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COVERING

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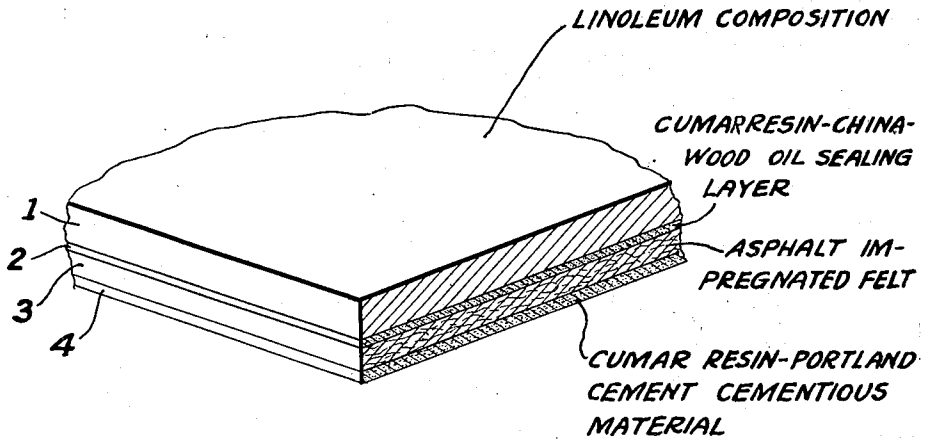

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COVERING

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This invention relates to smooth surface coverings comprising a decorative and wear-resisting surface material such as linoleum composition or the like and comprising a sheet-like foundation such as felt, fabric or the like. This invention relates especially to coverings suitable for installation on floors, walls, or the like.

It is an object of this invention to afford smooth surface coverings of the character mentioned which can be satisfactorily installed on sub-surfaces such as floors or walls that are subject to dampness. Ordinary linoleum, for example, cannot be satisfactorily installed on a damp sub-surface such as a damp concrete floor. Concrete frequently contains substantial moisture, e. g., because it is "green" (that is, not completely dried out) or because the concrete is at or below grade and therefore tends to absorb moisture from the ground. When ordinary linoleum is laid directly on damp concrete (i. e., without special treatment for first waterproofing the concrete) the moisture tends to prematurely disintegrate the surface layer of linoleum composition and the foundation sheet to which the linoleum composition is bonded and to weaken the strength of the bond between the linoleum composition and the foundation sheet. This invention is particularly suitable for use in the manufacture and installation of linoleum in tile form. Floor coverings made in the form of tiles are widely used for covering concrete basement floors but heretofore linoleum tiles have not been used due to their tendency to become deteriorated if the concrete surface is damp. The alkaline dampness of moist concrete is particularly harmful to linoleum.

In Patent No. 1,970,503, a ready-to-lay smooth surface covering of the linoleum or felt base type is described which is characterized by the fact that a cementitious material is preformed at the factory on the back of the body portion of the covering. While the coverings referred to in this patent are extremely desirable in ordinary use, the structures described are not suited for direct application to damp sub-surfaces such as moist concrete.

According to this invention, a smooth surface covering can be produced which has a smooth surface layer of ordinary linoleum composition, for example, but which can be successfully installed on a damp sub-surface such as moist concrete. For purposes which are mentioned in detail below, the covering is preformed with a layer of hardened cementitious material on the back thereof. This layer of cementitious material is of a special character described below and is combined with a body portion of the covering which is characterized primarily by imperviousness and resistance to disintegration by moisture.

Certain of the features of this invention relate to the new ready-to-lay product. Other features of this invention relate to the method of installing the product. From the point of view of the new product, resistance to sub-surface moisture is afforded by combining the moisture-resistant body portion of the covering with a water- and alkali-resistant cementitious layer which is preformed on the back of the covering and which contains a water- and alkali-resistant binder material that is soluble in water-miscible solvents.

A water- and alkali-resistant binder material that may be mentioned for purposes of exemplification and that may be used pursuant to the preferred practice of this invention is paracoumarone resin which will be referred to herein, for purposes of brevity, as cumar resin. This substance has the requisite resistance to water and to alkalis. Cumar resin is not appreciably affected by alkaline solutions such as are encountered in moist concrete.

In addition to the water- and alkali-resistant binder such as cumar resin, the backing layer of the covering preferably contains a water- and alkali-resistant filler. A preferred example of such a filler is Portland cement. Portland cement when included in the composition is water reactive and has the tendency to absorb any free moisture. Upon taking up moisture it becomes hardened, thus improving the bond rather than otherwise, and the hardened Portland cement is resistant to both water and alkali to which it may be subjected.

A desirable composition can be afforded by using the cumar resin and Portland cement in about equal proportions. While a mixture of these materials can be used alone, the addition of minor proportions of other ingredients is usually preferable. The following is a typical formula for a cementitious material adapted for use as a cementitious damp proof backing for coverings in the practice of this invention:

	Per cent
Cumar resin	43
Portland cement	43
Chlorinated rubber	2
Butyl "Cellosolve"	2
Pine oil	1
Asbestos fiber	9

The asbestos gives body to the cementitious ma-

terial and increases the film strength of the cement while wet. The chlorinated rubber adds to the tackiness and improves the adhesion of the cementitious material to the covering. The butyl "Cellosolve," that is mono-butyl glycol ether, serves as a solvent and plasticizer for the chlorinated rubber. The pine oil is a plasticizer and odorant.

In lieu of cumar resin, other water-resistant binder materials may be used such as synthetic phenol-aldehyde resins which are soluble in water-miscible solvents and which are preferably of low acid value. As above-mentioned, it is distinctly preferable to combine with the water- and alkali-resistant binder which is soluble in a water-miscible solvent, a filler material that is resistant to water and alkalis. Other such filler materials than Portland cement which may be referred to for purposes of illustration are china clay, whiting or talc. The use of at least about 35% of such filler materials is preferable. While still further ingredients may be included in the cementitious material for the back of the covering, all or part of these materials may be omitted without departing from the scope of this invention. In order to achieve the advantages of this invention to a commercially desirable extent, the cementitious material for the back of the covering should preferably contain at least about 20% of water- and alkali-resistant binder soluble in water-miscible solvents.

As hereinbefore mentioned, it is essential that the covering according to this invention comprise in combination with the backing of cementitious material above described, a body portion which is substantially impervious to moisture and not deteriorated thereby. Such body portion will preferably include as one element a strain-resisting foundation sheet which is water-resistant and substantially unaffected by moisture, and as another element, a water-insoluble and alkali-resistant sealing coat or layer. Ordinary linoleum normally comprises a foundation sheet of burlap or impregnated felt. The burlap foundation sheet is not waterproof and rapidly deteriorates in the presence of moisture while the impregnated felt, although water-resistant, is likewise subject to gradual permeation of moisture therethrough. By modifying the ordinary linoleum so as to employ a foundation sheet, such as a felted or woven fabric which has been thoroughly impregnated with a water-proofing material, and by providing a separate water- and alkali-resistant sealing coat or layer on one face of the foundation sheet, the body portion of the covering can be made substantially impervious to moisture and undeteriorated thereby. The coating of water-insoluble and alkali-resistant material is interposed between the felted or woven fabric sheet and the layer of decorative and wear-resisting material overlying the sheet. This coating or layer not only increases the waterproofness of the body portion as a whole, but also serves to bond the layer of linoleum composition or the like more firmly to such foundation sheet than would otherwise be the case. Furthermore, since this bonding layer is resistant to water and alkalis, this bonding layer is not disintegrated by any alkaline dampness than might penetrate through the impregnated fiber portion of the foundation sheet. The foundation sheet either per se or combined with the sealing layer will be referred to as the foundation member. By manufacturing the foundation member as described, it can be made waterproof. It likewise can be made resistant to disintegration by moisture.

For purposes of exemplification, the foundation sheet may, according to this invention, be made of felt and saturated with a bituminous saturant so that the felt is completely resistant to deterioration from moisture. Preferably the felt is coated with a continuous coating of water-insoluble material such as a coating comprising a water- and alkali-resistant resin as a binder. The coating may be made up using cumar resin and China-wood oil as a binder and a filler consisting of whiting, and red oxide of iron. The continuous coating or layer of water-insoluble material is disposed between the asphalt impregnated felt and a layer of decorative and wear-resisting material such as linoleum composition.

The component parts of a specific covering illustrative of this invention are as follows:

1. *Wearing surface*

Linoleum composition about 1.0 to 1.5 mm. in thickness.

2. *Intermediate sealing layer*

Varnish thinned with a suitable solvent and approximately about .03 mm. in thickness when hardened, said varnish having the following composition (dry basis):

	Percent
Cumar resin	10
China-wood oil	10
Whiting	72
Red oxide	8

3. *Strain-resisting foundation sheet*

A felted sheet of about 1.0 mm. in thickness saturated from 100% to 150% with an asphalt of about 20 penetration and about 155° F. softening point.

4. *Damp-proofing cementitious material*

A backing layer of cementitious material about .15 to .25 mm. in thickness and containing the ingredients given in the example mentioned hereinabove.

The covering can be manufactured in the usual way. A sheet of felt is first impregnated with a bituminous impregnating material. The bitumen impregnated felt is then coated with the sealing layer. This layer may be conveniently applied as a varnish, and the varnish is permitted to harden by evaporation of the solvent used to thin the solid varnish constituents. The linoleum composition is then deposited as is customary in the linoleum art on the sealing coating, the sealing coating and impregnated felt providing a waterproof foundation. After curing or seasoning the linoleum composition, the damp-proof backing is next applied by heating the cementitious material to about 220° F. and applying it in a heat softened condition to the back of the linoleum by means of a doctor blade. Upon cooling, the cementitious material becomes hard and the covering may be cut to size and packed for shipping.

The cementitious backing may also be applied by softening it with a solvent, applying it as a varnish, and permitting the solvent to evaporate. In any method of application precautions should be taken not to introduce moisture into the composition which would react with the Portland cement when this or other similar water-reactive material is used.

When it is said that the cementitious damp-

proof backing is "hard" or "normally hard" it is to be understood that these terms are used to distinguish from material which is so soft as to run or so soft and sticky as to readily stick to the surfaces of objects. That the cementitious backing may have sufficient tackiness or stickiness to stick somewhat to the surface of the covering when the covering is rolled or is stacked for purposes of storage is not inconsistent with the term "hard." If the surface of the covering should have sufficient tackiness as to cause such sticking during storage, this can be overcome by the use of a thin protective coating. A dusting of some material such as talc, or a sprayed emulsion of casein and chlorinated rubber are satisfactory, but the coating or dusting should not be such as to prevent the ready activation of the damp-proof backing with a water-miscible solvent.

When it is desired to use the covering, the cementitious material on the back of the covering may be activated by a water-miscible solvent for the water- and alkali-resistant binder material in the cementitious layer, e. g., acetone, methyl ethyl ketone or the like. Butyl "cellosolve" may also be used as a water-miscible solvent. When a synthetic phenol-aldehyde type resin is used, alcohol may be used as the solvent

In the preferred method of installation according to my invention, the surface on which the covering is to be laid is first coated with a spreadable composition comprising a water and alkali-resistant binder material dissolved in an appropriate water-miscible solvent. The binder material thus applied to the surface to be covered is preferably small in amount and is used primarily as a carrier for the water-miscible solvent. However, such additional binder cooperates with the binder preformed on the back of the covering to bond the covering to the sub-surface and is advantageous for this purpose. After the binder material and volatile solvent have been applied to the surface to be covered, the covering which will preferably be in the form of tiles should be deposited before the solvent has had an opportunity to evaporate. The solvent immediately activates the binder material on the back of the covering. Since the amount of solvent is relatively small, the adhesive sets rapidly and the covering, immediately upon being deposited in place, becomes bonded very firmly and uniformly with the sub-surface. Due to the formation of a powerful and immediate grip between the covering and the sub-surface, any tendency for the covering to curl at the corners is minimized. With similar coverings in tile form but without a backing layer of cementitious material there is a pronounced tendency for the corners to curl due to the swelling action of the solvent on the fabric back of the covering and sand bags have heretofore been used as weights to prevent curling. By the use of a cementitious backing layer of the character above-mentioned, this tendency to curl can be substantially eliminated and the use of sand bags can be dispensed with. Moreover, by having the cementitious back preformed on the covering, the total quantity of solvent necessary to produce satisfactory adhesion is relatively small and becomes dissipated much more rapidly than would be the case if no cementitious backing material were preformed on the back of the covering. The rapid dissipation of the solvent is desirable in securing a permanent bond as rapidly as possible and in removing the solvent so that it can not have a deleterious effect on the body portion of the covering. The solubility of the binder in a water-miscible solvent is of great importance, since this property of the solvent permits it to escape through the damp concrete. A further advantage of preforming the cementitious composition at the back of the covering is that it insures the presence of a continuous membrane of water- and alkali-resistant material between the sub-surface (e. g., damp concrete) and the body portion of the covering, as well as a uniform and continuous bond to the sub-surface. The fact that the backing carries part of the cementitious material used for bonding the covering to a sub-surface is also a great practical advantage due to difficulties incident to applying all the adhesive to the sub-surface, e. g., such difficulties as skinning, uneven application, and the like. These difficulties are overcome by utilizing as the damp proof backing an inherently cementitious composition.

If desired, the solvent-containing composition which is applied to the sub-surface may be very similar in composition to the composition of the cementitious layer preformed on the back of the covering structure. A suitable composition for this purpose is one having the following composition:

	Wet basis	Dry basis
	Per cent	*Per cent*
Cumar resin	35	42
Methyl ethyl ketone	16	0
Butyl "Cellosolve"	1	0
Pine oil	1	1
Chlorinated rubber	2	2
Asbestos fiber	8	9
Portland cement	37	46
	100	100

By having the composition substantially the same formula as that of the cementitious material preformed on the back of the covering, the merging of the two cementitious materials with each other is promoted. While it is preferable to include the ingredients other than the cumar resin in the adhesive that is applied to the sub-surface when thinned with a water-miscible solvent, the cumar resin or other water- and alkali-resistant binder material can be used alone and mixed with a suitable solvent. Other binder materials may be used in the adhesive such as water- and alkali-resistant synthetic phenol-aldehyde resins. The use of a water- and alkali-resistant filler in the adhesive composition such as Portland cement is preferable. Among such fillers Portland cement is to be preferred due to its water-reactive properties, but other water- and alkali-resistant fillers may be used such as china clay or whiting.

As above pointed out, a covering made according to this invention can be installed merely by activating the backing thereof with a water-miscible solvent and then depositing the covering on a sub-surface.

The wear-resisting and decorative surface of the covering not only may consist of linoleum composition, but also may be made of any other suitable coating or molded material such as paint, lacquer, enamel or the like, having as a basis a drying oil, a soluble cellulose ester, or the like. Moreover, the wear-resisting ornamental surface layer not only may be in the form of a separate layer overlying the foundation sheet of the covering, but also may be the surface of the foundation sheet itself. For example, suitable ornamenta-

tion may be impregnated directly into the upper surface of the foundation sheet. In such case the foundation sheet should be thoroughly impregnated with a water-insoluble material such as a resinous or oleoresinous material so that the foundation sheet itself may be substantially water-proof without the use of an impervious sealing coat.

As above mentioned, the foundation sheet may be any sheet-like material suitable as a backing or support for the wear-resisting or ornamental surface. The foundation sheet not only may be impregnated with a water-insoluble material of an asphaltic character, but also may be impregnated with other water-insoluble materials, as well, such as resins or varnish, so as to make the foundation sheet substantially water-proof. As mentioned hereinabove, the foundation sheet is preferably coated with a continuous coating of water-insoluble material, such as a varnish, using cumar resin and China-wood oil as a basis. Moreover, other water-insoluble and alkali-resistant binder materials may also be used for this coating, such as phenolic resin varnish, plasticized chlorinated rubber, etc. This layer preferably contains at least about 15% of a water- and alkali-resistant binder. It also preferably includes at least about 50% of a water- and alkali-resistant filler such as the fillers above mentioned, or other fillers such as china clay.

To assist in an understanding of this invention, the specific embodiment thereof described above for purposes of exemplification is shown in the accompanying drawing which is a perspective view with one side in section of a portion of the covering, the drawing being somewhat enlarged and semi-diagrammatic in indicating the relative thickness of the layers. The covering comprises a wearing surface layer 1 of linoleum composition of suitable color or combination of colors, a strain-resisting foundation sheet 3 of asphalt-impregnated felt, an intermediate sealing layer 2 having a cumar resin-China-wood oil base, and a cementitious layer 4 that is moisture-resistant and is composed primarily of cumar resin and Portland cement.

If the foundation sheet is sufficiently water-proof in itself, the sealing layer may be omitted, but it has been found that the sealing layer overlying the impregnated foundation sheet contributes to the resistance of the covering to subsurface moisture.

While this invention has been described in connection with certain specific embodiments thereof, this has been done for purposes of illustration and variations may be availed of according to this invention within the scope of the language of the following claims.

I claim:

1. As an article of manufacture, a preformed covering of the character described which is resistant to disintegration by moisture present in the sub-surface to which the covering may be applied, comprising a sheet-like body portion and on the back of said body portion a normally hard and water-resistant cementitious material, said body portion including a fibrous sheet impregnated with a waterproofing material, a top decorative and wear-resistant layer of linoleum composition and an alkali-resistant and substantially water-impermeable sealing layer containing water- and alkali-resistant resinous material between said sheet and said surface layer and directly bonded to the upper side of said sheet, and said cementitious material being directly bonded to the under side of said sheet and comprising at least about 20% of cumar resin.

2. As an article of manufacture, a preformed covering of the character described which is resistant to disintegration by moisture present in the sub-surface to which the covering may be applied, comprising a sheet-like body portion and on the back of said body portion a normally hard and moisture-resistant cementitious material, said body portion including a fibrous sheet impregnated with a waterproofing material, a top surface layer of wear-resistant and decorative material and a continuous alkali-resistant sealing layer which is composed essentially of water insoluble materials and is between said sheet and said surface layer and directly bonded to said sheet and which contains a water- and alkali-resistant resinous material, said covering being free of non-alkali and non-water-resistant material between said body portion and said cementitious material and said cementitious material including a water- and alkali-resistant resinous material soluble in a water-miscible solvent.

3. As an article of manufacture, a preformed covering of the character described which is resistant to disintegration by moisture present in the subsurface to which the covering may be applied, comprising a continuous top decorative and wear-resistant surface layer of linoleum composition and a composite backing integral with said layer of linoleum composition, said composite backing consisting of fibrous sheet material impregnated with a bituminous waterproofing material, a continuous water- and alkali-resistant sealing layer containing resinous material between said sheet and said layer of linoleum composition, and on the side of said sheet remote from said layer of linoleum composition continuously applied water- and alkali-resistant material comprising cementitious composition presenting a normally hard outer surface and including a water- and alkali-resistant filler and a water- and alkali-resistant resinous material soluble in a water-miscible solvent.

4. As an article of manufacture, a preformed covering according to claim 3, said cementitious composition consisting in major proportion of a mixture of cumar resin and a water- and alkali-resistant filler.

5. As an article of manufacture, a preformed covering of the character described which is resistant to disintegration by moisture present in the subsurface to which the covering may be applied, said covering consisting of a continuous top decorative and wear-resistant surface layer consisting essentially of drying oil composition, fibrous sheet material impregnated with a bituminous waterproofing material, a continuous sealing layer of water- and alkali-resistant material comprising a water- and alkali-resistant resinous material between said fibrous sheet material and said layer consisting essentially of drying oil composition, and on the other side of said fibrous sheet material continuously applied water- and alkali-resistant material consisting essentially of normally hard cementitious composition comprising in major proportion a water- and alkali-resistant filler and a water- and alkali-resistant resinous material soluble in a water-miscible solvent, said resinous material constituting at least about 20% of said cementitious composition.

6. As an article of manufacture, a covering of the character described which is resistant to dis-

integration by moisture present in the subsurface to which the covering may be applied, comprising a sheet-like body portion and on the back of said body portion a continuous backing layer of normally hard and water-resistant and alkali-resistant cementitious composition containing resinous material, said body portion including fibrous sheet material impregnated with waterproofing material, a top layer of decorative and wear-resistant material and between said sheet material and said top layer a continuous sealing layer of water- and alkali-resistant varnishing material, said covering being free of non-alkali- and non-water-resistant material between said backing layer and said sheet and between said sheet and said sealing layer.

7. As an article of manufacture, a covering according to claim 6 wherein said backing layer and said sealing layer comprise a substantial amount of cumar resin.

8. As an article of manufacture, a preformed covering of the character described which is resistant to disintegration by moisture present in the subsurface to which the covering may be applied, comprising a sheet-like body portion and on the back of said body portion a continuous backing layer of normally hard and water-resistant cementitious material including a water- and alkali-resistant filler and a water- and alkali-resistant resin soluble in a water-miscible solvent, said body portion including a fibrous sheet impregnated with a bituminous waterproofing material, a top decorative and wear-resistant surface layer of linoleum composition, and between said sheet and said surface layer a continuous sealing layer composed essentially of water-insoluble materials and containing a water- and alkali-resistant resinous material.

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