April 6, 1954 E. A. NEUGASS 2,674,558

METHOD FOR MANUFACTURING PANELS

Filed June 11, 1951

Fig. 1.

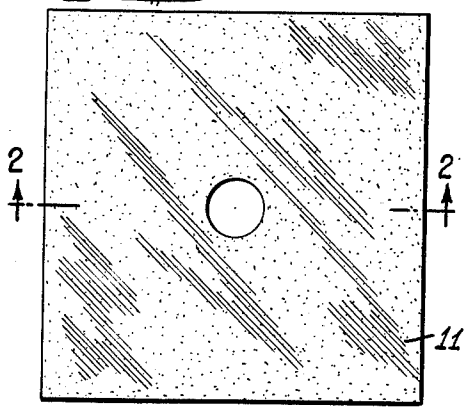
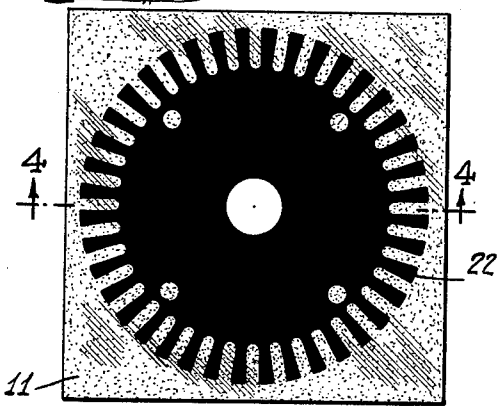


Fig. 3.



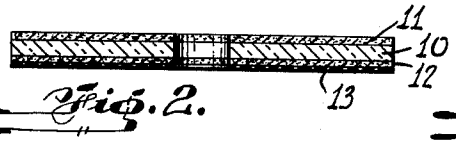


Fig. 2.

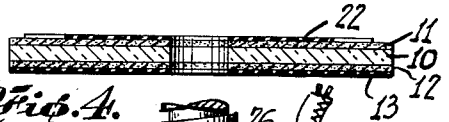


Fig. 4.

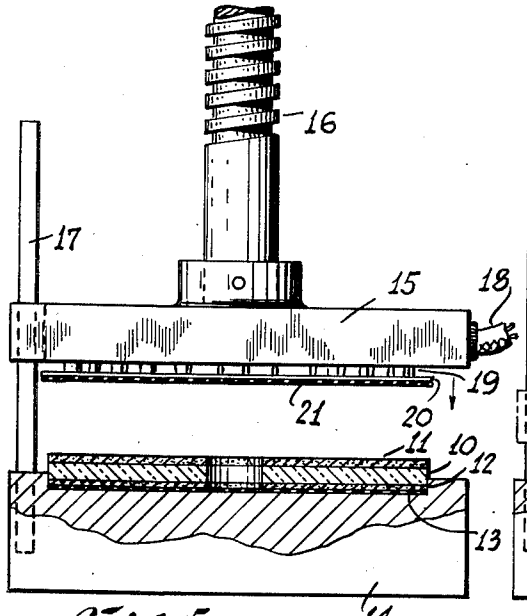


Fig. 5.

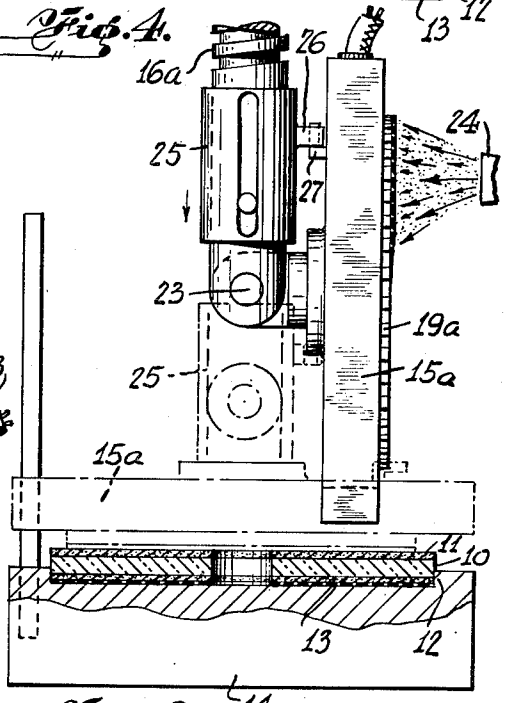


Fig. 6.

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METHOD FOR MANUFACTURING PANELS

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10 Claims. (Cl. 154—95)

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The present invention relates to a method and apparatus for manufacturing panels for instruments, and the like, of the kind shown in U. S. Patent No. 2,518,726 and in my co-pending application, Serial No. 144,457, filed February 16, 1950, now U. S. Patent No. 2,595,973, and is particularly directed to improvements in the method and apparatus for applying or forming the outermost opaque layer of such panels.

Panels of the kind referred to above generally consist of a core or body formed by a sheet of clear, transparent light-transmitting material, preferably plastic, such as, for example, methyl methacrylate laminated, at least on the side facing the viewer, with a relatively thin sheet or layer of translucent material, preferably plastic, such as, for example, cellulose acetate or polyvinyl chloride, and a sheet or layer of suitably opaque material, preferably plastic, such as, for example, vinyl or paint having preferably a matte finish. The last mentioned opaque layer or sheet is suitably cut out to expose desired portions of the underlying translucent sheet so that the exposed portions of the translucent sheet are caused to be illuminated, without glare, by the light transmitted through the clear body or core from a suitable panel light inserted in the panel. Panels of the kind described above may have the translucent and opaque layers disposed on one side of the clear plastic body as described above or may be composed of five laminae, that is, a clear core or body sandwiched between two translucent layers each having an opaque layer disposed against the outer surface thereof, as in the patent referred to above.

In any event, the practice followed in providing the cutout opaque layer facing the viewer heretofore consisted of forming the desired three-layer or five-layer lamination and then engraving away the opaque outer layer to form openings therethrough defining the desired indicia or characters. Since such panels usually are formed with a sharp color contrast between the outer opaque, and preferably dark layer, and the underlying translucent, and preferably light layer, so that the light underlying layer will sharply define the characters or indicia when the panel is viewed in daylight, extreme care must be exercised in engraving the outer layer to insure against undesired penetration of the translucent layer. Such undesired penetration of the underlying translucent layer reduces the clarity of the characters or indicia when viewed in daylight, and further exposes the clear light transmitting core or body which results in glare at the openings or cutouts, when the panel is illuminated. The performance of the engraving operation under such limitations is a tedious and expensive operation requiring the employment of highly skilled labor.

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It is therefore the primary object of the present invention to provide an improved method of forming or applying the penetrated opaque outer layer in panels of the described character, which improved method will result in substantial savings in the expense and time required for defining the desired indicia or characters in such outer opaque layer.

Another object is to provide a method of forming the indicia or character defining, penetrated opaque outer layer of panels of the described character in a manner dispensing with the engraving operation heretofore employed, and thus reducing the spoilage of panels by eliminating the possibility of undesired penetration of the underlying translucent layer.

Another object resides in the provision of a method and apparatus for stamping the opaque outer layer onto the desired areas of panels of the described character so that the uncovered areas of the underlying translucent layer will define the desired characters or indicia.

A further object is to provide a method and apparatus for stamping the opaque outer layer onto the desired areas of panels of the described character which permits the repetition of the stamping step for the purpose of building up the thickness of the opaque outer layer or for the purpose of correcting misprints in the event that an initial stamping operation does not adequately cover the desired areas.

A still further object is to provide a method of stamping the opaque outer layer onto the desired areas of panels of the described character and giving a matte finish to the opaque outer layer.

Various further and more specific objects, features and advantages of the present invention will clearly appear from the detailed description of preferred illustrative embodiments given below and to be read in connection with the accompanying drawing, which forms a part of this specification.

In the drawing:

Fig. 1 is a plan view of an assembly or lamination of sheets following an initial step in the practice of the method according to the present invention;

Fig. 2 is a sectional view along the line 2—2 of Fig. 1;

Fig. 3 is a plan view of a completed panel of the described character formed by the method according to the present invention;

Fig. 4 is a sectional view of the completed panel taken along the line 4—4 of Fig. 3;

Fig. 5 is a fragmentary, elevational view, partly broken away and in section, of apparatus employed in practicing the method according to one embodiment of the present invention; and

Fig. 6 is a fragmentary, elevational view, partly broken away and in section, of apparatus employed in practicing the method according to another embodiment or modification of the present invention, with the parts illustrated in full or unbroken lines in an inoperative position, and with the operative position of the parts illustrated in broken lines.

Referring to the drawing, wherein the same reference characters are used to denote the same parts throughout the several figures, the method according to the present invention includes an initial step of providing a preliminary lamination (Figs. 1 and 2). This preliminary lamination includes a core or body 10 formed by a sheet of clear, transparent, light transmitting material, preferably plastic, such as, for example, methyl methacrylate laminated between two relatively thin sheets or layers 11 and 12 of translucent, light colored material, preferably white and plastic, such as, for example, a cellulose acetate or polyvinyl chloride. The preliminary lamination illustrated in Figs. 1 and 2 is completed by a relatively thin sheet or layer 13 of opaque, dark colored material, preferably black and plastic, such as, for example, a vinyl resin, covering the translucent layer 12 to form the back surface of the panel.

The preliminary lamination may be performed by coating the surface of the sheets or layers with an adhesive, and then passing the superposed layers through a set of rolls to squeeze out the excess adhesive, disperse it uniformly over the entire area, and assist the adhesive in bonding the several layers together. Another method of forming the preliminary lamination, and the preferred one for that purpose, is to place the acrylic plastic sheet in a press with heated platens, between the sheets of translucent cellulose acetate or the like, and bond the three pieces together by means of heat and pressure. This lamination of the clear or transparent core 10 and the translucent layers 11 and 12 is then placed in the press with the opaque layer 13 placed against the layer 12 and a new lamination is made by the application of heat and pressure.

The preliminary lamination described above is intended for a completed panel of the kind having five layers, as in U. S. Patent No. 2,518,726, however, when the completed panel is to have a translucent layer and penetrated opaque layer only on the side of the clear core facing toward the viewer, then the layers 12 and 13 of Fig. 1 may be omitted.

The present invention particularly relates to the method and apparatus for applying an opaque, dark colored, preferably black, layer to selected areas of the surface of the translucent layer 11, and reference is to be had to Fig. 5 of the drawing for an understanding of this phase of the production of a panel of the described character. The preliminary lamination, consisting of the layers 10, 11, 12 and 13 is placed in a suitably shaped recess formed in a holder or bed 14 of a conventional press,

with the translucent layer 11 facing upwardly. The preliminary lamination is held in the recess to prevent lateral movement thereof. The press includes a vertically movable ram 15 which may be displaced vertically by the action of a nut-member (not shown) engaging a screw or worm 16 which supports the ram. The ram 15 is preferably held against turning and guided in its vertical movement by a guide rod 17 extending from the bed 14 and slidable through the ram so that the lateral relationship of the ram to the preliminary lamination in the bed 14 is maintained constant. The ram 15 has heating units (not shown) embedded therein, which are preferably of the electric resistance type and are energized by a suitable source of electric current (not shown) to which the electric conductors 18 extend. A suitably engraved die or plate 19 is secured or held to the lower surface of the ram 15 with the raised portions of the die 19 corresponding to those areas of the translucent sheet 11 to which the opaque layer is to be applied.

With the ram 15 in a raised position, a sheet of cellophane 20, or other suitable carrier, having a layer of dark colored, preferably black, pigment 21 on one surface thereof is placed against the die 19 with the layer of pigment facing in the direction toward the layer 11 of the preliminary lamination. A black vinyl resin in paint form has been found suitable for the layer 21. Such black vinyl resin in paint form may be provided by dissolving the vinyl resin in a suitable solvent, such as, chlorinated hydrocarbons, dioxan and acetic acid. The ram 15 is then lowered to press the pigment layer 21 against the translucent layer 11 and heated sufficiently to cause the transference of the pigment by heat and pressure from those portions of the cellophane sheet contacted by the raised parts of the die to the underlying areas of the translucent layer 11. The areas of the die which are recessed or hollowed out will not exert sufficient pressure against the cellophane sheet to effect transference of the pigment layer at those areas to the translucent sheet of the preliminary lamination, and, therefore, the areas of the sheet 11 corresponding to the recessed areas of the die will not have the opaque pigment transferred thereto. Thus, a layer of opaque pigment 22 (Figs. 3 and 4) is disposed upon the sheet 11 and has the form dictated by the configuration of the die 19 to thereby provide an opaque layer, penetrated where desired, at the side of the panel facing the viewer.

The operation of transferring the pigment from a sheet carrier to the surface of the translucent layer 11 may be repeated as often as desired in order to build-up the thickness of the deposited opaque layer 22 or to cover areas to which the pigment has not adhered or sufficiently covered during the first operation. Since the lateral relationship of the die 19 to the preliminary lamination held in the recess of the bed 14 is held constant, such subsequent reprints will always be exactly superimposed upon the first layers or markings.

In order to impart a matte finish to the opaque layer 22, the surface of the die 19 may be sand-blasted, or alternatively, the outer surface of the layer 22 may be similarly treated after being deposited on the panel.

If desired, the cellophane sheet 20 may be dispensed with as a carrier, as indicated in Fig. 6, and in that event the pigment layer is sprayed

or otherwise applied directly to the die for transfer from the raised portions of the die to the surface of the translucent layer of the preliminary lamination.

In order to facilitate the application of the pigment layer to the face of the die, the ram 15*a* of the press in Fig. 6 is preferably hinged, as at 23, to the lower end of the actuating worm or screw 16*a* so that, when the screw is displaced upwardly, the ram 16*a* may be swung to the side to conveniently expose the die 19*a* carried thereby to the pigment spray emitted from a suitable nozzle 24. If desired a slidable collar 25 is provided on the lower portion of the worm 16*a* to slide over the hinged together parts of the worm and ram, as shown in broken lines, and hold the ram in its operative, horizontal position. The collar 25 may also be formed with an eye or similar member 26 formed to receive a keeper 27 on the ram for holding the latter in its pigment receiving position, shown in full lines in Fig. 6.

With the apparatus illustrated in Fig. 6, the preliminary lamination consisting of the sheets 10, 11, 12 and 13 is once again held in a suitable recess of the bed 14*a*. The ram 15*a* is raised and swung to the side, and the pigment layer, preferably a vinyl resin in paint form, is sprayed or otherwise applied to the face of the die 19*a*. The ram is then returned to its operative horizontal position, heated and pressed against the surface of the translucent sheet 11 to transfer the pigment from the raised portions of the die to the confronting areas of the translucent sheet. As before, this pigment transferring operation may be repeated as often as is necessary to effect the deposit of an opaque layer of sufficient thickness and clarity.

Having thus described embodiments of the invention, it is to be understood that various changes and modifications may be made in the specifically described illustrative embodiments without departing from the spirit or scope of the invention as defined by the appended claims.

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

1. A method of applying an opaque layer to selected areas of the front surface of a panel lamination having a core of transparent light transmitting material positioned between two layers of translucent material and a rear layer of opaque material; comprising the steps of forming a die having raised portions corresponding to the selected areas of the front surface of the panel to which the opaque layer is to be applied, interposing a layer of opaque pigment between the die and the front surface of the panel, pressing the die against the front surface of the panel, and heating the die to effect the transfer of the opaque pigment to the front surface of the panel in the areas covered by said raised portions of said die.

2. A method of applying an opaque layer to selected areas of the front surface of a panel lamination as set forth in claim 1; wherein said layer of opaque pigment is applied to the surface of a flexible sheet, and the flexible sheet is interposed between said die and the front surface of the panel with the surface of the flexible sheet carrying the pigment facing toward the panel.

3. A method of applying an opaque layer to selected areas of the front surface of a panel lamination as set forth in claim 1; wherein said layer of opaque pigment is applied to the face of said die prior to said step of pressing the die against the panel.

4. A method of forming an instrument panel for internal illumination; comprising the steps of laminating a core of transparent light-transmitting material and a layer of light colored translucent material against at least one surface of said core, positioning a layer of dark colored opaque pigment opposite the outer surface of said translucent layer, pressing selected areas of the layer of opaque pigment against said translucent layer while applying heat thereto sufficient to transfer said selected areas of the opaque pigment to the outer surface of the translucent sheet, and roughening said selected areas of the opaque pigment.

5. A method of forming an instrument panel for internal illumination; comprising the steps of laminating a core of transparent light-transmitting material and a layer of translucent material against at least one surface of said core, forming a die having raised portions, heating the die, interposing a layer of opaque pigment between said die and said translucent layer, and pressing the heated die against said translucent layer to effect the transfer of the opaque pigment to the surface of said translucent layer in the areas covered by said raised portions of the die.

6. A method of forming an instrument panel as set forth in claim 5; wherein said layer of opaque pigment is applied to the surface of a flexible sheet, and the flexible sheet is interposed between said die and the layer of translucent material with the surface of the flexible sheet carrying the opaque pigment facing toward said layer of translucent material.

7. A method of forming an instrument panel as set forth in claim 5; wherein said layer of opaque pigment is applied directly to the face of said die prior to said step of pressing the heated die against said translucent layer.

8. A method of forming an instrument panel adapted to be internally illuminated; comprising the steps of forming a lamination of a core of transparent light-transmitting plastic between two layers of translucent plastic and a layer of opaque material against the outer surface of one of said translucent layers, positioning a layer of opaque pigment opposite the other of said layers of translucent plastic, and pressing selected areas of the layer of opaque pigment against said other translucent layer while applying heat thereto sufficient to transfer said selected areas of the layer of opaque pigment to the outer surface of said other translucent layer.

9. A method of applying an opaque layer to selected areas of the surface of an instrument panel adapted to be internally illuminated; comprising the steps of forming a die having raised portions corresponding to the selected areas of the panel to which the opaque layer is to be applied, sand-blasting the raised portions of the die, interposing a layer of opaque pigment between the die and the panel, and pressing the die against the panel while applying heat thereto sufficient to effect the transfer of the opaque pigment to the panel in the areas covered by the raised portions of said die.

10. A method of applying an opaque layer to selected areas of the surface of an instrument panel adapted to be internally illuminated; comprising the steps of forming a die having raised portions corresponding to the selected areas of the panel to which the opaque layer is to be applied, interposing a layer of opaque pigment between the die and the panel, pressing the die against the panel while applying heat thereto

sufficient to effect the transfer of the opaque pigment to the panel in the areas covered by the raised portions of said die, and sand-blasting the panel having the opaque pigment transferred to selected areas thereof to provide a matte finish thereto.

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