



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
03.01.2018 Bulletin 2018/01

(51) Int Cl.:
F21V 31/04 ^(2006.01) **F21S 4/22** ^(2016.01)
F21K 9/90 ^(2016.01) **F21Y 115/10** ^(2016.01)
F21Y 103/10 ^(2016.01) **F21Y 107/70** ^(2016.01)
F21V 15/01 ^(2006.01) **F21V 23/00** ^(2015.01)

(21) Application number: **17177797.2**

(22) Date of filing: **26.06.2017**

(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 MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA MD

• **Osram S.p.A. - Societa' Riunite Osram Edison Clerici**
20126 Milano (IT)

(72) Inventors:
• **BALDO, Lorenzo**
I-31040 Giavera del Montello (Treviso) (IT)
• **GRIFFONI, Alessio**
I-30030 Fossò (Venezia) (IT)

(30) Priority: **28.06.2016 IT UA20164709**

(71) Applicants:
• **OSRAM GmbH**
80807 München (DE)
Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

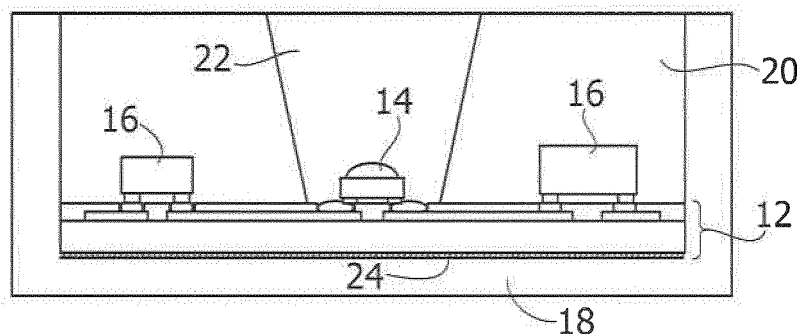
(74) Representative: **Bosotti, Luciano Buzzi, Notaro & Antonielli d'Oulx S.r.l.**
Via Maria Vittoria, 18
10123 Torino (IT)

(54) **A METHOD OF PRODUCING LIGHTING DEVICES AND CORRESPONDING DEVICE**

(57) A method of producing lighting devices includes:
- providing a channel-shaped housing (18),
- arranging in said housing (18) a lighting module (10) with at least one electrically-powered light radiation source (14), e.g. a LED source, and circuitry (16) coupled (120) with the light radiation source(s) (14), the light radiation source(s) (14) and the circuitry (16) facing towards the opening of the channel-shaped housing (12),

- providing a light-permeable cover (22, 26) that covers the light radiation source(s) (14) and leaves the associated circuitry (16) uncovered, and
- providing a sealing mass of light-impermeable material (20) which masks the circuitry (16), with the light radiation emitted from the light radiation source(s) (14) being adapted to propagate through the light-permeable cover (22, 26).

FIG. 1 f)



Description

Technical Field

[0001] The description relates to lighting devices.

[0002] One or more embodiments may refer to lighting devices employing electrically-powered light radiation sources, such as solid-state light radiation sources, e.g. LED sources.

Technological Background

[0003] Flexible LED modules, especially protected (sealed) modules, may have all the electrical and electronic components (LEDs, resistors, capacitors, LED drivers, etc., i.e. in general the circuitry associated to the light radiation sources) mounted on one and the same side of the support board, which is configured as a Printed Circuit Board (PCB).

[0004] This circuitry may come in dark-coloured (e.g. black) packages; as they are visible by the end user, when the LED module is off they may be perceived as dark spots, with an unpleasant appearance.

[0005] Moreover, said modules may be subject to colour shift phenomena (i.e. a shift in the emission wavelength) caused by the different reflection coefficients of the lens optionally associated to a LED and of the sealing mass deposited on the module. This problem may lead to a difficulty in implementing flexible and sealed LED modules having a warm and white Correlated Colour Temperature (CCT), with values amounting e.g. to 2000 K, 2400 K and 2700 K).

[0006] The aesthetic appearance may be improved by resorting to two process steps in order to implement the sealing.

[0007] The first step consists in covering the whole board surface with a material such as white silicone, the dark (black) components being therefore covered by said silicone layer and being invisible (masked) from the outside, while the Light Emitting Surface (LES) of the LEDs is left uncovered and therefore is not coated by said white layer. To this end, the LEDs may be chosen so that they are sufficiently "raised" with respect to the other components, so that they are not covered during this process step. However, this implies a limitation in the selection of the LEDs because, e.g., the designer may not be able to choose the best LEDs as regards performance, reliability and cost.

[0008] The second process step involves coating the whole board surface (already covered with the light or white silicone) with a transparent silicone, so as to favour an efficient light transmission through said transparent layer, while achieving the desired protection degree (e.g. Ingress Protection, IP, degree).

[0009] Another possible solution for improving the aesthetic appearance may involve requiring from the supplier components having a light-coloured, e.g. white, package. Some suppliers, however, may not be able to meet such

needs which, at any rate, are likely to involve an increased cost of the related components.

[0010] As regards the colour shift of the emitted radiation, the sealing layer may include a transparent elastomer material, having a reflection coefficient similar to the one of the LED lens. However, this transparent elastomer material may be costly and may lead to a significant increase in the overall price when it is deposited on the whole surface of the module.

[0011] Still another solution may consist in depositing, above the transparent layer and on the whole surface of the module, a layer of diffusive particles. Also this solution, however, may involve higher costs.

Object and Summary

[0012] One or more embodiments aim at overcoming the previously outlined drawbacks.

[0013] According to one or more embodiments, said object may be achieved thanks to a method having the features set forth in the claims that follow.

[0014] One or more embodiments may also concern a corresponding device.

[0015] The claims are an integral part of the technical teaching provided herein with reference to the embodiments.

[0016] One or more embodiments lead to the achievement of one or more of the following advantages:

- virtually only the LEDs are visible in the final product,
- it is possible to adapt to a wide range of LEDs and electrical/electronic components, so as to favour the use and the implementation of low cost LED modules;
- it is possible to reduce and virtually eliminate the emission colour shift due to the difference between the reflection coefficients of the LED lenses and of the transparent sealing mass of the module.

Brief Description of the Figures

[0017] One or more embodiments will now be described, by way of non-limiting example only, with reference to the annexed Figures, wherein:

- Figure 1, including portions denoted with letters from a) to f), shows steps of a method according to embodiments,
- Figure 2, including portions denoted with letters from a) to f), shows steps of a method according to embodiments, and
- Figure 3, including portions denoted with letters from a) to e), shows steps of a method according to embodiments.

[0018] It will be appreciated that, for clarity and simplicity of illustration, the various parts and components shown in the Figures may not be drawn to scale.

Detailed Description

[0019] In the following description, various specific details are given to provide a thorough understanding of various exemplary embodiments of the present specification. The embodiments may be practiced without one or several specific details, or with other methods, components, materials, etc. In other instances, well-known structures, materials or operations are not shown or described in detail to avoid obscuring various aspects of the embodiments.

[0020] Reference throughout this specification to "one embodiment" or "an embodiment" means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment. Thus, the possible appearances of the phrases "in one embodiment" or "in an embodiment" in various places throughout this specification are not necessarily all referring to the same embodiment. Furthermore, particular features, structures, or characteristics may be combined in any suitable manner in one or more embodiments.

[0021] The headings provided herein are for convenience only, and therefore do not interpret the extent of protection or scope of the embodiments.

[0022] One or more embodiments propose various solutions for producing flexible protected modules, e.g. LED modules, wherein only the LEDs are visible from the outside. Moreover, the conditions of low thermal colour shift are promoted.

[0023] One or more embodiments may e.g. envisage:

- the selective deposition of a light-coloured elastomer material (e.g. white silicone) onto a support such as a Flexible Printed Circuit (FPC), only covering the associated electrical/electronic circuitry without touching the LEDs,
- a selective deposition of a transparent elastomer material (e.g. silicone) onto the LEDs, and
- resorting to a special material composition and/or structure for the transparent elastomer which is adapted to enclose the LEDs.

[0024] One or more embodiments may envisage the use of an elongate, e.g. ribbon-shaped, flexible lighting module, denoted as 10 and shown in the annexed Figures in cross section.

[0025] As regards the present specification, said module 10 may be considered as an element of indeterminate length, optionally adapted to be cut to length according to the application and usage needs.

[0026] According to criteria known in themselves (which makes it unnecessary to provide a detailed description thereof), said module 10 may include (in this respect, see e.g. the portion denoted as a) in Figures 1, 2 and 3) :

- an elongate, e.g. ribbon-shaped, and flexible sub-

strate or support 12, which may include e.g. a Flexible Printed Circuit (FPC), with electrically conductive lines 120 provided e.g. on the front face (above in the Figures) of substrate 12,

- one or more electrically-powered light radiation sources 14, adapted to include solid-state light radiation sources such as e.g. LED sources, optionally with a lens 140 associated thereto, and
- one or more electrical and/or electronic circuit components 16 coupled to the light radiation sources 14 through the electrically conductive lines 120, having a supply and/or driving function.

[0027] In portion a) of Figures 1, 2 and 3, reference 160 denotes electrical junctions (e.g. soldering) between the electrically conductive lines 120 and the LEDs 14 and/or the circuitry 16 which, in one or more embodiments, may be mounted onto support or substrate 12 via an SMT mounting process.

[0028] For simplicity of illustration, in the remaining portions of Figures 1, 2 and 3, the only components of module 10 which are shown are the support 12, the light radiation source(s) 14 and the circuitry 16.

[0029] In the Figures, reference 18 denotes a generally channel-shaped housing or casing, including e.g. an elastomer material: this may be e.g. a white-coloured silicone elastomer.

[0030] Housing 18 is destined to host module 10 therein, with the possible application of one or more masses of sealing material (20 and 22 in the Figures) adapted to impart protection features against the penetration of external agents (e.g. an IP degree protection) to the lighting device.

[0031] One or more embodiments may envisage the use of a first material 20, e.g. a light-coloured elastomer (having any reflection index), generally light-impermeable, destined to be deposited into the channel profile of housing 18, with the exception of the area or region wherein the light radiation source(s) 14 are located.

[0032] In one or more embodiments, said area or region is adapted to be filled with a light-permeable material 22, e.g. a transparent elastomer, and/or to embed light-diffusive particles.

[0033] In one or more embodiments, elastomer 22 may have a reflection index matched to the reflection index of lens 140, optionally provided on the light radiation source(s) 14.

[0034] For example, in one or more embodiments, module 10 may be arranged within housing 18 as exemplified in portion b) of Figures 1 to 3, and it may be fixed in that position through an adhesive layer 24.

[0035] Starting from the portion denoted as c), Figures 1 to 3 exemplify possible embodiments adapted to differ in one or more features: the presence of a certain feature exemplified in one of the Figures 1 to 3 does not exclude the application of that same feature in one or more embodiments exemplified in other Figures.

[0036] In one or more embodiments as exemplified in

portion c) of Figure 1, around the or each light radiation source 14 there may be provided a protective shell or screen 26, e.g. of a non-stick material.

[0037] In one or more embodiments, shell or screen 26 may have a hollow shape (so that it may contain an aeriform mass surrounding source 14).

[0038] In one or more embodiments, a shell or screen 26 may be chosen having a flared shape, e.g. the shape of a truncated cone flaring in the direction away from source 14.

[0039] In one or more embodiments, shell 26 may have a height, orthogonally to the bottom plane of housing 18, approximatively equal or optionally superior to the corresponding dimension (again, the "height") of the side walls of housing 18.

[0040] As exemplified in portion d) of Figure 1, in one or more embodiments the sealing material 20 may be introduced into housing 18 so that it covers components 16 (which are assumed as being dark, e.g. black), so that the latter components are masked from the outside thanks to the generally light-coloured, e.g. white, sealing mass 20.

[0041] In a step exemplified in portion e) of Figure 1, shell or screen 26 may be removed (this operation may be made easier by the optional non-stick properties of the material of shell 26), and this may be followed by the introduction of the second sealing mass 22 in the position occupied by source(s) 14, i.e. in the portion of the inner cavity of housing 18 from which screen 26 has been removed and which now is uncovered.

[0042] Mass 22 may complete the sealing, i.e. the protection of the device against the penetration of foreign agents; because it is light-permeable (e.g. including a transparent silicone material), mass 22 may achieve said sealing/protection effect without hampering the propagation of the light radiation output from the source(s) 14 in operation.

[0043] In one or more embodiments, sealing masses 20 and 22 may undergo (e.g. thermal) curing.

[0044] This may take place via subsequent treatments, carried out either in discrete ways and times for mass 20 and mass 22, or in a single combined curing of both materials 20 and 22.

[0045] In one or more embodiments, as exemplified in Figure 2 (wherein parts and elements corresponding to parts and elements previously described with reference to Figure 1 are denoted by the same references, therefore making it unnecessary to repeat a detailed description thereof), the filling of housing 18 with sealing masses 20 (light-impermeable) and 22 (light-permeable) may take place in a so to say inverted sequence with respect to what is exemplified in Figure 1.

[0046] In the embodiments exemplified in Figure 2, once module 10 is arranged in housing 18 (see portions a) and b) of Figure 2), on the light radiation source (s) 14 there may be arranged a shell or screen 26, once again adapted to be hollow, so as to form e.g. a dome to protect source(s) 14.

[0047] In one or more embodiments, shell or screen 26 may be provided with at least one injection nozzle 26a, through which (see e.g. the sequence of portions c) and d) of Figure 2) the light-permeable sealing mass 22 may be injected, so as to fill the internal space of shell 26 above source(s) 14.

[0048] In one or more embodiments, shell or screen 26 may be comprised of a non-stick material, so as to favour the removal of screen 26 (see portion e) of Figure 2), so that around source(s) 14 it is possible to preserve a mass of light-permeable sealing material 22.

[0049] In one or more embodiments, material 22 does not hamper the propagation of the light radiation emitted by source (s) 14. At the same time, material 22 (which may optionally be already cured) may protect source(s) 14 when the sealing mass 20 is introduced into housing 18, as exemplified in portion f) of Figure 2.

[0050] Also in this case, the sealing mass 20 (which may be cured) forms a masking layer which hides the circuit components 16 from the outside. Moreover, the light-permeable mass 22 allows the light radiation output from source(s) 14 to propagate towards the outside.

[0051] In this case, mass 20 may round off the sealing, i.e. the protection of the device from penetration of external agents and in addition, because it is light-impermeable (e.g. because it is comprised of white silicone material), it may mask components 16 from the outside.

[0052] In one or more embodiments, sealing masses 20 and 22 may be subjected to curing (e.g. thermal curing), either with subsequent treatments, carried out discretely for mass 22 and for mass 20, or in one combined curing step of both materials 20 and 22.

[0053] As exemplified in Figure 2, in one or more embodiments shell 26 may be chosen with such dimensions that the mass of material 22 formed therein has a "height" superior to the height of the side walls of housing 18, so that mass 22 forms a dome projecting from the plane of the masking mass 20, the possibility being given (for mass 22) of performing an optical shaping action on the light radiation beam emitted by source(s) 14.

[0054] In one or more embodiments, as exemplified in Figure 3 (wherein, once again, parts or elements corresponding to parts or elements already described with reference to Figures 1 and 2 are denoted with the same references, which makes it unnecessary to repeat a corresponding detailed description) shell or screen 26 may instead be left in position.

[0055] To this end, in one or more embodiments, once module 10 has been arranged within housing 18 (portions a) and b) of Figure 3), around source(s) there may be arranged a fixing line 26b, e.g. of an adhesive material, so as to enable the fixation on module 10 of shell or screen 26, which is adapted to include a light-permeable material.

[0056] In one or more embodiments, screen or shell 26 may be imparted with optical properties, e.g. the features of a lens adapted to shape the light radiation beam emitted by source(s) 14.

[0057] In one or more embodiments, fixing shell or screen 26 may be achieved via a slight pressure exerted during mounting and/or thanks to curing line 26b, which may include e.g. curable adhesive material.

[0058] After positioning screen 26 (portion d) of Figure 3) it is possible to apply the light-impermeable sealing mass denoted as 20, adapted to perform a masking function of components 16.

[0059] In one or more embodiments as exemplified in Figure 3, it is possible to perform one single curing step of material 20 (which may optionally lead to curing line 26b as well).

[0060] In one or more embodiments, mass 20 is adapted to perform, in combination with shell 26 left in place, the function of protecting device 10 from external agents. Because it is light-impermeable (e.g. because it includes white silicone material), mass 20 may moreover perform a masking action of components 16 from the outside.

[0061] Said effect of sealing/protection may be achieved without hampering the propagation of the light radiation emitted by source(s) 14 in operation, because source(s) 14 are located within shell or screen 26, which is light-permeable.

[0062] One or more embodiments may therefore concern a method of producing lighting devices, the method including:

- providing a channel-shaped housing (e.g. 18),
- arranging in said housing a lighting module (e.g. 10) with at least one electrically-powered light radiation source (e.g. 14) and circuitry (e.g. 16) coupled (e.g. through lines 120) with said at least one light radiation source, said at least one light radiation source and said circuitry facing towards the opening of the channel-shaped housing,
- providing a light-permeable cover (e.g. 22, 26) that covers said at least one light radiation source and leaves said circuitry uncovered, and
- providing a sealing mass of light-impermeable material (e.g. 20) in said channel-shaped housing, said sealing mass masking said circuitry, with the light radiation emitted from said at least one light radiation source being adapted to propagate through said light-permeable cover.

[0063] One or more embodiments may include:

- providing a temporary screen (e.g. 26) covering said at least one light radiation source and leaving said circuitry uncovered,
- providing said sealing mass of light-impermeable material with said at least one light radiation source covered by said temporary screen,
- removing said temporary screen, and
- filling the free space resulting from removing said temporary screen with a filling of light-permeable material.

[0064] One or more embodiments may include:

- providing a temporary screen covering said at least one light radiation source and leaving said circuitry uncovered, said temporary screen including a hollow body,
- injecting (e.g. 26a) into said hollow body light-permeable material, thus providing a light-permeable cover that covers said at least one light radiation source and leaves said circuitry uncovered, and
- removing said temporary screen after injecting said light-permeable material into said hollow body.

[0065] In one or more embodiments, said light-permeable cover may include a hollow body of light-permeable material which encloses said at least one light radiation source, optionally leaving a space around said at least one light radiation source.

[0066] One or more embodiments may include providing said sealing mass of light-impermeable material by sealingly enclosing said light-permeable cover that covers said at least one light radiation source.

[0067] In one or more embodiments:

- said at least one electrically-powered light radiation source may include a LED source, and/or
- with said at least one electrically-powered light radiation source there may be associated a lens (e.g. 140), with said light-permeable cover having a reflection coefficient matched to the reflection coefficient of said lens.

[0068] In one or more embodiments, a lighting device may include:

- a channel-shaped housing,
- a lighting module arranged in said channel-shaped housing, said lighting module (10) having at least one electrically-powered light radiation source and circuitry coupled with said at least one light radiation source, the at least one light radiation source and the circuitry facing towards the opening of the channel shape of the housing,
- a light-permeable cover that covers said at least one light radiation source and leaves said circuitry uncovered, and
- a sealing mass of light-impermeable material that covers said circuitry, wherein said circuitry is masked by said light-impermeable material.

[0069] In one or more embodiments, said light-permeable cover may include light-permeable material introduced (e.g. 26a) into said channel-shaped housing.

[0070] In one or more embodiments, said light-permeable cover may include a body of light-permeable material that encloses said at least one light radiation source, optionally leaving a space around said light radiation source.

[0071] In one or more embodiments:

- said at least one electrically powered light radiation source may include a LED source, and/or
- with said at least one electrically powered light radiation source there may be associated a lens, with said light-permeable cover having a reflection coefficient matched to the reflection coefficient of said lens.

[0072] Without prejudice to the basic principles, the details and the embodiments may vary, even appreciably, with respect to what has been described herein by way of non-limiting example only, without departing from the extent of protection.

[0073] The extent of protection is defined by the annexed claims.

Claims

1. A method of producing lighting devices, the method including:

- providing a channel-shaped housing (18),
- arranging in said housing (18) a lighting module (10) with at least one electrically-powered light radiation source (14) and circuitry (16) coupled (120) with said at least one light radiation source (14), said at least one light radiation source (14) and said circuitry (16) facing towards the opening of the channel-shaped housing (12),
- providing a light-permeable cover (22, 26) that covers said at least one light radiation source (14) and leaves said circuitry (16) uncovered, and
- providing a sealing mass of light-impermeable material (20) in said channel-shaped housing (18), said sealing mass (20) masking said circuitry (16) with the light radiation from said at least one light radiation source (14) propagating through said light permeable cover (22, 26).

2. The method of claim 1, including:

- providing a temporary shield (26) covering said at least one light radiation source (14) and leaving said circuitry uncovered (16),
- providing said sealing mass of light-impermeable material (20) with said at least one light radiation source (14) covered by said temporary shield (26),
- removing said temporary shield (26), and
- filling the free space resulting from removing said temporary screen (26) with a filling of light-permeable material (22).

3. The method of claim 1, including:

- providing a temporary shield (26) covering said at least one light radiation source (14) and leaving said circuitry uncovered (16), said temporary shield (26) including a hollow body,
- injecting (26a) into said hollow body (26) light permeable material (22) providing a light-permeable cover that covers said at least one light radiation source (14) and leaves said circuitry (16) uncovered, and
- removing said temporary shield (26) after injecting (26a) said light permeable material (22) into said hollow body.

4. The method of claim 1, wherein said light-permeable cover includes a hollow body (26) of light-permeable material which encloses said at least one light radiation source (14), preferably by leaving a space around said at least one light radiation source (14).

5. The method of any of the preceding claims, including providing said sealing mass of light-impermeable material (20) by sealingly enclosing said light-permeable cover (22, 26) that covers said at least one light radiation source (14).

6. The method of any of the preceding claims, wherein:

- said at least one electrically powered light radiation source (14) includes a LED light source, and/or
- with said at least one electrically powered light radiation source (14) there is associated a lens (140) with said light-permeable cover (22) having a reflection coefficient matched to the reflection coefficient of said lens (140).

7. A lighting device, including:

- a channel-shaped housing (18),
- a lighting module (10) arranged in said channel-shaped housing (18), said lighting module (10) with at least one electrically-powered light radiation source (14) and circuitry (16) coupled with said at least one light radiation source (14), the at least one light radiation source (14) and the circuitry (16) facing towards the opening of the channel shape of the housing (18),
- a light-permeable cover (22, 26) that covers said at least one light radiation source (14) and leaves said circuitry (16) uncovered, and
- a sealing mass of light-impermeable material (20) that covers said circuitry (16), wherein said circuitry (16) is masked by said light-impermeable material.

8. The lighting device of claim 7, wherein said light-permeable cover includes light-permeable material (22) input (26a) into said channel-shaped housing.

9. The lighting device of claim 7, wherein said light-permeable cover includes a body (26) of light-permeable material that encloses said at least one light radiation source (14), preferably by leaving a space around said light radiation source (14). 5

10. The lighting device of any of claims 7 to 9, wherein:

- said at least one electrically powered light radiation source (14) includes a LED light source, and/or 10

- with said at least one electrically powered light radiation source (14) there is associated a lens (140) with said light-permeable cover (22) having a reflection coefficient matched to the reflection coefficient of said lens (140). 15

20

25

30

35

40

45

50

55

FIG. 1

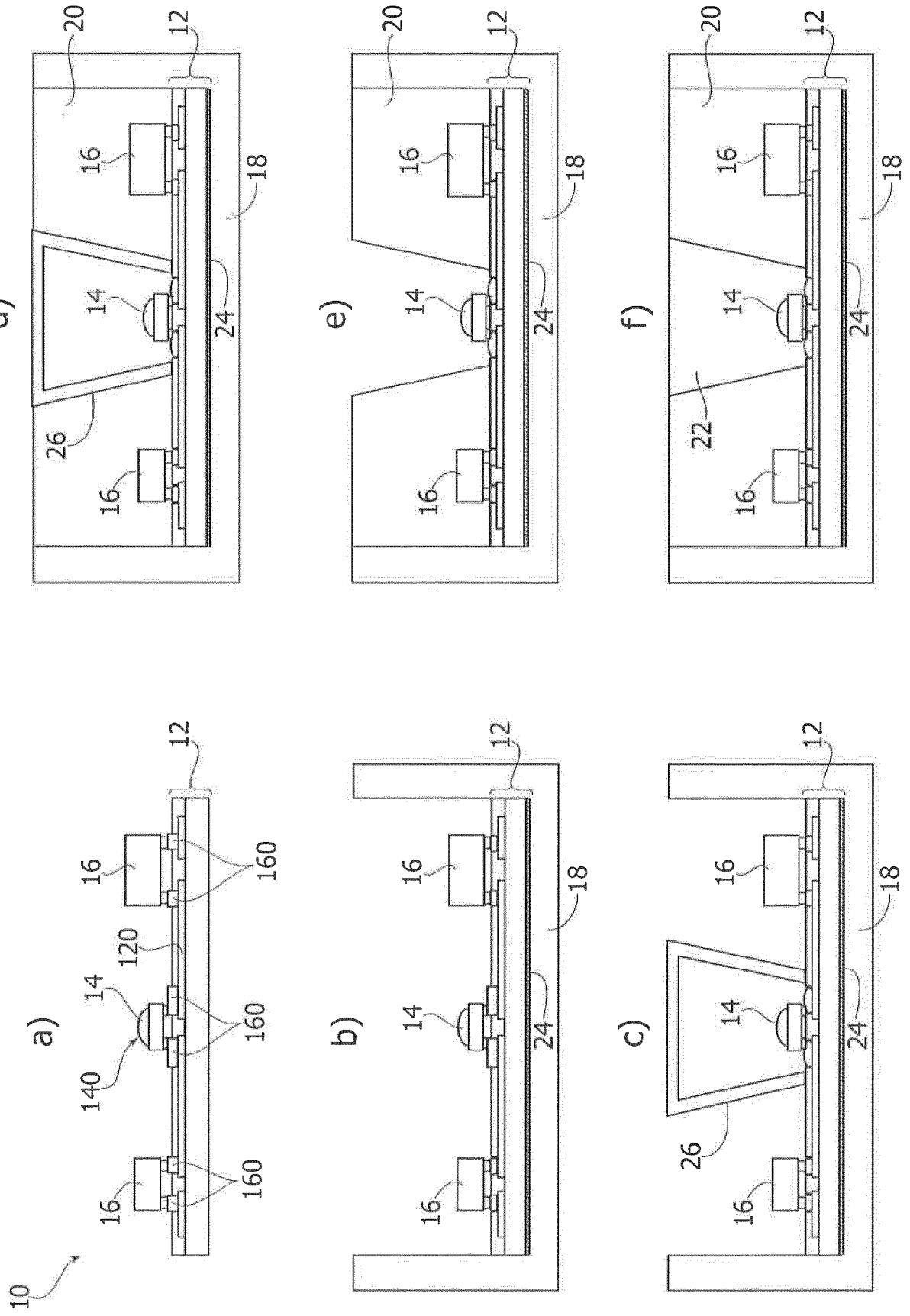


FIG. 2

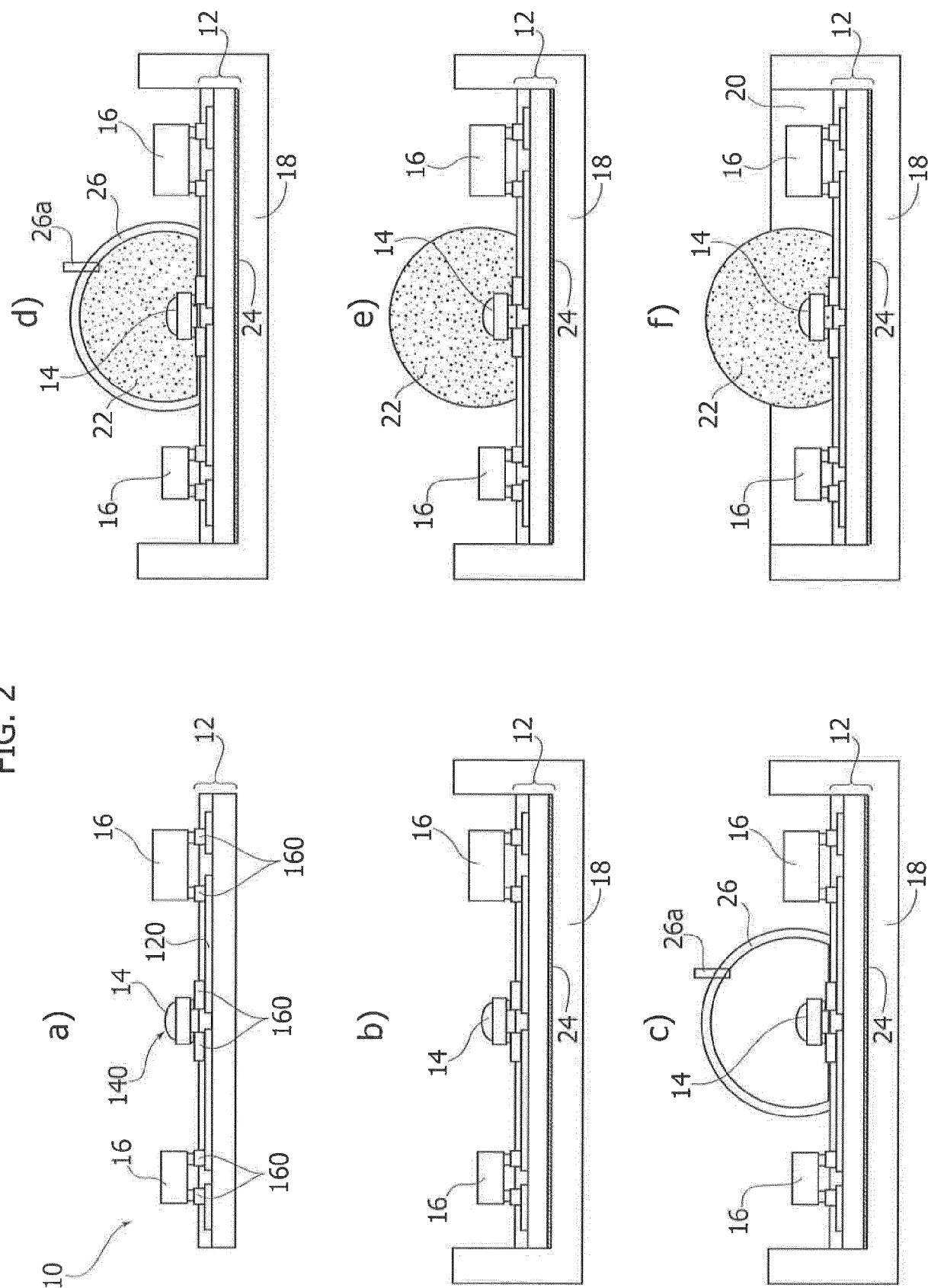
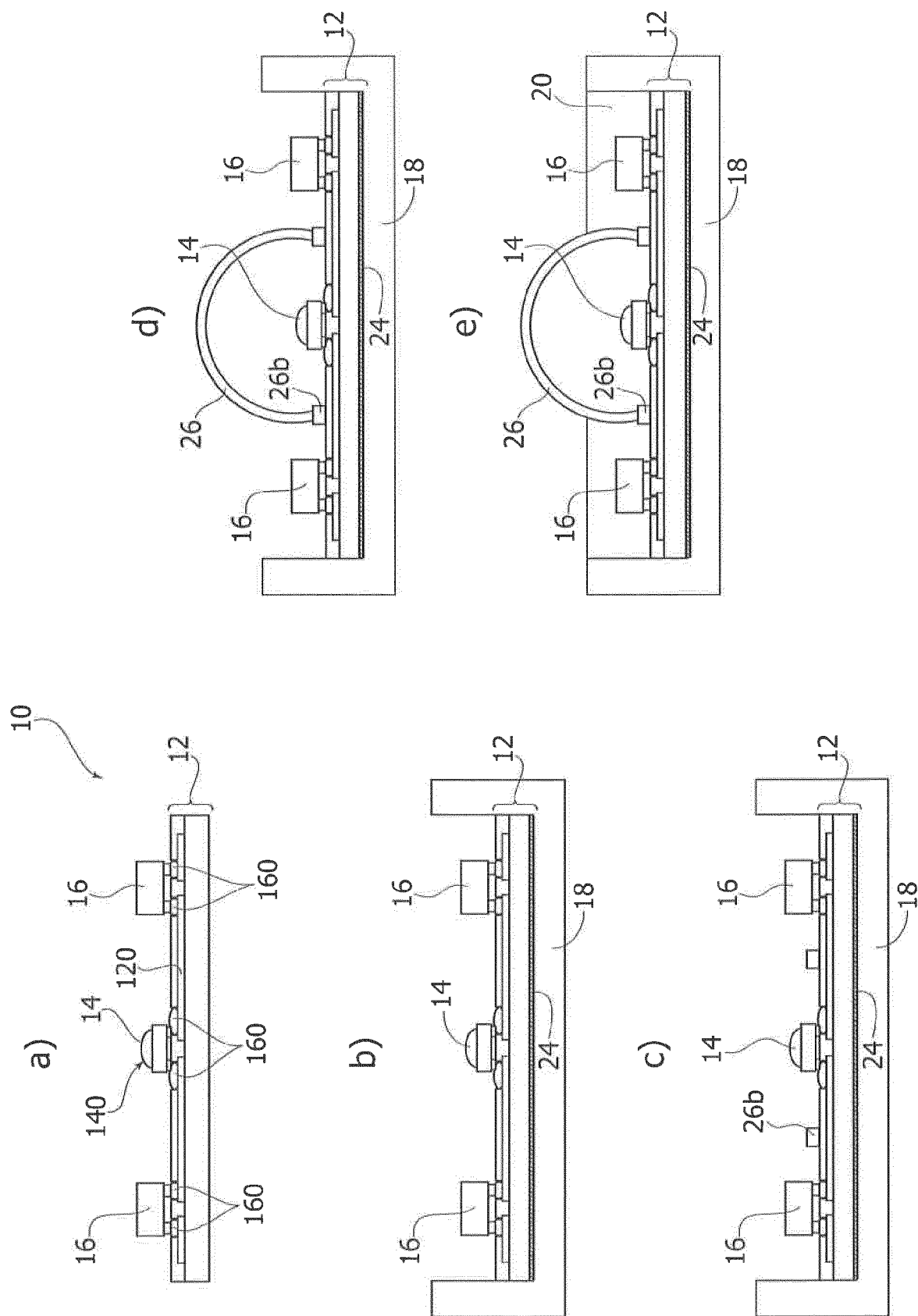


FIG. 3





EUROPEAN SEARCH REPORT

Application Number
EP 17 17 7797

5

10

15

20

25

30

35

40

45

50

55

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	EP 2 892 078 A1 (OSRAM GMBH [DE]; OSRAM SPA [IT]) 8 July 2015 (2015-07-08) * paragraph [0005] - paragraph [0012] * * paragraph [0028] * * paragraph [0032] * * paragraph [0046] - paragraph [0055] * * figures 1-5 *	1,6-10	INV. F21V31/04 F21S4/22 F21K9/90
X	US 2015/338080 A1 (DEXTER TIMOTHY RYAN [US] ET AL) 26 November 2015 (2015-11-26) * paragraph [0038] - paragraph [0046] * * figures 1,2,4,5,9-11 *	1,2,6	ADD. F21Y115/10 F21Y103/10 F21Y107/70 F21V15/01 F21V23/00
A	DE 10 2012 222093 A1 (OSRAM GMBH [DE]) 5 June 2014 (2014-06-05) * the whole document *	1-10	
A	US 2010/142180 A1 (POSSELT JASON [US]) 10 June 2010 (2010-06-10) * the whole document *	1-10	
A	JP 2009 194026 A (STANLEY ELECTRIC CO LTD) 27 August 2009 (2009-08-27) * the whole document *	1-10	TECHNICAL FIELDS SEARCHED (IPC)
A	US 6 505 955 B1 (HATJASALO LEO [FI] ET AL) 14 January 2003 (2003-01-14) * the whole document *	1-10	F21V F21S F21K F21Y
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 26 October 2017	Examiner Soto Salvador, Jesús
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 17 17 7797

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

26-10-2017

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2892078 A1	08-07-2015	NONE	
US 2015338080 A1	26-11-2015	NONE	
DE 102012222093 A1	05-06-2014	NONE	
US 2010142180 A1	10-06-2010	TW 201041096 A	16-11-2010
		US 2010142180 A1	10-06-2010
		US 2012153322 A1	21-06-2012
		WO 2010111010 A1	30-09-2010
JP 2009194026 A	27-08-2009	JP 5275642 B2	28-08-2013
		JP 2009194026 A	27-08-2009
US 6505955 B1	14-01-2003	AT 317091 T	15-02-2006
		AU 733755 B2	24-05-2001
		BR 9713289 A	26-10-1999
		CA 2271028 A1	04-06-1998
		CN 1238830 A	15-12-1999
		CZ 9901585 A3	17-05-2000
		DE 69735195 T2	02-11-2006
		DK 0939876 T3	01-05-2006
		EP 0939876 A1	08-09-1999
		ES 2257773 T3	01-08-2006
		FI 964696 A	26-05-1998
		HK 1024289 A1	16-01-2004
		HU 9904208 A2	28-04-2000
		JP 4040104 B2	30-01-2008
		JP 2001505708 A	24-04-2001
		KR 20000069116 A	25-11-2000
		PL 184066 B1	30-08-2002
		PT 939876 E	31-05-2006
		RU 2200274 C2	10-03-2003
		TR 9901160 T2	21-02-2000
		US 6505955 B1	14-01-2003
		WO 9823896 A1	04-06-1998

EPO FORM P0459

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