

Sept. 20, 1949.

R. W. CHARLTON ET AL

2,482,154

EMBOSSING OF COMPOSITION SURFACED COVERINGS

Filed April 15, 1947



Fig. 1.

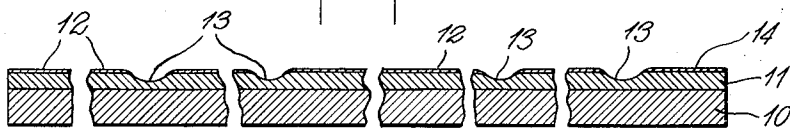


Fig. 2.

INVENTOR.
RALPH W. CHARLTON
BY FRANK X. ROVITO
Kenyon & Kenyon
ATTORNEYS

UNITED STATES PATENT OFFICE

2,482,154

EMBOSSING OF COMPOSITION SURFACED COVERINGS

Ralph W. Charlton, Verona, N. J., and Frank X. Rovito, Brooklyn, N. Y., assignors to Congoleum-Nairn Inc., a corporation of New York

Application April 15, 1947, Serial No. 741,592

10 Claims. (Cl. 117—45)

1

This invention relates to coverings for floors, walls, articles of furniture and the like and relates especially to coverings which comprise composition material that provides a tough and wear-resistant surface layer.

It is a purpose of this invention to provide coverings of the character mentioned which are of improved appearance because the surface presents an attractive pattern in the form of alligator embossing. "Alligator embossing," as this term is used herein and in the claims, is afforded whenever the surface of the surface layer of the covering presents a multiplicity of essentially smooth surface areas of varying shape and irregular outline surrounded by channel-like borders wherein the composition material of the surface layer is recessed below the general level of the surface provided by the smooth surface areas. Leather produced from the hide of alligators ordinarily presents embossed markings of the character referred to and it is for this reason that such random patterns have commonly been referred to as "alligator" markings or embossing. It is a further purpose of this invention to provide the alligator embossing without materially adding to the cost of coverings of the character referred to as conventionally produced with a continuous, flat and smooth surface, and without the necessity of using expensive machinery such as would be required if attempt were made to produce the alligator embossing by mechanical means.

This invention is based upon the discovery that in the case of coverings wherein the composition material of the wear-resistant surface layer consists essentially of pitch-base binder and a filler, certain waxes, namely, hard vegetable waxes of high softening point, have the property, when applied as a coating for the surface layer of such composition material, of inducing the development of alligator embossing in the surface of the surface layer of composition material merely upon subjecting the wax-coated layer of composition material to stoving at a temperature of the order of 130° F. to 200° F.

Coverings especially suited for use as flooring but also useful for covering the surfaces of walls, articles of furniture and the like have been manufactured extensively, which coverings comprise a surface layer of composition material wherein the base for the binder component is a vegetable or animal pitch material. Such pitch materials are derived as residua from the refinement of fats and oils of vegetable or animal origin and are generally known under such names as stearin pitch, cottonseed pitch, candle tar, corn

2

oil pitch, palm oil pitch, etc. When any such pitch material constitutes the base of the binder component of the composition material, it may be used as the sole binder but usually is blended with

a minor proportion of some modifying ingredient which may, for example, constitute from about 10% to about 20% by weight of the binder and which ordinarily consists of gilsonite, although other modifying binder substances may be employed such as wool grease, petroleum residua, etc. Any binder of the composition above described is referred to herein and in the claims as "pitch-base binder." The softening point of the pitch-base binder should be of the order of 95° F. to 150° F., and for most purposes the binder has a softening point of about 135° F. to about 145° F. A good pitch-base binder which is employed in most commercially-produced coverings of the type in question consists of about 80% to about 90% by weight of cottonseed pitch and about 10% to about 20% by weight gilsonite.

The pitch-base binder may be used to the extent of about 30% to about 65% by weight of the composition material employed as the wear-resistant surface layer of the covering in combination with suitable pigment and/or filler material. Any suitable pigment may be employed, the pigment most commonly used being red iron oxide pigment, although other pigments may be used such as black iron oxide, maroon oxide, green chromium oxide, ochre, and the like. Finely-divided solid substantially water-insoluble filler materials may be used as diluents or extenders such as limestone flour, slate flour, China clay, silica and the like. The pigment or other filler that is employed should, of course, be one which does not exhibit excessive decomposition or color change during those mixing or other operations which are carried out at elevated temperature, e. g., at a temperature of the order of about 300° F. to about 325° F. When it is stated that the filler is substantially water insoluble, this does not preclude the presence of a filler having slight water solubility of the order of gypsum. Whether the finely-divided solid filler material is in the form of a pigment or is in the form of a diluent or extender, it is referred to generally herein as finely-divided filler. The filler ordinarily constitutes from about 35% to about 70% by weight of the composition material of the surface layer of the covering. By way of specific example, a composition material which consists of about 35% of pitch-base binder and about 65% of combined pigment and mineral filler affords a composition which can be handled satisfactorily in the manu-

facture of a covering and which in the finished covering provides good wear-resistance and good resistance to indentation under load. Somewhat more generally, the composition material comprising pitch-base binder should be such that it is plastic and readily workable in a mixer at a temperature in the neighborhood of 300° F. and during the coating operation whereby it is spread to provide a surface layer for the covering. Moreover, the composition material should exhibit little or no flow at the temperature at which the covering is seasoned by stoving, such temperature being selected, depending upon the softening point of the particular composition material employed, from within a range which generally is of the order of 130° F. to 200° F. During stoving, the composition material should be capable of developing hardness, wear resistance, and indentation resistance appropriate for the use for which the covering is intended, e. g., a floor covering.

In the manufacture of a covering utilizing composition material of the character referred to having a pitch-base binder, the binder and filler ingredients are heated to a temperature of the order of 300° F. to 325° F. in a suitable mixer such as a Pfeleiderer mixer or a steam-jacketed pug mill, and the mixer is kept in operation until thorough mixing of the ingredients is accomplished. After the mixing has been completed, the composition material, while still hot and plastic, is applied to a suitable base sheet to provide the wear-resistant surface layer of the covering by any suitable means such as a heated doctor blade. The base sheet that is usually employed in coverings of the type referred to is asphalt saturated flooring felt, e. g., a 50 point (0.05 inch) dry felt which has been saturated to the extent of about 100% to 110% with asphalt having a softening point of about 160° F. In addition to asphalt saturated flooring felt, other suitable strain-resisting base sheets may be employed such as burlap or other fabric or other sheet or sheet-like material. The surface layer of composition material is ordinarily applied so that its thickness is of the order of 0.01 inch to 0.04 inch, a thickness of the order of 0.02 to 0.03 inch normally being suitable.

After the coating layer of composition material has been applied to the base sheet, the covering so produced is then stoved at a temperature of the order of 130° F. to 200° F. (usually about 155° F.) for a period of about five days in order to season the composition material of the coating layer. During the stoving, the composition material of the coating layer develops the increased hardness, increased wear-resistance and increased indentation-resistance appropriate for the purposes for which the covering is intended, e. g., a floor covering. The term "stoving" as used herein and in the claims refers to any operation wherein the covering is brought to the desired superatmospheric temperature appropriate for accelerating the seasoning of the composition material of the surface layer. The stoving is ordinarily accomplished in a large chamber in which the atmosphere is maintained at the desired stoving temperature and in which the covering is disposed with its surface exposed to the heated atmosphere until the seasoning is completed.

Coverings produced as described above have been extensively manufactured and sold, and as so made and sold have a continuous smooth surface which is the necessary result of the application of composition material in the form of a

surface layer of uniform thickness by means of a doctor blade or other similarly acting spreading device.

According to this invention, a covering having a wear-resistant surface layer of the composition material described above wherein the binder is pitch-base binder is provided with surface decoration which materially enhances the attractiveness of the appearance of the covering, such decoration being in the form of the alligator embossing that has been mentioned hereinabove.

According to this invention, a surface decoration in the form of alligator embossing is imparted to the wear-resistant surface layer of composition material of the character described hereinabove by coating the exposed surface of the surface layer of composition material with a thin coating of a high melting point hard wax and thereafter subjecting the covering to stoving at a temperature of the order of 130° F. to 200° F. During the stoving the decorative alligator embossing develops in the surface of the wear-resistant surface layer of the composition material, and after the stoving has been completed the covering, which comprises the decorative alligator embossing in the surface layer, is ready for the market.

Further purposes, features and advantages of the invention will be apparent from the following description of a typical example of the practice of this invention, the description being in connection with the accompanying drawings, wherein:

Fig. 1 is a plan view of a piece of covering which embodies this invention and which shows a typical pattern of alligator embossing in the surface thereof, and

Fig. 2 is a section taken on the line 2—2 of Fig. 1, Fig. 2 being on an enlarged scale for the purpose of clarity.

The covering shown in the drawing comprises a base sheet 10 which may, by way of specific example, be 50 point asphalt impregnated flooring felt of the type described more fully hereinabove. Adherent to the base sheet 10 is the layer 11 of composition material that provides the wear-resistant surface layer of the covering. The surface of the layer 11 of composition material, instead of being smooth and flat continuously throughout the extent of the piece of covering shown in the drawing, is broken up into areas 12 that are of different sizes and shapes and that have irregular outlines. The areas 12 present a smooth outer surface and are surrounded by the channel-like borders 13 wherein the composition material of the layer 11 is recessed below the general level of the smooth outer surface presented by the areas 12. The smooth outer surface of the areas 12 carries a thin coating 14 of wax, the relative thickness of which has been exaggerated in Fig. 2 for the purpose of clarity in the drawing. Attention is called to the fact that the wax coating 14, in the embodiment shown, does not extend into the channel-like borders 13. Because of this distribution of the wax coating 14 solely on the surface of the areas 12, the contrast between the areas 12 and the borders 13 is enhanced due to the fact that the areas 12 on which the wax coating 14 occurs have a somewhat higher gloss than the recessed borders 13.

The drawing shows a typical alligator embossing as it appears on a piece of the covering which may, for example, be 8' x 11'. For larger pieces,

the random pattern of the alligator embossing would present a similar decorative effect. The covering is well adapted for production in the form of wide sheets, e. g., 36 or 72 inches in width, which are of indefinite length and which are generally made up into rolls for storage and shipment. Alternatively, the covering can be produced in the form of tile-like bodies. It is to be understood that the particular alligator embossing pattern shown in the drawing is merely illustrative, for the decorative pattern of the embossing is a random pattern that is subject to wide variation as to the size and outline of the areas 12 and the width and depth of the channel-like borders 13.

The production of alligator embossing such as that shown in the drawing may be illustrated according to the following typical example of the practice of this invention. The composition material of the layer 11 consists of the following ingredients:

	Per cent
Cottonseed pitch (softening point about 125° F.)	30
Gilsonite	5
Red iron oxide pigment	30
Other finely-divided filler	35

The mixing and application of the composition material to the base sheet may be according to conventional practice as described and illustrated hereinabove, the layer 11 being applied so as to be substantially 0.03 inch in thickness. At this stage of the operation, the surface layer of composition presents a continuous smooth outer surface.

After the surface layer 11 has been applied to the base sheet 10 as described above, the smooth flat surface may be provided with decorative embossing according to this invention, the following being a specific example that is illustrative of preferred practice whereby the embossing is produced. While the layer 11 of composition material is warm, i. e., at a temperature of the order of 150° F. to 250° F., there is applied to the outer surface thereof a coating of wax emulsion wherein the wax employed is carnauba wax. The emulsion contains approximately 12% by weight of the carnauba wax, the balance of the emulsion being water except for the presence of a suitable emulsifying agent such as ammonium linoleate or other similar soap. Since it is the carnauba wax that is the effective agent in ultimately producing the alligator embossing, the constituents of the aqueous emulsion, other than the carnauba wax, are largely immaterial. An emulsion suitable for the purpose can be produced by known methods and emulsification techniques. The emulsion is applied at a rate such that in the coating, after the evaporation of the water, the weight of wax deposited is approximately 0.01 pound per square yard of surface. After application of the emulsion, the emulsion is dried and the covering is next subjected to stoving at a temperature of about 140° F. to 155° F. for four to six days. During the stoving the decorative alligator embossing develops gradually due solely to the interaction of the layer of composition material and wax coating under the conditions that occur during the stoving. After the stoving has been completed, the covering with the decorative pattern of alligator embossing is ready for the market, for during the stoving the layer of composition material also has acquired the increased wear-resistance and the increased indentation

resistance required for a satisfactory floor covering or the like.

In order to produce the alligator embossing, the wax that is used as the coating for the composition material should have a melting point of the order of 150° F. to 185° F. as determined by the standard ring and ball softening point test. The wax also should be a hard wax, namely, a wax the penetration of which at 77° F. is of the range 8 to 15 hundredths of a centimeter. The penetration values above given are determined by a modification of the Standard Method of Test for Penetration of Bituminous Materials, ASTM Designation D5-25 (page 220, part III, ASTM Standards, 1944). The penetration in hundredths of a centimeter is that which occurs in 5 seconds at 77° F. using a standard needle and a 500 gram load. The wax that is employed should be vegetable wax, for waxes of mineral and animal origin, even when within the ranges above mentioned for softening point and hardness, have not been found to be operative to effect the development of alligator embossing according to this invention. Carnauba wax has been found to be especially suitable for use in the practice of this invention. Other examples of suitable vegetable waxes are candelilla wax and esparto wax. Esparto wax is also known as fiber wax or reed wax. Such waxes are preferably used in commercially pure form, but may be admixed with minor quantities of diluent or extender materials so long as the mixture retains the properties of a vegetable wax of the softening point and hardness values that have been referred to above. Thus, there are on the market vegetable waxes which are not pure but contain some diluent or extender materials. Waxes of this character are suitable for use according to this invention but are less effective in producing the alligator embossing than the pure vegetable wax. When it is stated that the coating which is applied consists essentially of vegetable wax of given softening point and penetration, employment of such modified waxes as well as pure waxes is intended. Moreover, the presence of any emulsifying agent used to produce the wax in the form of an aqueous emulsion is not precluded.

Application of the wax coating to the wear-resistant surface layer of the covering is preferably accomplished by emulsification of the wax in water and distribution of the emulsion as a coating by means of spray application or other spreading means such as a suitable swab, for example, a wool blanket saturated with the aqueous emulsion. Application of the wax in a heat-liquefied condition by spray application also is satisfactory, but the intensity of the alligator embossing that is ultimately produced is somewhat less as compared with application of the wax while in an aqueous emulsion and the provision of a uniform coating is more difficult to control. In either case, namely, whether the wax is applied in the form of an emulsion or is applied as a spray while in molten condition, the wax is applied in the form of minute thermoplastic particles and such application of the wax is preferable in order to obtain best results when the covering is later stoved for the purpose of developing the alligator embossing. While the foregoing constitutes the preferred methods for applying the wax coating in the practice of this invention, the wax coating also may be applied by spreading the wax as by means of a suitable swab while the wax is in a heat-liquefied con-

dition, but the intensity of the alligator embossing is somewhat less when the wax coating is applied in this way. The wax may also be applied as a coating when thinned with a volatile solvent either by spreading as by use of a swab or by spray application, but the use of a volatile solvent not only detracts from the intensity of the alligator embossing that can be produced but also is less practical due to the added expense involved in the use of a solvent, due to the difficulties encountered in attempting solvent recovery, and due to the hazard of possible fire or explosion. More generally, any method of application of the wax coating may be employed, but in any case the coating should be applied so that the wax contained in the coating will become spread at the rate of at least 0.005 pound per square yard of surface covered. Generally it is impractical to apply the wax coating so as to be in excess of about 0.015 pound per square yard. For most purposes application of the wax coating so that the wax is distributed at the rate of about 0.01 pound to about 0.015 pound per square yard has been found to be preferable.

With regard to the stoving temperature, any temperature between about 130° F. and about 200° F. is appropriate for the development of the alligator embossing, although for the development of alligator embossing of greatest intensity the stoving should be carried out at a temperature below the softening point of the wax. For example, when the wax employed is a wax such as carnauba wax which has a softening point of about 185° F., a stoving temperature of the order of 135° F. to 155° F. has been found to be particularly effective in the development of very pronounced alligator embossing. The duration of the stoving treatment in any case is that which is required to develop the desired intensity of the alligator embossing. The embossing usually begins to become apparent after about one to three hours of stoving and thereafter gradually becomes more intense. Stoving for longer than about one day usually is not necessary as far as the development of alligator embossing is concerned for the intensity of the alligator embossing is not materially increased by more prolonged stoving. However, in connection with the duration of the stoving treatment, it also is necessary to take into consideration the amount of stoving which is required to develop in the composition material those properties of hardness, wear-resistance and indentation-resistance which are essential for the type of covering in question, e. g., a floor covering. It is one of the advantages of this invention, however, that in the ordinary case the duration of the stoving required to effect the desired degree of seasoning of the layer of composition material also accomplishes a satisfactory development of the alligator embossing. In the practice of this invention the wax coating is applied to the layer of composition material prior to substantial seasoning of the composition material, namely, while the composition material is sufficiently plastic so that it is susceptible of being worked at a temperature of the order of 300° F. and the stoving of the composition material of the coating layer not only accomplishes the seasoning of the coating layer but also the development of the alligator embossing when the layer of composition has the coating of wax applied thereto according to this invention.

As above mentioned it is preferable to apply the wax coating while the layer of composition material to which the coating is applied is warm,

i. e., at a temperature of the order of 150° F. to 250° F. However, it is not essential that the layer of composition material be warm when the wax coating is applied, for the alligator embossing may likewise be produced when the wax coating is applied while the layer of composition material is cold, although the embossed pattern is somewhat less intense.

In the production of the alligator embossing, the pattern that is obtained is, in any case, a random pattern. However, the intensity of pattern development, namely, the depth and width of the channel-like borders, and the boldness of the pattern, namely, the size of the areas surrounded by the channel-like borders, can be varied by varying the conditions under which the alligator embossing is produced. The most significant factor in this regard, aside from the duration of the stoving, is the weight per unit of area of the wax in the coating that is applied to the surface of the layer of composition material, for both the intensity and the boldness of the pattern are increased upon increasing the amount of wax per unit area that is applied. It has previously been mentioned that the intensity of the pattern is favored by application of the wax coating in the form of an emulsion, and by application of the wax coating while the layer of composition material, to which the wax coating is applied, is warm. Another factor bearing on the intensity of the pattern that is developed is the viscosity of the composition material at the time of coating it with the wax coating and under the temperature conditions of the coating operation, the intensity of the pattern that is developed being increased somewhat as the viscosity of the composition material is decreased while still affording plastic consistency appropriate for satisfactory mixing and spreading characteristics at the temperatures at which those operations are carried out. The temperature of the stoving in relation to the softening point of the wax employed is also material, maximum intensity being afforded when the stoving is carried out at a temperature slightly lower, namely, about 5° F. to 30° F. lower, than the softening point of the wax. The character of the alligator embossing is also influenced by the particular wax or wax mixture that is employed. Somewhat more generally the nature of the alligator embossing that is produced is subject to variation but can be controlled. Thus when those conditions for obtaining what is regarded as the most pleasing pattern have been determined, the general appearance of the pattern as to intensity and boldness is reproducible by operating under those conditions which are favorable to the production of such pattern.

In the development of the alligator embossing the channel-like borders become recessed into the wear-resistant layer of composition material and are not merely discontinuities in the wax coating. Thus even if the wax coating were to be removed from the finished product as by washing it off with a solvent, the alligator embossing would remain to give a decorative appearance to the surface of the layer of composition material. However, the wax coating is normally left intact for it provides a desirable finish for the areas which are surrounded by the channel-like borders. Moreover, it is the inherent result of the method of production of the alligator embossing according to this invention that the wax coating does not extend across the channel-like borders and this fact serves to enhance the contrast between

areas which carry the wax coating and the channel-like borders with resultant improvement in appearance.

While the production of alligator embossing according to this invention has been described in connection with a specific example of a covering comprising a base sheet and a wear-resistant surface layer of composition material having a pitch-base binder, it is to be understood that the invention is applicable for the production of alligator embossing in the case of any covering wherein the wear-resistant surface layer is provided by composition material of the character hereinabove generally described wherein the binder is a pitch-base binder. While smooth surface coverings of the character described, which heretofore have been produced commercially, have comprised a strain-resistant base sheet, it is apparent the alligator embossing can be produced whenever the composition material is disposed in the form of a wear-resistant surface layer, whether the composition material is or is not backed by a strain-resisting base sheet. Somewhat more generally, it is to be understood that while this invention has been described in connection with certain specific examples of the practice thereof and in connection with the specific embodiment thereof shown in the accompanying drawing, this has been done merely for the purpose of illustrating the practice of this invention and that the scope of this invention is to be governed by the language of the following claims.

We claim:

1. In the manufacture of a covering of the character described wherein the surface layer of the covering is formed from composition material comprising about 30% to about 65% by weight of a pitch-base binder having a softening point of the order of 95° F. to 150° F. and about 35% to 70% by weight of finely-divided solid substantially water-insoluble filler material, the production of alligator embossing in the surface of said surface layer of composition material by the steps comprising applying to the surface of said composition material constituting the surface layer of said covering prior to substantial seasoning of said layer a coating which weighs about 0.005 pound to about 0.015 pound per square yard and which consists essentially of a vegetable wax the softening point of which is of the order of 150° F. to 185° F. and the penetration of which at 77° F. is of the order of 8 to 15 hundredths of a centimeter and subjecting said surface layer of composition material with said coating applied thereto to stoving at a temperature above about 130° F. and below the softening point of the wax for at least one hour until the surface of said surface layer of composition material develops alligator embossing therein.

2. In the manufacture of a covering of the character described according to claim 1, the steps recited in claim 1 for the production of alligator embossing wherein said wax is applied in the form of minute thermoplastic particles in the production of said coating for said layer of composition material.

3. In the manufacture of a covering of the character described according to claim 1 the steps recited in claim 1 for the production of alligator embossing in the surface of said layer of composition material wherein the wax contained in said coating is applied in the form of an aqueous emulsion.

4. In the manufacture of a covering of the

character described according to claim 1 the steps recited in claim 1 for the production of alligator embossing in the surface of said layer of composition material wherein said coating is applied to the surface of said surface layer of composition material while said layer of composition material is at a temperature of the order 150° F. to 250° F.

5. In the manufacture of a covering of the character described according to claim 1 the steps recited in claim 1 for the production of alligator embossing in the surface of said layer of composition material wherein the stoving is carried out at a temperature 5° to 30° F. below the softening point of the wax in said coating to develop alligator embossing in the surface of said surface layer of composition material.

6. In the manufacture of a covering of the character described comprising a strain-resistant base sheet and integral with said base sheet a wear-resistant surface layer about 0.01 to about 0.04 inch in thickness wherein said surface layer is formed from composition material in which the binder has a softening point between about 95° F. and about 150° F. and is composed essentially of about 80% to about 90% by weight of cottonseed pitch and from about 10% to about 20% by weight of gilsonite and in which said binder constitutes from about 30% to about 65% by weight of said composition material, the balance of said composition material being essentially finely-divided solid water-insoluble filler material, the production of alligator embossing in the surface of said surface layer of composition material by the steps comprising applying to the surface of said composition material constituting the surface layer of said covering prior to substantial seasoning of said layer a coating which weighs about 0.005 pound to about 0.015 pound per square yard and which consists essentially of vegetable wax the softening point of which is of the order of about 150° F. to about 185° F. and the penetration of which at 77° F. is of the order of 8 to 15 hundredths of a centimeter and subjecting said surface layer of composition material with said coating applied thereto to stoving at a temperature above 130° F. and below the softening point of the wax for at least one hour until the surface of said surface layer of composition material develops alligator embossing therein.

7. In the manufacture of a covering of the character described according to claim 6, the steps recited in claim 6 for the production of alligator embossing in the surface of said layer of composition material wherein the wax contained in said coating is applied in the form of an aqueous emulsion.

8. A covering of the character described comprising a surface layer which is the product of stoving a composition material comprising about 30% to about 65% by weight of pitch-base binder having a softening point of the order of 95° F. to 150° F. and about 35% to about 70% of finely-divided solid substantially water-insoluble filler material, the surface of said layer presenting nonrepetitive alligator embossing in the form of a multiplicity of smooth surface areas of varying and random shapes and sizes defined by irregular outlines and surrounded by channel-like borders wherein the composition material of the surface layer is recessed below the general level provided by the said smooth surface areas, said smooth surface areas carrying a coating consisting essentially of vegetable wax having a

11

softening point of the order of 150° F. to 185° F. and a penetration at 77° F. of the order of 8 to 15 hundredths of a centimeter, and said channel-like borders being substantially free of wax.

9. In the manufacture of a covering of the character described according to claim 6 the steps recited in claim 6 for the production of alligator embossing in the surface of said layer of composition material wherein the stoving is carried out at a temperature 5° to 30° F. below the softening point of the wax in said coating to develop alligator embossing in the surface of said surface layer of composition material.

10. A covering of the character described according to claim 8 wherein said vegetable wax consists essentially of carnauba wax.

RALPH W. CHARLTON.
FRANK X. ROVITO.

12

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
453,689	Bradley -----	June 9, 1891
842,615	Boerche -----	Jan. 29, 1907
1,600,723	Egelhoff -----	Sept. 21, 1926
1,715,080	Frederickson -----	May 28, 1929
1,787,629	Kennedy -----	Jan. 6, 1931
2,290,741	Eckert -----	July 21, 1942