

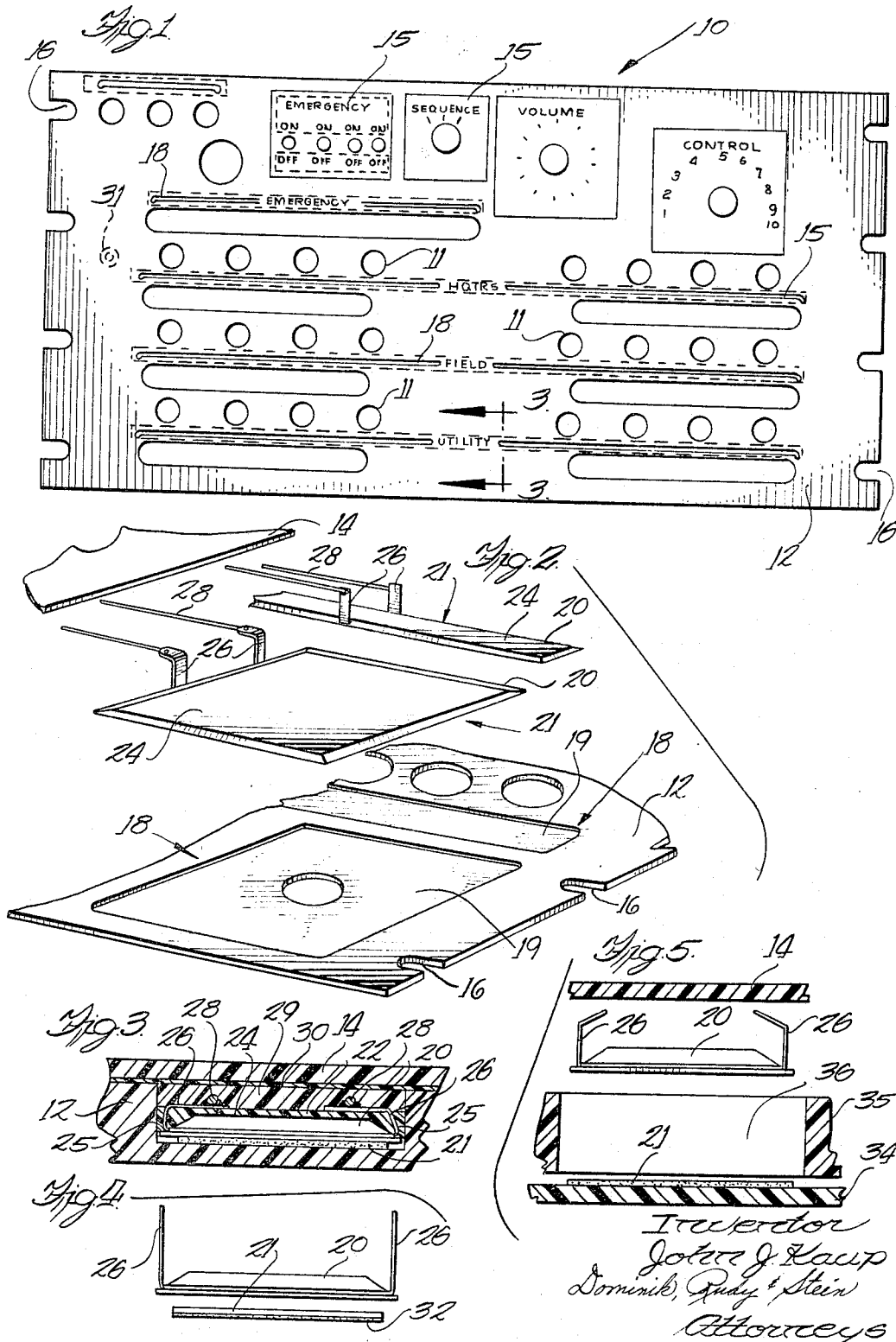
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ILLUMINATED PANEL AND METHOD FOR MAKING SAME

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ILLUMINATED PANEL AND METHOD FOR MAKING SAME

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4 Claims. (Cl. 40—130)

The present invention relates to a method for the preparation of an illuminated panel, and to the manufactured panel itself. Panels of this character find particular utility in airborne switch and communications equipment, but may also be utilized in various data processing control panels, and other control panels in which detailed lighted indicia are presented for viewing in darkened or completely darkened rooms.

Heretofore, various panels have been prepared in which luminescent lighting is employed. Luminescent lights of differing sizes are available which are formed by crystalline powders which are sandwiched between two electrically insulated surfaces, at least one of which is translucent. Such lights, however, are in flat form, and can be very expensive both from the standpoint of illumination as well as manufacture when cut into various sizes and shapes required for some of the complicated illuminated panel applications utilized in today's aircraft. If such luminescent lamps are punched, or otherwise modified under less than hermetical sealing and factory conditions, any moisture getting into the crystalline powders employed will vastly reduce the efficiency of the unit, and can greatly foreshorten its life if not destroy the same upon contact.

Accordingly, it is one of the primary objects of the present invention to provide an illuminated panel and method for making the same in which all military standards are met for illumination; which is economical to manufacture; durable in construction; and adaptable for a wide variety of applications.

A related advantage of the present invention is to furnish an illuminated panel in which the illumination is achieved to the most rigid specifications even though the panel is grey or black and white for daylight usage, the illumination being transmitted to the white portion, as a clearly defined red.

Still a further object of the invention looks to the uniform employment of a green phosphorous lamp delivering a maximum of illumination, and after an initial aging of 150 hours corrected to the aviation red standard of .60 foot lamberts.

Still another advantage of the present invention is achieved by illuminating only the indicia required so that the current drain and total power consumption per panel is held to a minimum.

Another and very important object of the invention is to provide a method for panel manufacture which permits the adaptability of manufacture readily to varying panel designs, the same being promptly put into production on an economical basis.

A further and more detailed advantage of the invention looks to the pocketing of the light elements within the panel construction itself, thereby further insuring a hermetically sealed condition for the light.

Further objects and advantages of the present invention will become apparent in the following description of an illustrative embodiment in which:

FIG. 1 is a typical front elevation view of the type of panel in which the present illuminating features are achieved.

FIG. 2 is an exploded perspective view of an illustrative rear portion of the panel shown in FIG. 1 illustrating

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the sequential positioning of the electroluminescent lights and their wiring.

FIG. 3 is an enlarged transverse sectional view taken along 3—3 of FIG. 1 through one of the lighting elements illustrating the various layers of sealant, luminescent paint and other details of the panel.

FIG. 4 is a partially diagrammatic exploded view of the same area as shown in FIG. 3 but illustrating an alternative embodiment thereof.

FIG. 5 is a further alternative embodiment of the construction of FIG. 3 taken from the same position in diagrammatic exploded transverse section.

In broad outline, the invention contemplates the employment of a pair of plates, one of which is recessed in its rear portion to accommodate the luminescent light panels of the invention, the light panels being embedded in the recessed areas after being appropriately treated to transmit the light to the specifications required; the rear plate portion being used to fully enclose and hermetically seal the entire panel in illuminated condition.

Referring now to the drawings, and more particularly FIG. 1 thereof, it will be seen that a panel 10 of an illustrative character has a plurality of holes 11 throughout it which, for purposes of illustration could be used for switchboard plug-ins. Various other reasons for the porosity or perforations and apertures may exist in practice. It is within the scope of the invention to provide a method for determining the design of each individual panel, and then fabricating and assembling the same in accordance therewith. There will first be described the method employed and in conjunction with this method, the various elements of the exemplary panel will become apparent.

Upon determining the particular intelligence to be transmitted by the panel, the designer then orients the various illuminated indicia in a linear, or curvilinear form, the same being isolated into either elongate paths, or into clusters of rectangular or square nature. Every attempt is made to eliminate circular openings which are enclosed by arcuately oriented indicia, but if the same is required, it is then concentrated into an area which can be defined by a rectangle of a given dimension.

After concluding the lamp layout, a clear acrylic plastic front plate 12, as in one commercial embodiment approximately .125 inch thick, is sawed to an oversized rectangular size, or other configuration required. The material found highly adaptable in commercial usage is sold under the trademark Plexiglas. The back plate 14 is similarly sawed to an oversized configuration, and is normally in such commercial embodiments approximately .060 inch thick.

The front plate 12 is then silk-screened with the copy on its face. The purpose of silk-screening the front plate first is to hold the cost of the particular elements to a minimum prior to the insertion of the lamps in the event that spoilage or rejects are encountered in the course of testing with the lamps in place. Furthermore, after the lamps have been inserted in the unit and tested satisfactorily, the risk of damage in the course of silk-screening is substantial.

A white silk screen coating of approximately one mil in thickness is first applied. Any epoxy base paint is employed in silk-screening the white in place. With this thickness, the covering paint is translucent, and screens out only approximately thirty to forty percent of the transmitted lighting behind it.

A black reverse screen coating over the white is then employed, the black thereby leaving showing the white beneath in the identical configuration of the indicia 15 to be illuminated. The black reverse screen coating em-

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ployed over the white one mil epoxy base paint is applied to a thickness of approximately one to two mils.

Thereafter, depending upon the color of the host portion of the panel, a reverse screen from the black screen coating is applied. The colors grey, blue, or black are commonly employed, but not necessarily to the exclusion of other colors. The base color is normally designed to provide a daylight differential in illumination between the printed indicia 15 and the host portion, and yet sufficiently opaque to cover the entire panel. One of the advantages of first applying the black reverse screen coating, and then the ultimate color is to hold to the irreducible minimum the possibility of any coincidental pin holes through which undesired illumination might appear.

Thereafter, at least two locating holes 16 are drilled through the front and back plates 12, 14 positioned so that they can subsequently be employed as mounting holes. These holes are drilled undersize, and to a dimension that is desirable for use in holding the front and rear plates in position for subsequent machining and assembly steps.

While the front plate is then held in position, a profile is prepared for the routing of the mounting channels 18 of the lamps as well as the mounting of the wiring in parallel. The layout of the mounting channels 18 are shown in dotted lines in FIG. 1. The routing is done to a depth of approximately .060 inch ($\frac{3}{64}$ inch) and finished to as smooth a channel base surface 19 as conveniently compatible with accepted manufacturing techniques.

The lamps 20 are silk-screened on the illuminated surface with a phosphorous red coating 21 to approximately .002 inch in thickness. Phosphorous red paints of this character are commercially available, one example is known as Velvaglow red manufactured by the Radiant Color Company of Oakland, California. Another is the Dayglow paint manufactured by the Switzer Company of Ohio. The silk-screening to the two mil thickness is preferably done in two steps in order to control the quality and red translucent characteristics of the treated lamp.

Thereafter the various lamps are positioned in the mounting channels 18, and clamped on their rear portion in order to provide intimate contact between the phosphorous red coated surface 21 and the channel base surface 19, and while clamped in this position are potted or otherwise secured in place by the application of an epoxy potting resin 22 to the back portion 24 of the illuminating lamp. As was indicated above, the depth of the routed out area is such that there is room for placing the epoxy over the rear which extends over the sidewalls of the illuminating lamp and contacts the vertical side walls of the routed area and forms an intimate side wall chemical contact 25 therewith, at the same time sealing the lamps into position. The electrical lamp leads extend outwardly from the lamp 20, and are positioned so that they may be soldered with circuit wires 28 which are subsequently placed into position. Because of the dielectrical characteristics of the epoxy material used to pot the lamp in position, a bare copper tinned wire of .025 inches can be employed as a circuit wire 28. The circuit wires 28 are then soldered into electrical connections with the leads 26 extending from the lamp. The circuit wires 28 are laid atop the first epoxy coating 22 in physical and electrical parallel relationship along the channels.

A second epoxy coating 29 is then placed into position to approximately level off the routed area with the adjacent surface portion of the front plate 12. While the second epoxy coating 29 is still in the soft condition, an ethylene dichloride solvent 30 is employed to the interfaces of the back plate and the front plate, and thereafter the back plate is subjected to pressure in order to permanently bond it to the front plate, and completely seal the instrument lamps 20 into position. Thereafter the instrument holes are machined out, and the final assembly made of the electrical connections. While the elec-

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trical connection for the ultimate illumination does not necessarily form a critical element of the invention, it has been determined that a bayonet type fastener 31 which extends through the back plate and is soldered or otherwise secured to the two parallel lead lines between the back and front plate is highly advantageous commercially.

Two alternative procedures are contemplated from the ones outlined above regarding the placing of the aircraft fluorescent red on the outer portion of the lamps. In the first variation (illustrated in FIG. 4) it is contemplated that the same thickness of red paint 21 be placed upon a thin sheet of vinyl type plastic material 32 approximating 2 to 10 mils in thickness, and thereafter, the sheet material positioned in the base portion of the routed out recesses in front of the lamps. In accordance with the second alternative method contemplated (illustrated in FIG. 5) the base of the routed out portions are smoothed with a suitable solvent, or molded smooth, or employed with a 3 plate construction, and thereafter painted directly with the red phosphorous type paint. In either application, the red paint, or other color to be transmitted, is placed between the electroluminescent light and the top plate or outer top plate 34. The top plate is finished in accordance with the method already described in detail.

A further alternative is illustrated in FIG. 5 wherein an outer front plate 34 has the indicia coating, and the lamp plate 35 has lamp openings 36 sawed or otherwise cut through its faces. The back plate 14 remains the same. In assembly, the outer front plate is bonded to the lamp plate 35 in the same manner as the back plate attachment has been described.

Although particular embodiments of the invention have been shown and described in full here, there is no intention to thereby limit the invention to the details of such embodiments. On the contrary, the intention is to cover all modifications, alternative embodiments, usages and equivalents to the illuminated panel and method for making same as fall within the spirit and scope of the invention, specification and appended claims.

I claim:

1. An illuminated instrument panel comprising, in combination, a plastic light transmitting front plate, translucent indicia on the outer face of the front plate for back lighting, means defining a plurality of recesses in the rear of the front plate and behind the translucent indicia, a plurality of electroluminescent lamps proportioned to nest within the recesses, electrical leads extending from the lamps, a coating of red phosphorous between said lamps and the translucent indicia, a pair of circuit wires in electrically parallel relationship atop a lamp and within the recess and connected to the lamp leads, a layer of potting resin embedding the circuit wires and lamps, and a back plate interfacially secured to and coextensive with the front plate, thereby sealingly embedding the electroluminescent lamps for backlighting the instrument panel indicia.

2. An illuminated instrument panel comprising, in combination, a plastic light transmitting front plate, a thin white coating on the front plate, an opaque reverse screen coating over the white defining color contrasting indicia for back lighting, means defining a plurality of recesses in the rear of the front plate and behind contrasting indicia, a plurality of electroluminescent lamps proportioned to nest within the recesses, electrical leads extending from the lamps, a coating of red phosphorous on said lamps and facing the indicia, circuit wires in electrically parallel relationship atop the lamp and connected to the lamp leads, a layer of potting resin embedding the circuit wires and lamps, and a back plate interfacially secured to and coextensive with the front plate, thereby sealingly embedding the electroluminescent lamps for backlighting the instrument panel indicia.

3. An illuminated instrument panel comprising, in combination, a plastic light transmitting front plate, a thin light colored translucent coating on the front plate, an

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opaque coating over the translucent coating leaving color contrasting indicia for back lighting, means defining a plurality of recesses in the rear of the front plate and behind contrasting indicia, a plurality of imperforate electroluminescent lamps proportioned to nest within the recesses, and having electrical leads extending therefrom, a coating of red phosphorous between said lamps and the indicia, a first layer of potting resin covering the lamp in the recess from which the lamp leads extend, a pair of circuit wires in electrically parallel and physically parallel relationship atop the first layer of potting resin means connecting the lamp leads to the circuit wires, a second layer of potting resin embedding the circuit wires, and a back plate interfacially secured to and coextensive with the front plate, thereby sealingly embedding the electroluminescent lamps for backlighting the instrument panel indicia.

4. An illuminated instrument panel comprising, in combination, a plastic light transmitting front plate, translucent indicia on the front plate for back lighting, means defining a plurality of elongate recesses in the rear of the front plate and behind translucent indicia, a plurality of elongate electroluminescent lamps proportioned to nest within the recesses, electrical leads extending from said lamps, a coating of red phosphorous between said lamps

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and the indicia, circuit wires in electrical connection with the lamp leads, potting resin embedding the circuit wires and lamps in the recesses, and a back plate interfacially secured to and coextensive with the front plate, thereby sealingly embedding the electroluminescent lamps for backlighting the instrument panel indicia.

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