(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 1 443 567 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
17.05.2017 Bulletin 2017/20

(21) Application number: **04001125.6**

(22) Date of filing: **20.01.2004**

(51) Int Cl.:
F21K 9/00 *(2016.01)* ***F21V 31/04*** *(2006.01)*
F21W 131/308 *(2006.01)* *F21W 131/401* *(2006.01)*
F21Y 101/00 *(2016.01)*

(54) Modular emitter device and manufacturing method thereof

Modulares Emitterbauelement und sein Herstellungsverfahren

Dispositif émetteur modulaire et son procédé de manufacture

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LI LU MC NL PT RO SE SI SK TR

(30) Priority: **24.01.2003 IT vi20030011**

(43) Date of publication of application:
04.08.2004 Bulletin 2004/32

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Description

[0001] The present invention can be applied in the field of the artificial lighting both for internal and external environments and, more generally, in the field of the electromagnetic radiation sources; its particular object is a modular emitter device and a manufacturing method thereof. More particularly, the modular emitter device is of the LED type.

[0002] Many embodiments of lighting devices whose lighting source is made of one or more light emitting diodes that are commonly designated with the name of Light Emitting Diodes or LEDs are known. A LED is generally an electronic device suitable to generate electromagnetic radiations with different wavelength, and in particular also in the band of visible light. A LED uses the radiative recombination transition of the charge carriers through the energy gap of a semiconductor.

[0003] The radiation generated by a LED is peculiar to the material used and cannot be in any way traced back to the thermal radiation the material could generate due to its temperature according to the Planck law. In particular, the emission efficiency of a LED is generally higher than the one of a device operating by thermal emission and the spectral distribution of the emitted radiation contains only one relatively narrow wavelength band. For this reason, the lighting devices of the LED type allow, for the same installed power, a considerable energy saving compared with the incandescent devices and the spectral content of the emitted light can be accurately selected.

[0004] Patents no. US-A-6274924, US-A-20020057057, US-A-415624, EP-A-0290697 disclose embodiments of photoemittor devices, each of them comprising a single LED mounted on a high thermal conductivity support element to dissipate the generated heat. The LED is protected by a box-shaped case or by means of a plastic material injected into a mould or into a containment seat. In some embodiments, a preformed lens whose sizes can be compared with the ones of the LEDs to concentrate the emitted electromagnetic radiations can be added.

[0005] A limit of these devices lies in their reduced power requiring the use of various single parallel devices or of additional elements such as reflecting surfaces or converging lenses that are properly sized in order to direct the emitted light energy to a spot beam.

[0006] When light sources with relatively high power are required, various photoemittor devices of the above-cited type are usually mounted on a common base and are controlled and fed by one control unit. In particular, patents no. US-A-6371636, US-A-20010037591, US-A-6283613 and WO-A-02065427 disclose signal devices to be used outdoors having a plurality of LEDs contained into one protective cover.

[0007] A clear limit of these solutions lies in the fact that in the manufacturing of the whole device, for each single LED, a reflecting element and a lens to increase its efficiency need to be additionally mounted. Moreover the LEDs and their feeding and control circuits must be protected from water and humidity by means of gaskets or other seals making the manufacturing difficult and increasing its cost. Water or humidity leakages inside the protective case could cause dangerous short circuits and undesirable power losses due to the forming of condensed steam among the components, for example between the LED emitting surface and their lenses.

[0008] Many embodiments of signal devices or modular lighting designed to be used in various applications are also known.

[0009] These kinds of embodiments are disclosed in patents no. WO-A-02052656, WO-A-0024062, EP-A-0979969, EP-A-0523927, US-A-6250774. Each modular device is made of one or more LEDs installed on a high thermal conductivity support element and protected by a case having at least one transparent portion to the emitted light and from which only the electric contacts come out, in order to make a compact light source with relatively small sizes. The light source thus obtained is fixed on a base being able to disperse heat and coupled with a concentrator element with optical refraction and/or reflectance features of the light emitted by the LED.

[0010] This solution allows using manufactured modular devices whose concentrator element is already coupled; they are very useful and versatile in the manufacturing of lamps, signal lights and the like with very different shapes and sizes. Moreover, the modularity of the devices makes the maintenance and repair easy in case of failures.

[0011] A drawback of this solution lies in that the concentrator element is coupled with the modular device by joints, mechanical constraints or bending agents. Therefore, even in this case the use of additional seals to avoid water or humidity leakages inside the single modular device causing the above-said drawbacks is required. Moreover, possible shocks of the modular devices during the various steps leading to the final products could damage the alignment of the concentrator element or causing its removal.

[0012] WO02/27235 discloses a light emitter device wherein a sealant is provided which surrounds the electric component in order to make the device water-proof.

[0013] US2002/089849 discloses a light emitter device having all the features of the preamble of claim 1.

Presentation of the invention

[0014] A primary object of the present invention is to remove the above-mentioned drawbacks, manufacturing a simple, solid, shock-resistant LED modular emitter device without losing the optical alignment among its components.

[0015] A particular object is the manufacturing of a device assuring a high resistance in wet and humid environments with waterproof features allowing its use also when immersed into tanks or aquaria.

[0016] A further object of the present invention is to carry out a versatile device to be used to assemble lighting and signal lamps of different kind for their type, sizes and complexity.

[0017] Another general object is the manufacturing of a cost-effective device that keeps its features unchanged in time.

[0018] Another particular object is the manufacturing of a device assuring high security levels without requiring special and additional arrangements such as expressly designed gaskets.

[0019] These and other objects that will result clearer from the following description. The present invention is defined in claims 1 and 5.

[0020] Thanks to this particular configuration a solid, reliable device assuring a high resistance in wet and humid environments with waterproof features allowing its use when immersed into tanks or aquaria can be obtained.

[0021] The feeding means are preferably electrically connected to the emitting source by an electric circuit that is entirely embedded into the covering element and comprise at least a couple of electric cables, each of them is provided with an insulating sheath extending at least partially inside the covering element.

[0022] Thanks to this particular configuration a high security level can be obtained without using special and expensive additional arrangements such as expressly designed gaskets or seals.

[0023] The support means properly comprise a dispersion element of the heat entirely embedded into the covering element and comprising a thermal conductivity plate upon which the emitting source is placed.

[0024] Thanks to this particular configuration, during operation, the temperature of the emitting source can be kept within a range of pre-set values and allows the same emitting source keeping its features substantially unchanged in time.

[0025] Further features and advantages of the invention will be clearer with reference to the detailed description of some preferred non-exclusive embodiments of a modular emitter device according to the invention, disclosed by way of non-limitative example with the help of the attached tables of drawings wherein:

Fig. 1 represents a front view of a first embodiment of an emitter device according to the invention;

Fig. 2 represents a side sectioned and enlarged view of a particular of the device of Fig. 1;

Fig. 3 represents a further side sectioned and enlarged view of a particular of the device of Fig. 1;

Fig. 4 represents a partial perspective view of the device of Fig. 1;

Fig. 5 represents an enlarged perspective view of a particular of the device of Fig. 1;

Fig. 6 represents a partially sectioned perspective view of a second embodiment of an emitter device according to the invention;

Fig. 7 represents a front view of the emitting device of Fig. 6;

Fig. 8 represents a partially sectioned perspective view of a third embodiment of an emitter device according to the invention;

Fig. 9 represents a sectioned side view of the emitter device of Fig. 8.

[0026] With particular reference to the cited Figures, a modular emitter device according to the invention marked in its whole with reference number 1 that can be applied to lamps and similar products is disclosed.

[0027] The device 1 comprises at least an emitting source of electromagnetic radiations provided with at least one LED. The emitting source 2 can be properly formed by at least one partially hollow case wherein one or more LEDs are positioned. The case can comprise a protection lens being transparent to the electromagnetic radiations emitted by the LEDs.

[0028] The emitting source 2 is mounted on suitable support means 3, comprising a dispersion element 4 of the heat generated by the emitting source 2. The dispersion element 4 can be made of a thermal conductivity plate 5 with a suitable shape. Moreover, the support means 3 comprise a covering element 6.

[0029] A peculiar feature of the invention lies in that the covering element 6 is shaped and sized in such a way that the emitting source 2 is at least partially embedded into the same element. Advantageously, the covering element 6 can contain a plurality of emitting sources 2.

[0030] The electric power allowing the operation of the emitting source 2 is supplied by proper feeding means 7 being also partially embedded into the covering element 6. This particular configuration substantially makes the device 1 waterproof.

[0031] In order to direct the electromagnetic radiations emitted by the emitting source 2, the device 1 comprises also an optical concentrator 8 obtained in such a way to make one piece with the covering element 6.

[0032] The feeding means 7 are electrically connected to the emitting source 2 by an electric circuit (not shown in drawings) entirely embedded into the covering element 6. The feeding means 7 can be of different kind and shape and can be made of stiff and/or flexible conductors. In particular, in the preferred embodiments shown in the attached tables of drawings, the feeding means 7 are formed by at least a couple of electric cables 9. Each electric cable 9 is provided with an insulating sheath 10 to insulate the relevant electric cable 9 and protect it from humidity, liquids and other potentially dangerous agents.

[0033] In order to use the device 1 also in humid or wet environments, the insulating sheath 10 of each electrical cable 9 at least partially extends inside the covering element 6. This arrangement protects the feeding means 7 from water and other liquids, and in particular the electric cables 9 also in correspondence with their ends.

[0034] The electric circuit can comprise at least a couple of beam leads (not shown in the drawings) obtained on the plate 5. The beam leads electrically connect the feeding means 7 to at least a couple of projections (not shown in the drawings) coming out of the emitting source 2.

[0035] In a first embodiment shown in the attached Fig. 1-4, the plate 5 is entirely embedded into the covering element 6. In this way, the plate 5, the emitting source 2, the couple of beam leads, the electric connections between the emitting source 2 and the couple of beam leads and between the latter and the electric cables 9 are entirely embedded into the covering element 6. Moreover, there are not electric parts being directly in contact with the air or being accidentally reached by water or other liquids.

[0036] The optical concentrator 8 and the covering element 6 are formed with the same material of the polymeric type. Advantageously, in the embodiment shown in Fig. 1-4, the optical concentrator 8 has a substantially flat end surface 11 and a sidewall 12 tapered towards the emitting source 2. The sidewall 12 at least partially reflects the electromagnetic radiations emitted by the emitting source 2 towards the end surface 11.

[0037] Advantageously, the optical concentrator 8 is a body of revolution whose axis of symmetry L is substantially orthogonal to the end surface 11. The generating line of the body of revolution has a bending apt to concentrate the electromagnetic radiations emitted by the emitting source 2 and direct them in order to form a radiation beam being substantially parallel to the axis of symmetry L.

[0038] In a second embodiment shown in Fig. 6, 7, the support means 3 comprise a thermal conductor base 4' upon which at least one dispersion element 4 and the relevant emitting source 2 are placed. The latter and partially also the thermal conductor base 4' are embedded into the covering element 6.

[0039] In a third embodiment shown in Fig. 8, 9, the support means 3 can comprise three dispersion elements 4, an emitting source 2 being mounted on each of them. The three dispersion elements 4 can be placed on the thermal conductor base 4' with a triangular setup. In these two final embodiments, the covering element 6 protects from the contact with air, water or other liquids that could damage the correct operation of the device 1 if they are wet or in humid environments. On the contrary, the thermal conductor base 4' is not affected by the presence of liquids therefore it can remain uncovered from the covering element 6. Moreover, this feature allows the efficient transmission of the heat generated by the one or more emitting sources to the surrounding environments through the thermal conductor base 4'.

[0040] The device 1 is manufactured according to a method comprising a plurality of subsequent steps. In the first step a) the emitting source 1 is fastened to the support means 3. More particularly, the projections coming out of the emitting source 2 are connected to proper terminals of the beam leads obtained on the plate 5 for instance by soldering points.

[0041] A second step b) contemplates the connection of the feeding means 7 to the support means 3 in order to obtain an intermediate assembly 14. With reference to the attached tables of drawings, each electric cable 9 is electrically connected to one of its ends with the beam leads of the plate 5. The intermediate assembly 14 is therefore made of the emitting source 2 mounted on the plate 5 and of an end portion of the cables 9 in the first embodiment shown in Fig. 1-5.

[0042] In the second embodiment shown in Fig. 6, 7, the intermediate assembly 14 comprises the emitting source 2 mounted on the plate 5, the end portions of the cables 9 and the thermal conductor base 4' on which the plate 5 is positioned.

[0043] In the third embodiment shown in Fig. 8, 9, the intermediate assembly 14 comprises three emitting sources 2 with the relevant plates 5 positioned on the thermal conductor base 4'.

[0044] During this manufacturing step of the intermediate assembly 14, all the electric connections allowing the proper operation of each emitting source 2 are carried out. In the subsequent steps special arrangements are implemented in order to protect the intermediate assembly 14 and increase its efficiency.

[0045] A third step c) comprises the arrangement of a mould (not shown in the drawings) whose shape is complementary to the optical concentrator and to the covering element 6 to be obtained. The mould comprises a hollow whose sizes are suitable to allow the insertion of the intermediate assembly 14 and a shaped portion whose shape is complementary to the one of the optical concentrator to be obtained.

[0046] During the fourth step d), the intermediate assembly 14 is at least partially positioned inside the mould. In particular, in order to obtain the first embodiment of Fig. 1-4, the intermediate assembly is completely inserted into the mould in order to be completely wrapped by the moulding material during the following step.

[0047] On the contrary, to obtain the embodiments of Fig. 6-9, the intermediate assembly 14 is positioned with a front portion 15 inside the mould and the thermal conductor base 4' partially outside the mould. Thanks to this positioning, the front portion 15 will be entirely embedded into the covering element 6, while the thermal conductor base 4' will be at least partially uncovered.

[0048] During the final step e) the moulded polymeric material is injected into the mould, in order to fill the hollow and at least partially embed the intermediate assembly 14. Advantageously, the polymeric material can be of the thermoplastic type.

[0049] A body made in one piece with the covering element 6 and the optical concentrator 8 is thus obtained with one moulding.

[0050] From the above-mentioned description it is clear that the device according to the invention reaches the fixed objects and in particular the absence of electric parts in direct contact with the outside makes the device substantially waterproof so that it can be used in humid and wet environments or immersed into tanks of various kinds such as swimming pools and aquaria.

[0051] Even though the device has been described with particular reference to the attached Figures, the reference numbers used in the claims are meant to increase the comprehension of the invention and therefore do not constitute limits to the protective scope claimed.

Claims

1. A modular emitter device for lamps, comprising a plurality of sources (2) emitting electromagnetic radiations each provided with at least one LED protected by a case, support means (3) of said emitting sources (2), an optical concentrator (8) for the emitting sources (2), feeding means (7) of the emitting sources (2), wherein said support means (3) comprise a covering element (6) and said optical concentrator (8) making a one-piece body, said emitting sources (2) and said feeding means (7) being at least partially embedded inside said covering element (6) in order to make the device (1) substantially waterproof;
wherein said feeding means (7) are electrically connected to said emitting sources (2) by an electric circuit that is entirely embedded into said covering element (6);
characterized in that:

   said support means (3) comprise a dispersion element (4) of the heat generated by said emitting sources (2), said dispersion element (4) comprising a thermal conducting plate (5) on which said emitting sources (2) are placed, said electric circuit comprising at least a couple of beam leads obtained on said plate (5), said emitting sources (2) comprising at least a couple of projections coming outwards and electrically connected to said beam leads to feed said LEDs;
   said support means (3) comprise a thermal conductor base (4') upon which the dispersion element (4) and the relevant emitting sources (2) are supported, the latter and part of said thermal conductor base (4') being embedded into said covering element (6), said thermal conductor base (4') being partially uncovered to remain exposed to the external environment, the thermal conducting plate (5) being positioned on said thermal conductor base (4') in such a manner that the heat generated by the emitting sources (2) within said covering element (6) is dissipated towards the external environment via the latter;
   said optical concentrator (8) and said covering element (6) are made of the same thermoplastic polymeric material so that said one-piece body is obtained by one injection moulding step.

2. The device according to claim 1, **characterized in that** said feeding means (7) comprise at least a couple of electric cables (9), each of them being provided with an insulating sheath (10).

3. The device according to claim 2, **characterized in that** said insulating sheath (10) at least partially extends inside said covering element (6).

4. The device according to claim 1, **characterized in that** said support means (3) comprise three triangular setup dispersion elements (4), on said thermal conductor base (4'), on each of said dispersion elements (4) a relevant emitting source (2) is mounted.

5. A method for the manufacturing of a modular emitter device according to one or more of the previous claims, wherein the device (1) comprises a plurality of emitting sources (2) of electromagnetic radiations each provided with at least one LED protected by a case, support means (3) provided with a covering element (6) to support and cover said emitting sources (2), an optical concentrator (8) and feeding means (7) for said emitting sources (2), said feeding means (7) being electrically connected to said emitting sources (2) by an electric circuit, said support means (3) further comprising a dispersion element (4) of the heat generated by said emitting sources (2), said dispersion element (4) comprising a thermal conducting plate (5), said electric circuit comprising at least a couple of beam leads obtained on said plate (5), said emitting sources (2) comprising at least a couple of projections coming outwards, said support means (3) further comprising a thermal conductor base (4');
wherein the method comprises the following steps:

   a) the fastening of said emitting sources (2) to said support means (3) including the steps of:

      a') electrically connecting the projections of said emitting sources (2) to said beam leads to feed said LEDs;
      a") placing said emitting sources (2) on said thermal conducting plate (5);
      a"') positioning the thermal conducting plate (5) on said thermal conductor base (4') so that the latter supports the dispersion element (4) and the relevant emitting sources (2);

b) the connection of said feeding means (7) to said support means (3) in order to obtain an intermediate assembly (14);
c) the arrangement of a mould whose shape is complementary to said optical concentrator (8) and to said covering element (6);
d) the positioning of said intermediate assembly (14) partially inside the mould;
e) the injection of said thermoplastic polymeric material in molten state into the mould, in order to partially embed said intermediate assembly (14) and obtain by one moulding a body made of one piece comprising said covering element (6) and said optical concentrator (8), said electric circuit being entirely embedded into said covering element (6);

wherein said intermediate assembly (14) is positioned with a front end (15) internal to said mould and with said thermal conductor base (4') partially external to the mould, so that the front portion (15) is entirely embedded into said covering element (6) and said thermal conductor base (4') is partially uncovered in such a manner that the heat generated by the emitting sources (2) within said covering element (6) is dissipated towards the external environment via the latter and said thermal conducting plate (5) arranged thereon.

Patentansprüche

1. Modulare Strahlvorrichtung für Lampen, umfassend eine Mehrzahl von Quellen (2), die elektromagnetische Strahlungen abstrahlen, die jeweils mit zumindest einer LED, die durch ein Gehäuse geschützt ist, Auflagemitteln (3) der abstrahlenden Quellen (2), einem optischen Konzentrator (8) für die abstrahlenden Quellen (2), Versorgungsmitteln (7) der abstrahlenden Quellen (2) versehen sind, wobei die Auflagemittel (3) ein Abdeckelement (6) umfassen und der optische Konzentrator (8) einen einstückigen Körper bildet, wobei die abstrahlenden Quellen (2) und die Versorgungsmittel (7) zumindest teilweise innerhalb des Abdeckelements eingebettet sind (6), um die Vorrichtung (1) im Wesentlichen wasserdicht zu machen;
wobei die Versorgungsmittel (7) durch eine elektrische Schaltung, die vollständig in das Abdeckelement (6) eingebettet ist, elektrisch mit den abstrahlenden Quellen (2) verbunden ist;
dadurch gekennzeichnet, dass:

die Auflagemittel (3) ein Verteilelement (4) der Wärme umfassen, die von den abstrahlenden Quellen (2) erzeugt wird, wobei das Verteilelement (4) eine Wärmeleitplatte (5) umfasst, auf der die abstrahlenden Quellen (2) angeordnet sind, wobei die elektrische Schaltung zumindest ein paar Stege umfasst, die auf der Platte (5) erhalten werden, wobei die abstrahlenden Quellen (2) zumindest ein paar Vorsprünge umfassen, die nach außen kommen und mit den Stegen elektrisch verbunden sind, um die LEDs zu versorgen;
die Auflagemittel (3) einen Wärmeleitsockel (4') umfassen, auf dem das Verteilelement (4) und die entsprechenden abstrahlenden Quellen (2) gelagert sind, wobei Letztere und Teile des Wärmeleitsockels (4') in das Abdeckelement (6) eingebettet sind, wobei der Wärmeleitsockel (4') teilweise abgedeckt ist, um der Außenumgebung ausgesetzt zu bleiben, wobei die Wärmeleitplatte (5) derartig auf dem Wärmeleitsockel (4') positioniert ist, dass die Wärme, die von den abstrahlenden Quellen (2) innerhalb des Abdeckelements (6) erzeugt wird, über Letzteres an die Außenumgebung abgeführt wird;
der optische Konzentrator (8) und das Abdeckelement (6) aus dem gleichen thermoplastischen Polymermaterial hergestellt sind, so dass der einstückige Körper durch einen Spritzgussschritt erhalten wird.

2. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** die Versorgungsmittel (7) zumindest ein paar elektrische Kabel (9) umfassen, von denen jedes mit einem isolierenden Mantel (10) versehen ist.

3. Vorrichtung nach Anspruch 2, **dadurch gekennzeichnet, dass** der isolierende Mantel (10) zumindest teilweise in das Abdeckelement (6) hineinreicht.

4. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** die Auflagemittel (3) auf dem Wärmeleitsockel (4') drei dreieckige Einrichtungs-Verteilelemente (4) umfassen, auf jedem der Verteilelemente (4) eine entsprechende abstrahlende Quelle (2) angebracht ist.

5. Verfahren zum Herstellen einer modularen Strahlvorrichtung nach einem oder mehreren der vorhergehenden Ansprüche, wobei die Vorrichtung (1) eine Mehrzahl abstrahlender Quellen (2) elektromagnetischer Strahlungen, die jeweils mit zumindest einer LED versehen sind, die durch ein Gehäuse geschützt ist, Auflagemittel (3), die mit einem Abdeckelement (6) versehen sind, um die abstrahlenden Quellen (2) zu tragen und zu abzudecken, einen optischen Konzentrator (8) und Versorgungsmittel (7) für die abstrahlenden Quellen (2) umfasst, wobei die Versorgungsmittel (7) durch eine elektrische Schaltung mit den abstrahlenden Quellen (2) elektrisch verbunden sind, die Auflagemittel (3) ferner ein Ver-

teilelement (4) der Wärme umfassen, die von den abstrahlenden Quellen (2) erzeugt wird, das Verteilelement (4) eine Wärmeleitplatte (5) umfasst, die elektrische Schaltung zumindest ein paar Stege umfasst, die auf der Platte (5) erhalten werden, die abstrahlenden Quellen (2) zumindest ein paar Vorsprünge umfassen, die nach außen kommen, die Auflagemittel (3) ferner einen Wärmeleitsockel (4') umfassen;
wobei das Verfahren folgende Schritte umfasst:

a) Befestigen der abstrahlenden Quellen (2) an den Auflagemitteln (3), einschließlich der Schritte:

a') elektrisches Verbinden der Vorsprünge der abstrahlenden Quellen (2) mit den Stegen, um die LEDs zu versorgen;
a") Anordnen der abstrahlenden Quellen (2) auf der Wärmeleitplatte (5);
a'") Positionieren der Wärmeleitplatte (5) auf dem Wärmeleitsockel (4'), so dass Letzterer das Verteilelement (4) und die entsprechenden abstrahlenden Quellen (2) trägt;

b) Befestigen der Versorgungsmittel (7) an den Auflagemitteln (3), um einen Zwischenaufbau (14) zu erhalten;
c) das Anordnen einer Gussform, deren Form auf den optischen Konzentrator (8) und das Abdeckelement (6) abgestimmt ist;
d) das teilweise Positionieren des Zwischenaufbaus (14) in der Gussform;
e) das Einspritzen des thermoplastischen Polymermaterials in die Gussform im geschmolzenen Zustand, um den Zwischenaufbau (14) teilweise einzubetten und durch ein Formen einen Körper zu erhalten, der aus einem Stück hergestellt ist, der das Abdeckelement (6) und den optischen Konzentrator (8) umfasst, wobei die elektrische Schaltung vollständig in das Abdeckelement (6) eingebettet ist;

wobei der Zwischenaufbau (14) mit einem vorderen Ende (15) innerhalb der Form und mit dem Wärmeleitsockel (4') teilweise außerhalb der Form positioniert ist, so dass der vordere Abschnitt (15) vollständig in das Abdeckelement (6) eingebettet ist und der Wärmeleitsockel (4 ') derart teilweise abgedeckt ist, dass die Wärme, die von den abstrahlenden Quellen (2) innerhalb des Abdeckelements (6) erzeugt wird, über Letzteres an die Außenumgebung abgeführt wird und die Wärmeleitplatte (5) darauf angeordnet ist.

Revendications

1. Dispositif émetteur modulaire pour des lampes, comprenant une pluralité de sources (2) émettant des rayonnements électromagnétiques chacune munie d'au moins une LED protégée par un boîtier, des moyens de support (3) desdites sources émettrices (2), un concentrateur optique (8) pour les sources émettrices (2), des moyens d'alimentation (7) des sources émettrices(2), dans lequel lesdits moyens de support (3) comprennent un élément de recouvrement (6) et ledit concentrateur optique (8) forme un corps monobloc, lesdites sources émettrices (2) et lesdits moyens d'alimentation (7) étant au moins partiellement intégrés à l'intérieur dudit élément de recouvrement (6) pour rendre le dispositif (1) sensiblement étanche à l'eau ;
dans lequel lesdits moyens d'alimentation (7) sont connectés électriquement auxdites sources émettrices (2) par un circuit électrique qui est entièrement intégrés dans ledit élément de recouvrement (6) ;
caractérisé en ce que :

lesdits moyens de support (3) comprennent un élément de dispersion (4) de la chaleur générée par lesdites sources émettrices (2), ledit élément de dispersion (4) comprenant une plaque conductrice de chaleur (5) sur laquelle sont placées lesdites sources émettrices (2), ledit circuit électrique comprenant au moins un couple de fils de faisceau obtenus sur ladite plaque (5), lesdites sources émettrices (2) comprenant au moins un couple de saillies sortant vers l'extérieur et connectées électriquement auxdits fils de faisceau pour alimenter lesdites LEDs ;
lesdits moyens de support (3) comprennent une base de conducteur thermique (4') sur laquelle sont supportés l'élément de dispersion (4) et les sources émettrices concernées (2), ces dernières et une partie de ladite base de conducteur thermique (4') étant intégrés dans ledit élément de recouvrement (6), ladite base de conducteur thermique (4') étant partiellement découverte pour rester exposée à l'environnement extérieur, la plaque conductrice de chaleur (5) étant positionnée sur ladite base de conducteur thermique (4') de telle manière que la chaleur générée par lesdites sources émettrices (2) à l'intérieur dudit élément de recouvrement (6) soit dissipée vers l'environnement extérieur par ce dernier ;
ledit concentrateur optique (8) et ledit élément de recouvrement (6) sont constitués du même matériau polymère thermoplastique de manière à former un corps monobloc obtenu par une étape de moulage par injection.

2. Dispositif selon la revendication 1, **caractérisé en**

ce que les moyens d'alimentation (7) comprennent au moins un couple de câbles électriques (9), chacun d'eux étant muni d'une gaine isolante (10).

3. Dispositif selon la revendication 2, **caractérisé en ce que** la gaine isolante (10) s'étend au moins partiellement à l'intérieur dudit élément de recouvrement (6).

4. Dispositif selon la revendication 1, **caractérisé en ce que** lesdits moyens de support (3) comprennent trois éléments de dispersion (4) de configuration triangulaire, sur ladite base de conducteur thermique (4'), sur chacun desdits éléments de dispersion (4) est montée une source émettrice concernée (2).

5. Procédé de fabrication d'un dispositif émetteur modulaire selon une ou plusieurs des revendications précédentes, dans lequel le dispositif (1) comprend une pluralité de sources émettrices (2) de rayonnements électromagnétiques, chacune étant munie d'au moins une LED protégée par un boîtier, des moyens de support (3) munis d'un élément de recouvrement (6) pour supporter et recouvrir lesdites sources émettrices (2), un concentrateur optique (8) et des moyens d'alimentation (7) pour lesdites sources émettrices (2), lesdits moyens d'alimentation (7) étant connectés électriquement auxdites sources émettrices (2) par un circuit électrique, lesdits moyens de support (3) comprenant en outre un élément de dispersion (4) de la chaleur générée par lesdites sources émettrices (2), ledit élément de dispersion (4) comprenant une plaque conductrice de chaleur (5), ledit circuit électrique comprenant au moins un couple de fils de faisceau obtenus sur ladite plaque (5), lesdites sources émettrices (2) comprenant au moins un couple de saillies sortant vers l'extérieur, lesdits moyens de support (3) comprenant en outre une base de conducteur thermique (4') ;
le procédé comprenant les étapes suivantes:

a) la fixation desdites sources émettrices (2) auxdits moyens de support (3) incluant les étapes de :

a') connexion électrique desdites sources émettrices (2) aux fils de faisceau pour alimenter lesdites LEDs ;
a") placement desdites sources émettrices (2) sur ladite plaque conductrice de chaleur (5) ;
a'") positionnement de la plaque conductrice de chaleur (5) sur ladite base de conducteur thermique (4') de sorte que cette dernière supporte l'élément de dispersion (4) et les sources émettrices concernées (2) ;

b) la connexion desdits moyens d'alimentation (7) auxdits moyens de support (3) afin d'obtenir un ensemble intermédiaire (14);
c) l'agencement d'un moule dont la forme est complémentaire dudit concentrateur optique (8) et dudit élément de recouvrement (6);
d) le positionnement dudit ensemble intermédiaire (14) partiellement à l'intérieur du moule;
e) l'injection d'un matériau polymère thermoplastique à l'état fondu dans le moule, afin d'encastrer partiellement ledit ensemble intermédiaire (14) et d'obtenir par un moulage un corps monobloc comprenant ledit élément de recouvrement (6) et ledit concentrateur optique (8), ledit circuit électrique étant entièrement encastré dans ledit élément de recouvrement (6) dans lequel ledit ensemble intermédiaire (14) est positionné avec une extrémité avant (15) interne audit moule et avec une base du conducteur thermique (4') partiellement extérieure au moule, de sorte que l'extrémité avant (15) soit entièrement intégré dans ledit élément de recouvrement (6) et ladite base de conducteur thermique (4') soit partiellement découverte de manière à ce que la chaleur générée par les sources émettrices (2) à l'intérieur dudit élément de recouvrement (6) soit dissipée vers l'environnement extérieur par ce dernier et ladite plaque conductrice de chaleur (5) agencée sur celui-ci.

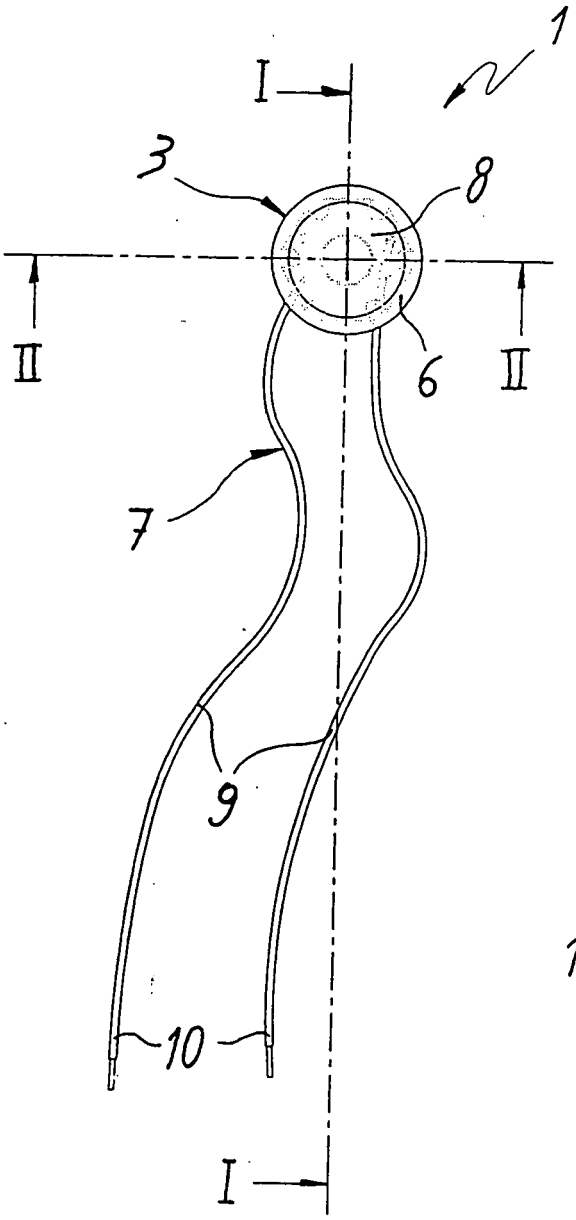

FIG. 1

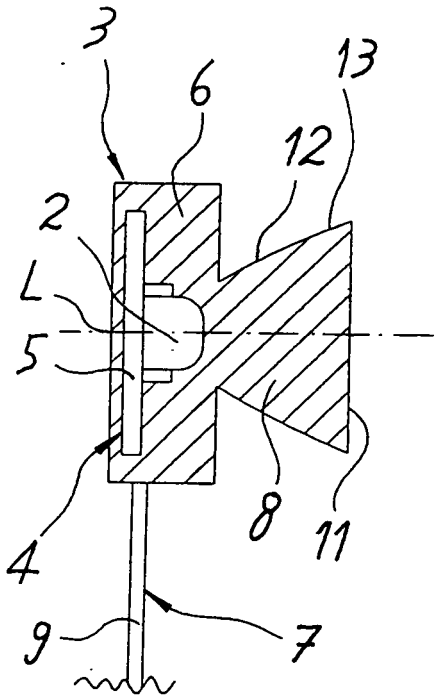

FIG. 2

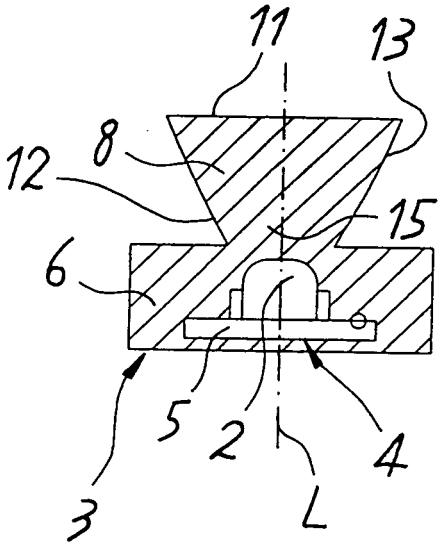

FIG. 3

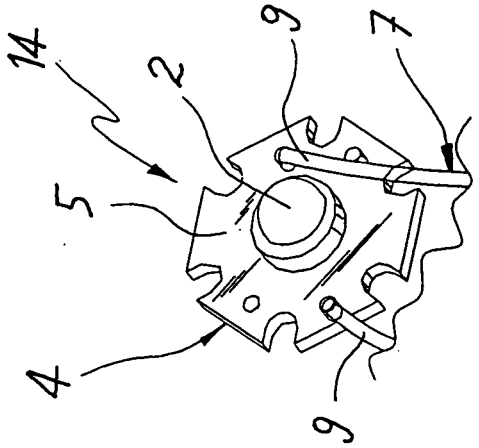

FIG. 5

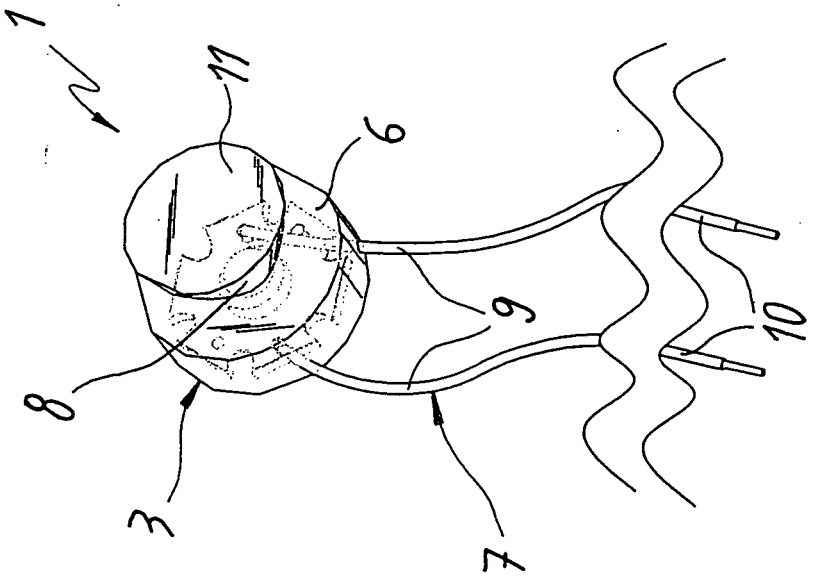

FIG. 4

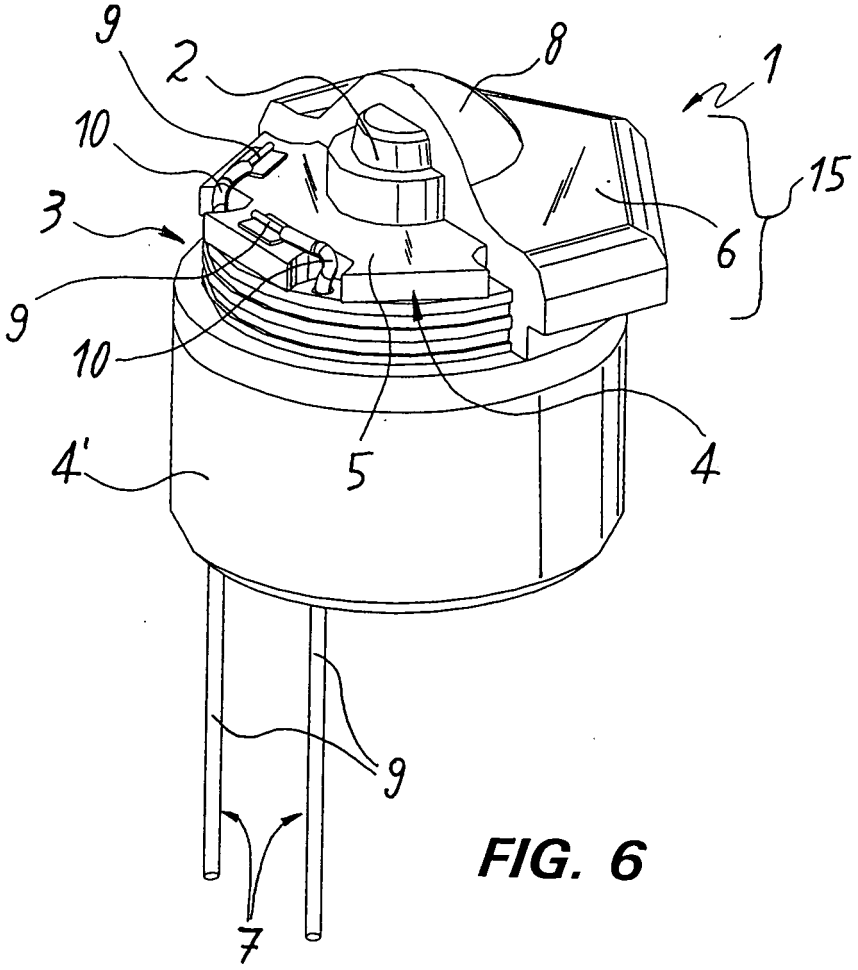

FIG. 6

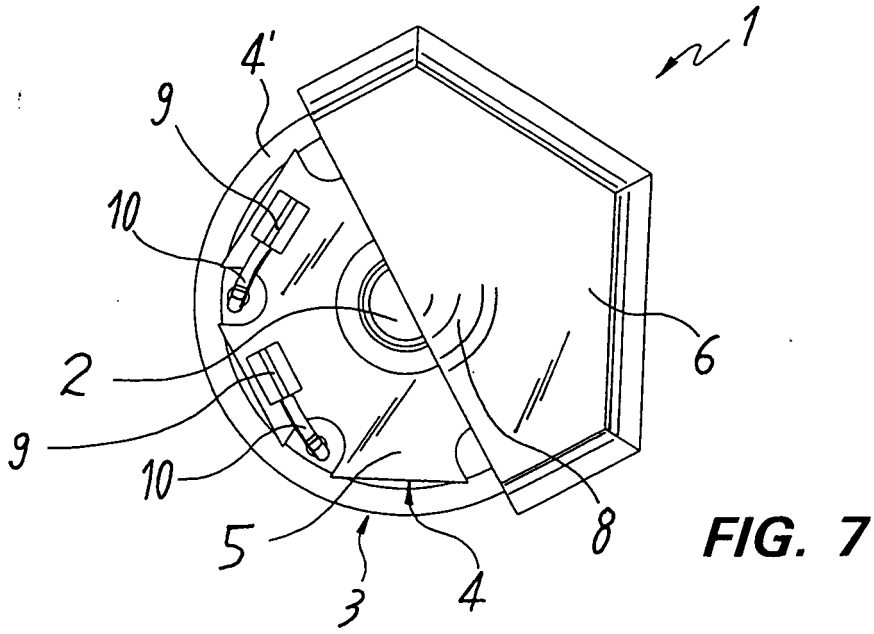

FIG. 7

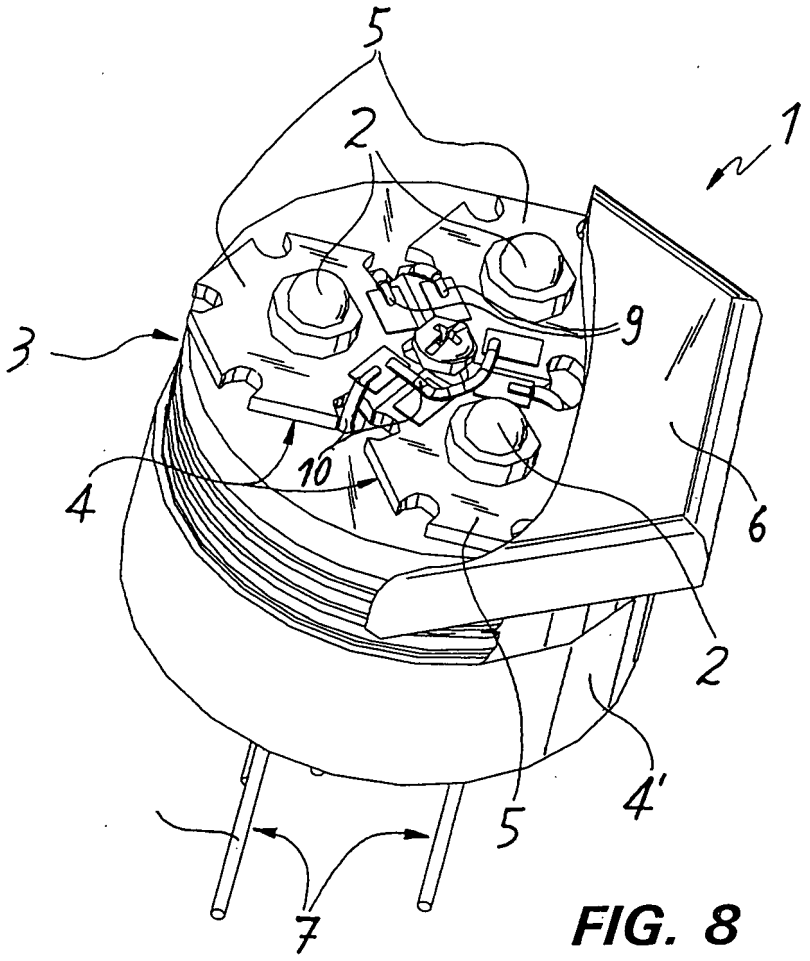

FIG. 8

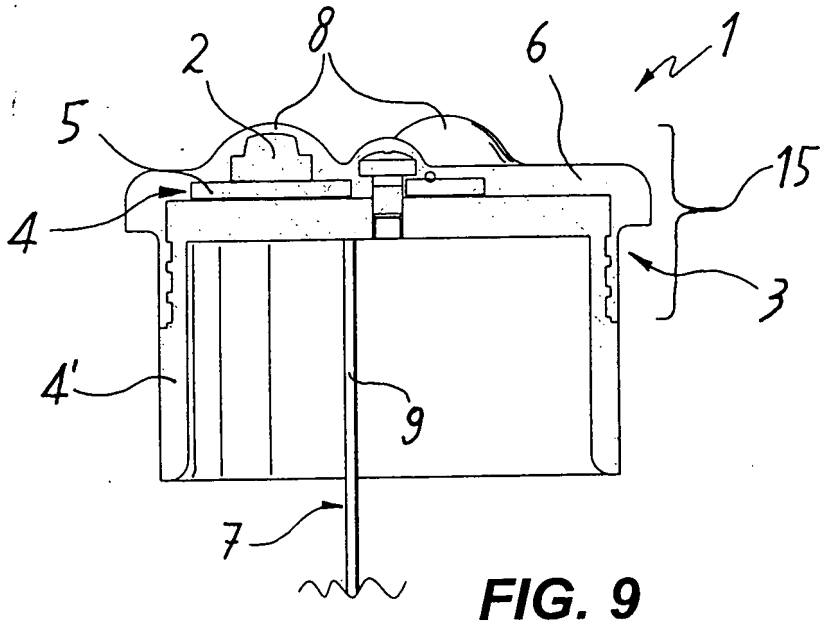

FIG. 9

REFERENCES CITED IN THE DESCRIPTION

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