Dec. 15, 1953 R. J. JACKSON 2,662,560

PILE FABRIC

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Fig. 1

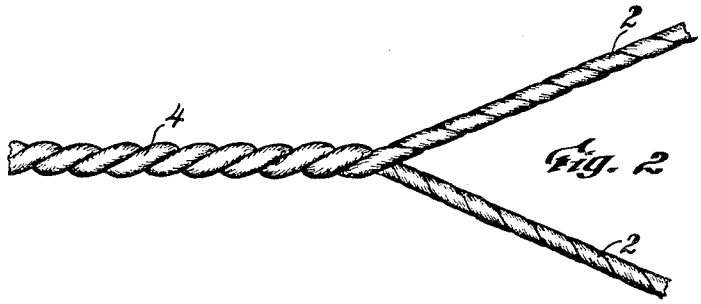


Fig. 2



Fig. 3

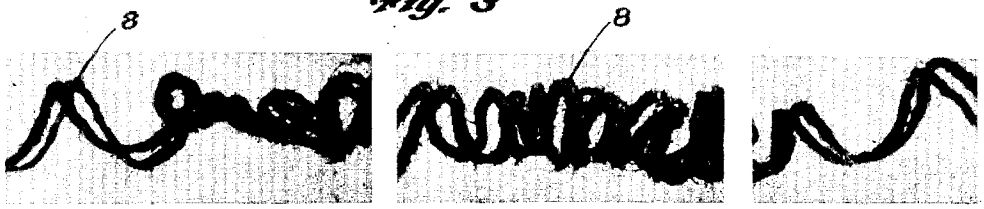


Fig. 4

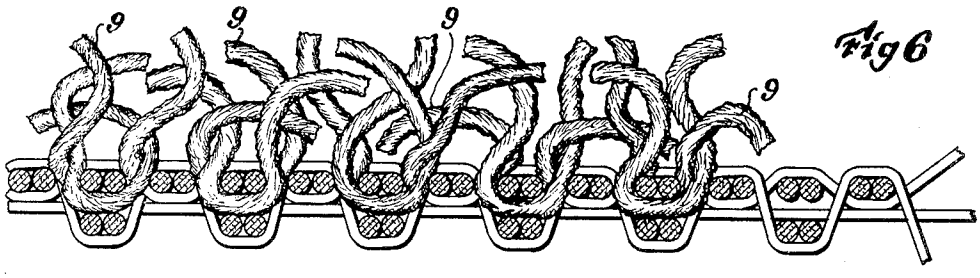


Fig 6

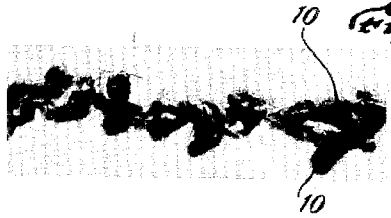


Fig. 5

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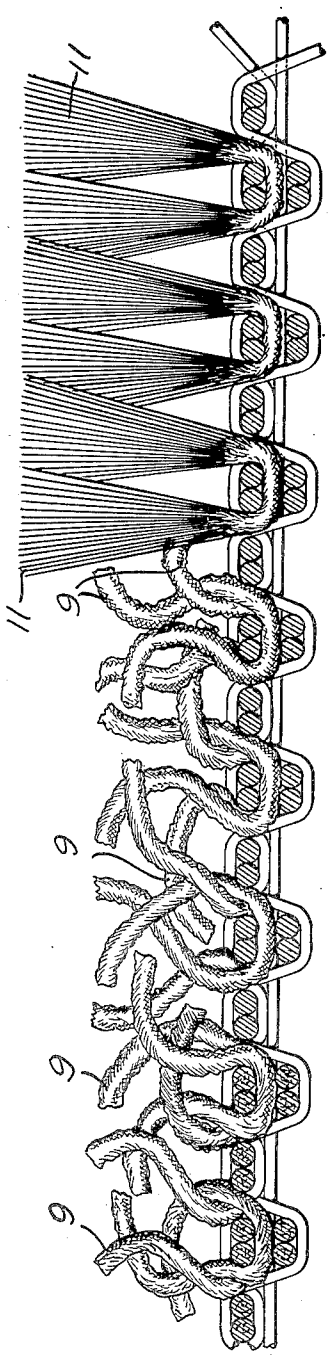


Fig. 7

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PILE FABRIC

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Application June 22, 1950, Serial No. 169,564

3 Claims. (Cl. 139—401)

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Carpets employing hard twisted yarns in the pile face are well known and popular, particularly the Axminster type. But in the manufacture of such carpets, employing, for example, the usual two-ply hard twisted yarns, it has been necessary to employ at least seven rows of pile per inch because otherwise the legs of the tufts of the hard twisted yarns do not provide complete coverage of the backing structure, that is, six or less rows per inch of tufts of hard twisted yarns would leave the backing structure exposed between the rows.

My invention relates to a woven pile carpet, in particular of the Axminster type, to pile yarns for such a carpet and to processes for producing the same. The primary object is to produce such a carpet, having a surface texture similar to that produced by the common hard twisted pile yarns, but in which the hard twisted yarns in each tuft spread out and cover a much larger area of the backing structure. By use of my novel yarn, I can produce a four-row carpet in which the backing structure is fully covered, thereby saving a substantial quantity of pile material in comparison to carpets having the conventional number of pile rows per inch, such as seven. Further, I can reduce the number of tufts per row to as few as one-half the conventional number without causing the backing to be exposed between the tufts.

Fig. 7 is a sectional view similar to Fig. 6 showing a carpet having a combination of straight pile and pile formed from the yarns of Fig. 3.

A further object is to provide such a carpet in which the legs of the pile tufts are bent, twisted, curled and kinked to a greater degree than has heretofore been attained.

In a carpet in which there are areas of pile tufts of conventional soft yarns and also areas of the twisted yarns of this invention, the pile surface is lower in the latter areas than in the areas composed of soft yarn tufts, thus giving the effect of a costly hand-carved carpet. The twisted pile tufts are of multiple-ply yarn, formed by giving the individual strands an initial twist in one direction, plying them together by twistng in the opposite direction, setting the twist in the plied yarn and finally twisting it in the direction opposite to the plying twist.

In the drawings,

Fig. 1 shows in elevation a single yarn strand with a Z twist, illustrating the first step of my process;

Fig. 2 shows in elevation two such strands plied together by being twisted in the S direction;

Fig. 3 shows in elevation the yarn resulting from setting and reverse twisting the yarn of Fig. 2, as it appears when under tension;

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Fig. 4 is a photograph, with parts broken away, of the yarn of Fig. 3 when relieved of tension, showing the variety of its helices and twists;

Fig. 5 is a photograph of the yarn of Fig. 4 after it has been subjected to the dampening treatment and when free of tension;

Fig. 6 is a warpwise sectional view of a carpet having pile formed from the yarns of Fig. 3.

All of the drawings are on an enlarged scale.

I spin a single strand of yarn 2 with the usual number of turns per inch, such as 2 to 6 turns, preferably 4½, in the Z direction, Fig. 1. I then ply two or more of these strands 2 together by twisting in the opposite or S direction to form a multiple-ply yarn 4, Fig. 2. I put in a sufficient number of turns to cause the yarn when free of tension to contract upon itself and form kinks. In the case of a two-ply yarn, I put in from four to fifteen turns per inch, preferably nine. I form this hard twisted yarn 4 into loose skeins. I subject this yarn to a treatment by a suitable means known in the art, which sets the plied twisted and kinky yarn so that the twist or tendency to twist in the direction of the ply twist is fixed so that it persists in the finished yarn. That is, the twist is set in the yarn so that thereafter the yarn tends to assume the twist which it had when it was set. The setting treatment also sets the kinks so that thereafter the yarn when relieved of tension tends to rekink.

I prefer to set the twist by immersing the yarn in water, with or without a wetting agent, and after centrifugally removing excess water, subjecting the yarn to saturated steam, preferably at about 250° F., for about 30 minutes in a closed chamber in which the pressure is maintained at a pressure about 15 pounds per square inch above atmospheric, as described in my copending application Serial No. 767,850 filed August 9, 1947, now Patent No. 2,509,347.

After so setting the yarn I wind it on bobbins, or the like, and then twist it in the Z direction, that is, the direction opposite that of the plying twist, giving it a greater number of turns than the number imparted in plying the strands. Six to eighteen turns, preferably eleven, are imparted.

Ordinarily about two turns more in the reverse direction than in the plying direction is sufficient when 4 to 11 turns are used in plying the single yarns together. But when twelve or more turns are used in plying the yarn, then three or four more additional turns are required in the reverse diection in order to effect the desired reverse twist.

The resulting yarn 6, Fig. 3, when unwound from the twister bobbins has a twist in the Z

direction. When relieved of tension it contracts and forms helical curls 8 (Fig. 4) of Z direction, the individual strands being loosened and detached from each other and having a single twist in the Z direction.

An advantageous characteristic of my method of making this multiple-ply yarn is that whereas, in a reverse twisting operation a single strand of yarn is apt to break under tension at the point of zero twist, when two or more of these strands are combined in a multiple-ply yarn, before reverse twisting, each of these strands resists breaking at the point of zero ply twist due to the strength inherent in the twist in each single strand.

This yarn may be employed as the pile yarn in the manufacture of Axminster, jacquard and velvet carpets.

When the yarn is to be used in an Axminster loom, it is given a temporary set, by means known in the art, when wound on the twister bobbins so that it is sufficiently straight to be threaded through the Axminster tube frames without difficulty.

I weave a carpet of any of the above named sorts having as few as four rows of pile per inch. I then subject the carpet to a dampening treatment, as is common in finishing, by wetting it with water or giving it a mild steaming treatment. The effect of such a dampening treatment on the yarn of Fig. 4 is illustrated in Fig. 5, in which it will be seen that the yarn assumes a great variety of irregular shapes, including tight kinks 10. The dampening treatment of the carpet activates the twist and curl in the tuft legs of the multiple-ply reverse twisted yarns, causing the tufts to twist, bend, kink and curl and to assume a variety of curls, bends, kinks, twists and angles 9 in the woven carpet, as shown in Fig. 6, so that the tufts completely cover a large area of the backing structure of the carpet. Thus I am able to produce a carpet satisfactory in texture and in coverage of the backing structure having a hard twisted pile with much less pile than is required with the conventional hard twisted yarns. For example, I produce a satisfactory carpet having as few as four rows per inch and having the characteristics of twisted pile surface using two-ply reverse twisted yarn, whereas with the conventional hard twist yarns a satisfactory carpet of less than seven rows per inch cannot be made because the backing structure would be exposed in the hard twist areas. I am also able to employ as few as one-half the conventional number of tufts in the weftwise rows, thereby further reducing the number of tufts per square inch and yet effectively cover and conceal the backing structure.

Fig. 7 illustrates a carpet having a combination of pile tufts formed from multiple-ply reverse twisted yarn and pile tufts formed from conventional soft yarn. In this figure pile tufts similar to those shown in Fig. 6 are indicated as having curls, bends, kinks, twists and angles 9 in the woven carpet and pile tufts 11 are composed of conventional soft yarn which in the finished carpet opens up to provide coverage as indicated in Fig. 7. It is to be noted that the reverse twisted yarn is pulled down below the level of the pile tufts which are composed of soft yarn.

The twisting, bending, kinking and curling of the tuft legs of the mutiple-ply reverse twisted yarns causes the tufts to be drawn down, so that in a carpet woven from this twisted yarn and the conventional soft yarn, the pile surfaces of

the areas composed of the twisted yarns are lower than the pile surfaces of these areas composed of soft yarn tufts so that I produce a multiple level effect which is obtainable usually only in expensive hand-carved carpets.

The dampening treatment removes the temporary set if one is present.

The use of a three-ply or a four-ply reverse twisted yarn produces an even more satisfactory four-row carpet with fewer tufts in the twisted yarn areas because of the greater bulk of these additional plies.

The twisting of the individual strands may be in the S direction; the plying should then be in the Z direction and the final reverse twisting should be in the S direction.

I claim:

1. A pile fabric comprising a backing and pile tufts secured therein, at least some of said tufts comprising yarns having two or more plies with a final plying twist of a given hand but being present with an initial plying twist of the opposite hand, said tufts having upstanding legs in which the individual plies are separated, bent and pulled down due to having been under a strain resulting from said preset initial twist of opposite hand.

2. A pile fabric comprising a backing and pile tufts secured therein, at least some of said tufts comprising yarns having two or more plies with a final plying twist of a given hand but being preset with an initial plying twist of the opposite hand, the individual plies having a singles twist of said given hand, said tufts having upstanding legs in which the individual plies are separated, bent and pulled down due to having been under a strain resulting from said preset initial twist of opposite hand.

3. A pile fabric comprising a backing and pile tufts secured therein, some of said tufts having straight upstanding legs, others of said tufts comprising yarns having two or more plies with a final plying twist of a given hand but being preset with an initial plying twist of the opposite hand, said other tufts having upstanding legs in which the individual plies are separated, bent and pulled down below the level of sad first tufts due to having been under a strain resulting from said preset initial twist of opposite hand.

ROBERT J. JACKSON.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,661,018	Stroud	Feb. 28, 1928
2,019,183	Heberlein	Oct. 29, 1935
2,019,185	Kagi	Oct. 29, 1935
2,058,948	Blumenthal et al.	Oct. 27, 1936
2,111,209	Dreyfus	Mar. 15, 1938
2,174,573	Finlayson	Oct. 3, 1939
2,304,089	Heberlein	Dec. 8, 1942
2,414,800	Charch et al.	Jan. 28, 1947
2,430,425	Jackson	Nov. 4, 1947
2,499,444	Allison	Mar. 7, 1950
2,503,583	Jackson	Apr. 11, 1950
2,509,351	Reinhardt et al.	May 30, 1950
2,557,453	Miller	June 19, 1951
2,564,245	Billion	Aug. 14, 1951

FOREIGN PATENTS

Number	Country	Date
397,046	Great Britain	Aug. 17, 1933
474,401	Great Britain	Nov. 1, 1937
588,107	Great Britain	May 14, 1947
592,592	Great Britain	Sept. 23, 1947