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(72) Inventor: **Larsson, Stefan**
732 34, Arboga (SE)

(74) Representative: **Reyier, Ann-Mari et al**
Bjerkéns Patentbyrå KB
Box 128
721 05 Västerås (SE)

(71) Applicant: **Optoga AB**
732 31 Arboga (SE)

(54) **A lamp including a light-emitting diode**

(57) The present invention relates to a lamp comprising a printed circuit board (7), in the following named PCB, having at least two electrical contact elements (27a-b), at least one light-emitting diode (8) mounted on the PCB, a heat sink (1) for removing heat generated by the diode, connector pins (18a-b) for connection to a power supply, and at least two conductors (17a-b) arranged to electrically connect the contact elements of the PCB to the connector pins. The lamp further comprises a hold-

er unit (15) including said conductors and designed to hold the PCB in a fixed position relative the holder unit, and to electrically connect the conductors to the contact elements of the PCB when holding the PCB, the heat sink is hollow and defines a cavity adapted to receive the holder unit and the PCB, and the holder unit is provided with fastening means (20a-b) adapted to cooperate with corresponding fastening means (30a-b) on the inside of the heat sink to form a mechanical attachment between the holder unit and the heat sink.

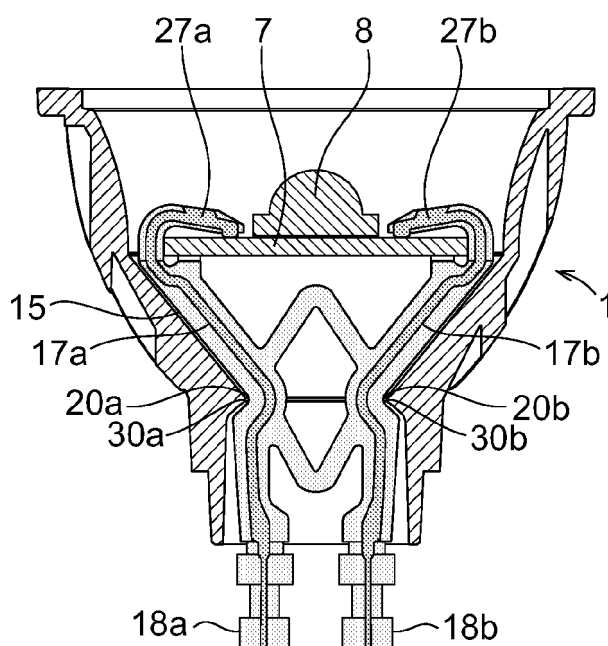


Fig. 4

Description

FIELD OF THE INVENTION

[0001] The present invention relates to a lamp comprising a printed circuit board, in the following named PCB, having at least two electrical contact elements, at least one light-emitting diode mounted on the PCB, a heat sink for removing heat generated by the diode, connector pins for connection to a power supply, and at least two conductors arranged to electrically connect the contact elements of the PCB to the connector pins.

[0002] The light-emitting diode can be an inorganic light-emitting diode (LED) as well as an Organic light-emitting diode (OLED). The lamp according to the invention is useful for many types of lamps, such as GU10, R50, E14, E27 or being directly built-in in a light fitting.

PRIOR ART

[0003] The use of lamps including light-emitting diodes, in the following named led-lamps, and accordingly the development of such lamps have increased dramatically during the last years due to the low energy consumption of the led-lamps compared to traditional lamps. To be able to compete with the traditional lamps it is necessary to reduce the costs for production of the led-lamps.

[0004] One time-consuming and accordingly costly step in the production of the led-lamps is soldering of conductors to the electrical contact elements of the PCB and to the contact pins. Different solutions to this problem have been proposed in the prior art. US2008/0274641 discloses a LED connector assembly for use in a led-lamp. The connector assembly includes a holder portion and a connector portion. The holder portion removably engages the connector portion by inserting contact pins. A PCB with a LED is rigidly supported in a recess of the holder portion. A heat sink is supported within the holder portion. The heat sink contacts the bottom side of the PCB. The PCB snaps into position in the holder portion and is retained by angled tips of contact fingers connected to the contact pins. The contact fingers and contact pins provide electrical paths to lead wires. A spring applies compressive force between the heat sink and the bottom of the PCB assembly. A disadvantage with the disclosed led-lamp is that it contains many parts and the mounting of the lamp is time-consuming. In particular the mounting of the spring is a bit tricky.

[0005] WO2009/085231 discloses a connector assembly for miniature LEDs that include heat sinks and provides a solution to the above-mentioned problem with the need of soldering. The connector assembly includes a contact carrier into which is assembled compliant contacts. A retention clip having an aperture is assembled over the LED and the retention clip exerts a force on the LED urging it into contacts with the heat sink body. Although the mounting time has been reduced with this

solution, a additional reduction of the mounting time is desired in order to reduce costs. Further, the solution proposed is not suitable for mounting of a led-lamp having a conical design.

OBJECTS AND SUMMARY OF THE INVENTION

[0006] The object of the present invention is to provide an improved led-lamp that is easy to mount and accordingly is cheap to produce.

[0007] This object is achieved by a lamp as defined in claim 1.

[0008] The lamp is characterized in that it comprises a holder unit including the conductors and designed to hold the PCB in a fixed relation relative to the holder unit, and to electrically connect the conductors to the contact elements of the PCB upon holding the PCB, the heat sink is hollow and defines a cavity adapted to receive the holder unit and the PCB, and the holder unit is provided with fastening means adapted to cooperate with corresponding fastening means on the inside of the heat sink to form a mechanical attachment between the holder unit and the heat sink.

[0009] The holding unit has several functions; it holds the diode at a fixed position inside the heat sink so that the cooling of the diode becomes efficient, and it provides an electrical path between the PCB and the contact elements. The lamp only contains a few parts and thus is easy and fast to assemble. The assembly of the heat sink, the PCB with the diode, and the holder unit is made in two steps; in a first step the PCB is attached to the holder unit, and in a second step the holder unit is attached to heat sink.

[0010] According to an embodiment of the invention, the fastening means are adapted to form a snap fit joint between the holder unit and the heat sink. A snap fit joint makes it quick and easy to mechanically attach the holder unit to the heat sink.

[0011] According to an embodiment of the invention, the holder unit is made of a resilient material and the conductors are compliant and embedded in the resilient material. This makes the holder unit flexible which makes it easier to fit the PCB in to the holder unit and to snap join the holder unit to the heat sink.

[0012] According to an embodiment of the invention, the holder unit comprises two resilient arms, each arm including one of said conductors that extends through the arm, and the arms are arranged to receive and hold the PCB between them in such way that an electrical connection is made between the conductors and the contact elements of the PCB. Further, the arms are resilient so that they are allowed be moved away from each other in order to receive the PCB and so that the PCB is clamped between the arms. The arms are designed for mechanical engagement to an edge part of the PCB. Thus, the holder unit will have a firm grip of the PCB. This embodiment makes it quick and easy to attach the PCB to the holder unit and is particularly suitable when only

one diode is used.

[0013] According to an embodiment of the invention, the heat sink is conically shaped. A conically shaped heat sink achieves an improved cooling due to its large surface.

[0014] According to an embodiment of the invention, the holder unit is elongated and is provided in one end with attachment means for mechanical engagement to the PCB and the attachment means are provided with contact elements designed for electrical connection to the contact elements of the PCB. The opposite end of the holder unit is designed to electrically connect to the connector pins. This enables electrical connection between the PCB and the holder unit upon attachment of the holder unit to the PCB.

[0015] According to an embodiment of the invention, the lamp comprises a bottom part made of an insulating material arranged for a snap fit connection to the heat sink and the connector pins are protruding through the bottom part. It is easy to fit the bottom part to the heat sink and accordingly the mounting time is further reduced.

[0016] According to an embodiment of the invention, the lamp comprises a bottom part made of an insulating material arranged for connection to the heat sink, said connector pins are connected to the bottom part, and the heat sink, the holder unit and the bottom part are designed so that the conductors are connected to the connector pins when the holder unit is mechanically attached to the heat sink and the bottom part is connected to the heat sink. This embodiment further reduced the mounting time.

[0017] Further developments of the device are characterized by the features of the additional claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] The invention will now be explained more closely by the description of different embodiments of the invention and with reference to the appended figures.

Figs. 1a - e shows parts of a lamp according to a first embodiment of the invention:

Fig. 1a shows a side view of a heat sink.

Fig. 1b shows a side view of a first example of a bottom part.

Fig. 1c shows a PCB and a light-emitting diode mounted on the PCB.

Fig. 1d shows a lens for dispersing the light emitted by the diode.

Fig. 1e shows a first example of a holder unit for holding the PCB.

Fig. 2

illustrates how the PCB with the diode is to be mounted in the holder unit

Fig. 3

illustrates how the holder unit with the PCB is to be mounted in the heat sink.

Fig. 4

shows a cross section through the heat sink and the first example of the holder unit, when the holder unit with the PCB is mounted in the heat sink.

Fig. 5

shows an elevation view of the bottom part of figure 1b.

Fig. 6

illustrates how the bottom part is to be mounted to the heat sink.

Fig. 7

shows the holder unit and the bottom part when the lamp is mounted.

Fig. 8

illustrates how the lens is to be mounted to the heat sink.

Fig. 9a

shows a second example of a holder unit.

Fig. 9b

shows a second example of a bottom part.

Figs. 10 - 13

illustrates how a lamp according to a second embodiment of the invention is to be mounted.

Figs. 14 - 16

show a third example of a holder unit and how the holder unit is connected to the PCB.

Figs. 17 - 19

show a fourth example of a holder unit and how the holder unit is connected to the PCB.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

[0019]

Figures 1a - e shows parts of a lamp according to a first embodiment of the invention. Figure 1a shows a heat sink 1. The heat sink is conically shaped and is provided with cooling flanges on its outside. The heat sink 1 is hollow and has one large opening in one end and a small opening in the opposite end.

Figure 1b shows a bottom part 2 of the lamp. The bottom part 2 is made of an insulating material, for example a plastic material such as Polybutylene Terephthalate (PBT) including fibreglass. The bottom part 2 and the heat sink 1 are provided with attach-

ment members for attaching the bottom part to the heat sink, for example, arranged for snap fit connection. In this example the heat sink is provided with flexible protruding devices 4a, 4b and the bottom unit 2 is provided with corresponding flexible members 5a-b designed to form a snap-fit joints between the bottom part 2 and the heat sink 1.

Figure 1c shows a printed circuit board 7, in the following named a PCB, having two contact elements 9, and a light-emitting diode 8 mounted on the PCB. The diode 8 can be of any type that emits light, such as a LED or an OLED. The contact elements 9 are adapted to receive power and to supply the diode 8 with power. In this embodiment, the contact elements 9 are arranged on the same side of the PCB as the diode and on opposite sides of the diode. The PCB is further provided with two notches 10a-b arranged on opposite positions along the edge of the PCB.

Figure 1d shows a lens 11 for dispersing the light emitted by the diode. The lens 11 is arranged to be connected to a wide side 12 of the conical heat sink. The bottom part 2 is arranged to be connected to a narrow side 14 of the heat sink. The narrow side 14 of the heat sink is provided with the attachment members 4a-b for mechanical attachment to the bottom part. The bottom part 2 is provided with corresponding attachment members 5a-b for mechanical attachment to the heat sink.

Figure 1e shows an example of a holder unit 15 adapted to receive the PCB 7 and to hold the PCB in a fixed position relative the holder unit. The holder unit includes two conductors 17a-b and is adapted to electrically connect the conductors to the contact elements 9 of the PCB upon receiving the PCB. The conductors are made of an electrically conducting material, such as steel or copper. In this example the holder unit further includes connector pins 18a-b for connection to a power supply. The holder unit is provided with fastening means 20a-b adapted to cooperate with corresponding fastening means on the inside of the heat sink to form a mechanical attachment between the holder unit and the heat sink. The conductors 17a-b are compliant and are embedded in a resilient material, such as a plastic material, such as Acetal/POM. This means that the holder unit is resilient. The holder unit comprises two resilient arms 22a-b protruding from one end of the holder unit, and two legs 23a-b protruding from an opposite end of the holder unit. In this example the legs 23a-b are connected to the connector pins 18a-b. The conductor 17a extends through the arm 22a and the leg 23a, and the second conductor 17b extends through the arm 22b and the leg 23b. The arms and legs are connected to each other via a resilient in-

termediate part 25.

[0020] The holder unit is elongated and is provided in one of its ends with attachment means 26a-b for mechanical engagement to the edge of the PCB, and the attachment means are provided with contact elements 27a-b designed for electrical connection to the contact elements 9 of the PCB. Each of the arms 22a-b has an angled tip including a contact element 27a-b electrically connected to the conductor 17a-b. The angle tip is adapted to connect the contact elements 27a-b to the contact elements 9 of the PCB. The arms are resilient in a direction that allows the arms to be moved away from each other in order to receive the PCB between them and to flex back and clamp the PCB between the arms. The angle tips of the arms are designed to grip the edge parts 10a-b of the PCB and hold the PCB in a fixed position. The conductors 17a-b are electrically connected to the connector pins 18a-b so that an electric path is formed between the contact elements 27a-b and the connector pins 18a-b. The heat sink 1 is hollow and defines a cavity designed to receive the holder unit 15 and the PCB 7.

[0021] Figure 2 illustrates how the PCB 7 with the diode is to be mounted in the holder unit 15. The resilient arms 22a-b are moved away from each other in order to receive the PCB between them. When the arms have received the PCB, the arms are moved back and clamp the PCB between them. Due to the fact that the arms are resilient it is easy to fit the PCB into the holder unit.

[0022] Figure 3 illustrates how the holder unit with the PCB is to be mounted in the heat sink. The PCB and the holder unit are pushed into the heat sink 1. The holder unit will flex in and then get stuck by using the snap-fit joints.

[0023] Figure 4 shows a cross section through the heat sink 1 and the holder unit 15, when the holder unit with the PCB is mounted in the heat sink. The fastening means 20a-b of the holder unit cooperate with corresponding fastening means 30a-b on the inside of the heat sink to form a mechanical attachment between the holder unit and the heat sink. The fastening means 20a-b, 30a-b are adapted to form a snap-fit joint between the holder unit and the heat sink. One of the corresponding fastening means comprises a recess and the other comprises a protruding part. In this example the holder unit includes a recess 20a-b and the fastening means of the heat sink includes a protruding part 30a-b. The recess and the protruding part form a snap-fit joint. This is possible due to the fact that the holder unit is resilient. The fastening means holds the holder unit in a fixed position relative the heat sink. The position of the holder unit relative the heat sink is chosen so that the holder unit, the PCB and the diode are surrounded by the heat sink and the diode is positioned at a distance below the upper edge of the heat sink. Further, the position of the holder unit relative to the heat sink is chosen so that the connector pins protrude on the outside of the lower part of the heat sink. The heat sink is provided with one opening for receiving

the holder unit when the holder unit is mounted and another hole in the opposite end of the heat sink through which the connector pins are protruding. Preferably, the shape of the inside of the heat sink is such that it guides the holder unit during the mounting of the holder unit in the heat sink and so that it supports the holder unit when it is positioned inside the heat sink.

[0024] Figure 5 shows an elevation view of the bottom part 2 of figure 1b. The bottom part is provided with openings 32 for receiving the connector pins 18a-b of the holder unit 15.

[0025] Figure 6 illustrates how the bottom part 2 is mounted to the heat sink 1. The bottom part will be pushed on the heat sink. The connector pins 18a-b, which are protruding through the bottom of the heat sink, are guided through the openings 32 of the bottom part. The flexing attachment members 5a-b of the bottom part and 4a-b of the heat sink will form snap-fit joints and will lock the bottom part together with the heat sink. Figure 7 shows the holder unit 15 with the connector pins 18a-b when it is mounted in the heat sink, and the bottom part has been mounted to the heat sink.

[0026] In a last step the lens is mounted. Figure 8 illustrates how the lens is to be mounted to the heat sink. The lens is provided with protruding flexible members 34 for fitting the lens to the heat sink 1. The lens 7 will be pressed into the heat sink.

[0027] Figures 9-13 show a lamp according to a second embodiment of the invention. Components corresponding to those in figures 1a-d have been given the same reference numbers, and will not be described in more detail here. Figure 9a shows a holding unit 40, which differs from the holding unit 15 shown in figure 1e in that instead of having connector pins, the conductors 17a-b protrude below the resilient material of the legs 23a-b. The holder unit 40 is not provided with any connector pins. The protruding parts 41a-b are adapted to be connected to connector pins provided on the bottom part during mounting of the lamp. Figure 9b shows another example of a bottom part 42. The bottom part 42 differs from the bottom part 2 shown in figure 1b in that the bottom part is provided with two connector pins 44a-b. The connector pins 44a-b are fixedly connected to the bottom part 42.

[0028] Figure 10 illustrates how the holder unit 40 with the PCB is to be mounted in the heat sink 1. Figure 11 shows a cross section through the heat sink 1 and the holder unit 40, when the holder unit with the PCB is mounted in the heat sink. The holder unit 40 with the PCB 7 is pushed into the heat sink 1 and gets stuck by using the snap-fit joints, as shown in figure 11. The tips 41a-b of the connectors protrude through the heat sink 1 and extend a distance below the edge of the heat sink.

[0029] Figure 12 illustrates how the bottom part 42 is to be mounted to the heat sink 1 and to the holder unit 40. Figure 13 shows the holder unit 40 when it is mounted in the heat sink and the bottom part has been mounted to the heat sink. The bottom part 42 including the con-

ductor pins 44a-b is pushed on the lower part of the heat sink so that the protruding connector parts 41a-b are fit into the connector pins, as shown in figure 13. Accordingly, the connectors 17a-b are electrically connected to the connector pins 44a-b.

[0030] Figure 14 shows a third example of a holder unit 50. One end of the holder unit is provided with an attachment member 52 for mechanical engagement to the PCB. In this embodiment the attachment member is designed as a bayonet. The attachment member 52 is provided with electrical connectors 54a-b adapted for electrical connection to corresponding electrical connectors 56a-b on the PCB. The electrical connectors 54a-b are also connected to conductors (not shown) running through the holder unit 50 and protruding on the opposite end of the holder part, thereby forming electrical connectors 41a-b for electrical connection to conductor pins. 5.

[0031] Figure 15 shows a PCB 55 and how the holder unit 50 is connected to the PCB. In this example the PCB 55 is provided with two light emitting diodes 65a-b positioned close to the edge of the PCB. In other embodiments it is possible to have more than two diodes positioned along the edge of the PCB. An opening 58, designed to receive the attachment member 52 of the holder unit 50 is arranged in the centre of the PCB. The attachment member 52 is elongated and the hole 58 of the PCB has a corresponding size. Two electrical connectors 56a-b are positioned close to the opening 58 and on the same side as the diodes. When the PCB 55 is to be connected to the holder unit 50, the attachment member 52 is pushed through the opening 58, and thereafter the PCB is rotated about 90° so that the attachment member 52 is angled relative the opening 58 and the contact elements 54a-b are in contact with the corresponding contact elements 56a-b of the PCB. In this example the holder unit is attached to the PCB by means of a bayonet joint. Figure 16 shows the PCB attached to the holder unit 50. The attachment member is provided on the top of the holder unit. The holder unit with the PCB is mounted in the same way as described with reference to the previous examples. This embodiment of the lamp is useful if it is desired to have more than one light emitting diode.

[0032] Figure 17 shows a forth example of the holder unit 60. The holder unit 60 comprises two resilient arms 64a-b, each arm including one conductors 66a-b that extends through the arm. The resilient arms of the holder unit are provided with attachment means 61a-b for mechanical engagement to the PCB and the attachment means 61a-b are provided with contact elements 62a-b designed for electrical connection to corresponding contact elements 56a-b of the PCB. The attachment means 61a-b are arranged at the ends of the arms and connected to the conductors 66a-b.

[0033] Figure 18 shows a PCB 64 provided with two light-emitting diodes 65a-b. However, in another embodiment the PCB can be provided with more than two light-emitting diodes positioned close to the edge of the PCB. The PCB is also provided with two electrical contact el-

elements 56a-b arranged on the same side of the PCB as the light-emitting diodes. The PCB is further provided with a through-hole 66 positioned in the centre of the PCB. The hole 66 is designed for receiving an upper part of the attachment means 61a-b of the holder unit 60. In this embodiment, the resilient arms of the holder unit are arranged so that they can flex towards each other and thereby makes it possible to move the upper parts of the attachment means through the opening 66 of the PCB. When the resilient arms flex back the electrical contact elements 62a-b of the arms will make electrical contact with the corresponding contact elements 56a-b of the PCB. Figure 18 shows the PCB mounted on the holder unit 60 in a view from above and figure 19 shows the holder unit 60 with the PCB in a view seen from below. The embodiment described with reference to figures 17-19 is suitable for lamps including more than one light-emitting diode.

[0034] The present invention is not limited to the embodiments disclosed but may be varied and modified within the scope of the following claims. For example, the holder unit may have various shapes, and different types of attachment means can be used for attaching the holder unit to the PCB. Further, it is possible that the heat sink and the connector pins are provided by the costumer, for example, they are built-in in a wall or a ceiling, and that the PCB with the diode and the holder unit are sold separately.

Claims

1. A lamp comprising:

a printed circuit board (7), in the following named PCB, having at least two electrical contact elements (27a-b),
at least one light-emitting diode (8) mounted on the PCB,
a heat sink (1) for removing heat generated by the diode,
connector pins (18a-b;44a-b) for connection to a power supply, and

at least two conductors (17a-b;66a-b) arranged to electrically connect the contact elements of the PCB to the connector pins, **characterized in that:**

- the lamp further comprises a holder unit (15; 40;50;60) including said conductors and designed to hold the PCB in a fixed position relative the holder unit, and to electrically connect the conductors to the contact elements of the PCB when holding the PCB,
- the heat sink is hollow and defines a cavity adapted to receive the holder unit and the PCB, and
- the holder unit is provided with fastening means

(20a-b) adapted to cooperate with corresponding fastening means (30a-b) on the inside of the heat sink to form a mechanical attachment between the holder unit and the heat sink.

2. The lamp according to claim 1, wherein said fastening means (20a-b, 30a-b) are adapted to form a snap fit joint between the holder unit (15) and the heat sink (1).
3. The lamp according to claim 1 and 2, wherein the holder unit (15;40;50;60) is resilient, and one of the corresponding fastening means (20a-b,30a-b) comprises a recess and the other comprises a protruding part.
4. The lamp according to any of the previous claims, wherein the holder unit (15;40;50;60) is elongated and is provided in one end with attachment means (26a-b;52;61a-b) for mechanical engagement to the PCB and the attachment means are provided with contact elements (27a-b;54a-b;62a-b) designed for electrical connection to the contact elements of the PCB.
5. The lamp according to claim 4, wherein the holder unit comprises two resilient arms (22a-22b;64a-b), each arm including one of said conductors (17a-b; 66a-b) that extends through the arm, and said attachment means (26a-b;61a-b) are arranged at the ends of the arms and connected to the conductors.
6. The lamp according to claim 5, wherein the arms (22a-22b) are arranged to receive and hold the PCB between them in such way that an electrical connection is made between the conductors (17a-b) and the contact elements (9) of the PCB.
7. The lamp according to claim 6, wherein the arms are resilient so that they are allowed be moved away from each other in order to receive the PCB and so that the PCB is clamped between the arms.
8. The lamp according to claim 6 or 7, wherein each of the arms (22a-22b) are designed for mechanical engagement to an edge part (10a-b) of the PCB.
9. The lamp according to any of the previous claims, wherein the holder unit (15;40;50;60) is made of a resilient material and the conductors (17a-b;66a-b) are compliant and embedded in the resilient material.
10. The lamp according to any of the previous claims, wherein the lamp comprises a bottom part (2;42) made of an insulating material arranged for a snap fit connection to the heat sink (1) and the connector pins (18a-b;44a-b) are protruding through the bottom part.

11. The lamp according to any of the previous claims, wherein the lamp comprises a bottom part (42) made of an insulating material arranged for connection to the heat sink (1), said connector pins (44a-b) are connected to the bottom part, and the heat sink, the holder unit (40;50;60) and the bottom part are designed so that the conductors (17a-b;66a-b) are connected to the connector pins (44a-b) when the holder unit is mechanically attached to the heat sink and the bottom part is connected to the heat sink. 5 10
12. The lamp according to any of the claims 1-10, wherein the holder unit (15) includes said connector pins (18a-b) and the conductors (17a-b) are connected to the connector pins. 15
13. The lamp according to claim 12, wherein the lamp comprises a bottom part (2) arranged for connection to the heat sink (1) and including openings (32) for receiving the connector pins (18a-b), and the connector pins are protruding through the bottom part when the bottom part is connected to the heat sink. 20
14. The lamp according to any of the previous claims, wherein heat sink (1) is conically shaped. 25
15. The lamp according to claim 14, wherein the lamp comprises a lens (11) for dispersing the light emitted by the diode, and the lens is connected to the widening side of the heat sink. 30

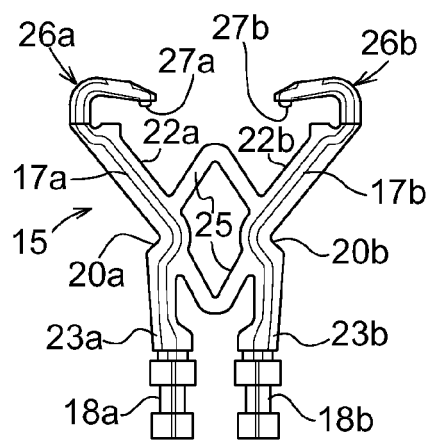
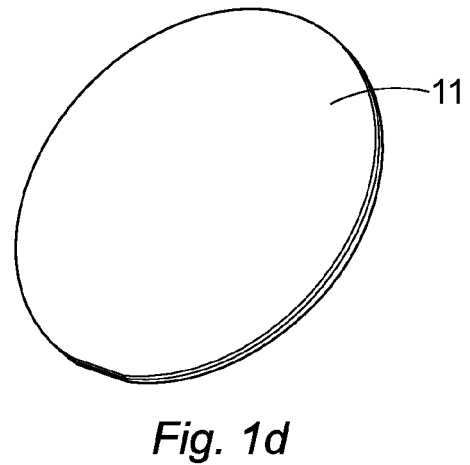
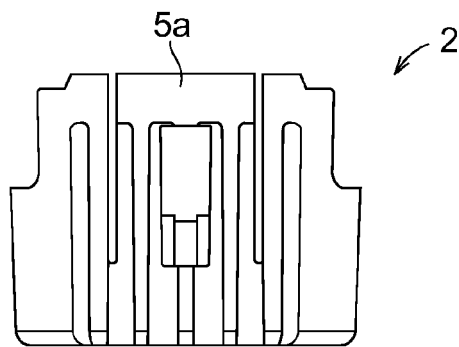
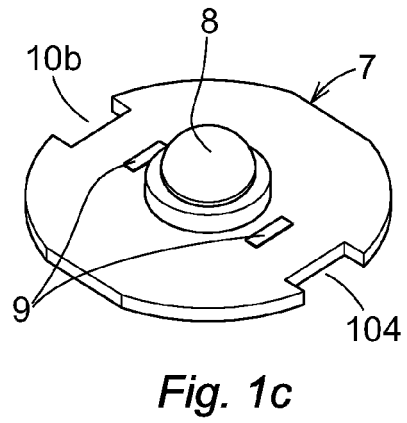
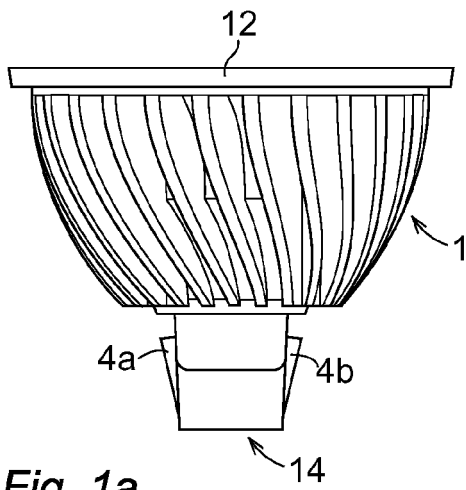
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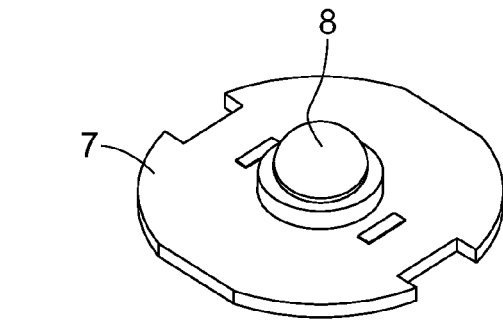


Fig. 2

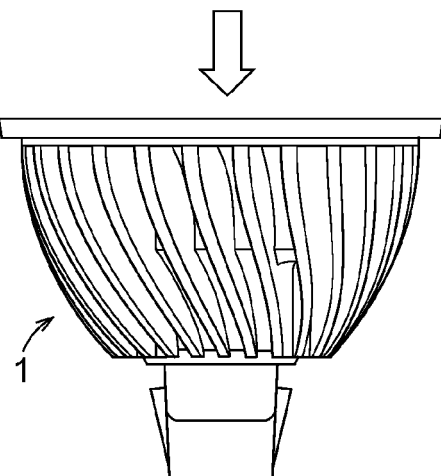
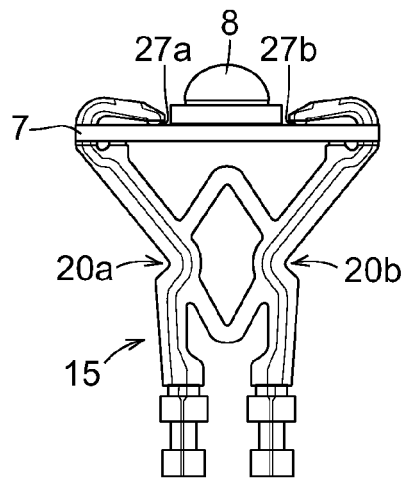
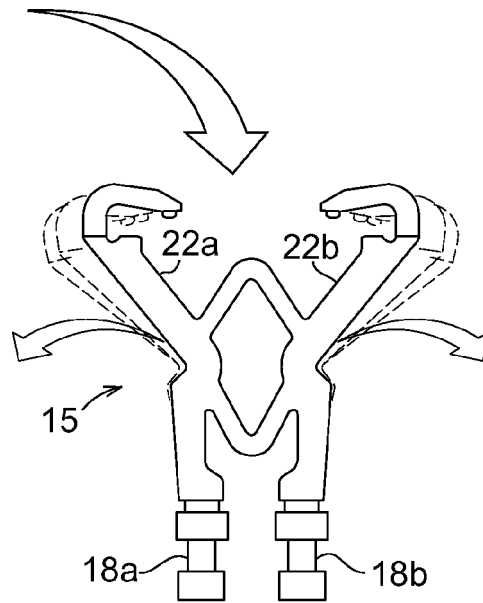


Fig. 3

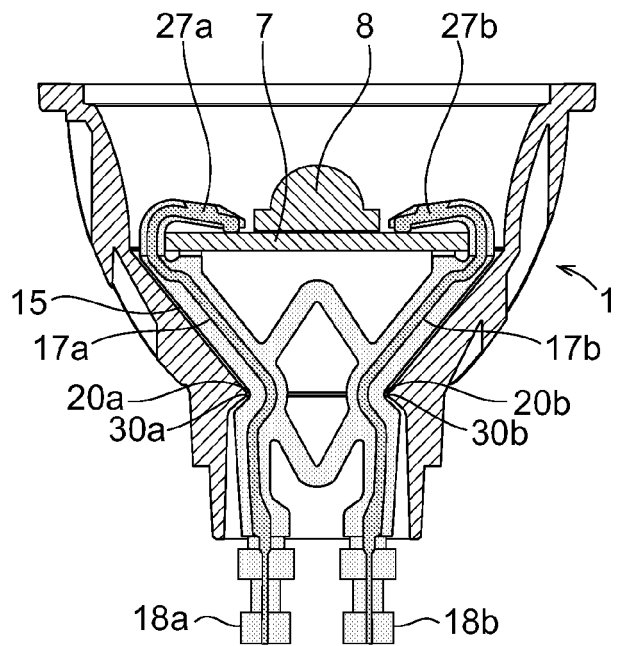


Fig. 4

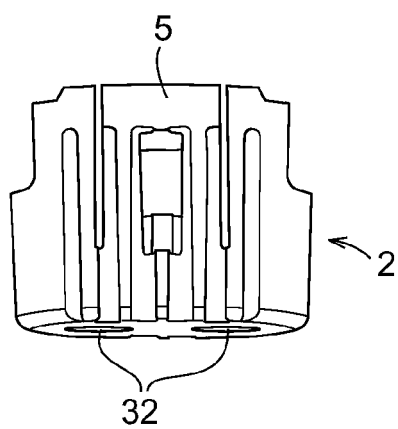


Fig. 5

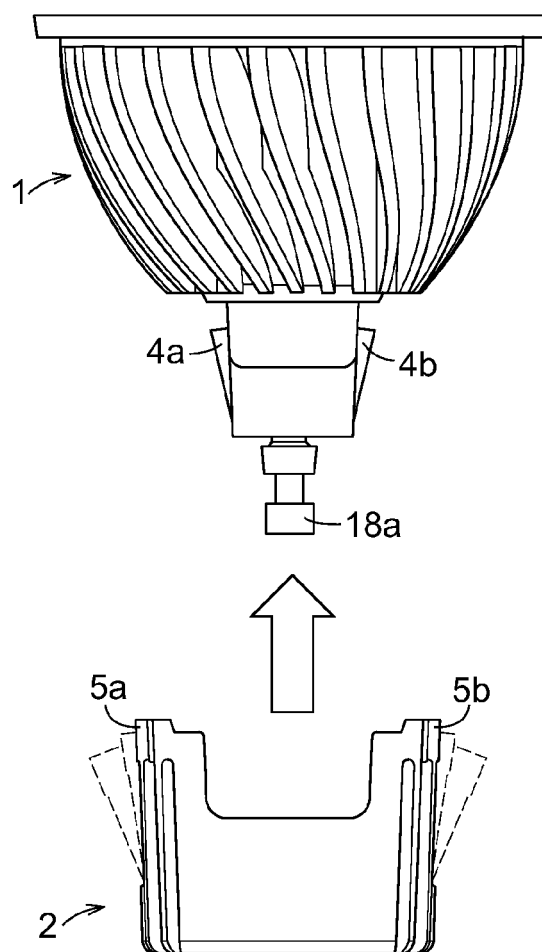


Fig. 6

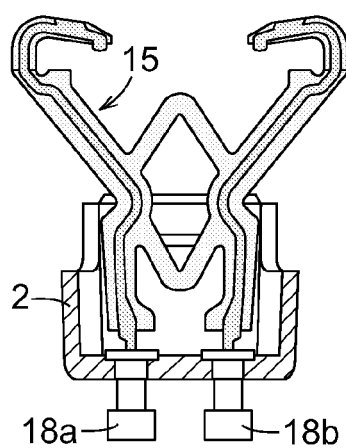


Fig. 7

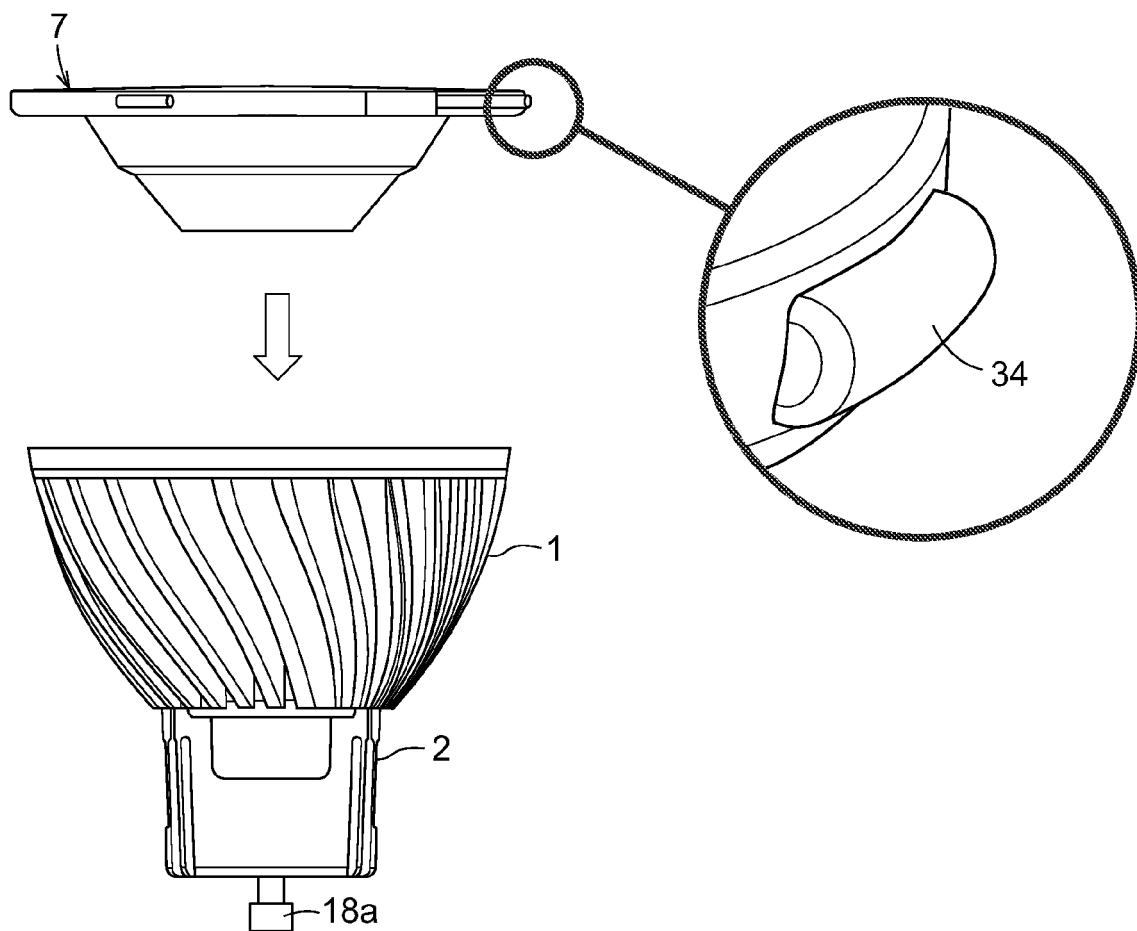


Fig. 8

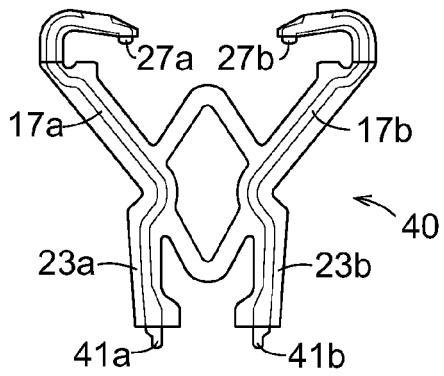


Fig. 9a

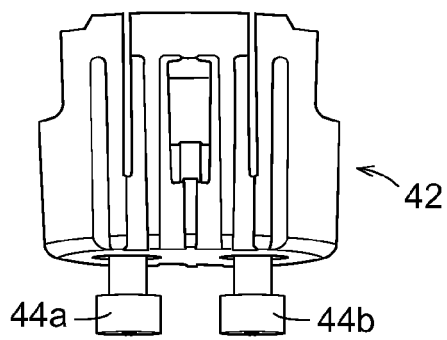
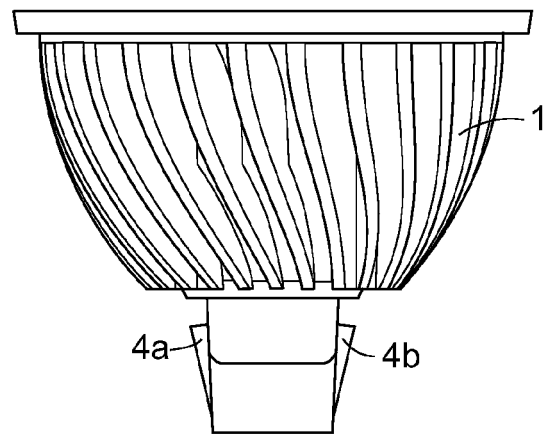


Fig. 9b

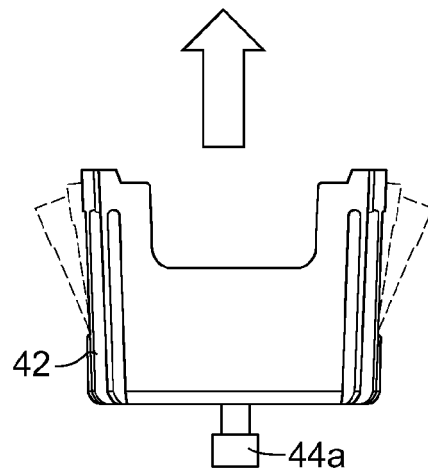


Fig. 12

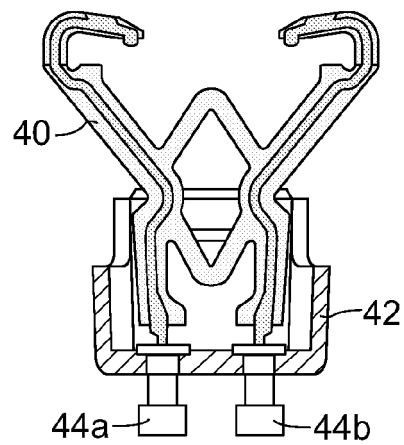


Fig. 13

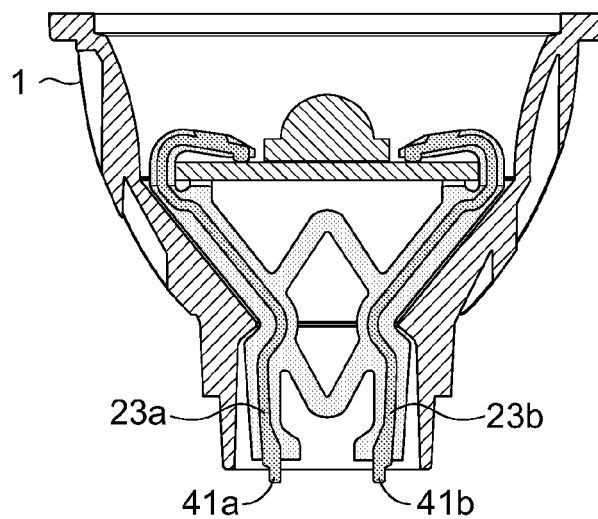
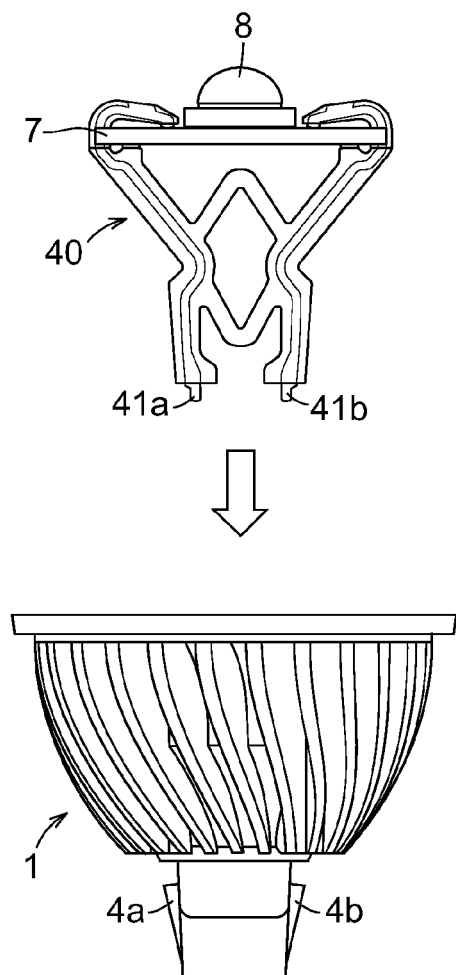


Fig. 14

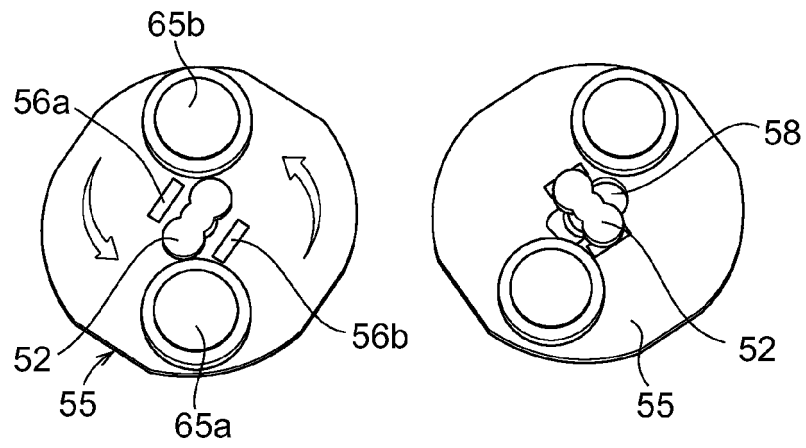
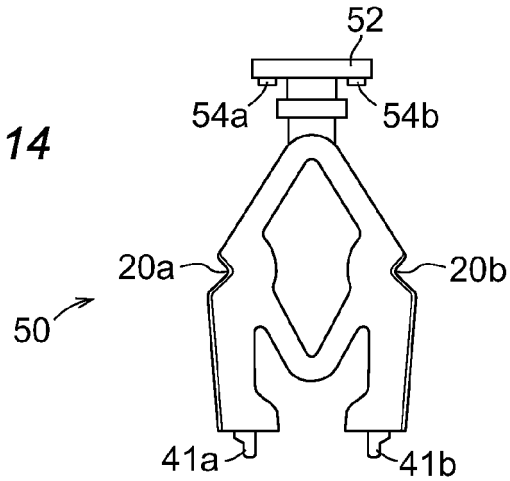
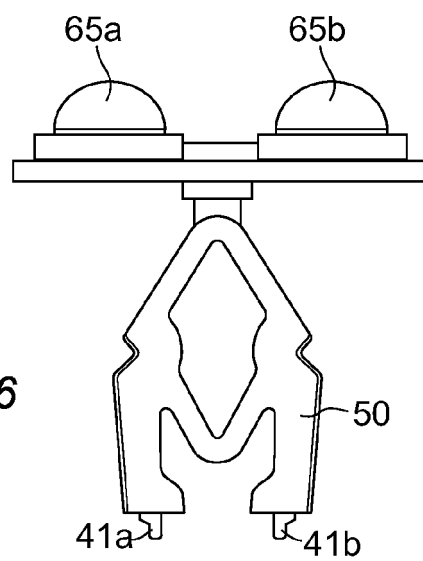


Fig. 15

Fig. 16



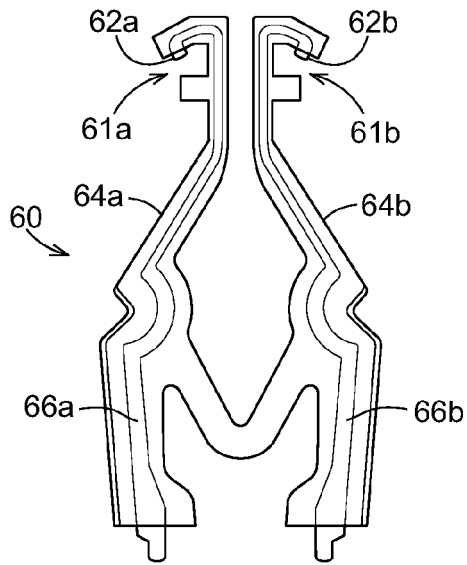


Fig. 17

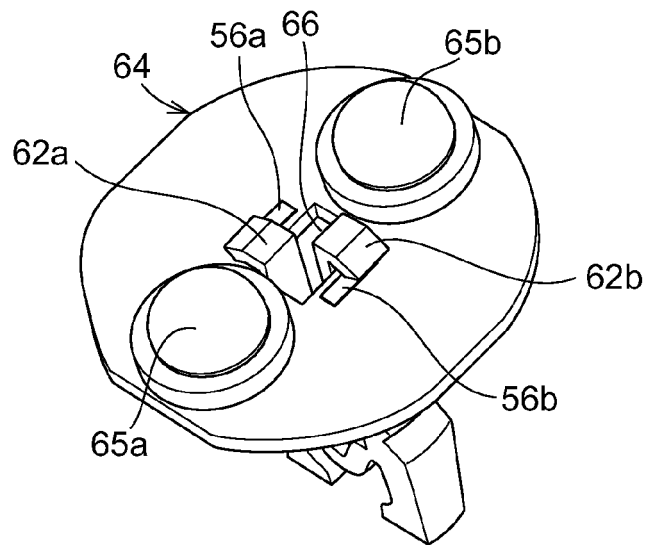


Fig. 18

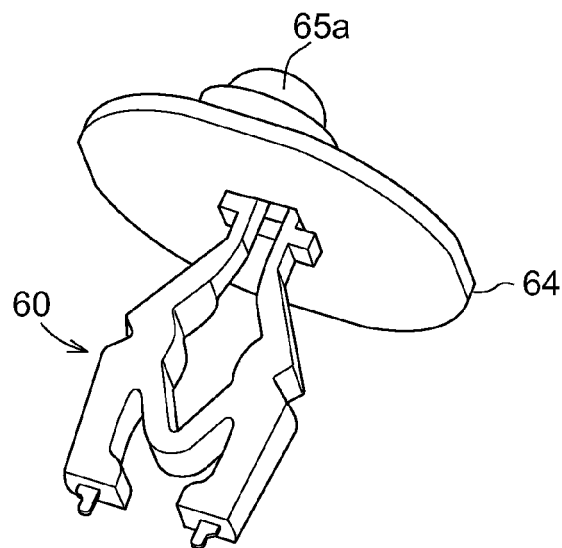


Fig. 19



EUROPEAN SEARCH REPORT

Application Number
EP 09 17 5905

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Place of search Munich		Date of completion of the search 21 April 2010	Examiner Berthommé, Emmanuel
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