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3,229,083

REPLACEABLE MINIATURE LAMP ASSEMBLY

Filed May 22, 1963

FIG. 3.

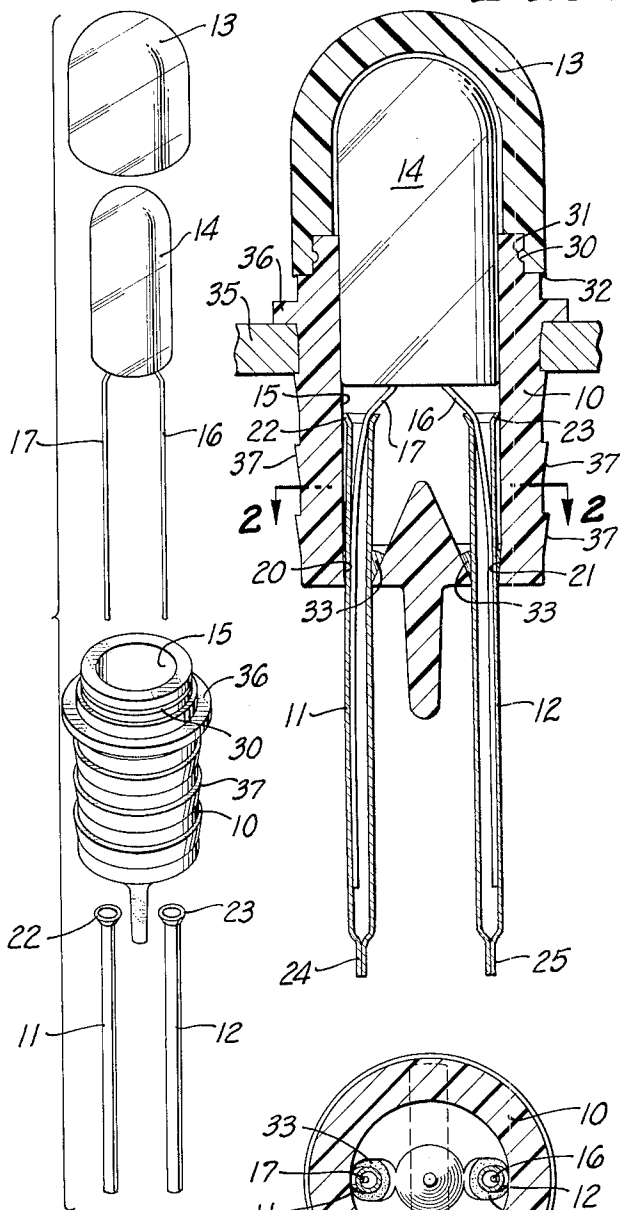


FIG. 1.

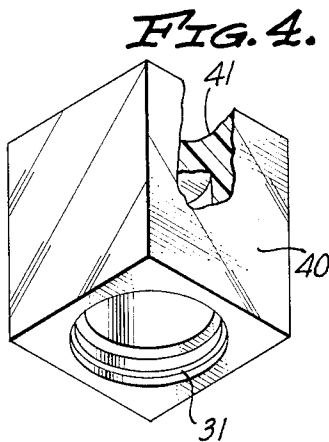


FIG. 4.

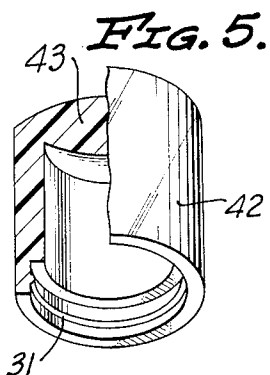
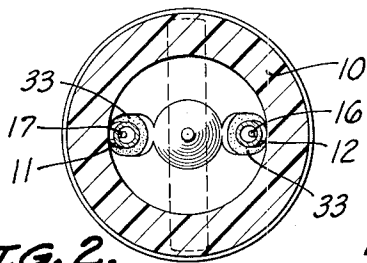


FIG. 5.

FIG. 2.



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REPLACEABLE MINIATURE LAMP ASSEMBLY

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9 Claims. (Cl. 240—8.16)

This invention relates to lamps and, in particular, to very small lamps for use with very small bulbs.

Extremely small electric bulbs are now widely used and are available with two different means for connection into electrical circuits. Bulbs with wire leads may be soldered or welded directly into the circuit. This mode of use is highly satisfactory for initial installation but presents many difficulties when a bulb needs replacing. Bulbs are also available with metal bases for insertion into mating sockets. Bulbs of this type are much easier to install and replace but the base and socket often is larger than the bulb, defeating the initial purpose of achieving a small over-all installation. It is an object of the present invention to provide a new and improved lamp particularly adapted for use with very small bulbs and one which permits the replacement of bulbs without utilizing bases and mating sockets. A specific object of the invention is to provide such a lamp for use with a wire lead miniature bulb for sliding insertion and removal of the bulb from the lamp housing. The invention is currently being used with production bulbs less than one-eighth inch in diameter and less than one-quarter inch in length.

It is an object of the invention to provide a lamp for a replaceable wire lead miniature bulb and including a housing having a receptacle for receiving the bulb, and a pair of tubular conductors positioned in the housing for slidably receiving the leads of the bulb disposed in the receptacle, with each of the conductors having an open end terminating within the housing and an opposite end terminating outside the housing.

It is an object to provide such a lamp which may be mounted in an opening in a circuit plate or chassis or the like by a simple push fit into the opening. A further object is to provide such a lamp including a cap for closing the open end of the housing and retaining the bulb, with the cap being transparent, translucent or partially opaque as desired. A particular object of the invention is to provide such a lamp which may utilize various forms of caps including a cap with an integral focusing lens and a cap with a flat exterior face for carrying various indicia.

The invention also comprises novel details of construction and novel combinations and arrangements of parts, which will more fully appear in the course of the following description. The drawing merely shows and the description merely describes preferred embodiments of the present invention which are given by way of illustration or example.

In the drawing:

FIG. 1 is a longitudinal sectional view of the preferred form of the lamp;

FIG. 2 is a sectional view taken along the line 2—2 of FIG. 1;

FIG. 3 is an exploded view of the lamp of FIG. 1; and
FIGS. 4 and 5 are isometric views of alternative forms of the cap.

The lamp includes a housing 10, tubular conductors 11, 12, and a cap 13, with the bulb 14 positioned within a receptacle 15 of the housing 10.

The bulb 14 may be a conventional bulb with flexible wire leads 16, 17 normally intended for soldering directly into an electrical circuit.

The housing 10 typically may be molded of plastic and includes openings 20, 21 at the closed end thereof for receiving the tubular conductors 11, 12. The tubes comprising the conductors 11, 12 preferably are flared at the inner ends 22, 23 to facilitate insertion of the bulb leads therein. The exterior ends 24, 25 of the tubes may be closed as by crimping, may be left open, or may be bent into a loop or other shape to facilitate connection thereto. The tubes 11, 12 preferably are made push fits in the openings 20, 21 so that the tubes may be slid into place in the housing.

The hemispherical cap 13 may be of cast plastic and may be transparent or translucent and may be clear or have any desired color. Means are provided for fixing the cap on the housing so that the cap may be mounted and removed as desired. Preferably, an annular groove 30 in the housing engages an annular rib 31 of the cap, permitting the cap to be pushed into place on the housing and to be removed by a pulling force, preferably by a tool engaging the edge 32.

In the preferred mode of use, the tubular conductors are installed in the housing at the factory, as by dipping a conductor in cement and then sliding the conductor into the housing opening, leaving a seal 33 about the conductor. Caps, bulbs and housings with conductors are supplied separately to the circuit assembler. The housing is mounted on a suitable support, such as a panel 35, by pushing the housing into a mating opening from the front side of the panel. The housing is preferably provided with a collar or flange 36 and a plurality of tapered surfaces 37, with the tapers converging toward the tubular conductor end of the housing. The opening in the mounting panel is preferably made a slight interference fit with the maximum size of the taper permitting the housing to be pushed into the opening with the shoulder of a taper engaging the back side of the mounting panel for retaining the housing in place. Normally the housings are cylindrical for insertion into round openings but of course square, octagonal and other cross-sectional shapes may be utilized for the housing as desired.

After the housing is mounted in the panel, the tubular conductors 11, 12 are connected into the electrical circuit by any suitable means. Then the bulb is inserted into the housing with the bulb leads sliding into the tubular conductors, after which the cap is snapped into place. The cap may be removed and a new bulb substituted at any time from the front side of the panel without requiring any soldering, screwing or other mechanical terminal manipulation.

The lamp of the invention is particularly adapted for use with very small bulbs and provides a complete installation for a replaceable bulb that is extremely small and one which requires a minimum of volume in addition to that occupied by the bulb itself. In one form now in use, bulbs less than one-eighth inch in diameter and one-quarter inch in length having wire leads in the order of .007 to .011 inch diameter are mounted in housings three-sixteenths of an inch outside diameter and may be installed in multiples with center-to-center spacing in the order of one-quarter of an inch. In this particular unit, the tubular conductors 11, 12 are formed of beryllium copper tubing .015 inch inside diameter with .005 inch wall thickness. In applications where many indicator lights are required, this extremely small lamp with its easily replaceable bulb permits a very compact and space-saving installation.

Various other forms of caps may be utilized with the housing of FIG. 1. A cap 40 with a square cross section and flat end face 41 is shown in FIG. 4. This form is particularly adapted for presenting indicia in rows and

columns. An opaque character may be positioned on the face 41 or the entire surface may be opaque except for the outline of the desired character.

Another alternative form of cap particularly adapted for producing a concentrated beam of light is shown in FIG. 5. A lens 43 is positioned at the end of the cap 42, the lens preferably being integrally moulded with the cap. This particular cap is especially adapted for use in indicator lamps for calling attention to a malfunction and in lamps used in control circuits for exciting a light sensitive element. These alternative caps are mounted on the housing in the same manner as the cap 13 of FIG. 1 and the caps may be interchanged as desired.

Although exemplary embodiments of the invention have been disclosed and discussed, it will be understood that other applications of the invention are possible and that the embodiments disclosed may be subjected to various changes, modifications and substitutions without necessarily departing from the spirit of the invention.

I claim as my invention:

1. In a miniature illuminating lamp, an assembly for replaceably connecting an illuminating bulb, having elongated flexible leads extending outwardly from the bulb, in an electrical circuit, comprising:

a housing having a receptacle for receiving the bulb; and

a pair of elongated tubular conductors, each slidably receiving and removably engaging with a loose fit one of the leads of said bulb, the interior radial dimensions of said tubular conductors being substantially larger than but related to the exterior dimensions of the leads to insure that the exterior surface of the lead slidably received and removably engaged therein bears against the interior surface of said conductor along a substantial portion of its length establishing an area of electrical contact sufficient to transfer electrical energy for operating said bulb, each of said conductors having an open end terminating in said housing and an opposite end terminating outside said housing for connection into an electrical circuit.

2. In a miniature illuminating lamp, an assembly for replaceably connecting an illuminating bulb, having elongated flexible leads extending outwardly from the bulb, in an electrical circuit, comprising:

a housing having a receptacle for receiving the bulb; and

a pair of elongated tubular conductors, each slidably receiving and removably engaging with a loose fit one of the leads of said bulb, the interior radial dimensions of said tubular conductors being substantially larger than but related to the exterior dimensions of the leads to insure that the exterior surface of the lead slidably received and removably engaged therein bears against the interior surface of said conductor along a substantial portion of its length establishing an area of electrical contact sufficient to transfer electrical energy for operating said bulb, each of said conductors having an open end terminating in said housing to permit insertion of the leads and an opposite end terminating outside said housing for connection in an electrical circuit.

3. In a miniature illuminating lamp, an assembly for replaceably connecting an illuminating bulb, having elongated flexible leads extending outwardly from the bulb in an electrical circuit, comprising:

a housing having a receptacle for receiving the lead end of the bulb;

a pair of elongated tubular conductors, each slidably receiving and removably engaging with a loose fit one of the leads of said bulb, the interior radial dimensions of said tubular conductors being substantially larger than but related to the exterior dimensions of the leads to insure that an area of electrical contact between the exterior surface of the lead slidably

received and removably engaged therein bears against the interior surface of said conductor along a substantial portion of its length establishing an area of electrical contact sufficient to transfer electrical energy for operating said bulb, each of said conductors having an open end terminating in said housing to permit insertion of the leads and an opposite end terminating outside said housing for connection in an electrical circuit; and

a cap for enclosing the opposite end of the bulb within said housing, said housing and cap including cooperating means for removably fixing said cap on said housing with a snap fit.

4. A miniature illuminating lamp assembly as defined in claim 3 in which said cap has a hemispherical closed end.

5. A miniature illuminating lamp assembly as defined in claim 3 in which said cap has an integrally formed lens at the closed end thereof for transmitting light from the bulb.

6. A miniature illuminating lamp assembly as defined in claim 3 in which said cap has a flat exterior face at the closed end thereof for carrying indicia.

7. In a miniature illuminating lamp, an assembly for replaceably connecting an illuminating bulb, having elongated flexible leads extending outwardly from the bulb, in an electrical circuit comprising:

a housing having a receptacle for receiving the bulb and having a peripheral mounting surface with at least one tapered surface extending outwardly from the axis of said receptacle and terminating at the larger end in an abrupt decrease in size; and

a pair of tubular conductors, each slidably receiving and removably engaging with a loose fit one of the leads of said bulb, the interior radial dimensions of said tubular conductors being substantially larger than but related to the exterior dimensions of the leads to insure that the exterior surface of the lead slidably received and removably engaged therein bears against the interior surface of said conductor along a substantial portion of its length establishing an area of electrical contact sufficient to transfer electrical energy for operating said bulb, each of said conductors having an open end terminating in said housing and an opposite end terminating outside said housing for connection in an electrical circuit.

8. In a miniature illuminating lamp, an assembly for replaceably connecting an illuminating bulb, having elongated flexible leads extending outwardly from the bulb, in an electrical circuit, comprising:

a housing having a receptacle for receiving the lead end of a bulb and having a peripheral mounting surface with at least one tapered surface extending outwardly from the axis of said receptacle and terminating at a larger end in an abrupt decrease in size;

a pair of elongated tubular conductors, each slidably receiving and removably engaging with a loose fit one of the leads of said bulb, the interior radial dimensions of said tubular conductors being substantially larger than but related to the exterior dimensions of the leads to insure that the exterior surface of the lead slidably received and removably engaged therein bears against the interior surface of said conductor along a substantial portion of its length establishing an area of electrical contact sufficient to transfer electrical energy for operating said bulb, each of said conductors having a flaring open end at said receptacle permitting the insertion of said leads and an opposite end terminating outside said housing for connection into an electrical circuit; and

a cap for enclosing the opposite end of the bulb within the housing, the housing and cap including cooperating means for removably fixing said cap on said housing with a snap fit.

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9. A miniature illuminating lamp assembly comprising:
 an illuminating bulb having elongated flexible leads extending outwardly from the bulb;
 a housing having a receptacle for receiving the lead 5
 end of the bulb; and
 a pair of elongated tubular conductors, each slidably receiving and removably engaging with a loose fit one of the leads of said bulb, the interior radial dimensions of said tubular conductors being substantially larger than but related to the exterior dimensions of said leads to insure that the exterior surface 10
 of the lead slidably received and removably engaged therein bears against the interior surface of said conductor along a substantial portion of its length establishing an area of electrical contact sufficient to transfer electrical energy for operating said bulb, each of said conductors having an open end terminating in said housing and an opposite end termi-

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nating outside of said housing for connection into an electrical circuit.

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