

[54] SWITCHBOARD LAMP CARTRIDGE PLUG

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[58] Field of Search 340/381 R

[56] References Cited

UNITED STATES PATENTS

3,438,027 4/1969 Silvius 340/381 R

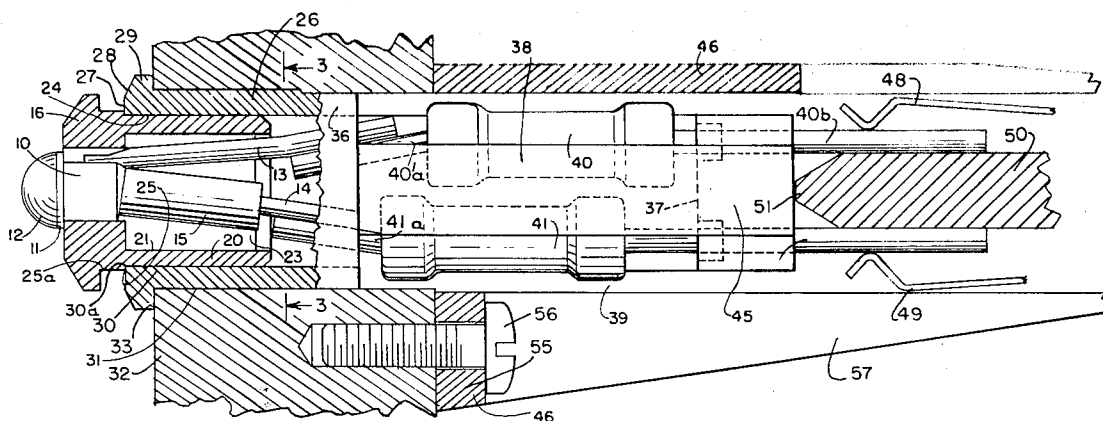
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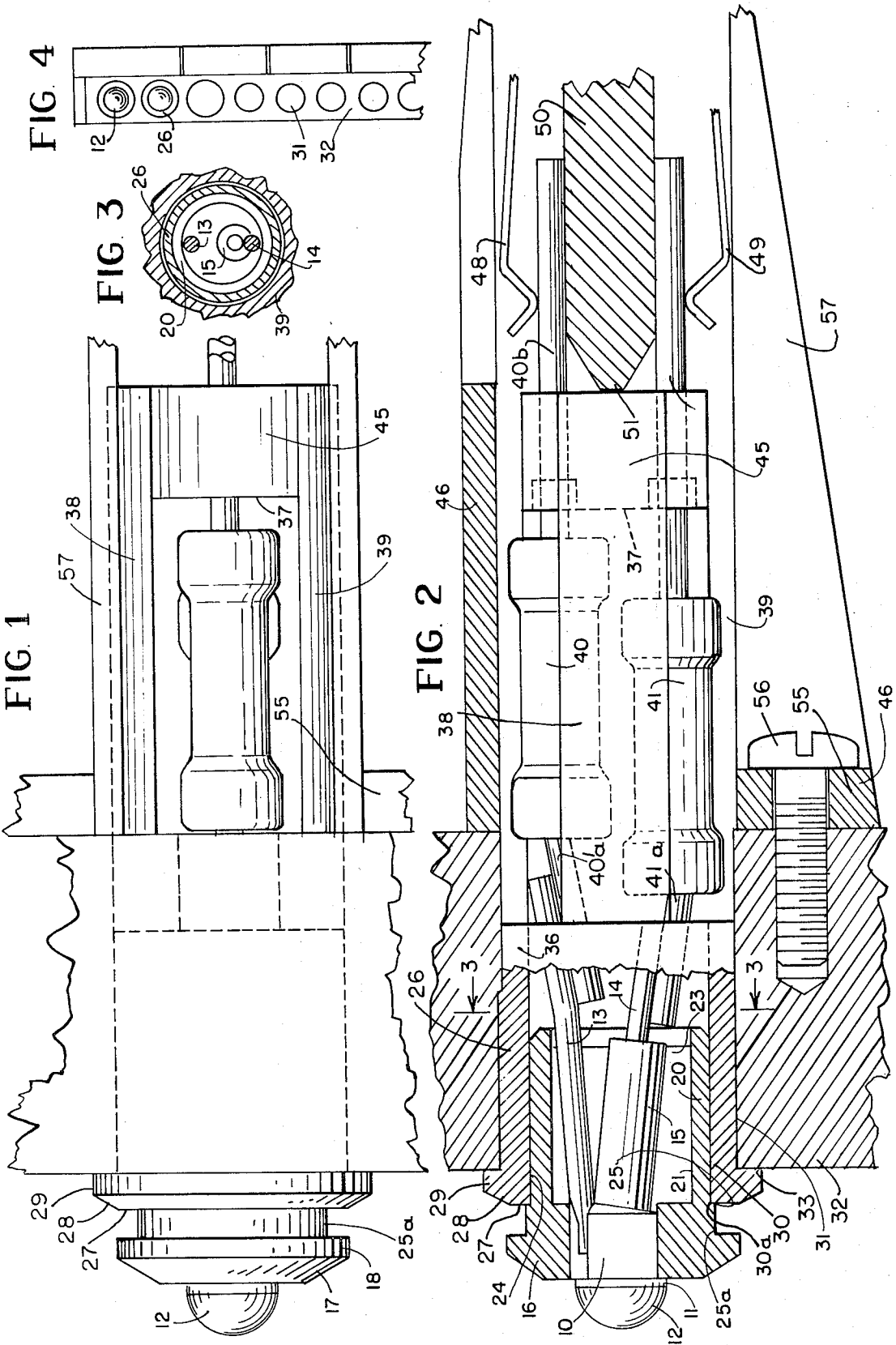
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[57] ABSTRACT

This invention provides a plug or cartridge assembly wherein a heat sensitive Light Emitting Diode (LED), and ballast resistor are part of an assembly, longitudinally spaced along the assembly so that when mounted in a panel aperture, the LED is at one (front) face of the panel and ballast beyond the other (or rear) face of the panel. The ballast is so mounted as to be accessible to atmosphere at the rear of the panel. The entire assembly is readily insertable into or removable from a panel.

1 Claim, 4 Drawing Figures





SWITCHBOARD LAMP CARTRIDGE PLUG

INTRODUCTION

This invention relates to a switchboard lamp cartridge plug and while adapted for general switchboard use, the invention is particularly suitable for telephone boards or other communication system boards having a large number of sockets. While a telephone switchboard uses low power indicating lamps, the large number of such lamps distributed over a board creates a serious heat problem. For the most part, a switchboard or panel generally includes as a supporting element an extensive panel or board of synthetic plastic having a large number of recesses or openings in which are disposed signal lamps and sockets for accommodating plugs or switches for connecting or disconnecting individual circuits as required. Examples of such panels are disclosed in prior U.S. Pat. No. 3,597,866 granted Aug. 10, 1971 and U.S. Pat. No. 3,611,360 granted Oct. 5, 1971. In many instances such signal lamps may be on for long periods of time. The lamps must be visible from the front of the panel.

Within recent years there have been introduced so called SOLID STATE LAMPS. Such lamps are light-emitting diodes having, for example, at least one electrode of such material as Gallium Phosphide, adapted to emit light. These lamps are adversely affected by heat. The light emission is obtained by electroluminescence from a diode during electric current conduction. Such diodes are high efficiency, physically tiny devices, each having two wire leads, usually gold plated. Such light emitting diodes (LED), like all electron discharge devices, require a ballast resistor for each lamp for current control and are used in circuits energized by direct voltages of definite values such as, for example, 24 or 48 volts, widely used in telephone work.

Inasmuch as a solid state lamp requires its own ballast resistor, the value of which depends upon the magnitude of the voltage supply, it is desirable to handle the lamp and its ballast as a unit and design the unit so that it becomes a cartridge plug for insertion into a jack in a panel board.

THE INVENTION GENERALLY

The invention herein comprises a cartridge or plug assembly, of LED lamp together with its ballast, which is suitably assembled in a holder so dimensioned and provided with suitable stiff wire leads so that the entire assembly may be handled as a plug which can be inserted into a conventional jack. The LED lamp is quite sensitive to heat. While the lamp itself is highly efficient and requires little power, the ballast with which the lamp is associated must dissipate, by comparison, a substantial amount of heat energy. Because of this, the plug assembly is so constructed as to promote ready access of atmosphere to the interior of the assembly.

The plug assembly or cartridge itself is constructed to have two rearwardly extending stiff leads which are adapted to function or cooperate with jack contact blades carried by the panel board. Thus, the plug assembly may be readily inserted into or removed from a panel board in the event that a lamp must be replaced. As a rule the arrangement is such that a complete plug assembly consisting of lamp and ballast resistor and stiff leads are treated as a unit which is expendable and replaceable conveniently.

THE DRAWINGS

In order that the invention may be understood it will be explained in conjunction with the drawings wherein:

FIG. 1 is a side elevation of a plug unit embodying the present invention, this unit being shown as positioned within a panel board, the scale of the drawing being much larger than the actual physical size of the item;

FIG. 2 is a view similar to FIG. 1 but showing a longitudinal section of the plug unit and also showing the spring contacts of a jack with which the rearwardly extending leads of the plug unit cooperate;

FIG. 3 is a transverse section along line 3—3 of FIG. 2;

FIG. 4 is a view of a portion of a panel in which the new plug units may be carried.

DESCRIPTION OF THE PREFERRED SPECIES

The panel board upon which the embodiment of the invention is adapted to be carried may consist of any conventional board having a plurality of recesses or openings therethrough disposed along lines, for example, as shown in the issued patents previously identified. As an example, a panel board may be of Bakelite or other rigid insulating plastic material having a thickness of the general order of about one-fourth of three-eighths of an inch and having at least one or more rows of circular apertures therethrough, each one of which may be about one-fourth of an inch in diameter with adjacent apertures being suitably spaced from each other. Above each line of apertures on a panel board, there may be means for accommodating the mounting of indicating or labeling strips to identify each particular receptacle or aperture. A panel board as a rule is rigidly supported in a frame. Sometimes a large number of rows of apertures are disposed in one panel board or one insulating strip may have an individual line of apertures and is carried in a metal frame with spaced strips to make up a complete switchboard panel as suggested in FIG. 4.

The rear face of a panel board usually has means for rigidly bolting a jack for each panel aperture, the jack extending rearwardly perpendicular to the face of the panel. As an example, a panel strip of insulating material having a thickness of substantially three-eighths of an inch may carry jacks having a length of something over 2 inches extending rearwardly from the rear face of the panel strip. Inasmuch as panel strips and panel boards are well known and widely used, no further description thereof is deemed necessary.

DESCRIPTION OF THE PLUG ASSEMBLY EMBODYING THE INVENTION

LED lamp 10 has a generally cylindrical body with enlarged head 11, both being of brass or other conducting metal. Enlarged portion 11 functions as a bezel in which is disposed, as by cementing, lens 12 consisting of transparent or translucent plastic. Lamp 10 comes with leads 13 and 14, preferably of copper and may have a thin plating of gold thereover. As an example, the body of LED lamp 10 is cylindrical and has a diameter of 0.07 inches and a length of about 0.07 inches. The lens has a diameter of substantially 1/10 inches. Wire lead 13 is the anode lead and has a diameter of 0.025 inches while wire 14 is a cathode lead having a

diameter of about 0.020 inches. To prevent short circuiting, one of the wires, here shown as 14, is covered with insulating tubing 15. The lamp is disposed within molded insulating cap 16 having beveled front portion 17 provided with annular shoulder 18. The body of cap 16 continues rearwardly as sleeve 20 whose inner surface 21 is large enough so that wire leads 13 and 14 may lie within sleeve portion 20. To maintain the lamp and its leads firmly within cap 16, interior 23 of sleeve portion 20 may be filled with potting compound used in transformers and other electrical devices for insulation as well as for anchorage. Outer surface 24 of sleeve portion 20 is cylindrical and is shaped to provide small step 25 leading to neck portion 25a which extends to annular portion 18.

Cap 16 is preferably of molded insulating plastic with outer surface 24 of sleeve portion 20 adapted to fit snugly within housing 26. Housing 26 is of molded insulating plastic and has a generally cylindrical inner surface adapted to fit over outer cylindrical surface 24 of the cap. Housing 26 has forward end 27 bevelled at 28 to provide annular portion 29. Housing 26 has sleeve-like portion 30 whose outer surface is cylindrical and is adapted to fit snugly within cylindrical aperture 31 of panel board 32. Housing sleeve portion 26 has edge portion 30a extending between the outer cylindrical sleeve portion 30 and shoulder 33 of the bevelled forward edge. Housing sleeve portion 26 is cemented to outer sleeve portion 24 of the cap. Any suitable cement, such as epoxy resin, may be used. Housing portion 26 however fits snugly within aperture 31 through the panel board and is adapted to be readily inserted into or removed from the panel, as a plug or cartridge.

Housing portion 26 extends rearwardly to provide generally cylindrical elongated support portion 36 having a number of longitudinal windows 37 to leave support fingers 38 and 39. The region within support portion 36 between the fingers is long enough and large enough to accommodate one or two ballast resistors 40 and 41. In some instances, only one resistor is needed. Each resistor has a low power rating usually about one-half watt and a suitable valve. Each resistor has leads 40a and 41a which normally extends forwardly of the resistor and is spot-welded to lamp leads 13 and 14. Resistors 40 and 41 have rearwardly extending leads 40b and 41b if two resistors are used. In the event that only one resistor is needed for a lamp combination, the original lead (13 or 14 as the case may be) is extended rearwardly for the necessary distance. Rear leads 40b and 41b (if two separate leads are necessary) are preferably thick enough and stiff enough to function as contact pins.

Thus for example, if resistor 41 is unnecessary, lead 14 of the lamp is extended rearwardly as lead 41b. The two rearwardly extending leads pass through suitable passages in rear end portion 45 of the housing, said leads being adapted to fit snugly in such passages to be supported thereby. Rear end portion 45 of the housing has substantial thickness along the length of the housing so that good mechanical support is provided for the leads. Jack support bracket 46 carries metal jack spring blade contacts 48 and 49 of conventional shape as shown. Insulating blade 50 having forwardly tapering portion 51 provides a support for jack contact spring blades 48 and 49 against which such contact spring blades can rest. Due to the shape of the forward ends

of contact springs 48 and 49, it is obvious that the rear lead pin portions 40b and 41b, suitably spaced apart from each other, can engage the two contact spring blades and force them open to slip between the spring contact and the insulating blade.

Inasmuch as the lamp assembly is replaced infrequently, the pin-shaped contact leads 40b and 41b can be just stiff enough so that an assembly can be pushed in as shown in FIG. 2. Annular shoulder 33 will rest against the front face of panel 32 and limit the inward travel of the plug cartridge assembly. The entire assembly can be removed by gripping the forward end of housing 26 and withdrawing the assembly.

The light emitting lamp is at the front of the entire plug assembly and is normally well ventilated. In back of the panel, the various ballast resistors will be adequately ventilated, either natural or forced, and will normally be far enough from the lamps so that the possibility of a lamp being subjected to undesirable temperature conditions is quite remote. The housing part of the entire assembly is part of a plug construction where the ballast resistor (or resistors) is spaced rearwardly of the front or diode end of the assembly sufficiently so that for any normal panel thickness, the diode light emitting portion will be at one (front) face of the panel and the ballast (or ballasts) will be rearwardly of the panel other (rear) face so that the ballasts will be in air for heat dissipation.

An individual jack includes a mounting support portion 55 adapted to lie against the rear panel face and adapted to be bolted to the panel rear face by bolt 56. In this instance, the jack mounting support is of molded plastic and has side webs 57. Other jacks may have a metal angle iron, a long leg supporting the jack components and a short leg functioning as a fastening part, similar to portion 55. Any kind of jack may be used for cooperation with the plug assembly described before.

What is claimed is:

1. A lamp cartridge plug for switchboards comprising a light emitting diode having a pair of leads, an insulating cap for supporting said diode, said cap being sleeve-shaped with a light emitting part of said diode disposed at a front cap end for external viewing, said diode leads extending from the rear cap end, a cartridge housing of molded, non-metallic material, said housing having a front sleeve portion disposed about the cap with the light emitting part extending forwardly of the housing sleeve front end, said housing sleeve portion having laterally spaced fingers extending rearwardly of said cartridge, terminating in a dual lead support rear cartridge portion, at least one ballast resistor disposed in said housing at a region between said spaced fingers, a pair of stiff wire leads extending longitudinally of said cartridge, supported in said rear cartridge support portion and extending rearwardly straight from said cartridge, said stiff wire leads being electrically connected through at least one ballast resistor to said diode, said housing outer surface being cylindrical and dimensioned to be insertable as a plug in a signal panel aperture and said stiff leads cooperating with contact blades of a signal panel mounted jack, each diode unit being exposed to atmosphere in front of the panel and longitudinally spaced from a ballast, the ballast being located beyond the rear face of a signal panel, whereby an array of lamp cartridge plugs will have ballast resistors freely accessible to open air in the rear of said signal panel for heat dissipation and individual cartridges may be removed or replaced in case of failure or change in operating conditions.

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