

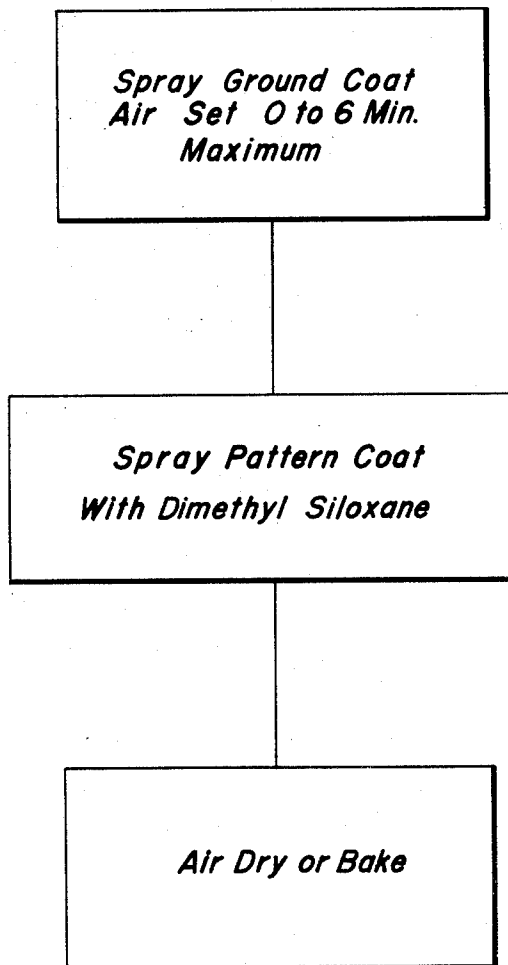
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SURFACE TEXTURING SYSTEM AND MATERIALS THEREFOR

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SURFACE TEXTURING SYSTEM AND MATERIALS THEREFOR

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The present application is directed to liquid coating compositions and more particularly to an improved method whereby certain decorative effects resembling natural leathers are obtained.

There have been prior attempts to produce coatings on various bases, which would have a texture resembling leather. In one such process, it was necessary to first lay down a film with a primer composition, which was baked, after which it was sprayed with a plastisol or organosol enamel. Thereafter the enamel was sprayed with a solvent in order to give the desired texture, and then the assembly was baked. Such a product had only a faint resemblance to leather; the film was too thick and the cost thereof was relatively high. The appearance was that of a small stipple and could be produced only in a monocolour.

The present invention is intended and adapted to overcome the disadvantages inherent in the prior art and to provide a method whereby a leather-like finish is provided which can hardly be distinguished from natural leather.

It is also among the objects of the present invention to provide a method which permits great flexibility in the conditions of operation so that as a result, at the will of the operator, a variety of types of leather can be simulated.

It is further among the objects of the present invention to provide a method which is rapid, effective, inexpensive, which can be conducted by even relatively unskilled workers and which enables the use of the ordinary equipment used in making coating films.

The method of the present invention is primarily a two-step method. In the first step there is provided a ground coat consisting essentially of a resin or plastic material, a solvent, and such other usual ingredients of a ground coat which are ordinarily employed. It is permitted to dry partially but only to such an extent as to accommodate the top or pattern coat. The second step of the operation is the laying down of the pattern coat which consists essentially of a resinous or plastic material having cobwebbing characteristics. Such a coat may contain in addition to the resinous material and the solvent, the other usual ingredients such as modifying agents, pigments and the like.

An essential feature of the pattern coating composition is that it contains a silicone in quite small amounts. Usually the minimum is .01% of the liquid coating composition, and the maximum may be the limit of compatibility thereof with the other constituents of the composition.

Another feature of the invention is the use of polar solvents in conjunction with the silicones. Such polar solvents are usually the low molecular weight ketones, esters and alcohols, such substances being readily volatile under the usual conditions of application. It has been found that mixtures of polar solvents are preferable to the use of a single polar solvent. Such solvents are classified as fast, medium and slow, based upon the rate of evaporation thereof at temperatures ordinarily encountered in producing coatings.

It is considered that the use of the silicones together with polar solvents provides a synergistic action whereby the improved results of the invention are obtained. The polar solvents have a high degree of penetrating power

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into the ground coat and they effect a lowering of the surface tension. This is best obtained by the use of ketones as a part of the mixture of polar solvents. The pattern coat is sprayed onto the ground coat so that the resinous material is projected in the form of threads and forms a pattern or design on the ground coat. The solvent in the pattern coat lowers the viscosity of the ground coat at those areas where it strikes. The silicone having a high degree of surface activity lowers the surface tension of the ground coat solution so that the threads sink into and are fixed as the solvent evaporates. The slower the evaporation of the solvent, the greater the penetration, but the mixture of solvents of different rapidity gives the best results as it enables the operator to determine the amount of penetration which he desires and thus controls the operation as designed.

The silicone oils are preferred and it has been found that a wide range of viscosities are adapted for the purpose. The silicone resins are less effective and require a considerable addition, say, about 5% or more, which renders the use thereof expensive. From the technical standpoint the silicone used must have a great deal of surface activity.

The ground coat is of a usual composition and may embody the various known resins and solvents although it is preferred for the present invention to have polar solvents present therein. After the ground coat is applied, it is allowed to set for a short time until it is wet to the touch but not tacky or sticky. A practical test to determine the correct degree of dryness thereof is to touch it with the finger and if some of the composition remains on the finger, the condition is satisfactory. Another test is that when the pattern coat is applied it should sink into the surface of the ground coat. The presence of the slow solvent retards evaporation and permits the sinking of the surface coat. The speed of drying of the ground coat is affected by various conditions such as the temperature, the tip or orifice, the distance of the spray gun from the orifice of the solvents. The user will readily determine from the conditions, the time element in applying the pattern coating after the ground coat is applied.

The faster the solvent in the ground coat, the shorter is the time for the application of the pattern coat. Ordinarily the time would vary from about 10 seconds up to two minutes interval but under some conditions, the interval may be up to five or six minutes. The character of the pattern coat is affected by other factors such as the setting of the spray gun, variations in the amount of the pattern coat being deposited, the ratio of air to composition, the size of the nozzle and needle, the adjustment of the tip or orifice, the distance of the spray gun from the object and similar factors. After a few trials, the ordinary operator will be enabled to correctly conduct the spray operation.

While the above compositions have been described as containing resins and solvents, modifying agents are usually incorporated in both the ground and pattern coats. Resins may be added to the pattern coat to alter the characteristics of the webbing resins and such additions should or may not be compatible with the basic composition. Pigments, dyes and sheen modifiers as known in the art may be introduced. If the pattern composition has a relatively high viscosity, the deposited patterns are relatively large with deep valleys, and vice versa. The patterns are affected by the spray gun settings.

Styrenated alkyds, rosin modified alkyds, nitrocellulose lacquers and polyamide-catalyzed epoxies, being air dry materials, lend themselves to the vast field of wood as well as metal coatings. The epoxy again is the recommended ground coat base because of its superior toughness and durability as well as its superior leather-like

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texture when topcoated properly. A primer or sealer is suggested to seal the pores of the wood before applying the pattern coat. The epon-urea resin vehicle is preferred as the base for the ground coat; first, because it seems to work best since it contains polar solvents; and second, because when topcoated and cured, it will provide a tough, adherent and abrasion and chemical resistant finish.

In the accompanying drawing, the single figure is a self-explanatory flow sheet of the process involved in practicing the present invention.

The following examples are illustrative of the various formulations using various types of polymers with varying amounts of solids and solvents having various rates of evaporation. From these examples, it will be noted that the slower the solvent, the higher will the solids content and/or the viscosity have to be in order to produce the desired cobwebbing effect. These are basic formulations and are not to be considered as the best for commercial use since they are intended to illustrate the extremes in solvents and polymers. In these examples, the proportions of the constituents are given by weight.

Example 1

The following is a composition having a low molecular weight polymer and a fast solvent. The total solids content thereof is about 40.4%.

Styrenated phthalic-glycerine-maleic alkyd	80.0
Methyl-ethyl ketone	19.6
Dimethyl polysiloxane (4-30 cs. at 100° F.)	0.4

Example 2

This composition illustrates the use of a low molecular weight polymer and a slow solvent. The total solids content thereof is about 45.4%.

Styrenated rosin-phthalic glyceride alkyd	90.0
High flash naphtha	9.6
Dimethyl polysiloxane (4-30 cs. at 100°)	0.4

Example 3

The following illustrates the use of a high molecular weight polymer and a fast solvent in which the total solids content is about 9.1%.

Polyvinyl butyral resin	8.9
Acetone	90.9
Dimethyl polysiloxane (4-30 cs. at 100° F.)	0.2

Example 4

The composition contains a high molecular weight polymer and a medium fast solvent having a total solids content of 12.2%.

Polyvinyl butyral resin	12.0
Methyl-isobutyl ketone	87.8
Dimethyl polysiloxane (4-30 cs. at 100° F.)	0.2

Example 5

The composition contains a high molecular weight polymer and a slow solvent, the composition having a total solids content of about 16.9%.

Polyvinyl butyral resin	16.7
Isophorone	83.1
Dimethyl polysiloxane (4-30 cs. at 100° F.)	0.2

The following examples show the use of still other webbing resins or compositions used in the pattern coat whereby a cobwebbing effect is obtained.

Example 6

The following composition has a total solids content of about 32.2%.

Acrylic ester polymer	80.0
Toluene	19.8
Dimethyl polysiloxane (100 cs. at 100° F.)	0.2

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Example 7

The following composition has a total solids content of about 25.2%.

5 Chlorinated rubber (20 centipoises)	25.0
Xylene	68.4
Solvent naphtha	6.4
Dimethyl polysiloxane (100 cs. at 100° F.)	0.2

Example 8

The following composition has a total solids content of about 30.2%.

Hydroxylated vinyl chloride-acetate copolymer	30.0
Acetone	69.8
15 Dimethyl polysiloxane (100 cs. at 100° F.)	0.2

Example 9

The following composition has a total solids content of about 63.5%.

20 Epichlorohydrin-bisphenol (epoxy) resin	62.5
Acetone	36.5
Dimethyl polysiloxane (100 cs. at 100° F.)	1.0

Example 10

The following composition has a total solids content of about 31.0%.

Polystyrene	79.2
Toluene	20.6
30 Dimethyl polysiloxane (100 cs. at 100° F.)	0.2

The following examples illustrate the wide variety of complete pattern coatings containing not only the basic materials but other constituents normal to the coating compositions.

Example 11

The following is the composition of a commercially acceptable pattern coat providing a brown leather finish:

Polyvinyl butyral and ketone resins	15.910
40 Red iron oxide, carbon black, magnesium silicate	4.925
Silica aerogel	0.580
Ethyl, butyl and diacetone alcohols	24.745
Methyl ethyl ketone and ethyl acetate	21.150
Methyl isobutyl ketone	8.700
45 Toluene and xylene	23.885
Citric acid	0.005
Dimethyl siloxane (4-30 cs. at 100° F.)	0.100

Example 12

The following is another complete formula intended to give a leather-like finish resembling pigskin or ostrich skin.

Polyvinyl butyral and ketone resins	14.780
50 Red iron oxide and carbon black	3.355
Silica aerogel	0.440
Ethyl, butyl and diacetone alcohols	28.260
Ethyl Cellosolve	10.000
Methyl ethyl and methyl isobutyl ketones	17.330
60 Toluene and xylene	25.780
Citric acid	0.005
Dimethyl polysiloxane (200 cs. at 25° C.)	0.050

In Examples 11 and 12, the formulations include silicates which are introduced to lower the gloss. Pigments are included in order to obtain the desired color and a ketone resin is provided to improve adhesion. Fast, medium and slow solvents are included to provide good working properties. In Example 11 the atomizing air pressure is usually 25 lbs. and in Example 12 it is usually about 50 lbs.

The important and essential ingredient of all of the above compositions of Examples 1 to 12 is a silicone oil which is generally dimethyl polysiloxane. The viscosities thereof may vary widely and depending upon the viscosity will depend the exact amount thereof to be used. Gen-

erally those silicone oils having a viscosity of about 0.65 to about 1,000,000 centistokes are preferred. Other oils of this character are also usable, as for example the phenyl methyl siloxane compounds. Silicone resins are suitable under special conditions but are considered to be inferior to the silicone oils. While it is preferred to use the minimum amounts of silicone oils, the maximum thereof is limited only by the factors of compatibility or cost.

The use of polar solvents such as ketones improves the leather-like effects although they are not absolutely necessary. Such less polar solvents as toluene may be used with good results. To obtain optimum results, it is highly desirable to include medium and slow ketone solvents in the ground coat as well as the pattern coat.

The use of a mixture of slow, medium and fast evaporating polar solvents (ketones, ethers, esters, alcohols is recommended), so that a heavy coat will not sag and yet will remain wet long enough to enable the pattern coat to leave an impression. The fast solvents may include aromatic hydrocarbons such as toluene, or aliphatic hydrocarbons such as naphtha. If a large object is to be coated, an increased proportion of a slow solvent, such as butyl Cellosolve, should be incorporated in the ground coat. Likewise in the summer, when the temperature reaches 90° or 100° F., more diacetone alcohol or butyl Cellosolve should replace some of the methyl isobutyl ketone to prevent the ground coat from drying too fast. In cold temperature, the reverse procedure should be followed. The same principle applies to the pattern coat as well. Below is a partial list of solvents and their evaporation rates that may be used in both the ground and the pattern coats:

Extra slow: Isophorone, butyl Cellosolve, and cyclohexanol.

Slow: Diacetone alcohol, Cellosolve acetate, and cyclohexanone.

Medium: Butanol, xylene, butyl acetate, VM & P naphtha, and methyl isobutyl ketone.

Fast: Toluene, methyl ethyl ketone, and ethyl acetate.

In the ground coat practically the entire field of varnish or lacquer resins may be used. They include drying and non-drying alkyd resins, urea-formaldehyde, melamine-formaldehyde, vinyl chloride-acetate, polyacrylic ester, epoxy, nitrified ester, polyester, phenol-formaldehyde varnish, nitrocellulose, ethyl cellulose, cellulose acetate, cellulose acetate-butyrate, chlorinated rubber, vinyl toluene, japan, polyamide, latex, silicone resin, polyvinyl butyral, styrenated alkyd, plastisol and organosol.

The following examples illustrate a few of the very great number of ground coats which might be used.

Example 13

Epon resin	18
Urea-formaldehyde resin	9
Rutile titanium dioxide	19
Silica aerogel	1
Ethyl acetate and Cellosolve acetate	25
Butyl alcohol	6
Toluene and xylene	22

Example 14

Melamine-formaldehyde resin	10
Short drying soya alkyd resin	55
Silica aerogel	2
Butyl Cellosolve and naphtha	15.3
Yellow and red iron oxide	16
Lampblack and titanium dioxide	1.7

Example 15

Maleic modified vinyl-chloride acetate	15
Cyclohexanone	25
Methyl isobutyl ketone	15

Xylene	30
Titanium dioxide	14.7
Lampblack	0.3

It is possible to achieve a multi-colored effect if the user so desires. Normally, the ground coat is sprayed at 50 lbs. of air pressure to a dry film thickness of 1 to 3 mils, depending on the type of vehicle and on whether it is to be air dried or baked. For example, to spray a baking epoxy-urea type of ground coat at a film thickness greater than 1.5 dry mils would be running the risk of producing a blistered film. The pattern coat is sprayed over the ground coat at any time up to 120 seconds later, using approximately 25 lbs. of atomizing air pressure, and standing 1.5 to 2 feet from the object being coated. After a flash-dry period of five to 10 minutes, the coating is baked at about 325° F. for 15 minutes. The baking schedule will depend on the type of ground coat as well as the user's oven facilities. Air-dry ground coats have been successfully formulated. In unusual cases, where large objects are to be sprayed, the air-set time between the ground coat and the pattern coat may be extended to five or six minutes by reducing both coats 10 to 20% with an extra slow solvent such as butyl Cellosolve.

The sprayer can control the pattern desired, whether fine or heavy, by narrowing or widening the fan, and by increasing or decreasing the amount of pattern coat coming from spray gun. The formulator, by increasing the proportion of fast solvents can produce a finer pattern and, conversely, by increasing the amount of slow solvents will produce a coarse pattern. Also, the shorter the time between the ground coat and the pattern coat, e.g., 10 to 15 seconds, the more the pattern coat will spread out over the ground coat. A long air-set time will minimize the spreading tendency. The preferable appearance is a matter of personal taste.

We claim:

1. A method of making a film having a leather-like finish which comprises depositing a ground coat containing a resin and a solvent, permitting said solvent to evaporate for a sufficient time to leave said ground coat wet enough to enable a pattern coat to become impressed therein, then at said time depositing on said ground coat a pattern coat comprising a resin which is compatible with methyl polysiloxane, a solvent, and a methyl polysiloxane in the amount of at least about .01% of said pattern composition up to the limit of compatibility thereof.
2. A method according to claim 1 in which said pattern coat solvent is at least in part a polar solvent.
3. A method according to claim 1 in which said ground coat solvent is at least in part a polar solvent.
4. A method according to claim 2 in which a mixture of polar solvent of differing volatility is provided.
5. A method according to claim 1 in which said polysiloxane is taken from the class consisting of dimethyl- and phenyl-methyl-polysiloxane.
6. A method according to claim 1 in which said pattern composition contains cobwebbing resins.
7. A method according to claim 1 in which said polysiloxane is in the form of an oil.
8. A method according to claim 1 in which said polysiloxane is in the form of a resin.
9. A method according to claim 1 in which said polysiloxane has a viscosity of about 0.65 to 1,000,000 centistokes at 25° C.
10. A method according to claim 1 in which said pattern coat is applied after about 10 to 120 seconds.
11. A method according to claim 1 in which at least one of said coats is deposited by spraying.
12. A method of making a film having a leather-like finish which comprises depositing a ground coat containing a resin and a solvent, permitting said solvent to evaporate for a sufficient time to leave said ground coat wet enough to enable a pattern coat to become impressed therein, then at said time depositing on said ground coat

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a pattern coat containing a resin which is compatible with methyl polysiloxane, a solvent, and a methyl polysiloxane in the amount of at least about .01% of said pattern composition up to the limit of compatibility thereof, then air drying said deposit.

13. A method of making a film having a leather-like finish which comprises depositing a ground coat containing a resin and a solvent, permitting said solvent to evaporate for a sufficient time to leave said ground coat wet enough to enable a pattern coat to become impressed therein, then at said time depositing on said ground coat a pattern coat containing a resin which is compatible with methyl polysiloxane, a solvent, and a methyl polysiloxane in the amount of at least about .01% of said pattern composition up to the limit of compatibility thereof, then air drying said deposit for several minutes, and finally baking said deposit.

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14. A process for producing a decorative finish on a surface to be coated which comprises the steps of (1) applying a resinous film-forming composition to said surface and thereafter, before said composition sets (2) applying a coating composition containing as an essential ingredient from 0.01% to 1% by weight of dimethyl polysiloxane.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,149,994

September 22, 1964

John S. Congleton et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

In the grant, lines 2 and 12, and in the heading to the printed specification, line 5, for "Maas & Wallstein", each occurrence, read -- Maas & Waldstein --.

Signed and sealed this 30th day of March 1965.

(SEAL)

Attest:

ERNEST W. SWIDER
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