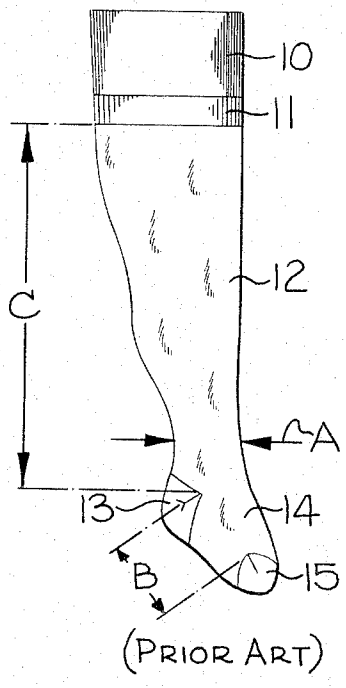
Jan. 23, 1968 L. M. CALDWELL 3,364,542

METHOD OF FORMING LADIES' STRETCHABLE SEAMLESS STOCKINGS

Original Filed Feb. 28, 1966




(PRIOR ART)

Fig-1

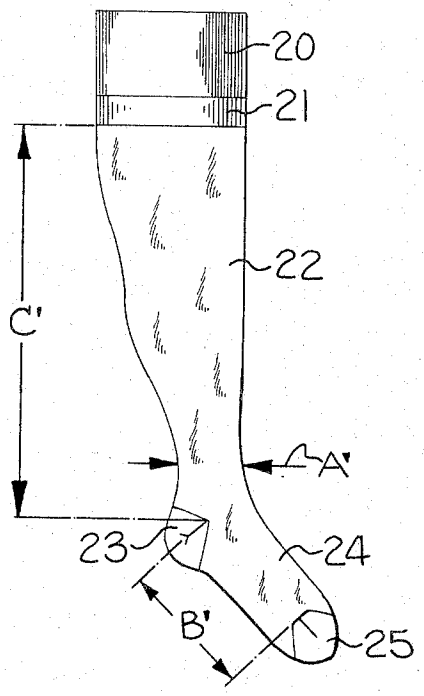



Fig-2

INVENTOR:
LEAZAR M. CALDWELL

BY Parrott, Bell, Seltzer, Park & Heard

ATTORNEYS

United States Patent Office 3,364,542 Patented Jan. 23, 1968



3,364,542

# METHOD OF FORMING LADIES' STRETCHABLE SEAMLESS STOCKINGS

Leazar M. Caldwell, Concord, N.C., assignor to Wiscassett Mills Company, a corporation of North Carolina

Original application Feb. 28, 1966, Ser. No. 530,429. Divided and this application June 1, 1967, Ser. No. 642,943

1 Claim. (Cl. 28—72)

## ABSTRACT OF THE DISCLOSURE

A method of forming a ladies' torque yarn stretch seamless stocking which has a narrow ankle and a long slim foot and leg and is produced by knitting at least the leg and foot of false-twisted type 6 nylon yarns, and then boarding the stocking on a narrow boarding form to shrink the stocking to the configuration of the boarding form.

The present application is a division of the Leazar M. Caldwell application Ser. No. 530,429, filed Feb. 28, 1966.

This invention relates to improved stretch yarns and ladies' improved seamless stretch stockings made therefrom, and more particularly to an improved method of forming the same.

The improved method of this invention involves the use of an improved stretch yarn and a preferred narrow boarding form which cannot be used for boarding seamless stockings made with the usual type of stretch yarn.

The improved seamless stretch stocking produced by the method of this invention, made with the improved stretch yarn and boarded on a narrow leg form, has a narrow or trim ankle and foot and a long leg that provides a slim appearance of the type commonly produced heretofore in conventional, non-stretch stockings, but not obtainable heretofore in seamless stretch stockings.

Conventional seamless stretch stockings are made with monofilament nylon yarn of 7 or 15 denier that is known as "type 66" nylon. This yarn is first processed to render it suitable for producing stretch stockings, by presetting the yarn with heat, and then twisting the yarn on a conventional "uptwister" machine to give the yarn sufficient liveliness or torque so that the stitches of the stocking will distort and incline when the stocking is relaxed. When this torque type stretch yarn is knitted to form the seamless stretch stocking, the knitted stocking is usually boarded on a wide leg form and the resultant boarded stocking has a wide ankle, a short leg, and a stubby foot which is commonly known as a "club" foot. The preferred narrow leg forms cannot be used satisfactorily for boarding of the conventional stretch stockings because the heat-setting and twisting of the monofilament "type 66" nylon yarns removes a large portion of the shrinkage therefrom. Thus, the heat-set and twisted monofilament "type 66" nylon torque yarn shrinks less than the untwisted nylon yarn of a non-stretch stocking, and a seamless stretch stocking made from this twisted torque yarn will not shrink or contract sufficiently during boarding to conform to the narrow ankle and foot type of boarding form. The compulsory use of the wide form results in the unattractive "club" foot and wide ankle seamless stocking.

In accordance with the method of the present invention, the disadvantages and limitations of the prior procedures and resulting undesired product have been overcome and an attractive narrow ankle and narrow foot seamless stretch stocking has been obtained for the first time. This has been accomplished by using a different form of nylon and processing the yarn in a different manner to avoid reducing the contraction or shrinkage



capacity of the yarn and seamless stocking knitted therefrom, and boarding of this stocking on a narrow form.

The different form of nylon used in accordance with this invention is known as "type 6" nylon, and the processing, i.e., heat-setting and twisting, of this yarn is carried out on a machine known as a "false-twist" machine. The type 6 nylon is a fiber-forming substance of any long-chain synthetic polyamide having recurring amide groups as an integral part of the polymer chain. This type 6 nylon is similar chemically to the conventional twist type 66 nylon, but has a higher shrinkage than the type 66 nylon.

A false-twist machine of a suitable type is produced by the Lessona Corporation of Cranston, R.I., and known as the "553" stretch yarn machine. A machine of this type is disclosed in Patent No. 3,152,436, issued Oct. 13, 1964. The type 6 nylon yarn is held under tension while it is being heated and false-twisted so that only a small portion of the shrinkage is removed therefrom. This type of false-twist machine is commonly used for producing multifilament stretch yarns for use in sweaters, knit shirts and garments, other than ladies' stockings. On the other hand, monofilament hosiery yarn for use in the production of conventional stretch stockings is commonly produced on an uptwister machine.

Other than the narrower or trim ankle and foot features of the stretch stocking of the present invention, it corresponds generally to a stretch stocking produced from monofilament torque yarn which is knitted in alternating courses with yarns of opposite torque and in which the stitches incline in opposite directions to produce the stretch characteristic. Further details of a stretch stocking of this type, but not embodying the improvements of the present invention, may be found in Patent No. 2,771,759, issued Nov. 27, 1956.

Details of the invention will appear as the description proceeds, when taken in connection with the accompanying drawings, in which—

FIGURE 1 is a side elevation of a ladies' boarded seamless stretch stocking of the type currently being produced and illustrating the short leg, thick ankle and short foot, which has become known as the "club" foot configuration; and

FIGURE 2 is a side elevation of a ladies' boarded seamless stretch stocking produced in accordance with the method of the present invention and illustrating the relatively long leg, narrow or thin ankle and relatively narrow and long foot, the configuration of this stretchable stocking being the same as a conventional non-stretchable stocking.

As shown in FIGURE 1, the conventional seamless stretch stocking has the "club" foot appearance and includes a turned welt **10**, a shadow welt **11**, a short shaped leg portion **12** and a foot including a heel pocket **13**, an instep portion **14** and a toe pocket **15**. The stocking shown in FIGURE 1 is illustrated in relaxed flattened condition, as it would appear in finished condition after the final boarding process and after it is removed from the wide boarding form. The turned welt **10** and shadow welt **11** are knit in a conventional manner of any desired type of yarn.

The leg **12** and instep portion of the foot **14** are knit in the conventional manner with an alternating pattern of lively 15 denier monofilament nylon type 66 yarns which have opposite torque of sufficient force to distort the stitch loops and provide stretchability in this portion of the stocking. The torque is provided in the yarn by the conventional process of heat-setting and then twisting on an uptwister.

The stocking produced by the method of the present invention (FIGURE 2) includes a turned welt **20**, a

shadow welt **21**, a leg portion **22**, and a foot including a heel pocket **23**, instep portion **24**, and a toe pocket **25**. The leg portion **22** and instep portion **24** are knit of oppositely false-twisted monofilament, 15 denier type 6 nylon yarns having a shrinkage capacity of at least 13 to 15% prior to being false-twisted. The type 6 nylon used in the stocking of the present invention should have an elongation characteristic of about 32 to 34%, prior to being false-twisted.

Liveliness and torque are applied to the monofilament nylon 6 yarn by the false-twisting operation. In this false-twisting operation, one yarn is passed upwardly through a hollow spindle rotating in one direction and the yarn is heat-set below the spindle to thus provide a torque in one direction, for example in a Z direction. Another yarn is passed upwardly through a hollow spindle rotating in the opposite direction while the yarn is heat-set below the spindle so that this second yarn has a torque in the opposite direction, for example in an S direction.

After knitting, the stocking is then finished in the conventional manner by seaming or looping the toe and dyeing and boarding. During the usual boarding operation, the stockings are placed on forms and subjected to moist heat under pressure to shrink the stockings and heat-set the shape therein. This is a well known and conventional process and may include pre-boarding and final-boarding. Also, the boarding and dyeing may be carried out in a single continuous operation on an automatic hosiery dyeing and finishing machine. The description of the various conventional hosiery finishing processes may be referred to in the "Man-Made Textile Encyclopedia" (page 454), published by the Textile Book Publishers, Inc. (1959). However, by knitting with a false-twisted type 6 nylon yarn it is now possible to board this new stretchable seamless stocking on a narrow boarding form so that it has substantially the same configuration as a conventional, non-stretchable stocking with a relatively long slim appearing leg, narrow ankle and relatively long slender foot, as shown in FIGURE 2.

The differences between the conventional type stretch stocking (FIGURE 1) and the stretch stocking of the present invention (FIGURE 2) are more evident by comparing corresponding measurements of the two. The following measurements were made with the stockings laid out in side-by-side relaxed and flattened condition. Across the ankle at A, the conventional stretch stocking measures 3⅝ inches while the stretch stocking of the present invention measures 3 inches across the ankle at A′, i.e., approximately 19% narrower. The foot of the conventional stretch stocking, from the heel gore line to the toe pocket gore line at B, measures 4 inches while the foot of the stretch stocking of the present invention measures 4⅝ inches along the corresponding line B′, i.e., approximately 17% longer. The leg of the conventional stocking from the bottom edge of the shadow welt **11** to the top of the heel gore line, along the line C, measures 15¾ inches, while the leg of the stretch stocking of the present invention measures 17 inches along the corresponding line C′, i.e., approximately 8% longer. Thus, by comparing the measurements of the two stockings, represented in FIGURES 1 and 2, it is apparent that the ankle of the present stretch stocking is narrower, the foot is longer and narrower, and the leg is longer, so that the configuration of the present stretch stocking is substantially the same as a conventional finished non-stretchable stocking while the conventional stretch stocking has the unattractive "club" foot appearance.



The stretchability of the stretch stocking of the present invention has been compared with the conventional stretch stocking, knit of conventionally twisted nylon 66 yarn. It was found that the present stretch stocking has increased stretchability.

The present invention has been described in detail above for purposes of illustration only, and is not intended to be limited by this description or otherwise, except as defined in the appended claim.

I claim:

1. A method of forming a ladies' stretch seamless stocking which is characterized by a narrow ankle and a long slim foot and leg, in contrast to the wide ankle and short stubby "club" foot and leg of the usual seamless stretch stocking, said method comprising knitting at least the leg and foot portions of the stocking with false-twisted type 6 nylon yarn which has an unusually high shrinkage capacity, and boarding with sufficient heat to heat-set said stocking on a narrow boarding form while shrinking the ankle and foot portions sufficiently to impart said narrow ankle and slim foot thereto.


**References Cited**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 2,800,780 | 7/1957 | Chivington. | |
| 2,778,187 | 1/1957 | Leath et al. | |
| 2,772,191 | 11/1956 | Burleson. | |
| 2,771,760 | 11/1956 | Burleson. | |
| 2,771,759 | 11/1956 | Leath et al | |
| 2,771,758 | 11/1956 | Weller. | |
| 2,771,757 | 11/1956 | Burleson et al. | |
| 2,771,756 | 11/1956 | Burleson et al. | |
| 2,771,733 | 11/1956 | Leath et al. | |
| 2,771,660 | 11/1956 | Ephland. | |
| 2,755,616 | 7/1956 | Weller. | |
| 2,736,945 | 3/1956 | Burleson et al. | |
| 2,717,486 | 9/1955 | Comer. | |
| 2,714,812 | 8/1955 | Leath et al. | |
| 2,714,757 | 8/1955 | Leath et al. | |
| 2,711,627 | 6/1955 | Leath et al. | |
| 2,841,971 | 7/1958 | Bird et al. | |
| 2,914,226 | 11/1959 | Russell | 223—75 |
| 2,952,116 | 9/1960 | Burleson | 57—157 |
| 2,963,848 | 12/1960 | Finlayson et al. | 57—157 |
| 3,069,837 | 12/1962 | Olson | 57—157 |
| 3,077,724 | 2/1963 | Stoddard et al. | |
| 3,098,348 | 7/1963 | Bryner | 57—157 |
| 3,112,600 | 12/1963 | Stoddard et al. | 57—157 XR |
| 3,125,848 | 3/1964 | Baebler | 28—72 XR |
| 3,131,840 | 5/1964 | Berger et al. | 223—76 |
| 3,166,881 | 1/1965 | Servage | 57—157 XR |
| 3,284,996 | 11/1966 | Fujii | 57—157 |

FOREIGN PATENTS

| | | |
|---|---|---|
| 940,691 | 10/1963 | Great Britain. |


MERVIN STEIN, *Primary Examiner.*

R. FELDBAUM, *Assistant Examiner.*