier UK application	Date of filing (day / month / year)	
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Are all the applicants named above also inventors?	No		
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Description: **18**

Claim(s): **3**

Abstract: **1**

Drawing(s): **14**

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11. I/We request the grant of a patent on the basis of this application.

Signature:	Subject: Ivo De Baere 33908; Issuer: European Patent Office, European Patent Office CA G2	Date:	13 Jun 2014
12. Name, e-mail address, telephone, fax and/or mobile number, if any, of a contact point for the applicant		DE BAERE, Mr. Ivo Email: info@iplodge.be Telephone: +32 16 40 98 10 Fax: +32 16 20 06 21	

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Adjustable Display Tile for Tiled Display

Field of the Invention

The present invention pertains to the field of display apparatus, and in particular to a display tile, a tiled display apparatus comprising same, an apparatus for
5 adjusting the geometry of a display tile, a method for adjusting the geometry of a display tile and a jig to facilitate the method for adjusting.

Background

The regularity of the seam existing between display tiles in a tiled display is important to avoid visual artefacts. The regularity of the seam is a function of
10 the alignment of the display tile. Technique and apparatuses to align display tiles in tiled display are known in the art. For instance, US8,384,616B2 describes how clips and receptacles are used to align adjacent display tiles with a high accuracy.

These and similar tile alignment techniques supposes that the LED themselves
15 are properly aligned with the tile itself.

The LEDs are soldered to a LED board and the LED board is fastened to a carrier board. Aligning the LED board and the carrier board is usually done by means of one or more reference pin. The reference pin(s) are used to align the LED board with references (e.g. a corner) of the carrier board. Unfortunately,
20 there are tolerances on the position of the LEDs with respect to the LED board on which they are soldered and therefore, aligning the LED board perfectly with the carrier board by means of reference pins on the LED board does not mean that the LED themselves will be perfectly aligned with the carrier board. As a result, even if adjacent LED tiles are perfectly aligned, the relative position of
25 the LEDs on different LED tiles may vary across a tiled display, thereby introducing visual artefacts.

Another problem not addressed by the clips and receptacles used in the prior art is the “z-coordinate” or position of the LED in a direction perpendicular to the plane of the LED board. Variation of the z position of the LED from tile to tile is

the source of visual artefacts when the direction of a viewer's gaze is not normal to the plane of a tiled display.

What is needed is a solution to adjust the distance between the top of the LEDs on the LED board and a reference, e.g. the back surface of the carrier board.

5 It is known in the art to adjust the distance between two objects fastened together with e.g. screws and bolts by adding washers between the two objects. The problem with this technique is that varying the distance between two objects is only possible by multiples of the thickness of the washers if off-the shelf washers are used or that the washers have to be machined for every LED
10 board in function of the actual distance between the LED and the LED board. This is neither practical nor economical.

Summary of the Invention.

A display tile according to the invention comprises a display board (1) and a carrier board (3) fastened together by the intermediary of a spacer (7) and an
15 adjusting mean (6) positioned between the spacer and the carrier board. The adjusting mean (6) engages in an opening (33) in the carrier board.

It is an advantage of the present invention that adjusting the relative position of LEDs on a LED board with respect to a carrier board will improve the alignment of tiles in tiled displays where the seam between tiles will be as regular as
20 possible, thereby avoiding the introduction of misalignments and their associated visual artefacts without having to machine components specific to a LED board in function of the distance between the LEDs and the LED board.

The position of the adjusting mean in the opening is changed until the distance
25 between a first surface (61) of the adjusting mean and a first surface (31) of the carrier board is the difference between a nominal distance (D0) and the sum of the distance between the top of LEDs (2) on the LED board (1) and a second surface (12) of the LED board, the length of the spacer (7) and the thickness of the carrier board (3). In other words, the distance between a first surface 61 of
30 the adjusting mean 6 and a first surface 31 of the carrier board 3 is equal to:

D_0 – (distance between the top of the LEDs and a second surface of the LED board) – (length of the spacer) – (thickness of the carrier board).

The nominal distance is the desired distance between the top of the LED and the second surface 32 or back of the carrier board (3).

5 It is an advantage of that aspect of the invention that the position of the top of the LEDs on the LED board with respect to the carrier board, and in particular a second face or back face of the carrier board will be determined with higher precision than if the distance of the LED board and the carrier board were only determined by spacers of fixed dimensions positioned between the LED board
10 and the carrier board. The invention allows the realization of tiled displays where the top of the LEDs across the tiled display are substantially in the same plane thereby avoiding virtual artefacts.

In another aspect of the invention, the sidewall (34) of the opening (33) in the
15 carrier board are perpendicular to the second surface (32) of the carrier board (3).

Furthermore, the sidewall (63) of adjusting mean (6) can be parallel to the sidewall (34) of the opening (33) in the carrier board.

20 It is an advantage of that aspect of the invention that it will be easier to change the position of the adjusting mean and to fasten it to the spacer from the back of the display tile.

In another aspect of the invention, the cross section of the adjusting mean (6) fits in the opening (33). In other words, the distance between the sidewall of the opening and the sidewall of the adjusting mean is less than e.g. 5% or less than
25 e.g. 1% of a lateral dimension of the opening. In particular, the distance between the sidewall of the opening and the sidewall of the adjusting mean can be small enough to introduce some friction between the sidewall of the opening and the adjusting mean without making movement of the adjusting mean in the opening impossible when e.g. a force of e.g. 1N or between 1 and 10N or

between 10 and 100N is applied on the adjusting mean in a direction perpendicular to the second surface of the carrier board.

It is an advantage of that aspect of the invention that the movement of the adjusting mean in the opening will be substantially restricted except in a direction perpendicular to (the second surface of) the carrier board thereby simplifying the task of the technician adjusting the relative position of the LED board and the carrier board. Furthermore, if the distance between the sidewall of the adjusting mean and the sidewall of the opening is limited, it will be easier to dispense glue without spilling it beyond the adjusting mean before it has been cured, in particular when the perpendicular to the carrier board is parallel to the local acceleration of gravitation, the second face of the carrier board facing "up".

In another aspect of the invention, the adjusting mean (6) is fastened to the carrier board by glue dispensed on the second surface (62) of the adjusting mean and the sidewall (34) of the opening (33).

It is an advantage of this aspect of the invention that it is possible to easily fix the distance between the top of the LED and the second surface of the carrier board of the display tile with a minimum of operations.

In a further aspect of the invention, the cross section of the adjusting mean in the opening varies in a direction perpendicular to the carrier board. The distance between the sidewall of the adjusting mean can for instance be greater in the upper part of the adjusting mean (i.e. the part of the adjusting mean closest from the second surface of the carrier board when the adjusting mean is in the opening) than in the lower part of the adjusting mean.

It is an advantage of this aspect of the invention that it will be easier to dispense glue on part of the sidewall of the adjusting mean, thereby improving the fastening of the adjusting mean to the carrier board.

In a further aspect of the invention, a fastening mean 8 fastens the adjusting mean to the spacer.

The fastening mean can go through an opening in the adjusting mean before mating with the spacer.

The fastening mean can for instance be a screw.

In an alternative aspect of the invention, the fastening mean 8 is an integral part of the adjusting mean. The fastening mean can be a threaded extension that extends from the first surface of the adjusting mean in a direction perpendicular to that surface of the adjusting mean to mate with a threaded opening in the spacer. The second surface of the adjusting mean can then be a driving surface, i.e. it can be slotted, the slot (65) allowing interaction of the second surface (62) with a tool like a screwdriver.

It is an advantage of that aspect of the invention that it will further limit the number of operation required to fasten the adjusting mean to the spacer.

According to an aspect of the invention, there is provided a method to adjust the distance between the top of the LED on a display tile and the back surface of the carrier board of the display tile. It is an advantage of the proposed method that it will compensate for the tolerances affecting the position of the LED, the thickness of the LED board, the length of the spacers and the thickness of the carrier board.

The LED board and the carrier board are positioned parallel to each other (the first surface of the carrier board facing the second surface of the LED board), the distance between the top of the LED and the second surface or back surface of the carrier board being taken equal to the desired distance. In other words, the top of the LED on the LED board are positioned in a first reference plane; the second surface of the carrier board is positioned in a second reference plane parallel to the first plane, the second surface of the carrier board facing away from the LED board; the distance between the first reference plane and the second reference plane being the desired or nominal distance between the top of the LEDs and the second surface of the carrier board. The opening in the carrier board aligned with the spacer on the LED board.

The adjusting mean is moved in the opening in the carrier board until a first surface of the adjusting mean contacts the spacer.

The adjusting mean and the spacer are fastened together. Glue is dispensed in the opening on the sidewall of the opening and on a second surface of the adjusting mean. The glue is then cured to fasten the adjusting mean to the carrier board at the position where the adjusting mean compensate for the tolerances affecting the position of the LED with respect to the carrier board in a direction perpendicular to the carrier board.

Fixing the distance between the top of the LED and the second surface of the carrier board can be facilitated by using a jig manufactured with better tolerances than the LED board and the carrier board.

- 10 The jig has a first surface or reference surface. Sidewalls extend from the first surface of the jig. If the tolerance on the thickness of the carrier board are sufficiently small to be neglected, the top of the sidewalls serves as support or stop for the carrier board that is positioned in parallel with the reference surface. The LED board is positioned with the LED in contact with the reference surface.
- 15 The height of the sidewalls is chosen such that when the sidewalls are in contact with the carrier board, the distance between the second surface of the carrier board (facing away from the reference surface) and the reference surface is equal to the nominal distance or desired distance between the top of the LED on the LED board and the second surface of the carrier board. The position of the adjusting mean in the opening of the carrier board is modified until a first surface of the adjusting mean contact the spacer. The adjusting mean and the spacer are then fastened. Glue is dispensed in the opening to fasten the adjusting mean to the carrier board and fix its position in the opening, thereby guaranteeing that when the carrier board and LED board are taken out of the jig, the distance between the second surface of the carrier board and the top of the LED is equal to the nominal or desired distance.

If the tolerances on the thickness of the carrier board cannot be neglected, the sidewalls of the jig preferably have a step. The distance between the top of the outermost part of the sidewall extends and the reference surface (in a direction perpendicular to the reference surface) is equal to the nominal or desired

distance. The distance between the top of the innermost part of the sidewall and the reference surface is less than the nominal or desired distance minus the nominal thickness of the carrier board.

A flexible material (like e.g. rubber, silicone rubber or polyurethane foam) is positioned between the top of the innermost part of the sidewall and the carrier board. The thickness of the flexible material is chosen so that pressure must be applied to the carrier board to make the second surface of the carrier board flush or coplanar with the top of the outermost part of the sidewall of the jig. When the second surface of the carrier board is flush with the top of the outermost part of the sidewall of the jig, the distance between the top of the LED and the second surface of the carrier board is the nominal or desired distance. The position of the adjusting mean in the opening of the carrier board is modified until a first surface of the adjusting mean contact the spacer. The adjusting mean and the spacer are then fastened. Glue is dispensed in the opening to fasten the adjusting mean to the carrier board and fix its position in the opening, thereby guaranteeing that when the carrier board and LED board are taken out of the jig, the distance between the second surface of the carrier board and the top of the LED is equal to the nominal or desired distance.

Brief description of the figures.

Figure 1 shows a perspective view of a display tile according to the invention.

Figure 2 shows a perspective view of the carrier board and the adjusting mean.

Figure 3 shows an exploded view of a display tile according to the invention.

Figure 4 shows a cross section of a display tile according to the invention by a plane perpendicular to the display tile when the tolerances are negligible.

Figure 5a shows a cross section of a display tile according to the invention when the top of the LED is farther away from the first surface **11** of LED board **1** than nominal.

Figure 5b shows a cross section of a display tile when the top of the LED is farther away from the first surface **11** of LED board **1** than nominal and not compensated for.

Figure 6a shows a cross section of a display tile according to the invention when the top of the LED is closer the first surface **11** of LED board **1** than nominal

Figure 6b shows a cross section of a display tile when the top of the LED is closer the first surface **11** of LED board **1** than nominal is not compensated for.

Figure 7a shows examples of geometries for the adjusting mean **6** and the opening **33**.

Figure 7b shows an example of adjusting mean **6** where the cross sections in a first part and a second part of the adjusting mean are different.

Figure 8a, 8b and 8c shows a cross section of a display tile according to the invention where the adjusting means **6** and **6b** compensate for an irregular LED board, spacers **7** and **7b** of different lengths and an irregular carrier board respectively.

Figure 9 shows a perspective view and a cross section of an example of adjusting mean with an integral fastening mean.

Figure 10 shows an example of method to adjust a display tile according to the invention.

Description of embodiments.

While the description will be done for a LED display, the invention also applies to display tile where an image forming element (e.g. a liquid crystal panel) or a set of image forming elements (e.g. OLED) on a display board must be aligned with a carrier board.

A LED board **1** consists of a printed circuit board (PCB) bearing electrically conducting tracks e.g. copper tracks that connects Light Emitting Diodes **2** (LED) to various electronic components (like e. g. current drivers, power supply

contacts etc...). As seen on figure 1, The LED board **1** has a first face **11** and a second face **12** that are parallel. The LEDs are mounted on the first face **11** of the LED board. The tolerance on the vertical position of the LED **2** with respect to the first face **11** is the same for all LED mounted on the same LED board **1**.

- 5 The LED can be surface mount devices or through-hole devices.

The LED board **1** is fastened to a carrier board **3**. The carrier board **3** will be the mechanical interface between the LED board and a support structure **4** of a tiled display **5**.

- 10 The carrier board **3** has a first face **31** and a second face **32**. The first face **31** and the second face **32** are substantially parallel to each other. The distance between the first face **31** and the second face **32** is the thickness T1 of the carrier board **3**. The first face **31** (the front or front face of the carrier board **3**) will be closest to the LED board **1** when the LED board **1** and the carrier board **3** are assembled. The second face **32** (the back or back face of the carrier board **3**) will be closest to the support structure **4** when the LED board **1** and its
15 associated carrier board **3** are fastened to the support structure **4**.

- The carrier board **3** has at least one opening **33** extending from the first face **31** to the second face **32**. The opening **33** has sidewalls **34** that are preferably perpendicular to the first face **31** and the second face **32** of the carrier board **3**.
20 The intersection of the sidewalls **34** and the first face **31** is a curve C1. C1 is preferably a circle but other curves are possible.

- An adjusting mean **6** has a first face **61** and a second face **62**. The first face **61** and the second face **62** are preferably substantially parallel to each other. The adjusting mean **6** has a third face **63** extending from the first face **61** to the
25 second face **62**. The third face is preferably perpendicular to the first face **61** and the second face **62**. The adjusting mean **6** is positioned in the opening **33** in the carrier board **3**, the first face and second face **61** and **62** of adjusting mean **6** being parallel to the first and second face **31** and **32** of the carrier board **3**. For instance, if the opening **33** is cylindrical and the curve C1 is a circle of radius R1
30 as on figure 2, the cross section of the adjusting mean **6** is preferably a circle

C2 with a radius R2 equal to or slightly smaller than the radius R1. Other cross sections are possible for the adjusting mean **6**, some examples of which are given on figure **7a** where the curve C1 is a curve or a square. In some cases it may be advantageous that the thickness T2 of the adjusting mean **6** is less than the thickness T1 of the carrier board **3** (in particular at the level of the opening **33**).

The cross section of the adjusting mean **6** by a plane parallel to first face **61** can vary from the first surface **61** to the second surface **62**. In particular, the cross section of adjusting mean **6** can decrease close to the second surface. In particular as illustrated on figure 7b, the cross section can have an area equal to that of the first surface **61** in a first part of the adjusting mean close to first surface **61** and can have a second area less than the area of surface **61** in a second part of the adjusting mean adjacent to surface **62**. If the opening **33** is determines a circle in the second surface **32** of the carrier board **3**, the adjusting mean can for instance be the combination of two circular right cylinders: a cylinder of radius R1 in a first part delimited on one side by the first surface **61** and a second cylinder of radius R2 in a second part delimited on one side by the second surface **62**.

The space **35** between the sidewall **34** of the opening **3** and the sidewall **63** of the adjusting mean **6** along the second part of the adjusting mean **6** is thereby larger and it is easier to dispense glue in the space **35** to fasten the adjusting mean to the carrier board **3**. At the same time, the first part of the adjusting mean will prevent the glue to spill on the spacer and the LED board. It is advantageous to have a space **35** between to dispense glue on both a portion of the sidewall **34** of the opening **33** and a portion of the sidewall **63** of the adjusting mean **6**. Indeed, by increasing the surface glued, the fastening of the adjusting mean **6** to the carrier board **3** is improved.

At least one spacer **7** is fastened to the second face **12** of the LED board **1**. The position of the spacer **7** corresponds to the position of the opening **31** in the carrier board **3** when the LED board **1** is positioned parallel to the carrier board **3**, the second face **12** of the LED board **1** facing the first face **31** of the carrier

board **3**. The length of spacer **7** on different LED boards is less variable than the distance D1 between the top of LED **2** and the first face **11** of LED board **1** on different LED boards. The spacer **7** is usually cylindrical and is of the female type, i.e. it has an opening that can accommodate a fastening element **8**.

- 5 At least one fastening element **8** is used to fasten the carrier board **3** to the LED board **1**. The fastening element **8** is for instance a screw that fits in the opening **71** of the spacer **7**.

As seen on figure 3, the fastening element **8** goes through an opening **64** of adjusting mean 6 from the second face **62** to the first face **61**, preferably
 10 perpendicularly to the faces **61** and **62**. The opening **64** is preferably unthreaded, the fastening element **8** can move through it without excessive resistance.

A head **81** of fastening element will stop the progression of fastening element **8** through adjusting mean 6. For instance, if the fastening element **8** is a screw,
 15 the head of the screw will press against the second face **62** of the adjusting mean 6 and stop the progression of the screw **8** even if a force is exerted on the screw.

As the screw **8** is screwed in the female spacer **7**; the screw **8** moves closer to the second face **12** of LED board **1**. The screw **8** has a length such that it can
 20 be screwed in the spacer **7** until the first face **61** of adjusting mean 6 is in contact with spacer **7**. For instance, the length L1 of the screw **8** is less than the thickness T2 of the adjusting mean 6 and the length L2 of the female opening of the spacer **7** combined ($L1 < T2 + L2$). When the screw **8** cannot go any deeper into the spacer **7**, the adjusting mean 6 is fastened to the carrier board **3**. This
 25 can be done by dispensing glue **9** inside the opening **33**, preferably from the second surface **32**, the glue **9** contacting at least the second surface **62** of adjusting mean 6 and the sidewall **34** of the opening **33** in the carrier board **3**. Depending on the cross section of adjusting mean 6, the glue may go deeper into the opening **33** and contact the sidewalls **63** of adjusting mean 6.

Alternatively, the opening **64** of adjusting mean **6** can be threaded and the spacer **7** can have a male threaded part **72** instead of a threaded opening **71**. Adjusting mean **6** is screwed over the male threaded part **72** until it cannot slide any further into the opening **33**. Glue **9** is then dispensed in the opening **33** on the sidewall **34** and the second face **62** of adjusting mean **6** to fasten the carrier board **3** and the adjusting mean **6** together.

The glue **9** is chosen in function of the material of the carrier board **3** and the adjusting mean **6**. The glue **9** is preferably a fast curing glue.

There are preferably more than one spacer **7** distributed evenly across the second face **12** of the LED board **1**. For each spacer **7b**, there will be a corresponding opening **33b** in the carrier board **3** and a corresponding adjusting mean **6b**. The position in an opening **33b** of the adjusting mean **6b** associated with a particular spacer **7b** can be the same for all the openings and their associated adjusting mean. This will be the case if the thickness of the LED board **1**, the thickness of the carrier board **3** is constant across the board and the length of the spacers **7**, **7b**... is the same for spacer **7**, **7b**...

If the thickness of the LED board **1** and/or the carrier board **3** is not constant across the board and/or the length of the spacers is not the same for the spacers **7**, **7b** ... due to tolerances, the position of adjusting means **6**, **6b**... in their corresponding opening **33**, **33b**... can be different. This is illustrated on figure 8a (thickness of the LED board not constant across the board), figure 8b (spacers **7** and **7b** have different lengths) and figure 8c (thickness of the carrier board not constant across the board). The adjusting mean **6** can thus compensate for tolerances affecting different components of the display tile.

The area of opening **33** in the carrier board **3** is preferably larger than the area of a cross section of the spacer **7** by a plane parallel to the first and second faces of the carrier board. This is to ensure that the spacer **7** can penetrate the opening **33** if made necessary by the tolerance on the position of the LED **2** with respect to the first surface **11** of the LED board **1**.

Alternatively to a screw, the fastening mean **8** can be an integral part of the adjusting mean **6**. As illustrated on figure 9, the fastening mean **8** can be a threaded extension that extends from the first surface **61** of the adjusting mean **6** in a direction perpendicular to that surface of the adjusting mean **6** to mate with a threaded opening in the spacer **7**. The second surface **62** of the adjusting mean can then be a driving surface, i.e. it can be slotted, a slot **65** in second surface **62** allowing interaction of the second surface **62** with a tool like a screwdriver.

Alignment of the LEDs **2** with carrier board **3** can be facilitated by the use of a jig **10**.

The jig has at least a first “bottom” part **10A**. The bottom part **10A** has a first surface **101**. The first surface **101** has an area sufficient to accommodate all the LED on the LED board **1**.

The jig can have a second “top” part **10B**. The top part **10B** will help position the carrier board with respect to the LED board **1**.

The bottom part **10A** has sidewalls **102** extending above its first surface **101**. The rim of the first surface **31** of the carrier board **3** can contact a surface **103** of the sidewalls **102**. The distance between the first surface **101** of the bottom part **10A** and the second surface **32** of the carrier board **3** corresponds to the desired distance **D0** between the top of the LED **2** on the LED board **1** and the second surface **32** of the carrier board **3**. In this first embodiment of the jig **10**, the distance between the surface **103** and the first surface **101** is equal to the nominal distance **D0** minus the thickness of the carrier board **3**.

In general, when the tolerance on the thickness of the carrier board is not negligible, a second embodiment of the jig **10** is used wherein the sidewalls **102** have a second surface **104** along an outer edge of the sidewalls **102**. The second surface **104** is parallel to the first surface **101** (the reference surface). The distance between the second surface **104** and the first surface **101** is equal to the nominal distance **D0** desired between the top of the LEDs **2** and the second surface **32** of the carrier board **3**. In this case, the distance between the

surface **103** and the first surface **101** is less than the nominal distance D0 minus the nominal thickness of the carrier board **3**.

An elastic material **105** like e.g. rubber covers the surface **103** of the sidewalls. The thickness of the elastic material **105** is determined in function of its elasticity, the distance between the first surface **103** and the second surface **104** and the nominal thickness of the carrier board **3**. Once positioned in the jig, the carrier board **3** is in contact with the elastic material **105** and a force is applied on one or more points of the second surface **32** of the carrier board **3** to bring the second surface **32** of the carrier board at the same level as the second surface **104** of the sidewall **102**. This is evaluated in first instance at the periphery of the carrier board **3**. Alternatively, a top part **10B** of the jig **10** is fastened to the bottom part **10A** of the jig by mean of e.g. screws. Pressure is applied to the carrier board either directly by the top part or by mean of screws fitting in threaded opening in the top part. Once the second surface **32** of the carrier board **3** is flush with the second surface **104** of the sidewalls, the distance between the top of the LEDs **2** (in contact with the reference surface **101**) and the second surface **32** of the carrier board **3** is equal to the nominal or desired distance. Openings in the top part **10B** of the jig permit access to the openings **33**, **33b** ... in the carrier board **3**.

We will now detail the method to assemble the LED board **1** to the carrier board **3** in order to obtain the desired distance between the top of the LED **2** and the second surface **32** of the carrier board **3**. An example of the method is given on figure 10.

In a first step S10 the top of the LEDs **2** on the LED board **1** are positioned in a first reference plane **101**.

With help of the jig 10, this is done by positioning the LED board **1** on the bottom part **10A** of the JIG **10** with the top of the LEDs **2** in contact with the first surface 101.

In a second step S20, the openings (33, 33b ...) in the carrier board are aligned with the spacers (7, 7b ...).

In a third step S30, the second surface **32** of the carrier board **3** is positioned in a second reference plane **104**; the first surface **31** of the carrier board **3** facing the second surface **12** of the LED board. The first and second reference planes are parallel and the distance between the first and second reference plane is equal to a nominal distance D0.

When using the first embodiment of the jig, positioning the second surface **32** of the carrier board in the second reference plane in step S20 is done by bringing the first surface **31** of the carrier board in contact with the surface **103** of the sidewall **102**.

When using the second embodiment of the jig **10**, the first surface **31** of the carrier board **3** is brought into contact with the elastic material **105** and pressure is applied to the carrier board until the second surface **32** of the carrier board in the second reference plane corresponding to the second surface **104** of the sidewall **102** of the jig.

In a fourth step S40, an adjusting means **6** is positioned in the opening **33** and moved in the opening in a direction perpendicular to the second surface **32** until a first surface **61** of the adjusting mean contacts a spacer **7**. This operation is repeated for every spacer **7** that can be accessed by an opening **33** in the carrier board.

In a fifth step S50, the adjusting mean **6** is fastened to the spacer **7**. This operation is repeated for every spacer **7** that can be accessed by an opening **33** in the carrier board.

When using e.g. a screw **8** to fasten the adjusting mean **6** to the spacer **7**, the opening **71** in the spacer **7** and the opening **64** in adjusting mean **6** are aligned.

Screw **8** is engaged in opening **64** and screwed in threaded opening **71** of the spacer **7** until the head **81** of screw **8** contacts the second surface **62** of adjusting mean **6** and presses adjusting mean **6** against the spacer **7**.

In a sixth step S60, the adjusting mean **6** is fastened to the carrier board **3**. This can be done by dispensing glue **9** in the opening **33** of the carrier board. The

operation is repeated for each spacer on the LED board **1** facing an opening in the carrier board **3**.

The distance between the top of the LED and the second face of the carrier board is now fixed and equal to D0.

- 5 Alternatively, step S50 and step S60 can be interchanged. In particular, when the fastening mean **8** is an integral part of the adjusting mean as is the case on figure 9; the first surface **61** of the adjusting mean **6** will come in contact with the spacer **7** after the fastening mean **8** is completely engaged in the threaded opening of spacer **7**. In other words, the first surface **61** will contact the spacer **7**
 10 as a result of fastening the adjusting mean **6** to the spacer **7**.

- If glue is used to fasten the adjusting mean to the carrier board and if a screw going through an opening **64** of the adjusting mean is used to fasten the adjusting mean and the spacer, it may be advantageous to fasten adjusting mean and spacer before dispensing the glue. Indeed, in that case, the opening
 15 **64** being then obstructed by the screw **8**, the glue **9** will not spill into the opening **64**.

Figure 4 to Figure 6 show three typical situations and the resulting position of the adjusting mean **6** to fasten LED board **1** to carrier board **3**.

- In figure 4, the top of the LED is at a nominal distance from the first surface **11**
 20 of LED board **1**.

In Figure 5a, the top of the LED is farther away from the first surface **11** of LED board **1** than nominal (nominal distance between the LED body and the LED board is figured as ND on figures 4 to 6b).

- If nothing were done about it (as on figure 5b), where the carrier board and the
 25 LED board are fastened together without the help of adjusting mean **6**), fastening the LED board **1** to the carrier board **3** without the adjusting mean **6** would lead to a distance D1 between the back of the carrier board **3** and the top of LED **2** larger than the desired distance D0.

The difference between D1 and D0 can be compensated by the adjusting mean 6 as follows: the spacer 7 can enter the opening 33; and the adjusting mean 6 sliding into opening 33 follows the spacer 7 thereby compensating for the difference between the actual and nominal position of the LED 2 above the first surface 12 of the LED board. The position of adjusting mean 6 is fixed with glue and the distance between the top of the LED 2 and the back 32 of the carrier board 3 is the desired D0.

In Figure 6a, the top of the LED is closer the first surface 11 of LED board 1 than nominal.

If nothing were done about it as on figure 6b, fastening the LED board 1 to the carrier board 3 without the adjusting mean 6 would lead to a distance D1 between the back of the carrier board 3 and the top of LED 2 smaller than the desired distance D0.

The difference between D1 and D0 can be compensated by the adjusting mean 6 as follows: the spacer 7 does not intersect the plane of the first surface 31 of the carrier board 3 and the adjusting mean 6; comes partially out of opening 33 (the first surface 61 is below the first surface 31) and stops when it contacts the spacer 7 compensating for the difference between the actual and nominal position of the LED 2 above the first surface 12 of the LED board. The position of adjusting mean 6 is fixed with glue and the distance between the top of the LED 2 and the back of the carrier board 3 is the desired D0.

The LED board 1 can warp during manufacturing or manipulation. To compensate for this, pressure can be applied at several points of the second surface 12 of LED board 1 when it is positioned in a jig 10.

The top part 10B of the jig 10 is fastened to the bottom part 10A e.g. by means of screws. At least one threaded component 11 e.g. screws with a blunt end can be screwed through threaded openings in the top part 10B and pass through openings in the carrier board 3. The blunt ends 110 of the threaded components 11 straighten a warped LED board by applying pressure on at least one point of

the LED board **1** and preferably 4 non collinear points of the second surface **12** of the LED board **1**.

Claims.

1. A display tile comprising a display board (1) and a carrier board (3) fastened together by the intermediary of a spacer (7) and an adjusting mean (6) positioned between the spacer and the carrier board characterized in that the adjusting mean engage in an opening (33) in the carrier board.
2. A display tile according to claim 1 further characterized in that the distance between a first surface (61) of the adjusting mean and a first surface (31) of the carrier board is the difference between a nominal distance (D0) and the sum of the distance between the top of LEDs (2) on the LED board (1) and a second surface (12) of the LED board, the length of the spacer (7) and the thickness of the carrier board (3).
3. A display tile according to any of the preceding claims further characterized in that the sidewall (34) of the opening (33) in the carrier board (3) are perpendicular to the second surface (32) of the carrier board (3).
4. A display tile according to any of the preceding claims further characterized in that the sidewall (63) of adjusting mean (6) is parallel to the sidewall (34) of the opening (33) in the carrier board.
5. A display tile according to any of the preceding claims further characterized in that the thickness of the adjusting mean (6) is less than the thickness of the carrier board (3).
6. A display tile according to any of the preceding claims further characterized in that the cross section of the adjusting mean (6) fits in the opening (33).

- 5
7. A display tile according to any of the preceding claims further characterized in that the adjusting mean (6) is fastened to the carrier board by glue (9) extending on a second surface (62) and/or a sidewall (63) of the adjusting mean (6) and the sidewall (34) of the opening (33).
- 10
8. A display tile according to any of the preceding claims characterized in that the cross section of the adjusting mean has a first area in a first part of the adjusting mean and a second area in a second part of the adjusting mean.
- 15
9. A display tile according to claim 11 further characterized in that the adjusting mean has a first part that is a circular right cylinder with a first radius and a second part that is a circular right cylinder with a second radius smaller than the first radius.
- 20
10. A display tile according to any of the preceding claims further characterized in that a fastening mean (8) fastens the adjusting mean (6) to the spacer (7).
- 25
11. A display tile according to claim 10 further characterized in that the fastening mean (8) goes through an opening (64) in the adjusting mean (6).
- 30
12. A display tile according to claim 11 further characterized in that the fastening mean (8) is a screw.
13. A display tile according to any of claims 1 to 10 further characterized in that a threaded extension extends from a first surface (61) of the adjusting mean (6) and that the spacer (7) has a matching threaded opening to receive the threaded extension.
14. A display tile according to claim 13 further characterized in that the second surface (62) of the adjusting mean is a driving surface.

15. A method to adjust the distance between the top of the LED (2) on a first surface of a LED board on a display tile and the back surface (32) of the carrier board (3) of the display tile, the method comprising the step:

5

- Positioning the top of the LEDs (2) on a LED board (1) in a first reference plane (101).

- Aligning openings (33, 33b...) in the carrier board with spacers (7, 7b...) distributed on the LED board (1).

10

- Positioning a second surface of a carrier board (3) in a second reference plane (104); a first surface (11) of the carrier board facing a second surface of the LED board (1); the first and second reference plane being parallel and the distance between the first and second reference plane being equal to a nominal distance (D0).

15

- Moving adjusting means (6, 6b...) in the openings (33, 33b) until a first surface (61, 61b ...) of each adjusting mean contacts a spacer (7, 7b).

- Fastening each adjusting mean to its corresponding spacer.

20

- Fastening the adjusting means (6, 6b) to the carrier board (3).

Abstract

The invention relates to a display tile comprising a display board and a carrier board fastened together by the intermediary of a spacer and an adjusting mean positioned between the spacer and the carrier board characterized in that the
5 adjusting mean engage in an opening in the carrier board.

The invention further relates to methods to adjust the distance between the top of a LED on a first surface of a LED board on a display tile and the back surface of the carrier board of the display tile.

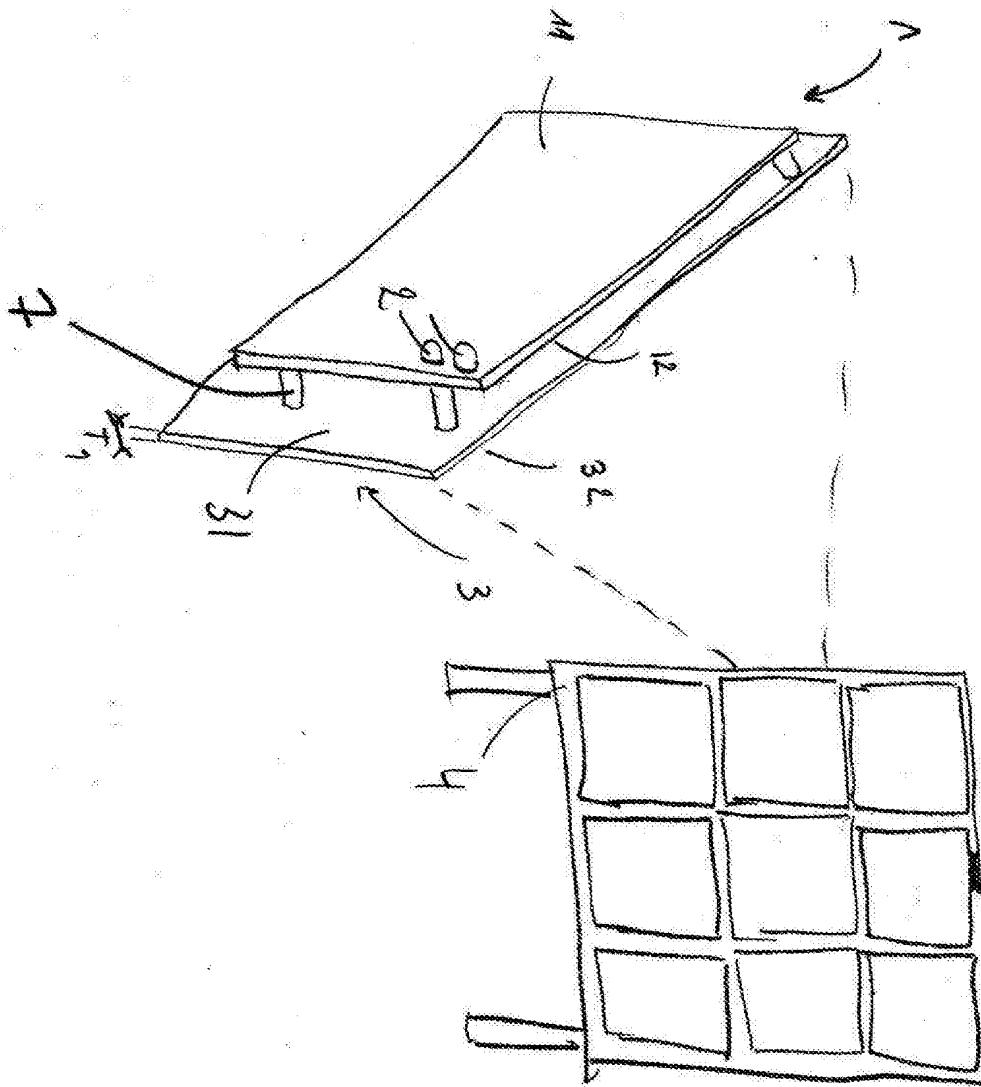


FIG. 1.

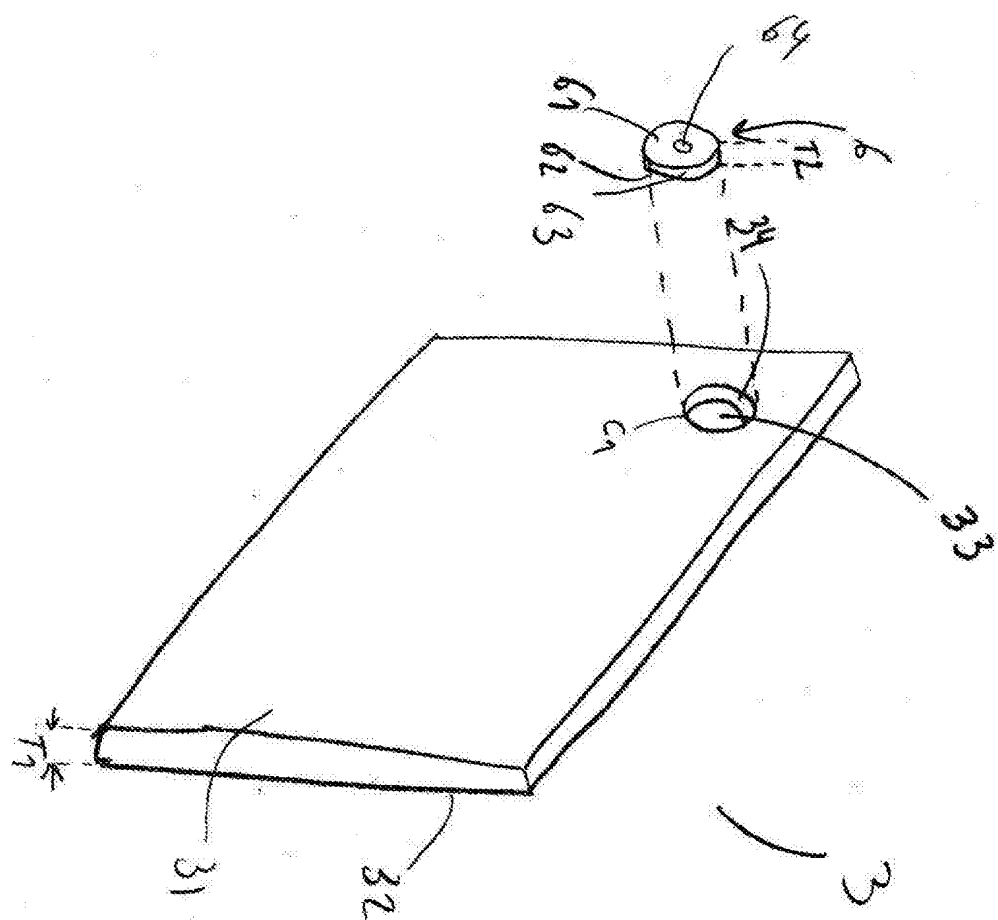


FIG. 2

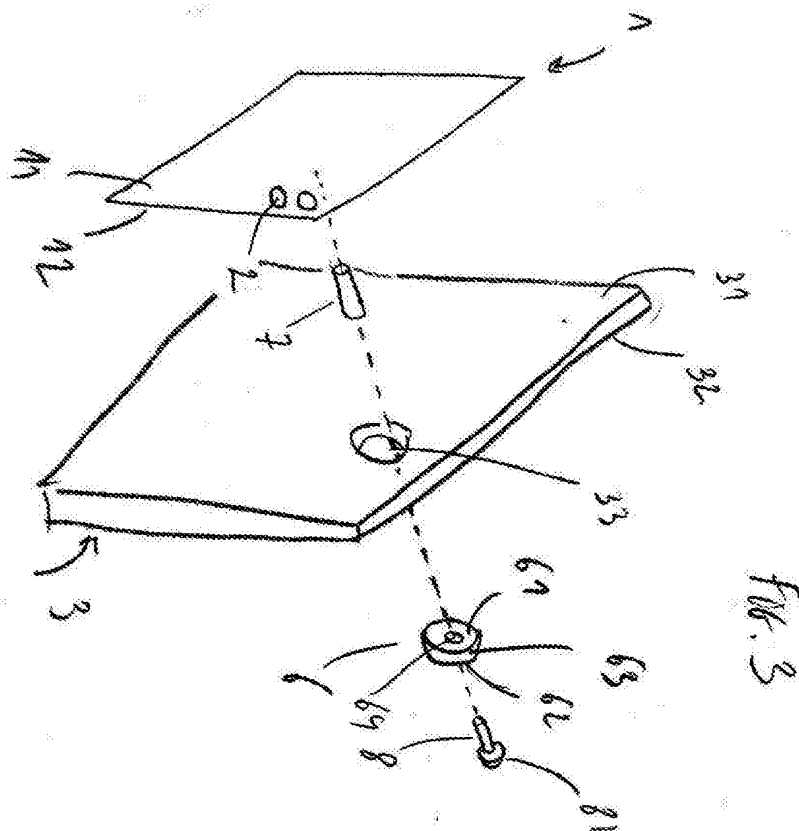


Figure 4.

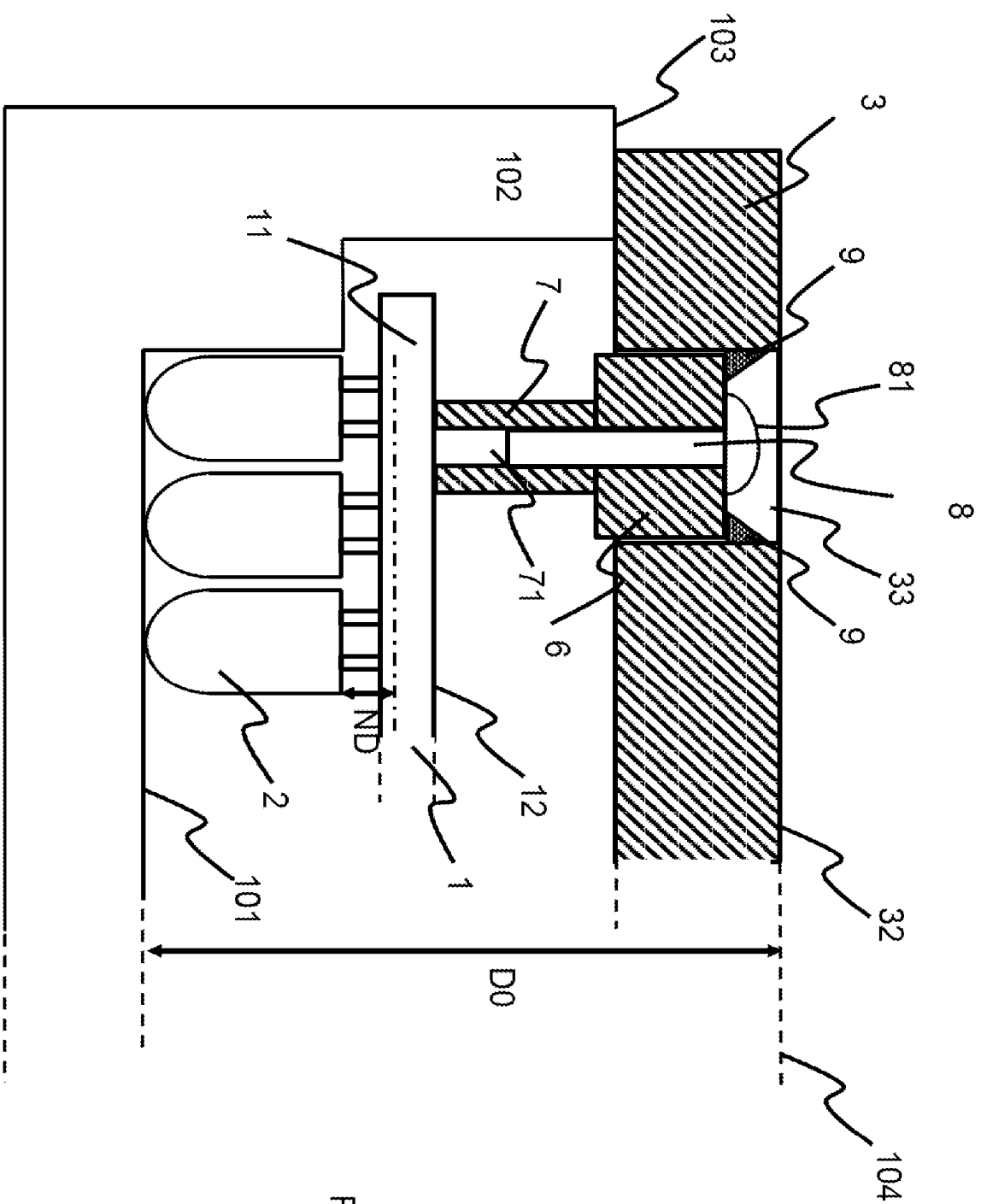


Figure 6a.

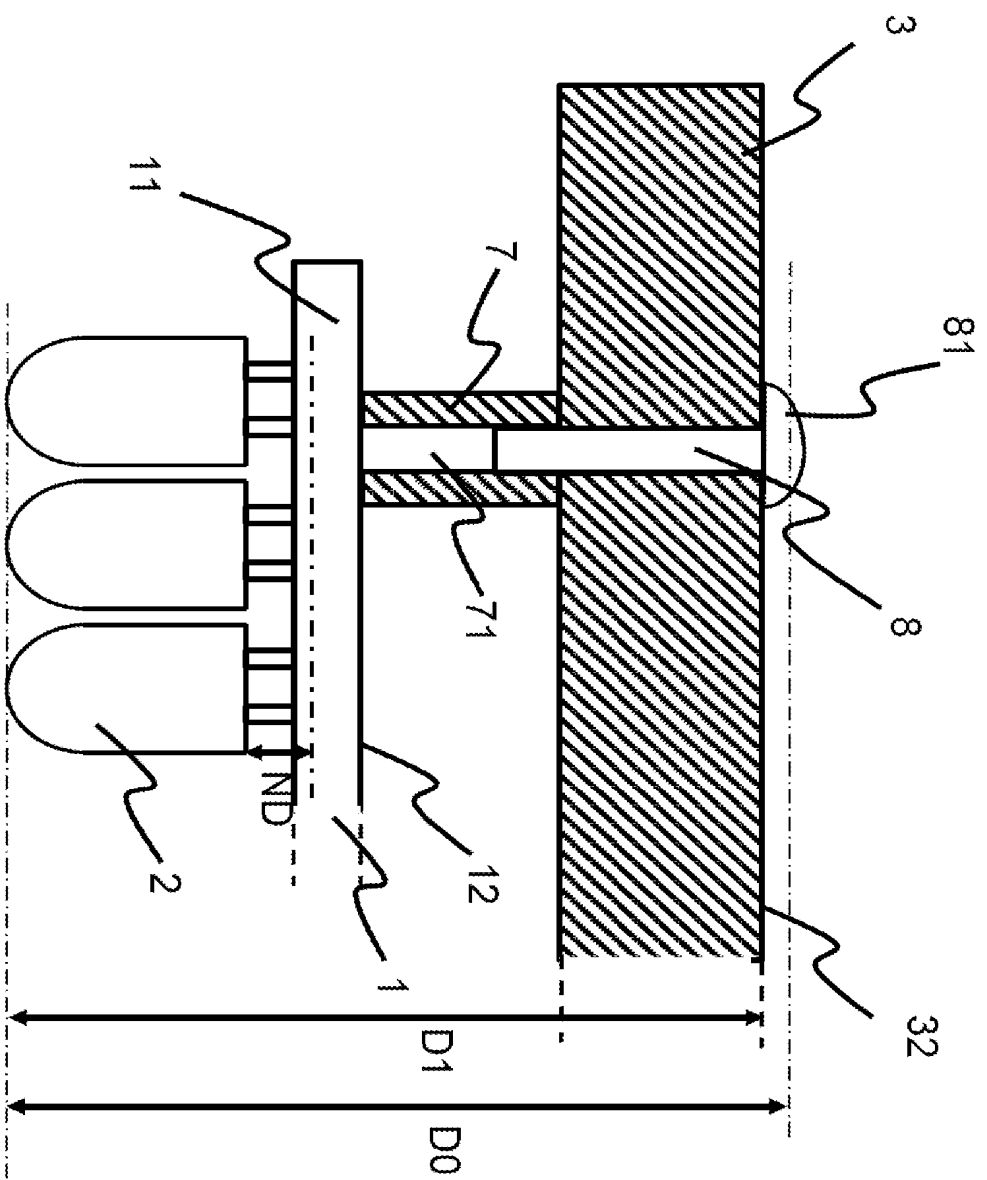


Figure 6b.

Figure 7a

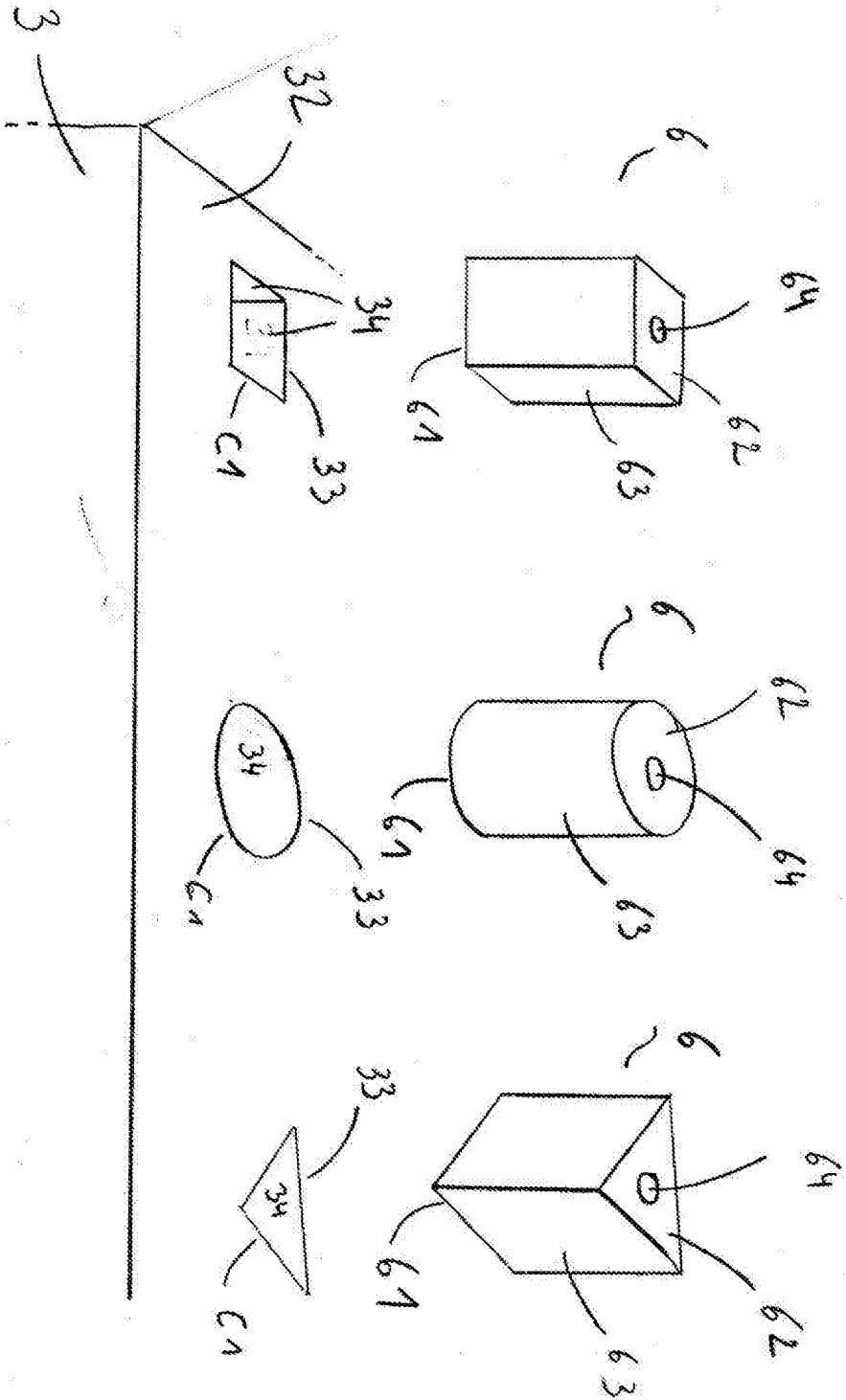
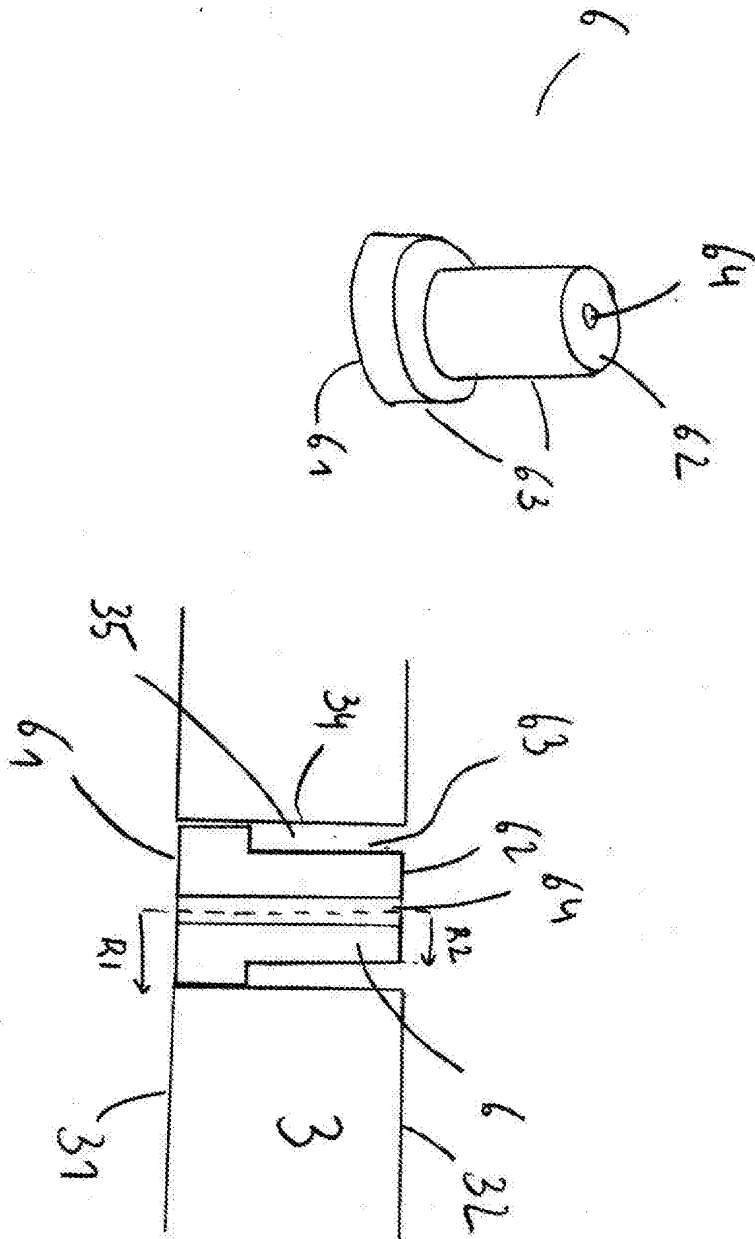


Figure 7b



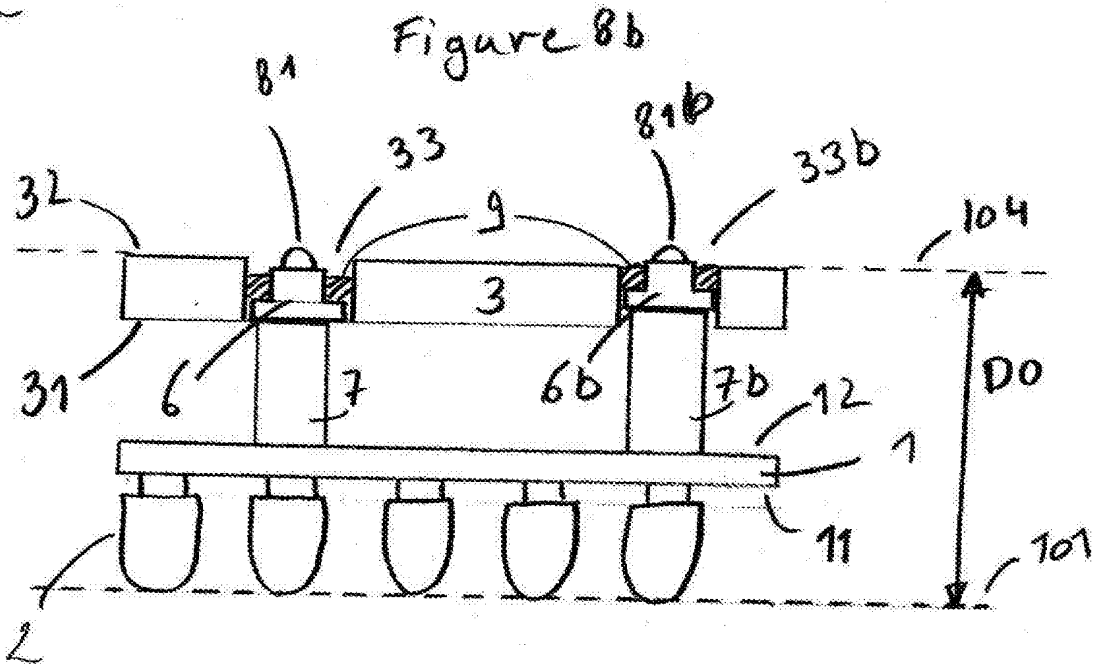


Figure 8c

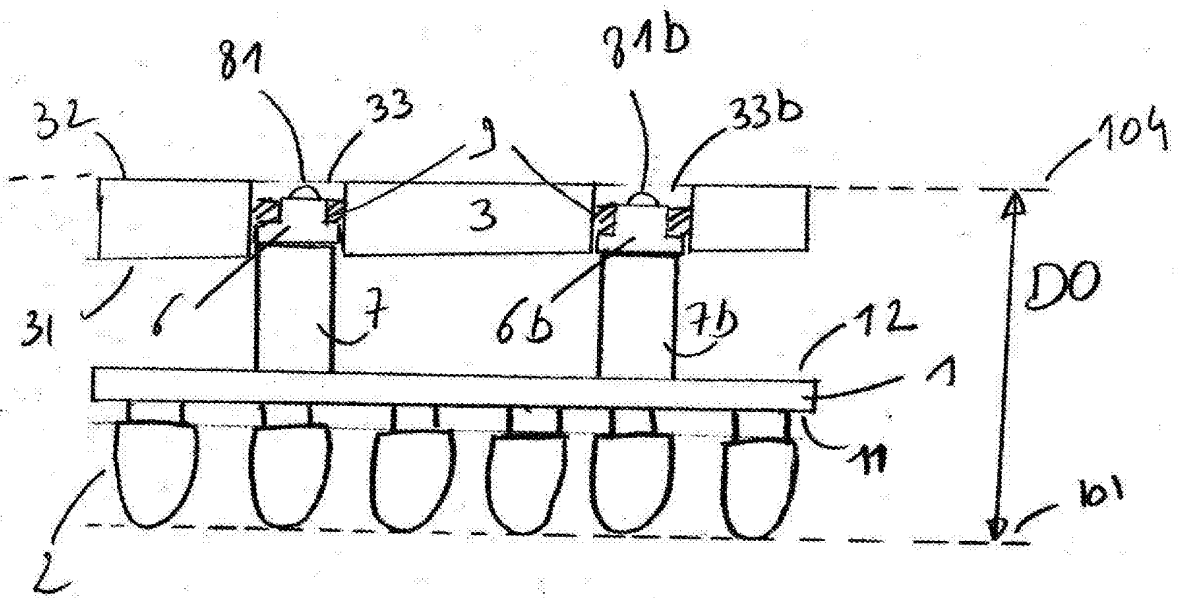
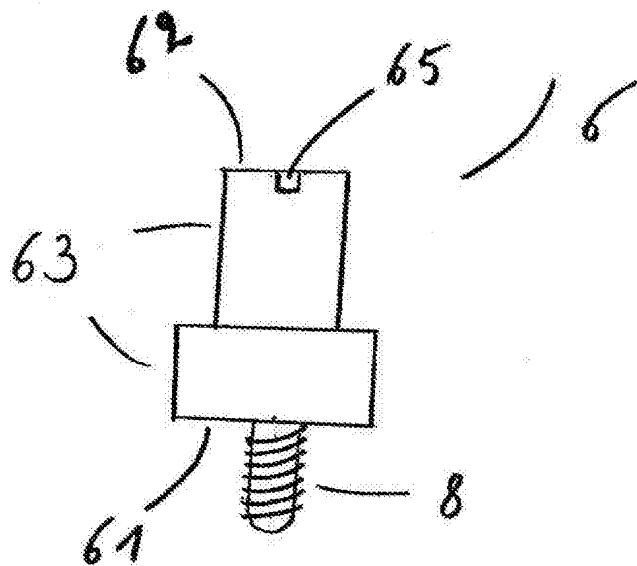
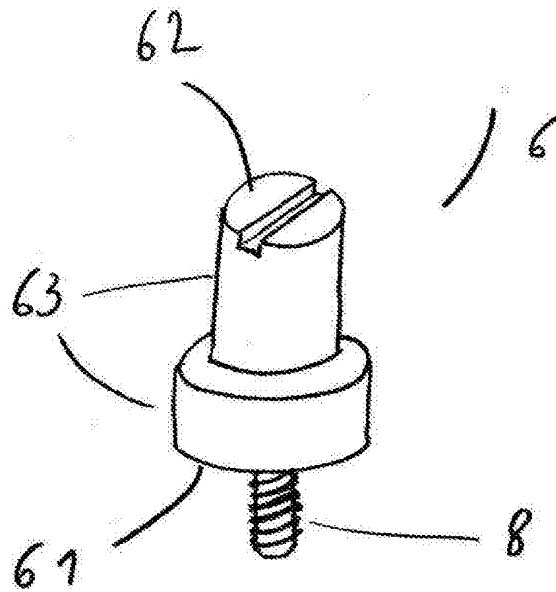


Figure 9.



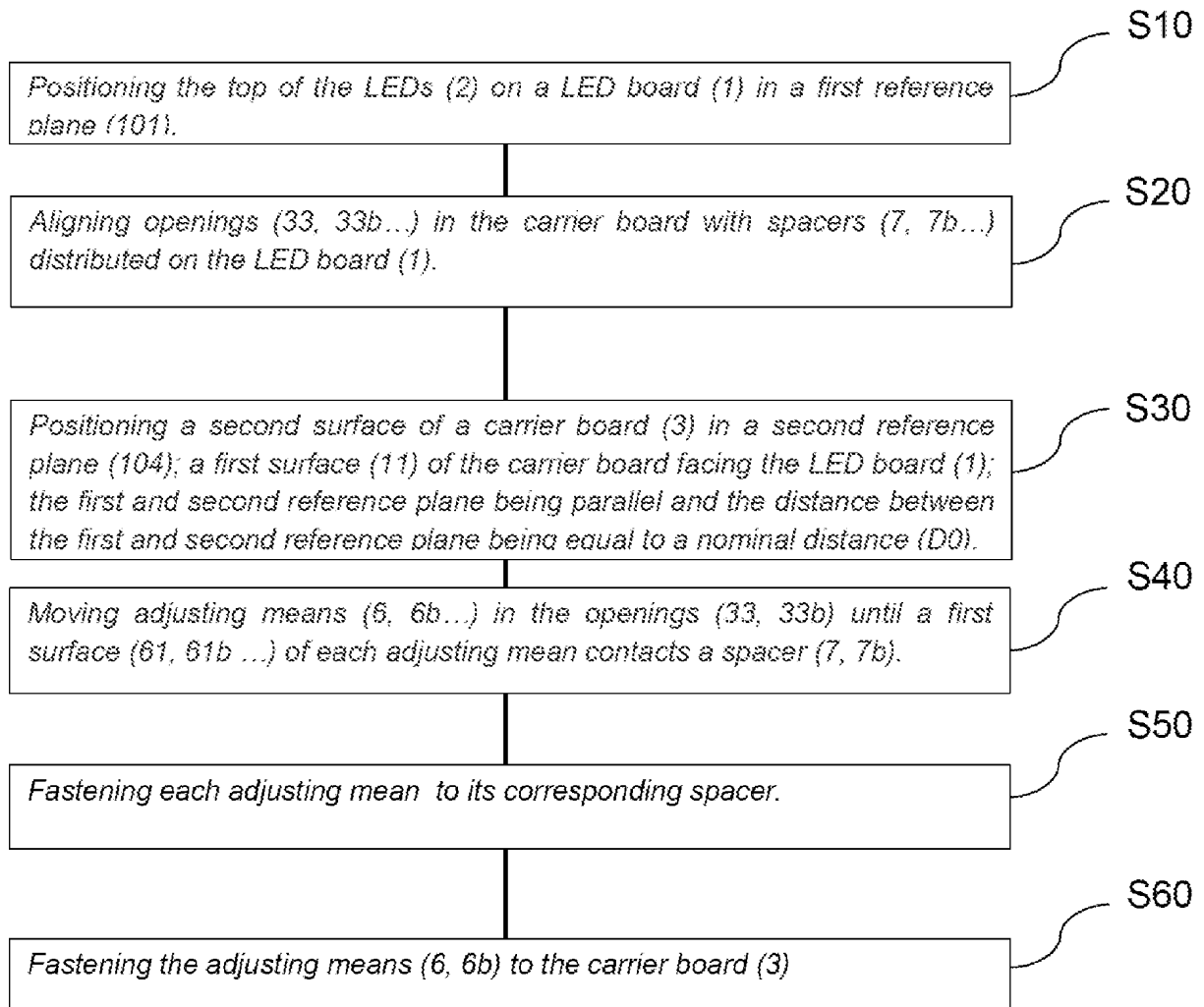


Figure 10

DOCUMENT MADE AVAILABLE UNDER THE PATENT COOPERATION TREATY (PCT)

International application number:	PCT/EP2015/063150
International filing date:	12 June 2015 (12.06.2015)
Document type:	Certified copy of priority document
Document details:	Country/Office: GB
	Number: 1410637.1
	Filing date: 13 June 2014 (13.06.2014)
Date of receipt at the International Bureau:	02 July 2015 (02.07.2015)

Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a),(b) or (b-bis)

PCT REQUEST

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0	For receiving Office use only	
0-1	International Application No.	PCT/EP2015/063150
0-2	International Filing Date	12 JUN 2015 (12.06.2015)
0-3	Name of receiving Office and "PCT International Application"	RO/EP
0-4	Form PCT/RO/101 PCT Request	
0-4-1	Prepared Using	PCT Online Filing Version 3.5.000.241e MT/FOP 20141031/0.20.5.20
0-5	Petition The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty	
0-6	Receiving Office (specified by the applicant)	European Patent Office (EPO) (RO/EP)
0-7	Applicant's or agent's file reference	BAR2309PCT
I	Title of Invention	Adjustable Display Tile for Tiled Display
II	Applicant	
II-1	This person is	Applicant only
II-2	Applicant for	All designated States
II-4	Name	Barco N.V.
II-5	Address	President Kennedypark 35 B-8500 Kortrijk Belgium
II-6	State of nationality	BE
II-7	State of residence	BE
III-1	Applicant and/or inventor	
III-1-1	This person is	Inventor only
III-1-3	Inventor for	All designated States
III-1-4	Name (LAST, First)	DECLERCK, Tom
III-1-5	Address	Heulbosstraat 4 8760 Meulebeke Belgium

PCT REQUEST

Print Out (Original in Electronic Form)

IV-1	Agent or common representative; or address for correspondence The person identified below is hereby/ has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:	Agent
IV-1-1	Name	IPLodge bvba
IV-1-2	Address	Technologielaan 9 B-3001 Heverlee Belgium
IV-1-3	Telephone No.	+32 16 40 98 10
IV-1-4	Facsimile No.	+32 16 20 06 21
IV-1-5	e-mail	info@iplodge.be
IV-1-5(a))	E-mail authorization The receiving Office, the International Searching Authority, the International Bureau and the International Preliminary Examining Authority are authorized to use this e-mail address, if the Office or Authority so wishes, to send notifications issued in respect of this international application:	as advance copies followed by paper notifications
IV-1-6	Agent's registration No.	515
V	DESIGNATIONS	
V-1	The filing of this request constitutes under Rule 4.9(a), the designation of all Contracting States bound by the PCT on the international filing date, for the grant of every kind of protection available and, where applicable, for the grant of both regional and national patents.	
VI-1	Priority claim of earlier national application	
VI-1-1	Filing date	13 June 2014 (13.06.2014)
VI-1-2	Number	1410637.1
VI-1-3	Country	GB
VI-2	Priority document request The International Bureau is requested to obtain from a digital library a certified copy of the earlier application(s) identified above as item(s), using, where applicable, the access code(s) indicated:	VI-1 Access code: D5E3

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VI-3	Incorporation by reference : where an element of the international application referred to in Article 11(1)(iii)(d) or (e) or a part of the description, claims or drawings referred to in Rule 20.5(a) is not otherwise contained in this international application but is completely contained in an earlier application whose priority is claimed on the date on which one or more elements referred to in Article 11(1)(iii) were first received by the receiving Office, that element or part is, subject to confirmation under Rule 20.6, incorporated by reference in this international application for the purposes of Rule 20.6.		
VII-1	International Searching Authority Chosen	European Patent Office (EPO) (ISA/EP)	
VIII	Declarations	Number of declarations	
VIII-1	Declaration as to the identity of the inventor	—	
VIII-2	Declaration as to the applicant's entitlement, as at the international filing date, to apply for and be granted a patent	—	
VIII-3	Declaration as to the applicant's entitlement, as at the international filing date, to claim the priority of the earlier application	—	
VIII-4	Declaration of inventorship (only for the purposes of the designation of the United States of America)	—	
VIII-5	Declaration as to non-prejudicial disclosures or exceptions to lack of novelty	—	
IX	Check list	Number of sheets	Electronic file(s) attached
IX-1	Request (including declaration sheets)	4	✓
IX-2	Description	19	✓
IX-3	Claims	3	✓
IX-4	Abstract	1	✓
IX-5	Drawings	9	✓
IX-7	TOTAL	36	
	Accompanying Items	Paper document(s) attached	Electronic file(s) attached
IX-8	Fee calculation sheet	—	✓
IX-19	Other	Pre-conversion archive	✓
IX-20	Figure of the drawings which should accompany the abstract	1	
IX-21	Language of filing of the international application	English	

PCT REQUEST

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X-1	Signature of applicant, agent or common representative	(PKCS7 Digital Signature)
X-1-1	Name	IPLodge bvba
X-1-2	Name of signatory	Michaël Beck 35079
X-1-3	Capacity (if such capacity is not obvious from reading the request)	(Representative)

FOR RECEIVING OFFICE USE ONLY

10-1	Date of actual receipt of the purported international application	12 JUN 2015 (12.06.2015)
10-2	Drawings:	
10-2-1	Received X	
10-2-2	Not received	
10-3	Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application	
10-4	Date of timely receipt of the required corrections under PCT Article 11(2)	
10-5	International Searching Authority	ISA/EP
10-6	Transmittal of search copy delayed until search fee is paid	X

FOR INTERNATIONAL BUREAU USE ONLY

11-1	Date of receipt of the record copy by the International Bureau	
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PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference BAR2309PCT	FOR FURTHER ACTION		See Form PCT/IPEA/416
International application No. PCT/EP2015/063150	International filing date (<i>day/month/year</i>) 12.06.2015	Priority date (<i>day/month/year</i>) 13.06.2014	
International Patent Classification (IPC) or national classification and IPC INV. G09F9/302			
Applicant Barco NV			
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of <u>9</u> sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p style="margin-left: 20px;">a. <input checked="" type="checkbox"/> (<i>sent to the applicant and to the International Bureau</i>) a total of <u>15</u> sheets, as follows:</p> <p style="margin-left: 40px;"><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and/or sheets containing rectifications authorized by this Authority, unless those sheets were superseded or cancelled, and any accompanying letters (see Rules 46.5, 66.8, 70.16, 91.2, and Section 607 of the Administrative Instructions).</p> <p style="margin-left: 40px;"><input type="checkbox"/> sheets containing rectifications, where the decision was made by this Authority not to take them into account because they were not authorized by or notified to this Authority at the time when this Authority began to draw up this report, and any accompanying letters (Rules 66.4bis, 70.2(e), 70.16 and 91.2).</p> <p style="margin-left: 40px;"><input type="checkbox"/> superseded sheets and any accompanying letters, where this Authority either considers that the superseding sheets contain an amendment that goes beyond the disclosure in the international application as filed, or the superseding sheets were not accompanied by a letter indicating the basis for the amendments in the application as filed, as indicated in item 4 of Box No. I and the Supplemental Box (see Rule 70.16(b)).</p> <p style="margin-left: 20px;">b. <input type="checkbox"/> (<i>sent to the International Bureau only</i>) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing, in the form of an Annex C/ST.25 text file, as indicated in the Supplemental Box Relating to Sequence Listing (see paragraph 3ter of Annex C of the Administrative Instructions).</p>			
<p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the report</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input type="checkbox"/> Box No. VIII Certain observations on the international application</p>			
Date of submission of the demand 07.04.2016		Date of completion of this report 26.09.2016	
Name and mailing address of the international preliminary examining authority:  European Patent Office P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Fax: +31 70 340 - 3016		Authorized officer Zanna, Argini Telephone No. +31 70 340-9945 	

**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/EP2015/063150

Box No. I Basis of the report

1. With regard to the **language**, this report is based on
- ☒ 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 (under Rules 12.3(a) and 23.1(b))
 - ☐ publication of the international application (under Rule 12.4(a))
 - ☐ international preliminary examination (under Rules 55.2(a) and/or 55.3(a) and (b))
2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

Description, Pages

1-23 as originally filed

Claims, Numbers

1-17 filed with the letter of

05-07-2016

Drawings, Sheets

1/9-9/9 as originally filed

- ☐ a sequence listing - see Supplemental Box Relating to Sequence Listing.
3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since either they are considered to go beyond the disclosure as filed, or they were not accompanied by a letter indicating the basis for the amendments in the application as filed, as indicated in the Supplemental Box (Rules 70.2(c) and (c-bis)):
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
5. ☐ This report has been established:
- ☐ taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rules 66.1(d-bis) and 70.2(e)).
 - ☐ without taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91(Rules 66.4bis and 70.2(e)).

**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/EP2015/063150

6. ☒ With regard to top-up searches (Rules 66.1 *ter* and 70.2(f)):
- ☒ A top-up search was carried out by this Authority on 09.09.2016 (all discovered documents are listed in the Supplemental Box Relating to Top-up Search).
 - ☐ Additional relevant documents have been discovered during the top-up search.
 - ☐ No top-up search was carried out by this Authority because it would serve no useful purpose.
7. ☐ Supplementary international search report(s) from Authority(ies) has/have been received and taken into account in establishing this report (Rule 45bis.8(b) and (c)).

* If item 4 applies, some or all of those sheets may be marked "superseded".

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	<u>1-17</u>
	No: Claims	
Inventive step (IS)	Yes: Claims	<u>3, 6-10, 14, 15</u>
	No: Claims	<u>1, 2, 4, 5, 11-13, 16, 17</u>
Industrial applicability (IA)	Yes: Claims	<u>1-17</u>
	No: Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Reference is made to the following documents:

- D1 US 2002/122134 A1 (KALUA KEVIN A [US]) 5 September 2002
(2002-09-05)
- D2 US 6 150 996 A (NICHOLSON TIMOTHY J [US] ET AL) 21 November
2000 (2000-11-21)
- D3 US 6 813 853 B1 (TUCKER WAYNE R [US]) 9 November 2004
(2004-11-09)
- D4 CN 201 226 214 Y (SHANGHAI DAXIAGU OPTO ELEC SCI&TECHN C)
22 April 2009 (2009-04-22)
- D5 US 5 805 117 A (MAZUREK NIEL [US] ET AL) 8 September 1998
(1998-09-08)

2. Initial remarks

The Applicant's arguments in her letters were taken into consideration and the following remarks are made:

(a) Concerning document D1:

Document D1 was initially regarded as disclosing all the features of claim 1 (see Written Opinion of the International Searching Authority).

The Applicant disagreed that the threaded assembly of D1 ("standoff" 147 in figures 17 and 18) is an adjusting means. She argued that the component 147 of D1 is a fixing means (see Applicant's letter dated 07-04-2016, section III. Novelty).

The examiner underlined that the standoff 147 in figure 18 of D1 may "establish a uniform spacing between the strongback and the LED circuit board" (see paragraph [0060], lines 10-12 of D1) and "the shank may translate freely through the hole 150" (line 16 of paragraph [0058] of D1). Hence, the fact that a screw can be fixed

tightly or loosely to a respective female connecting compartment (the bore 159 in figure 17 of D1), in order to achieve uniform spacing, was regarded as an implicit feature of the screw.

The Applicant stated that there is no indication in D1 of a compensation of "the tolerances affecting the position of the LEDs with respect to the carrier board". Additionally, she explained that "in LED display devices it is important to have a fixed and tight connection between the display board and the carrier board, in order to avoid undesired effects" and, therefore, D1 cannot be regarded as implicitly disclosing a tightening/loosening screw (see Applicant's letter dated 05-07-2016, pages 3 and 4).

The International Preliminary Examining Authority agrees with the Applicant's reasoning that document D1 does not explicitly disclose all the features of claim 1. In particular, the standoff 147 in figure 18 of D1 may "establish a uniform spacing between the strongback and the LED circuit board" (see paragraph [0060], lines 10-12), but does not have an adjusting function as such, i.e. does not explicitly allow the compensation of the tolerances affecting the position of the LEDs with respect to the carrier board.

(b) Concerning document D2:

Document D2 was also initially regarded as disclosing all the features of claim 1 (see Written Opinion of the International Searching Authority).

The Applicant in her letter dated 07-04-2016 (see section III. Novelty) stated that D2 does not disclose any adjusting means.

Having followed the same way of thinking as in (a) above, the Examiner was still of the opinion that D2 discloses an adjusting means (see in particular reference number 143 in figure 19).

The Applicant in her letter dated 05-07-2016 argued that each mounting screw of D2 (i) "is a single solid piece and, therefore, there is no disclosure of particular items like spacers and adjusting means" and (ii) is used to attach a display module to a mounting track and not to a back cover.

The International Preliminary Examining Authority agrees with the Applicant's reasoning that document D2 describes a mechanism to attach a display module to a mounting track (14, figures 8, 10, 17; column 11, lines 38-42). Consequently,

document D2 does not disclose a carrier board and does not mention the problem of adjusting the distance between the LED board and the carrier board (or, at least, the mounting track).

(c) Given the above, documents D1 and D2 are discarded. However, D5 is still relevant and becomes the closest prior art to the subject-matter claimed in the present application.

3. Independent claim 1

The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claim 1 does not involve an inventive step in the sense of Article 33(3) PCT.

Document D5 is regarded as being the prior art closest to the subject-matter of claim 1, and discloses:

A display tile (100, figures 1 and 21; column 6, lines 7-8) comprising a display board (100, figure 21; column 19, line 3) and a carrier board (310, figure 21; column 19, line 4),

~~LED's being mounted on a first face of the display board~~ *the display board being a liquid crystal display module* (column 1, lines 10-12)

and the carrier board being for attachment to a frame (80, figure 1; column 6, line 7),

the display board and the carrier board being fastened together by the intermediary of a spacer (1610, figure 21; column 19, lines 4-5) and an adjusting means (1630, figure 21; column 19, line 8*) positioned between the spacer and the carrier board (figure 21; column 19, lines 6-9**)

wherein the adjusting means engage in an opening in the carrier board (1615, figure 21; column 19, line 7),

the adjusting means allowing a compensation of the tolerances affecting the position of the ~~LED's~~ *LCD display board* with respect to the carrier board in a direction perpendicular to the carrier board (the adjusting means 1630 is part of the "alignment device 320", see column 19, lines 1-14*)

whereby the compensation is obtained by the position of the adjusting means in their corresponding opening (figure 21; column 19, lines 1-14).

Notes:

*The bushing 1630 of D5 is part of the "alignment device 320" (see column 18, lines 49-57). The alignment device 320 allows a compensation of the tolerances affecting the position of the display board with respect to the carrier board in three orthogonal directions (see figures 21 and 22), *including* the direction which is perpendicular to the base plate (Z-direction in figure 21; column 19, lines 9-11).

**The spacer (post 1610) is positioned inside a hollow adjusting means (bushing 1630) and the adjusting means are positioned inside a hole in the carrier board (hole 1615 of the base plate 310). Starting from the centre of the spacer (axis of the cylinder) and moving radially, the following are found: the spacer, the adjusting means and the carrier board. The adjusting means is, therefore, indeed explicitly *between* the spacer and the carrier board.

The subject-matter of claim 1 therefore differs from this known display tile in that it comprises an LED display module.

It is however generally known to the person skilled in the art that an LED display is an equivalent to the LCD display of D5 and can be interchanged with that feature where circumstances make it desirable.

Claim 1 of the present application cannot be considered to involve an inventive step (Article 33(3) PCT).

4. Independent claim 16

The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claim 1 does not involve an inventive step in the sense of Article 33(3) PCT.

Based on the argumentation for claim 1 above, document D5 is regarded as being the prior art closest to the subject-matter of claim 16, and discloses:

A method to adjust the distance between the ~~tops of the LEDs on a~~ first surface of a ~~LED an LCD~~ board on a display tile and the back surface of the carrier board of the display tile (column 18, lines 49-53), the method comprising the steps:

- positioning the ~~tops of the LEDs~~ *first surface* on a ~~LED an LCD~~ board in a first reference plane (bottom surface of 100, figure 21),
- aligning openings in the carrier board (1615, figure 21; column 19, line 7) with spacers distributed on the ~~LED LCD~~ board (1610, figure 21; column 19, lines 4-5),
- positioning a second surface of the carrier board in a second reference plane (top surface of 310, figure 21); a first surface of the carrier board facing a second surface of the ~~LED LCD~~ board (figure 21); the first and second reference planes being parallel and the distance between the first and the second reference planes being equal to a desired nominal distance (figure 21; column 18; lines 49-53*),
- moving adjusting means in the openings until a first surface of each adjusting means contacts a spacer (move of the adjusting means 1630 in the Z-direction around the spacer 1610; figure 21; column 19, lines 9-11),
- fastening each adjusting means to its corresponding spacer (column 19, lines 6-9**),
- fastening the adjusting means to the carrier board (column 19, lines 41-43***).

Notes:

*It is apparent that the concept "alignment" includes the concept of having a desired relative position of two or more compartments. In this case, the device 320 of D5 is an "alignment device" that allows alignment in three orthogonal directions, including the Z-direction as explained above (see pont 3.).

**Document D5 discloses that the spacer 1610 is slidably mounted to the alignment device 320 by -among others- a screw 1640. It is apparent that the compartments 1610 and 1630 are fastened with the help of this screw. In other words, without the screw, the spacer 1610 and the adjusting means 1630 would not be in contact.

***The adjusting means 1630 is fastened to the carrier board with the help of the other compartments of the alignment device 320, as shown in figure 21.

The subject-matter of claim 16 therefore differs from this known method in that the display tile comprises an LED display module.

It is however generally known to the person skilled in the art that an LED display is an equivalent to the LCD display of D5 and can be interchanged with that feature where circumstances make it desirable.

Claim 16 of the present application cannot be considered to involve an inventive step (Article 33(3) PCT).

5. Dependent claims 2, 4, 5, 11-13 and 17 (negative assessment)

Dependent claims 2-15 do not appear to contain any additional features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of inventive step. In particular:

claim 2: The subject-matter of claim 2 does not add any further features to the subject-matter of claim 1. The reasoning in point 3. above applies for claim 2.

claims 4, 5: see D5; figure 21

claims 11-13: see D5; 1640, figure 21

claim 17: see D5; 100, figures 1 and 21; column 6, lines 7-8

6. Dependent claims 3, 6-10, 14 and 15 (positive assessment)

The combination of the features of dependent claims 3, 6-10, 14 and 15 seems to be not known, neither rendered obvious, from the available prior art.

VIA EPO ONLINE FILING

5 April 2016

European Patent Office
International Searching Authority

Mr. A. Zanna (Examiner)

Patentlaan 2
2280 HV Rijswijk
The Netherlands

Your Ref.

-

Our Ref.

BAR2309PCT

Subject

International patent application PCT/EP2015/063150

Filing date: 12 June 2015

Applicant: Barco N.V.

Title: "Adjustable display tile for tiled display"

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To the Written Opinion dated 28 September 2015

Dear Mr. Zanna,

Please find enclosed the Demand form PCT/IPEA/401.

I. Amendments and support

Claim 1 has been amended by replacing the feature "being for adjusting a relative position of the display board (1) with respect to the carrier board (3)" by "allowing a compensation of the tolerances affecting the position of the LED's with respect to the carrier board (3) in a direction perpendicular to the carrier board".

This amendment is based on the description, page 6, lines 12-15.

All other claims are maintained as originally filed.

The amendments in claim 1 being disclosed in the application as filed, the amendments are not going beyond the disclosure in the international application as filed and the requirements of Art 34 (2), (b) PCT are met.

II. Clarity

In point VIII, 1 of the Written Opinion, a clarity objection is raised against the use of the term “nominal distance” in claims 3 and 16 because this term “has no well-recognized meaning”. The definition of the term “nominal distance” can be found in the description, e.g. page 3, lines 8-9 or page 6, lines 3-6.

Further, in point VIII, 2 of the Written Opinion, a clarity objection is raised against claim 16. It is asserted that this claim “is worded as a method claim” but “it refers to the use of the apparatus of claim 1”.

Applicant respectfully disagrees. Indeed, claim 16 is drafted as a claim describing a method for adjusting the distance between the tops of the LEDs on a first surface of a LED board on a display tile and the back surface of the carrier board (3) of the display tile. Claim 16 contains no indication of using the apparatus of claim 1.

The Art. 6 PCT objection, raised under point VIII of the Written Opinion is thus no longer valid.

III. Novelty

D1 discloses a modular video display including a plurality of video image units. Each unit (31) comprises i.a. a strongback (Fig. 18:61), a LED circuit board (81) having a number of LED's (83) and a front panel (37). The strongback (61) and the LED circuit board (81) are secured to the front panel (37) by threaded assemblies (141). Each threaded assembly comprises i.a. a standoff 147 which “establishes a uniform spacing between the strongback (61) and the LED circuit board (81). According to D1, the threaded assembly is a fixing means and not an adjusting means. D1 does not provide any means allowing a compensation of the tolerances affecting the position of the LED's (in the invention the position of the tops of the LED's with respect to the carrier board, corresponding to the strongback in D1). There is not even a mentioning in D1 of the distance between the top of the LED's and the back of the strongback.

Thus, amended claim 1 is novel over D1.

D2 discloses a message sign system comprising a number of modules. Each module (12) comprises i.a. a mounting rack (Fig. 17: 14), a circuit board (20) having a number of LED's (Fig. 14, 74) and a translucent cover (112). The modules (12) are mechanically mounted on the mounting rack using mounting screws (160) and standoffs (134). The standoffs (134) extend between the circuit board (20) and the translucent cover (112) (see col. 9, lines 1- 16). The distance between mounting rack (14) and the circuit board (20) is fixed by the dimensions of a neck (Fig. 19:143) and the dimensions of a shoulder (143), both parts of the standoff and there is no adjusting means provided in D2 that allow a compensation of a variation of said distance. There is surely no indication in D2 of a compensation the tolerances affecting the position of the LED's with respect to the mounting rack (the carrier board in the invention).

Thus amended claim 1 is clearly novel over D2.

All other claims being dependent claims, they are also novel over the cited prior art.

IV. Inventive step

None of the cited documents include a hint or an indication towards the essential features of claim 1 (adjusting means allowing a compensation of the tolerances affecting the position of the LED's with respect to the carrier board). The cited documents do not even mention the distance between (the top of) the LED's and the carrier board.

Claim 1 and claim 16 are thus inventive over the cited prior art.

All other claims being dependent claims, they can be considered to meet the PCT-requirements concerning inventive step.

V. Final remarks

The three criteria referred to in Article 33 (1) PCT now being satisfied and the application meeting the requirements of Article 6 PCT, the Examiner is respectfully requested to issue a positive IPRP on the basis of the new set of claims.

We request that the filing of documents relating to any other formal matter be delayed until the national phases.

Thank you.

Very truly yours

Ariane Bird
the Representative

encl.: - amended claims 1-17, clean version
- amended claims 1-17, version showing amendments
- Demand form PCT/IPEA/401

VIA EPO ONLINE FILING

05/07/2016

European Patent Office
International Preliminary Examining Authority
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Your Ref. -
Our Ref. BAR2309PCT
Subject International patent application PCT/EP2015/063150
Filing date: 12 June 2015
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To the second Written Opinion dated 11 May 2016

Dear Mr. Zanna,

We herewith enclose without prejudice amended claims 1 – 17.

Reference is made to the following documents:

D1: US 2002/122134
D2: US 6 150 996
D5: US 5 805 117

I. Amendments and possible extension of subject-matter

Claim on file 1 has been amended by adding the following features:

- "LED's (2) being mounted on a first face of the display board" (this addition is based on the description, page 10, lines 1-6);
- "whereby the compensation is obtained by the position of the adjusting means in their corresponding opening (33)" (this addition is based on the description, page 13, lines 11-26).

In claim on file 3 the feature "wherein the nominal distance (D0) is the distance between the top of the LEDs and the second surface (32) or back of the carrier board (3)" has been added (based on the description page 3, lines 8-9).

In claim on file 16, the word “desired” has been inserted before “nominal distance” (based on the description, e.g. page 13, lines 11-26 or page 5, lines 25 -28).

All other claims are maintained as originally filed.

The amendments in claims 1, 3 and 16 being disclosed in the application as filed, the amendments do not go beyond the disclosure in the international application as filed and the requirements of Art 34 (2), (b) PCT are met.

II. Clarity

In point VIII, 1 of the Written Opinion, a clarity objection is raised against the use in claim 1 of the term “the position of the LEDs”, in particular because the LEDs are not mentioned before in the claim (antecedent basis) and because claim 1 fails to disclose the exact location of the LEDs. The clarity requirement is met by the amendment of claim 1 “LED's (2) being mounted on a first face of the display board”.

In point VIII, 2 of the Written Opinion, a further clarity objection is raised in relation with claim 1 because it is alleged that the matter for which protection is sought is not clearly defined, in particular because the claim is attempting to define the subject-matter in terms of the result to be achieved without providing the technical features necessary for achieving for this result. By adding the amendment relating to the position of the adjusting means within the openings, this clarity requirement is met.

In point VIII, 3 of the Written Opinion, a further clarity objection is raised in relation with the term “nominal distance” claims 3 and 16. Claims 3 and 16 have been amended in order to avoid any possible lack of clarity.

It is therefore respectfully requested to withdraw the Article 6 PCT objections, raised under point VIII of the Written Opinion.

III. Novelty

Amended claim 1 reads:

“A display tile comprising a display board (1) and a carrier board (3), LED's (2) being mounted on a first face of the display board and the carrier board being for attachment to a frame, a. the display board (1) and the carrier board (3) being fastened together by the intermediary of a spacer (7) and an adjusting means (6) positioned between the spacer and the carrier board

- b. wherein the adjusting means engage in an opening (33) in the carrier board,
- c. the adjusting means allowing a compensation of the tolerances affecting the position of the LED's with respect to the carrier board (3) in a direction perpendicular to the carrier board
- d. whereby the compensation is obtained by the position of the adjusting means (6) in their corresponding opening (33)."

Novelty of claim 1 over D1

Without acquiescing to the arguments presented by the Examiner, according to the analysis made in the W.O., the following correspondences are alleged between the parts of the video display, illustrated in figures 17 and 18 of D1 and the parts of the present invention:

standoff (spacer) 153 corresponds to the spacer in claim 1;

standoff 147 corresponds to the adjusting means in claim 1 (see Note below);

LED circuit board 91 (corrected into 81) corresponds to the display board of claim 1;

strongback 61 corresponds to the carrier board in claim 1;

opening 64 in strongback 61 corresponds to opening 33 in the carrier board of claim 1.

Note: Applicant cannot agree to the alleged equivalence between the standoff 147 in D1 and the adjusting means in claim 1. Indeed, standoff 147 has not the slightest adjusting capacity; it has a fixed length and builds, together with standoff 153, a single spacer. However, in order to assess the novelty of claim 1 over D1 and as a pure mental exercise, it is supposed that standoff 147 constitutes an adjusting means.

Applying the correspondences above to the video display of D1: the adjusting means 147 are not engaging **in** the opening 64 of the carrier board. Feature b above is thus not disclosed in D1.

Feature c above is also not disclosed in D1 because, as mentioned in the Written Opinion, the goal of the standoff 147 is to establish "a uniform spacing between the strongback and the LED circuit board", there is no indication in D1 of a compensation of "the tolerances affecting **the position** of the LED's with respect to the carrier board (3) in a direction perpendicular to the carrier board".

D1 mentions the spacing between the strongback and the LED circuit board and not the tolerances affecting the position **of the LEDs** with respect to the carrier board. The disclosure in D1 is thus different from the object of feature c.

On the same point, it is asserted in the Written Opinion that "the fact that a screw can be fixed tightly or loosely to a respective female connecting compartment (the bore 159 in figure 17 of D1), in order to achieve uniform spacing, is regarded as an implicit feature of the screw". Applicant cannot agree with this assertion. Indeed, in LED display devices it is important to have a fixed and tight connection between, on one hand, the display board and, on the other hand, the carrier board in order to avoid

undesired effects. This can be illustrated by the explanation given in col. 19, lines 15- 26 of D5 where special compression devices are provided in order to maintain “alignment of the display module when the tiled display system is subject to shock or vibration”. A screw, loosely connected to its female counterpart, would in reality deteriorate the functioning of the display system.

In case this argument with respect to the screw is maintained, Applicant requests, respectfully, that the Examiner provides a document stating the use of a loosely fixed screw as a means for compensating distance tolerances in display systems.

Applicant submits that feature c above is also not disclosed in D1.

Feature d above relating to the position of the adjusting means in the opening cannot be disclosed in D1 because in this document standoff 147 is even not partially located in the opening 64. According to figure 17, this standoff is provided with a collar 148, preventing the standoff to enter the opening 64. This collar is necessary to guarantee the “uniform spacing between the strongback and the LED circuit board”.

As a general conclusion, and even supposing that standoff 147 constitutes an adjusting means (*quod non*) it can thus be said that amended claim 1 is novel over D1.

Novelty of claim 1 over D2

In D2, figure 17, display modules (12), including a translucent cover (112) are mounted on a mounting track (14) using mounting screws (160). The mounting screws extends from the cover face (148) and threadably engages a selfclinching fastener (210), located in the mounting track. Each mounting screw is single solid piece so that there is no disclosure of particular items like spacers and adjusting means. Because there is no disclosure of any spacer or adjusting means, features a to d of claim 1 cannot be disclosed in D2.

Novelty of claim 1 over D5

Figure 21 of D5 shows an alignment device (320) utilized in attaching a display module (100) to a base plate (310). The pixels (Fig. 20A, 1310) of the display modules (100) must be substantially in alignment with the mask openings (1538) of the global mask (1530; see col. 18, 39 -43). The alignment device (320) permits the realignment of the display module (100; col. 18, 49-50). The alignment itself consists thus essentially of a movement of the display module in the plane of this module, parallel to the plane of the base plate and not a movement in a direction perpendicular to the base plate. The alignment is obtained by the use of vertical and horizontal screw assemblies (fig. 22, 1730 and 1740; col. 19, 41-54). It may be worthwhile to note that by “vertical” is meant a direction in the plane of the display module, any movement in a direction perpendicular to the base plate being

made impossible by the presence of compression devices (1650; col. 19, 15-17).

Looking for a possible analogy between the device, shown in Fig. 21 of D5 and the arrangement of claim 1, the following correspondences can be made:

display module 100 with the display board of claim 1;

base plate 310 with the carrier board of claim 1;

post 1610 with the spacer of claim 1;

hole 1615 and the opening of claim 1.

Note:

In D5, the bushing is not an adjusting means, it **allows** (together with post 1610) the adjusting by the screw assemblies (1730, 1740), which are the only adjusting means provided in D5.

The following differences exist between the alignment device of D5 and the arrangement of claim 1:

- in D5, the bushing (1630) is not positioned between the post (1610) and the base plate (310); the bushing is positioned around the post; thus feature a of claim 1 is not disclosed in D5;
- the bushing (1630) does not allow a compensation of the tolerances affecting the position of the LEDs with respect to the base plate (310) in a direction perpendicular to the base plate; the distance between the LEDs and the base plate, measured in a direction perpendicular to the base plate is fixed and determined by the thickness of the display board and the small platforms underneath the compression devices; feature c of claim 1 is thus also not disclosed by D5;
- the position of bushing 1630 within hole 1615 compensates the changes of the position of the LEDs in a plane parallel to the base plate and not in a direction perpendicular to the base plate; feature d of claim 1 is also not disclosed in D5.

Claim 1 is thus also novel over D5.

Claim 1 being novel over all cited documents, claim 1 is novel over the prior art.

Claim 16 reads as follows:

“A method to adjust the distance between the tops of the LEDs (2) on a first surface of a LED board on a display tile and the back surface (32) of the carrier board (3) of the display tile, the method comprising the steps:

e. positioning the tops of the LEDs (2) on a LED board (1) in a first reference plane (101),

f. aligning openings (33, 33b...) in the carrier board with spacers (7, 7b...) distributed on the LED board (1),

g. positioning a second surface of a carrier board (3) in a second reference plane (104); a first surface

(1 1) of the carrier board facing a second surface of the LED board (1); the first and second reference planes being parallel and the distance between the first and second reference planes being equal to a desired nominal distance (D0),

- h. moving adjusting means (6, 6b...) in the openings (33, 33b) until a first surface (61 , 61 b ...) of each adjusting means contacts a spacer (7, 7b),
- i. fastening each adjusting means to its corresponding spacer,
- j. fastening the adjusting means (6, 6b) to the carrier board (3)."

Novelty of claim 16 over D1

It has to be underlined that the object of the method described in claim 16 is "to adjust the distance between the tops of the LEDs (2) on a first surface of a LED board on a display tile and the back surface (32) of the carrier board (3) of the display tile". There is no mentioning of such adjusting in any of the cited documents.

At least features h, i and j above are not disclosed in D1 because adjusting means (even supposing they are present, *quod non*) are not moved in openings and D1 does not provide any adjusting means.

Claim 16 is thus novel over D1.

Novelty of claim 16 over D5

In D5 the base plate (310) is positioned at a given distance from the display module and not at a given distance from the plane, containing the tops of the LEDs (the first reference plane in claim 16). Feature g is thus not disclosed in D5.

In D5, the only adjusting means are the screw assemblies 1730 and 1740 and these assemblies are adjusting in a plane parallel with the plane of the base plate. These screw assemblies are not moved in the hole 1615 so that feature h is not disclosed either in D5. Features i and j are also not disclosed in D5.

It can thus be concluded that claim 16 is novel over D5.

Claim 16 being novel over all cited documents, claim 16 is novel over the prior art.

All other claims being dependent claims, they are also novel over the prior art.

IV. Inventive step

When assessing the inventive step of claim 1, it is proposed to take D1 as the closest prior art. D1 discloses a LED circuit board, mounted on a strongback. The distance between the LED circuit board and the strongback is fixed and determined by the dimensions of a standoff 147 (paragraph [0060]: “The standoff 147 establishes a uniform spacing between the strongback and the LED circuit board”). The technical problem with the arrangement of D1 lies in the absence of any possibility of compensating for differences in the position of the tops of the LEDs because the tops of the LEDs of different tiles are not necessarily lying in a same reference plane. Such differences may lead to visual artefacts (see the description, page 1, 24-26). They are due to unavoidable differences between the dimensions of LEDs or of boards belonging to different production lots. The technical problem is solved by the combined features b, c and d, mentioned above.

The prior art does not contain any indication of such a combination of features and also not a hint pointing at such a combination.

Claim 1 is thus inventive over the prior art.

Taking again D1 as closest prior art when assessing the inventiveness of claim 16, the problem raised when applying D1 lies in the fact that D1 does not allow to adjust the distance between the a first surface containing the tops of the LEDs and the strongback (in reality, D1 does not allow any adjusting of distances in a direction, perpendicular to the plane of the strongback). This problem is solved by providing method steps h, i and j above.

The prior art does not contain any combination of these steps h, i and j.

Claim 16 is thus also inventive over the prior art.

All other claims being dependent claims, they can be considered to meet the PCT requirements concerning inventive step.

V. Conclusion

In view of the above we respectfully request to issue a positive IPRP under Art. 35 PCT.

Should the Examiner disagree with any of the comments above, the Examiner is cordially invited to contact our firm by telephone in accordance with Rule 66 PCT.

Thank you.

Very truly yours,

Ariane Bird
European patent attorney

Encl. : - amended claims 1- 17, clean version
- amended claims 1- 17, version showing amendments

Amended Claims (clean version)

1. A display tile comprising a display board (1) and a carrier board (3),
5 LED's (2) being mounted on a first face of the display board and the carrier
board being for attachment to a frame, the display board (1) and the carrier
board (3) being fastened together by the intermediary of a spacer (7) and an
adjusting means (6) positioned between the spacer and the carrier board
wherein the adjusting means engage in an opening (33) in the carrier board,
10 the adjusting means allowing a compensation of the tolerances affecting the
position of the LED's with respect to the carrier board (3) in a direction
perpendicular to the carrier board whereby the compensation is obtained by
the position of the adjusting means (6) in their corresponding opening (33).
- 15 2. A display tile according to claim 1 wherein the display board (3) has
LEDs (2) and the adjusting means is for adjusting a relative position of the
tops of the LEDs (2) with respect to a carrier board (3).
- 20 3. A display tile according to claim 1 or 2 wherein the display board (3) has
LEDs (2) and the distance between a first surface (61) of the adjusting
means and a first surface (31) of the carrier board is set to the difference
between a nominal distance (D0) and the sum of the distance between the
tops of LEDs (2) on the LED board (1) and a second surface (12) of the
LED board, the length of the spacer (7) and the thickness of the carrier board
25 (3), wherein the nominal distance (D0) is the distance between the top of the
LEDs and the second surface (32) or back of the carrier board (3).

4. A display tile according to any of the preceding claims wherein a sidewall (34) of the opening (33) in the carrier board (3) is perpendicular to the second surface (32) of the carrier board (3).

5

5. A display tile according to any of the preceding claims wherein a sidewall (63) of the adjusting means (6) is parallel to the sidewall (34) of the opening (33) in the carrier board.

10 6. A display tile according to any of the preceding claims wherein the thickness of the adjusting means (6) is less than the thickness of the carrier board (3).

15 7. A display tile according to any of the preceding claims wherein the cross section of the adjusting means (6) fits in the opening (33).

20 8. A display tile according to any of the preceding claims wherein the adjusting means (6) is fastened to the carrier board by glue (9) extending on a second surface (62) and/or a sidewall (63) of the adjusting means (6) and a sidewall (34) of the opening (33).

9. A display tile according to any of the preceding claims wherein the cross section of the adjusting means has a first area in a first part of the adjusting means and a second area in a second part of the adjusting means.

25

10. A display tile according to claim 9 wherein the adjusting means has a

first part that is a circular right cylinder with a first radius and a second part that is a circular right cylinder with a second radius smaller than the first radius.

5 11. A display tile according to any of the preceding claims wherein a fastening means (8) fastens the adjusting means (6) to the spacer (7).

12. A display tile according to claim 11 wherein the fastening means (8) goes through an opening (64) in the adjusting means (6).

10

13. A display tile according to claim 12 wherein the fastening means (8) is a screw.

14. A display tile according to any of claims 1 to 11 wherein a threaded
15 extension extends from a first surface (61) of the adjusting means (6) and that the spacer (7) has a matching threaded opening to receive the threaded extension.

15. A display tile according to claim 14 wherein the second surface (62) of
20 the adjusting means is a driving surface.

16. A method to adjust the distance between the tops of the LEDs (2) on a first surface of a LED board on a display tile and the back surface (32) of the carrier board (3) of the display tile, the method comprising the steps:
25 - positioning the tops of the LEDs (2) on a LED board (1) in a first reference plane (101),

- aligning openings (33, 33b...) in the carrier board with spacers (7, 7b...) distributed on the LED board (1),
- positioning a second surface of a carrier board (3) in a second reference plane (104); a first surface (1 1) of the carrier board facing a second surface of the LED board (1); the first and second reference planes being parallel and the distance between the first and second reference planes being equal to a desired nominal distance (D0),
- moving adjusting means (6, 6b...) in the openings (33, 33b) until a first surface (61 , 61 b ...) of each adjusting means contacts a spacer (7, 7b),
- fastening each adjusting means to its corresponding spacer,
- fastening the adjusting means (6, 6b) to the carrier board (3).

17. A tiled display apparatus comprising a plurality of display tiles according to any of the claims 1 to 15 fixed to a frame.



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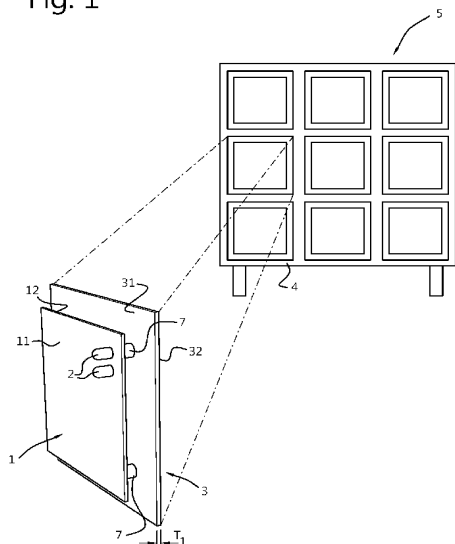
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(54) **Title:** ADJUSTABLE DISPLAY TILE FOR TILED DISPLAY

Fig. 1



(57) **Abstract:** The invention relates to a display tile comprising a display board (1) and a carrier board (3) fastened together by the intermediary of a spacer (7) and an adjusting means positioned between the spacer (7) and the carrier board (3) whereby the adjusting means engage in an opening in the carrier board (3). The invention further relates to methods to adjust the distance between the top of a LED (2) on a first surface (11) of a LED board on a display tile and the back surface (32) of the carrier board of the display tile.

Adjustable Display Tile for Tiled Display

Field of the Invention

The present invention pertains to the field of display apparatus, and in particular to a display tile, a tiled display apparatus comprising same, an apparatus for
5 adjusting the geometry of a display tile, a method for adjusting the geometry of a display tile and a jig to facilitate the method for adjusting.

Background

The regularity of the seam existing between display tiles in a tiled display is important to avoid visual artefacts. The regularity of the seam is a function of
10 the alignment of the display tile. Technique and apparatuses to align display tiles in tiled display are known in the art. For instance, US8,384,616B2 describes how clips and receptacles are used to align adjacent display tiles with a high accuracy.

These and similar tile alignment techniques suppose that the LED themselves
15 are properly aligned with the tile itself.

The LEDs are soldered to a LED board and the LED board is fastened to a carrier board. Aligning the LED board and the carrier board is usually done by means of one or more reference pin(s). The reference pin(s) is/are used to align the LED board with references (e.g. a corner) of the carrier board.
20 Unfortunately, there are tolerances on the position of the LEDs with respect to the LED board on which they are soldered and therefore, aligning the LED board perfectly with the carrier board by means of reference pins on the LED board does not mean that the LED themselves will be perfectly aligned with the carrier board. As a result, even if adjacent LED tiles are perfectly aligned, the
25 relative position of the LEDs on different LED tiles may vary across a tiled display, thereby introducing visual artefacts.

Another problem not addressed by the clips and receptacles used in the prior art is the “z-coordinate” or position of the LED in a direction perpendicular to the plane of the LED board. Variation of the z position of the LED from tile to tile is

the source of visual artefacts when the direction of a viewer's gaze is not along the normal to the plane of a tiled display.

What is needed is a solution to adjust the distance between the top of the LEDs on the LED board and a reference, e.g. the back surface of the carrier board.

- 5 It is known in the art to adjust the distance between two objects fastened together with e.g. screws and bolts by adding washers between the two objects. The problem with this technique is that varying the distance between two objects is only possible by multiples of the thickness of the washers if off-the shelf washers are used or that the washers have to be machined for every LED
10 board in function of the actual distance between the LED and the LED board. This is neither practical nor economical.

Summary of the Invention.

- A display tile according to the invention comprises a display board (1) and a carrier board (3) fastened together by the intermediary of a spacer (7) and an
15 adjusting means (6) positioned between the spacer and the carrier board. The adjusting means (6) engages in an opening (33) in the carrier board. The adjusting means is for adjusting the distance between the display board and the carrier board, e.g. between the tops of LEDs on the display board (called the LED board) and the carrier board.

- 20 It is an advantage of the present invention that adjusting the relative position of LEDs on a LED board with respect to a carrier board will improve the alignment of tiles in tiled displays. Another advantage is that the seam between tiles will be as regular as possible, thereby avoiding the introduction of misalignments and their associated visual artefacts. These advantages can each or both be
25 achieved without having to machine components specific to a LED board in function of the distance between the LEDs and the LED board.

- The position of the adjusting means in the opening is changed until the distance between a first surface (61) of the adjusting means and a first surface (31) of
30 the carrier board is the difference between a nominal distance (D0) and the sum

of the distance between the top of LEDs (2) on the LED board (1) and a second surface (12) of the LED board, the length of the spacer (7) and the thickness of the carrier board (3). In other words, the distance between a first surface (61) of the adjusting means (6) and a first surface (31) of the carrier board (3) is equal to:

$D0 - (\text{distance between the top of the LEDs and a second surface of the LED board}) - (\text{length of the spacer}) - (\text{thickness of the carrier board}).$

The nominal distance D0 is the desired distance between the top of the LEDs and the second surface (32) or back of the carrier board (3).

It is an advantage of that aspect of the invention that the position of the tops of the LEDs on the LED board with respect to the carrier board, and in particular a second face or back face of the carrier board will be determined with higher precision than if the distance of the LED board and the carrier board were only determined by spacers of fixed dimensions positioned between the LED board and the carrier board. Embodiments of the invention can allow the realization of tiled displays where the tops of the LEDs across the tiled display are substantially in the same plane thereby avoiding visual artefacts.

In another aspect of the invention, a sidewall (34) of the opening (33) in the carrier board can be perpendicular to the second surface (32) of the carrier board (3).

Furthermore, the sidewall (63) of adjusting means (6) can be parallel to the sidewall (34) of the opening (33) in the carrier board.

It is an advantage of that aspect of the invention that it will be easier to change the position of the adjusting means and to fasten it to the spacer from the back of the display tile.

In another aspect of the invention, the cross section of the adjusting means (6) fits in the opening (33). In other words, the distance between the sidewall of the opening and the sidewall of the adjusting means is less than e.g. 5% or less

than e.g. 1% of a lateral dimension of the opening. In particular, the distance between the sidewall of the opening and the sidewall of the adjusting means can be small enough to introduce some friction between the sidewall of the opening and the adjusting means without making movement of the adjusting means in the opening impossible when e.g. a force of e.g. 1N or between 1 and 10N or between 10 and 100N is applied on the adjusting means in a direction perpendicular to the second surface of the carrier board.

It is an advantage of that aspect of the invention that the movement of the adjusting means in the opening will be substantially restricted except in a direction perpendicular to (the second surface of) the carrier board thereby simplifying the task of the technician adjusting the relative position of the LED board and the carrier board. Furthermore, if the distance between the sidewall of the adjusting means and the sidewall of the opening is limited, it will be easier to dispense glue without spilling it beyond the adjusting means before it has hardened, or set or has been cured, in particular when the perpendicular to the carrier board is parallel to the local acceleration of gravitation, i.e. when the second face of the carrier board is facing "up".

In another aspect of the invention, the adjusting means (6) is fastened to the carrier board by glue dispensed on the second surface (62) of the adjusting means and the sidewall (34) of the opening (33).

It is an advantage of this aspect of the invention that it is possible to easily fix the distance between the top of the LED and the second surface of the carrier board of the display tile with a minimum of operations.

In a further aspect of the invention, the cross section of the adjusting means in the opening varies in a direction perpendicular to the carrier board. The distance between the sidewall of the adjusting means can for instance be greater in the upper part of the adjusting means (i.e. the part of the adjusting means closest to the second surface of the carrier board when the adjusting means is in the opening) than in the lower part of the adjusting means.

It is an advantage of this aspect of the invention that it will be easier to dispense glue on part of the sidewall of the adjusting means, thereby improving the fastening of the adjusting means to the carrier board.

- 5 In a further aspect of the invention, a fastening means 8 fastens the adjusting means to the spacer.

The fastening means can go through an opening in the adjusting means before mating with the spacer.

The fastening means can for instance be a screw.

- 10 In an alternative aspect of the invention, the fastening means 8 is an integral part of the adjusting means. The fastening means can be a threaded extension that extends from the first surface of the adjusting means in a direction perpendicular to that surface of the adjusting means to mate with a threaded opening in the spacer. The second surface of the adjusting means can then be
15 a driving surface, i.e. it can be slotted, the slot (65) allowing interaction of the second surface (62) with a tool like a screwdriver.

It is an advantage of that aspect of the invention that it will further limit the number of operations required to fasten the adjusting means to the spacer.

- 20 According to an aspect of the invention, there is provided a method to adjust the distance between the tops of the LEDs on a display tile and the back surface of the carrier board of the display tile. It is an advantage of the proposed method that it will compensate for the tolerances affecting the position of the LEDs, the thickness of the LED board, the length of the spacers and the thickness of the carrier board.

- 25 The LED board and the carrier board can be positioned parallel to each other (the first surface of the carrier board facing the second surface of the LED board), the distance between the tops of the LEDs and the second surface or back surface of the carrier board being taken equal to the desired distance. In other words, the tops of the LEDs on the LED board are positioned in a first

reference plane; the second surface of the carrier board is positioned in a second reference plane parallel to the first plane, the second surface of the carrier board facing away from the LED board; the distance between the first reference plane and the second reference plane being the desired or nominal distance between the tops of the LEDs and the second surface of the carrier board. The opening(s) in the carrier board aligned with the spacer(s) on the LED board.

The adjusting means is moved in the opening in the carrier board until a first surface of the adjusting means contacts the spacer.

The adjusting means and the spacer are fastened together. Glue is dispensed in the opening on the sidewall of the opening and on a second surface of the adjusting means. The glue is then allowed to harden, to set or to cure to fasten the adjusting means to the carrier board at the position where the adjusting means compensates for the tolerances affecting the position of the LEDs with respect to the carrier board in a direction perpendicular to the carrier board.

Fixing the distance between the top of the LEDs and the second surface of the carrier board can be facilitated by using a jig manufactured with better tolerances than the LED board and the carrier board.

The jig has a first surface or reference surface. Sidewalls extend from the first surface of the jig. If the tolerance on the thickness of the carrier board is sufficiently small to be neglected, the top of the sidewalls serves as support or stop for the carrier board that is positioned in parallel with the reference surface. The LED board is positioned with the LEDs in contact with the reference surface.

The height of the sidewalls can be chosen such that when the sidewalls are in contact with the carrier board, the distance between the second surface of the carrier board (facing away from the reference surface) and the reference surface is equal to the nominal distance or desired distance between the tops of the LEDs on the LED board and the second surface of the carrier board. The position of the adjusting means in the opening of the carrier board is modified

until a first surface of the adjusting means contacts the spacer. The adjusting means and the spacer are then fastened. Glue is dispensed in the opening to fasten the adjusting means to the carrier board and to fix its position in the opening, thereby guaranteeing that when the carrier board and LED board are taken out of the jig, the distance between the second surface of the carrier board and the tops of the LEDs is equal to the nominal or desired distance.

If the tolerances on the thickness of the carrier board cannot be neglected, the sidewalls of the jig preferably have a step. The distance between the top of the outermost part to which the sidewall extends and the reference surface (in a direction perpendicular to the reference surface) is equal to the nominal or desired distance. The distance between the top of the innermost part of the sidewall and the reference surface is less than the nominal or desired distance minus the nominal thickness of the carrier board.

A flexible material (like e.g. elastomer, rubber, such as silicone rubber, or a foam such as polyurethane foam) is positioned between the top of the innermost part of the sidewall and the carrier board. The thickness of the flexible material is chosen so that pressure must be applied to the carrier board to make the second surface of the carrier board flush or coplanar with the top of the outermost part of the sidewall of the jig. When the second surface of the carrier board is flush with the top of the outermost part of the sidewall of the jig, the distance between the tops of the LED and the second surface of the carrier board is the nominal or desired distance. The position of the adjusting means in the opening of the carrier board is modified until a first surface of the adjusting means contacts the spacer. The adjusting means and the spacer are then fastened. Glue is dispensed in the opening to fasten the adjusting means to the carrier board and to fix its position in the opening, thereby guaranteeing that when the carrier board and LED board are taken out of the jig, the distance between the second surface of the carrier board and the tops of the LEDs is equal to the nominal or desired distance.

The present invention in other aspects relates to a display apparatus, a tiled display apparatus comprising display tiles, an apparatus for adjusting the

geometry of a display tile, to a jig to facilitate the method for adjusting a relative position of the display board with respect to the carrier board.

Brief description of the figures.

- 5 Figure 1 shows a perspective view of a display tile according to an embodiment of the invention.

Figure 2 shows a perspective view of the carrier board and the adjusting means according to an embodiment of the invention.

- 10 Figure 3 shows an exploded view of a display tile according to an embodiment of the invention.

Figure 4 shows a cross section of a display tile according to an embodiment of the invention by a plane perpendicular to the display tile when the tolerances are negligible.

- 15 Figure 5a shows a cross section of a display tile according to an embodiment of the invention when the top of the LED is farther away from the first surface **11** of LED board **1** than nominal.

Figure 5b shows a cross section of a display tile when the top of the LED is farther away from the first surface **11** of LED board **1** than nominal and not compensated for.

- 20 Figure 6a shows a cross section of a display tile according to an embodiment of the invention when the top of the LED is closer the first surface **11** of LED board **1** than nominal

Figure 6b shows a cross section of a display tile when the top of the LED is closer the first surface **11** of LED board **1** than nominal is not compensated for.

- 25 Figure 7a shows examples of geometries for the adjusting means **6** and the opening **33** according to an embodiment of the invention.

Figures 7b and 7c show an example of adjusting means **6** where the cross

sections in a first part and a second part of the adjusting means are different according to an embodiment of the invention.

Figures 8a, 8b and 8c show a cross section of a display tile according to embodiments of the invention where the adjusting means 6 and 6b compensate
5 for an irregular LED board, spacers 7 and 7b of different lengths and an irregular carrier board respectively.

Figure 9 shows a perspective view and a cross section of an example of adjusting means with an integral fastening means according to an embodiment of the invention.

10 Figure 10 shows an example of method to adjust a display tile according to an embodiment of the invention.

Description of embodiments.

The present invention will be described with respect to particular embodiments and with reference to certain drawings but the invention is not limited thereto but
15 only by the claims. The drawings described are only schematic and are non-limiting. In the drawings, the size of some of the elements may be exaggerated and not drawn on scale for illustrative purposes. The dimensions and the relative dimensions do not correspond to actual reductions to practice of the invention.

20

While the description will be done for a LED display, the invention also applies to display tile where an image forming element (e.g. a liquid crystal panel) or a set of image forming elements (e.g. OLED) on a display board must be aligned with a carrier board. In the following any reference to LED (light emitting diode)
25 can be replaced with OLED (organic light emitting diode). In the following a display board will be described with reference to an LED display, and hence the display board will be called LED board, as an example. However, the display board is not limited to an LED board but includes other types of boards such as display boards with OLED emitters.

30

A LED board **1** consists of a printed circuit board (PCB) bearing electrically conducting tracks e.g. copper tracks that connects Light Emitting Diodes **2** (LED) to various electronic components (like e. g. current drivers, power supply contacts etc...). As seen on figure 1, The LED board **1** has a first face **11** and a second face **12** that are parallel. The LEDs are mounted on the first face **11** of the LED board. The tolerance on the vertical position of the LED **2** with respect to the first face **11** is the same for all LEDs mounted on the same LED board **1**. The LEDs can be surface mount devices or through-hole devices.

The LED board **1** is fastened to a carrier board **3**. The carrier board **3** will be the mechanical interface between the LED board and a support structure **4** of a tiled display **5**.

The carrier board **3** has a first face **31** and a second face **32**. The first face **31** and the second face **32** are substantially parallel to each other. The distance between the first face **31** and the second face **32** is the thickness T1 of the carrier board **3**. The first face **31** (the front or front face of the carrier board **3**) will be closest to the LED board **1** when the LED board **1** and the carrier board **3** are assembled. The second face **32** (the back or back face of the carrier board **3**) will be closest to the support structure **4** when the LED board **1** and its associated carrier board **3** are fastened to the support structure **4**.

The carrier board **3** has at least one opening **33** extending from the first face **31** to the second face **32**. The opening **33** has sidewalls **34** that are preferably perpendicular to the first face **31** and the second face **32** of the carrier board **3**. The intersection of the sidewalls **34** and the first face **31** is a curve C1. C1 is preferably a circle but other curves such as arcuate are possible.

An adjusting means **6** has a first face **61** and a second face **62**. The first face **61** and the second face **62** are preferably substantially parallel to each other. The adjusting means **6** has a third face **63** extending from the first face **61** to the second face **62**. The third face is preferably perpendicular to the first face **61** and the second face **62**. The adjusting means **6** is positioned in the opening **33** in the carrier board **3**, the first face and second face **61** and **62** of adjusting

- means **6** being parallel to the first and second face **31** and **32** of the carrier board **3**. For instance, if the opening **33** is cylindrical and the curve C1 is a circle of radius R1 as on figure 2, the cross section of the adjusting means **6** is preferably a circle C2 with a radius R2 equal to or slightly smaller than the radius R1. Other cross sections are possible for the adjusting means **6**, some examples of which are given on figure **7a** where the curve C1 is a curve or a square. In some cases it may be advantageous that the thickness T2 of the adjusting means **6** is less than the thickness T1 of the carrier board **3** (in particular at the level of the opening **33**).
- 10 The cross section of the adjusting means **6** by a plane parallel to first face **61** can vary from the first surface **61** to the second surface **62**. In particular, the cross section of adjusting means **6** can decrease close to the second surface. In particular as illustrated on figures 7b and 7c, the cross section can have an area equal to that of the first surface **61** in a first part of the adjusting means close to first surface **61** and can have a second area less than the area of surface **61** in a second part of the adjusting means adjacent to surface **62**. If the opening **33** determines a circle in the second surface **32** of the carrier board **3**, the adjusting means can for instance be the combination of two circular right cylinders: a first cylinder of radius R3 (not shown – slightly smaller than R1) in a first part delimited on one side by the first surface **61** and a second cylinder of radius R2 in a second part delimited on one side by the second surface **62**.
- 25 The space **35** between the sidewall **34** of the opening **3** and the sidewall **63** of the adjusting means **6** along the second part of the adjusting means **6** is thereby larger and it is easier to dispense glue in the space **35** to fasten the adjusting means to the carrier board **3**. At the same time, the first part of the adjusting means will prevent the glue from spilling onto the spacer and the LED board. It is advantageous to have a space **35** between to dispense glue on both a portion of the sidewall **34** of the opening **33** and a portion of the sidewall **63** of the adjusting means **6**. Indeed, by increasing the surface glued, the fastening of the adjusting means **6** to the carrier board **3** is improved.
- 30

At least one spacer **7** is fastened to the second face **12** of the LED board **1**. The

position of the spacer **7** corresponds to the position of the opening **33** in the carrier board **3** when the LED board **1** is positioned parallel to the carrier board **3**, the second face **12** of the LED board **1** facing the first face **31** of the carrier board **3**. The length of spacer **7** on different LED boards is less variable than
5 the distance D1 between the top of LED **2** and the first face **11** of LED board **1** on different LED boards. The spacer **7** is usually cylindrical and is of the female type, i.e. it has an opening that can accommodate a fastening element **8**.

At least one fastening element **8** is used to fasten the carrier board **3** to the LED board **1**. The fastening element **8** is for instance a screw that fits in the opening
10 **71** of the spacer **7**.

As seen on figure 3, the fastening element **8** goes through an opening **64** of adjusting means **6** from the second face **62** to the first face **61**, preferably perpendicularly to the faces **61** and **62**. The opening **64** is preferably unthreaded, the fastening element **8** can move through it without excessive
15 resistance.

A head **81** of fastening element will stop the progression of fastening element **8** through adjusting means **6**. For instance, if the fastening element **8** is a screw, the head of the screw will press against the second face **62** of the adjusting means **6** and stop the progression of the screw **8** even if a force is exerted on
20 the screw.

As the screw **8** is screwed in the female spacer **7**; the screw **8** moves closer to the second face **12** of LED board **1**. The screw **8** has a length such that it can be screwed in the spacer **7** until the first face **61** of adjusting means **6** is in contact with spacer **7**. For instance, the length L1 of the screw **8** is less than the
25 thickness T2 of the adjusting means **6** and the length L2 of the female opening of the spacer **7** combined ($L1 < T2 + L2$). When the screw **8** cannot go any deeper into the spacer **7**, the adjusting means **6** is fastened to the carrier board **3**. This can be done by dispensing glue **9** inside the opening **33**, preferably from the second surface **32**, the glue **9** contacting at least the second surface **62** of
30 adjusting means **6** and the sidewall **34** of the opening **33** in the carrier board **3**.

Depending on the cross section of adjusting means 6, the glue may go deeper into the opening **33** and contact the sidewalls **63** of adjusting means 6.

Alternatively, the opening **64** of adjusting means 6 can be threaded and the spacer **7** can have a male threaded part **72** instead of a threaded opening **71**.

- 5 Adjusting means 6 is screwed over the male threaded part **72** until it cannot slide any further into the opening **33**. Glue **9** is then dispensed in the opening **33** on the sidewall **34** and the second face **62** of adjusting means 6 to fasten the carrier board **3** and the adjusting means 6 together.

- 10 The glue **9** is chosen in function of the material of the carrier board **3** and the adjusting means 6. The glue **9** is preferably a fast curing glue.

- There is preferably more than one spacer **7** distributed evenly across the second face **12** of the LED board **1**. For each spacer **7b**, there will be a corresponding opening **33b** in the carrier board **3** and a corresponding adjusting means **6b**. The position in an opening **33b** of the adjusting means **6b**
15 associated with a particular spacer **7b** can be the same for all the openings and their associated adjusting means. This will be the case if the thickness of the LED board **1**, the thickness of the carrier board **3** is constant across the board and the length of the spacers **7**, **7b**... is the same for spacer **7**, **7b**...

- If the thickness of the LED board **1** and/or the carrier board **3** is not constant
20 across the board and/or the length of the spacers is not the same for the spacers **7**, **7b** ... due to tolerances, the position of adjusting means **6**, **6b**... in their corresponding opening **33**, **33b**...can be different. This is illustrated on figure 8a (thickness of the LED board not constant across the board), figure 8b (spacers **7** and **7b** have different lengths) and figure 8c (thickness of the carrier
25 board not constant across the board). The adjusting means **6** can thus compensate for tolerances affecting different components of the display tile.

- The area of opening **33** in the carrier board **3** is preferably larger than the area of a cross section of the spacer **7** by a plane parallel to the first and second faces of the carrier board. This is to ensure that the spacer **7** can penetrate the
30 opening **33** if made necessary by the tolerance on the position of the LED **2** with

respect to the first surface **11** of the LED board **1**.

Alternatively to a screw, the fastening means **8** can be an integral part of the adjusting means **6**. As illustrated on figure 9, the fastening means **8** can be a threaded extension that extends from the first surface **61** of the adjusting means **6** in a direction perpendicular to that surface of the adjusting means **6** to mate with a threaded opening in the spacer **7**. The second surface **62** of the adjusting means can then be a driving surface, i.e. it can be slotted, a slot **65** in second surface **62** allowing interaction of the second surface **62** with a tool like a screwdriver.

Alignment of the LEDs **2** with carrier board **3** can be facilitated by the use of a jig **10**.

The jig has at least a first "bottom" part **10A**. The bottom part **10A** has a first surface **101**. The first surface **101** has an area sufficient to accommodate all the LED on the LED board **1**.

The jig can have a second "top" part **10B**. The top part **10B** will help position the carrier board with respect to the LED board **1**.

The bottom part **10A** has sidewalls **102** extending above its first surface **101**. The rim of the first surface **31** of the carrier board **3** can contact a surface **103** of the sidewalls **102**. The distance between the first surface **101** of the bottom part **10A** and the second surface **32** of the carrier board **3** corresponds to the desired distance **D0** between the tops of the LED **2** on the LED board **1** and the second surface **32** of the carrier board **3**. In this first embodiment of the jig **10**, the distance between the surface **103** and the first surface **101** is equal to the nominal distance **D0** minus the thickness of the carrier board **3**.

In general, when the tolerance on the thickness of the carrier board is not negligible, a second embodiment of the jig **10** is used wherein the sidewalls **102** have a second surface **104** along an outer edge of the sidewalls **102**. The second surface **104** is parallel to the first surface **101** (the reference surface). The distance between the second surface **104** and the first surface **101** is equal

to the nominal distance D0 desired between the top of the LEDs **2** and the second surface **32** of the carrier board **3**. In this case, the distance between the surface **103** and the first surface **101** is less than the nominal distance D0 minus the nominal thickness of the carrier board **3**.

- 5 An elastic material **105** like e.g. elastomer or rubber covers the surface **103** of the sidewalls. The thickness of the elastic material **105** is determined in function of its elasticity, the distance between the first surface **103** and the second surface **104** and the nominal thickness of the carrier board **3**. Once positioned in the jig, the carrier board **3** is in contact with the elastic material **105** and a
- 10 force is applied on one or more points of the second surface **32** of the carrier board **3** to bring the second surface **32** of the carrier board at the same level as the second surface **104** of the sidewall **102**. This is evaluated in first instance at the periphery of the carrier board **3**. Alternatively, a top part **10B** of the jig **10** is fastened to the bottom part **10A** of the jig by means of e.g. screws. Pressure is
- 15 applied to the carrier board either directly by the top part or by means of screws fitting in threaded openings in the top part. Once the second surface **32** of the carrier board **3** is flush with the second surface **104** of the sidewalls, the distance between the top of the LEDs **2** (in contact with the reference surface **101**) and the second surface **32** of the carrier board **3** is equal to the nominal or
- 20 desired distance. Openings in the top part **10B** of the jig permit access to the openings **33**, **33b** ... in the carrier board **3**.

The method of assembling the LED board **1** to the carrier board **3** in order to obtain the desired distance between the top of the LED **2** and the second surface **32** of the carrier board **3** will now be detailed. An example of the method

25 is given on figure 10.

In a first step S10 the tops of LEDs **2** on the LED board **1** are positioned in a first reference plane **101**.

With help of the jig **10**, this is done by positioning the LED board **1** on the bottom part **10A** of the JIG **10** with the tops of LEDs **2** in contact with the first

30 surface **101**.

In a second step S20, the openings (33, 33b ...) in the carrier board are aligned with the spacers (7, 7b ...).

In a third step S30, the second surface **32** of the carrier board **3** is positioned in a second reference plane **104**; the first surface **31** of the carrier board **3** facing
5 the second surface **12** of the LED board. The first and second reference planes are parallel and the distance between the first and second reference plane is equal to a nominal distance D0.

When using the first embodiment of the jig, positioning the second surface **32** of the carrier board in the second reference plane in step S20 is done by bringing
10 the first surface **31** of the carrier board in contact with the surface **103** of the sidewall **102**.

When using the second embodiment of the jig **10**, the first surface **31** of the carrier board **3** is brought into contact with the elastic material **105** and pressure is applied to the carrier board until the second surface **32** of the carrier board in
15 the second reference plane corresponding to the second surface **104** of the sidewall **102** of the jig.

Steps 20 and 30 can be interchanged. For instance when only part 10A is used, the carrier board can first be positioned on the surface 103 to be at the correct distance and then slid in the plane of surface 103 to align openings 33, 33b ...
20 with the corresponding spacers 7, 7b ...

In a fourth step S40, an adjusting means **6** is positioned in the opening **33** and moved in the opening in a direction perpendicular to the second surface **32** until a first surface **61** of the adjusting means contacts a spacer **7**. This operation is repeated for every spacer **7** that can be accessed by an opening **33** in the
25 carrier board.

In a fifth step S50, the adjusting means **6** is fastened to the spacer **7**. This operation is repeated for every spacer **7** that can be accessed by an opening **33** in the carrier board.

When using e.g. a screw **8** to fasten the adjusting means **6** to the spacer **7**, the

opening **71** in the spacer **7** and the opening **64** in adjusting means **6** are aligned. Screw **8** is engaged in opening **64** and screwed in threaded opening **71** of the spacer **7** until the head **81** of screw **8** contacts the second surface **62** of adjusting means **6** and presses adjusting means **6** against the spacer **7**.

- 5 In a sixth step S60, the adjusting means **6** is fastened to the carrier board **3**. This can be done by dispensing glue **9** in the opening **33** of the carrier board. The operation is repeated for each spacer on the LED board **1** facing an opening in the carrier board **3**.

The distance between the tops of the LEDs and the second face of the carrier
10 board is now fixed and equal to D0.

Alternatively, step S50 and step S60 can be interchanged. In particular, when the fastening means **8** is an integral part of the adjusting means as is the case on figure 9; the first surface **61** of the adjusting means **6** will come in contact with the spacer **7** after the fastening means **8** is completely engaged in the
15 threaded opening of spacer **7**. In other words, the first surface **61** will contact the spacer **7** as a result of fastening the adjusting means **6** to the spacer **7**.

If glue is used to fasten the adjusting means to the carrier board and if a screw going through an opening **64** of the adjusting means is used to fasten the adjusting means and the spacer, it may be advantageous to fasten the adjusting
20 means and the spacer before dispensing the glue. Indeed, in that case, the opening **64** being then obstructed by the screw **8**, the glue **9** will not spill into the opening **64**.

Figure 4 to Figure 6 show three typical situations and the resulting position of the adjusting means **6** to fasten LED board **1** to carrier board **3**.

- 25 In figure 4, the tops of the LEDs **2** are at a nominal distance from the first surface **11** of LED board **1**.

In Figure 5a, the tops of the LEDs **2** are farther away from the first surface **11** of LED board **1** than nominal (nominal distance between the LED body and the LED board is figured as ND on figures 4 to 6b).

If nothing were done about it (as on figure 5b), where the carrier board and the LED board are fastened together without the help of adjusting means 6, fastening the LED board **1** to the carrier board **3** without the adjusting means 6 would lead to a distance D1 between the back of the carrier board **3** and the tops of LEDs **2** larger than the desired distance D0.

The difference between D1 and D0 can be compensated for by the adjusting means 6 as follows: the spacer **7** can enter the opening **33**; and the adjusting means 6 sliding into opening **33** follows the spacer **7** thereby compensating for the difference between the actual and nominal position of the LED **2** above the first surface **12** of the LED board. The position of adjusting means **6** is fixed with glue and the distance between the top of the LED **2** and the back **32** of the carrier board **3** is the desired D0.

In Figure 6a, the tops of the LEDs **2** are closer to the first surface **11** of LED board **1** than a nominal distance.

If nothing were done about it as on figure 6b, fastening the LED board **1** to the carrier board **3** without the adjusting means **6** would lead to a distance D1 between the back of the carrier board **3** and the top of LED **2** smaller than the desired distance D0.

The difference between D1 and D0 can be compensated for by the adjusting means **6** as follows: the spacer **7** does not intersect the plane of the first surface **31** of the carrier board **3** and the adjusting means 6 comes partially out of opening **33** (the first surface **61** is below the first surface **31**) and stops when it contacts the spacer **7** compensating for the difference between the actual and nominal position of the LED **2** above the first surface **12** of the LED board. The position of adjusting means 6 is fixed with glue and the distance between the top of the LED **2** and the back of the carrier board **3** is the desired D0.

The LED board **1** can warp during manufacturing or manipulation. To compensate for this, pressure can be applied at several points of the second surface **12** of LED board **1** when it is positioned in a jig **10**.

The top part **10B** of the jig **10** is fastened to the bottom part **10A** e.g. by means of screws. At least one threaded component **11** e.g. screws with a blunt end can be screwed through threaded openings in the top part **10B** and pass through openings in the carrier board **3**. The blunt ends **110** of the threaded components

5 **11** straighten a warped LED board by applying pressure on at least one point of the LED board **1** and preferably 4 non collinear points of the second surface **12** of the LED board **1**.

Fig. 1

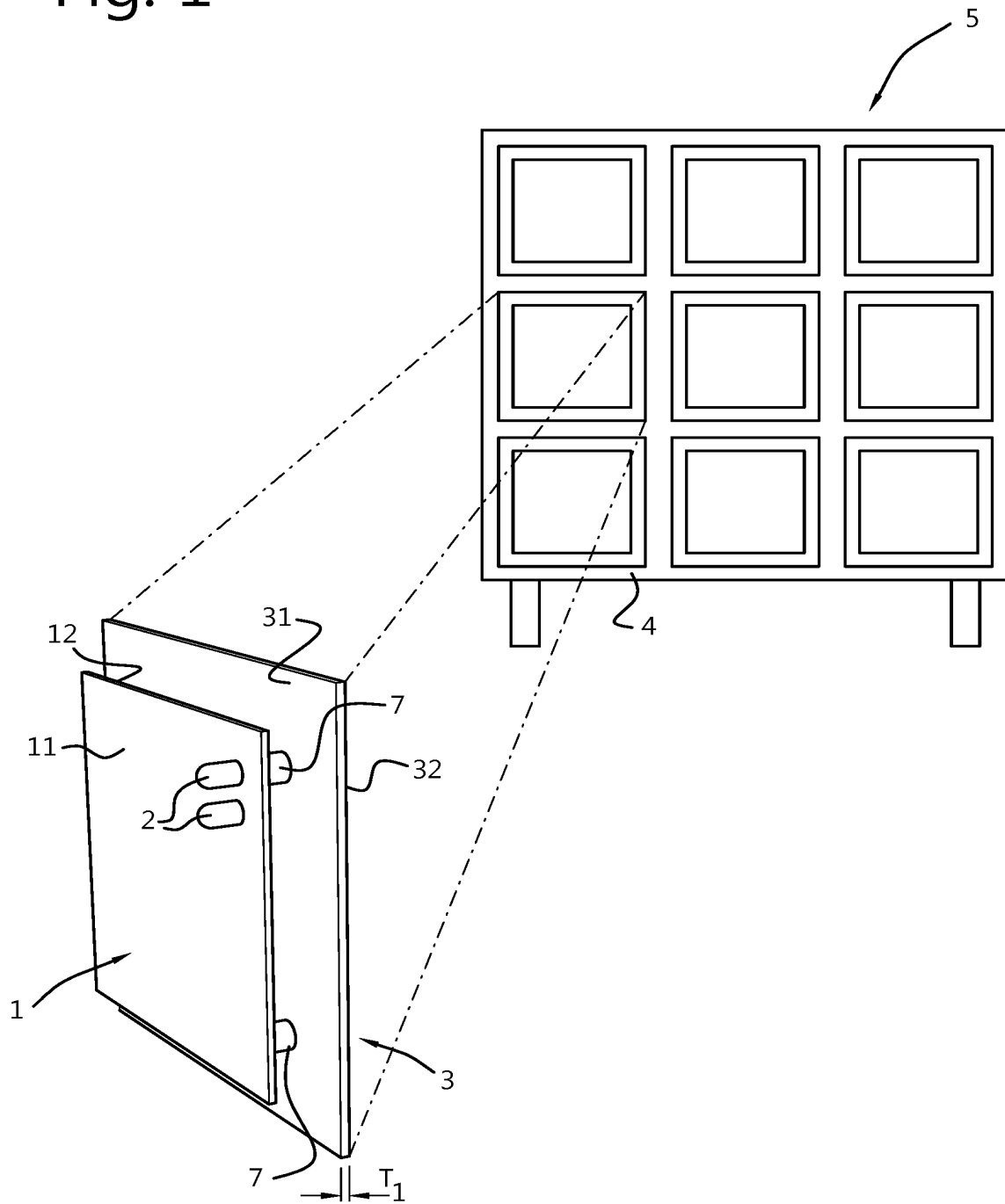


Fig. 2

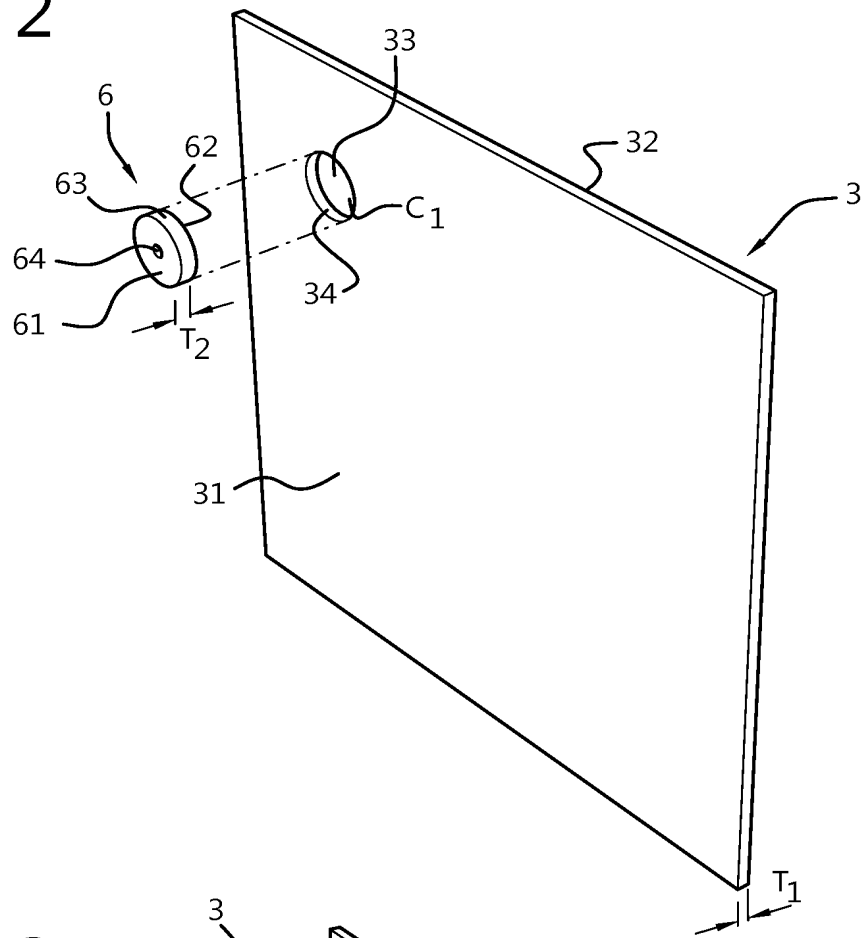


Fig. 3

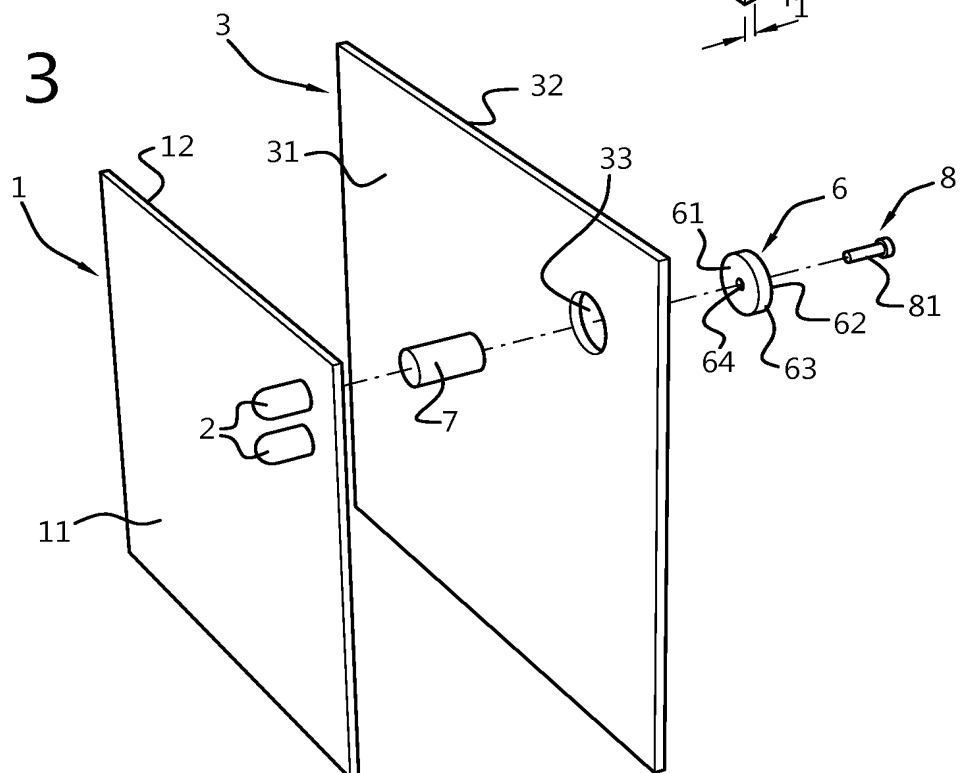


Fig. 4

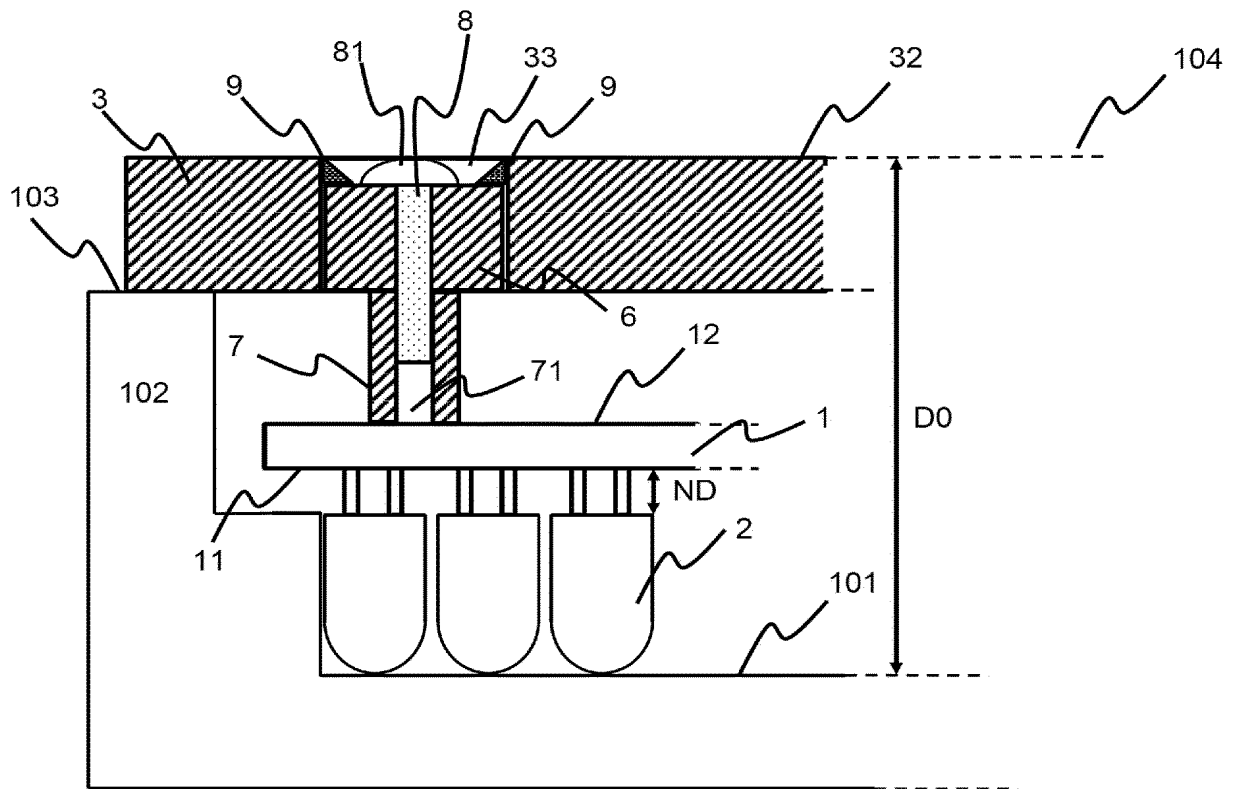


Fig. 5a

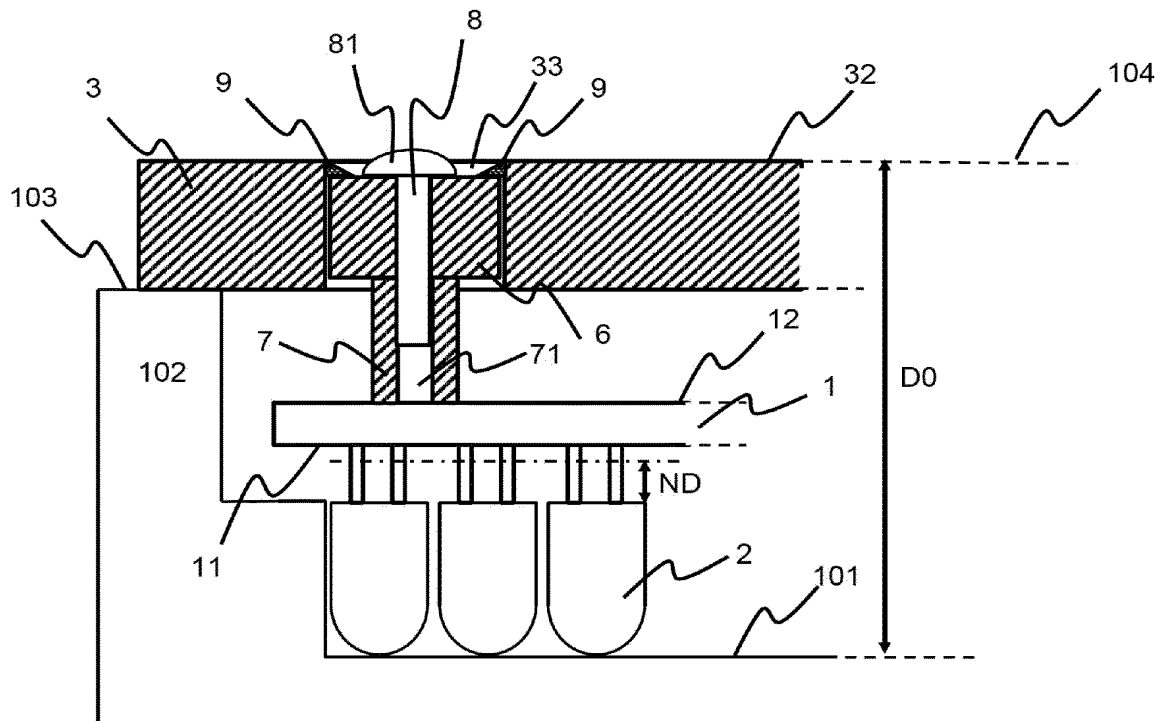


Fig. 5b

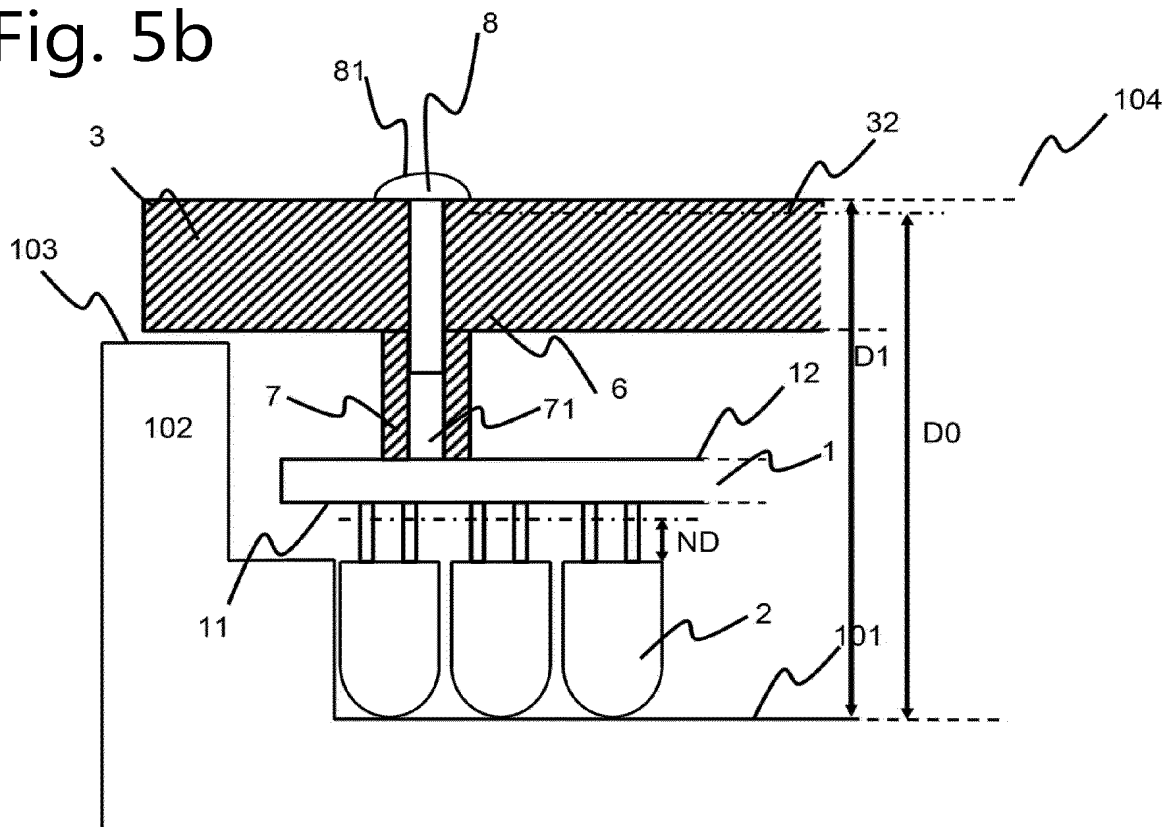


Fig. 6a

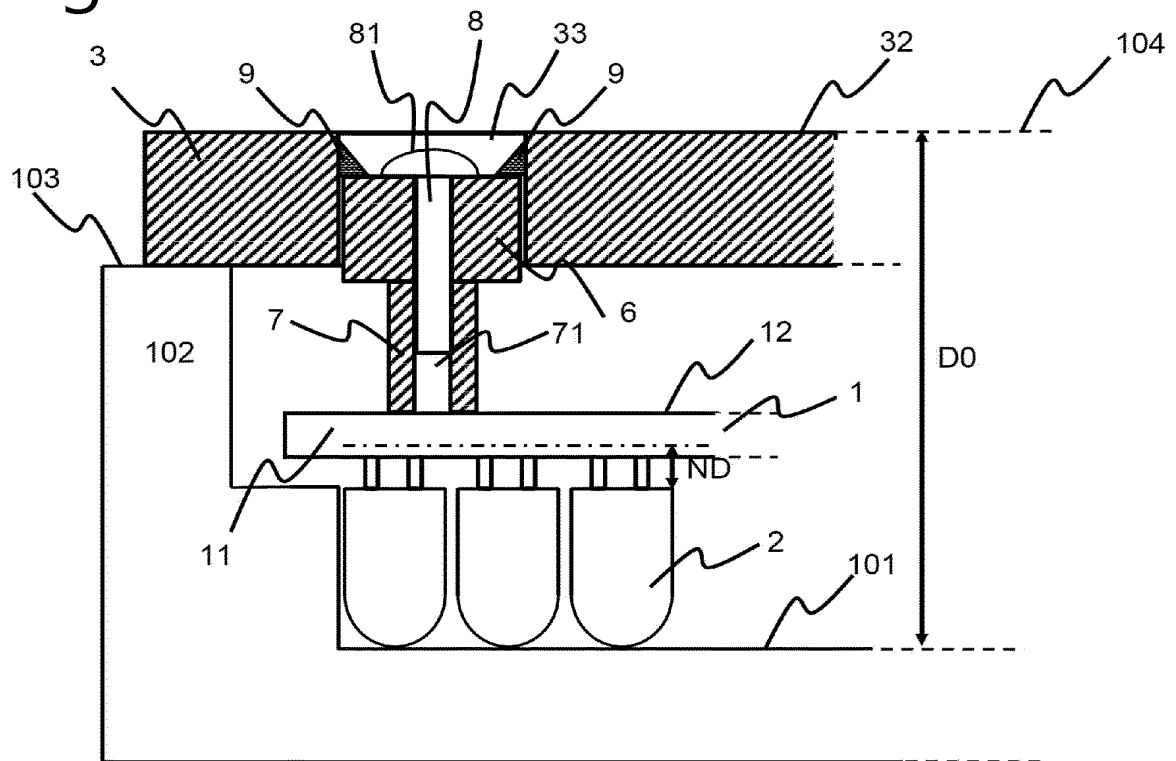


Fig. 6b

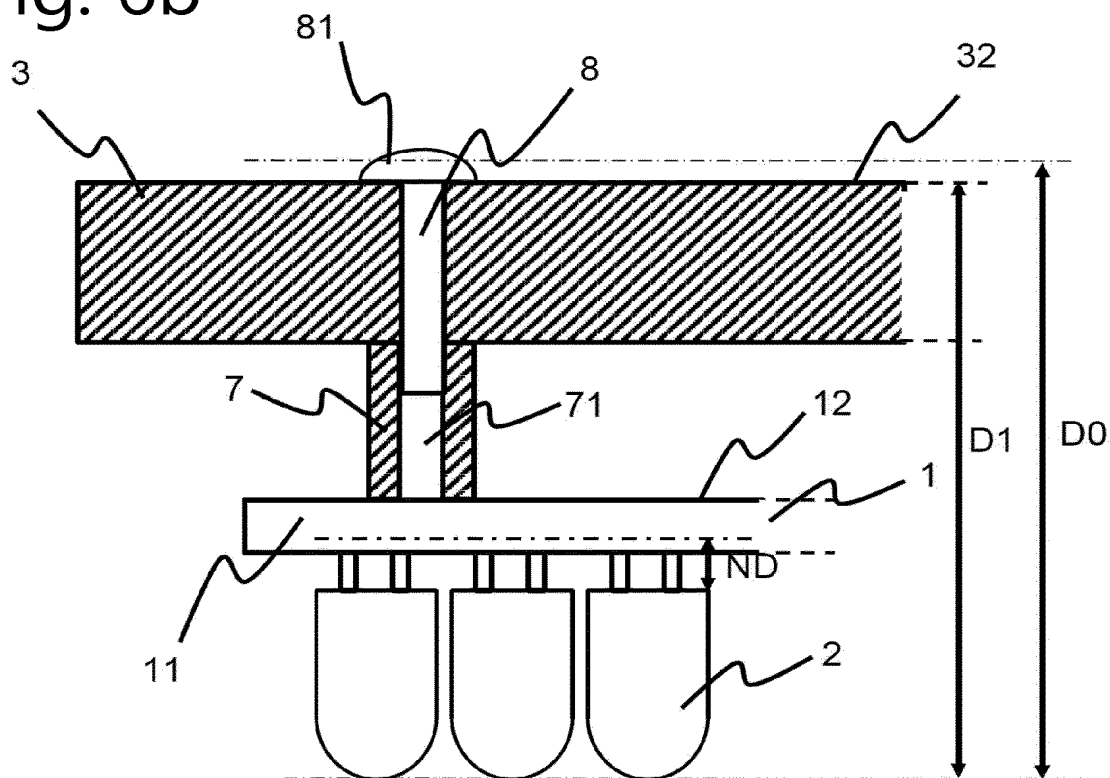


Fig. 7a

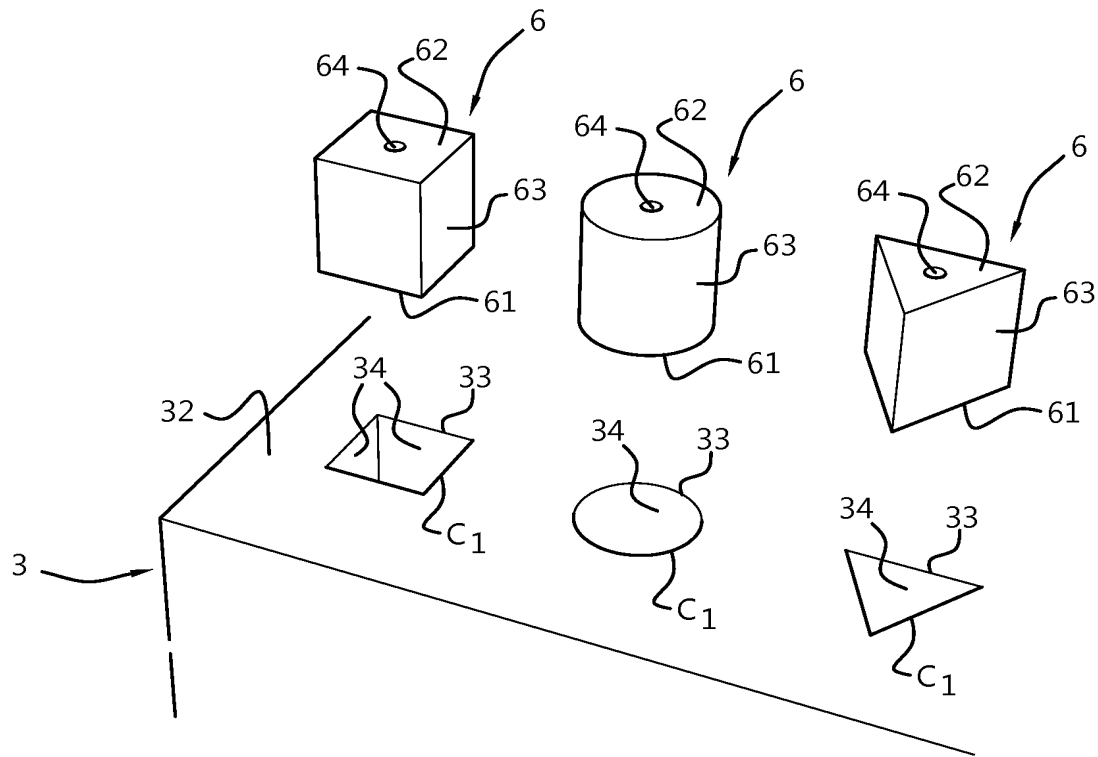


Fig. 7b

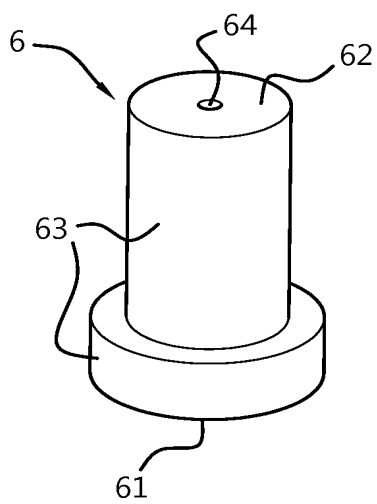


Fig. 7c

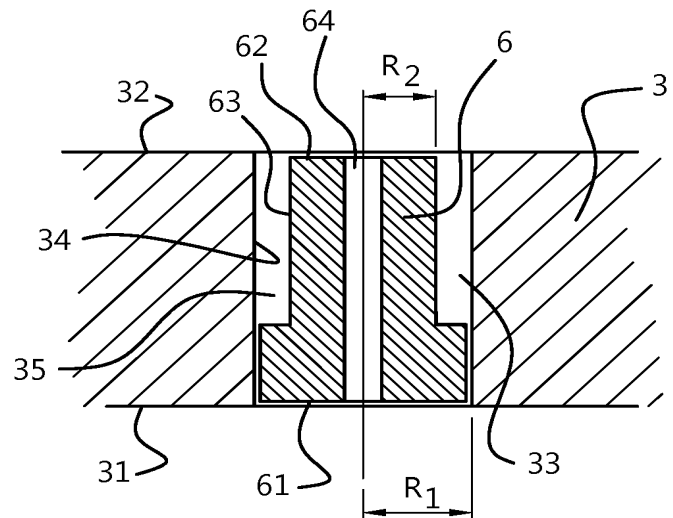


Fig. 8a

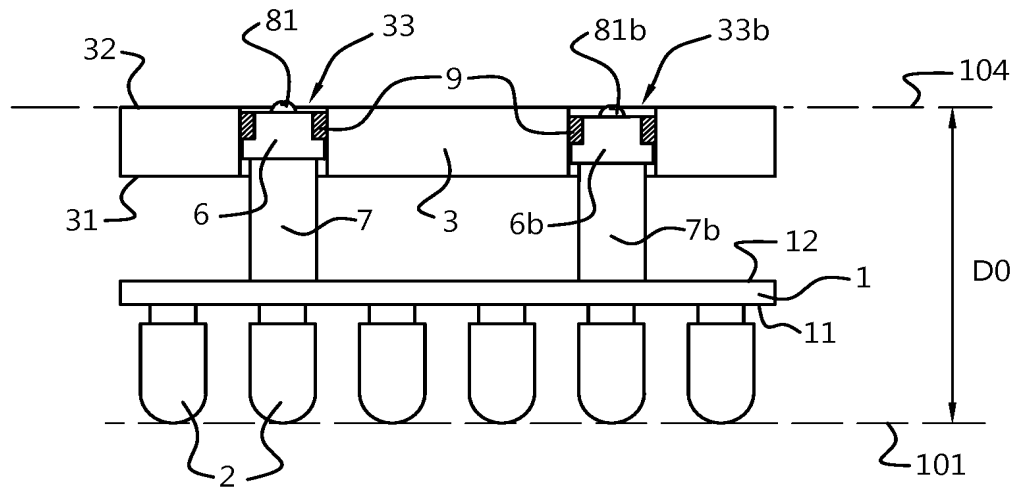


Fig. 8b

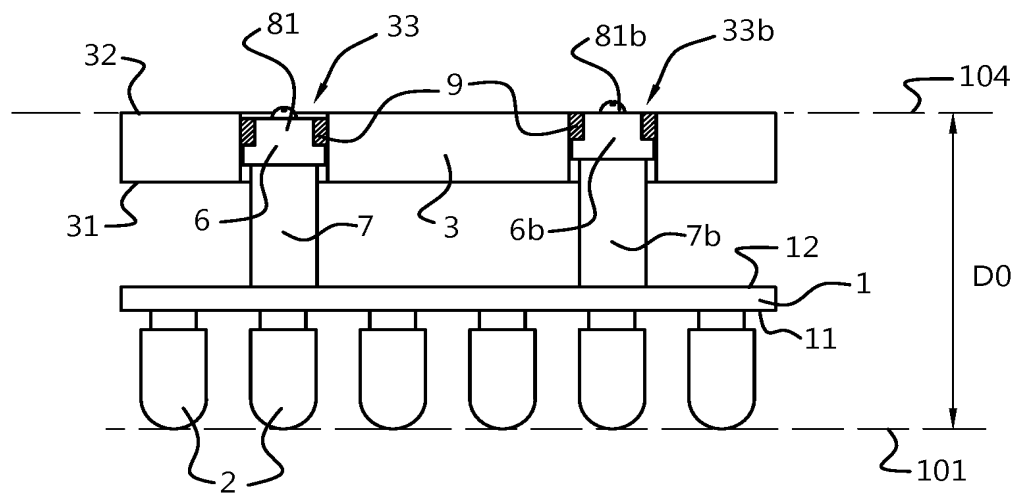


Fig. 8c

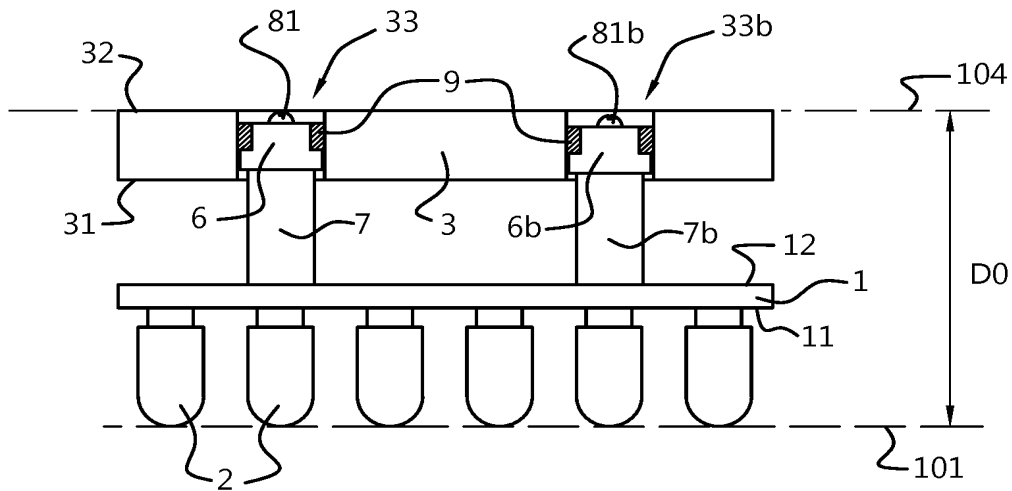


Fig. 9a

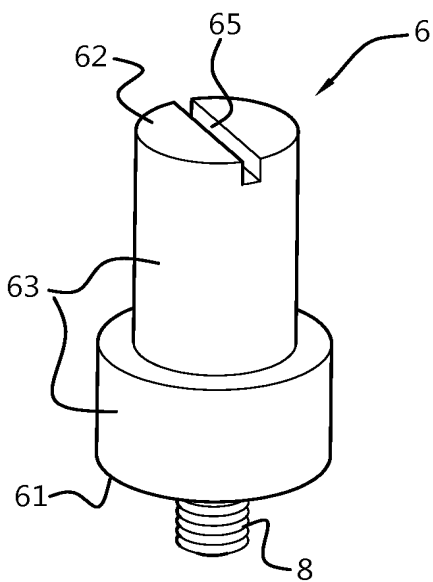


Fig. 9b

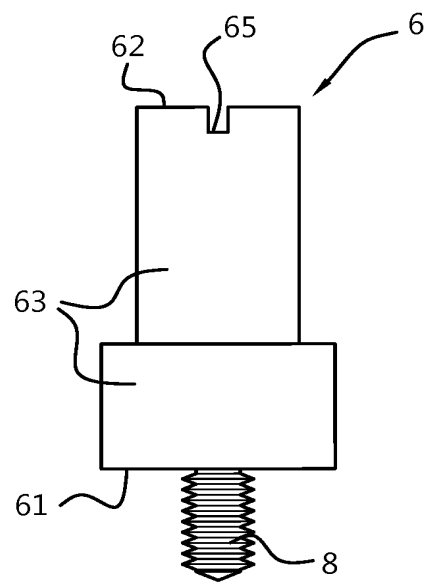
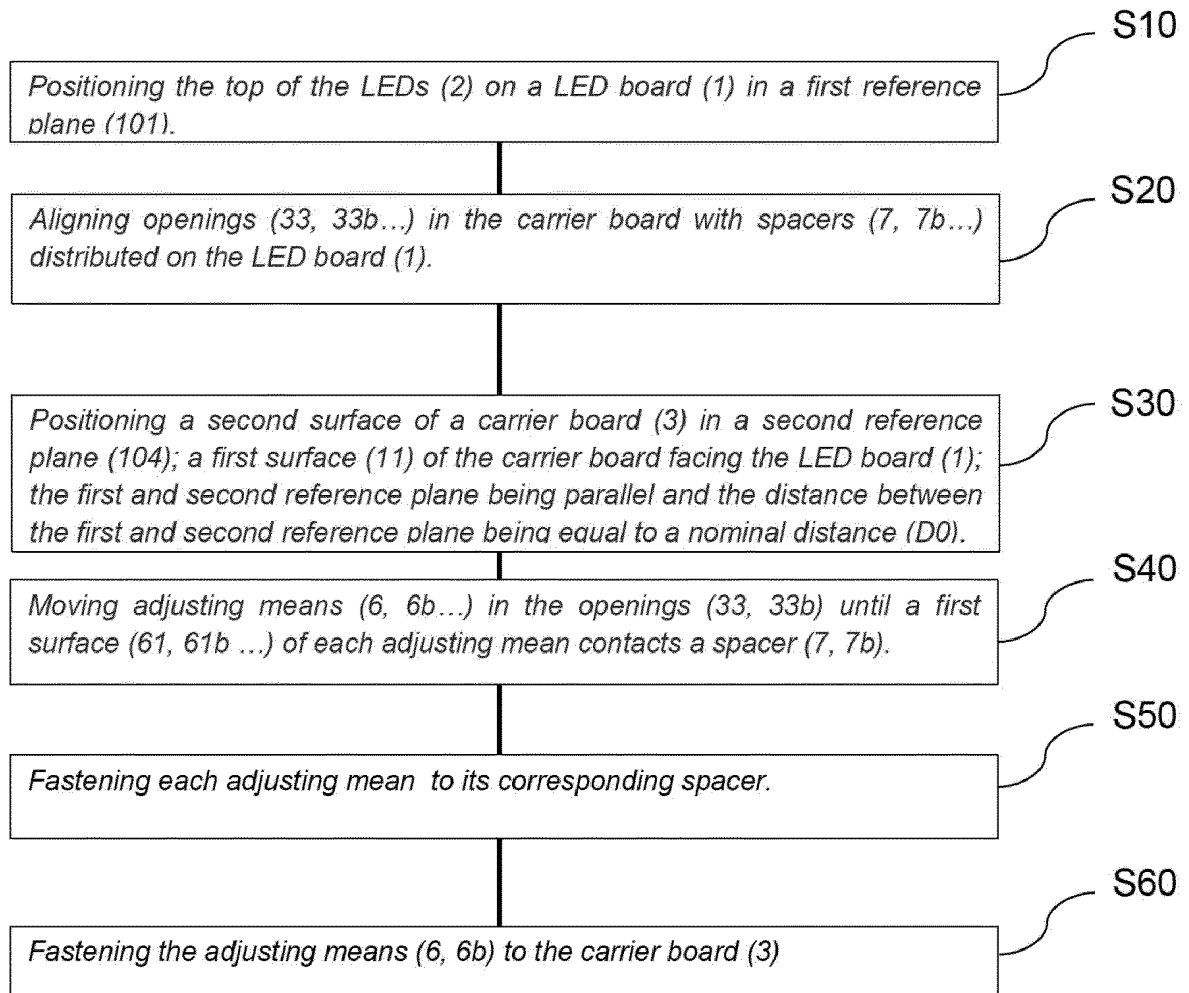


Fig. 10



Claims.

1. A display tile comprising a display board (1) and a carrier board (3), the carrier board being for attachment to a frame, the display board (1) and the carrier board (3) being fastened together by the intermediary of a spacer (7) and an adjusting means (6) positioned between the spacer and the carrier board wherein the adjusting means engage in an opening (33) in the carrier board, the adjusting means being for adjusting a relative position of the display board (1) with respect to the carrier board (3).
2. A display tile according to claim 1 wherein the display board (3) has LEDs (2) and the adjusting means is for adjusting a relative position of the tops of the LEDs (2) with respect to a carrier board (3).
3. A display tile according to claim 1 or 2 wherein the display board (3) has LEDs (2) and the distance between a first surface (61) of the adjusting means and a first surface (31) of the carrier board is set to the difference between a nominal distance (D0) and the sum of the distance between the tops of LEDs (2) on the LED board (1) and a second surface (12) of the LED board, the length of the spacer (7) and the thickness of the carrier board (3).
4. A display tile according to any of the preceding claims wherein a sidewall (34) of the opening (33) in the carrier board (3) is perpendicular to the second surface (32) of the carrier board (3).
5. A display tile according to any of the preceding claims wherein a sidewall (63) of the adjusting means (6) is parallel to the sidewall (34) of the opening (33) in the carrier board.
6. A display tile according to any of the preceding claims wherein the thickness of the adjusting means (6) is less than the thickness of the

carrier board (3).

- 5
7. A display tile according to any of the preceding claims wherein the cross section of the adjusting means (6) fits in the opening (33).
8. A display tile according to any of the preceding claims wherein the adjusting means (6) is fastened to the carrier board by glue (9) extending on a second surface (62) and/or a sidewall (63) of the adjusting means (6) and a sidewall (34) of the opening (33).
- 10
9. A display tile according to any of the preceding claims wherein the cross section of the adjusting means has a first area in a first part of the adjusting means and a second area in a second part of the adjusting means.
- 15
10. A display tile according to claim 9 wherein the adjusting means has a first part that is a circular right cylinder with a first radius and a second part that is a circular right cylinder with a second radius smaller than the first radius.
- 20
11. A display tile according to any of the preceding claims wherein a fastening means (8) fastens the adjusting means (6) to the spacer (7).
12. A display tile according to claim 11 wherein the fastening means (8) goes through an opening (64) in the adjusting means (6).
- 25
13. A display tile according to claim 12 wherein the fastening means (8) is a screw.
- 30
14. A display tile according to any of claims 1 to 11 wherein a threaded extension extends from a first surface (61) of the adjusting means (6) and that the spacer (7) has a matching threaded opening to receive the

threaded extension.

15. A display tile according to claim 14 wherein the second surface (62) of the adjusting means is a driving surface.

5

16. A method to adjust the distance between the tops of the LEDs (2) on a first surface of a LED board on a display tile and the back surface (32) of the carrier board (3) of the display tile, the method comprising the steps:

- 10
- positioning the tops of the LEDs (2) on a LED board (1) in a first reference plane (101),
 - aligning openings (33, 33b...) in the carrier board with spacers (7, 7b...) distributed on the LED board (1),
 - positioning a second surface of a carrier board (3) in a second
- 15
- reference plane (104); a first surface (11) of the carrier board facing a second surface of the LED board (1); the first and second reference planes being parallel and the distance between the first and second reference planes being equal to a nominal distance (D0),
- 20
- moving adjusting means (6, 6b...) in the openings (33, 33b) until a first surface (61, 61b ...) of each adjusting means contacts a spacer (7, 7b),
 - fastening each adjusting means to its corresponding spacer,
 - fastening the adjusting means (6, 6b) to the carrier board (3).

25

17. A tiled display apparatus comprising a plurality of display tiles according to any of the claims 1 to 15 fixed to a frame.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875						Application or Docket Number 15/317,761			
APPLICATION AS FILED - PART I									
(Column 1)		(Column 2)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY			
FOR	NUMBER FILED	NUMBER EXTRA	RATE(\$)	FEE(\$)		RATE(\$)	FEE(\$)		
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	280		
SEARCH FEE (37 CFR 1.16(k), (j), or (m))	N/A	N/A	N/A			N/A	480		
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	720		
TOTAL CLAIMS (37 CFR 1.16(i))	27	minus 20 = 7				x 80 =	560		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	2	minus 3 =				x 420 =	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		
			TOTAL			TOTAL	2040		
* If the difference in column 1 is less than zero, enter "0" in column 2.									
APPLICATION AS AMENDED - PART II									
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY	
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)	
	Total (37 CFR 1.16(i))	27	Minus 20	7	x	-	x	-	
	Independent (37 CFR 1.16(h))	2	Minus	3	x	-	x	-	
	Application Size Fee (37 CFR 1.16(s))								
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))								
			TOTAL ADD'L FEE			TOTAL ADD'L FEE			
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY	
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)	
	Total (37 CFR 1.16(i))	-	Minus	-	x	-	x	-	
	Independent (37 CFR 1.16(h))	-	Minus	-	x	-	x	-	
	Application Size Fee (37 CFR 1.16(s))								
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))								
			TOTAL ADD'L FEE			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.									