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W. D. KELLOGG

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PILE FABRIC

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Fig. 1.

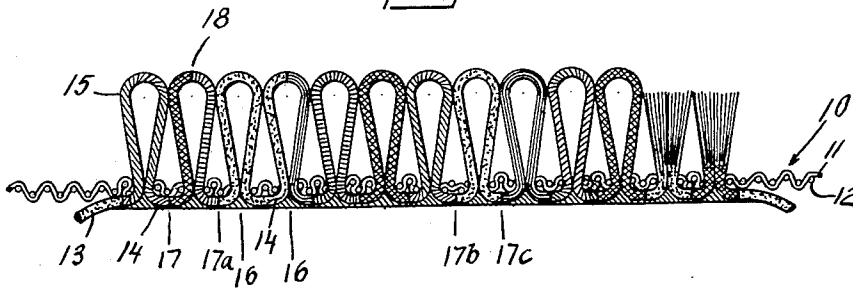


Fig. 2.

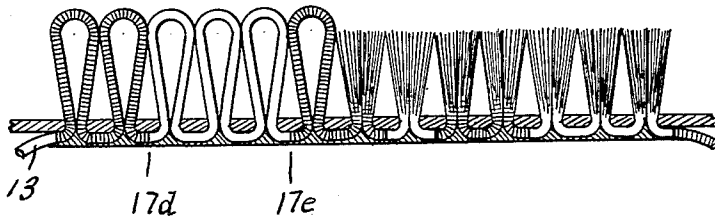
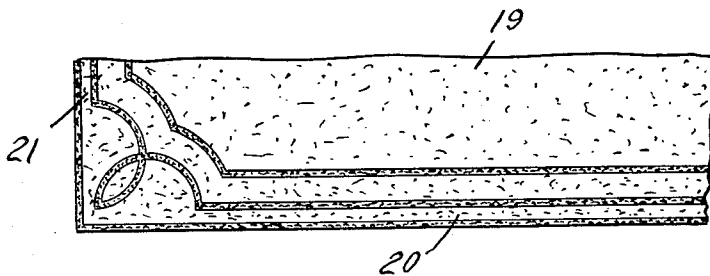


Fig. 3.



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PILE FABRIC

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3 Claims. (Cl. 112—1)

This invention relates to pile fabrics having a pattern on the pile surface and is concerned more particularly with a novel figured pile fabric and a new method by which such a fabric can be produced by a sequence of operations not involving weaving.

Pile fabrics have been produced heretofore without weaving and the method commonly used includes insertion of the pile yarns by means of needles in a base or backing, such as a fabric, to form pile loops, the fabric then being coated on the back with an adhesive which binds the pile yarns in place. Special sewing machines are employed for inserting the pile yarns, and in one type of machine, the needles through which the yarns are threaded are hollow and as the base is fed to the machine, the needles move down through it, carrying the yarn with them. As the needles are withdrawn from the base, a loop of yarn is produced which projects beyond the face of the base, and suitable means are provided for preventing the needles from pulling out the previously inserted loops as new loops are made. In the completed fabric, the tops of the loops may remain connected or be severed, depending on the kind of fabric being made.

Fabrics of the type described as heretofore made have commonly had a pile of a single color, the yarns being dyed the proper color before being inserted in the backing. Some attempts, however, have been made to produce a figured pile, and for this purpose, the fabric is first produced in the ordinary way and the pile design is then stamped or printed on the pile surface. Figured pile fabrics thus made are not satisfactory because the number of colors than can be used in the stamping or printing operation is limited and the application of the colors in this manner results in the coloring material penetrating only a short distance into the pile. As the pile is worn or crushed, the uncolored areas soon become visible and this detracts from the appearance of the fabric. Moreover, sharp clean-cut designs cannot be produced in this manner because of the nature of the surface to which the color is applied. The appearance of such fabrics is consequently quite inferior to that of figured pile fabrics made by ordinary weaving operations.

The present invention is directed to the provision of a pile fabric made without weaving and having a patterned pile surface comparable with that of a fabric produced by weaving. In the new fabric the tuft yarns are colored throughout their lengths instead of only at their free ends and the design on the pile may include a much larger

number of colors than can be employed when the design is printed or stamped and the figures in the design are sharp and clean. The method of producing this fabric permits it to be manufactured cheaply and efficiently.

The new fabric comprises a base or backing, which is preferably an ordinary woven fabric, and tuft yarns inserted in this base and having minor portions which lie against the under surface of the base alternating with major portions projecting through the base and extending above the face thereof to form the pile. The yarns are colored along their length, in accordance with the pattern to be produced, prior to their insertion in the base, and the yarns may carry spots of color applied thereto either by spot printing or by drum printing. In the application of the coloring matter, the yarns are printed in unit lengths and each such unit length is equal to the distance along the yarn in the finished goods from the mid-point of a minor portion of the yarn at the under surface of the base to the mid-point of the next major portion or pile loop. Each spot of color on the yarn then has a length equal to a multiple of the unit length and the colored yarns are so introduced into the backing that each spot of a color terminates at one of the mid-points referred to.

In some instances as, for example, when rugs are being manufactured which have a border and a central design with the borders of a solid color, the yarns employed in the side borders running from end to end of the rug may be dyed rather than printed. The other yarns which form the pile both in the end borders and in the central design are then printed in accordance with the desired pattern.

By applying the colors to the yarns in unit lengths bearing a definite relation to the height of the pile and inserting the yarns so that the ends of each spot of color thereon coincide with the mid-points either of major or minor portions, it is possible to produce a fabric in which each pile tuft is colored throughout its exposed length instead of only at its tip, as is the case when patterns are produced by printing or stamping the pile surface. The pile on the new fabric thus closely resembles the pile of an ordinary woven pile fabric and it may be made with the same sharpness and cleanness of design.

For a better understanding of the invention, reference may be had to the accompanying drawing, in which

Figure 1 is a view in longitudinal section of one form of the new fabric;

Figure 2 is a similar view of a different form of the new fabric, certain parts being illustrated conventionally, and

Figure 3 is a fragmentary plan view of one form of the completed fabric.

The new fabric as illustrated in Figure 1 comprises a base 10 which may be a woven fabric comprising warp threads 11 and weft threads 12 interwoven in the usual manner. The tuft yarns 13 are passed through this base from the rear by suitable sewing machines, such for example, as that illustrated in my Patent No. 1,990,907 issued February 12, 1935 on application Serial No. 681,453, filed July 21, 1933, of which this application is a continuation in part. These pile yarns are made up of alternate minor and major portions designated 14 and 15, respectively, and each minor portion lies in contact with the under surface of the base and extends from one point 16 to the next adjacent point 16, these points being the places where the yarn is passed through the base to produce tufts. Each major portion of a yarn is that part of the yarn which is passed through the base at a point 16 to form a tuft loop.

In the production of the new fabric with a pattern on the entire pile, the tuft yarns used are colored by spot or drum printing, and the length of each spot on a yarn which is of the same color is a multiple of a unit length. The unit length employed is the distance along the yarn from the mid-point 17 of a minor portion to the mid-point 18 of the next adjacent major portion and the length of each spot of a color on a yarn is equal to one unit length or to a whole number of unit lengths. For example, in the fabric illustrated in Figure 1, the yarn 13 is indicated as carrying a spot of one color from the minor portion mid-point 17 to the major portion mid-point 18 and this yarn has a spot of another color extending from the major portion mid-point 18 referred to to the next minor portion mid-point 17a. The length of both these spots is accordingly equal to one unit length. At another place, the yarn carries a spot from the minor portion mid-point 17b to the next adjacent minor portion mid-point 17c and this spot is two unit lengths long. The length of a spot on the yarn may be equal to any number of unit lengths, as may be required by the pattern, as for example, in Figure 2 the yarn 13 has a spot of a single color which extends from the minor portion mid-point 17d to the minor portion mid-point 17e, the length of that spot being six unit lengths long.

After the yarns have been printed and the colors have been set, the yarns are fed to the sewing machine for insertion in a base. When spot printing is employed, the yarns can pass continuously from the printing apparatus through means for setting the color to the sewing machine. When drum printing is employed, the yarns are treated to set the color after removal from the drum, and the yarns then have to be arranged to place the spots on the different yarns in their proper relative positions in accordance with the pattern prior to the yarns being fed to the sewing machine. The yarns are fed to and inserted by the needles in such manner that a yarn changes color only at the mid-point either of a major or of a minor portion. With the ends of a spot of color on a yarn coinciding with mid-points, that length of the yarn constituting half of a major portion or one leg of a tuft loop is of a single color throughout and the other half of the major portion referred to, that is, the other leg of the

pile loop, is also of one color, and the colors of the two legs may be the same or different.

By applying the colors to the yarn and inserting the yarns in the base in the manner referred to, it is possible to produce a fabric, the pile of which closely resembles that of a fabric produced by ordinary weaving methods. If the new fabric has pile loops as shown at the left in Figure 1, the yarn in each loop will ordinarily be of the same color throughout, but if the loops are to be cut as indicated at the right in Figure 1, each portion of tuft yarn projecting upwardly from the base may have a different color from every other one, but each single portion is of the same color throughout its length.

In Figure 3, there is illustrated a portion of a rug produced by the new method and such a rug may have a pile surface which includes a central portion 19 which may be plain or figured and side borders 20 and end borders 21. In some instances, these borders may be of plain colors and the yarn employed in the side borders 20 is then of the same color from end to end of the rug, whereas the yarn that appears in the end borders also appears in the central portion bearing the design. In the production of such a rug, the yarn employed in the side borders may be dyed a solid color while the yarn which is used elsewhere is drum or spot printed in accordance with the principles above set forth.

Upon completion of the fabric in the manner described, the tuft yarns are bound in place, and for this purpose, a coating of a binding material is applied to the under surface of the base and over the minor portions of the tuft yarns. Various kinds of binding material may be employed for the purpose, such as rubber compositions, cellulose acetate, asphalt, and the like, a rubber composition being preferred. Upon the drying of the adhesive, the fabric is completed and ready for use.

While the new fabric may be made by means of various kinds of apparatus I prefer to employ that disclosed in my co-pending application referred to.

I claim:

1. A pile fabric which comprises a self-sustaining, preformed base fabric consisting of interwoven warp and weft threads and pile yarns extending generally lengthwise of the base and having minor portions extending along and exposed on the under surface of the base and major portions extending through the base and beyond the face thereof to form a pile surface, each yarn being colored in unit lengths, each unit length being equal to the distance along the yarn from the midpoint of a minor portion to the mid-point of the next adjacent major portion and each yarn having each end of each unit length thereof coinciding with one of said mid-points, said yarns changing color only at mid-points and at mid-points of both major and minor portions and a binding layer on the under surface of said base and said minor portions of pile yarn.

2. A pile fabric which comprises a preformed fabric serving as a base and consisting of interwoven warp and weft threads and pile yarns having minor portions extending along and in contact with the under surface of the base and major portions extending through the base and beyond the face thereof to form a pile surface, certain of said yarns being colored in accordance with a pattern and the length of one of said yarns in said fabric being the sum of a multiple of the length of a minor portion plus a multiple of the length

of a major portion, each colored yarn being colored in unit lengths, each of which is equal to the distance along the yarn from the mid-point of a minor portion to the mid-point of the next adjacent major portion and the length of a portion of the yarn bearing the same color being a multiple of said unit length, said yarns changing color only at said mid-points and at mid-points of both major and minor portions, and a layer of binding material on the under surface of said base and said minor portions.

3. A method of producing a fabric having a pile surface which comprises applying colors in spots on pile yarns, the colors and their locations on the yarns being selected in accordance with the pattern to appear on said pile surface and

said colors being applied in unit lengths, each of which is equal to half the length of that portion of said yarn which is to form a single pile tuft in said surface, inserting loops of said colored yarns in a base fabric from the back thereof with a major portion of each loop exposed at the face of the base and a minor portion extending along and in contact with the back of the base, said yarn loops being so inserted that said colored portions terminate only at the mid-points of the major and minor portions of said loops, said yarns changing color at the mid-points of both major and minor portions, and applying a coating of binding material to cover the back of the base and said minor portions of the loops.

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