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(54) **A mounting assembly for lighting devices, corresponding lighting device and circuit board**

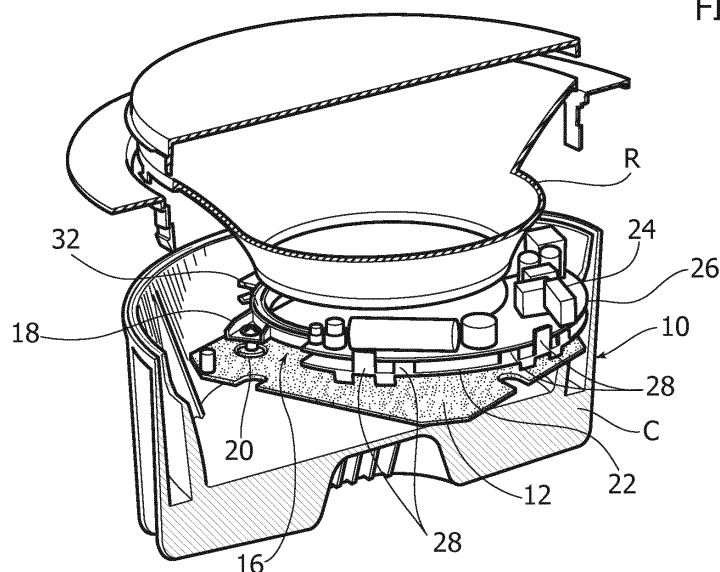
(57) A mounting assembly for lighting devices (10) includes:

- an annular holder (16) coupleable (18) to a lighting source (14), e.g. a LED lighting source, with the annular holder (16) surrounding the lighting source (14),
- a bracket member (22) extending radially of the annular holder (16) over at least a portion of the periphery of the annular holder (16), and
- a circuit board (26) supporting electrical drive components for the lighting source (14) mounted on said bracket member (22).

The circuit board (26) has an arched, crescent-like shape corresponding to the shape of bracket member (22).

The annular holder (16) includes an annular formation (30) for coupling with an optical element, e.g. a reflector (R) which acts on the light radiation emitted by the lighting source (14).

FIG. 1



Description

Technical field

[0001] The present disclosure relates to lighting devices.

[0002] Various embodiments may refer to solid-state lighting devices, for example LED lighting devices.

Technological background

[0003] There are known various implementations of holders that may be used in conjunction with solid-state lighting sources. Such holders are adapted to match optical elements such as lenses or reflectors of various kinds, and having substantially the same shape and having been manufactured via the same technology (i.e., basically belonging to one and the same "family").

[0004] Such implementations basically perform the function of supporting an optical element couplable to an electrically powered lighting source, with possible drivers associated thereto.

Object and Summary

[0005] In this field of application the need may be felt for multifunctional solutions which, beside performing a supporting function for optical elements (lens and/or reflector) may in addition accommodate the circuit board on which there are mounted the drivers of the lighting source, while offering the ability of absorbing possible tolerances linked to different sizes of the parts.

[0006] One or more embodiments aim at satisfying such a requirement.

[0007] One or more embodiments achieve this goal thanks to a mounting assembly having the features set forth in the claims that follow.

[0008] One or more embodiments may also refer to a corresponding lighting device, as well as to a corresponding circuit board.

[0009] The claims are an integral part of the technical teaching of the invention provided herein with reference to the invention.

[0010] One or more embodiments lead to the achievement of a flexible assembly which is adapted to support optical elements (e.g. reflectors) of different kinds, to absorb the tolerances derived from different manufacturing processes and/or from thermal expansion phenomena during operation, and which is moreover adapted to accommodate the drivers located e.g. outside the optical element and inside the luminaire housing.

[0011] One or more embodiments lead to the achievement of one or more of the following advantages:

- savings in costs and ease of use,
- possibility to omit external ECGs, with a consequent saving in the cost of the housing of the device,
- integration of several separate parts into a single

multifunctional unit (optical element holder/driver holder) with a possible action of pressing the lighting device (e.g. a LED module) against a heat sink,

- simplification of manufacturing processes, for example during the step of mounting the printed circuit board (PCB), which may be mounted through a simple interlocking mechanism,
- ability of absorbing tolerances between the optical element and the carrier body, also with reference to the tolerances deriving from thermal stress,
- possibility to easily customise the lighting device in order to meet use requirements, for example as regards optical elements, with the possibility to use machined parts and/or molded parts and to absorb dimensional variations derived from different production processes,
- ensuring electrical insulation even when using a metal or plastic metallized optical element,
- possibility to separate the optical element (e.g. a reflector) from the light radiation source (LED module) and from the drivers, and consequently possibility to access the optical element from the outside.

[0012] One or more embodiments may be implemented in downlight lighting devices, such as recessed ceiling-mounted spotlights.

Brief Description of the Figures

[0013] One or more embodiments will now be described, by way of non-limiting example only, with reference to the enclosed figures, wherein:

- Figure 1 is a perspective exploded view, partially in broken-out section, of a lighting device according to embodiments, with parts omitted for clarity,
- Figures 2 and 3 show in greater detail features of parts of embodiments, and
- Figure 4 is a magnified view highlighting the coupling modes of parts of embodiments.

Detailed Description

[0014] In the following description, numerous specific details are given to provide a thorough understanding of various exemplary embodiments. One or more 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 aspects of the embodiments. 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 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 em-

bodiment. Furthermore, the particular features, structures, or characteristics may be combined in any suitable manner in one or more embodiments.

[0015] The references provided herein are for convenience only and do not interpret the scope or meaning of the embodiments.

[0016] In Figure 1, reference 10 denotes a lighting device including a carrier body C, which may allow the use of device 10, for example as a downlight lighting device such as a so-called recessed ceiling-mounted or suspended-ceiling-mounted spotlight.

[0017] Carrier body C, which is herein shown with an approximately cylindrical cup shape, may have different structures and shapes, according to the embodiments and/or use requirements.

[0018] In one or more embodiments, in the lighting device 10 there may be located a light radiation source, including for example a base board 12 supporting a light radiation source including for example an array 14 of LED sources.

[0019] In the presently described embodiment, array 14 has an approximately circular polygonal shape. This choice is by no way compulsory: in one or more embodiments, light radiation source 14 may be for example a single light radiation source, or an array of light radiation sources arranged according to a different shape from what is presently shown.

[0020] In one or more embodiments, to device 10 there may be associated an optical element R, adapted to cooperate with the radiation emitted by source 14. As used herein, the wording "optical element" may denote for example a reflector (as the presently exemplified reflector R), a lens, a light diffuser or a combination of said components.

[0021] In one or more embodiments, above the base board 12 there may be mounted, in a position generally surrounding light radiation source 14, an annular, e.g. circular, holder 16.

[0022] As will be seen more clearly in the following, in one or more embodiments holder 16 may be used to mount on device 10 an optical element such as for example reflector R.

[0023] For example, holder 16 may form an abutment for an edge R1 (see Figure 4) of the inlet end of reflector R. In the presently considered example, reflector R may be interlocked with carrier body C at the outlet end thereof, e.g. via an interlocking ring provided with toothed parts adapted to be inserted into a frontal groove of the mouth edge of carrier body C; of course, other solutions are possible.

[0024] In one or more embodiments, holder 16 may be mounted on body C of the device above board 12 via a plurality of legs 18 (for example three legs with a mutual angular spacing of approximately 120° along the periphery of annular holder 16, at least one of which may be practically included in the bracket member 22 which will be dealt with in greater detail in the following).

[0025] In one or more embodiments, legs 18 may be

fixed to carrier body C of device 10, for example by screwing, while interposing gaskets 20 of a resilient material, i.e. being adapted to absorb possible tolerances between connected parts and/or to perform an anti-vibration function.

[0026] In one or more embodiments, the fixing elements (e.g. screws) that attach annular holder 16 to carrier body C of device 10 may extend into openings (for example notches or circumferential cuts) of base board 12; in this way, board 12 and the lighting source 14 arranged thereon may be "floating" relative to the body of device 10, while annular holder 16 may support one or several pressure pads 21, pressing board 12/source 14 against carrier body C of device 10, which may have (thanks to the material thereof and/or the possible presence of finning, etc.) the properties of a heat sink, so as to favour heat dissipation from source 14.

[0027] In one or more embodiments, the mounting mechanism of annular holder 16 onto ground plate 12 may be different from what presently exemplified, for example as regards the use of legs 18 and as regards the structure, the arrangement and the shape thereof.

[0028] Figures 2 and 3 show in greater detail possible embodiments of the above described elements.

[0029] As can be seen more clearly in Figures 2 and 3 (the latter being an exploded perspective view of the same parts shown in Figure 2, the base board 12 and the light radiation source 14 not being shown for clarity), in one or more embodiments annular holder 16 may surround light radiation source 14 and support a bracket member 22 which is generally arched or crescent shaped, which projects over at least a part of the periphery of holder 16.

[0030] In one or more embodiments, bracket 22 may extend for an angular width of approximately 120°.

[0031] In one or more embodiments, bracket 22 may protrude towards the outside of annular holder 16.

[0032] In one or more embodiments, on bracket 22 there may be accommodated the drivers 24 of light radiation source 14.

[0033] In one or more embodiments, circuits 24 of a known kind may be arranged on a circuit board substantially comparable to a printed circuit board (PCB) with an arched crescent-like shape, corresponding to the shape of bracket 22.

[0034] In one or more embodiments, circuit board 24 may be coupled to bracket 22 via interlocking formations, adapted to implement e.g. a snap fit of board 26 with bracket 22.

[0035] In one or more embodiments, such formations may include at least partially resilient tongues, denoted by 28, adapted to be coupled with board 26 e.g. by penetrating in slots formed in board 26, and/or by surrounding the board on the sides, so as to keep it fixed (together with circuits 24 formed thereon) on holder 16.

[0036] To this respect, it will be appreciated that the correspondence of the arched crescent-like shape of the board 26 with the shape of bracket 22 does not mean

necessarily that the arched shape of board 26 must be matched, i.e. that it must have a radius equal or substantially equal to the arched shape of bracket 22.

[0037] Consequently:

- in one or more embodiments, the shape of board 26 may be actually matched, i.e. it may have a bending radius equal or substantially equal to the shape of bracket 22;
- in one or more embodiments, the shape of board 26, while still being complementary to the shape of bracket 22, may nevertheless have a less curved shape, i.e. a bending radius which is greater (or possibly even smaller) than the radius of bracket 22.

[0038] Similarly, defining the shape of board 26 (and therefore possibly also of bracket 22) as crescent-shaped does not necessarily imply a tapered shape at one or both ends, as herein shown by way of example, for board 26.

[0039] As a consequence, in one or more embodiments, board 26 (and/or bracket 22) may have either a tapered shape at one or both ends, as shown herein by way of example, or a non-tapered shape, i.e. a constant (radial) width.

[0040] Whatever the specific choice of implementation, the arched shape of board 26 (and of bracket 22) allow board 26 and circuits 24 accommodated thereon to be arranged along a path that matches more or less precisely the contour of holder 16, with the consequent possibility of matching the shape of carrier body C without increasing the overall size.

[0041] Moreover, the possibility is achieved to:

- use, without modifications, a single kind of driver 26 in conjunction with holders 16 and/or carrier bodies C having different diameters, and/or
- retain in any case ease of mounting and the ability to absorb tolerances between coupled parts.

[0042] In one or more embodiments, optical element R (in the presently considered examples, a reflector with a general frusto-conical flared shape) may have an annular formation R1 adapted to be coupled to holder 16, as exemplified in Figure 4, i.e. by inserting formation R1 into a frontal groove 30 of holder 16 where a gasket 32 of resilient material, e.g. silicone material, is arranged.

[0043] This offers moreover the possibility to retain optical element R (adapted to be interlocked with carrier body C e.g. via an annular flange provided with gripping teeth, see Figure 1) by a form fit with holder 16, and/or to absorb possible dimensional tolerances, either due to the manufacturing of the mutually coupled parts or due to the size variations which may derive from thermal expansions caused by heating of parts during operation of the lighting device.

[0044] Of course, without prejudice to the underlying principles of the invention, the details and the embodi-

ments 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, said extent being determined by the annexed claims.

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Claims

1. A mounting assembly for lighting devices (10), including:

- an annular holder (16) coupleable (18) to an electrically powered lighting source (14) with the annular holder (16) surrounding the lighting source (14),
- a bracket member (22) extending radially of the annular holder (16) over at least a portion of the periphery of the annular holder (16), and
- a circuit board (26) supporting electrical drive components (24) for the lighting source (14) and mounted on said bracket member (22), the circuit board (26) having an arched, crescent-like shape corresponding to the shape of the bracket member (22).

2. The mounting assembly of claim 1, wherein the bracket member (22) extends radially outwardly of the annular holder (16).

3. The mounting assembly of claim 1 or claim 2, wherein the bracket member (22) and the circuit board (26) include a mutual interlocking mechanism (28).

4. The mounting assembly of claim 3 wherein the interlocking mechanism includes protruding interlocking tongues (28), preferably extending from the bracket member (22) to the circuit board (26).

5. The mounting assembly of any of the preceding claims, wherein the annular holder (16) includes at least one of:

- radial fixation legs (18) to a carrier body (C) of a lighting device (10), preferably with the interposition of resilient gaskets (20),
- at least one pressure pad (21) acting on the lighting source (12, 14).

6. The mounting assembly of any of the previous claims, wherein the annular holder (16) includes an annular coupling formation (30) for an optical element (R) acting on the light radiation from said lighting source (14).

7. The mounting assembly of claim 6, wherein said annular coupling formation (30) is a frontal groove of the annular holder (16).

8. The mounting assembly of claim 6 or claim 7, wherein said annular coupling formation (30) is provided with a gasket (32) of a resilient material.
9. A lighting device including : 5
- an electrically powered lighting source (14), preferably a LED source, and
 - the mounting assembly of any of claims 1 to 8, mounted (18, 20) with the annular holder (16) 10 surrounding said lighting source.
10. A circuit board (26) for mounting electrical driver components (24) coupleable to an electrically powered lighting source (14), wherein the circuit board 15 (26) has an arched, crescent-like shape.

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FIG. 1

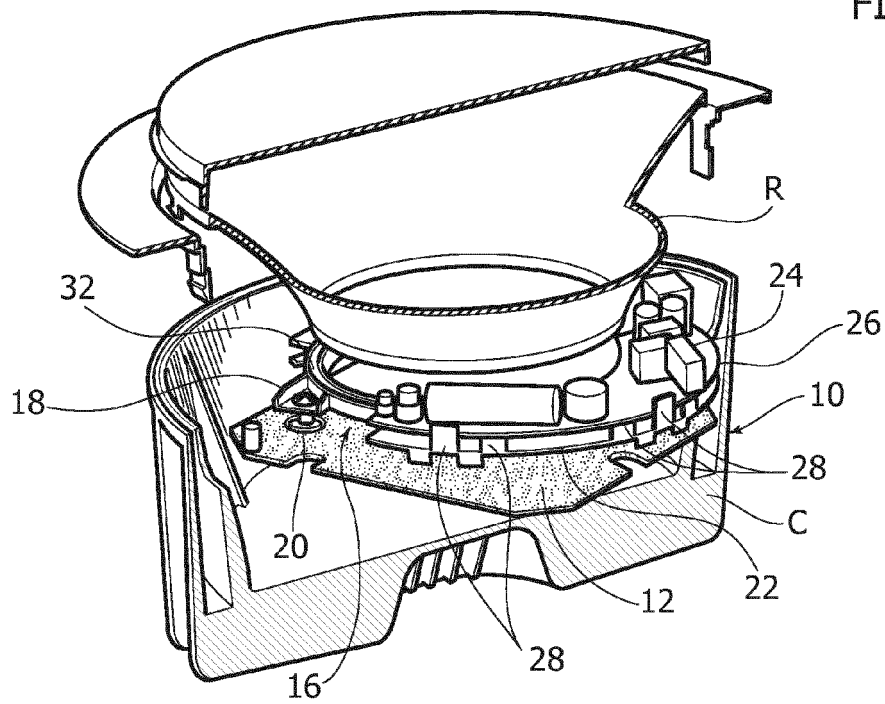


FIG. 2

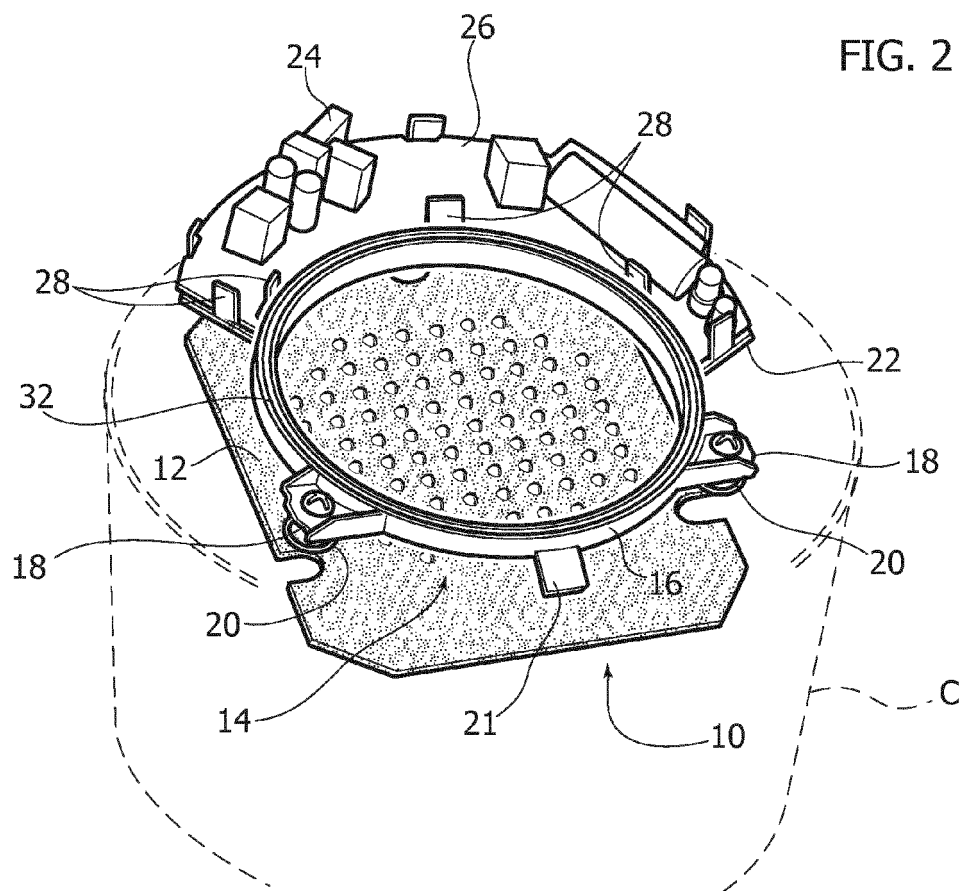


FIG. 3

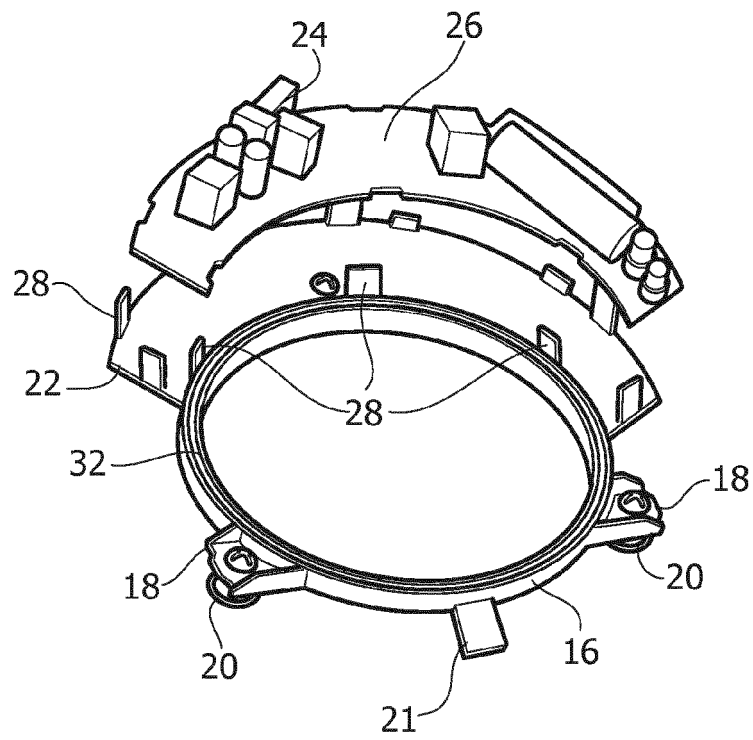
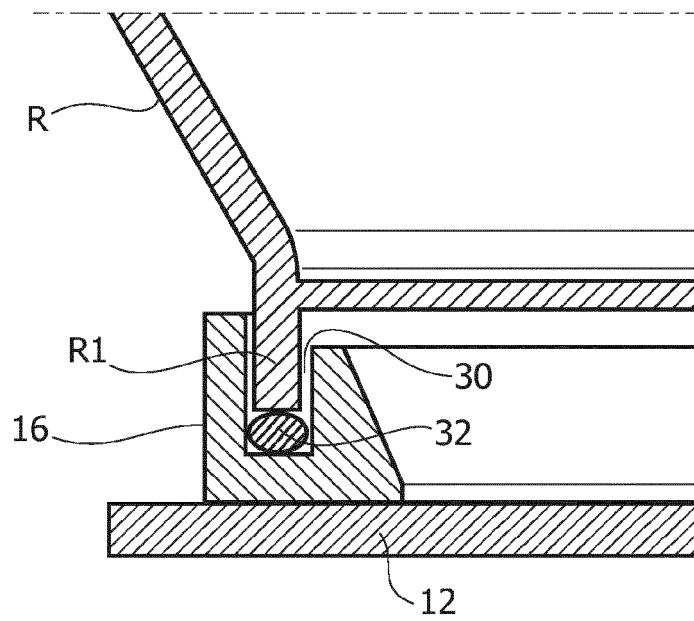


FIG. 4





EUROPEAN SEARCH REPORT

Application Number
EP 14 17 6861

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Place of search The Hague		Date of completion of the search 27 August 2014	Examiner Allen, Katie
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			

**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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