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(71) Applicant: **Copenhagen Led Light IVS**
2960 Rungsted Kyst (DK)

(72) Inventors:
- **Åxman, Henrik**
  2950 Vedbæk (DK)
- **Davidsen, Tina**
  2960 Rungsted Kyst (DK)

(74) Representative: **Guardian**
IP Consulting I/S
Diplomvej, Building 381
2800 Kgs. Lyngby (DK)

(54) Composite panel, lighting element, and arrangement comprising the same

(57) The present invention relates to a composite panel (101) for receiving a lighting element (200) comprising a housing (201) comprising a first (203) and a second (204) electrical contact element, the composite panel (101) comprising a first and at least a second electrically conductive layer (105, 105'), and at least one electrically insulating layer (106), where the at least one electrically insulating layer (106) separates and electrically isolates the first and the second conductive layers (105, 105') from each other,
Wherein the composite panel (101) comprises a receiving recess (115) adapted to, during use, receive the lighting element (200) in at least the electrically insulating layer (106) so that the first electrical contact element (203) of the lighting element (200) forms an electrical connection with the first conductive layer (105) and the second electrical contact element (204) of the lighting element (200) forms an electrical connection with the second conductive layer (105'), and the receiving recess (115) comprises at least one first securing element (102) adapted to engage with at least one second securing element (202) of the lighting element (200) thereby securing the lighting element (200) in the composite panel (101) when the lighting element (200) is received by the receiving recess (115).

The present invention also relates to a lighting element and an arrangement comprising a composite panel and at least one lighting element.

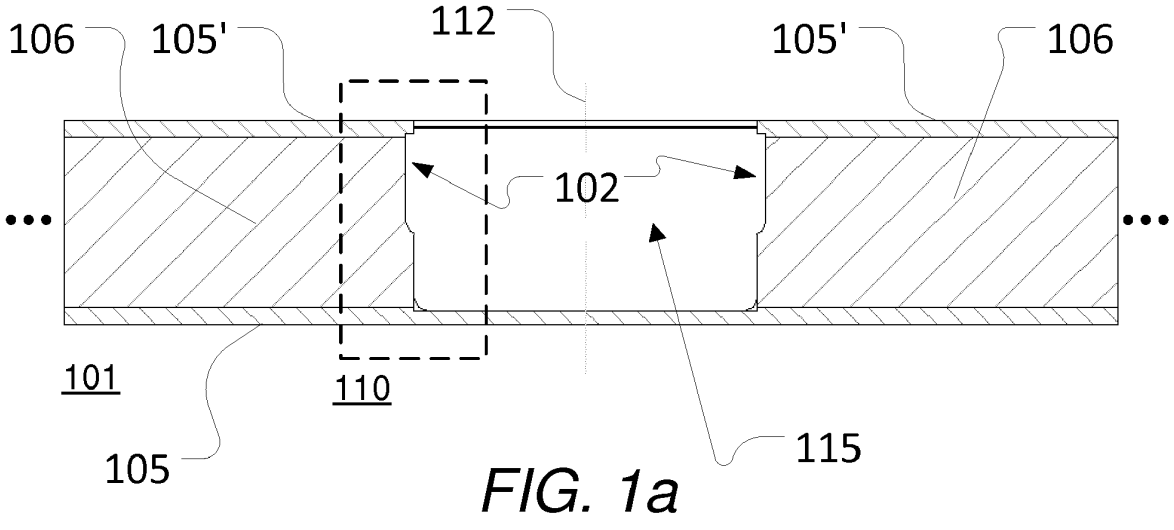

FIG. 1a

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Description

Field of the invention

[0001] The present invention relates generally to a composite panel and to a lighting element, where the lighting element, in use, is received by the composite panel. The present invention also relates to an arrangement comprising a composite panel and at least one lighting element.

Background

[0002] Light arrangements consisting of a two electrically conductive layers with an insulating layer or core in-between, often formed as a sandwich board, sheet, panel, or the like, are generally known where one or more lighting elements are inserted into the panel in such a way that an electrical circuit involving the two electrically conductive layers and the lighting element is closed.

[0003] An applied electrical potential over the two conductive layers will cause the lighting elements to emit light.

[0004] The insulating layer or core is usually relative low density, to keep the overall weight down, and the electrically conductive layers may be made from a relatively lightweight electrically conductive material such as aluminium.

[0005] Certain such boards, sheets, panels are sometimes referred to as Dibond panels.

[0006] Lighting elements used in this context are often light emitting diodes (LEDs).

[0007] Throughout the description, such sandwich boards, sheets, panels, and the like will be referred to as composite panels.

[0008] There are production processes that involve drilling or milling a number of suitably sized holes in the panel at desired locations and then simply inserting the lighting elements into the holes to give a desired pattern of lights.

[0009] Such panels may be used for general lighting or for signs where the lighting elements may form a logo, text, graphics, etc.

[0010] It is not unusual for a panel to comprise e.g. about 20 - about 400 light elements although it of course can be more and also fewer.

[0011] However, when transporting and/or handling such panels with inserted light elements it is not unusual that one or more light elements will release itself from the panel. By releasing themselves, the electrical circuit powering the given released light elements may be disconnected thereby causing them not to function properly.

[0012] Furthermore, some light elements may even dislodge themselves completely from the panel. Such light elements may easier go missing and/or be damaged during transportation and/or handling.

[0013] It is not unusual of panels of this type to be fairly large size, e.g. when being used for a sign, compared to its depth whereby it relatively easy will bend that will increase the likelihood of light elements being released.

[0014] There is therefore a need for a panel, a lighting element, and an arrangement comprises a panel and at least one lighting element that (also on their own) alleviate one or more of the above mentioned drawback at least to some extent.

Summary

[0015] According to a first aspect, disclosed herein is a composite panel for receiving a lighting element, the lighting element comprising a housing comprising a first and a second electrical contact element, the composite panel comprising a first and at least a second electrically conductive layer, and at least one electrically insulating layer, where the at least one electrically insulating layer separates and electrically isolates the first and the second conductive layers from each other, wherein the composite panel comprises a receiving recess adapted, during use, to receive the lighting element in at least the electrically insulating layer so that the first electrical contact element of the lighting element forms an electrical connection with the first conductive layer and the second electrical contact element of the lighting element forms an electrical connection with the second conductive layer, and the receiving recess comprises at least one first securing element adapted to engage with at least one second securing element of the lighting element thereby securing the lighting element in the composite panel when the lighting element is received by the receiving recess.

[0016] Accordingly, a composite panel is provided that readily enables that one or more lighting elements inserted into the composite panel is securely held in its respective receiving recess, even during transport and/or handling of the composite panel where the panel may bend or warp to some extent, since the first securing element together with the second securing element will restrict movement of an inserted lighting element in a direction out of the composite panel.

[0017] In some embodiments, the at least one first securing element is a further recess located in at least a part of the electrically insulating layer.

[0018] In some embodiments, the at least one second securing element is a resilient member fitting into the further recess.

[0019] In some embodiments, the further recess is located substantially all the way about a central axis of the receiving recess.

[0020] In some embodiments, the further recess located in at least a part of the second conductive layer and comprises a first rim or edge in the second conductive layer adapted to engage a distal end of the second securing element when the lighting element is received by the receiving recess and wherein the second securing element is made of an electrically conductive material and it is also the second electrical contact element.

[0021] In this way, electrical power to an inserted lighting element may be transferred via the second securing element abutting against the second conductive layer in the further recess when the second securing element is made as an electrical contact or conductor and is appropriately connected to in the lighting element.

[0022] Additionally, this facilitates a double function of the second securing element simplifying the construction of the composite panel and lighting element.

[0023] Furhtermore, a lighting element may be inserted into the receiving recess without requiring any specific rotational oritentation, which is a great advantage during assembly/insertion.

[0024] In some embodiments, the further recess comprises a second rim or edge, wherein the second rim or edge is rounded.

[0025] That the second rim or edge is rounded enables a simpler drilling or milling process of the further recess since it is easier to have a gradual/rounded transition than a sharper one. Additionally, easier installation of a lighting element is also facilitated since it then cannot get stuck on the second rim or edge so easily or at all during installation of the lighting element into the receiving recess.

[0026] In some embodiments, the receiving recess is substantially cylindrical and defines a substantially circular opening in the second conductive layer, a substantially cylindrical volume in at least a part of the electrically insulating layer, and also goes at least partly into the first conductive layer.

[0027] In some embodiments, the composite panel further comprises a transparent cover fixed to the second electrically conductive layer, wherein the transparent cover is made from a material selected from polycarbonate, plexiglass, glass, etc.

[0028] By having a transparent cover like this and of such material will increase the durability of the composite panel by many magnitudes enabling many further uses of the composite panel and lighting element.

[0029] The transparent cover may e.g. be glued to the second electrically conductive layer or fixed to it in another way.

[0030] The transparent cover may e.g. have a concave or convex part to spread or focus the emitted light.

[0031] The transparent cover may e.g. also comprise an O-ring or other seal to ensure that the lighting element is water and/or gas-tight, which may be important for certain off-shore and/or marine uses.

[0032] According to a second aspect, disclosed herein is a lighting element for being received by a receiving recess of a composite panel where the composite panel comprises an electrically insulating layer electrically isolating a first and a second conductive layer, wherein the lighting element comprises a housing comprising a first and a second electrical contact element, and a light source, wherein the lighting element is adapted to form an electrical connection between the first electrical contact element and the first conductive layer of the composite panel and an electrical connection between the second electrical contact element and the second conductive layer of the composite panel when the lighting element is received by the receiving recess, and comprises at least one second securing element adapted to engage with at least one first securing element in the receiving recess thereby securing the lighting element in the composite panel when the lighting element is received by the receiving recess.

[0033] In some embodiments, the at least one first securing element is a further recess located in at least a part of the electrically insulating layer.

[0034] In some embodiments, the at least one second securing element is a resilient member fitting into the further recess.

[0035] In some embodiments, the further recess located in at least a part of the second conductive layer and the second securing element comprises a distal end adapted to engage a first rim or edge in the second conductive layer of the further recess when the lighting element is received by the receiving recess and wherein the second securing element is made of an electrically conductive material and it is also the second electrical contact element.

[0036] In some embodiments, the receiving recess is substantially cylindrical and defines a substantially circular opening in the second conductive layer, a substantially cylindrical volume in at least a part of the electrically insulating layer (106), and also goes at least partly into the first conductive layer.

[0037] In some embodiments of the composite panel and/or the lighting element, the lighting element comprises at least one light emitting diode.

[0038] According to another aspect is disclosed a lighting arrangement comprising a composite panel and embodiments thereof as described above and throughout the description and at least one lighting element and embodiments thereof as described above and throughout the description.

Brief description of the drawings

[0039]

Figure 1 a schematically illustrates a cross section of one embodiment of a composite panel;

Figure 1b shows an expanded view of a portion 110 of the composite panel of Figure 1a;

Figure 1c schematically illustrates a view of a part of a composite panel, e.g. the one shown in Figure 1a, in an insertion direction of the lighting element;

Figure 2 schematically illustrates an exemplary embodiment of a lighting element to be used with the composite panel of Figures 1 a - 1 c, and 6 shown from one side;

Figure 3 shows the lighting element of Figure 2 shown from above;

Figure 4 shows the lighting element of Figures 2 and 3 shown from below;

Figure 5 shows the lighting element of Figures 2, 3, and 4 shown from another side; and

Figure 6 shows the composite panel of Figures 1 a - 1 c comprising a further element.

Detailed description

[0040] Various aspects and embodiments of a composite panel, a lighting element, and an arrangement comprising a composite panel and at least one lighting element as disclosed herein will now be described with reference to the figures.

[0041] Figure 1 a schematically illustrates a cross section of one embodiment of a composite panel.

[0042] Shown is a composite panel 101 for receiving a lighting element (not shown; see e.g. 200 in Figures 2, 3, 4, and 5) comprising a first (not shown; see e.g. 203 in Figures 2, 4, and 5) and a second (not shown; see e.g. 204 in Figures 2 - 5) electrical contact element.

[0043] The composite panel 101 comprises a first 105 and a second 105' electrically conductive layer. Furthermore, the composite panel 101 also comprises an electrically insulating layer 106, where the electrically insulating layer 106 separates and electrically isolates the first and the second conductive layers 105, 105' from each other.

[0044] The composite panel 101 has in this way a 'sandwich' structure with a core being the electrically insulating layer 106 separating the first and second conductive layers 105, 105'.

[0045] The electrically insulating layer 106 is of a generally non-conducting material and may be of a relative low density (e.g. as compared to metal) material to keep the overall weight of the composite panel 101 down. The electrically insulating layer 106 may be made of certain types of materials e.g. polyethylene (PE), rubber-like polymers, most plastics, etc. The width of the electrically insulating layer 106 may depend on a specific use.

[0046] The electrically conductive layers 105, 105' may in principal be made from any conductive material e.g. like a suitable sheet metal. The electrically conductive layers 105, 105' are preferably made of a relatively lightweight electrically conductive material, e.g. aluminium. Alternatively, the electrically conductive layers 105, 105' may be made of stainless steel, copper, etc. The width of each electrically conductive layer may be different depending on specific use, but will typically be somewhat smaller than the width of the electrically insulating layer 106. The widths of the two electrically conductive layers may be the same or may be different from each other, again depending on specific use.

[0047] The composite panel 101 further comprises at least one receiving recess 115 where each receiving recess 115 is adapted to receive a lighting element during use in at least the electrically insulating layer 106 so that a first electrical contact element (not shown; see e.g. 203 in Figures 2, 4, and 5) of the lighting element forms an electrical connection with the first conductive layer 105 and the second electrical contact element (not shown, see e.g. 204 in Figures 2 - 5) of the lighting element forms an electrical connection with the second conductive layer 105'. In the lighting element, a given light source, such as e.g. one or more LEDs, is electrically connected to the first and second electrical contact elements so that a circuit is formed. In some embodiments (e.g. the ones shown in Figures 2 - 5), the second securing element and the second electrical contact element of the lighting element are the one and same element, which will provide some further advantages, as will be explained in the following.

[0048] An applied electrical potential over the two conductive layers 105, 105' will thereby cause a lighting element inserted into a receiving recess 115 to emit light and actually cause all the lighting elements inserted in this way into the composite panel to emit light.

[0049] The actual design of the lighting element including design and location of the its first and second electrical contact elements may vary as long as it enables separate connection with the first and second conductive layers 105, 105'.

[0050] The receiving recess 115 goes in certain embodiments, e.g. as shown in Figure 1a, all the way through the second electrically conductive layer 105' and in this particular and similar embodiments also all the way through the electrically insulating layer 106 while only partially into the first electrically conductive layer 105 thereby exposing the first electrically conductive layer 105 for electric connection while also using it as an abutment surface.

[0051] The receiving recess 115 may in certain embodiments, e.g. as shown in Figure 1a, be substantially cylindrical about a central axis 112 whereby the receiving recess 115 then defines a substantially circular opening in the second conductive layer 105' and a substantially cylindrical volume in at least a part of the electrically insulating layer 106 for receiving a lighting element.

[0052] The receiving recess 115 may alternatively go fully through also the first conductive layer 105, at least at some locations, just as long as the first electrical contact element is designed accordingly.

[0053] Such receiving recesses 115 may generally be made in the composite panel 101 relatively easy and efficiently during manufacture e.g. using appropriate drilling or milling processes.

[0054] The receiving recess 115 furthermore comprises at least one first securing element 102 adapted to engage with at least one second securing element (not shown; see e.g. 202 in Figures 2, 3,4, and 5) of the lighting element thereby securing the lighting element in the com-

posite panel 101 when the lighting element is received by the receiving recess 115.

[0055] In this way, it is readily enabled that the one or more lighting elements inserted into a composite panel is securely held in its respective receiving recess, even during transport and/or handling of the composite panel where the panel may bend or warp to some extent.

[0056] The first securing element 102 may together with the second securing element restrict movement of an inserted lighting element in a direction out of the composite panel 101. It is even further advantageous if the first and/or second securing elements still facilities easy insertion of the lighting element, especially since some composite panels may comprise a high number of inserted lighting elements, and also if the first and the second securing elements engage in an expedient and simple way.

[0057] In certain embodiments, the at least one first securing element is a further recess 102 located in at least a part of the electrically insulating layer 106. Shown in Figure 1 a is an embodiment comprising one further recess 102 going all the way around, i.e. being 360 degrees, inside the receiving recess 115. This facilitates simple insertion of the lighting element into the receiving recess 115. As will be explained further in connection with Figure 1b the further recess 102 forms an upper rim, edge, etc. (see 109 in Figure 1 b) for keeping an inserted lighting element in place after insertion.

[0058] In embodiments as shown in Figure 1 a and similar embodiments, the further recess 102 are additionally also located in the second conductive layer 105'.

[0059] That the further recess 102 is located (also) in the second conductive layer 105' enables that electrical power to the lighting element may be transferred via the second securing element abutting against the second conductive layer 105' in the further recess 102 when the second securing element is made as an electrical contact or conductor and is appropriately connected to in the lighting element. This facilitates a double function of the second securing element simplifying the construction of the composite panel 101 and lighting element 200.

[0060] This furthermore enables the lighting element to be inserted into the receiving recess 115 without requiring any specific rotational oritentation, which is a great advantage during assembly/insertion.

[0061] It is to be understood that the further recess 102 need not necessarily go all the way around on the inside of the receiving recess 115. It could e.g. go only a substantial part around, e.g. 350 degrees or less, and still provide more or less the same functionality. The further recess 102 could also be separated into two or more further recesses instead of a single continuous recess. The smaller the recess is about the central axis 112 and the greater the number of smaller separate recesses the single recess is replaced by to more careful the lighting element has to be inserted in relation to its specific rotational orientation (to ensure that the contacts add up), but it may still provide some of the other mentioned advantages.

[0062] The further recess 102 and its surroundings (labelled by box 110 in Figure 1 a) are shown as an expanded view in Figure 1b and will be described in further details in connection thereby.

[0063] Preferably, the at least one second securing element (of the lighting element) is a resilient member (not shown; see e.g. 202 in Figures 2, 3, 4, and 5) fitting into the further recess 102. The resilient member may e.g. be a resilient leg, peg, or similar. And as mentioned, it may be made of an electrically conductive material and be appropriately connected enabiling also to double in function as the second 204 electrical contact.

[0064] If the second securing element(s) is/are a resilient member secured at one end to the housing of the lighting element while the other end is free and the secured end is the first end of the two to be inserted then it may simply be pressed against the housing of the lighting element during insertion and then snap into the further recess at a proper location thereby locking and securing the lighting element in the composite panel 101.

[0065] The further recess 102 may also be manufactured using an appropriate drilling or milling process, e.g. using a CNC (computer numeric control) milling machine e.g. a high speed machine capable of up to about 40.000 rpm. The receiving recess 115 and the further recess 102 may be produced in a single milling run or process e.g. using a single tool making it relatively easy to manufacture. Alternatively, the receiving recess 115 and the further recess(es) 102 may be produced by two different milling runs or processes e.g. with two different tools.

[0066] It is noted that only a part of the composite panel 101 is shown in Figure 1 a and often the composite panel 101 will comprise a plurality of receiving recesses and thereby a plurality of lighting elements in use but may of course in principle also comprise only one receiving recess and one lighting element if that is suitable for a given use.

[0067] When inserted into the receving recess 115, the lighting element will, in certain embodiments, be flush or in line with the the second conductive layer 105', i.e. the lighting element will not extend beyond the second conductive layer 105'. In other embodiments, the lighting element may extend beyond and in such cases, the lighting element may comprise a collar, sleeve, skirt, or the like.

[0068] Figure 1b shows an expanded view of a portion 110 of the composite panel of Figure 1 a.

[0069] Shown is a portion 110 of a composite panel of Figure 1 a that illustrate the first and second conductive layer 105, 105', the electrically insulating layer 106, the receiving recess 115, and the first securing element here in the form of a further recess 102 as discussed in connection with Figure 1 a.

[0070] The further recess 102 comprises a first rim or edge 109 in the second conductive layer 105' and in a part of the insulating layer 106 being adjacent to the second conductive layer. The first rim or edge 109 is adapted to engage the second securing element, e.g. more spe-

cifically adapted to engage a distal end (not shown; see e.g. 202' in Figure 5) of the second securing element, e.g. in the form of a resilient member, leg, peg, etc., when the lighting element is received by the receiving recess 115.

[0071] When the lighting element is inserted into the receiving recess 115, the second securing element in the form of a resilient member, leg, peg, etc. will snap into the further recess 102 thereby locking and securing the lighting element in the composite panel from being moved out again. Even if the composite panel is bend or warped during handling or transportation. Preferably, the angle between the rim or edge 109 and the insulating layer is substantially rectangular or 'sharp', i.e. about 90 degrees. The angle may be different to some extent. What is significant is that the angle enables reliable securing of an inserted lighting device and if the angle differs too much from 90 degrees (either direction) then the second securing element may more easily 'pop' out thereby releasing an inserted lighting device.

[0072] The further recess 102 also comprises a second rim, edge, or the like 108. This second rim or edge 108 is preferably more rounded than the sharper first rim or edge 109. That the second rim or edge 108 is rounded enables a simpler drilling or milling process of the further recess 102 since it is easier to have a gradual/rounded transition than a sharper one. Additionally, that it is rounded also facilitates easier installation of the lighting element 200 since it then cannot get stuck on the second rim or edge 108 so easily or at all during installation of the lighting element 200 into the receiving recess 115.

[0073] As mentioned, that the first rim or edge 109 is in the second conductive layer 105' as well enables using the second securing element also as the second 204 electrical contact element (see 202 and 204 in Figures 2 - 5).

[0074] As already mentioned, the receiving recess 115 ends partly into the first electrically conductive layer 105, which creates a further rim or edge 111 between the first electrically conductive layer 105 and the electrically insulating layer 106. This further rim or edge 111 may also be substantially rounded in order to enable a simpler drilling or milling process of the receiving recess 115.

[0075] The composite panel of Figure 1 a (and 1 b) is shown and explained further in connection with Figure 1 c.

[0076] Figure 1c schematically illustrates a view of a part of a composite panel, e.g. the one shown in Figure 1a, in an insertion direction of the lighting element.

[0077] Shown is a view of a part of a composite panel 101 in the direction of insertion of a lighting element. The view corresponds to seeing Figure 1 a from 'above'.

[0078] Shown is a part of the composite panel 101 comprising a second conductive layer 105' and a substantially circular (as seen from this direction) receiving recess 115. The receiving recess 115 reveals a part of a first conductive layer 105 otherwise located under the second conductive layer 105' with an electrically insulating layer (not shown; see e.g. 106 in Figures 1 a and 1 b) between them as already explained.

[0079] Further illustrated is a further recess 102 adapted to receive one or more corresponding second securing element(s)/resilient member(s) (not shown; see e.g. 202 in Figures 2, 3, 4, and 5) e.g. arranged in pairs (see e.g. 211 in Figures 3 and 4) when the lighting element is received by the receiving recess 115, where the second securing element(s)/resilient member(s) may also function as second 204 electrical contact element(s).

[0080] This and corresponding embodiments enables very reliable securing of an inserted lighting element. It also enables that an inserted lighting element do not need to have a specific rotational orientation in the receiving recess 115 when being inserted.

[0081] Figure 2 schematically illustrates an exemplary embodiment of a lighting element to be used with the composite panel of Figures 1 a - 1 c, and 6 shown from one side.

[0082] Shown is an exemplary embodiment of a lighting element 200 comprising a housing 201 comprising at least a first 203 and a second 204 electrical contact element, a light source (not shown; see e.g. 301 in Figure 3), and at least one second securing element 202. The light source may e.g. comprise one or more LEDs, and be electrically connected to the first and second electrical contact elements 203, 204.

[0083] The lighting element 200 is for being received by a receiving recess of a composite panel (not shown; see e.g. 115 and 101 in Figures 1a - 1c, and 6) like the ones shown and explained elsewhere.

[0084] As mentioned, the lighting element 200 will form an electrical connection between the first electrical contact element 203 and a first conductive layer (see e.g. 105 in Figures 1 a - 1 c, and 6) of the composite panel and an electrical connection between the second electrical contact element 204 and a second conductive layer (see e.g. 105' in Figures 1 a - 1 c, and 6) of the composite panel when the lighting element 200 is received by the receiving recess 115 of the composite panel.

[0085] In addition, the at least one second securing element 202 is adapted to engage with at least one first securing element (not shown; see e.g. 102 in Figures 1 a - 1 c, and 6), preferably in the form of a further recess, in the receiving recess of the composite panel thereby securing the lighting element 200 in the composite panel when the lighting element 200 is received by the receiving recess.

[0086] In the shown embodiment, the lighting element 200 comprises four second securing elements 202 arranged in two pairs 211 of two elements where only one pair is visible in the Figure. The other non-visible pair is located on the opposite side of the housing 201.

[0087] Preferably, the at least one second securing element 202 is a resilient member, each fitting into a further recess (not shown; see e.g. 102 in Figures 1 a - 1c, and 6). The resilient member may e.g. be a resilient leg, peg, or similar.

[0088] In this and similar embodiments, the at least one second securing element 202 is electrically conductive and connected appropriately to the light source making it function also as the second electrical contact element 204 as already explained.

[0089] The first electrical contact element 203 is preferably resilient for simple and reliable contact with an exposed first conductive layer (see e.g. 105 in Figures 1a - 1c, and 6).

[0090] The shown embodiment of the lighting device fits into the embodiments of the composite panel shown in Figures 1 a - 1 c, and 6.

[0091] It is to be understood, that several other embodiments, e.g. changing the number, type, and/or location of the second securing elements/second electrical contact elements 202/204, are contemplated and covered.

[0092] Figure 3 shows the lighting element of Figure 2 shown from above.

[0093] Shown is the lighting element 200 of Figure 2 shown from above (i.e. in its insertion direction). Here is can readily be seen that it comprises two pairs 211 of two second securing elements 202. Furthermore, the light source 301 is shown. The light source may e.g. comprise one or more LEDs, electrically connected to the first and second electrical contact elements.

[0094] It is to be understood for the lighting element of Figures 2 - 5, that the securing elements 202/contacts 204 need not be arranged in pairs. As alternatives, they could e.g. be placed equidistantly from each other on the housing 201 or in other ways.

[0095] Figure 4 shows the lighting element of Figures 2 and 3 shown from below.

[0096] Shown is the lighting element 200 of Figures 2 and 3 shown from below (i.e. opposite its insertion direction) revealing further details of the first electrical contact element 203, here comprising two resilient legs bending 'downwards' the insertion direction of the lighting element for contacting the first conductive layer of a composite panel. Alternatively, the first electrical contact element 203 could comprise another number of resilient legs, e.g. one, four, e.g. located as a (greek) cross, eight, etc.

[0097] Figure 5 shows the lighting element of Figures 2, 3, and 4 shown from another side.

[0098] Shown is the lighting element 200 of Figures 2, 3, and 4 shown from another side being 90 degrees from the shown side of Figure 2.

[0099] Figure 6 shows the composite panel of Figures 1 a - 1 c comprising a further element.

[0100] Shown in Figure 6 is a part of a composite panel 101. Figure 6 corresponds to Figure 1 a with the addition of a further element being a transparent cover sheet 600 preferably made by a durable material like polycarbonate, plexiglass, glass, etc. The transparent cover 600 may be glued to the second electrically conductive layer 105' or fixated to it in another way.

[0101] The transparent cover 600 may e.g. have a concave or convex part (not shown) to spread or focus the emitted light.

[0102] The transparent cover 600 may e.g. also comprise an O-ring or other seal to ensure that the lighting element is water and/or gas-tight, which may be important for certain off-shore and/or marine uses.

[0103] By having a transparent cover 600 in this way and of such material will increase the durability of the composite panel by many magnitudes enabling many further uses of a composite panel and lighting element as described.

[0104] In the claims enumerating several features, some or all of these features may be embodied by one and the same element, component or item. The mere fact that certain measures are recited in mutually different dependent claims or described in different embodiments does not indicate that a combination of these measures cannot be used to advantage.

[0105] It should be emphasized that the term "comprises/comprising" when used in this specification is taken to specify the presence of stated features, elements, steps or components but does not preclude the presence or addition of one or more other features, elements, steps, components or groups thereof.

Claims

1. A composite panel (101) for receiving a lighting element (200), the lighting element (200) comprising a housing (201) comprising a first (203) and a second (204) electrical contact element, the composite panel (101) comprising

- a first and at least a second electrically conductive layer (105, 105'), and
- at least one electrically insulating layer (106), where the at least one electrically insulating layer (106) separates and electrically isolates the first and the second conductive layers (105, 105') from each other,

wherein

- the composite panel (101) comprises a receiving recess (115) adapted, during use, to receive the lighting element (200) in at least the electrically insulating layer (106) so that the first electrical contact element (203) of the lighting element (200) forms an electrical connection with the first conductive layer (105) and the second electrical contact element (204) of the lighting element (200) forms an electrical connection with the second conductive layer (105'), and
- the receiving recess (115) comprises at least one first securing element (102) adapted to engage with at least one second securing element (202) of the lighting element (200) thereby securing the lighting element (200) in the compos-

ite panel (101) when the lighting element (200) is received by the receiving recess (115).

2. The composite panel (101) according to claim 1, wherein the at least one first securing element is a further recess (102) located in at least a part of the electrically insulating layer (106).

3. The composite panel (101) according to claim 2, wherein the at least one second securing element is a resilient member (202) fitting into the further recess (102).

4. The composite panel (101) according to any one of claims 2 - 3, wherein the further recess (102) is located substantially all the way about a central axis (112) of the receiving recess (115).

5. The composite panel (101) according to any one of claims 2 - 4, wherein the further recess (102) located in at least a part of the second conductive layer (105') and comprises a first rim or edge (109) in the second conductive layer (105') adapted to engage a distal end (202') of the second securing element (202) when the lighting element (200) is received by the receiving recess (115) and wherein the second securing element (202) is made of an electrically conductive material and it is also the second electrical contact element (204).

6. The composite panel (101) according to any one of claims 2 - 5, wherein the further recess (102) comprises a second rim or edge (108), wherein the second rim or edge (108) is rounded.

7. The composite panel (101) according to any one of claims 1 - 6, wherein the receiving recess (115) is substantially cylindrical and defines a substantially circular opening in the second conductive layer (105'), a substantially cylindrical volume in at least a part of the electrically insulating layer (106), and also goes at least partly into the first conductive layer (105).

8. The composite panel (101) according to any one of claims 1 - 7, wherein the composite panel (101) further comprises a transparent cover (600) fixed to the second electrically conductive layer (105'), wherein the transparent cover (600) is made from a material selected from polycarbonate, plexiglass, glass, etc.

9. A lighting element (200) for being received by a receiving recess (115) of a composite panel (101) where the composite panel (101) comprises an electrically insulating layer (106) electrically isolating a first (105) and a second (105') conductive layer, wherein the lighting element (200) comprises

- a housing (201) comprising a first (203) and a second (204) electrical contact element, and a light source (301),

wherein the lighting element (200)

- is adapted to form an electrical connection between the first electrical contact element (203) and the first conductive layer (105) of the composite panel (101) and an electrical connection between the second electrical contact element (204) and the second conductive layer (105') of the composite panel (101) when the lighting element (200) is received by the receiving recess (115), and
- comprises at least one second securing element (202) adapted to engage with at least one first securing element (102) in the receiving recess (115) thereby securing the lighting element (200) in the composite panel (101) when the lighting element (200) is received by the receiving recess (115).

10. The lighting element (200) according to claim 9, wherein the at least one first securing element is a further recess (102) located in at least a part of the electrically insulating layer (106).

11. The lighting element (200) according to claim 10, wherein the at least one second securing element is a resilient member (202) fitting into the further recess (102).

12. The lighting element (200) according to any one of claims 10 - 11, wherein the further recess (102) located in at least a part of the second conductive layer (105') and the second securing element (202) comprises a distal end (202') adapted to engage a first rim or edge (109) in the second conductive layer (105') of the further recess (102) when the lighting element (200) is received by the receiving recess (115) and wherein the second securing element (202) is made of an electrically conductive material and it is also the second electrical contact element (204).

13. The lighting element (200) according to any one of claims 9 - 12, wherein the receiving recess (115) is substantially cylindrical and defines a substantially circular opening in the second conductive layer (105'), a substantially cylindrical volume in at least a part of the electrically insulating layer (106), and also goes at least partly into the first conductive layer (105).

14. The composite panel (101) according to any one of claims 1 - 8 and/or the lighting element (200) according to any one of claims 9 - 13, wherein the lighting

element (200) comprises at least one light emitting diode (301).

15. A lighting arrangement comprising a composite panel (101) according to any one of claims 1 - 8, and 14 and at least one lighting element (200) according to any one of claims 9 - 14.

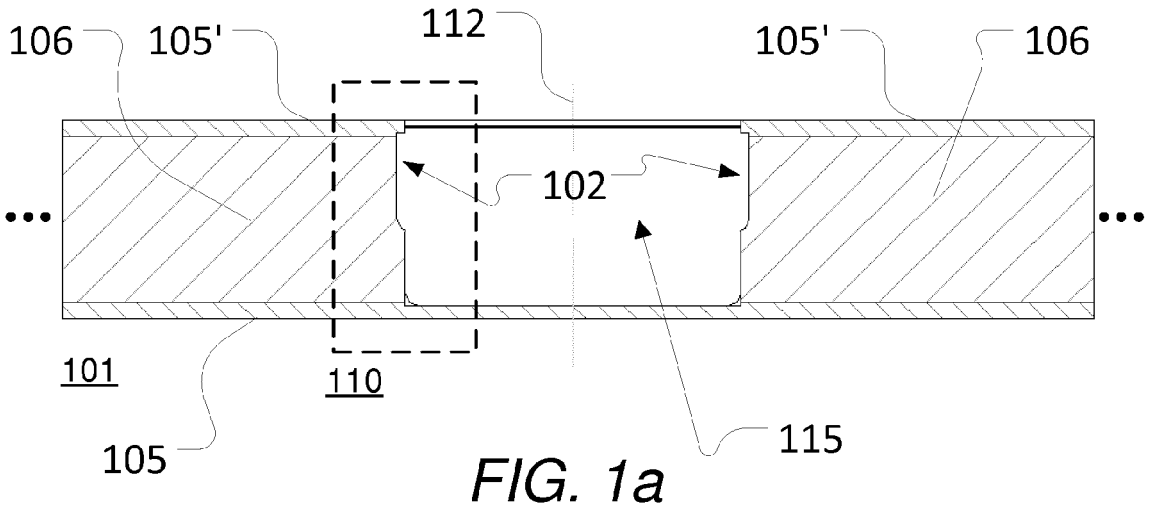


FIG. 1a

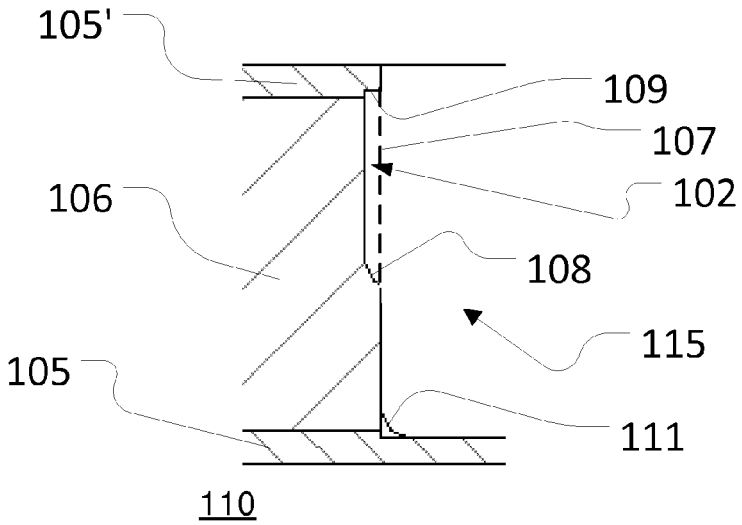


FIG. 1b

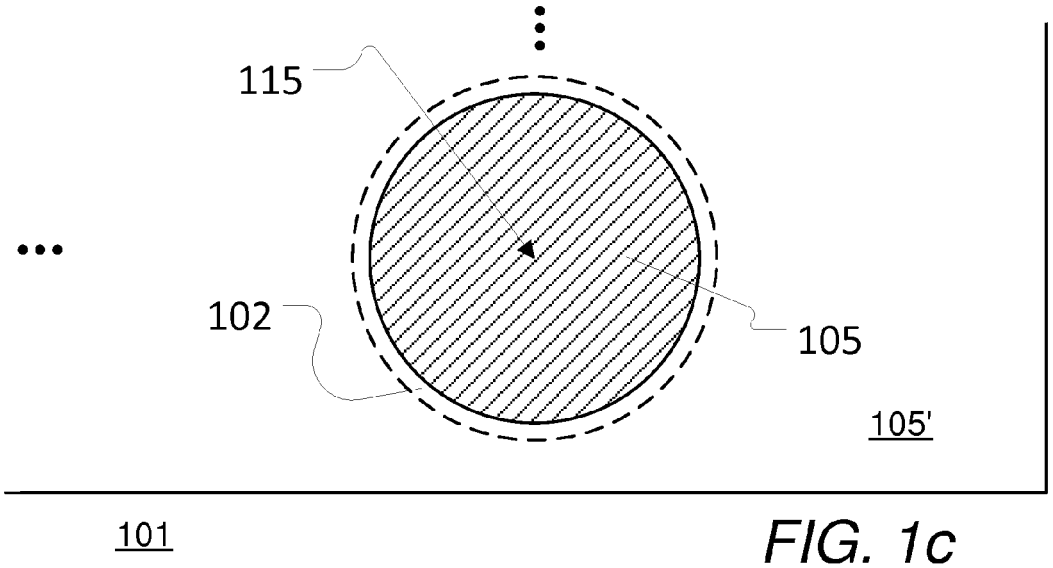
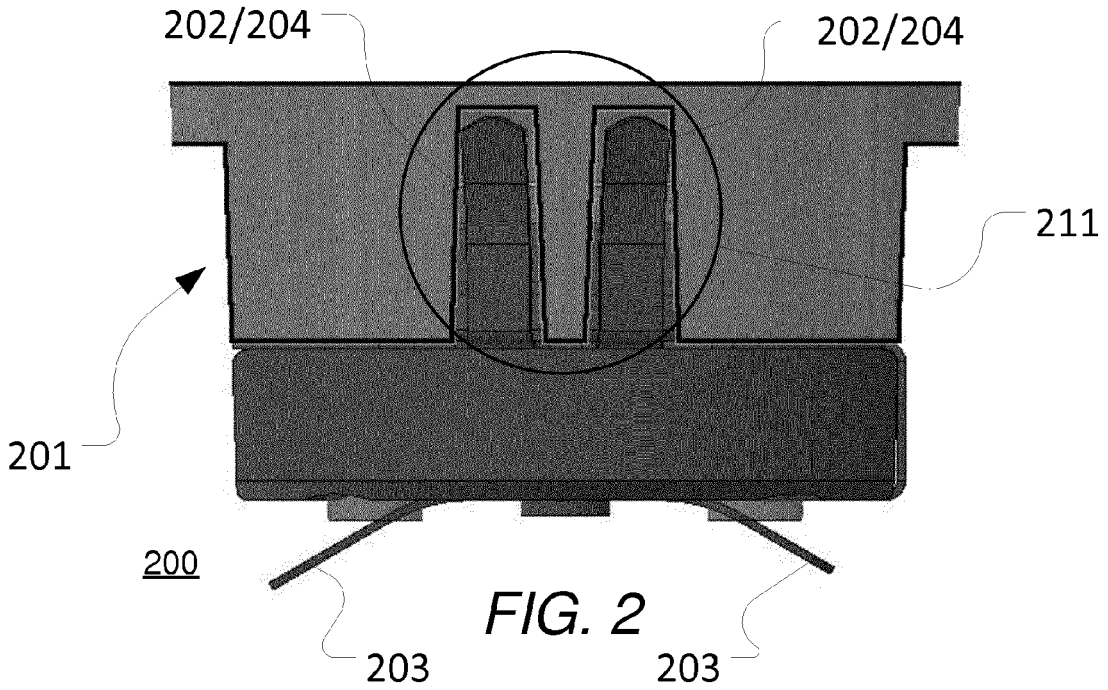


FIG. 1c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203
203

FIG. 2

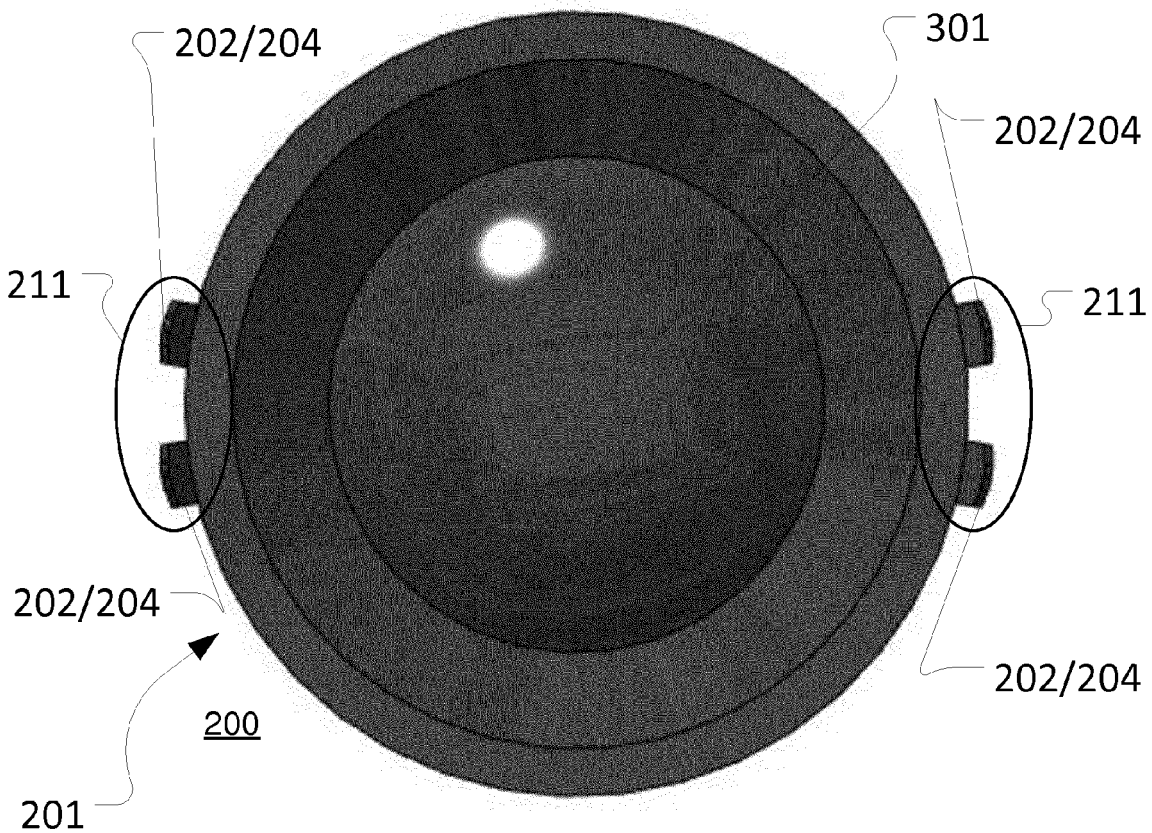
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FIG. 3

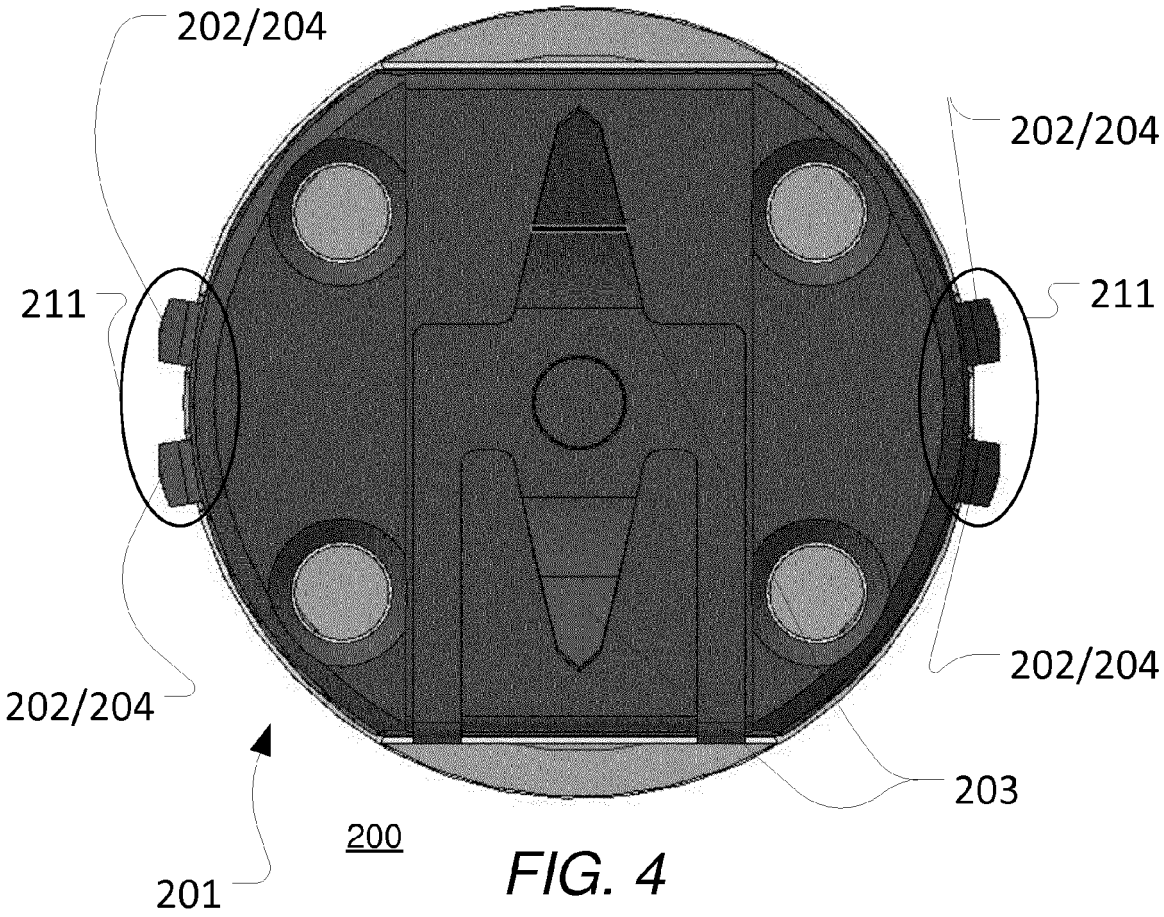
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FIG. 4

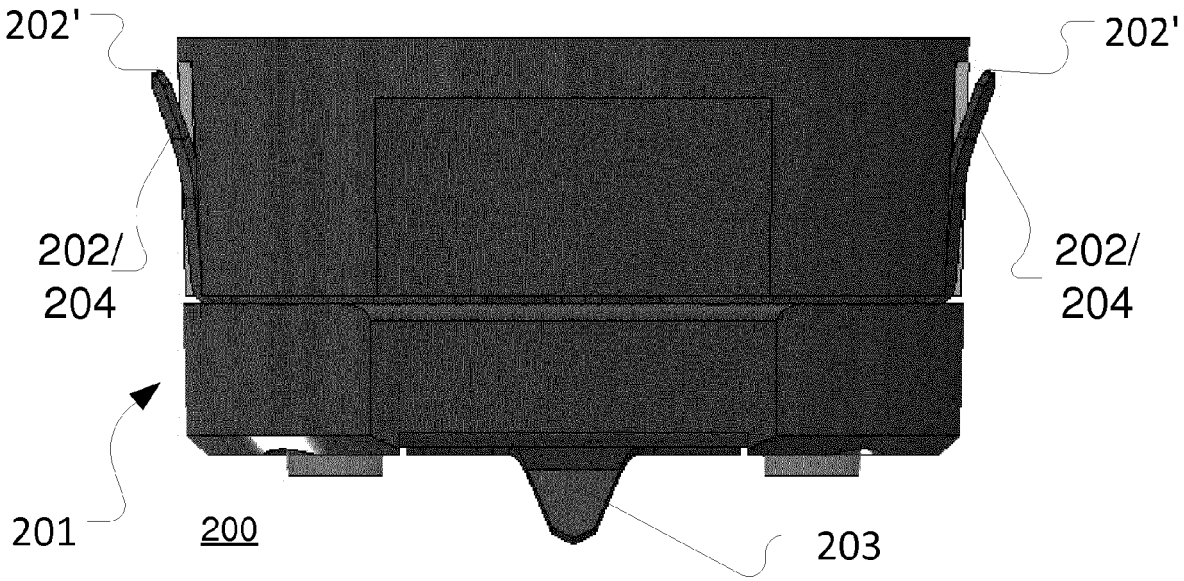
202'
202'
202/
204
202/
204
201
200
203

FIG. 5

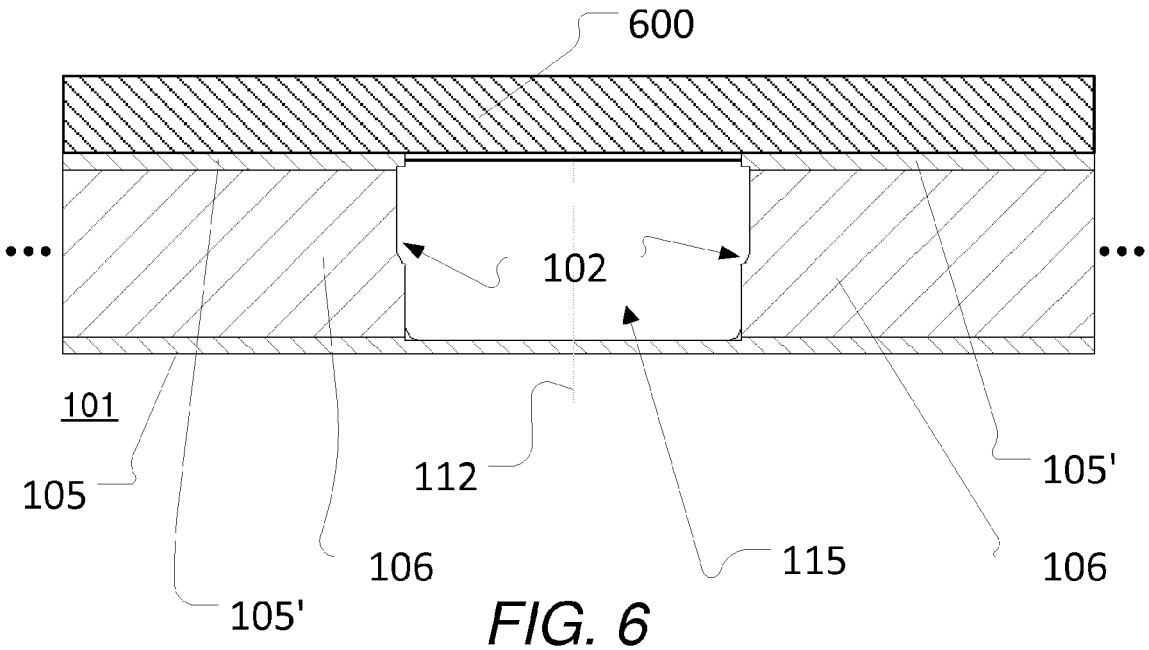

FIG. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 14 19 9323

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F21K
H01R
F21W
F21Y
F21S

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	27 May 2015	Kebemou, Augustin

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82