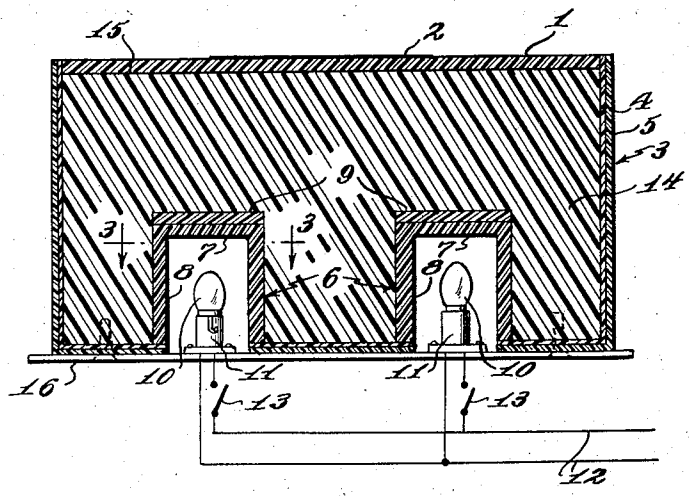
April 7, 1959 J. F. SULLIVAN 2,880,536

ILLUMINATED DISPLAY DEVICE

Filed June 10, 1957

FIG. 1.



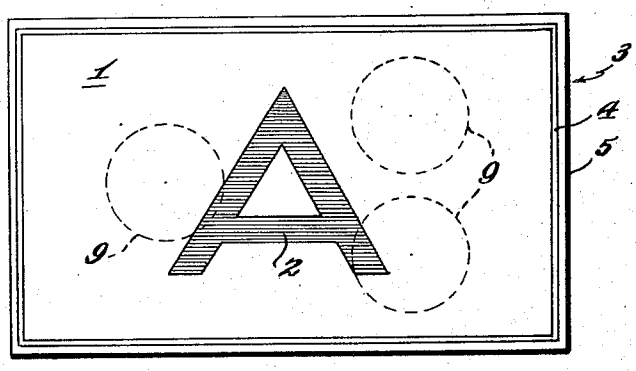


FIG. 2

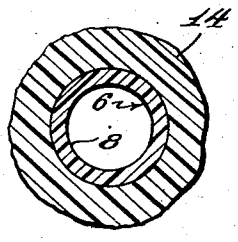


FIG. 3

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ILLUMINATED DISPLAY DEVICE

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14 Claims. (Cl. 40—130)

This invention relates to display devices and particularly to a novel illuminated display device capable of displaying indicia as a sharp and uniformly illuminated image without requiring critical positioning or adjustment of the light source employed. The invention is further characterized by the ability to display selectively in different colors or to display indicia of one color against a background of any selected one of a plurality of colors.

While many types of illuminated display devices have been proposed in the past, such devices have not been entirely satisfactory for many current commercial applications. This is particularly true where, in connection with the operation of machines and process equipment, it is desirable to uniformly illuminate panel indicia with a selected one of a plurality of colors emanating from a plurality of light sources. Heretofore, edge lighting of a translucent panel with a plurality of colored light sources has been utilized to achieve uniform lighting of the panel indicia. However, such lighting requires an excessive number of component parts surrounding the panel edges and is relatively inefficient, since only a small portion of the available illumination penetrates the edge of the panel.

It is therefore an object of the invention to provide an improved display device for uniformly illuminating panel indicia with a selected color.

Another object is to devise such a device which provides for color selection, either as to the indicia displayed or as to the background for the indicia, simply by selective energization of a plurality of light sources.

A further object is to provide a display device including an indica member or panel illuminated by any selected one of a plurality of light sources spaced apart in a plane parallel to and behind the indicia member or panel, the character of the display illumination obtained being substantially independent of the position of the light source energized.

A still further object of the invention is to provide a device of the type described which is in the nature of a single rigid structure without any moving parts whatsoever.

In order that the manner in which these and other objects are accomplished in accordance with the invention can be understood in detail, reference is had to the accompanying drawings, which form a part of this specification and wherein:

Fig. 1 is a transverse sectional view, taken on a plane at right angles to the indicia being displayed, of an illuminated display device constructed in accordance with one embodiment of the invention;

Fig. 2 is a plan view of the device of Fig. 1, and

Fig. 3 is a transverse sectional view taken on line 3—3, Fig. 1.

Referring now to the drawings in detail, it will be seen that the embodiment of the invention illustrated therein comprises a flat indicia sheet 1 carrying indicia 2 to be displayed. Indicia sheet 1 is of transparent or translucent material, and may be suitably formed from transparent or translucent methyl methacrylate resin. Indicia sheet 1 may also be established as a layer or film of white transparent or translucent material applied as a coating or paint to the front face of an element 14 hereinafter described. The indicia 2 to be displayed can be applied to indicia sheet 1 by painting, or can be a self-supporting body or bodies secured to the front face of the indicia sheet in a suitable manner. Indicia 2 can be opaque or translucent or transparent.

If desired, indicia sheet 1 may be of white material, forming an overall background for the display, with indicia 2 being of a color other than white and adapted to be illuminated when the device is in operation. On the other hand, both sheet 1 and indicia 2 may be colorless or of the same color. Then when both are illuminated with the selected color, the indicia is seen to disappear.

In this embodiment, indicia sheet 1 is illustrated as a rectangle. Engaging the edges of sheet 1, and extending rearwardly from sheet 1, are the side walls of a housing 3, the housing 3 being a laminated structure having an inner lamina 4 and an outer lamina 5. A removable base plate member 16 is detachably secured by suitable fasteners to side walls 3. It will be understood that base plate 16 may be the outer surface of an article on which the display device is mounted when in use, and may, for example, be the walls of a building. The inner lamina 4 constitutes a reflecting surface which, as will be explained, is operative to direct light from within the housing toward the indicia sheet 1. Lamina 4 is of a white plastic material, preferably a copolymer of vinyl chloride and vinyl acetate. The outer lamina 5 is then of a black material, preferably a copolymer just mentioned. Alternatively, the wall areas, including the side walls and back wall, of the housing may be defined by a metal reflecting member or by a metalized surface established on element 14 to be described. At laterally spaced points within the housing 3 are provided a plurality of cup-shaped color filters 6 opening toward the rear of the device, so that their bottom walls 7 are closest to the indicia sheet 1. As indicated in Fig. 3, the color filters 6 are of circular cross section, so that each color filter includes a tubular or cylindrical wall portion 8 extending substantially at right angles to the plane of sheet 1. The open ends of the cup-shaped color filter 6 abut the inner surface of the rear wall of housing 3 and may be secured directly to inner lamina 4 of the housing, or to base member 16, if desired. As will be evident from later explanation, the several color filters 6 are of different colors.

Overlying the bottom walls 7 of the color filters 6 are flat, circular light diffusing elements 9 of white translucent material, which may be a copolymer of vinyl chloride and vinyl acetate.

A plurality of light sources 10, such as conventional miniature incandescent lamps, are each disposed within the cavity defined by a different one of the color filters 6. A plurality of conventional lamp sockets 11 may be secured to base member 16 at laterally spaced points selected to register with the several color filters. Base member 16 is removable to facilitate the changing of bulbs 10. The light sources 10 are activated selectively. Thus, assuming that incandescent lamps are employed, the lamps 10 are connected in parallel to an electrical supply circuit 12 via switches 13 each disposed to control the flow of current to a different one of the lamps.

From the foregoing, it will be understood that the combination of indicia sheet 1, housing 3, color filters 6 and light modifying elements 9 defines a cavity. This cavity is completely filled by a solid body 14 of material having uniform light transmitting characteristics, which may be a clear, transparent methyl methacrylate resin. Of course, other suitable materials which transmit light uniformly may be used. Thus, the transparent body 14

has a front face 15 against which the indicia sheet 1 lies in face-to-face contact. Similarly, the body 14 has side and rear surfaces against which the reflecting surfaces provided by housing 3 lie in face-to-face contact. Also, the body 14 includes recesses which are complementary to the outer shape presented by the color filters 6 and light modifying elements 9, the outer surfaces of the color filters and light modifying elements lying in face-to-face contact with the walls of such recesses.

The device just described may be fabricated by use of any of several well-known plastic molding techniques. Thus, the solid body 14 can be produced by conventional plastic molding steps, as by compression molding from a powder, by pressure lamination of a plurality of sheets, or by injection molding. The color filters 6 and the light modifying elements 9 may be handled as inserts in a pressure mold, so that elements 1, 14, 6 and 9 are secured rigidly together as a result of a single molding operation.

The housing 3 providing the reflecting surface overlying all portions of body 14 except the front face thereof may be formed by a separate step, using conventional laminating procedures, and then secured to the body 14 in any suitable fashion. Alternatively, the housing 3 may be molded to final form and adhered to the body 14 simultaneously with molding of the body 14. In this case, separate sheets 4 and 5 can be provided with openings to accommodate color filter units 6, the color filters and the light modifying elements 9 being disposed in the mold cavity as inserts and the openings in sheets 4 and 5 being aligned with the color filters. Sheets of methyl methacrylate resin are then stacked upon sheets 4 and 5 and sheet 1 is then disposed at the top of the stack. Simple pressure molding will then shape the entire unit and bind the various elements thereof together. In this connection, it will be understood that the resinous materials hereinbefore mentioned are thermoplastic in nature and that the various elements are laminated together solely by molding at a temperature sufficiently elevated to make the resinous materials flowable.

It is thus apparent that the completed unit seen in cross section in Fig. 1 can be made, in effect, integral. The finished product is thus extremely durable and rigid. Further, the particular method of construction employed makes it possible to design a fully operable display device of extremely small size, the smallness being limited only by the sizes of light sources available.

In operation, light emanating from any of the sources 10 is directed outwardly through the color filters 6 into the solid body 14. Since all outer surfaces of body 14 are covered by a reflecting surface, except for the front face of the body lying in contact with indicia sheet 1, substantially all of the light is conducted to the rear face of the indicia sheet. Presence of the white, translucent light modifying elements 9 prevents direct transmittal of light from the light sources to the indicia sheet and thereby eliminates the "hot spots" of illumination which would otherwise occur. It will be noted that the light sources are laterally spaced, rather than being centered with respect to the indicia sheet. Employing the particular construction disclosed, the indicia sheet is uniformly illuminated when any one of the light sources is actuated, the illumination of the indicia sheet being independent of the particular position of the light source.

While, in the preferred embodiment illustrated, the color filters 6 and the light modifying elements 9 are initially separate from the body 14, it will be understood that the body 14 may simply be provided with suitable recesses and the color filters and light modifying elements then established on the appropriate wall surfaces of such recesses by a coating step, for example. Such an alternative procedure is, however, less practical where a unit of very small size is to be produced. Similarly, while it is advantageous to have the indicia sheet 1 in the form of a translucent methyl methacrylate body, with the indicia applied to the face thereof, it will be understood that the indicia can be applied directly to the front face of the body 14, the remaining areas of such front face not covered by the indicia then being advantageously supplied with a white, translucent coating.

While the present invention has been disclosed by means of specific illustrative embodiments thereof, it would be obvious to those skilled in the art that various changes and modifications in the means of operation described or in the apparatus, may be made without departing from the spirit of the invention as defined in the appended claims.

I claim:

1. In a device for displaying indicia, the combination of an indicia sheet, means forming a housing behind said indicia sheet and presenting inwardly directed light reflecting wall surfaces extending rearwardly with respect to said indicia sheet, a light source disposed in said housing and spaced rearwardly with respect to said indicia sheet, a translucent light modifying element disposed between said light source and indicia sheet and operative to limit direct transmittal of light from said source to said sheet, and a hollow color filter in said housing and surrounding said light source, the combination of said sheet and its indicia being capable of passing light to display the indicia.

2. In a device for displaying indicia, the combination of an indicia sheet, means forming a housing behind said indicia sheet and presenting inwardly directed light reflecting wall surfaces extending rearwardly with respect to said indicia sheet, a light source disposed in said housing and spaced rearwardly with respect to said indicia sheet, a light modifying element disposed between said light source and indicia sheet and operative to limit direct transmittal of light from said source to said sheet, and a hollow color filter in said housing and surrounding said light source, the space defined by the combination of said indicia sheet, said housing, said light modifying element and said filter being completely filled by a solid body of transparent material having uniform light transmitting characteristics, the combination of said indicia sheet and its indicia being capable of passing light to display the indicia.

3. A device constructed in accordance with claim 2 and wherein said solid body is of methyl methacrylate resin, and said light modifying element is a body of vinyl cloride-vinyl acetate copolymer adhered directly to said body of methyl methacrylate resin.

4. In an illuminated display device, the combination of a solid body of transparent material having uniform light transmitting characteristics, said body having a face surface, side surfaces and at least one recess spaced from said face surface and surrounded by said side surfaces, an indicia sheet extending over said face surface in contact therewith and capable of passing light, a light source disposed in said recess, a reflecting surface extending over said side surface and disposed to reflect light transmitted from said source, and a white translucent light modifying element disposed in said recess between said light source and said indicia sheet.

5. In an illuminated display device, the combination of a solid body of transparent material having uniform light transmitting characteristics, said body having a front surface, a recess spaced rearwardly from said front surface, and side surface extending rearwardly from said front surface and surrounding said recess, said recess having a first wall extending generally parallel to said front surface and also having rearwardly extending sidewalls; a light source disposed in said recess; a white translucent light modifying element disposed in said recess between said source and front surface and overlying said first wall of said recess; a tubular color filter disposed in said recess and surrounding said light source; an indicia sheet overlying said front surface and capable of passing light and a reflecting surface extending over said

side surfaces of said body and operative to reflect light from said source toward said indicia sheet.

6. In an illuminated display device, the combination of a solid block of transparent material having uniform light transmitting characteristics, said block having a front face, side surfaces extending rearwardly from said front face and a plurality of recesses surrounded by said side surfaces and spaced rearwardly from said front face; an indicia sheet overlying the front face of said block in face-to-face contact therewith and capable of passing light; a plurality of light sources each disposed in a different one of said recesses; a plurality of white translucent light modifying elements each disposed in a different one of said recesses between said front face and the corresponding one of said light sources; a plurality of color filters each disposed in a different one of said recesses and each surrounding the light source in such recess; means for selectively activating said light sources, and reflecting means extending over the side surfaces of said block and operative to reflect light from said sources toward said front face.

7. A device constructed in accordance with claim 6 wherein said recesses are of cylindrical configuration extending generally at right angles to said front face.

8. A device constructed in accordance with claim 7 wherein said light modifying elements each comprises a disc disposed in contact with the end wall of the corresponding one of said recesses and completely filling the cross-sectional area of such recess adjacent said end wall.

9. A device constructed in accordance with claim 7 wherein said color filters each comprises a tubular body overlying the cylindrical wall of the corresponding one of said recesses.

10. In a device for displaying indicia, the combination of an indicia bearing sheet; a light transmitting unit disposed behind said sheet and comprising a solid light transmitting body disposed in contact with said sheet and provided with a rearwardly extending recess, the front wall of said recess being defined by a translucent white surface and the side walls of said recess being defined by a color filter layer; a light reflecting surface overlying the side surfaces of said light transmitting unit and extending rearwardly from said indicia bearing sheet to surround said recess, and a light source in said recess, the combination of said sheet and its indicia being capable of passing light, transmitted to it from said source by said light transmitting unit, to display the indicia.

11. In a device for displaying indicia, the combination of an indicia sheet, means forming a housing behind said indicia sheet and presenting inwardly directed light reflecting wall surfaces extending rearwardly with respect to said indicia sheet, a light source disposed in said housing and spaced rearwardly with respect to said indicia sheet, a cup-shaped color filter element inclosing said light source and having a bottom wall generally parallel to said indicia sheet, and a translucent light modifying element overlying said bottom wall and operative to limit direct transmittal of light from said source to said indicia sheet, the combination of said sheet and its indicia being capable of passing light to display the indicia.

12. In a laminated display device, the combination of a solid body of methyl methacrylate resin, said body having a plane front face and a plurality of recesses opening toward the rear face of the body, a plurality of sources of different colored light each operatively disposed in a different one of said recesses, a plurality of translucent light modifying elements each disposed between the front face of said body and a different one of said sources of colored light, indicia to be displayed supported at the front face of said body, and continuous reflecting means disposed in contact with all exterior surfaces of said body other than said front face.

13. In a device for displaying indicia, the combination of an indicia sheet, means forming a housing behind said indicia sheet and presenting inwardly directed light reflecting wall surfaces extending rearwardly with respect to said indicia sheet, a plurality of light sources disposed in said housing and spaced rearwardly from said indicia sheet, said light sources being spaced from each other transversely with respect to an axis extending rearwardly from said indicia sheet, a plurality of color filters each surrounding a different one of said light sources, a plurality of light modifying elements each disposed between said indicia sheet and a different one of said light sources and operative to prevent direct transmittal of light from said sources to said indicia sheet, and means operatively connected to said light sources to activate the same selectively, the combination of said indicia sheet and its indicia being capable of passing light to display the indicia.

14. In a device for displaying indicia, the combination of means forming a housing having an open front and sidewalls extending rearwardly therefrom, said sidewalls having inwardly directed light reflecting surfaces, means providing an indicia-bearing surface extending across the front of said housing, a light source disposed within said housing and spaced rearwardly from said indicia-bearing surface, a color filter surrounding said light source, and a light diffusing element disposed between said light source and said indicia-bearing surface and operative to prevent direct transmittal of light from said sources to said indicia-bearing surface, the combination of said surface and the indicia borne thereby being capable of passing light to display the indicia.

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