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(54) Watertight spotlight fixture

(57) A watertight light fixture includes a cylindrical housing (10); a circuit board (20) in the housing (10) and comprising a light source (22) and a first convex lens (23) on the light source (22); a funnel shaped reflector (30) on the convex lens (23); a watertight cover (50) comprising a second convex lens (51) rested upon the reflector (30), and a lens collar (52) releasably secured to the housing (10) so as to mount the watertight cover (50) on the housing (10) with both the second convex lens (51) and the reflector (30) being fastened therein; a power unit (60) comprising a watertight block (65); and a bottom plate (70) releasably secured to the housing (10) to fasten the watertight block (65). Light emitted by the light source (22) is converged by the convex lens (23) and is further converged by the second convex lens (51).

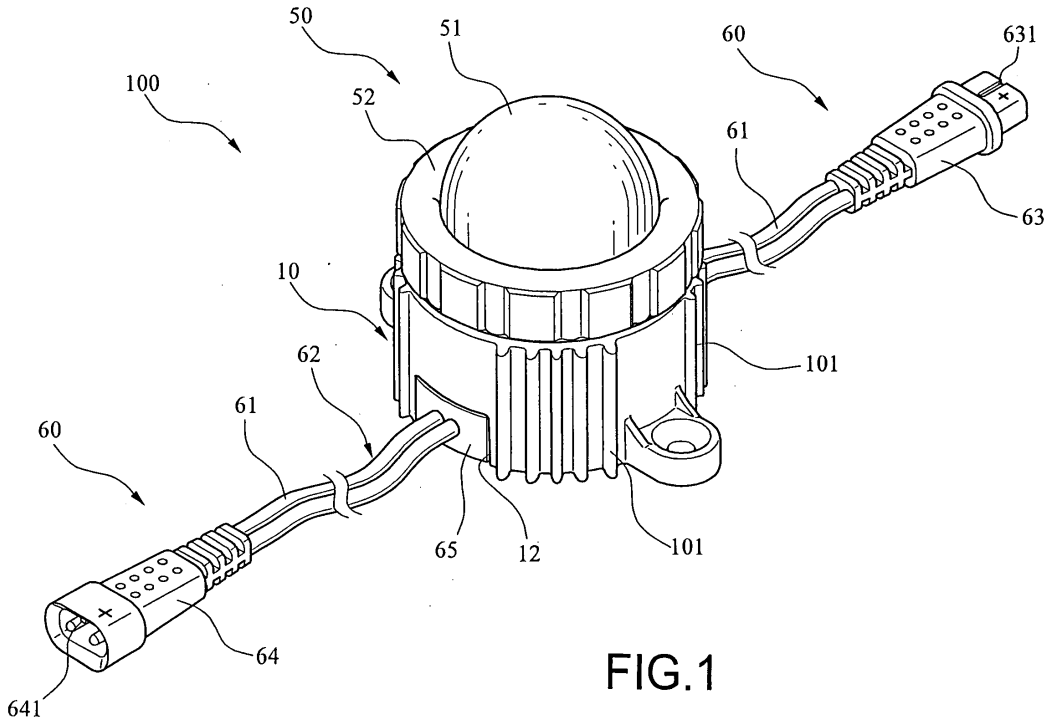

FIG.1

EP 2 284 438 A1

Description

BACKGROUND OF THE INVENTION

1. Field of Invention

[0001] The invention relates to outdoor lighting and more particularly to a watertight spotlight fixture for use outdoor, the watertight spotlight fixture having convex lens for increasing the intensity of output light and other characteristics including improved watertightness.

2. Description of Related Art

[0002] A great number of different spotlight fixtures for outdoor use are commercially available. One main concern with any outdoor light fixture is to ensure that water cannot come into contact with electrical wiring or leads to the light fixture in any way. Otherwise, the lighting fixture may be rusted in a short period of using time. To achieve this, all watertight spotlight fixtures are tightly sealed. However, sealed spotlight fixtures may cause heat buildup. Further, to meet the requirement of increase intensity of spotlight fixtures, great heat dissipation become an even more serious problem if a high temperature light bulb is mounted in a watertight spotlight fixture.

[0003] Thus, continuing improvements in the exploitation of watertight spotlight fixture are constantly being sought.

SUMMARY OF THE INVENTION

[0004] It is therefore one object of the invention to provide a watertight spotlight fixture comprising a first convex lens mounted on a light source, a reflector mounted on the convex lens, and a second convex lens mounted on the reflector so that the intensity of light emitted by the light source can be increased significantly and using the low temperature light bulb the power for the watertight spotlight fixture can be decreased accordingly.

[0005] It is another object of the invention to provide a watertight spotlight fixture having improved watertightness by driving two electricity conducting screws through a circuit board, two threaded insulative sleeves, and first and second bossed threaded holes to have its sharp ends piercing through an insulation layer of a power cord to be electrically connected thereto and annular flanges sealingly urging against a watertight block so that water is prevented from entering the watertight block and the electricity conducting screws.

[0006] To achieve the above and other objects, the invention provides a watertight light fixture comprising a cylindrical housing; a circuit board mounted in the housing and comprising a light source and a first convex lens mounted on the light source; a funnel shaped concave reflector mounted above the first convex lens; a watertight cover comprising a second convex lens rested upon the reflector, and a lens collar releasably secured to the housing so as to mount the watertight cover on the housing with both the second convex lens and the reflector being fastened therein; a power unit comprising a watertight block; and a bottom plate releasably secured to a bottom of the housing to fasten the watertight block therein, wherein light emitted by the light source is converged by the first convex lens and travels toward the second convex lens, and the light is further converged by the second convex lens.

[0007] The above and other objects, features and advantages of the invention will become apparent from the following detailed description taken with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

FIG. 1 is a perspective view of a preferred embodiment of watertight light fixture according to the invention;

FIG. 2 is an exploded view of the watertight light fixture;

FIG. 3 is an exploded, perspective view of the partially assembled watertight light fixture of FIG. 2;

FIG. 4 is a longitudinal sectional view of the watertight light fixture of FIG. 1;

FIG. 5 is a detailed view of the lower central portion of FIG. 4;

FIG. 6 is a view similar to FIG. 4 showing beams of output light after leaving the second convex lens as the light source is enabled; and

FIG. 7 is a perspective view showing two watertight light fixtures according to the invention being coupled together.

DETAILED DESCRIPTION OF THE INVENTION

[0009] Referring to FIGS. 1 to 6, a watertight light fixture 100 in accordance with a preferred embodiment of the invention comprises the following components as discussed in detail below.

[0010] A hollow cylindrical housing 10 is formed of good heat conducting metal (e.g., aluminum) and comprises outer threads 13 on an upper portion, a plurality of longitudinal fins 101 on an outer surface for heat dissipation, the fins 101 being disposed under the threads 13, an internal space 11, a transverse channel 12 on an underside, the channel 12 comprising a flat bottom 121, two threaded holes 14 on a bottom of the space 11 being in communication with the channel 12, two annular flanges 15 each formed around the threaded hole 14 on the channel 12, and two arc positioning cavities 161, 162 each formed on the wall of the channel 12 besides the flange 15.

[0011] A substantially cross shaped circuit board 20 is mounted in the space 11 and comprises, on a top surface

(see FIG. 2), a central light source (e.g., light-emitting diode (LED)) 22, a first convex lens 23 mounted on the light source 22, and positive and negative electrical connections 21 extending from the light source 22 toward opposite directions. Note that LED as the light source 22 may be replaced with an electric light bulb in other embodiments.

[0012] A funnel shaped reflector 30 is mounted above the first convex lens 23. A watertight cover 50 comprises a second convex lens 51 rested upon the reflector 30, the second convex lens 51 being made of transparent glass or plastic, and a lens collar 52 having inner threads (not shown) secured to the threads 13 so that the watertight cover 50 can be mounted on the housing 10 with both the second convex lens 51 and the reflector 30 being fastened therein. Moreover, an upper O-ring 53 is provided on inner annular groove (not numbered) of the lens collar 52, and a lower O-ring 54 is provided on an annular groove (not numbered) between the threads 13 and the grooved outer surface of the housing 10 so as to make the coupling of the watertight cover 50 and the housing 10 watertight.

[0013] A power unit 60 comprises a watertight block 65 being shaped substantially as a parallelepiped, the watertight block 65 comprising, on its top surface 651, a first bossed threaded hole 661 at one side proximate one corner, a first arc projection 653 projecting from one side and being adjacent the first bossed threaded hole 661, a second bossed threaded hole 662 at the other side proximate another corner which is diagonal with respect to one corner that the first bossed threaded hole 661 is adjacent thereto, and a second arc projection 652 projecting from the other side and being adjacent the second bossed threaded hole 662. The power unit 60 further comprises a first section of a power cord 61 comprising an insulation layer 62 formed therearound, a plug 64 at one end of the first section of the power cord 61 and having an inner, short positioning ridge 641 adjacent its two prongs (not numbered), an opposite second section of the power cord 61 comprising an insulation layer 62 formed therearound, and a receptacle 63 at one end of the second section of the power cord 61 and having two inner holes (not shown) and an outer, short positioning groove 631. The first and second sections of the power cord 61 are electrically connected together in the watertight block 65 with one conductor of the power cord 61 passing below the first bossed threaded hole 661 and the other conductor of the power cord 61 passing below the second bossed threaded hole 662 respectively.

[0014] A disc shaped bottom plate 70 comprises a transverse trough 71 shaped in conformity to the watertight block 65, and a plurality of threaded holes 72 on both sides of the trough 71. A plurality of screws 81 are driven through the circuit board 20 into threaded holes (not shown) of the housing 10 for securing the circuit board 20 and the housing 10 together. The watertight block 65 is then placed on the channel 12 with the first bossed threaded hole 661 partially inserted in one threaded hole 14, the first arc projection 653 matingly engaged with one positioning cavity 162, the second bossed threaded hole 662 partially inserted in the other threaded hole 14, and the second arc projection 652 matingly engaged with the other positioning cavity 161. A plurality of (two) electricity conducting screws 82 are driven through the circuit board 20, a plurality of (two) threaded insulative sleeves 821, the threaded holes 14, and first and second bossed threaded holes 661, 662 to have its sharp ends piercing through the insulation layers 62 to be electrically connected to the conductors of the power cord 61 (see FIGS. 4 and 5). Also, the flanges 15 are sealingly urged against peripheries of the first and second bossed threaded holes 661, 662 to seal same therein (i.e., functioning as a watertight annular wall) so that water is prevented from entering the points of the electricity conducting screws 82 piercing the power cord 61 (i.e., water is prevented from entering the power cord 61). Further, the heads of the electricity conducting screws 82 are electrically connected to the positive and negative electrical connections 21 respectively. Finally, a plurality of screws 90 are driven through the threaded holes 72 into threaded holes (not numbered) on the underside of the housing 10. As a result, the power unit 60 is secured to the housing 10. This completes the assembly of the invention.

[0015] In addition to the improved watertightness, the invention has an additional advantage. Light emitted by the light source 22 is converged by the first convex lens 23 and travels toward the bottom of the second convex lens 51 with the help of the reflector 30 (i.e., the light converging effect is enhanced). Next, the light leaves the second convex lens 51 with the light converging effect being further enhanced. That is, the provision of the reflector 30, the first convex lens 23, and the second convex lens 51 can direct beams of light emitted by the light source 22 to leave the light fixture 100 in a collimated fashion. Thus, the intensity of output light is increased significantly and the power for the watertight spotlight fixture can be decreased accordingly.

[0016] Referring to FIG. 7, one watertight light fixture 100 can be coupled to the other watertight light fixture 100 by inserting the plug 64 into the receptacle 63 with the ridge 641 and the groove 631 being matingly secured together with a correct connection polarity when used in a DC (Direct Current) source. In such a manner, a plurality of watertight light fixtures 100 can be electrically connected together.

[0017] While the invention herein disclosed has been described by means of specific embodiments, numerous modifications and variations could be made thereto by those skilled in the art without departing from the scope of the invention set forth in the claims.

Claims

1. A watertight spotlight fixture comprising:

a cylindrical housing (10);
a circuit board (20) mounted in the housing (10) and comprising a light source (22) and a first convex lens (23) mounted on the light source (22);
a funnel shaped concave reflector (30) mounted above the first convex lens (23);
a watertight cover (50) comprising a second convex lens (51) rested upon the reflector (30), and a lens collar (52) releasably secured to the housing (10) so as to mount the watertight cover (50) on the housing (10) with both the second convex lens (51) and the reflector (30) being fastened therein;
a power unit (60) comprising a watertight block (65); and
a bottom plate (70) releasably secured to a bottom of the housing (10) to fasten the watertight block (65) therein,
wherein light emitted by the light source (22) is converged by the first convex lens (23) and travels toward the second convex lens (51), and the light is further converged by the second convex lens (51).

2. The watertight spotlight fixture of claim 1, further comprising at least one O-ring (53) for making the mounting of the watertight cover (50) on the housing (10) watertight.

3. The watertight spotlight fixture of any one of the preceding claims, wherein the circuit board (20) further comprises positive and negative electrical connections (21), and the watertight spotlight fixture further comprising two insulative sleeves (821) and two electricity conducting screws (82) driven through the circuit board (20) and the threaded insulative sleeves (821) to be electrically connected to the positive and negative electrical connections (21) respectively.

4. The watertight spotlight fixture of any one of the preceding claims, wherein the second convex lens (51) is made of transparent material.

5. The watertight spotlight fixture of any one of the preceding claims, wherein the second convex lens (51) is made of transparent plastic.

6. The watertight spotlight fixture of any one of the preceding claims, wherein the bottom plate (70) is threadedly secured to the housing (10).

7. The watertight spotlight fixture of any one of the preceding claims, wherein the light source (22) comprises a light-emitting diode (LED).

8. The watertight spotlight fixture of any one of the preceding claims, wherein the light source (22) comprises an electric light bulb.

9. The watertight spotlight fixture of any one of the preceding claims, wherein the bottom plate (70) comprises a transverse trough (71) shaped in conformity to the watertight block (65), and wherein the housing (10) further comprises a plurality of longitudinal fins (101) on an outer surface for heat dissipation, a transverse channel (12) on an underside, a plurality of threaded holes (14) on a bottom being in communication with the channel (12), and a plurality of annular flanges (15) each formed around and urged against an opening of the threaded hole (14) on the channel (12) so that water is prevented from entering both the watertight block (65) and the housing (10).

10. The watertight spotlight fixture of any one of the preceding claims, wherein the power unit (60) further comprises a power cord (61) comprising a first section extending in a first direction, a plug (64) formed on an end of the first section, a second section extending in a second direction opposing the first direction, and a receptacle (63) formed on an end of the second section, wherein the watertight block (65) comprises first and second bossed threaded hole (661, 662) partially disposed in the threaded hole (14) respectively, the watertight spotlight fixture further comprising two electricity conducting screws (82) driven through the circuit board (20), the threaded holes (14), and the first and second bossed threaded holes (661, 662) to have its sharp ends piercing into the power cord (61) to be electrically connected thereto, and wherein the first and second bossed threaded holes (661, 662) are sealingly surrounded by the flanges (15) so that water is prevented from entering both the watertight block (65) and the housing (10).

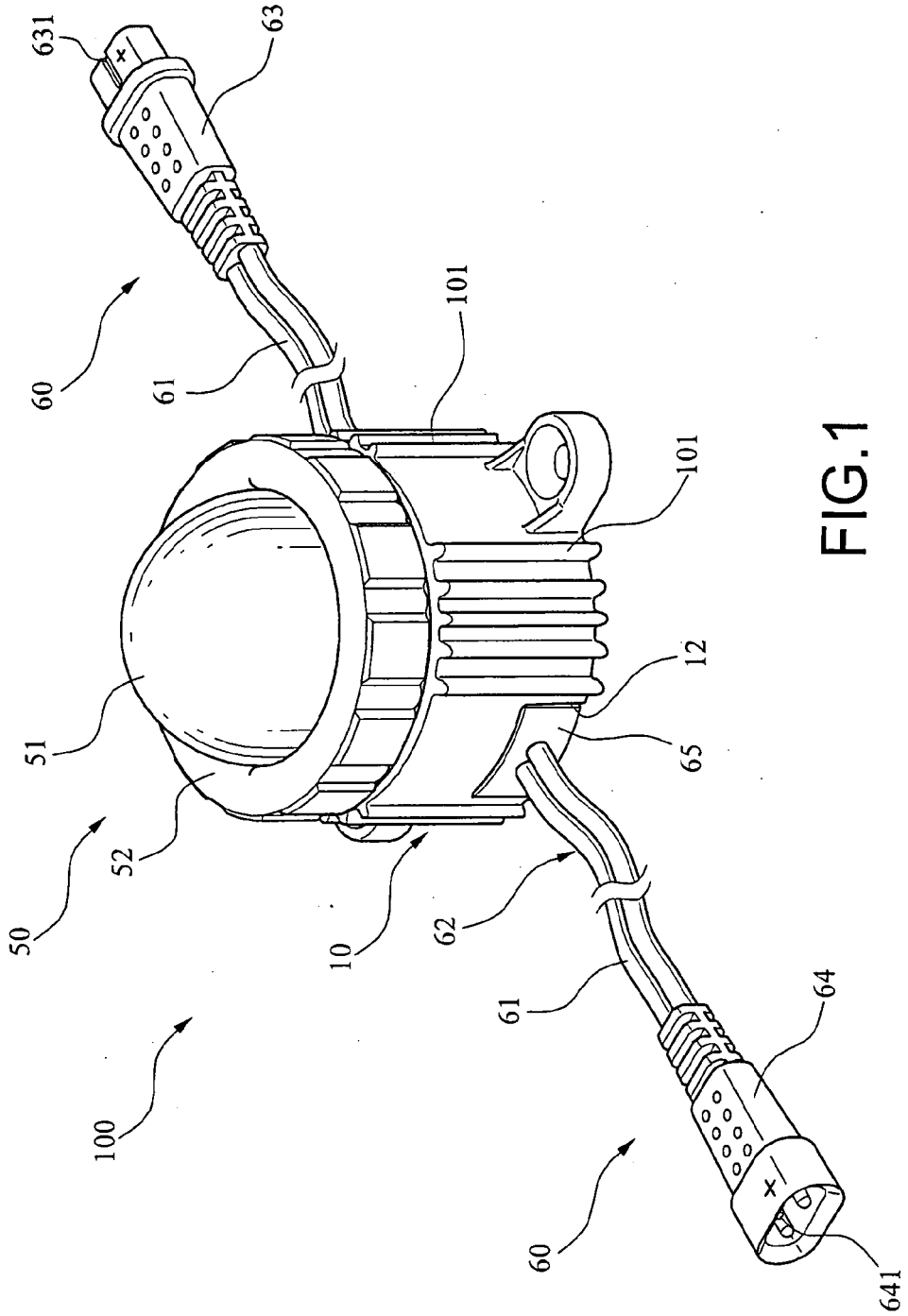

FIG.1

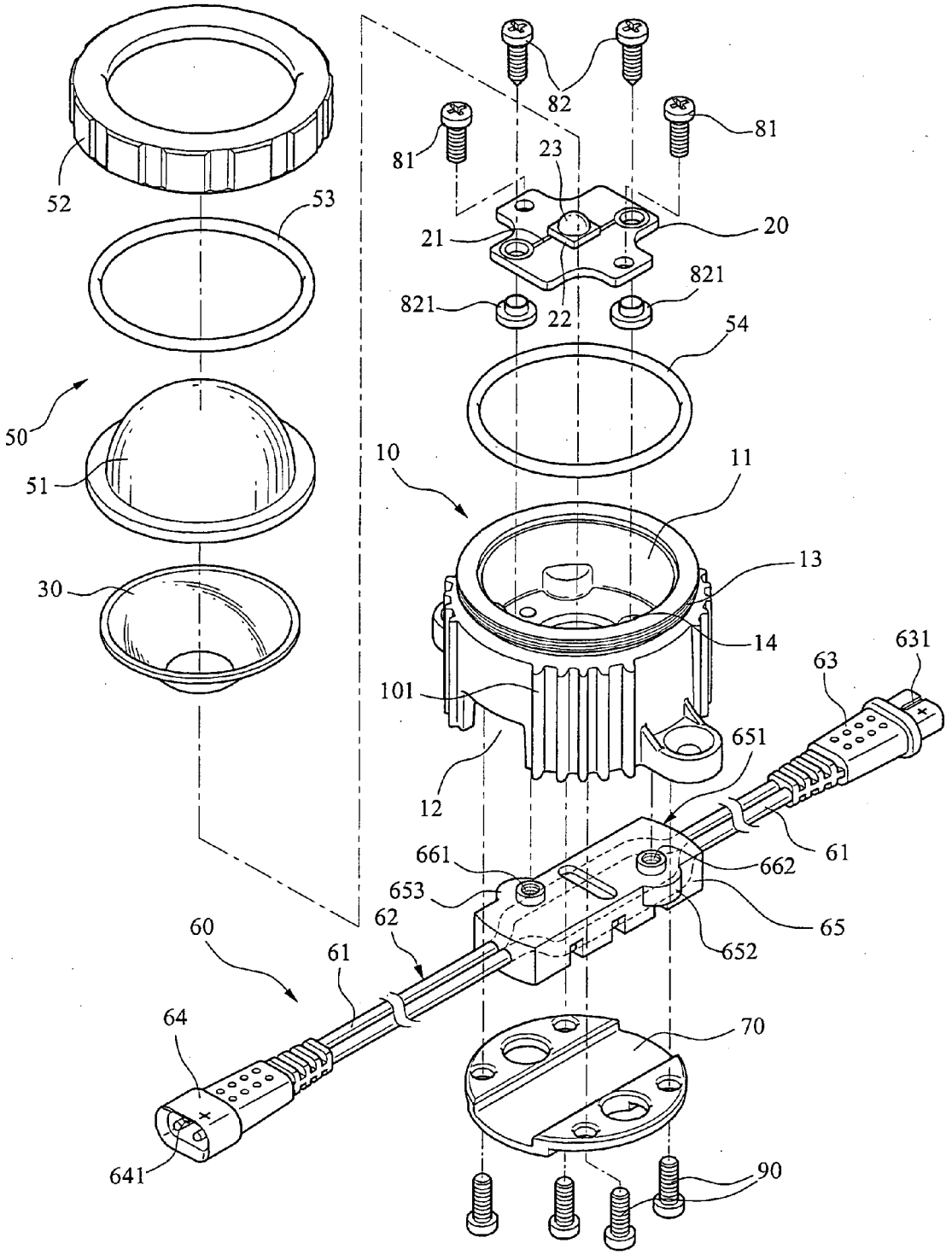
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FIG.2

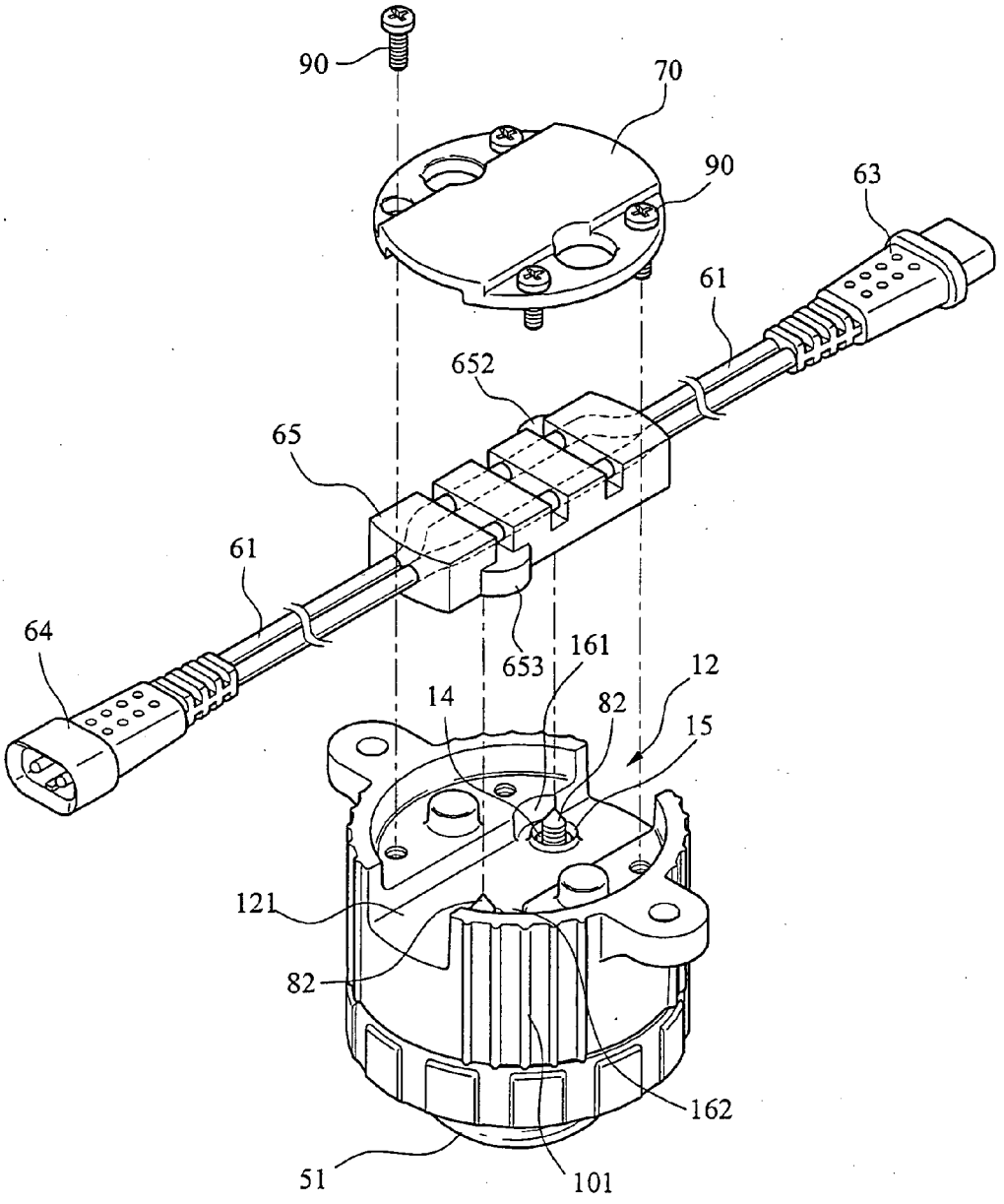

FIG.3

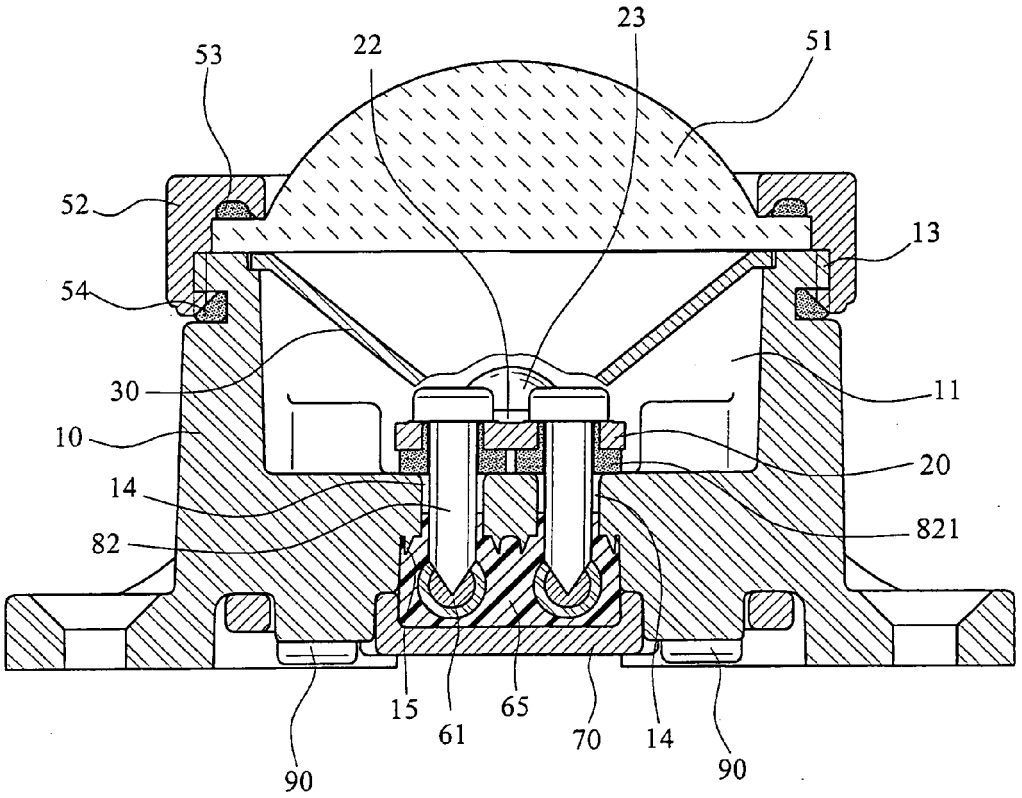
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FIG.4

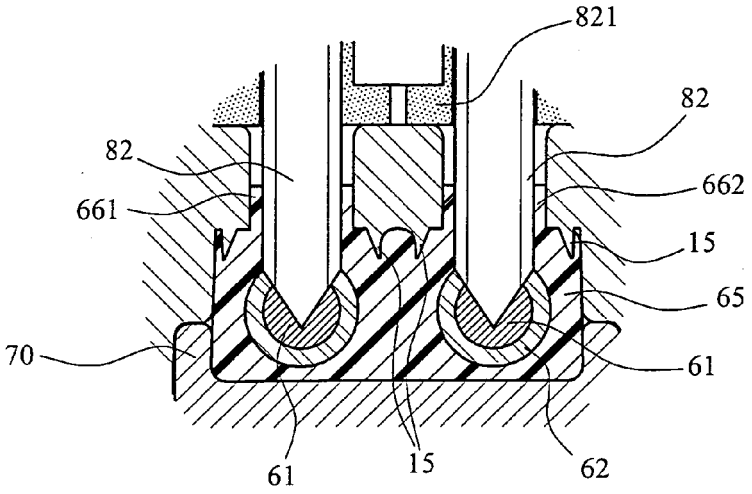
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FIG.5

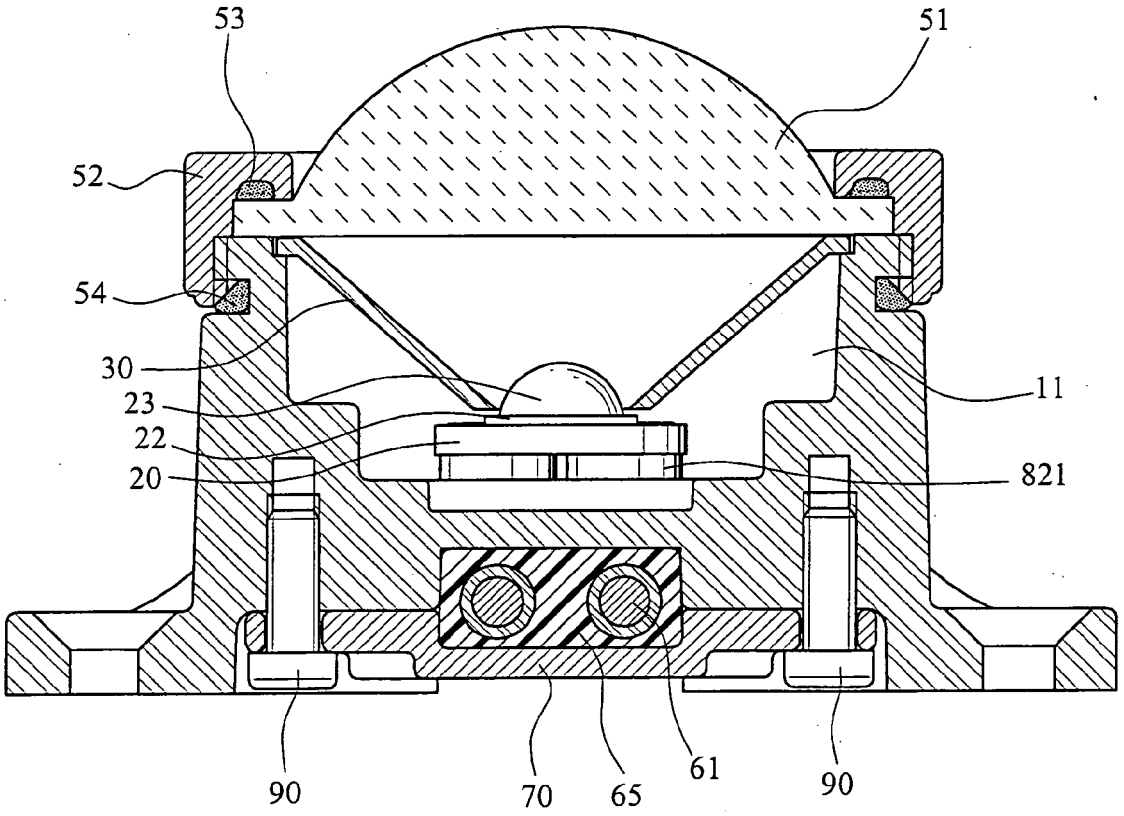

FIG.6

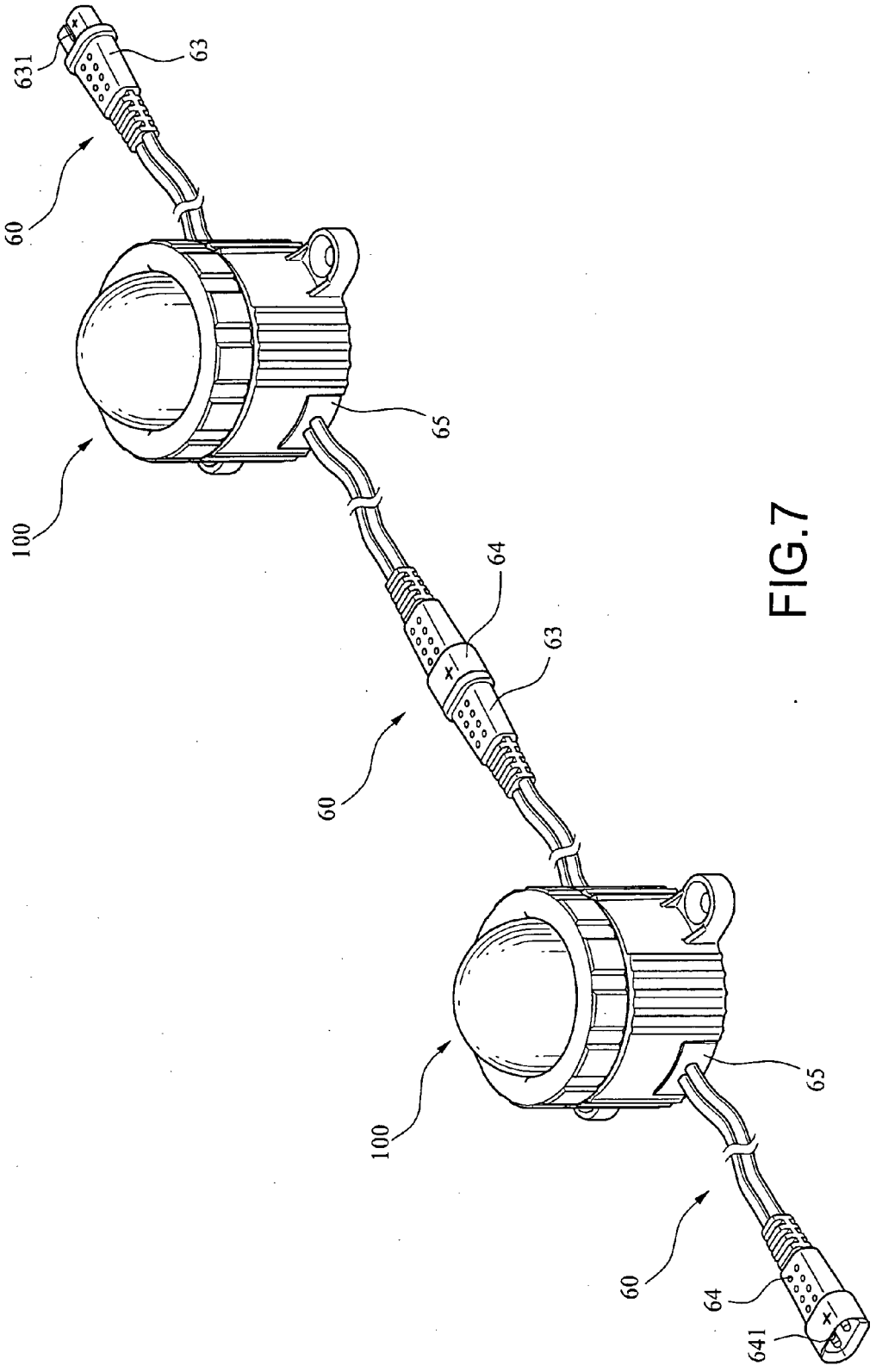

FIG.7

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EUROPEAN SEARCH REPORT

Application Number
EP 09 01 1001

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	20 October 2009	von der Hardt, M

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2

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EUROPEAN SEARCH REPORT

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	20 October 2009	von der Hardt, M

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