Dec. 22, 1953 G. W. MOLER ET AL 2,663,107

ILLUMINABLE STRUCTURE

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Fig. 1

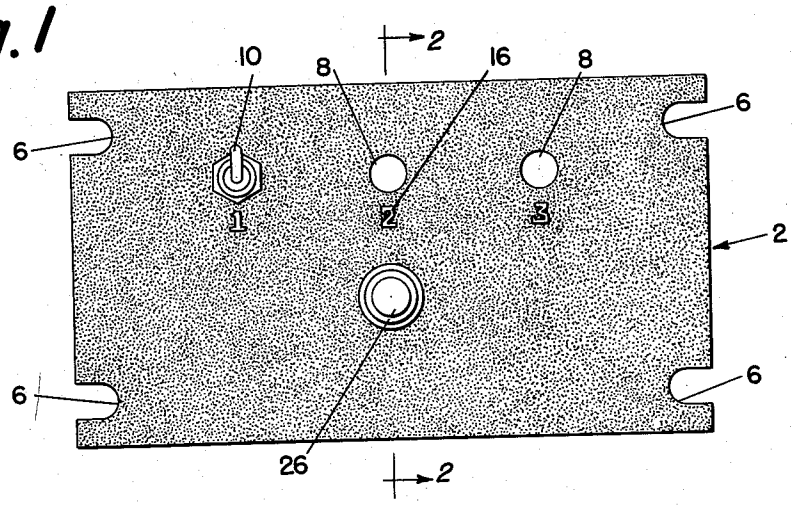
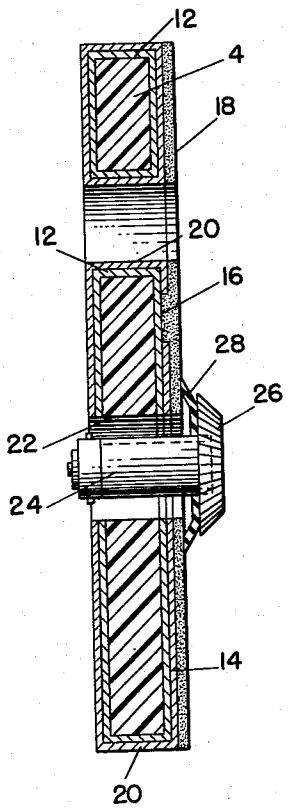


Fig. 2



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ILLUMINABLE STRUCTURE

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This invention relates to illuminable structures and method of making.

More particularly the method according to this invention is adapted for the making of illuminable structures which do not permit escape of light, either direct or reflected, except through markings or characters desired to be illuminated, such, for example, as instrument boards, consoles, and the like.

Heretofore it has been known to form illuminable structures of the type contemplated here with the use of acrylic plastics, such, for example, as methyl methacrylate, which, in sheet or panel form, has the capacity to transmit light throughout the body thereof from a source, or sources, at an edge, or edges, thereof with escape of light from the surfaces thereof.

In prior practice for the preparation of an illuminable structure, a sheet of acrylic plastic has been lightproofed by coating its surfaces except for such design or characters desired to be illuminated and providing holes extending inwardly from its edges for the reception of light sources. Various protection for the exposed surfaces has been provided by coating with a clear coating or laminating on a protective sheet through the medium of an adhesive.

The prior practice has not resulted in the production of a satisfactory product in that it lacks surface uniformity and fineness of detail of the character or design to be illuminated, is readily defaced by scratching and, where a protective sheet is laminated on the face, such tends to separate in time, the protective sheet tends to discolor with age, which detracts from the contrast between the printing and the background.

Now in accordance with the method of this invention, particular procedure with the use of particular materials is provided whereby a superior product embodying this invention is readily produced.

Generally speaking, procedure according to this invention for the production of an illuminable structure embodying this invention, involves coating the face of a panel of acrylic plastic with a white pigmented vinyl base lacquer. This coating will be applied by the silk screen process. The coated face is then printed by a reverse silk screen process, using a black, or colored, pigmented vinyl base lacquer, thus forming the design or characters as cut-outs from a black ground.

The face having been coated and printed, a protective coating of a clear vinyl base lacquer is applied over the printed face, preferably by the silk screen process. If desired, an alternate

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method of protection will be afforded to the printed face by laminating directly over the printing on the panel a thin sheet of polyvinyl-chloride-acetate plastic, which will be readily accomplished by the application of heat and pressure without the use of an adhesive, since the protective sheet will be compatible with the coatings and printing on the face of the panel.

The panel is now fabricated completely for the purpose intended except for the holes for the reception of the light sources.

The fabricated panel, including the edges, back and the surfaces of all holes, is then coated, as by spraying, with a white pigmented vinyl base lacquer and then the back, edges and the surfaces of all holes are coated, as by spraying, with a black, or colored, pigmented vinyl base lacquer.

The holes for the light sources are then drilled and polished to complete the panel.

More specifically, for the production of an illuminable structure embodying this invention by the method according to this invention, the face of a sheet or panel formed from acrylic plastic having a surface area consistent with its ultimate purpose and a thickness of say .187 inch or more after thorough cleaning, as, for example, with a detergent, is given two coats, by silk screening, with a white pigmented vinyl base lacquer stock, comprising, for example, vinyl chloride acetate copolymer resins, plasticized with, for example, butyl phthalate, methyl phthalate and blown castor oil and pigmented with, for example, titanium dioxide, and having, for example, the following formula:

	Per cent
Resin #1 $[CH_2{=}CHCl{-}CH_2{=}CH{-}OCOCH_3]_{195\text{-}200}$	30
Resin #2 $[CH_2{=}CHCl{-}CH_2{=}CH{-}OCOCH_3]_{290\text{-}295}$	10
Butyl phthalate $C_6H_4CO_3CH_3CH_2CH_2CH_3$	9
Methyl phthalate $C_6H_4CO_3CH_3$	4
#15 blown castor oil	2
Titanium dioxide TiO_2	45

which mixture, or white stock, will be diluted to the semi-paste form required for silk screening on the following formula:

	Per cent
White stock	20
Methyl ethyl ketone ($CH_3COC_2H_5$)	50
Methyl isobutyl ketone ($CH_3COCH_2CH(CH_3)_2$)	30

The above may be further diluted, to insure proper flow through the mesh of the silk screen, with toluene or xylene.

The coated face will now be printed by reverse

silk screen process, to form the desired designs or characters on the face of the panel in cut-out, using a black pigmented vinyl base lacquer stock comprising, for example, vinyl chloride acetate copolymer resins with butyl and methyl phthalate as plasticizers and carbon black or lamp black and having, for example, the following formula:

	Per cent
Resin #1 [CH_2=CHCl—CH_2=CH—$OCOCH_3$]$_{195-200}$	50
Resin #2 [CH_2=CHCl—CH_2=CH—$OCOCH_3$]$_{290-295}$	15
Butyl phthalate $C_6H_4CO_3CH_3CH_2CH_2CH_3$	10
Methyl phthalate $C_6H_4CO_3CH_3$	5
Carbon black or lamp black	20

The amount of carbon or lamp black which is added depends upon the degree of opacity required. In no case should more than 25% per load be used and this increase should be at the expense of the resins.

This mixture or black stock is diluted to the semi-paste form required for silk screening on the following formula:

	Per cent
Black stock	20
Methyl ethyl ketone ($CH_3COC_2H_5$)	50
Methyl isobutyl ketone ($CH_3COCH_2CH(CH_3)_2$)	30

and the above may be further diluted, if necessary, to insure proper flow through the mesh of the silk screen, with toluene or xylene.

It will be appreciated that in place of carbon black or lamp black a colored pigment may be used in making up the above stock.

The silk screen for printing may be prepared in well known manner. Thus, sensitized silk screen carbon tissue is exposed in close contact with a negative made from a drawing of the design, symbols, characters, or the like, to be printed on the face of the panel. After exposure the carbon tissue is washed with warm running water to wash away the non-exposed portion and the gelatine side of the carbon tissue is then applied to the surface of Swiss silk stretched on a silk screen frame. After drying the backing sheet of acetate is peeled from the carbon tissue leaving the carbon tissue forming the design, symbols, characters, or the like, on the silk screen. With the silk screen so formed the background will be printed leaving the design, symbols, characters, or the like, as cut-outs.

After the face of the panel has been printed a dull clear protective coat is applied, by silk screening, over the printed face. The protective coat will be formed with a clear vinyl base lacquer, comprising, for example, vinyl chloride acetate copolymer resins mixed with titanium dioxide as a dulling agent and with butyl acetate as a plasticizer and solvent, and having, for example, the following formula:

	Per cent
Resin #1 [CH_2=CHCl—CH_2=CH—$OCOCH_3$]$_{195-200}$	35
Resin #2 [CH_2=CHCl—CH_2=CH—$OCOCH_3$]$_{290-295}$	14
Titanium dioxide TiO_2	1
Butyl acetate $CH_3COOC_4H_9$	50

The above may be further diluted, if necessary, with toluene.

Alternative to the application of the above protective coat by silk screening, a thin protective sheet of hard polyvinyl-chloride-acetate plastic is placed over the printed face of the panel and subjected to heat and pressure, say a temperature of 250° F. under a pressure of 150 lbs. per square inch, which will cause the protective sheet to adhere directly to the printing, since the two are compatible, as it will be noted are the several coatings and printing applied to the base of the panel.

The panel is now cut to size, drilled for mounting and otherwise fabricated as may be necessary for its ultimate purpose and all surfaces except the printed face, i. e., the back, edges and all holes which may have been drilled, are given, by spraying, two coats of a white pigmented vinyl base lacquer having, for example, the formula given above for the initial white coating of the face of the panel. Then the back, edges and all holes are given one coat of a black pigmented vinyl base lacquer having, for example, the formula given above for the printing of the face of the panel. The final black coating of the back, edges, holes, etc. should be carefully done to insure that there will be no leakage of light.

Finally the holes for the light sources are drilled in the panel and polished.

It will now be appreciated that the structure according to this invention comprises a base formed from acrylic plastic coated and having a design, symbol, character, or the like, formed on a coated face thereof by reverse silk screening, as detailed above, with a pigmented vinyl resin base lacquer, the printed face being protected by a coating of clear vinyl resin base lacquer, or alternatively, if desired, with a sheet of polyvinyl-chloride-acetate adhered directly to the printing by heat and pressure without the use of adhesive.

It will be appreciated that the various formulae given above by way of illustration may be modified to meet various conditions without departing from this invention so long as the base of vinyl resin be retained.

It will be appreciated that the method according to this invention comprises the several steps with use of the several materials as detailed above as such may be modified by those skilled in the art to meet various conditions.

A specific embodiment of a panel made in accordance with this invention is shown for purposes of exemplification in the figures, in which:

Figure 1 is a front elevation of a panel made in accordance with this invention.

Figure 2 is a section taken on the plane indicated by the line 2—2 in Figure 1.

As shown in the figures, panel 2 has a sheet of transparent plastic material 4. Sheet 4 has two cut out slots 6 on each side thereof to permit the bolting of the panel to a suitable support (not shown). Openings 8 are drilled in sheet 4 for the reception of a toggle switch, one of which is shown at 10.

All the surfaces of the panel, including the interior of the slots 6 and openings 8, are coated with a white pigmented vinyl base lacquer 12. A layer 14 of black pigmented vinyl base lacquer overlies layer 12 on the front of panel 2, layer 14 having openings 16 to form appropriate numerals under openings 8. Overlying the front of panel 2 is a protective film 18 of clear vinyl resin. All of the surfaces of panel 2 other than the front, and including slots 6 and openings 8, are completely covered with a black pigmented vinyl base lacquer 20.

The last step in the formation of the panel is to drill an opening 22, the walls of the open-

ing 22 formed by sheet 4 being free of any coating. Opening 22 provides means for the entry of light which will be transferred through the sheet 4 and out through the translucent white pigmented vinyl base lacquer 12 and through the clear protective coating 18. Although no part of this invention, there is shown positioned within the opening 22 a bulb 24 mounted in a cap 26 having a rubber skirt 28. The bulb 24 is adapted to be secured in a socket (not shown) mounted on the structure to which panel 2 is secured.

The method and product according to this invention in their broader and more specific aspects are defined in the appended claims.

What is claimed is:

1. An illuminable structure comprising an acrylic plastics panel, a coating of white pigmented vinyl resin on all surfaces of said panel, printing in cut-out from a ground of black pigmented vinyl resin on the face of said panel, a protective film of clear vinyl resin on the face of said panel, an overcoating of black pigmented vinyl resin on all surfaces of said panel except

the printed face thereof and a light source recess in said panel.

2. An illuminable structure according to claim 1, characterized by the fact that the protective film comprises a sheet of polyvinyl-chloride-acetate laminated and adhered directly onto the protective coating on the printed face of the panel.

3. An illuminable structure according to claim 1, characterized by the fact that the protective film is formed directly on the printed face of the panel.

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