

July 9, 1963

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3,096,561

TUFTED PILE FABRIC AND METHOD

Filed Dec. 14, 1959

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FIG. 1 -



FIG. 2 -



FIG. 3 -



FIG. 4 -

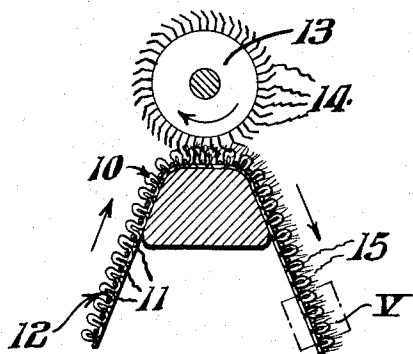


FIG. 5 -

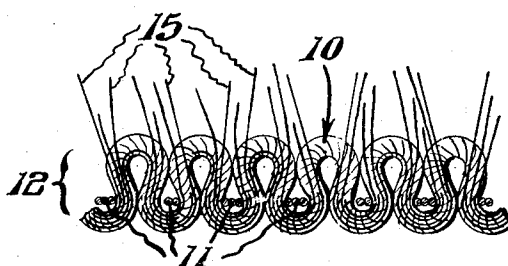


FIG. 6 -

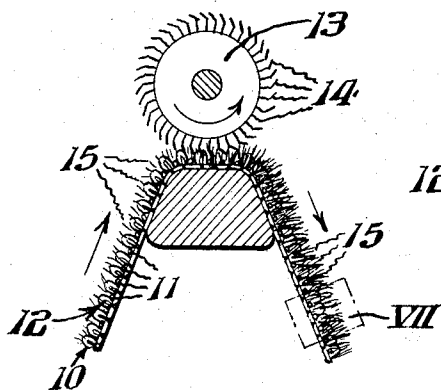
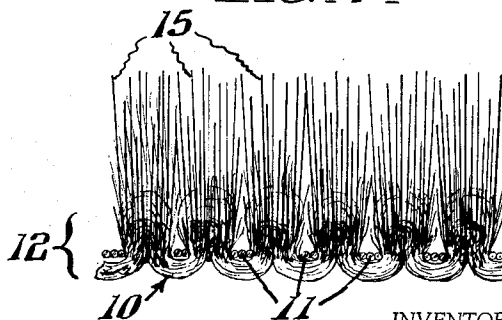


FIG. 7 -



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FIG. 8 -

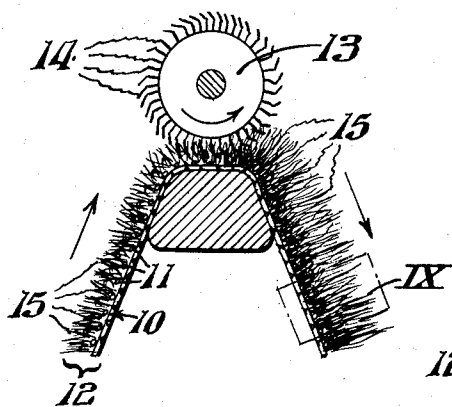


FIG. 9 -

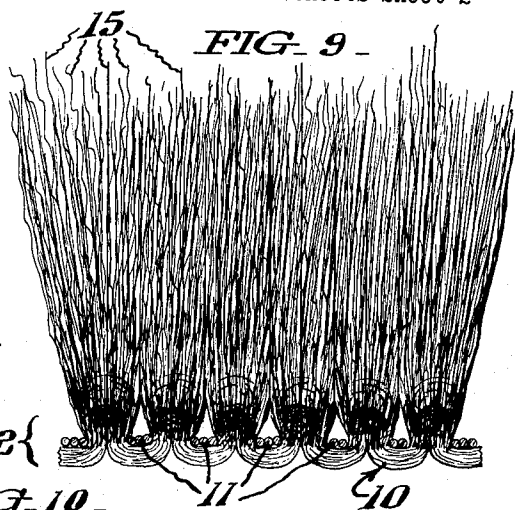


FIG. 10 -

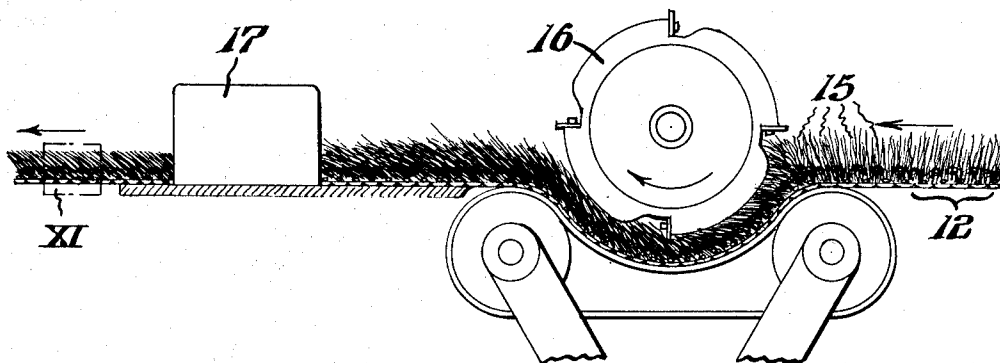
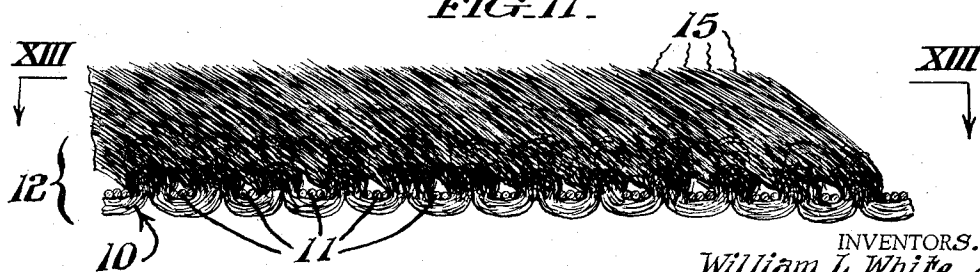


FIG. 11 -



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FIG. 12.

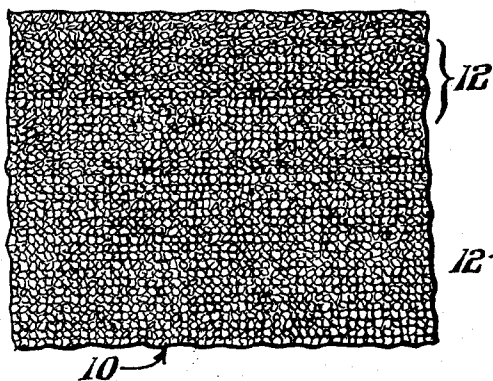


FIG. 13.

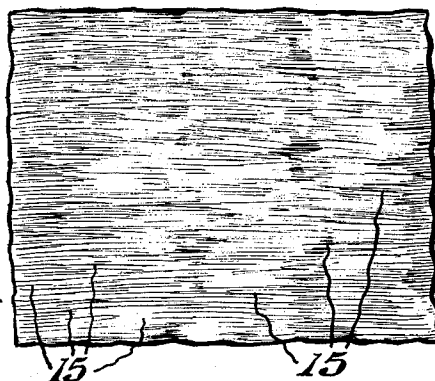


FIG. 14.

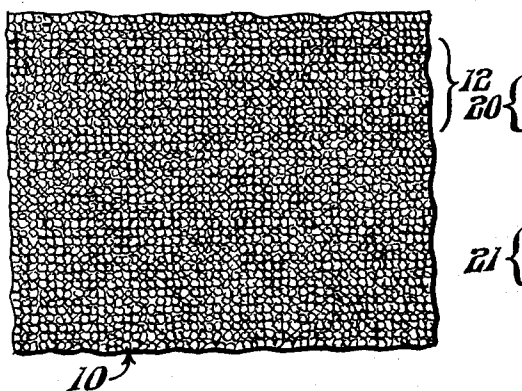


FIG. 15.

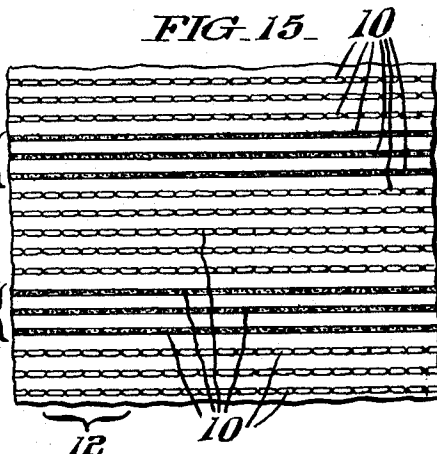
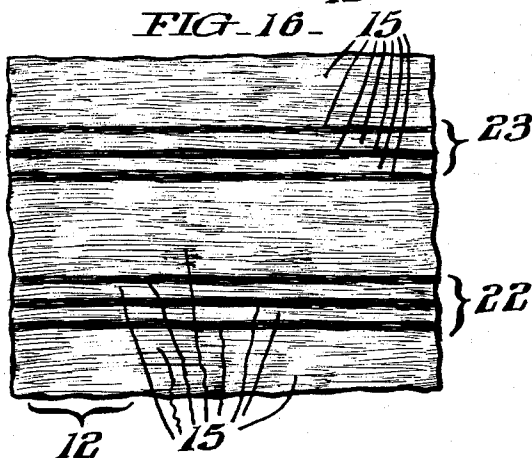


FIG. 16.



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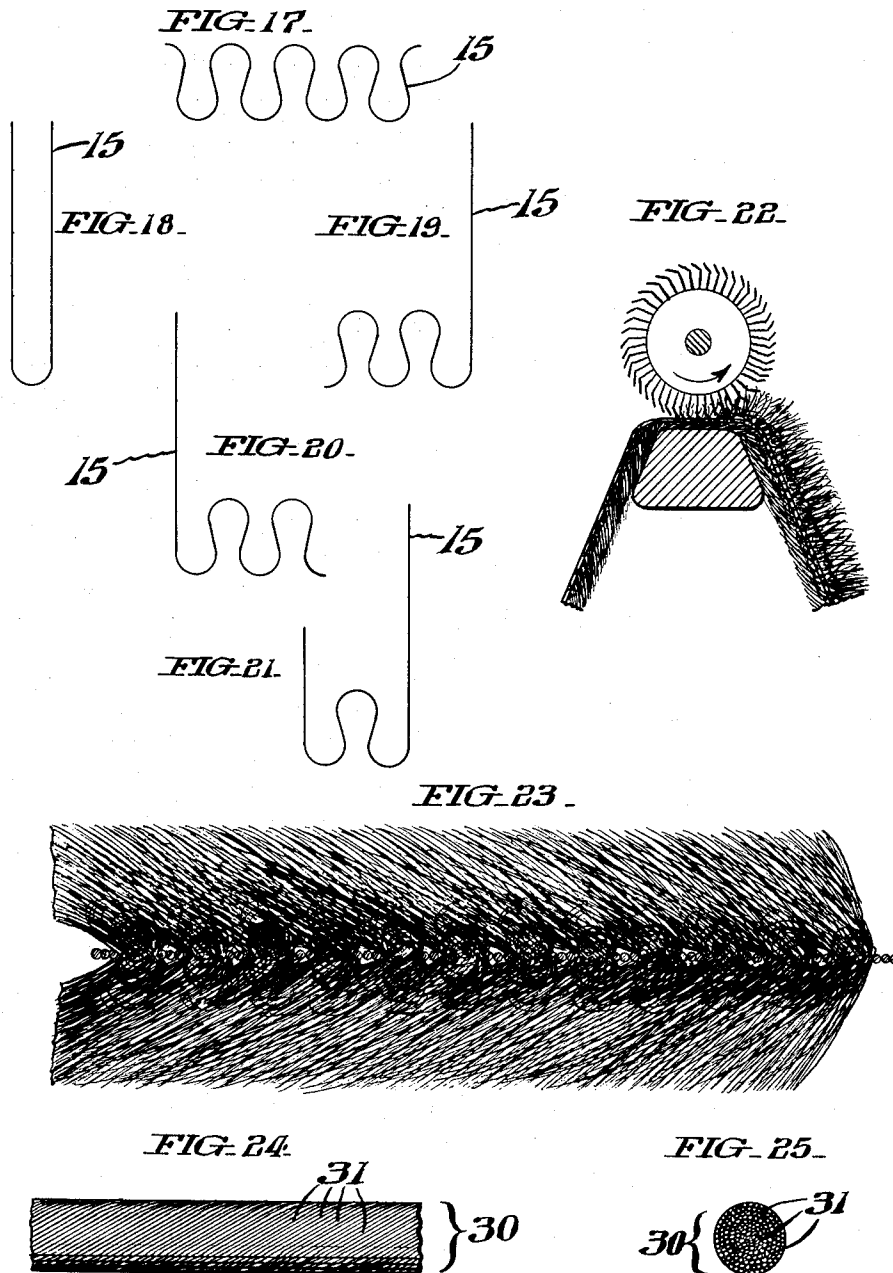
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## TUFTED PILE FABRIC AND METHOD

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6 Claims. (Cl. 28—72)

This invention relates to a tufted pile fabric and method of making same and more particularly to a tufted pile fabric in which the pile yarns are opened up to form a high, fluffy, furry pile.

In the art relating to tufted pile fabrics, it has been known to form pile loops in a tufted fabric by needle tufting and to cut the loops so tufted either during the tufting operation by means of cutting blades associated with the tufting loopers or by shearing the tops of the loops after the tufting operation. Fabrics so made have generally been characterized by the failure of the cut pile to close over the base fabric and by the instability of the pile yarns in the backing material.

It is an object of this invention to provide a tufted pile fabric and a method of making same wherein the original pile loops are substantially destroyed as yarns thereby forming a high fluffy pile which completely closes on the backing material.

It is a further object of this invention to provide a tufted pile fabric wherein the pile fibers are more securely anchored in the backing material than can be done in the normal tufting operation.

The objects of the invention are carried out as set forth in the description of a specific embodiment of the invention and the drawings associated therewith in which:

FIG. 1 is a fragmentary side elevational view of a pile yarn used in carrying out the invention;

FIG. 2 is an end view of the fragment of yarn shown in FIG. 1;

FIG. 3 is a sectional view showing a tufted fabric employed in carrying out the invention;

FIG. 4 is a schematic drawing illustrating the opening up of the pile yarns;

FIG. 5 is a view similar to FIG. 3 showing the tufted pile fabric following the operation shown in FIG. 4 and indicated in the rectangle V in FIG. 4;

FIG. 6 is a schematic drawing illustrating a tigering operation employed in the invention;

FIG. 7 is a view similar to FIG. 5 showing the tufted pile fabric following the operation of FIG. 6 and indicated in the rectangle VII in FIG. 6;

FIG. 8 is a schematic drawing showing a further finishing operation employed in the invention;

FIG. 9 is a view similar to FIG. 7 showing the tufted pile fabric following the operation of FIG. 8 and indicated in the rectangle IX in FIG. 8;

FIG. 10 is a schematic view showing the final finishing operation employed in the invention;

FIG. 11 is a view similar to FIG. 9 of the finished fabric after the operation of FIG. 10 and indicated in the rectangle XI in FIG. 10;

FIG. 12 is a plan view of the tufted fabric as indicated by the lines and arrows XII—XII in FIG. 3;

FIG. 13 is a plan view similar to FIG. 12 and indicated by the lines and arrows XIII—XIII in FIG. 11;

FIG. 14 is a plan view similar to FIG. 12;

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FIG. 15 is a back view of the fabric shown in FIG. 14; FIG. 16 is a plan view of the fabric shown in FIGS. 14 and 15 following the operation shown in FIG. 10;

FIG. 17 is a schematic view of a single fiber of the yarn illustrated in FIG. 3;

FIGS. 18, 19, 20 and 21 are schematic views of the fiber of FIG. 17 in various conditions produced by the method of the invention;

FIG. 22 is a view of the operation shown in FIG. 8 applied to the reverse side of a fabric which has already been subjected to the method of the invention;

FIG. 23 is a view of the fabric of FIG. 22 after the final finishing operation;

FIG. 24 is a fragmentary side elevational view similar to FIG. 1 of a pile yarn used in a modified form of the invention;

FIG. 25 is an end view similar to FIG. 2 of the fragment of yarn shown in FIG. 24.

In describing the preferred embodiment of the invention illustrated in the drawing, specific terminology will be resorted to for the sake of clarity. However, it is not the intention to be limited to the specific terms so selected, and it is to be understood that each specific term includes all technical equivalents which operate in a similar manner to accomplish a similar purpose.

The yarn 10 shown in FIG. 1 is a typical textile yarn comprising a plurality of spun fibers. The fibers may be of any known textile material either natural or synthetic and of any length consistent with the formation of a usable textile yarn. The yarn 10 is shown in cross section in FIG. 2. In FIG. 3 the yarn 10 is shown tufted into a backing material having yarns 11 running in one direction. In accordance with the method of the invention, the tufted fabric 12 shown in FIG. 3 is subjected to a kneeing operation which is illustrated in FIG. 4. Here the wires 14 of a tigering roll 13 are run in a reverse direction so that the knees of the wires 14 strike the loop pile surface of the fabric 12. The fabric 12 is passed under roll 13 in a direction opposite to the rotation of the roll. The result of the operation of FIG. 4 is illustrated in FIG. 5 where the pile yarns 10 have been partially opened up and some of the component fibers 15 have been drawn out. In the next step of the method, the fabric 12 is subjected to a tigering operation by roll 13 wherein the wires 14 are run directly against the loop pile surface of the fabric 12. This results in substantial opening of the pile yarns and in further withdrawal of the fibers 15 thereof, as illustrated in FIG. 7. Here, the pile yarns 10 above the level of the backing yarns 11 have begun to lose their identity. The final tigering operation is shown in FIG. 8 and the resultant fabric is shown in FIG. 9. Here the fibers 15 are substantially drawn out fully and intertangled among themselves forming a fluffy pile mass. The pile yarns 10 retain their identity as yarns on the under side of the backing material. The final operation of the invention is shown in FIG. 10 wherein the fabric 12 is passed under a hot grooved roller 16 of the type commonly used in finishing fur fabrics and can then be sheared by cutting shear 17 to provide a level pile surface. The finished fabric 12 is shown in cross-section in FIG. 11. A plan view of the original tufted loop pile fabric is shown in FIG. 12 and the finished pile fabric is shown in plan in FIG. 13.

One of the unique features of this invention is that the fibers of the pile yarn, while they may be to some

limited extent broken, are principally drawn out of the body of the pile yarns intact and extend vertically above the level of the base fabric. It has been found that, by using the method of the invention, the fibers of the pile yarns travel longitudinally of those yarns. This phenomenon is illustrated in FIGS. 14-16. FIG. 14 shows a plan view of a portion of the tufted loop pile fabric before the operations described above have begun. FIG. 15 is a back view of the fabric of FIG. 14 showing two arbitrary color bands 20 and 21 printed on the back of fabric 12. None of the color from bands 20 and 21 appears in the loop pile face of the fabric, as shown in FIG. 14. After the operations of the invention, it has been found that the color imprinted in color bands 20 and 21 on the back of fabric 12 have become color bands 22 and 23 in the face of fabric 12 as shown in FIG. 16. It is thus certain that the individual fibers of pile yarns 10 have been drawn longitudinally of those yarns from the back of fabric 12 to form the fluffy pile 15 of the finished fabric. By means of the invention, it is, therefore, possible to color the face of a fluffy pile fabric in any arbitrary manner by the simple device of printing the desired design on the back of the fabric. A further advantage of the invention is the obtaining of a fluffy pile surface made up of individual fibers which are substantially intermeshed forming a rough pile surface with a minimum of shedding. The remaining integral portions of the pile yarns 10 are drawn more tightly into the backing yarns 11 thereby locking the pile yarns more securely in the base fabric. The resultant fabric is thus substantially more stable than a comparable fabric in which the pile yarns have been cut or sheared according to known methods.

A specific fluffy pile fabric has been produced according to the invention in the following manner employing a tufted Orlon pile yarn. The fabric is first dyed and extracted and then given four kneeing runs as shown in FIG. 4, followed by one tigering run as illustrated in FIG. 6. This is followed by the finishing operation illustrated in FIG. 10 in which the pile surface is steam beaten and sheared with two runs on the shear. It will be appreciated that many variations may be made in the precise number and sequence of steps without departing from the scope of the invention.

A typical fiber 15 of the pile yarn 10 is illustrated in FIGS. 17-21. In FIG. 17 the fiber 15 is shown in its original loop tufted form. It will be noted in this example that the fiber traverses four loops of the pile yarn 10. After the kneeing, tigering and finishing operations of the invention, position of fiber 15 in the backing material of the tufted fabric 12 may be any of those illustrated in FIGS. 18-21 or, of course, any number of other possible positions. It is to be understood that the examples given in FIGS. 18-21 are only illustrative and not limited. In FIG. 18 the fiber 15 has been drawn out of all loops above the base fabric 12 and remains only in a single loop at the back of fabric 12, extending upward vertically as two fibers. In FIG. 19, fiber 15 has been drawn out of two loops and remains in two. In FIG. 20 the resultant position of fiber 15 is the same as shown in FIG. 19 except in the other direction. And in FIG. 21 fiber 15 is shown withdrawn from all but one loop above the base fabric 12 providing two upstanding fibers of unequal length. As has been previously pointed out, the fiber 15 not only is drawn out of the loops as shown in FIGS. 17-21, but also may be caused to move lengthwise of the yarn 10. The fiber 15 may also be broken providing a plurality of shorter fibers. In general, it has been found that the best results are obtained when the individual fibers 15 do not traverse more than eight pile loops nor less than three pile loops in the pile yarn 10. The condition of the pile fibers 15 may further be varied by the nature of the tigering operations. Thus, if the pressure on the tigering roll is high, the fibers 15 in yarns 10 will be more likely to break providing a shorter, denser pile whereas if the

pressure on the tigering roll is low, the fibers 15 will be less likely to break providing a substantially higher pile. The height of the pile fibers in the finished fabric is also affected by the height of the original pile loops, the higher loops providing a higher pile, and the longer that the tigering operation continues, the higher the pile is likely to be.

The method of the invention can be applied to both sides of a tufted pile fabric as shown in FIGS. 22 and 23. The method is in all respects similar to that illustrated in the preceding figures of the drawings and described above. The resultant fabric is illustrated in FIG. 23.

The method of the invention may also be applied to tufted pile fabrics in which the pile yarns are composed of continuous filaments rather than fibers. Yarn 30 shown in FIGS. 24 and 25 is thus made up of continuous filaments 31. It will be appreciated that in using a continuous filament yarn 30, it is first necessary to break a substantial number of the filaments before the effects of the method of the invention can be obtained. Therefore, in the initial kneeing up operation, it is essential that a substantial number of the filaments be broken providing free ends similar to those of the fibers 15 in yarn 10. Once the filaments are broken into relatively short lengths, the method of the invention can be applied as described above to produce the same results.

While in accordance with the provisions of the statutes, we have illustrated and described the best form of embodiment of our invention now known to us, it will be apparent to those skilled in the art that changes may be made in the precise form of the method described without departing from the spirit and scope of the invention, as set forth in the appended claims, and that in some cases certain features of our invention may be used to advantage without a corresponding use of other features.

What is claimed is:

1. The method of making a high fluffy tufted pile fabric comprising tufting a loop pile yarn in a backing material, separating the fibers of the loops of the pile yarns above the surface of the backing material with minimal breaking and cutting of said fibers by first subjecting said yarns to the kneeing action of a tigering roll and then drawing the separated fibers lengthwise of and partially out of said pile yarns to form a high fluffy pile surface by subjecting said yarns to the tigering action of a tigering roll, intermeshing the separated fibers of the loops of the pile yarns extending above the backing material thereby locking the pile yarns in the base fabric and then subjecting the pile surface to the action of a hot grooved roller and shearing it to form a finished pile surface.

2. The fabric made according to the method of claim 1.

3. The method of making a high fluffy tufted pile fabric comprising tufting a loop pile yarn in a backing material, coloring portions of the loop pile yarns on the back of the backing material in a pre-determined design, separating the fibers of the loops of the pile yarns above the surface of the backing material with minimal breaking and cutting of said fibers, drawing the separated fibers lengthwise of and partially out of said pile yarns to form a high fluffy pile surface and substantially transfer said design to said fluffy pile surface and intermeshing the separated fibers of the loops of the pile yarns extending above the backing material thereby locking the pile yarns in the base fabric.

4. The fabric made according to the method of claim 3.

5. The method of making a high fluffy tufted pile fabric comprising tufting a loop pile yarn comprising continuous filaments in a backing material, breaking the filaments into relatively short lengths to form fibers, separating the fibers above the surface of the backing material with minimal breaking and cutting of said fibers, drawing the separated fibers lengthwise and partially out of said pile yarns to form a high fluffy pile surface and intermeshing the separated fibers of the loops of the pile

## 5

yarns extended above the backing material thereby locking the pile yarns in the base fabric.

6. The fabric made according to the method of claim 5.

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