PLATED KNITTED GARMENT AND METHOD OF MAKING SAME

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Fig. 1

Fig. 2

Fig. 3

INVENTOR.

Herbert Knohl

BY
This invention is concerned with knitted fabrics and with garments of such fabrics of the so-called "stretch" type, that is low modulus stretch fabrics and garments exemplified by "stretch" stockings which are able to enclose snugly, but without discomfort, a wide range of body or limb sizes and to adapt themselves to individual departures from ideal body contours.

The usual method of attaining low modulus stretch characteristics in such fabrics, particularly in stocking fabrics, is by means of a pretreatment whereby thermoplastic yarns are crimped and distorted and thermoplastically set in that condition before the fabrics are knitted. This is an expensive process which in the denier yarns presently available produces fairly dense fabrics.

It is an object of this invention to provide attractive dull-surfaced "stretch" fabrics and garments thereof which may be very sheer, the yarns of which have not been thermoplasstically set in a crimped and distorted condition before knitting.

In the drawings:

Figure 1 illustrates a typical stretch garment in this instance a circularly knit stocking embodying the fabric construction of this invention.

Figure 2 is an enlarged view of the fabric of Figure 1 being an illustration of a typical fabric of this invention in the relaxed or unstretched condition.

Figure 3 is an enlarged view of the fabric of Figure 1 being an illustration of a typical fabric of this invention in the stretched condition.

It has long been known that when fabric is knitted of fairly high twist yarns, the wales assume an angle with the courses which is inclined from the usual 90° angle between wales and courses. This is also true of tubular knitting. The degree of inclination of the wales depends upon the amount of twist while the direction of twist determines the direction of inclination. Wales of yarns with right hand twist incline to the right and those of yarns with left hand twist incline to the left. This phenomenon is illustrated in a stocking in the Meyers U. S. Patent No. 2,102,730 wherein the observation is made that the elasticity of web fabric is increased by alternating bands of courses knitted from yarns twisted at different degrees and in opposite direction.

I have discovered that very attractive frosty or powdery surfaced appearing stretch fabrics and garments, particularly stockings, may be made by plating yarns of opposite twist, that is by knitting a loop from a right hand twist yarn and a loop from a left hand twist yarn in superimposed relationship in each stitch. This construction superficially presents to the eye a relatively smooth appearance. When examined under magnification, however, the individual stitches are seen to incline almost haphazardly to one side or the other in highly irregular fashion but with a tendency for succeeding loops in a wale to incline in opposite directions from the vertical. The wales of the relaxed fabric of this invention do not, therefore, assume the usual precise linear pattern of ordinary knitted fabric. The enlarged view of the fabric shown in Figure 2 was traced from a shadow graph of an example of actual relaxed fabric of this invention and illustrates clearly the unique type of irregularity the fabrics of this invention possess. Such irregularity is apparently responsible for the stretch characteristics of the fabric since when stretched wale-wise, the thus elongated stitches pull into alignment. The original irregularity returns, of course, after the stretching forces are removed.

Considerable latitude exists in the selection of suitable yarns for the fabrics and garments of this invention with regard to material. Any yarn material normally suitable for garments may be utilized whether it be in the form of a single thread or monofilament or in the form of a composite or multifilament and whether the yarn is spun or continuous filament. Stretch characteristics are imparted to fabrics and garments in accordance with the invention whether the yarns are cotton, wool, silk, rayon, nylon or any of the other usual yarns although I have found that those yarns which have a tendency, like nylon, to be wiry, produce the greatest stretch under given conditions and on the whole present the best appearance. Some of the newer thermoplastic yarns of almost wire-like resilience normally are especially suitable for fabrics of this construction.

With regard to the amount of twist to be given each of the two individual plied yarns, I have found the most desirable range to be between 25 and 100 turns per inch although some stretch characteristics are imparted at less than 25 turns per inch. At 10 turns per inch, however, the stretch becomes relatively insignificant. Similarly stretchy materials may be made from yarns twisted more than 100 turns per inch but the fabric begins to lose its sheerness and with increasing density becomes more difficult to knit.

Referring now to Figures 2 and 3 of the drawings, normally I prefer to have the same degree of twist in each of the oppositely twisted yarns 14 and 15 of the fabrics of this invention since otherwise the inclination of the stitches is too preponderantly in the direction of twist of the higher twist yarn, the best stretch characteristics. Referring to Figure 1, a typical garment of this invention, a stretch stocking, is shown with reinforced toe 10 and heel 11, welt 12 and body 13. The stocking illustrated in Figure 1 is made on the usual circular knitting machine equipped for plating. Stockings knit on such machines are typically tubular knitting. The degree of inclination of the wales depends upon the amount of twist while the direction of twist determines the direction of inclination. Wales of yarns with right hand twist incline to the right and those of yarns with left hand twist incline to the left. This phenomenon is illustrated in a stocking in the Meyers U. S. Patent No. 2,102,730 wherein the observation is made that the elasticity of web fabric is increased by alternating bands of courses knitted from yarns twisted at different degrees and in opposite direction.

The fabric of this invention is not limited, however, to that made upon circular machines. "Stretch" fabric made in accordance with this invention may be made upon any machine in which plating may be accomplished including flat bed machines, whether the stitch size is relatively constant or varies and irrespective of stitch size.

Where thermoplastic yarns are utilized I prefer that the yarn be completely relaxed or preshrunk before the twisting operation in order that the highest degree of stretch commensurate with the stretch and stitch size be realized.

With thermoplastic yarns it may be desirable to board the finished garment and it is advantageous to do this at as low a temperature as possible and certainly below the annealing temperature of the particular yarn. Where the garment is shaped by wafer fashioning, I prefer to board twisted nylon stockings at about 200°—210° F. for instance. But where the boarding is an important part
of the shaping process as with non-wale-fashioned garments such as the normal circular knit stocking, I prefer to board at somewhat higher temperatures. Twisted nylon stockings of this invention may be boarded under such circumstances at temperatures about 220° to 230° F., with very slight loss of "stretch" quality.

Normally the yarns of this invention may be utilized in extremely fine denier. Two oppositely twisted yarns as fine as 7½ denier each may be knitted into plaited fabric without difficulty. Apparently yarns as fine as it is practical to make into fabric may be utilized.

I claim:

1. A "stretch" stocking including two yarns of preshrunk nylon, individually twisted in opposite directions and having substantially equal degrees of twist in the range of 25 to 100 turns per inch, said yarns being knitted in plaited relationship.

2. The method of manufacturing stretch stockings comprising relaxing wiry thermoplastic yarns, individually twisting two of such yarns to substantially the same degree in opposite directions, knitting said twisted yarns in plaited relationship on a circular knitting machine into a stocking, seaming the toe portion of said stocking and boarding said finished stocking at temperatures in the range of 200° to 230° F.

3. A "stretch" stocking including two wiry thermoplastic preshrunk yarns twisted individually in opposite directions and having substantially equal degrees of twist in the range of 25 to 100 turns per inch, said yarns being knitted in plaited relationship.

4. The method of manufacturing stretch stockings comprising relaxing wiry thermoplastic yarns, individually twisting two of such yarns to substantially the same degree in opposite directions, knitting said twisted yarns in plaited relationship on a circular knitting machine into a stocking, seaming the toe portion of said stocking and boarding said finished stocking at temperatures in the range below the annealing temperature of the yarns.

5. The method of manufacturing stretch stockings comprising relaxing wiry thermoplastic yarns, individually twisting two of such yarns to substantially the same degree in opposite directions, knitting said twisted yarns in plaited relationship into stocking fabric, seaming portions of said fabric to form a finished stocking and boarding said finished stocking at temperatures in the range below the annealing temperature of the yarns.

References Cited in the file of this patent

UNITED STATES PATENTS

<table>
<thead>
<tr>
<th>Patent Number</th>
<th>Inventions</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>648,581</td>
<td>Benger</td>
<td>May 1, 1900</td>
</tr>
<tr>
<td>648,582</td>
<td>Benger</td>
<td>May 1, 1900</td>
</tr>
<tr>
<td>1,811,081</td>
<td>Hartwell</td>
<td>June 23, 1931</td>
</tr>
<tr>
<td>2,170,149</td>
<td>Lockheed</td>
<td>Aug. 22, 1939</td>
</tr>
<tr>
<td>2,711,627</td>
<td>Leath et al.</td>
<td>June 28, 1955</td>
</tr>
</tbody>
</table>