

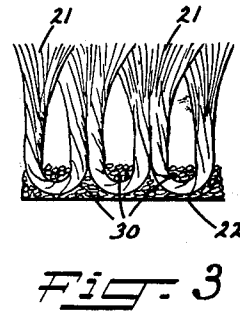
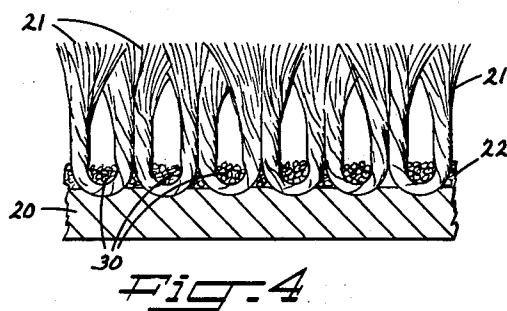
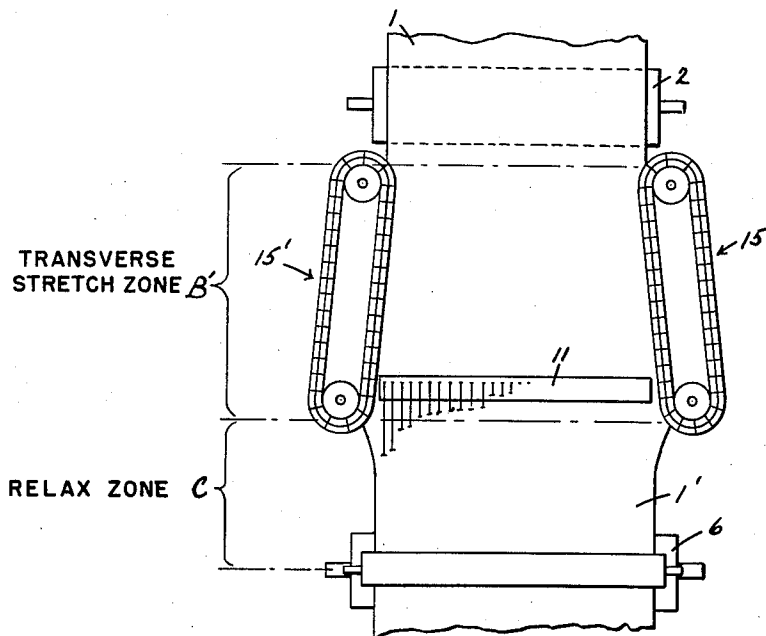
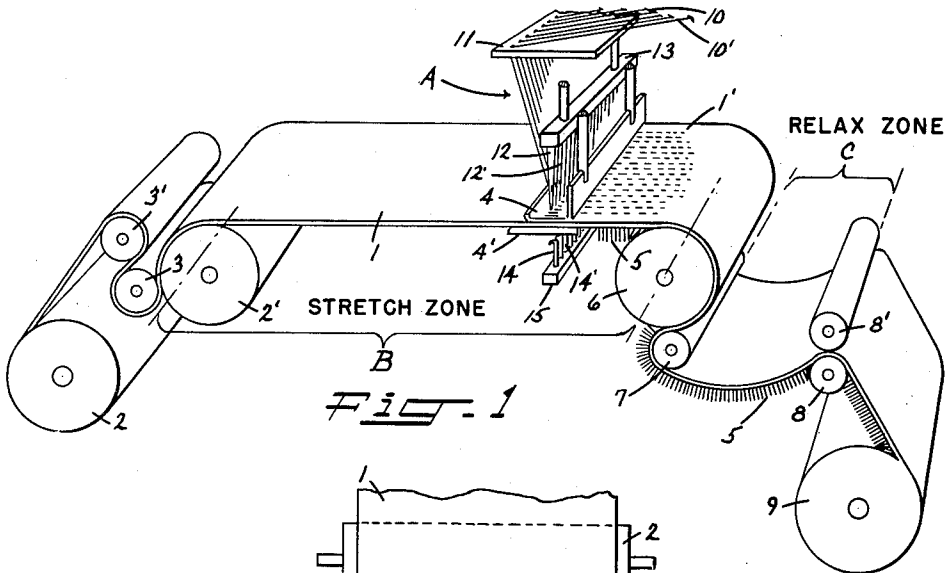
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TUFTED FABRIC

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TUFTED FABRIC

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1 Claim. (Cl. 112—79)

The present invention relates to a tufted fabric or web and more particularly to a process and apparatus for producing a tufted fabric which may be used as a floor covering. This application is a division of application Serial No. 493,957, filed March 14, 1955 and now abandoned.

In recent years much research and development have been conducted with respect to the production of tufted fabrics suitable for use as floor coverings. The general practice is to form a pile of yarn loops on one face of a woven fabric by interweaving the yarn through the fabric. The loops may be cut during the interweaving operation to provide a fluffy or tufted surface on the backing fabric.

A disadvantage found with many of these tufted fabrics, especially with those used as floor coverings, is that the yarn tufts break loose from the base since the tufts are not anchored firmly in place within the base fabric or web. Usually, after the tufting operation, the woven backing is treated with an adhesive composition to bind the pile yarns to the backing. If the adhesive is not applied carefully, it may penetrate the pile layer and spoil the upper surface.

It is therefore one object of the present invention to provide a tufted fabric which may be used as a floor covering wherein the tufts are firmly locked in place and which will not become dislodged upon handling during laying or during continuous wear.

A further object of the invention is to provide a method for producing the tufted fabric in which the tufted pile is firmly anchored to the backing without use of adhesives.

Another object is to provide an apparatus for producing a tufted fabric in which the tufted pile is closely packed and firmly anchored.

In general, a tufted fabric is produced according to this invention by feeding a porous elastic web formed of elastic fibers in random distribution to a tufting point and tufting the web with tufting yarns by forcing the rubber fibers apart in the web so that the yarns pass therebetween, the yarns being under constant compression by the adjacent elastic fibers which have been stretched apart. In a preferred embodiment the process comprises feeding an elastic web formed of elastic fibers in random distribution to a tufting point, stretching the elastic web either longitudinally and/or transversely with respect to web travel prior to tufting, then tufting the web with yarns while the web is so stretched so that the yarns pass between the elastic fibers and finally relaxing the web to bind the tufted yarns in the web. The product so produced comprises a tufted fabric having a backing comprising a web of elastic fibers in random distribution and a tufted pile formed of yarns passing through the web between the elastic fibers, the tufted yarns being firmly anchored to the backing by the compression exerted by the stretched elastic fibers adjacent the tufted yarns. In a preferred embodiment, tufted fabric also comprises a layer of cushioning material bonded to the elastic backing web on the side opposite to the tufted pile to form an integral cushion and non-skidding under-surface.

A better understanding of the invention may be had from the following description and drawings in which:

FIGURE 1 is a perspective of the apparatus for producing the tufted web;

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FIGURE 2 is a top view of an embodiment of the apparatus of FIGURE 1;

FIGURE 3 is a section of a tufted fabric produced in accordance to one embodiment of the invention; and

FIGURE 4 is a second embodiment of the fabric.

The base web used in the present invention comprises a non-woven elastic web formed of synthetic or natural rubber fibers, the fibers being in random distribution and bonded together at their points of crossing. The web is thin and porous so that when stretched open areas can be developed between fibers. Suitable fibrous rubber base webs and the method and apparatus for making the same are disclosed and claimed in co-pending United States applications: McMahon and Watson, Serial No. 400,240, filed December 24, 1953, now Patent No. 2,950,752; Till and Smallom, Serial No. 400,252, filed December 24, 1953, now Patent No. 2,810,246; and Watson, Serial No. 400,304, filed December 24, 1953, now abandoned.

Referring now to the drawings, in a preferred embodiment the apparatus for forming the tufted fabric comprises feed rolls 2, 2' and tension rolls 3, 3' through which the fibrous rubber web is initially fed to rolls 6 and 7, the rolls 6 and 7 traveling at a greater surface speed than rolls 2 and 2' so that the web is stretched between rolls 2' and 6. From the feed rolls 2, 2' the base web 1 is passed through the plate guides 4, 4' of the tufting apparatus A at which station tufting yarns 10 and 10' are applied to the base web 1 as hereinafter described. The tufted web 1' then passes over tension roll 7 and is relaxed between roll 7 and the pair of rolls 8, 8' and then collected on roll 9. Rolls 8, 8' travel at a surface speed such as to permit the stretched web to relax in the zone C. As mentioned above, the yarn tuft 5 is applied to the base web 1 as it passes through guide plates 4, 4' of the tufting apparatus A. Yarns 10, 10' are threaded through a yarn guide board 11 and through tufting needles 12, 12' which are supported by needle bar 13 mounted for vertical reciprocation. On the downward stroke of bar 13 the needles 12, 12' draw the yarn 10, 10' downwardly between the elastic fibers in the stretched web 1. Upon the return, or upward stroke, of bar 13 the needles 12, 12' draw the yarn singles 10, 10' upwardly through the base web 1 thereby forming a pile surface of yarn loops on the bottom face of the web 1. The tensioning of the base web as described opens up the elastic web so as to facilitate the yarns passing between the fibers of the web. If desired, the tufted pile loops may be cut by blades 14, 14' which are supported by, and extend upwardly from, bar 15 which is also mounted for vertical reciprocation. As yarn loops are formed by the action of the needles 12, 12', the blades 14, 14' cut the yarn loops upon the upward stroke of bar 15 to form the yarn pile 5.

FIGURE 2 is an embodiment of the apparatus of FIGURE 1. With this embodiment, tenter frame supports 15, 15' are provided for gripping the edges of the elastic web 1 to stretch it laterally of its direction of travel in the zone B' wherein it is tufted and then the web is allowed to relax in zone C to bind the tufted yarns. As described with reference to FIGURE 1 the web 1 can be stretched longitudinally of its direction of travel by driving the roll 6 at a faster rate of speed than the feed roll 2. By stretching the base web 1 both longitudinally and transversely of the direction of web travel, the tufting operation is more easily performed than is possible when the web is stretched only longitudinally or only transversely of its direction of travel.

The amount of stretch to be applied, either longitudinally and/or transversely, to the elastic backing will vary depending upon the thickness of the elastic backing web. When the backing web has a thickness of about $\frac{1}{16}$ of an inch the web needs to be stretched only about 5% to 30% to facilitate tufting. With thicker backing webs of the

order of $\frac{1}{8}$ inch, the stretch is preferably from 10% to 50% in any one direction. When the web is stretched in both directions simultaneously, the degree of stretch may be materially reduced to about one-half of the values shown. When the webs are relatively thin, less than $\frac{1}{16}$ inch, the backing web need not be stretched at all because the passage of the needle through the web structure will cause a stretching of the individual rubber fibers adjacent the needle and permit the needle and yarn to pass through the web. Therefore, it is to be understood that the invention contemplates broadly using a fibrous elastic web formed of a multiplicity of elastic fibers in random distribution, the fibers of which stretch to permit tufting and then return to their original position after tufting to bind the tufted yarns by compression therebetween.

In a preferred embodiment of the apparatus, the needle employed for tufting is of the "ball-point" type which has been found to penetrate even thick fibrous elastic webbing without cutting the individual rubber fibers. Wetting the needle with water or with a mixture of water and a hygroscopic substance such as glycerine, ethylene glycol, diethylene glycol and the like facilitates the tufting operation by lubricating the surface of the needle with respect to the rubber fibers.

In FIGURE 3 there is shown one embodiment of the tufted fabric of the invention in which the tufted pile is formed of yarns 21 passing between the individual elastic fibers 30 of the elastic backing web 22 which serves the elastic fibers compressing the yarns 30 so that they are firmly anchored into the backing web without the use of adhesives or other means. Because the elastic web is fibrous and porous the fabric will be permeable to moisture and air and thus allow the fabric to "breathe." When this fabric is used as upholstery or floor covering, the ventilation permitted by the porous backing will retard mildewing.

In FIGURE 4, there is shown another embodiment of the article tufted fabric in which the elastic backing web 22 is united by vulcanizing, sewing or adhesive laminating to a layer 20 of cushioning material such, for example, as a layer of sponge or foam rubber, horsehair, wool, felt or other carpet cushioning material. In the preferred embodiment, the extra layer 20 is formed of a thick layer of fibrous elastic webbing of the type used for the backing 22 because it can be anchored to the backing web 22 by vulcanizing or rubber cement and provides an integral, non-skid, porous cushion when the article is used for floor covering.

The tufting yarn may be of any natural or synthetic textile fiber which will unravel to a certain degree when

it is cut so as to form a tuft. Rayon yarns have been found to be most satisfactory for the tuft yarn of the invention. The denier of the tuft yarn used depends upon the thickness or density of the tuft desired.

The main advantage of the tufted fabric or floor covering of the present invention is that the yarn tuft is firmly anchored within the base web due to the contraction property of the elastic fibers in the base web as exerted upon the yarn tuft. The individual rubber fibers must stretch apart to permit the relatively thick yarn to pass therebetween so in the final products the yarns are under constant compressive forces from the adjacent stretched fibers. The tufted floor covering of the present invention can therefore stand continuous wear and abuse without the tuft being pulled out or otherwise separated from the base web. Another advantage presented by the present invention is that tufted floor coverings of light weight and good strength can be provided, since even the thinnest fibrous rubber webs used in accordance with the invention exhibit good strength and will not tear or rip easily. It should also be pointed out that the tufted floor coverings produced in accordance with the present invention have non-slip backings because of the natural friction coefficient of the fibrous rubber in the base web.

It is apparent that variations or modifications may be made with respect to applicant's invention without departing from the spirit or scope of the present invention as set forth in the appended claim.

I claim:

The method of making a tufted elastic fabric comprising drawing an elongated elastic backing web formed of elastic fibers in random distribution from a supply roll, simultaneously stretching the web longitudinally and transversely to the extent where spaces are opened between adjacent fibers of the web, inserting yarn tufts through the opened spaces in the stretched web, releasing the stretching action to permit the web to return to its normal unstretched condition, and winding the unstretched tufted web into a roll.

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