

[54] **IMITATION SHEEPSKIN FABRIC**

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1968, abandoned.

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161/63

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[58] **Field of Search**.....161/62, 63, 66, 67, 173;
28/72 FT, 72 P, 72.17, 76 P; 139/391;
156/72; 26/2

[56]

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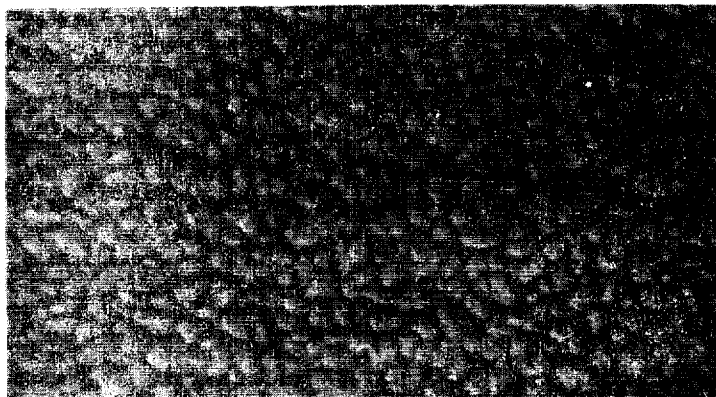
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[57]

ABSTRACT

Imitation sheepskin or lambswool pile fabrics are made by inserting quenched, helically crimped polyethylene terephthalate fibers in a base, shearing the pile and thereafter developing the textured surface, as by tumbling in hot air. The surface texture, which consists of areas of fibers coalesced into pebble-like clumps and substantially fiber-free areas separating the clumps, remains undisturbed by subsequent hot wet treatments such as piece dyeing and washing.

5 Claims, 3 Drawing Figures



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FIG. 1

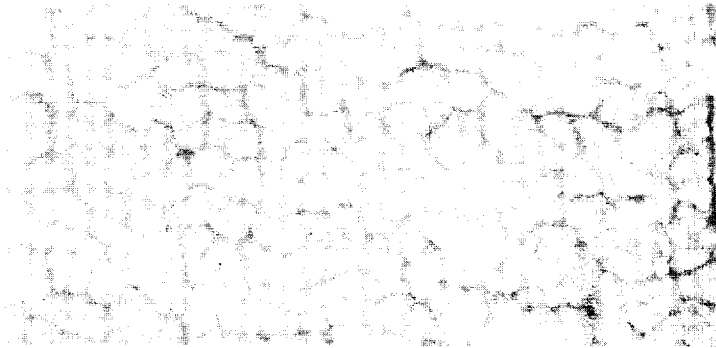


FIG. 2

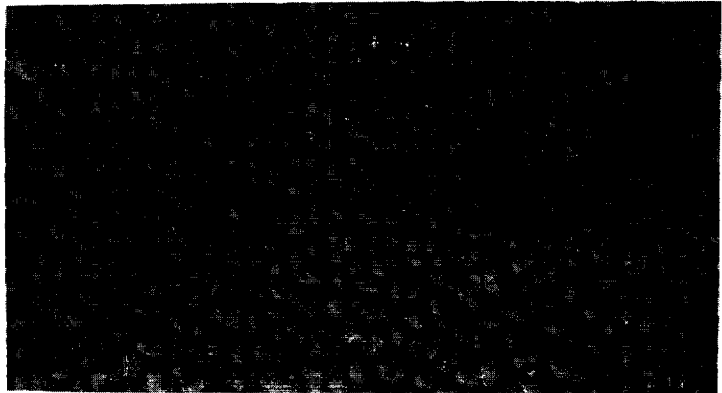
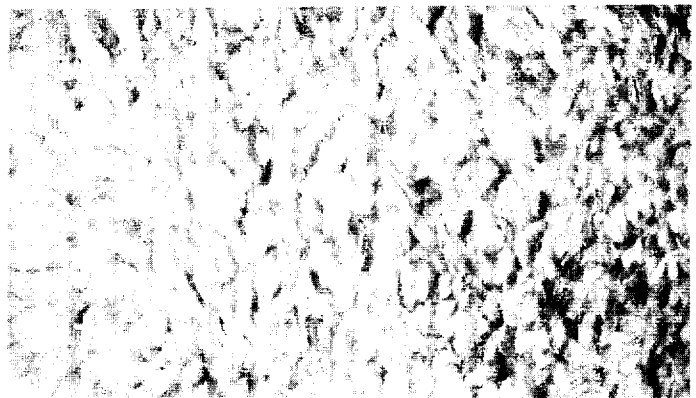


FIG. 3



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IMITATION SHEEPSKIN FABRIC

This application is a continuation-in-part of application Ser. No. 766,239, filed Oct. 9, 1968 now abandoned.

This invention relates to imitation sheepskin fabric, more particularly a simulated sheepskin or lambs-wool pile fabric in which the pile comprises a particular synthetic fiber.

Simulated sheepskin or lambswool pile fabrics have been made by various means by weaving or knitting, using wool, acrylic or cotton fibers in the pile. The sheepskin or lambswool appearance in the imitation fabric may be obtained by a final finishing operation which usually employs tumbling the cloth in hot air. By this technique the fibers in the pile form themselves into small clumps giving an overall "pebbled" appearance to the cloth. This appearance, however, is readily disturbed during surface abrasion of the fabric and is lost if the fabric is treated with a liquid or wet treated, e.g., washed. If it is desired to piece dye such a woven fabric this must be done prior to tumbling so as not to disturb the pile. In the case of sliver knitted fabrics, the pile fibers have to be dyed as loose stock, since piece dyeing is impracticable due to the aforementioned matting and pile disturbance of the fabrics during wet treatment.

I have now found that certain helically crimped synthetic fibers (defined hereafter) having additionally certain other physical properties, result in fabrics of the type mentioned aforesaid and which have a more regular appearance and much improved properties and which can be treated without substantially disturbing their appearance. These improvements have not been possible with hitherto commonly used other fibers. The pile of our fabric remains undisturbed during machine or hand washing, and dry cleaning and it can even be piece-dyed at the boil without disturbing the sheepskin type of appearance of the pile. Suitable fibers are those made from helically crimped meltspun quenched polyethylene terephthalate filaments which are obtainable in fiber form as TERYLENE (Registered Trade Mark).

According to the invention I provide imitation sheepskin or lambskin fabric comprising a pile made from synthetic fibers which are crimped and which are attached to a base fabric, characterized in that at least a major proportion of the fibers in the pile are resilient helically crimped meltspun quenched polyethylene terephthalate fibers of a denier of 4 or more and in which a number of tufts of fibers which are attached to the base fabric by anchoring or locking points, is greater than pebble-like clumps per unit area, further characterized in that the tufts of fibers are formed into said pebble-like clumps which are separated by distinct cleavages which are enhanced or at least retained in their general appearance after treatment with liquids and even after hot wet treatment such as dyeing and washing with detergents. I have found that fibers even having a denier of 16 will give a sheepskin effect although the finished fabric will have a somewhat harsher feel when touched. Processes are known for making such helically crimped polyethylene terephthalate fibers for example by air or by liquid quenching the meltspun filaments, from which the fibers are made, as they issue from the spinneret. Processes for doing this

are described for example in British Pat. Nos. 809,273 and 1,087,321. It should be appreciated that although the fibers produced according to British Pat. No. 1,087,321 have a denier of 1 to 6 that higher denier fibers can also be produced, e.g., using larger spinneret holes of lower windup speeds at constant polymer melt throughput by those skilled in the art, and it would be noted that for the present application deniers of 4 or more for each filament are required for at least a major proportion or preferably all the fibers in the pile. Such fibers have a tenacity of 2 to 6 grams per denier, but higher tenacity fibers may also be used, an extension of break of 10 to 60 percent, an initial modulus of 25 to 40 grams per denier, a crimp index of 15 to 70 percent, a crimp level of 2 to 13 crimps per straight inch, a mean rate of change of instantaneous modulus between 5 and 10 percent, extension of 90 to 160 grams per denier, and an asymmetry of refractive index of not less than 1.10^{-3} measured across the width of the fibers. The helix diameter of the crimp is substantially uniform in individual fibers, but may vary between fibers within the specified limits. As already mentioned the fibers can be made by melt spinning filaments from said polyester and quenching a bundle of hot filaments asymmetrically during their travel from the spinneret to a winding device in which they come into contact with a continuously renewed thin film of a quenching liquid on the surface of a solid body and in which said liquid, preferably water at room temperature, is at a temperature considerably below that of the filaments and in which the filaments first contact said quenching liquid at a distance between 4 and 14 inches below the spinneret, followed by drawing the filaments in the form of a tow in a liquid or in steam, followed by heat setting and cutting the tow into fibers. These fibers are then inserted in suitable lengths as a pile into a base fabric.

The helically crimped fibers may also be composite fibers the components of which differ in intrinsic viscosity and are melt spun in contiguous relationship, for example in side-by-side relationship or sheath-core relationship. Intrinsic viscosity referred to here is determined from 2 percent solutions of the polyester in orthochlorophenol at 20°C.

I have found that these fabrics whether knitted or woven and which have a pile made from resilient helically crimped fibers of a denier of 4 or more, display the aforementioned advantages when made from polyethylene terephthalate. These advantages are not shared if the pile consists of fibers made for example from fibers having a zig-zag sawtooth crimp as obtained by conventional stuffer box crimping nor is the effect obtained when the fibers have a denier of less than 4 for example 2, even though the fibers were made from polyethylene terephthalate and even if they exhibited a helical crimp.

The fabrics can be woven or knitted for example on a sliver knitting machine such as a Wildman HP8.

Suitable fabric would be knitted with 80-480 stitches/square inch (tufts/square inch) preferably 150-250 stitches/square inch (tufts/square inch). Each tuft of fiber as collected by the needles would have a cross section approximately equivalent to yarns in the count range of Nm4-24 (Numeral metric count).

After formation of the pile fabric, the pile is sheared to the required length and we have found a pile height

of about 6 to 20 millimeters suitable, after shearing. After shearing the fibers in the pile are disturbed to a required degree of interlocking between adjacent fibers which form pebble-like clumps and cleavages between the clumps. Some of the conventional textile operations such as hot air tumbling, winch processing or even stentering with a suitable down-draft of hot air may be adapted to give the required degree of interlocking or coalescing of the fibers into pebble-like clumps.

During tumbling for example, the loose fabric is revolved in a box or container which is rotated on a substantially horizontal axis at a speed which is insufficient to retain the loose fabric in any given position by centrifugal force. The fabric should be of a suitable dimension so that it can fall under its own weight in the revolving container, when it has been carried up by the rotating inside walls or when assisted by suitable deflectors positioned inside the container. Such deflectors may be fixed, or rotating blades, or peripherally mounted brackets, or other suitable projections may be used. The required effect aimed for should be that the fabric is released near the highest point and then falls to a lower point or to the bottom of the container. If desired the movement of the fabric may be assisted by moving fluids including liquids and gases, but preferably blasts of hot air. Hot fluids such as steam may also be used as well as solvents or even water-based liquids. During such processing the fibers of the pile should be physically moved relative to each other in the pile to give the required effect of pebble-like clumps and cleavages as hereinafter described.

During such a treatment the helically crimped configuration of the fibers is disturbed to cause neighboring fibers to coalesce. This coalescence proceeds to the point where groups of tangled fibers form into definite small areas of pebble-like clumps of somewhat greater density than fibers as knitted. The denser clumps of fibers become separated by cleavages in which there are no, or only a few fibers. The overall effect is that the original smooth pile surface is now replaced by a randomly pebbled or textured surface composed of groups, clumps or clusters of coalesced tufts of fibers separated by said indentations or cleavages of substantially equal depth and size, which give an overall appearance which may be likened to the textured surface of lambswool skin. The appearance of the samples of imitation lambswool fabric herein described have been likened by wool experts to lambskins of Merino breeds from Tasmania and Queensland, of young sheep up to 8 months old.

In the typical lambswool fabric there will be about 2 to 30 preferably 10 to 25 clumps per 2.5 cm² in which the clusters are of random size and shape varying from substantially round to irregular elliptical or kidney shapes substantially without any sharp corners. The pile surface in its pebbled configuration has a height of about 5 to 20 millimeters from the base-fabric. The size of the clumps of fibers in the pile have a maximum dimension, as determined in plan view, varying between 1 to about 15 millimeters, bearing in mind that two or more tufts would be required to form each clump.

The cleavages between the clumps may extend right down to the base cloth and they are substantially of equal depth and a random width from about 0.5 to

about 6 millimeters. It should be noted that the individual tufts are no longer visible after their disturbance and accordingly the number of clumps per sq.cm. is very much smaller than the number of tuft anchoring or locking points per sq.cm. of fabric.

It should be appreciated that more common types of pile fabrics such as carpets, rugs, etc. contain fibers not so crimped, i.e., having no crimp or a zig-zag crimp and that the tufts are not so coalesced and also therefore their number corresponds to their anchoring or locking points in the base fabric. This type of sinusoidal or saw-tooth crimp formation does not cause adjacent fibers to adhere in the same manner as the helically crimped fibers. However, a textured surface which is not part of the invention, may be achieved by other means, for example by embossing or by a suitable construction of the fabric.

After shearing to the required height, a slight reduction in height of up to 10 percent results from the subsequent adherence of the fibers, e.g., by hot air tumbling. It should be noted that this reduction in height of about 3 to 9 percent is considerably less than when other crimped fibers are used, presumably due to resilience, shape and denier and other intrinsic properties of my fibers. I have observed that little or no matting occurs between the fibers according to my invention. If fibers of a denier of less than 4, for example 2 or 3 denier fibers are used, some matting does occur, even when helically crimped polyester fibers are used, and considerable matting occurs in the case of polyacrylic fibers. Moreover, in the case of the polyester fibers the imitation lambswool fabric is resistant to washing, hot-wet processing even including dyeing, and dry-cleaning but the pebbled effect is developed further with this treatment and becomes more pronounced, presumably also because residual fibers in the cleavages are taken up by the clumps, which themselves become tighter and of increased density. In contrast a similar fabric structure made from acrylic fibers loses its lambswool appearance by hot-wet processing.

It will be realized therefore that in the case of the imitation lambswool fabric the effect is enhanced by wet processing, without felting the fibers as would occur with wool, and without matting as would occur with other synthetic fiber or even with low denier polyethylene terephthalate fibers. To obtain the desired effect the pile in my fabric should contain at least a major proportion of the defined helically crimped polyester fibers of at least 4 denier. Although I have found that the best results are obtained using 100 percent of the defined polyethylene terephthalate fibers that a minor proportion of other fibers may be blended with the polyethylene terephthalate fibers for the pile. Cross dyeing effects may be obtained by blending the polyethylene terephthalate fibers for example with helically crimped nylon fibers in the pile. A two-tone effect may be obtained using 25 percent of such other fibers, and provided that some matting during subsequent hot-wet treatments is acceptable. The clusters or groups of fibers in the pile have a random diameter which may vary between 1 to 15 millimeters and in which the clumps are separated by indentations or cleavages.

If desired the fabric may be subjected to a further treatment such as polishing the pile fibers with high-gloss rapidly rotating heated cylinders. This has the effect of reducing the size of the clumps and the width of the cleavage.

The fabrics are suitable as scatter rugs, and for apparel uses, particularly for baby wear, shoe linings, adult outerwear, including coat linings.

I also provide a process for the manufacture of imitation sheepskin or lambswool fabric comprising inserting a pile into a knitted or woven base fabric made from a sliver of fibers in which all or at least a major proportion of the fibers are helically crimped polyethylene terephthalate fibers of a denier of 4 or more, if desired, coating the back of the fabric with a transparent, translucent or white latex adhesive, heat setting the pile fabric, shearing the pile to the required height, followed by a treatment for disturbing the pile so as to develop the desired sheepskin or lambswool effect by coalescing the fibers amongst themselves into pebble-like clumps and so that the clumps become separated by cleavages or indentations; the effect so obtained for example by tumbling the fabric in hot air is enhanced or at least retained by a further hot or wet treatment such as dyeing and/or washing at temperatures up to boiling water.

Suitable temperature for mechanically disturbing the filaments or when using air, are between 60° and 140°C, preferably 115°-125°C. Using conventional tumbling drums suitable tumbling times are from about one-fourth to 1 hour but I have found that 20 minutes gives a desirable and adequate result.

The attached figures are photographs on a slightly reduced scale substantially in plan view of samples of fabric in which:

FIG. 1 is a typical imitation lambskin fabric using 4 denier helically crimped polyethylene terephthalate fiber;

FIG. 2 the same fabric as in FIG. 1 after piece dyeing in which the pebble-like clumps and the general lambskin appearance have been enhanced by this hot-wet processing; and

FIG. 3 is a comparative fabric made from polyacrylic synthetic 3 denier fibers after piece dyeing in which any resemblance with lambskin has disappeared.

The following examples illustrate preferred embodiments of my invention:

EXAMPLE 1

Polyethylene terephthalate 2 inches long staple fibers having a denier of 4 and a helical crimp, of 10 crimps/inch having, in the form of a batt a specific volume of 20 cc. per gram at a pressure of 24.3 g./cm.² obtainable under the trade mark TERYLENE, were inserted as pile fabrics, into a knitted base comprising 1/14's cotton count 100 percent spun TERYLENE (Register Trade Mark), polyethylene terephthalate fibers knitted on a machine of 26 ins. diameter and 12 gauge. The sliver was inserted at a weight of 135 grains per yard, a backing yarn speed of 290 feet/min. and a feed roller gearing of 27/39 teeth, on top and bottom gears respectively.

The resulting fabric was finished by coating the back with a transparent latex adhesive such as a vinyl latex, SKP 35 heat setting at 160°C for 5 minutes, shearing

the pile to three-eighths inch and tumbling in hot air at 180°F for 20 minutes in a perforated cylinder.

After the final tumbling sequence, the fabric displayed an appearance similar to that found in Lambswool skin. This effect was not disturbed even after surface abrasion due to wear, repeated washing and tumble drying. Samples, machine washed even 10 times show no change in appearance.

COMPARATIVE EXAMPLES

For comparison if the fabric was made of identical construction as in Example 1 but using polyethylene terephthalate fibers of a denier of 2 the sheepskin effect would not be realized satisfactorily and would not be permanent.

Similarly, a fabric made as in Example 1 but using a polyethylene terephthalate pile in which the fibers have a denier of 4 but in which the fibers had a sawtooth like crimp, the desired appearance could not be achieved satisfactorily and any possible similar appearance would be lost during washing.

EXAMPLE 2

A fabric is knitted using a Wildman HP8 Sliver knitting machine of 12-gauge, 26-inch diameter and having eight feeding beads and finished as in Example 1 except that polyethylene terephthalate fibers of any 1½ inches length also of 4 denier are used. A similar pleasing lambswool effect fabric is obtained which is soft to the touch and displays good heat insulating properties.

EXAMPLE 3

A fabric is knitted and finished as in Example 1 except that the polyethylene terephthalate fibers used for the pile have a length of only 1¾ inches and also of 4 denier, a similar effect is obtained as in the fabrics of Example 1 or 2.

EXAMPLE 4

A fabric is woven as in Example 1 but instead, using polyethylene terephthalate helically crimped fibers of 2½ inches staple length and a denier of 16. A pleasing sheepskin appearance is obtained after shearing and finishing by hot air tumbling as in Example 1, although the fabric is somewhat harsher to the touch but it is resistant to piece dyeing at the boil and subsequent repeated washing with commercial and domestic detergents.

EXAMPLE 5

4 denier 1½ inches bicomponent fiber was made as described hereafter, dressed with fiber lubricant set at 135°C. and cut from a 75,000 denier tow. A pile fabric was made as described in Example 1.

The bicomponent fibers were made as follows: Polyethylene terephthalate polymers of two different nominal I.V.'s 0.675 and 0.485 were dried in air at 170°C. for 4 hours. The dried polymers were melted separately in a twin-screw extruder and fed to a spinning pack in which the two streams of molten polymer were combined just prior to extrusion through the spinneret. A distributor plate and spinneret or a scatter pattern type was used with 292 holes, each of 0.035 inch diameter. The extruder temperatures were

controlled in zones at temperatures from 255°C. to 280°C. for low I.V. polymer and 265°C. to 280°C. for the higher I.V. polymer.

The filaments were wound up at 3,000 ft. per minute, there being a throughput of 56 lb. per hour/pack.

Spun birefringence of the bicomponent fibers was 4.2×10^{-3} in the higher, and 3.2×10^{-3} in the lower I.V. component. The difference in I.V. was 0.17. The filaments were dressed with a lubricant in a pre-drawframe bath and drawn using steam to a draw ratio of 1:3.8 at a speed of 200 ft. per min., dried at 135°C. and crimped.

The properties are set out in the following table:

Means birefringence	3.9×10^{-3}
Asymmetry of birefringence	3.2×10^{-3}
Asymmetry of I.V. in yarn	0.177
The properties of the fibers were as follows:	
Crimp index 50 percent	
Crimp frequency 14-16 crimps per crimped inch.	

EXAMPLE 6

Example 5 is repeated but instead of the scatter pattern of spinneret holes an annular spinneret is used with outflow quench, as described in British Pat. No. 938,056.

Cut fibers made as described in Examples 1 and 2 were knitted, coated, heat set, sheared and tumbled in hot air as described in Example 1. The resulting fabric

displayed an appearance as illustrated in FIG. 1 and after dyeing as shown in FIG. 2.

What is claimed is:

1. A process for the manufacture of an imitation sheepskin or lambswool fabric comprising sliver-knitting a pile made from a sliver of at least a major proportion of helically crimped, melt spun, quenched, drawn polyethylene terephthalate fibers of a denier of 4 to 16 into a knitted base fabric, heat setting the pile fabric, shearing the pile, mechanically disturbing the pile to develop the desirable lamb or sheepskin effect until individual fibers coalesce into pebble-like clumps which become separated by cleavages or indentations and enhancing or at least retaining said effect by subjecting the fabric to a hot wet treatment such as piece-dyeing or washing.

2. A process according to claim 1 in which the fabric is heat set at a temperature between 100° and 250°C.

3. A process according to claim 1 in which the fabric is tumbled in hot air at a temperature of 115° to 125°C.

4. A process according to claim 3 in which tumbling is carried out for about 20 minutes, until an adequate effect is obtained.

5. A process as in claim 1 wherein the polyethylene terephthalate fibers are bicomponent fibers.

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