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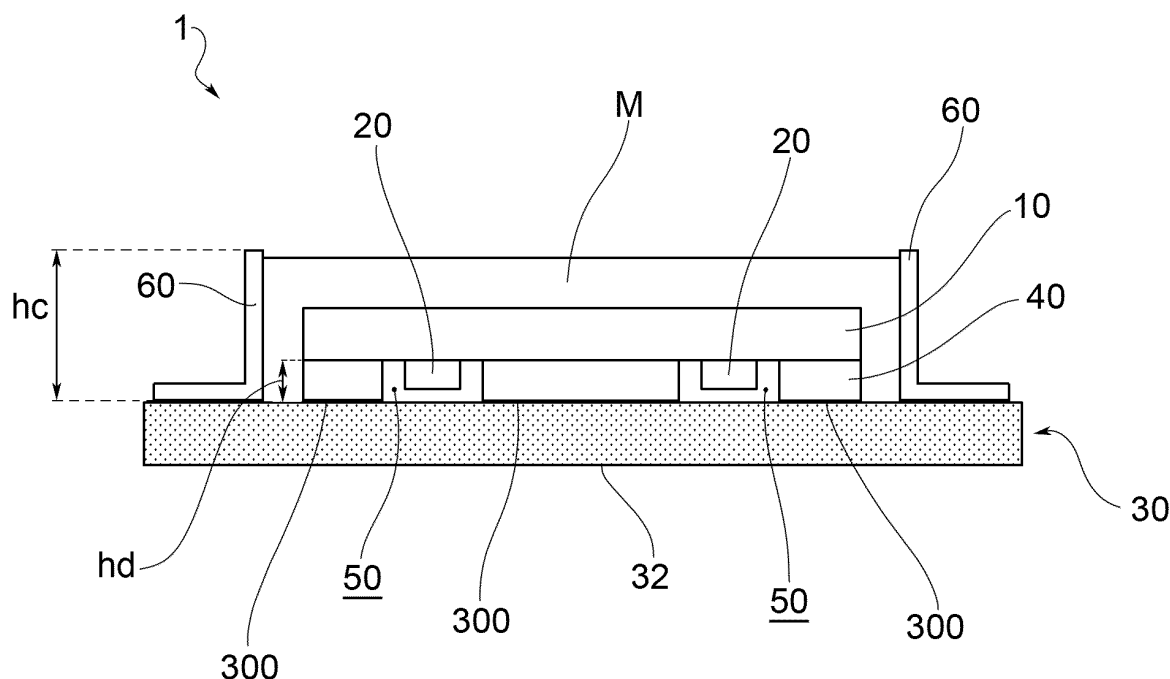
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GE KH MA MD TN(71) Applicant: **Endelbyte S.r.l.****25126 Brescia (IT)**(72) Inventor: **DI PEPPE, Pierluigi****I-25126 Brescia (IT)**(74) Representative: **Chimini, Francesco et al****Jacobacci & Partners S.p.A.****Piazza della Vittoria 11****25122 Brescia (IT)**(30) Priority: **29.08.2023 IT 202300017718****(54) LIGHT-SIGNALING DEVICE AND METHOD OF MANUFACTURING THEREOF**

(57) A light-signaling device (1) comprises an electronic lighting board (10) onto which a plurality of LEDs (20) is mounted, an at least partially transparent signaling panel (30), the electronic lighting board (10) facing the signaling panel (30), a spacer panel (40) interposed between the inner side (31) of the signaling panel (30) and the electronic lighting board (10). Around and above

the spacer panel (40) and the lighting board (10) there is identified an insulating volume (V) filled with an insulating material (M). At least one LED seat (50) is obtained in the spacer panel (40), the LEDs of the plurality of LEDs (20) being completely accommodated in the at least one LED seat (50). The insulating material (M) is completely outside each LED seat (50).

**FIG.3**

Description

[0001] The present invention relates to a light-signaling device of the LED type.

[0002] In particular, the present invention is in the field of LED-type fixed or variable signaling panels comprising a transparent panel on the rear side of which an electronic LED board is mounted to generate information of any type. In fact, the LEDs are arranged on the electronic board so as to form letters, symbols, or icons.

[0003] For example, the present invention is in the field of price signs for fuel distributors.

[0004] Solutions of light-signaling devices of the type mentioned above are known in the prior art. In certain applications, especially for use in outdoor environments, or those otherwise exposed to humidity, dust, or other outdoor elements, the electronic board is housed inside a special container body, the front cover of which may be composed of the signaling panel.

[0005] A typical issue with these light-signaling devices is the inability to completely isolate the electrical/electronic components from the external environment, except through the use of specific components that make the signaling device expensive to produce and assemble. In particular, the protection systems currently used do not allow adequate and lasting protection from humidity to be obtained, which results in a considerable reduction in the performance of the electrical and electronic components, compromising the operation thereof.

[0006] Furthermore, the feature of having the electronic board housed in a box-like body determines a limitation in relation to the overall size and weight of the light-signaling device, which also make its positioning and maintenance difficult, for example on support devices at a certain height in relation to the ground.

[0007] The object of the present invention is to propose a light-signaling device of the type mentioned above, but capable of overcoming the drawbacks of the prior art mentioned above.

[0008] This object is achieved by a light-signaling device according to independent claims 1 or 2 and by an assembly method of the light-signaling device according to claims 15 or 16.

[0009] In addition, further features and advantages of the invention will become clear from the description provided below of the preferred embodiments thereof given as non-limiting examples with reference to the accompanying figures, in which:

- Fig. 1 shows schematically a sectional view of a light-signaling device in separate parts according to a first embodiment;
- Fig. 2 shows schematically a sectional view of a light-signaling device in separate parts according to a second embodiment;
- Fig. 3 is a sectional view of an assembled light-signaling device according to the first embodiment of Fig. 1;

- Fig. 4 is a sectional view of an assembled light-signaling device according to the second embodiment of Fig. 2;
- Fig. 5a is a front view of the assembled light-signaling device according to an embodiment;
- Fig. 5b is a rear view of the assembled light-signaling device according to an embodiment;
- Fig. 6a and 6b are perspective views of an example of an electronic lighting board of the signaling device; and
- Fig. 7 is a perspective view of an example of a spacer panel for the light-signaling device in Fig. 1 and 3.

[0010] With reference to the accompanying figures, a light-signaling device is indicated with the reference numeral 1.

[0011] The light-signaling device 1 comprises an electronic lighting board 10.

[0012] The electronic lighting board 10 has a lighting side 11 onto which a plurality of LEDs 20 is mounted. Each LED of the plurality of LEDs 50, when activated, emits a light beam.

[0013] Furthermore, the electronic lighting board 10 has a rear side 12 opposite the lighting side 11. Preferably, electrical and electronic components 500 suitable for controlling, powering, connecting the electronic lighting board 11, such as, for example, a microcontroller, a power connector, are mounted onto the rear side 12 of the electronic lighting board 10. Therefore, in one embodiment, the plurality of LEDs 20 is exclusively mounted onto the lighting side 10.

[0014] According to an embodiment, the LEDs 20 protrude with respect to a board surface 100 defined by the lighting side 11. In other words, the lighting side 11 defines a board surface 100 from which the plurality of LEDs 50 protrudes.

[0015] The arrangement of the LEDs on the electronic lighting board depends on the message to be transmitted through the light-signaling device. In fact, the LEDs may be arranged in such a way as to form, for example, letters, symbols or icons.

[0016] Preferably, in the case of price signs for fuel distributors, the light-signaling device has a panel shape in which the LEDs are arranged to determine numbers, i.e., the price per liter of fuel, or text.

[0017] The light-signaling device 1 comprises a signaling panel 30.

[0018] The signaling panel 30 has a signaling panel inner side 31 and a signaling panel outer side 32.

[0019] Preferably, the signaling panel 30 is made of a transparent material at least at the plurality of LEDs 20, so that the light beams generated by the plurality of LEDs 20 pass therethrough.

[0020] By virtue of the transparency of the signaling panel, at least at the LEDs 20, the light beam emitted by each LED forms a message that a user may read.

[0021] The electronic lighting board 10 faces the signaling panel inner side 31.

[0022] According to an embodiment, the light-signaling device 1 comprises a spacer panel 40. The spacer panel 40 is interposed between the signaling panel inner side 31 of the signaling panel 30 and the electronic lighting board 10.

[0023] The spacer panel 40 has a spacer panel outer side 41 in contact with the signaling panel inner side 31 of the signaling panel 30 and a spacer panel outer side 42 in contact with the lighting side 11 of the lighting board 10.

[0024] In the spacer panel 40 at least one LED seat 50 is obtained in which the LEDs of the plurality of LEDs 20 are completely accommodated. Preferably, a seat 50 for each LED of the plurality of LEDs 50 is obtained in the spacer panel 40.

[0025] Around and above the spacer panel 40 and the lighting board 10 there is identified an insulating volume V filled with an insulating material M, so that the insulating material M is completely outside each LED seat 50.

[0026] The term "insulating material" refers mainly, although not in a limiting way, to a hardening insulating liquid compound, in particular a resin or gel.

[0027] In other words, the spacer panel and the electronic lighting board define above and around them an insulating volume V which is filled with the insulating material M. The stacked structure, which is created by assembling the electronic lighting board 10 and the spacer panel 40 in such a way that the plurality of LEDs 20 is accommodated in the at least one LED seat 50, is such as to ensure that the insulating material M is completely outside each LED seat 50.

[0028] The LEDs 20 have an LED height h in relation to the board surface 100.

[0029] The spacer panel 40 has a spacer panel thickness h_d .

[0030] According to one embodiment, the spacer panel thickness h_d is at least equal to the LED height h. Preferably, the spacer panel thickness h_d is greater than the LED height h so that the at least one LED seat 50 present in the spacer panel 40 completely accommodates one or more LEDs of the plurality of LEDs 20.

[0031] According to one embodiment, a perimeter frame 60 is fixed at the signaling panel inner side 31 of the signaling panel 30, which perimeter frame surrounds the spacer panel 40 and the electronic lighting board 10 to contain the insulating material M.

[0032] According to one embodiment, the perimeter frame 60 is temporarily fixed to the signaling panel inner side 31 so as to contain and limit the flow of the insulating material until the insulating material hardens, thereby creating a protective insulating layer. In fact, the insulating material determines a barrier layer which protects the electronic lighting board from external atmospheric elements, in particular humidity, preserving the quality and operation of the LEDs mounted onto the electronic lighting board.

[0033] Furthermore, the construction of seats suitable for containing the LEDs allows said LEDs to be isolated from the flow of insulating material. This feature makes it

possible not to alter the power and quality of the light beam emitted by each LED, consequently allowing a clearer and more visible message to be obtained even at high distances. In particular, if the resin were to creep into the LED seats, it would decrease the power and alter the color of the light beam generated by the LEDs. This requirement becomes crucial when the light-signaling device according to the present invention is in the form of a price sign for fuel distributors, as the user must be able to read the price of the fuel per liter clearly, and even at great distances.

[0034] Preferably, the perimeter frame 60 is permanently fixed to the signaling panel inner side 31 of the signaling panel 30. According to this embodiment, the perimeter frame 60 performs a support frame function, favoring a better fixing of said frame to a support device at great heights above the ground. Furthermore, the perimeter frame 60 also performs a protective frame function insofar as it makes it possible to protect the electronic lighting board from any impact or damage, especially during movement and assembly. Consequently, the perimeter frame 60 allows the electrical features of the LEDs mounted onto the electronic board to be maintained unaltered, reducing the need for maintenance.

[0035] The perimeter frame 60 has a frame height h_c .

[0036] Preferably, the frame height h_c is greater than an overall height of the spacer panel 40 coupled to the electronic lighting board 10. According to such embodiment, the fact that the frame height h_c is greater than the overall height of the coupling between the spacer panel 40 and the electronic lighting board 10 allows a necessary quantity of insulating material M to be poured to create a uniform and sufficiently protective insulating layer.

[0037] According to one embodiment, the at least one LED seat 50 made in the spacer panel 40 is a through seat.

[0038] In one embodiment variant, the at least one LED seat 50 made in the spacer panel 40 is a blind seat, i.e., it does not open onto the outer side of the spacer panel 40. In other words, the at least one LED seat 50 has a lower LED seat height than the spacer panel height h_d . In this case, at the at least one LED seat 50, the spacer panel 40 is transparent so that, once the LEDs 20 are coupled to the at least one seat 50, the light beam emitted by each LED of the plurality of LEDs 20 still passes through the spacer panel 40.

[0039] According to an embodiment, the LEDs of the plurality of LEDs are inserted with shape-coupling into the at least one LED seat 50.

[0040] According to one embodiment, the insulating material M is a polymer resin, for example epoxy, polyurethane, or silicone, or a gel or a silicone rubber, of the type used for electronic inclusion (potting), i.e., in the processes of filling an electronic assembly with a solid or gelatinous compound in order to obtain high features of resistance to shocks and vibrations, and impermeability to water, humidity, or corrosive agents.

[0041] According to a variant of the device shown in Fig. 2 and 4, instead of providing for the use of a spacer panel 40 in which the LED seats 50 are obtained, such LED seats 50 are obtained directly in the signaling panel 30.

[0042] This technical solution makes it possible to avoid the use of the spacer component, but requires obtaining, for example by means of subsequent processing, the LED seats 50 in the signaling panel.

[0043] According to such embodiment, the lighting board 10 has the lighting side 11 in contact with the signaling panel inner side 31 of the signaling panel 30. Also in this case, around and above the lighting board 10 there is identified an insulating volume V filled by the insulating material M, so that the insulating material M is completely outside each LED seat 50.

[0044] According to an embodiment, each LED of the plurality of LEDs 20 is completely accommodated in a relevant LED seat 50.

[0045] The signaling panel 30 is made of a transparent material, for example polymethyl methacrylate.

[0046] In some embodiments, the signaling panel 30 has, externally to regions facing the plurality of LEDs 20, opaque portions 300, for example background portions or portions bearing fixed information.

[0047] According to one embodiment, the opaque portions 300 are obtained by applying a printed sheet to at least one side of the signaling panel 30. In other embodiments, said opaque portions 300 are printed directly on the signaling panel 30, for example by ink jet printers.

[0048] Object of the present invention is also an assembly method of a light-signaling device.

[0049] According to the embodiment wherein the light-signaling device has the spacer panel 40 interposed between the signaling panel 30 and the electronic lighting board 10, the assembly method comprises the following steps:

- a. providing the signaling panel 30;
- b. positioning the spacer panel (40) so that the spacer panel inner side (41) is in contact with the signaling panel inner side (31);
- c. positioning the electronic lighting board (10) so that the plurality of LEDs is accommodated in the at least one LED seat (50), and the lighting side (11) of the electronic lighting board (10) is in contact with the spacer panel outer side (32);
- d. positioning the perimeter frame (60) around the spacer panel (40) and the electronic lighting board (10) so as to define the insulating volume (V);
- e. Pouring the insulating material (M) into the insulating volume (V).

[0050] According to the embodiment wherein the light-signaling device does not require the use of the spacer panel, the assembly method comprises the following steps:

- a. providing the signaling panel (30) having at least one LED seat (50) to accommodate the plurality of LEDs (20) mounted onto the electronic lighting board (10);
- b. positioning the electronic lighting board (10) so that the plurality of LEDs is accommodated in the at least one LED seat (50), and the lighting side (11) of the electronic lighting board (10) is in contact with the signaling panel inner side (31);
- c. positioning the perimeter frame (60) around the electronic lighting board (10) so as to define the insulating volume (V);
- d. pouring the insulating material (M) into the insulating volume (V).

[0051] Innovatively, the light-signaling device and the method of thereof largely achieve the intended object by overcoming the typical problems of the prior art.

[0052] It is clear that a person skilled in the art may make changes to the invention described above in order to meet contingent needs, which changes all fall within the scope of protection as defined in the following claims.

Claims

1. A light-signaling device (1), comprising:

- an electronic lighting board (10) having a lighting side (11) to which a plurality of LEDs (20) is mounted, the plurality of LEDs (20) protruding from a board surface (100) defined by the lighting side (11);
- a signaling panel (30) having a signaling panel inner side (31) and a signaling panel outer side (32), the electronic lighting board (10) facing said signaling panel inner side (31), the signaling panel (30) being made of a transparent material at least at the plurality of LEDs (20) so that the light beams generated by the plurality of LEDs (20) pass therethrough;
- a spacer panel (40) interposed between the inner side (31) of the signaling panel (30) and the electronic lighting board (10), wherein an insulating volume (V) filled with an insulating material (M) is identified around and above the spacer panel (40) and the lighting board (10), wherein at least one LED seat (50) is obtained in the spacer panel (40), the LEDs of the plurality of LEDs (20) being completely accommodated in the at least one LED seat (50), the spacer panel (40) having a spacer panel outer side (41) in contact with the signaling panel inner side (31) of the signaling panel (30) and a spacer panel outer side (42) in contact with the lighting side (11) of the lighting board (10) so that the insulating material (M) is completely outside each LED seat (50).

2. A light-signaling device (1), comprising:

- an electronic lighting board (10) having a lighting side (11) to which a plurality of LEDs (20) is mounted, the plurality of LEDs (20) protruding from a board surface (100) defined by the lighting side (11);

- a signaling panel (30) having a signaling panel inner side (31) and a signaling panel outer side (32), the electronic lighting board (10) facing said signaling panel inner side (31), the signaling panel (30) being made of a transparent material at least at the plurality of LEDs (20) so that the light beams generated by the plurality of LEDs (20) pass therethrough, wherein an insulating volume (V) filled with an insulating material (M) is identified about and above the lighting board (10), wherein at least one LED seat (50) is obtained in the signaling panel (30), the LEDs of the plurality of LEDs (20) being completely accommodated in the at least one LED seat (50), the lighting board (10) having the lighting side (11) in contact with the signaling panel inner side (31) of the signaling panel (30) so that the insulating material (M) is completely outside each LED seat (50).

3. Light-signaling device (1) according to any one of the preceding claims, wherein each LED of the plurality of LEDs (20) is completely accommodated in a relevant LED seat (50).

4. Light-signaling device (1) according to any one of the preceding claims, wherein the signaling panel (30) is made of a transparent material, for example polymethyl methacrylate, and has opaque portions (300), for example background portions or portions bearing fixed information, externally to regions facing the plurality of LEDs (20).

5. Light-signaling device (1) according to claim 4, wherein said opaque portions (300) are obtained by applying a printed sheet to at least one side of the signaling panel (30) or are directly printed on the signaling panel (30).

6. Light-signaling device (1) according to claim 1, wherein the LEDs (20) have an LED height (h) with respect to the board surface (100), and wherein the spacer panel (40) has a spacer panel thickness (hd) at least equal to the LED height (h).

7. Light-signaling device (1) according to claim 1 or claim 6, wherein a perimeter frame (60) surrounding the spacer panel (40) and the electronic lighting board (10) to contain the insulating material (M) is fixed to the signaling panel inner side (31) of the signaling panel (30).

8. Light-signaling device (1) according to claim 6, wherein the perimeter frame (60) has a frame height (hc) greater than an overall height of the spacer panel (40) coupled to the electronic lighting board (10).

9. Light-signaling device (1) according to claim 2, wherein a perimeter frame (60) surrounding the electronic lighting board (10) to contain the insulating material (M) is fixed to the signaling panel inner side (31) of the signaling panel (30).

10. Light-signaling device (1) according to claim 9, wherein the electronic lighting board (10) has a lighting board height (hs), wherein the perimeter frame (30) has a frame height (hc) greater than the lighting board height (hs).

11. Light-signaling device (1) according to any one of the preceding claims when dependent on claim 1, wherein the at least one LED seat (50) obtained in the spacer panel (40) is a through seat.

12. Light-signaling device (1) according to any one of claims 1 to 8, wherein the at least one LED seat (50) obtained in the spacer panel (40) is a blind seat.

13. Light-signaling device (1) according to any one of the preceding claims, wherein the LEDs of the plurality of LEDs are inserted by shape coupling into the at least one LED seat (50).

14. Light-signaling device (1) according to any one of the preceding claims, wherein the insulating material (M) is a hardening, insulating liquid compound, such as a polymer resin, for example an epoxy or polyurethane resin, or a gel or a silicone rubber.

15. A method for assembling a light-signaling device according to any one of the preceding claims when dependent on claim 1, comprising the following steps:

- providing the signaling panel (30);
- positioning the spacer panel (40) so that the spacer panel inner side (41) is in contact with the signaling panel inner side (31);
- positioning the electronic lighting board (10) so that the plurality of LEDs is accommodated in the at least one LED seat (50), and the lighting side (11) of the electronic lighting board (10) is in contact with the spacer panel outer side (32);
- positioning the perimeter frame (60) around the spacer panel (40) and the electronic lighting board (10) so as to define the insulating volume (V);
- pouring the insulating material (M) into the insulating volume (V).

16. Method for assembling a light-signaling device according to any one of the preceding claims when dependent on claim 2, comprising the following steps:

- a. providing the signaling panel (30) having at least one LED seat (50) to accommodate the plurality of LEDs (20) mounted onto the electronic lighting board (10);
- b. positioning the electronic lighting board (10) so that the plurality of LEDs is accommodated in the at least one LED seat (50) and the lighting side (11) of the electronic lighting board (10) is in contact with the signaling panel inner side (31);
- c. positioning the perimeter frame (60) around the electronic lighting board (10) so as to define the insulating volume (V);
- d. pouring the insulating material (M) into the insulating volume (V).

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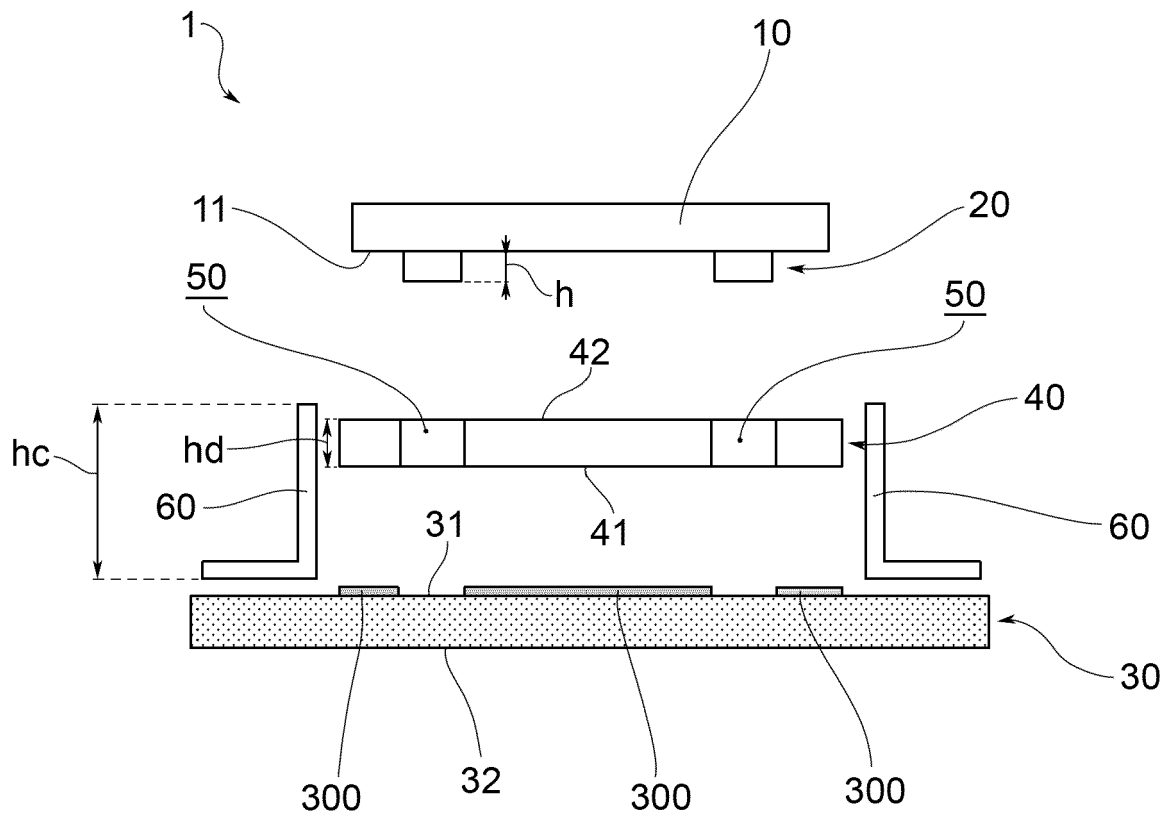


FIG.1

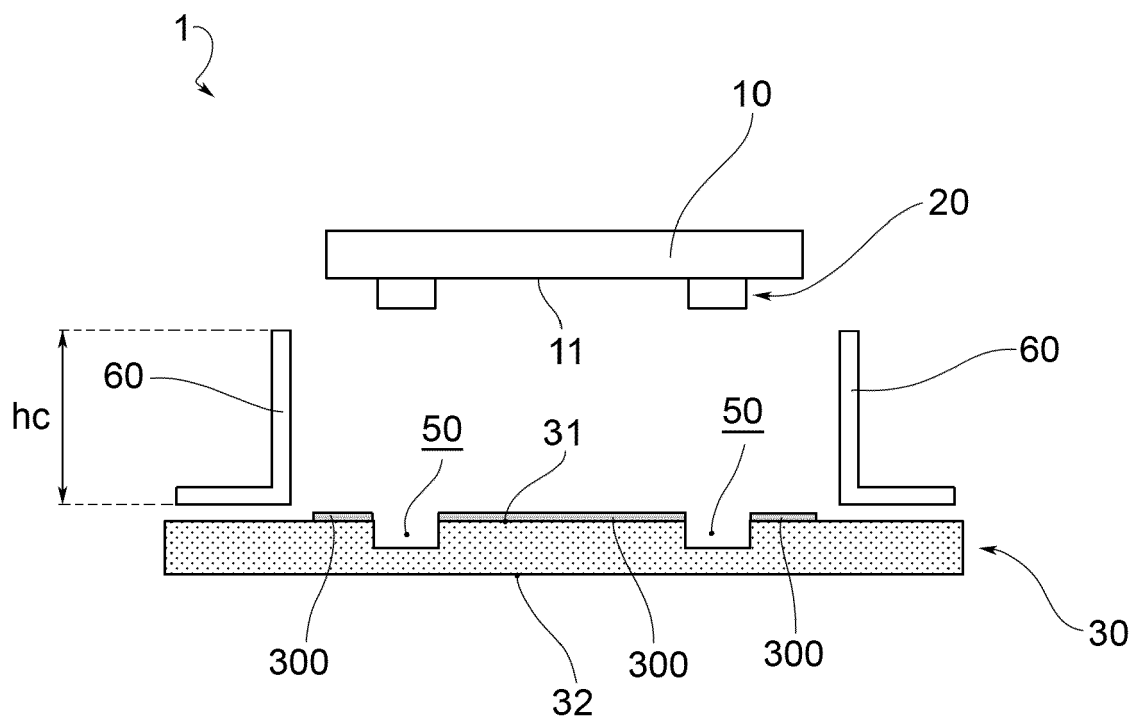


FIG.2

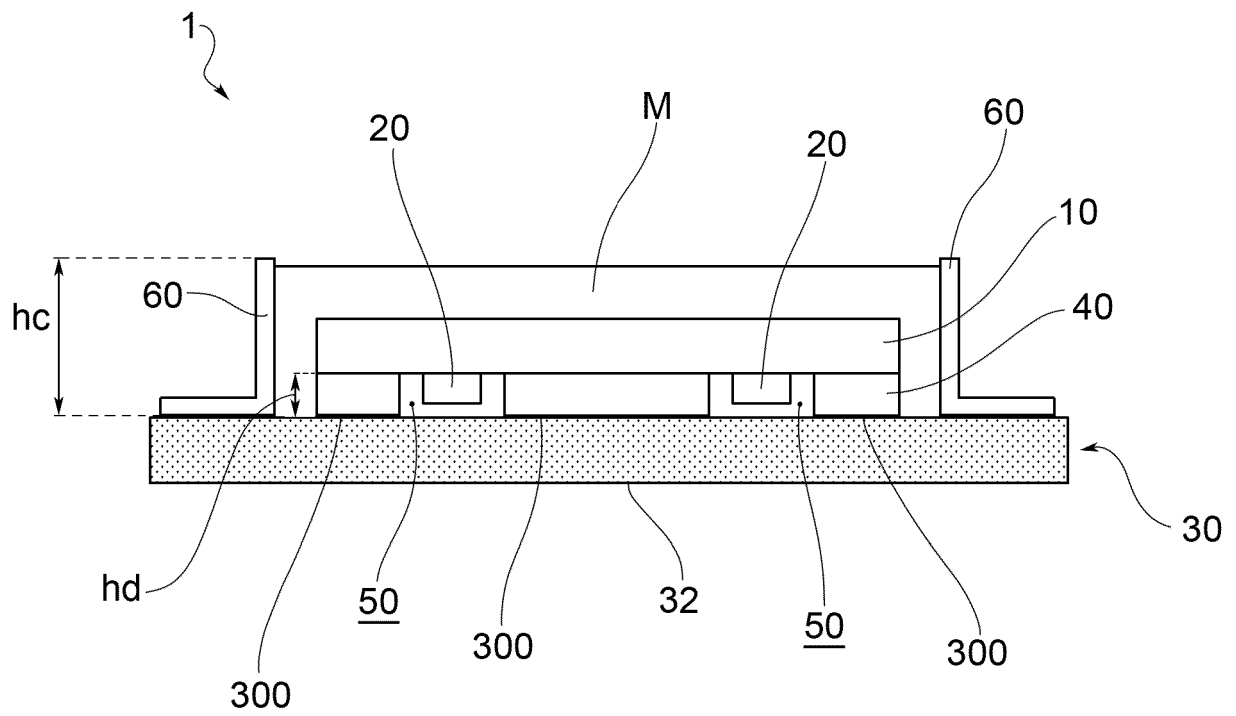


FIG.3

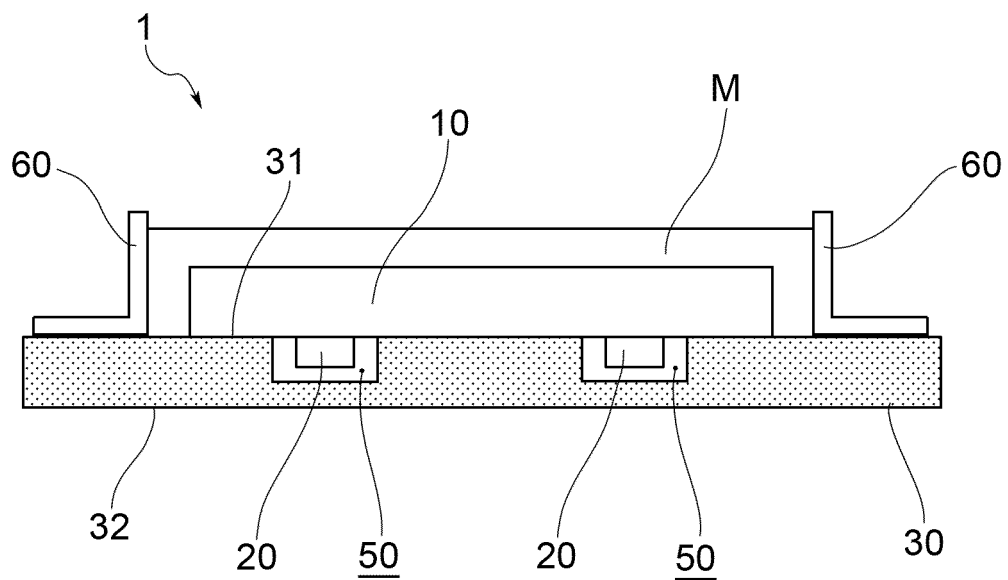


FIG.4



FIG. 5a

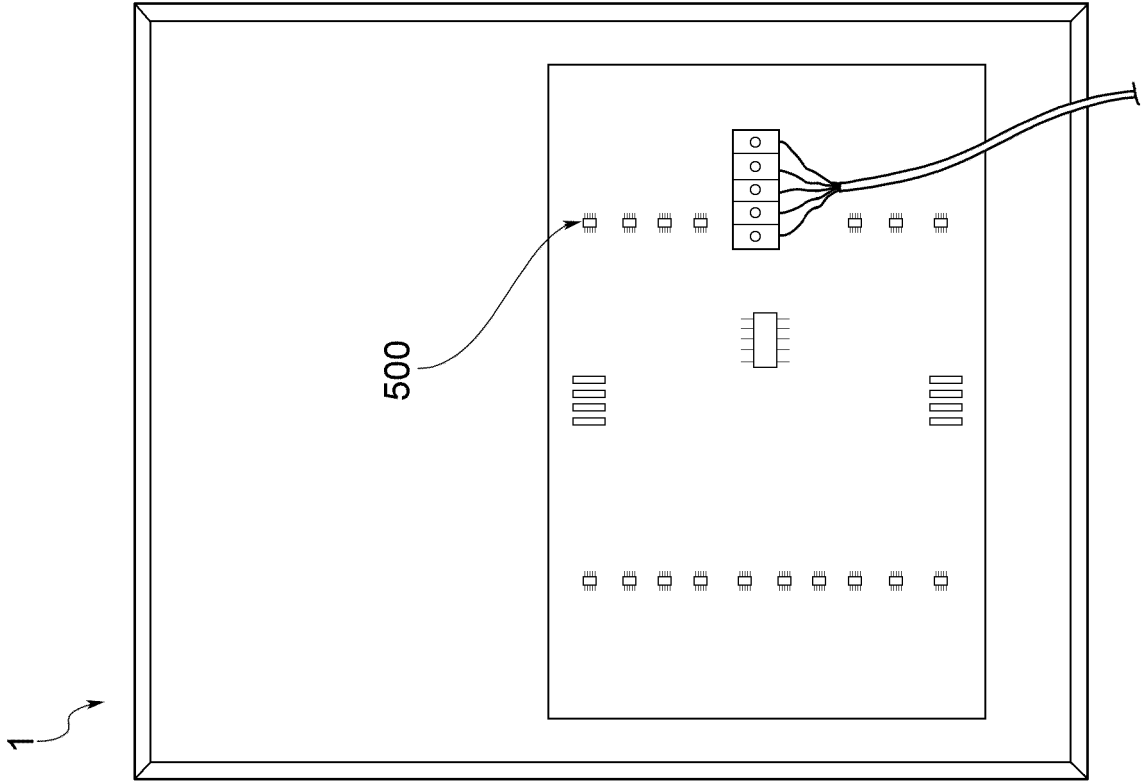
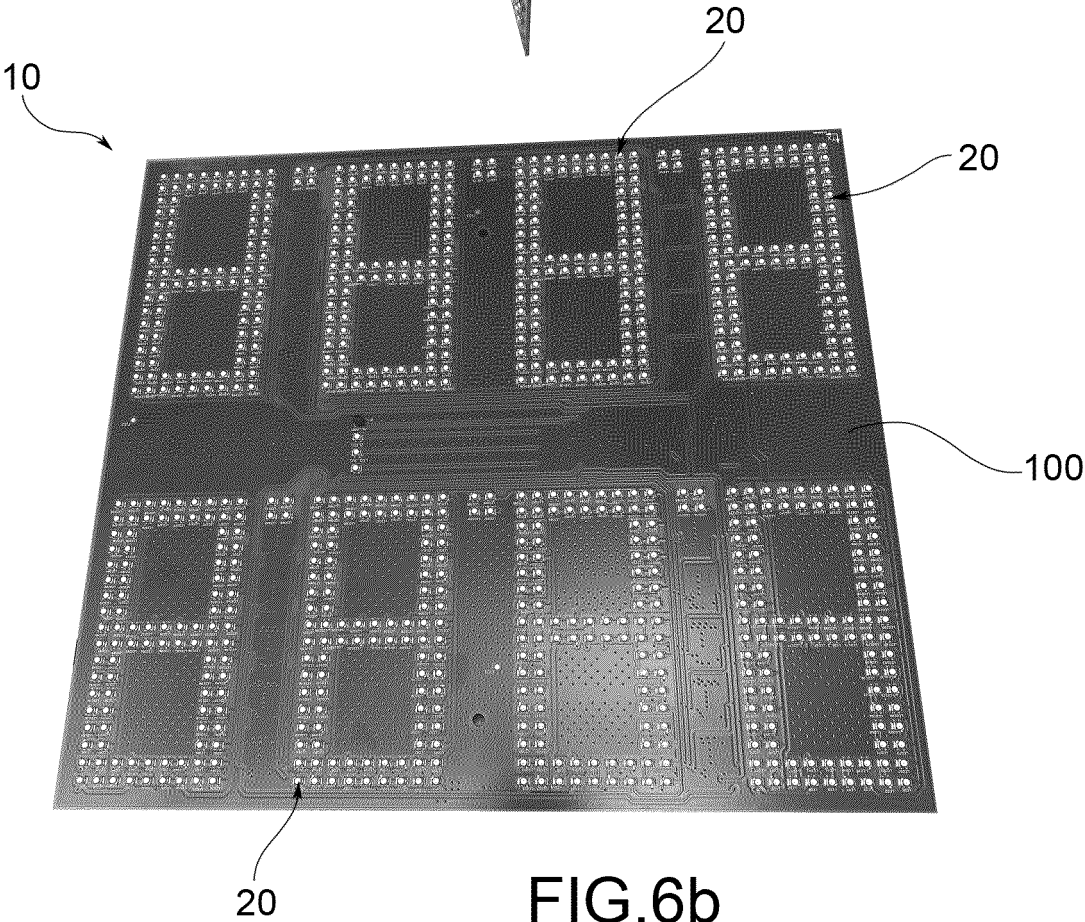
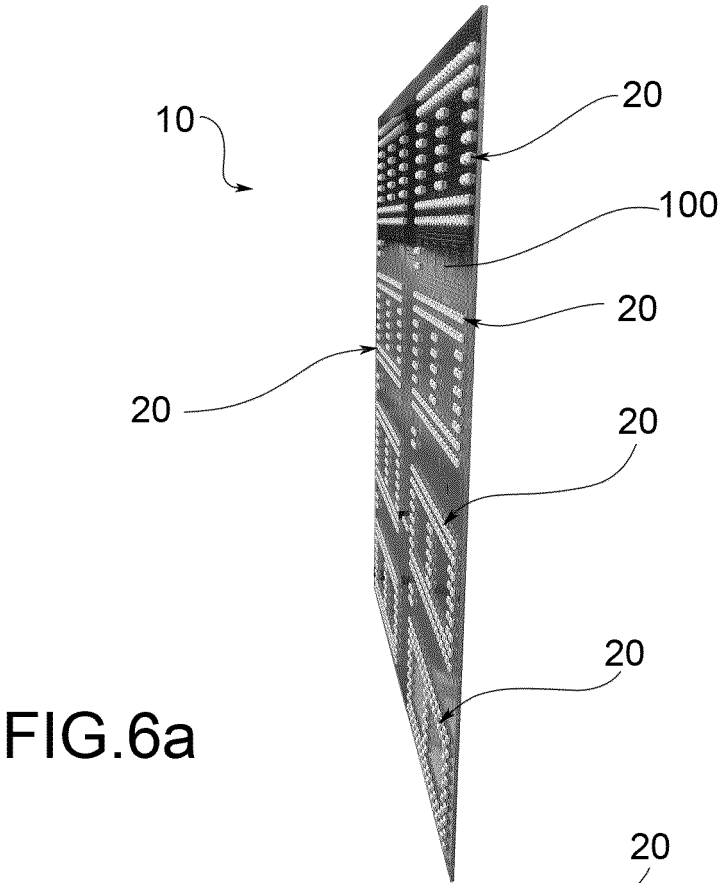


FIG. 5b



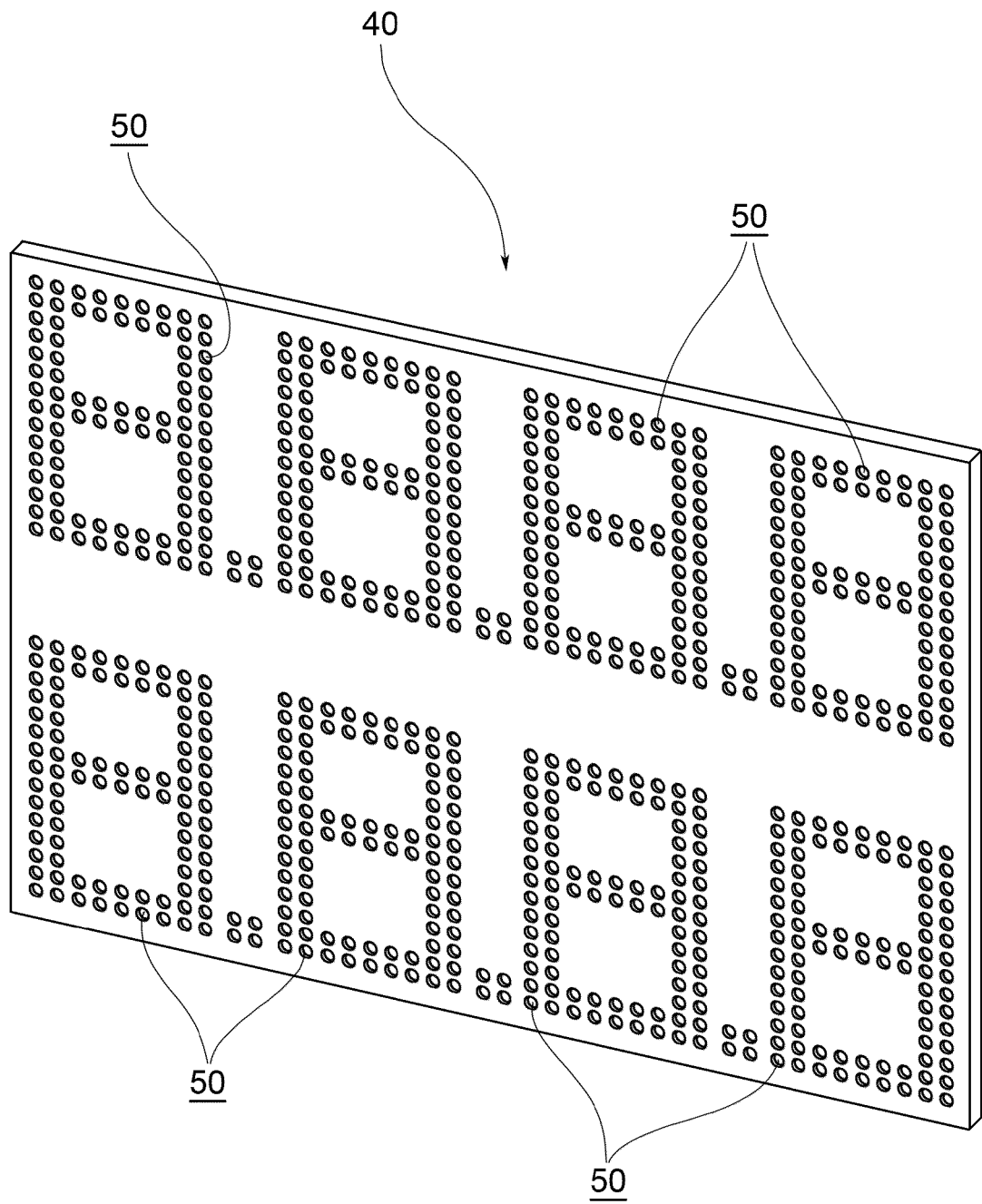


FIG.7



EUROPEAN SEARCH REPORT

Application Number

EP 24 19 5652

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	CN 101 571 265 B (DALIAN LUMING LIGHT SCIENCE & TECHNOLOGY CO LTD) 28 March 2012 (2012-03-28) * abstract; figures 1-3 *	1-16	INV. G09F9/33
X	CN 1 488 128 A (AGILENT TECHNOLOGIES INC [US]) 7 April 2004 (2004-04-07) * abstract; figures 1-16 *	1-16	
X	JP 2001 215899 A (ROHM CO LTD) 10 August 2001 (2001-08-10) * abstract; figure 6 *	1-16	
X	JP H09 81054 A (ROHM CO LTD) 28 March 1997 (1997-03-28) * abstract; figures 1-4 *	1-16	
			TECHNICAL FIELDS SEARCHED (IPC)
			G09F F21Y
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		22 November 2024	Pantoja Conde, Ana
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ON EUROPEAN PATENT APPLICATION NO.

EP 24 19 5652

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
CN 101571265 B	28-03-2012	NONE	

CN 1488128 A	07-04-2004	CN 1488128 A	07-04-2004
		WO 03030132 A1	10-04-2003

JP 2001215899 A	10-08-2001	JP 3802724 B2	26-07-2006
		JP 2001215899 A	10-08-2001

JP H0981054 A	28-03-1997	NONE	

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