

April 16, 1963

G. G. LOIZILLON

3,085,410

HOSIERY AND METHOD OF FORMING THE SAME

Filed Feb. 3, 1960

2 Sheets-Sheet 1

Fig-2

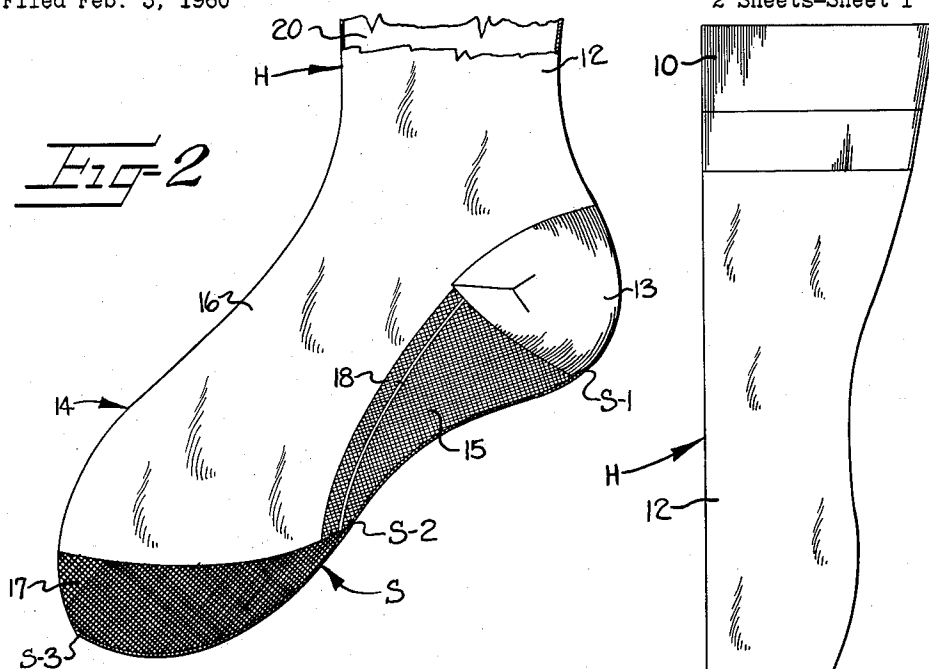
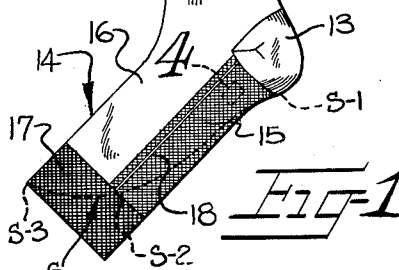
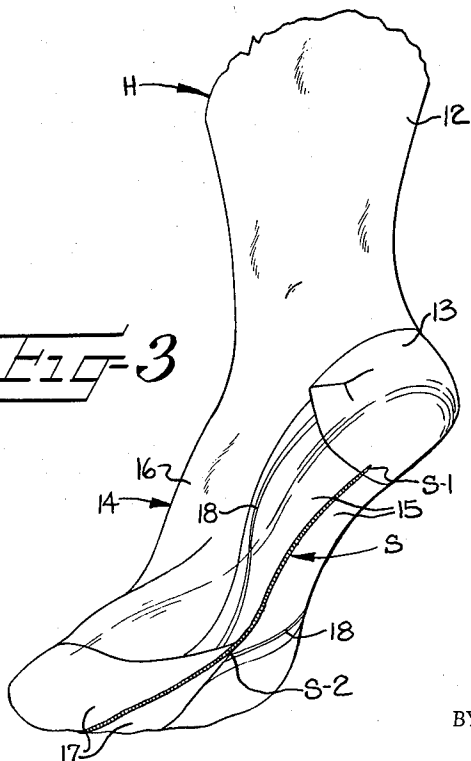


Fig-3



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2 Sheets-Sheet 2

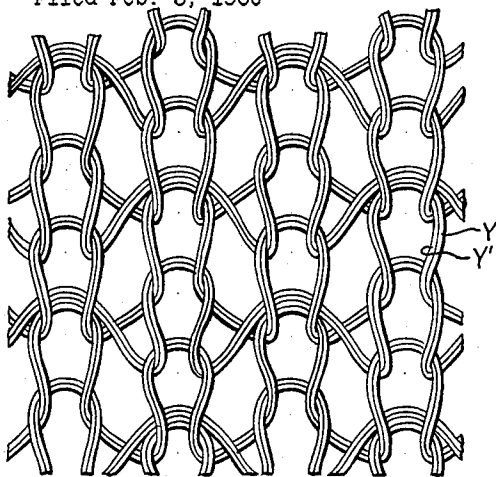


Fig-4

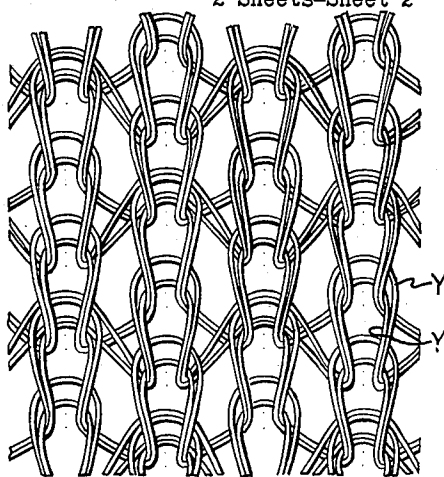


Fig-5

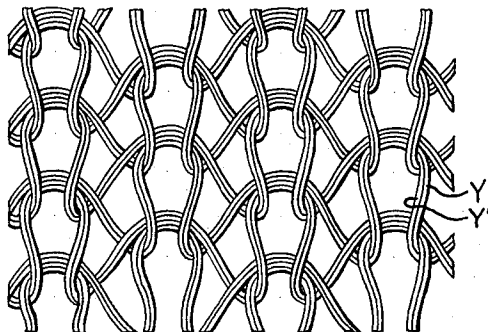


Fig-6

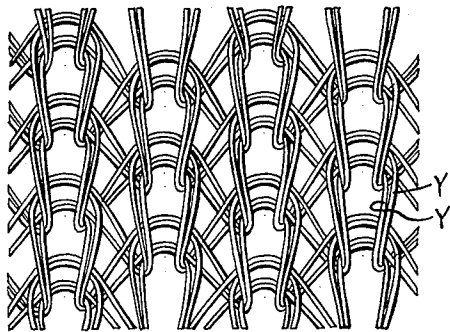


Fig-7

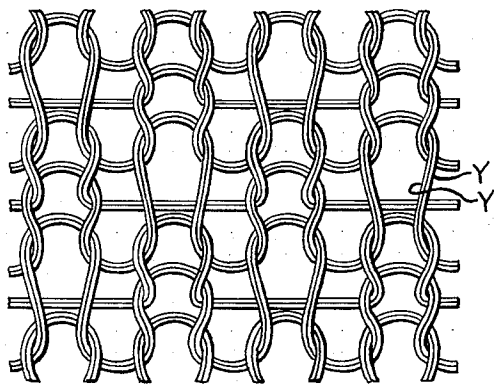


Fig-8

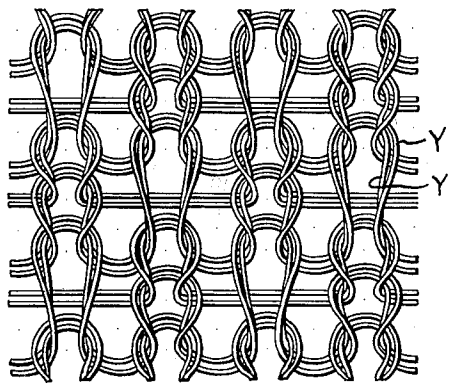


Fig-9

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3,085,410

HOSIERY AND METHOD OF FORMING THE SAME
 Guy Georges Loizillon, Fontaine-les-Gres, France, assignor, by mesne assignments, to Pilot Research Corporation, Valdesco, N.C., a corporation of North Carolina
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 Claims priority, application France Feb. 21, 1959
 8 Claims. (Cl. 66—185)

The present invention relates to improvements in seamless hosiery and particularly to an improved foot and toe portion for women's seamless hosiery and to the novel method of forming the same.

For many years it has been the general practice to form the lower end of seamless hosiery by reciprocatorily knitting a toe pocket and then closing the same in a separate operation which is known as looping. In the looping operation, the operator impales pairs of stitch loops on the points of a looper which sews or stitches these pairs of loops together. It has long been known that this method of forming and closing the toe of hosiery greatly increases the cost of manufacture. The cost is increased because it takes the knitting machine longer to reciprocatorily knit the toe pocket than it does to knit a straight tubular portion by rotary knitting, and the proper looping of the toe depends to a large degree upon the skill of the looping operator in placing the pairs of stitch loops on the points of the looping machine.

In an attempt to reduce the cost of producing seamless hosiery, it has been proposed to replace the looping operation by a simple over-edge seaming or sewing process, however, this seaming process produces a ridge which lacks flexibility, is unattractive and requires very close stitches. Even with very close stitches, all of the stitch loops may not be caught and result in drop stitches and runs developing at the seam.

Attempts have also been made to close the toe of stockings knit with synthetic yarn by use of an over-edge seam produced by a machine that cuts and sews simultaneously in conjunction with means for heating or plasticizing the selvages as they are seamed together, either by a heating element or by high frequency currents. It has also been attempted to make the edges of the toe stick together by softening the knifed fabric while holding the same together so that they will stick together with or without seaming the same. In either of these instances, the seam is predominant, coarse, and lacks flexibility because of the heat treatment to which the fabric is subjected.

Also, hosiery has been formed by knitting a synthetic yarn to form a straight tube while utilizing plain jersey stitches throughout, then closing one end of the tube with a curved or diagonal seam line, and then placing the closed tube on a hosiery boarding form to set the synthetic yarn and shape the leg, foot, heel and toe. The tube is placed on the form in stretched condition and the seam is positioned to extend longitudinally along the bottom of the foot. This type of seam is not as likely to be uncomfortable to sensitive feet because the bottom of the foot is normally tougher than the sides. On the other hand, it is impossible to make a straight, plain knit tube conform to the configuration of a boarding form without stretching some portions more than others and thereby distorting the stitches in the highly stretched portions. Also, when this type of hose is placed on the boarding form, pockets of the fabric are formed at each terminal end of the seam. This is due to the fact that the same number of needles are active throughout the knitting thereof and in spite of some slight variation by tightening the stitches, the main variation in size between the foot portion and the leg portion is accom-

plished during the boarding operation and this distorts the stitches adjacent the ankle and in the foot portion.

It has also been proposed to form the toe pocket by a complicated arrangement of narrowings and widenings so that the toe opening is positioned to extend longitudinally beneath the foot instead of transversely. However, this is still a slow method of knitting the toe pocket and requires extensive and complicated modifications of the conventional knitting machine to produce the same.

With the foregoing in mind, it is the primary object of the present invention to provide an improved seamless hose having a perfect and comfortable fit, a seam extending beneath the foot and out of sight, and foot and toe portions formed of special stitches and yarns to prevent runs from the seam. This improved hose is formed with a conventional heel pocket and a tubular knit foot and toe portion which is then sewn along a curved line to form a seam beginning closely adjacent the lower end of the heel pocket whereby the desired shape of the foot may be obtained to insure a perfect and comfortable fit. The lower portion of the tubular knit foot and toe portion is knit with run-resistant stitches to thereby reduce the likelihood of runs in the event the seam yarn does not engage every knit loop and to further provide two-way stretchability and flexibility to the knit fabric so that the same will more readily conform to the shape of the boarding form without distortion of the stitches. The run-resistant stitches in the lower portion of the tubular knit foot and toe portion are knit with a pair of synthetic yarns which are knit in plated relation and one of the synthetic yarns is preshrunk while the other is unshrunk, whereby upon boarding the unshrunk yarn will shrink and the yarns in each stitch loop will separate and further reduce the likelihood of runs.

The primary object of the invention having been stated, other objects will appear as the description proceeds when taken in connection with the accompanying drawings, in which—

FIGURE 1 is a side elevation of a flattened knit seamless hose as it appears when removed from the knitting machine and prior to finishing;

FIGURE 2 is an enlarged view of the lower portion of the hose shown in FIGURE 1 after the same has been cut and simultaneously seamed and then positioned on a hosiery boarding form for finishing;

FIGURE 3 is a perspective view of the hose on a woman's foot and looking upwardly underneath the foot portion;

FIGURE 4 is a greatly enlarged view of the area indicated by the dotted rectangle 4 in FIGURE 1 and illustrating one type of run-resistant stitch formation which may be used and showing the relative positions of the shrunk and unshrunk yarns prior to boarding and finishing the hosiery;

FIGURE 5 is a view similar to FIGURE 4 but showing the relative positions of the shrunk and unshrunk yarns after boarding and finishing of the hosiery;

FIGURE 6 is a view similar to FIGURE 4 but showing another type of run-resistant stitch formation which may be used and showing the relative positions of the shrunk and unshrunk yarns prior to boarding and finishing the hosiery;

FIGURE 7 is a view similar to FIGURE 6 but showing the relative positions of the shrunk and unshrunk yarns after boarding and finishing the hosiery;

FIGURE 8 is a view similar to FIGURES 4 and 6 but showing still another type of run-resistant stitch formation which may be used and showing the relative positions of the shrunk and unshrunk yarns prior to boarding and finishing the hosiery;

FIGURE 9 is a view similar to FIGURE 8 but showing

the relative positions of the shrunk and unshrunk yarns after boarding and finishing the hosiery.

Referring to FIGURE 1, the hose H is provided with a conventional welt 10, leg 12 and heel pocket 13. The upper part of the hose H, including the welt 10 and leg 12 may be knit of any desired yarn and stitch construction and is knit tubular without a seam up the rear portion. The heel pocket 13 is made in a conventional manner and when knitting the hose on a circular knitting machine, the needle cylinder is reciprocated and the number of needles which knit is progressively decreased and then increased to produce the heel pocket 13.

The portion of the hose below the heel pocket 13 is referred to broadly as the foot portion 14 and is knit tubular with the same number of needles being employed until the hose is removed from the knitting machine. The foot portion 14 (FIGURE 1) includes a sole 15, an instep 16 and a toe 17. It is to be understood that the opposite side of the foot portion 14 of the hose H, shown in FIGURES 1 and 2, is identical to the side shown and the sole 15 extends upwardly on the other side of the hose to join the other edge of the instep 16. It is preferred that the 17 be knit with an extra reinforcing yarn, not shown, to add strength.

During the knitting of the foot portion 14 the needles which knit the sole 15 and the toe 17 take the yarns and knit special stitches which give the sole 15 and the toe 17 run-resisting characteristics. Several different types of special stitches may be utilized to reduce the likelihood of runs. Some types of special stitches which may be used are shown in FIGURES 4, 6 and 8. It is preferred that the complete hose be knit with two yarns in plated relationship, one of the yarns being preshrunk prior to knitting and the other being unshrunk or shrunk to a lesser degree than the first yarn prior to knitting. However, as far as the present invention is concerned, it is only necessary that the two yarns be used in the sole 15 and toe 17 of the hose. In FIGURES 4 through 9, the preshrunk yarns are indicated at Y and the unshrunk yarns are indicated at Y'.

Referring to FIGURE 4, this type of run-resistant fabric is produced by feeding the preshrunk yarn Y and the unshrunk yarn Y' in plated relationship while raising certain needles to tuck level in the sole and toe portions. In the fabric shown in FIGURE 4, alternate needles are raised to tuck level during the first course. In the second course, all needles are raised to shed level and form stitches. In the third course, intervening needles are raised to tuck level and in the fourth course all needles are raised to shed level to form stitches. This sequence is repeated throughout the knitting of the sole 15 and toe 17 while the needles in the instep 16 all knit plain stitches.

In the run-resistant fabric shown in FIGURE 6, tuck stitches are again formed and both the preshrunk yarn Y and the unshrunk yarn Y' are used. However, in this instance, alternate needles are raised to tuck level in the first course and in the second course intervening needles are raised to tuck level and this procedure is repeated throughout the knitting of the sole 15 and toe 17 while the needles in the instep 16 all knit plain stitches.

In the run-resistant fabric shown in FIGURE 8, alternate needles are not raised high enough to pick up the yarns so that it is floated across these wales in the first course. In the second course both yarns are picked up and knit by all of the needles. In the third course intervening needles are not raised high enough to pick up the yarns so that it is floated across these wales. In the fourth course both yarns Y and Y' are picked up and knit by all the needles.

The sole 15 and toe 17 may be made run-resistant by utilizing tuck stitches as shown in FIGURES 4 and 6 or draw stitches and floats as shown in FIGURE 8. Also, the run-resistant fabric in the sole 15 and toe 17 may be knit by a combination of tuck and draw stitches, if desired. During the knitting of the sole 15 and instep 16, reference lines, indicated at 18, are formed adjacent op-

posite edges of the sole 15. These reference lines are formed by knitting plain stitches in one or more wales which are spaced inwardly from the edges of the sole 15. The reference lines 18 may be used to guide the operator during the seaming operation, they may be used to identify size of the hose or they may be used to identify the style of hose being knit.

After the proper number of circular courses are formed to complete the sole 15 and instep 16, the toe 17 is knit with the run-resistant fabric being formed by all the needles. As heretofore stated, it is preferred that a reinforcing yarn be knit with the unshrunk and preshrunk yarns during the knitting of the toe 17. Thus, when hose H is completed, the foot portion 14 forms a tubular sleeve which is of substantially the same diameter throughout and there is no toe pocket, as such, formed.

Upon completion of the knitting operation, the hose is flattened, as shown in FIGURE 1, and the lower edge and end of the foot portion 14 is closed by a seaming and cutting operation which is carried out simultaneously on a machine adapted to apply an over-edge seam and simultaneously cut off the excess portion of the tubular fabric. The seam, indicated broadly at S, is started at the lower edge of the knit heel pocket 13 at substantially the point indicated at S-1 in FIGURE 1, and continues in a curved line, as indicated by the broken line in FIGURE 1, to close the end of the foot portion 14. The curvature of the seam S may be varied to vary the diameter or width and length of the foot portion 14. As shown in FIGURE 1, the seam gradually moves inwardly along the sole 15 and enters the reinforced toe 17 at the lower end of the plain knit reference line 18 and at the point indicated at S-2. The seam S continues in a curved path across the toe 17 and terminates at the upper folded edge of the toe 17 at the point indicated at S-3.

Upon completion of the seaming operation, the hose H is placed on a rigid boarding form 20 (FIGURE 2), the lower end of which is shaped to conform to the desired shape of the finished foot of the hose H. The hose is placed on the form so that the seam S extends along the lower terminal end of the form 20 and the end S-3 of the seam is positioned at the forward extremity or tip of the boarding form 20. Due to the stretchability of the run-resistant stitches employed in the sole 15 and the toe 17 and because the heel pocket 13 is formed during knitting, the knit fabric at the lower end of the hose H will readily conform to the shape of the boarding form 20 without distorting the stitches in the plain knit areas of the hose.

The hose H on the form 20 may then be subjected to the conventional boarding temperatures which are sufficient to set the same in the desired shape. The special run-resistant stitch construction in the sole 15 and toe 17 of the hose H will help prevent runs in the event that the seam thread does not catch and engage every knit loop of the fabric. During the boarding operation, the unshrunk yarn Y' will shrink while the preshrunk yarn Y will remain in the original position so that the two yarns in each stitch will separate, as indicated in FIGURES 5, 7 and 9. This separation of the yarns will also help prevent runs originating at the seam and along the lower portion of the foot of the hose.

The improved hose of the present invention thus may be produced in an economical manner, the foot size may be changed by merely changing the curvature of the seam at the lower end of the hose and the knit fabric adjacent the seam is run-resistant.

In the drawings and specification there has been set forth a preferred embodiment of the invention and, although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation, the scope of the invention being defined in the claims.

I claim:

1. A knit hose having a seamless tubular leg, a knit

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heel pocket and a foot portion, said foot portion including an instep, a sole and a toe, a pair of synthetic yarns lying in spaced apart relationship in portions of the stitch loops of said sole and toe to impart run-resistant characteristics thereto, the knit stitches of said sole including tuck stitches to impart additional run-resistant characteristics thereto, and a curved seam located entirely beneath said foot portion and extending from said heel pocket to the forward extremity of the toe.

2. A knit hose having a seamless tubular leg, a knit heel pocket and a foot portion, said foot portion including an instep, a sole and a toe, a pair of synthetic yarns lying in spaced apart relationship in portions of the stitch loops of said sole and toe to impart run-resistant characteristics thereto, the knit stitches of said sole including draw stitches to impart additional run-resistant characteristics thereto, and a curved seam located entirely beneath said foot portion and extending from said heel pocket to the forward extremity of the toe.

3. A method of forming a ladies' seamless hose of synthetic yarn which comprises the steps of knitting a seamless tube to form a leg portion, knitting a heel pocket, knitting a second seamless tube to form a foot portion, knitting at least the lower and free end portions of the foot portion with a preshrunk and an unshrunk yarn in plated relationship to provide run-resistant characteristics therein, knitting at least the lower and free end portions of the foot portion with tuck stitches to provide additional run-resistant characteristics therein, closing one end of the foot portion by forming a curved seam extending along the lower portion and across the free end portion of the foot portion, cutting off the end of the foot portion beyond said seam, positioning the hose on a shaped hosiery form, and then applying heat to the hose on the form to set the hose in the shape of the form.

4. A method of forming a ladies' seamless hose of synthetic yarn which comprises the steps of knitting a seamless tube to form a leg portion, knitting a heel pocket, knitting a second seamless tube to form a foot portion, knitting at least the lower and free end portions of the foot portion with a preshrunk and an unshrunk yarn in plated relationship to provide run-resistant characteristics therein, knitting at least the lower and free end portions of the foot portion with draw stitches to provide additional run-resistant characteristics therein, closing one end of the foot portion by forming a curved seam extending along the lower portion and across the free end portion of the foot portion, cutting off the end of the foot portion beyond said seam, positioning the hose on a shaped hosiery form, and then applying heat to the hose on the form to set the hose in the shape of the form.

5. A lady's sheer circular knit stocking, at least a portion of said stocking having run-resistant characteristics and comprising a plurality of courses of knit stitches, each of said courses including a pair of synthetic yarns, said yarns lying in spaced apart relationship in portions of the stitch loops of said courses to impart run-resistant

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characteristics to said portion, and said courses including tuck stitches to impart additional run-resistant characteristics to said portion.

6. A lady's sheer circular knit stocking, at least a portion of said stocking having run-resistant characteristics and comprising a plurality of courses of knit stitches, each of said courses including a pair of synthetic yarns, said yarns lying in spaced apart relationship in portions of the stitch loops of said courses to impart run-resistant characteristics to said portion, and said courses including draw stitches to impart additional run-resistant characteristics to said portion.

7. A method of forming a lady's sheer circular knit stocking having at least certain courses thereof formed with run-resistant characteristics, said method comprising forming successive courses of stitch loops while knitting preshrunk and unshrunk synthetic yarns in plated relationship to form said certain courses and while forming tuck stitches therewith to impart run-resistant characteristics to said certain courses, positioning the stocking on a s shaped hosiery form, and then applying heat to the thusly positioned stocking to set the stocking in the shape of the form while shrinking the unshrunk synthetic yarn and causing this yarn to move apart from the preshrunk yarn to thereby impart additional run-resistant characteristics to said certain courses.

8. A method of forming a lady's sheer circular knit stocking having at least certain courses thereof formed with run-resistant characteristics, said method comprising forming successive courses of stitch loops while knitting preshrunk and unshrunk synthetic yarns in plated relationship to form said certain courses and while forming draw stitches therewith to impart run-resistant characteristics to said certain courses, positioning the stocking on a shaped hosiery form, and then applying heat to the thusly positioned stocking to set the stocking in the shape of the form while shrinking the unshrunk synthetic yarn and causing this yarn to move apart from the preshrunk yarn to thereby impart additional run-resistant characteristics to said certain courses.

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