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(11)

EP 1 580 482 A2

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
28.09.2005 Bulletin 2005/39

(51) Int Cl.7: **F21V 23/02**, F21V 15/01
// F21Y101/02

(21) Application number: **05005306.5**

(22) Date of filing: **10.03.2005**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IS IT LI LT LU MC NL PL PT RO SE SI SK TR**
Designated Extension States:
AL BA HR LV MK YU

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(30) Priority: **23.03.2004 IT FI20040072**

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(54) **Low-voltage illuminating device**

(57) Low-voltage illuminating device to be applied, particularly, to spotlights and the like, comprising a low-voltage lamp section, characterized in that it comprises a lamp section provided with low-voltage illuminating el-

ements (99) and a transformer unit (91) attached to each other in a single unit, i.e., with the output of the transformer (91) directly connected to the input or supply terminals (94) of the lamp section (92).

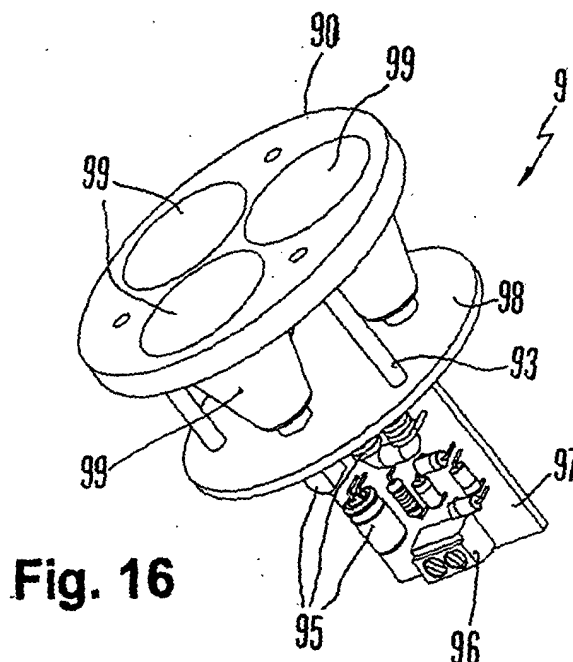


Fig. 16

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Description

[0001] The present invention relates to a low-voltage illuminating device to be applied, particularly, to spotlights and the like.

[0002] In recent years, the field of illuminating engineering has witnessed an increase in the use of low voltage illuminating devices, for example of illuminating devices with LED diodes. Such devices require a low voltage (for example 12V) and, therefore, may not be directly connected to a regular line, which carries a higher voltage (for example 220V).

[0003] The connection between the regular line and the said low-voltage illuminating devices requires a secondary circuit made of a transformer connected to the line and of a secondary low-voltage electrical line, located between the transformer and the device requiring electrical feed.

[0004] In comparison to an illuminating device functioning on mains voltage, the use of a low-voltage device therefore implies an increase in the number of components, with the consequent increase in time and costs of production, assembly and installation.

[0005] Another inconvenient consists in the simultaneous presence of two circuits, respectively with high and low voltage, which must be appropriately differentiated and identified for obvious safety reasons.

[0006] The main objective of the present invention is to eliminate, or at least drastically reduce, the aforementioned inconveniences.

[0007] This result has been achieved, according to the invention, by adopting the idea of making a low voltage device having the characteristics disclosed in claim 1. Further characteristics of the present invention are dealt with in the dependent claims.

[0008] Among others, the advantages of the present invention lie in the fact that it is possible to eliminate the secondary low-voltage feed grid, thereby eliminating low-voltage connection cables, at least one terminal for such cables, etc., therefore reducing installation time, as it is sufficient to connect the device directly to the main electrical line, without further connections to be made and avoiding operations such as cables cutting and stripping.

[0009] Moreover, according to a particular form of realization of the invention, it is possible to noticeably simplify the construction of the stand for a luminous spotlight built with the said device and to drastically reduce construction time and costs; it is possible to ensure maximum safety as each part of the stand is made of insulating material and the components are interconnected without the use of external fasteners, that is without the use of metal screws or the like; it is possible for the stand according to the invention to maintain unaltered characteristics even after a prolonged utilization.

[0010] These and other advantages and characteristics of the invention will be best understood by anyone skilled in this technical field from a reading of the follow-

ing description in conjunction with the attached drawings, given as a practical example of the invention, but not to be considered in a limitative sense, wherein:

- 5 - Fig. 1 is a schematic perspective of a possible construction example of an articulated stand for a luminous spotlight equipped with a device according to the invention;
- Fig. 2 is an exploded view of the example shown in Fig. 1;
- 10 - Fig. 3 is a schematic perspective, having removed some components, of the example shown in Fig. 1;
- Fig. 4 is an exploded view of the example shown in Fig. 2;
- 15 - Fig. 5 is a longitudinal section view of the example shown in Fig. 1;
- Fig. 6 is an enlarged detail of Fig. 5;
- Fig. 7 is a section view along the line VII-VII of Fig. 6;
- Fig. 8 is an enlarged view of the particular encircled by the broken line of Fig. 6;
- 20 - Fig. 9 is a schematic perspective of a shell according to the invention;
- Fig. 10 is a plan view, with sectioned parts, of the shell shown in Fig. 9, connected to a locking ring;
- 25 - Figs. 11 and 12 are a side view (Fig. 11) and a longitudinal section view (Fig. 12) of a possible utilization of the invention;
- Fig. 13 shows a side view of another possible utilization of the invention;

[0011] Figs. 14, 15, 16 and 17 are schematic respectively a front view, a side view, a plan view from above and a plan view from below of a possible construction example of a low-voltage illuminating device made according to this invention;

Figs. 18, 19, and 20 are, respectively, a longitudinal section view, a perspective exploded view from the above and a perspective exploded view from the bottom of the lamp section according to a further example.

[0012] In the attached drawings, an illuminating device according to the invention has been marked in its entirety with the reference numeral (9) and is shown in more detail in Figs. 14-17. In order to better understand the possible utilizations of the device (9), an articulated stand (100) for a luminous spotlight, equipped with the device (9) according to the invention, is shown in Figs. 1-13.

[0013] The stand (100) includes a fork (1) and a collar (2). The stand (100) may be used to support a shell (5) apt to contain the device (9).

[0014] The fork (1) may be made of insulating material, of plastic material for example, and has a cylindrical and hollow base (10). The base (10) has a circular development and is provided with a neck (11) having an annular groove (12), which allows it to be engaged with corresponding retention devices described below.

[0015] The two arms (13) of the fork are elastically yielding and are provided with a cylindrical pin (14) in

correspondence with the respective free ends. Each pin (14) may enter into a corresponding hole (50) of an external spotlight shell (5), so that it becomes a connecting hinge uniting the shell (5) to the fork (1), thus allowing the shell to rotate about the axis (x-x) defined by the two pins (14). Said axis (x-x) is transversal to the arms (13) of the fork (1) since, as shown in the drawings, each pin (14) is orthogonal to the respective arm (13).

[0016] Moreover, the fork (1) is provided, in correspondence of each pin, with at least one tooth (18) radially developed with respect to the corresponding pin (14).

[0017] The shell (5), in correspondence of said holes (50), is provided with a plurality of angularly spaced radial notches or slits (58) located around the hole (50) and defining corresponding seats to hold the said tooth (18), thus allowing different angular positions of the shell (5) in relation to the fork (1). In such way, it is possible to variously position the shell (5) defining the spotlight body in relation to the fork (1). The arms (13) of the fork, due to their elasticity, may be easily spaced to allow the positioning of the shell (5) into a set of angular configuration in relation to the fork (1).

[0018] The collar (2) may also be made of insulating material, of plastic material for example, and, with the stand (100) assembled, it is fitted around the neck (11) at the base of the fork (1). Internally, the collar (2) is provided with retention means consisting of multiple appendices (20), elastically yielding, and which protrude centripetally in order to intercept the base (10) of the fork (1) and enter the said groove (12), thus creating a stable and irremovable junction with a longitudinal stop, thanks to which the fork is prevented to escape from the collar (2).

[0019] Moreover, as more clearly visible in Fig. 7, the neck (11) at the base of said fork (1) is provided with a projecting part (15) constituting a stopping element for a corresponding inner radial appendix (25) of the collar (2) in order to block the full rotation of the fork (1) about the central longitudinal axis (a-a) of the collar (2); this characteristic prevents the twisting of the cable (7), thus increasing the safety of the stand. Consequently, the supported spotlight may rotate about the axis (a-a), in addition to being set in varying angular positions about the axis (x-x). The great simplicity of construction of the stand (100) in question results evident in the above description, in as much as it made of only two elements: the fork (1) and the collar (2).

[0020] In the illustrated examples, the articulate stand (100) in question also includes a bushing (3) which may be inserted into the collar (2) and which is provided with means (33) connecting it to the collar and retention means (39) for the said base (10) of the fork (1).

[0021] In detail, the said means for connection to the collar are made of at least one retention knob or tooth (33) exhibited on a flexible portion of the bushing (3). The knob (33) protrudes externally and is intended to be inserted into a corresponding hole (23) in the collar

(2) so as to prevent any relative movement of these parts (2, 3). The retention means for the said base of the fork (1) are made of the upper edge (39) of the bushing (3) which exhibits an internal diameter (D3) slightly greater than the corresponding external diameter (D1) exhibited by a lower portion (19) of the base of the fork (1), thus preventing the eventual oscillation of the fork in relation to the collar (2). In Fig. 9, the configuration of the shell (5) is more clearly visible. Internally, the shell (5) is provided with a plurality of tabs (55) running lengthwise and substantially parallel to the longitudinal axis (h-h) of the shell (5). The tabs (55) exhibit a free end (56) which protrudes beyond the edge (57) of the front opening of the shell (5) and are set at an equal angular distance from one another.

[0022] The illuminating element (9) is contained inside the shell (5) and, to ensure a better cooling of the former, the shell (5) exhibits a series of aeration holes (52). A ring (93) is provided in order to attach the illuminating element (9) to the interior of the shell (5). In the illustrated example, the ring (93) is provided with a plurality of tabs (930), in the same number as that of the said tabs (55) of the shell (5). In detail, the tabs (930) of the ring (93) are disposed as to result combined, two by two, with the corresponding pairs of tabs (55) of the shell, with each pair of tabs of the ring (93) defining a slightly minor angle than the angle defined by the corresponding pair of tabs of the shell (5). In such way, it is possible, by inserting each pair of tabs (930) between two tabs (55), to connect the ring (93) to the shell (5) with a sufficient friction to keep the two parts united. It is also possible to add teeth and/or seats (not shown) along the length of the tabs (930) meant to interact with corresponding seats/teeth of the tabs (55), with the benefit of establishing an even more effective connection. The ring (93) may also be bound to the shell (5) by gluing.

[0023] As more clearly visible in Figs. 14-17, the illuminating device (9) includes a lamp section (92) and a transformer section (91) attached to each other in a single unit. Practically, the output of the transformer (91) is directly connected to the input or supply terminals (94) of the lamp section (92) which includes diode elements (99).

[0024] In detail, the device (9) includes a screen (90) covering the front part of the lamp section (92) which, in the non-limitative illustrated example, includes three conical diode elements (99). Each diode (99) has a substantially conical shape and contains, according to known techniques and therefore not described in detail, a LED diode inserted in a relative projector, the opening of which coincides with the screen (90). Each LED diode (99) receives the adequate low-voltage feed through two terminals (94). The terminals (94) are set on a planar support (98) which lies parallel to the screen (90) and are connected to the latter by three rigid stems (93). A second printed circuit, defining the transformer section (91) of the device (9), is perpendicularly attached to the

planar support (98).

[0025] Practically, the transformer section (91) includes a supply terminal (96) which may be directly connected to the high-voltage electrical line (for example a 220V line) and a set of electronic components (95) in order to change the out-coming voltage to the desired value (for example 12V)

and which are connected, at the output point, to the terminals (94) of the diode elements (99) intended to be mounted on the planar support (98). The planar support (98) may consist of a printed circuit with tracks opportunely laid out in order to connect the terminals (94).

[0026] In such way, it is possible to connect the low-voltage illuminating device in question directly to the main line, eliminating all those components and assembly procedures that, at the time being, still impinge upon the known techniques.

[0027] A device (9) thus assembled is noticeably compact and allows its stable positioning inside the shell (5) described above.

[0028] The assembly of the stand (100) is possibly made as follows.

[0029] The collar (2) is fitted onto the base (10) of the fork (1), particularly onto the neck (11), until the upper edge (29) of the collar (2) intercepts the frame (16) set on the upper area of the neck (11).

[0030] Simultaneously, the tabs (20) inside the collar (2) will have shifted into position inside the said groove (12). At this point, the connection of the collar (2) to the fork (1) is completed.

[0031] The said bushing (3), inserted into the collar from below, is provided in order to increase the stability of the connection. The insertion of the bushing (3) into the collar (2) requires, as limit stop, the insertion of the knob (33) into the corresponding hole (23) of the collar (2), with the simultaneous approaching of the upper edge (39) of the bushing (3) to the said lower portion (19) of the fork (1).

[0032] Moreover, the collar (2) and the bushing (3) are provided with corresponding holes (27) and (37) which, once the assembly has been completed, result overlapping in correspondence of a threaded area inside the bushing (3). The thread may be utilized to employ a known type of fastener, such as a cable lock (8). The two holes (27) and (37) may be utilized for the passage of further fastening devices.

[0033] The fastening of the shell (5) to the fork (1) may be carried out before or after the assembly described above, because the passage of the cable (7) inside the elements (1), (2) and (3) is still permitted. In order to fasten the shell (5) to the fork (1) it is sufficient to elastically widen the two arms (13), as mentioned above, inserting the knobs (14) inside the holes (50) of the shell (5). The positioning of the teeth (18) inside the seats (58) will determine the inclination of the shell in relation to the fork.

[0034] The illuminating unit (9) as well may be attached to the shell (5) by means of the ring (930) before

or after being fastened to the fork (1), because such manoeuvre is still permitted.

[0035] Two possible ways of using the invention are illustrated in Figs. 11, 12 and 13. In Figs. 11 and 12, the stand (100) hangs from the relative electrical feed cable (7) with the aid of a cable lock (8). In Fig. 13, instead, the stand (100) is mounted onto a plane (6) and turned facing upwards. Even in this case, a cable lock (8), screwed into the thread (38) of the bushing (3) to fix the stand, is used.

[0036] With reference to the example shown in Figs. 18-20, the lamp section (92) comprises one only diode (99). The latter is connected to the output of a feeding device (91) mounted on a printed circuit (97) which is parallel to the base (98) of the diode (99), thus allowing an even more compact realization of the lamp section (92). A disc-shaped heatsink (97) is advantageously interposed between said base (98) and the printed circuit (97). Said heatsink features a surface (998) onto which lies the said base (98) and an opposite surface (998) with which the printed circuit is in contact. Said surfaces (998, 999) are spaced to each other and there is a gap between them, the air is allowed to flow through the gap contributing to the cooling of the lamp section when it is on. For example, the heatsink may be made of plastic material including metal particles (a material commonly available on the market) and it is provided with a plurality of side appendixes (995) apt to laterally engage the printed circuit (97). The components (95) of the printed circuit (97) form, for example, an inverter to be connected to a 12V DC or AC voltage. In Figs. 18-20, the wires (7) connect the input of the inverter to the external supply line, while the wires (77) connect the output of the inverter with the diode (99).

[0037] Practically, the construction details may vary in any equivalent way as far as the shape, dimension, disposition of elements, nature of the used materials are concerned, without nevertheless departing from the scope of the adopted solution idea and, thereby, remaining within the limits of the protection granted to the present patent.

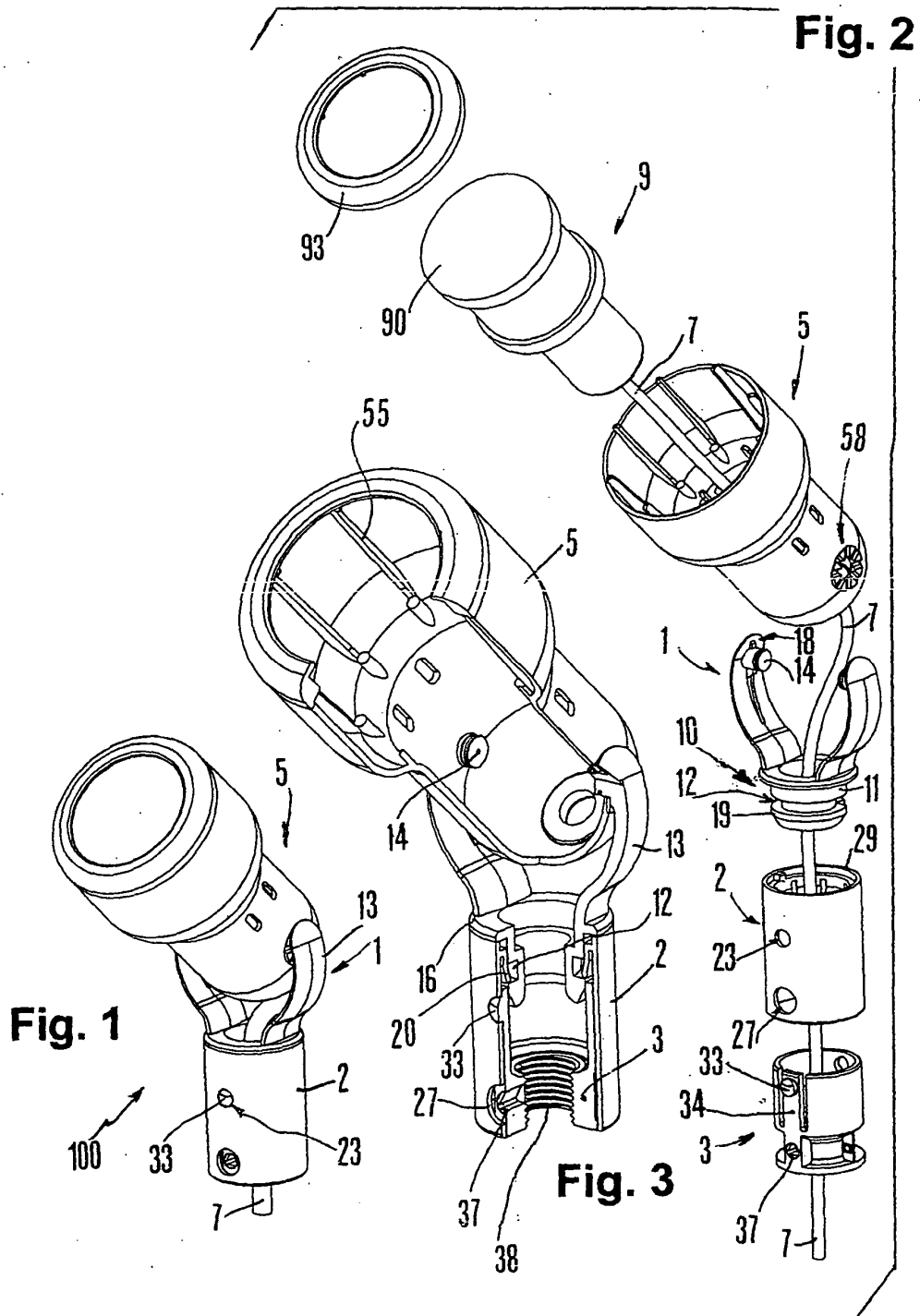
Claims

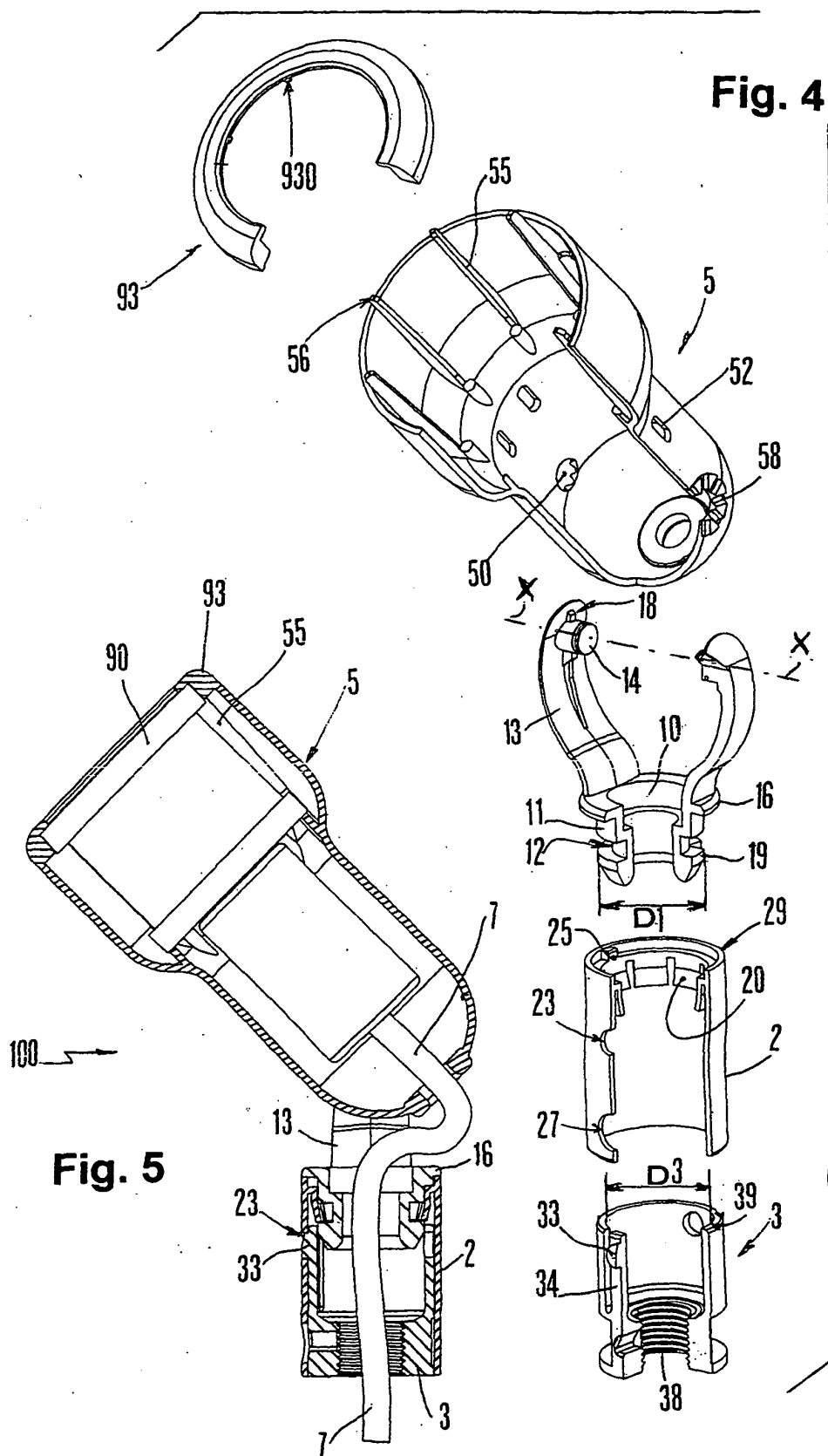
1. Low-voltage illuminating device to be applied, particularly, to spotlights and the like, comprising a low-voltage lamp section, **characterized in that** it comprises a lamp section provided with low-voltage illuminating elements (99) and a transformer unit (91) attached to each other in a single unit, i.e., with the output of the transformer (91) directly connected to the input or supply terminals (94) of the lamp section (92).
2. Illuminating device according to claim 1 **characterized in that** the device (9) includes a screen (90) covering the front part of the lamp section (92)

which includes a number of diode elements (99), each diode element (99) being directly connected to the transformer (91).

3. Illuminating device according to claim 1 and/or 2 **characterized in that** the transformer unit (91) consists of a printed circuit (97) provided with an input section (96) directly connectable to the main electrical line and a set of electronic components (95) apt to change the out-coming voltage to a desired value, said printed circuit (97) being directly united to a planar support (98) which is a part of the lamp section (92).
4. Illuminating device according to claim 1 **characterized in that** it comprises an articulated spotlights stand (100) comprising:
 - a fork (1) made of insulating material and having a cylindrical and hollow base (10), said base having a circular development and being provided with a neck (11) having an annular groove (12), which allows it to be engaged corresponding retention means, the arms (13) of the fork being elastically yielding and provided with a cylindrical pin (14) in correspondence with the respective free ends, each pin being apt to enter into a corresponding hole (50) of an external spotlight shell (5), so that it becomes a connecting hinge uniting the shell (5) to the fork (1), thus allowing the shell to rotate about the axis (x-x) defined by the two pins (14);
 - a collar (2) made of insulating material, which is fitted around a neck (11) at the base of the fork (1) and, internally, is provided with retention means consisting of multiple appendices (20), elastically yielding, and which appendices protrude centripetally in order to intercept the base (10) of the fork (1) and enter the said groove (12), thus creating a stable and irremovable junction with a longitudinal stop, so that the fork is prevented to escape from the collar (2).
5. Illuminating device according to claim 4 **characterized in that** it comprises a bushing (3) which may be inserted within the collar (2) and is provided with connecting means (33) for the connection thereof with the same collar and retention means (39) for said base (10) of the fork (1).
6. Illuminating device according to claim 5 **characterized in that** said collar connecting means are made of at least one retention knob or tooth (33) exhibited by the bushing (3), said knob protruding externally and being intended to be inserted into a corresponding hole (23) in the collar (2) so as to prevent any relative movement of these parts (2, 3).

7. Illuminating device according to claim 5 **characterized in that** said retention means for the base of the fork (1) are made of the upper edge (39) of the bushing (3) which exhibits an internal diameter (D3) slightly greater than the corresponding external diameter (D1) exhibited by a lower portion (19) of the base of the fork (1), thus preventing the eventual oscillation of the fork in relation to the collar (2).
8. Illuminating device according to claim 4 **characterized in that** the neck (11) at the base of said fork (1) is provided with a projecting part (15) constituting a stopping element for a corresponding inner radial appendix (25) of the collar (2) in order to avoid the full rotation of the fork (1) about the central longitudinal axis (a-a) of the collar (2).
9. Illuminating device according to claim 4 **characterized in that** the fork (1) is provided, in correspondence of at least one of said pins (14), with at least one tooth (18) radially developed with respect to the corresponding pin (14), said shell (5), in correspondence of said holes (50), being provided with a plurality of angularly spaced radial notches or slits (58) located around the hole (50) and defining corresponding seats to hold the said tooth (18), thus allowing different angular positions of the shell (5) in relation to the fork (1).
10. Illuminating device according to claim 4 **characterized in that** said shell (5) is provided with a plurality of tabs (55) substantially parallel to the longitudinal axis (h-h) of the shell and angularly spaced according to a preset angular pitch, a fixing ring (93) being provided, which comprises a plurality of tabs (930) with each pair of tabs defining a slightly minor angle than the angle defined by the corresponding pairs of tabs of the shell (5) so as to realize a fixing association between the two pluralities of tabs (55, 930) with a sufficient friction to keep the shell and the ring united to each other.





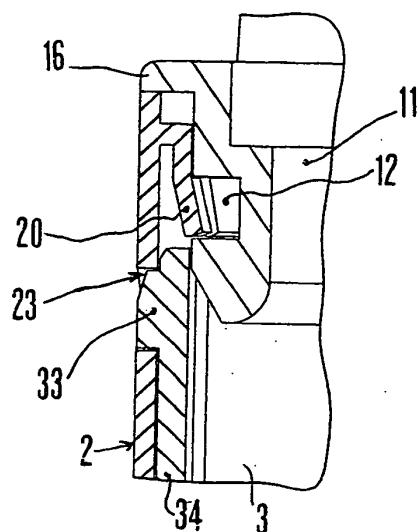


Fig. 8

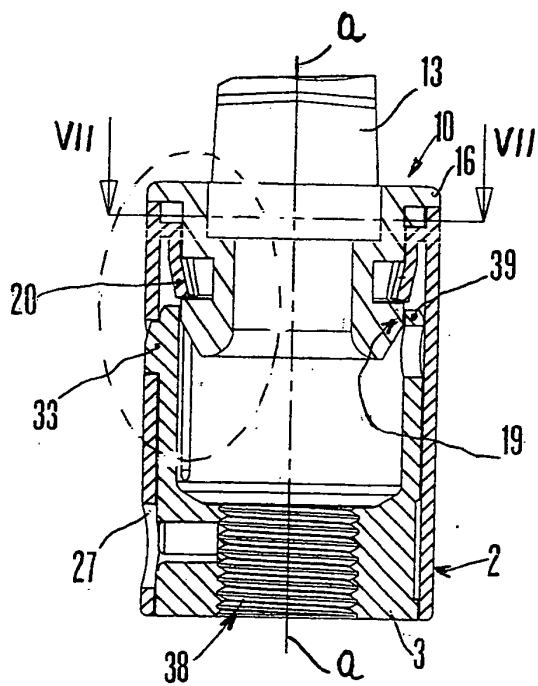


Fig. 6

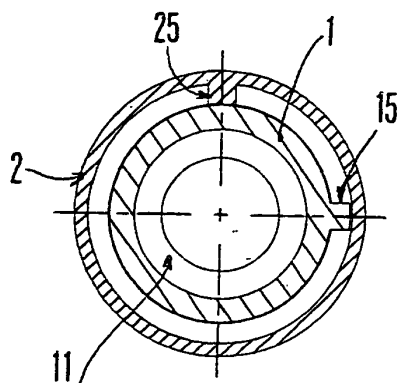


Fig. 7

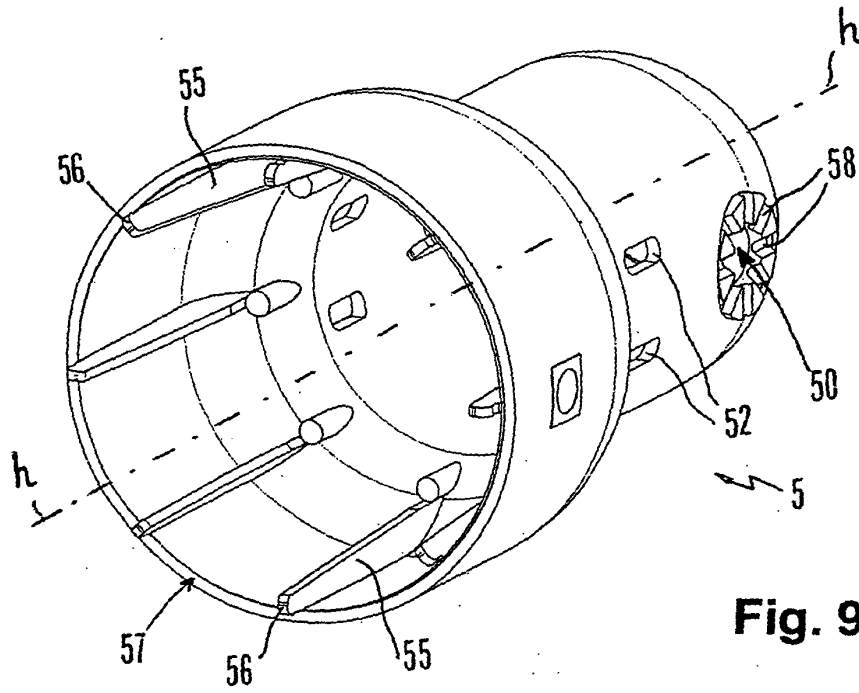


Fig. 9

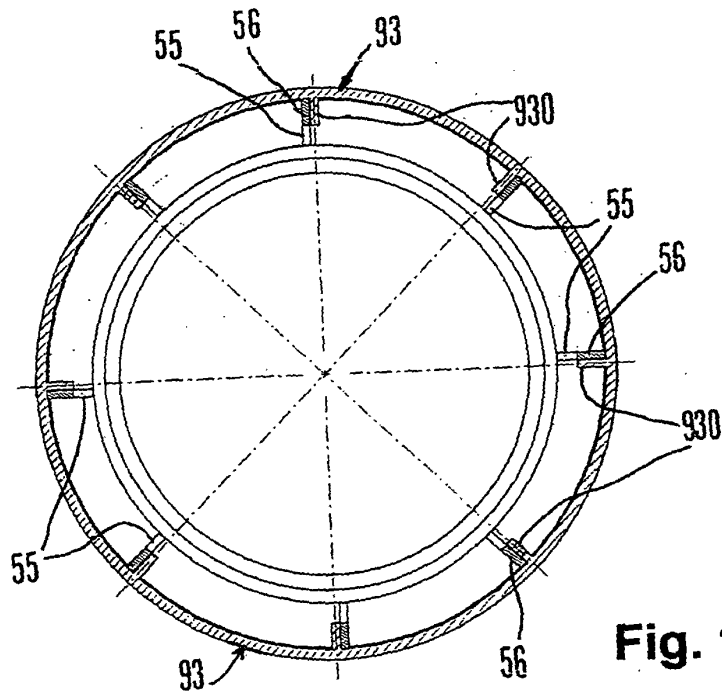


Fig. 10

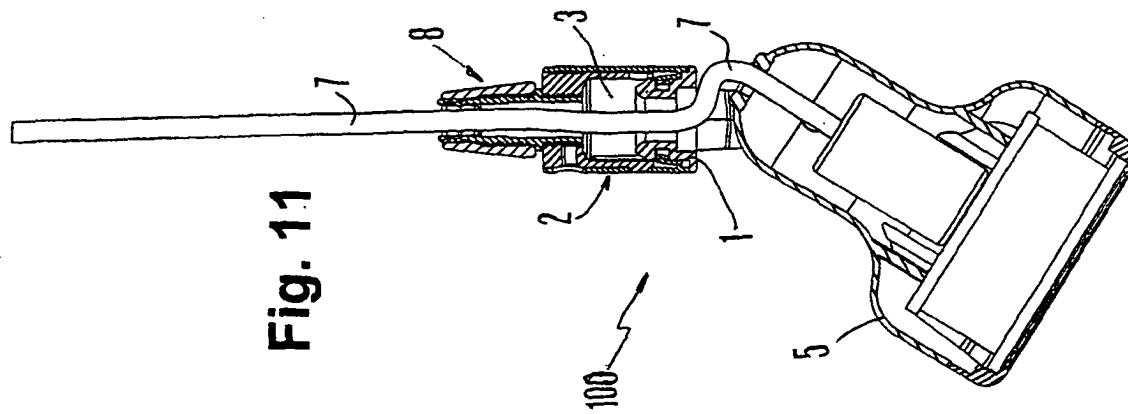
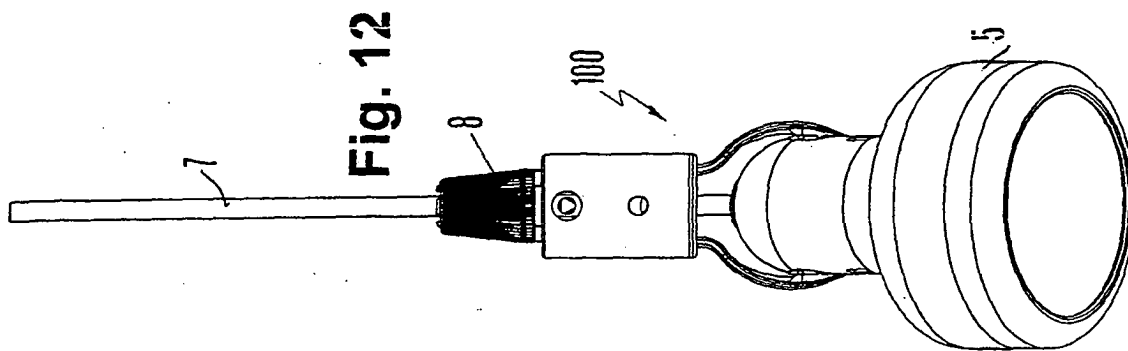
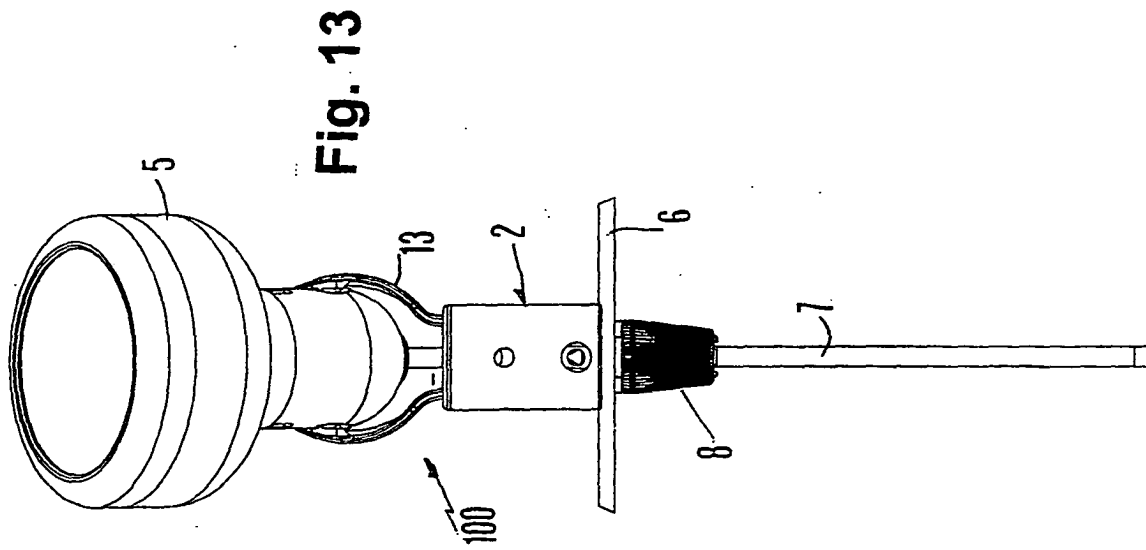


Fig. 14

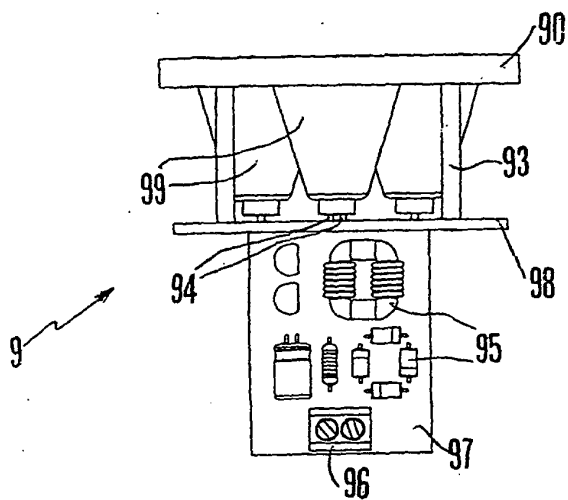


Fig. 15

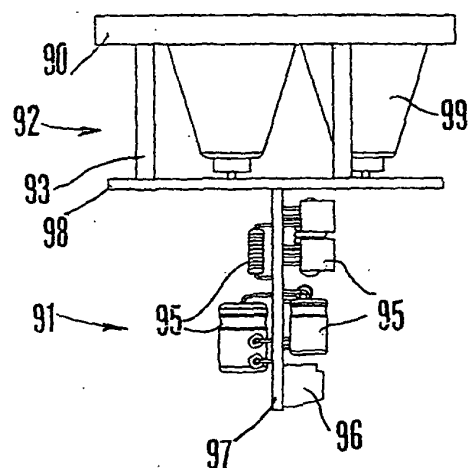


Fig. 16

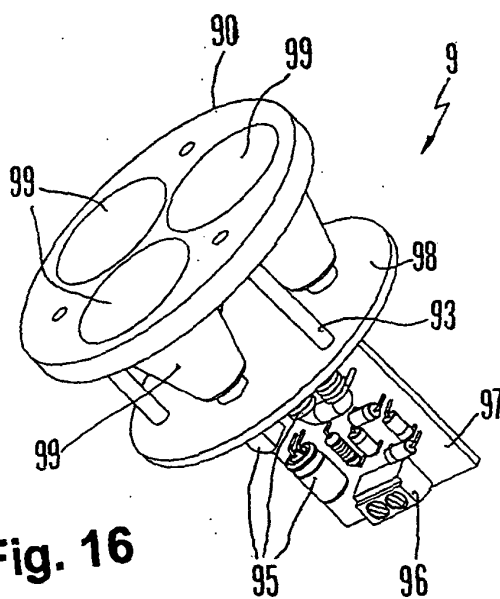
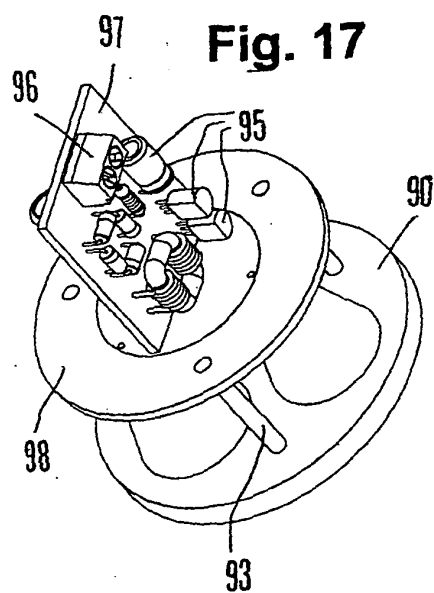


Fig. 17



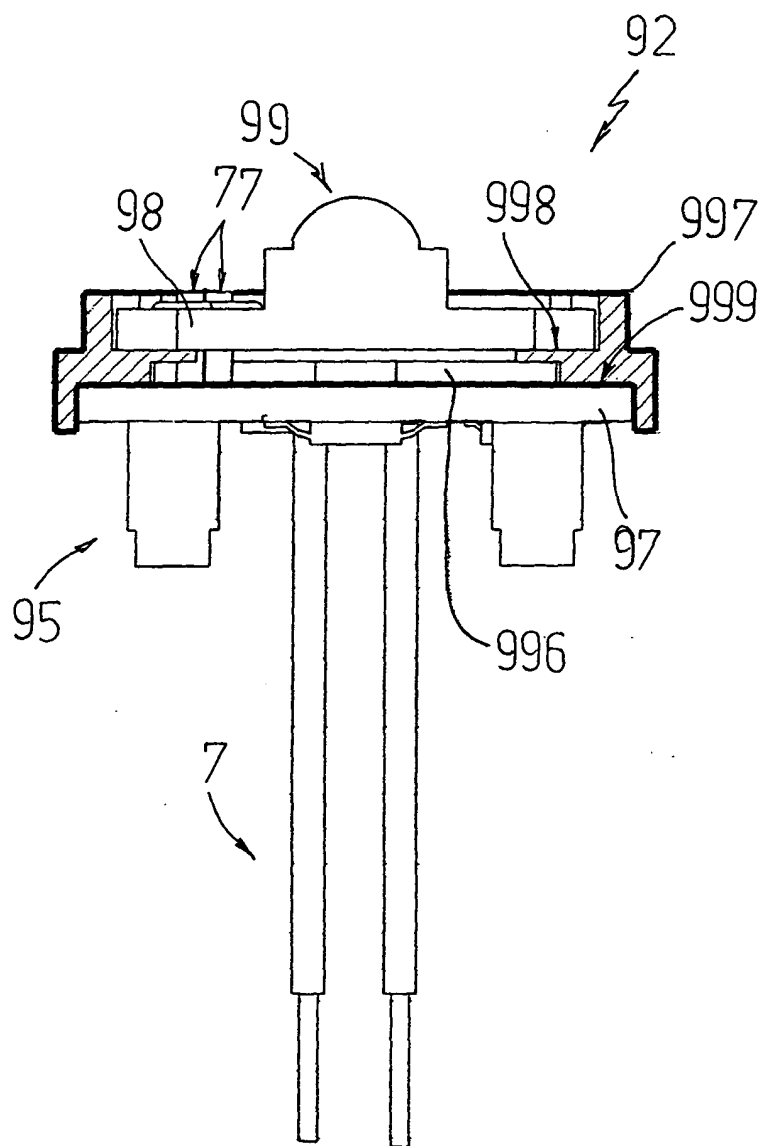


FIG.18

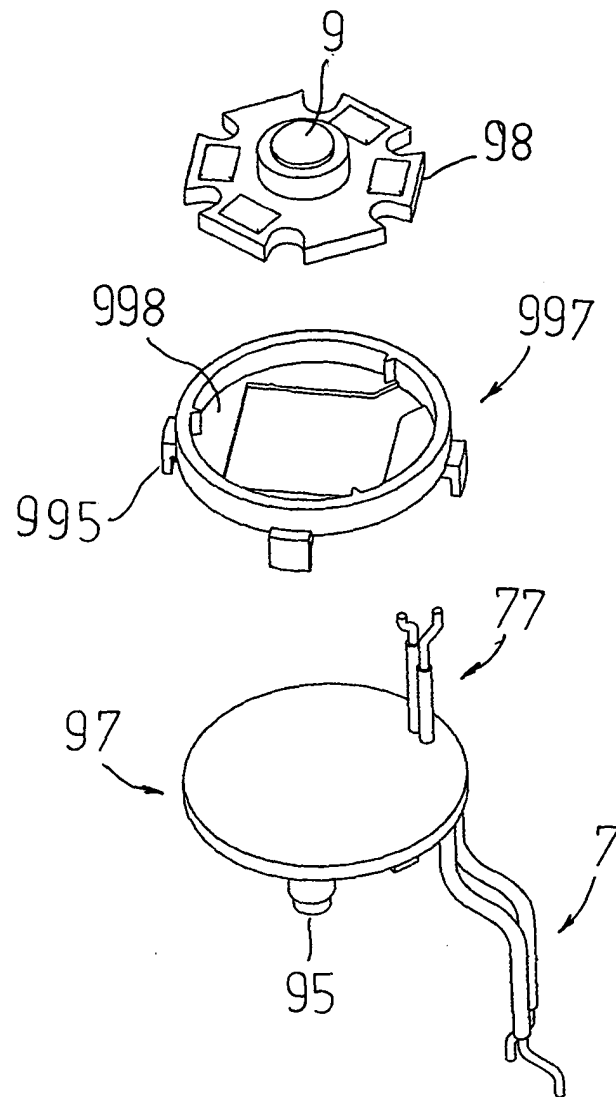


FIG.19

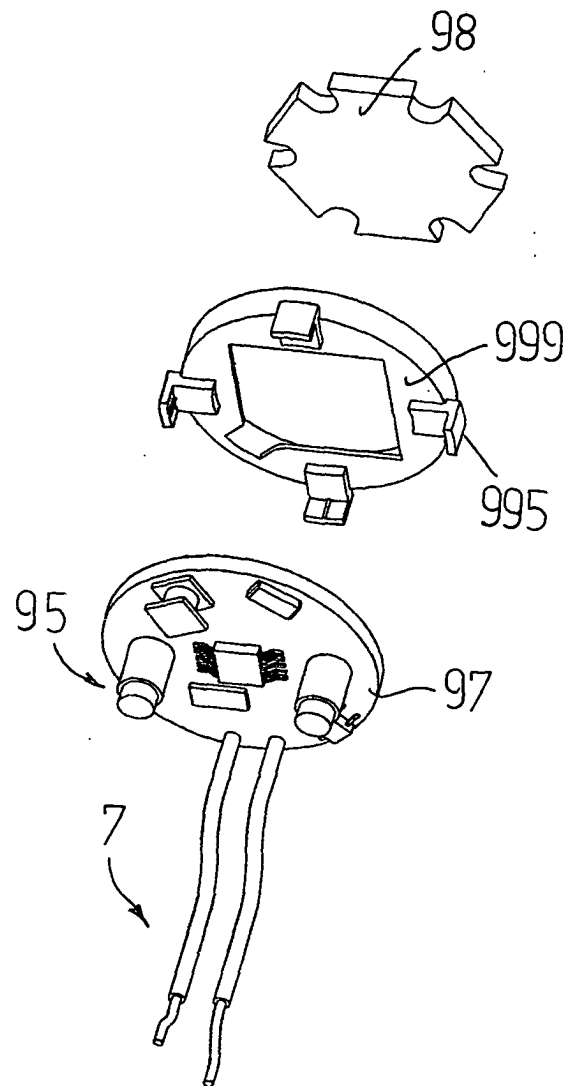


FIG.20