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METHOD OF PREPARING A PARTIALLY COLLAPSED
LATEX FOAM BACKED CARPET
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3,383,243

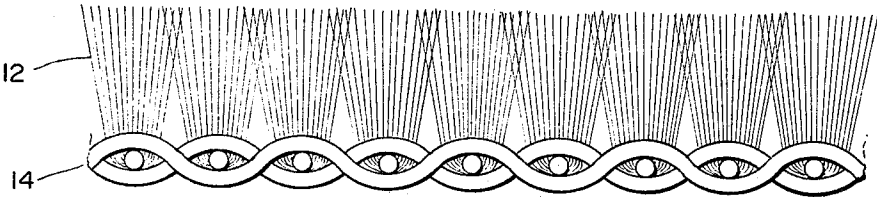


FIG. 1

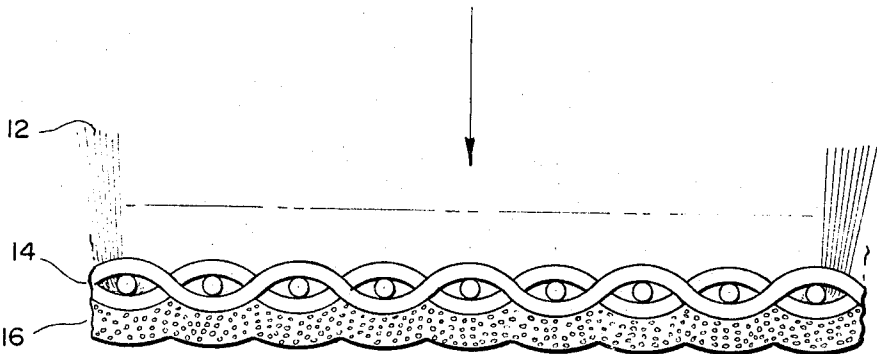


FIG. 2

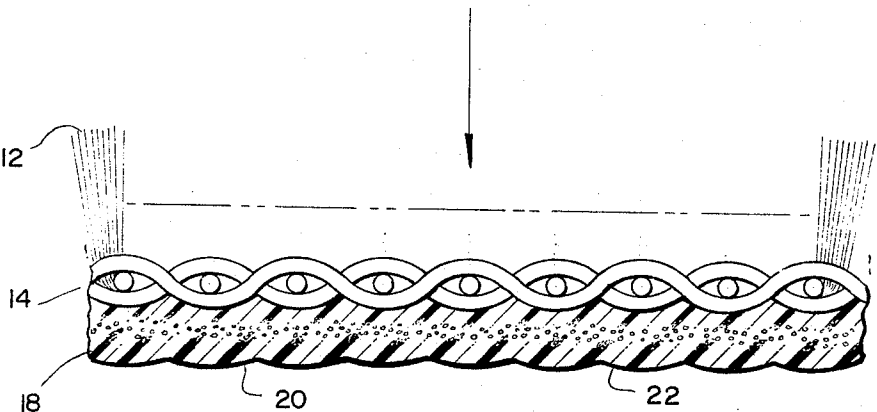


FIG. 3

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METHOD OF PREPARING A PARTIALLY COLLAPSED LATEX FOAM BACKED CARPET

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Continuation-in-part of application Ser. No. 330,655,
Dec. 16, 1963. This application July 19, 1967, Ser.
No. 654,534

5 Claims. (Cl. 117—161)

ABSTRACT OF THE DISCLOSURE

A non-skid rug is formed by applying a frothed binder composition to a rug backing and then partially collapsing the froth and drying the binder composition. The finished rug includes a backing having a binder layer wherein the binder layer is characterized by a density gradient from the surface to the center.

This application is a continuation-in-part of application Ser. No. 330,655, filed Dec. 16, 1963, now abandoned.

The present invention is concerned with rug coatings and more particularly with processes for producing rugs having improved non-skid properties.

In the production of rugs, whether they be of the woven type wherein the yarn is woven into a backing sheet, e.g., velvets, axminsters, etc., or of the tufted type wherein a plurality of loops or strands of the yarn are deposited in the backing sheet by tufting machines, it has generally become the practice to lock the yarns in place with a binder or backing layer. Generally such binder or backing layers comprise a natural and/or synthetic polymer latex and can be cured or uncured, as desired. Further, they often contain moderate to large amounts of inert fillers, primarily as extenders but also to stiffen or rigidify the latex backing. Although these coatings anchor the yarn firmly, they often have an adverse effect upon the non-skid properties of the rug.

In the past, one method of achieving non-skid properties in rugs has been by first applying a binder layer to secure the fibers of the backing fabric and then applying a second rubber coating to provide the desired non-skid properties. Such two layer systems are taught in U.S. Patents Nos. 1,823,131 and 3,227,574. It can be readily seen that this application of two specialized layers of rubber adds considerably to the processing operation and the cost of the rug.

The art has also employed a foamed rubber backing material to achieve the desired non-skid properties. However, foamed backing material provides little, if any, locking of the stitches of the tufted rug; therefore, this method also requires a two step operation; one to bind the stitches and another to provide the non-skid characteristics by means of the foamed binder material.

A novel process has now been found whereby the single application of the binder material can both provide the desired locking of the stitches of the tufted rug while at the same time providing efficient non-skid characteristics.

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It has now been found that non-skid properties can be achieved in rugs by aerating (with air or other gases) binder materials, applying a layer of said binder material to a rug backing and then partially collapsing the thus-formed foam. If desired, vulcanization can be carried out simultaneously with the collapse of the foam.

By applying the binder material to the rug backing as a froth or foam relatively low weight of binder material is employed, while at the same time the valleys, that is the depressions and irregularities in the rug backing, will be readily penetrated by the frothed binder material. More efficient coverage of the rug backing will provide a greater degree of non-skid properties since more non-skid rug area is exposed to the floor.

The controlled collapse of the frothed material is achieved by heating the coated rug. As mentioned above, this can be accomplished during the vulcanization step. The absence of the gelling agent in the binder material results in the collapse of the foam to provide better penetration into the rug backing than prior art foam. However, the overall density of the backing layer of the present invention is less than that achieved with a conventional non-foamed binder material. The degree of collapse of the foam is time and temperature dependent and, therefore, various combinations of conditions can be employed to obtain the desired end products. The froth or foam is preferably collapsed to 50% to 90% of its original volume, more preferably 75 to 85%. In the final product, a density gradient exists in the binder layers, with a relatively high density at the outer surfaces of the layer and a relating low density in the intermediate portion of the layer. Where a relatively low degree of collapse is achieved, the center of the layer generally contains an irregular, relatively small cell structure.

The finished rug possesses the advantages of both the rugs prepared using conventional binders and rugs prepared using foamed binders while the same time lacking the deficiencies of both. Thus, the novel rugs of the present invention possess backings that are uniformly covered with binder material; employ a lower coating weight than prior art rugs and employ only a single binder material applied in a single, continuous, simple operation.

Because the binder material of the present invention is applied to the rug as a foam which is subsequently collapsed, a relatively thick skin is formed on the surface of the binder material opposite that surface which contacts the rug backing. It is this relatively thick, tough skin which provides the advantageous non-skid properties. The surface of binder material next to the rug backing forms an extremely secure bond with the backing because it can obtain intimate contact with the fibers and stitches by means of better penetration achieved during partial collapse of the froth thereby insuring a secure grip after curing.

The binder compositions of the present invention employ natural and/or synthetic latices. In a preferred embodiment, a combination of natural and synthetic latices is used. Useful synthetic latices included Pliolite 5355 and Pliolite 151 (trade names of Goodyear Tire and Rubber Company for butadiene styrene latices). A preferred natural latex is centrifuged Hevea latex. Preferably the binder material is aerated prior to its application to the rug backing. Such an embodiment allows the use of the

lowest cost blowing agent (air) and permits the operator to determine the density of the coating composition before it is applied to the rug. The froth or foam is prepared by simply beating air or other gases, e.g., butane, fluorocarbons, and the like into the coating composition using conventional apparatus such, for example, as an Oakes mixer or a Firestone foamer.

Another method for preparing the froth comprises the employment of blowing agents, which when activated, e.g., thermally, chemically, etc., generate gases such as carbon dioxide, ammonia, nitrogen, etc.

Such blowing agents which are well known to the art may be applied directly to the coating solution and may be activated either before the coating is applied to the rug or after it is applied but before it is fully cured. As examples of such materials mention may be made of ammonium bicarbonate, urea, or dinitroso-pentamethylenetetraamine.

The amount of aeration and the resulting density of the binder composition may be varied to suit the particular needs. In a preferred embodiment the density of the coating solution is less than 1.0 gm./cc. and, more particularly, less than 0.80. In a particularly preferred embodiment, the density was between about 0.60 and about 0.8.

The binder composition of the present invention is applied in any convenient manner; for example, by brushing, spreading, and the like using conventional equipment such as roll coaters. The amount applied to the rug varies over a relatively wide range depending upon the desired result. Generally the use of about six to sixteen ounces per yard, preferably twelve ounces per yard is employed. Subsequent to coating, the water may be removed by well known techniques, e.g., evaporation, coagulation, and the like. It is during the removal of the water, that is, the drying of the binder composition, that the controlled collapse of the froth is achieved. Vulcanizers and accelerators are added to the binder composition to provide vulcanization simultaneously with the partial collapse of the froth; if desired.

Turning now to the drawing, which illustrates the novel product and the method of preparation, FIGURE 1 shows a rug having tufts 12 imbedded in a backing fabric 14. FIGURE 2 shows the frothed latex composition 16 applied to the backing. After the application of heat partially collapse the froth, and if desired, cure the rubber, the binder layer 18, as shown in FIGURE 3, is composed of tough outer skin 20 which provides the non-skid characteristics to the rug and inner skin 24 which provides the binding characteristics to the stitches and fibers of the backing. Center portion 22 of the binder layer is composed of an area of lower density than the outer faces.

The process of the present invention are especially useful in providing the non-skid properties of rugs wherein the binder composition contains fillers. Usually the non-skid properties of the rugs will vary inversely with the amount of filler present. As examples of useful fillers, mention may be made of whiting or calcium carbonate, diatomaceous earth, clays, aluminum silicate and aluminum hydrate. The amount of filler used in such a coating varies over a considerable range. As much as two or even three parts of the filler may be employed per part, by weight, of the dry rubber. The effectiveness of the present invention was especially pronounced when the filler was present in at least a 0.8 to 1 ratio and more particularly a 1 to 1 ratio of filler to dry rubber.

The coating compositions of the present invention may also contain surfactants, preservatives, deodorants, pigments, dispersing agents, suspending agents, vulcanizing agents, accelerators, thickeners, and the like. The presence of a surface active agent is especially useful in aerating the coating solutions and the presence of the thickener is especially helpful in maintaining the binder

composition in an aerated condition during application to the rug.

The following non-limiting example illustrates the processes of the present invention.

EXAMPLE

A latex coating composition was made up in two parts.

	Material	Percent Solids	Dry Weight	Wet Weight
10	Part A comprised:			
	Phiolite 5355 (a butadiene-styrene latex).....	66	60.0	90.91
	Phiolite 151 (a butadiene-styrene latex, high in styrene).....	53	25.0	47.17
15	Acintol DLR Special (Potassium salt of a mixed resin/fatty acid soap manufactured by Arizona Chemical Co.).....	21.5	1.61	7.50
	Ultrawet DS (an alkylbenzene sodium sulfonate surfactant produced by Atlantic Refining Co.).....	30	0.60	2.00
	Centrifuged Natural Latex.....	62	40.0	64.52
20	Naugawhite (a dispersion of an anti-oxidant made by Naugatuck Chemical Co.).....	39.6	1.79	3.00
	Dispersed Sulfur.....	69.7	0.10	0.15
	Zinc Dibutyl Dithiocarbonate (dispersion).....	52	2.08	4.00
	Zenite Special (A dispersion of zinc mercapto benzothiazole accelerator produced by Du Pont).....	51.5	1.03	2.00
25	Zinc Oxide Dispersion.....	52.4	5.24	10.0
	Titanium Dioxide Dispersion.....	63.6	5.30	8.33
	Water.....			70.0
	Tetra Sodium Pyrophosphate.....	100	1.00	1.00
	Whiting.....	100	175.00	175.00
	Paraffin Oil Emulsion.....	69.6	5.22	7.5
	Karaya Gum Solution.....	3	0.30	10.0
30	Polyacrylate Thickener.....	10	0.50	5.0
	Total.....		324.8	508.1
	Part B comprised:			
	Dispersed Sulphur.....	52.3	2.62	5.00
35	Arquad 12-50 (Dodecyltrimethyl ammonium chloride produced by Armour).....	50.0	1.00	2.00
	Total.....		3.62	7.00

Just prior to use, Part B was added to Part A with gentle agitation and the resultant mixture had a density of about 1.30.

For comparative purposes the above-described composition was then employed as follows:

(1) The composition was applied by roller coating to tufted goods at about 12 ounces/sq. yd. and dried for 12 minutes at 290° F. The finished coating thickness was 0.050 inch. This represented a conventional, single, unfoamed binder application.

(2) The composition was added to an Oakes mixture and air was introduced until the product, as discharged, had a density of about 0.6 to 0.8. The frothed composition was applied by roller coating to tufted goods at an about 12 oz./sq. yd. and dried for 12 minutes at 290° F. during which the froth partially collapsed. The finished coating thickness was 0.065 inch. This represented the process of the invention.

(3) The composition was treated as in (2) above except that 5 parts of a gelling agent, ammonium acetate, was added, whereby the foam structure was maintained after drying was complete. The thickness of the coating was 0.155 inch.

From the foregoing it will be noted that an increase in thickness of coverage of about 30% is achieved over a binder composition which is not foamed and then collapsed. While the foamed and gelled binder had a greater thickness than that of this invention the adhesion to the backing is not as great nor are the aging properties of the product as satisfactory.

When the non-skid properties of the rug of the present invention were compared with one which was not frothed in an inclined plane test, it was found that the angle of the plane could be raised 60 to 80% higher for the rug of the present invention before slipping took place.

The Oakes continuous mixer, which was used above, is a self-contained machine consisting essentially of a mixing head or chamber, a positive displacement pump to

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handle the product being mixed, and means to introduce air or other gases into the system for incorporation into the product. By controlling the latex flow rate and the air flow rate a wide range of densities may be obtained.

Since changes may be made in the above process and product without departing from the scope of the invention herein involved, it is intended that all matter contained in the above description shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A process for preparing rugs which comprises frothing in the absence of a gelling agent a latex composition selected from the group consisting of natural and synthetic latices, coating said frothed composition onto the back of a tufted rug, heating said frothed composition to a temperature and for a time sufficient to affect partial collapse of said frothed composition of from 50 to 90 percent of its original volume and to affect drying of said frothed composition; whereby said rug is provided with a backing characterized by tough, relatively thick skins of collapsed froth at the rug-composition interface and at the exposed face of said composition and by a relatively low density uncollapsed foam structure intermediate said thick skins.

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2. The process as defined in claim 1 wherein said composition contains a filler.

3. The process as defined in claim 1 wherein said composition is frothed by the introduction of air to said composition.

4. The method as defined in claim 1 employing said composition at a relative density of less than 1.0.

5. A process as defined in claim 2 wherein said composition contains at least about one part by weight of said filler per part of dry rubber.

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