

UNITED STATES PATENT OFFICE

2,286,964

SEALING COATING COMPOSITION

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No Drawing. Application October 15, 1940,
Serial No. 361,255

14 Claims. (Cl. 117—69)

This invention relates to coating compositions and more particularly to new and novel compositions for sealing surfaces containing "bleeding" coloring matter when employed as intermediate coatings before application of the final finish.

Certain asphaltic or bituminous materials, soluble dyes and soluble or partially soluble organic pigments, particularly red coloring matter of this type, when present in a finish exhibit a phenomenon known in the trade as "bleeding" when additional organic coatings are applied over them. This undesirable defect manifests itself as an unsightly discoloration of the top coat, particularly if the final coating is white or light colored in a shade not similar to the "bleeding" color. The action is probably one of diffusion of soluble color caused by solvent effects from the newly applied coating. The reduction or elimination of "bleeding" is important in general finishing practice but is particularly important in the refinishing of automobiles when it is desired to apply the new finish over the old finish without stripping the old finish to the bare metal.

In the past, various expedients have been resorted to in attempts to eliminate "bleeding" tendencies with only partial success and generally at the sacrifice of some other essential property such as adhesion or durability. Sealer compositions based on water-soluble protein compounds such as casein and glue which are insoluble in the organic solvents commonly used in top coat compositions have been proposed, but this expedient increases water sensitivity, provides poor adhesion for the organic top-coat compositions and causes generally poor durability. The use of aluminum powder in the sealing coat is beneficial but does not eliminate or reduce bleeding effects to the desired degree. An alternative proposal involves the use in the top-coat composition of a solvent balance that tends to avoid any considerable dissolving of the soluble organic coloring matter in the old finish or applied undercoat containing such materials. This method, however, greatly narrows the choice of solvent vehicle for the top-coat composition and is not in any sense universally applicable in all finishing systems. Solvent balance is critical and careful control of all factors in

the finishing system must be exercised. Furthermore, except possibly in isolated cases, "bleeding" is not entirely eliminated and the compromise for partial reduction in this tendency is not acceptable commercially in many instances.

The present invention affords marked superiority over any of the aforementioned methods in that adverse "bleeding" tendencies are entirely eliminated or reduced to a degree that the effect is negligible, thus affording a commercially acceptable finishing system and greatly expanding the utility of simplified systems that avoid the need of cleaning a surface to the bare metal for refinish work.

It is an object of the invention, therefore, to provide a composition which, when applied as an intermediate coating, will effectively prevent the diffusion of soluble coloring material from a surface containing such material to the final top-coat finish. Another object is the provision of a system for finishing articles, in which the undercoat may contain soluble or partially soluble coloring material, without adversely affecting the final top coat. Another object is the provision of a method for finishing articles wherein the undercoat contains "bleeding" coloring material, which affords excellent general durability. A further object of the invention is the provision of an improved multi-coat finishing system wherein contamination of the final top coat from an undercoat containing soluble coloring material is prevented. Another object is the provision of an intermediate coating composition which affords good adhesion for subsequently applied top coats. A still further object is the provision of a sealing coating composition that permits the refinishing of surfaces containing "bleeding" coloring matter without first removing the old finish, thus contributing important operating economies.

These objects are accomplished by applying as an intermediate coating in a multi-coat finishing system wherein the undercoat or primary surface contains soluble coloring material, an organic coating composition containing as an essential ingredient a suitable activated carbon of such character and in amount sufficient to prevent discoloration of the top-coat finish. "Nuchar XXX," an activated carbon commer-

cially available through the Industrial Chemical Sales Corporation of New York City, appears to be eminently suited for the present purpose.

The following examples are given by way of illustrating the invention and no limitations are intended thereby except as indicated in the appended claims:

Example 1

FIRST PORTION

	Per cent by weight
Activated carbon	8.3
Tricresyl phosphate	5.0
Blown linseed oil (Iodine No. 115-130)	5.0
Ethyl acetate (99%)	3.0
High solvency petroleum naphtha (95-135° C.)	8.3
Butyl alcohol	1.4
Ethyl alcohol (denatured)	1.1

SECOND PORTION

Petroleum naphtha (B. R. 88-131° C.)	1.8
High solvency petroleum naphtha (B. R. 95-135° C.)	3.5
Methyl ethyl ketone	11.0
Isobutyl acetate	2.6
Cellulose nitrate (½ sec. visc.)	10.7
Ethyl alcohol (denatured)	6.5

THIRD PORTION

Shellac (wax-free)	14.6
Ethyl alcohol (denatured)	17.2

100.0

The activated carbon used in this example consisted of powdered Darco, Grade S-51, manufactured by the Darco Corporation of New York City.

In preparing this composition, the activated carbon was ground with the other ingredients of the first portion in a ball mill with flint pebbles in the ratio of 3 parts by weight of pebbles to 1 part by weight of mill charge as the grinding means for a period of 48 hours. A previously prepared cellulose nitrate solution consisting of the several ingredients of the second portion was then added and the grinding continued for one-half hour. The shellac was finally added as a solution in alcohol as a third portion and the entire charge ground for one-half hour.

Two coats of the composition of Example 1, which may be thinned with a suitable conventional thinner, if desired, were sprayed with a ten minute drying interval between application of the coats over a previously prepared conventional cellulose nitrate finish containing a toluidine toner red pigment, a widely used pigment which is a notoriously bad bleeding pigment. This intermediate or sealing coating was allowed to dry for 30 minutes after which two double coats of a cellulose nitrate composition of the type described in U. S. Patent 2,214,667 and containing titanium dioxide as the pigment, were applied directly over the sealer coating and allowed to dry overnight at room temperature. Inspection of the final coating showed a complete absence of any reddish or pink cast.

Substituting sealer compositions based on the use of shellac or aluminum powder as employed in the prior art in the above described finishing system failed to prevent the bleeding of the toluidine toner into the final white top coats. These results clearly demonstrated the practical superiority of the composition of the present invention. Other tests showed that the new sealer was likewise effective when applied over asphaltic

surfaces and rubber surfaces containing bleeding ingredients, whereas the conventional methods just referred to failed to eliminate discoloration of the white top coat as caused by bleeding effects.

Example 2

FIRST PORTION

	Per cent by weight
Activated carbon	10.9
Dibutyl phthalate	5.2
Damar resin solution*	8.8
Ethyl acetate (99%)	3.2
High solvency petroleum naphtha (95-135° C.)	8.8
Butyl alcohol	1.5
Ethyl alcohol (denatured)	1.2

SECOND PORTION

Castor oil	3.4
Petroleum naphtha (88-131° C.)	2.5
High solvency petroleum naphtha (95-135° C.)	5.2
Methyl ethyl ketone	16.3
Isobutyl acetate	3.8
Cellulose nitrate (½ sec. visc.)	15.6
Ethyl alcohol (denatured)	9.6

THIRD PORTION

Ester gum	4.0
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100.0

*The damar resin solution in the first portion consisted of:

	Per cent by weight
Damar resin	44.0
High solvency petroleum naphtha (95-135° C.)	17.4
Ethyl alcohol (denatured)	38.6

100.0

The activated carbon used in this example was of the same type as that described in Example 1.

The composition was prepared according to the procedure of Example 1 except that the resin constituting the third portion was incorporated in powdered form rather than in a separately prepared solution. When tested as a sealing coating over surfaces containing bleeding ingredients, it was found that discoloration of a subsequently applied white cellulose nitrate enamel was effectively prevented.

Example 3

	Per cent by weight
Activated carbon	18.2
Synthetic resin solution*	48.0
High solvency petroleum naphtha (B. R. 95-135° C.)	15.0
Cobalt drier (1.9% metallic cobalt)	1.5
Lead drier (1.6% metallic lead)	2.4
High solvency petroleum naphtha (B. R. 95-135° C.)	14.9

100.0

*The synthetic resin solution employed in this example consisted of a 55% cut in mineral spirits (B. R. 95-135° C.) of a 50% linseed oil modified diglycerol-triphthalate resin prepared in accordance with procedures well known in the art.

The activated carbon used in this example was a commercially available product known as "Nuchar XXX" sold by the Industrial Chemical Sales Corporation of New York City.

The composition was prepared by grinding the ingredients of the first portion in a ball mill for 48 hours with steel balls in a ratio of 3 parts by weight of steel balls to 1 part by weight of mill

charge. The ingredients of the second portion were then incorporated by simple mixing.

When this product was employed as an intermediate sealing coating over an alkyd resin undercoat containing toluidine toner as the pigment and a white alkyd resin top coat subsequently applied over the sealing coat, no discoloration of the top coat was observed. On the other hand, serious bleeding of the color into the top coat occurred when the conventional finishing system was used with the same types of coatings but omitting the new sealing coat.

Example 4

	Per cent by weight
Activated carbon	16.0
Oleo-resinous varnish	84.0
	100.0

The varnish vehicle of this example was a conventional 50 gallon linseed oil-rosin varnish. The activated carbon used was the same type as that described in Example 3. The preparation of the composition was carried out by grinding the varnish and activated carbon with steel balls in a ball mill with a ratio of 3 parts by weight of steel balls to 1 part by weight of charge for a period of 48 hours.

This composition was brushed over a wood surface which had been stained with a conventional spirit soluble wood stain. After the coating was dry, an alkyd resin composition containing a white pigment was applied. No discoloration of the white top coat was observed although if the new sealing coat was omitted serious discoloration of the top coat occurred. This product was also found to be quite effective in preventing bleeding of soluble asphaltic or bituminous materials through its use as a sealing coat over asphalt impregnated paper board and roofing compositions.

Example 5

	Per cent by weight
Synthetic resin solution*	18.2
Activated carbon	6.9
Dibutyl phthalate	4.4
Castor oil	1.1
High solvency petroleum naphtha (B. R. 95-135° C.)	10.8
Methyl ethyl ketone	3.0
Antimony oxide	11.5
Talc	11.5
Cellulose nitrate (1/4 sec. visc.)	9.1
Alcohol (denatured)	4.2
Methyl ethyl ketone	2.6
Butyl acetate	9.8
Butyl alcohol	3.3
High solvency petroleum naphtha (B. R. 95-135° C.)	3.3
Phosphoric acid (85%)	.3
	100.0

*The synthetic resin solution employed in this example consisted of a 50% cut in toluene of a 37% rosin-linseed oil modified diglycerol-triphthalate resin prepared in accordance with procedures well known in the art.

The activated carbon used in this example was a commercially available product known as "Nuchar XXX" sold by the Industrial Chemical Sales Corporation of New York City.

The composition was prepared by grinding the ingredients of the first portion in a ball mill with steel balls in the ratio of 3 parts by weight of

steel balls to 1 part by weight of mill charge for a grinding cycle of 24 hours. The phosphoric acid and cellulose nitrate of the second portion were then added, the cellulose nitrate having been previously dissolved in the solvents and diluents indicated, and grinding continued for one hour.

The composition of Example 5 represents a typical primer-surfaces which has been advantageously modified by the inclusion of activated carbon to provide sealing properties against bleeding coloring matter. Two coats of this composition thinned equal parts with a thinner consisting of

	Per cent by weight
Butyl acetate	20.6
Methyl ethyl ketone	10.5
Alcohol (denatured)	7.0
Butyl alcohol	5.0
High solvency petroleum naphtha (B. R. 95-135° C.)	49.9
High solvency petroleum naphtha (B. R. 135-190° C.)	7.0
	100.0

were sprayed over a coating composition of the type described in U. S. Patent 2,214,667 containing a bleeding maroon toner pigment and allowed to dry. Two coats of a white enamel of the type shown in the aforementioned patent and containing titanium dioxide as the pigment were then sprayed over the sealer coat. No evidence of discoloration of the white top coat was observed although in a similar system where no activated carbon was included in the primer-surfacer, bleeding of the maroon toner into the white top coat was quite pronounced.

Example 6

	Per cent by weight
Shellac solution	66.0
Activated carbon	11.5
Shellac solution	22.5
	100.0

The shellac solution used in this example consisted of a 46% solution of wax-free bleached shellac in 23A denatured alcohol. The activated carbon consisted of "Nuchar XXX."

The composition was prepared by grinding the activated carbon in the shellac solution of the first portion in a pebble mill with flint pebbles in the ratio of 2 parts by weight of pebbles to 1 part by weight of shellac solution for 24 hours.

The shellac solution of the second portion was then added to facilitate removal of the charge.

Two coats of this composition thinned equal parts with 23A denatured ethyl alcohol were sprayed over a coating of the type described in U. S. Patent 2,214,667 containing a bleeding maroon toner pigment and allowed to dry. Two coats of a white enamel of the type shown in the aforementioned patent and containing titanium oxide as the pigment were then sprayed over the sealer coat. No evidence of discoloration of the white top coat was observed although in a similar system where no activated carbon was included in the shellac composition, bleeding of the maroon toner into the white top coat was quite pronounced.

In cellulose nitrate enamel finishing systems it is preferred to employ in the sealing composition a liquid volatile vehicle consisting of solvents and diluents having evaporation rates

greater than that of amyl acetate since a more rapid drying composition seems to aid in most effectively attaining the objectives of the invention in some cases. However, this modification represents the preferred embodiment of the invention only since exhaustive tests clearly show that the activated carbon is the primary factor in the new sealer and the use of less volatile solvents and diluents is not precluded. In general, the principle of preferably utilizing a relatively fast-evaporating liquid volatile vehicle likewise holds for other film-forming materials such as synthetic resin or oleoresinous vehicles when such materials are employed with activated carbon as sealing coatings.

It has also been determined that for best results the activated carbon should be finely ground and homogeneously dispersed in the sealer vehicle. This is desirable both from the standpoint of greater efficiency in the elimination of bleeding and for providing a smoother surface for receiving the final top-coat finish.

The amount of activated carbon required varies over a considerable range depending upon the amount and type of bleeding color in the surface to be coated, the particular finishing system employed, i. e., whether a resinous coating is applied over a cellulose derivative coating or vice versa or whether the vehicles in the system are identical or dissimilar and also to a minor extent upon the type of volatile solvents and diluents used in the sealer composition. However, for most purposes, an amount of activated carbon between 1 part by weight of activated carbon to about 1 part of vehicle solids content and 1 part of activated carbon to about 7 parts of vehicle solids content suffices in securing the important benefits herein described.

The invention is not limited to compositions based on any specific cellulose derivative or synthetic resin since it is widely applicable to various types of film-forming polymer vehicles including cellulose ethers, for example, ethyl cellulose, mixed cellulose esters, for example, cellulose acetopropionate and cellulose acetobutyrate, alkyd resins which may be modified with non-drying and drying vegetable oils, vinyl resins, urea-aldehyde resins and acrylic and methacrylic acid resins. The invention is also applicable with oleoresinous vehicles, natural resin vehicles, particularly shellac, and synthetic resin vehicles prepared from commercially available synthetic resins including phenol-formaldehyde, urea-aldehyde, acrylic and methacrylic acid resins, alkyds and vinyl type resins.

The selection of solvents and diluents is not critical except when the preferred embodiment of the invention is employed as previously described and any of the commercially available solvents and diluents suitable for use with the selected film-forming vehicle may be used. This applies also to the plasticizer ingredient of the new compositions.

The invention is not limited to any particular form of commercially available activated carbon since numerous types which have been tested appear to function as effective sealing agents. Various grades of "Nuchar," a commercially available product which is believed to be manufactured from paper, is particularly efficient for the purposes of the present invention. The grade of "Nuchar" known as "Nuchar XXX" is especially effective. "Darco," an alternative commercially available activated carbon believed to

be manufactured from lignite, is also satisfactory.

The compositions of the invention are useful as intermediate or sealer coatings in multi-coat finishing systems in preventing the bleeding through to the final top coat with unsightly discoloration thereof, of soluble coloring matter from the undercoats. Finishes prepared from oleoresinous, synthetic resin, cellulose derivative, asphaltic and rubber compositions, which contain soluble color ingredients such as soluble or partially soluble dyes, pigments (including para and toluidine toners, and maroons of organic derivation), inhibitors and accelerators may be successfully sealed with the new compositions, thereby preventing diffusion of soluble coloring matter to the top-coat finish. The invention is of particular merit in connection with refinishing automobiles where the original finish contains a bleeding red or maroon pigment and it is desired to apply a new finish of different color. The present invention avoids the necessity of removing the old finish prior to the application of the new coating as required by conventional practice if discoloration was to be avoided. Spirit soluble stains commonly applied to wood surfaces are also successfully sealed against diffusion of such material to the top coat if it is desired to finish the surface with a white or light colored coating composition.

The sealer is also useful in connection with the present-day metallic finishes including the so-called "transparent" metallic finishes. It is of practical advantage in the finishing of new automobiles where multi-tone color combinations are frequently employed in that the application of the sealer to adjacent areas where the color is varied prevents diffusion of bleeding color from one finished area to another.

The invention is marked by several outstanding advantages which contribute importantly to the technical and economic development of the finishing industry. There has long been a crying need, particularly in the refinishing of automobiles, for a sealing composition which would effectively prevent the diffusion of soluble color to the final top coat. The present compositions fully meet this requirement in permitting the application of a white or light-colored finish differing in color from that of the undercoat by functioning as a sealing medium against discoloration by soluble color from the old finish undercoats. The new product provides important economies in eliminating substantial labor costs and time required in removing the old finish containing bleeding color prior to the application of a new finish as required in prior conventional practice. As previously indicated, the new system may be applied directly over the old finish. The new sealer coat does not deleteriously affect the adhesion of the final top-coat finish but rather provides excellent anchorage for the final decorative and protective coatings commonly employed. No special skill is required in using the new composition since no critical factors are encountered such as characterize some of the older expedients previously employed in compromise attempts to combat the bleeding problem. The new sealer coating does not detract in any way from the general durability of the complete finish—rather it has been found that the compositions of the present invention when employed as an intermediate or sealer coat effectively reduce to a negligible degree or completely eliminate bleed-

ing of soluble color from an under-coat to the top-coat finish without any sacrifice in other essentially important properties.

In the appended claims, the term "activated carbon" refers to a form of carbon well known in the art for its high adsorption power obtained by the destructive distillation of carbonaceous vegetable materials such as paper, lignite, wood, peat and the like at high temperatures preferably with activating gases, sometimes in a vacuum or with limited air supply and with or without chemical treatments to free the pores of the primary carbon from condensed tarry matter and adsorbed materials. The term "activated carbon," however, is well understood in the art and it is believed that common usage has fully established it as a distinctive material not to be confused with the ordinary forms of carbon.

As many widely different embodiments of this invention may be made without departing from the spirit and scope thereof, it is to be understood that I do not limit myself to the specific embodiments thereof except as defined in the appended claims.

I claim:

1. A sealing coating composition comprising an organic film-forming polymer vehicle and activated vegetable carbon.

2. Composition of claim 1 in which the vehicle is essentially oleoresinous.

3. Composition of claim 1 in which the vehicle consists essentially of a resin.

4. Composition of claim 1 in which the vehicle contains a cellulose derivative as the essential ingredient.

5. A sealing coating composition comprising cellulose nitrate, resin and activated vegetable carbon.

6. Composition of claim 5 in which the resin is a natural resin.

7. A sealing coating composition comprising an

organic film-forming polymer vehicle and activated vegetable carbon in the proportion of 1 part of activated carbon to between about 1 to 7 parts of vehicle solids content.

8. A sealing coating composition comprising cellulose nitrate and activated vegetable carbon in the proportion of 10 parts by weight of cellulose nitrate to about 7 parts by weight of activated carbon.

9. A sealing coating composition comprising cellulose nitrate, activated vegetable carbon and a liquid volatile vehicle containing cellulose nitrate solvents having evaporation rates greater than that of amyl acetate.

10. In the process of finishing organic surfaces containing coloring matter soluble in the solvent vehicle of the top coat, the step of applying an intermediate organic sealing coating composition containing activated vegetable carbon.

11. An article of manufacture comprising an object carrying a plurality of organic coatings including a top coat, an intermediate sealing coating containing activated vegetable carbon and an undercoat containing coloring material soluble in the solvent vehicle of the said top coat.

12. In the process of finishing surfaces in which a plurality of coats are applied, one of which other than the surface coat contains a pigment which bleeds, the improvement which comprises applying over the said pigmented coat a composition containing a film-forming polymer and activated vegetable carbon.

13. An article of manufacture having a surface adapted to be decorated which comprises an undercoat containing a pigment which normally bleeds, an intermediate coat containing activated vegetable carbon and a surface coat.

14. Composition of claim 5 in which the resin is shellac.

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