

Oct. 14, 1958

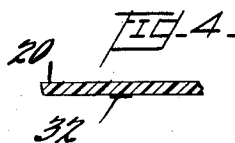
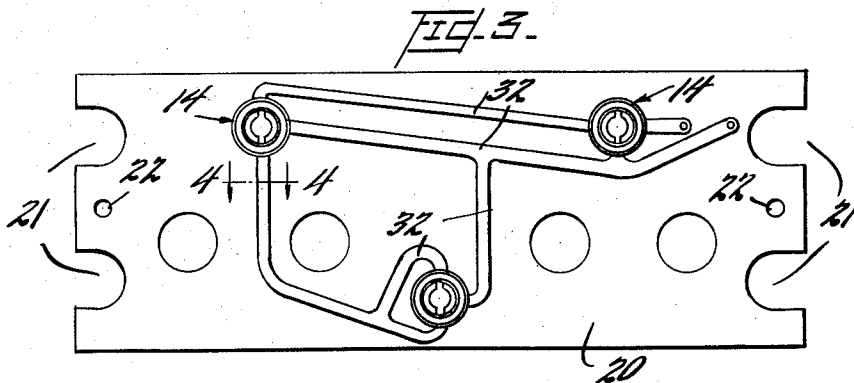
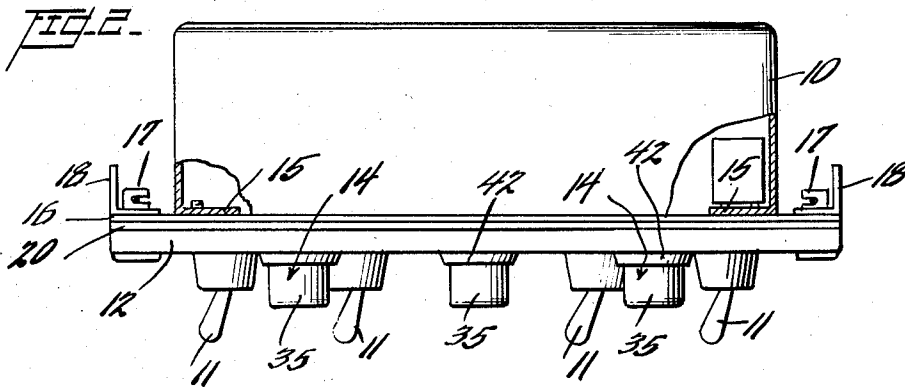
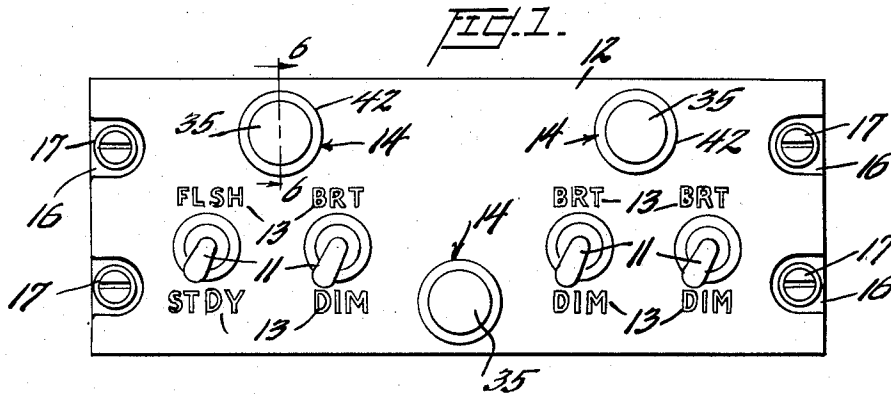
J. M. ROPER

2,855,709

ILLUMINATED INSTRUMENT PANEL

Filed July 27, 1955

2 Sheets-Sheet 1



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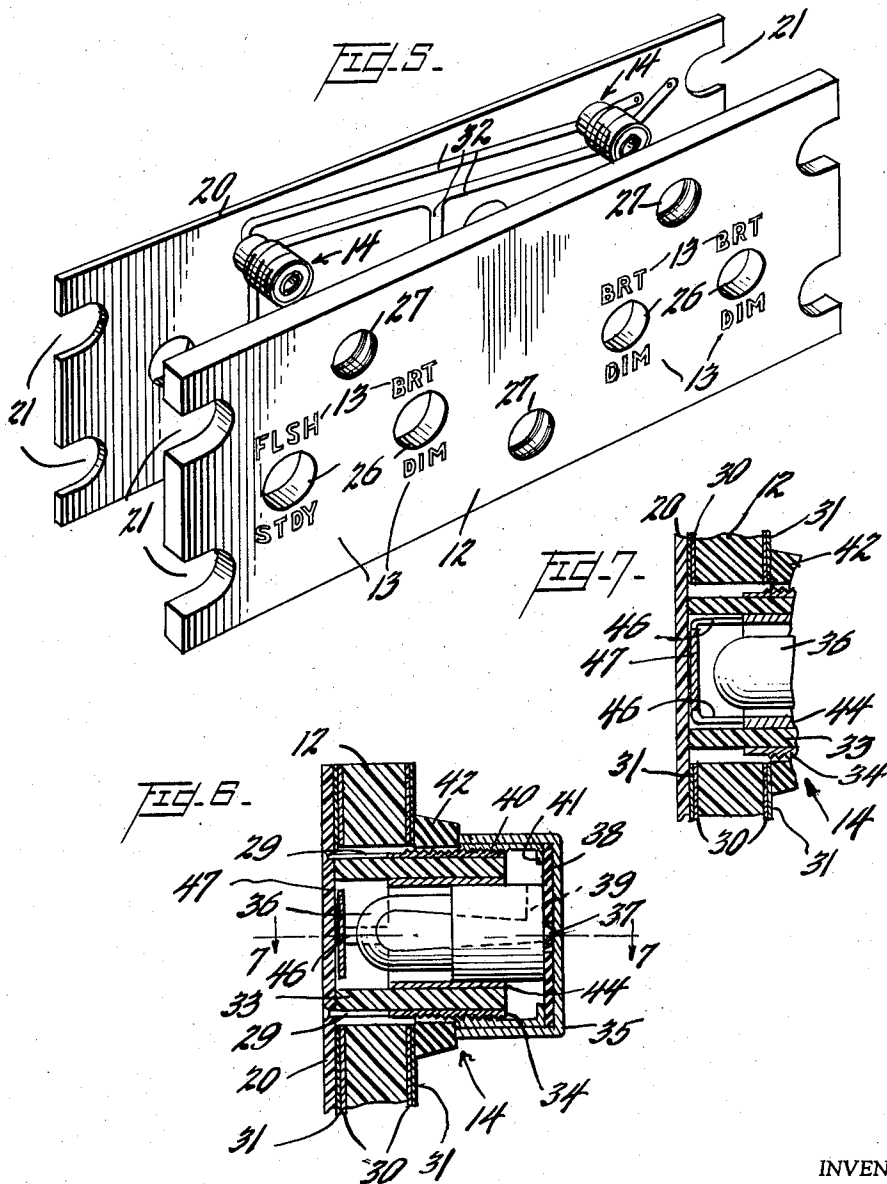
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ILLUMINATED INSTRUMENT PANEL

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2 Sheets-Sheet 2



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1

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ILLUMINATED INSTRUMENT PANEL

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10 Claims. (Cl. 40—130)

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 has grown for an illuminated panel arrangement which may be readily altered and adapted to changes and modifications in the instruments, switches, legends and indicia showing at the front of the panel.

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

2

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 printed 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.

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 box-like chassis. The sockets for the illuminating lamps are coupled to this panel and the necessary conductors for energizing the lamps positioned within these sockets are printed on the surfaces of the support panel. In operation the illuminated panel is positioned over the lamp socket support panel so that the holes are in alignment with the projecting sockets and various controls and the like.

The illuminated panel is clamped into position relative to the socket support panel by protective covers 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 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, the support panel is exposed to view and the sockets and conductors carried thereon are readily accessible.

In the event that it is desired to provide modified information on the front of the panel, the removed panel

3

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.

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 drawings wherein:

Figure 1 is an elevation view of an instrumentation control employing the panel of this invention,

Figure 2 is a plan view of the structure shown in Figure 1 and showing the association of the socket support panel and the illuminated panel with respect to the chassis containing the instrumentation components.

Figure 3 is a plan view of the socket support panel of this invention and showing in detail an arrangement for interconnecting a plurality of mounted sockets for use with an illuminated panel,

Figure 4 is a section view taken along line 4—4 shown in Figure 3,

Figure 5 is a perspective view showing an illuminated panel in position for placement in operative association with a socket support panel,

Figure 6 is a sectional view taken along line 6—6 of Figure 1 and showing the detailed structure of a mounted lamp socket,

Figure 7 is a partial sectional view taken at a right angle to the view shown in Figure 6.

Referring now to Figures 1 and 2 of the drawings, a preferred embodiment of the illuminated panel of this invention is shown in operative association with instrumentation or control apparatus which is confined within box-like chassis 10. The components (not shown) located within box 10 are generally of an electrical and/or electronic nature, and the circuitry thereof is manually controlled, for example, by a plurality of toggle switches 11 having toggles which are exposed for manual operation in front of a panel 12. This panel contains information legends 13 which are to be illuminated by lamps housed within sockets 14. The actual switch mechanism of each switch 11 is located within box 10, and a threaded shank of each switch projects through the overlying panels and a plate 16 for exposure at the face of illuminated panel 12.

Box 10 is usually fabricated of metal to provide some measure of shielding for the components disposed therein and also a common ground. In order to provide a completely effective shield, it is, of course, obvious that box 10 should be covered during circuit operation by a metallic plate or the like; and therefore the flanges 15 formed integrally with the end walls of box 10 are engaged by a covering metallic plate 16. The end portions of plate 16 overhanging the ends of box 10 are rigidly coupled by means of fasteners 17 to a pair of frame members 18. These frame members support box 10 and panels 12 and 20 through plate 16.

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

As is best shown in Figures 3 and 5, both panels 12 and 20 are formed with cutouts 21 sufficiently large so that the head portions of fasteners 17 pass freely therethrough, thereby providing an arrangement in which the fasteners are only effective to clamp cover plate 16 to frame members 18. A plurality of holes 22 are provided within panel 20 so that this panel may be separately fastened to cover plate 16 by means of screws (not shown). Panel 12 is coupled to underlying panel 20 only through the tightening of the caps 35 of 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 caps 35 and pulling panel 12 from its position over the loosely fitting projecting components.

4

As is shown in Figure 5, illuminated panel 12 is formed with a plurality of holes 26 for receiving loosely the shanks of toggle switches 11, and also a plurality of holes 27 for receiving relatively tightly sockets 14.

The number and positioning of the various holes formed in panel 12 is determined by the particular elements which project from chassis 10 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 Figures 6 and 7. 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 for receiving toggle switches 11 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 3 and 5 through 7. Support panel 20 is fabricated of electrical insulation so that conductors 32 may be applied directly to the surface thereof by techniques well known in the art. These sockets may, of course, be electrically connected in parallel or in series, or any other configuration desired for a particular application.

The details of a typical socket construction for use in the panel arrangement of this invention are best shown in Figures 6 and 7. The socket comprises a central insulator sleeve 33 formed of transparent or translucent material. One end of this sleeve rests in a contacting relationship with the face of panel 20 which is to be positioned adjacent panel 12. A cap retaining sleeve 34 is positioned over insulator sleeve 33 in a tightly fitting manner. Sleeve 34 is supported on panel 20 by means of a pair of anchored posts 29 shown in Figure 6. Posts 29 are relatively narrow in width and therefore an annular lower portion of insulator sleeve 33 is exposed, whereby light can be readily transmitted therefrom to the adjacent walls of panel 12.

Cap retaining sleeve 34 is externally threaded so as to receive the mating threads of socket cap 35 which is adapted to close the end portion of the socket. Lamp 36 is fixedly carried by cap 35 inasmuch as contact 37 of the lamp is soldered to the inner end wall of cap 35. Insulator disc 38 prevents the undesired shorting of lamp contact 37 to the metallic base contact 39 of the lamp. Insulator disc 38 is fixed within cap 35 by a cylindrical member 40 having flanged ends 41 which press tightly against disc 38 thereby maintaining the disc in place.

Sealing ring 42 is positioned over cap retaining sleeve 34 and is held fixedly in this position by means of cap 35. Ring 42 effectively seals the enclosed areas of the socket from the harmful effects of moisture and the like. A contact sleeve 44 is positioned within insulator sleeve 33 so as to establish electrical contact with the metallic base 39 of lamp 36. Contact sleeve 44 is supported with respect to panel 20 by means of a pair of relatively thin posts 46 as is shown in Figure 7. With this arrangement, the

5

light of lamp 36 is not obstructed from passage through the bottom portion of insulator sleeve 33 into panel 12. Posts 46 are connected one to the other by means of a metallic disc 47 which is riveted or otherwise fastened to panel 20.

Current flow through the socket is completed by a circuit which includes center contact 47, posts 46, contact sleeve 44, lamp base 39, the filament of lamp 36, contact 37, cap 35, member 40, cap retaining sleeve 34 and posts 29. Printed conductors 32 shown in Figure 3 supply the energizing currents for the lamp housed within socket 14 by connections made to the sockets at posts 29 and center contact 47.

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 the sockets 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 35 tightly on their associated cap retaining sleeves which project through holes 27. The removal of panel 12 is effected by simply unscrewing caps 35 and withdrawing panel 12. This operation permits the ready inspection of the sockets and conductors of panel 20. If it is 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 arrangement is 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.

Having thus described the invention what is claimed as new and required to be secured by Letters Patent is:

1. Panel lighting apparatus comprising a panel of electrical insulating material, a lamp socket fixedly supported on said panel and projecting in only one direction therefrom, said socket being adapted to house a lamp which is partially exposed, a plurality of conductors supported by said panel and connected to said socket, a second panel of transparent material, a layer of opaque material overlying a substantial surface portion of said second panel with portions of said layer being removed in accordance with desired information areas which are to be illuminated, and a socket cap having a lamp therein, said cap securing said second panel in position when engaged with said socket, said second panel as processed being exposed for access and formed with a hole for receiving said socket whereby the mating of the two panels one to the other and the energization of said lamp positioned within said socket effects the illumination of said areas.

2. Panel lighting apparatus comprising a relatively thin panel of electrical insulating material, a lamp socket fixedly positioned only on one face of said panel and projecting only from said one face thereof, said socket being adapted to house a lamp which is optically exposed, a plurality of conductors printed on said one panel face and connected to said socket, a second relatively thin panel of light conducting material, a layer of opaque material overlying a substantial surface of said second panel with portions of said layer being removed in accordance with desired information areas which are to be illuminated, and a cap having a lamp therein, said cap and said socket engaging to secure said second panel to said first mentioned panel, said second panel as processed being exposed for access and formed with a hole for receiving said socket whereby the mating of the two panels one to the other and the energization of said lamp positioned within said socket effects the illumination of said areas.

3. Panel lighting apparatus comprising a panel of electrical insulating material, a lamp socket supported

6

by said panel and projecting therefrom, said socket having a light outlet adjacent the panel, a plurality of conductors supported by said panel and connected to said socket, a second panel of transparent material, a layer of light reflecting material covering a substantial surface of said second panel, a second layer of opaque material overlying a substantial area of said first layer with portions of said second layer being removed in accordance with desired information areas which are to be illuminated, and a cap having a projecting portion thereon, said projecting portion securing said second panel to said first panel when said cap engages said socket, said second panel as processed being exposed for access and formed with a hole for receiving said socket whereby the mating of the two panels one to the other and the energization of said lamp positioned within said socket effects the illumination of said areas through said light outlet.

4. Lighting apparatus comprising a body of electrical insulating material, a lamp socket fixedly positioned on one surface of said body and projecting therefrom, said socket having a light outlet adjacent the body, a plurality of conductors supported by said body and connected to said socket, a second body of light conducting material, a layer of opaque material overlying a substantial surface of said second body with portions of said layer being removed in accordance with desired information areas which are to be illuminated, and a cap having a lamp therein, said cap engaging said socket and securing said two bodies together, said second body as processed being exposed for access and formed with a hole for receiving said socket whereby the close mating of the two bodies one to the other and the energization of said lamp positioned within said socket effects the illumination of said areas.

5. Lighting apparatus comprising a relatively thin panel, a lamp socket fixedly positioned on one surface of said panel and projecting therefrom, said socket having a side light outlet, a plurality of conductors supported by said panel and connected to said socket, a second panel of light conducting material, a layer of relatively poor light conducting material overlying a substantial surface of said second panel with portions of said layer being removed in accordance with desired information areas which are to be illuminated, said second panel as processed being exposed for access and being formed with a hole for receiving said socket, an annular sealing ring on said socket adjacent said second panel and a cap having a lamp therein, said cap engaging said sealing ring and said second panel to cause said sealing ring to act as a moisture excluding seal said cap threadably engaging said socket and abutting said sealing ring to secure said sealing ring between said cap and said second panel whereby the mating of the two panels one to the other and the energization of said lamp positioned within said socket effects the illumination of said areas.

6. Panel lighting apparatus comprising a relatively thin panel of electrical insulating material, a plurality of lamp sockets fixedly positioned only on one surface of said panel and projecting only from said one surface, said sockets each being adapted to receive and house a lamp which is optically exposed in a substantially complete circular and ring-like area next adjacent said panel, a plurality of film-like conductors applied to the one surface of said panel and connected to said sockets to establish an energizing circuit therefor, a plurality of terminals supported by said panel and individually connected to a different one of said conductors, a second relatively thin plastic panel of transparent material, a layer of white vinyl material overlying a substantial surface portion of said second panel, a layer of opaque black vinyl material overlying a substantial surface portion of said white vinyl layer with portions of said opaque layer being removed in accordance with desired information areas which are to be illuminated, said second panel as processed being exposed for access and being formed with a plurality of

holes each for receiving a different socket whereby said ring-like area of each socket is light coupled to the exposed side walls of the associated hole, and a protective cover cap for each of said sockets adapted for coupling to a portion of an associated socket projecting from the surface of said second panel and for clamping the two mated panels closely one to the other.

7. Panel lighting apparatus comprising a relatively thin panel of electrical insulating material, a plurality of lamp sockets fixedly positioned only on one surface of said panel and projecting therefrom, said sockets each being adapted to receive and house a lamp which is optically exposed in a substantially complete circular and ring-like area next adjacent said panel, a plurality of film-like conductors applied to the one surface of said panel and connected to said sockets to establish an energizing circuit therefor, a second relatively thin-plastic panel of transparent material, a layer of white vinyl material overlying a substantial surface portion of said second panel, a layer of opaque black vinyl material overlying a substantial surface portion of said white vinyl layer with portions of said opaque layer being removed in accordance with desired information areas which are to be illuminated, said second panel as processed being exposed for access and being formed with a plurality of holes each for receiving a different socket whereby said ring-area of each socket is optically coupled to the exposed side walls of the associated hole, and a protective cover cap for each of said sockets adapted for coupling to a portion of an associated socket projecting from the surface of said second panel having the information areas and clamping the two mated panels closely one to the other.

8. Lighting apparatus comprising a relatively thin body of electrical insulating material, a plurality of lamp sockets fixedly positioned on only one surface of said body and projecting therefrom, said sockets each having a side light outlet adjacent said body and being adapted to receive and house a lamp, a plurality of film-like conductors applied to the one surface of said body and connected to said sockets to establish an energizing circuit therefor, a plurality of terminals supported by said panel and individually connected to a different one of said conductors, a second relatively thin body of light conducting material, a layer of relatively poor light conducting material overlying a substantial surface portion of said second body with portions of said opaque layer being removed in accordance with desired information areas which are to be illuminated, said second body as processed being exposed for access and being formed with a plurality of holes each for receiving a different socket whereby said light outlet of each socket is light coupled to the exposed side walls of the associated hole, and a protective cover cap for each of said sockets adapted for coupling to a portion of an associated socket projecting from the surface of said second body and for clamping the two mated bodies closely one to the other.

9. Panel lighting apparatus comprising a relatively thin panel of electrical insulating material, a lamp socket

fixedly positioned on only one surface of said panel and projecting therefrom, said socket having a side light outlet adjacent said body and being adapted to receive and house a lamp, a plurality of conductors supported by said panel and connected to said socket to establish an energizing circuit therefor, a plurality of terminals supported by said panel and individually connected to a different one of said conductors, a second relatively thin panel of transparent material, a layer of light reflecting material overlying a substantial surface portion of said second panel, a layer of opaque material overlying a substantial surface portion of said first layer with portions of said opaque layer being removed in accordance with desired information areas which are to be illuminated, said second panel as processed being exposed for access and formed with a hole for receiving said socket whereby said light outlet is light coupled to the exposed side walls of the associated hole, and a protective cover cap for said socket adapted for coupling to a portion of an associated socket projecting from the surface of said second panel and for clamping the two mated panels closely one to the other.

10. Panel lighting apparatus comprising a relatively thin panel of electrical insulating material, a lamp socket fixedly positioned on only one surface of said panel and projecting therefrom, said socket having a side light outlet and being adapted to receive and house a lamp, a plurality of conductors supported on the one surface of said panel and connected to said socket to establish an energizing circuit therefor, a plurality of terminals supported by said panel and individually connected to a different one of said conductors, a second relatively thin panel of transparent material, a layer of light reflecting material overlying a substantial surface portion of said second panel, a layer of opaque material overlying a substantial surface portion of said first layer with portions of said opaque layer being removed in accordance with desired information areas which are to be illuminated, and a socket cap having a lamp therein, said socket cap having a projecting portion thereon to secure said second panel to said first panel when said cap engages said socket, said second panel as processed being exposed for access and formed with a hole for receiving said socket whereby said ring-area of each socket is light coupled to the exposed side walls of the associated hole.

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