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REMOVABLE FLOOR OR WALL COVERING

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This invention relates to a removable floor or wall covering of the hard-surfaced flexible type.

The invention principally concerns a floor covering having a felt base saturated with a suitable hydrocarbon semi-solid bituminous, or equivalent, filling material and having an ornamental wearing layer of paint, ornamented paper, linoleum, or other plastic mixture applied to the base to improve its ornamental appearance and wear resistance.

To wear satisfactorily, floor coverings of the flexible type should be firmly anchored to the sub-surface since looseness is likely to result in scuffing up, bulging and cracking of the covering. This is accomplished by attaching the covering to the sub-surface with a layer of cement, such as linoleum paste, which functions not only as a bonding medium but also to smooth over and fill irregularities in the sub-surface. The practice of cementing down the covering, while in most cases a practical necessity for proper wear, has caused much difficulty in removal of worn coverings for replacement. The problem has been particularly extreme in the case of the felt base type of coverings since the cement bond of such a base to a sub-surface is normally stronger than the comparatively weak tear resistance of such covering material.

To alleviate this removal difficulty, it is common practice in the case of floor coverings to first cement, by means of a water soluble composition, a layer of lining felt to the floor, and then cement the floor covering to the lining felt. When the floor covering is removed from such an installation, the initial rupture occurs in the lining felt. The residual lining felt and cement remaining on the floor can be then removed with water. This method is undesirable because of first, the added cost of the lining felt, and second, the increased tendency of the floor covering to dent.

Proposals for eliminating the lining felt have included interposition between the saturated felt of the floor covering and the cement of a layer—usually in the form of a back coating on the felt—of a material which is more easily ruptured than the saturated felt, or else has such a weak bond to the saturated felt, relative to its own internal cohesive strength and that of the saturated felt, that, during removal, the two layers will preferentially cleave and separate along the plane of contact or interface between the layer and the felt base.

None of the materials suggested in these proposals had, however, been satisfactory. Thus,

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an early suggestion was an interposed layer of a cohesively weak Montan wax. A back coat of such material, however, required high temperature application to the asphalt saturated felt, and at best, was brittle and had poor aging properties. Little, if any, better results have been secured by utilizing materials such as gums and acaroid resins. Layers of all these materials are so brittle that under constant impact of traffic they shatter and powder, with resultant progressive impairment of the bond of the floor covering to the sub-surface to such an extent that the bond is often completely destroyed long before the expiration of the normal wearing life of the floor covering. When this happens, as it usually does, the advantages of cementing are secured for initial periods only, and the likelihood of scuffing, bulging and cracking, after the weak strength layer at heavy traffic locations has crumbled, is greater than if no cement had been used.

Further, many of these materials are water-insoluble and thus require expensive solvent spreading (for instance, alcohol and the like) and their residue adherent to the laying cement after stripping of a covering is not readily removable by water-washing.

In an attempt to improve on these foregoing materials, Bradley Patent No. 2,341,078 describes a layer formed from a multiple emulsion of oil, casein, wax, fatty acid, and pigments. A layer of this type has fairly strong cohesion, and removability of the floor covering is afforded by reason of the relatively weak adhesion of the layer to the saturated felt base. As stated in that patent, the mechanism of cleavage is not fully understood and, in practice, it has been found that pull-off characteristics have varied widely between manufacturing runs, apparently through uncontrollable preferential wetting of the saturated felt, with the result that, unless extremely careful controls are set up and maintained, the products do not remove satisfactorily from subsurfaces after cementing. When, to this manufacturing variation is cumulatively added the complication in the preparation of the multiple emulsion mix of the Bradley patent, with its high-temperature expensive wax melt, the product becomes commercially difficult.

Despite the above proposals, dry back felt and duplex felt floor coverings are still offered on the market and widely used, though a truly satisfactory removable saturated felt would completely displace these compromise products which have their individual drawbacks in ragged cut-

ting, too quick cement drying for cutting seams and for insert work, and tendency to dent. This invention provides such a truly satisfactory removable saturated felt product.

In accordance with this invention it has been found that a saturated felt floor or wall covering may be provided with a back-coating—the bonding strength of which to the saturated felt or the internal cohesive strength of which, whichever is less, is fully sufficient to insure that the floor covering material will not tear loose under normal traffic conditions, but is less than the internal strength of the saturated felt so as to permit ready removability of the floor covering—compounded from natural or synthetic rubber or latex, or reclaimed rubber, vulcanizing ingredients, a water-soluble binder, pigments and/or fillers. Such coatings, in addition to having proper strength characteristics relative to the saturated felt as just described, to permit the desired type of removal, possess other characteristics rendering them eminently suitable for removable floor covering use, particularly with regard to flexibility, freedom from tackiness, resistance to staining and to traffic and aging breakdown, ease of preparation and application, and pleasing appearance and texture, as will be hereinafter more fully described.

Highly satisfactory results have been obtained, for example, with a saturated felt bearing a coating of the following composition:

	Parts by weight
Dispersed reclaimed red inner tube stock (55% solids)	23.8
Pigment (red slate flour)	100
Vulcanizing ingredients—zinc oxide (Kadox 15)	.6
Sulphur (50% dispersion)	.8
Accelerator (butyl zimate 40%)	.5
Casein (as 10% solu.)	35 to 55
Water—as needed	

A stable casein solution which has been found suitable is made as follows:

Six hundred fifty-five (655) grams of water are heated to 165°. With agitation, 8 grams sodium fluoride, 1.2 grams ammonium oxalate and 10.3 grams borax are added. Then 76 grams casein are slowly added and the mix agitated at 165° for 30 minutes.

The above dispersion may be made in the following manner:

The casein solution is added to a vessel fitted with good agitation and the sulphur, zinc oxide and red slate are added in that order. When the paste is uniform, the rubber dispersion is added, and then the accelerator. Water is added to suit, depending on the method of application to be used. For roller coating application it may be necessary to add an anti-foaming agent, such as pine oil to prevent undue fluffing.

The dispersion is stable for only about 24 to 48 hours, but will remain stable for much longer periods if the accelerator be withheld. A saturated felt which may or may not have been first thinly coated with an ordinary high strength bond paint solution or emulsion, such as an oil-resin-pigment mixture, to provide a smoother surface, is coated, as with a doctor blade, with the above dispersion, and is then baked at 150° to 170° F. for at least one hour to vulcanize the coating. This is followed by usual floor covering operations involving lamination of a tread surface to the saturated felt and the subsequent curing of the entire article for, in the extreme case of linoleums, from 5 to 20 days at elevated temperature, depending upon the particular nature of the tread surface. Shorter cures are sufficient in the case of printed felt bases. In some cases decorative or other coatings may be applied over the rubber coating in any stage of the operation subsequent to the application of the dispersed rubber coating.

Where the rubber coating is applied directly to the saturated felt, satisfactory results have been secured with the spreading equipment set to spread from 24 to 35 lbs. (dry weight) of the coating material per 100 sq. yds. A coating of this thickness is sufficient to withstand ordinary linoleum baking cures without becoming tacky, staining, or being otherwise adversely affected. The coating after curing will also neither stick nor stain when tested as follows. The sample to be tested is placed, rubber coat down, against the face of a nitrocellulose lacquered linoleum and is weighted with a dead weight of 100 lbs. per sq. inch and left under conditions of 100° F. and better than 75% humidity for at least one hour. The sample should lift free without any sticking to the underlying surface and should show no signs of stain.

Where a smoothing coat of paint underlies the rubber coating, or where the cure is less severe, the amount of rubber coating may be cut down somewhat without loss of stick and stain freedom.

The saturated felt-to-hardened linoleum paste bonding strength of the vulcanized rubber-pigment coating made as described above, 55 parts casein solution being used, was uniformly between 8 and 15 lbs. when tested on a 90° pull on a Scott tensile strength machine in 5'' widths after being subjected to the 10 day linoleum bake. This range is below the internal cohesive strength of saturated felt which runs upwardly from a minimum of about 15 lbs., but is usually above 25 lbs. in 5'' width strips. However, the particular bonding strength may be varied, by varying the pigment to casein ratio, within the range of 2 to 25 lbs. per 5'' width strip. This bonding strength, however, in practice must be made less than that of the particular felt employed so that floor covering when being stripped will not break in the substance of the felt. In general, increase of casein will increase the bonding strength, and vice versa.

The break in the above example occurred in the backing near the saturated felt-backing interface. It is found that the strength of the bond may be varied somewhat by a variation in formulation, but that it differs as well with a change in coating method and equipment. The data above is representative of backing applied in the laboratory by means of a Bird film applicator. Generally, roller coating application has given a weaker bond.

It has also been found that if a thin coat of an emulsion paint is applied on the saturated felt before my backing, the bond between this paint and my backing is usually stronger than between saturated felt and my backing. I have further found that as the amount of emulsion backing is increased up to 10 lbs. per 100 sq. yds., the bond is increased.

It is obvious that if the internal strength of my backing is greater than its bond to saturated felt or a protein paint, the cleavage will be at the interface. It it is weaker, the rupture will be internally in my backing paint.

Formulations can be made to achieve either

condition. The internal strength can be widely varied by variation binder-pigment ratio.

As stated above, if it is desired to rupture at the interface between the backing and the felt, the bond strength will depend on the method of application, the thickness of the backing, and the presence, thickness, and nature of any intermediate backing coat.

The above described pigment coat has a soft, velvety texture, is extremely flexible, entirely free from tendency to shed pigment, and has a remarkably clean surface that does not gather dust. It has a high bond strength to the usual linoleum pastes.

The red slate flour has been chosen because it gives a desirable red pigmentation to the back surface of the felt. Other pigments, of course, may be substituted, depending upon the particular color desired.

The vulcanizing ingredients and their proportions are given as examples only. For instance, other low-temperature accelerators, such as Tepidone, may be substituted for Butyl Zimate, and if desired, anti-oxidants may also be included, though it has been found that the aging properties of the coating of this invention are fully adequate when reclaimed rubber is used even without the inclusion of anti-oxidants, the coating remaining unchanged in an oxygen bomb test corresponding to a 15 year aging.

Instead of casein, similarly successful results have been secured with the use of other high molecular weight water soluble organic binders, in substantially the same proportions, including animal glue, methyl cellulose, dihydroxyethyl cellulose, polyvinyl alcohol, and alginates (such as Superloid).

The purpose of these materials is to stabilize the emulsion paint, as they all are able to function as protective colloids; to contribute to the film strength of the backing; and to help form a non-tacky, dry backing.

The function of the rubber is to contribute to the strength of the coating and to impart a high degree of flexibility. A proper balance between pigment and fillers, rubber, and water-soluble binders is the object of this invention so as to impart the necessary flexibility with freedom from tack and sticking, the proper degree of adhesion or internal strength to the coating. All prior coatings to my knowledge have failed in practice due to failure to fulfill these conditions, all of which are vital to a successful product.

Where certain types of reclaims are used, such as black tube or whole tire reclaim, there is less troublesome residual tack These other reclaims cannot very well be used where light color is desired, though in other respects the results of this invention are procurable.

A natural rubber dispersion may be used in accordance with the following formula:

	Parts by weight
Hevea latex (50% solids)	32
Sulphur (50%)	.8
Butyl zimate (40%)	.5
Phenyl B naphthylamine	.5
Zinc oxide	.7
Gray slate	100
Water—to suit—	
Casein (10% solution)	55

Backing paints using synthetic rubbers have also been made which have satisfactory removability.

Examples of such formulae include:

	Parts by weight
Neoprene dispersion (53% solids)	12.5
Pigment (red slate flour)	100
Zinc oxide	.6
Potassium hydroxide (20%)	11.0
Casein (10%)	29
Water—to suit	
GR-S dispersion—butadiene-styrene copolymer type (50% solids)	9.0
Sulfur dispersion (50%)	.8
Neozone D	.26
Accelerator	.26
Zinc oxide	.6
Red slate	100
Casein solution (10%)	12.5
Butyl[1] rubber reclaim dispersion (50% solids)	22.5
Sulfur dispersion (50%)	.8
Accelerator	.25
Zinc oxide	.6
Red slate	100
Casein solution (10%)	55

[1] Copolymers of isobutylene and small amounts of diolefin.

In accordance with the invention, as actual practise shows, it is vital that the rubber content of the backing composition not exceed 20% thereof, and preferably not exceed 18%, the best results being had in the lower ranges of the order of 6–15%, depending on the particular rubber employed (all being based on the dry weight of the compositions).

In the case of all the above vulcanized rubber back coats, with or without an interposed smoothing coat of the type above described, when the floor covering is removed from a sub-surface after cementing with a usual floor covering cement, the saturated felt strips from the sub-surface along a plane of cleavage lying intermediate the back surface of the saturated base (or of the interposed smoothing coat) and the back surface of the vulcanized rubber backing coat. In the usual case, where the smoothing coat is not used and the vulcanized rubber coat is spread directly on the saturated felt, the plane of cleavage lies substantially at the level of the interface between the vulcanized rubber coat and the saturated felt. However, the internal cohesive strength of the rubber coat may be so decreased and/or its bond to the saturated felt simultaneously so increased, as by increasing the amount of pigment in proportion to the other ingredients, that the plane of cleavage is below the interface and involves internal rupture of the vulcanized rubber coat. Such lower plane of rupture is often more common when the smoothing coat is interposed, due to the greater bond of the vulcanized rubber coat to the paint coat than to the saturated felt. As will be understood, where it is contemplated that the cleavage shall take place at the interface of the vulcanized rubber coat and the saturated felt, the internal cohesive strength of the vulcanized rubber coat, as distinguished from the strength of its bond to the saturated felt, may be less, equal to, or even greater than the internal cohesive strength of the saturated felt.

This is a continuation-in-part of my application Serial No. 558,963, filed October 16, 1944, now abandoned.

I claim:

1. A hard-surfaced flexible removable covering for floors, walls, and the like, adapted to be ce-

mented to an underlying supporting surface by linoleum paste, comprising a fibrous base saturated with bituminous material, an ornamental tread layer on one side of said fibrous base, and a flexible, dry, coherent non-tacky backing coat on the opposite side of said base consisting essentially of a composition including rubber selected from the class consisting of isobutylene-diolefin copolymer, neoprene, butadiene-styrene copolymer, vulcanized natural rubber, and vulcanized reclaim rubber, said composition including pigment and a water-soluble organic binder, the rubber content of said composition not exceeding 20% (by weight) thereof, the internal cohesive strength of said backing coating and its bonding strength to the floor covering being sufficient to firmly anchor the floor covering to an underlying layer of hardened linoleum paste on a supporting surface but at least one of said strengths being substantially less than the internal cohesive strength of said saturated base, whereby said base is strippable as a unit from said supporting surface after attachment thereto by such hardened paste.

2. A hard-surfaced flexible removable covering for floors, walls, and the like, adapted to be cemented to an underlying supporting surface by linoleum paste, comprising a fibrous base saturated with bituminous material, a heat-cured ornamental tread layer on one side of said fibrous base and a flexible, dry, coherent non-tacky backing coat on the opposite side of said base consisting essentially of a composition including vulcanized rubber and including pigment and a water-soluble organic binder, the rubber content of said composition not exceeding 20% (by weight) thereof, the internal cohesive strength of said backing coating and its bonding strength to the floor covering being sufficient to firmly anchor the floor covering to an underlying layer of hardened linoleum paste on a supporting surface but at least one of said strengths being substantially less than the internal cohesive strength of said saturated base, whereby said base is strippable as a unit from said supporting surface after attachment thereto by such hardened paste.

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