

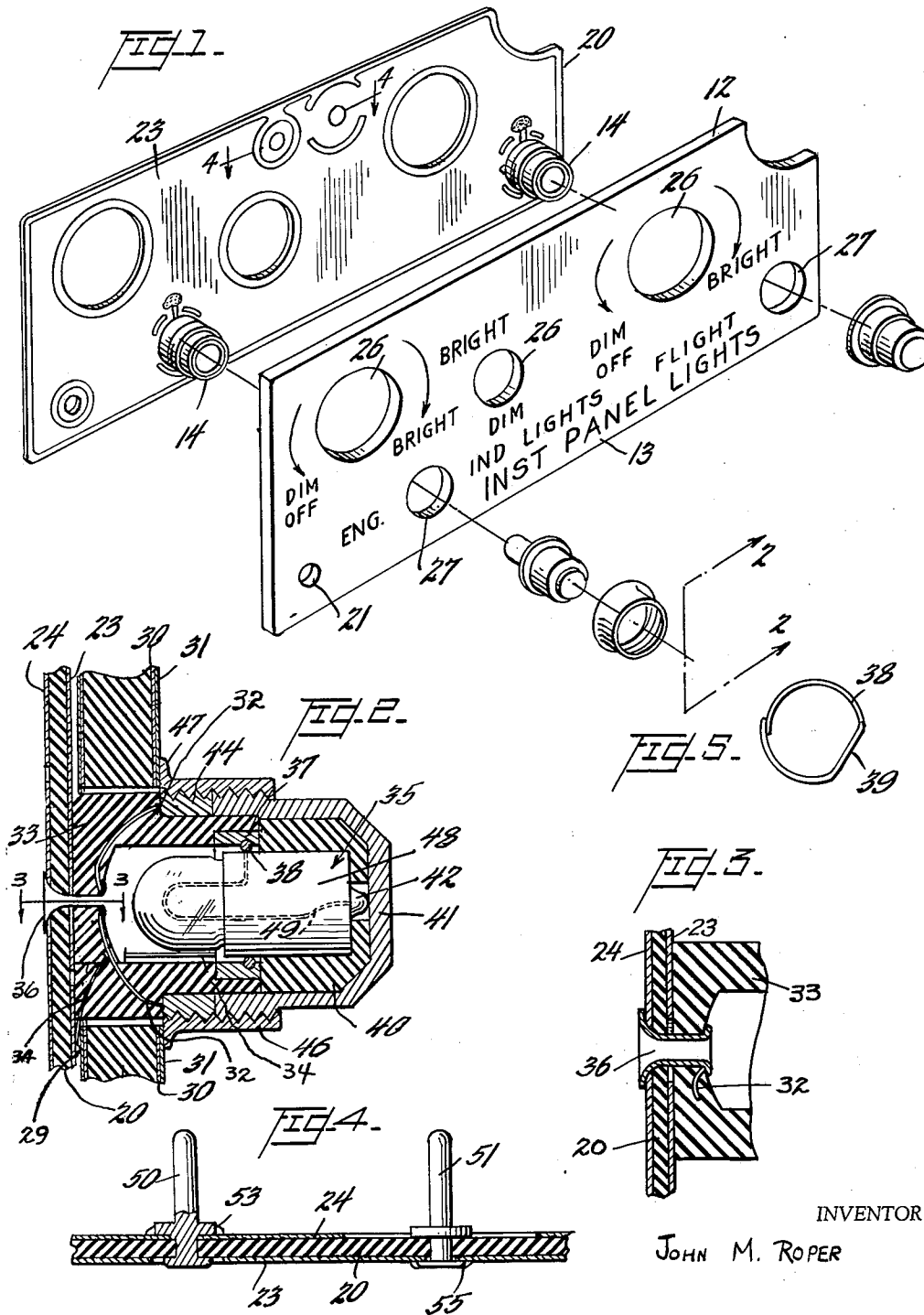
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ILLUMINATED INSTRUMENT PANEL ASSEMBLY

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ILLUMINATED INSTRUMENT PANEL ASSEMBLY

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This invention relates to panels which are illuminated so that the legends and indicia carried thereon may be read at night or under other circumstances involving the absence of adequate natural lighting.

More particularly, this invention has reference to the illumination of instrumentation panels by light transmitted through the medium of the material of which the panel is composed. This light is usually supplied by a source which is coupled closely to the panel and located substantially in the plane thereof. The rays of light are transmitted edgewise of the body of the panel and confined therein except at the information areas defined by the legends or indicia.

In the usual practical installation of an illuminated panel of the foregoing type, the panel is fabricated from a plastic material which is transparent. The surfaces of the panel are processed with one or more coatings of material which may, for example, include a white vinyl layer applied directly to the surfaces of the panel, and an overlying layer of opaque black vinyl. The black vinyl layer is appropriately etched or engraved so as to expose portions of the white vinyl layer in accordance with appropriate indicia or legends. The panel thus fabricated is processed with one or more holes which individually receive an associated lamp. These lamps when energized illuminate the interior of the panel, and inasmuch as the light is readily transmitted they also illuminate the legends which are rendered easily readable in contrast to their opaque black background.

Various arrangements have heretofore been proposed in the prior art for particular panel constructions, including the application of various overlying layers of material for covering a transparent panel, and the positioning and support of lamp sockets and the energizing conductors for these sockets upon the panel. In view of the considerable advances made within recent years in the instrumentation for aircraft and other devices requiring a panel type disposition of controls, considerable demand now exists for commensurate improvements in the illuminated panel arrangements associated with such instrumentation.

It can be readily appreciated that prior art arrangements in which the conductors for energizing the illuminating lamps are applied to the panel by the techniques of printed circuitry with sockets connected appropriately to these printed conductors and sealed against the deleterious effects of moisture and the like are not readily conducive to alterations in panel design. Additionally, the relatively complex arrangements for appropriately covering the printed conductors and the panel by one or more covering layers of material closely contacting the sockets add considerably to the difficulty encountered in effecting changes in panel design. In the usual instance, a redesign of a prior art panel requires a new panel inasmuch as salvage techniques cannot be applied easily and economically to the old panel. It is not possible, for example, to rearrange the printed conductors applied to a panel without removing a considerable portion of the overlying layers of covering material and reapplying them.

Moreover, in the event that faults in panel illumination occur, the inspection and detection of the cause for these faults are relatively impossible under usual circumstances for the reason that the electrical circuitry involving print-

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ed conductors is irrevocably sealed beneath one or more overlying layers of material.

Under certain circumstances it is desirable to remove the panel for modifications and adaptations which are possible. However, inasmuch as connected components are coupled to the panel such as, for example, the sockets for the illuminating lamps, the processing of the panel is rendered relatively difficult or even impractical.

Accordingly, a first object of this invention is to provide an illuminated panel which may be easily removed from the installation with which it is associated and readily inspected, and if desired, modified and adapted to a new disposition of legends and indicia.

Another object of this invention is to provide an illuminated panel which may be readily replaced by a substitute panel of simple and economical construction.

Another object of this invention is to provide an illuminated panel in which the cause of faulty illumination may be readily detected and corrected with a minimum of effort and expense.

Another object of this invention is to provide an illuminated panel arrangement in which the panel carrying the indicia or legends and which is illuminated is devoid of integrally related sockets and conductors whereby these panels may be readily fabricated and handled.

This invention is an improvement of my illuminated panel arrangement as disclosed and described in application Serial No. 524,639, filed July 27, 1955, which has matured into Patent No. 2,855,709, issued October 14, 1958.

A preferred embodiment of this invention features the advantageous association of two panels. One of these panels is an illuminated panel and the other supports the lamp sockets and its conductors. The socket supporting panel is fabricated of electrical insulating material and is processed with a set of apertures for permitting components to pass therethrough. These apertures correspond in position and size to a like set of apertures formed in the illuminated panel. In a typical installation, both the illuminated panel and the lamp socket supporting panel are positioned on the front of a chassis-like box which contains the components of the instrumentation. The switches and controls of these units are exposed for viewing and operation through shafts or the like which pass through the holes located in both panels.

The lamp socket support panel is positioned adjacent the control box chassis. The sockets for the illuminating lamps are rigidly secured to this panel and the necessary conductors for energizing the lamps positioned within these sockets are printed or otherwise formed on opposite surfaces of the supporting panel. In operation the illuminated panel is positioned over the lamp socket supporting panel so that the holes are in alignment with the projecting sockets and various controls and the like.

Advantageously, the illuminated panel is clamped in position on the socket supporting panel by projecting flanges on the lamp cap assembly associated with each socket. With the foregoing arrangement, the illuminated panel can be readily removed from the associated structure by merely loosening and removing the lamp caps or socket covers. The illuminated panel contains only a set of properly disposed apertures and indicia or legends formed on the face of the panel. Inasmuch as no electrical components or conductors are carried thereon, the panel appears as a flat plate-like element without any projecting elements or the like.

With the removal of the illuminated panel assembly which is plugged into suitable sockets, the support panel is separated from the indicia panel by removing the lamp cap assembly and the sockets and conductor carried on opposite sides of the supporting panel are readily accessible. However, the extensive area on these conductors

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and their location on opposite sides of the panel are directed to reduction of maintenance to a minimum.

In the event that it is desired to provide modified information on the front of the panel, the removed panel may be readily reprocessed inasmuch as no components are contained thereon. If desired, a new panel, which is relatively easy and economical to fabricate inasmuch as no electrical circuitry is contained thereon, may be provided for positioning with respect to the support panel.

Each lamp socket includes a group of annular rings constructed to engage each other in a simple compact arrangement. A plastic cylinder having one end substantially closed and a pair of annular recesses on the other end defines the skeletal structure for the lamp socket. The plastic ring has a reduced portion adjacent the supporting plate and a metallic rivet or brad engages this reduced portion and the periphery of an aperture in the supporting plate to secure the plastic ring to the supporting plate and to provide an electrical connection between one of the conductors in the plastic ring and the conductor on one surface of the supporting plate. Advantageously, one of the annular recesses is on the inner periphery of the plastic cylinder and terminates in a supporting shoulder for a metallic ring. Also, advantageously, the other annular recess is on the outer periphery of the plastic ring and terminates in a supporting shoulder at approximately the longitudinal midpoint of the plastic ring. A pair of conductors are inserted in the plastic ring; for example, they may be inserted in holes drilled longitudinally of the plastic ring. This pair of conductors terminates at two metallic rings, one of the rings being inserted in the annular recess on the outer periphery of the plastic ring and engaging the shoulder at the termination of this recess, the other ring being inserted in the recess on the inner periphery of the plastic ring and engaging the shoulder at the termination of this recess. These two rings and the electrical conductors provide electrical paths for the energization of the illuminating lamp as will be subsequently explained.

After the lamp socket is assembled and mounted on the supporting plate, by means of the rivet, the indicia panel is slipped over the control knobs or switch shafts and the lamp socket or sockets, as the case may be, and the cap assembly containing the illuminating lamp is threadably engaged with the first metallic ring. This lamp cap includes an internally threaded ring which engages the lamp supporting portion of the cap, the metallic ring on the outer portion of the plastic ring, and includes a flange which engages and secures the indicia panel in position. Thus, the lamp cap assembly performs the functions of securing the illuminating lamp to the lamp socket, providing electrical contact with the electrical circuit and, finally, holding the indicia panel in position.

Advantageously, a wire ring is inserted in a groove on the inner surface of the innermost annular metallic ring to insure good electrical contact between the annular metallic ring and the conducting outer shell of the lamp. While the wire ring has an outer radius substantially the same as the radius of the groove over a portion of its periphery, it also has a portion which defines a cord of the aperture defined by the innermost annular ring. This cord portion of the ring engages the periphery of the base of the lamp in resilient contact relationship, thus insuring a good electrical connection between the innermost metallic ring and the peripheral base contact of the lamp.

Also, advantageously, the supporting plate may be equipped with suitable plugs to engage jacks in such a manner that the entire supporting plate may be readily inserted and removed relative to the supporting instrument cabinet or container. Such an arrangement provides a structure which is easy to assemble as well as to service. Further, such an illuminated instrument panel assembly, in which only an indicia panel and a light socket supporting plate are required and the panel and plate are engaged

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by means of the light socket covers, is exceedingly simple and therefore economical to manufacture.

Accordingly, it is a feature of this invention to secure metallic conducting rings in recesses in a plastic ring to thus provide a compact illuminating lamp support for an indicia panel.

It is another feature of this invention to construct a lamp support for an indicia panel from a number of annular rings, one of the annular rings being of plastic and having recesses on its inner and outer peripheries, which recesses receive two annular metallic rings which are connected through conductors recessed in the plastic ring and lying substantially longitudinally of the plastic ring to provide electrical paths for current to the illuminating lamp.

It is another feature of this invention to insert a wire ring in one of the annular metallic rings of the lamp support, which wire ring has a first portion which has an outer radius substantially the same as the inner radius of the innermost annular ring and which has another portion which defines a cord across the aperture defined by the innermost metallic ring, which cord portion insures good electrical contact with the peripheral base contact of the lamp.

It is another feature of this invention to provide a lamp supporting cap for an illuminating lamp with a locking ring which engages the outer periphery of a portion of the cap, the outer periphery of the outermost metallic annular ring on the lamp support and having a flange which engages and secures the indicia panel in position.

In order that all of the features for attaining the objects of this invention may be readily understood, detailed reference is herein made to the accompanying drawing wherein:

FIGURE 1 is a perspective view showing an illuminated panel in position for placement in operative association with a socket support panel;

FIGURE 2 is a sectional view taken along line 2—2 of FIGURE 1 and shows the detailed structure of a mounted lamp socket;

FIGURE 3 is a partial sectional view taken along line 3—3 of FIGURE 2 and shows the detailed structure of the connection between the supporting plate and the lamp socket; and

FIGURE 4 is a partial sectional view taken along line 4—4 of FIGURE 1 and shows the mountings and connections of the contact pins of the support panel;

FIGURE 5 is a plan view of wire ring 38, shown in section in FIGURE 2.

Referring now to FIGURES 1, 2 and 3 of the drawing, a preferred embodiment of the illuminated panel of this invention is shown in operative association with instrumentation or control apparatus which is confined within a box-like chassis (not shown). The components (not shown) located within the box are generally of an electrical and/or electronic nature, and the circuitry thereof may be manually controlled, for example, by a plurality of switches and knobs (not shown) controlling a rotatable component such as a potentiometer. The switches and knobs are exposed for operation relative to panel 12 which contains information legends or indicia 13 which are to be illuminated by lamps housed within sockets 14. The shaft of each control element projects through the overlying panels for exposure at the face of illuminated panel 12.

As will be described hereinafter in detail, panels 12 and 20 are separate panels which together with the lamp mounting assembly comprise the illuminated panel arrangement of this invention.

As is best shown in FIGURE 1, both panels 12 and 20 are formed with holes, such as hole 21 so that fasteners (not shown) pass freely therethrough, thereby providing an arrangement in which the fasteners are effective to clamp panel 12 to the frame member (not shown). Panel 12 is coupled to underlying panel 20 only through the

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tightening of the lamp cap assemblies to the lamp sockets as will be hereinafter explained in detail. The removal of panel 12 from the associated structure is effected merely by unscrewing all of the lamp cap assemblies and pulling panel 12 from its position over the loosely fitting projecting components.

As is shown in FIGURE 1, illuminated panel 12 is formed with a plurality of holes 26 for loosely receiving switches or other projections, such as dials, and also a plurality of holes 27 for receiving relatively tightly lamp sockets 14. The number and positioning of the various holes formed in panel 12 is determined by the particular elements which project from the instrument housing and are to appear at the front face of panel 12, and also the number and disposition of the sockets which are to illuminate the particular legends required on the panel. The disposition and number of sockets and toggle switches herein are merely illustrative, and it should be understood that the principles of this invention are applicable to other arrangements of components on an illuminated panel.

Panel 12 is preferably fabricated of a transparent plastic material, whereby light energy introduced through the walls of holes 27 may be transmitted throughout the entire panel. In order to prevent the undesired absorption of light introduced into the panel by means of the environmental structure, panel 12 is preferably coated by a highly reflective, white vinyl layer 30 as is shown in FIGURE 2. Layer 30 is covered by an overlying layer 31 which is preferably of opaque black vinyl. These coatings may be applied by any of the techniques which are now conventional in the art.

Legends 13 are formed by engraving or otherwise removing the necessary portions of black vinyl layer 31 so as to expose in letter form the underlying white vinyl layer 30. The walls of holes 26 are preferably covered by both layers 30 and 31 in order to prevent the undesired escape of illumination at these areas. The walls of holes 27 must necessarily be free from the materials of layers 30 and 31 in order that light may be transmitted through these areas by the lamps housed within associated sockets 14.

Sockets 14 are carried by support panel 20 as is shown in FIGURES 1, 2 and 3. Panel 20 is fabricated of insulating material so that conductors 23 and 24 may be applied directly to the surfaces thereof by techniques well known in the art.

The details of the socket construction in the illustrative panel arrangement in accordance with this invention are best shown in FIGURES 2 and 3. The socket comprises an annular insulating sleeve 33 formed of transparent or translucent material. One end of this sleeve has one or more projections. These projections serve as a key and are inserted in suitable apertures in supporting panel 20 to control the conductor radial location and thus reduce the possibility of resulting shadows on indicia 13.

Conductors 32 and 34 are embedded longitudinally in sleeve 33 to define electrical connections between conductors 23 and 24 on supporting plate 20 and lamp 35 as will be explained. Conductor 34 is positioned close to the inner periphery of sleeve 33 while conductor 32 is positioned close to the outer periphery of ring 33. Conductor 32 extends radially through the reduced portion of ring 33 and is engaged by a rivet or brad 36, which rivet has flanges which secure ring 33 to plate 20. Conductor 34 is secured as by soldering at point 29 to conductor 23. Conductor 23 is cut away from rivet 36 to prevent the short circuiting of the electrical circuit. A second metallic sleeve or ring 37 is fitted into an annular recess in the inner periphery adjacent the outer end of sleeve 33 and is connected to embedded conductor 34. Alternatively, conductor 32 may be formed integrally with sleeve 37 and interted in sleeve 33 and then bent to make the connection at point 29. Sleeve 37 contains, in a groove on its inner periphery, a metallic snap ring

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38, best shown in FIGURE 5. The purpose of snap ring 38 is to insure good electrical contact between sleeve 37 and the peripheral contact on the base of lamp 35. This purpose is fulfilled by a portion 39 of the ring 38, which portion defines a cord of the aperture defined by the inner periphery of sleeve 33. Lamp 35 is embedded in plastic material 40, which material is contained in metallic cap 41. Metallic cap 41 is threaded on its outer periphery to engage threaded sleeve 46. Lamp 45 has a projecting metallic member 42 in the center of its base for the purpose of defining good electrical contact between cap 41 and the central contact of lamp 35. A first annular metallic sleeve or ring 44 is threaded on its outer periphery and is pressed frictionally fitted on the outer periphery of sleeve 33 and connected to conductor 32 in a manner similar to the connection between second sleeve 37 and conductor 34. When the illuminating assembly is complete, conducting cap 41 abuts against first metallic sleeve 44. Metallic sleeve 44, cap 41, and pin 42 defining the portion of the lamp circuit which connects with conductors 32, 34, 23 and 24. A clamping or securing ring 46 is threaded in its inner periphery and engages the threaded outer peripheries of cap 41 and sleeve or ring 44. Securing ring 46 has a flange 47 on its outer periphery which flange secures panel 12 firmly against panel 20. This clamping ring 46 secures lamp cap 41 in place, insures electrical contact between sleeve 44 and cap 41 and acts as a securing member for panel 12.

FIGURE 4 shows an exemplary embodiment of connecting pins 50 and 51 which are mounted on supporting plate 20 to establish electrical contact for conductors 23 and 24 with a suitable source of power, not shown. For example, pin 50 is shown soldered around a portion of its base as indicated at 53 to conductor 24 while a portion of conductor 23 is removed in the region of the extension of the base of pin 50, which base may be conveniently bradded or otherwise flattened to secure pin 50 in plate 20. Similarly, pin 51 is soldered around its bradded extension, as shown at 55, to conductor 23 and a portion of conductor 24 is removed in the region adjacent pin 51.

From the foregoing explanation of the elements of the instrument lighting panel, it is apparent that the lighting circuit includes pin 50, conductor 24, rivet 36, conductor 32, ring 44, ring 46, cap 41, pin 42, filament 49, the peripheral base contact 48, snap ring 38, sleeve 37, conductors 34 and 23 and pin 51.

It will be noted that the panel structure herein features two panels, one of which supports the lamp sockets and the energizing conductors therefor, and the other of which contains no components whatsoever. In order to effect illumination of the legends, simple placement of panel 12 in alignment with sockets 14 supported by panel 20 is all that is required. These two panels are held fixedly in place with respect to one another by merely screwing caps 41 tightly on their associated lamp sockets which project through holes 27 and locking by means of locking rings, such as ring 46. The removal of panel 12 is effected by simply unscrewing locking rings 46 and caps 41 and withdrawing panel 12. This operation permits the ready inspection of the sockets and conductors of supporting panel 20. If desired, the conductors of panel 20 may be covered by a coating of vinyl material (not shown) to protect the printed conductors from the harmful effects of moisture and the like. This coating can be transparent so that the conductors are visible for inspection.

It is to be understood that the above-described arrangements are illustrative of the application of the principles of this invention. Numerous other arrangements may be devised by those skilled in the art without departing from the scope of the invention.

I claim:

1. Panel lighting apparatus comprising a panel of in-

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insulating material, a lamp socket fixedly supported on said panel and projecting therefrom, a first and a second conductor on said panel, said lamp socket comprising a first and a second annular metallic ring, a plastic sleeve having one end substantially closed and connected to said supporting panel and having recesses on its inner and outer peripheries, said first annular ring having threads on its periphery, said second annular ring being inserted in the recess on the inner periphery of said sleeve, conducting means in said lamp socket for defining electrical connections between said first and second conductors and said first and said second annular metallic rings, a cap having a threaded outer portion which abuts said first annular ring, the threaded portions of said first annular ring and said cap defining a single threaded cylindrical surface, a lamp in said cap, an indicia panel having an aperture therein to receive said lamp socket, and means for securing said cap and said indicia panel to said insulating panel, said last-mentioned means including a securing ring having threads on its inner surface whereby said securing ring passes over said cap, secures said cap in abutting relation with said first an-

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nular ring and engages said indicia panel to secure said indicia panel to said panel of insulating material.

2. Panel lighting apparatus in accordance with claim 1 wherein said conducting means comprises a rivet having flanges which secure said sleeve to said insulating panel, said rivet defining the connection to one of the conductors of said insulating panel and a thin conductor connecting said rivet with said first annular ring.

3. Panel lighting apparatus in accordance with claim 1 wherein said first and second conductors are located on opposite sides of said insulating panel.

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