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LAMP SOCKET

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Fig. 1

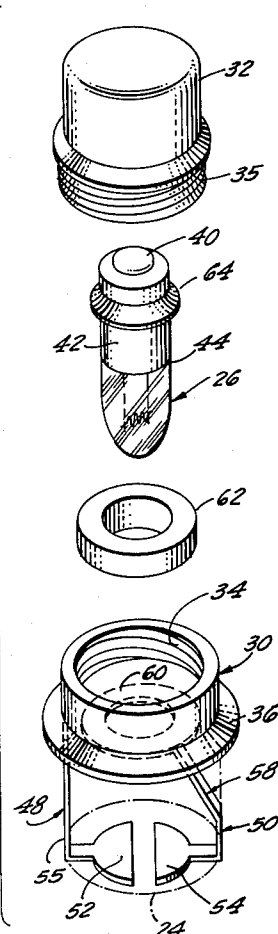


Fig. 2

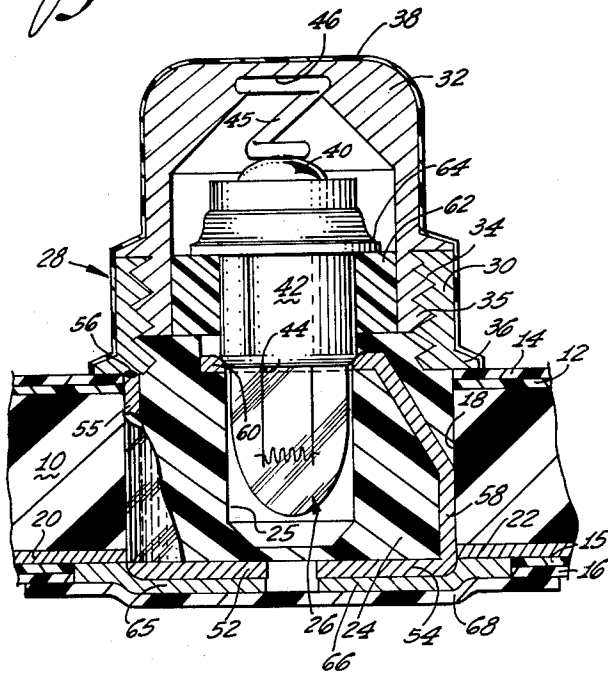
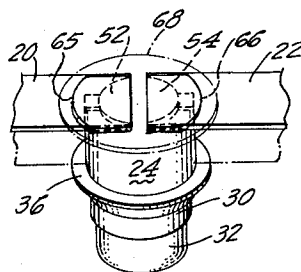


Fig. 3



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LAMP SOCKET

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This invention relates to means to illuminate an edge-lighted panel of the type commonly used in aircraft and more particularly relates to a lamp assembly comprising a lamp bulb in a lamp housing for mounting in an edge-lighted panel.

An edge-lighted panel commonly comprises a relatively thick layer of clear or transparent plastic with thin translucent layers on the opposite faces of the main layer and with thin outer opaque layers covering the translucent layers. On the front face of the panel indicia are formed by cut-outs on the opaque layer.

Lamp means positioned within the planes of the main layer illuminates the cut-outs to make the indicia visible in darkness. The lamp means is energized by printed circuit conductors which may be located on one or both of the two faces of the panel. The printed circuit conductors may be covered by one or both of the opaque and translucent layers.

The invention is directed to the problem of meeting four requirements for certain types of installations. One requirement is to provide an assembly comprising a lamp bulb and lamp housing of such construction that the lamp bulb may be quickly and easily replaced whenever necessary. The second requirement is that the lamp assembly construction lend itself to miniaturization. A third requirement is to provide such a lamp assembly that is both inexpensive to make and inexpensive to install in a panel. A fourth and important requirement is that the lamp assembly provide for effective and durable connection with the printed circuit conductors.

Most lamp assemblies have heretofore been made of several parts that are produced by automatic screw machines and which necessitate considerable manipulation for assembly. The requirement in this regard is for an inexpensive lamp assembly which may be installed as a single unit. To meet this requirement, it has become a common practice to form a one-piece lamp assembly by housing a lamp in a plastic block for mounting in a recess or aperture in an edge-lighted panel. Some lamp assemblies of this general type have electrical terminals in the form of large wings or lateral projections to make possible efficient connections with the printed circuit conductors of panels. Such constructions, however, are relatively expensive for some types of assemblies and, moreover, are not easily fabricated in sub-miniature sizes. Other lamp assemblies employing plastic blocks are reduced in cost by employment of electrical terminals in the form of thin pliable metal fingers which may be bent to facilitate connection to printed circuit conductors. The disadvantage here, however, is that the thin fingers are relatively fragile and, moreover, provide only limited areas for contact with the printed circuit conductors. Consequently, the electrical joints inherently create relatively high contact resistance and, more serious, too often fail to stand up under vibration.

The present invention achieves its purpose by employing a plastic block with parts molded therein to provide a lamp assembly unit by employing relatively few parts for such a unit, by employing relatively inexpensive sheet metal stampings instead of parts produced by automatic screw machines, and by so shaping the parts as to simplify the problem of molding the parts into the plastic block. The sheet metal parts provide two terminal elements on one end of the plastic block to make possible effective

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durable connections with the printed circuit conductors on a panel. The terminal elements are of ample area to minimize contact resistance and are positioned close to the plane of the adjacent circuit conductors of the panel to facilitate the making of the necessary electrical joints. Since the lamp assembly has the configuration of a simple solid cylinder with no lateral projections, it may be readily fabricated in sub-miniature sizes for use with sub-miniature lamp bulbs.

A further feature of the invention, as will be explained, is that the lamp assembly may be mounted with equal facility either in a panel that has all the printed circuit conductors on its back face or in a panel having printed circuit conductors on both of its opposite faces.

The features and advantages of the invention may be understood from the following detailed description and the accompanying drawing.

In the drawing, which is to be regarded as merely illustrative:

FIG. 1 is an exploded view of the presently preferred embodiment of the invention;

FIG. 2 is an enlarged sectional view of the lamp assembly installed in a panel; and

FIG. 3 is a bottom perspective view of the installed lamp assembly on a reduced scale showing how the lamp assembly is connected to printed circuit conductors.

FIG. 2 shows in cross section a typical edge-lighted panel comprising: a main layer 10 of clear or transparent plastic, a translucent plastic layer 12 on the forward side of the main layer, an outer opaque layer 14 on the front face of the panel, a second translucent plastic layer 15 on the rearward side of the main layer, and an outer opaque layer 16 on the rear face of the panel. The two opaque layers 14 and 16 may be made of epoxy. In preparation for mounting a lamp assembly in the panel, the panel is bored to provide a circular aperture 18.

In the construction shown, there are two printed circuit conductors 20 and 22 adjacent opposite sides of the circular aperture on the back side of the panel as indicated in FIG. 3. These printed circuit conductors are pressed into the planes of the main transparent layer 10 of the panel and, as shown in FIG. 2, are covered by both the translucent layer 15 and the opaque layer 16 on the back face of the panel.

The lamp assembly of the illustrated embodiment of the invention comprises a cylindrical block of plastic 24 with a central longitudinal cavity 25, a lamp bulb 26 extending into the cavity, closure means generally designated 28 of conducting material cooperating with the plastic block to enclose the lamp bulb, and means including parts embedded in the plastic block 24 for connecting the lamp bulb with the two printed circuit conductors.

The plastic block 24 which may be made of clear butyrate, or may be colored to produce colored light, is of substantially the same axial dimension as the thickness of the laminated panel so that the cylindrical plastic block may be mounted in the bore or circular aperture 18 with the two opposite ends of the plastic block substantially flush with the two opposite faces of the panel. At least a portion of the closure means 28 is accessible for access to the lamp bulb. For this purpose the closure means 28 may comprise a metal cylindrical member 30 bonded to the plastic block 24 and a cap member 32 releasably connected to the cylindrical member. In the construction shown the cylindrical member 30 is formed with an internal screw thread 34 which is engaged by an external screw thread 35 of the cap member 22. It is to be understood that the screw thread arrangement may be reversed with an external screw thread on the cylindrical member and with an internal screw thread on the cap member.

Preferably the cylindrical member 30 is slightly larger in diameter than the plastic block 24 to overhang the plastic block for two purposes. One purpose is to serve as a stop for contact with the front face of the panel when the lamp assembly is inserted into the bore or the circular aperture 18. A second purpose of the overhang is to facilitate the connection of the cylindrical member 30 with a printed circuit conductor when such a printed circuit conductor is on the front side of the panel. In the construction shown, the cylindrical member 30 is formed with a radial bottom flange 36 which overhangs the plastic block 24. The cap member 32 and the cylindrical member 30 are both covered with an insulating layer 38 which may be made of epoxy like the adjacent opaque layer 14 of the panel.

The lamp bulb 26 is of conventional construction with an end contact 40 and a ferrule contact 42. The ferrule contact 42 is tapered at its inner end to form a tapered shoulder 44. A metal spring 45 seated in a recess 46 in the cap member 32 presses against the end contact 40 to connect one side of the lamp bulb to the circuit.

As best shown in FIG. 1, two sheet metal stampings designated 48 and 50 respectively, provide two corresponding spaced electrical terminal elements 52 and 54 on the inner end of the cylindrical plastic block 24 close to the plane of the back face of the panel. Each of the two terminal elements 52 and 54 is of ample area and may be of the configuration of half of a disk as may be seen in FIG. 1. As shown in FIG. 1, the sheet metal stamping 48 forms an angular leg 55 which is joined to the cylindrical member 30 by welding indicated at 56 in FIG. 2. The leg 55 serves as a conductive means on one side of the lamp circuit.

The second sheet metal stamping 50 forms an angular leg 58 and a central ring 60 integral with the angular leg. The central ring 60 is bonded to the upper end of the plastic block 24 around the entrance to the cavity 25 to seat the tapered circumferential shoulder 44 of the ferruled contact 42 of the lamp. The leg 58 together with the central ring 60 serves as a conductive means on the second side of the lamp circuit.

It is apparent that the spring 45 has a dual function in that it not only serves as a conductor in the lamp circuit but also serves as means to press the lamp bulb ferrule against the central ring 60 of the sheet metal stamping 50. An insulating spacer in the form of a sleeve 62 of rubberlike material is shown surrounding the ferrule contact 42 between the central ring 60 and a radial flange 64 of the ferrule contact. This sleeve may be omitted.

The manner in which the lamp assembly serves its purpose may be readily understood from the foregoing description. In preparation for installing the lamp assembly, the panel is bored to provide the circular aperture 18. Also, as indicated in FIG. 2, adjacent portions of the back translucent layer 15 and the back opaque layer 16 are removed on the back side of the panel to expose portions of the two printed circuit conductors 20 and 22. The lamp assembly is then inserted in the circular aperture 18 to a limit position at which the flange 36 of the cylindrical member 30 abuts the outer face of the panel to overlie the front epoxy layer 14. The plastic block 24 is permanently cemented in the circular aperture 18 and for this purpose may be coated with suitable cement material before it is inserted.

The next step is to make electrical connections between the two terminal elements 52 and 54 of the lamp assembly and the corresponding printed circuit conductors 20 and 22 of the panel. For this purpose a conductive silver composition may be applied by brush to form two conducting layers 65 and 66. Each of these conducting layers extends over a terminal element 52 or 54 and over the adjacent portion of the corresponding printed circuit conductors 20 and 22 as may be seen in FIG. 2. The areas of the two conducting layers 65 and 66 and the areas of the associated printed circuit conductors 20

and 22 are indicated by broken shading in FIG. 3. The final step consists of applying a thin adhesive vinyl disk 68 to cover and insulate the conducting layers 65 and 66 and the exposed portions of the printed circuit conductors 20 and 22.

It is apparent that the lamp assembly comprises a relatively small number of parts. The construction is especially inexpensive because two of the parts are inexpensive sheet metal stampings. It is to be noted that the sheet metal stamping 50 not only provides the electrical terminal element 54 and the associated annular leg 58 but also provides the central ring 60 for seating the lamp. It is to be noted moreover, that the two sheet metal stampings 48 and 50 facilitate the molding operation since the stamping 48 serves as an initial support for the cylindrical member 30 and the stamping 50 serves as an initial support for the central ring 60. It is also apparent that the central ring 60 may be employed to hold a core for molding the cavity 25 with the core serving as means to accurately position the cavity concentrically of the central ring.

In the described installation, both of the circuit conductors 20 and 22 are on the back side of the panel. If one of these is on the front side of the panel, the end contact 40 of the lamp bulb will be connected thereto by means of the flange 36 of the cylindrical member 30 of the lamp assembly.

My description in specific detail of the selected embodiments of the invention will suggest various changes, substitutions and other departures from my disclosure within the spirit and scope of the appended claims.

I claim:

1. A lamp assembly for mounting endwise in a circular aperture of an edge-lighted panel for illumination thereof, wherein the panel has two circuit conductors bonded thereto adjacent one face thereof, said assembly comprising:

- a block of non-conducting light-transmitting material of circular cross section of a diameter to fit snugly in said aperture, said block being hollow with a relatively thick cylindrical wall and being open at at least one end to provide a cavity therein;
- a lamp bulb extending into said cavity at said one end of the block, said lamp bulb having an end contact and a ferrule contact, said ferrule contact forming a circumferential shoulder;
- a first conductive means at least partially embedded in said block;
- a ring-shaped first portion of said conductive means being exposed at the inner circumference of said block at said one end thereof and seating said circumferential shoulder of the ferrule contact, a second portion of said conductive means being exposed on the other end of said block for connection to one of said two circuit conductors, a third portion of said conductive means extending through the material of the block and interconnecting the first and second portions;
- a cylindrical member of conducting material bonded to said block and extending from said one end thereof;
- a threaded cap of conducting material in screw-threaded engagement with said cylindrical member for enclosing the lamp bulb and in electrical communication with said end contact of the lamp bulb; and
- a second conductive means at least partially embedded in said block, a first portion of said conductive means extending from said cylindrical member to said other end of the block, a second portion of said second conductive means being exposed at said other end of the block for connection to the other of the two circuit conductors.

2. A lamp assembly for mounting endwise in a circular aperture of an edge-lighted panel for illumination thereof, wherein the panel has two circuit conductors

bonded thereto adjacent one face thereof, said assembly comprising:

- a block of non-conducting light-transmitting material of circular cross section of a diameter to fit snugly in said aperture, said block being hollow with a relatively thick cylindrical wall and being open at at least one end to provide a cavity therein; 5
 - a lamp bulb extending into said cavity at said one end of the block, said lamp bulb having an end contact and a ferrule contact, said ferrule contact forming a circumferential shoulder; 10
 - a first conductive means in the form of a metal stamping at least partially embedded in said block, a ring-shaped first portion of said conductive means being exposed at the inner circumference of said block at said one end of the block and seating said circumferential shoulder of the contact, a second portion of said conductive means extending from said first portion to the outer circumference of the block and extending longitudinally of the outer surface of the block to the other end of the block for connection to one of said two circuit conductors; 20
 - a cylindrical member of conducting material bonded to said block and extending from said one end thereof; 25
 - a threaded cap of conducting material in screw-threaded engagement with said cylindrical member for enclosing the lamp bulb and in electrical communication with said end contact of the lamp bulb; and
 - a second conductive means at least partially embedded in said block, said conductive means extending from said cylindrical member longitudinally of the block along its periphery to said other end of the block for connection to the other of the two circuit conductors. 30 35
3. A combination as set forth in claim 2 in which portions of said two conductive means respectively are exposed on two halves respectively of the end surfaces of said block at said other end of the block.
4. A lamp assembly for mounting endwise in a circular aperture of an edge-lighted panel for illumination thereof, wherein the panel has two circuit conductors 40

bonded thereto adjacent one face thereof, said assembly comprising:

- a block of non-conducting light-transmitting material of circular cross section of a diameter to fit snugly in said aperture, said block being hollow with a relatively thick cylindrical wall and being open at at least one end to provide a cavity therein;
- a lamp bulb extending into said cavity at said one end of the block, said lamp bulb having an end contact and a ferrule contact, said ferrule contact forming a circumferential shoulder;
- a first conductive means partially embedded in the plastic block, said conductive means extending from said one end of the plastic block to the other end of the plastic block and extending from the inner circumference of the plastic block to the outer circumference of the plastic block and being exposed at said other end of the plastic block for electrically connecting the ferrule contact of the lamp bulb to one of said circuit conductors;
- a cylindrical member of conducting material bonded to said block and extending from said one end thereof;
- a threaded cap of conducting material in screw-threaded engagement with said cylindrical member for enclosing the lamp bulb and in electrical communication with said end contact of the lamp bulb; and
- a second conductive means partially embedded in said plastic block in spaced relation to said first conductive means, said second conductive means extending from said cylindrical member to said other end of the plastic block and being exposed at said other end of the plastic block for connecting the cylindrical member to the other of said two circuit conductors.

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