

Nov. 6, 1945.

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2,388,649

CIRCULAR KNIT HOSIERY AND METHOD OF MAKING SAME

Filed May 31, 1945

Fig. 2.

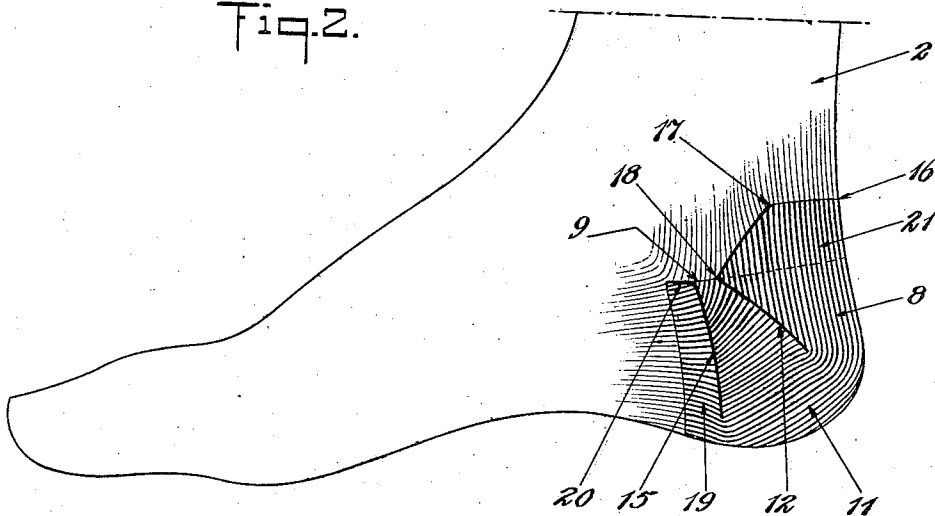
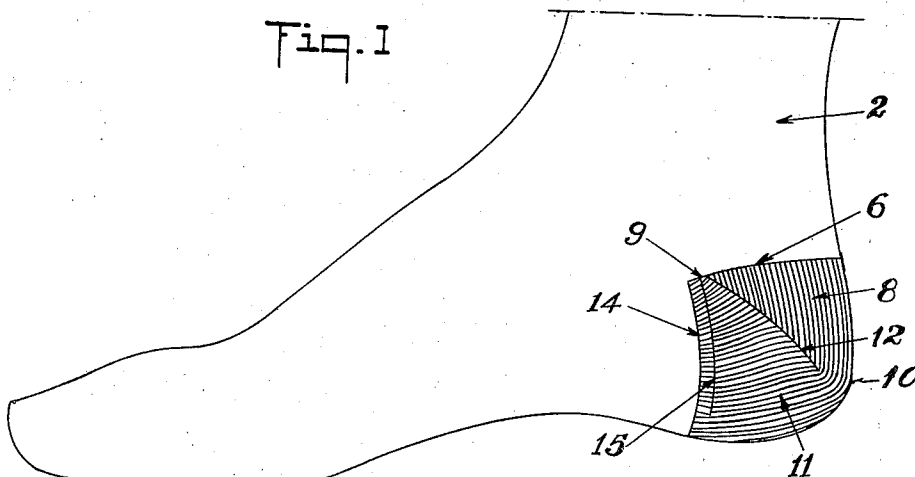


Fig. 1



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UNITED STATES PATENT OFFICE

2,388,649

CIRCULAR KNIT HOSIERY AND METHOD
OF MAKING SAME

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Application May 31, 1945, Serial No. 596,846

20 Claims. (Cl. 66—187)

This invention relates to circular knit hosiery and methods of making same and more particularly to the structure of the heel. The invention is adapted to be carried out on circular knitting machines having independent needles and capable of having relative rotary and reciprocary movements of the needles and knitting cams. Although the invention may be practiced on various types of knitting machines, in this specification the invention will be described in connection with the U. S. patent to Albert E. Page et al., No. 1,841,205, dated January 12, 1932.

One object of the invention is to make a stocking with a low heel, as shown for example in the reissue patent to Robert W. Scott No. 16,795, dated November 22, 1927, and to have the heel extend well under the foot. Other advantages include a smooth instep, an improved angle between the leg and foot, a lack of puckering on the sides, and absence of eyelet holes at the inner ends of the heel sutures. The heel is strong, and, as viewed from the side, occupies a large segment of a circle of fabric in going from the ankle to the foot. According to this invention, the heel contains as its largest elements two adjacent, progressively narrowed gussets. The first course of the second gusset contains more wales than the starting course of the first gusset, and being progressively narrowed beyond the first gusset, a low heel is formed that, when viewed from the side, occupies a segment of a circle which is larger than that of the normal small heel of the said Scott patent.

In the drawing, Figure 1 represents a diagrammatic view of the foot of a stocking made in accordance with one embodiment of the present invention. The number of lines shown in the gusset is much less than the actual number of wales. Figure 2 is a similar view of a modified construction in which there is a widened gusset above the first narrowed gusset.

The construction of the welt, leg, foot and toe of a stocking embodying the present invention may be of any conventional or desired construction, except for the heel, which is the part to which the invention is directed. For purposes of illustration only, let us assume that the stocking is to be knit from top to toe on a circular knitting machine having a rotary needle cylinder 3 3/4 inches in diameter, containing four hundred needles.

To explain the structure of the heel as shown in Fig. 1, its method of manufacture will now be set forth with reference to the above-mentioned Page et al. Patent 1,841,205. Let us as-

sume that the welt and leg have been knit in any conventional or other desired manner and that the rotary knit leg 2 immediately above the heel contains four hundred wales.

Prior to the knitting of the first course of the heel, all of the needles except one hundred fifty-four on the heel side of the stocking are moved to an inactive level known as the instep level which, in the above-mentioned Page machine, is an elevated level. The first course of the heel is knit in a reverse direction, i. e., opposite to that of the round-and-round movement. As the one hundred fifty-four active needles start in this reverse direction on the first stroke, the leading needle is raised out of action by a narrowing pick in the customary manner, and the first course of the gusset 8, i. e., the one joined to the leg along the line 6, therefore contains one hundred fifty-three stitches. It will be observed that this is much less than half the needles in the machine and that a small heel which does not show above a low shoe is to be made. In the example being described, there are seventy-five courses in the first gusset 8, including the above-mentioned first course, and therefore the last course of this gusset is knit in the reverse direction. The leading needle is picked out of action before knitting on each oscillation, namely, one per course.

The next two courses knit are novel in character. As the cylinder moves in the forward direction to make the first of these two novel courses, switch cams like the cams 24, 25 in the Page et al. patent restore to knitting position not only the part of the group of one hundred fifty-four heel needles which were picked up out of action during the first gusset 8, but also three needles on either end of the group. These cams are inserted at the mid-point of the active segment, the point marked 10 on the drawing, and as a consequence the added needles on one side of the heel, namely, those at the trailing end of the active (considered on the forward stroke) segment become active on the forward stroke; and those on the leading end (i. e., the needles which trail on the reverse stroke) become active on the following or reverse stroke, which is the first full course of the second gusset. The first full course of the second gusset 11 is knit in the reverse direction after deducting the leading needle which is put out of action by the up-pick. This means that one hundred fifty-nine stitches are knit in this course. The narrowing continues so that on the next course one hundred fifty-eight stitches will be knit. There are one hun-

dred four courses in the second gusset. The last course in this gusset therefore contains fifty-seven stitches, the narrowing being at a rate of one needle per course, as in the first gusset. The narrowing in both cases is preferably by up-pick action alone. The second gusset contains more courses than the first gusset. In other words, the second gusset is progressively narrowed on each side of the stocking beyond the wale where the first gusset ended. There are also more wales in the second gusset than in the first. The suture 12 between the first and second gussets is shorter than the suture 15 on the side of the second gusset which faces toward the toe 5.

The knitting of extra stitches or wales 9 at 15 the inner end of the second gusset avoids the formation of eyelets which otherwise would occur if the two gussets started at the same wale. This strengthens the corner both because of the separation and because the extra stitches provide continuity of wales from the instep side of the stocking into the central gusset. The extra courses due to the extra narrowing near the side help to turn the foot up to a more acute angle. It will be observed that no widened segments have been used in turning the corner and that a low heel is obtained with extra stitches which carry the heel well under the foot. The suture resulting from this narrowed construction does not stretch so freely as a narrowed and widened heel suture—a desirable feature.

It is sometimes desirable to add even more to the heel fabric under the foot, and for this purpose and others, a third gusset can be added. This gusset is preferably a widened one. For this purpose the interrelated action of the two switch cams 24 and 25 again moves all the idled needles except the instep needles back to knitting level. This amounts to one hundred sixty needles, as in the case of the second gusset. The active needles knit on successive courses, one hundred sixty plus one, two, three, etc. stitches as the net increase of the narrowing and widening picks—both of which are used—one needle up, two down. After the sixth course, which is in the reverse direction, circular knitting is resumed, the action of the switch cam 24 of the Page et al. patent restoring all the needles to active position. If there is no third gusset the cam 24 restores all needles to active position at the end of the second gusset.

The number of courses in the gussets 8, 11 and 14 may be varied, the exact number of courses in the several gussets as recited in the preceding description being for illustrative purposes only. The relative number of needles knitting the first and second gussets 8 and 11, respectively, effects the knitting of a heel having several desirable qualities, such as a smooth and flat appearing heel without the usual puckering of the heel gores which frequently results from knitting in accordance with accepted methods. The novel heel also has a tendency to pull the fabric down, i. e., take up the slack at the instep. The heel corners are also stronger, which, in part, at least, is due to the fact that the longitudinal pull or strain on the stocking is distributed over three separate points, and that the stitches joining the instep and the heel in the second gusset are in uninterrupted wales, i. e., constitute continuous fabric without any change in the direction in which the thread runs. Thus it will be noted that not only is there no suture at this point, but that the reinforced stitches on the first row adjacent the instep on each side are all knit together in one course.

The construction shown in Fig. 2 differs essentially in adding to the combination a widened gusset 21 so placed as to correspond to a high heel reinforcement. (To make clear the shape of gussets 21 and 8, a dotted line is shown in the drawing where they meet each other.) The balanced cooperative effect of this gusset on the rest of the novel structure will be set forth after its construction has been described. Let us assume that the leg 2 has been made by rotary knitting on all the needles down to what in Fig. 1 is the beginning of the heel. In Fig. 2 this line includes, among others, points 16, 17, 18, etc., on each side. The new gusset is knit next. All the needles except those at the back of the stocking between points 16 and 17 on the one side and the corresponding needles on the other side (the latter wales not being shown), are thrown out of action. Reciprocatory knitting then takes place on this small group of needles at the back of the stocking, widening the segment as the knitting progresses along the point 17 to the point 18 which is at the inner end of the first narrowed segment. This brings us to a position corresponding to the line 6 in Fig. 1. The widened segment just knit acts as a neat high splice. It will be noted that the level portion of the reinforcement around the back of the heel is not a suture, but that the tapered sides 17, 18 are sutures. The first narrowed gusset 8 is then knit in the same manner as in the stocking of Fig. 1, followed by the second narrowed gusset 11. Thereafter a final gusset 19 is knit in much the same manner as the third gusset of Fig. 1, with widening at the ends of the active segment of needles to give a suture 20 whose direction is in direct continuation of the line between point 18 and point 9 where the reinforced fabric of the second gusset 11 ends. It will be noted that the continuity of the plain fabric from the instep side of the stocking into the second or central gusset 11 provides added strength between the instep and the heel in the constructions of both Figs. 1 and 2. In the construction of Fig. 2, in addition to that feature and the separation of the inner ends of the suture lines between the first and second narrowed gussets and the second and third gussets, there are other advantages. The reinforced areas at the inner ends of the suture lines are balanced on the two sides and extend a greater and even arc of protection around those areas. Of course, they also extend the contour of the heel.

Obviously, the recited number of needles active during the knitting of the gussets 8, 11, 14 and 21 will vary when machines having a number of needles other than four hundred are availed of to practice the present invention. Furthermore, the number of needles knitting the various gussets may be varied, even when knitting with a knitting machine having, for example, four hundred needles.

This application is a continuation-in-part of my application for patent for Circular knit hosiery and method of making same, filed October 10, 1944, Serial Number 558,018.

I claim:

1. In a circular knit stocking having a heel comprising a plurality of adjacent progressively narrowed tapered gussets arranged one below the other, each extending to the instep fabric, an upper gusset having less than half the wales of the leg and the gusset below it containing more courses than said upper gusset, whereby the heel is extended under the foot.

2. A circular knit stocking according to claim 1 in which the lower gusset contains more wales in one or more courses adjacent a neighboring gusset than the longest course of said neighboring gusset.
3. In a circular knit stocking having a heel comprising a plurality of tapered gussets arranged one below the other, every course in said gussets containing less than half the wales in the leg of the stocking, the provision of a lower gusset having one or more gussets between it and the leg, said lower gusset extending further into the instep than the gussets above it, whereby continuity of plain wales from the instep of the stocking into said lower gusset is obtained and the heel is extended under the foot.
4. In a circular knit stocking, the combination in the heel of two progressively narrowed gussets arranged one below the other, said gussets having less than half the wales of the leg and the lower gusset containing more wales in one or more courses adjacent the upper gusset than the longest course of said upper gusset, whereby the inner ends of the suture lines between two gussets and between the lower gusset and the fabric adjacent it on the toe side are separated.
5. In a circular knit stocking, the combination in the heel of two or more tapered gussets with suture lines on the sole side of each of two such gussets which are adjacent, the upper of said two adjacent gussets having in its longest course less than half the wales of the leg, and the lower of said two adjacent gussets containing in one or more courses adjacent the other of said two gussets more wales than the longest course of said other gusset, whereby there is continuity of plain fabric from the instep of the stocking into said lower gusset.
6. A circular knit stocking having a heel with a plurality of gussets, there being among said gussets an upper gusset, a lower gusset and a central one therebetween containing more wales in one or more courses than the longest courses of said upper gusset, whereby there is continuity of plain wales from the instep of the stocking into said central gusset, the upper and lower gussets being tapered and presenting suture lines to the instep side of the stocking, there also being suture lines between the central gusset and the one on either side of it, all courses in said heel gussets containing less than half the wales in the leg of the stocking.
7. A circular knit stocking having a heel containing a plurality of gussets, said gussets comprising two tapered gussets, a central tapered gusset therebetween containing more wales in one or more courses beside an adjacent gusset than in the longest course of said adjacent gusset, whereby there is continuity of plain wales from the instep in said gusset, said tapered gussets on each side of the central gusset presenting suture lines to the instep side of the stocking, there being suture lines between the central gusset and the one on each side of it, the suture line between the central gusset and the one above it being shorter than the suture line on the other side of said central gusset.
8. A circular knit stocking having a heel with a plurality of tapered gussets, there being among said gussets a tapered gusset and a central one containing more courses than said tapered gusset, said tapered gusset being adjacent the central gusset on the leg side thereof, and said central gusset also having more wales in one or more courses adjacent said leg-side gusset than the longest course in said leg-side gusset, whereby there is continuity of plain wales from the instep into said central gusset, in combination with a tapered gusset on the foot side of said central gusset, the gusset on each side of said central one presenting a suture line to the instep side of the stocking and every course in said gussets containing less than half the wales of the leg, whereby an extended low heel is produced.
9. A circular knit stocking having a heel of less than half the wales of the foot at the instep, said heel comprising two adjacent progressively tapered gussets, one below the other, with a suture therebetween, the lower gusset containing more wales in one or more courses near the upper gusset than the longest course of said upper gusset, in combination with a widened gusset between the lower gusset and the foot, there being a suture between the lower and third gussets longer than the first-mentioned suture and a widened gusset above the upper gusset, there being no suture between the upper widened gusset and the tapered gusset below it, the two widened gussets being equal in length to the adjacent gussets at their points of juncture therewith; whereby an extended heel is formed.
10. A circular knit stocking having a heel comprising two progressively narrowed gussets arranged one below the other, the upper gusset having less than half the wales of the leg and the second gusset containing more courses than the first gusset, whereby the heel is extended under the foot.
11. A circular knit stocking having a heel comprising two progressively narrowed gussets arranged one below the other, each having less than half the wales of the leg, the upper gusset containing fewer narrowed courses than the second gusset, whereby a low heel occupying a large segment of a circle is formed.
12. A circular knit stocking having a heel comprising two successive narrowed gussets each having less than half the wales of the leg at the point where the leg meets the heel, the second gusset from the top containing more wales in one or more courses adjacent the first gusset than the starting course of said first gusset.
13. A circular knit stocking having a low heel of less than half the wales of the foot at the instep, said heel comprising two adjacent progressively narrowed gussets arranged one below the other, the long course of the upper gusset adjacent the leg containing fewer wales than the longest course of the second gusset, said second gusset containing more narrowed courses than the first gusset, whereby the heel is low but extends over a large segment of a circle.
14. A circular knit stocking having a heel of less than half the wales of the foot at the instep, said heel comprising two adjacent progressively narrowed gussets arranged one below the other, the suture between the two gussets being shorter than the suture on the edge of the second gusset facing toward the toe, in combination with a progressively widened gusset above the upper gusset.
15. A circular knit stocking having a low heel of less than half the wales of the foot at the instep, said heel comprising two adjacent progressively narrowed gussets with a suture therebetween, in combination with a third gusset between the second gusset and the foot, the suture between said second and third gussets being longer than the first-mentioned suture, and said first two gussets being without widened segments,

said third gusset comprising a widened segment whereby there is additional fabric in the heel extending under the foot.

16. In a method of making circular knit hosiery, the steps of knitting a leg, knitting a heel by making a progressively narrowed gusset on less than half of the wales of the leg, thereafter making a second gusset by knitting a course in all the first gusset wales plus a few wales on each end of the group and progressively narrowing the second gusset, continuing the narrowing beyond the point where it stopped on the first gusset, whereby an extended low heel is produced.

17. In a method of making circular knit hosiery from top to toe, the steps in the making of a heel of making a progressively narrowed gusset on less than half of the wales of the leg, thereafter making a second gusset by knitting a course in all the first gusset wales plus a few wales on each end of the group and progressively narrowing the second gusset, continuing the narrowing beyond the point where it stopped on the first gusset, whereby an extended low heel is produced.

18. In a method of making circular knit hosiery from top to toe, the steps in the making of a heel of making a progressively narrowed gusset on less than half of the wales of the leg, thereafter making a second gusset by knitting a course in all the first gusset wales plus a few wales on each end of the group and progressively narrowing the second gusset, continuing the narrowing beyond the point where it stopped on the first gusset and knitting a third gusset on all the

wales and widening on each course beyond the upper ends of the sutures between the second and third gussets, whereby an extended low heel is produced.

19. In a method of making circular knit hosiery, the steps of knitting a leg, making a heel on less than half the wales of the leg by the steps of knitting a progressively widened gusset, making a progressively narrowed gusset starting with the maximum number of wales of the widened gusset, then making another gusset by knitting one or more courses in all the wales of the narrowed gusset plus a few wales on each end of the group and progressively narrowing the gusset, continuing the narrowing beyond the point where it stopped on the first-mentioned narrowed gusset, and thereafter making a progressively widened gusset starting with approximately the number of wales in the last course of the second narrowed gusset, whereby an extended low heel is produced.

20. In a circular knit stocking having a heel in which there are a plurality of adjacent progressively narrowed tapered gussets arranged one below the other, the combination of an upper gusset having less than half the wales of the leg, and a lower gusset joined to it by a suture, there also being a suture along the edge of the lower gusset facing toward the toe, the suture between said two gussets being shorter than the suture along the edge of the lower gusset facing the toe, whereby the heel is low but extends over a large segment of a circle.

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