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(54) **Heat sinking light source holder**

Lichtquellenhalter mit Wärmesenke

Support de source lumineuse à dissipation de chaleur

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(73) Proprietor: **Vossloh-Schwabe Italia SPA
47027 Sarsina (Forlì) (IT)**

(72) Inventor: **Tentelli, Carlo
48122, Ravenna (IT)**

(74) Representative: **Rüger, Barthelt & Abel
Patentanwälte
Webergasse 3
73728 Esslingen (DE)**

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Description

[0001] The invention relates to a light source holder for at least one light emitting device, in particular a semiconductor based light emitting device (LED) or an array of light emitting devices.

[0002] Lamp holders are usually made of ceramics or plastics adapted to withstand the heat generated by the light bulb or whatever light source is placed therein. It is known that light sources usually produce a large amount of waste heat at a high temperature. Therefore, lamp holders are designed to withstand the heat and to properly operate at a raised temperature level. In particular, in view of incandescent lamps it is the primary goal of the lamp socket and corresponding lamp holder to electrically and mechanically connect the lamp with, and to thermally isolate the lamp from, the luminaire. This is in particular true for halogen bulbs which are designed to operate at very high temperature levels. Usually, some measures are taken for preventing the lamp sockets from absorbing too much heat from the light bulb. The basic idea of this concept is to prevent the heat from excessively migrating through the lamp socket into the luminaire.

[0003] The concept of thermally isolating light sources from the luminaire has to be left aside when it comes to semiconductor based light emitting devices commonly referred to as LEDs. While the efficacy of LEDs is superior in comparison to many conventional light sources, in particular incandescent lamps, they still produce some waste heat which, however, has to be drained from the LEDs in an efficient way to prevent them from overheating. Lifetime and efficacy will suffer at higher temperatures levels. Therefore, cooling of the LEDs is an issue to be considered.

[0004] DE 10 2008 013 454 A1 discloses a LED light source consisting of a printed circuit board with a plurality of LED chips placed thereon. The printed circuit board is located within an aluminium rail having a U-shaped cross section. The printed circuit board is submerged into a transparent cured resin which covers the printed circuit board and fills the interior space of the rail. The aluminium rail provides heat dissipation, i.e. a cooling effect. The overall structure of this lighting assembly results in an elongated design. However, more often luminary designs are required which are similar to wide spread customary lighting assemblies as there are spot lights, down lights or the like.

[0005] US 2010/0127637 A1 discloses an LED light assembly for use in a light fixture assembly. The LED light assembly includes an LED lighting element and one or more resilient members to maintain a compression force between the light assembly and a housing to provide effective heat transfer from the LED to the housing. The thermally conductive housing may include a plurality of surface-area increasing structures such as ridges. Those ridges may provide heatdissipating surfaces and allow the housing to act as an effective heat sink. Heat,

however, is completely transferred to the backside of the light assembly.

[0006] A light source holder for semiconductor based light sources shown in US 2010/0237760 comprises: a one-piece body made of plastic material and comprising a mounting surface for receiving, and thermally connecting, the semiconductor based light source to the one-piece body; means for mechanically fixing the semiconductor based light source on the body; Contact means for electrically connecting the semiconductor based light source and lead wires; heat dissipating fins being an integral part of the one-piece body and extending away therefrom, so that heat received on the mounting surface is conducted along a continuous thermal path from the mounting surface into the fins for dissipating heat to the environment; wherein the light source holder comprises a collar surrounding the mounting surface and being an integral part of the body, the collar being designed to position the light source holder in a luminaire; wherein the collar is connected to, or abuts against, at least one end of at least one of the fins; wherein the body comprises a centre portion with the fins extending laterally or axially away therefrom; wherein the collar may cover the rim of the cutout of a luminaire the light source holder is to be fitted in; and wherein the collar comprises a ring shaped planar surface at the back side thereof, which surface forms a thermal interface thermally connecting the light source holder to the luminaire.

[0007] It is an object of the invention to provide a light source holder suitable for receiving semiconductor based light sources as for example LEDs and OLEDs.

[0008] The inventive light source holder comprises a body, which is both a heat sink and a socket means. The one single plastic body harbours at least two contact means for electrically connecting the semiconductor based light source to a power supply. Though made of plastic material, the light source holder comprises a mounting surface for supporting the light source and for receiving waste heat from the light source. Cooling fins are provided on the light source holder body for distributing and dissipating the heat taken up from the light source. The cooling fins are part of the one-piece plastic body and made of plastics themselves. The light source holder body is a seamlessly formed one-piece body, which provides an uninterrupted thermal path from the light source receiving mounting surface to the very tip of each of the cooling fins.

[0009] Preferably the light source holder body is formed by an injection moulding process. The plastic material of the body is a heat conductive and electrically insulating material. Contact elements may be housed within cavities of the body without additional electrical insulation.

[0010] Preferably the mounting surface is planar and uninterrupted. The surface area of the mounting surface preferably is at least as large as the surface area of a flat back of the semiconductor based light source. Except the holes provided for receiving the contact pins, no

voids, dents, cutouts, holes or the like are provided in the mounting surface. So the thermal resistance formed by the interface between the back side of the light source and the mounting surface is minimized.

[0011] Alternatively the mounting surface may have different shapes. It may be formed as an internal thread, in particular like an Edison thread. If so, the shape of the mounting surface provides for anchorage and fastening of the light source.

[0012] Irrespective of the specific shape of the mounting surface the cooling fins multiply the heat dissipating area of the body. The cooling fins are thin walled structures, at least some of them defining a wall thickness considerably smaller than the length thereof. The fins extend away from the mounting surface spreading the heat received and transferring it to the surrounding air.

[0013] The light source holder comprises at least one internal chamber with the electrical contact elements disposed therein, forming an electrical interface for electrically connecting the semiconductor based light source to a power source. Openings are provided through the mounting surface for allowing electrical terminals of the light source to be introduced into the internal chamber and to come into abutment with the electrical contact elements.

[0014] Preferably the light source holder comprises anchoring means for clamping or pressing the light source against the mounting surface of the heat sinking body. The anchoring means can be the mounting surface itself if it is formed as an internal screw thread. Alternatively, electrical contacts provided on the light source may draw the back of the light source against the mounting surface. Here the anchoring means is established by providing an internal ramp cooperating with an enlarged head of the contact pin. The ramp is provided in the internal chamber, which receives the contact(s), adjacent to the slot like contact opening the contact pin is extending through.

[0015] In addition to the cooling fins the light source holder may have a thermal interface to the fixture so that some of the heat is directly dissipated into the environment (via the cooling fins of the heat sinking body) and another fraction of the heat is transferred to the fixture. The fixture then contribute to the cooling of the semiconductor based light source.

[0016] For increasing the cooling effect, the light source holder comprises a collar surrounding the mounting surface and being an integral part of the body. The back of the collar provides a thermal interface to the fixture. Moreover the collar preferably is designed such that the front side of the collar dissipates heat into the environment. Heat transfer and heat dissipation may be facilitated by providing a heat conductive seamless connection from the body to the collar. Moreover a dark and/or rough surface structure may support the heat transfer further.

[0017] The collar is designed to position the light source holder in the fixture. Moreover the collar covers the rim of the cutout of the fixture the light source holder

is fitted in. The collar may be designed to receive an optical front piece within a central opening thereof.

[0018] The heat sink including the fins and the collar is integrally formed so that no thermal interface exists between the centre portion of the heat sink, the fins, and the collar. This body of the light source holder consisting of heat sink with or without fins and collar may be seamlessly integrally formed, e.g. by injection molding in one single piece.

[0019] Additional parts of the inventive light source holder may include screws, springs, bolts or the like for mechanically fixing the light source in the light source holder. Furthermore, the light source holder may comprise means for fixing the light source holder in a lighting fixture, e.g. in a luminaire, in a household appliance like a cooker hood or as a down light in a ceiling.

[0020] The inventive light source holder reduces material and assembly costs in comparison to a system consisting of a conventional light source holder with a separate heat sink made of aluminium. The new light source holder does not require any assembly of the heat sink which is already an integral part of the light source holder. The use of plastic material allows creating complex shapes with fine surface structures like fins for improved heat dissipation. At the same time, injection molding is a production process for low-cost production of mass products.

[0021] The plastic material of the heat sink may have a thermal conductivity inferior to the thermal conductivity of aluminium. However, the plastic heat sink is in direct contact to the light emitting device so that only one single thermal interface is present between the light source and the heat dissipating surface of the light source holder. The interface is defined by the contact surface of the heat sink and a respective contact surface of the light source. The fact that only one single thermal interface is provided between the light source and the heat sink as well as any other heat removing surface can make up for the lower thermal conductivity of the material of the light source holder. Once the heat entered the light source holder at the contact surface to the light source, it is conducted to all points of the complete light source holder without having to cross any further thermal interface.

[0022] Further the heat sink may be provided with a large number of cooling fins which even may bifurcate which may result in a large cooling surface for heat removal and dissipation.

[0023] The plastic material may be filled with heat conductive particles as there are carbon particles, carbon fibres, graphene, diamond particles, metal particles, in particular copper particles, aluminium particles, fibres, tinsels or the like. The heat sink may even comprise a core made from a solid body of heat conductive material. The core may be formed from aluminium, copper or the like. The core may be embedded into the molded, e.g. injection molded, plastic heat sink.

[0024] The inventive light source holder comprises means for connecting the light source to a contact surface

of the heat sink. Preferably said means are adapted to clamp the light source against the contact surface of the heat sink. Those clamping means may involve spring means, bolts, washers, or a combination thereof.

[0025] The inventive light source holder provides heat dissipation for the light source, in particular, a semiconductor based light emitting device and keeps the operating temperature as low as necessary while it conducts the heat away from the light source and dissipates and distributes the heat to an extent that the temperature at the light source is prevented from reaching an improper temperature level.

[0026] Attention is drawn to the fact that the invention provides a very simple easy to manufacture and easy to use light source holder which uses its entire surface including back side and front side for heat removal i.e. cooling. This keeps the temperature of the LED assembly low and safeguards good operating conditions for the LED and a long lifetime as well.

[0027] Further details of embodiments of the inventive light source holder are to be taken from the subclaims, from the drawing and/or the description. Some embodiments of the invention are given by example in the drawing in which:

Figure 1 illustrates a perspective front view of a light source holder according to the invention;

Figure 2 illustrates a perspective view of the light source holder according to figure 1, seen from behind;

Figure 3 illustrates a perspective front view of the body of the light source holder of figures 1, and 2;

Figure 4 illustrates a partial sectional view of the light source holder;

Figure 5 illustrates a schematic partial view of the inventive heat sinking light source holder;

Figure 6 illustrates a perspective view of an alternative embodiment of the inventive light source holder;

Figure 7 illustrates a perspective view of the embodiment of figure 7 seen from behind;

Figure 8 illustrates an exploded view of the embodiment of the light source holder of figures 6 and 7;

Figure 9 illustrates a luminaire including semiconductor based light sources mounted on light source holders according to a further embodiment not covered by claim 1.

Figure 10 illustrates an exploded view of the light source holder according to Fig 9;

Figure 10a illustrates a cross sectional view of a detail of the heat sinking body;

Figures 11, 12 and 13 illustrate another embodiment of the inventive light source holder, a light source with electrical contacts, and a down light housing;

Figures 14 to 18 illustrate an embodiment of a light source holder suitable for installation in a suspended ceiling, a cooker hood or the like;

Figures 19 and 20 illustrate a further modified embodiment of a light source holder suitable for LED retrofit lamps.

Detailed Description of Embodiments of the Inventive Semiconductor Based Light Source Holder

[0028] Referring to Figure 1, a light source holder 10 for semiconductor based light sources of any type is illustrated. The light source holder 10 comprises an at least partially translucent or transparent cover element 11. The cover element 11 may have a planar or spherically rounded surface and a curved, e.g. circular, outer edge 12 which surrounds the element 11 at the circumference thereof. The edge 12 may have any alternative shape as there is polygonal, triangular, octagonal, hexagonal or square. A collar 13 may surround the optical cover element 11 which collar 13 consists of plastics.

[0029] Figure 2 in particular illustrates the overall structure of the light source holder 10, which is integrally made of plastics. Collar 13 tapers in steps 14, 15 to a plate section 16 surrounding a round opening 18 at the centre thereof.

[0030] Cover element 11 and collar 13 together form the at least partially visible front end of the light source holder 10. Cover 11 fits into a larger opening surrounded by the collar 13 and covers the inner central opening 18 thereof (see Fig. 3). Figure 3 illustrates the light source holder 10 with the cover 11 removed. At least the collar 13 is preferably made of a heat conductive plastic material e.g. by injection molding. Collar 13 may comprise a ring shaped planar surface at the back side thereof (Figure 2) which surface can form a thermal interface 17 thermally connecting the light source holder 10 to a luminaire.

[0031] A heat sinking body 25 is provided on the collar 13 as to be taken from figure 2. The body 25 is a one-piece unit which rises from the plate section 16 and is seamlessly joint thereto. The body 25 preferably comprises a centre portion 26 which forms a solid body of cylindrical or frustoconical shape. It may comprise basically a circular or polygonal cross section. The centre body 26 may be placed directly behind the opening 18.

[0032] Fins 27 are part of the body 25 and extend away from the centre portion 26. They may extend radially, for example. While the fins 27 directly merge into the plate 16 at one end and directly merge into the centre body 26 at the other end they support the centre body. There is

no gap, no interface nor any other thermal barrier between the centre body 26, the fins 27 and the collar 13.

[0033] In the present embodiment eight fins are provided each comprising a bifurcation 28 at which fin 27 splits into at least two outer fins 29, 30. Any fin 27, 29, 30 forms a thin-walled structure. The fin 27 seamlessly adjoins the centre portion 26 and the plate section 16. The complete light source holder 10 forms a heat dissipation means. Heat sinking body 25 including the centre portion 26 and the fins 27, 29, 30 is preferably made of heat conductive plastic material e.g. by injection molding or transfer molding. The plastics material may be a homogenous material, a filled plastic material of thermoplastic or duroplastic nature. The filler particles can in particular be carbon fibres, diamant powder, SiC particles, metal particles or the like.

[0034] Preferably the centre portion 26 comprises a flat top mounting surface 31, surrounded by an edge 32 (Figure 3). At the opposite end of the centre portion 26, a bottom surface 33 is provided which is surrounded by an edge 34 (Figure 2). The bottom surface 33 may be planar or have any other desired shape. In particular the surface 33 may have a concave or a convex shape.

[0035] The centre portion 26 is surrounded by a side surface 35 from which the fins 27 extend and protrude. As illustrated, for maximizing the transferring surface of the fins and for maximizing the cooling efficacy, all fins 27 run from the upper edge 32 to the lower edge 34.

[0036] The lower narrow edges of the fins 27 and the bottom surface 26 are preferably flush one to the other. Consequently the light source holder 10 is relatively flat.

[0037] As can be seen from Figure 4, a light emitting assembly 36 is provided at the mounting surface 31 of the heat sink 25. The light emitting assembly 36 is located within opening 18.

[0038] The Light emitting assembly 36 comprises a base plate 37 usually consisting of a heat conductive metal plate, a ceramic plate or the like. At least one light emitting semiconductor chip 38 is placed at the base plate 37 and usually covered by an enclosure 39 which may be formed by a dome-shaped light transmissive element e.g. a lens. The light transmissive element may likewise be a body filled with disperse particles for transforming light of a first wave length into light of a second wave-length and/or for dispersing the light emitted by the chip 38.

[0039] The plate 37 comprises a planar back side 40 which abuts against the mounting surface 31.

[0040] Means 41 are provided for pressing the back surface 40 against the mounting surface 31. The clamping means 41 may comprise two or several screws 42 inserted into openings, e.g. bores 43, provided in the heat sink 25. Bores 43 are preferably even walled bores while the screws 42 preferably comprise self-cutting threads. However, the bore 43 may be a threaded bore if desired. Bore 43 may be a through bore or a counter bore as desired.

[0041] Preferably spring means 44 are provided for

keeping the plate 37 pressed against the centre body 26 no matter whether cold or hot. The spring means 44 may comprise a split ring washer 45 and/or a regular washer 46 if desired. Any other spring means for exerting axial forces on plate 37 may be used for replacing the split ring washer 45.

[0042] It can be seen from Figure 2 that leads 47, 48 may be connected to the light emitting assembly 36. The leads 47, 48 are insulated conductors e.g. stiff or flexible wires.

[0043] As further to be taken from Figure 2, clamping springs 49, 50 may be provided for mounting the light source holder 10 in or on a luminary or at any other fixture. The clamping springs 49, 50 may be formed as angled leave springs fitting into respective pockets. Screws 53, 54 may be provided for fitting through a respective hole of clamping springs 49, 50 and into respective bores provided in columns 23 and 24.

[0044] The light emitting assembly 36 is firmly pressed against the top mounting surface 31. The mounting surface 31 is a contact surface for receiving heat generated by the chip 38 and spread by the plate 37. The interface between the surfaces 31 and 40 comprises a low thermal resistance. A thermally conductive grease, paste or film or sheet or the like may be applied to the surfaces 31 and 40 to optimize the heat transfer across these surfaces. Once the heat flow reached the heat sink body 25 it easily spreads into all fins 27 toward the tips thereof. Because of the large surface area of fins 27 it may be taken away by the air contacting the back side of the light source fixture 10. Moreover, heat may transfer from fins 27 to collar 13 and be dissipated from the front side of collar 13. Further the heat flux may leak from the collar 13 to the fixture which further contributes to the cooling of the semiconductor based light source 36, i.e. the LED chips.

[0045] Summarizing it can be said that the heat sink body 25 provides a socket for receiving any standardized semiconductor based light emitting assembly 36 and transmits the heat into the surrounding environment for sufficiently cooling the light emitting assembly 36.

[0046] The cooling efficacy may be increased by embedding highly heat conductive members into heat sink 25. Figure 5 illustrates the heat sink body 25 with a metal inlay 57 schematically illustrated in dotted lines. The metal inlay 57 can be made from aluminium or any other suitable material. Preferably, it is completely covered by the plastic material of the heat sink 25. It may have radial wings 58 which extend into the fins 27 for increasing the heat flow therein.

[0047] While the previously described embodiment of the inventive light source holder 10 uses the body 25 and the collar 13 formed in one piece and being connected via plate 16 they, alternatively, may be connected by webs extending from the fins 27 to the collar 13. While Figure 6 illustrates the overall appearance of the modified embodiment with the cover element 11 formed as an optical element provided with a facet lens 59 in the centre

part thereof, for example, Figure 7 illustrates the view from behind and Figure 8 illustrates an exploded view.

[0048] As can be seen preferably all fins 27, in particular the outer ends of the fins 29, 30 are provided with axially extending extensions 61 which seamlessly merge into the collar 13 and form heat conductive webs. The heat sink 25 and the collar 13 are integrally formed preferably by injection molding or pressing. Still referring to the embodiment of Figure 2, obviously no thermal barrier exists between the heat absorbing mounting surface 31 and the plate 37. However, the heat sinking body 25 and plate member 37 may also be formed as separate members. If this is the case Body 25 is pressed against the collar 13 so that heat is transferred to the outer surface of the collar 13. Consequently, even in case that the thermal conductivity of the plastic material the collar 13 and the body 25 are made of is low, the net thermal resistance of the whole fixture is low.

[0049] For illustrative purposes the lead wires 47 and 48 are directly connected to the base plate 37 e.g. soldered to corresponding solder pads provided thereon as in Figure 8 in particular. Preferably however, electrical contact means 62, 63 are provided which do both, electrically and mechanically connecting the semiconductor based light source 36 to the body 25. Reference is made to Figures 9 and 10 which illustrate an embodiment of a semiconductor based light source comprising a planar back surface 40 with two contact pins 64 axially extending therefrom. The two pins may be formed identically and each may have a slender first portion 65 carrying a head 66 at the free end thereof. Head 66 is an enlarged diameter portion of pin 64. The pins 64 are preferably located in diametrically opposed positions. In other words they define a 180° angle relative to the longitudinal middle axis of the light source 36. It is however possible to select different angles and positions to avoid confusion of the contacts when coupling the light source 36 to the heat sinking base body 25. Alternatively or additionally pins 64 may have different shapes. They may have for example heads 66 with different shapes or diameters, different axial lengths or any other structural feature. In this was, they can function as a key that guarantees the correct combination of light source 36 and heat sinking base body 25 respectively light source holder 10.

[0050] As to be taken from Figure 10, light source 36 may carry a lens arrangement 67 which may be fixedly or replaceable arranged on the front side of the base plate 37.

[0051] The central heat sinking body 25 comprises openings 68, 69 which intersect the planar and otherwise uninterrupted mounting surface 31. The openings 68 may have an enlarged diameter portion 70 and a preferably curved slot extending therefrom. The enlarged portion 70 is adapted to receive the head 66 of each pin 64. The slot extending therefrom however is narrow. It will let pass the first portion 65 of each pin 64, however block head 66 from being pulled out of the opening 68 or 69 like a bayonet lock.

[0052] Preferably the wall behind the narrow portion extending from the openings portion 70 will ramp away from the mounting surface 31. Figure 10a illustrates an inclined ramp surface 71a which pulls the pin 64 axially downward if the head is travelling along the slot. The inclination of the ramp surface 71a is selected such that plate 37 will be firmly pulled against mounting surface 31 if the pins 46 are inserted into the openings 68 and 69 and if the light source 36 is turned somewhat thereafter. Obviously the pins 64 and the ramping surfaces behind the openings 68 and 69 will form mechanical mounting and tightening means.

[0053] Cavities 71 are provided for receiving contacts 72. Preferably contacts 72 are identically or symmetrically formed one to another. They are inserted into the cavities 71 for electrically contacting pins 64 and lead wires which pass through contact bores 73 provided in the body 25.

[0054] The contacts 72 may have any suitable shape. In particular they can comprise a lead spring portion 74 for contacting pins 64 and a wire contacting portion 75. The wire contact portion 75 may be a plug in contact having a resilient contact tongue or the like.

[0055] Cover plates 76 may be provided for closing cavity 71 and locating the contact elements 72 in place.

[0056] The plastic body 25 is provided with cooling fins 27 which all extend away from the mounting surface 31 in parallel one to another. A mounting flange 78 may run like a collar around the tips of all cooling fins for mounting the body 25 on any fixture or luminaire. The complete assembly consisting of base body 25, contact elements 27, and cover plates 76, if any, form the light source holder 10. One or several of those light source holders 10 may be mounted in a luminaire 100 as illustrated in Figure 9 and comprising a luminaire body 101 and a luminaire shell 102 mounted thereon. Luminaire 100 may be a ceiling luminaire, a dome luminaire, roof luminaire or the like.

[0057] Figures 11 to 13 illustrate a somewhat modified embodiment. As far as this embodiment is structurally and functionally identical to the previously described embodiment(s), the same reference numbers are used in the drawing and it is referred to the description given above.

[0058] Figure 11 illustrates a downlight housing 103 for fixing the light source 36 in a suspended ceiling, a cooker hood, or the like. A mostly cylindrical base body 104 merges into a front side flange 113 which surrounds the through opening 105 defined by the housing 103. Curved ribs 106 may extend in circumferential direction along the inner cylindrical surface of base body 104. The ribs 106 are provided for supporting and fixing the body 25 in the fixture housing. Radially extending lugs 107 are provided at the base body 25 of the light source holder adjacent to a radial flange 108 provided at the front end thereof. The lugs 107 fit between the opposing ends of the two ribs 106 and slide behind the ribs 106 if the body 25 is turned around its longitudinal axis.

[0059] As can be seen from Figure 11, spring elements

108 may be provided for supporting the luminaire on a card board, suspended ceiling, or the like.

[0060] Figures 14 to 18 illustrate different views of another embodiment of a light source holder. Reference numbers known from the description above are used again here. They refer to similar structural features.

[0061] As can be seen, body 25 is connected to plate 37 of the light source 36. The mechanical and electrical connection therebetween is achieved as illustrated in Figures 12 and 13. However, while base body 25 forms the support for the light source 36 in all previous embodiment, the embodiment of Figures 14 to 18 uses the light source 36 for carrying the body 25. In particular Figures 17 and 18 illustrate a mounting spring 109 formed like a snap ring. The mounting spring 109 comprises radially extending portions 110 which fit into slots 111 provided in the tubular housing 104. The front flange of the lens assembly 37 rests against an annular rib 112 running around the inner circumference of housing 104 as shown in Figure 16.

[0062] While all previously discussed embodiments rely on a planar thermal interface surface between the semiconductor based light source 36 and the heat sinking body 25, it is possible to use other shapes of thermal interfaces. Figure 19 illustrates a luminaire 114 in a sectional view which luminaire 114 is illustrated in Figure 20 in a side view. The luminaire 114 comprises a fixture for receiving the body 25 which connects the semiconductor based light source 36 to the luminaire 114. Heat sinking body 25 comprises an internal thread which here forms the mounting surface 131. The thread is preferably an Edison thread. The outer thread of the light source 36 fits into the Edison thread 131 which provides both mechanical support for the light source 36 and close abutment of the heat delivering threaded circumferential surface of light source 36 and the heat receiving surface 131.

[0063] Cooling fins 27 may be arranged around the circumference of the slightly frustoconical body 25 which may contain two or some electrical contact tongues 172. This electrical contact tongues or elements 172 are to be connected to the lead wires 47 and 48. At the rear side of the body 25, a screw neck 116 may be provided for securing a heat sinking base body 25 in the fixture.

[0064] As clearly to be seen, the internal thread 131 is adapted for receiving heat generated by the semiconductor based light source 36 while the body 25 is adapted for transferring the heat received directly into the fins 27 for dissipating the heat. Fins 27 preferably extend radially and axially. They run along the overall lengths of body 25 from the end close to the light source 36 to the end close to the screw neck 116. Preferably the thickness of the fins 27 is much lower than the radial length thereof. The radial dimension of the fins 27 is preferably considerably large. The distance from the internal threaded surface 131 to the radial outer edge of a fin 27 is preferably at least as large as the diameter of the thread 131.

[0065] The new light source fixture 10 comprises a heat sink 25 for receiving the light source and dissipating the

heat emerging therefrom. The heat sink 25 keeps the temperature of the light source assembly 36 below a critical temperature level. Preferably, heat sink 25 is entirely made of plastics.

Reference Numbers:

[0066]

10	Light source holder
11	Cover element
12	Edge
13	collar
14	Step
15	Step
16	Plate
17	interface
18	Opening
25	body
26	Centre portion
27	Fins
28	Bifurcation
29	First outer fin
30	Second outer fin
31	Mounting surface
32	Edge surrounding top surface 31
33	Bottom surface
34	Edge surrounding bottom surface 33
35	Side surface
36	Light source
37	Base plate
38	Light emitting semiconductor chip
39	Enclosure
40	Back surface

13		EP 2 466 198 B1		14	
41	Clamping means		75	Wire contacting portion	
42	Screw		76	Cover plate	
43	Bore	5	77		
44	Spring means		78	Mounting flange	
45	Split ring washer		100	Luminaire	
46	Washer	10	101	Luminaire body	
47	Lead wire connected to LED module		102	Luminaire shell	
48	Lead wire connected to LED module	15	103	Fixture for (suspended) Ceiling or Cooker Hood	
49	Clamping spring		104	Base Body	
50	Clamping spring		105	Through opening	
51	U-shaped Section of Clamping Spring 49 or 50	20	106	curved ribs	
53	Screw		107	Lugs	
54	Screw	25	108	Springs	
57	Metal inlay		109	Mounting spring	
58	Wing		110	Radially extending portion of mounting spring	
59	Facet lens	30	109		
61	Axial extension of fins 27, 29, 30		111	Slots	
62, 63	Connecting means	35	112	Rib	
64	Contact pins		113	Flange	
65	First portion of pin 64		114	Luminaire	
66	Head	40	131	Edison Thread	
67	Lenses		172	Contact tongues	
68	Opening	45	116	Screw neck	
69	Opening				
70	Opening portion				
71	Cavities	50	1.	Light source holder (10) for semiconductor based light sources (36), comprising:	
72	Contacts			a one-piece body (25) made of plastic material and comprising a mounting surface (31, 131) for receiving, and thermally connecting, the semiconductor based light source (36) to the one-piece body (25);	
73	Contact bores	55		means (68, 69, 131) for mechanically fixing the	
74	Leaf spring portion				

semiconductor based light source (36) on the body (25);

contact means (72, 172) for electrically connecting the semiconductor based light source (36) and lead wires (47, 48);

heat dissipating fins (27) being an integral part of the one-piece body (25) and extending away therefrom, so that heat received on the mounting surface (31, 131) is conducted along a continuous thermal path from the mounting surface (31, 131) into the fins (27) for dissipating heat to the environment;

wherein the light source holder comprises a collar (13) surrounding the mounting surface (31) and being an integral part of the body (25), the collar (13) being designed to position the light source holder (10) in a luminaire;

wherein the collar (13) is connected to, or abuts against, at least one end of at least one of the fins (27);

wherein the body (25) comprises a centre portion (26) with the fins (27, 29, 30) extending laterally or axially away therefrom;

wherein the collar may cover the rim of the cutout of a fixture the light source holder is to be fitted in;

wherein the collar (13) comprises a ring shaped planar surface at the back side thereof, which surface forms a thermal interface (17) thermally connecting the light source holder (10) to the luminaire;

characterized in that the light source holder (10) comprises at least one internal chamber (71) with the electrical contact elements (72) disposed therein, forming an electrical interface for electrically connecting the semiconductor based light source (36) to a power source;

wherein openings (68, 69) are provided through the mounting surface (31, 131) for allowing electrical terminals (62, 62) of the light source (36) to be introduced into the internal chamber (71) and to come into abutment with the electrical contact elements (72); and

wherein the plastic material of the body (25) is a heat conductive and electrically insulating material.

2. Light source holder according to claim 1, wherein the collar (13) is designed to receive an optical front piece (11) within a central opening of the collar (13).
3. Light source holder according to any of the preceding claims wherein the body (25) is formed by injection moulding.
4. Light source holder according to claim 1, wherein the body (25) comprises a centre portion (26) having a top surface adapted to form the mounting surface (31) for receiving the flat back side (40) of the sem-

iconductor light source (36), a bottom surface (33), and side surfaces (35) extending from an outer edge (32) of the top surface (31) to an outer edge (34) of the bottom surface (33) and surrounding the centre portion (26), and wherein the fins (27) extend away from the centre portion (26).

5. Light source holder according to claim 1, wherein at least one of the fins (27) comprises at least one bifurcation (28).
6. Light source holder according to any of the preceding claims, wherein bores (43) are provided in the body (100) for receiving screws (42) for fixedly mounting the light source (36) on the body (25).
7. Light source holder according to any of the preceding claims, wherein connecting means (49, 50, 108) are provided for fixedly mounting the body (25) in the receiving opening of an installation/fixture (101, 102, 103).

Patentansprüche

1. Lichtquellenhalter (10) für halbleiterbasierte Lichtquellen (36) aufweisend:

einen einstückigen Körper (25), der aus Kunststoffmaterial hergestellt ist und eine Anbringungsfläche (31, 131) zur Aufnahme und zum thermischen Verbinden der halbleiterbasierten Lichtquelle (36) an dem einstückigen Körper (25) aufweist;

Mittel (68, 69, 131) zum mechanischen Anbringen der halbleiterbasierten Lichtquelle (36) an dem Körper (25);

Kontaktmittel (72, 172) zum elektrischen Verbinden der halbleiterbasierten Lichtquelle (36) mit Verbindungsleitungen (47, 48);

Wärmeabfuhrrippen (27), die ein integraler Teil des einstückigen Körpers (25) sind und sich davon weg erstrecken, so dass die Wärme, die an der Anbringungsfläche (31, 131) aufgenommen wurde, entlang eines kontinuierlichen thermischen Pfades von der Anbringungsfläche (31, 131) in die Rippen (27) geleitet wird, um die Wärme an die Umgebung abzugeben;

wobei der Lichtquellenhalter einen Kragen (13) aufweist, der die Anbringungsfläche (31) umgibt und ein integraler Teil des Körpers (25) ist, wobei der Kragen (13) dazu eingerichtet ist, den Lichtquellenhalter (10) in einer Leuchte zu positionieren;

wobei der Kragen (13) mit bzw. an zumindest einem Ende von zumindest einer der Rippen (27) verbunden ist bzw. anliegt;

wobei der Körper (25) einen Zentralabschnitt

- (26) aufweist, von dem sich die Rippen (27, 29, 30) seitlich oder axial weg erstrecken;
wobei der Kragen den Rand der Ausnehmung einer Halterung abdecken kann, in die der Lichtquellenhalter einzusetzen ist;
wobei der Kragen (13) an seiner Rückseite eine ringförmige ebene Fläche aufweist, die eine thermische Schnittstelle (17) darstellt, die den Lichtquellenhalter (10) mit der Leuchte thermisch verbindet;
dadurch gekennzeichnet, dass der Lichtquellenhalter (10) zumindest eine innere Kammer (71) mit den darin angeordneten elektrischen Kontaktelementen (72) aufweist, die eine elektrische Schnittstelle zum elektrischen Verbinden der halbleiterbasierten Lichtquelle (36) mit einer Energiequelle bilden;
wobei Öffnungen (68, 69) durch die Anbringungsfläche (31, 131) vorhanden sind, um es elektrischen Anschlüssen (62, 62) der Lichtquelle (36) zu erlauben, in die innere Kammer (71) eingeführt und in Anlage mit den elektrischen Kontaktelementen (72) gebracht zu werden; und
wobei das Kunststoffmaterial des Körpers (25) ein wärmeleitendes und elektrisch isolierendes Material ist.
2. Lichtquellenhalter nach Anspruch 1, wobei der Kragen (13) ausgeführt ist, um ein optisches Frontteil (11) in einer zentralen Öffnung des Kragens (13) aufzunehmen.
 3. Lichtquellenhalter nach einem der vorhergehenden Ansprüche, wobei der Körper (25) durch Spritzgießen hergestellt ist.
 4. Lichtquellenhalter nach Anspruch 1, wobei der Körper (25) einen Zentralabschnitt (26) mit einer oberen Fläche, die dazu eingerichtet ist, die Anbringungsfläche (31) zur Aufnahme der flachen Rückseite (40) der Halbleiterlichtquelle (36) zu bilden, einer unteren Fläche (33) und seitlichen Flächen (35) aufweist, die sich von einer äußeren Kante (32) der oberen Fläche (31) zu einer äußeren Kante (34) der unteren Fläche (33) erstrecken und den Zentralabschnitt (26) umschließen, und wobei sich die Rippen (27) von dem Zentralabschnitt (26) weg erstrecken.
 5. Lichtquellenhalter nach Anspruch 1, wobei zumindest eine der Rippen (27) wenigstens eine Verzweigung (28) aufweist.
 6. Lichtquellenhalter nach einem der vorhergehenden Ansprüche, wobei Löcher (43) in dem Körper (100) zur Aufnahme von Schrauben (42) vorhanden sind, um die Lichtquelle (36) an dem Körper (25) zu befestigen.

7. Lichtquellenhalter nach einem der vorhergehenden Ansprüche, wobei Verbindungsmittel (49, 50, 108) vorhanden sind, um den Körper (25) in der Aufnahmeöffnung einer Vorrichtung/Halterung (101, 102, 103) zu befestigen.

Revendications

1. Support de source lumineuse (10) pour des sources lumineuses à base de semi-conducteurs (36), comprenant :

un corps monobloc (25) fabriqué en matière plastique et comprenant une surface de montage (31, 131) pour recevoir, et relier thermiquement, la source lumineuse à base de semi-conducteurs (36) au corps monobloc (25) ;
des moyens (68, 69, 131) pour fixer mécaniquement la source lumineuse à base de semi-conducteurs (36) au corps (25) ;
des moyens de contact (72, 172) pour relier électriquement la source lumineuse à base de semi-conducteurs (36) et des fils de connexion (47, 48) ;
des ailettes de dissipation thermique (27) faisant partie intégrante du corps monobloc (25) et s'étendant à partir de celui-ci, de sorte que la chaleur reçue sur la surface de montage (31, 131) est conduite suivant un chemin thermique continu depuis la surface de montage (31, 131) jusqu'aux ailettes (27) pour dissiper la chaleur dans l'environnement ;
dans lequel le support de source lumineuse comprend une collerette (13) qui entoure la surface de montage (31) et qui fait partie intégrante du corps (25), la collerette (13) étant conçue pour positionner le support de source lumineuse (10) dans un luminaire ;
dans lequel la collerette (13) est reliée à, ou en butée contre, au moins une extrémité d'au moins une des ailettes (27) ;
dans lequel le corps (25) comprend une partie centrale (26) avec les ailettes (27, 29, 30) qui s'étendent latéralement ou axialement à partir de celle-ci ;
dans lequel la collerette peut couvrir le bord de la découpe d'un appareil dans lequel le support de source lumineuse doit être inséré ;
dans lequel la collerette (13) comprend une surface plane annulaire sur son côté arrière, laquelle surface forme une interface thermique (17) reliant thermiquement le support de source lumineuse (10) au luminaire ;
caractérisé en ce que le support de source lumineuse (10) comprend au moins une chambre intérieure (71) avec les éléments de contact électrique (72) disposés à l'intérieur, formant

une interface électrique pour relier électriquement la source lumineuse à base de semi-conducteurs (36) à une source de courant ;
des ouvertures (68, 69) étant ménagées à travers la surface de montage (31, 131) pour permettre à des bornes électriques (62, 62) de la source lumineuse (36) d'être introduites dans la chambre intérieure (71) et de venir en butée contre les éléments de contact électrique (72) ;
et la matière plastique du corps (25) étant une matière thermiquement conductrice et électriquement isolante.

2. Support de source lumineuse selon la revendication 1, dans lequel la collerette (13) est conçue pour recevoir une pièce frontale optique (11) à l'intérieur d'une ouverture centrale de la collerette (13). 5
3. Support de source lumineuse selon l'une quelconque des revendications précédentes, dans lequel le corps (25) est formé par moulage par injection. 10
4. Support de source lumineuse selon la revendication 1, dans lequel le corps (25) comprend une partie centrale (26) possédant une surface de dessus apte à former la surface de montage (31) pour recevoir le côté arrière plat (40) de la source lumineuse à semi-conducteurs (36), une surface de fond (33) et des surfaces latérales (35) s'étendant depuis un bord extérieur (32) de la surface de fond (31) jusqu'à un bord extérieur (34) de la surface de fond (33) et entourant la partie centrale (26), et dans lequel les ailettes (27) s'étendent à partir de la partie centrale (26). 15
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5. Support de source lumineuse selon la revendication 1, dans lequel au moins une des ailette (27) comprend au moins une bifurcation (28). 40
6. Support de source lumineuse selon l'une quelconque des revendications précédentes, dans lequel des perçages (43) sont prévus dans le corps (100) pour recevoir des vis (42) pour monter de manière fixe la source lumineuse (36) sur le corps (25). 45
7. Support de source lumineuse selon l'une quelconque des revendications précédentes, dans lequel des moyens de liaison (49, 50, 108) sont prévus pour fixer de manière fixe le corps (25) dans l'ouverture réceptrice d'une installation/d'un appareil (101, 102, 103). 50

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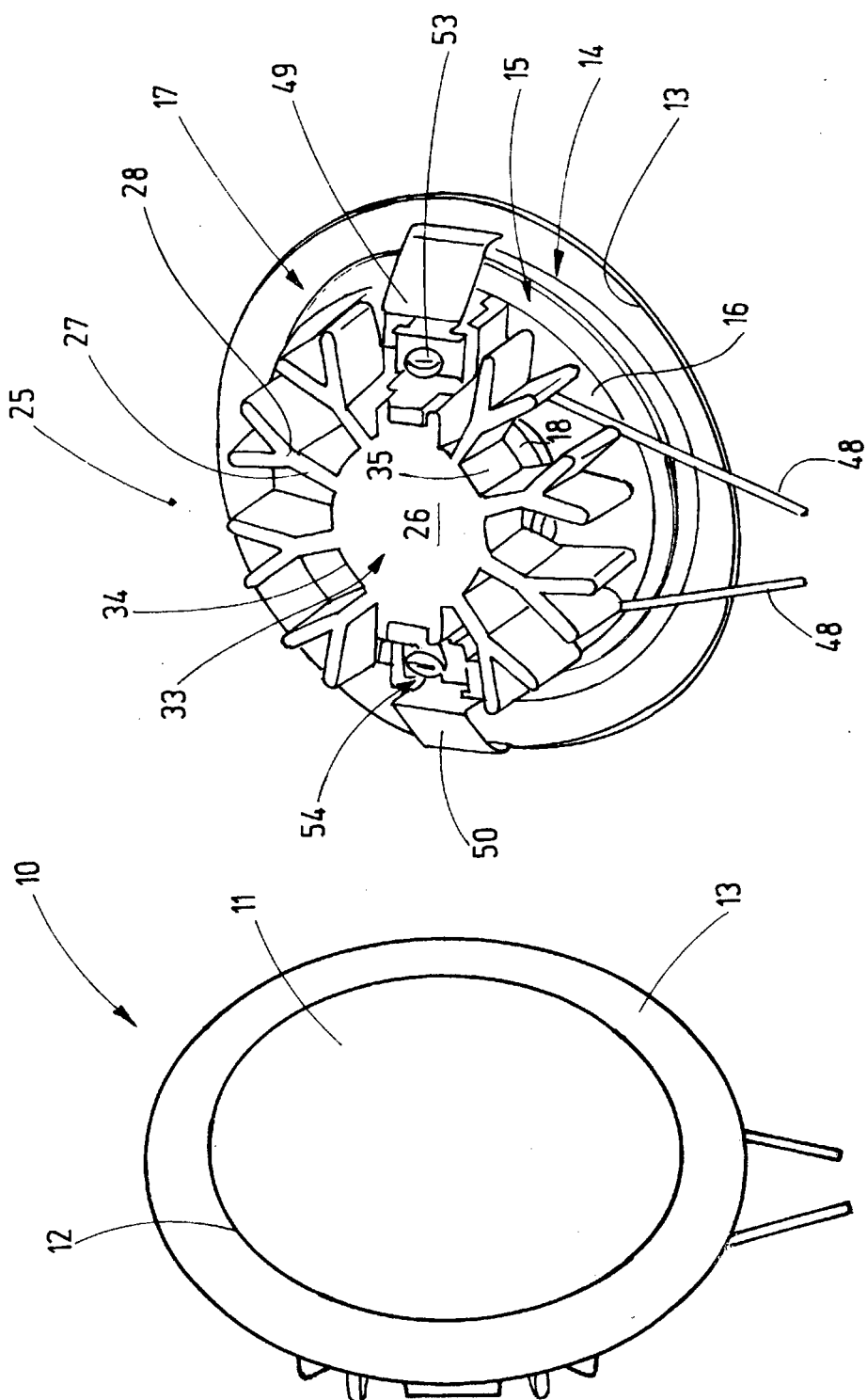


Fig. 2

Fig. 1

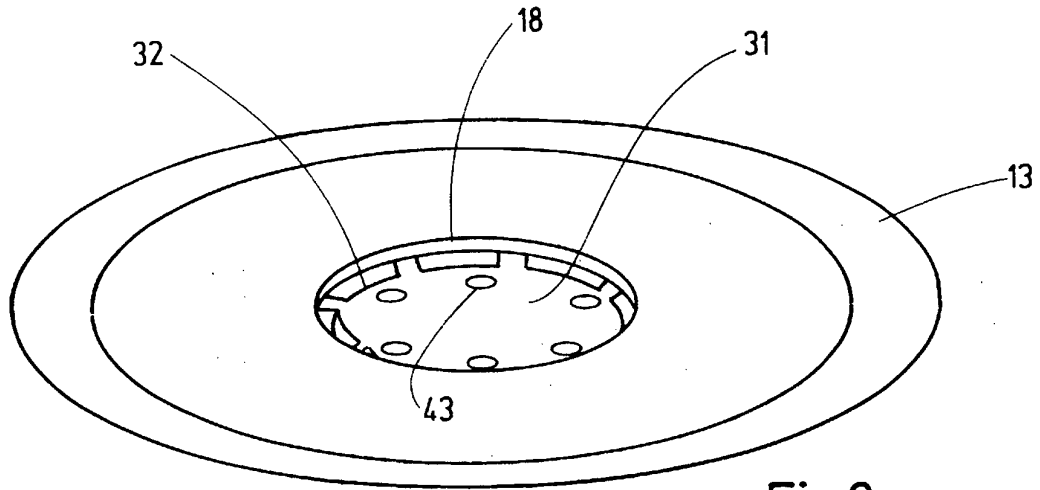


Fig.3

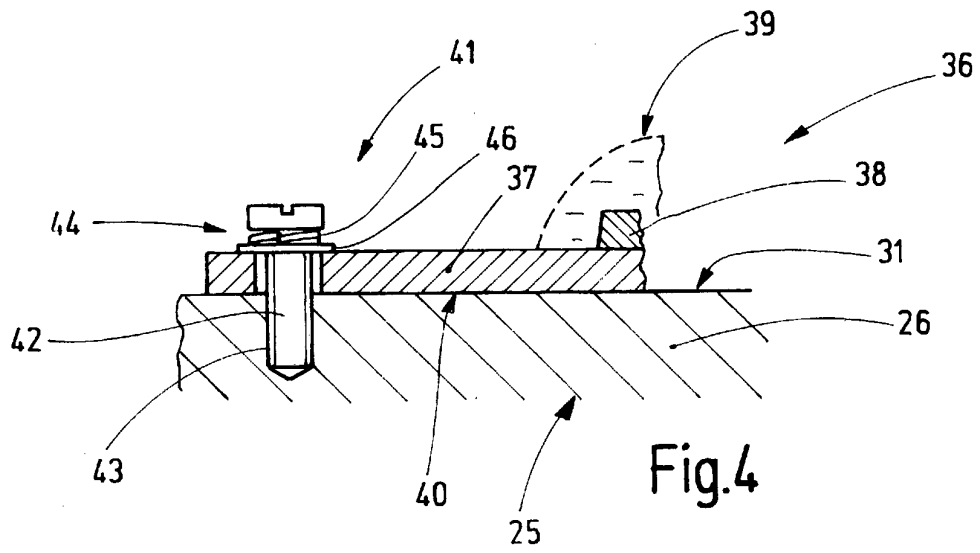


Fig.4

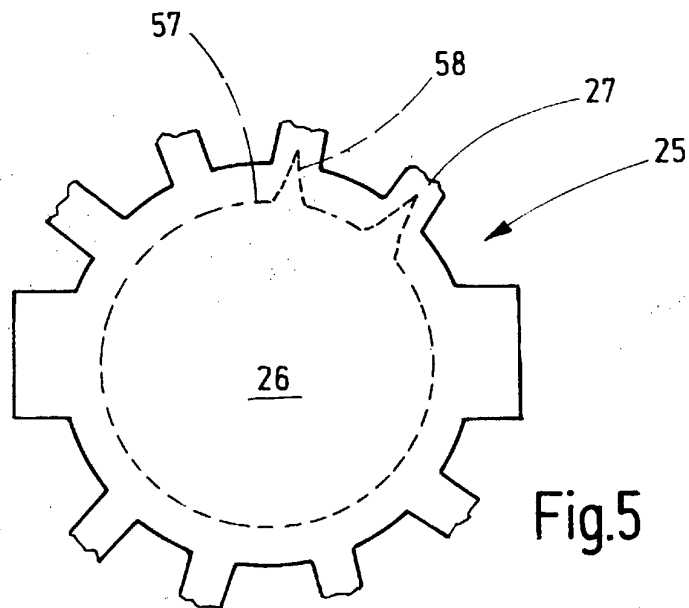


Fig.5

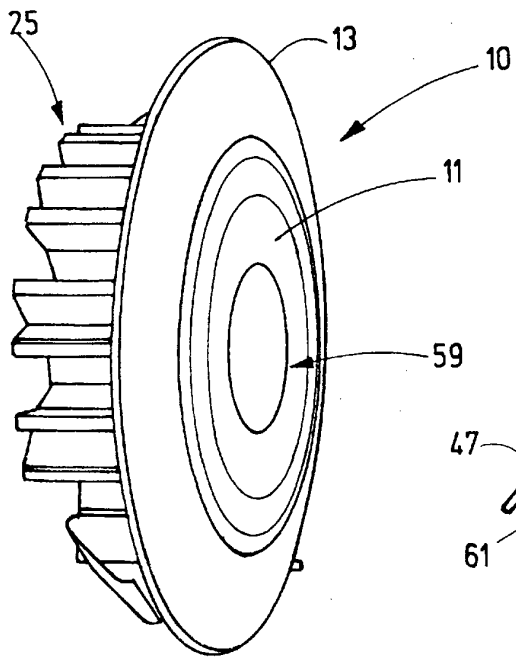


Fig.6

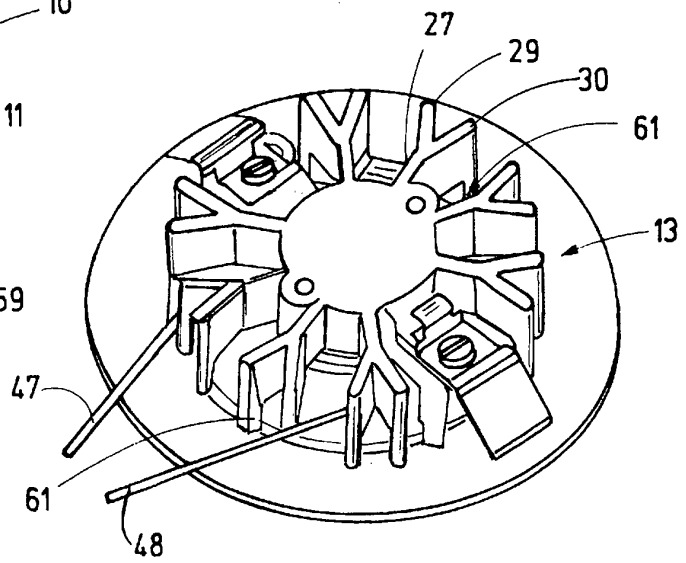


Fig.7

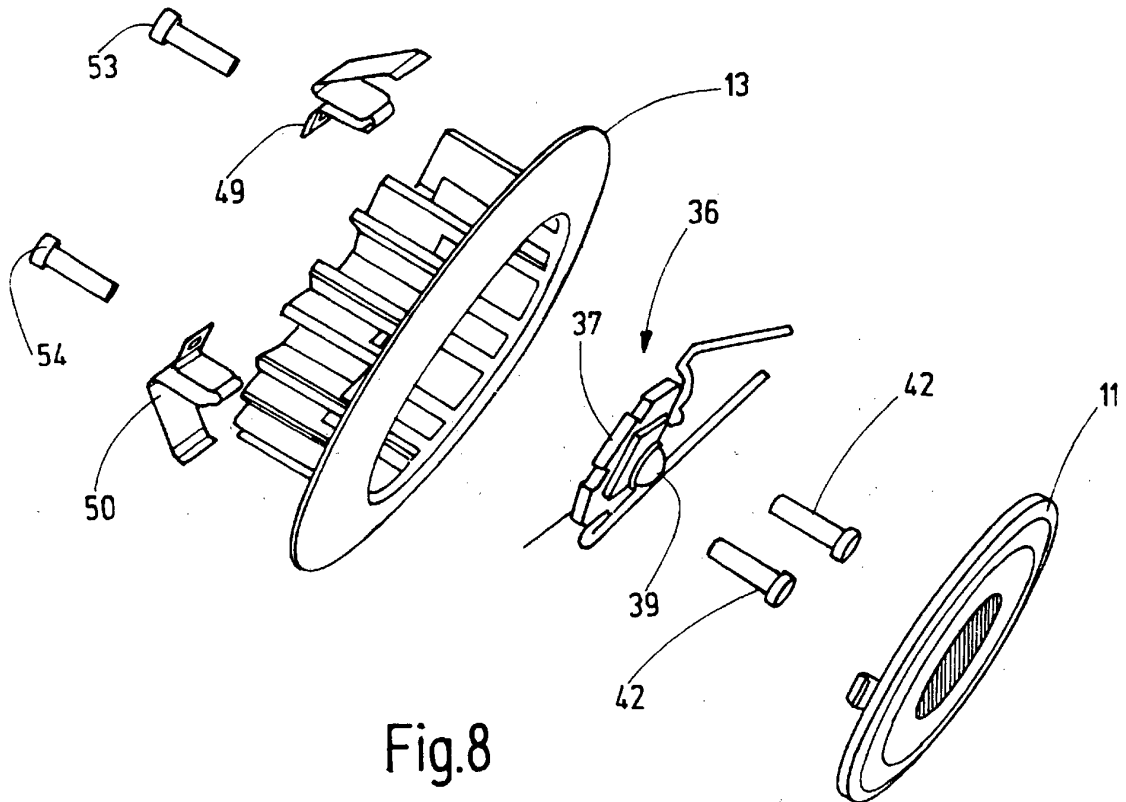


Fig.8

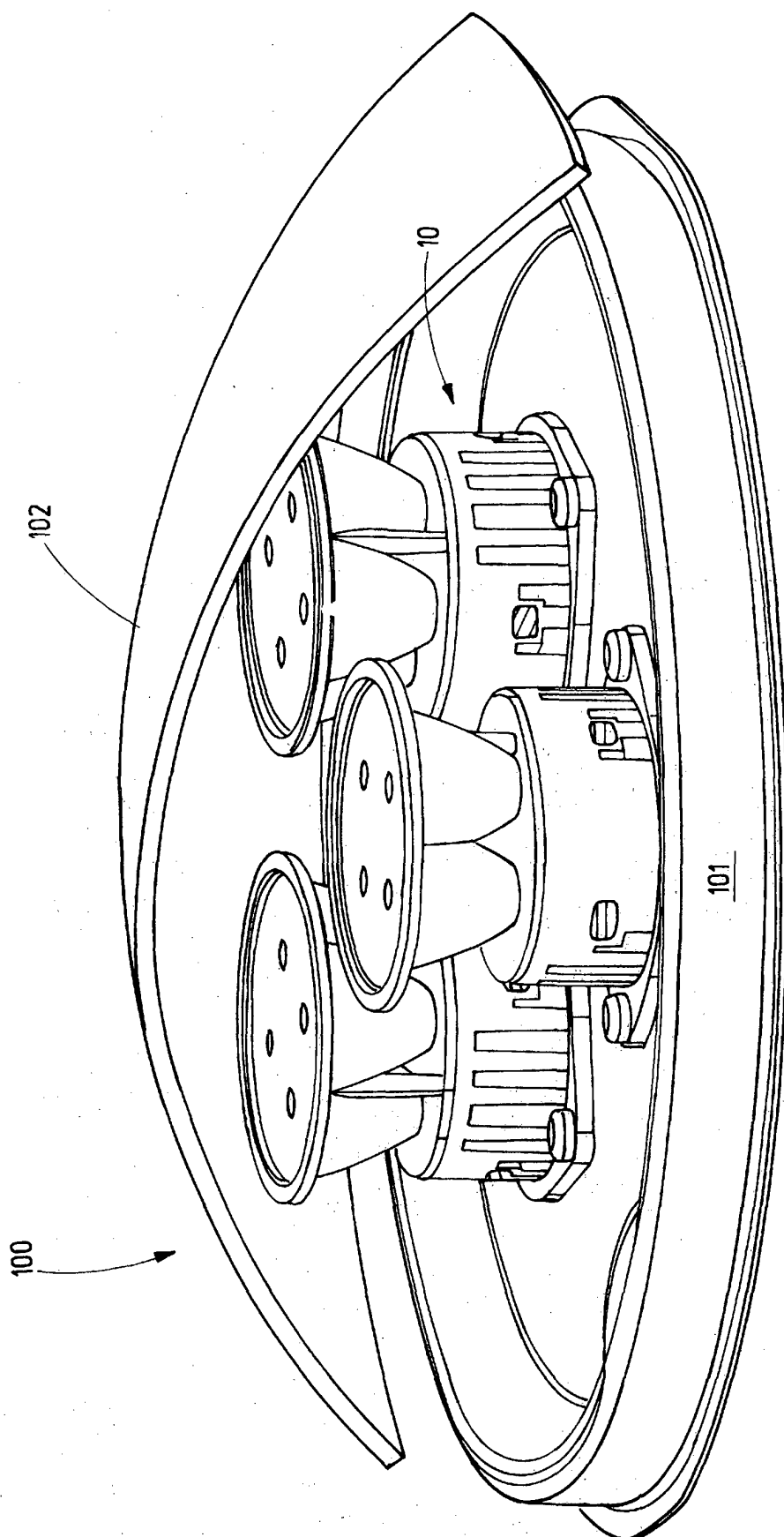
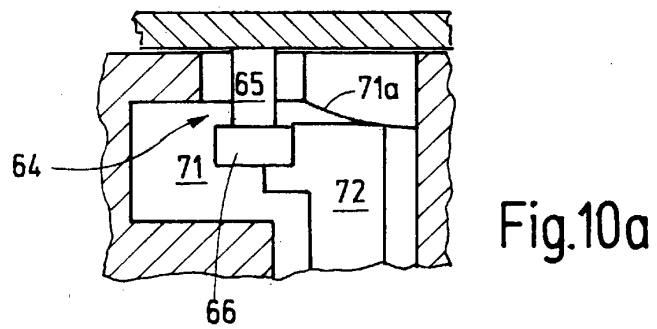
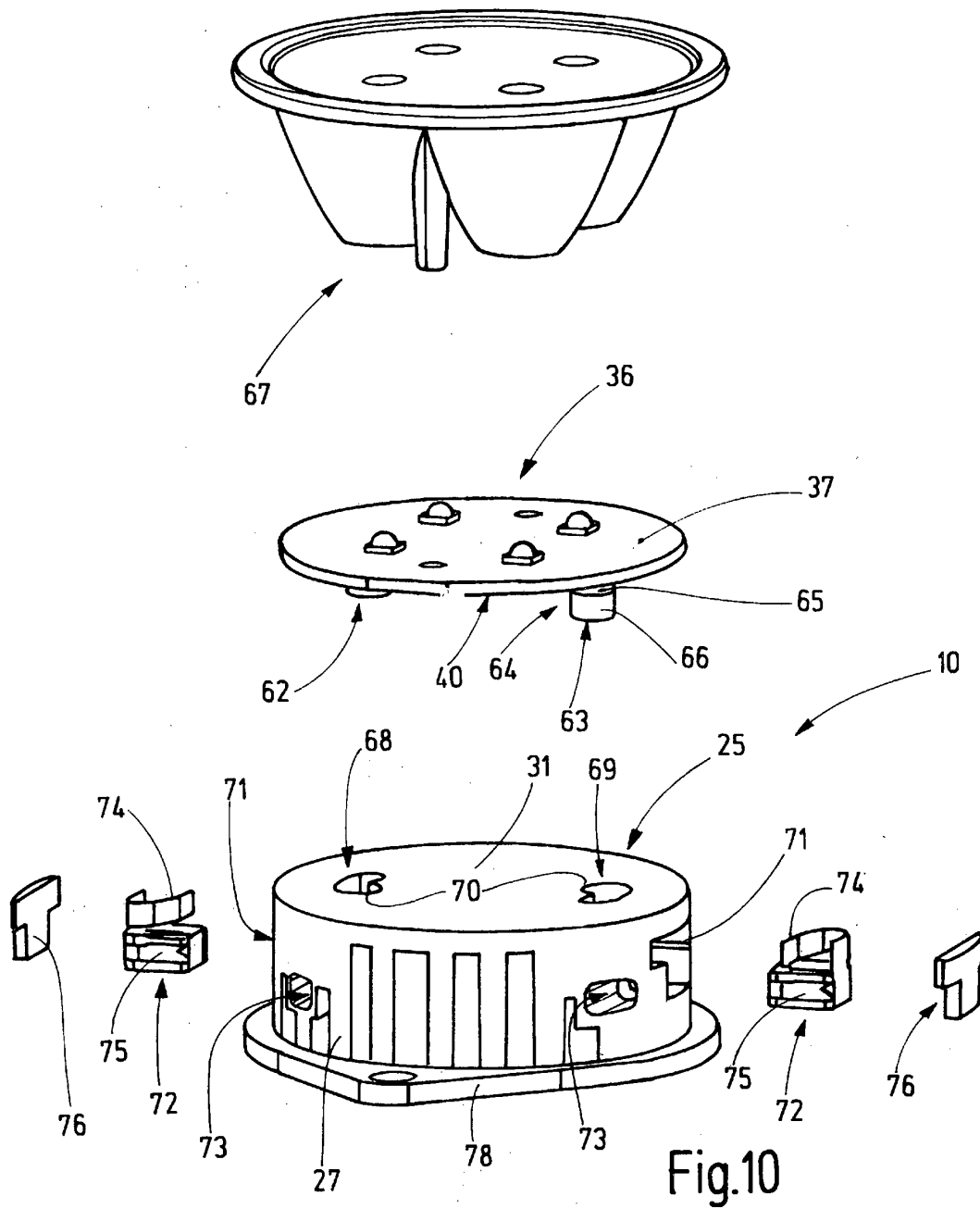


Fig.9



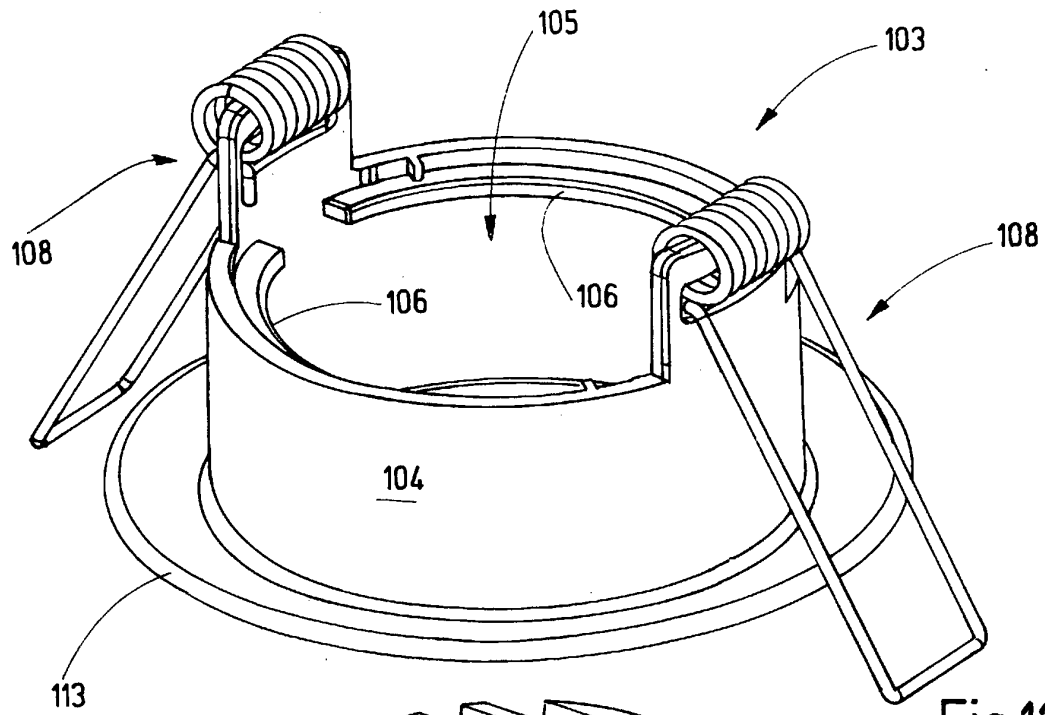


Fig. 11

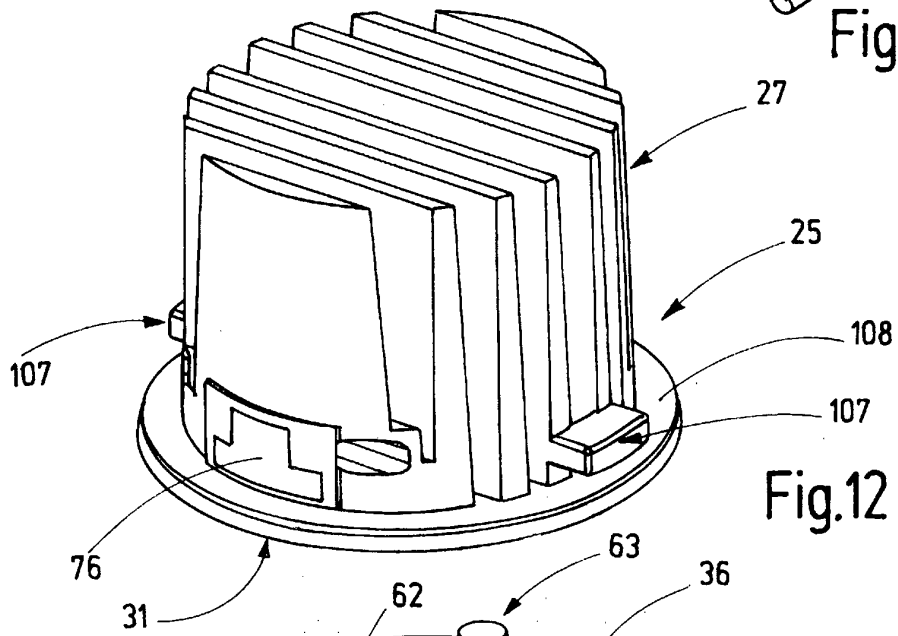


Fig. 12

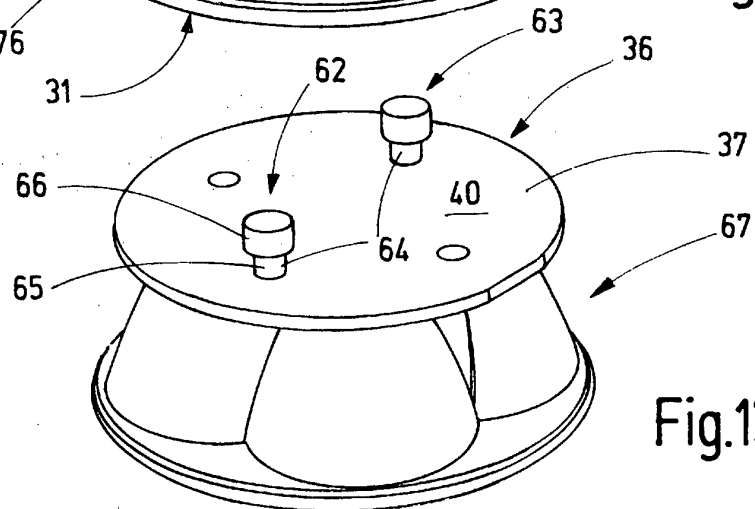


Fig. 13

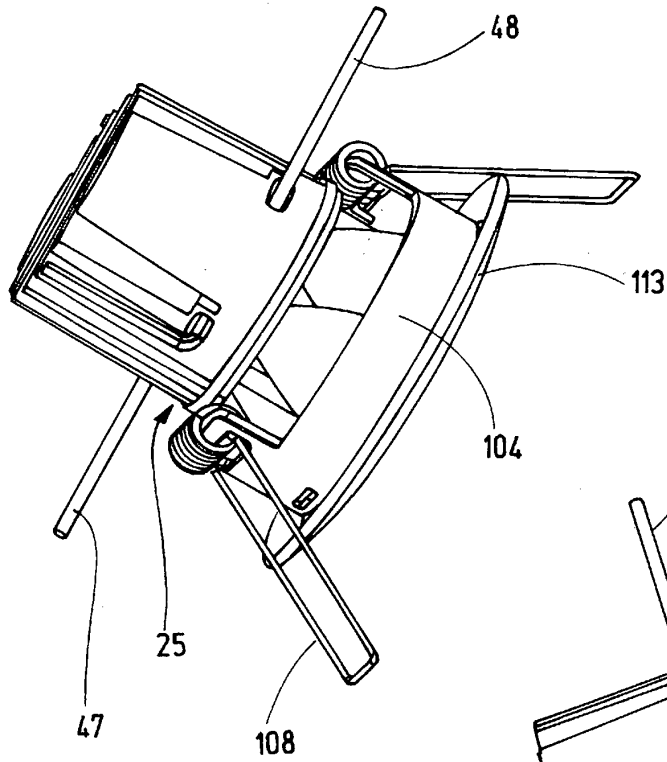


Fig.14

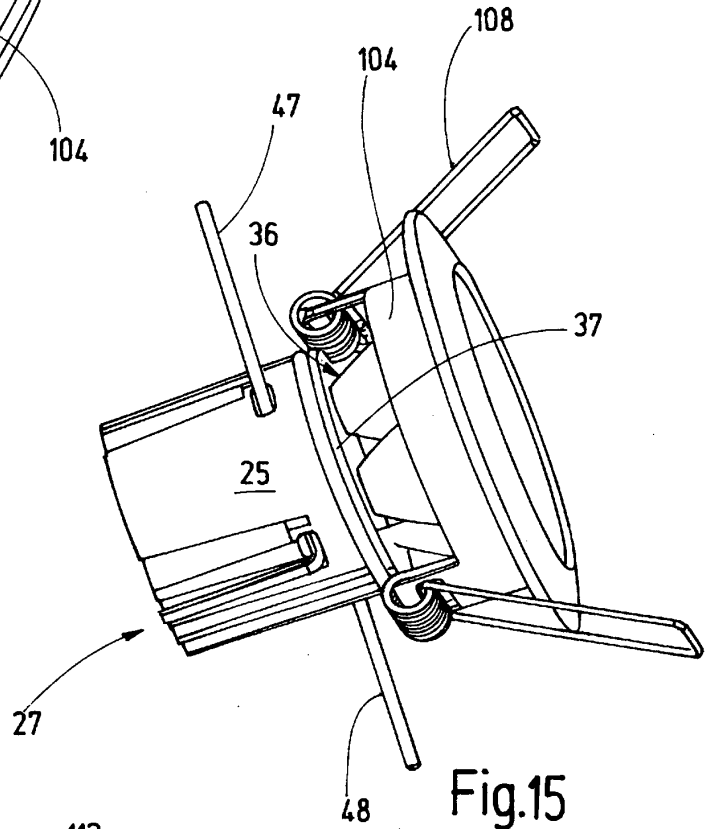


Fig.15

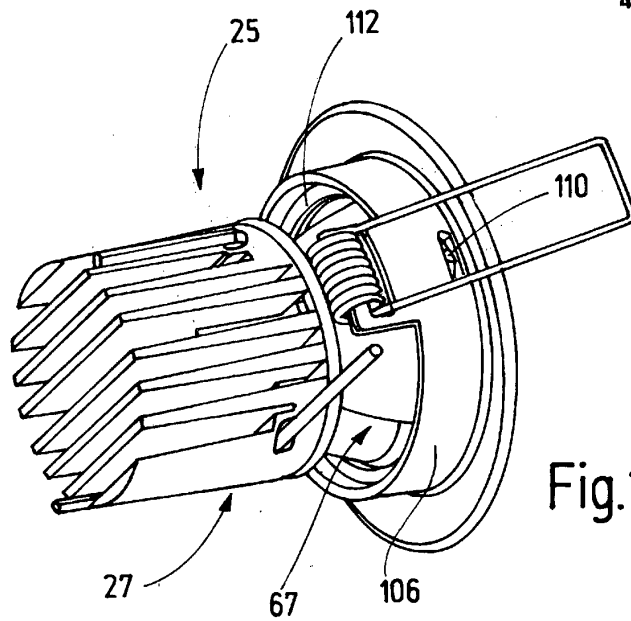


Fig.16

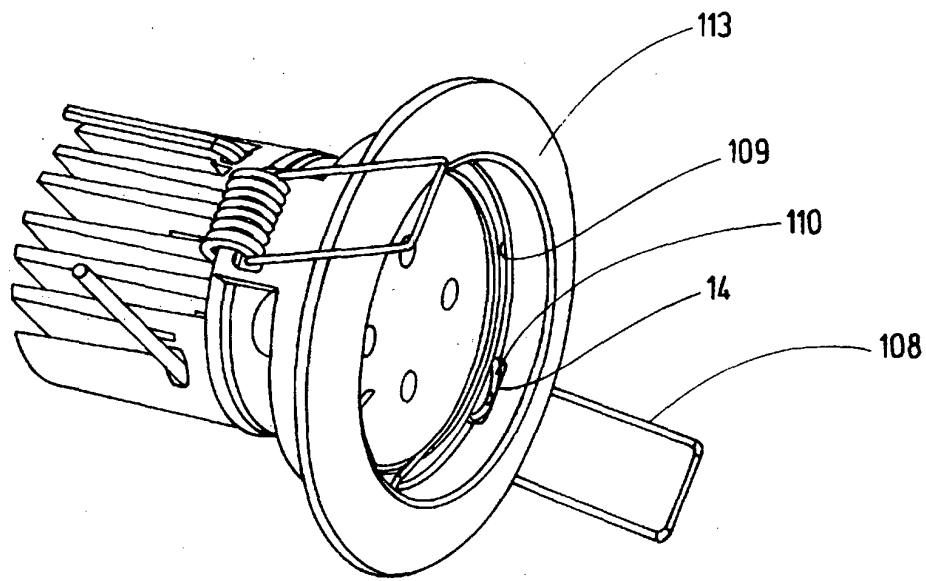


Fig.17

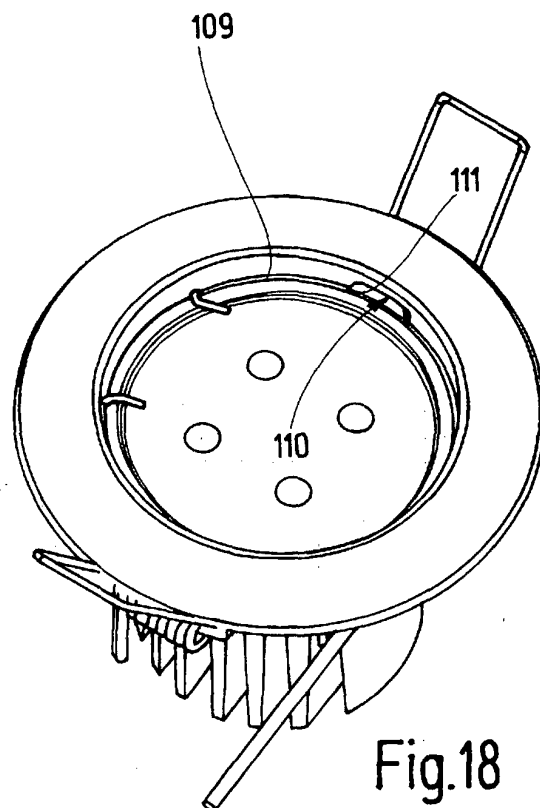
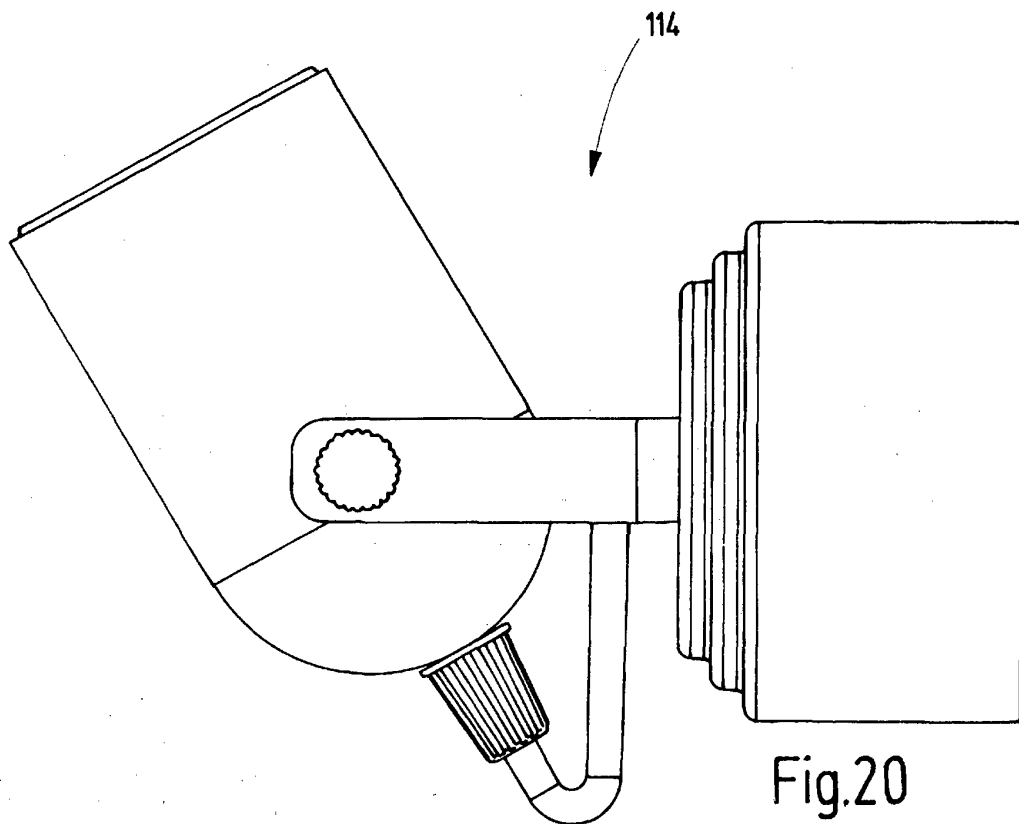
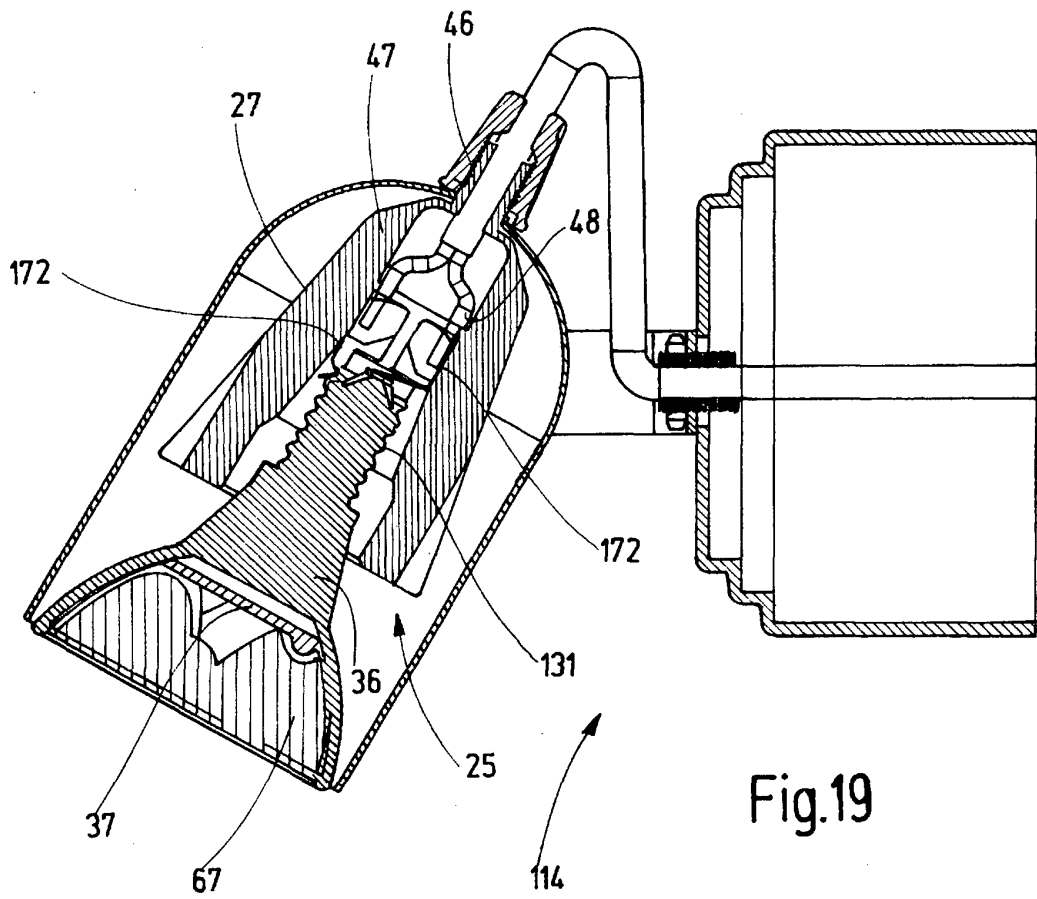


Fig.18



REFERENCES CITED IN THE DESCRIPTION

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