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METHOD OF PRODUCING A LADY'S STRETCHABLE AND RETRACTABLE STOCKING AND THE RESULTING STOCKING

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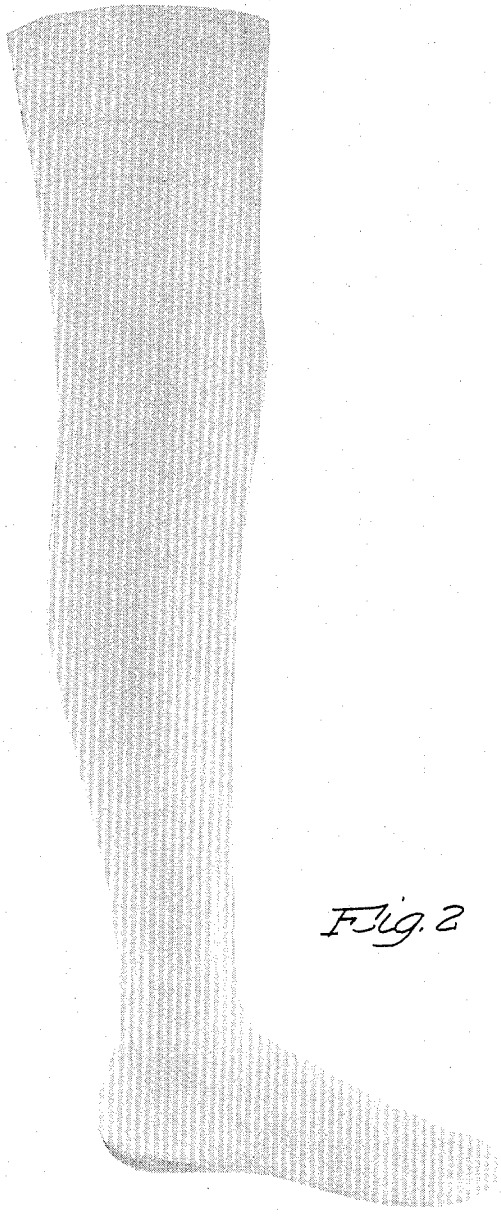


Fig. 2

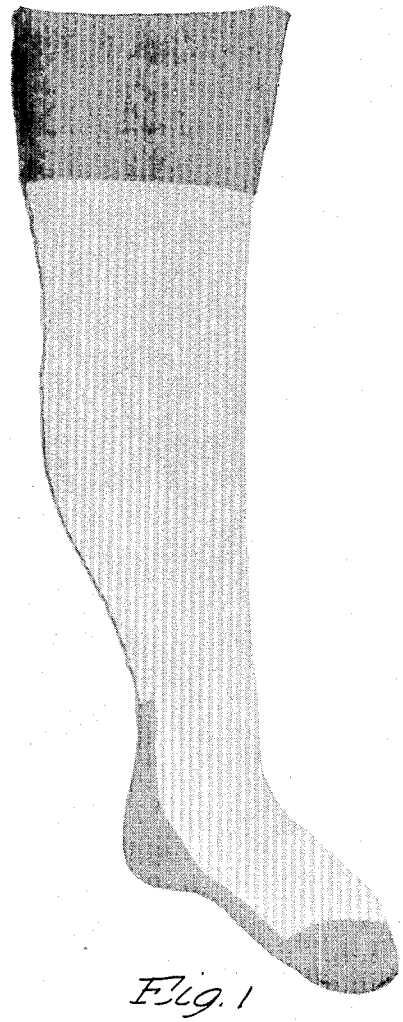


Fig. 1

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METHOD OF PRODUCING A LADY'S STRETCHABLE AND RETRACTABLE STOCKING AND THE RESULTING STOCKING

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8 Claims. (Cl. 28—76)

This invention relates to a method of producing ladies' stretchable and retractable stockings and more particularly to the development of these properties during the knitting and finishing of the stockings.

A characterizing feature of the method of this invention is the co-action of a lively yarn, which has been previously twisted and set to obtain the liveliness, with a non-lively untwisted yarn, knitted in adjacent parallel position, whereby the lively properties of the first yarn are imparted to a substantial extent to the second yarn, and the combined liveliness of the two yarns provides stretchable and retractable properties in the stockings knitted with these yarns.

The inducing of the lively properties into the originally unlively yarn is effected in part by the knitting of the two yarns in close parallel relationship, and particularly by the subsequent finishing treatments applied to the knitted hose, e. g., steaming, dyeing and boarding of the hose at elevated temperatures. The knitted stockings, prior to any of these treatments, show a slight bending or deformation of the originally untwisted yarn as a result of the action of the lively yarn thereon, but the stocking at this stage does not have the desired degree of stretchability and has very limited retractability after stretching.

The more extensive stretchability and retractability properties are produced, in situ, during the high temperature treatments after knitting of the stocking. As a result of these heat treatments, the initial deformation of the unlively yarn by the action of the closely associated lively yarn is extended substantially and is permanently set by the heat. These features will be more clearly understood from the following more detailed description of typical yarns and procedures.

For producing the lively yarn referred to above, the process disclosed in W. J. Leath and Frank E. Bobo patent application Serial No. 447,600, filed August 3, 1954, may be employed. As explained in that application, this yarn may be produced by first twisting the yarn in one direction, for example, about 20 to 50 turns per inch to the right, heat-setting the yarn thus twisted, and then reverse twisting the yarn about 20 to 60 turns per inch to the left, which imparts to the yarn a marked wildness or liveliness necessary for obtaining the stretchable and retractable properties in the stockings knitted from this yarn. This type of lively yarn may be used in combination with untwisted nylon or other yarn in accordance with the process of this invention as follows:

The two threads of yarn, one twisted and the other untwisted, are knitted together in side-by-side relationship to form a single course of the knitted stocking, the two threads not being plied or twisted together before knitting. As a result of this procedure, there are two loops formed in the knitted stocking, one of the untwisted nylon yarn which may be, for example, 10 denier monofilament nylon yarn, and the other loop formed from the twisted yarn which may be, for example, 15 denier monofilament nylon yarn.

In the knitting operation, the above-mentioned twisted yarn is wound on cones, tubes or other yarn supports and these packages used in pairs on the knitting machine, one of the packages containing the twisted yarn having an S or right twist and the other package containing yarn having a Z or left twist. These two oppositely twisted yarns are used for knitting the hose by alternating the course of left and right twisted yarns, for example, knitting two courses of right twisted yarn followed by two courses of left twisted yarn.

The 10 denier monofilament nylon yarn is knitted at the same time as the above-mentioned twisted yarn and is run through the same carrier tube with the twisted yarn; that is, one end of 10 denier yarn runs through a carrier tube containing the S twist yarn and another end of 10 denier yarn runs through a tube containing the Z twist yarn. These pairs of twisted and untwisted yarns are knitted usually by alternating every two courses.

Following the knitting operation, it will be found that the stocking possesses some stretchability and recoverability properties, but not to as great an extent as desired, and upon examination of the loops in the stocking it will be noted that the 10 denier untwisted nylon yarn is now formed in a slightly "bent" condition but with little lively characteristics yet induced into that untwisted yarn. In fact, if an end of the 10 denier untwisted yarn is removed from the stocking and stretched, it will be noted that the initial bent condition more or less disappears.

After the stocking is knitted as above described, it is steamed, for example in the conventional steam box, for about one hour at approximately 210° F. and then dried at about 170° F. for about 15 minutes. As a result of this second step in the process, the stocking is much shorter in length and has gained decidedly in stretchability and retractability characteristics. Upon raveling a course of the 10 denier untwisted yarn from the stocking after steaming, it will be found that the above-described original bent condition has become substantially more definite and permanent and is more or less set in this condition. As a result of this treatment, the stocking now has a greater and more permanent stretchability and recoverability.

The next step in the process, after steaming, comprises dyeing the stocking at a temperature of about 210° F. for approximately 30 minutes. This dyeing operation at elevated temperatures, together with the mechanical agitation of the stockings at this stage, has a further influencing effect on the 10 denier nylon yarn and establishes a tendency of the originally twisted yarn to intertwine with the originally untwisted nylon yarn and impress further and more permanently its effect on the originally untwisted yarn.

Following the dyeing operation, the stocking is placed on a boarding form of conventional type except of substantially smaller size and in relaxed position, that is, the stocking is slipped over the form but is not pulled down or stretched in the usual manner. The stocking on this small boarding form is then subjected to a temperature between about 250° F. and 255° F. for about 15 seconds. The elevated temperature is obtained with steam, which effects a final setting of the deformation of the 10 denier monofilament nylon yarn by the action of the twisted yarn thereon. As a result of the several various treatments of the stocking as above described, the 10 denier originally untwisted nylon yarn upon close examination now shows that it has gained an appearance substantially similar to the originally twisted yarn and has imparted to it a stretchable characteristic somewhat similar to the originally twisted yarn.

It is to be understood that the foregoing description of a typical method of operation for this invention is

for illustrative purposes only and the method is not limited to the particular types of yarns and sizes or the exact temperatures specified, but is characterized especially by the imparting of the characteristics of the originally twisted yarn to the closely associated originally untwisted yarn whereby the stretchability and retractability properties of the stocking knitted from these yarns are substantially improved and made more permanent.

An illustration of the stretchable type of stocking of the present invention is shown in the accompanying drawing in which:

Fig. 1 is a photolithograph, in side elevational view, of a lady's full fashion stretchable nylon stocking of the type disclosed in our above-mentioned application Serial No. 447,600, filed August 3, 1954, but containing in the present instance two paired yarn ends in each course, one of which is a heat-set twisted lively monofilament nylon yarn and the other yarn in the pair is an untwisted monofilament less lively nylon yarn;

Fig. 2 is an elevational view of the same stocking shown in Fig. 1 but stretched over a foot and leg form.

We claim:

1. A method of producing a lady's stretchable and retractable stocking, comprising: knitting a stocking from right and left twisted yarns in alternation, each paired with another yarn, the yarns of each pair always being knitted together and one yarn of each pair consisting of untwisted yarn and the other yarn consisting of a yarn that has been heat-set and then twisted sufficiently to impart to the yarn a permanent substantial liveliness, and to prevent loss thereof by high temperature finishing treatments subsequently applied thereto; steaming the stocking; then dyeing the stocking at an elevated temperature; and finally boarding the stocking in relaxed, substantially unstretched condition, said treatments of the stocking causing the originally twisted yarns to impart to the originally untwisted yarns some of the lively charatceristics of the twisted yarns, thereby increasing the stretchability and retractability of the knitted stocking.

2. A method of producing a lady's stretchable and retractable stocking, comprising: knitting a stocking from right and left twisted yarns in alternation, each paired with another yarn, the yarns of each pair always being knitted together in side-by-side relation and one yarn of each pair consisting of non-lively untwisted yarn and the other yarn consisting of a yarn that has been heat-set and then twisted sufficiently to impart to the yarn a permanent, substantial liveliness and to prevent loss of said liveliness by high temperature finishing treatments subsequently applied thereto, then subjecting the knitted stocking to steam at a temperature of approximately 210° F. for a period of about one hour, drying the stocking at a temperature of about 170° F. for a period of about 15 minutes, dyeing the stocking at a temperature of approximately 210° F. for a period of about one hour, drying the stocking at a temperature of about 170° F. for a period of about 15 minutes, dyeing the stocking at a temperature of approximately 210° F. for a period of about 30 minutes, boarding the stocking and steam-heating the boarded stocking at a temperature of approximately 250° F. to 255° F. for a period of about 15 seconds, said steaming, drying, dyeing, boarding and final heating of the stocking causing the originally twisted yarns to impart to the originally untwisted yarns some of the lively characteristics of the twisted yarns, thereby increasing the stretchability and retractability of the knitted stocking.

3. A method of producing a lady's stretchable and retractable stocking, comprising, knitting a stocking from right and left twisted yarns in alternation, each paired with another yarn, the yarns of each pair always being knitted together and one yarn of each pair consisting of untwisted yarn and the other yarn consisting of a yarn that has been heat-set and then twisted sufficiently to impart to the yarn a permanent, substantial liveliness to prevent loss thereof by subsequent high temperature finishing treatments, for causing the originally twisted yarns to impart to the originally untwisted yarns some of the lively characteristics of the twisted yarns, thereby increasing the stretchability and retractability of the knitted stocking.

4. A method as defined in claim 1 and in which the twisted yarn of each pair is a monofilament nylon yarn which has been twisted approximately 20 to 50 turns per inch in one direction followed by heat-setting and reverse twisting approximately 20 to 60 turns per inch in the opposite direction.

5. A method as defined in claim 1 and in which the originally untwisted yarn of each pair is a monofilament nylon yarn.

6. A lady's stretchable and retractable stocking composed of alternating courses of heat-set and subsequently right and left twisted lively yarns each paired with and always knitted together with a separate untwisted less lively yarn.

7. A lady's stretchable and retractable stocking as defined in claim 6 and in which the yarns are monofilament nylon yarns.

8. A lady's stretchable and retractable stocking as defined in claim 6 and in which the twisted yarns are 15 denier monofilament nylon yarns and the untwisted yarns are 10 denier monofilament nylon yarns.

References Cited in the file of this patent

UNITED STATES PATENTS

2,333,160	Dunn	Nov. 2, 1943
2,353,666	Hathorne et al.	July 18, 1944
2,584,944	Tilles	Feb. 5, 1952