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METHOD OF PRODUCING TUFTED CARPETS

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Fig. 1.

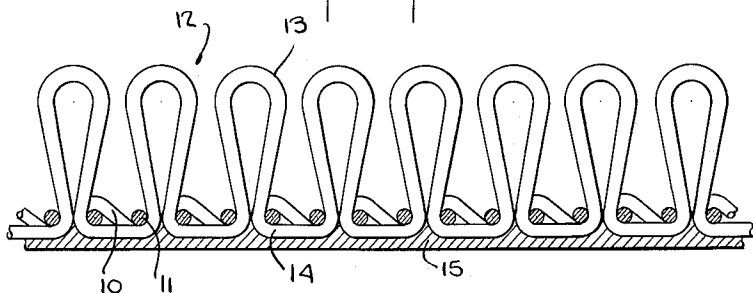


Fig. 2.

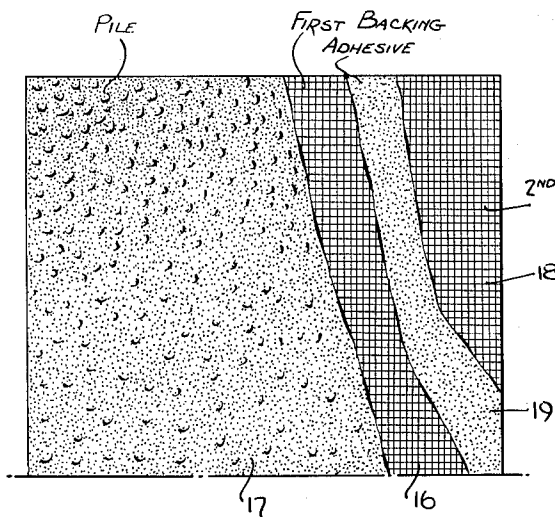
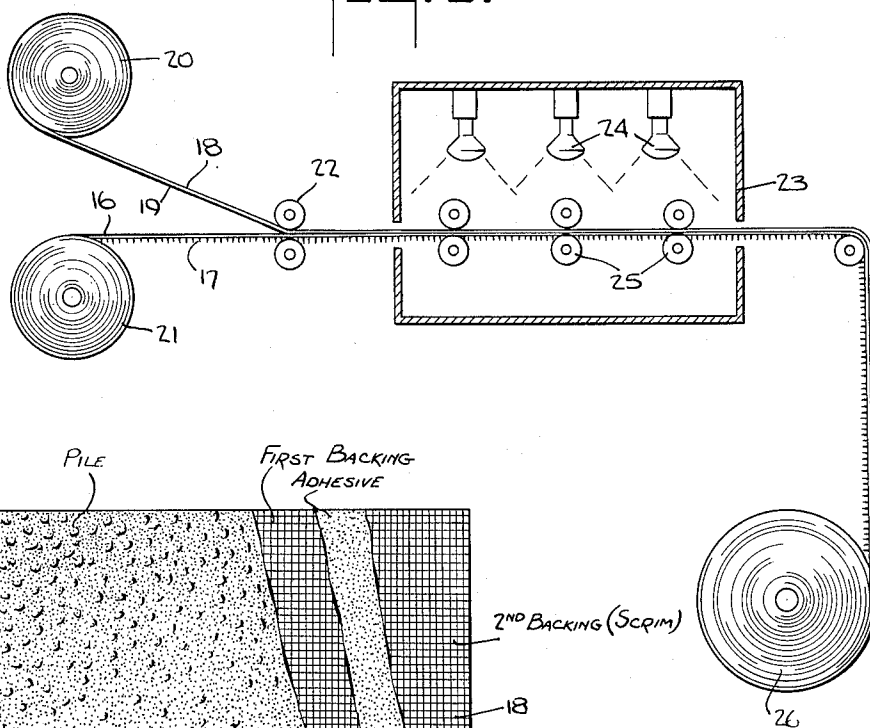


Fig. 3.

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METHOD OF PRODUCING TUFTED CARPETS

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The present invention relates generally to tufted carpets and more particularly to improved backings therefor and to methods for utilizing such backings in the manufacture of tufted carpets.

Tufted fabrics, such as rugs, carpets, draperies and the like are manufactured by threading pile yarns through a ready-made woven backing to form pile loops. Backings commonly employed in tufted fabrics are made of woven material such as cotton duck or woven jute fibres. In the case of tufted carpets, a coating of latex is applied to the back which acts to lock the tufts to the backing fabric, to stiffen it and to make it skid-resistant.

In the manufacturing process, the woven backing is fed through a multiple-needle tufting machine. A row of needles carrying the pile yarns pass through the spaces in the backing and as the needles are withdrawn from the backing, looper members serve to hold the inserted yarns, thereby forming pile loops which project beyond the face of the backing. In the completed fabric the crests of the loops may remain connected or be severed, depending on whether a short loop pile or a cut pile fabric is desired.

The nature of the backing incorporated in the tufted fabric is a significant factor in determining the wearing and handling qualities of the finished product. Cotton duck, for example, is relatively light in weight and lacking in body. As a consequence, rugs fabricated with a cotton duck backing have a tendency to curl and are structurally unstable. These disadvantages also to some extent characterize rugs made with jute backings, the finished fabric having an excessively soft feel or handle. For the rug to lie flat on the floor it is essential that it possess a degree of stiffness so as to resist "kick-up" and curling. With conventional backings, insufficient body is imparted to the rug and the rug has low resistance to buckling. Moreover, existing backing materials are highly absorbent and act to take on undue amounts of latex or other water-insoluble adhesives used to bond the pile yarn to the backing, thereby adding materially to production costs.

Also to be taken into account in evaluating the qualities of a woven backing is the ease with which the warp and filler yarns are displaced by the thrust of the looping needles through the pores or interstices of the material. With conventional backings there is poor slippage between the warp and filler fibers and substantial resistance is offered to the rapid reciprocal movement of the needles. Such friction produces excessive heating of the needles with an attendant loss of temper. As a result, the needles require frequent replacement.

One may minimize needle friction as well as needle deflection by using backings having a loose, open-weave construction. Since these backings are easily penetrated, they have less of a tendency to deflect the tufting needles. Such deflection gives rise to broken backing yarns, irregular tuft height and pattern distortion. However, while needle efficiency is improved with a loose backing weave, the resultant carpet lacks proper density and has a somewhat skimpy appearance.

In fabricating tufted carpets, the conventional prac-

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tice is to apply a coating of latex to the backing to bind the tufts thereof. It is also customary to laminate a scrim or second backing to the carpet, the first backing being first sized with a coating of water-based latex, the scrim then being bonded to the backing by a second coating of latex. This process has a number of drawbacks. To begin with, latex is relatively expensive. Furthermore, in applying it to the back of the carpet, some of the latex may smear onto the surface, thereby creating seconds. Also, in order to evaporate the water from the latex, large dryers are necessary, further adding to production costs.

In view of the foregoing, it is the main object of this invention to provide tufted fabrics of superior construction utilizing a novel backing material.

Also an object of the invention is to provide a new method of fabricating tufted carpet and the like wherein needle deflection is minimized during the tufting operation to increase tufting efficiency, and yet the final product is of good density with improved tuft bind.

It is still another object of the invention to provide a method of fabricating a tufted carpet wherein unusual patterning effects may be obtained by selectively varying the density of the ultimate product.

A further object of this invention is to provide a method of laminating a scrim to the backing of a tufted carpet without the use of latex and without the need for a subsequent drying operation.

Briefly stated, these objects are accomplished by the use of a backing for a tufted carpet which is composed in whole or in part of heat-shrinkable thermoplastic yarns. The backing is so woven or otherwise formed in a manner whereby the resultant fabric presents a rather loose and easily penetrated structure, thereby facilitating the needling of the fabric. In tuft binding of the carpet as by means of latex, the backing is subjected to elevated temperatures causing the backing to shrink, thereby to improve the density of the fabric. By varying the degree of shrinkage, it is also possible to create novel design effects.

In lieu of latex, the invention also contemplates the use of a scrim or second backing having a coating on one side of thermoplastic resin. In finishing, this coating as well as the thermoplastic backing on the tufted carpet is heated, whereby the coating is rendered viscous while the backing is caused to shrink, the scrim thereby being laminated to the backing to provide a double backed tufted carpet of superior quality.

For a better understanding of the invention as well as other objects and further features thereof, reference is made to the following detailed description to be read in conjunction with the accompanying drawing, wherein like components in the views are designated by like reference numerals.

In the drawing:

FIG. 1 is a sectional view of a tufted carpet in accordance with the invention.

FIG. 2 is a schematic view of a system for fabricating a carpet in accordance with the invention, and

FIG. 3 is a plan view of another embodiment of a tufted carpet in accordance with the invention, the structure being broken away to show the various layers thereof.

Referring now to FIG. 1, a tufted fabric in accordance with the invention includes a preformed backing constituted by longitudinally extending warp threads 10 and transversely extending weft or filler threads 11. The warp and weft threads are loosely interwoven in any known manner on a loom. While a woven backing is shown,

it is to be understood that the backing may be knitted or otherwise formed. Tufted into the backing is a pile yarn 12 which may be of cotton, wool, or any suitable natural or synthetic fiber.

The yarn is introduced in the usual manner by feeding the backing web through a tufting machine wherein rows of needles carrying the yarns pass them through the interstices of the backing to form chains of pile loops 13 projecting above the face of the backing, the pile loops being linked by connecting loops 14 closely drawn against the under surface of the backing.

The under surface of the backing is covered with a relatively thin anchoring coating 15 of a water-insoluble adhesive, such as latex. The adhesive is applied in a fluid state and flows freely into the spaces between the warp and weft threads to define a film-like coating which bonds the connecting loops to the backing threads. This latex coating is then cured, or if other forms of adhesive are employed, the coating is allowed to harden and set as required.

The backing fabric is woven or otherwise formed of heat shrinkage thermoplastic yarns or combinations or composites of thermoplastic yarns with other textile yarns, as, for example, cotton, jute, rayon and paper. The thermoplastic yarns are of the type having softening or distorting characteristics which lend themselves to shrinkage control in a temperature range about 150° F. to 450° F.

Examples of suitable thermoplastic yarns are yarns manufactured in various densities from polypropylene resin, polyamide resin, polyester resin and polyacrylic resin. Vinyl fibers, such as dynel, may be used (60% vinyl chloride, 40% acrylonitrile) having a 45% shrinkage in 300° F. air, or polyethylene fibers of the high density type having a shrinkage of 12 to 18% in 240° F. air. Also, saran having a shrinkage of 60% in 350° F. air is usable.

The backing fabric, utilizing thermoplastic yarns or combinations thereof, is so formed as to present a rather loose structure having easily penetrated well-defined interstices. This eliminates or minimizes the usual problems encountered in needling the backing with tufting yarns. In the finishing operation, when latex is applied to the backing to tuft bind the individual carpet tufts, the carpet is subjected to air temperatures ranging from 225°-450° F. The degree of shrinkage will of course depend on the nature of the thermoplastic material used and the temperature range applied. It is therefore possible to vary the degree of shrinkage selectively to create novel design effects, this being accomplished by introducing into the carpet predetermined areas of greater or lesser yarn density. Such effects have not heretofore been attainable with tufted carpets and one may produce a wide variety of patterns formed by sectors of differing density.

Thus the invention, by providing a relatively open backing structure, improves tufting efficiency and eliminates pattern distortion resulting from a too closely woven backing fabric. It also prevents excessive floats or broken yarns which protrude and show up in the pile yarns. After being subjected to elevated temperatures in the finishing operation, improved tuft bind is realized and the invention also enables density control to produce novel patterning effects.

While the above results may be accomplished with conventional latex finishing techniques, such techniques, as pointed out previously, have certain commercial drawbacks. In accordance with another aspect of the invention, a double backed tufted rug is provided, as shown in FIG. 3, with a thermoplastic backing 16, of the type disclosed in conjunction with FIG. 1 having a pile 17 tufted therein, the backing having a scrim 18 laminated thereon by means of an adhesive coating 19 in the form of a thermoplastic resin whose composition is compatible with the thermoplastic yarns in the main backing.

The resin coating is applied in liquid form to scrim 18, which may be formed of closely woven paper yarns, by means of conventional roller coating techniques. Suitable resins for this purpose having proper softening points or molecular weights are petroleum resins such as Piccopale, polyvinyl chloride and copolymers thereof, polyvinylidene chloride and copolymers thereof, resin and resin derivatives such as Vinsol, Dresinol and Herculyn, polybutene resins such as Vistac and styrene-butadiene resins and copolymers thereof.

The scrim is coated with the resin in solution and dried to provide a non-tacky coated scrim. When the scrim is to be laminated to the carpet backing, it is simply heated to the softening point of the coating and combined under pressure with the backing. No preliminary back coating or latexing operation is entailed. Among the advantages of this operation are a saving in adhesive and latex costs (hot melt resins are cheaper), ease of application and lower laminating costs (no dryers are necessary), and the fact that no adhesive will or can smear onto the front surface of the carpet.

While the coated scrim may be applied to the back of a conventional tufted fabric, there are distinct advantages in using it in conjunction with a fabric having a thermoplastic backing as above described, for the heat necessary to soften the coating on the scrim may also function to shrink the thermoplastic backing.

Thus, as shown in FIG. 2, the scrim 18 having the coating 19 is drawn in web form from a supply roll 20. The tufted fabric also in web form is drawn from supply roll 21, the coating 19 of the scrim being juxtaposed with the backing 16 of the rug in rolls 22. The two webs are then fed into a heating chamber 23 provided with infra-red heaters 24 or other suitable means to raise the temperature to the desired level sufficient to shrink the backing fabric and to soften the resin coating. Combining rolls 25 are provided to subject the two webs to pressure to effect lamination therebetween. Belts may be used instead of rolls for this purpose. The combined structure is wound up on take-up roll 26.

To insure effective lamination, it is preferable that the resin coating on the scrim be of the same family as the thermoplastic yarns in the backing and hence compatible therewith. For example, if the yarns are of the vinyl family, the resin should be selected accordingly.

Thus, while there has been shown what are considered to be preferred embodiments of the invention, it will be understood that many changes and modifications may be made therein without departing from the essential spirit of the invention as defined in the appended claims.

What is claimed is:

1. The method of fabricating a tufted carpet comprising the steps of needling tufting yarns into a backing formed at least in part of heat-shrinkable thermoplastic yarn, and laminating a scrim to said backing having a hot melt coating thereon by simultaneously heating said coating and said backing to shrink said backing and render said coating viscous to effect a bonding action.

2. The method, as set forth in claim 1, wherein said coating is of hot melt, resinous material compatible with said thermoplastic material.

3. The method of producing a double-backed tufted carpet, comprising the steps of needling tufting yarn into a primary backing formed at least in part of heat-shrinkable thermoplastic yarn, coating a secondary backing with a thermoplastic resin in solution form and drying same to provide a non-tacky coating, and laminating the coated side of said secondary backing to said primary backing by subjecting said backings simultaneously to heat and pressure to cause said coating to soften and to cause said primary backing to shrink, whereby said shrunken primary backing and said secondary backing are interbonded.

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