May 12, 1964

L. E. MADANSKY

3,132,811

LAMP ASSEMBLY FOR PANEL

Filed June 11, 1962

Fig. 1

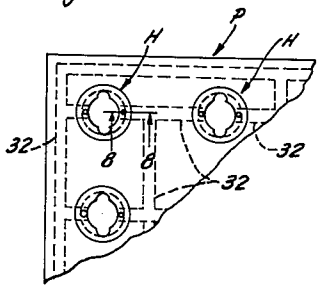


Fig. 2

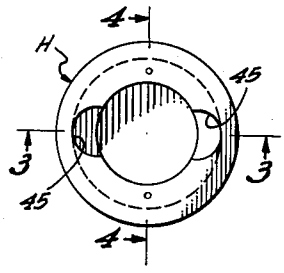


Fig. 3

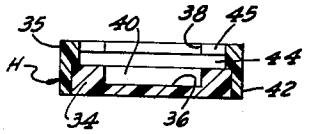


Fig. 4

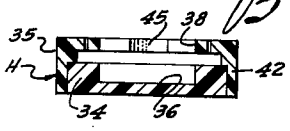


Fig. 6

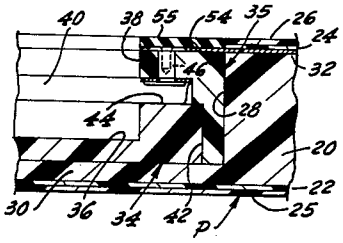


Fig. 5

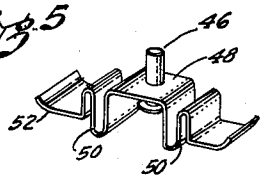


Fig. 7

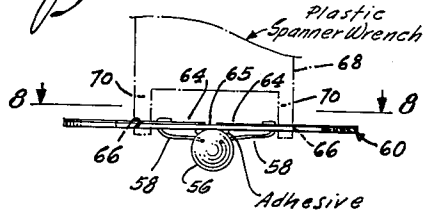


Fig. 8

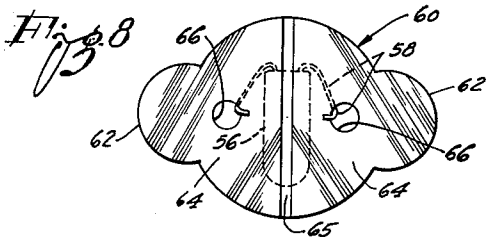


Fig. 9

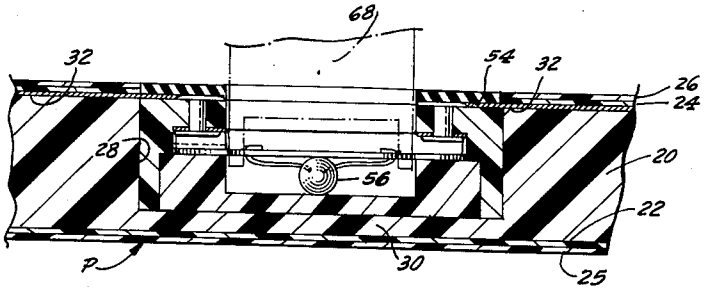
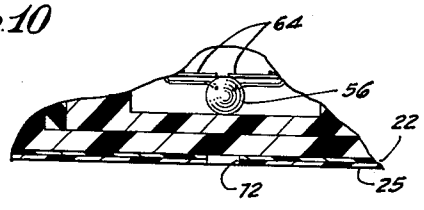


Fig. 10



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LAMP ASSEMBLY FOR PANEL

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8 Claims. (Cl. 240—8.16)

This invention relates to a lamp assembly for an edge-lighted panel of the type commonly used in the cockpit of an aircraft. Such a panel is of laminar construction with a thick main layer of transparent plastic, a thin outer opaque layer and a thin translucent layer under the opaque layer. The opaque layer has indicia cut-outs which are illuminated by edge-lighting, i.e. by light transmitted through the main transparent layer edgewise thereof from one or more lamps mounted in the planes of the main layer.

Many different kinds of lamp housings and methods of mounting lamp housings in a panel have been developed with conductors incorporated in the panel for energizing the lamps. In recent years, miniature lamps have been developed that are substantially smaller in width than the thickness of an edge-lighted panel and various suggestions have been made for mounting such small lamp bulbs completely inside the panel with no structure protruding at either face of the panel. In general, such panel assemblies have been of costly complicated construction.

One suggestion for dealing with this situation has been to embed or pot the miniature lamp bulb in the panel in an integral manner. The disadvantage of such a solution to the problem is that there is always a possibility that an embedded lamp bulb may fail and in such an event it is usually cheaper to discard the whole panel than to attempt to replace the buried lamp bulb.

The present invention meets the requirement for a lamp installation in an aircraft panel that is simple and inexpensive and at the same time permits quick and convenient replacement of the lamp bulb if need for such replacement should arise. To achieve this purpose a lamp bulb is simply adhesively bonded to the underside of a disk which is formed with radial projections for bayonet engagement with a lamp recess in a panel. Such a disk with radial projections or ears may be molded inexpensively or may simply be stamped out of a sheet of suitable plastic material.

A feature of the invention is a simple answer to the problem of constructing such a disk for convenient manual rotation in installing or removing the plastic body. For this purpose a pair of symmetrically located spaced spanner apertures is provided in the plastic body to receive a suitable tool of the character of a spanner wrench. Such a tool, for example, may comprise simply a rod of non-conducting material such as a suitable plastic to serve as a handle with a pair of spaced pins mounted in one end face of the rod.

For the purpose of electrically connecting the lamp on the underside of the plastic disk or body with the circuit conductors on the panel, two spaced conductive layers are mounted on the outer face of the plastic body, the two conductive layers extending over the two bayonet ears respectively to cooperate with corresponding conductive elements that extend from the circuit conductors into the bayonet slots of the panel. The miniature lamp bulb has two wire leads which are connected to the two conductive layers. The two wire leads of the lamp bulb extend through the pair of spanner apertures in the plastic body so that the two apertures serve not only as openings for cooperation with a spanner tool but also serve as openings for the two wires of the lamp bulb. By using a spanner tool with a non-conducting body the possibility of the tool shorting the lamp circuit is avoided.

It is conceivable that the bayonet slots for receiving the bayonet projections of the plastic body may be formed in the panel itself. A feature of the preferred practice of the invention, however, is the concept of providing a bore in the panel and permanently mounting in the bore a suitable plastic housing made in sections that are inexpensive and designed for mass production. Such a plastic housing not only saves the expense of machining bayonet recesses in the material of the panel but also makes it possible to use plastic materials other than the material of the panel.

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 a fragmentary plan view of an aircraft panel incorporating lamp assemblies constructed in accord with the teachings of the invention;

FIG. 2 is a plan view of a multiple section plastic lamp housing for mounting in a blind bore on the back side of an edge-lighted panel;

FIG. 3 is a section of the lamp housing taken along the diameter 3—3 of FIG. 2;

FIG. 4 is a similar section on the diameter 4—4 of FIG. 2;

FIG. 5 is a perspective view of a spring metal element that may be incorporated in the lamp housing to serve as a bayonet contact for the lamp circuit;

FIG. 6 is an enlarged fragmentary section showing how the lamp housing of FIGS. 2, 3 and 4 is mounted in a blind bore of a panel;

FIG. 7 is a side elevation, partly in section, of a plastic disk with a lamp bulb mounted on the underside thereof, the plastic disk having radial bayonet projections for engagement with the bayonet slots of the lamp housing;

FIG. 8 is a plan view of the plastic disk as seen along the line 8—8 of FIG. 7 showing the two spaced conductive layers with the lamp wires attached thereto;

FIG. 9 is a sectional view showing the plastic disk installed in the panel; and

FIG. 10 is a fragmentary section similar to FIG. 9 showing how an opening may be provided in the outer opaque layer of the panel to permit the lamp bulb to function as an indicator light.

In the drawings illustrating a selected embodiment of the invention, the letter P generally designates an edge-lighted panel of a well-known construction which, as indicated in FIGS. 6 and 9, is of laminar construction with a relatively thick main layer 20 of a suitable transparent plastic material. The front and back faces of the main layer 20 are covered with translucent layers 22 and 24 respectively which serve to reflect interior light. The front face of the panel is covered with an outer opaque layer 25 and the back face of the panel is covered with an outer opaque layer 26, both of which opaque layers may be made of epoxy. The front opaque layer 25 is typically formed with numerous cut-outs (not shown), which serve as indicia and which are illuminated from the interior of the panel through the front translucent layer 22.

The panel P has a number of wells in which lamp bulbs are mounted for illumination of the interior of the panel, which wells may extend completely through the panel but in the present practice of the invention are blind bores 28 extending in the rear face of the panel. Thus a thin web 30 of the main transparent layer 20, separates the bottom of a blind bore or well 28 from the front face of the panel.

Suitable conductors 32 for the opposite sides of a lamp circuit extend to each of the wells 28. In the construction shown, these conductors are printed circuit conductors

interposed between the main transparent layer 20 and the translucent layer 24 on the back side of the panel, the two printed circuit conductors 32 terminating at diametrically opposite edges of each of the circular wells 28.

In accord with the teachings of the invention, each of the wells or blind bores 28 may be formed with bayonet slots to receive a complementary non-conducting body carrying a lamp bulb. In the preferred practice of the invention, however, a circular housing H of light-transmitting material such as a suitable plastic, is permanently mounted in each of the wells, for example, by adhesive bonding, the housing being formed with a bayonet-slotted circular recess to receive a non-conducting body carrying a lamp bulb.

In addition, the invention teaches that each of the circular housings may be made of a plurality of separate members or sections that are produced separately and then bonded together. In this regard, a feature of the invention is the concept of employing molded sections of simple configuration to form the housing with a juncture between sections at the bayonet slots of the recess that is formed by the housing. Thus the bayonet slots may be provided by merely forming recesses on the juncture side of at least one of the sections that make up the housing.

In the present embodiment of the invention, the lamp housing, which is generally designated by the letter H, comprises a first member or housing section 34 to lie against the web 30 or bottom wall of the circular well 28 and a second member or housing section 35, the first member being formed with a circular depression 36 on its outer side and the second member being a ring member with a circular opening 38 registered with the circular depression, the circular depression and the circular opening together forming a circular recess 40 opening onto the outer face of the housing. Preferably the first member 34 is substantially smaller in outside diameter than the inside diameter of the circular well 28 to provide a peripheral clearance space around the first member and the ring-shaped second member 35 is formed with a cylindrical flange 42 which embraces the first member and occupies this peripheral space.

In the construction shown, the inner side of the second member 35 is formed with an inner circumferential annular recess 44 and the inner circumference of the ring-shaped member has two diametrically opposite notches 45 that extend through the outer wall of the annular recess. When the two members 34 and 35 are bonded together, the annular recess 44 becomes an inner circumferential groove of the housing H. The two notches 45 and the two corresponding halves of the annular recess or groove 44 constitute respectively two bayonet slots in the circular recess 40 of the housing H.

Prior to the bonding together of the two housing members or sections 34 and 35, two suitable conductive elements are mounted in the second member 35 at 90 degrees from the two notches 45 to provide electrical communication between the two printed circuit conductors 32 and the interiors of the two bayonet slots of the housing. In this particular practice of the invention, each of the conductive elements comprises a rivet or eyelet 46 and a spring metal member 48, the rivet extending through the wall of the annular recess 44 and the spring metal member being anchored by the rivet in position in the annular recess. As best shown in FIG. 5 the spring metal member 48 is formed with two loops 50 which serve as bayonet stops and is further formed with two bowed ends 52 to serve as yielding retainers.

When a housing H is adhesively bonded in a circular well 28 in the position indicated in FIGS. 6 and 9, each of the two printed conductors 32 is extended over the outer surface of the housing into electrical contact with the corresponding eyelet 46 of the housing. For this purpose adhesive conductive material 54 may be simply manually painted onto the outer surface of the housing by means of a brush to extend the two conductors 32 to

the two eyelets 46 respectively. Then the outer surface of the housing H, including the exposed eyelets 46 and the newly added conductive material 54 may be covered by a suitable insulating gasket 55, the gasket being cut away to conform to the two diametrically opposite notches 45 of the housing.

A miniature lamp bulb 56 for mounting in the housing has two terminals in the form of short wires 58. The lamp bulb 56 is adhesively bonded to the underside of a non-conductive body, for example, a relatively thin fibreglas disk 60 with two diametrically opposite ears or extensions 62 dimensioned to pass through the two notches 45 of the housing H. The outer surface of the disk 60 has two spaced conductive layers 64 which are separated by a gap 65 and which extend over the surfaces of the two corresponding ears 62. It will be readily understood that the disk 60 may be inserted into the recess 40 of the housing H with the ears 62 passing through the two notches 45 and then the disk may be rotated 45 degrees to bring the two ears against the two stops 50 respectively in yielding engagement with the two bowed retainer ends 52 of the two spring metal members 48. Only one bowed end appears in FIGS. 6 and 9 since these views are sections taken on a diameter that passes transversly through the middle of the narrow dimension of the clip.

To facilitate manual rotation of the disk 60 into engagement with the two bayonet slots of the housing H, a pair of spaced recesses in the form of apertures 66 may be provided in the disk for engagement by a suitable spanner. Such a spanner may comprise a short rod or bar 68 of plastic material with a pair of metal pins 70 in the end of the rod, the two pins being dimensioned and spaced to enter the two apertures 66. Since the handle of the tool is made of non-conducting material the tool does not electrically connect the two conductive layers 64. The two wires 58 of the lamp bulb 56 extend through the two apertures 66 respectively and are connected to the two conductive layers 64 respectively.

The manner in which the invention serves its purpose may be readily understood from the foregoing description. It is a simple matter to place the disk 60 carrying a lamp bulb 56 in position to move the two ears 62 of the disk through the two notches 45 into the inner circumferential recess 44 of a lamp housing. The spanner tool is then applied to the disk by inserting the two metal pins 70 of the tool into the two apertures 66 of the disk and the tool is rotated in either direction to rotate the two ears 62 of the disk into engagement with the two spring metal members 48. The rotation of the disk is stopped by abutment of the two ears 62 against stops 50 of the two spring metal members 48 and when the ears abut the stops the ears are in frictional engagement with the bowed retainer ends 52 of the two spring metal members.

The spring pressure exerted by the spring metal members 48 on the two ears 62 of the disk 60 retain the disk in its installed position and effectively anchor the disk against loosening action by vibration. It is apparent that at the installed position of a disk 60 the two spring metal members 48 together with the two corresponding eyelets 46 and the two corresponding layers 54 of printed circuit material comprise what may be termed conductive elements for electrically connecting the lamp bulb with the two circuit conductors 32 on the panel P.

FIG. 10 shows how such a lamp installation may serve as an indicator lamp on a panel. For this purpose it is merely necessary to form an aperture 72 in the opaque layer 25 on the front face of the panel. The adjacent translucent layer 22 may also be apertured if desired.

My description in specific detail of the selected embodiment 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 in a bayonet-slotted circular recess in a panel of the edge-lighted type, wherein the panel incorporates two conductors for the opposite

sides of a lamp circuit terminating at the recess, said lamp assembly comprising:

a circular body of non-conducting material dimensioned to fit into said recess and having a pair of radial extensions for bayonet engagement with the recess;

a pair of spaced apertures in said body to facilitate manual rotation of the body into bayonet engagement with the recess;

a pair of spaced conductive layers on the outer side of said body for contact with said two conductors respectively when the body is mounted in the recess, said conductive layers extending over said radial extensions respectively;

a lamp bulb fixedly mounted on the underside of said body; and

a pair of conductive means extending from said lamp bulb through said apertures respectively to said conductive layers respectively for electrically connecting the lamp bulb to said two conductors respectively on the panel.

2. A combination as set forth in claim 1 in which said body is a relatively thin flat plastic disk.

3. A combination as set forth in claim 1 in which said lamp bulb is adhesively bonded to the inner face of said body.

4. A lamp assembly for mounting in a circular well in a panel of the edge-lighted type, wherein the panel incorporates two conductors adjacent the well for the opposite sides of a lamp circuit, said lamp assembly comprising:

a circular housing of light-transmitting material fitting into said well, said housing having a circular recess opening onto the outer side of the housing, said recess being formed with a pair of bayonet slots;

two conductive elements mounted on said housing and electrically connected respectively with said two conductors of the panel, said conductive elements extending into said bayonet slots respectively;

a body of non-conducting material with radial extensions for mounting in said recess in engagement with said bayonet slots, said body having a pair of spaced apertures to facilitate manual rotation of the body into bayonet engagement with the recess;

a pair of spaced conductive layers on the outer side of said body contacting said two conductive elements respectively of the housing when the body is mounted in the recess; and

a lamp bulb fixedly mounted on said body and electrically connected to said two conductive layers respectively.

5. A lamp assembly for mounting in a circular well in a panel of the edge-lighted type, wherein the panel incorporates two conductors adjacent the well for the opposite sides of a lamp circuit, said lamp assembly comprising:

a circular housing of light-transmitting material fitting into said well, said housing having a circular recess opening onto the outer side of the housing, said recess being formed with a pair of bayonet slots;

two conductive elements mounted on said housing and electrically connected respectively with said two conductors of the panel, said conductive elements extending into said bayonet slots respectively;

a circular body of non-conducting material fitting into said recess and having a pair of radial extensions for bayonet engagement with the recess;

a pair of spaced apertures in said body to facilitate manual rotation of the body into bayonet engagement with the recess;

a pair of spaced conductive layers on the outer side of said body contacting said two conductive elements respectively when the body is mounted in the recess, said conductive layers extending over said radial extensions respectively;

a lamp bulb fixedly mounted on the underside of said body; and

a pair of conductive means extending from said lamp bulb through said apertures respectively to said conductive layers respectively for electrically connecting the lamp bulb to said two conductors respectively on the panel.

6. A lamp assembly for mounting in a blind bore in a panel of the edge-lighted type, wherein the panel incorporates two conductors for the opposite sides of a lamp circuit, said lamp assembly comprising:

a first circular plastic member dimensioned for fitting into the bottom of said blind bore with substantial peripheral clearance, said member having a circular depression on its outer side;

a second ring-shaped plastic member bonded to the outer side of the first member to form therewith a plastic housing, said second member having a cylindrical flange dimensioned for occupying said peripheral clearance, said two members forming a circular recess opening onto the outer side of the housing, said recess being formed with bayonet slots;

two conductive elements mounted on one of said two members and electrically connected respectively with said two conductors of the panel, said two conductive elements extending into said bayonet slots respectively;

a body of non-conducting material fitting into said recess and having a pair of radial extensions for bayonet engagement with said bayonet slots;

a pair of spaced recesses in said body to facilitate manual rotation of the body into bayonet engagement with the housing recess;

a pair of spaced conductive layers on the outer face of said disk and extending over said radial extensions respectively contacting said two conductive elements respectively;

a lamp bulb fixedly mounted on said body; and

a pair of conductive means electrically connecting the lamp bulb to said two conductive layers respectively.

7. A combination as set forth in claim 6 in which:

said lamp bulb is mounted on the inner side of said body;

in which said pair of recesses on the body are apertured through the body; and

in which said pair of conductive means extend through said pair of apertures respectively.

8. A combination as set forth in claim 6 in which the juncture of said two members is at said bayonet slots, the juncture side of at least one of the two members being recessed to form portions of the two bayonet slots.

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