United States Patent [19]

Iverson et al.

[11] **3,816,155**

[45] **June 11, 1974**

[54] **DECORATIVE WOOD GRAINING METHOD AND ARTICLES**

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[22] Filed: **Mar. 3, 1972**

[21] Appl. No.: **231,723**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 854,761, Sept. 2, 1969, abandoned.

[52] **U.S. Cl.** ..... **117/10,** 117/8, 117/39, 117/64 R, 117/119.4, 117/DIG. 5

[51] **Int. Cl.** **B44d 5/02,** B44d 5/06

[58] **Field of Search** ..... 117/8, 10, 37, 64 R, 39, 117/119.4; 269/158, 73.7 U; 106/248; 264/73, 74; 260/37 R

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[57] **ABSTRACT**

A method for producing decorative and ornamental protective coatings in simulation of wood graining. A plurality of portions of thixotropic viscous settable liquid coating vehicle colored with metallic pigments are prepared in either different colors, or shades of the same color, or both, depending upon the natural coloring of the wood to be simulated. These separate portions of vehicle are combined with a minimum of admixing, either in a common container from which the mixture is applied to a base surface, or by spreading the several vehicle portions onto the base. The applied coating mixture is allowed to level or is leveled into a relatively uniform layer. While still liquid and viscous, the leveled coating in most cases is furrowed to develop a lined pattern therein in simulation of wood graining. The coating is permitted to set up and harden. The coating may be formed on a nonadhering surface from which it may be stripped as a self-sustaining film. Effects such as sandblasted graining, distressed wood graining, burled graining, aged wood, pickled wood, and the like, may be obtained by variations of the basic method.

15 Claims, No Drawings

DECORATIVE WOOD GRAINING METHOD AND ARTICLES

This application is a continuation-in-part of our co-pending application Ser. No. 854,761, filed Sept. 2, 1969, now abandoned.

This application relates to a method for producing decorative and ornamental protective coatings in simulation of wood. Graining is a process employed to make the surface of one wood look like that of another or to make surfaces such as pressed wood panels, chip board, fiber board, metal, paper, etc. look like wood. As described in Goodheart-Willcox's Painting and Decorating Encyclopedia (1964 edition, edited by William Brushwell, published by the Goodheart-Willcox Company, Inc., Homewood, Ill.) pages 223–225, wood graining is an exacting tedious process requiring high skill, much practice and numerous tools. Graining tools include steel and rubber graining combs, fitch brushes for veining and knotting, sable pencil brushes, hog hair mottlers, camel's hair mottlers, piped overgrainers, badger's hair blenders, stipplers, and graining check rollers. A properly mixed ground color must first be applied and allowed to dry. Pores are produced by water color stippling over the dried ground coat. This is grained over with oils. The stain is applied and while wet the area is stippled. When this has dried, a graining stain is applied and allowed to partially set. Then figure work is applied using combs, brushes, sponges, etc. Thereafter, a protective finish must be applied over the grain produced. As described in the same work on pages 187 to 228, finishing of natural wood is likewise a tedious task requiring skill, patience and much time.

An alternative to the tedious method of producing simulated wood graining or finishing natural wood is to reproduce photographically a wood grain pattern onto a suitable base surface, or apply such a pattern by printing or engraving methods, such as hot stamping foils and roll printing. These methods have the disadvantage that the same pattern is reproduced over and over, contrary to the never-ending variations found in nature, and the graining is of minute thickness such that it is readily removed, for example if the surface is sanded or accidentally damaged.

A further discussion of the prior art relating to wood graining is found in Danielson U.S. Pat. No. 2,257,595, issued Sept. 30, 1941. The Danielson patent is directed to a paint for simulating wood grain. The paint is composed essentially of a mixture of a resinous vehicle and a non-leafing metal powder pigment and a coloring material such as an asphaltic varnish. This paint is used to produce what is described as a strikingly realistic representation of a grained wood surface. When applied with a brush, the paint is described as automatically forming a series of dark and light bands or lines of random size and shade in close simulation of the natural grain of a large variety of woods. Alternatively, the paint may be applied by spraying and thereafter brushed. Danielson requires that his pigments be preliminarily treated to positively prevent leafing. For example, the powder is preliminarily mixed with a small quantity of the vehicle and then preferably aged, as by heating for 15 to 30 minutes at about 100° C, because, in Danielson's relatively thin flowable vehicle, leafing metal powder pigment would tend to rise uniformly to the surface and give an undesirable overall metallic appearance.

Danielson requires a long enough drying time so there is no immediate thickening or setting to impede ready application or reworking with a brush so that rapid drying vehicles are preferably avoided. Danielson states substituting pigments of the ordinary type in lieu of asphalt has generally been found unsatisfactory. He states thus, for example, carbon black produces an unsatisfactory mottled effect, while ground pigments merely produce a correspondingly colored streaky surface when brushed. In general, the coloring material should be entirely or chiefly of a soluble or quasi-soluble nature like asphalt rather than in the form of precipitated particles like pigments of the ordinary type.

The process of the present invention permits the simulation of wood in an almost unlimited variety of patterns such as fir, oak, burled walnut, ebony, mahogany, tiger wood, and the like, and textures such as buffed and polished, sandblasted, distressed, and the like. The process may be carried out with a minimum of skill. The grain pattern extends through most of the entire thickness of the coating and cannot be destroyed by buffing or sanding unless the entire coating is destroyed. The coating may be produced adhered to a base surface or it may be applied to a smooth non-adhering surface from which it may be stripped to form a self-sustaining film. Depending upon the coating vehicle used, the coating may be extra-ordinarily tough and durable.

Broadly stated, the method comprises the steps of:

1. Preparing a plurality of portions of colored thixotropic viscous non-free-flowing settable liquid coating vehicle;

2. Either combining these portions without homogenization of the portions and applying, or applying the colors separately;

3. Spreading the resulting heterogeneous liquid mixture onto a base over substantially the entire surface;

4. While the coating mixture is still liquid and viscous leveling it into a layer of substantially uniform thickness and developing a pattern having visible color lines of demarcation in the coating or simply permitting the relatively non-flowing mixture to seek its own level; and

5. Permitting the coating to set up and harden.

VEHICLE

The coating vehicle used in carrying out the method of the present invention may be any one of the natural or synthetic resins, or drying oils, or lacquers, and mixtures thereof, commonly used in preparing decorative and protective coatings such as paints and varnishes and having thixotropic properties. Such suitable resinous vehicles include synthetic resins such as alkyd resins; polyester resins, including water extended polyesters, polystyrene, vinyl resins including polyvinyl acetate, polyvinyl chloride, vinyl chloride-vinyl acetate copolymers, etc.; polyamide resins, polyurea resins, acrylic resins; phenolic resins; maleic resins, coumarone-indene resins; urea-formaldehyde resins; melamine-formaldehyde resins; epoxy resins including water emulsifiable epoxy resins; silicone resins; ionomer resins; acetal resins, polyethylene; polypropylene, hydrocarbon resins; rubber derivatives, such as chlorinated rubber; polycarbonate resins: phenoxy resins, fluoroplastics; styrene-butadiene resins; polyurethane resins; furane resins; polysulfone resins; pentaerythritol

resins; ester gum, copal ester; and the like. Natural resins which may be used include shellac, rosin copal resins, dammar resins, manilla resins, etc. Lacquers such as those formed from nitrocellulose, cellulose acetate, cellulose acetate-butyrate, ethyl cellulose, etc. may be used. Drying oils which may be used include those commonly used in paints and varnishes, such as linseed oil, soybean oil, tung oil, dehydrated castor oil, perilla oil, oiticica oil, fish oil, safflower oil, and the like.

These vehicles commonly contain solvents, diluents, thinners, driers, ultra-violet light absorbers, fire retardants, and the like. Typical solvents and thinners include turpentine, dipentine, pine oil, petroleum spirits, naphtha, mineral spirits, ethyl and methyl alcohol, toluol, benzol, xylol, acetone, ethyl acetate, amyl acetate, etc. Typical driers include cobalt driers, lead driers, manganese driers, calcium driers, iron driers, zinc driers, etc., all of which are well known to the trade.

The vehicle may be one which sets up and hardens as a result of oxidation, such as drying oils; or by evaporation of solvents, such as shellac and lacquer; by catalytic action, such as some epoxy and polyurethane resins; by baking such as some alkyds, hydrocarbon resins, some epoxy resins; by exposure to high energy electronic accelerator, and the like. The vehicle should preferably be set up and hardened as rapidly as possible after development of the graining pattern, preferably in a few seconds. Depending upon mode of curing, baking, etc., the time may be closely controlled. Setting up of catalyst-curable vehicles can be accelerated by addition of more catalyst. Sufficient time is allowed to permit leveling, furrowing, etc. of the coating and then the coating is desirably set up immediately, ordinarily no more than a few (about 10 to 20) minutes after application.

The several portions of vehicle used in preparing any one decorative coating are generally composed of the same basic materials although they may have varying amounts of thinners, solvents, fillers, etc. so as to vary their viscosities and other physical properties, but there may be a combination of unrelated resins used on the same panel to provide texture and growth lines.

COLORING AGENTS

The portions of coating vehicle used to prepare the coating, according to the method of the present invention, are colored by the inclusion of metallic pigments alone or with any one of a combination of inorganic or organic color pigments, extender pigments or fillers, stains, dyes or clear colored pigments.

Useful metallic pigments include aluminum powder, copper powder, bronze powders available in various shades depending upon the alloy composition, zinc powder, gold and gold-like powders, and the like. Metallic pigments are used in combination with each other in combination with other pigments so that no metallic appearance results. These are ordinary commercial "leafing" type products not subjected to treatment to prevent leafing. The thick viscous vehicle is capable of holding ordinary leafing pigments in suspension. If metal pigment rises to the surface sufficient to give an allover metallic leafing appearance, this can readily be removed by light sanding or rubbing with steel wool.

Typical inorganic pigments useful for wood graining include those iron pigments ranging in color from yellow through red, reddish-brown, brown to black, similar to those found in natural wood. Such iron pigments include yellow ocher, raw and burnt sienna, and raw and burnt umber. Other useful inorganic color pigments include chrome yellow, cadmium sulfide, zinc yellow, cobalt blue, ultramarine blue, iron oxide, chrome green, chromium oxide green, chromium hydroxide green, lamp black carbon, and white pigments such as titanium dioxide, titanium calcium, zinc oxide, zinc sulfide, antimony oxide, lithopone, etc. Although lead pigments may be used, they are preferably avoided because of the safety hazard involved in their use. Organic pigments which may be used include toluidine red, phthalocyanine blue and green, Vandyke brown, alizarin, madder lake, lithol red, a pearl essence by itself or colored pearl essence, etc.

Finely divided fillers or extender pigments provide little or no hiding power. However, they are used to stabilize pigment suspension, to improve leveling, control flow, build adequate film, lower gloss and influence opacity, etc. They affect film properties such as cleanability, scrubability and appearance. In the present instance, due to the transparency and translucency of the extender pigments, three-dimensional depth is imparted to the graining pattern. Typical fillers include calcium carbonate, barium sulfate, china clay, talc, quartz silica, tripoli, mica, quarry dust, calcium sulfate, magnesium carbonate, magnesium oxide, aluminum hydrate, slate flour, Cab-O-Sil brand fumed silica, volcanic ash, pumice, flint, garnet, emery, aluminum oxide, silicon carbide, rotten stone, fine mesh South Dakota Stone, ground mica, microspheres such as glass, and the like, reinforcing fibers and pellets such as glass fiber, metal whiskers, fiber glass whiskers, crystal whiskers, asbestos filler, and the like. Fire retardant agents may also be included. Ultraviolet absorbers should be included in all coatings and usually are incorporated in the base resin as obtained from the supplier.

Stains and dyes are available in several types and colors. They may be soluble in water, alcohol or oil and are available in basic colors such as walnut, brown mahogany, red mahogany, cherry red, various shades of oak and maple, and the like. Oil stains consist of finely ground color pigments, such as the transparent earth pigments like raw and burnt sienna, burnt umber, and Vandyke brown in linseed oil, varnish, turpentine, etc.

PREPARING THE COLORED VEHICLE PORTIONS

The several colored portions of vehicle prepared for application of the coating are selected and prepared to simulate the particular wood whose pattern is to be simulated. For example, if it is desired to simulate a walnut grain the vehicle is divided into three portions which are pigmented in gradations of the same color such as found in natural walnut. A pale gold metal powder pigment is admixed in one portion, a pale copper powder pigment in another, and antique bronze metal powder in the third. In contrast, South American tiger wood which consists of distinctly different colors can be simulated by dividing the vehicle into only three parts, one of which is colored black and the other two are bright orange and muted orange.

Desirably an extender pigment, such as pumice, silica, Cab-O-Sil, quarry dust, volcanic ash, slate powder, ground mica, or the like, is added to the vehicle to increase the viscosity of the vehicle, assist in making it thixotropic and assist in preventing the mixtures from becoming homogeneous both before and after application to a surface. The number of portions into which

the vehicle is divided is dependent primarily upon the number of colors and distinct shades of colors present in the wood whose grain is to be simulated. The portions need not be of the same viscosity nor need they be colored by the same means. For example, one portion may be colored with a dye, another with an oil stain, still another with metallic powders, or a combination of these may be used in the same portion. Pickled wood effects are obtained by incorporating light pigments, Desirably a flattener is admixed in one or more of the vehicle portions so as to provide a surface variation in glossiness, characteristic of natural woods where the harder portions of the grain tend to be more glossy than the intervening softer portions.

COMBINING THE VEHICLE PORTIONS AND APPLYING

The several portions of colored vehicle prepared for simulation of a given wood grain are combined, but without appreciable admixture of the several portions. This may be done in a single container, care being taken to prevent homogenization of the several portions. The degree of mixing is related to some extent to the size of the containers of vehicle portions. If the containers are relatively large, more mixing is required to produce narrow ribbons of wood graining within the mixture. Otherwise, when applied the bands of color would be too wide and would not resemble natural wood. In smaller containers, less mixing is required to achieve the same result. This combined mixture is then applied to a base surface, generally by pouring, by extruding or flowing from different width openings or nozzles, or by spraying, or the like. Alternatively, the several colored portions of vehicle can be combined on the surface to be coated by pouring or otherwise applying them individually and then spreading the coating or permitting the coating to spread itself so as to cause the portions to merge and intermingle to some extent, but without becoming homogeneous. Because of the viscous relatively non-free-flowing character of the vehicle it is necessary that substantially all of the surface to be coated be covered since relatively little spreading occurs after application.

The combined colored vehicle portions may be applied to the surface in a variety of directional configurations. Where a straight grain is to be simulated, the portions are desirably applied generally linearly. Where a burled or knotty effect is desired, the colored vehicle portions may be applied in a nonlinear pattern and left to make its own burled or knotty effects. Since most natural wood samples of any appreciable size contain a variety of different grain configurations, desirably the colored vehicle portions are applied in non-uniform patterns, part linear, part circular, etc., giving the effect of different cuts of wood.

LEVELING AND FURROWING

Whether the combined colored vehicle portions are applied from a single container or separately, the coating is spread and leveled, as by means of a doctor blade or similar scraping or leveling device, so as to make it substantially smooth and uniform in thickness. The coating is leveled to the desired mil thickness by removing any excess material. Then, while the viscous coating is still liquid and unset, the leveled coating is furrowed to develop a pattern in the coating. The graining may be done at the same time the coating is applied in one operation.

The furrowing may be done with any of a variety of tools including serrated blades, combs, rakes, wire whisks, and the like. The furrowing or dragging tool is desirably dragged through the entire thickness of the coating, not merely the surface. One effective tool consists of a plurality of rotatable spaced apart discs. The spacing between adjacent teeth or discs may be uniform or non-uniform. Alternatively, part of the coated surface may be furrowed with a tool having closely spaced apart elements. Other parts may be furrowed with tools having more widely spaced apart elements. The furrowing patterns may be superimposed upon one another in whole or in part at the same time. The tool should not pick up and transport coating material as in the case of a brush.

Development of the graining pattern may occur spontaneously simply as a result of leveling, without the use of any furrowing tool. The same result may occur spontaneously along with selfleveling of the coating if the vehicle is applied in bands or ribbons of vehicle in gradations of the same or different colors, even if applied as a single non-homogeneous mixture from a single container. When the material is applied either by pouring in strips, through a number of openings or nozzles or the like, lines of demarcation result where the materials meet each other and graining may result without further acting upon the material with leveling or graining devices.

The furrowing may be generally linear or it may be in zig-zag or circular patterns or combinations thereof. Furrowing of the coating initiates and stimulates a migration of the coloring. Some blending of the several different colored vehicle portions occurs, but with little or no blurring of the interfaces due to diffusion of one portion into another. A concentration of the coloring agent, be it pigment, dye or stain, occurs in the ridges caused by the teeth or disc elements, which, as they leave the coating, form the darker lines in the coating. This simulates the natural lines which tend to be darker in natural wood. A corresponding lightening of color occurs in the valleys between the ridges. The migration of color does not stop with the completion of the furrowing step, however. Instead, there is a continuing movement and growth of pattern in the sub-surface layers of the coating material. Lighter weight pigments, for example, may tend to rise toward the surface. Denser materials may tend to descend somewhat. These materials are not completely independent of one another, however, so that they influence one another in their movements with some adhering lighter particles descending and other denser particles remaining at the surface of the coating. In areas where the vehicle may be slightly less viscous and more fluid, there is greater migration. Similarly, where the coating is somewhat thicker, as in the ridges between the furrows, more movement and pattern growth may take place almost instantaneously.

Where a consistently repeating graining pattern is desired, the graining pattern is formed from thin metallic or similar fins secured together in the desired pattern and desirably treated with a release agent, such as a silicone. The coating surface is furrowed by pressing this array of fins into the coating and then lifting vertically. The lifting fins raise the coating corresponding to their pattern establishing the desired lined graining design.

SPECIAL EFFECTS: SANDBLASTING

Ordinarily, the coating after furrowing is permitted to return to its substantially uniform thickness, either as a result of being level or by means of a leveling tool. Drying may be hastened by heat. In some instances, it is desired that the coating surface have a ridged or furrowed contour in simulation of rough hewn wood or wood which has been sandblasted. In the latter, the softer wood structure between the denser harder growth rings is eroded away and forms depressions. This effect can be achieved by permitting the coating to set up and harden while furrowed, without leveling or permitting the coating material to level itself. The discs cause the coating to be pulled up as the discs leave the coating and cause ridges to remain. This sandblasted effect may be achieved in a number of ways. For example, the coating material itself may be highly viscous such that it tends to retain the furrowed pattern when it is made. In the case of a bakeable coating material, the coated surface may be subjected to baking immediately after furrowing before the coating material has had an opportunity to level out. In the case of a catalyst curable vehicle, the furrowing step may be performed toward the end of the pot life of the material or extra catalyst may be used to quicken setting up, such that permanent setting up and hardening begins while the coating is in the furrowed condition.

KNARLING, ETC.

Effects simulating burled, knarled and knotty graining can be simulated by stirring air bubbles into one or more of the portions of vehicle prior to application to the base surface. The air bubbles tend to rise to the surface of the coating. They are broken spontaneously, or as a result of the spreading or leveling steps or as a result of the furrowing step. This causes migration of the coloring agents somewhat similar to that achieved by furrowing. The darker coloring tends to concentrate around the periphery of the collapsed air bubble. Pleasing effects are obtained, particularly when air bubbles of varying sizes are incorporated into the coating, broken at the surface and the surface levels itself. Flatteners, thinners, etc. distributed non-uniformly throughout the coating causes different viscosities and surface tensions and similar burling effects.

DISTRESSING

A distressed effect on the surface can be achieved by incorporating small masses of a low-density incompatible conglomerated material in the vehicle prior to or upon application. The distressing agent is incompatible in that it does not mix intimately with or combine with the vehicle and can be readily removed from the surface after the coating has set up. A commercial flatting or flattening agent, usually a metallic soap such as calcium, aluminum or zinc stearate, may be used for this purpose. It is folded in an agglomerated mass or "glob" and is only slightly stirred so as to be distributed on a non-uniform basis. It is spread and acted upon to some extent by the leveling and furrowing operations and tends to rise to the surface. After the coating has set up and hardened, the surface is flushed with water or with a jet of air or is brushed or blasted to wash out or otherwise remove the exposed spots of flattening agent leaving pits, pores and fissures in simulation of distressing. Preferably the flattener is stained or dyed a compatible color before incorporation into the coating vehicle so as to avoid any whitish appearance in the distress marks upon removal of the distressing material. Other substances, such as talc, whiting, chalk, and the like, may also be used for this purpose.

SIMULATED MATTE POLISHED SURFACE

Epoxy resin and similar catalyst curable resins set up and harden with a very high gloss finish. For some purposes, this is desirable. For other purposes, it is necessary to buff and polish the surface to provide a smooth non-glossy muted or matte finish. It has been discovered that this latter operation may be eliminated and that the epoxy or similar coating may be cured to a non-glossy surface finish by gently applying water to the surface before the coating has completely set up, and then permitting it to set up and harden. Thereafter, the water evaporates very quickly. The resulting finish resembles that of a finely buffed and polished non-glossy surface or very dull rich surface.

RIPPLED SURFACE

A pleasing rippled effect can be achieved by using a catalyst curable coating vehicle, flushing it with water at a different temperature, hotter or colder, prior to completely setting up and hardening and then permitting to harden. The water causes contraction and/or expansion of the surface skin. The finish has a slightly rippled surface contour and pleasing matte appearance.

COATING PROPERTIES

The coating has generally the properties of the vehicle from which it is primarily formed. Thus, the requisite properties of resistance to stains, acid, moisture, impact scratching, etc., can be achieved by using resins or other vehicles known to possess these properties. Because the graining pattern extends through most of and sometimes through the entire thickness of the coating, in contrast to printed and photographically reproduced simulated woods, any superficial surface scratches, cigarette burns, or the like, can easily be removed by sanding with fine grain sandpaper and polishing with a mild polishing agent (such as Wright's Silver Cream) to match the luster of the adjoining surfaces. If the surface is dull, it may be rubbed with fine steel wool.

BASE SURFACES

The coating in most instances is applied to low-grade wood surfaces, such as plywood, particle-board, pressed board, paper board, and the like. However, it may be applied to virtually any surface, flat or otherwise. Although generally applied to horizontal surfaces, it may be applied to vertical surfaces as well, in view of the thixotropic properties of the vehicle. It may be applied directly to surfaces such as floors, table tops, counter tops, desk tops, insulation board, acoustical tile, fiber board, foam panels, concrete blocks, metal surfaces, patio blocks, wood, fiberglass, asbestos board, paper honeycomb panels, etc. It can be applied to either rigid surfaces or flexible surfaces, such as paper, textile fabrics, plastic films, metal and the like. The latter provides a material which lends itself to application in the manner of wallpaper and the like. The surface coated is usually flat but may be any appropriate shape, such as molding, carving, spindles, and the like. The coating may be formed adherent to the base surface. Alternatively, it may be formed as a self-sustaining film by application to a smooth polished surface from which the set up and hardened coating may be stripped off. Surfaces from which the coating may be readily stripped include polished metal, glass, cellophane, Mylar, waxed and greased surfaces, and the like. Depending upon its thickness, it may be cut into strips or panels

or squares for use as flooring, wall paneling, station wagon paneling, and the like. The film may be vacuum molded or pressure molded into whatever shape is desired.

The surface from which the coating is stripped is in most instances a flat smooth surface from which a wallpaper-like film is produced having the qualities of the resin used. However, the coating may likewise be applied as the liner surface in molds used for manufacture of intricately carved furniture, plaques, false beams and the like. Such molds are usually formed from glass-/epoxy, beryllium-copper, silicone rubber, urethane elastomer, and the like, depending upon the nature of the molding material. According to the present invention, the mold is lined with a relatively thin layer of material in simulation of wood graining and then backed up with foamed polystyrene, rigid polyurethane foam, polyesters, expanded ABS (acrylonitrile-butadiene-styrene) or the like.

The method described herein is entitled a "one-coat" method because the decorative and ornamental graining effect is achieved and contained in a single coating layer. In most instances, the graining coating layer is applied to an otherwise unfinished plywood, pressed board, particle-board or fiber board surface, or the like. It may, however, be applied to a previously finished surface. In some instances, that surface may be prepared so as to serve as a base layer of complementary or contrasting color compatible to the graining design being produced. In most instances, it is contemplated that the set and hardened surface of the applied coating will not be provided with any additional finishing material. In some instances, however, it may be desirable to provide a further transparent top coat over the decorative grained coating in order to impart additional protection.

The process according to the present invention lends itself readily to mechanization and automation. The surface to which the coating is applied may be stationary and the manipulative steps of applying, leveling, furrowing, etc. may be carried out by moving the appropriate utensils or tools relative to the surface by moving the panel relative to the utensils and/or applicator. Under mechanized conditions, however, in most instances the surfaces being treated are flat panels carried on a conveyor and moved relative to fixed or movable applicator means, leveling means, furrowing means, drying and baking ovens, water applicators, jet streams, and the like. As the surfaces being coated are moved longitudinally, the coating applicator means, leveling means, furrowing means, etc. may be fixed against longitudinal movement but adapted for slight transverse movement in order to introduce pattern variations. The coating applicator means may include continuously charged hoppers, dispensers, such as funnels, tubing, nozzles, sprays, etc. for applying the coating materials to the surface to be coated. A series of nozzles or tubes or similar dispensers of different sizes are spaced at different intervals so that when the coating material is flowed onto the surface, it is applied in different colors and in different widths similar to wood grain. Where the coating is uniformly applied, no mechanical leveling is ordinarily needed.

Certain resins, such as polyesters, may be catalyzed by passing through a vapor tunnel of catalyst. Alternatively, catalyst cured resins, after development of the pattern, may be moved past spray nozzles applying catalyst to the coating. In the case of air inhibited coating resins, such as certain polyester resins, the coating is cured while sealed from contact with air. The applied coating is covered with a film of cellophane, Mylar, or the like, which may have a high gloss or frosted surface. The film is gently smoothed over the unset coating with a roller or the like in intimate contact with the top surface of the coating without any entrapped air present. After the coating is cured, the covering film is removed. The surface of the coating mirrors the contacting surface of the covering film, be it glossy or matte. No further surface treatment is then necessary.

EXAMPLES

The invention may be further understood by the following illustrative examples:

EXAMPLE I

A simulated burled rosewood panel was prepared as follows: 4 parts by volume of liquid epoxy resin (Genepoxy 190 — General Mills) and 2 parts by volume of polyamide resin (Versamid 140 — General Mills) were mixed thoroughly with 0.5 part of commercial flatting paste (RC 8349), 0.3 part of general purpose thinner composed of 95 per cent mineral spirits and 5 per cent methyl isoamyl ketone, 0.3 part powdered volcanic glass, and 0.1 part rotten stone. This mixture was divided into three equal parts. To one part was added 0.02 part Venus turkey red metallic powder, to another 0.02 part Venus antique bronze metallic powder and to the third 0.02 part Venus bright copper metallic powder. Each color was mixed thoroughly. The three resulting colored mixtures were poured into one container and stirred with a stirring implement. The result was a heterogeneous blend of the three colors. This mixture was then poured generally longitudinally onto a flat level pressed board surface. A graining tool comprising a plurality of rotating discs on a common spindle was rolled through the material longitudinally over about one third of the surface on each of the opposite side edge portions of the panel. The center of the panel was left undisturbed. A burling effect appeared in the center surrounded by simulated linear graining on the opposite sides. The coating was allowed to cure. The sample was then lightly sanded with No. 400 sandpaper. The result was a smooth surfaced panel in simulation of non-glossy polished burled rosewood.

EXAMPLE II

A panel having the textural effect of sandblasted wood was prepared as follows: 4 parts by volume of epoxy resin (Genepoxy 190) and 2 parts by volume of polyamide resin (Versamid 140) was mixed thoroughly with 0.5 part commercial flatting paste (RC 8349) and 3.0 parts powdered volcanic glass and divided equally into three portions. To one portion was added and mixed 0.02 part Venus smooth gold metallic powder, to a second portion 0.02 part Venus dull gold metallic powder and to the third 0.02 part Venus French antique bronze metallic powder. These three colored mixtures were then poured into one container, stirred but not homogenized and poured onto the pressed wood surface to be coated. The coating was applied and a discing tool rolled longitudinally through the leveled coating. The coating was highly viscous, containing a large proportion of extender pigment and no thinner. As the tool was rolled through the material, the material was raised in ridges as the discs leave the material

leaving furrows between the ridges. Because of the high viscosity of the material, the coating set up in ridges and valleys and resulted in a striated coating that gives the appearance and feel of sandblasted wood with the growth lines standing more prominent than the softer wood between.

EXAMPLE III

A simulated distressed wood panel was prepared as follows: 6 parts by volume of a flexible liquid polyester resin was mixed with 013 part of pumice and divided into three parts. Into one of these parts was mixed 0102 part of Venus antique bronze metallic powder, into the second 0.02 part Venus dull gold metallic powder, and into the third 0.02 part Venus copper metallic powder. The three separate portions were catalyzed by the addition of 1/60 part of methyl ethel ketone peroxide and poured into one container, after which one part of a low density commercial flatting paste (RC 8349), which was dyed a dark walnut color, was gently folded into the resin so as not to mix with the resin. The coating material was then poured longitudinally onto a pressed board surface. The coating was leveled out and furrowed longitudinally on the opposite outside thirds of the panel with a notched doctor blade, leaving the center third ungrained. The doctor blade established a grained pattern after which the resin coating leveled itself out and the flatting agent which was distributed non-uniformly in the coating rose to the surface. The coating was allowed to set up and harden. After curing, the surface was lightly sanded to expose the areas of the flatting agent. A stream of water was directed against the surface to flush out the flatting agent, leaving fissures, pockmarks, etc. that simulate the surface of distressed wood.

EXAMPLE IV

A textured surface having a rippled effect was obtained by admixing 4 parts by volume of epoxy resin (Genepoxy 190), 2 parts by volume of polyamide resin (Versamid 140), 0.5 part commercial flatting agent (RC 8349), 0.3 part general purpose thinner, 0.3 part powdered volcanic glass and 0.1 part rotten stone, dividing into three parts and admixing into each part 0.02 part of different toned metallic powders. The colored mixtures were poured into a single container, slightly stirred and poured onto a base surface. The coating leveled and was allowed to cure until the surface was dry and non-tacky to the touch, but soft and spongy underneath. At this point in time, the sample was gently flushed with a stream of water that was alternately warm and cold. This caused the surface of the coating to expand and contract unevenly, leaving an uneven surface having a rippled appearance. The more complete the cure is before flushing water is initiated, the finer is the resulting surface texture.

EXAMPLE V

A self-sustaining polyurea polymer film simulating wood graining was prepared as follows: 3 parts of di-isocyanate (DDI RC 8555 – General Mills) was mixed with 3 parts of ketimine (ketone blocked amine) (Modified Amine A-100 RC 8118 – General Mills). 0.5 part flatting paste (RC 8349), 0.3 part general purpose thinner, 0.3 part powdered volcanic glass and 0.1 part rotten stone were admixed and the mixture divided into three equal parts. Venus turkey red metallic powder, Venus antique bronze metallic powder and Venus bright copper metallic powder were admixed with each portion in the amount of 0.02 part each. The three colored mixtures were poured into a single container and stirred slightly. The combined mixture was poured onto a smooth non-porous glass surface sprayed with a releasing agent (General Mills Releasagen). The coating was leveled. The graining tool was passed longitudinally through the coating to establish a graining pattern and the coating leveled itself, set up and hardened. The coating was stripped from the base surface resulting in a flexible self-sustaining film with the appearance of blonde walnut wood which may be applied with adhesive to virtually any surface, flat or curved.

EXAMPLE VI

Simulated knarled wood was prepared as follows: 3 parts of epoxy resin (Genepoxy 190) was mixed with 2 parts polyamide resin (Versamid 140), 0.3 part powdered volcanic glass and 0.3 part of a solvent consisting of 9 parts xylene and 1 part butanol. This resin mixture was divided into three equal portions. To two of these were added and admixed 0.2 part commercial flatting paste. The third contained no flatting agent. The three resin portions were colored identically to Example I and the portions were rejoined in a single container without appreciable mixing. Part of the coating was applied to a surface, leveled and furrowed with a rotating disc tool along the outer edges leaving the center ungrained. Another part was poured onto a similar surface, leveled but not furrowed. In the first case, simulated knarling developed in the center of the panel between the growth line patterns. In the other, simulated knarling appeared over the entire surface. Both panels had alternating glossy and non-glossy patterns due to the non-uniform distribution of the flatting agent.

EXAMPLE VII

A self-sustaining polyurea polymer film was formed as follows: 3 parts of di-isocyanate (DDI-RC 8555) was mixed with 3 parts of ketimine (Modified Amine A-100 - RC 8118). Into this mixture was added 0.15 part commercial flatting agent, 0.3 part xylenebutanol solvent and 0.2 part by volume of light gray pumice. This was thoroughly mixed and divided into three equal parts. Into the first of these was mixed 0.02 part Venus pale copper metallic powder, into another 0.02 part Venus pale dull gold metallic powder, and into the third 0.02 part Venus bright fire metallic powder. The three portions were put back into one container and stirred lightly so as not to mix them thoroughly. The combined coating material was then poured onto a glass sheet which had been sprayed with a releasing agent (General Mills Releasagen). The coating was raked linearly and allowed to cure, after which it was stripped from the glass. The result was a self-contained film having a finely grained textured surface. The product is very tough and flexible.

EXAMPLE VIII

A further self-sustaining polyurea film was prepared using the same basic di-isocyanate-ketimine mixture with flatting agent, solvent and pumice as in Example VII. The basic mixture was divided into only two parts. Venus pale copper metallic powder was admixed in one and Venus deep rich gold metallic powder in the other. The two portions were rejoined and lightly stirred. The

coating was then poured onto the glass surface treated with a releasing agent. A fine graining tool was passed through the coating and the coating was allowed to cure. Upon stripping from the glass, a thin grained translucent film was obtained.

EXAMPLE IX

A self-sustaining polyurea film in simulation of wood grain was prepared as follows: 3 parts di-isocyanate (DDI-RC 8555), 3 parts ketimine (Modified Amine A-100 - RC 8118), 0.5 part commercial flatting paste and 0.15 part pumice were thoroughly admixed. This base mixture was then divided into four equal parts into one of which was mixed Venus bright turkey red metallic powder, into another Venus bright copper metallic powder, into the third Venus pale dull gold metallic powder, and into the fourth Venus antique bronze metallic powder, each in the amount of about 0.02 part. These four pigmented portions were rejoined in a common container and stirred but not homogenized with a narrow paddle and then poured onto a sheet of polished aluminum which had been sprayed with a releasing agent (General Mills Releasagen). The coating was non-uniformly furrowed with a graining tool and allowed to cure. It was then sanded with No. 400 sandpaper and stripped from the base. The result was a film having a beautiful simulation of a rich mahogany wood grain in a matte finish.

EXAMPLE X

The process of Example IX was repeated with the exception that, after combination of the pigmented resin portions, the coating was poured onto a 1/4 inch tempered Masonite panel. The marginal edge portions of the coated panel were furrowed with a graining tool. After curing, a rigid panel in simulation of mahogany resulted, the panel being grained along the edges and having a burled appearance in the center.

EXAMPLE XI

A panel having a matte finished simulated walnut graining was prepared by mixing 4 parts of epoxy resin (Genepoxy 190), 2 parts by volume of polyamide resin (Versamid 140), 0.5 part commercial flatting paste, 0.3 part general purpose thinner (Coast to Coast), 0.3 part powdered volcanic glass and 0.1 part rotten stone. This mixture was divided into three parts and 0.02 part Venus bright fire metallic powder was added to one portion, 0.02 part Venus flat gold leaf powder to another portion and 0.02 part Venus antique bronze metallic powder to the third. The pigmented portions were rejoined in a single container, slightly mixed, poured onto a panel of Timblend particle board, leveled and furrowed along the side margins. After the coating was partially cured so that the surface was dry and nontacky to the touch, it was gently flushed with a stream of water. This resulted in a smooth dull matte finish without any further effort. The finished panel had the appearance of fine walnut wood.

EXAMPLE XII

A simulated pecan wood panel was prepared by mixing 4 parts by volume of epoxy resin (Genepoxy 190), 2 parts by volume of polyamide resin (Versamid 140), 0.5 part commercial flatting paste, 0.3 part general purpose thinner, 0.3 part powdered volcanic glass and 0.08 part rotten stone. This base mixture was divided into two portions. To the first was added 0.02 part Venus statuary bronze metallic powder, and to the other 0.02 parts Venus smooth pale gold powder. The two pigmented portions were combined, poured onto a panel of Timblend particle board and leveled with a blade without furrowing. Upon curing, the coating had a very fine grain and small knots simulating pecan wood.

EXAMPLE XIII

A panel simulating blonde, bleached or pickled mahogany was prepared by admixing 6 parts of a flexible polyester resin with 0.3 part pumice and dividing into two portions. Into one portion was mixed 0.02 part oil stain (Platinum 4366-02) and 0.02 part Venus pale gold metallic powder. Into the other portion was mixed 0.02 part bleached mahogany oil stain (Benwood 237-52) and 0.15 part rotten stone. Each pigmented portion was catalyzed by the addition of 1/60 part of methyl ethyl ketone peroxide and the portions were poured into a common container and then poured onto a flat surface without any stirring. The coated panel was furrowed with an unevenly spaced wire whisk and allowed to set up and cure. After curing, the surface was rubbed with very fine steel wool to remove leafing leaving the coating with a dull matte finish and a color and graining resembling bleached or pickled mahogany.

EXAMPLE XIV

A panel in the form of simulated tiger wood was prepared by mixing 4 parts epoxy resin (Genepoxy 190) with 2 parts polyamide resin (Versamid 140), 0.5 part commercial flatting paste and 0.3 part pumice. This was mixed thoroughly and divided into three equal portions. Into one portion was mixed 0.02 part orange polyester dye, 0.01 part bright Venus copper metallic powder and 0.01 part platinum oil stain (Coast to Coast) to mute the orange dye. Into the second portion was mixed 0.01 part ebony oil stain (Benwood 237-94). Into a third portion was mixed 0.02 part orange polyester dye, 0.01 part Venus bright copper metallic powder and 0.01 part platinum oil stain (Coast to Coast 4336-52). The three portions of colored base resin were poured into a common container with the ebony stained portion poured in second so that it lay generally between the other two colors. The combined resin was then poured onto the panel surface to be coated. About 2/3 of the surface on the opposite sides were furrowed linearly with a graining tool. The center portion of the panel was simply allowed to level and produced a knotty appearance. After the coating was almost completely cured, it was flushed gently with a stream of water. This caused a texture on the surface which generally followed the graining and the burls in the coating.

EXAMPLE XV

A panel in the form of simulated aged wood was prepared by mixing 4 parts epoxy resin with 2 parts polyamide resin, 0.5 part commercial flatting paste and 0.3 part pumice. This was mixed thoroughly and divided into three equal portions into each of which was admixed 0.01 part rotten stone, 0.125 part commercial flatting base (Glidden 5012), 0.08 part xylene-butanol solvent and 0.08 part powdered volcanic glass. One of these portions was pigmented with 0.02 part Venus natural fine copper powder, another with 0.02 part Venus

pale flat gold powder and the third with 0.02 part Venus martian gold powder. Each portion was mixed slightly and poured onto a flat panel in adjacent strips which were allowed to flow together into one another and level out before setting up. The result was a wood-like finish having the appearance of very old wood with small weathered lines. Where the portions of coating material touched one another, dark lines appeared resembling wood graining.

EXAMPLE XVI

A panel in the form of simulated pickled burled wood was prepared by mixing 4 parts epoxy resin with 2 parts polyamide resin, 0.5 part commercial flatting paste and 0.3 part pumice. This was mixed thoroughly and divided into three equal portions into each of which was added 0.01 part aluminum powder, 0.33 part flatting base (Glidden 5012) and 0.02 part Valspar epoxy thinner. One of these portions was pigmented with 0.02 part Venus brushed brass powder and 0.02 part platinum stain (Coast to Coast). Another portion was pigmented with 0.02 part Venus martian gold powder and 0.02 part platinum stain. The third was pigmented with 0.02 part Venus pale gold extra bright powder. These three pigmented portions were poured into a single container and lightly mixed. The heterogeneous mixture was then poured in stripes on a flat panel, allowed to run together and set up. This resulted in an unusual burl with great contrast in the burls compared to the unburled areas in the coating.

The precise manner in which the patterns are formed in the coating according to the present invention are not fully understood. It is obvious that non-compatible materials within the coating are antagonistic or allergic to one another such that they cause forces to act upon the materials to create interfaces, migration of pigment into separated areas of greater and lesser concentrations, a constantly changing ebulition within the coating until it begins to set up resulting in growing patterns. The pattern is influenced by flow induced as a result of leveling and/or furrowing, but may also occur as the portions of the heterogeneous applied coatings flow into one another as they level themselves. In this instance, the coating is acted upon wholly by forces induced by the heterogeneous mixture of the coating. Because of the high viscosity of the vehicle, there is little or no diffusion between different portions of the vehicles at their interfaces.

The metallic powder pigments, which appear to contribute most significantly to the production of the unusual results of this invention, are used in much lesser quantity than is customary in the production of metallic pigmented paints. Not more than about 3 per cent maximum metallic powder is used and preferably, as illustrated by the Examples, the amount should be between about 1.5 per cent (Example XVI) and about 0.3 per cent (Example XIV) of metallic pigment relative to the vehicle base. The finely divided inorganic filler is present in greater proportion than the metal pigment and, as illustrated by the Examples, is preferably present in amounts between about 7.5 per cent (Example XIII) and about 2.5 per cent (Example IX) relative to the vehicle base. However, as illustrated in Example II, where the filler is used to increase the viscosity of the vehicle, the extender pigment may be present in amounts as great as 50 per cent relative to the vehicle base. The flattener is an optional constituent of the coating material depending upon the desired effects. As illustrated by the Examples, when used, the flattener is desirably present in amounts ranging from about 8.3 per cent (Examples I, II, IV, etc.) down to about 2.5 per cent (Example VII) relative to the vehicle base. However, as illustrated in Example III, where the flattener is not distributed homogeneously through the vehicle for its normal flattening function, but is used instead as an agglomerated distressing agent, the amounts may be considerably greater, for example about 16.7 per cent relative to the vehicle base. Where lesser distressing is desired, lesser amounts are used, and vice versa. Likewise the presence of a thinner admixed with the vehicle base is optional. When ued, as illustrated by Examples I, IV, V, etc., the thinner is desirably present in amounts of about 5 per cent relative to the vehicle base. This amount can vary widely depending upon the thickness and viscosity of the vehicle base and the desired thickness and viscosity of the coating to be applied.

It is apparent that many modifications and variations of this invention as hereinbefore set forth may be made without departing from the spirit and scope thereof.

The embodiment of the invention in which an exclusive property or privilege is claimed and defined as follows:

1. A one-coat method for producing a decorative and ornamental protective simulated wood grain coating which comprises the steps of:

A. preparing a plurality of portions of non-homogeneous colored viscous settable liquid resinous thixotropic coating vehicle, at least some of said portions of coating vehicle being in gradations of the same color corresponding to the colors of the wood grain to be simulated, at least part of said portions of colored viscous settable liquid resinous coating vehicle having admixed therein at least one finely divided metallic powder pigment along with at least one finely divided inert inorganic filler, said metallic pigment being present in total amount between about 0.3 and 3.0 percent relative to the vehicle base and said filler being present in amount between about 2.5 and 50 percent relative to the vehicle base,

B. combining said portions without homogenizing admixture of the portions, and

C. spreading said resulting viscous liquid heterogeneous mixture onto a base surface over substantially the entire surface in a directional pattern corresponding generally to the desired wood grain pattern,

D. while said base surface is maintained flat and level, and said coating mixture is still liquid and viscous leveling the same into a layer of substantially uniform thickness to cause flow and running together of adjacent portions of the heterogeneous coating mixture to develop a wood grain pattern having visible color lines of demarcation in the coating, and

E. permitting said coating to rapidly set-up and harden.

2. A method according to claim **1** further characterized in that said colored portions of coating vehicle are combined in a common container without appreciable admixture of the portions prior to application to the base surface.

3. A method according to claim **1** further characterized in that said lined pattern is developed in said coat-

ing layer by furrowing the coating mixture while still liquid and viscous.

4. A method according to claim **3** further characterized in that the furrowed coating is permitted to return to its substantially uniform thickness before the coating sets up and hardens.

5. A method according to claim **3** wherein said coating is in simulation of sandblasted wood graining characterized in that said furrowed coating is set up and hardened before said coating can return to its substantially uniform thickness, the ridges of said furrows simulating harder growth lines of wood and the valleys of said furrows simulating softer wood removed by sandblasting.

6. A method according to claim **1** wherein said coating is in simulation of distressed surfaces further characterized in that:

A. a low-density agglomerated finely divided agent which is non-compatible with said vehicle is folded non-uniformly into at least one of said portions of vehicle and applied to said base surface therewith,

B. at least part of said non-compatible agent is permitted to rise to the surface of the coating before the coating sets up and hardens,

C. after the coating has set up and hardened said non-compatible distressing agent is physically removed from the surface of the coating to produce pits in the surface of the coating in simulation of distress marks therein.

7. A method according to claim **6** further characterized in that said distressing agent is dyed or stained a color complementary to the color of the portion of vehicle in which it is admixed.

8. A method according to claim **1** further characterized in that a flattening agent is admixed uniformly throughout at least one but less than all of said portions of vehicle whereby the set-up coating has areas of alternating glossy and dull finish in simulation of natural wood.

9. A method according to claim **1** further characterized in that:

A. said vehicle is catalyst curable resin,

B. water is gently applied over the substantially uniformly coated surface prior to complete setting up and hardening of the coating, and

C. the coating is permitted to set up and harden completely whereby the coating has a smooth uniform matte surface in simulation of a non-glossy buffed and polished surface.

10. A method according to claim **1** further characterized in that:

A. at least one but less than all of said portions of vehicle is stirred to admix bubbles of air therein prior to application to a base surface,

B. said combined portions are spread on the base surface with said air bubbles therein, and

C. said air bubbles are permitted to rise to the surface of the coating and break and the surface is permitted to level itself before the coating sets up and hardens,

whereby the coating after setting up and hardening simulates knarled natural wood.

11. A method according to claim **1** further characterized in that:

A. the base surface has a smooth non-adhering surface, and

B. after setting up and hardening the coating is stripped from the surface.

12. A product having a decorative and ornamental protective coating thereon in simulation of wood graining produced by the method of claim **1.**

13. A product having a decorative and ornamental protective coating thereon in simulation of a sandblasted wood grained surface produced by the method of claim **5.**

14. A product having a decorative and ornamental protective coating thereon in simulation of a distressed wood grained surface produced by the method of claim **6.**

15. A product having a decorative and ornamental protective coating thereon in simulation of a knarled wood grained surface produced by the method of claim **10.**

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