

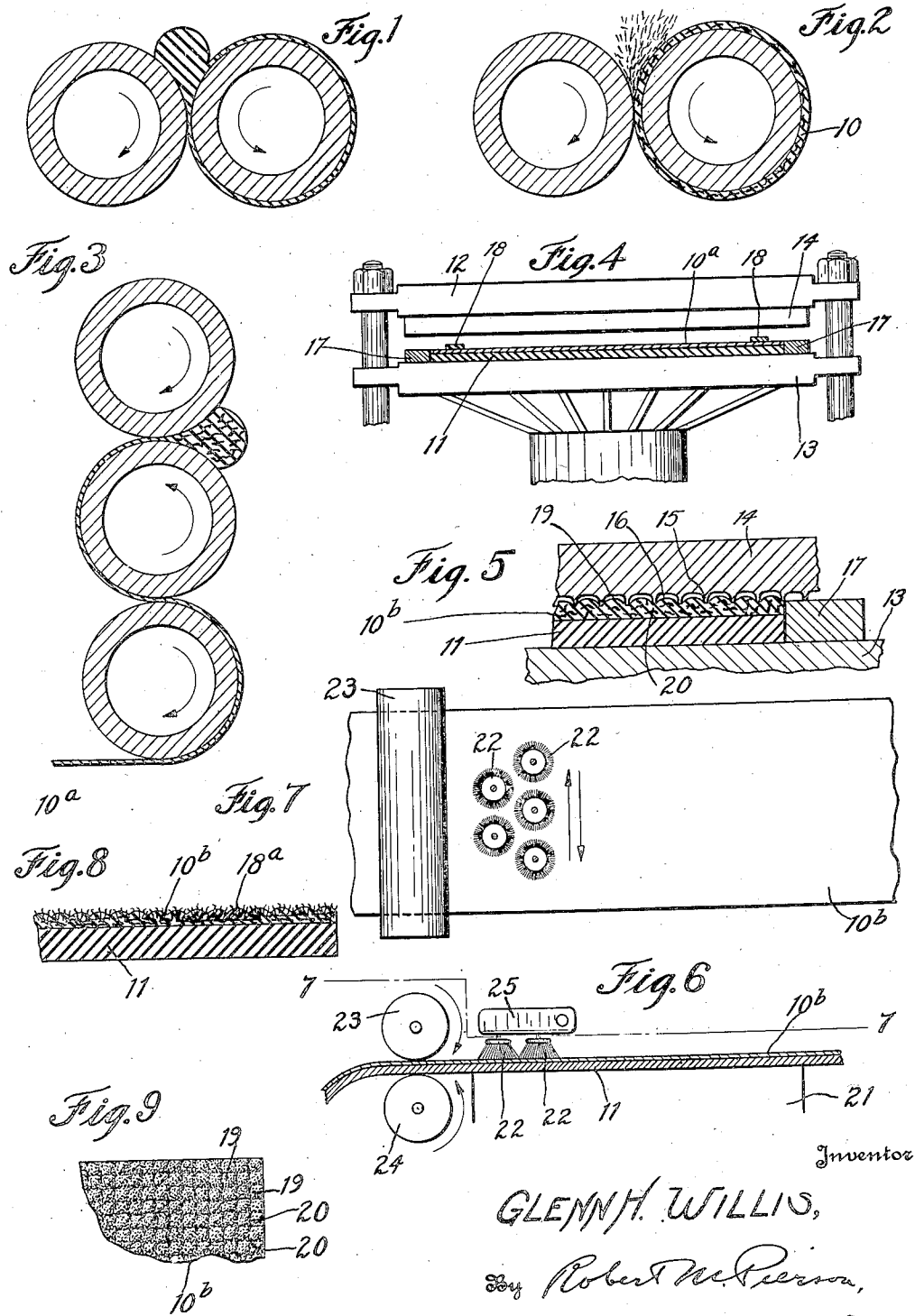
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SHEET MATERIAL AND METHOD OF MAKING SAME

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SHEET MATERIAL AND METHOD OF MAKING SAME

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This invention relates to composite sheet material having a napped wearing surface composed of fibers held by a binder such as rubber. Its principal object is to provide a comparatively inexpensive and easily cleaned material of this nature having sufficient durability to adapt it for use as an indoor carpet or mat as well as for upholstering and like purposes, and also having superior weather-proof qualities adapting it for outdoor uses where ordinary carpet is too perishable.

It is a well-known fact that no successful floor-covering material employing vulcanized rubber as a binder and made with a fibrous nap in imitation of ordinary woven carpet has heretofore been produced, although a good-looking material of this type which could be supplied in long lengths for stair coverings, hall runners, etc., and in short lengths as mats and rugs, at the same or a lower price than woven textile carpeting or rugs, would command a ready market on account of its high resistance to wear and its easy cleansing properties. My present invention fills this need with a comparatively low-cost, easily cleaned and highly durable product of attractive appearance which can be made in close imitation of woven carpet.

As the fiber ingredient of this new material I prefer to employ animal hair, including that of cattle, goats and hogs, and may employ this ingredient in relatively large proportions up to about 40% or even more of the total by weight, which corresponds to a large preponderance of fiber by volume as compared with that of the binder composition. The hair may be used in its natural color or it may be dyed, preferably before being intermixed with the rubber, and the rubber stock may be given the same or a different color by using a suitable pigment or pigments. The finished surface may include any suitable design such as a body color and an inlaid border stripe or other ornamentation of a contrasting color, and it is one of the purposes of my invention to permit the use of colored inlays with well-defined and regular edges which will not substantially flow or distort during the vulcanizing operation.

After vulcanization of the fiberized rubber composition its surface is buffed, scratched, combed or abraded to raise a nap of projecting fibers. One of the important features of my invention, which I believe to be wholly new, consists in vulcanizing the immediate tread surface in a substantially non-compacted condition so that the fibers at the surface will be loosely held by the rubber and may be readily brushed up into a nap, whereas adjacent portions may be somewhat compacted to anchor the fibers more firmly, as by molding its surface without press pressure against a grid-like plate which permits free swelling of the material into its cavities. A further feature of the invention consists in an improved mode of combing or brushing up the nap.

This application is a continuation in part of my prior applications Ser. No. 51,143 filed Aug. 19, 1925 and Ser. No. 229,803 filed Oct. 31, 1927, which were copending with each other, and the latter of which is pending at the time of this filing.

Of the accompanying drawing, Fig. 1 is a sectional view, somewhat diagrammatic in character, showing the rolls of an ordinary rubber mill and illustrating one step in my improved process.

Fig. 2 is a similar view showing a continuation of the mixing operation.

Fig. 3 is a similar cross-sectional view showing the rolls of a calendar and illustrating the manner in which my improved product is formed into sheets.

Fig. 4 is a side elevation showing the upper portion of a vulcanizing press, opened to receive the unvulcanized material and illustrating in cross section the manner of positioning said material therein.

Fig. 5 is an enlarged cross-section showing a portion of the press platens with the material between them and illustrating the swelling action of the material and the absence of press pressure at the crests of its projections.

Fig. 6 is a diagrammatic side elevation, partly in section, illustrating the preferred mode of combing and abrading the vulcanized material to raise the nap thereon.

Fig. 7 is a plan view and partial section of Fig. 6 taken from the plane 7—7 on the latter view.

Fig. 8 is a fragmental section of the finished material, including an inlaid strip.

Fig. 9 is a fragmental plan view of said material indicating the imitation fabric weave.

In carrying out my invention I prefer to employ for the rubber ingredient a quantity of new crude rubber such as smoked sheet, pale crepe, No. 2 amber, etc., and a larger quantity of high-grade reclaimed rubber such as that obtained from inner tubes, and mix this with filling or activating substances such as lithopone and zinc oxide and lime for a dryer, together with coloring matter, sulphur for vulcanization, an accelerator and an oleaginous softener or fluxing agent such as cottonseed oil, for which any other suitable drying, semi-drying or non-drying oil could be substituted in whole or in part.

For the fiber ingredient of a floor covering material I prefer to employ a stiff and tough hair or fiber of animal origin such as grey goat hair or heavy cattle hair, or where a very stiff and high nap is desired I may use a blend of substantially equal parts by volume of goat and hog hair.

While the proportions and ingredients may vary considerably, the following base-stock formula has given good results:

	Pounds
First-latex crepe rubber-----	15
Inner-tube reclaimed rubber-----	22
Lithopone-----	7
Zinc oxide-----	4
Lime-----	1.25
Sulphur-----	1
Cottonseed oil-----	7.25
Diorthotolylguanidine-----	.5
	58

This makes a grey stock suitable for use with hair of natural color. Where the hair is dyed and a similarly colored stock is desired, a suitable quantity of pigment of the desired color will be included in the base stock. For mixed shades such as "heather", a suitable mixture of base-stock pigments and a mixture of differently colored hairs may be employed.

The base stock is thoroughly mixed or masticated, as in a Banbury mixer or on the roller mill shown in Fig. 1, until it is thoroughly soft and plastic. The mill rolls are then opened as shown in Fig. 2 and the animal hair or other fiber is slowly added, the rolls being adjusted to press the fibrous material into the stock without forming a bank, and being proportionately moved apart as increasing quantities of fiber are added, to take care of the resulting addition in volume.

As the base stock is exceedingly soft, the fiber may be worked into it without the usual

bank, thereby avoiding excessive friction and permitting the fibers to be incorporated without unduly breaking and shortening them. By way of example, 42 lbs. of hair may be added to the 58 lb. batch of base stock in the example given above to make a total batch of 100 lbs.

The fiberized sheet 10 of rubber composition may be refined and the materials further blended, if desired, on a roller mill or a calender as represented in Fig. 3, and extended into a sheet 10^a of suitable thickness.

Where a sheet of this composition is to be attached to a backing layer, I may employ any suitable backing 11 such as, for example, a soft layer composed of felted animal hair secured thereto by an intermediate thin layer of adhesive rubber, and the several layers may be united by running them together through a calender such as shown in Fig. 3. Other backing materials may be used such as ordinary solid rubber matting stock composed mainly of reclaimed rubber, mineral rubber and earthy or other fillers, or I may employ any one of numerous other backing materials or compositions. The semi-finished or finished fiberized layer, vulcanized to the backing layer, is indicated at 10^b in Figs. 5 to 9.

The vulcanization of the material is performed in an ordinary hydraulic press, such as shown in Fig. 4, with steam-heated fixed and movable platens 12, 13, and where it is to be vulcanized in long lengths for stair carpeting or runners, an ordinary belt press may be employed or a modified belt press having suitable provision for limiting the pressure of the platens.

Where an imitation woven pattern or other embossed or indented configuration is to be impressed upon the wearing surface of the sheet material, a molding plate 14 having a reverse of the pattern formed in its under surface is secured to the under side of the top press platen 12. This molding plate, for example, may be made of hard rubber with a grid-like pattern of molding projections 15 and intervening pockets or cavities 16 formed therein. The unvulcanized material is laid in the open press on the lower platen 13 as shown in Fig. 4 and spacer bars 17 are placed around its edges, between the platen 13 and the margins of the molding plate 14, to limit the amount of the compression imparted to the material. If border stripes or other color-pattern elements are to be incorporated in the upper surface of the latter, suitable strips or pieces 18, of the same mixture of rubber composition and animal hair as the body sheet 10^a but of a contrasting color, are placed upon the upper surface of said body sheet before closing the press. During the vulcanizing operation these strips or pieces become embedded or inlaid in the upper surface of said body sheet, but without

any substantial flowing or distortion of their edges, because the stiff mat of animal hair interspersed in the binder prevents such flowing or distortion, leaving the inlaid edges regular and sharply defined. The inlaid strip in the finished product is indicated at 18^a in Fig. 8.

By employing spacer bars 17 of suitable thickness, or by otherwise regulating the pressure, the molding and vulcanization or setting takes place without any appreciable press pressure upon the immediate tread surface of the fiberized rubber layer 10^b. During vulcanization, the soft-rubber composition swells somewhat, probably due to the presence of small quantities of trapped air in the composition, or the partial vaporizing of the cottonseed oil, and it puffs up into the cavities 16 of the molding plate in biscuit-like projections or elevated portions 19 wherein the fibers are loosely held by the rubber binder but the intermediate indented or depressed portions 20 produced by the action of the mold plate projections 15 are more densified or compacted than said elevated portions, and hence form a better anchorage for the hair, so that the subsequent brushing or napping operation acting upon the elevated portions produces a better and more durable nap than if the surface were smooth throughout before napping.

This effect is plainly visible in the vulcanized product before napping, especially with the aid of a magnifying glass, the elevated portions being striated or fibrous and but thinly rubberized in appearance, while in the depressed, densified portions, more of the rubber has been forced to the surface, giving more of the appearance of a smooth, compacted, molded rubber surface.

While the brushing or napping operation may be performed in a variety of ways, I have found that a scratching or combing action by means of flexible wire teeth or bristles moving parallel with the plane of the sheet produces the minimum amount of gouging of said surface and removal of rubber and hair-ends therefrom, and consequently produces a superior napped surface as compared with other forms of abrasion.

Figs. 6 and 7 illustrate more or less diagrammatically a suitable form of napping apparatus in which the vulcanized sheet material is led over a table 21, under a group of wire brushes 22 and out between a pair of upper and lower feed rolls 23, 24. The shafts of the brushes 22 are geared together within the casing 25 and rotated, preferably alternately in opposite directions throughout the series, by suitable gearing, and said casing 25 may be given a reciprocating movement across the sheet as indicated by the arrows in Fig. 7 to cover the entire width of said sheet. The brushes are rotated at high speed and they bear with considerable pressure upon

the sheet which moves slowly beneath them, the fibers being thereby effectively combed into a nap.

The resulting product has the appearance of woven carpet, it may be produced in a wide variety of colors and patterns, somewhat more cheaply than the better grades of carpet, it is highly resistant to wear, easily cleaned by washing, and is adapted for floor and earth coverings for both indoor and outdoor uses and for upholstering and analogous purposes.

While I have particularly described a preferred embodiment, it will be understood that the steps and features may be considerably varied within the scope of my invention as defined in the claims.

I claim:

1. The herein-described method which comprises embossing the surface of a fiberized rubber sheet, and raising a fiber nap thereon by removal of rubber from the elevated portions to a greater extent than from the depressed portions.

2. The herein-described method which comprises mixing a suitable rubber composition with fibers, sheeting the mixture, vulcanizing the sheeted mixture substantially without compacting pressure, causing it to swell during vulcanization, and removing a portion of the surface rubber to produce a fibrous nap.

3. The herein-described method which comprises mixing a suitable rubber composition with relatively stiff fibers, sheeting the mixture, vulcanizing the sheeted mixture against an indented press plate, causing it to swell, during vulcanization, into the hollows of said plate, and abrading the vulcanized sheet to raise a fiber nap thereon.

4. The method of producing color-patterned sheet material for floor-coverings and the like which comprises mixing and sheeting differently colored body and inlay materials of plastic binder and fiber composition, laying a relatively small piece of the inlay material on a sheet of the body material, heating the two, and embedding the inlay material substantially without edge distortion in the body material during the heating process.

5. The method of making napped sheet material which comprises producing a sheet of fiberized plastic binder, embossing said sheet, setting the binder, and napping the elevated portions by an abrading action parallel with the surface of the sheet.

6. The method of making napped sheet material which comprises mixing rubber and fibers, sheeting the mixture, vulcanizing the sheet against an embossing plate formed in imitation of carpet weave, and combing the elevated portions of the sheet surface by the action of wire bristles moving parallel with the surface of the sheet to raise a fiber nap thereon.

7. Sheet material comprising a non-compacted, vulcanized tread of rubber mixed with fibers and having the fibers protruding therefrom as a nap.

8. Sheet material comprising a vulcanized mixture of fiber and rubber having an indented tread surface with compacted, depressed portions forming an anchorage for the fiber and non-compacted, elevated portions from which the fiber projects as a nap.

9. Sheet material adapted for floor coverings and comprising a vulcanized rubber mixture containing from 35 to 45 per cent by weight of relatively long fibers and formed with an embossed tread having elevated portions from which the fibers project as a nap.

10. Sheet material adapted for floor coverings and the like and comprising a mixture of vulcanized rubber and fibers, embossed in imitation of carpet weave and having non-compacted, napped elevated rubber portions.

11. Color-patterned sheet material comprising a body sheet and an inlay sheet of a different color, integrally embedded therein and both composed of a binder having an intermixture of fiber which avoids edge distortion of the inlay.

12. Color-patterned, flexible sheet material comprising a body sheet and an inlay sheet of a different color integrally embedded therein and both composed of vulcanized rubber intermixed with fiber which is dyed in at least one of the two, said material being embossed in imitation of carpet weave and having a surface nap of said fiber, including the dyed fiber.

In witness whereof I have hereunto set my hand this 12th day of January, 1931.

GLENN H. WILLIS.

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