

Oct. 16, 1956

W. A. RICE

2,766,506

PATTERNED SEWN TUFTED FABRIC

Filed Jan. 13, 1956

2 Sheets-Sheet 1

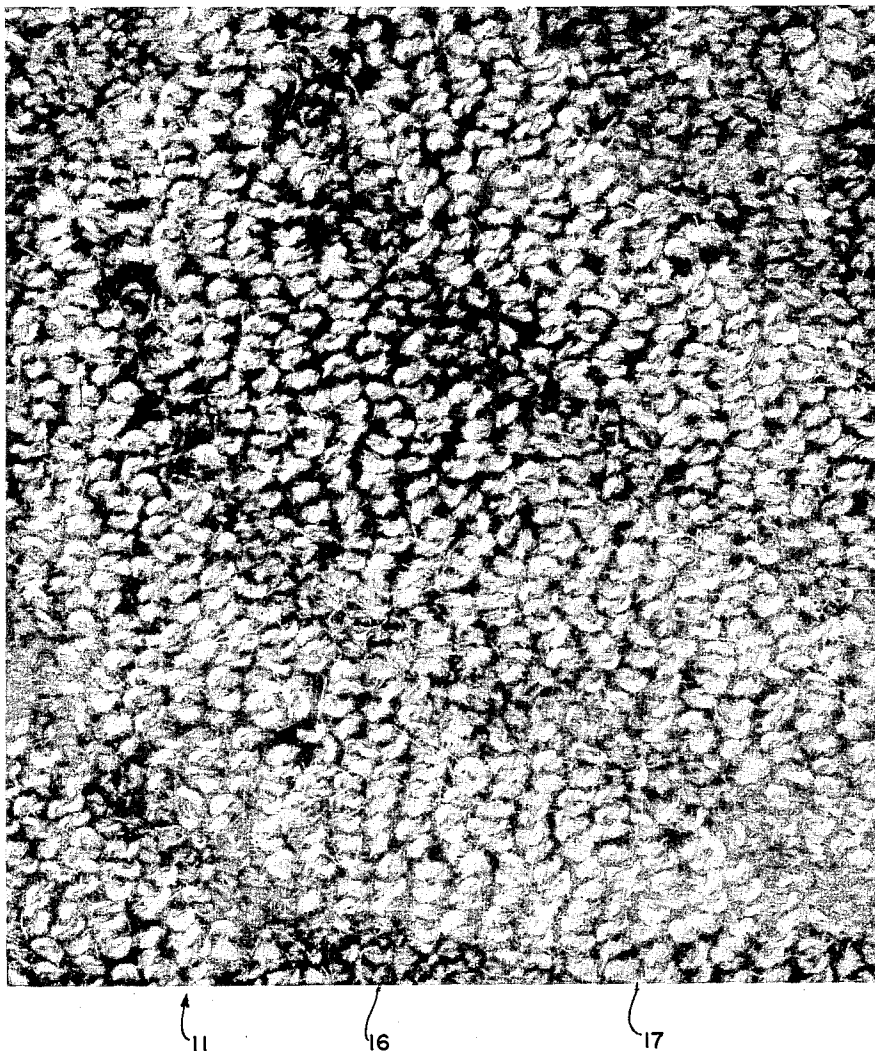


FIG. 1

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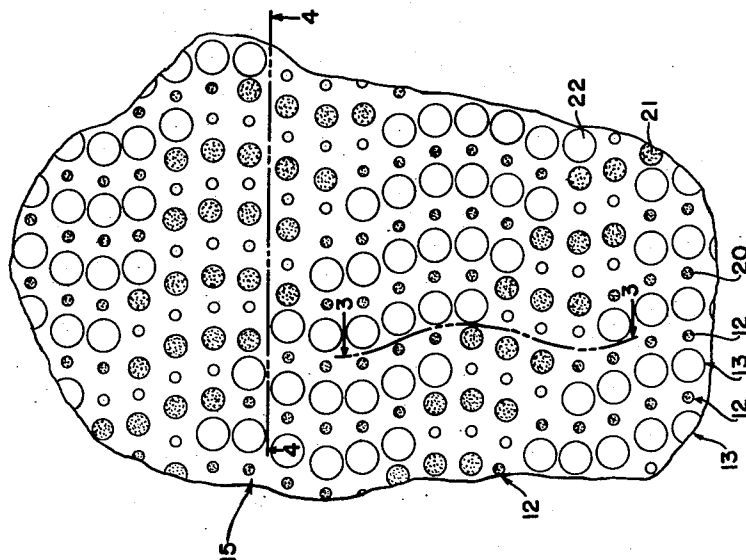


FIG. 2

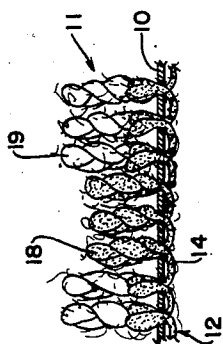


FIG. 3

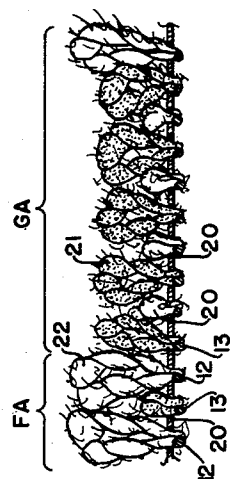


FIG. 4

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PATTERNED SEWN TUFTED FABRIC

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5 Claims. (Cl. 28—78)

This invention relates to pile fabrics suitable for use as floor coverings in the form of carpets and rugs and is concerned more particularly with a novel pile fabric of the sewn tufted type having a pile carrying a pattern, which is composed of figure and ground areas differing in color and, preferably, also in height. The new fabric may be made in forms closely resembling woven fabrics of Wilton construction, in which two frames of pile yarn are used, but can be produced more rapidly and at lower cost than a Wilton fabric can be woven on a loom.

In the production of pile fabrics by weaving operations on a loom equipped with pile wires, patterns have been formed in the pile by employing sets of pile wires, which include high and low wires arranged in alternation, so that the high pile loops formed over the high wires will mask or conceal the low loops formed over the low wires. Also, it has been common practice heretofore to form a pattern in the pile of a woven fabric by using pile wires having a wavy top and arranging the wires in such manner that, in certain areas of the pile, high loops conceal low loops. In a pile wire loom, the number of wires in a set is relatively small and ordinarily does not exceed thirty, so that each repeat of the pattern in the pile is made up of a correspondingly small number of transverse rows of pile elements. As a result, the patterns are greatly limited in variety and interest.

In the production of pile fabrics by tufting operations on sewing machines, some attempts have been made heretofore to produce fabrics with a pattern in the pile composed of figure and ground areas differing in height, but, in all such fabrics with which I am familiar, the pile yarns have been of the same color or color arrangement throughout the pile and the patterns have been made up of simple geometric figures or designs.

The present invention is directed to the provision of a novel pile fabric, which can be produced by tufting operations on a sewing machine and has a pile having a pattern with figure and ground areas differing in color and, if desired, also in height. The pattern in the pile of the fabric has repeats, which are not readily detectable and may be very long, and the pattern may be an elaborate one with the figure and ground areas of any desired shape.

The desired results are obtained in the fabric of the invention by utilizing two sets of pile yarns with the yarns of one set alternating across the fabric with those of the other. The yarns of the two sets differ in color and, although the yarns of both sets are present as loops in both the figure and the ground areas, the loops of the yarns of only one set are visible in any single area, while the loops of yarns in the other set are masked and concealed in that area by the visible loops. In its preferred form, the pile of the fabric has figure and ground areas

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differing in height, so that the pile loops are of three heights, namely, high loops visible in the figure areas, loops of intermediate height visible in the ground areas, and low loops present but concealed in both the figure and ground areas. Since the fabric is made on a sewing machine, the pile loops lie in rows extending lengthwise of the fabric, but the rows are not straight as is usual but have a wavy or undulating form. As a result, the pile is more homogeneous than in ordinary tufted fabrics and there are no straight lines of loops of the same color to distract attention from the pattern. As the new fabric may be made with surface effects not heretofore available in sewn tufted products, it extends the field of use of such products and makes it possible for the manufacturer to offer tufted carpeting in a wide variety of new and interesting patterns.

For a better understanding of the invention, reference may be made to the accompanying drawings, in which

Fig. 1 is a photographic plan view of a pile fabric of the invention;

Fig. 2 is a diagrammatic plan view of one form of the new fabric; and

Figs. 3 and 4 are transverse and longitudinal sectional views of a pile fabric of the construction represented by Fig. 2, the sections being indicated by the line 3—3 and 4—4, respectively, of Fig. 2.

The fabric of the invention includes a base or backing sheet 10 and a pile 11 made of loops of yarns in two sets anchored in the backing sheet. The sheet is a fabric woven of suitable yarns and is frequently made of relatively heavy jute yarns, while the pile yarns ordinarily include two or more plies and may be made of any of the usual fibers, such as wool, wool-rayon blends, rayon, and cotton, which are commonly used in pile yarns for use in carpets. The yarns in the two sets differ in color to a degree readily distinguishable by the naked eye and the yarns in each set may be made of different solid or mixed colors, so long as the yarns in the two sets are distinguishable. A useful combination of yarns includes yarns of a single solid color forming one set of the pile yarns and yarns making up the second set, which are plied of a component of the same color as the yarns in the first set and a second component of a contrasting color.

The pile loops in the fabric lie spaced in rows extending longitudinally of the fabric and the loops in such rows are represented by the circles of different size in Fig. 2. The loops in alternating rows across the fabric are made of the yarns of the two sets, so that the loops in the odd longitudinal rows, such as the rows 12, are made of yarns of one set and the loops in the even longitudinal rows 13 are made of yarns of the second set. In the production of the fabric on a multi-needle sewing machine, all the loops in a longitudinal row are made by the same needle and of the same yarn and adjacent loops in such a row are connected by lengths of yarn 14 lying against the back of the base 10. As all the needles of a sewing machine lie in a row extending transversely of the fabric, the loops in the longitudinal rows also lie in transverse rows 15. Although the ends of each loop are connected at the underside of the backing sheet to the ends of longitudinally adjacent loops, each loop assumes a position with its plane lying transversely of the fabric. Accordingly, all the loops in a transverse row lie substantially in the same plane.

In ordinary tufted fabrics, the backing sheet is fed through the tufting machine along a rectilinear path, so

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that the longitudinal rows of loops are straight. In the fabric of the invention, the base fabric is tufted in such manner that the longitudinal rows of loops are wavy or undulating, as will be apparent from Figs. 1 and 2. The amplitude of the waves in the longitudinal rows of loops may vary considerably, but, in the fabric illustrated, the amplitude is about twice the spacing between adjacent longitudinal rows of loops. As a result, straight lines extending lengthwise of the fabric will pass through loops in at least two adjacent longitudinal rows. The insertion of the loops in wavy longitudinal rows does not affect the arrangement of the loops in alignment in straight transverse rows.

The fabric illustrated has a pile made up of a set of yarns of a single color relatively dark in shade and a second set of yarns made up of two components, one of which is white and the other of which is of the same color as the yarns of the first set but of a lighter shade. A pile loop of a dark yarn of the first set is shown on Fig. 1 at 16 and a loop of a yarn of the second set is shown at 17. In Fig. 2, the circles representing the loops are stippled to indicate that the loops are made of yarns of the first set and are left blank to indicate that the loops are made of yarns of the second set. Similarly, in Figs. 3 and 4, the stippled loops, such as the loop 18, are of yarns of the first set and the unshaded loops, such as the loop 19, are of yarns of the second set.

The fabric illustrated has a pile, in which the figure areas are higher than the ground areas, so that the pile has a carved or embossed appearance. As shown in Fig. 1 and as will be apparent from Figs. 3 and 4, the figure areas appear to be made of loops of yarns 19 only, while, in the ground areas, only loops 18 are visible. Actually, there are loops of yarns of both kinds present in all areas throughout the pile. In order to obtain high figure and low ground areas, the pile loops in the new fabric are of at least three heights and consist of low loops 20, loops 21 of intermediate height, and high loops 22. In Fig. 2, the low loops 20, the intermediate loops 21, and the high loops 22 are represented by circles bearing the same reference characters and of a diameter varying with the height of the loops.

The width of the loops in the fabric varies with their height and the heights of the high and intermediate loops are chosen in relation to the spacing between adjacent longitudinal rows of loops, so that the minimum relaxed width of the loops of these heights is at least about twice the spacing. The low loops are preferably as low in height as can be made without danger of the loops being dislodged from the backing sheet. While the intermediate loops may vary in height, these loops are in all cases of noticeably less height than the high loops.

In the production of the new fabric on a tufting machine, the pile yarns are fed to the needles by feeding means, which supply the yarns to the needles in accordance with the requirements of the pattern to be produced. The feeding means preferred for the purpose are those disclosed in the copending applications of Crawford, Ser. No. 445,007, filed July 22, 1954, and Ser. No. 468,030, filed November 10, 1954. The Crawford feeders control the rate at which the individual yarns are fed to their needles and, in a fabric produced by the use of such feeders, the height of each loop throughout the pile may be controlled. In the production of the new fabric by means of such feeders, the yarns, which are to form the loops visible in the figure areas, are fed to their needles at such a rate during the tufting of these areas that the needles insert high loops, while the yarns, which are not to be visible in the figure areas, are at the same time fed at such a rate that low loops are formed. Similarly, the yarns, which are to form the loops visible in the ground areas, are fed to their needles at such a rate during the tufting of these areas, that the needles insert loops of intermediate height, while the other yarns are so fed that low loops are formed.

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In each transverse row of loops lying within a given figure or ground area of the pattern of the new fabric, there are high or intermediate loops alternating with low loops. Thus, in the ground area represented by the loops within the bracket GA in Fig. 4, intermediate loops 21 alternate with low loops 20 in a transverse row, whereas, in the figure area represented by the loops within bracket FA, high loops 22 alternate with low loops 20. In both areas, the low loops are concealed within the pile, so that, in the fabric shown in Fig. 4, each ground area appears to be made only of loops of the dark yarns 21 of one set and each figure area appears to be made only of loops of the lighter yarns 22 of the second set.

The fabric of the invention need not include loops of three heights, but can be made in a form, which contains loops of a minimum height and loops of a greater height. In such a fabric, there is no limitation as to the height of the high loops, except that they must be capable of concealing the low loops. When the pile is made of loops of two heights only, it has a flat surface, in which only the higher loops are visible.

While I have described the fabric as having a pile formed of loops of pile yarns of two different sets with the yarns of each set all of the same color or color combination and distinguishable from those of the other set, it will be apparent that the yarns in each set may differ from one another in color and be employed in an arrangement determined by the requirements of the pattern. Ordinarily, the yarns of one set will be all of the same color and form the loops visible in the ground areas, while the yarns of different color, which make up the second set, are employed in the figure areas of the pile. Fabrics having multi-color yarns in one set may have more elaborate pattern effects than those, in which the yarns of each set are all of the same color or combination of colors.

The constructional details of the new fabric may vary greatly as, for example, in the number of rows of pile loops per inch, the number of loops per inch, the height of the loops, etc. In a typical fabric of the invention, the rows of loops are $\frac{1}{8}$ " apart and contain 8 or 9 loops to the inch. The rows of loops are wavy and the amplitude of the waves is about twice the spacing between adjacent rows or $\frac{1}{4}$ ". The high loops, when relaxed, have a height of $\frac{3}{8}$ " and a width of $\frac{1}{4}$ ", while the intermediate loops in the same condition have a height of $\frac{1}{4}$ " and a width of $\frac{3}{16}$ ". The low loops in relaxed condition have a height of $\frac{1}{8}$ " and a width of $\frac{1}{16}$ ", so that, with the longitudinal rows of loops spaced $\frac{1}{8}$ " apart, the high and intermediate loops overhang and conceal the low loops lying between them in the same transverse row.

I claim:

1. A pile fabric, which comprises a base of woven fabric and a pile made up of loops anchored in the base and formed of yarns in two sets with the yarns of one set differing in appearance from those of the second set, the pile loops being spaced apart in both undulating longitudinal and straight transverse rows and lying at an angle to the longitudinal rows and approximately aligned in the transverse rows, the loops in the odd longitudinal rows being made of yarns of one set and those in the even longitudinal rows being made of yarns of the other set and the loops being of at least two heights, the pile consisting of figure and ground areas with the parts of the transverse rows of loops in the areas of one kind being formed of low loops of yarns of one set alternating with higher loops of yarns of the second set and the parts of the transverse rows in the areas of the other kind being formed of low loops of yarns of the second set alternating with higher loops of yarns of the first set, the higher loops in each transverse row extending laterally and overlying and substantially concealing adjacent low loops in said row.

2. The pile fabric of claim 1, in which the pile loops are of low, high, and intermediate heights and the parts

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of the transverse rows of loops in the pile areas of one kind are formed of alternate high and low loops and the parts of the transverse rows of loops on the pile areas of the other kind are formed of alternate intermediate and low loops.

3. The pile fabric of claim 1, in which the yarns of the two sets differ from one another in color.

4. The pile fabric of claim 1, in which the pile yarns are plied of at least two components and the yarns of one set include a component differing in color from at least one component of the yarns of the second set.

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5. The pile fabric of claim 4, in which the amplitude of the undulations of the longitudinal rows of pile loops is about twice the spacing between adjacent rows.

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