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(54) ILLUMINATION SYSTEM

(57) An illumination system comprises a feed and control bar and at least one illumination device which is couplable to the feed bar. The feed and control bar carries a feed line and a digital control line. Each illumination device is provided with mechanical connection means to mechanically support the illumination device by the feed bar, feed contacts adapted to establish an electric contact with the feed line, and control contacts adapted to establish an electric contact with the digital control line so as to allow the illumination device to be controlled by a remote control unit.

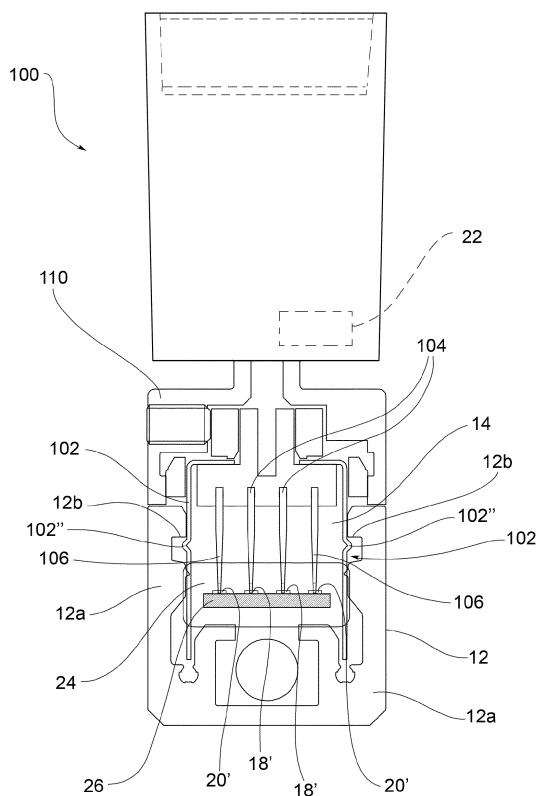


FIG.2

Description

[0001] The present invention relates to an illumination system.

[0002] Illumination systems are known, comprising a feed bar to which one or more illumination devices are connected, for example, adjustable spotlights, lamps, suspensions lamps, etc. For example, the feed bar is fixed to a ceiling or wall and also mechanically support the devices connected thereto.

[0003] Usually, the feed bar carries a feed line which simultaneously provides the feed of electricity to all connected devices. The user, by means of a switch, may therefore turn on, turn off and possibly dim all the devices connected to the same feed line, without however having the possibility to individually control such devices.

[0004] Furthermore, although these illumination systems are increasingly designed to be assembled and mounted on site even by unskilled personnel, the connection of the illumination devices to the feed bar requires rather expensive mechanical fixing and electrical wiring operations, which may be complex and time-consuming for inexperienced users.

[0005] It is the object of the present invention to suggest an illumination system of the aforementioned type, but adapted to allow a selective control of single devices or groups of devices.

[0006] It is another object of the invention to suggest an illumination system which is particularly simple and quick to assemble, as well as highly flexible from the point of view of the positioning of the illumination devices along the feed bar.

[0007] It is a further object of the invention to provide an illumination system which, in addition to obviating the aforementioned drawbacks, is designed to be used in outdoor environments as well.

[0008] Such objects are achieved by an illumination system in accordance with claim 1. The dependent claims describe preferred or advantageous embodiments of the illumination system.

[0009] The features and advantages of the illumination system according to the invention will however become apparent from the following description of preferred embodiments thereof, given by way of indication and not by way of limitation, with reference to the accompanying drawings, in which:

- Figures 1 and 1a are two views of an example of an illumination system according to the invention;
- Figure 2 is a sectional view of the illumination system, at the coupling between a spotlight and the feed and control bar; and
- Figure 3 is a plan view of a portion of a circuit board of the feed and control bar.

[0010] In said drawings, reference numeral 1 indicates an illumination system according to the invention as a whole.

[0011] In accordance with a general embodiment, the illumination system 1 comprises a feed and control bar 10 and at least one illumination device 100; 100' which may be coupled to the feed and control bar 10, in any axial position along the latter.

[0012] The feed and control bar 10 comprises a bar body 12 which extends longitudinally along a bar axis (X). For example, the bar body 12 is made with an extruded section bar, for example, of aluminum.

[0013] This bar body 12 is adapted to be fixed to a support 2, for example a ceiling or a wall.

[0014] The bar body 12 forms a body seat 14 defining a longitudinal opening 16 in the bar body 12. In other words, the body seat 14 is open along one side of the bar body 12, for example, a side opposite to that for fixing it to the support.

[0015] The feed and control bar 10 further comprises a feed line 18, which extends along the bar body 12, and a digital control line 20, which also extends along the bar body 12.

[0016] Each illumination device 100; 100' is provided with mechanical connection means 102 adapted to interact with the bar body 12 in order to mechanically support the illumination device 100; 100' on the feed bar 10.

[0017] Each illumination device 100; 100' is further provided with feed contacts 104 adapted to establish an electric contact with the feed line 18 so as to feed electricity to the illumination device 100; 100'.

[0018] Each illumination device 100; 100' is further provided with control contacts 106 adapted to establish and electric contact with the digital control line 20 so as to allow the illumination device 100; 100' to be controlled by a remote control unit - not shown.

[0019] Each illumination device 100; 100' further comprises an electronic processing unit 22, operatively connected to the control contacts 20.

[0020] In an embodiment, the feed 18 and control lines 20 consist of electrical conductors 18', 20', which are embedded in a band-shaped body 24 made of a polymer material and inserted with shape and/or force coupling into the body seat 14.

[0021] In an embodiment, the electrical conductors 18', 20' are formed on a circuit board 26 embedded in the band-shaped body 24.

[0022] For example, the circuit board 26 is co-molded with the band-shaped body 24. In an alternative embodiment, the band-shaped body 24 is crossed by a longitudinal seat and the circuit board 26 is subsequently inserted in such a longitudinal seat.

[0023] In any case, the band-shaped body 24 with the circuit board 26 is inserted with shape and/or force coupling into the body seat 14 so as to give the feed and control bar 10 a degree of protection which is suitable for use in outdoor environments, thus resistant to weathering and dust.

[0024] In an embodiment, the feed line 18 consists of two conductors 18', one for the positive pole and one for the negative pole, for example +24V and -24V.

[0025] In an embodiment, the control line 20 consists of two electrical conductors 20'.

[0026] In an embodiment, the control line 20 and the electronic processing unit 22 are designed to support a digital communication protocol, for example, the standard "Dali" protocol.

[0027] For example, the four electrical conductors 18', 20' extend parallel to one another.

[0028] In an embodiment, in the case of several illumination devices 100; 100' coupled to the feed and control bar 10, such devices are fed in parallel.

[0029] In an embodiment, the feed contacts 104 and the control contacts 106 are in the form of needles adapted to penetrate the band-shaped body 24.

[0030] In an embodiment, the mechanical connection means 102, the feed conductors 104 and the control conductors 106 are designed so as to simultaneously produce the mechanical and electrical connection between the illumination device 100; 100' and the feed and control bar 10.

[0031] For example, the mechanical connection means 102 and the feed 104 and control conductors 106 extend from a connecting portion 110 of the illumination device resting against the bar body 12 when said mechanical connection means 102 are hooked on the bar body 12.

[0032] In an embodiment, the mechanical connection means 102 comprise a pair of anchoring arms 102' adapted to engage the bar body 12 in a snap-fit manner.

[0033] For example, these anchoring arms 102' are suitable for snap engaging a pair of parallel lateral walls 12a of the bar body 12 which delimit the longitudinal seat 14.

[0034] In an embodiment, an undercut 12b is formed in each of the lateral walls 12a. Each anchoring arm 102' is provided with a locking tooth 102" which is engageable by a relevant undercut 12b of the lateral wall 12a.

[0035] In other words, the anchoring arms 102' are elastic arms snapping into the locking position when the locking tooth meets the undercut.

[0036] In some embodiments, the locking tooth 102" has a curvilinear profile, so as to allow the disengagement thereof from the undercut if the illumination device 100; 100' is pulled in a direction orthogonal to the bar axis (X).

[0037] In other embodiments, however, the locking tooth is designed so as to prevent a separation of the illumination device 100; 100' from the bar 10.

[0038] Of course, the mechanical connection means may have other shapes and may engage the outer sides of the lateral walls. For example, they may comprise brackets, tilting plates, and/or screw systems.

[0039] In some embodiments, the mechanical connection means and the feed and control conductors are obtained in a connecting portion 110 of the illumination device, adapted to be housed in the body seat 14. For example, this connecting portion 110 may be designed so as to be inserted with shape and/or force coupling into

the body seat 14. In other words, it is the connecting portion itself that performs the function of mechanical connection means.

[0040] In an embodiment, the illumination device 100' is designed so as to be fully accommodated, for example with shape and/or force coupling, in the body seat 14. For example, the illumination device 100' is in the form of an illumination bar and comprises a linear illumination source, for example, created with a circuit board on which a row of point sources is mounted, embedded in an insulating body, for example, made of a transparent polymer material, such as a silicone material.

[0041] In an embodiment, the electronic processing unit is designed to receive a control signal from the remote control unit, by means of the digital control line 20, and to control the feed of electricity to the illumination device depending on such a control signal.

[0042] In particular, the processing unit of each illumination device is operatively connected to storage means in which a unique address associated with the device (or a group of devices) is stored. The control signal comprises a data item representative of such a unique address.

[0043] Therefore, in the case of an illumination system comprising a plurality of illumination devices which may be coupled to the feed and control bar, it is possible for the user to control, even selectively, individual devices or groups of devices by interacting with the remote control unit.

[0044] The illumination devices, being smart, recognize the digital command transmitted by the remote control unit along the control line. If such a digital command contains an identification signal, for example an address, coinciding with the identification data item stored in the device, the processing unit on board the device enables the control of the feed of electricity.

[0045] It is apparent that the structure of the illumination system further allows the illumination devices to be coupled to the feed and control bar in a highly simple and quick manner, also allowing to position the devices at any point of the bar.

[0046] By virtue of the contact created between the connecting portion of the illumination device and the band-shaped body made of a polymer material, the coupling of the device to the bar is sealed against the penetration of water, dust and other external agents. Therefore, the illumination system may also be used in outdoor environments.

[0047] Those skilled in the art may make changes and adaptations to the embodiments of the illumination system according to the invention or may replace elements with others which are functionally equivalent in order to meet contingent needs, without departing from the scope of the following claims. All the features described as belonging to a possible embodiment can be achieved irrespective of the other embodiments described.

Claims**1.** Illumination system, comprising:

- a feed and control bar; and
- at least one illumination device which is couplable to the feed bar, in any axial position along said illumination bar,

wherein:

- the feed and control bar comprises:
 - a bar body which extends longitudinally along a bar axis (X), is suitable for being fixed to a support, for example a ceiling or a wall, and forms a body seat defining a longitudinal opening in the bar body;
 - a feed line which slides along the bar body;
 - a digital control line which slides along the bar body; and wherein
 - each illumination device is provided with:
 - mechanical connection means suitable for interacting with the bar body in order to mechanically support the illumination device on the feed bar;
 - feed contacts suitable for establishing electrical contact with the feed line so as to feed electricity to the illumination device;
 - control contacts suitable for establishing electrical contact with the digital control line so as to allow the illumination device to be controlled by a remote control unit;
 - an electronic processing unit operatively connected to the control contacts.

2. Illumination system according to claim 1, wherein the feed and control lines are formed by electrical conductors, for example in the form of needles, that are embedded in a band-shaped body which is made of a polymeric material and is form-fittingly and/or force-fittingly inserted into the body seat.**3.** Illumination system according to claim 2, wherein said electrical conductors are formed on a circuit board embedded in the band-shaped body.**4.** Illumination system according to either claim 2 or claim 3, wherein the feed contacts and the control contacts are in the form of needles suitable for penetrating the band-shaped body.**5.** Illumination system according to any of the preceding claims, wherein the mechanical connection means, the feed conductors and the control conductors are designed so as to simultaneously produce the mechanical and electrical connection between the illumination device and the feed and control bar.**6.** Illumination system according to any of the preceding claims, wherein the mechanical connection means and the feed and control conductors extend from a connecting portion of the illumination device that rests against the bar body when said mechanical connection means are hooked on the bar body.**7.** Illumination system according to any of the preceding claims, wherein the mechanical connection means comprise a pair of anchoring arms suitable for engaging the bar body in a snap-fit manner.**8.** Illumination system according to the preceding claim, wherein the bar body has a pair of parallel lateral walls which delimit the body seat, an undercut being made in each of said lateral walls, and wherein each anchoring arm is provided with a locking tooth which is engageable by a relevant undercut of the lateral wall.**9.** Illumination system according to any of the preceding claims, wherein the mechanical connection means and the feed and control conductors are made in a connecting portion of the illumination device that is suitable for being housed in the body seat.**10.** Illumination system according to any of the preceding claims, wherein the electronic processing unit is designed to receive a control signal from the remote control unit and to control the feed of electricity to the illumination device depending on said control signal.**11.** Illumination system according to claim 10, comprising a plurality of illumination devices which couplable to the feed and control bar, wherein the processing unit of each illumination device is operatively connected to storage means in which a unique address associated with the device is stored, and wherein the control signal comprises a data item which is representative of said unique address.

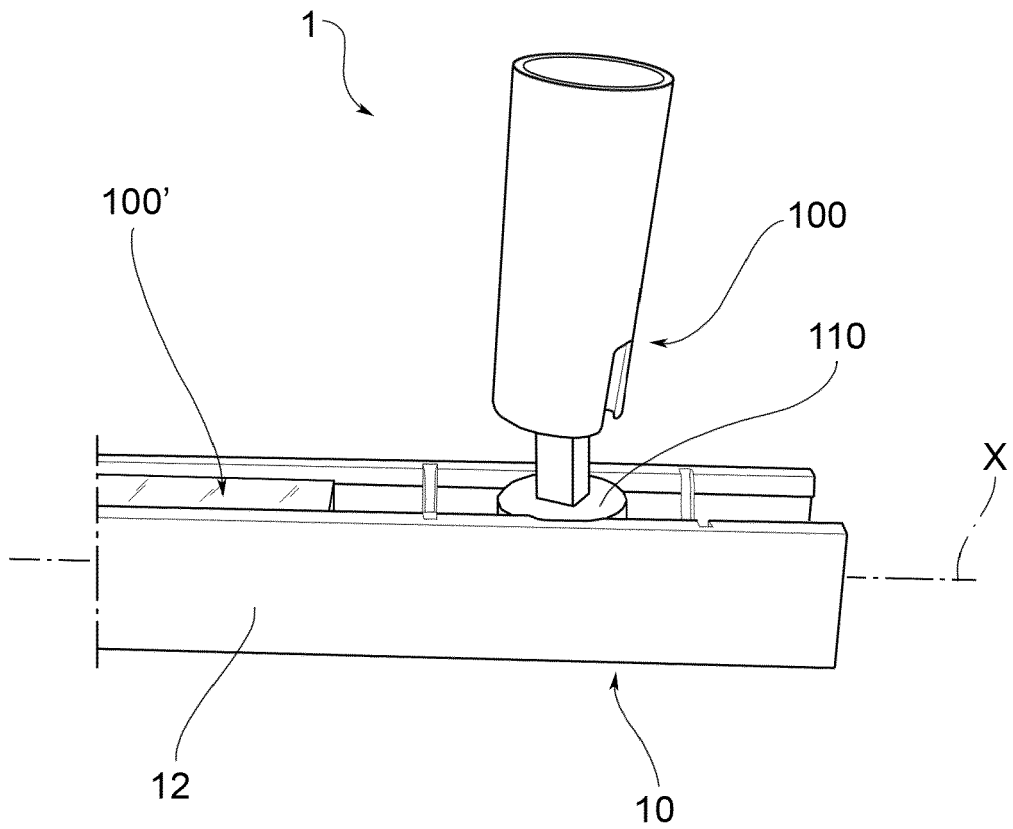


FIG. 1

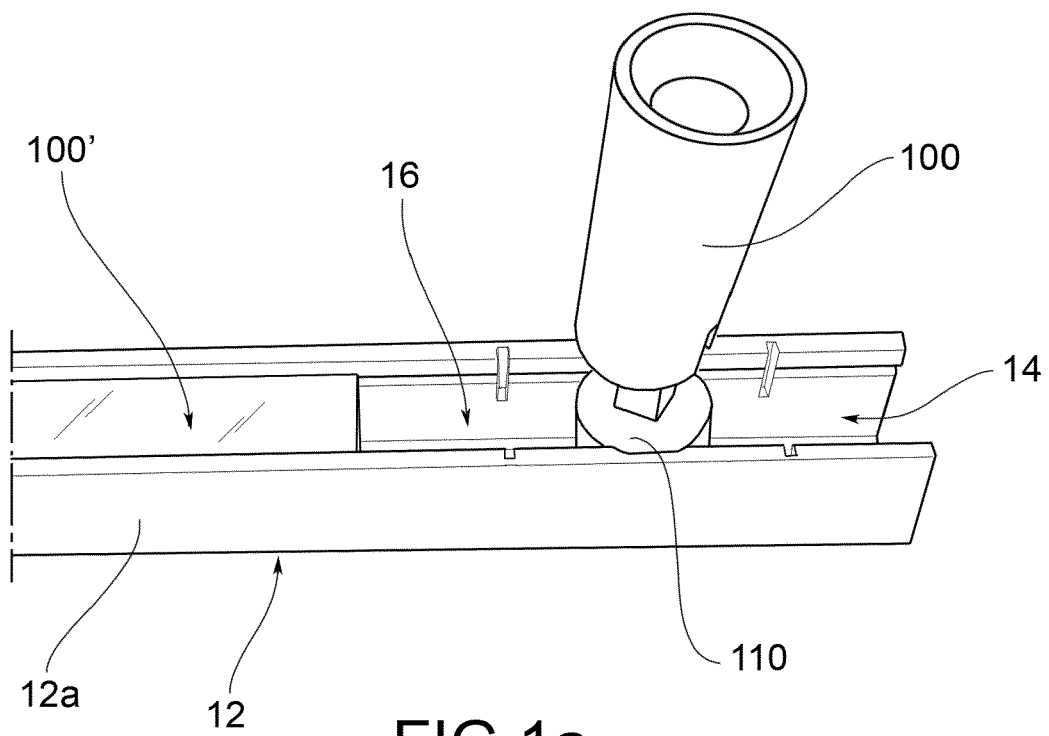


FIG. 1a

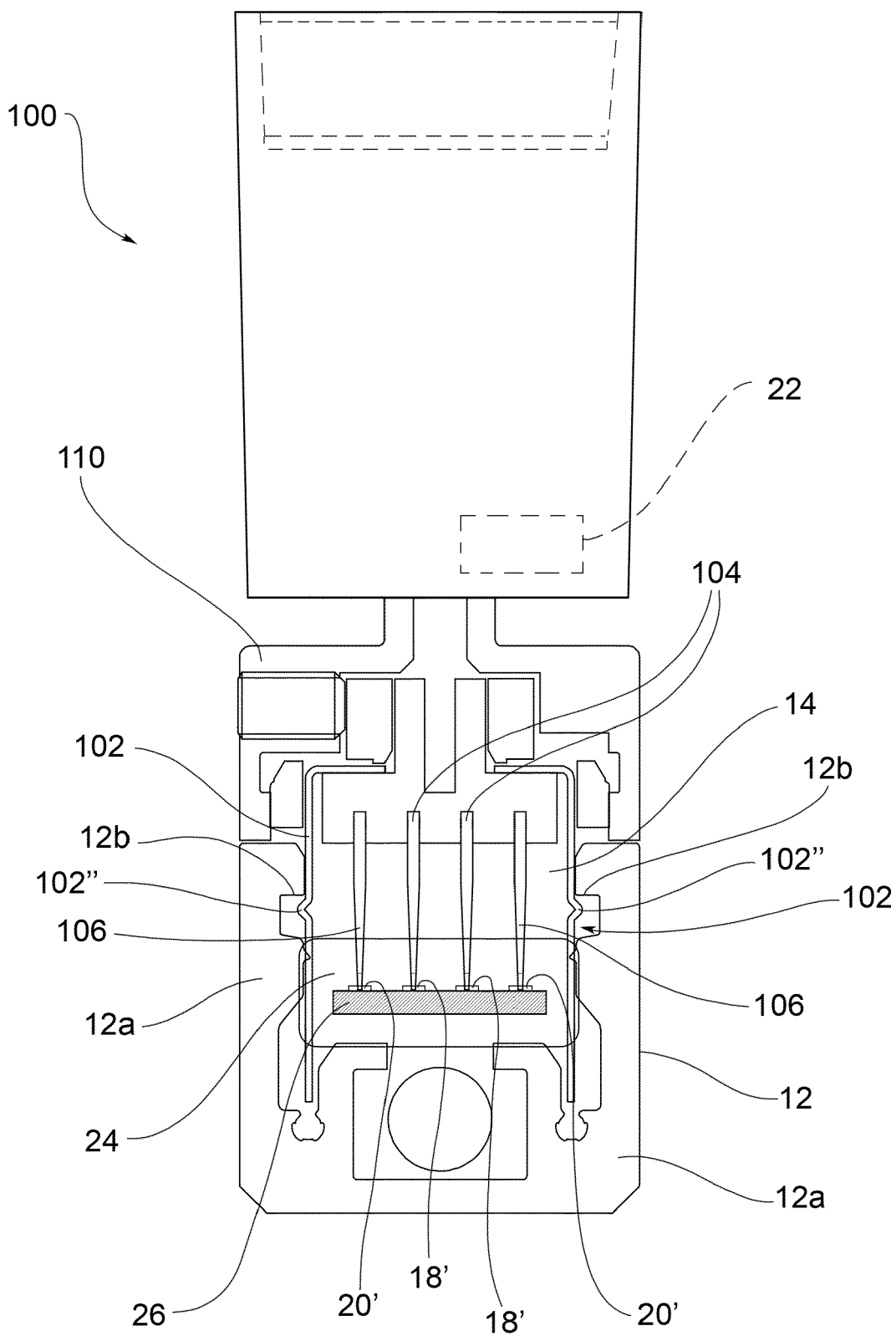


FIG.2

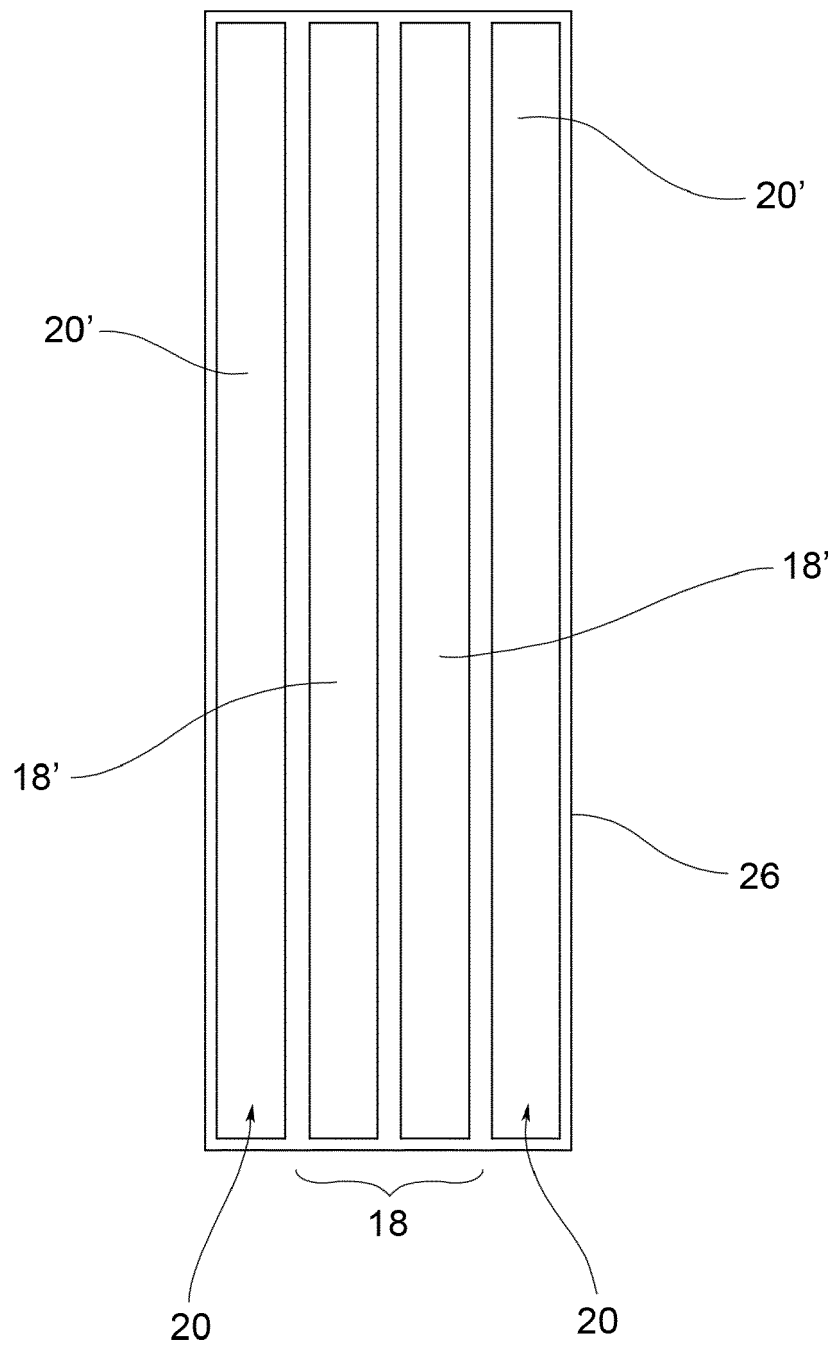


FIG.3



EUROPEAN SEARCH REPORT

Application Number
EP 21 16 1787

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 8 915 609 B1 (SHAH ASHOK DEEPAK [US] ET AL) 23 December 2014 (2014-12-23)	1-6,9-11	INV. H05B47/18
Y	* column 4, line 50 - column 5, line 18 * * column 10, line 11 - column 11, line 42; figures 9-11 *	7,8	F21S8/00 F21V21/005 F21V21/02 F21V23/06
Y	----- WO 2019/175913 A1 (LINEA LIGHT S R L [IT]) 19 September 2019 (2019-09-19) * page 8, line 25 - page 14, line 32; figures 8,9 * -----	7,8	ADD. F21V21/002 H01R12/61
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			H05B F21V F21S H01R
Place of search		Date of completion of the search	Examiner
Munich		22 July 2021	Waters, Duncan
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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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22-07-2021

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			WO 2019175913 A1 19-09-2019

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