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PROCESS OF MAKING PERMANENTLY SET
HARD TWIST WOOL YARN

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2 Claims. (Cl. 28—76)

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My invention relates to a process for producing a hard twist wool yarn, adapted for use as the pile in a pile floor covering or fabric, carpet or rug. Its principal object is to provide an improved hard twisted wool yarn in order to obtain pile fabrics in which an improved pebbly textured pile surface is produced by the use of such yarn and in which the twist in the tuft legs made therewith is permanently set, i. e., resistant to wetting, as in washing and shampooing.

When wool yarn, twisted and prepared as heretofore, is woven as warp into pile over the pile wires in a pile wire loom (Tapestry or Jacquard) and the pile loops are cut, the legs of the tuft tend to untwist and straighten out so that the desired pebbly textured finish is not fully obtained. Wool yarn has been treated in various ways in attempts to prevent or minimize this untwisting of the pile when cut but not with complete success, especially with yarns dyed in the darker shades. A serious defect is that when the fabric is wet, as with liquid spilled on it, or is washed or shampooed, the tuft legs further untwist so that the resilience and appearance of the fabric are seriously deteriorated.

My invention is most useful when applied to three-ply and two-ply yarns, although single yarns and yarns composed of as many as seven-ply may also be used. In the case of the preferred three-ply and two-ply yarns, the single strands of yarn are given from two to five turns per inch. In twisting these strands of yarn together, I put in from four to twelve turns per inch in forming the three-ply yarn and four to fifteen turns per inch in forming the two-ply yarn. Thus I give the wool yarn an abnormally hard twist.

I form the hard twisted yarn into loose skeins whereby the yarn, being free from tension, coils upon itself and forms kinks. I wet the skeins of kinked yarn and heat them with saturated steam at a pressure in the range between 5 and 40 pounds per square inch for a suitable time. Thereby the twists and kinks in the yarn are set. I then dry the yarn.

The product of my process is a hard twisted wool pile yarn having, when relaxed as in skein form, kinks at intervals and a permanent set resistant to untwisting and to twisting in either direction.

The yarn may be prepared for use as the pile yarn of a floor covering by winding it under tension on spools to straighten out the kinks while retaining in the yarn the strain which would cause the yarn to kink if the tension were re-

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leased. The yarn may then be wound under tension on the warp beam of a wire loom and woven while under tension over the wires of the loom. The withdrawal of the wires cuts the pile loops.

The legs of the cut tufts are sufficiently twisted and stiff to stand upright with occasional kinks. But they are not all at the same angle, so that the face of the fabric, which is formed by the pile ends, has the desired pebbly and irregular appearance. The twist in the tuft legs is permanently "set" in that it does not become untwisted when the pile is wet as in washing and shampooing.

My preferred practice is as follows: The wool, with or without other fibers, is dyed in the raw stock, processed and spun into strands in the usual way. The strands, which may have from two to five turns per inch, are then twisted abnormally, i. e., about 10 turns to the inch and reeled into skeins. The skeins are removed from the reels so that the yarn in skein or bulk form is free from tension. The twist in the yarn causes it to kink at intervals. The kinked skeins are immersed in water, with or without a wetting agent, and, after centrifuging to remove excess water, they are subjected to saturated steam at about 250° F. for about thirty minutes in a closed chamber in which, by means of suitable check valves, the pressure is maintained at about 15 lbs. per square inch above atmospheric. The twist in the yarn is thereby set. The yarn is dried. It is wound under tension onto spools thereby straightening out the kinks, but retaining the twisting strain so that if the tension were relaxed the yarn would again kink. The yarn is then ready to be used as the pile yarn in a wire loom as above pointed out.

In case the yarn is more than average resistant to the steaming treatment, the severity of that treatment may be increased by increasing the temperature and the pressure above 15 lbs. per square inch and/or the time. The pressure may be increased if the exposure time is reduced. But the pressure should not exceed 40 lbs. per square inch with a 30 minute exposure because at that level the treatment would tend to lessen unduly the durability of the yarn by oxidation.

I prefer to treat the dyed wool with acid to protect the wool from damage by oxidation during steaming and to preserve the color. This acid can be of the type commonly used in dyeing, for example, either mineral or organic acids or acid liberating compounds or mixtures. I prefer to use either acetic acid or sodium acid sulphate,

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the latter liberating 40 per cent free sulphuric acid by weight when dissolved in water. These acids may be used in small quantities up to 20 percent by weight of the wool used. The amount used depends upon several factors; such as the color change permissible, the allowable oxidation on the wool, the previous fixation of the dyestuff, i. e., whether it has been exhausted from the dye bath or applied as a stain, and the amount of undyed wool present.

Rugs and carpets having permanent highly twisted cut pile yarn of my invention have many advantages over fabrics made from twisted yarn by former processes, including improved texture effect, very few, if any, untwisted tuft legs, an increased luster giving a pearly appearance to the surface of the rug or carpet and a set permanent to wetting and shampooing.

Such rugs and carpets of my invention are claimed in my co-pending application Serial No. 79,320 filed March 2, 1949 and the method of making them in my application Serial No. 702,105 filed October 9, 1946, of which the present application is a division. The yarn of my invention is claimed in my co-pending application Serial No. 82,495 filed March 19, 1949.

I claim:

1. The process for producing hard twisted wool yarn, adapted to be woven as the pile in a pile fabric, which consists essentially in hard twisting a wool yarn in one direction only, reeling the twisted yarn into skeins, relaxing the tension in said yarn to cause kinks at intervals, wetting the skeins of yarn, setting the twist and kinks in said yarn by subjecting the skeins of wet yarn while in a relaxed tensionless kinky condition to a steaming treatment with saturated steam at a pressure of at least five pounds and not over forty pounds per square inch for such a time that

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the severity of the steaming treatment does not exceed that represented by treatment for 30 minutes at 40 pounds per square inch pressure, and drying the skeins of yarn in a tensionless kinky condition, whereby the completed yarn has kinks at intervals when relaxed and is permanently set and resistant to untwisting and to twisting in either direction.

2. The process for producing abnormally highly twisted wool yarn, adapted to be woven as the pile in a pile fabric, which consists essentially in hard twisting a wool yarn in one direction only, reeling the twisted yarn into skeins, producing kinks in said yarn by releasing the skeins from tension, setting the twist in said yarn by subjecting the skeins of yarn while in a relaxed tensionless kinky condition to a steaming treatment with saturated steam at a pressure of at least five pounds and not over forty pounds per square inch for such a time that the severity of the steaming treatment does not exceed that represented by treatment for 30 minutes at 40 pounds per square inch pressure, drying the skeins of yarn in a tensionless kinky condition and winding the yarn on spools under tension sufficient to temporarily straighten out the kinks.

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