Oct. 3, 1967 B. V. STRIANESE 3,344,545

PANEL LIGHTING SYSTEM

Filed March 25, 1965

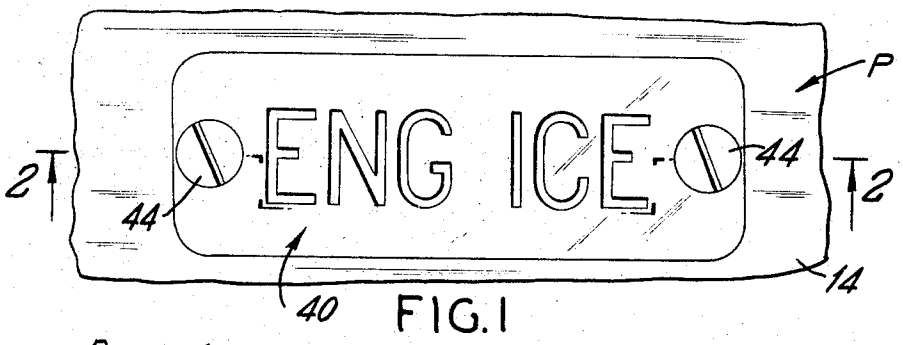


FIG. 1

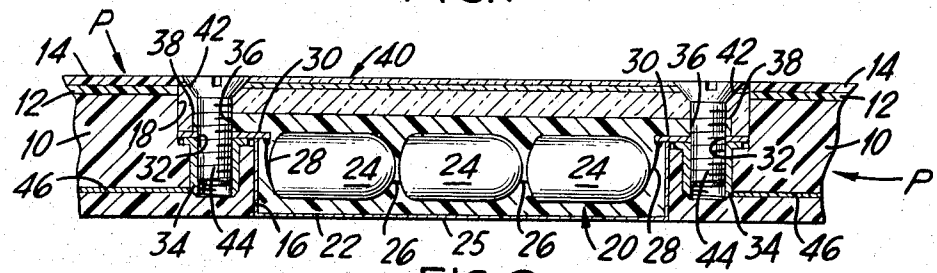


FIG. 2

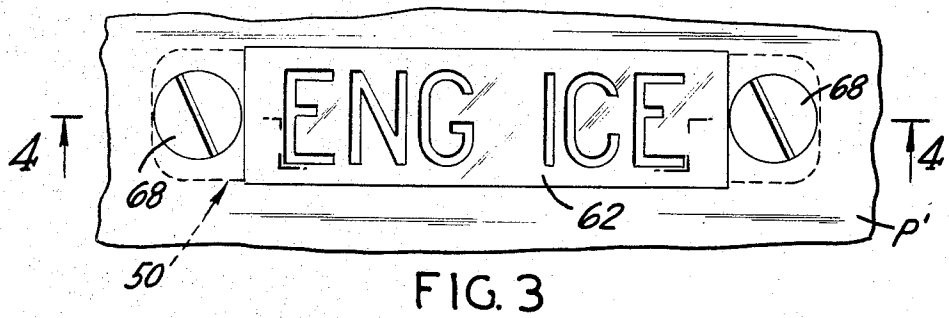


FIG. 3

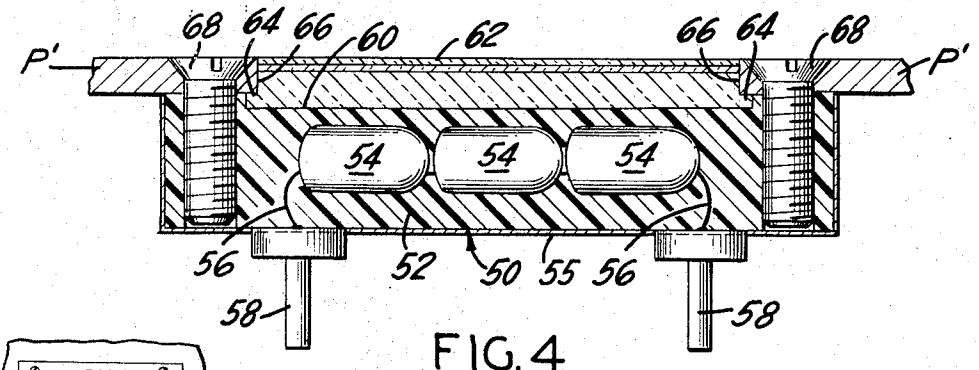


FIG. 4

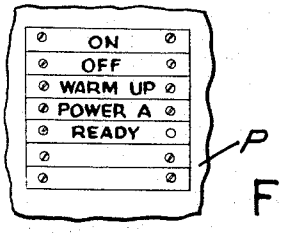


FIG. 5

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PANEL LIGHTING SYSTEM

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ABSTRACT OF THE DISCLOSURE

An internally illuminated indicia presentation having interchangeable indicia panels and bulb-containing body means.

This invention relates to instrument panels and more particularly to such panels having very small, removable indicia bearing sections on the front surface thereof and integrally contained illuminating means therefor.

Instrument panels such as those used in aircraft, for example, are commonly illuminated by edge lighting. The panel itself would be of multilayer construction comprising a main body portion of transparent plastic, a thin middle layer of translucent material and finally, a thin outer layer of opaque material. Indicia are cut into the outer opaque layers to the depth of the middle transparent layer. Miniature lamps are then placed within the plane of the relatively thick main body portion of the panel whereby they may be energized by a remote power source to illuminate particular portions of the panel.

Panels of the aforementioned type, particularly those used in aircraft, may be as large as 200 square inches. A panel of this size, costing approximately $100.00, could have as many as 50 separate and distinct indicia bearing areas requiring 60 lamps for proper and uniform illumination. Disregarding the material cost for the moment, the labor cost per unit panel is extremely high because the environment of the panel dictates extreme accuracy and reliability. To meet these requirements, each panel is fabricated by complex techniques such as mechanical or photoengraving.

In spite of all the care taken during manufacture, panels do fail to meet specifications for one reason or another and must be destroyed. The engraving may be defective in only one small area and yet, if this is discovered after the operation is complete, then all the work that went into the panel is lost. The panel may be improperly handled and scratched or broken after it is engraved. Once again it must be discarded. Although the miniature lamps employed are rated in the order of fifty thousand hours, it is conceivable that some will be defective resulting in a much shorter operational life. Accordingly, the panel must be removed from the installation at a high cost and must be replaced. It is also possible that at some time, particularly in the early design stage, it would be desirable to make an alternation in the panel indicia. In the past, such a change of requirements necessitated the scrapping of an entire panel.

The foregoing possibilities are not uncommon and have long been recognized as serious problems in the field of instrument panel lighting. Several attempts have been made to solve one or more of the problems but, to the best of applicant's knowledge, none has offered economical means for avoiding the loss of an entire panel because of the failure of or a defect in one small portion thereof. It is evident therefore that a need exists for an edge lighted panel having a high degree of both repair and design flexibility.

The prior art contains several examples of construction that graphically illustrates the difficulties involved. In one instance, the miniature lamps are embedded in the back surface of the panel with a light transmitting "potted" compound. This is in effect a permanent assembly that precludes the possibility of repair and/or change of any one, small portion of the panel. Accordingly, the entire panel must be removed from its installation and replaced if a single lamp burns out prematurely or the front of the panel is damaged in a critical area. Thus while this type of construction takes advantage of the ruggedness and relative simplicity of a "potted" assembly, it must sacrifice repair and design flexibility when either the front of the panel or one of the lamps is defective. The "potted" lamp type assembly makes design changes so difficult as to be virtually impractical for large and complex panels.

In order to simplify one aspect of repairs, that is, the replacement of defective lamps, other examples of the prior art provide removable lamp shells fabricated of materials having light transmitting characteristics. Perforce the shells, because of their size, must be limited in their application both as to quantity and location. Furthermore, this type of installation makes no provision for the replacement of a small damaged section of the front of the panel nor does it have either the compactness or ruggedness of the permanently installed lamps.

In the embodiments to be illustrated and described hereinafter, there is disclosed means to solidly and permanently mount an individual lamp or a plurality of lamps in an easily removable, extremely small section of the panel. A heat sink may be provided in each embodiment to dissipate at least some of the heat generated by the lamps. In one embodiment of the invention, the section in question is removed from the front of the panel while in another embodiment, access to the removable section may be had from the rear of the panel. In either case, a replaceable filter insert overlays the lamp module. Thus, in addition to being able to replace individual lamps or groups of lamps, the indicia carried by the filter insert may also be changed if required due to either damage or application considerations. It should also be noted that the color of the filter may also be changed as desired.

Different terminal arrangements are available for the lamp modules which, together with the filter insert, are removably secured to the main panel by means of the screws. Thus it will be seen that discrete areas of a large and expensive panel may readily be removed and replaced should it be found to be defective or inoperative. The entire panel need not be scrapped and conceivably, the substitution of sections may be made in the field without having to remove the entire panel from its installation.

Accordingly, it is an object of the present invention to provide an improved edge lit panel assembly.

Another object is to provide an internally lit panel assembly having easily removable indicia bearing sections.

An additional object is to provide an internally lit panel assembly having easily removable modules in which a lamp or lamps is permanently embedded.

A further object is to provide an internally lit panel assembly wherein a filter insert and/or a lamp module may be removed from the front of the panel.

A still further object is to provide an internally lit panel assembly wherein a filter insert and/or a lamp module may be removed from the rear of the panel.

Another object of the present invention is to provide an edge lit panel assembly having compact, rugged, yet removable illuminating means.

These and other features, objects and advantages of the invention will, in part, be pointed out with particularity and will, in part, become obvious from the following more detailed description of the invention, taken in conjunction with the accompanying drawing which forms an integral part thereof.

In the various figures of the drawing like reference characters designate like parts.

In the drawing:

FIG. 1 is a fragmentary front view of one embodiment of the present invention;

FIG. 2 is a sectional view taken along line 2—2 of FIG. 1;

FIG. 3 is a fragmentary front view of an alternative embodiment of the present invention;

FIG. 4 is a sectional view taken along line 4—4 of FIG. 3; and

FIG. 5 is a front view of a typical panel utilizing a stacked array of the modules comprising the present invention.

Referring now to the drawing, FIG. 1 and FIG. 2 illustrate that embodiment of the present invention wherein both a filter insert and a lamp module may be removed from the front of a larger panel P which may in one type of installation have a relatively thick first translucent layer **10**, a second, thin translucent layer **12**, and a third, thin opaque layer **14**. Normally, the indicia would be cut into the opaque layer **14** to the depth of the second translucent layer **12**. A small opening **16** and a somewhat larger opening **18** are formed in the panel P to removably accommodate the elements of the present invention.

Lamp module **20** is comprised of a translucent plastic body **22** in which one or more lamps **24** are embedded. A heat sink **25** comprised of a metal shell encloses the sides and bottom of the plastic body so that at least some of the heat generated by the lamps will be quickly dissipated. Body **22** is dimensioned so as to closely fit into opening **16** of main panel P. Conductors **26** are comolded with the lamps and body to connect the lamps within the module in series. Terminal conductors **28** extend from the end lamps and are in electrical connection with a pair of metallic contact spring members **30**.

An aperture **32** is formed in each of the contacts, the apertures being in registry with threaded inserts **34** suitably positioned in panel P and with apertures **36** formed in end flanges **38** of lamp module body **22**. It will be seen in FIG. 2 that end flanges **38**, contact spring members **30**, and the flange of each threaded insert **34**, are seated on the interface defined by the two openings **16** and **18** in panel P.

Filter overlay **40**, in the assembled condition, is superimposed over the front surface of lamp module **20**. The insertable filter is comprised of substantially the same three basic layers as the remainder of the panel. However, in the case of the filter insert, the relatively thick base layer may be translucently colored such as with aviation red. The thin intermediate layer would be translucent white and the thin engravable outer layer would be an opaque black in keeping with the outer surface of the remainder of the panel. Thus, the close fit and the matching colors will make the filter insert barely discernible and certainly not distracting.

Countersunk apertures **42** in filter overlay **40** are in registry with apertures **32** and **36** in the contact springs and the end flanges **38**, respectively, as well as the threaded inserts **34**. Insulating nylon screws **44** mate with flanged inserts **34** whereby the filter overlay may readily be removed from the front of panel P. The electrical circuit to the lamps is completed by means of conductors **46** extending between threaded inserts **34** and the external source of power. Conveniently, conductors **46** are embedded inconspicuously in panel P.

The desired nomenclature is engraved on the outwardly facing surface of the filter overlay, as shown schematically in FIG. 1. It should be noted that the basic design of the assembly can be altered in height and width to accommodate varying requirements of the user. By way of example, the embodiment described hereinbefore has a height of ⅜ inch, a width of 1¼ inch (FIG. 1), and a depth from the front of the engraved filter overlay to the base of the lamp module (FIG. 2) of only ¼ inch. By virtue of the improved construction, the filter overlay can also be readily changed in order to accommodate the user's requirements pertaining to particular color and brightness.

A second embodiment of somewhat different construction is illustrated in FIG. 3 and FIG. 4. The basic objectives of the invention are the same in both embodiments with the exception that the structure now to be described may be removed from the rear of the panel. Either metal or plastic may be used for the panel.

Lamp module **50** is comprised of a translucent plastic body **52** in which are molded a plurality of series-connected incandescent lamps **54**. Heat sink **55**, enclosing lamp module on the sides and bottom thereof, serves to dissipate at least some of the heat generated by lamps **54**. Conductors **56** electrically connect the lamps to a pair of terminals **58** extending rearwardly of the lamp module whereby connection may be made to a suitable power source. Lamp module **50** is also provided with a central recess **60** dimensioned to receive the base of filter insert **62**. It will be seen in FIG. 4 that filter insert **62** has a flange portion **64** of larger dimension that opening **66** in panel P'. Thus by means of screws **68** passing through suitable apertures in the panel and mating with threaded bores in the body **52** of the lamp module, the filter insert flange is captured between the recess **60** and the inside surface of the panel. Removal of screws **68** permits the filter insert to be removed through the rear of the panel.

As in the previous embodiment, filter insert **62** would be of such multilayer construction as permits rapid and simple changeover to meet varying requirements of the user. Of course, the size of the device may just as easily be changed. For example, in FIG. 3, the height of area on which the nomenclature is engraved may vary from ¼ inch to ½ inch or even larger. In FIG. 4, the width of the lamp module may be within a range of 1¼ to 1¾ inch. The dimension from the back of the panel to the back of the lamp module is approximately ¼ inch, while the panel which may be either metal or plastic, need not be more than 1/16 inch thick.

FIG. 5 illustrates the compact structure of the present invention. A number of inserts, each bearing indicia of different conditions to be monitored may be secured to a very small area of panel P. Either embodiment hereinabove described may be utilized in this manner without taking up very much space on the panel surface.

In both of the embodiments herein described there is provided simple and effective means for changing discrete portions of a large edge lit panel. Furthermore, the lamps may readily be changed on an individual basis without the necessity of destroying an entire panel. Of particular importance is the design flexibility permissible by use of the structure of the present invention. The assemblies illustrated herein are rugged, compact and readily removable. In addition, the user has the choice of front or rear access to the panel in order to meet a large variety of installation situations.

In both of the embodiments, a heat sink is provided in order to overcome a very serious and common problem, namely, failure as a result of the plastic buckling due to heat. In combination with the metallic heat sink, the metallic contact fingers serve to maintain electrical connection even though a slight distortion may occur because of the plastic body being heated by the lamps. Thus in a very small device, great reliability is offered while at the same time the more serious shortcomings and disadvantages of the prior art are overcome.

There has been disclosed heretofore the best embodiments of the invention presently contemplated and it is to be understood that various changes and modifications may be made by those skilled in the art without departing from the spirit of the invention.

What is claimed is:

1. In an internally lighted panel assembly, the combination of:

(a) a panel having a main, relatively thick light-transmitting layer defining front and rear surfaces, said

panel having at least one opening formed by the removal of a section therefrom;

(b) a first insert member comprising a light-transmitting section and at least one lamp having a pair of of terminals imbedded therein;

(c) a second insert member comprising a light-transmitting layer and an indicia-bearing layer, said second insert member being disposed in the opening of said panel in overlaying relationship with said first insert member whereby said indicia-bearing layer is flush with the front surface of said panel;

(d) conductive means arranged to connect said lamp to an E.M.F. source; and

(e) fastener means removably securing said first and second insert members to said panel, wherein the opening in said panel includes a ledge of smaller dimension than the remainder of the opening, wherein said first insert member includes a flange portion seated on the ledge of the opening in said panel and wherein said fastener means passes through said second insert member, said panel further including means to removably capture said fastening means whereby said first and second insert member may be removed from the front of said panel.

2. The combination in accordance with claim **1** wherein said light-transmitting layer has a larger surface area than said indicia-bearing layer defining a peripheral flange abuttingly sandwiched between said first insert member and the rear surface of said panel, said first insert member including means to removably capture said fastening means whereby said first and second insert members may be removed from the rear of said panel.

3. The combination in accordance with claim **2** including a pair of terminal members integral with said first insert members and in electrical contact with the terminals of said lamp, said terminal members extending rearwardly of said first insert member whereby said terminal members are adapted to be connected to an E.M.F. source.

4. The combination in accordance with claim **1** including a heat sink comprising a metal shell secured to and enclosing at least the sides and bottom surfaces of said first insert member.

5. The combination in accordance with claim **1** including a pair of metallic threaded inserts integral with the ledge of said panel and adapted to removably receive said fastening means, a first pair of electrical conductors in contact with said threaded inserts, each of said first conductors being electrically connected to one of the lamp terminals and a second pair of conductors electrically connected to said threaded inserts whereby said lamp is adapted to be connected to an E.M.F. source.

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LAWRENCE CHARLES, *Primary Examiner.*