Nov. 19, 1963 T. M. RHODES 3,110,905

TUFTED PILE FABRIC COMPRISING A FLAT WOVEN SYNTHETIC PLASTIC BACKING

Filed Sept. 26, 1961 2 Sheets-Sheet 1

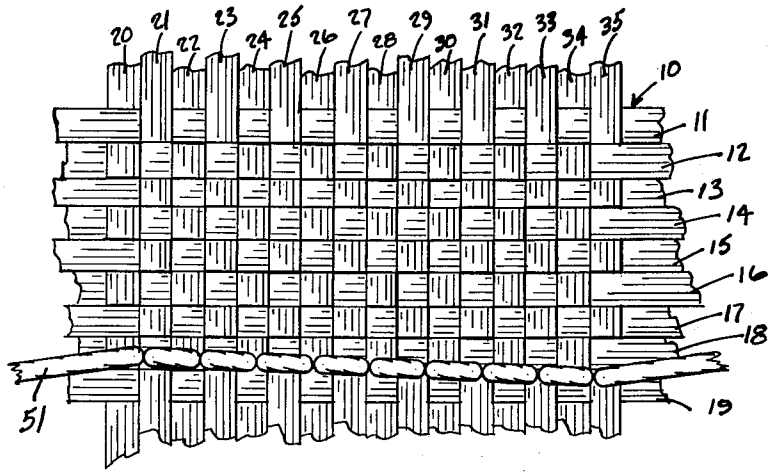


FIG. 1

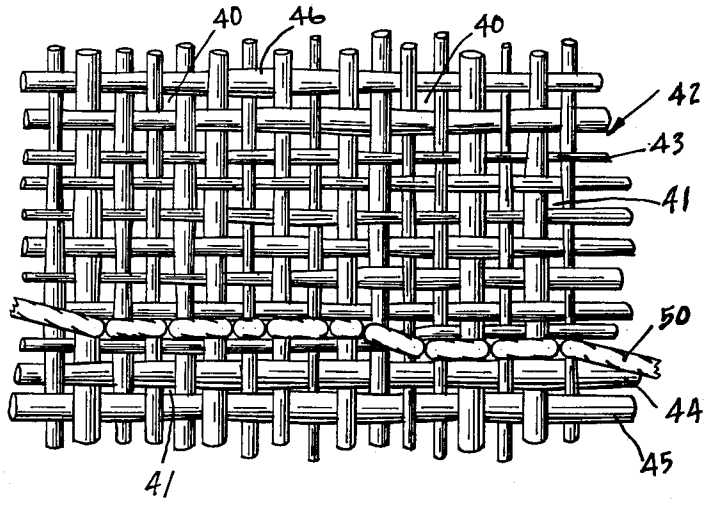


FIG. 2 PRIOR ART

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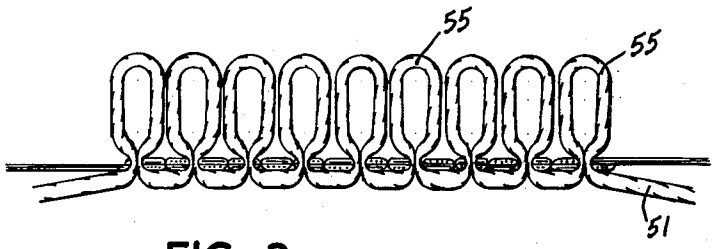


FIG. 3

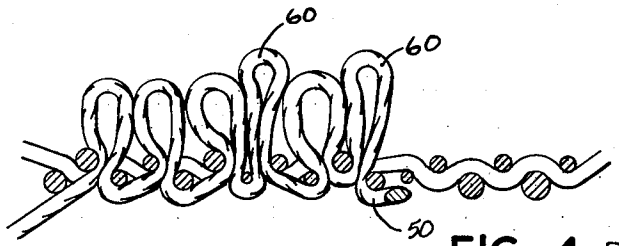


FIG. 4 PRIOR ART

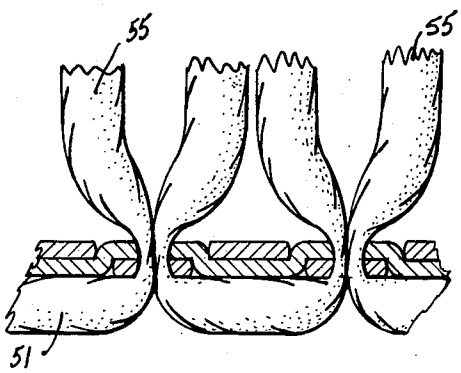


FIG. 5

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3,110,905

TUFTED PILE FABRIC COMPRISING A FLAT WOVEN SYNTHETIC PLASTIC BACKING

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10 Claims. (Cl. 139—391)

This invention relates to soft floor coverings and more particularly to pile fabrics produced on a tufting machine employing a plurality of needles which carry the pile yarn through the backing material.

It is present practice to employ a flat woven burlap-type backing material having yarns composed of jute, sisal, or sometimes paper. A serious disadvantage of this backing resides in the fact that the backing fabric is not of uniform thickness nor density. This characteristic is, of course, due in part to the actual interstices between the individual yarns and in part to the wide variation in thickness between individual yarns and varying thicknesses in the same yarn. As a result, the tufting needles sometimes meet no resistance whatsoever. At the other extreme, the needles encounter maximum resistance due to the necessity for penetrating a thick yarn or double yarns. In still other instances the needles seem to push aside the yarns with little or no penetration of the yarn itself. As a result, the rows of pile yarn stitches frequently jump back and forth between the same longitudinal yarns in the backing thus causing gaps between adjacent rows of stitches which include as few as one and sometimes as many as three yarns of the backing material. This causes grinning and uneven rows of pile. Heretofore it has been found necessary to overcome this disadvantage by producing tutfed pile fabrics with sufficient pile length so that these irregularities are substantially concealed. These irregularities occur both longitudinally and transversely of the fabric since a relatively thick transverse yarn in the backing causes a lateral gap or irregularity in the stitch spacing which cannot be in any way controlled by adjustment of the tufting machine.

Since the pile projections in a cut pile tufted fabric naturally tend to spread more effectively than in the case of an uncut pile fabric, it is, of course, feasible to tuft a lower cut pile fabric and obtain adequate coverage than is the case with an uncut or loop pile tufted fabric. The present invention permits the provision of a pile fabric having much lower pile projections, particularly in a loop pile construction, than has previously been possible and still produce a commercially saleable fabric.

In view of the above causes of unevenness in a tufted pile fabric particularly in the case of loop pile or low pile height, it might have been assumed that the use of a uniform sheet material would overcome these disadvantages. Efforts to obtain satisfactory results using a non-woven sheet backing material have also proved fruitless because in this case there did not appear to be sufficient friction or bind on the yarns to permit uniform control of pile height, particularly after disengagement with the loopers. While the precise reasons for unsatisfactory results with sheet material may not be completely understood, and applicant does not wish to be bound by any theory advanced in connection therewith, it is believed that in the case of a sheet material the needle merely punches holes which do not have sufficient tendency to re-close or grip the yarns to provide adequate or at least uniform yarn engagement as the needles are removed. In any event and for whatever reasons, the present invention permits the tufting of a highly satisfactory pile fabric having adequate coverage with much lower pile projections and particularly in a loop pile construction. It has accordingly been found that a backing material constructed of a synthetic plastic material and woven from relatively flat yarns so that there is uniform needle penetration of the backing material throughout the fabric solves the above-mentioned problems and avoids the disadvantages thereof.

A primary object of the invention, therefore, is to provide an improved backing material for a tufted pile fabric.

A further object of the invention is to provide an improved tufted pile fabric having adequate coverage with substantially low pile projections.

A further object of the invention is to provide a tufted pile fabric having adequate coverage and utilizing a relatively low uncut pile.

A further object of the invention is to provide a tufted pile fabric having a backing material woven from synthetic plastic yarns with a substantially rectangular cross section.

Further objects will be apparent from the specification and drawings in which:

FIGURE 1 is a bottom view of the improved backing for a tufted pile fabric but showing only one row of pile stitches,

FIGURE 2 is a bottom view showing on an enlarged scale the conventional backing for a tufted pile fabric produced from non-uniform backing yarns and having interstices between the warp and weft of the yarns of the backing,

FIGURE 3 is an end view of the structure of FIGURE 1, with the pile projections on top,

FIGURE 4 is an end view of the structure of FIGURE 2, with the pile projections on top, and

FIGURE 5 is an enlarged sectional detail of a portion of the fabric of FIGURE 3.

The invention comprises essentially the provision of a woven backing material for a tufted fabric formed of a flat weave of synthetic yarns in which every point on the backing is of substantially uniform thickness. The yarns preferably employed to produce the improved backing fabric of the present invention may comprise any synthetic plastic material capable of being spun, extruded, or shaped into a flattened or rectangular shape. Some of these are members of the polyolefin family such as polyethylene and polypropylene. Other suitable synthetic yarns include those generically called acrylic, modacrylic, polyester, nylon, rayon, acetate, triacetate, cellulosic, vinyl, vinylidene chloride, polyvinyl chloride, etc. In some cases it has been found desirable to shape the originally formed ribbons or yarns much wider than the finished width. These wider strands are then folded over upon themselves one or more times to provide either a U or Z shaped cross section.

Referring now to the drawings, a backing material 10 (FIGURE 1) comprises a series of warp yarns numbered 11–19 which are interwoven in a one-and-one weave with weft yarns 20–35. The even width and thickness of yarns 10–19 and 20–35 permits the woven fabric to form a substantially uniform sheet of material having a thickness equivalent to two yarns at every point in the fabric. This construction then automatically eliminates the interstices 40, 41 which are an inherent feature of the conventional jute or burlap-like backing fabric 42, shown schematically in FIGURE 2. Furthermore, it is possible to control the thickness and width of the synthetic yarns with much greater precision than is the case with the jute-type yarns so that all irregularities due to the interweaving of thin yarns such as 43 and thicker yarns 44 and 45 are likewise eliminated. There are no slubs 46 nor thick and thin places on the synthetic yarns which in turn frequently cause the pile yarn, for example, yarn 50, to jump over uneven numbers of wefts in the jute backing. It will be noted that the pile yarn 51 in FIGURE 1 has been shown as slightly biased with the general direction of warp backing yarns 18 and 19. This is perhaps an exaggerated show-

ing but illustrates the fact that even though the stitches in pile yarn 51 do not always penetrate the backing in a line parallel to the backing fabric warps, it is possible for the stitches to cross from adjacent warps in the backing without in any way affecting the relative dimensions and shape of the pile projections.

To more clearly bring out the differences produced in the pile yarns, reference may be made to FIGURES 3 and 4 which show a series of loop pile projections 55, 55 in pile yarn 51. It will be observed that the longitudinal spacing between each of the stitches is approximately the same regardless of whether the stitch happens to fall in the middle of one of the backing yarns, in-between two adjacent backing yarns, or near the edge of one of the yarns. This characteristic illustrates the beneficial results which are achieved when the pile yarn carrying tufting needles always penetrate a homogeneous and relatively uniform woven backing material. By comparison, the pile projections 60, 60 illustrative of the pile yarn 50 in FIGURE 2 are clearly uneven, not only with regard to their height, but with regard to the length of the stitches. It will be understood that the showing of FIGURE 4 has been purposely exaggerated to illustrate the overall result of multi-needle tufting in a backing fabric in which the yarns of the backing are non-uniform and are not tightly spaced with respect to each other so that there are no apparent or actual interstices between the yarns. Furthermore, with a yarn having a flattened or rectangular cross section the tendency for the needles to glance off the yarns or for the needles to displace the yarns without piercing or penetrating them, particularly when one of the yarns is not squarely pierced in the middle, is eliminated. In view of the relatively high tufting speeds in current practice, it will be appreciated that the needles rarely ever penetrate a yarn having a generally circular cross section. These yarns are almost always pushed to one side or the other of the needles thus producing an irregular or uneven effect as is illustrated in FIGURE 4.

The enlarged showing of FIGURE 5 more clearly illustrates the way in which the flattened yarns of the backing are uniformly penetrated by the needles without displacement with respect to each other. It will be noted that it is possible to maintain the stitch length at a uniform dimension for two reasons. First of all, a flat rather than an arcuate surface is presented to the needles as the backing fabric is penetrated. Second, the tight weave and close spacing provided with my improved backing does not permit shifting or displacing of the yarns in the backing as is the case with the conventional jute backing.

For purposes of clarity, I have eliminated all of the pile yarns with the exception of one row of stitches in the showing of FIGURES 1, 3, and 5. It will be understood that in fabrics of this type a plurality, as many as 1500 rows, of parallel stitches are simultaneously produced on a multi-needle tufting machine. Examples of such tufting machines are shown in Patents 2,862,465; 2,977,905; and 2,352,153.

Further important advantages of the present invention are the fact that in addition to uniform stitch length it is possible to obtain much better control of pile height in the low pile areas. The pile projections are of substantially constant height and shape. Furthermore, it has

unexpectedly been found that for the same needle penetration adjustment on the tufting machine, the present invention produces relatively higher pile projections because of the better gripping action between the backing fabric and the pile yarns. With the elimination of a jute backing, it is possible to achieve better dyeing and particularly formula dyeing, because there is no color run-out from the burlap or jute type backing. Heretofore it has been found commercially impossible to piece dye tufted fabrics using formula dyeing.

In addition to the advantages recited above, pile fabrics constructed in accordance with the present invention have no transverse gaps or streaks often referred to as machine marks caused when the tufting machine is stopped and subsequently started. Likewise, the dimensional stability of the fabric is greatly improved.

Having thus described my invention, I claim:

1. A tufted pile fabric comprising a synthetic plastic backing material of uniform thickness woven of uniform strands, and rows of pile projections piercing said strands.

2. A fabric in accordance with claim 1 in which the backing strands are closely spaced together both warpwise and weftwise of the fabric to eliminate interstices therebetween.

3. A fabric in accordance with claim 1 in which the strands of the backing material are selected from a material comprising polyethylene, polypropylene, nylon, polyester.

4. A tufted pile fabric comprising a synthetic plastic backing material woven of uniform yarns of relatively flat cross section, and rows of pile projections piercing said yarns.

5. A fabric in accordance with claim 4 in which the pile yarn stitches penetrate at least two of the backing yarns at all times.

6. A fabric in accordance with claim 4 in which the backing yarns are closely spaced together both warpwise and weftwise of the fabric to eliminate interstices therebetween.

7. A fabric in accordance with claim 4 in which the yarns of the backing material are selected from a material comprising polyethylene, polypropylene, nylon, polyester.

8. A low loop pile tufted pile fabric comprising a tightly woven backing of synthetic plastic yarns without interstices therebetween, and at least one row of pile yarns forming projections on one side of the backing said pile yarns piercing the yarns of said backing.

9. A fabric in accordance with claim 8 in which the synthetic plastic yarns of the backing are of rectangular cross section.

10. A fabric in accordance with claim 8 in which the synthetic plastic backing yarns are selected from the group comprising polyethylene, polypropylene, nylon, polyester.

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