



EUROPEAN PATENT APPLICATION

(43) Date of publication:

29.05.2024 Bulletin 2024/22

(21) Application number: 23201630.3

(22) Date of filing: 04.10.2023

(51) International Patent Classification (IPC):

F21S 8/06 ^(2006.01) **F21V 21/002** ^(2006.01)
F21V 21/35 ^(2006.01) **F21S 8/00** ^(2006.01)
F21V 31/00 ^(2006.01) **F21Y 115/10** ^(2016.01)
F21Y 103/10 ^(2016.01) **F21V 23/00** ^(2015.01)

(52) Cooperative Patent Classification (CPC):

F21V 21/002; F21S 8/066; F21V 21/35;
F21S 8/038; F21V 23/001; F21V 31/00;
F21Y 2103/10; F21Y 2115/10

(84) Designated Contracting States:

AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL
NO PL PT RO RS SE SI SK SM TR

Designated Extension States:

BA

Designated Validation States:

KH MA MD TN

(30) Priority: 22.11.2022 IT 202200024021

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(54) LIGHTING SYSTEM

(57) A lighting system (1) comprises a feed bar (10) having a bar body made of a metal material, a linear electronic board (20), and an insulating body (24) made of a polymeric material and inserted by shape and/or force coupling into the feed bar (10), where the linear electronic board (20) is embedded, or inserted into, or

covered by said insulating body (24).

Under the linear electronic board (20) a protective sheet (200) is positioned made of electrically insulating material and suitable for preventing an accidental contact between electrical connection needles (104) of lighting devices installed on the feed bar and the bar body.

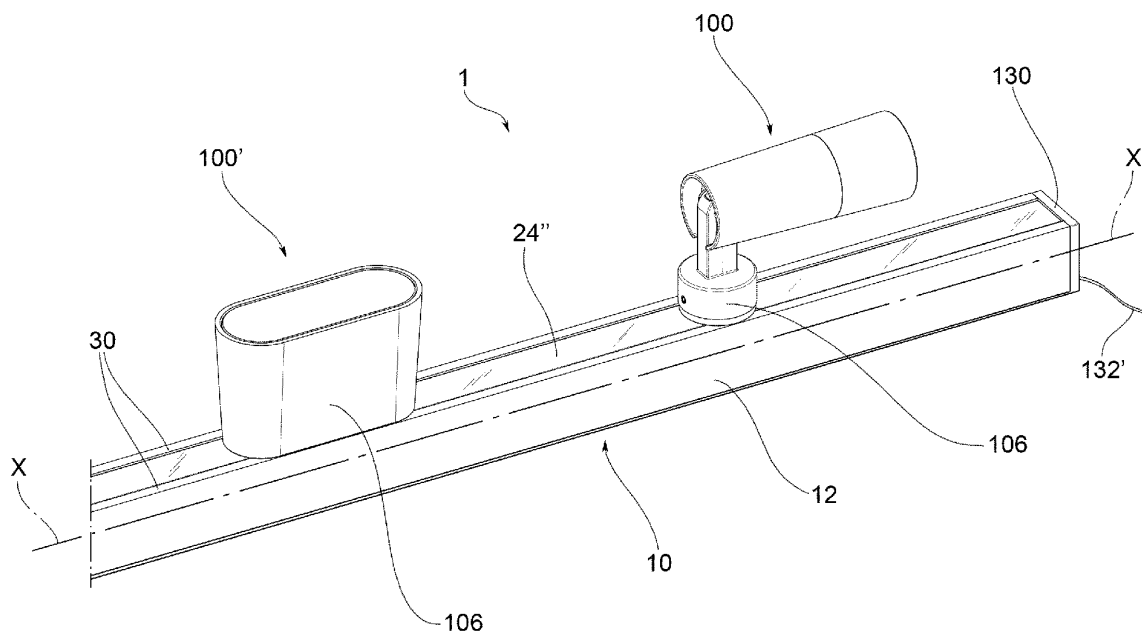


FIG. 1

Description

[0001] The present invention relates to a lighting system comprising a feed bar and at least one lighting device couplable to the feed bar, in any axial position with respect thereto.

[0002] Feed bars suitable for supporting and powering lighting fixtures are well known.

[0003] Also known, for example from EP3882513A1, in the name of the same Applicant, are lighting systems capable of combining a diffuse lighting effect produced by a lighting bar with a more concentrated lighting effect directed toward a desired point produced by a lighting device fixed to and powered thereby.

[0004] In such lighting systems, a linear power supply electronic board is housed in a bar body, such as an extruded aluminum profile, and is embedded in or covered by an insulating body made of a polymeric material suitable to ensure a high degree of protection for the lighting system. The lighting devices are provided with electrical connection needles that pass through the insulating body to make electrical contact with the power supply tracks of the linear electronic board.

[0005] In some cases, it has been found that, due to an unfavorable combination of dimensional tolerances and an excessive pressure exerted by the installer on the lighting device when connecting it to the bar, the electrical connection needles perforate the electronic board and make contact with the bar body. If the latter is made of a conductive material, such as aluminum, a short circuit is generated that damages the lighting device.

[0006] The object of the present invention is to provide a lighting system of the type mentioned above, but which is capable of overcoming the aforesaid drawback.

[0007] This object is achieved with a lighting system according to the attached claim 1. The dependent claims describe preferred or advantageous embodiments of the lighting system.

[0008] The features and the advantages of the lighting system shall be made apparent from the following description of preferred embodiments thereof, provided purely by way of non-limiting example, with reference to the accompanying figures, wherein:

- Fig. 1 is a perspective view of a lighting system according to the invention;
- Figs. 2 and 2a are two axial sections of the lighting bar and of a connecting portion of a lighting device, in an exemplary embodiment, before and after the mutual coupling thereof, respectively;
- Fig. 3 is a cross section of the bar only;
- Fig. 3a is an axial section of the bar in separate parts;
- Fig. 4 is an axial section of an insulating body made of polymeric material in which a linear electronic board and a protective sheet are incorporated according to the present invention;
- Fig. 4a is a view similar to the preceding one, showing electrical connection needles of a lighting device

engaging the linear electronic board; and

- Fig. 5 is a plan view of a portion of the linear electronic board and of the underlying power connector.

[0009] In said drawings, a lighting system according to the invention has been collectively indicated with 1.

[0010] The lighting system 1 comprises a feed bar 10 and at least one lighting device 100; 100' couplable to the feed bar, in any axial position along the lighting bar.

[0011] In the example of Fig. 1, for example, a projector 100 with adjustable optics and a downlight 100' with fixed optics are coupled to the feed bar 10. Of course, other types of devices may be simultaneously connected to the feed bar 10, according to the coupling methods described below.

[0012] The feed bar 10 comprises a bar body 12 longitudinally extending along a bar axis X. This bar body 12 is suitable for being fixed to a support, for example a ceiling or wall, or even recessed or suspended.

[0013] In one embodiment, the bar body 12 is an extruded profile, for example made of aluminum.

[0014] The bar body 12 forms a longitudinal central seat 14 delimited by a bottom wall 31 and two side walls 30. The longitudinal central seat 14 forms a longitudinal central opening 16.

[0015] The feed bar 10 comprises a linear electronic board 20 on which at least one first electric power supply circuit 26 is obtained. "Linear electronic board" 20 refers to an elongated, that is, strip-shaped, electronic board along the body axis X. The first electric power supply circuit 26 extends substantially along the entire length of the linear electronic board 20.

[0016] The feed bar 10 further comprises an insulating body 24 made of a polymeric material and inserted by shape and/or force coupling into the central seat 14.

[0017] The linear electronic board 20 is embedded or inserted into, or covered by the insulating body 24.

[0018] Each lighting device 100; 100' is provided with at least one pair of anchoring arms 108 suitable for providing a mechanical connection with the bar body 12, and with electrical connection needles 104 suitable for providing an electrical contact with the first electric power supply circuit 26 so as to electrically power the lighting device.

[0019] The electrical connection needles 104 are suitable for providing the electrical contact with the first electric power supply circuit 26 passing through the longitudinal central opening 16 and through the insulating body 24.

[0020] A protective sheet 200, made of electrically insulating material and suitable for resisting a perforation by the electrical connection needles 104 so as to prevent accidental contact between the electrical connection needles 104 and the bottom wall 31, is interposed between the linear electronic board 20 and the bottom wall 31 of the longitudinal central seat 14.

[0021] In other words, between the side of the linear electronic board 20 opposite the central opening 16 and

the bottom wall 31 of the longitudinal central seat 14 a strip 200 or band is placed, having substantially the same length and width as the linear electronic board 20. This strip or band 200 may have a thickness equal to or less than the linear electronic board 20. Thus, the term "sheet" denotes an element with a very small thickness, which does not significantly affect the height of the feed bar 10.

[0022] Thus, even in the event that the electrical connection needles 104 should be pressed against the linear electronic board 20 (in particular against the electrical conductors, or conductive tracks, thereof) with excessive force, for example, due to excessive pressure exerted by the installer in a phase of coupling of the lighting device to the feed bar, there is no risk of short circuit. The protective sheet 200 may possibly deform at the tips of the needles 104 (as depicted in Fig. 4a), but its presence does not allow the linear electronic board 20 to be fully perforated or in any case the sheet itself is not perforated and thus does not in any event allow the passage of the needles 104 and their contact with the bottom wall 31.

[0023] In fact, the Applicant has noted that if the linear electronic board 20 is resting directly on the bottom wall 24a of the body made of insulating material 24, an excessive pressure of the needles on the electronic board may cause the full perforation of said board and, at that point, the perforation of said bottom wall 24a, it being made of a very soft polymeric material with respect to the rigidity of the needles. On the other hand, the protective sheet 200, being stiffer relative to the insulating polymeric material, absorbs more of the pressure exerted by the needles and consequently prevents the complete perforation of the electronic board. Said electronic board, and the underlying protective sheet, deform locally at the needle tips, as shown in Fig. 4a.

[0024] Therefore, it is not necessary to make the electrical connection needles 104 and the insulating body 24 with very tight dimensional tolerances, nor it is necessary to envisage, for the electrical connection operation, a limitation of the insertion pressure of the needles into the insulating body.

[0025] In this way, the electrical connection is always ensured, but without the risk of short circuit.

[0026] In one embodiment, the linear electronic board 20 is inserted into a board seat 20a obtained in the insulating body 24 and separated from the bottom wall 31 of the longitudinal central seat 14 by a bottom portion 24a of the insulating body. The protective sheet 200 is positioned in the board seat 20a between the linear electronic board 20 and this bottom portion 24a.

[0027] In one embodiment, the protective sheet 200 is placed in contact with the linear electronic board 20.

[0028] In one embodiment, the insulating body 24 comprises an outer shell 242 and an inner shell 244, for example made of a translucent polymeric material. The outer shell 242 forms an insulating body bottom wall comprising the bottom portion 24a and two insulating body side walls 24b. The inner core 244 is housed, at least partially, in the outer shell 242.

[0029] The linear electronic board 20 is embedded in or covered by this inner core 244. The protective sheet 200 is placed between the electronic board 20 and the bottom wall 24a of insulating body.

[0030] In one embodiment, the protective sheet 200 is made of a plastic material.

[0031] In one embodiment, the protective sheet 200 is between 0.2 mm and 1 mm thick.

[0032] In one embodiment, the central seat 14 is obtained in an inner portion 12a of the bar body 12, which further comprises an outer portion 12b.

[0033] The outer portion 12b is formed of two side walls 12b' removably fixed to the inner portion 12a.

[0034] Each side wall 12b' forms, with the inner portion 12a, a longitudinal side pocket 122 open at least in the same direction as the central opening 16.

[0035] In one embodiment, on the linear electronic board 20 a lighting circuit 22 is also obtained, suitable for generating a light beam, preferably a substantially continuous light beam, directed towards the longitudinal central opening 16 when it is electrically powered by a second power supply circuit 25, independent of the first power supply circuit 25, extending along the linear electronic board 20.

[0036] For example, the lighting circuit comprises a row of LEDs 22' mounted and uniformly distributed on the electronic board.

[0037] In one embodiment, the insulating body 24 with the linear electronic board 20 confers to the feed bar 10 a degree of protection suitable for use in outdoor environments, therefore making it resistant to weather and dust.

[0038] For example, the two power supply circuits 25, 26 comprise electrical conductors extending substantially for the entire length of the linear electronic board 20. For example, such electrical conductors are in the form of tracks obtained on the linear electronic board 20.

[0039] In one embodiment, each electrical power supply circuit 25, 26 consists of a positive pole and a negative pole, for example 24V.

[0040] Each lighting device 100; 100' is provided with mechanical connection means 102, suitable for cooperating with the bar body 12 for mechanically supporting the lighting device 100; 100' by means of the feed bar 10.

[0041] As said above, in one embodiment, each lighting device 100 is provided with at least one pair of anchoring arms 108, each suitable for being inserted into a relevant longitudinal side pocket 122 and for snap-engaging the inner portion 12a and/or the outer portion 12b of the bar body 12 for mechanically supporting the lighting device 100 by means of the feed bar 10.

[0042] In one embodiment, the anchoring arms 108 and the electrical connection needles 104 are configured to simultaneously obtain the mechanical and electrical connection of the lighting device 100; 100' with the feed bar 10.

[0043] In one embodiment, the anchoring arms 108 and the electrical connection needles 104 extend from a

base portion 106 of the lighting device 100; 100' which rests against the feed bar 10 when the anchoring arms 108 are hooked to the feed bar 10.

[0044] In one embodiment, the electrical connection needles 104 extend from a connector 120 housed in the base portion 106. This connector 120 is configured to abut against an overlooking outer surface 24" of the insulating body 24. For example, this outer surface 24" is substantially flat.

[0045] In one embodiment, the connector 120 is configured to create a calibrated interference with the outer surface 24", so as to prevent the penetration of external agents into the perforation area of the insulating body 24 by means of the electrical connection needles 104.

[0046] For example, the connector 120 forms, around each electrical connection needle 104 or around the entire area of the electrical connection needles 104, an annular tooth 123 which, when the lighting device 100; 100' is hooked to the bar body 12, interferes with the outer surface 24" of the insulating body 24, for example by exerting a calibrated pressure thereon which prevents the penetration of external agents into the area of the insulating body 24 delimited by each annular tooth 122.

[0047] In one embodiment, each outer side wall 12b' is substantially parallel to, and spaced from, the relevant inner side wall 30. Each longitudinal side pocket 122 is therefore delimited by an inner side wall 30 and by an outer side wall 12b'.

[0048] In one embodiment, the longitudinal side pockets 122 are closed on the part opposite to the insertion opening of the anchoring arms 108.

[0049] In one embodiment, each outer side wall 12b' is provided with a transverse pin 130 inserted with reversible force coupling into a relevant pin seat 132 obtained in the central body 12a.

[0050] In one embodiment, each transverse pin 130 has a sawtooth-shaped lateral surface.

[0051] Preferably, each transverse pin 130 is made in one piece with the outer portion 12b of the bar body 12, i.e., it is in one piece with the bar body 12. In other words, the outer portion 12b of the bar body 12 and each transverse pin 130 are a single drawn piece.

[0052] In one embodiment, each transverse pin 130 is inserted into a cap 136 made of polymer material.

[0053] Furthermore, the cap 136 made of polymer material favors the stable but reversible coupling between the transverse pin 130 and the relevant pin seat 132.

[0054] In one embodiment, when the transverse pin 130 is completely inserted into the relevant pin seat 132, a proximal portion 138 of the relevant outer side wall 12b' abuts with shape coupling with a corresponding proximal portion 140 of the inner portion 12a of the bar body 12. Thus, the press-fit insertion of the transverse pin 130 into the relevant pin seat 132 may be carried out easily by pressing on the proximal portion 138 of the outer side wall 12b'.

[0055] In one embodiment, moreover, each transverse pin 130 extends from a thinned portion of the relevant

side wall (for example coinciding with the proximal portion 138), which is made with a thickness that is such to flex so as to favor the extraction of the transverse pin 130 from the relevant pin seat 132.

[0056] The possibility of decoupling the outer side walls 12b' from the inner portion 12a allows access to the anchoring arms 108 to disengage them from the respective pockets 122 and therefore be able to disconnect the lighting device from the bar 12, for example for replacement or maintenance thereof.

[0057] At the same time, the outer side walls 12b', when connected to the inner portion 12a, allow the anchoring arms 108 to be hidden from view and protected, which arms would otherwise be completely exposed to the outside.

[0058] In some embodiments, an undercut 32 facing the respective longitudinal side pocket 122 is obtained in each of the inner side walls 30. Each anchoring arm is provided with a locking tooth 110 which is engageable by a relevant undercut 32 of the inner side wall 30.

[0059] In other words, the anchoring arms 108 are elastic arms which snap into the locking position when the locking tooth 110 encounters the undercut 32.

[0060] In some embodiments, the locking tooth 110 has a curvilinear profile, so as to allow the disengagement thereof from the undercut 32 if the lighting device 100; 100' is pulled along the direction of the anchoring arm 108.

[0061] In other embodiments, however, such as those illustrated in the drawings, the locking tooth 110 is configured in such a way as to prevent a separation of the lighting device 100; 100' from the bar 10 acting along the direction of the anchoring arm 108; in this case, it is necessary to remove the outer side walls 12b' to flex the anchoring arms 108 outwards, so as to cause the locking tooth 110 to come out of the relevant undercut.

[0062] In one embodiment, the electrical connection needles 104 extend between and parallel to the anchoring arms 108.

[0063] In one embodiment, there are at least four electrical connection needles 104: a first pair of needles 104a and a second pair of needles 104b.

[0064] Preferably, the first pair of needles 104a is configured to intercept a first conductor 26a of the first electrical power supply circuit 26; the second pair of needles 104b is configured to intercept a second conductor 26b of the first electrical power supply circuit 26.

[0065] Preferably, the first pair of needles 104a is aligned parallel to the bar axis X.

[0066] Preferably, the second pair of needles 104b is aligned parallel to the bar axis X and spaced in the direction transverse from the first pair of needles 104a.

[0067] In this way, if the linear lighting source 18 had such a length to require, for production needs, interruptions of the copper tracks 26, 26b (as illustrated in Fig. 4), and if a lighting device 100, 100' was randomly positioned right across one of these interruptions, there is the certainty that at least one needle of each pair of needles

104a and 104b creates an electrical contact with the relevant conductor 26, 26b.

[0068] Fig. 4 shows an example of positioning the pairs of needles 104a, 104b with respect to the linear lighting source 18, wherein a needle of each pair ends precisely at an interruption - for example of about 1 mm - of the conductors 26a, 26b of the linear electronic board 20. It may be noted that in this case the other needle of each pair of needles is instead in contact with the respective conductor 26a, 26b. The power supply of the lighting devices 100, 100' is therefore always ensured, regardless of their position along the bar 10.

[0069] In one embodiment, the two power supply circuits 25, 26 are powered by means of a power cable 132' electrically connected thereto at one end of the insulating body 24. For example, in order to guarantee a high degree of IP protection (such as IP67), the power cable is connected to the power lines by means of a cap 130 made of insulating material (such as silicone), co-molded to the insulating body 24.

[0070] Those skilled in the art may make several changes, adjustments and replacements of elements with other functionally equivalent ones to the embodiments of the present invention in order to meet incidental needs, without departing from the scope of the following claims. Each of the features described as belonging to a possible embodiment may be obtained independently of the other described embodiments.

Claims

1. A lighting system (1), comprising:

- a feed bar (10); and
- at least one lighting device (100; 100') which is couplable to the feed bar, in any position along said feed bar,

wherein:

- the feed bar comprises:
 - a bar body (12) made of a metal material, for example by extrusion, which longitudinally extends along a bar axis, is suitable for being fixed to a support, for example a ceiling, a wall, suspension cables, and forms a longitudinal central seat (14) delimited by a bottom wall (31) and two side walls (30), said longitudinal central seat (14) forming a longitudinal central opening (16);
 - a linear electronic board (20) on which at least one first electric power supply circuit (26) is obtained;
 - an insulating body (24) made of a polymeric material and inserted by shape and/or force coupling into the central seat (14), said

linear electronic board (20) being embedded, or inserted into, or covered by said insulating body (24);

- each lighting device (100; 100') is provided with at least one pair of anchoring arms (108), suitable for providing a mechanical connection with the bar body (12), and with electrical connection needles (104) suitable for providing an electrical contact with the first electrical power supply circuit (26) so as to electrically power the lighting device, said electrical connection needles (104) being suitable for forming the electrical contact with the first electric power supply circuit (26) passing through the longitudinal central opening and through the insulating body (24),

and wherein a protective sheet (200), made of electrically insulating material and suitable for preventing accidental contact between said electrical connection needles (104) and said bottom wall (31), is interposed between the linear electronic board (20) and the bottom wall (31) of the longitudinal central seat (14).

2. Lighting system according to claim 1, wherein the linear electronic board (20) is inserted into a board seat (20a) obtained in the insulating body and separated from the bottom wall (31) of the longitudinal central seat by a bottom portion (24a) of said insulating body, and wherein the protective sheet (200) is positioned in said board seat between the linear electronic board and said bottom portion.

3. Lighting system according to claim 1 or 2, wherein the protective sheet (200) is placed in contact with the linear electronic board (20).

4. Lighting system according to any one of the preceding claims, wherein the insulating body comprises an outer shell (242) which forms an insulating body bottom wall (24a) and two insulating body side walls (24b) and, having at least partially received an inner core (244) made of translucent polymer material in said outer shell, the linear electronic board (20) being embedded or covered by said inner core, the protective sheet (200) being positioned between the electronic board and the insulating body bottom wall.

5. Lighting system according to any one of the preceding claims, wherein the protective sheet (200) is made of a plastic material.

6. Lighting system according to any one of the preceding claims, wherein the protective sheet has a thickness comprised between 0.2 mm and 1 mm.

7. Lighting system according to any one of the preced-

ing claims, wherein, when the electrical connection needles (104) are pressed against the linear electronic board (20), the linear electronic board (20) and the protective sheet (200) are locally deformed at the tips of the electrical connection needles (104),
5 but not completely perforated.

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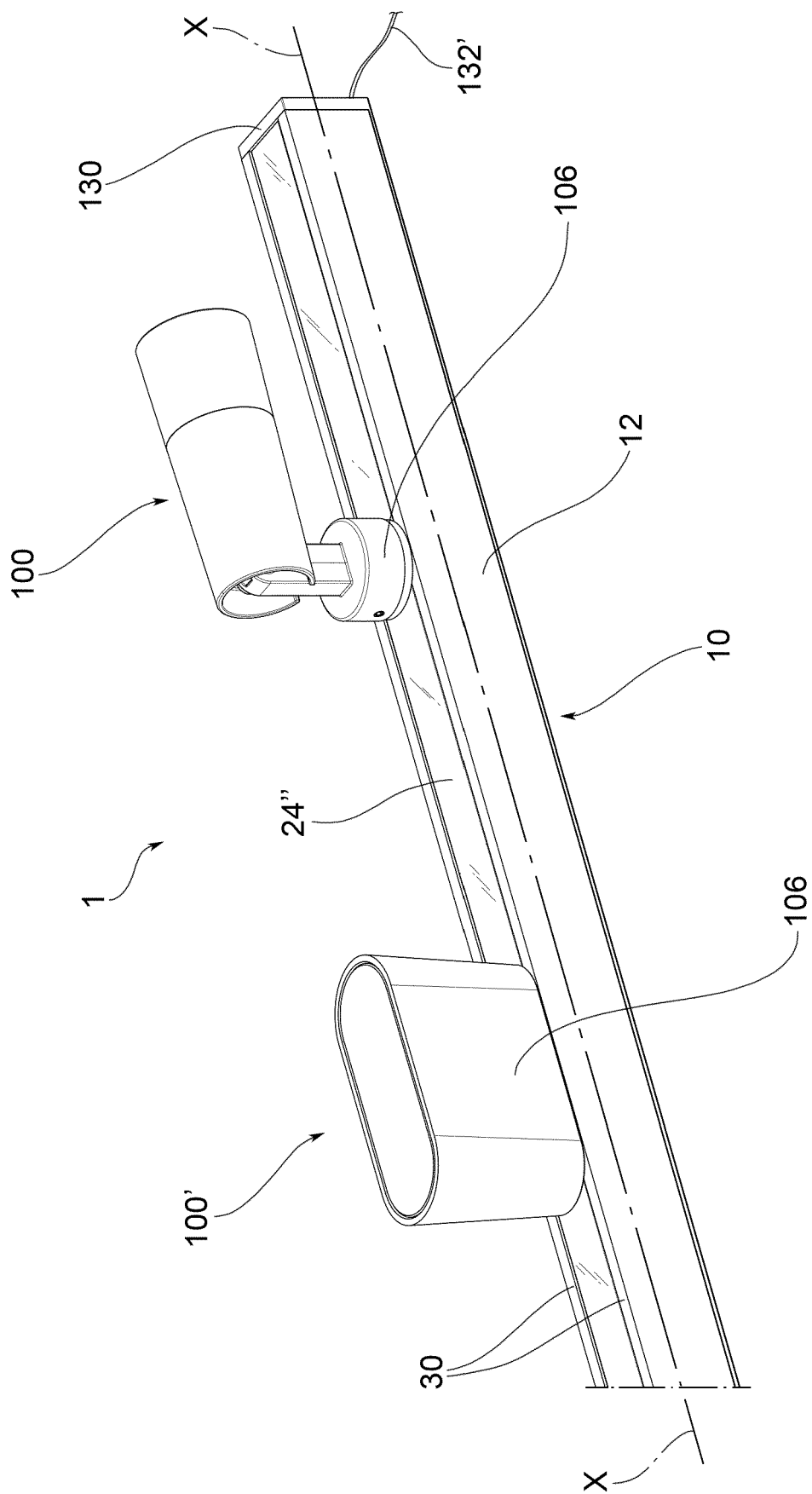
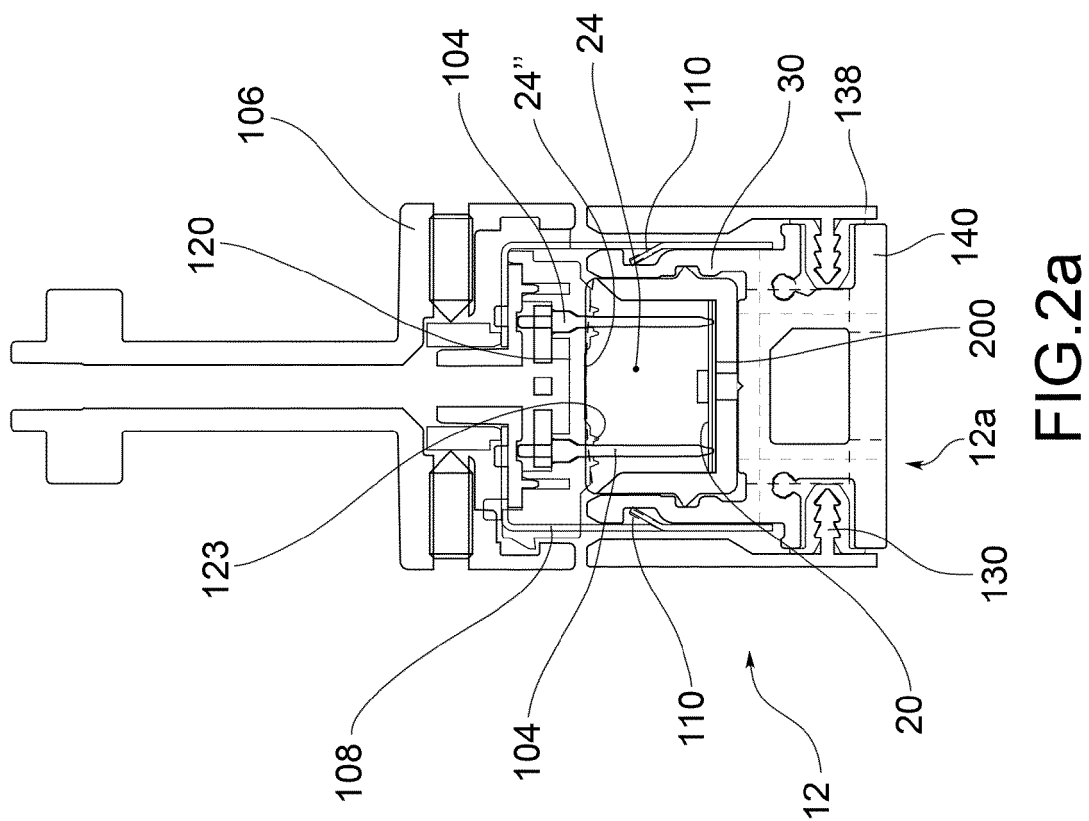
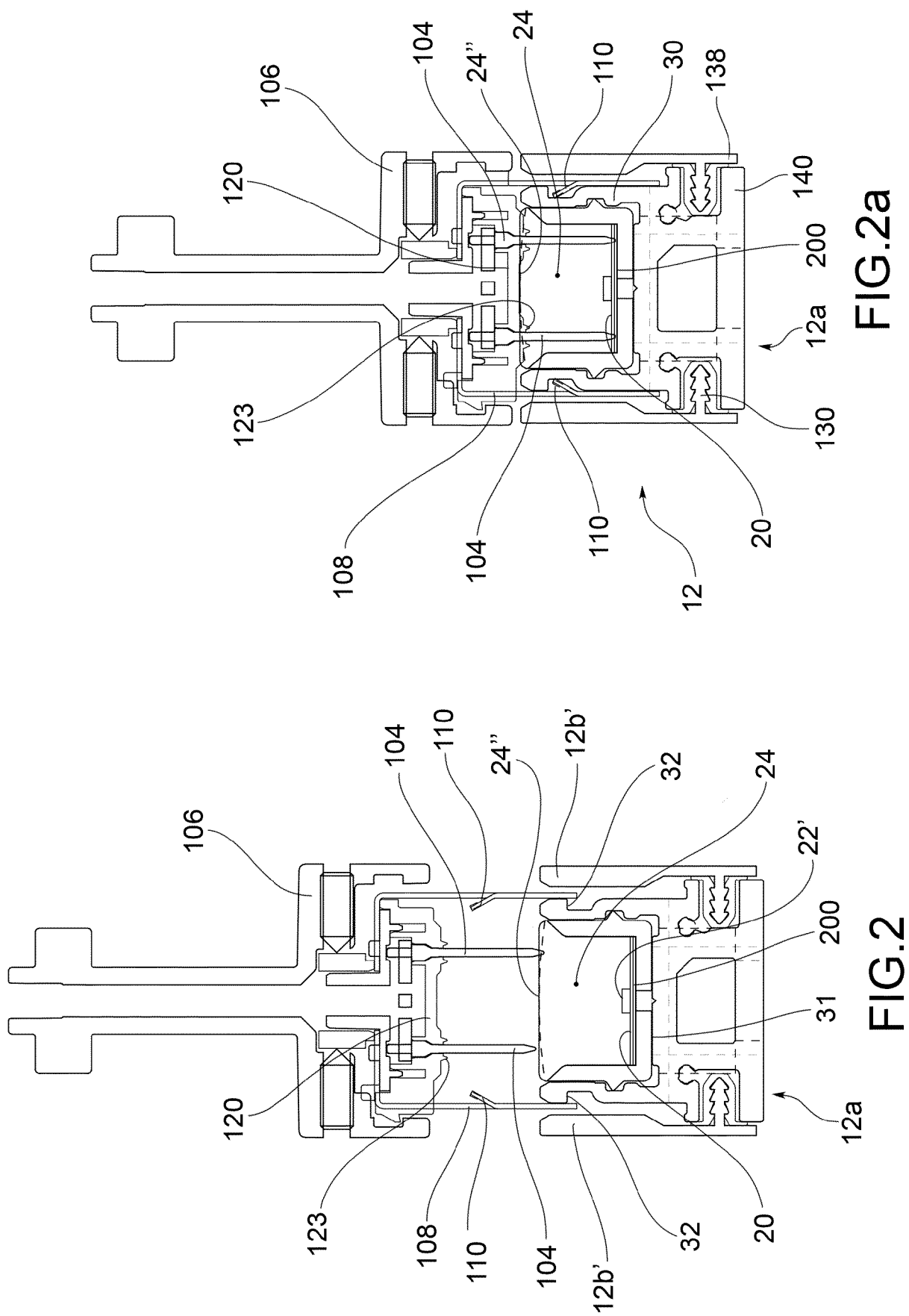


FIG.1



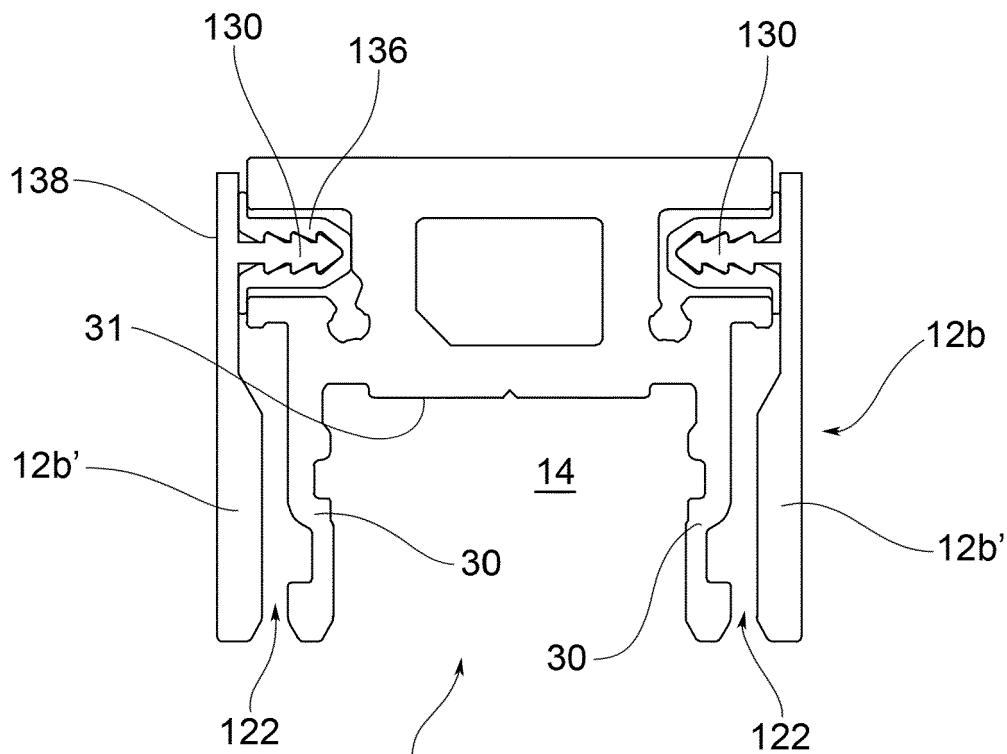


FIG.3

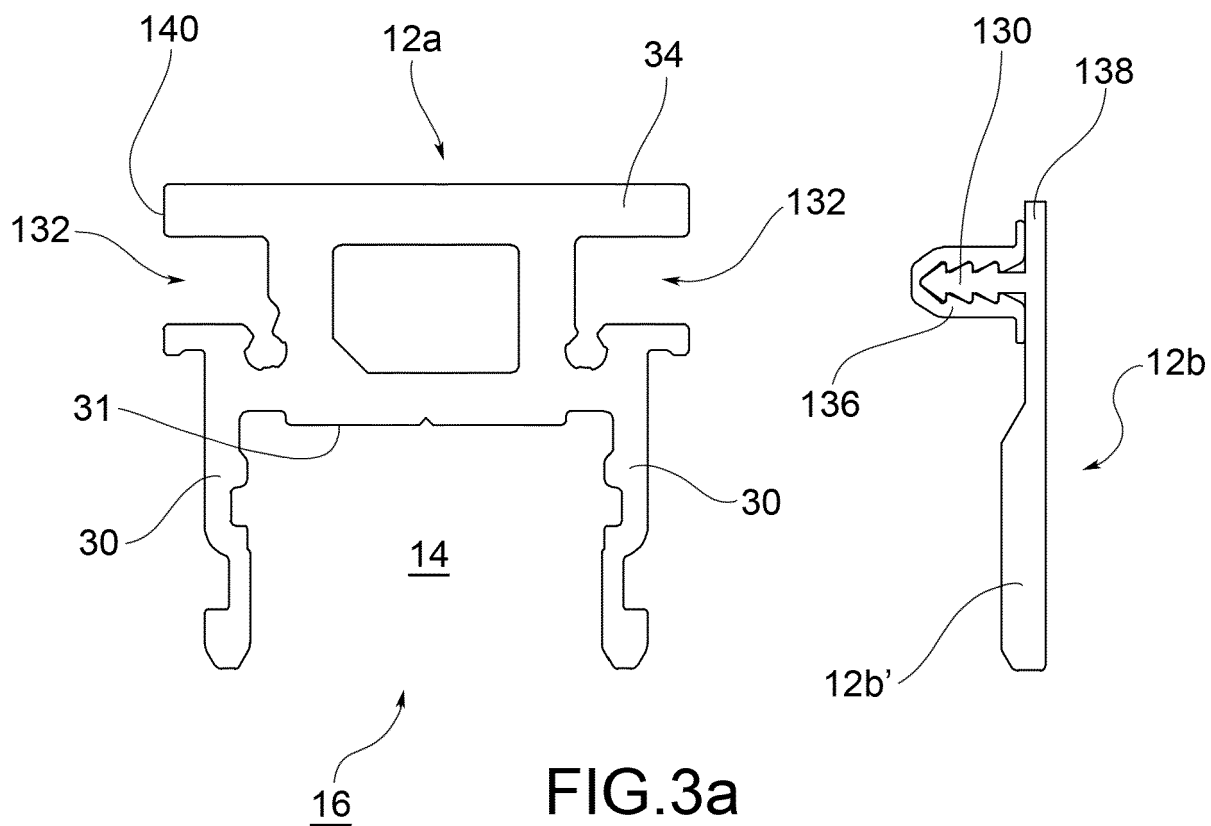


FIG.3a

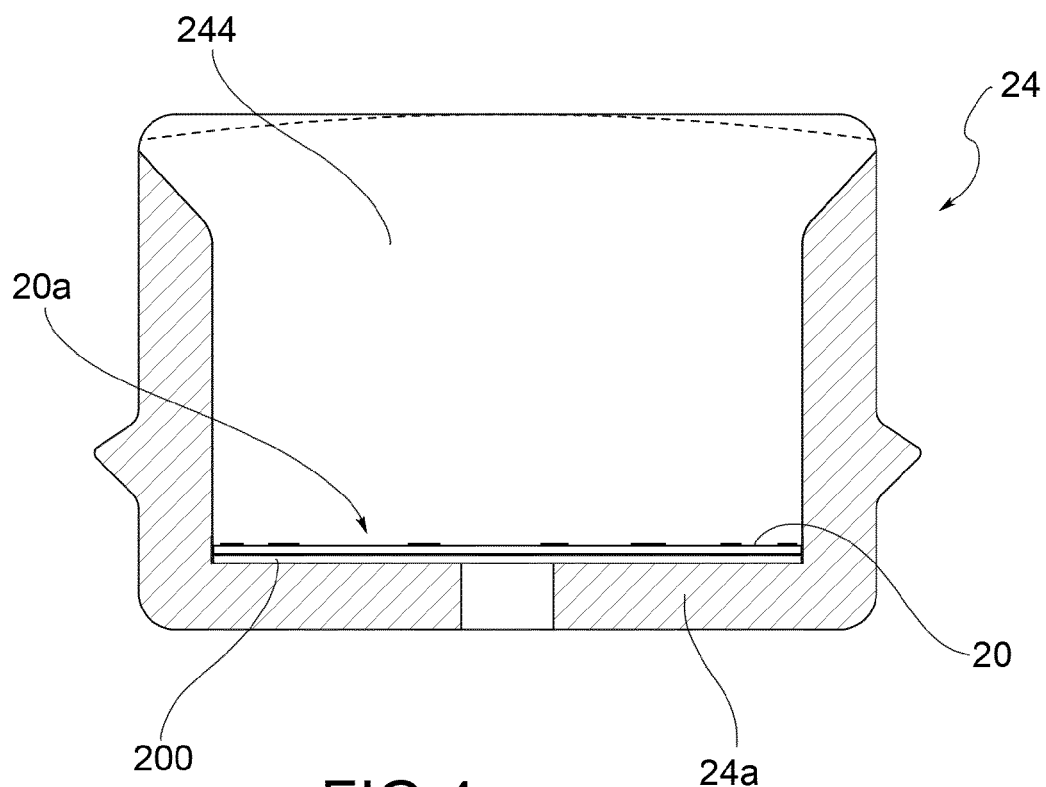


FIG.4

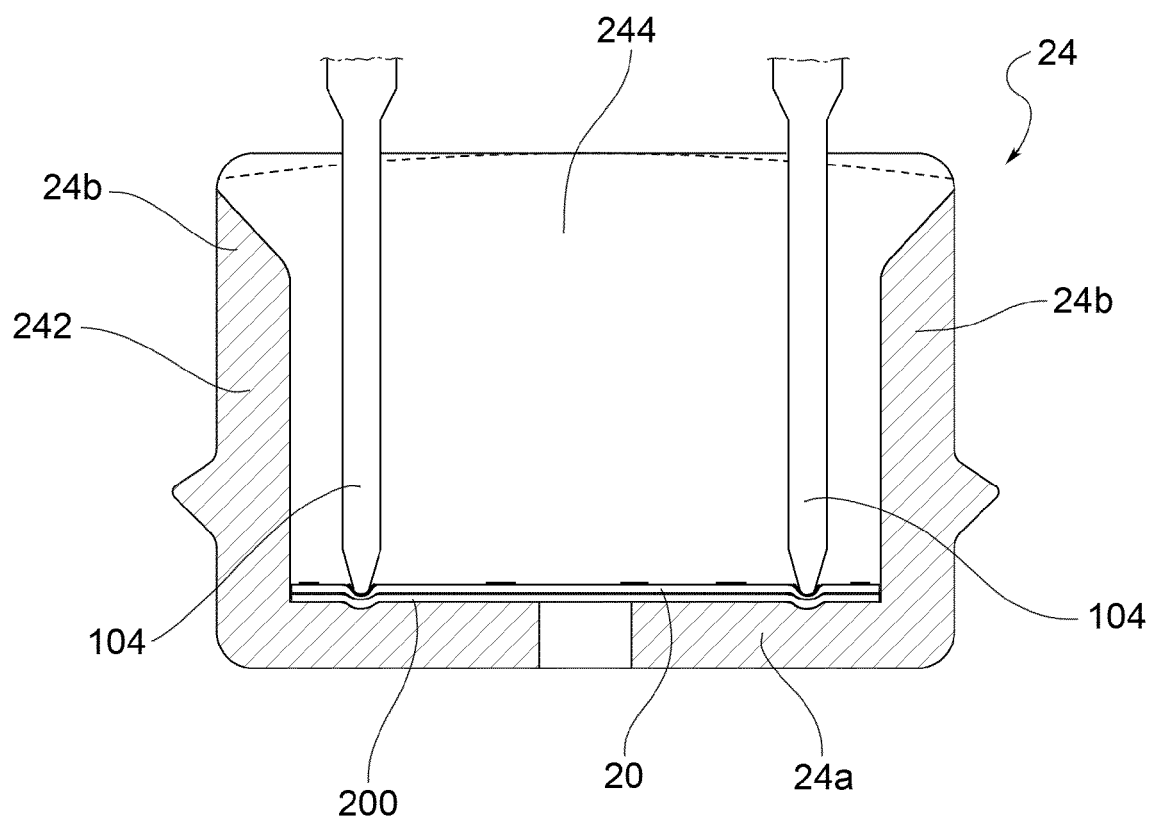


FIG.4a

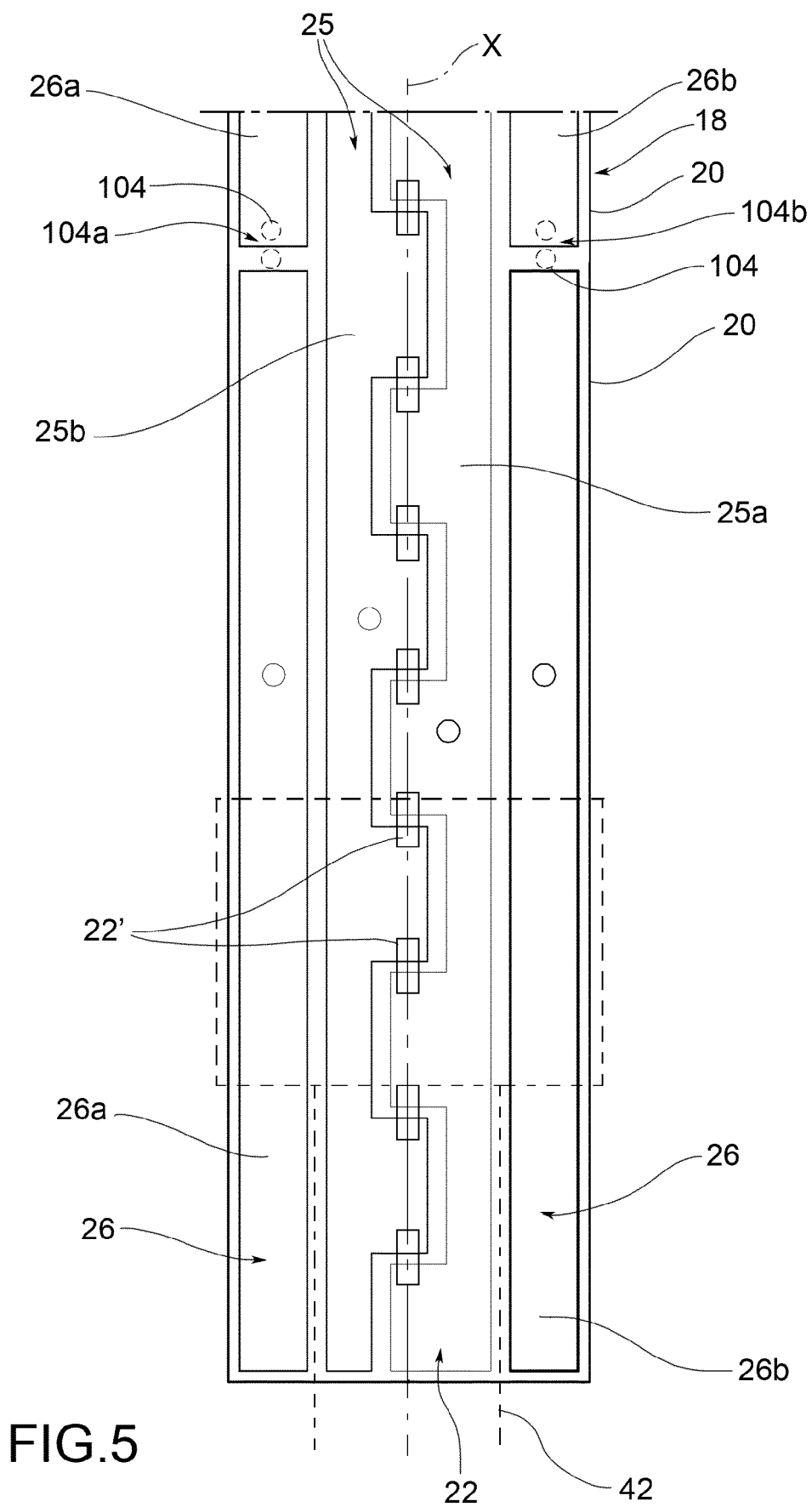


FIG.5



EUROPEAN SEARCH REPORT

Application Number

EP 23 20 1630

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EPO FORM 1503 03.82 (P04C01)

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,D	EP 3 882 513 A1 (SIMES [IT]) 22 September 2021 (2021-09-22) * the whole document *	1, 3, 5-7	INV. F21S8/06 F21V21/002 F21V21/35
A	US 2018/017238 A1 (VOLPATO LUCA [IT] ET AL) 18 January 2018 (2018-01-18) * the whole document *	1-7	ADD. F21S8/00 F21V31/00 F21Y115/10 F21Y103/10 F21V23/00
A	KR 2013 0028338 A (IT & T CO LTD [KR]) 19 March 2013 (2013-03-19) * the whole document *	1-7	
A	WO 2021/043269 A1 (JIAXING SUPER LIGHTING ELECTRIC APPLIANCE CO LTD [CN]) 11 March 2021 (2021-03-11) * the whole document *	1-7	
A	WO 2019/175913 A1 (LINEA LIGHT S R L [IT]) 19 September 2019 (2019-09-19) * the whole document *	1-7	
A	IT 2020 0000 5665 A1 (SIMES [IT]) 17 September 2021 (2021-09-17) * the whole document *	1-7	TECHNICAL FIELDS SEARCHED (IPC) F21V
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 20 February 2024	Examiner Soto Salvador, Jesús
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ON EUROPEAN PATENT APPLICATION NO.**

EP 23 20 1630

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 3882513 A1	22-09-2021	NONE	
US 2018017238 A1	18-01-2018	EP 3270053 A1 US 2018017238 A1	17-01-2018 18-01-2018
KR 20130028338 A	19-03-2013	NONE	
WO 2021043269 A1	11-03-2021	CN 214337557 U US 2023020744 A1 WO 2021043269 A1	01-10-2021 19-01-2023 11-03-2021
WO 2019175913 A1	19-09-2019	EP 3765778 A1 WO 2019175913 A1	20-01-2021 19-09-2019
IT 202000005665 A1	17-09-2021	NONE	

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 3882513 A1 [0003]