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2,594,081

ILLUMINATED PANEL

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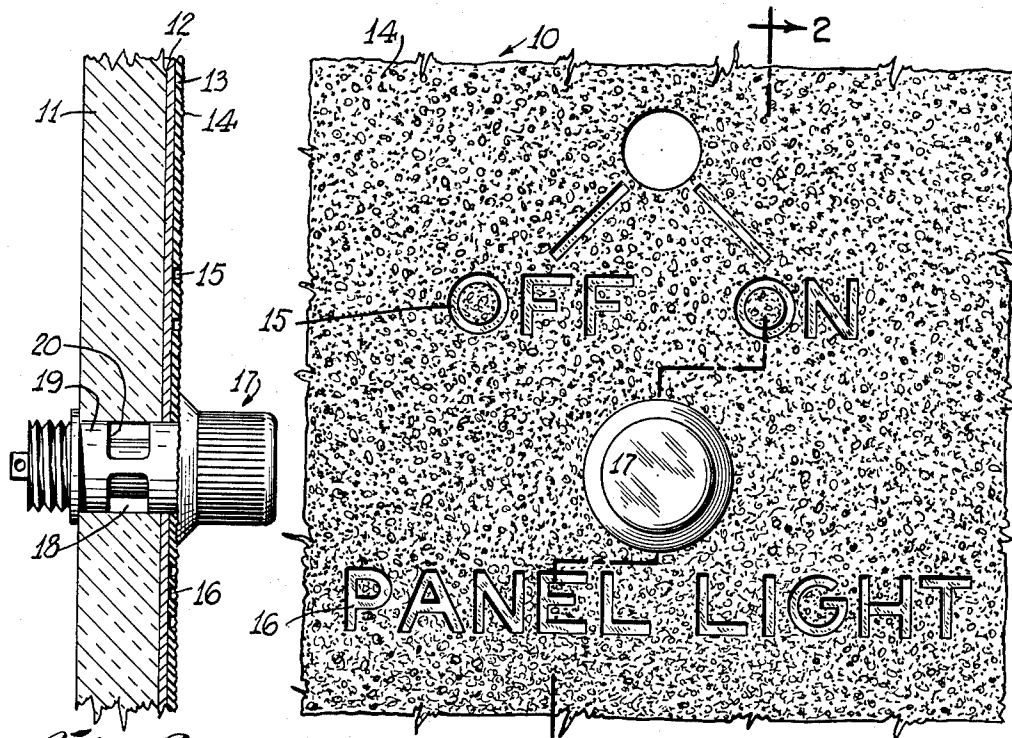


Fig. 2.

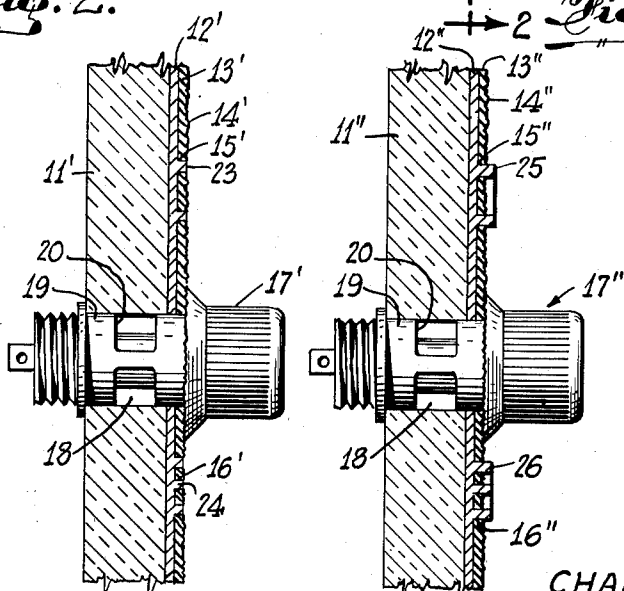


Fig. 3.

Fig. 4.

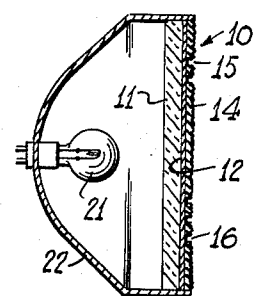


Fig. 5.

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ILLUMINATED PANEL

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This invention relates to improvements in illuminated panels, and particularly panels for aircraft instruments. It is designed to meet specifications unattainable in other panels, such as, specifications set forth in the United States Air Force-Navy Aeronautical Specifications.

It is an object of the present invention to provide a panel wherein the engraved characters are sharply defined without glare.

Another object is to provide a panel of the character described which gives a high contrast between the characters and the face of the panel, with the panel having a matte finish to diminish reflection of light from an oblique source in front thereof.

A further object of the invention is to provide a panel of the type described having a matte finish, or low reflective surface, which resists scratching or scoring to thereby retain its light "trapping" characteristic indefinitely.

A still further object of this invention is to provide a laminated panel of the type described including a light transmitting lamination, a transilluminated, or translucent, lamination and an opaque outer lamination having a matte finish resisting abrasion and wherein openings are formed in the outer lamination to define characters and expose portions of the transilluminated or translucent intermediate lamination, with the outer and intermediate laminations providing a high contrast for improved visibility of the characters.

Yet another object of the present invention is to provide a laminated panel having the characteristics referred to above, wherein the outer lamination is flexible to cushion the light transmitting lamination against shocks, retains splinters or chips that may be broken off the light transmitting lamination, and renders the panel more flame-resistant.

Various further and more specific objects, features and advantages will clearly appear from the detailed description given below, taken in connection with the accompanying drawing which forms a part of this specification and illustrates, merely by way of example, several embodiments of the invention.

The invention consists in such novel features, arrangements and combinations of parts as may be shown and described in connection with the apparatus herein disclosed by way of example only and as illustrative of preferred embodiments.

In the drawing:

Fig. 1 is a front elevation of a portion of a panel according to this invention;

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Fig. 2 is a vertical sectional view taken on the line 2—2 of Fig. 1;

Fig. 3 is a vertical sectional view, similar to Fig. 2, of a panel according to a modification of this invention;

Fig. 4 is a vertical sectional view, similar to Fig. 2, of a panel according to another modification of this invention; and

Fig. 5 is a vertical sectional view illustrating an alternative manner of illuminating the panels according to this invention.

Referring to the drawing in detail, and initially to Figs. 1 and 2 thereof, a panel 10 is there shown which comprises a relatively thick sheet 11 of clear, light-transmitting material, preferably plastic, such as for example methyl methacrylate; an intermediate relatively thin lamination, coating or film 12 of flexible translucent material, preferably of the class of polyvinyl or vinyl resins or materials, their polymers or copolymers, such as, for example, polyvinyl chloride using suitable plasticizers for flexibility or blended with nitrile rubbers for that purpose, vinyl chloride-acetate copolymers, polyvinylidene chloride, or vinyl chloride-vinylidene chloride copolymers; and an outer relatively thin lamination, coating or film 13 of flexible opaque material, preferably of the class of polyvinyl or vinyl resins or materials, their polymers or copolymers, such as, for example, any of those mentioned above, and formed with a matte finish on its outer surface 14.

Translucent film 12 is preferably colored while the opaque film 13 is preferably colored black to provide a high contrast. However, other colors, providing a suitable high contrast could be used.

The lamination may be performed by coating the surface of the sheets or layers with an adhesive, and passing the superposed layers or sandwich through a set of rolls to squeeze out the excess adhesive, disperse it uniformly over the entire area, and help it to bond the layers together, or the lamination may be performed by bonding the several layers together with heat and pressure. As still another possibility, the films 12 and 13 may be sprayed or brushed on in the form of a paint.

After the lamination of sheet 11 and films 12 and 13 is formed, the panel is fabricated therefrom by cutting it to suitable size and shape, and performing any other machine work that may be required, such as providing drilled holes for mounting. The characters are formed in the panel by suitable cutting away the black opaque film 13, as at 15 and 16, to expose the white trans-

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luculent film 12, therebeneath. When the panel is illuminated from the front, the characters will be easily visible by reason of the high contrast between the white letters and the black surface of the panel. Since the surface 14 has a matte finish, that is a surface made up of a myriad of closely spaced peaks and valleys acting as light traps, there will be very little reflection off the surface 14 to disturb the high contrast.

It has been found that these peaks, forming the matte finish, are easily broken off, as by scratching or abrasion, when the outer film 13 is formed of a rigid material. When the outer film is formed of a flexible or elastometric material having a vinyl resin base in accordance with this invention, the resistance to the breaking off of these peaks is greatly increased and the panel retains its low reflective characteristic indefinitely.

The use of flexible material for films 12 and 13 in addition to retaining the matte finish of the outer surface 14, contributes several other noteworthy characteristics to the resulting panel. The flexible films 12 and 13 protect the brittle methyl methacrylate forming sheet 11 from shocks, and act to retain any chips or splinters in place, if the sheet 11 is shattered. Further, the vinyl resins have the characteristic of being self-extinguishing, and therefore increase the flame resistance of the panel since the methyl methacrylate sheet 11 is only slow-burning.

The panel described above may be either edge illuminated, by a source of light embedded therein (Figs. 1-4) or directed at the edges thereof, or by light projected from the rear (Fig. 5). As seen in Figs. 1-4, edge lighting of the panel, by a source of light embedded therein, may be provided by a panel light 17 of conventional construction, such as that manufactured by Grimes Manufacturing Company, Urbana, Ohio, under part No. A4295, which is disposed in an opening 13 formed through panel 10. Since the panel light is conventional, it will not be described in detail except to indicate that the sleeve 13 thereof is formed with cutouts 20 so that the light is directed radially into light transmitting sheet 11. Sheet 11 then transmits the light to the translucent sheet 12 to transilluminate the latter and a clear outline of the cutout characters 15 and 16 will be provided, free from glare.

It should be noted that if red bulbs are used in panel lights 17, or while bulbs with red filters therearound, the light transmitted by the clear methyl methacrylate sheet 11 will be red and the characters 15 and 16 will appear red when so transilluminated and white when light 17 is extinguished.

In Fig. 5 an embodiment of the invention is illustrated in which the panel 10, similar to that heretofore described, is illuminated by light projected against the rear surface of sheet 11 by a source 21 enclosed within a suitable casing 22 which may be shaped to direct the projected light uniformly against the back surface of the panel. Here again, the light-transmitting sheet 11 will transmit the light to the translucent sheet 12 to illuminate the characters defined by cutouts 15 and 16 formed in the outer opaque sheet 13. It has been found that with illumination from the rear, as in Fig. 5, the illumination of the characters with colored light, for example red light, is best achieved by coloring sheet 11 red and utilizing a source 21 of white light. The sheet 11 then transmits red light to the translucent sheet so that the characters will appear red when

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illuminated from the rear and white when the source 21 is extinguished.

In Fig. 3, a modification of the panel according to this invention is illustrated which includes the relatively thick sheet of light transmitting material 11', and thin films of flexible vinyl 12' and 13' which are, respectively, translucent and colored white and opaque and colored black, as in the case of the panel in Figs. 1 and 2. Film 13' is provided with a matte finish 14' as before, and sheet 11' is edge-illuminated by the panel light 17', as illustrated, or may be illuminated from the rear by a construction similar to that shown in Fig. 5. To define the characters, film 13' is formed with suitable cutouts 15' and 16', however, as distinguished from the embodiment in Figs. 1 and 2, sheet 12' extends forwardly into cutouts 15' and 16', as at 23 and 24, to lie flush with the matte finished outer surface 14'.

In Fig. 4, still another modified embodiment of the invention is shown including a light transmitting sheet 11'', translucent flexible sheet 12'' and opaque flexible sheet 13'' having a matte surface 14''. The characters are defined by cutouts 15'' and 16'' formed in the sheet 13'', and the sheet 12'' is extended through these cutouts beyond the surface 14'', as at 25 and 26, to provide improved visibility of the characters when the panel is viewed from an angle. Since the raised characters, formed by extending sheet 12'' through the cutouts in sheet 13'', are of an elastometric material they will resist abrasion and rubbing off much in the same manner as the matte finish of surface 14. Although the panel in Fig. 4 is shown as being edge lighted by a panel light 17'', embedded therein, it is to be understood that the rear lighting arrangement of Fig. 5 could be applied with equal facility.

Although, in describing preferred embodiments of the invention, I have specified certain suitable materials and forms, it is to be understood that the panels of each modification embodying the invention have, in common, a sheet of light-transmitting material, a film or coating of lightly colored, translucent, elastometric or "rubbery" material and an outer film or coating of dark colored, opaque, elastometric or "rubbery" material formed with a matte finish and suitable cutouts exposing portions of the underlying translucent film defining the desired characters.

Having thus described the invention, it is to be understood that changes and modifications, obvious to one skilled in the art, may be effected in the illustrated embodiments within the scope of the invention which is intended to be defined by the appended claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. A panel comprising a sheet of light transmitting material, a light colored translucent film formed of an elastomeric and low-reflective flexible material and superposed on said sheet, and a dark colored opaque film formed of an elastomeric and low-reflective flexible material and superposed on said translucent film, said opaque film being formed with a roughened low-reflective outer surface and cut through to expose said translucent film for defining characters.

2. A panel comprising a sheet of light transmitting material, a light colored translucent film superposed on said sheet, and a dark colored opaque film superposed on said translucent film and having a roughened low-reflective outer surface, both said translucent and opaque films being formed of an elastomeric material having

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a low-reflective flexible vinyl resin base, said opaque film being cut through to expose said translucent film for defining characters.

3. A panel according to claim 2; wherein said translucent film extends into the cut-out portions of said opaque film to lie flush with said low-reflective outer surface at said cut-out portions.

4. An internally illuminating panel comprising a sheet of light transmitting material, a light colored translucent film formed of an elastomeric and low-reflective flexible material and superposed on said sheet, a dark colored opaque film formed of an elastomeric and low-reflective flexible material and superposed on said translucent film, said opaque film being formed with a roughened low-reflective outer surface and having cut-out portions to expose said translucent film for defining characters, and means for illuminating said light transmitting sheet to transilluminate the exposed translucent film at said cut-out portions of the opaque film.

5. A panel comprising a sheet of light transmitting material, a light colored translucent film superposed on said sheet, and a dark colored

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opaque film formed of an elastomeric, flexible and low-reflective material superposed on said translucent film, said opaque film being formed with a roughened low-reflective outer surface and having portions thereof cut-through to expose said translucent film for defining characters.

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