Sept. 17, 1968 W. E. CAFFRAY 3,402,066

METHODS OF MAKING DECORATIVE ARTICLES

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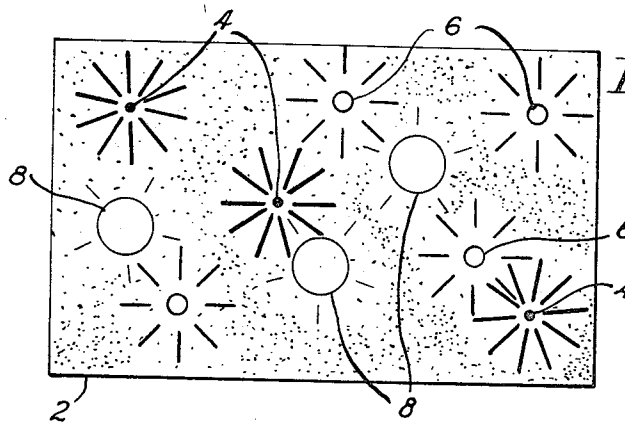


Fig. 1

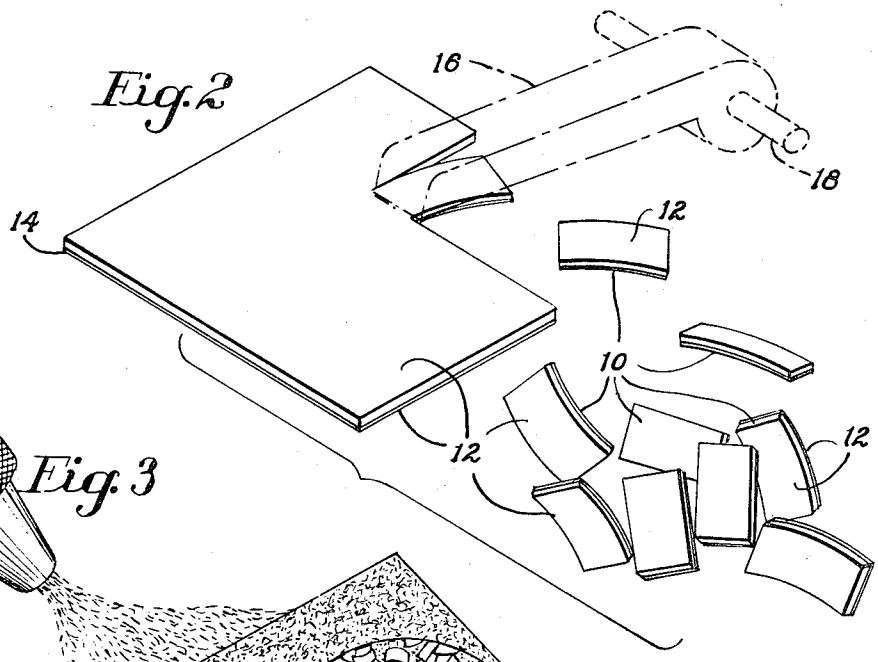


Fig. 2

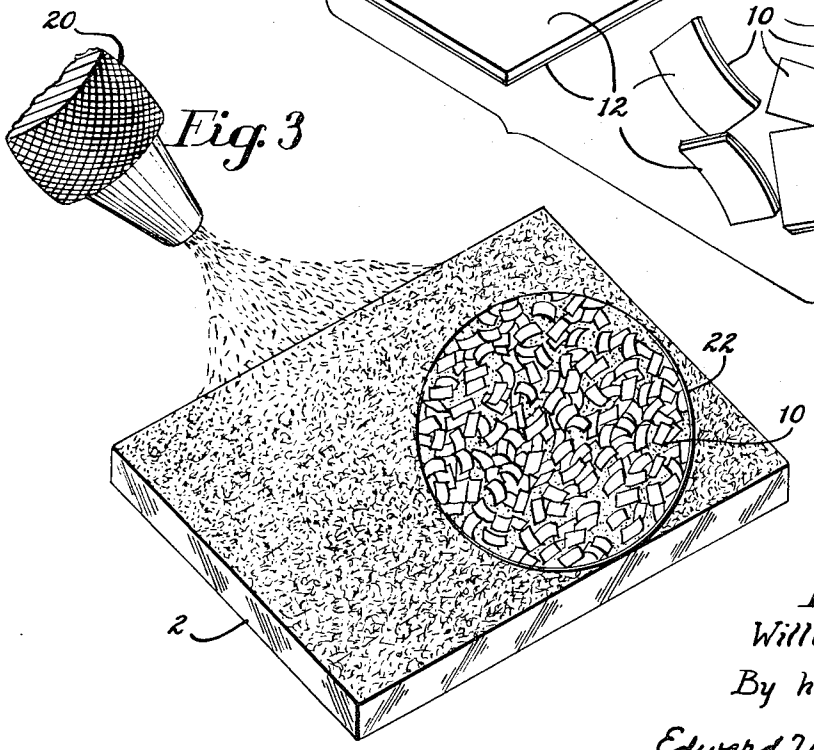


Fig. 3

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Fig. 4

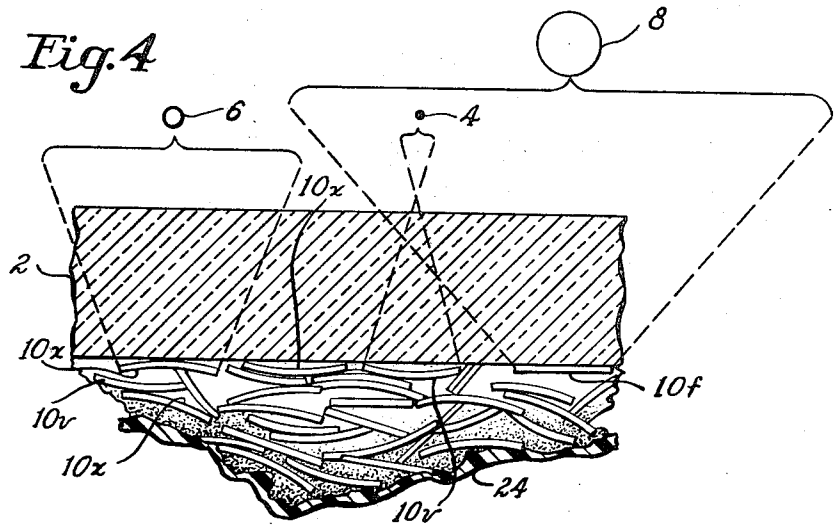
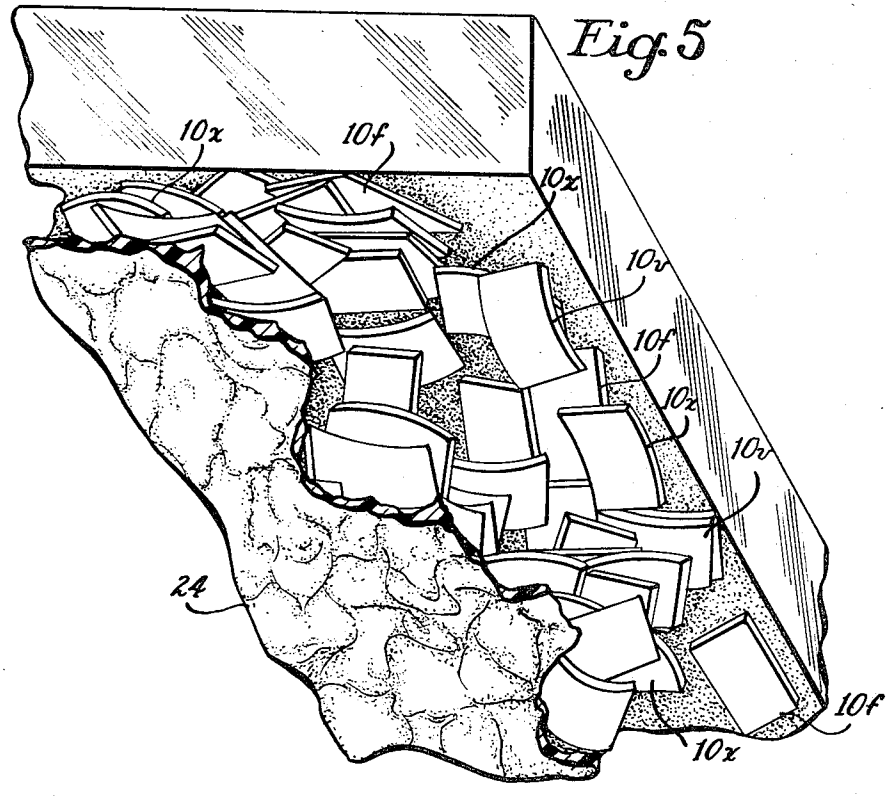


Fig. 5



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METHODS OF MAKING DECORATIVE ARTICLES

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ABSTRACT OF THE DISCLOSURE

A method of making decorative articles of semitransparent material containing small reflective plates of uniform dimensions and of substantial curvatures admixed with hardenable clear vehicle sprayed upon a transparent support having a smooth light conducting front surface toward which the article is viewed, the admixed plates and vehicle being projected at the rear of the support with sufficient force to flatten out certain plates against the rear surface of the support, the remaining plates retaining their unflattened condition with convex and concave curvatures facing the front to accentuate depth effects by varying intensities of reflected light rays.

This invention relates to methods of making decorative articles and is hereinafter described as being practiced by procedures involving the use of small reflective plates admixed with a hardenable vehicle for enhancing perspective or depth effects according to the manner of their application to a suitable transparent support.

The use of reflective particles to produce decorative effects is well known either in the form of multishaped finely divided power or nonuniform flakes or chips. Decorative effects produced by such particles result in brilliant flashes or rays reflected in a haphazard manner from any surface to which they are applied. The most common method of application is by the use of an adhesive vehicle, painted or sprayed in place.

The present invention has for its object the improvement in the manner of ornamenting a decorative article in such a way that the article so ornamented has the appearance of greater depth than its actual thickness otherwise would indicate, while still retaining, or even exaggerating, the intensity of rays produced by the treatment given. A further object is to simplify the application of an ornamental coating having small reflective plates admixed therein, the mixture of the coating having a wide range of effective latitude either with a relatively small number of plates for a given quantity of coating material or a large number with the same quantity, still retaining beneficial and desirable advantages not found in the usual form of reflective particle coating procedures. By providing a wide latitude procedure it is possible for an unskilled workman to obtain satisfactory results without any special skill or experience.

With these and other objects in view, the present method comprises the provision of a plurality of small reflective plates having uniform dimensions but with substantial curvatures admixed in a hardenable clear vehicle and sprayed upon a transparent support having smooth light conducting outer surfaces, the admixed plates and vehicle being projected at the rear of the support looking from the direction in which the support is to be viewed. The sprayed plates and vehicle are projected against the support by air pressure with sufficient force to flatten out certain plates against the rear surface of the support, to retain other plates in unflattened condition with their convex and concave curvatures facing in spaced relation from the rear surface of the support, the spaces between the plates and the support being filled with the clear vehicle, so that the concave curvatures of the plates provide brilliant reflected rays of light, the convex curvatures of the

plates providing less brilliant reflected rays and the flattened plates providing the least brilliant rays as a result of interface reflection between the flattened plates and the support. On this account an appearance is presented of greater depth of separation between the plates and the support than actually exists. Also, the rays from concave curvatures diverge from each other within a relatively small conical angle, while the rays from the convex curvatures diverge within a larger conical angle and the rays from interface reflection diverge within a much greater angle than either of the others. Such an arrangement is consistent with increased perspective effects, inasmuch as reflections from small particles of shiny material usually produce intensely brilliant reflections from positions close to the exposed surfaces of transparent mediums in which they are imbedded while the particles disposed in deeper positions produce less intense reflections but with smaller conical angles confining the reflections on account of surface refraction by such transparent medium for objects located at a greater depth.

These and other features of the invention as hereinafter described and claimed will readily be apparent to those skilled in the art from the following detailed specification, taken in connection with the accompanying drawings, in which:

FIG. 1 is a view in front elevation of a decorative article illustrating by means of arbitrary symbols how reflected light rays of three different intensities and divergent angles appear when reflected by small shiny plates disposed closely to the rear surface of a transparent support after application thereto in accordance with the present invention;

FIG. 2 is a perspective view on an enlarged scale showing the manner by which reflective plates utilized in the decorative article of FIG. 1 may be formed;

FIG. 3 is perspective detail view on a somewhat smaller scale showing, by means of an enlarged circular area, the manner of applying the reflective plates to the support;

FIG. 4 is a side sectional view of the support shown in FIG. 1 indicating the key to the symbols employed to illustrate the intensity of reflected rays of differently disposed plates; and

FIG. 5 is a perspective view on the same scale as used in FIG. 4, looking at the rear surface of the support to show the manner of distribution of the reflective plates and a final sealing coating on that surface.

The decorative article illustrated in FIG. 1 shows differently divergent rays reflected from a decorative article comprising a flat transparent support 2 having smooth light conducting outer surfaces with a plurality of highly reflective plates secured to its rearward surface opposite that exposed to view. The support 2 is composed of clear acrylic, other synthetic plastics, or even ordinary glass. The reflected rays are indicated respectively by the number and width of the lines radiating from the central circular symbols 4, 6 and 8, the symbols 4 being solid dots, the symbols 6 being small circles and symbols 8 being larger circles. Surrounding these symbols are radial lines of heaviest weight and greatest number surrounding each dot 4, and of somewhat lighter weight and fewer number surrounding each of the smaller circles 6, while those around the larger circles 8 are of the lightest weight and least in number, indicating that the intensity of light is greater at the locations of the dots, less at the locations of smaller circles and least at the locations of the larger circles. It has been found necessary to provide a coating on the rear surface of the article opposite that which is exposed to view for securing attachment of a plurality of reflective plates the dimensions of which are uniform, the plates being oriented with respect to the support 2 more or less in parallel relation rather than being piled up

indiscriminately. Also, as an essential to variations in intensities of the rays 4, 6 and 8, the plates being highly reflective are required to be curved with relatively uniform and large radii as compared with their greatest dimension.

Each plate, indicated at 10, in FIG. 2 is composed of polished metal foil, such as aluminum, having a tarnish resistant surface layer 12, (see FIG. 2) the entire thickness of the foil plus the resistant layer is between 0.0004 and 0.0007 of an inch. The surface coating ordinarily is applied by calendering epoxy varnish and after hardening, the foil is cut into small diamond or rectangular shapes of a maximum dimension between 0.003 and 0.015 of an inch in length but whatever maximum size of plate is utilized all of the plates in a particular coating should be maintained uniformly the same throughout. Otherwise the intensity of reflected light rays and divergence of the rays will not have the same proportionate relationship between one another, so that the appearance of depth and perspective will not be accentuated to maximum possible degree. The diameter of the symbols 4, 6, and 8 give a rough approximation of solid conical angles forming limits of the divergent rays reflected from the respective locations.

From FIG. 1 it will be seen that the most intense rays are caused to diverge from each other through the smallest angles about the dots 4 and the less intense rays diverge from each other through substantially larger angles about the smaller circles 6 and the least intense rays diverge from each other through the largest angles about largest circles 8. Thus, when there is motion imparted relatively to the transparent support 2 and the eye of a beholder the effect will be to produce short concentrated flashes of light from the support at the dots 4, more prolonged, less intense flashes of light at locations of the smaller circles 6 and still more prolonged, least intense flashes of light at the locations of the largest circles 8. Because of the differences in intensities of rays and the lengths of time during which the rays can be seen by reason of their different divergence the sense of great depth of separation or perspective between the sources of the rays and the support 2 and, consequently, the apparent thickness of the article is greatly increased.

To obtain these desirable results with consistency it has also been found that if a size of plate utilized is smaller than 0.003 of an inch maximum dimension then it is impossible to obtain intensities of brilliance and the essential contrast between the reflected rays required for the depth and perspective effects. If plates having maximum dimensions of more than 0.015 of an inch are employed it is impossible to spray these plates in a proper manner through a nozzle of the type required by the method of application to the decorative article. Thus, the limits between 0.003 and 0.015 of an inch are critical for the desired results.

Ordinarily, the tarnish resistant layer 12 for the aluminum foil on which the plates 10 are made is in the form of an epoxy varnish and the foil so covered is obtainable from Dobeckmun Division of the Dow Chemical Company, P.O. Box No. 6417, Cleveland, Ohio, or Revere Copper and Brass Company, Inc. 24 N. Front St. New Bedford, Mass. The foil after having the tarnish resistant layer applied is cut into the reflective plates by precise feeding movements of the foil indicated at 14, relatively to a rapidly rotating cutter 16 secured to a power driven shaft 18, as shown in FIG. 2.

The plates formed by the cutter 16 have larger or smaller curvatures depending upon the angle formed between the foil as it is being severed by the cutter. Variation of the angle is accomplished by raising or lowering the foil with respect to the cutter shaft 18 and this may be done by mounting the foil on a table (not shown) which is capable of proper adjustment. Also, such table should have a pair of steel shearing edges cooperating with the cutter 16 to provide clean severed edges on the plates.

After formation of the plates 10 they are admixed with a liquid vehicle of clear acrylic resin, cellulose nitrate or cellulose acetate resin. Pastel tints may be applied to the layer on the foil, or other coloring process, such as "aluminizing," may be used before cutting the plates to produce contrasting effects if desired. The liquid vehicle containing the plates is then introduced into an air impelled sprayer having a nozzle 20, as shown in FIG. 3, so then when the nozzle is directed toward the rear surface of the support 2 a mixture of vehicle and plates will be applied to the support in any thickness desired. Spraying the rear surface of the support in this way has conveniently been termed "back spraying."

In most instances the mixture of vehicle end plates is back sprayed on the support 2 as lightly as convenient while still avoiding large sized spaces between the plates. The large scale circular area 22 shows an average light application of the mixture to a support in FIG. 3.

After the vehicle and plate mixture is hardened on the support 2 a protective overall covering 24 is sprayed onto the back of the mixture, as shown in FIGS. 4 and 5. This covering is composed of a vehicle similar to that employed with the plates 10, except that it is not admixed with any reflective particles, although a pigment or opaque light absorbent dye may be included which may be similar in color to that employed in the tarnish resistant layer on the foil before cutting the plates. The application of the layer on the plates is much thinner however and does not appreciably effect the reflectivity of the plates. The covering 24, being sprayed is applied so much thicker that it is practically opaque, the layer on the plates being the result of a calendering process on the foil. When the covering 24 is finally hardened the support 2 and the materials, which are applied to it form a single unitary construction capable of absorbing heavy impacts without damage and providing the desired decorative effects.

In spraying the vehicle and plates onto the support 2 the force with which they are projected and the occasional absence of any vehicle on a side of a plate 10 causes that plate to be flattened tightly against the rear surface of the support, as indicated numerals 10*f* in FIGS. 4 and 5. Flattened plates cause multiple reflection between the interface surfaces of the plates and support, thus producing the least intense reflected light with the greatest angle of divergence. In most other instances the plates are disposed in slightly spaced and unflattened relation to the support, either with their convex surfaces facing the support, as at 10*x*, or with their concave surfaces facing the support, as at 10*v*. Although the plates are all disposed quite close to the support all of the plates are of identical size and produce different intensities of light reflected through different angles of divergence in each of three instances with relation to the surface of the support. This is the primary reason for the perspective or depth effects. To a certain degree these effects may be enhanced by increasing or decreasing the curvature imparted to the plates when they are severed from a sheet of foil. Thus, for decorative articles to be viewed from short distances the curvatures should be greater and those to be viewed from longer distances should have smaller curvatures.

Articles decorated by the method herein disclosed have found ready market for certain items for use where high visibility or enhanced decorative effects are desired. For instance, crash helmets for hazardous occupations or automobile hub caps, which have particular appeal by reason of their conspicuous appearance, both show good prospects.

The nature and the scope of the invention having been indicated and a particular procedure having been described, what is claimed is:

1. A method of making decorative articles, comprising the provision of a plurality of curved reflective plates of uniform dimensions, a hardenable vehicle with which the plates are admixed, and a transparent sup-

port having smooth light conducting outer surfaces, said method including the steps of

spraying the admixed vehicle and plates on the surface at the rear of the support looking from the direction in which it is exposed to view with sufficient force to flatten out certain plates against the rear surface of the support and

to retain other plates unflattened with their convex and concave curvatures facing in spaced relation from the rear surface of the support by filling the space between the plates and the support with the vehicle,

the concave curvatures of the plates which face the support providing the most brilliant reflected rays of light,

the convex curvature of the plates providing less brilliant reflected rays, and

the flattened plates providing the least brilliant rays from interface reflection between the flattened plates and the adjacent rear surface of the support,

thereby presenting an appearance of greater depth of separation between the plates and the support than actually exists.

2. A method of decorating a flat transparent support, comprising

the provision of a plurality of curved reflective plates cut from polished metal foil, the thickness of which

is between approximately 0.0004 and 0.0007 of an inch and a maximum dimension between 0.003 and 0.015 of an inch,

admixing the plates with a transparent vehicle, and

spraying the resultant mixture onto a surface of the support at the rear of that to be exposed to view with such force that the plates are disposed generally parallel to the flat support.

3. A method of decorating a flat transparent support, as in claim **2**, in which

the resultant mixture is sprayed with such force that an occasional plate is flattened tightly against the rear surface of the support and some of the plates have their concave surfaces facing the suport while other plates have their convex surfaces facing the support.

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