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FELT BASE FLOOR COVERING AND METHOD OF MAKING THE SAME

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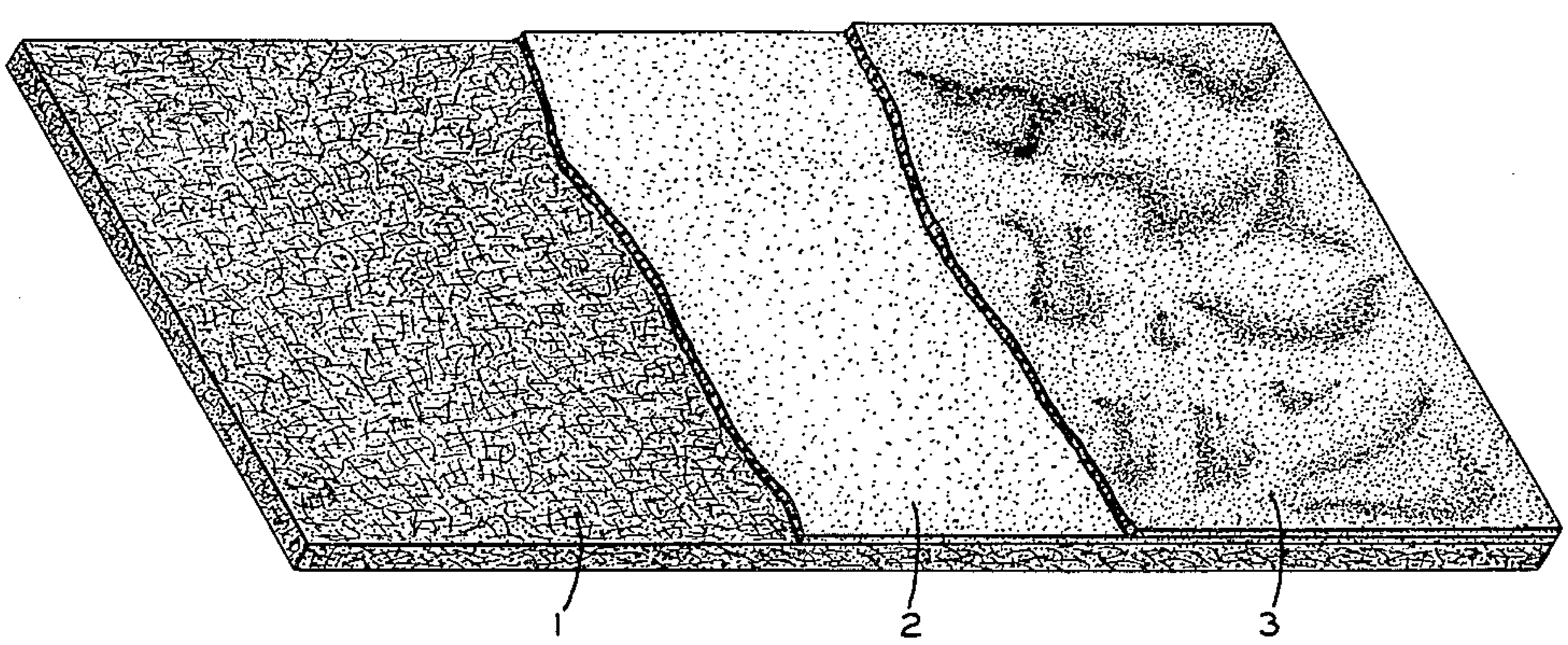

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FELT BASE FLOOR COVERING AND METHOD OF MAKING THE SAME

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6 Claims. (Cl. 117—15)

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This application is a continuation-in-part of my copending application Serial No. 80,781, filed March 10, 1949.

This invention relates to felt base floor coverings. More particularly, the invention relates to an improved felt base floor covering having a decorative wearing surface containing a vinyl resin produced by depositing a thin film of vinyl resin onto a carrier which may be a saturated felt coated with a composition containing a filler and selected resins and rubberlike polymers.

Felt base floor coverings are well-known to the art and, generally speaking, they comprise a saturated felt backing, a seal coat, and a paint film which serves as both a decorative and wearing surface. One widely used method of producing such floor coverings involves the steps of face-coating a saturated felt sheet with a coating paint by means of a knife or other suitable apparatus to provide what is known in the art as a seal coat. Following the application of the seal coat, the material is passed through a block printing apparatus. The blocks are dipped into a container of decorative material, and various designs are applied by means of the blocks to the coated felt base. Following the application of the decorative coating, the material is suspended in stoves to dry the paint film. The paints employed, because of the manner in which they are applied, are called print paints; and in the art the goods are known as printed felt base goods.

Various coatings have been used for decorating the surface of a seal-coated saturated felt. Generally speaking, these coatings are conventional print paints containing the desired color pigment and a drying oil-resin type vehicle. These drying oil-resin type vehicles have found wide use in the production of printed felt base goods, but until the invention of this application there have been no block printed felt base goods containing a pigmented vinyl resin decorative coating. While it has been recognized that vinyl resins do provide highly desirable properties as a print paint for felt base goods, attempts to produce such products by the conventional block printing techniques have met with no success. One reason for this lack of success has been the unavailability of a composition which could be applied by conventional block printing apparatus. Another reason for the lack of success has been that decorative coatings containing vinyl resins have not adhered well to the seal coats applied to the saturated felt backings.

I have found that printed felt base floor coverings may be produced by conventional block printing techniques when a particular type of vinyl resin dispersion is employed as a decorative coating over a specially prepared seal coat containing a mixture of selected rubberlike polymers and selected vinyl polymers to which have been added selected amounts of filler materials.

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The figure of the drawing is illustrative of a floor covering prepared in accordance with my invention. In the drawing, 1 represents a sheet of saturated felt to which has been applied, by means of a knife coater or any other suitable device, a filled coating paint 2, which will be more fully described below. Over the coating paint is printed a decorative vinyl resin containing wearing surface 3.

In accordance with my invention, any raw felt suitable for use in the production of printed felt base floor coverings can be saturated with any of a number of saturants, including asphalt and synthetic rubber, such as a butadiene-styrene copolymer, chloroprene polymers, and the like. Such saturated felts may be prepared by passing a sheet of the raw felt through a tank containing the saturant; or if desired, the saturant may be deposited upon the fibers in a beater in accordance with well-known beater saturating techniques. The use of beater saturation is particularly desirable when the saturant is a rubberlike material, such as a rubberlike butadiene-styrene copolymer. After saturation of the felt material and drying of the saturant by conventional means, the seal coat is then applied. Generally speaking, this is done by passing the saturated felt through a knife-coating apparatus, though if desired, other coating methods may be used. The intermediate or seal coat advantageously contains an inherently tacky compound, which serves to enhance adhesion between the coating paint and the saturated felt, and a reinforcing agent, which is a resinous vinyl type polymer and which serves to build up the internal strength of the coating paint, and because of chemical similarities to the vinyl resin wearing surface, to enhance adhesion between the seal coat and the wearing surface. If desired, in order to improve the appearance of the product, a smoothing coat, which may be an oleo-resinous binder mixed with filler and pigments, may be interposed between the saturated felt and the seal coat. The seal coat also contains an excess of filler material to enhance the laminate strength by affording a microscopically roughened surface. Such seal coats are described and claimed in copending application Serial No.

207,587, filed January 24, 1951, by Irving I. Bezman and Daniel D. Browning, and now abandoned. Generally speaking, the seal coat contains about 20% to about 50% of a rubberlike component admixed with a vinyl resin reinforcing agent together with about 80% to about 50% of an inert filler. The binder or rubber-resin mixture advantageously contains about 50% to about 80% rubberlike polymer and about 50% to 20% reinforcing resin. If less than about 50% rubberlike polymer is employed, the seal coat does not key well to the saturated felt base. If less than about 20% reinforcing resin is contained in the coating paint which forms a seal coat, a good key between the paint and the particular vinyl resin decorative coat is not obtained. It is also desirable to utilize a quantity of inert filler which is no less than about 50% by weight of the coating paint composition. If less than about 50% filler is employed, the desired tooth or mechanical bond between the seal coat and adjacent surface is not obtained. When more than about 80% filler is employed, the seal coat possesses very little internal strength. Typical examples of tackifiers and reinforcing agents which may be used in forming the seal coat are as follows:

A. Tackifiers

1. A styrene-butadiene copolymer containing 30–60 parts of styrene and 70–40 parts of butadiene.

2. An acrylonitrile-butadiene copolymer containing 55–80 parts of butadiene and 45–20 parts of acrylonitrile.

3. An isobutylene-isoprene copolymer containing 97–99 parts of isobutylene with 3–1 parts of isoprene.

4. A polychloroprene.

B. Reinforcing agents

1. Polyvinyl chloride.

2. A copolymer of polyvinyl chloride and polyvinyl acetate containing 95–80 parts of polyvinyl chloride with 5–20 parts of polyvinyl acetate.

3. A polyvinyl chloride-polyvinylidene chloride copolymer containing a majority of polyvinylidene chloride.

4. A styrene-butadiene copolymer containing 98–80 parts of styrene with 2–20 parts of butadiene.

5. Polystyrene.

In each instance about one to three parts of an inert filler, such as wood flour, micronized slate, whiting, clay, and the like, are employed for each one part of the binder or resin-rubberlike polymer mixture. It is believed that the binder may be described as a mixture of rubberlike polymer tackifier and a vinyl resin reinforcing agent.

After application of the seal coat to the saturated felt backing, the resulting material is then passed under a series of printing blocks which apply the decorative wearing surface in any desired pattern. In order to print a pattern upon the seal-coated saturated felt base, it is necessary that certain conditions be observed in the production of the decorative surface coating. Typical of a vinyl resin print paint possessing the required properties are those described and claimed in my above referred to copending application Serial No. 80,781, filed March 10, 1949. The basic or film-forming ingredient of the print paint employed in the production of the floor covering of my invention may be a virtually insoluble or difficultly soluble vinyl resin such as the delta and gamma polyvinyl chlorides. It is also possible to utilize the more soluble vinyl resins, such as beta polyvinyl chloride, a copolymer of vinyl chloride, and vinyl acetate which has average molecular weights above 16,000 as determined by Staudinger's method and containing vinyl chloride in the range of about 90% to 97% by weight, as well as copolymers of vinyl chloride and dibutyl maleate, ethyl acrylate, methyl acrylate, butyl acrylate, methyl methacrylate, and butyl methacrylate, all containing substantially the same amount of combined vinyl chloride and having the same average molecular weight. In addition, copolymers of vinyl chloride and acrylonitrile containing 45% to 80% vinyl chloride may also be used, as well as certain copolymers of vinyl chloride and vinylidene chloride. All of the resins mentioned hereinabove may be characterized as vinyl resins which are substantially insoluble in toluene at 25° C. In other words, toluene in the ratio of ten parts of toluene to one part of resin will extract a fraction amounting to no more than 15% of the entire resin. The term "vinyl chloride resin" is used herein to define these toluene-insoluble resins.

A nonaqueous dispersion of minutely subdivided vinyl chloride resin particles may be prepared by dispersing them in a nonaqueous medium containing a small amount of a butylated urea-formaldehyde resin or other suitable dispersing agent. By such a method it is possible to produce dispersions of vinyl chloride polymer resins of relatively low viscosity and low content of volatile material in which the vinyl chloride polymer is present in an amount in excess of 50% by weight. Generally speaking, from about 0.5% to 2.5% by weight of the butylated urea-formaldehyde resin based on the vinyl chloride resin is employed in producing a resin dispersion suitable for application to floor coverings by the block printing technique. There are other ways, of course, of obtaining the desired viscosity in the vinyl chloride polymer suspensions. However, in order to be useful in the practice of my invention, the vinyl chloride polymer resin dispersion must be characterized by a viscosity index of not less than 1.67 when not more than 5% of volatile material is present in said dispersion. A dispersion so characterized may be block printed to form a smooth decorative wearing surface with satisfactory appearance and wearing properties. All dispersions of vinyl chloride polymer resins that have viscosity indices of less than 1.67 with 5% volatile material present, or those that require the addition of more than 5% volatile material to attain a viscosity index of at least 1.67, are unsuitable for block printing decorative wearing surfaces. The dispersions employed in the practice of my invention permit the deposition of thicker wear film and, in a multicolor printing operation, permit varying the viscosity of the dispersion over a wide range, thereby facilitating the production of printed designs with clean sharp outlines. Dispersions outside of the scope of the definition hereinabove require excessive amounts (more than 40%) of volatile material in order to secure a smooth, level, printed surface, and the viscosity of such dispersions will be so low that additional quantities of volatile material will not effect a sufficiently marked lowering of viscosity to permit the "last down" color in a multicolor printing operation to transfer properly from the printing block. As a result, the printed design will be

"fuzzy" and will have an unsatisfactory "smeared" appearance.

As used herein, the term "viscosity index" is the slope of the curve which is obtained when the deflections shown on a variable speed standard model Brookfield synchro-electric viscosimeter are plotted as abscissae against the revolutions per minute required to produce the deflections as ordinates. The deflections may be measured with any suitable spindle, but the data are plotted on the basis of the deflections that would be obtained, actually or theoretically, on the No. 7 spindle. Deflections are measured at spindle speeds of 2, 4, 10, and 20 revolutions per minute, while the dispersion is at a temperature of 25° C. The well-known techniques specified for use in measuring viscosities with the Brookfield synchro-electric viscosimeter are applied to obtain the data required for determining the viscosity indices of the vinyl chloride polymer resin dispersions.

A typical formulation which may be used in the practice of my invention is as follows:

EXAMPLE I

	Parts by weight
Titanium dioxide pigment	80
Lead chromate pigment	16
Dioctyl phthalate plasticizer	136
Vinyl chloride vinyl acetate copolymer resin	410
Mineral spirits	110
Butylated urea-formaldehyde resin (60% solids in 50-50 butanol xylene)	13.8

The titanium dioxide and lead chromate serve as coloring matter for the coating dispersion and the dioctyl phthalate as a plasticizer for the vinyl copolymer, the latter serving as the film-forming resin.

It should be recognized that other well-known plasticizers of vinyl resins may be employed in lieu of that designated in the above example. Typical examples of plasticizing material are as follows: dioctyl phthalate, dibutyl sebacate, diallyl phthalate, di-butoxy ethyl phthalate, tricresyl phosphate, and di-capryl sebacate. Other viscosity reducing agents than the butylated urea-formaldehyde resin may be employed, such as the alkyl aryl polyether alcohols.

In some instances, it may be desirable to add additional ingredients to the decorative surface coating material so that the tendency of the material to crack on drying is reduced. Chlorinated paraffins or chlorinated biphenyls may be added to such compositions and small amounts of various alkyd resins, such as a long oil soybean oil modified pentaerythritol-phthalic acid polyester, may also be used. The typical formulation containing such modifiers is illustrated in the following example:

EXAMPLE II

	Parts by weight
Pigment	292
Polyvinyl chloride resin	1000
Heat stabilizer	20
Chlorinated paraffin	100
Plasticizer	333
Butylated urea-formaldehyde resin (60% solids in bi-flash naphtha)	25
Alkyd resin (70% solids in mineral spirits)	12
Mineral spirits	318

Following application of the decorative wearing surface by means of the block printing technique, the resulting product is then subjected to

temperatures sufficiently high to fuse the resin decorative coating. One advantageous method of obtaining the desired fusion involves passing the printed material beneath a source of infra-red radiation. However, other methods of fusing the coating may be employed.

While particularly effective results have been obtained in the practice of my invention by utilizing a saturated felt sheet to which has been applied a seal coat such as that described hereinabove, it is also within the scope of my invention to produce a floor covering by block printing the decorative wearing surface on any sheet which is sufficiently smooth to meet the requirements of the floor covering art. For example, if desired, the felt may be calendered to render the surface smooth enough to receive the film of vinyl chloride resin containing the decorative colors. On the other hand, a thin film of paper or other material may be applied to the saturated felt backing to provide the desired smooth surface. However, generally speaking, it is advantageous to utilize a seal coat such as that described above because of the more convenient manner of application and because of the strong bond maintained between the saturated felt backing and the decorative vinyl resin wearing surface through the seal coating materials.

I claim:

1. A method of making a floor or wall covering comprising seal coating a sheet of saturated felt material with a composition containing a tackifier of the group consisting of styrene-butadiene copolymers, acrylonitrile-butadiene copolymers, isobutylene-isoprene copolymers, and polychloroprene, and a reinforcing agent of the group consisting of polyvinyl chloride, copolymers of polyvinyl chloride and polyvinyl acetate, copolymers of polyvinyl chloride and polyvinylidene chloride, styrene-butadiene copolymers, and polystyrene, block printing onto the resulting seal coat a plurality of color areas of a decorative composition containing a dispersion of vinyl resin having a viscosity index of at least 1.67 when not more than 5% volatile material is present therein, whereby said color areas will flow out on said seal coat to produce a sharply-defined pattern, and heating the resulting coated product until the vinyl resin contained in the coating material is fused, said viscosity index being the slope of the curve which is obtained when the deflections shown on a variable speed standard model Brookfield synchro-electric viscosimeter are plotted as abscissae against the revolutions per minute required to produce the deflections as ordinates, the deflections being measured at spindle speeds of 2, 4, 10, and 20 revolutions per minute, while the dispersion is at a temperature of 25° C.

2. The product of the process of claim 1.

3. A method of making a floor or wall covering comprising seal coating a sheet of bituminous saturated felt material with a composition containing a tackifier of the group consisting of styrene-butadiene copolymers, acrylonitrile-butadiene copolymers, isobutylene-isoprene copolymers, and polychloroprene, and a reinforcing agent of the group consisting of polyvinyl chloride, copolymers of polyvinyl chloride and polyvinyl acetate, copolymers of polyvinyl chloride and polyvinylidene chloride, styrene-butadiene copolymers, and polystyrene, block printing onto the resulting seal coat a plurality of color areas of a decorative composition containing a dispersion of polyvinyl chloride having a viscosity

index of at least 1.67 when not more than 5% volatile material is present therein, whereby said color areas will flow out on said seal coat to produce a sharply-defined pattern, and passing the resulting coated product beneath a source of infrared radiation to fuse the polyvinyl chloride contained in the coating material, said viscosity index being the slope of the curve which is obtained when the deflections shown on a variable speed standard model Brookfield synchro-electric viscosimeter are plotted as abscissae against the revolutions per minute required to produce the deflections as ordinates, the deflections being measured at spindle speeds of 2, 4, 10, and 20 revolutions per minute, while the dispersion is at a temperature of 25° C.

4. A method of making a floor or wall covering comprising coating a sheet of saturated felt with a composition containing a rubberlike polymer of butadiene with acrylonitrile and polyvinyl chloride, drying the resulting coating, block printing onto said dried coat a plurality of color areas of a decorative composition containing a dispersion of polyvinyl chloride having a viscosity index of at least 1.67 when not more than 5% volatile material is present therein, whereby said color areas will flow out on said seal coat to produce a sharply-defined pattern, heating the resulting coated product until the polyvinyl chloride contained in the coating material is fused, said viscosity index being the slope of the curve which is obtained when the deflections shown on a variable speed standard model Brookfield synchro-electric viscosimeter are plotted as abscissae against the revolutions per minute required to produce the deflections as ordinates, the deflections being measured at spindle speeds of 2, 4, 10, and 20 revolutions per minute, while the dispersion is at a temperature of 25° C.

5. The product of the method of claim 4.

6. A method of making a floor or wall covering

comprising seal coating a sheet of saturated felt material with a composition containing a rubberlike polymer of butadiene with acrylonitrile and polyvinyl chloride, block printing onto the resulting seal coat a plurality of color areas of a decorative composition containing a dispersion of vinyl chloride polymer resin provided with about 0.5% to 2.5% by weight of butylated urea-formaldehyde resin based on the vinyl chloride resin and having a viscosity index of at least 1.67 when not more than 5% volatile material is present therein, whereby said color areas will flow out on said seal coat to produce a pattern, and heating the resulting coated product until the vinyl chloride polymer resin contained in the coating material is fused, said viscosity index being the slope of the curve which is obtained when the deflections shown on a variable speed standard model Brookfield synchro-electric viscosimeter are plotted as abscissae against the revolutions per minute required to produce the deflections as ordinates, the deflections being measured at spindle speeds of 2, 4, 10, and 20 revolutions per minute, while the dispersion is at a temperature of 25° C.

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