METHOD OF MAKING COATED FLOOR COVERINGS

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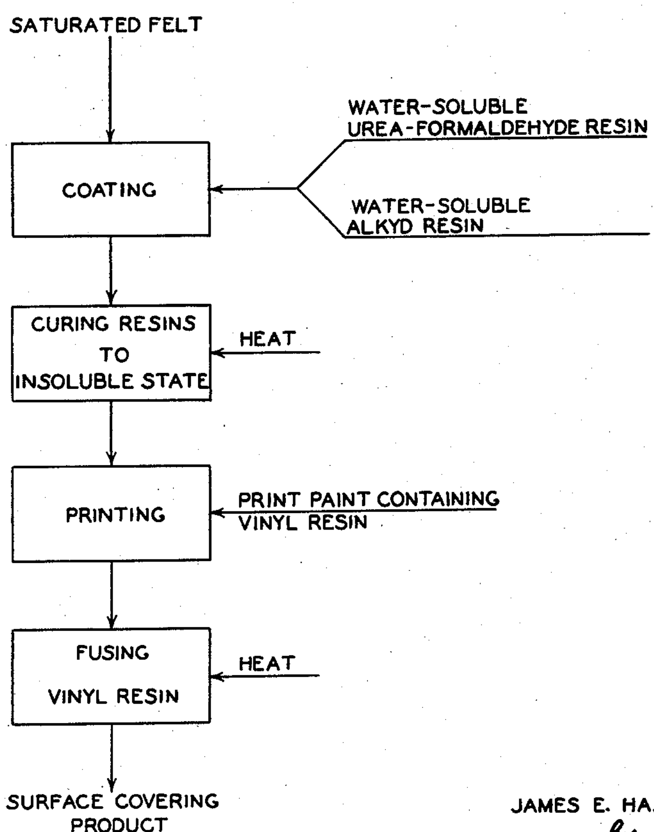
Fig. 1

Fig. 2



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METHOD OF MAKING COATED FLOOR COVERINGS

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This invention relates to plastic floor coverings. More particularly, the invention relates to a plastic floor covering obtained by depositing a film of plastic onto a seal coated saturated felt backing and heating the resulting material to temperatures sufficiently high to effect fusion of the plastic film, thereby producing a felt base floor covering characterized by resilience, flexibility, and resistance to alkalies and oils normally employed in the home.

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 a wearing surface. One widely used method of producing such floor coverings involves the step of face coating a saturated felt sheet with a coating paint by means of a knife or other suitable apparatus to produce 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 dried to produce a hard paint film.

Various coatings have been used for decorating the surface of a seal coated saturated felt in the production of printed floor coverings. Generally speaking, these coatings have been what are known to the art as print paints which contain the desired color pigments and drying oil-resin type vehicle. These drying oil-resin type vehicles have found wide use in the production of the printed felt base goods, but it has been difficult to attain the desired alkali resistance in such floor coverings because of the nature of the decorative top coat.

Recently there have been developed methods of producing a type of printed felt base floor covering in which the newer synthetic plastics have been employed as the wearing surface coat. These synthetic plastics, such as the vinyl resins, for example, copolymers of vinyl chloride and vinyl acetate, polymers of vinyl chloride, and the like, possess outstanding wearing characteristics and are highly resistant to alkalies and washing powders which have a rather adverse effect upon the drying oil type print coats.

In order to produce attractive patterns of plastic floor coverings by block printing methods, it has been necessary to utilize organosols and plastisols having viscosities within particular ranges. This has been necessary to obtain proper leveling of the paint after application by the printing block. A typical organosol print paint binder contains a plasticizer such as dioctyl phthalate, a polyvinyl chloride resin, and a solvent such as mineral spirits. To this binder is added the pigment, which may be any of the pigments well known in the art, such as titanium dioxide, lead chromate, and the like. In the production of printed organosol floor coverings, the material after printing is heated to fuse the vinyl resin dispersion which is applied as the top coating. To obtain adequate fusion

of this dispersion, comparatively high temperatures, such as 300° F. and higher, must be used. With such high temperatures, a solvent and diluent in the vinyl resin dispersion are caused to attack and soften the seal coat over the saturated felt base material. This results in a final product which is somewhat soft or spongy and is lacking in sufficient resistance to damage by impact or scuffing. Impact resistance or scuff resistance is highly important in any material which is to be used as a floor covering.

This problem of seal coat attack has been overcome to some extent by incorporating in such seal coats a material which renders the binder of the seal coat sufficiently insoluble in the solvents and diluents normally used in the vinyl resin dispersion to resist the softening effect of such solvents and diluents. Water-dispersible proteins have been used, but such materials are characterized by lack of flexibility, which prohibits the admixture of sufficient quantities of these materials and seal coating compositions to render the seal coat completely resistant to the softening effect of solvents and diluents. Furthermore, the water resistance of the coating is impaired by the presence of such water-dispersible protein materials. Thus, although improvement has resulted in the problem of resistance to impact and scuffing, there are still undesirable characteristics present in printed felt base floor coverings of the type under consideration.

I have found that these undesirable properties can be substantially completely eliminated by seal coating saturated felt backings which are to receive printed or otherwise deposited vinyl resin dispersions with a coating containing a binder which includes water-soluble urea-formaldehyde resin and an alkyd resin containing sufficient polar groups, such as hydroxyl groups, carboxyl groups, and the like, to render the alkyd resin water soluble. Seal coats containing such binders may be cured in the presence of the usual catalyst employed for curing urea-formaldehyde resins to produce a seal coating which is substantially completely resistant to the softening effect of solvents and diluents under the conditions obtaining in the production of printed felt base floor coverings, including fusing the top coat at high temperatures such as at least 300° F.

The accompanying drawing illustrates several features of the invention in which:

Figure 1 is a sectional view of a floor covering of the present invention; and

Figure 2 is a flow sheet of the present process.

In Figure 1 the numeral **1** designates a saturated felt backing, **2** is the seal coat described hereinafter, and **3** is the printed top coat described below.

The water-soluble urea-formaldehyde resins which may be employed in the practice of my invention are well known to the art. They may be obtained by condensing urea and formaldehyde, as by reacting 5 parts by weight of a commercial 40% solution of formaldehyde and 1 part urea. In some instances, complexes have been formed which are water-soluble urea-formaldehyde resins. For example, the simultaneous reaction of 1 mol of urea and 2 mols of formaldehyde to form dimethylol urea and 1 mol of formaldehyde and 1 to 2 mols of ethylene glycol to form the ethylene glycol formals, the dimethylol urea and the formals then reacting, yields water-soluble urea-formaldehyde resins. Such water-soluble urea-formaldehyde resins and their method of preparation are well known to the art.

The water-soluble alkyd resins may have acid numbers between 45 and 65 and may be derived from condensation of dicarboxylic acids such as maleic, itaconic, citraconic, chloromaleic, and the like, with the polyols such as polyethylene glycol having average molecular weights by the cryoscopic method of 400 to 600, and, if desired, lesser amounts of higher polyols such as pentaerythritol, sorbitol, and the like. For example, a typical water-soluble alkyd may be prepared by heating 65.05 grams itaconic acid with 200 grams polyethylene glycol, having a molecular weight of 400 (cryoscopic method) under an inert gas at 167° C. until an acid number of 60 is attained.

While the proportions of water-soluble urea-formaldehyde resins and water-soluble alkyd resins employed in the binder of the seal coating of my invention may be varied, generally speaking, particularly advantageous results are obtained when the binder is comprised of about 50 parts by weight water-soluble urea-formaldehyde resin and about 50 to about 75 parts by weight of water-soluble alkyd resin. The binder-to-filler ratio is advantageously 1 to about 3.5, but may vary between 1 to about 2.5 to 1 to about 5. Any of a number of conventional fillers, such as clay, slate flour, or mixtures thereof, may be used.

In accordance with my invention, the backing material is first formed by saturating felt with asphalt, synthetic resin, synthetic rubber, or other material. The saturation may be carried out by passing a sheet of raw felt through a saturating bath or, if desired, by depositing binder material onto fibers while in a slurry, such as by a process known as beater saturation. It is advantageous to utilize a waterproof felt such as one produced by saturation with asphalt; but it is also within the scope of my invention to employ felts which are saturated with materials that are not highly resistant to the action of water. To the saturated felt backing is applied a seal coating having a binder comprised of water-soluble urea-formaldehyde resin and water-soluble alkyd resin. A typical formulation of the seal coat is as follows:

Example I

	Parts by weight
Red slate flour	610
Water-soluble urea-formaldehyde resin (condensation product of 5 parts 40% formaldehyde solution and 1 part urea—80% solids in H_2O)	84.4
Water-soluble alkyd resin (itaconic acid-polyethylene glycol condensation product—70% solids in H_2O)	146.4
Water	180
Tetra sodium pyrophosphate	.4
Triton X–100 (alkyl aryl polyether alcohol)	.9

The pyrophosphate is used as a pigment or filler wetting agent and the Triton is used as a saturated felt wetting agent. Although improved results are obtained, they may be eliminated from the composition if desired.

Coatings such as those defined in Example I may be applied by means of a doctor blade or any conventional coating means, and after application the coated felt is advantageously dried under such conditions as to provide a cure for the alkyd resin and the urea-formaldehyde resin to render them water resistant and solvent resistant. A typical curing cycle involves heating for about 3 to 4 hours to a maximum temperature of about 195° F. for about 1 hour. The maximum temperature may vary from about 190° F. to about 200° F. To accelerate the cure, catalysts for urea-formaldehyde resin cures may be employed. Typical of such catalysts are zinc chloride, hydrochloric acid, sulfuric acid, nitric acid, aluminum chloride, phosphoric acid, acid butyl phosphates, and the like. Sufficient catalyst is added to render the seal coat acid to litmus, for example, 2% by weight based on urea-formaldehyde resin solids. The thus treated felt is then passed through block printing units and the desired pattern is printed onto the coated felt, utilizing a print paint which may include any of the organosol print paints known to the art. A typical organosol print paint is as follows:

Example II

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

Following application of the organosol print paint, the material is passed through a heating unit at temperatures of at least 300° F. to fuse the decorative organosol coating.

It is advantageous in the practice of my invention to employ an anchor coat between the seal coat and the organosol top coat. Such anchor coats result in improved adhesion between the top coat and the seal coated felt. Typical of the anchor coats which may be used are those described in copending application Serial No. 277,584, filed March 20, 1952, by Irving I. Bezman and Daniel D. Browning, now U. S. Patent No. 2,739,082, as a continuation in part of Serial No. 207,587, filed January 24, 1951, now abandoned. As described in said application, such anchor coats may contain about 20% to about 50% rubberlike polymer-resin mixture and about 80% to about 50% inert filler; the binder mixture advantageously contains about 25% to 80% rubberlike polymer and about 75% to 20% reinforcing resin. A typical binder contains 55 parts polyvinyl chloride and 45 parts butadiene-acrylonitrile copolymer containing about 35 parts acrylonitrile.

The floor coverings of my invention are characterized by excellent properties, such as resistance to alkalies, oils, and the like, and are further characterized by resistance to indentation and gouging due to the resistance of the coating paint to materials contained in the organosol print paints. Increased solvent resistance is obtained and more solvent resistant material may be included in the seal coat without sacrificing flexibility of the finished floor covering. While particular reference has been made to floor coverings, the products of my invention may be also employed as wall coverings.

I claim:

1. In the manufacture of block printed floor or wall covering prepared by printing onto a saturated backing a vinyl resin paint containing solvents and diluents which will deleteriously affect a urea-formaldehyde resin coating on said backing, and subjecting the printed floor covering to temperatures in excess of about 300° F., the improvement comprising coating said saturated felt with a composition, the binder of which contains relative proportions of about 50 parts by weight water-soluble urea-formaldehyde resin and about 50 to about 75 parts by weight water-soluble alkyd resins, and treating said binder to convert said resins to a water-insoluble condition, whereby said solvents and diluents in said print paint will not deleteriously affect said composition.

2. The method according to claim 1 wherein said composition contains a catalyst for curing said urea-formaldehyde resin.

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