United States Patent

Leslie et al.

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[54] LAMP ASSEMBLY HAVING TERMINAL PINS FOR ENGAGING EXTERNAL CIRCUIT CONNECTORS

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[52] **U.S. Cl.** .....**313/318,** 339/126, 339/176 L, 340/324, 340/366 G, 340/378 A

[51] **Int. Cl.** **H01j 5/48,** H01j 5/50

[58] **Field of Search** .....313/318; 340/324 R, 366 G, 340/378 R, 378 A; 339/126, 127 R, 59 L, 176 L, 144, 145

[56] **References Cited**

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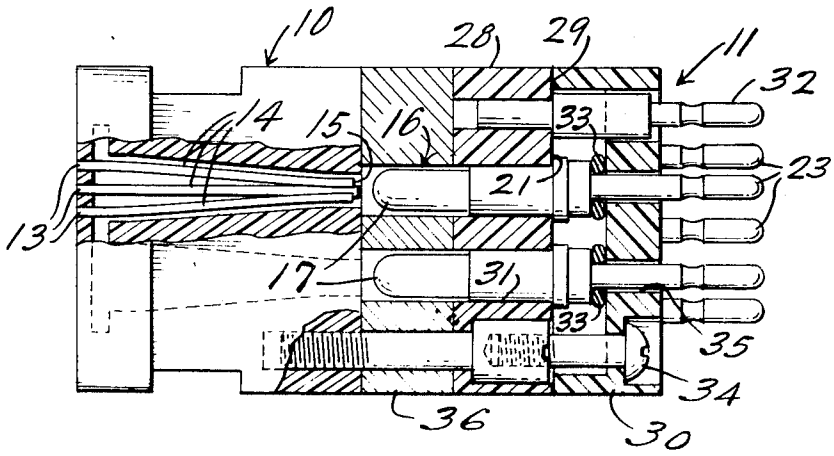
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[57] **ABSTRACT**

An assembly for mounting a plurality of lamps in readout devices, illuminated switches, indicators, and the like. In one embodiment, each lamp is electrically connected to a flanged base and to a terminal pin insulated from and projecting from the base. The lamps are positioned in openings through a conductor carrying lamp mounting plate. The lamp terminal pins, and a common terminal connected to the conductor on the mounting plate, project through openings in a base plate which is releasably attached to the mounting plate for changing the lamps. In a second embodiment, lamps having conventional flanged bases are positioned in openings in the mounting plate and headed terminal pins are mounted in the base plate such that the pin heads contact the lamps. In both embodiments, a plurality of elastomeric rings, one placed on each terminal pin, are compressed between the lamps, or the terminal pin heads, and the base plate to urge the lamp base flanges into electrical contact with the conductor on the lamp mounting plate. The terminal pin openings in the base plate are slightly enlarged so that the terminal pins can move to a small extent to align with an external circuit connector.

17 Claims, 4 Drawing Figures



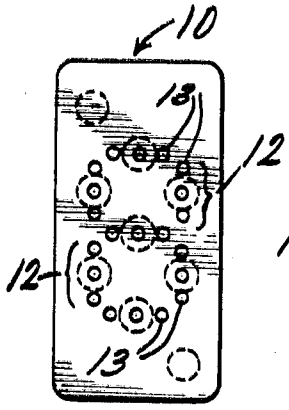


FIG-1-

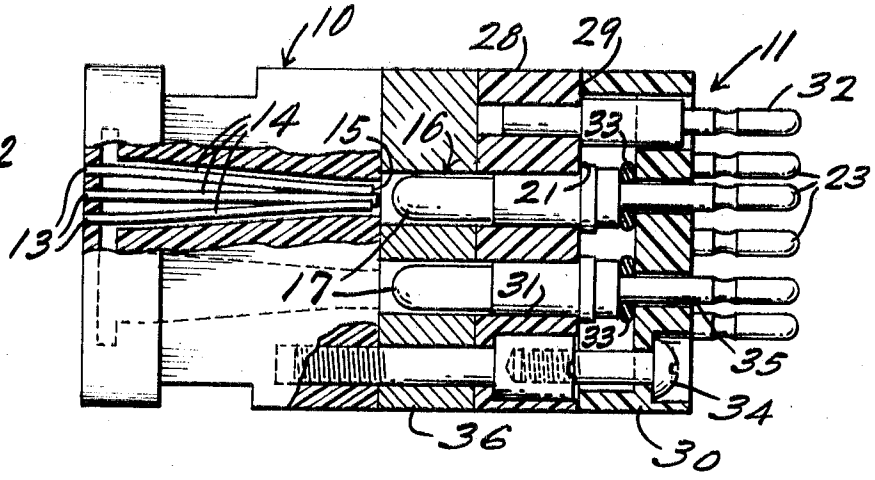


FIG-2-

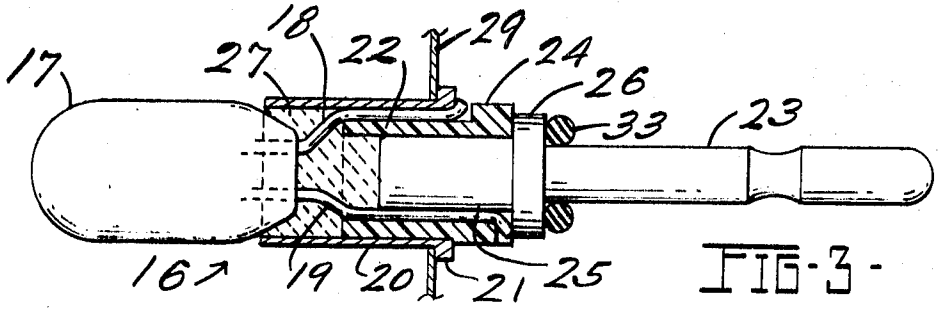


FIG-3-

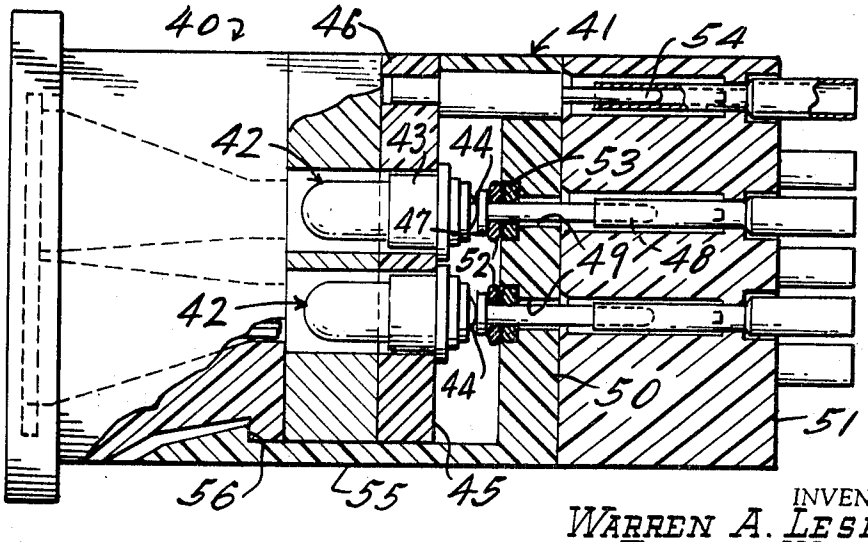


FIG-4-

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LAMP ASSEMBLY HAVING TERMINAL PINS FOR ENGAGING EXTERNAL CIRCUIT CONNECTORS

BACKGROUND OF THE INVENTION

This invention relates to lamp assemblies and more particularly to an improved assembly for mounting a plurality of lamps in readout devices, illuminated switches, indicators, and the like.

Lamp assemblies are used in various devices to mount one or more electric lamps and to make the necessary electrical connections to the mounted lamps. Miniaturization of many electrical devices has presented problems in mounting lamps for ease of replacement, while maintaining reliable electrical connections to the lamps. These problems are particularly serious in readout devices, such as warning and message indicators, segment type readout devices and projection type readout devices, because each of these devices typically includes several small lamps mounted in a closely spaced relationship. Furthermore, readout devices of this type are often used in critical circuits, such as in computer control panels and in aircraft and military controls, where faulty lamps must be quickly replaced. In the past, miniature and sub-miniature lamps have usually had either wire leads or flanged bases for connection to an external circuit. The wires, which are soldered to or wrapped around terminals, provide a reliable electrical connection. However, lamps with wire lead connections are difficult to replace. Lamps having flanged bases are easier to replace. However, electrical contact is typically made through a small spring terminal which is subject to failure. When, for example, the lamp has a diameter on the order of one-eighth inch and as many as 16 lamps are mounted in a three-quarter inch by five-eighth inch space, it is difficult to mount sixteen small, yet reliable spring terminals in such a confined space. If any spring terminal or lamp base becomes dirty or oxidized, a resistive contact can occur between the terminal and the lamp, resulting in a failure.

SUMMARY OF THE INVENTION

According to the present invention, an improved assembly is provided for removably mounting a plurality of lamps in electrical devices. In one embodiment of the invention, each lamp includes a bulb which is attached to a flanged base and to a terminal pin. Electrical connections are made from the bulb to the base and to the terminal pin which is projecting from, and insulated from, the base. The flanged lamp bases are received by openings in a conductor carrying mounting plate, such as a copper clad circuit board. A base plate having openings for passing the lamp terminal pins is releasably attached to the mounting plate. A nonconducting, elastomeric ring is positioned on each lamp terminal pin between the lamp base and the mounting plate. The elastomeric ring may, for example, comprise either an O-ring or a ring molded in place. When the base plate is attached to the mounting plate, each elastomeric ring is compressed between the lamp base and the base plate, forcing the flanges on the lamp bases into electrical contact with the conductor on the mounting plate. The conductor is in turn connected to a common terminal. The terminal pin openings in the base plate are sufficiently large that the pins will move to self-align with an external circuit connector. One or more of the lamps can be quickly replaced by simply removing the external circuit connector and the base plate and lifting the loose lamps from the mounting plate.

In a second embodiment of the invention, lamps having conventional flanged bases with a center contact are used in the lamp assembly. The flanged lamp bases are again positioned in openings in a conductor carrying mounting plate, with the base flanges contacting the conductor. A plurality of headed terminal pins are positioned in openings in a base plate such that each pin head will align with a center contact on a different lamp. At least one, and preferably two, elastomeric rings are placed on each terminal pin. The base plate is then releasably attached to the mounting plate with the rings compressed between the pin heads and the base plate. The rings exert a sufficient force to maintain electrical and mechanical contact between each terminal pin head and the adjacent lamp center contact and between the lamp base flanges and the conductor on the mounting plate. The pin openings in the base plate are sufficiently large that the pins can move to align with an external circuit connector. When two elastomeric rings are placed on a terminal pin, one is preferably recessed into the base plate to retain the pin with the base plate while the base plate is removed for lamp replacement and to form a seal for preventing passage of dust and moisture.

Accordingly, it is a primary object of this invention to provide an improved lamp assembly for releasably mounting a plurality of lamps.

Another object of the invention is to provide an improved assembly for releasably mounting a plurality of closely spaced lamps in readout devices, illuminated switches, indicators, and the like.

Other objects and advantages of the invention will become apparent from the following detailed description, reference being made to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a front elevational view of a readout device embodying an improved lamp assembly according to the instant invention;

FIG. **2** is a side elevational view, in partial section, of the readout device of FIG. **1**, showing the lamp assembly in detail;

FIG. **3** is an enlarged sectional view of a lamp showing the attachments to the flanged base and the terminal pin; and

FIG. **4** is a side elevational view, in partial section, of a modified embodiment of a lamp assembly.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to FIGS. **1** and **2**, a readout device **10** is shown embodying a lamp assembly **11** according to the instant invention. The readout device **10** is of a segment type wherein each segment **12** is defined by ends **13** of a plurality of fiber light guides **14**. The fiber light guides **14** for each segment have second ends **15** which are bundled together adjacent a lamp **16**. When the lamp **16** is energized, light passes through the guides **14** and is emitted from the guide ends **13** to define a brightly illuminated segment **12**. By energizing preselected combinations of the lamps **16**, the seven segments **12** may be illuminated to form the digits one through nine and zero.

Although the lamp assembly **11** is shown embodied in a segment type readout device **10**, it is to be understood that the lamp assembly **11** may be embodied in other types of readout devices. For example, the lamp assembly **11** may be embodied in a projection type readout device as shown in Hollowich et al. U.S. Pat. No. 3,096,512 or in a warning indicator device such as is shown in Hallerberg U.S. Pat. No. 3,090,949. The disclosures of the Hollowich et al., and Hallerberg patents are incorporated herein.

Referring now to FIG. **3**, the lamp **16** comprises a bulb **17** having wire leads **18** and **19**, a tubular base **20** having an annular flange **21**, an insulator sleeve **22**, and a terminal pin **23**. The base **20** is formed of a conductive material such as brass and has either the same or a slightly larger outer diameter as the bulb **17**. The insulator sleeve **22** is designed to slide into the base **20** with the lead **18** pinched between the insulator sleeve **22** and the base **20**. A flange **24** on the insulator sleeve **22** prevents the sleeve **22** from moving too far into the base **20**. An end **25** of the terminal pin **23** is similarly pressed into the insulator sleeve **22**, with the lead **19** pressed between the sleeve **22** and the pin end **25**. A flange **26** on the pin **23** limits axial movement of the pin **23** into the insulator sleeve **22**. Sufficient pressure is exerted on the leads **18** and **19** to maintain electrical contact between the lead **18** and the base **20** and between the lead **19** and the pin end **15** without soldering or welding the leads **18** and **19**. Void spaces within the base **20** are filled with a suitable cement, such as an epoxy resin, to bond the bulb **17** to the base **20**, the insulator sleeve **22** and the pin **23**.

Turning again to FIG. 2, one embodiment of a lamp assembly 11 is shown in detail. The lamp assembly 11 generally comprises a mounting plate 28 having an electrical conductor 29 attached thereto and a base plate 30. The mounting plate 28 and conductor 29 may, for example, consist of a copper clad printed circuit board or a plate molded from a synthetic resinous material with a conductor attached thereto. The lamps 16 are inserted into openings 31 in the mounting plate 28. The openings 31 are sufficiently large as to pass the lamp bases 20, while blocking passage of the flanges 21. All of the lamp base flanges 21 electrically contact the conductor 29, which is connected to a common terminal 32. An elastomeric ring, such as a conventional O-ring 33, is placed on the terminal pin 23 for each lamp 16 to function as a spring. When the base plate 30 is attached to the mounting plate 28 by means of one or more screws 34 or with other suitable attaching means, the O-ring 33 on each lamp terminal pin 23 is compressed against the base plate 30, thereby urging the lamp base flange 21 into mechanical and electrical contact with the conductor 29. The screws 34 or other attaching means releasably engage the mounting plate 28 to allow removal of the base plate 30 for replacing the lamps 16. The base plate 30 has a plurality of openings 35, one for passing each lamp terminal pin 23. The openings 35 are preferably larger in diameter than the diameter of the pins 23, allowing the lamps 16 to move slightly for aligning the pins 23 with an external circuit connector (not shown). The lamp assembly 11 is also provided with a plate 36 positioned about the bulb 17 of each of the lamps 16. The plate 36 is formed of aluminum, or other suitable heat conductive material, and functions as a heat sink to cool the lamps 16.

Referring now to FIG. 4, a readout device 40 is shown with a modified lamp assembly 41. The lamp assembly 41 is adapted for use with a conventional lamp 42 having a flanged base 43 and a center contact 44. The flanged lamp base 43 contacts a conductor 45 which is attached to a mounting plate 46. The lamp center contact 44 is in electrical contact with a headed end 47 of a terminal pin 48. The terminal pin 48 passes through an opening 49 in a base plate 50. Again, the opening 49 in the base plate 50 is slightly larger than the diameter of the terminal pin 48, allowing the terminal pin 48 to move into alignment with an external circuit connector 51. Two O-rings 52 and 53 are shown positioned on the terminal pin 48. The O-rings 52 and 53 are compressed between the headed end 47 of the terminal pin 48 and the base plate 50 to urge the pin head 47 into electrical contact with the lamp contact 44 and the flanged lamp base 43 into electrical contact with the conductor 45. The conductor 45, which is connected to all of the lamp bases 43, is connected to a common terminal 54. The base plate 50 includes a resilient arm portion 55 which terminates into a catch 56 for releasably engaging the readout device 40. By releasing the catch 56, the base plate 50 is removed from the readout device 40 for replacing the lamps 42. The O-rings 53 on the terminal pins 48 are recessed into the base plate 50 to serve the further functions of sealing the terminal pins 48 to the base plate 50 against passage of dust and moisture, and of holding the terminal pins 48 in the base plate 50 when the base plate 50 is removed from the readout device 40. Although two O-rings 52 and 53 are shown in FIG. 4, it is readily apparent that other similar types of elastomeric rings may be used. Elastomeric material can, for example, be molded into generally flat washers or into short tubular pieces for replacing the O-rings.

It will be appreciated that various modifications and changes may be made in the lamp assembly and in devices in which the lamp assembly is incorporated without departing from the spirit and the scope of the appended claims.

What we claim is:

1. A lamp assembly comprising, in combination, a plurality of lamps, each having electrical connections to a flanged base and to a terminal pin projecting from said base, said terminal pin being electrically insulated from said lamp base, a common terminal, a lamp mounting plate having a plurality of openings for receiving and supporting said plurality of lamp bases, means electrically connecting said lamp bases to said common terminal, a plurality of springs, at least one spring positioned on each lamp terminal pin, an electrically nonconducting base plate having a plurality of openings for passing said lamp terminal pins whereby each of said lamp terminal pins is in position to engage an external circuit connector, and means for releasably connecting said base plate to said lamp mounting plate, said springs being compressed between said base plate and said lamps when said base plate is connected to said lamp mounting plate.

2. A lamp assembly, as defined in claim 1, wherein said means connecting said lamp bases to said common terminal comprises an electrically conductive layer attached to said lamp mounting plate, said springs urging said flanged lamp bases into electrical contact with said layer on said mounting plate.

3. A lamp assembly, as defined in claim 2, wherein said springs are elastomeric O-rings.

4. A lamp assembly, as defined in claim 1, wherein said springs are elastomeric O-rings.

5. A lamp assembly, as defined in claim 1, wherein said springs are elastomeric rings.

6. A lamp assembly, as defined in claim 1, wherein said means for releasably connecting said base plate to said lamp mounting plate includes at least two retaining screws.

7. A lamp assembly, as defined in claim 1, wherein said means for releasably connecting said base plate to said lamp mounting plate includes snap means.

8. A lamp assembly, as defined in claim 1, wherein the terminal pin openings in said base plate are larger than the diameters of said terminal pins, whereby said terminal pins can move to align with an external circuit connector.

9. A lamp assembly comprising, in combination, a plurality of lamps, each lamp having electrical connections to a flanged base and to a terminal insulated from said base, a common terminal, a lamp mounting plate having a plurality of openings for receiving and supporting said plurality of lamp bases, means electrically connecting said lamp bases to said common terminal, an electrically nonconducting base plate, means for releasably connecting said base plate to said mounting plate, a plurality of headed terminal pins, said terminal pins being positioned in openings through said base plate with the head of each pin in electrical contact with a lamp terminal and wherein the other end of each of said terminal pins is in position to engage an external circuit connector, and a plurality of elastomeric rings, at least one elastomeric ring positioned on each terminal pin, each elastomeric ring being compressed between the terminal pin head and said base plate to urge such pin head into electrical contact with a lamp terminal.

10. A lamp assembly, as defined in claim 9, wherein said elastomeric rings are O-rings.

11. A lamp assembly, as defined in claim 9, wherein said means connecting said lamp bases to said common terminal comprises an electrically conductive layer attached to said lamp mounting plate, said elastomeric rings urging said flanged lamp bases into electrical contact with said layer on said mounting plate.

12. A lamp assembly, as defined in claim 11, wherein the terminal pin openings in said base plate are larger than the diameters of said terminal pins, whereby said terminal pins can move to align with an external circuit connector.

13. A lamp assembly, as defined in claim 12, wherein two elastomeric rings are mounted on each terminal pin, one of said two rings on each terminal pin engaging a recess on said base plate to retain said terminal pins when said base plate is released from said mounting plate.

14. A lamp assembly comprising, in combination, a lamp having electrical connections to a flanged base and to a terminal pin projecting from said base, said terminal pin being electrically insulated from said lamp base, a common terminal, a lamp mounting plate having an opening for receiving and supporting said lamp base, means electrically connecting said lamp base to said common terminal, a spring, said spring

being positioned on said lamp terminal pin, a base plate having an opening for passing said lamp terminal pin whereby an end of said lamp terminal pin is in position to engage an external circuit connector, and means for releasably connecting said base plate to said mounting plate, said spring being compressed between said base plate and said lamp when said base plate is connected to said mounting plate.

15. A lamp assembly, as defined in claim **12**, wherein said spring is an elastomeric O-ring.

16. A lamp assembly comprising, in combination, a lamp having electrical connections to a flanged base and to a terminal insulated from said base, a common terminal, a lamp mounting plate having an opening for receiving and supporting said lamp base, means electrically connecting said lamp base to said common terminal, a base plate, means for releasably connecting said base plate to said mounting plate, a headed terminal pin, said terminal pin being positioned in an opening through said base plate with said pin head in electrical contact with said lamp terminal and wherein an end of said terminal pin is in position to engage an external circuit connector, and at least one elastomeric ring positioned on said terminal pin, said elastomeric ring being compressed between said terminal pin head and said base plate to urge said pin head into electrical contact with said lamp terminal.

17. A lamp assembly, as defined in claim **16**, wherein said elastomeric ring is an O-ring.

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