ABSTRACT

The invention contemplates a method and product whereby, for certain densities of flock-finish on fabric, the fabric can have a texture, appearance and hand closely akin to and resembling that of natural-leather chamois or suede. The technique relies upon soaking a suitable flock-finished fabric with a dilute solution of compatible adhesive, wringing out and drying the soaked fabric, and then curing the adhesive.

24 Claims, 7 Drawing Figures
FLOCK-TEXTURING METHOD AND PRODUCT

The invention relates to a texturized-flock fabric and to the method of making the same, all in the specific context of precision-cut flock of synthetic fiber. It is an object of the invention to provide a novel flock-texturizing method and product of the character indicated.

A specific object is to produce an artificial chamois or suede fabric, characterized by hand and appearance closely akin to that of natural leather.

Another specific object is to produce such a synthetic chamois or suede, using existing materials and equipment.

A still further specific object is to produce double-faced synthetic sueded fabric wherein texturizing patterns correspond on both faces of the fabric.

Another specific object is to achieve the above objects with different texture but corresponding texture patterns on the respective faces of the fabric.

Other objects and various further features of novelty and invention will be pointed out or will occur to those skilled in the art, from a reading of the following specific description in conjunction with the accompanying drawings.

FIG. 1 is a simplified sectional view through a flock-coated fabric, typifying its condition in readiness for performing the method of the invention;

FIG. 2 is a simplified diagram of steps in the method of the invention;

FIG. 3 is a perspective view illustrating an individual bent flock fiber, greatly enlarged, to permit identification of various degrees of bend;

FIG. 4 is a succession of four like perspective views of single fibers, bent to the respective extents identified at sections a-b-c-d in FIG. 3;

FIG. 5 is a corresponding succession of sectional views taken at the respective sections d-b-c-a of FIG. 3;

FIG. 6 is a simplified enlarged fragmentary sectional view through a fabric texturized in accordance with the invention; and

FIG. 7 is a view similar to FIG. 6, on a lesser scale, to illustrate the invention in application to a fabric that is flock-finished on both sides.

The invention utilizes flock-finished fabric wherein precision-cut synthetic fibers of uniform denier and length are bonded at one end to a woven fabric base, such as a piece of cotton drill 10. A first set of such fibers 11 is shown distributed over and bonded to one side or face of the fabric 10, being rooted in an adhesive coat 12 on said side; a second set of such fibers 13 is shown distributed over and bonded to the other side or face of the fabric, being rooted in an adhesive coat 14 on said other side. The flock fibers 11 are of the same material, denier and precision-cut length, and are distributed over the fabric with substantial uniformity, at less than maximum density, meaning that space exists between adjacent fibers; preferably, such space S1 is very substantially less than the fiber length L1, which projects free of its root to the adhesive layer 11 and is in the order of magnitude of the fiber diameter D1; generally, the rooted portion is in the range of 15 to 30 percent of the fiber length L1. A similar relationship exists for the flock fibers 13 on the other side of the fabric, as to the spacing S2, diameter D2 and free length L2 of such fibers 13. It will be understood that fibers 11-13 may be formed and spaced and projected in precisely the same manner on both sides of the fabric, or the quantities S, D and L may be selected for different values on opposite sides of the fabric, depending upon appearance effects desired, as will later be clear.

In accordance with the method of the invention, flock-finished fabric as described in connection with FIG. 1 is subjected to processing in a succession of steps, in one embodiment of which FIG. 2 may be considered illustrative. First, such fabric is subjected to soaking in a dilute solution of a curable adhesive which is compatible with the flock-fiber material and preferably also with the existing adhesive layer 12 (14), thus coating all flock fibers 11-13 with adhesive. The material is then crumpled, crushed, compacted, wrung or otherwise folded on itself, preferably at random and therefore without any particular pattern. Such compaction is carried to the extent of extracting approximately one half the soaking solution which is carried with the fabric upon its removal from the soaking bath. It is then dried, as by tumbling in a rotating drier, but preferably by spreading out the fabric and allowing it to dry, without use of an iron or other flattening means. When fully dried, the fabric is subjected to a heat cycle appropriate to the curing of the particular adhesive, so that adjacent flock fibers which may have been adhesively "tacked" to each other in the crushing step will become permanently bonded in the orientation in which they were adhesively "tacked."

I have yet to develop a completely satisfying explanation of the actual mechanics of my process, but FIGS. 3 to 7 are presented to implement an approach to understanding. FIG. 3 serves to illustrate a single length or partial length of a flock fiber, for different degrees of bend of its central axis 20. In FIG. 3, section a-a is taken at the outer surface of the adhesive layer 12 in which the fiber is rooted and from which it projects in a direction normal to the local surface region of layer 12. The bend beyond section a-a progresses to a point at section b-b where axis 20 is inclined 30° from the normal, thence to section c-c where axis 20 is inclined 45° from the normal, thence to section d-d where axis 20 is inclined 60° from the normal, and so on, as far as it is desired to carry the analysis.

Each of the sections a-a, b-b, c-c, d-d, is taken in a plane parallel to the local fabric 10 or adhesive 12 surface orientation, the respective sections being displayed in FIGS. 5 a-b-c-d. From these sections, it can be seen that what started as circular becomes elliptical, with growth only in the major axis; for example, for the 60° bend situation depicted for section d-d, the major axis is twice the fiber diameter D. FIG. 4 depicts at a-b-c-d the appearance of individual fibers if frozen or bonded at the respective degrees of bend represented by the different sections taken in FIG. 3; in all cases, the fiber length Lh, Ll, Lp which projects beyond the bend is straight and is oriented at the particular indicated angle of bend.

FIG. 6 illustrates how adjacent bent fibers 21-22-23-24 of diameter D and spacing S come to be bonded to each other, by reason of adhesive "tacking" along adjacent surface regions of the straight-projecting outer ends, such regions being identified 25-26-27. Such bonds become "tacked" when the soaked fabric is wrung, and the "tacking" becomes permanent upon
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adhesive cure. Also, upon cure, the remaining film of adhesive which may not have been involved in such "tacking" becomes a stiffening shell around the individual fibers, particularly upon curing, thus tending further to retain the particular set of the bend for the tacked adjacent fibers 21-22-23-24. It will be appreciated that for the fiber alignment shown in FIG. 6, the bend to achieve "tacking" at 25-26-27 is approximately 45°, by reason of the spacing S being approximately 70 percent of the fiber diameter D.

For section alignments other than that depicted in FIG. 6, the spacing S may bear a different relation to the diameter D, i.e., other than 70 percent. For example, in certain areas of the fabric the spacing S will substantially equal D, in which case the fibers thus arrayed are susceptible to "tacked" bending at 60°; and for still other areas and alignments, the spacing S may be still other fractions of the diameter D, with different "tacked" orientations determined thereby.

FIG. 7 illustrates that for fibers 11 (on one fabric side) of different denier or spacing than those 13 on the opposite side, there will be different angles at which "tacking" interference occurs, when the fabric is subjected to wringing.

The foregoing explanation is intended to show how the various regions of the flock-finished fabric may be caused to retain the clustering of locally tacked bent fibers, occasioned by wringing the wetted fabric. After drying and curing, the fabric surface has a unique texture which, in certain cases can resemble natural leather chamois or suede as to hand and appearance. In a specific example, the fabric of FIG. 1 was a piece of cotton drill, coated at 12 (14) with a water-base acrylic adhesive to which viscose-rayon flock 11 (13) had been applied. The flock 11 was 1 denier, precision cut to 0.030-inch length, imbedded to the extent of approximately 25 percent of its length in the adhesive layer 12, and applied to the density achieved by 1.5 ounces per square yard on a given side of the fabric; on the other side, the flock 13 is of the same or a different denier, within the preferred range 0.5 to 2.0, depending upon the desired sameness difference in appearance.

For flock-finished fabric as thus described, I use an aqueous soaking solution in which adhesive, fabric delustrant and an an-ionic softening agent are present in dilute proportions. Specifically, an aqueous solution producing highly satisfactory results, consists essentially of the following:

a. 2 percent acrylic-resin adhesive, for compatibility with the viscose-rayon flock.

b. 5 percent fabric delustrant, such as titanium dioxide; being a commercially available product such for example as that known as RADUL-S™, the same being selected for light or dark coloring depending upon the dye of the flock.

c. 5 percent an-ionic softening agent or agents, being preferably the same as used in initial preparation of the flock-finished fabric (FIG. 1).

d. 88 percent water.

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Generally, I prefer that the solution should be warm, for example at 160°F, and soaking which proceeds as much as ten minutes has produced excellent results.

For a fabric treated in accordance with the invention and using the above soaking solution, about 5 percent of the initial weight of the solution ingredients remain as part of the cured ultimately texturized product. Also, for fabric that has been soaked in the indicated solution, curing of the wrung and bone-dry fabric requires curing temperatures in the range of 300° to 400° Fahr. for example, about 3 minutes at 300°F., or 2 minutes at 325°F.

In another satisfactory soaking solution, the proportions and ingredients were even more dilute:

- 0.8% adhesive
- 0.8% delustrant
- 0.4% softener
- 98% water

The described process and article are found to achieve all stated objects, the product exhibiting a soft chamois-like hand, for the case of 1-denier viscose-rayon flock applied in the indicated density. The thus-texturized material exhibits the luxury-look of suede and exhibits exceptionally long wear, particularly at cuff and other garment regions of great abuse; such wear, hand and texture are retained in spite of machine-laundering with water and conventional household soaps or detergents. Such wear characteristics also apply for other texture configurations which result from substantial departures of flock proportions. For example, 1.5-denier viscose-rayon flock, cut to 0.055-inch length, and otherwise applied and treated as described, will produce a texturized fine-grain or small-scale "wet-dog" or "shag-rug" appearance, with the same exceptional wearing characteristics.

While the invention has been described in detail for the preferred forms and steps indicated, it will be understood that modifications may be made without departure from the invention.

What is claimed is:

1. The method of treating a flock-finished fabric wherein the flock consists of synthetic fibers of uniform denier and length bonded at corresponding ends to at least one side of a fabric base and uniformly distributed over the base and oriented normal to the base, the flock density being less than maximum and at least such that the average fiber-to-fiber spacing is substantially less than projecting flock-fiber length, which method comprises soaking the flock-finished fabric with a dilute aqueous solution of a heat-curable adhesive to which the flock is compatible, randomly folding the soaked fabric, wringing from the folded fabric a substantial fraction of the fabric-adhered solution, spreading the wrung-out solution, drying the spread and wrung-out fabric, and then heating the dried fabric to a temperature and for a period sufficient to cure the adhesive.

2. The method of claim 1, in which the volume of wrung-out solution is approximately one half that which is fabric-adhered after removal from the soaking solution.

3. The method of claim 1, in which the flock is viscose rayon and the adhesive is an acrylic-resin adhesive.

4. The method of claim 1, in which the soaking solution includes a fabric delustrant.

5. The method of claim 4, in which the delustrant includes titanium dioxide.

6. The method of claim 1, in which the soaking solution includes an an-ionic softening agent.

7. The method of claim 3, in which the proportion by weight of adhesive in the solution is in the order of 2 percent.
8. The method of claim 4, in which the proportion by weight of fabric delustrant is in the order of 5 percent.

9. The method of claim 6, in which the proportion by weight of an-ionic softening agent in the solution is in the order of 5 percent.

10. As an article of manufacture, a flock-finished fabric comprising a woven-fabric sheet having front and back faces, an adhesive layer covering one of said faces, precision-cut flock of synthetic fiber of predetermined length and denier rooted at one end to said adhesive layer and projecting normal thereto, the flock density being less than that to produce a full coat of said one face and at least such that the average fiber spacing is substantially less than the projecting length of individual flock fibers, random groups of adjacent flock fibers being adhesively bonded to each other along their adjacent edges in randomly distributed bent-over alignments wherein the orientation of bonded adjacent flock fibers is angularly offset from the local normal to said one face.

11. The article of claim 10, in which the average fiber spacing is in the order of magnitude of the flock-fiber diameter.

12. The article of claim 10, in which the flock is viscose rayon.

13. The article of claim 12, in which the adhesive layer consists essentially of an acrylic adhesive.

14. The article of claim 13, in which the bonding adhesive consists essentially of an acrylic component.

15. The article of claim 10, in which the woven fabric is cotton drill.

16. The article of claim 10, in which the other of said faces has a covering layer of adhesive, further precision-cut flock of said synthetic fiber of predetermined length and denier rooted at one end to the adhesive layer of said other face and projecting normal thereto, the density of said further flock being less than that to produce a full coat of said other face and at least such that the average fiber spacing is substantially less than the projecting length of individual flock fibers on said other face, random groups of adjacent flock fibers on said other face adhesively bonded to each other along their adjacent edges in randomly distributed bent-over alignments wherein the orientation of bonded adjacent flock fibers is angularly offset from the local normal to said other face.

17. The article of claim 16, in which flock length on opposite faces is the same.

18. The article of claim 16, in which flock length on one face is greater than that at the other face.

19. The article of claim 16, in which denier of the flock on both faces of said fabric is the same.

20. The article of claim 16, in which denier of the flock on one face of said fabric is greater than that on the other face of said fabric.

21. The article of claim 16, in which flock density on one face of said fabric is substantially the same as on the other face of said fabric.

22. The article of claim 16, in which flock density is greater on one face of said fabric than on the other face.

23. The method of treating a flock-finished fabric wherein the flock consists of synthetic fibers of uniform denier and length bonded at single corresponding ends to at least one side of a fabric base and uniformly distributed over the base and oriented normal to the base, the flock density being less than maximum and at least such that the average fiber-to-fiber spacing is substantially less than projecting flock-fiber length, which method comprises soaking the flock-finished fabric with a dilute solution of a heat-curable adhesive to which the flock is compatible, extracting from the folded fabric a substantial fraction of the fabric-adhered solution by compacing the soaked fabric, spreading out the compacted fabric, drying the spread fabric, and then heating the dried fabric to a temperature and for a period sufficient to cure the adhesive.

24. The method of claim 23, in which the fabric is flock-finished on both sides, the heat-curable adhesive being selected for compatibility with the synthetic fibers of the flock on both the respective sides of the fabric.

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