Nov. 14, 1950 H. W. CROCKETT 2,529,799

MOISTURE RESISTANT COVERING MATERIAL

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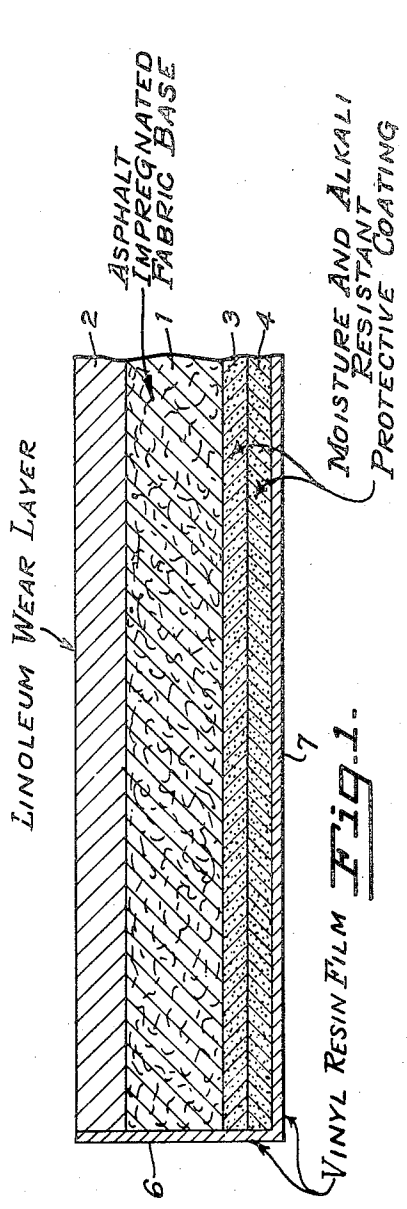


Fig. 1.

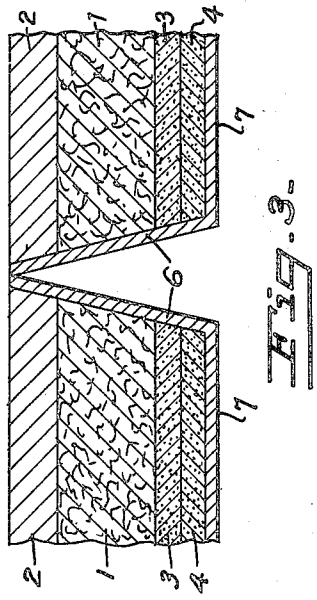


Fig. 3.

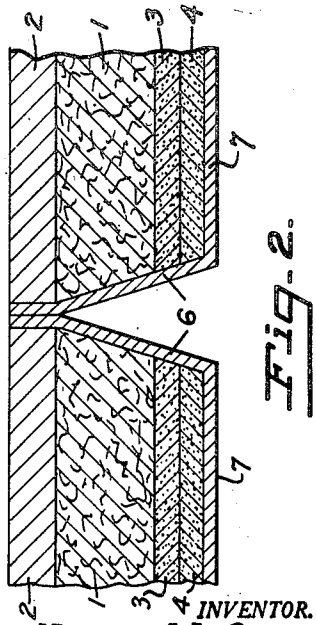


Fig. 2.

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MOISTURE RESISTANT COVERING MATERIAL

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My invention relates to covering material, and more particularly to a fabric base or foundation sheet having a decorative surface layer such as linoleum or the like, and which is particularly adapted for installation on sub-surfaces such as floors, walls or the like subject to dampness.

The installation of conventional surface coverings of the type described on cement sub-surfaces, such as cement floors, presents a problem because the moisture frequently present, and the alkali brought up by the moisture result in rapid deterioration of the covering. This problem becomes especially bothersome where the cement sub-surface is below ground level, because the cement generally absorbs moisture from the ground, and hence remains damp. A linoleum wear layer is especially adversely affected by the alkaline dampness frequently existing on cement sub-surfaces, because the alkalinity attacks the saponifiable solidified oils and the resins in the linoleum composition, and also causes rotting of the conventional burlap backing or foundation sheet.

My invention is designed to overcome this problem, and it has as its objects, among others, the provision of an improved coating for covering material of the character described which will enable the covering material to be united to sub-surfaces subject to dampness and will protect the covering against deterioration which would otherwise result from the moisture present, and which can be readily and economically applied. Other objects of my invention will become apparent from the following description.

Referring to the drawings:

Fig. 1 is a fragmentary sectional view of my improved coated covering, which, for purposes of clarity, is more or less schematic in illustrating the relative thickness of the various layers;

Fig. 2 is a similar view showing the covering formed in individual tile shapes having undercut beveled edges;

Fig. 3 is a view similar to Fig. 2 illustrating a different form of undercut on the edges.

In general, the covering of my invention comprises any suitable flexible fabric foundation sheet or base 1 which is preferably well known asphalt-impregnated felt, in which the asphalt imparts body to the sheet and renders it moisture resistant. Such base may be impregnated with any other suitable moisture resistant composition, such as varnishes, resins and that disclosed in my assignee's United States Patent No. 1,802,009, dated April 21, 1931. On top of the base 1 is provided an ornamental and wear resistant layer 2 of any suitable coating material such as print

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paint or enamel but I preferably employ any usual linoleum mix applied to such base in the well known manner for the making of linoleum.

If a paint or enamel coating is employed as the wear layer, I preferably employ the usual seal coat over the foundation sheet 1 to preclude bleeding of the impregnant into the paint which might otherwise occur. The base sheet 1 is preferably about 0.030 to 0.050 in. in thickness and the wear layer when comprising linoleum about 0.035 to 0.085 in. thick. In this connection, it is to be understood that these dimensions are merely by way of example, and may be varied in accordance with commercial requirements and the wear resisting qualities desired.

Even though foundation sheet 1 is impregnated with the moisture resistant material, this does not serve to prevent deterioration of the covering material when it is laid on an inherently damp sub-surface, such as cement below ground level, because it is difficult to render the foundation sheet entirely moisture impervious. I therefore provide on the underside of foundation sheet 1, a protective coating of both moisture and alkali resistant material. A single coating of such material having a suitable thickness may be employed, but I preferably apply two separate coatings 3 and 4 for the reason that it may be difficult to obtain complete coverage of the back of the foundation sheet by application of a single coat even though it is a comparatively thick coat. However, by applying two separate coats, the second one of which is applied after the first has dried, and the combined thickness of which may be no greater than a single coat, complete coverage is insured. The thickness of each coat may be about 0.001 in. to 0.003 in.

Any composition may be employed as the backing coating which is both alkali resistant and moisture resistant. For example, compositions of the type disclosed in United States Patent to Allen, No. 2,300,193, dated October 27, 1942 may be utilized. However, I prefer to employ a composition consisting essentially of the reaction product of an oil reactive synthetic resin and a fatty acid pitch, and which contains a suitable alkali resistant filler and also preferably a small quantity of gilsonite to increase the drying rate of the coating and impart to it a harder film. In preparing such type of composition, well known varnish making principles are employed. The fatty acid pitch, the synthetic resin, and the gilsonite may be first reacted by application of heat, and then a small quantity of drier is preferably incorporated. Air blowing is also preferably employed to provide a melting point of the composi-

tion of about 180° F. to 190° F. (A. S. T. M. D36–26, Ball and Ring method). The reacted mass is then dissolved in a suitable solvent thinner. When ready to be applied as a coating, the alkali and moisture resistant filler is thoroughly incorporated. A satisfactory formula in percent and parts by weight on the dry basis is as follows:

	Percent
Cottonseed pitch	9.50
Cresylic resin (alkali condensed cresol-formaldehyde resin, preferably "Super Becacite #P–172 by Reichhold Chemicals, Inc.) (M. P. range 230° F. to 244° F.) (A. S. T. M.—D36–26, Ball and Ring method) (Acid No. 55–60)	1.50
Gilsonite	3.00
Drier (litharge, manganese naphthenate, and hydrated lime in about equal proportions)	1.00
Whiting (finely divided)	85.00
	100.00

The cottonseed pitch, the cresylic resin and the gilsonite are heated in an open varnish kettle to about 480° F. This temperature is held until the ingredients are thoroughly melted and foaming ceases. Next the litharge and the hydrated lime are slowly added with stirring, and the charge is heated slowly up to about 500° F. While this temperature is maintained, the charge is air blown until the melting point reaches about 180° F. to 190° F., whereupon the charge is removed from the fire and the manganese naphthenate is added with stirring.

After these ingredients except the whiting have been thus reacted, they are then dissolved in any suitable solvent which will dissolve the ingredients and yet have minimum solvent effect on the preferred asphalt impregnant for the base sheet 1. Hydrocarbon solvents of petroleum origin are best adapted for this purpose; and it is preferred to incorporate alcohol in the solvent to inhibit the solvent effect on the asphalt. A ratio of about 40 parts by weight of the reacted ingredients to about 60 parts by weight of solvent is preferred. The solvent preferably comprises about 90% by weight of petroleum thinner and about 10% by weight of denatured alcohol. To the resultant vehicle comprising the solvent and the reacted ingredients, is then added with stirring the requisite amount of whiting in accordance with the formula which will be about 70 parts by weight of the whiting, to about 30 parts by weight of the vehicle. The solvent extended vehicle containing the whiting provides the coating composition which after application to the base 1 and upon evaporation of the solvent, provides the desired proportions on the above noted dry basis.

The first coat 3 may be applied to the desired thickness by any suitable flexible steel blade coating machine whereupon the sheet is heated in a suitable festooner at about 150° F. until the coat has dried to a sufficiently non-tacky condition permitting application of the second coat 4 which is similarly dried. The drying period for each coat may take from 3 to 5 hours. After such drying, the linoleum wear layer 2 is applied and the entire covering with its two back coatings 3 and 4 is then stoved or cured at a temperature of about 165° F. for about 10 to 14 days.

Application of the linoleum layer 2 is accomplished in the usual manner, namely, by laying a suitable linoleum mix on the upper surface of the foundation sheet 1 and pressing the same to the sheet by passing the sheet through conventional warmed rolls which are spaced apart sufficiently to press firmly the linoleum mix to the sheet without distorting the sheet. As previously mentioned, instead of applying the backing as two separate coatings 3 and 4, a single backing coating having approximately the combined thickness of the two coatings may be applied, but the two individual coatings are preferred to insure complete coverage and also more thorough drying.

In the above formula for my preferred alkali and moisture resistant backing coating, the proportions stated, although preferred as they have been found to produce the best results, are not particularly critical. Such proportions may vary widely depending upon the particular characteristics of the coating desired. A suitable range of proportions on the dry basis and in parts by weight is as follows:

	Parts by weight
Cottonseed pitch	5–15
Cresylic resin	1– 5
Gilsonite	2–10
Drier	½– 5
Whiting	50–90

The amount of solvent may vary widely but should be sufficient to permit ready application of the coating. The greater the amount of alkali resistant filler (whiting) the harder will be the resultant coating; while the quantities of gilsonite, and the oil reactive resin which reacts with the pitch in processing of the coating determine to a considerable extent the resultant flexibility of the coating.

Substitutions of ingredients may also be made for those of my preferred composition, in the range of proportions stated. Instead of cottonseed pitch, any other fatty acid pitch of vegetable or animal origin may be employed, such as any of the so-called stearine pitches, soy bean pitch, linseed pitch, marine pitch, and tall oil pitch. Drying or semi-drying oils, such as linseed, tung and soy bean oils, may be partially substituted in minor amounts for the fatty acid pitch. Mixtures of the oil and the pitch may be also utilized.

In place of the preferred cresylic resin, any other alkali resistant synthetic resin may be utilized, having oil reactive functional groups capable of reacting with drying or semi-drying oils and also with the fatty acids of the pitch. Resins of the phenolic type are preferred, such as an oil reactive paraphenyl phenol-formaldehyde resin (preferably "Bakelite" BR 254, by Bakelite Corporation). However, the resin may be of other types, such as alkyl type resins, preferably the adduct of maleic anhydride and cyclopentadiene reacted with rosin and a polyhydric alcohol, such as glycerol, such as disclosed in the patent to Catlow, No. 2,381,969, dated August 14, 1945 (particularly "Bakelite"—BR 13,202, by Bakelite Corporation); and the adduct of terpinene and maleic anhydride reacted with rosin and a polyhydric alcohol, such as glycerol, such as disclosed in the patent to Peterson, No. 1,993,028, dated March 5, 1935, (particularly "Petrex" X4356–89, by Hercules Powder Co.). Also suitable are polymerized hydrocarbon resins of petroleum origin produced by catalytic polymerization of unsaturated petroleum fractions, such as ("Velsicol" AF–3, by Velsicol Corporation).

The gilsonite, which may be either natural or

synthetic gilsonite, may be omitted from the product, but is preferred, as it results in harder and more alkali resistant coatings. Any of the well known driers, such as cobalt, manganese, lead or zinc naphthenates, tallates or linoleates may be utilized in place of my preferred drier. As the filler, instead of whiting, any other finely divided alkali resistant mineral may be substituted, such as asbestos fines, trap rock, asbestine, and diatomaceous earth. Clay containing fillers are not desirable because of emulsifying tendencies in the presence of moisture.

I have found that even with the alkali and moisture resistant back coating applied to the foundation sheet, there may be locations of weakness therein through which alkali containing moisture may pass from the sub-surface and attack the sheet. Also, such back coating does not in any way protect against moisture attack that may obtain at the raw uncoated edges of the sheet. In the case where the sheet is pre-cut in the form of tile, and laid as such, such attack at the raw edges is particularly troublesome. To overcome these problems, I find it extremely important to coat the raw edges, and also the moisture and alkali resistant back coating with a moisture and alkali impermeable film. Such film is illustrated as edge coating 6 and under surface coating 7 in Fig. 1.

The choice of material and ease of application are important in providing such alkali and moisture impermeable film. I discovered such film can be readily formed of so-called vinyl type resins formed essentially of halogen substituted ethylene polymers or copolymers and which are of a viscosity and molecular weight adapted to provide suitable bases for lacquer or solution application. For this purpose, the molecular weight of the resin will generally be about 6,000 to 12,000 (Staudinger viscosity method). Any suitable resin of this type may be employed, which will dissolve without much difficulty in any suitable solvent therefor, to enable solution application thereof. After the solvent evaporates, a relatively tough flexible film obtains. The lacquer may be conveniently applied to the back coating by any suitable method such as brushing or spraying, but preferably by doctor blade or roller coating application. Over the raw edges of the sheet, brush or spray application is preferred because such application is conveniently applied simultaneously on a plurality of edges of vertically stacked sheets.

My preferred lacquer base is a vinyl chloride, vinyl acetate copolymer containing from 85% to 88% by weight of vinyl chloride, such as "Vinylite-VYHH" by Carbide and Carbon Chemicals Corporation, and having an average molecular weight of about 10,000 (Staudinger viscosity method). I preferably employ quick drying solvents, preferably those of the ketone type, such as methyl ethyl ketone, methyl isobutyl ketone or acetone. These solvents may be diluted up to 50% dilution of the total solvent content, with diluents of the aromatic hydrocarbon type, such as xylene, toluene, or aromatic petroleum hydrocarbons.

My preferred lacquer formula in parts and percent by weight is:

	Percent by weight
Vinyl chloride-vinyl acetate copolymer "Vinylite-VYHH"	25
Methyl ethyl ketone	75
	100

As is well known in the lacquer art, the proportions of the solvent and the lacquer base may vary widely, depending on viscosities desired and conditions of application. Other suitable vinyl resin bases for the lacquer are polymerized vinyl chloride alone, vinyl chloride-vinylidene chloride copolymers, and vinylidene chloride-acrylonitrile copolymers, all of the described molecular weight for solvent application. Other halogens besides chlorine, such as bromine, may be substituted in the ethylenes, as is well known for these types of resins. Small quantities of plasticizers such as tricresyl phosphate, butoxyglycol phthalate, chlorinated diphenyl and dibutyl phthalate may be incorporated in the usual amounts of up to about 35% by weight of the resin base. However, it is preferred to omit the plasticizer because it may render the film less impervious to moisture.

Another typical lacquer formula is as follows:

	Percent by weight
Polyvinyl chloride (6,000 to 10,000 molecular weight by Staudinger viscosity method)	6.3
Methyl ethyl ketone	70.3
Acetone	23.4
	100.0

The quantity of lacquer applied is preferably such that for every 100 square yards of material, there will be approximately 1.0 to 2.0 lbs. of non-volatile ingredients left after evaporation of the solvent. This will produce a moisture impervious film of about 0.0005 to 0.0010 in. thick. The lacquer is applied to the back coating 4 after the wear layer 2 is applied and after the previously described curing. To expedite drying of the lacquer, the parent sheet may be run through a drying tunnel which is at a graduated temperature of 175° F. to 250° F.; the total time in the tunnel being about 1 minute. After the parent sheet has been dried, it may be cut into the form of tile when tile is to be produced.

To allow for edgewise expansion of the material when laid in the form of pre-cut tile, I preferably undercut or bevel the edges, as shown in Figs. 2 and 3 in which the same reference characters are applied as in Fig. 1. A 15° straight undercut from the vertical, as illustrated in Fig. 3, is suitable. However, such undercut need not extend all the way but may be partial as is illustrated in Fig. 2, in which the undercut is not formed in wear layer 2. The angle of the undercut may vary depending upon the expansion characteristics of the material, but generally it should not exceed 20° from the vertical. If desired, the undercut may be omitted. In any event, after the parent sheet has been cut in the form of tile, the raw cut edges are coated with the lacquer, as was previously explained. Drying of the coated edges may be expedited in the manner previously related for drying of the back coating.

In laying the covering material on the sub-surface, any suitable so-called water-proof floor covering adhesive may be employed for cementing the covering to the sub-surface, such as disclosed in United States Patent No. 1,846,637 to Fleischman, dated Feb. 23, 1932. Preferably the adhesive should contain an aromatic solvent, as in the described patent formula, because such solvent causes slight softening of the moisture impermeable film 7 to enhance bonding power to the sub-surface to which the covering is united. My preferred adhesive is of the asphaltic

type and in accordance with the following formula in percent and parts by weight:

	Percent by weight
Asphalt	50
Paracoumarone indene resin ("Cumar A–X" by The Barrett Company)	15
Asbestos fibre	10
Benzol	25
	100

In place of benzol, aromatic petroleum solvent may be employed.

In cementing my covering to the sub-surface, the usual floor covering cementing technique may be employed by the workmen. When cementing the covering to cement sub-surfaces, it is desirable to remove the alkalinity present at the surface of the cement by washing it with acid. A 2 to 1 dilution of water and commercial hydrochloric acid containing about 35% by weight of hydrogen chloride is satisfactory for this purpose. After such acid treatment, the sub-surface is flushed clean with fresh water until the acid is washed off. The acid treatment in addition to cleaning the surface, produces an etched surface on the cement, which imparts "tooth" to the surface and hence enhances bonding to the cement. Preferably, after the acid treatment and the subsurface is dry, I coat it with a prime coating of a vinyl resin lacquer of the same type applied to the covering material itself, to provide a moisture and alkali seal on the cement surface; and after the primer is dried, the covering may be cemented thereto. The acid treatment of the cement surface and the prime coating thereon are not essential but are preferred.

Although the covering material of my invention is particularly adapted for cement sub-surfaces below ground level where the moisture present is usually high, it may be applied to any other sub-surfaces such as metal or wood. The preferred construction of my covering embodies the moisture and alkali resistant back coating **3**, **4**, but it is to be understood that the vinyl resin moisture and alkali impermeable coating **7** may be employed alone on the back surface and on the exposed raw edges of the covering, with some enhancement of the life of the covering when laid in damp environments. The coating **3**, **4** is desirable, however, as it provides a second line of defense against such moisture.

I claim:

1. Covering material comprising a fibrous foundation sheet impregnated with a waterproofing agent, a top linoleum wear layer, a vinyl chloride-vinyl acetate copolymer resin providing a moisture impervious film on the back of such sheet, and a moisture and alkali resistant coating between said moisture impervious film and said sheet; said coating comprising the reaction product of a fatty acid pitch and an oil reactive synthetic resin, and containing a moisture and alkali resistant mineral filler.

2. As an article of manufacture, a preformed flexible covering material the back of which is adapted to be adhesively united to a subsurface and which is resistant to deterioration in the presence of moisture which may be present in such subsurface, comprising a fibrous foundation sheet impregnated with a waterproofing agent, a top non-metallic ornamental wear layer, a vinyl resin providing a moisture impervious film on the back of said sheet, said vinyl resin being selected from a group consisting of a vinyl chloride-vinyl acetate copolymer, polymerized vinyl chloride, vinyl chloride-vinylidene chloride copolymers, and vinylidene chloride-acrylonitrile copolymers, and a moisture and alkali resistant coating between said vinyl resin film and said foundation sheet; said coating comprising a resinous composition containing a moisture and alkali resistant mineral filler.

3. As an article of manufacture, a preformed flexible covering material the back of which is adapted to be adhesively united to a subsurface and which is resistant to deterioration in the presence of moisture which may be present in such subsurface, comprising a fibrous foundation sheet impregnated with a waterproofing agent, a top non-metallic ornamental wear layer, a vinyl resin providing a moisture impervious film on the back of said sheet, said vinyl resin being selected from a group consisting of a vinyl chloride-vinyl acetate copolymer, polymerized vinyl chloride, vinyl chloride-vinylidene chloride copolymers, and vinylidene chloride-acrylonitrile copolymers, and individual moisture and alkali resistant coatings between said vinyl resin film and said fibrous foundation sheet; each of said coatings comprising a resinous composition containing a moisture and alkali resistant mineral filler.

HAROLD W. CROCKETT.

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