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METHOD OF TWISTING THREAD

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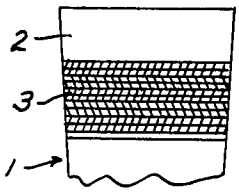


FIG 1

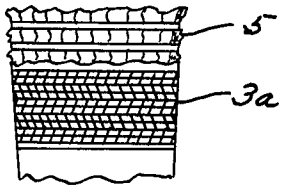


FIG 2

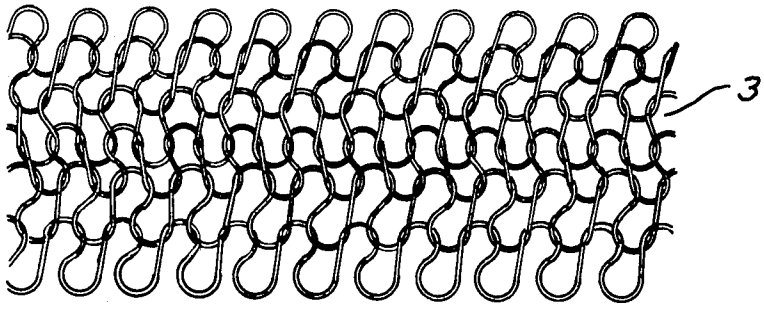


FIG 3

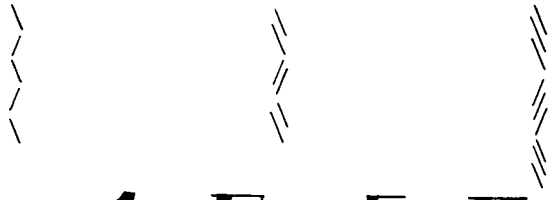


FIG 4 FIG 5 FIG 6

INVENTOR.
MAX F. WELLER
BY
William J. Ruano
ATTORNEY

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METHOD OF TWISTING THREAD

Max F. Weller, South Temple, Pa., assignor, by mesne assignments, to Patentex, Inc., New York, N. Y., a corporation of New York

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3 Claims. (Cl. 57—157)

This invention relates to the method of making ladies' hosiery, such as nylon hosiery, and more particularly to the method of twisting threads in the welt or longitudinally stretchable zone or band above or adjacent the knee which will absorb strains as a consequence of bending of the knee and thereby prevent undue tension of the threads or downward pull of the stocking. This application is a division of my copending application Serial No. 301,099, filed July 26, 1952, for "Lady's Stocking Having Stretchable Zone."

It is well known in the art to provide in ladies' nylon hosiery a longitudinally stretchable zone above the knee which serves as a strain absorbing zone since it incorporates fine gauge elastic rubber yarn for the purpose of imparting stretchability considerably beyond that of the nylon fibers from which the stocking is made. Various arrangements for knitting the rubber yarn and of combining or alternating it with the basic nylon yarn have been devised in the past in an attempt to prevent the inherent tendency of the rubber yarn to curl and become unsightly and to tend to form ribs, since knitting of rubber yarn inherently imparts tension thereto, but these attempts have not met with success. Moreover, many persons are allergic to the effects of rubber yarn which continually contacts the skin, therefore are unable to wear stockings embodying such rubber yarn. Additionally, from the standpoint of appearance rubber yarn is readily discernible and does not compare in sheerness or attractiveness with knotted nylon.

For many years the method of support of ladies' stockings has been a perplexing problem and despite the many obvious disadvantages of supporting them with supporters extending from girdles, this continues to be the accepted way for suspending ladies' stockings. While it has been attempted to eliminate the necessity of girdles and supports by sewing garter tops on ladies' stockings, these have not been successful because as a consequence of bending of the knee the garter is drawn downwardly of the woman's thigh therefore causing bagging at the knee after the knee is straightened which requires pulling up of the stockings numerous times. If it is attempted to overcome this tendency by making the garter tighter, severe strains and tensions exist; besides welts or deep skin impressions are caused by long wear of tight garters causing discomfort. Even if it were attempted to combine a garter top with a rubber knit strain absorbing zone above the knee, the tension created in the rubber as a result of knee bending will tend to pull the garter downwardly of the thigh and cause bagging at the knee followed by bagging of the entire stocking.

An object of this invention is to overcome the above mentioned disadvantages and to provide a novel method of making a longitudinally stretchable zone at or above the knee in ladies' full fashioned or circular knit stockings of nylon, or other suitable material, which zone is entirely devoid of rubber yarn and which is completely knit of the same basic fabric as the remainder of the stocking or other suitable relatively inelastic fabric and

yet which inherently provides an amazing amount of elasticity or longitudinal stretch upon bending of the knee.

A more specific object of this invention is to provide, in ladies' nylon hosiery, a novel method of twisting the threads in a strain absorbing zone or longitudinally stretchable band portion above the knee (or adjacent to the knee) which is knit entirely from the basic nylon or other suitable fiber and in which longitudinal stretchability is obtained by imparting twists in opposite directions in adjoining courses or groups of courses of the stocking giving it a remarkable range of longitudinal stretch so as to allow free bending of the knee without imparting longitudinal strains or bagging of the stocking.

Other objects and advantages of the invention will become apparent from a study of the following specification taken with the accompanying drawing in which:

Figure 1 is a fragmentary elevational view of the top portion of a lady's nylon stocking (extending from the region of the knee upwardly) and embodying a longitudinally stretchable zone at or above the knee knit from the basic yarn of the stocking in accordance with the principles of the present invention.

Figure 2 is a modified form of a lady's nylon stocking including in addition to the longitudinally stretchable zone shown in Figure 1 a garter top and being devoid of a welt.

Figure 3 is an enlarged diagrammatic view showing a portion of the type of knitting in the longitudinally stretchable zone embodies in Figures 1 and 2.

Figure 4 shows a modification wherein adjoining single courses are made up of yarn twisted in opposite directions.

Figure 5 is a schematic representation of the alternating double courses made up of yarn twisted in opposite directions as shown in Figures 1 and 2.

Figure 6 is a similar schematic view showing a modification of the knit construction wherein three transverse courses (instead of two) are made up of yarn twisted in one direction and the next three, of yarn twisted in the opposite direction, and the next three of yarn twisted in the same direction, etc.

Referring more particularly to Figure 1, numeral 1 generally denotes the top portion of a lady's stocking, such as a nylon stocking, extending upwardly from the knee and comprising an upper welt 2 and a longitudinally stretchable band portion or strain absorbing zone 3 located above the knee, or in some cases at or adjacent the knee. The purpose of the longitudinally stretchable zone 3 is to allow it to take up the stretch and permit free bending of the knee without exerting undue longitudinal strains on the fiber of the stocking. In other words, band portion 3 will freely stretch longitudinally to a considerably greater extent than the remainder of the stocking lengthening perhaps of the order of 1½ inches, thus preventing undue strain to the portion of the stocking where the garter is attached, and providing comfort to the wearer of the stocking.

Figure 2 shows a modification of a lady's stocking wherein the welt is eliminated and replaced by garter top 5 made of suitable elastic material, such as a conventional garter, sewed to the top, and wherein a longitudinally stretchable band portion 3*a*, which may be of identical construction as band 3 in Figure 1, is located immediately adjacent the garter top although it may be spaced from the garter top if so desired. The longitudinally stretchable band portion 3*a* a likewise is preferably located above the knee; however, its lower portion may extend from the knee or perhaps slightly below the knee.

An important and outstanding feature of the present invention resides in the construction of the longitudinally

stretchable zone or band portion 3 or 3*a* of Figures 1 and 2, respectively.

Figure 3 most clearly shows the particular construction of the knit in one embodiment of the invention as shown in Figures 1 and 2. Broadly stated, the longitudinal band portion 3 of Figure 1 (or 3*a* of Figure 2) is knitted from the same basic fabric, such as nylon, as the remainder of the stocking and is entirely devoid of rubber yarn. Longitudinal stretch is imparted by virtue of longitudinally twisting the threads of the respective courses or groups of courses in opposite directions. For instance, as shown in Figure 3, one preferred embodiment is to provide a twist in one direction to two successive courses, and a twist in the opposite direction to the next two successive courses, and again a twist in the same direction in the following two successive courses, and so on. Stated differently, a longitudinal right twist is imparted to the top horizontal courses whereas a left twist is imparted to the succeeding two courses, then a right twist to the next succeeding courses, and so on. As a consequence of such alternate longitudinal twisting of succeeding double courses, there will be a sinuous zigzag pattern in the longitudinal rows. Therefore, it will be apparent that upon longitudinal stretch of the band portion from the normal position shown as caused by bending of the knee, there will be a tendency for the vertical zigzag rows to straighten out and ultimately become straight vertical rows at the limit of longitudinal stretch. The greater the amount of twisting, the greater will be the angle of these zigzag vertical rows and hence the greater the longitudinal stretchability. A longitudinal stretch of the order of 1½ inches or greater, which is adequate, is easily obtained from the construction shown in Figure 3 as well as the succeeding figures in the drawing.

The selection of double courses twisted in opposite directions in Figure 2 arises mainly from the desire to avoid accentuating the width of a group of courses and to make the longitudinally stretchable band almost alike in appearance with the knit in the remainder of the stocking. It will be apparent that instead of double courses, triple courses may be twisted in opposite directions.

Figure 4 shows very schematically a modification of the knitting arrangement of Figure 3, that is, a single course twisted in one direction and in adjoining single course twisted in an opposite direction and so on.

Figure 5 shows diagramatically the knit construction shown in Figure 3 wherein two courses are twisted on one direction and the next two courses are twisted in an opposite direction and so on.

Figure 6 shows a still further modification wherein three courses (that is, the horizontal or transverse rows) are twisted in one direction, the next three in an opposite direction, and so on.

It will become apparent that other modifications will readily suggest themselves, such as course groups of 4 or larger, the threads of each group twisted in opposite directions from the threads adjoining groups—or perhaps unequal groups of courses whose threads are twisted in opposite directions in some geometrical pattern so long as there will be a number of courses twisted in one direction and a number in an opposite direction throughout the width of the band portion. Preferably the total number of oppositely twisted courses should be substantially the same throughout the width of the band portion.

A very important feature of the present invention resides in the method of imparting a twist to the threads in order for them to provide the amazing stretchability heretofore unknown and to assume the pattern shown in Figure 3 and the succeeding figures.

The yarn for the longitudinally stretchable zone 3 or 3*a* in Figures 1 and 2, respectively, stated briefly, is made of nylon, or other suitable basic fibers (but not rubber). It will be apparent that two types of yarn must be prepared, one twisted in one direction, which we might call a right twist, and the other twisted in the opposite direction, which we might call a left twist. A description of the method of twisting one of these types, such as the right twist, will suffice to indicate how both types are twisted.

To give a right twist to the yarn the yarn is first wound on a spinner bobbin and simultaneously spun about 35 turns per inch, more or less that it, it is given a right twist of about 35 turns onto a take up shaft. The right twisted yarn is then placed in a conditioning box in which is maintained a temperature of about 220 degrees F. dry bulb—200 wet bulb for about eight hours. After such conditioning the yarn is allowed to relax for about 24 hours (while the right twist prevails) in an air conditioned room at a temperature of about 80 degrees F. and about 50% humidity. The yarn is then rewound and simultaneously twisted in a reverse direction (to the left) about the same number or a greater number of turns, that is from about 35 to perhaps 40 or a greater number of turns per inch. Then it is placed in the same high temperature conditioning box described above at the same elevated temperature indicated for about the same length of time (eight hours) and then relaxed for about 24 hours in an air conditioned room of about 80 degrees F. and 50% humidity, and afterwards sized and oiled for delivery. The initial right twist that has been imparted will have become set following the conditioning and although a left twist is afterwards imparted the thread when completed will have a tendency to return to its initial right twist.

The method of making the yarn with a left twist for adjoining courses is substantially the same as described above except that the respective twists are in the opposite direction, that is to say the yarn is initially twisted to the left instead of the right for about 35 turns or so per inch, and after high temperature conditioning, it is allowed to relax at room temperature, twisted to the right and conditioned again at high temperature and finally relaxed at room temperature, sized and oiled for delivery. Of course variations may be made in the number of turns, temperature, humidity, etc. within the contemplation of the above described method.

By use of a striping attachment, the alternations or zig zagging of adjoining courses or course groups may be obtained.

Thus it will be seen that I have provided a longitudinally stretchable zone or band portion at or above the knee which is knitted of the same basic fiber, such as nylon, and devoid of rubber together with its attendant disadvantages, which band portion has a remarkable degree of longitudinal stretch heretofore unobtainable, making it an effective substitute for the conventional rubber containing, above-the-knee strain absorbing zone. In view of the amazing degree of longitudinal stretch it is possible to use a garter top, such as shown in Figure 2, without the danger of pulling down of the garter as a consequence of the high degree of longitudinal tension that would exist even in a rubber knit strain absorbing zone as caused by bending of the knees. Also I have provided a longitudinally stretchable zone which has a knit of attractive appearance and which may be of the same or different deniers, such as alternating deniers. That is, alternates courses or course groups may be of the same or different deniers. And most important I have provided a strain take up zone which is readily stretchable in a longitudinal direction and located at or above the knee and which by virtue of its being knit of the same basic fabric as the remainder of the stocking provides an extremely comfortable feel or fit against the thigh and which will not cause welts or skin impressions and the discomfort as caused by strain absorbing zones having rubber yarn incorporated therein.

And finally, I have provided an efficient construction for ladies hosiery which will enable dispensing of the use

of supporters and girdles and the discomfort of wearing them without sacrificing the ability to support the stockings neatly at all times irrespective of frequent bending of the knee.

Instead of knitting the stretchable zone above the knee it may be knitted below the knee instead.

Although stretchable band portion 3 or 3*a* in Figures 1 and 2, respectively, are described as being part of a stocking it will be apparent that they may be incorporated in other fabrics wherein stretchability is desired, such as girdles, undershirts, etc. Furthermore, either vertical or horizontal or even angular band portions may be integrally knit in the fabric. In some instances the entire fabric may embody the stretchable knit described in the present invention.

While I have illustrated and described several embodiments of my invention for twisting the yarn in either direction, it will be understood that these are by way of illustration and example only and that various changes and modifications may be made within the contemplation of my invention and within the scope of the following claims.

I claim:

1. The method of imparting a longitudinal twist to relatively inelastic thread of nylon or similar plastic material to be knitted into a fabric, such as a lady's stocking, comprising longitudinally twisting the thread in one direction approximately 35 turns per inch, placing the thread in an atmosphere of about 220 degrees F.—200 wet bulb for about eight hours, then allowing the twisted thread to relax for about 24 hours, at room temperature, then reversely twisting the thread a slightly greater number of turns, subjecting the reversely twisted thread to an atmosphere of about 220 degrees F.—200 wet bulb for about eight hours, and finally relaxing the twisted thread at room temperature for about 24 hours, whereby a permanent twist in the last named direction is obtained.

2. A method according to claim 1, in which the thread is finally sized and oiled.

3. A method of imparting liveliness to a thread of nylon or similar plastic material to be knitted into a stretchable fabric, such as a lady's stocking, comprising twisting the thread to a relatively high degree sufficient to make the thread lively and yet manageable, conditioning the thread at a relatively high temperature and for a sufficient length of time to set the twist therein but without damage to the thread, relaxing the thread at room temperature for a period of hours, twisting the thread in a direction reverse to the first twist and at least about the same number of turns as in the first twist, conditioning the reversely twisted thread at substantially the same high temperature and for substantially the same length of time as aforesaid, and thereafter relaxing the thread at room temperature.

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