Jan. 16, 1968 R. M. SLIPP 3,364,090

METHOD OF MAKING THREE DIMENSIONAL DISPLAY PANEL

Filed Aug. 20, 1964

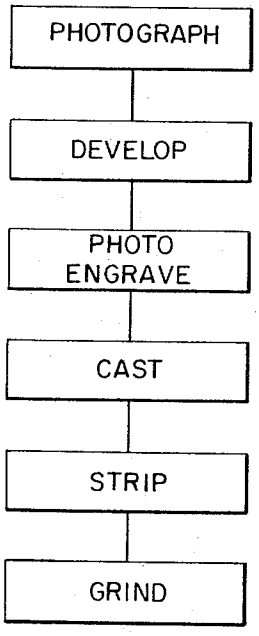


FIG. 1

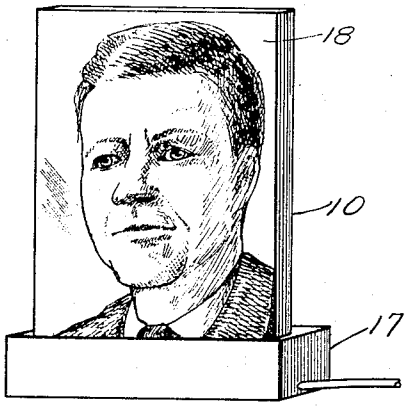


FIG. 2

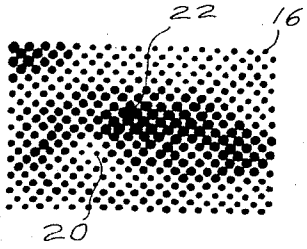


FIG. 3

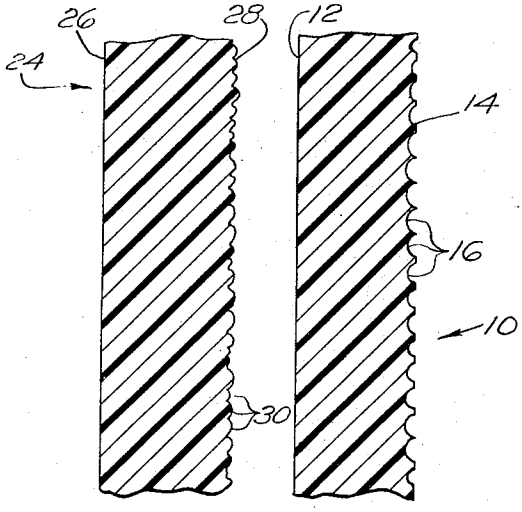


FIG. 4A FIG. 4

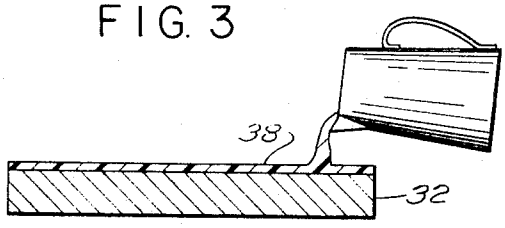


FIG. 6

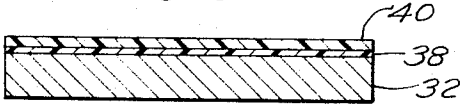


FIG. 7

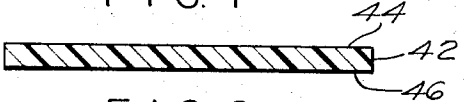


FIG. 8

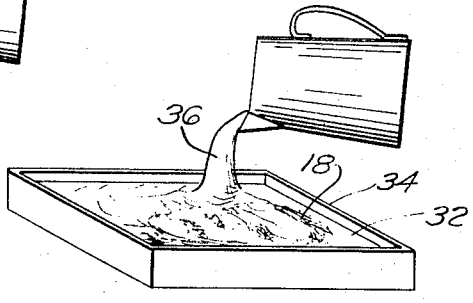


FIG. 5

INVENTOR.
ROY M. SLIPP
BY
Mow, Attman & Oates
ATTORNEYS

United States Patent Office 3,364,090 Patented Jan. 16, 1968

3,364,090

METHOD OF MAKING THREE DIMENSIONAL DISPLAY PANEL

Roy M. Slipp, Seekonk, Mass., assignor to Clearfloat, Inc., Attleboro, Mass., a corporation of Massachusetts

Filed Aug. 20, 1964, Ser. No. 390,962
2 Claims. (Cl. 156—245)

ABSTRACT OF THE DISCLOSURE

A transparent casting is formed with one surface being smooth and the opposite surface cast with a relieved half-tone image. When the casting is illuminated edgewise, the image presents a very striking appearance which is quite life-like and has a three-dimensional effect.

The image is obtained by casting a transparent plastic over a half-tone photo-engraved plate of the image, allowing the plastic to cure, then separating the plate and casting.

This invention relates generally to display products and their manufacture, and more particularly is directed towards a transparent panel having a half-tone relief image thereon providing unique optical effects particularly when illuminated along an edge. This invention also is directed towards a novel process for manufacturing transparent display products having half-tone relief images thereon.

There have been available heretofore for use in advertising displays and the like transparent panels of which one surface is embossed or etched in a particular pattern. These display panels heretofore have been fabricated by hand engraving, imprinted or molded on hand shaped dies. Panels produced in this fashion, by reason of the high degree of skill and art work involved, have been quite expensive and able to depict but a relatively restricted type of scene. As a result, panels of this sort have not found wide acceptance in the trade but rather have been used only as novelty items. Furthermore, panels of this type heretofore have been somewhat lacking in detail, luminosity and three dimensional effect.

Accordingly, it is an object of the present invention to provide improvements in transparent display products having a relief image thereon.

Another object of this invention is to provide a transparent display panel having a relief image thereon and characterized by improved illuminating qualities, detail and life-like representation.

Still another object of this invention is to provide an improved process for producing transparent products such as panel displays and the like with relieved half-tone images thereon.

More particularly, this invention features a transparent display panel having one side configured in half tones to produce a relief image thereon visible on both sides of the panel. Relief may be defined as a figure or design formed by elevations and depressions. The relieved surface is formed by casting a transparent stratum over a photoengraved plate or replica thereof and permitting the stratum to harden into a solidified panel. The solidified transparent stratum or panel is then separated from the plate and the surface of the panel which has been overlying the face of the plate will be formed with a permanent half-tone relieved image corresponding to the plate image. The resulting panel, when illuminated along an edge thereof, displays a particularly bright image characterized by depth, detail and remarkable life-like qualities.

However, these and other features of the invention, along with further objects and advantages thereof, will become more fully apparent from the following detailed description of preferred embodiments of the invention,

with reference being made to the accompanying drawings, in which

FIG. 1 is a flow diagram showing the process for making transparent panels according to the invention,

FIG. 2 is a view in perspective of a transparent display panel made according to the invention,

FIG. 3 is a greatly enlarged detail of the FIG. 2 panel showing the half-tone dot formation,

FIG. 4 is a sectional view in side elevation of the FIG. 2 panel also on a greatly enlarged scale,

FIG. 4A is a view similar to FIG. 4 showing a modification of the invention,

FIG. 5 is a view in perspective showing the casting step in the process of producing the FIG. 2 panel, and

FIGS. 6, 7 and 8 are sectional views in side elevation somewhat schematic showing a modified process for producing the FIG. 2 panel.

Referring now to the drawings and to FIGS. 2, 3 and 4 in particular, the reference character **10** generally indicates a transparent panel of a rigid transparent plastic material such as acrylic or the like. The panel **10**, as best shown in FIG. 4, is formed with front and rear faces **12** and **14**, respectively, with the front face being smooth and flat while the rear face is cast with a grid pattern defining a plurality of small shallow pits **16**. These pits vary in size and depth throughout the rear face **14** with the shallow pits producing a dark effect when side lighted, as by a lamp base **17**, while the deeper pits produce a light effect. In any event, the pits correspond to half tones and according to their size and depth, define a relief image **18** visible on both sides of the panel. This effect is due to light refracting and reflecting from the number of small pits dispersed over the rear surface of the panel.

As best seen in FIG. 3, the pits **16** are generally circular and appear as individual three dimensional dots, which in some cases blend with adjacent dots to represent white or high light portions as at **20** or appear as mere pinpoints to indicate very dark portions as at **22**. The remaining circular dots or pits **16** which are more clearly defined, correspond to various shades of grey depending upon size and depth.

The optimum relief effect is best achieved with a relatively coarse half-tone screen. In practice, a screen of 50 lines per inch or coarser should be employed for the proper effect and a 37 screen has been found to produce an ideal half-tone relief effect. This half-tone relief effect is enhanced by a coarse texture in which the pits have an average depth of .008 inch or deeper to achieve the desired light refraction and reflection.

Referring now more particularly to FIG. 4A of the drawing there is illustrated a modification of the invention and in this embodiment a transparent panel **24** of a material such as used in the panel **10**, acrylic plastic for example, is formed with a flat smooth front surface **26** and an embossed or cameo rear surface **28**. The rear surface will be seen to be cast with a plurality of small dot-like protrusions **30** generally convex and of various sizes. These protrusions correspond in reverse to the pits **16** of the FIG. 4 embodiment and produce an analogous effect. The protrusions are arranged in the same grid pattern and the size and extent of each protrusion vary according to various shades between light and black to produce the desired half-tone relief effect on the rear face of the panel.

The transparent half-tone relief panels may be produced by the processes described below. A desired subject or scene is photographed and developed in the usual fashion and a half-tone photoengraved plate **32** is made from the photograph. In making the plate **32** a screen of the proper texture, preferably having 50 lines to the inch or coarser, is employed in order to achieve the desired effect. The half-tone plates are made from photo-

graphs, wash drawings or other art work done in continuous tones that range from white through intermediate greys to black, as distinguished from all black lines and areas of line copy. To reproduce or simulate these tones use is made of the half-tone screen which in its standard form consists of two plates of glass each ruled or etched with fine parallel lines and cemented together face to face with the lines on one crossing the lines of the other at right angles. The lines are opaque, the spaces between them transparent and the lines and spaces are the same width.

In making the half tone the screen is placed in the camera directly in front of the film or photographic plate but not in contact with it. The space between the screen and the photograph varies with the nature of the copy but is generally ⅛ to ½ inch. The photograph which has been made through the screen consists of an image made up of dots of different sizes. In white areas such as highlights, these dots will overlap producing on the negative the effect of very fine white dots on a black background. Similarly, areas of black on the copy register on the negative as pinpoint black dots and the greys register as dots of varying intermediate sizes.

The half-tone negative is then etched onto a heavy plate such as 11 gauge brass for example. The resulting half-tone plate consists of thousands of tiny dots of different sizes and depths corresponding to the shading on the original photograph. When the original photograph is a positive, the dark areas are etched into the plate deeper than the light areas to form a female or negative plate. A male or positive plate may be made by using a negative print as copy or using a photographic positive instead of a negative in etching the plate. In using a male plate the FIG. 4 intaglio panel will be produced, whereas a female plate will produce the cameo-like panel of FIG. 4A.

For purposes of this description relief is intended to include both the intaglio surface of FIG. 4 and the cameo-like surface of FIG. 4A. Also, unless otherwise specified, photoengraved plate is intended to include both male and female plates.

The plate **32** whether it is male or female is laid face up on a horizontal surface and a dam **34** is placed around the edges of the plate. A suitable transparent plastic **36** in liquid or semi-liquid form is then poured over the face of the plate **32**, completely covering it, and the plastic is allowed to cure into a solid casting. Once the casting has polymerized, it is separated from the plate and, if the front surface or top of the casting is not sufficiently smooth, it is ground flat and polished to produce the panel **10**. It will be understood that the rear face of the panel will have taken on the image on the place, this image being relieved either in the form of half-tone intaglio pits as in FIG. 4, or half-tone cameo-like protuberances as in FIG. 4A, depending upon which type of plate is employed.

In the practice of this invention, various types of transparent plastics may be employed to advantage. One such plastic which has been found to have given excellent results is transparent acrylic resin such as a slurry mix of methyl methacrylate. This slurry gels quickly, has a low shrinkage factor and quickly takes shape. This slurry may consist of 60% hardened polymers and 40% non-hardened monomers. Other material such as transparent epoxies and polyesters may also be used.

Referring now to FIGS. 6, 7 and 8, there is illustrated a modified process of producing a panel such as shown in FIG. 4 or 4A. This process, which may be referred to as skin casting, includes the steps of pouring a thin skin **38** of suitable transparent plastic in a liquid form over the photoengraved face of the plate **32**. The skin casting may be an acrylic resin, both in liquid or semi-liquid form, for example. While the skin casting **38** is still in liquid form, a flat rigid stratum **40** of transparent plastic material such as acrylic, for example, is pressed

down onto the skin casting **38**, as suggested in FIG. 7. The skin casting **38** and stratum **40** should be of compatible materials so that the two strata will coalesce without an interface boundary. In any event, once the skin casting **38** has polymerized, both the skin casting and now-joined stratum **40** are stripped from the photoengraved plate **32**. If desired they may be placed in an autoclave for faster polymerization.

With this process, there is no need to grind the front surface of the finished panel since the stratum **40** is provided in flat form so that the finished panel is ready for use as soon as the skin casting has polymerized against the stratum **40** into the single integrated panel **42** (FIG. 8) having a flat smooth front surface **44** and a half-tone relieved rear surface **46**.

It will be understood that the stratum **40** may be of any transparent plastic material which is compatible with the skin material and serves as a medium to transmit light to the skin casting and to support the relatively thin skin. It also will be understood that the photoengraved plate **32** may be of any suitable material such as brass or steel or a replica thereof such as electrotype, for example.

The panel may be made in various sizes and shapes depending upon their use. The process lends itself to the production of very large size decorative panels for use as room dividers, doors or large advertising displays. The optimum relief effect is achieved by edge lighting the panel and using a relatively coarse half-tone screen when reproducing the selected image. Any scene or subject matter which can be photographed may be faithfully reproduced on the panel with the processes described above.

The panel may be made up with a wide variety of scenes, permanently cast thereon, providing particularly attractive products useful in a number of different applications such as the building trades, advertising and the like.

While the invention has been described with particular reference to the illustrated embodiments, it will be understood that numerous modifications thereto will appear to those skilled in the art. For example, the casting may be done with a number of different materials under different conditions of temperature and pressure to achieve the desired casting.

Accordingly, the above description and the accompanying drawings should be taken as illustrative of the invention and not in a limiting sense.

Having thus described the invention, what I claim and desire to obtain by Letters Patent of the United States is:

1. A process for producing a transparent display panel having a half-tone relief image cast on the face thereof, comprising the steps of

(a) forming a photoengraved half-tone plate of said image,

(b) casting over said plate a relatively thin stratum of transparent plastic in liquid form,

(c) applying a relatively thick rigid stratum of transparent material over said thin stratum,

(d) allowing said stratum to solidify so that the face of said thin stratum overlying said plate will be bonded to and formed with a permanent half-tone relief image, and

(e) separating both of said strata and said plate.

2. The process of claim **1** including the step of heating both of said strata to polymerize said thin stratum.

References Cited

UNITED STATES PATENTS

2,180,002 11/1939 Ford ..... 161—2

OTHER REFERENCES

"Advances in Xerography," 1958–1962. Photographic Science and Engineering, vol. 1, No. 1, January–February 1963, pp. 12, 13, 18 and 19.

JACOB H. STEINBERG, *Primary Examiner.*