March 18, 1952 I. W. GROTHEY ET AL 2,590,008

CIRCULAR-KNIT MULTIFEED STOCKING AND METHOD OF MAKING SAME

Filed April 26, 1948

2 SHEETS—SHEET 1

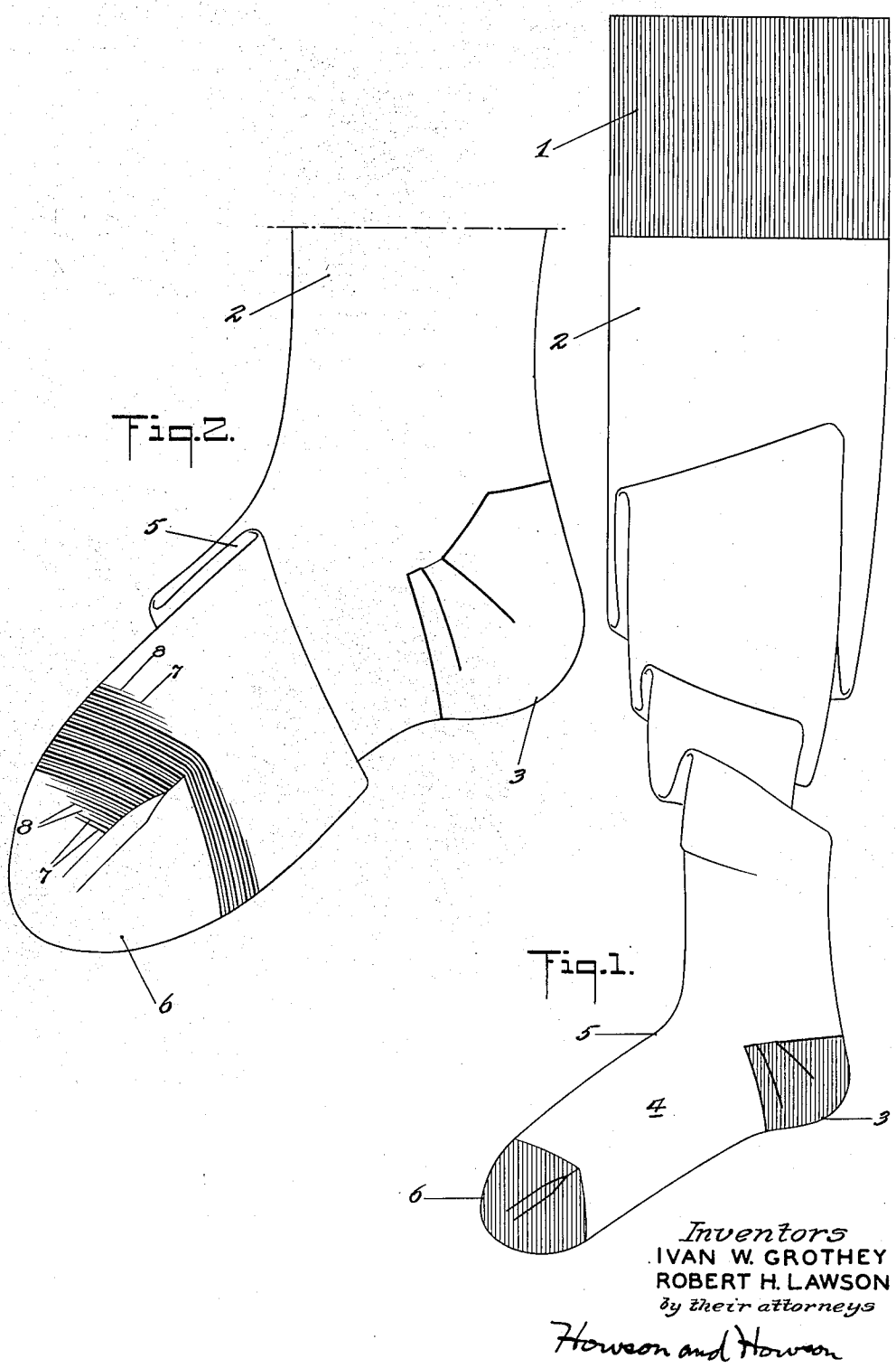


Fig. 2.

Fig. 1.

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2 SHEETS—SHEET 2

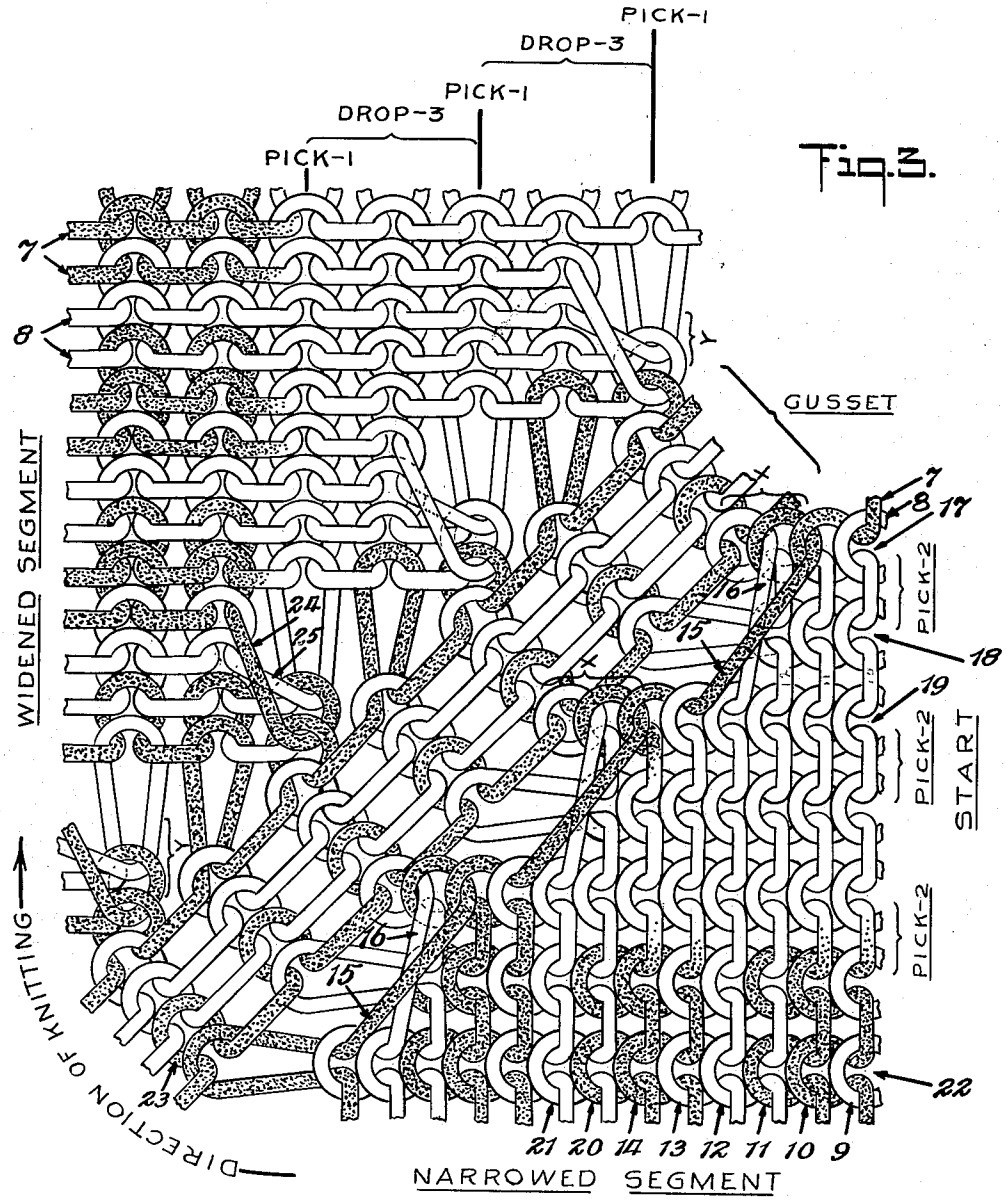


Fig. 3.

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CIRCULAR-KNIT MULTIFEED STOCKING AND METHOD OF MAKING SAME

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Application April 26, 1948, Serial No. 23,224

14 Claims. (Cl. 66—187)

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This invention relates to a circular-knit, multi-feed stocking and method of making same, more particularly one which is knit multi-feed throughout. It has heretofore been known to knit the leg and foot of a stocking in a two or three-course spiral, with consequent saving in production time. However, if the leg is knit multi-feed and the heel single-feed, defects occur in the stocking wherever a feed is thrown out of or into action. These defects are known as eyelets. One of the difficulties in multi-feed knitting throughout is the necessity for changing yarns. In knitting fine gauge hosiery it is essential to change yarns. For example, it is desirable to use relatively heavy yarns in the welt, heel and toe, and to use relatively light yarns in the leg and instep. The difficulty is much increased when it is desired to make reciprocatory knitting by multi-feed. Another difficulty in knitting a heeel or toe of a circular stocking by multi-feed reciprocatory knitting is the tendency of the sutures in the heel and toe to form eyelets. In stockings made in accordance with our invention, eyelets due to changes in the number of feeds have been completely eliminated by making the courses in the stocking continuous from the welt into the toe. Eyelets in the sutures of the heel and toe, due to the multiplicity of feeds, i. e., multi-course knitting, have been minimized by the construction hereinafter set forth. It is characteristic of our invention, as far as concerns the eyelets in the sutures of the heel and toe, that the sutures are multi-feed, single-sided sutures. Other features minimizing the size of these eyelets are set forth in the following description and claims.

Our invention will be shown embodied in a two-feed, circular-knit stocking in which a two-course spiral is used in the rotary-knit parts of the stocking, and in the reciprocatorily-knit heel and toe pockets there are two courses in each group knit simultaneously in the same direction.

In the drawings:

Figure 1 is the outline of a complete circular-knit stocking such as our invention relates to, showing typical yarn changes;

Figure 2 is a view on an enlarged scale of the foot of the stocking of Fig. 1, showing the uninterrupted character of the multi-feed courses in the foot and toe;

Figure 3 is a diagrammatic showing of the interlooping of the yarns in part of a heel or toe pocket made in accordance with our invention, the number of wales and courses shown being illustrative and not typical.

A circular-knit stocking knit multi-feed is shown in Fig. 1, such as can be produced according to our invention. It has a welt 1, a leg 2, a heel 3, foot 4 with instep 5 and toe 6. As indicated in this figure, the yarn or yarns used in knitting the welt 1, heel 3 and toe 6 are relatively heavier than the yarn or yarns used in the leg 2 and instep 5. The sole side of the foot 4 is sometimes made of heavier yarn and sometimes lighter yarn. In modern fine-gauge hosiery, changes of yarn are essential when knitting multi-feed.

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In Fig. 2 we have given an example of the fact that according to the first feature of our invention all the courses in one part of the stocking continue uninterrupted into the next part. We have shown a two-course, rotary-knit spiral in the foot 4 consisting of yarns 7 and 8, the courses continuing uninterrupted into the reciprocatorily-knit toe 6. The same may be true of the welt 1 into the leg 2, and the leg 2 into the heel 3.

Another source of eyelets is the stitch formation at the sutures. While some elementary forms of sutures such as a plain 1 x 1 double-sided suture between the narrowed and widened segments of a plain heel or toe do not have any eyelets along their length, there are many other forms of sutures which do have eyelets. We have discovered that although a plain narrowed and widened heel when knit multi-feed produces large eyelets, it is possible to minimize those eyelets greatly by the construction which we will describe. We have found that it is now possible to produce a stocking with yarn changes in it and which is multi-feed throughout, yet will be substantially free of eyelets. According to our invention, the eyelets, due to discontinuity of courses, have been eliminated entirely from the stocking, and the eyelets in the sutures have been minimized.

It should be noted that when a heel or toe pocket is made single-feed, the end stitch in every course on one side of the suture is directly connected to a course on the other side. This is true whether the single-feed suture is single-sided or double-sided. In other words, whether a suture is formed by the tapered edge of a single reciprocatorily-knit segment and a continuous course of stitches, or of two tapered reciprocatorily-knit segment edges, every reciprocatorily-knit course will be directly interknit with the fabric on the other side of the suture as long as the reciprocatory segment or segments are knit single-feed. In a stocking knit double or triple-feed, the suture works out differently.

In multi-feed knitting, when it is attempted to knit narrowed and widened segments to form a heel pocket, the resulting double-sided suture has large eyelets in it. We have discovered that these eyelets can be avoided by placing a number

of continuous courses of stitches, i. e., a gusset between the narrowed and widened segments thereby splitting the usual double suture into two singled-sided sutures. In the resulting structure, of which the preferred embodiment is shown in Fig. 3, not only are the eyelets minimized along the suture, but the suture is strengthened by certain tie-across stitches hereinafter described. The shape of the resulting heel or toe pocket may be substantially the same as if the gusset had not been inserted between the narrowed and widened segments. This construction can be used in the heel pocket or toe pocket, or both. In Fig. 3 we have embodied this novel form of pocket in the toe in the form of gusset shown in the U. S. reissue patent to John M. Allen No. 17,958, dated Feb. 10, 1931; and in the heel we have shown the invention embodied in the form of heel shown in the Harry N. Sheppard U. S. Patent No. 2,388,649, dated November 6, 1945.

While in Fig. 3 we have shown the simpler form of gusset embodied in the toe shown in Fig. 2, it should be understood that the form shown in Fig. 3 can be used equally well in the heel pocket if desired. The construction shown in Fig. 3 comprises three basic elements in addition to the sutures. These are a narrowed segment knit first, a gusset or parallel-sided element joined to a tapered edge of the narrowed segment by a single-sided suture and finally a widened segment joined to the other edge of the gusset by a single-sided suture.

We will next describe the general manner or sequence in which this fabric is produced, beginning at the right of the figure with the narrowed segment where the word "Start" will be found on the drawing. As already mentioned, the embodiment of our invention shown in this figure is knit at two feeds so that two courses are being knit simultaneously. The stitches of courses 9 and 10 indicated at the start of the narrowed segment are knit from right to left when the sheet is held in a horizontal position. The stitches of courses 11 and 12 as they appear in the drawings are knit from left to right so that the last stitches to be knit are those in the wale at the extreme right—namely, the wale marked 17. As the needles then start moving in the other direction, the first two needles, namely, those knitting wales 17 and 18, are raised or picked up out of action so that they do not knit in courses 13 and 14. However, the two needles have been raised out of action simultaneously and have the ends of the yarns coming from the two throat plates attached to them. The yarns will float across in front of the needles which knit wales 17 and 18, forming crossed floats or tie-across yarns 15 and 16 which are knit into successive stitches by the needle knitting the adjacent wale 19. It will be noted that the set of loops or stitches marked "X" formed in the wale 17 about the time that the needle of wale 17 and the needle of wale 18 are raised out of action, project toward the suture lying between the narrowed segment and the gusset further than the stitches in wale 18. The last loop of this set of stitches X remains on the needle in the wale 17. It will be noted also that in wale 19 two courses, which can be considered as forming a group, are terminated so that in wale 18 there are at least two stitches less than in wale 19 at this end of the courses. The stitch in wale 18 formed at the same time as the last stitch in wale 17 remains on the needle in wale 18. The machine now knits courses 20 and 21, and the cycle repeats itself. When the last wale 22 at the left is the wale on the end active needle, the narrowed segment may, for purposes of illustration, be considered as completed, though it should be understood that the number of wales and courses is not typical.

The gusset is then knit by throwing back into action the desired idled needles including the needle for wale 17. The needles knit the first continuous course 23 of the gusset and the stitches put on the needles in the narrowing, including the tie-across stitches 15, 16, are shed off the needles. The machine knits over and back, which completes four courses. This is merely illustrative, as the gusset would normally have, say, nine oscillations for a total of eighteen courses. The ends of the gusset would normally be tapered. Approximately the same number of needles that were thrown into action at the beginning of the gusset are thrown out again when the gusset is completed. The machine, continuing to reciprocate, will pick up one needle at the end of each reciprocation and a dropper will put three needles back into action, giving a net increase of two. The throwing back into action of the above needle which was raised out of action sheds the short tie-across yarns 24, 25 shown in the widened segment and leaves the set of stitches Y of that segment in the position shown in the drawing. It will be observed that with this construction there is direct continuity of the set of stitches in every wale extending from the narrowed segment through the gusset and into the widened segment. While in the construction shown, the courses of the narrowed and widened segments are not staggered or offset with relation to each other, as a practical matter it may be desirable to offset the courses in these two segments so that the set of stitches do not fall into line. The reason for this is that in the toe the segment must taper down near the looping and this will give a double-sided suture at this point. This putting of the ends of the courses in stepped relation is important when a double-sided suture is being made, because this tends to minimize the eyelets. Wherever a gusset is interposed between the narrowed and widened segments it makes no difference whether or not the courses in the narrowed and widened segments are offset.

With this construction eyelets are substantially eliminated and the tie-across yarns provide a substantial increase in strength at the sutures.

We claim:

1. A circular-knit stocking knit multi-feed throughout having a turned welt, leg, heel, foot and toe, characterized in that the welt, heel and toe are knit of relatively heavy yarn or yarns and the leg and instep of the foot of relatively light yarn or yarns, in combination with the fact that the stocking is knit with the same number of feeds throughout and that the courses in the welt, leg and foot are all continued uninterrupted into the leg, heel and toe, whereby eyelets due to increase or decrease in the number of courses are eliminated.

2. A circular-knit stocking having a turned welt, leg, heel, foot and toe, the welt, leg and foot being knit in a two-course spiral with the welt of heavier yarn or yarns than the leg, and the heel and toe being knit in two-course reciprocation of heavier yarn or yarns than the instep of the foot, characterized in that the two-course spiral and two-course reciprocatory knitting maintain complete continuity of all the courses from the welt to the toe, whereby eye-

lets due to increase or decrease in the number of feeds are eliminated.

3. A circular-knit stocking with a welt and knit multi-feed throughout in which the courses are all continuous from the welt into the toe, characterized by the provision of at least two single-sided sutures in the heel and toe, whereby eyelets at the suture are minimized.

4. In a circular-knit stocking knit multi-feed throughout with the courses all continuous from the welt into the toe, the provision of one or more pockets having one or more single-sided sutures, whereby eyelets at the suture are minimized.

5. A circular-knit stocking knit multi-feed throughout with the courses all continuous from the welt into the toe, having one or more pockets in which there is a tapered segment in combination with a gusset and a suture between the segment and gusset, the segment being formed of groups of courses successively knit in opposite directions with the ends of the groups of courses at the suture in stepped relation, there being a continuous course of stitches forming the edge of the gusset at the suture, whereby eyelets due to the multi-feed construction are minimized.

6. A circular-knit stocking having a narrowed and widened pocket in which there are two tapered segments, a gusset therebetween and a single-sided suture between the gusset and each segment, each segment being formed of groups of courses successively knit in opposite directions with the ends of the groups of courses at the suture in stepped relation, each edge of the gusset at a suture being a continuous course of stitches, whereby eyelets due to the multi-feed construction are minimized.

7. A circular-knit stocking knit multi-feed throughout having a narrowed and widened pocket in which there are two tapered segments, a gusset therebetween and a single-sided suture between the gusset and each segment, each segment being formed of groups of courses successively knit in opposite directions with the ends of the groups of courses at the suture in stepped relation, each edge of the gusset at a suture being a continuous course of stitches, whereby eyelets due to the multi-feed construction are minimized.

8. A circular-knit stocking in accordance with claim 7 characterized in that on the tapered side of each suture the yarns from the different feeds float across each other in passing from wale to wale as well as course to course, whereby the fabric is tied together and strengthened at the suture, minimizing eyelets.

9. A circular-knit stocking in accordance with claim 7 characterized in that on the segment side of each sature the yarns from the different feeds float across each other in passing from one wale to another wale spaced therefrom as well as in passing from course to course, whereby the fabric is tied together and strengthened at the suture, minimizing eyelets.

10. A circular-knit stocking knit multi-feed throughout, having narrowed and widened heel and toe pockets in which there are two tapered segments, a gusset therebetween and a single-sided suture between the gusset and each segment, each segment being formed of groups of courses successively knit in opposite directions with the ends of the groups of courses at the suture in stepped relation, each edge of the gusset at a suture being a continuous course of

stitches, whereby continuity of all course-connected wales is maintained from the narrowed to the widened segments and eyelets are minimized.

11. A circular-knit stocking having heel and toe pockets knit multi-feed throughout, there being in one or more pockets at least a tapered segment and a gusset with a suture between the segment and gusset, characterized in that the suture edge of the gusset is a continuous course and that at the suture edge of the segment the ends of alternate courses are knit to the intervening courses in combination with the ends of the intervening courses being locked to the alternate courses by tie-across floats, thereby producing a multi-feed suture of superior strength with minimized eyelets.

12. A circular-knit stocking having heel and toe pockets knit two-feed throughout with at least a tapered segment, a gusset and a suture in each pocket, the suture being located between the segment and gusset, characterized in that the edge of the gusset at the suture is a continuous course and in the suture edge of the segment a multiplicity of ends of courses in stepped relation are present, the ends of alternate courses being knit to the intervening courses, in combination with tie across floats from both feeds locking spaced wales together, whereby a two-feed suture with minimized eyelets and superior strength is formed.

13. In a method of making a circular-knit stocking by multi-feed knitting, the steps of knitting a leg or foot by a multi-feed spiral, continuing those feeds uninterrupted into the reciprocatory knitting of a pocket, knitting the pocket by multi-feed reciprocatory knitting including narrowing a segment by picking needles out of action a plurality at a time, and then throwing all the idled needles back into action simultaneously so as to knit a continuous course, whereby a multi-feed single-sided suture is formed in which eyelets due to the multi-feed construction are minimized.

14. In a method according to the preceding claim, the step during reciprocatory knitting of the pocket, of simultaneously throwing a multiplicity of needles out of action which were the last needles to knit in one direction of movement, and then moving them in the other direction of movement as idled needles while knitting on the adjacent needles, whereby tie-across floats of yarn from each of the feeds are created crossing each other, locking together different wales, whereby a multi-feed suture of superior strength is made.

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