ABSTRACT: A tufted pile loop fabric comprising successive transverse lines of loops of yarn having a bulk equivalent to wool yarn of 16 to 23 yards per ounce and about 35 to 47 pile loops per square inch with certain loops in each transverse line more closely spaced than others to form spaced tightly packed areas which are offset in successive stitches to eliminate the appearance of lines in the fabric.
This invention relates to tufted pile fabrics and has for an object to provide a tufted fabric wherein the pile loops are formed of relatively large yarns and wherein the loops are so closely spaced that the fabric has an overall uniform patternless appearance.

Another object is to provide a tufted loop pile fabric in which the loops are so tightly packed together as to provide a full overall coverage without apparent lines or breaks.

Various other objects and advantages will be apparent as the nature of the invention is more fully disclosed.

In one embodiment the fabric is of the floor-covering type in which the pile loops are composed of coarse yarn such as wool yarn having a weight of 16 to 23 yards per ounce or a synthetic or blended yarn having an equivalent bulk. With yarns of this size the transverse rows of loops are closely packed when disposed at five or six rows of loops per inch. Successive stitches in the direction of stitching lie in general contact when disposed at a spacing of five or six stitches per inch. Thus the fabric may contain from 25 to 36 loops per square inch over its surface.

In accordance with the present invention the formation of lines in the fabric is prevented by providing an irregular spacing in the transverse direction between at least some of the loops. This may be accomplished by inserting said additional loops in the otherwise closely packed rows of loops. For example, a pair of additional loops may be inserted at predetermined intervals in some or all of the transverse lines of loops or between successive stitches. Alternately the loops in each transverse line may be arranged in pairs with the loops in each pair more closely spaced than the adjacent loops of successive groups.

The result is to crowd additional loops in the otherwise closely packed area so that the loops are pushed out of line so as to prevent the apparent formation of regular lines or breaks in the otherwise patternless surface.

In the drawing:

FIG. 1 is a sectional view illustrating the tufting process;

FIG. 2 is a transverse section of fabric showing one arrangement of the loops in a transverse line.

FIG. 3 is a section similar to FIG. 2 illustrating a different arrangement of the loops; and FIGS. 4 to 8 are diagrammatic views illustrating various loop arrangements embodying the present invention.

Referring to the drawing more in detail the loop pile is shown as formed on a backing fabric 10 by stitching through the fabric 10 with a bank of needles 11, each of which carries a pile yarn 12 from which a series of loops is formed.

In operation the needles pierce the fabric 10 from the reverse side to pull a loop 14 of yarn through the fabric. The needles penetrate the fabric by a predetermined distance, depending upon the size of loop which is to be formed, and the loop is engaged and held by a holding member as the needle is withdrawn. The fabric is then advanced a predetermined stitch length and the needles again advanced to form the next line of loops.

The operation above described is a standard tufting operation and only so much thereof has been shown as is necessary for an understanding of the present invention.

In accordance with the present invention the bank of needles is so controlled that each needle is actuated independently so that any selected group of needles may be actuated in each transverse line of stitches. Representative mechanism for actuating such needles independently is shown by way of example in U.S. Pat. No. 3,177,833 dated Apr. 13, 1965. It is to be understood however that any suitable actuating mechanism which is known in the art may be used.

In order to obtain tightly packed loops a coarse yarn is used, such as a wool yarn of 16 to 23 yards per ounce, or other yarns of natural or synthetic material having a corresponding bulk. The yarn may be of single ply or may be a plied or cabled yarn.

With yarns of this size the loops are tightly packed when five or six loops are used per inch in the transverse direction with a similar number of stitches per inch in the longitudinal or stitch direction. When so disposed adjacent loops in each row are in substantial contact and the loops in successive rows are generally in contact to provide a full overall coverage. In the drawing the loops 14 are arranged in transverse line 15 and successive lines 15 are displaced by a stitch length such that the loops are generally in close contact.

Although the loops in the lines 15 are closely packed the invention provides for packing the loops still tighter by the insertion of additional loops 16 in each line 15 or between successive lines or rows. In a fabric having five loops per inch in a transverse line, two intermediate loops 16 per inch may be in or between lines. The number of intermediate loops may vary but in general should be less than half of the number of loops in the lines 15.

The positions of the loops 16 in successive stitches may be selected at random so as to assist in providing a patternless appearance.

In the embodiment of FIGS. 2 and 4 additional loops 16 are disposed in the same transverse lines as the loops 14. Thus each selected line 15 may contain seven loops per inch instead of five. The five loops 14 are substantially equally spaced with the loops 16 interposed between certain of the loops 14 so that the line 15 contains loops of unequal spacing. The loops 16 of successive stitches may be staggered so as to prevent alignment and the formation of apparent lines in the fabric.

In the embodiment of FIGS. 3 and 5 the loops 16 are formed by advancing the backing fabric 10 a half a stitch length and actuating a selected pair of needles. For example, using a bank of five needles per inch all five needles are actuated for each line 15 of loops, and two of the needles may be actuated to insert the first intermediate loops 16. In successive intermediate stitches a different pair of needles would be actuated.

Alternatively, the loops 16 may be inserted by a separate set of needles carrying different yarns in which case the loops 16 are placed between lines and between rows as shown in FIG. 6 and the yarns of the loops 16 may or may not be composed of the same material as the loops 14. In a further embodiment as shown in FIG. 7, 10 needles per inch may be used and alternate needles may be actuated in successive stitches so that the loops on successive stitches are staggered. Thus, one line 17 may contain five loops 18 formed by alternate needles of the bank and the next line 19 may contain five loops 20 formed by the remaining set of alternate needles.

In the embodiment of FIG. 8 the loops 21 are shown as arranged in pairs in the transverse direction with the pairs more widely spaced than the loops of each pair. The two loops of each pair may be disposed in the same transverse line as shown in FIG. 8 or may be staggered in successive stitches as shown in FIG. 7. In the latter case the needles which form the two loops may be carried on different needle bars and the two loops can be placed in closer contact than if the needles were all carried on the same bar where a certain minimum clearance would be required between adjacent needles.

In accordance with the present invention relatively large pile yarns are used for making the loops as set forth in the following examples. The yarns are of multiple plies and are preferably cabled. The yarns may be composed essentially of wool, but one or more of the plies may be made of continuous filament synthetic material such as nylon or polypropylene which have been artificially bulked, as in a stuffer crimper or of a synthetic spun yarn such as a spun yarn from acrylic staple fibers.

The fabric may contain from 25 to 36 loops 14 per square inch plus the additional loops 16 referred to above which may constitute an additional 10 or 12 loops per square inch. In order to obtain the desired effect the pile loops are relatively low, for example being not more than three-fourths of an inch in height. Loops of this height remain closely packed and retain their relative arrangement in the fabric, arranged five loops per inch in the transverse direction with two additional loops per inch inserted and with five stitches per inch and with a loop height of three-fourths of an inch.
Example 1
The loop yarn may comprise three-ply yarn composed of three wool ends having a total weight of 16 to 23 yards to the ounce and having a ply twist of not over 2 ½ but preferably 1¼ turns per inch.

Example 2
An improved effect is obtained by using for the pile yarns a cabled wool yarn composed of two-plied ends wherein each of the ends comprises three singles each having a weight of 125 yards to the ounce and a twist of from 4 to 4 ½ turns per inch and plied with a ply twist of three turns per inch, the two ends being cabled with a cable twist of 1¼ to 1½ turns per inch. The loops are tufted six loops per inch in a transverse line six stitches per inch and with two additional loops per inch between successive stitches, the pile loops having a height of one-half inch.

Example 3
Instead of using all wool yarns as referred to in examples 1 and 2, one or more of the ends may be composed of synthetic yarns such as continuous filament nylon or polypropylene which have been artificially bulked as in a stuffer crimper, or of a yarn spun from acrylic staple fibers or of other synthetic staple fibers, the synthetic ends having substantially the same overall bulk as the wool ends referred to above. In this embodiment the synthetic yarn serves to support the wool yarns and to improve the wear resistance of the fabric. The synthetic yarn may be of the same color as the wool yarn or may be of contrasting color.

Example 4
The pile loops may be formed of all synthetic yarns of the type specified in example 3, the synthetic yarns being plied or cabled as set forth in examples 1 and 2 and having substantially the same bulk as the wool ends or yarns described in the above examples.

We claim:
1. A tufted loop pile fabric comprising a fabric backing layer and pile loops tufted therein, said pile loops being composed of a yarn equivalent in bulk to a wool yarn of 16 to 23 yards per ounce, being arranged in a series of transverse lines and longitudinal rows and having a loop density sufficient to form tightly packed pile loops, said loops being arranged in groups, which are more widely spaced than the loops in each group, the loops of each group extending through separate needle holes in the backing fabric and being so closely spaced that they are displaced from their normal positions in said backing fabric by their mutual contact to provide a patternless effect.

2. A tufted loop pile fabric as set forth in claim 1 wherein the loops of each group are formed by the same pile yarn in successive stitches, the stitches being so closely spaced that the loops are in mutual contact, successive groups of loops in the longitudinal direction being offset transversely to avoid the formation of apparent lines in the fabric.

3. A tufted loop pile fabric as set forth in claim 1 wherein the loops of each group lie in the same transverse line across said backing fabric.

4. A fabric as set forth in claim 3 in which the groups are offset in successive stitches.

5. A loop pile fabric as set forth in claim 3 wherein the group are separated by at least one individual loop.

6. A loop pile fabric as set forth in claim 3 wherein the loops of each group are offset.