Aug. 22, 1939. W. L. HOUSEMAN 2,170,076

STOCKING AND METHOD OF MAKING THE SAME

Filed Jan. 5, 1939 2 Sheets-Sheet 1

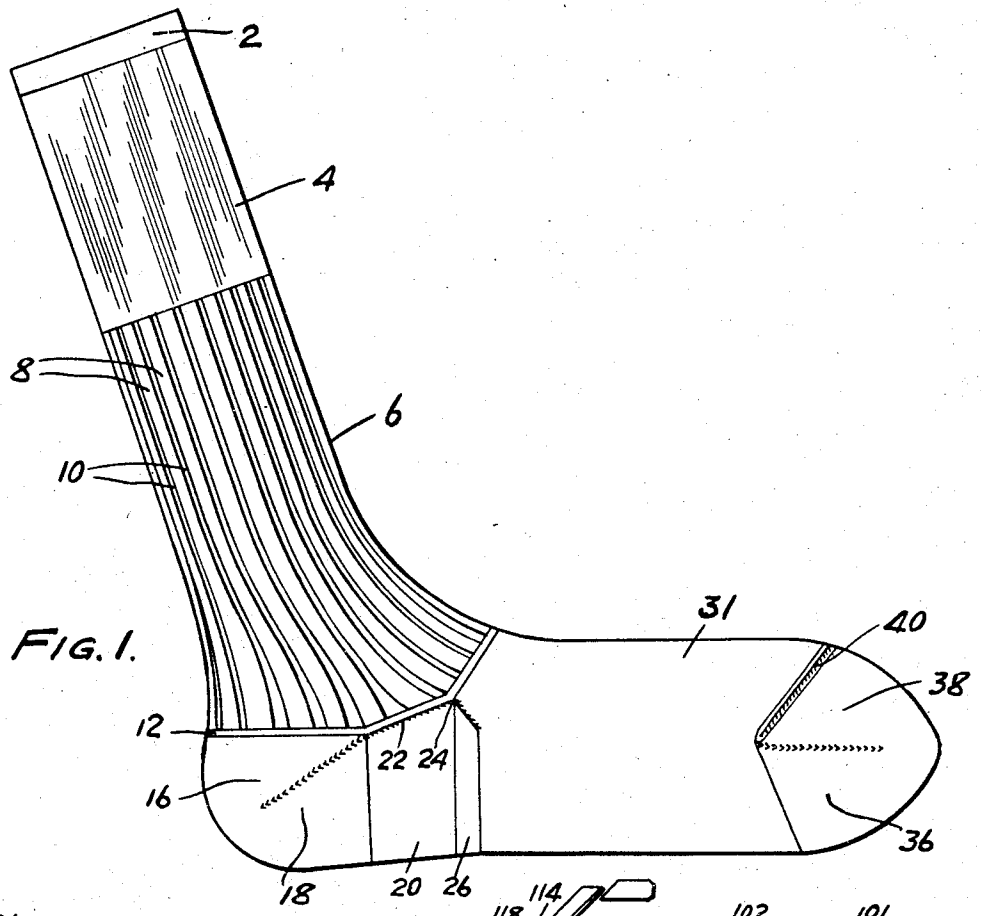


FIG. 1.

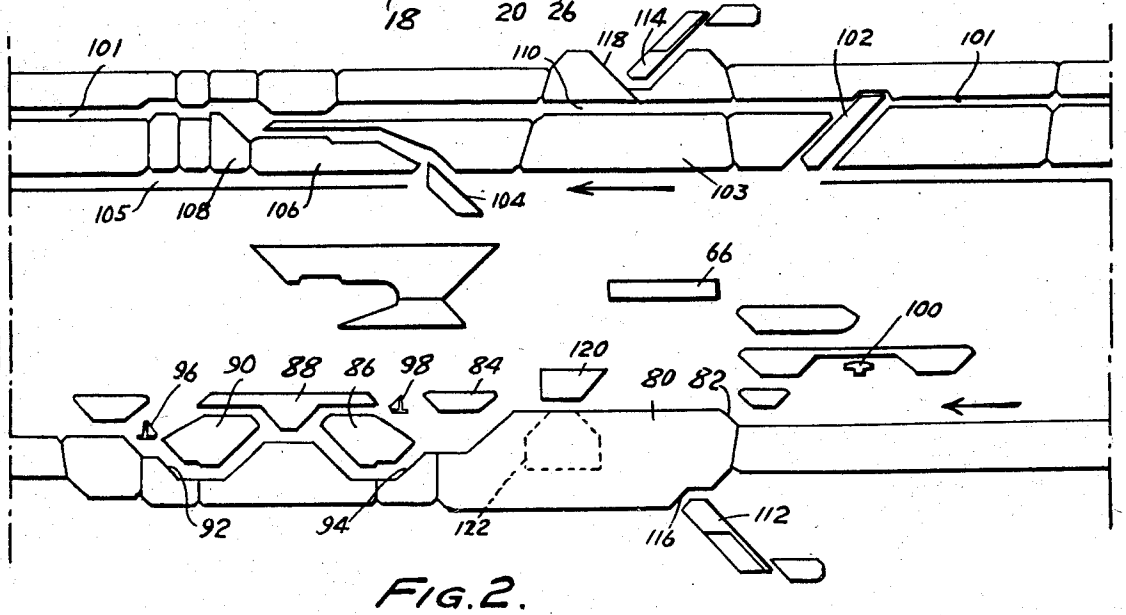


FIG. 2.

INVENTOR

WITNESS:

Robt. R. Kitchel.

Wilbur L. Houseman

BY

Busser & Harding

ATTORNEYS.

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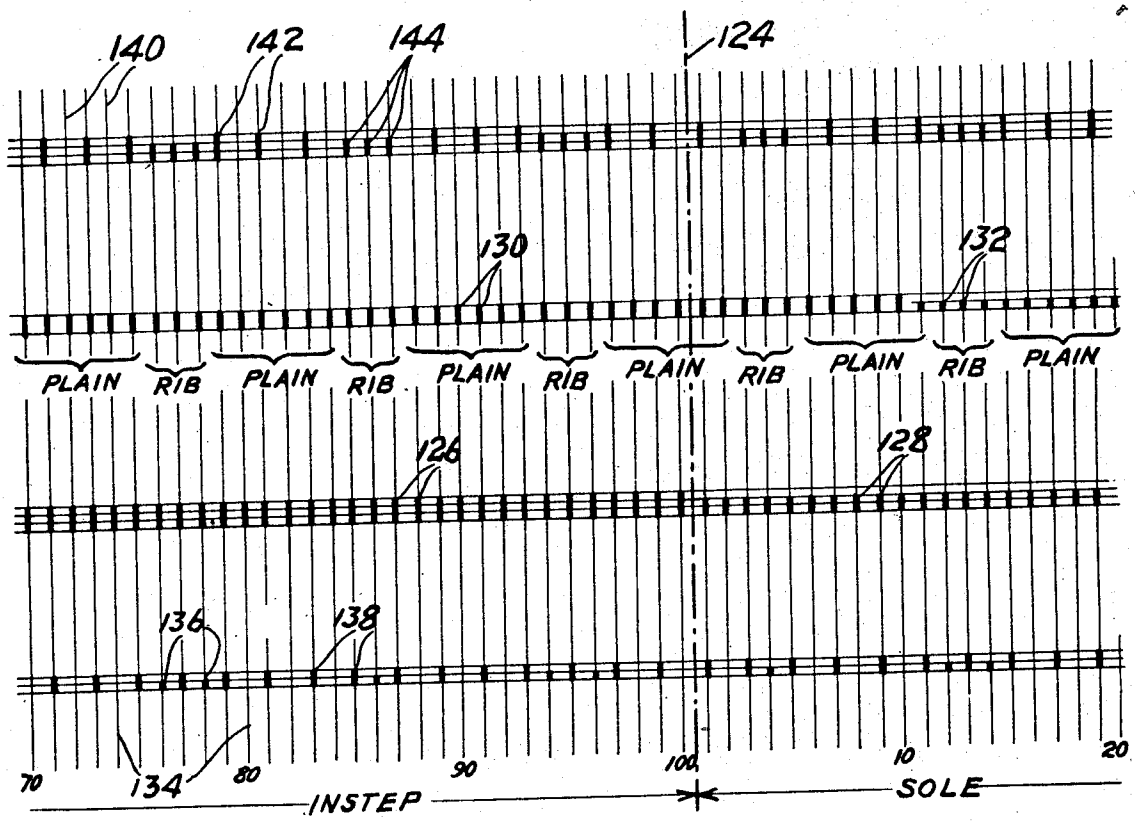


FIG. 3.

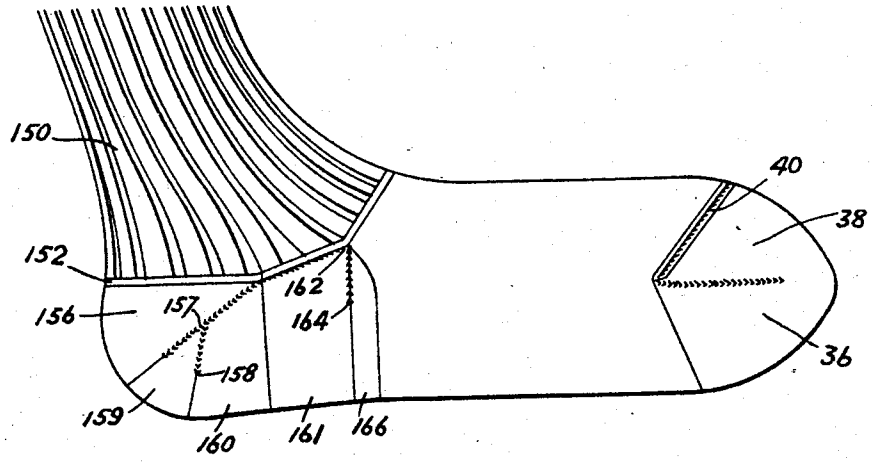


FIG. 4.

INVENTOR

Wilbur L. Houseman

BY

Bruesch & Harding

ATTORNEYS.

WITNESS:

Robt. R. Mitchell

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UNITED STATES PATENT OFFICE

2,170,076

STOCKING AND METHOD OF MAKING THE SAME

Wilbur L. Houseman, Maplewood, N. J., assignor to Scott and Williams, Incorporated, Laconia, N. H., a corporation of Massachusetts

Application January 5, 1939, Serial No. 249,524

6 Claims. (Cl. 66—185)

This invention relates to a stocking and method of making the same, and has particular reference to a type having its foot portion more closely approaching a right angle with its leg portion than stockings generally manufactured heretofore and having patterns in its leg portion, the leg portion being knit integrally with its foot portion.

As disclosed in the patents to E. A. Hirner Nos. 1,154,116 and 1,549,307, it is possible by the inclusion of extra fabric at the bottom of the foot portion of a stocking to cause the foot portion as a whole to extend at an angle approaching a right angle with respect to the leg. This stocking provides a much better fit on the foot of the wearer than most conventional forms of stockings, this being particularly noticeable in the absence of creases over the instep due in the ordinary stocking to the fact that the foot tends to force the foot portion of the stocking more closely toward a right angle with the leg portion than is the case in the stocking before it is put on the foot. Additionally, with a stocking of the Hirner type, a pull exerted on the top of a stocking, for example, by a garter, does not tend to tighten the stocking about the toe, but the pull is absorbed by the instep with resulting greater comfort to the wearer when the stockings are pulled tight. Wear at the toes is also reduced.

As disclosed in said Hirner patents, the stocking is one involving plain knitting throughout. In the event that it was desired to provide a patterned leg, for example, carrying designs formed by reverse plating or floating or having structural features such as ribs, it was heretofore necessary to provide a leg at the lower end of which were provided transfer stitches to be stitched to the upper end of a separate foot portion formed in accordance with the principles described in the Hirner patents. Such transfer stitches are invariably larger than the normal stitches running through both the leg and the foot, therefore providing an unsightly junction between the leg and the foot, and also impairing the strength of the stocking.

It is the object of the present invention to provide a stocking and method for producing the same in which a leg portion having structural or colored patterning as, for example, ribs, is knit integrally with a foot having the characteristics disclosed in said Hirner patents. By reason of such integral knitting of the leg portion with the foot portion, the objectionable looped junction is eliminated and a product superior in both appearance and strength secured.

The improved method particularly involves the formation of such a stocking on a type of machine having superposed cylinders between which selective transfer of needles takes place for transitions between stitched portions of the stocking containing various formations of loops.

The above objects of the invention and other objects which more particularly relate to details of the invention will become apparent from the following description, read in conjunction with the accompanying drawings, in which:

Figure 1 is a diagrammatic elevation of a preferred form of stocking constructed in accordance with the invention;

Figure 2 is a diagrammatic view illustrating in developed form the inner surfaces of various cams of a double cylinder type of machine adapted for the formation of the improved stocking;

Figure 3 is a diagram illustrating the arrangement in the machine of various needle controlling sliders carrying knitting and transfer butts; and

Figure 4 is a view similar to Figure 1, showing the lower part of the leg and foot portion of an alternative type of stocking formed in accordance with the invention.

Referring first to Figure 1, there is illustrated therein a preferred type of stocking formed in accordance with the invention and to which the disclosure of the method described herein is made specifically applicable. This stocking comprises a welt 2 which, as pointed out later, comprises a series of courses surmounting a rib top 4 in which a conventional 1 x 1 rib arrangement may be embodied, which rib top in turn surmounts a ribbed leg portion 6, which, as specifically illustrated in Figure 1, and as described in connection with the method, is of the well-known English broad rib type or 6 x 3 rib construction. The plain stitched portions 8 are six wales wide, while the depressed ribs 10 are three wales wide, the ribs being due, as is usual, to the reverse fashions in which the loops of the contrasting fabric portions are interlinked.

At the lower end of the leg portion 6 there are several rounds indicated at 12 which contain plain knitting. Below these rounds the heel, consisting of narrowed and widened portions 16 and 18, respectively, is formed and in front of this is the widened gore 20 followed by the narrowed gore 26, providing extra fabric characteristic of the foot of the Hirner type stocking. Such arrangement of the gores is specifically illustrated in Figure II of Hirner Patent 1,549,307, referred to above.

Following the gore 26 is the foot proper, indicated at 31, which is formed by plain knitting. (The lines shown in the drawing extending across the arch are merely to illustrate knitting zones; no visible lines are actually present in the stocking.)

The foot is finished with the toe comprising the narrowed and widened portions 36 and 38, respectively, and the loopers rounds indicated at 40 where the stitching takes place to finish the toe of the stocking.

Before discussing the variations of this stocking within the scope of the invention there will be first described the method of its formation upon the double cylinder type of machine commonly used for the production of the so-called English broad rib. This machine is of the well known Bentley type, as illustrated for example, by Spires Patent 1,210,866, dated January 2, 1917 and Bentley Patent 1,713,736, dated May 21, 1929. This type of machine comprises upper and lower cylinders which are driven in unison during both rotation and reciprocation and are provided with aligned slots in their exterior surfaces within which are adapted to slide double-ended needles having upper and lower hooks with cooperating latches. Also slidable within the slots, but remaining in their respective cylinders are upper and lower sliders which are held in position by spring bands. The upper sliders carry transfer butts and knitting butts, the transfer butts being above the knitting butts, while the lower sliders carry transfer butts and knitting butts, the transfer butts being below the knitting butts. These transfer butts are for the purpose of providing transfer of the needles from one cylinder to the other, while the knitting butts are designed to cause the needles connected to the sliders to move through their proper knitting waves.

Sinkers of conventional type serve to cooperate with the needles in the usual fashion for the formation of stitches.

In order to control the sliders for the proper transfer of the needles there is provided at the height of the separation between the cylinders a separating cam indicated at 66 in Figure 2, which includes a slot having various cam surfaces for the purpose of moving outwardly away from engagement with the hooks of needles those sliders from which transfers are being made.

These machines are of well known type, and it will be unnecessary to go into them in greater detail in view of the disclosures of the machine patents just referred to. For the purposes of the present invention it will suffice to describe the cams cooperating with the various knitting and transfer butts of the sliders, which cams are illustrated in developed form in Figure 2.

These cams comprise a cam 80 provided with a rise 82 adapted to engage the knitting butts of the lower sliders and cause the needles which they engage to rise so that the loops they carry will clear their latches. A stitch cam 86, a center cam 88 and a second stitch cam 90 are associated to cause the lower sliders to move needles through a conventional knitting wave. Raising cams 92 and 94 are provided which are, respectively, operative during forward rotation and forward reciprocations and backward reciprocations. Raising pickers 96 and 98, of conventional spring controlled type, are located in the vicinity of these various cams. A guard cam 84 is provided to insure proper motions of the needles after the rise 82 during forward knitting.

The lowering picker 100, which is spring controlled for its operation in conventional fashion, but also adapted for additional control so as to come into operation only at proper times, is arranged to have an inoperative position above the inactive level of the knitting butts of the lower sliders and is located between guard cams as illustrated. It is unnecessary to go into detail with respect to these various cams, since they perform their usual functions in rotary and reciprocatory knitting, acting on the knitting butts of the lower sliders to properly control the needles which they engage.

The knitting butts of the upper sliders are also adapted to be properly controlled for knitting when the cylinders are moved in a forward direction, no provision being made for knitting during backward reciprocations because the needles in the upper cylinder need not form stitches at such times. A latch clearing cam 102 is provided, this cam being mounted so as to be slidable toward and from the needle cylinder under control of the main pattern drum of the machine. Following this is a cam 103, designed to hold the upper sliders in lower position, followed by a cam 104, which is also adapted to be moved toward and from the upper cylinder under the control of pattern cams on the main pattern drum. Following this are cams 106 and 108, the latter being the stitch cam for control of the upper sliders to cause them to move their needles to draw stitches after taking yarn. Above the cam 103 is a race 110 for the passage of the knitting butts of the upper sliders, this race forming a continuation of the race 101. A race 105 below the cams 106 and 108 is also provided.

A lower transfer cam is provided at 112, this being under the control of a lever operating from the pattern drum of the machine, which cam 112 is adapted to occupy three alternative positions so as to fail to engage any transfer butts on the lower sliders, engage long transfer butts thereon, or engage the long and short transfer butts thereon.

Similarly, an upper transfer cam 114 is provided, also arranged to be controlled through a suitable lever, not shown, by means of cams on the pattern drum of the machine so as to occupy any one of three alternative positions to miss all pattern butts carried by the upper sliders or to engage successively butts of different lengths as will be presently described. Following the cam 112 is a cam 116 adapted to move the lower sliders downwardly after they are raised by cam 112 and a similar cam 118 following cam 114 is adapted to raise the upper sliders after they are lowered by cam 114. It will be noted that the cams 112, 116, 114 and 118 are arranged in sequence so that rise under the action of cam 112 and lowering under the action of cam 116 of the lower sliders is immediately followed by the lowering under the action of cam 114, and the rise under the action of cam 118 of upper sliders.

For the purpose of raising lower sliders having long knitting butts into an inoperative position during the formation of the heel and toe, there is provided a cam 122 which is located in a position to engage long butts only and which is arranged to slide under the action of controlling means in a vertical direction so as to be located either at a level substantially that of the top of cam 80 or a higher level to raise the long butts as specified.

For the purpose of restoring lower sliders to action, there is provided a cam 120 located above

the cam 122. In the conventional machine, the cam 120 is mounted on the same slide as the cam 122. In the present case, however, a differential action is required and consequently the cam 120 is located at a fixed level, but is arranged to be moved inwardly and outwardly under the control of the pattern mechanism of the machine so as to occupy either one of two alternative positions, i. e., an outer position in which it does not engage any knitting butts and an inner position in which it may engage both long and short knitting butts.

The cams which were not heretofore mentioned as being capable of adjustable positioning are, in general, fixed, but it will be understood that, with due regard to the necessary cam arrangements for performing the desired results, the various cams may be made adjustable and additional controlling mechanisms added to produce variations as desired for the formation, for example, of special heel, foot and toe structures. In view of the state of the art, however, these changes will be clear to machine designers.

Before referring specifically to the formation of the stocking of Figure 1, brief reference may be made to the mode of transfer of needles from one cylinder to the other. Assuming, for example, that a certain needle is in the lower cylinder, and its hook engaged by a lower slider and is to be transferred to the upper cylinder. the upper slider will have been depressed by the cam 102 to a needle receiving position, its knitting butt moving below the cam 103. When the lower slider reaches the cam 112 its transfer butt will ride up this cam, causing the upper hook of the needle to enter the engaging opening in the corresponding upper slider. At the same time, the upper end of the lower slider, which has a slightly cammed surface, will engage a slidable portion of the cam 66 and will be moved slightly outwardly thereby. As the rotation proceeds and the lower slider moves across the top of the cam 112, the upper end of the slider will be cammed further outwardly by a rise on the cam 66 so as to be disengaged from the lower hook of the needle. While such disengagement is effective, the cam 116 engages the transfer butt of the lower slider and pulls the slider downwardly. As the slider is then released by the cam 66 it will move back against the hook of the needle, but with its engaging portion below the hook so that it may slide downwardly independently of the needle which it has released. Thus the needle is left under the control of the upper slider.

The reverse transfer from the upper slider to the lower one takes place in the same fashion, the cams 114 and 118 being now effective to move the upper slider downwardly and then upwardly, the slider engaging on its downward movement suitable portions of the cam 66 and being disengaged from the needle by suitable surfaces on that cam.

The cams 112 and 114 may be active at different times or may be simultaneously active to effect a double transfer in a single course involving the location of certain needles in the upper cylinder followed by either immediate return of some of the needles so raised or of other needles to the lower cylinder. The slight angular displacement between the cams 112 and 114 permits such action to take place.

Passing now to a consideration of the specific formation of the stocking of Figure 1, reference may be made to the butt set-up diagrammed in Figure 3. In this diagram there are illustrated in conventionalized form the upper and lower sliders, indicated by the vertical lines in the upper and lower portons of this figure, adjacent the line of separation 124 between the long and short knitting butt series of lower sliders. It may be assumed, for example, that the machine is of a type carrying two hundred needles. The numbers of the end needles of both the long and short butt series of lower sliders are indicated at the bottom of the figure, i. e., the hundredth needle of the long butt series of sliders is located adjacent the first needle of the short butt series of sliders. Long knitting butts of the lower sliders are indicated at 126, and short knitting butts at 128.

The knitting butts of the upper sliders are also long and short, as indicated at 130 and 132, respectively, but only for the purpose of facilitating the entry of cams, and for this purpose the line of demarcation between the sliders is not at 124, but is displaced into the sole needle series, as indicated in the figure.

So far as transfer butts are concerned, the lower sliders are of three classes. First there are sliders 134 which contain no transfer butts, these sliders remaining always in the lower cylinder and holding their needles in that cylinder. Corresponding to these sliders there need not be any sliders in the upper cylinder, though to complete the set there may be sliders as indicated at 140 which also are without transfer butts.

Besides these plain sliders in the lower cylinder are sliders containing short butts 136 and long butts 138, as indicated. It will be noted that every other slider contains a long transfer butt 138, the sliders having short transfer butts being interspersed in a regular fashion, as will be obvious from discussion of the knitting.

In the upper cylinder besides the sliders 140 which carry no transfer butts there are sliders carrying transfer butts of two lengths indicated at 142 and 144. The arrangement of these various sliders will be evident from the discussion of the operation of the machine. For convenience of reference, there are indicated in the central portion of the figure the groups of sliders corresponding to the needles which form plain and rib stitches during the production of the leg. However, this diagram does not hold except for the leg, since during the formation of the rib top every other needle is in the upper cylinder and forms rib stitches, while the intermediate needles are in the lower cylinder and form plain stitches. Similarly, during the formation of the heel, foot and toe portions, plain fabric is knit on many of the needles which form rib stitches in the leg.

In the operation of the machine to form the stocking of Figure 1, all of the needles following the formation of the previous stocking will be in the lower cylinder engaged by the lower sliders. At this time, cam 102 will be in its active position to engage the knitting butts of all the upper sliders and cause them to pass beneath the cam 103. The first course or courses may then be knit as plain courses, the needles being controlled by the lower sliders, the knitting butts 62 of which will pass up the clearing cam surface 82 of the cam 80 and will then be depressed slightly by cam 84 to move up over stitch cam 86 below center cam 88 and below stitch cam 90 to take the yarn, being then raised by cam 92 to the level of the approach to cam 82.

In order to form a welt 2 and provide for the knitting of the 1 x 1 rib top, the first transfer of the needles occurs.

It will be noted that every other one of the lower sliders is provided with a long transfer butt 138. To effect the transfer, the transfer cam 112 is moved inward so as to engage only the long butts 138 and miss the short butts 136. By reason of this action, and the cooperation of the cam 66 with the upper ends of the sliders, as heretofore described, the needles will be transferred from those lower sliders carrying the long butts 138 to the corresponding upper sliders which now have their knitting butts moving below the cam 103. As the knitting butts of the upper sliders pass upwardly over cam 108, the needles thus transferred will take yarn as well as those needles which remain in the lower cylinder, and consequently a course having a 1 x 1 rib will be provided. As soon as the transfer is completed the cam 102 is withdrawn, whereupon the needles in the upper cylinder will not be caused to move downwardly so that the loops clear their latches and the knitting butts of the upper sliders will move directly from 101 through the groove 110 to be raised slightly by the cam 108 and then reenter the groove 101. As a result, these needles do not take yarn, while the yarn feeds normally to the needles remaining in the lower cylinder. Thus there may be produced a few courses during which loops are held on the needles in the upper cylinder. The result is knitting of the welt 2.

It may be pointed out here that during all phases of the operation, sliders which do not carry needles pass idly through the knitting waves along with those which do control the needles.

The knitting of the rib top 4 may then be begun merely by permitting the cam 102 to move into its active position, this operation taking place in steps by having it first move inwardly as the short knitting butts 132 of the upper sliders are passing it, and it will move to its full inward position as soon as it is cleared by these short butts and depresses the long butts 130. By the action of cam 102, the loops of the upper cylinder needles are caused to clear their latches. The path of the knitting butts of the upper sliders will then be below cam 102, below 103, above 104, 106 and 108, during passage by the last of which the needles take yarn, thence into the groove 101 to be again lowered by the clearing cam 102. At the same time, the needles of the lower cylinder are passing through the knitting wave previously described. Accordingly, the 1 x 1 rib structure of the top is knit.

The second transfer now takes place in passing from the 1 x 1 rib top to the 6 x 3 rib leg 16 having plain stitched parts 8 and ribs 10. The cam 112 is moved all the way in to engage the transfer butts of all of the lower sliders. The transfer cam 114 is moved inward so as to engage only the longest transfer butts 142 of the upper sliders. Accordingly, a double transfer occurs. As the lower sliders ride up the cam 112, all of the needles remaining in the lower cylinder and engaged by sliders having transfer butts 136 are transferred to the upper cylinder. (The needles corresponding to sliders having butts 138 are already in the upper cylinder.) Immediately, however, the longest butts of the upper sliders are engaged by the transfer cams 114 and consequently the needles corresponding to such upper sliders are transferred to the lower cylinder. Study of Figure 3 will reveal that this action will result in having in the lower cylinder groups of six needles with intermediate groups of three needles, each, in the upper cylinder. The continued knitting, therefore, will result in the production of the 6 x 3 rib leg which is illustrated. At this point it may be noted, as pointed out above, that by more elaborate control of the transfer, particularly when a plurality of yarns are being fed to the needles to produce plating, there can be produced quite elaborate designs. It will be understood, therefore, that the reference to 6 x 3 rib at this point and in connection with the further discussions of the rib areas is only for purposes of illustration and that there is possible great latitude of variation in the production of structural and design modifications.

Knitting under the conditions just mentioned will continue until the point of change to the several rounds indicated at 12 preceding the knitting of the heel. At the point of change to these rounds of knitting the upper transfer cam 114 is moved inward to engage all of the transfer butts of the upper sliders, i. e., butts 142 and 144. The needles belonging to those upper sliders which carry the long transfer butts 142 will have already been transferred to the lower cylinder, and accordingly the positioning of the transfer cam 114 as just mentioned will result in the transfer of the needles engaged by the sliders having the shorter transfer butts 144. Thus as knitting continues plain fabric will be knit on all of the needles.

Following the formation of several courses at this point control is effected to begin the knitting of the heel. For this purpose, the cam 120 is withdrawn and the cam 122 raised to engage the long knitting butts of the lower sliders. By this action the needles engaged by the sliders having long knitting butts are raised to their inactive positions, the long butts rising above the level of cams 84 and 88 and below the lowering picker 100. At the same time, cam 104 is withdrawn from its active position so that the needles in the upper cylinder will also be in an inactive position so as not to engage the yarn, the knitting butts of their sliders moving along the race 105 below the various cams.

Reciprocation is now started and the raising pickers 96 and 98, which have been inactive, now engage and elevate the short butt needles one at a time at each end of the short butt series. The narrowing now continues forming the portion 16 of the heel pocket until there remain in action only those needles at the narrowest point of the heel.

The widening now takes place to form the portion 18 of the heel pocket and is effected by permitting the lowering picker 100 to come into action. The lowering of the needles takes place in conventional fashion, two needles being lowered and one raised at each reciprocation on each end of the series of needles in action. Inasmuch as the cam 122 must be lowered out of its active position so that it will not raise long butt needles when they are later picked down into action, it is convenient to provide that this cam 122 will be lowered at the same time as the lowering picker is rendered active.

The lowering of the short butt sliders and their needles now takes place for the formation of the widened part 18 of the heel pocket. Instead of stopping the lowering of the needles, however, at the ends of the short butt series of sliders, the picking action for widening is continued for the formation of the widened heel extension 20, long

butt sliders and their needles being lowered one by one by the same type of double lowering and single raising operations as was carried out on the short butt sliders. It is at this time that the lowering of the cam 122 becomes necessary, since otherwise it would raise immediately any long butt slider which was picked down.

By reason of this action, there is provided a suture along the line 22 terminating at some point such as 24.

In the preferred form of this invention there is formed still another narrowed extension 26, which is provided by rendering the lowering picker 100 inactive so that needles corresponding to the long butt sliders are picked up one by one at each end of the series of active needles resulting in a further narrowing. This narrowing may be continued if desired into the short butt series of sliders to produce the desired formation in front of the heel.

During the reciprocatory knitting just described, since more than half the needles are rendered active for reciprocatory knitting, it is necessary to provide a sufficiently increased range of reciprocation to insure that proper knitting and picking will take place. This is, of course, readily accomplished by increasing the throw of the conventional devices for imparting reciprocation to the cylinders.

With the completion of the portion 26 of the stocking, rotary knitting is again resumed to form the foot. To effect this the cam 120 is again moved into action to lower all of the long butt lower sliders and such short butt sliders as might have been raised in the event that the narrowing proceeded into that series. As a result, knitting takes place in the foot in the same fashion as occurred in the formation of the rounds 12.

When the position of the toe is reached, there occurs narrowing through portion 36 and widening through portion 38 for the formation of the toe carried out in the fashion described for the formation of the heel. Following this there may be provided by the usual rotary knitting in obvious fashion the formation of the loopers rounds 40 at which stitching will take place to complete the stocking. Thus the stocking is completed with all of the needles in the lower cylinder ready for the knitting of the welt 2 of a succeeding stocking.

It will be obvious that a minor variation of the above may be used to form the type of foot illustrated in Hirner Patent 1,154,116, namely, a foot which does not have the narrowed gore 26. For the formation of such a foot it is, of course, only necessary to omit those operations which give rise to that gore and proceed with the formation of the foot immediately following the formation of the gore 20.

A third type of Hirner foot, illustrated in Figure I of Hirner Patent 1,549,307, is illustrated in Figure 4, from which its mode of formation will be readily apparent in view of the discussion of the machine operation advanced heretofore. The leg of this stocking is illustrated at 150 and is produced in the same fashion as the leg 6 of the modification of Figure 1. Likewise, the rounds 152 are produced in similar fashion. Some modification of the heel, however, is illustrated to produce a greater turn of the shape of the stocking at the heel. This involves the formation of the pocket portion 159 by widening to the point 157. At this point the lowering picker 100 is rendered inoperative to produce narrowing to the point 158, followed by widening through the entire short butt series of lower sliders to finish the heel pocket by the formation of the portion 160. Following this, widening may take place into the long knitting butt series of lower sliders to form the portion 161 corresponding to 20 of Figure 1, the widening taking place to the point 162. At this point, the long knitting butt series of sliders may be removed from action by the rise of cam 122 which is immedately thereafter relowered. Widening is thereupon resumed from the points 164 at the separation of the sole and instep needles to produce a suture between 164 and 162 on each side. During this widening the portion 166 is formed, adding excess fabric at the bottom of the stocking and providing for the turn of the foot in much the same fashion as the narrowed gore 26 in the previous modification. Following the completion of this widening operation and without subsequent narrowing, operations are performed to form the foot and thereafter the operations are precisely the same as those in connection with the formation of Figure 1.

One of the most evident modifications of the product and method will be the formation of more elaborate designs than those secured by the mere formation of ribs running through the leg. The 6 x 3 rib construction has been described as typical and involves no transfers of needles except in the regions of demarcation between different portions of the stocking. However, needles may be transferred from course to course in the well known fashions to produce what amount to various areas of plain and rib stitches, i. e., concatenations of the loops which involve passage through previously formed loops of other loops in selective opposite directions. Such patterns are, of course, produced by more elaborate control of the transfer operations and are secured by suitable set-ups of the transfer butts on both the upper and lower sliders with corresponding controls of the transfer cams. For more elaborate control, it will be obvious that the sliders can be associated with jacks having butts at different levels cooperating with pattern controlling cams. Such designs as well as ribs of the type specifically disclosed are characterized by the selective reverse concatenation of the loops.

Such patterns can be produced while feeding a single yarn to the needles. In the case, however, of the feeding of several yarns plating and reverse plating will occur in well known fashion, normal plating occurring in those loops which are formed by the needles in the lower cylinder and reverse plating will occur in those loops formed by needles in the upper cylinder. Selective floating may also be secured in well known fashions to produce quite elaborate designs in the leg. Wrapping may, of course, be accomplished in conventional fashion.

In addition to such patterning in the leg, the foot itself is susceptible of variations consistent with the improvements of the invention. For example, the foot may be of the true split type or the rotary split foot type. Elastic yarn may be knit into the arch portion either alone or in conjunction with a non-elastic yarn and right and left toes may be knit in accordance, for example, with the disclosure of the patent to Barr 1,160,819. It will be clear that all such variations may be provided consistently with the improvements to which this invention relates.

Mention may be made of the fact that if desired the foot may be formed by knitting the heel and arch on needles controlled by short knitting butt sliders only, thereby avoiding the neces-

sity for increasing the stroke or throw of the needle cylinder. For example, by beginning knitting of the heel with all of the long butt sliders, and, say, ten of the short butt sliders on either end elevated, twenty-eight needles might be picked up, after which thirty-eight needles, or in other words, all of the needles controlled by short butt sliders may be picked down, following which ten of these may be again picked up. However, this entails some reduction of the amount of fabric in the sole portion, which fabric contributes to the turn of the foot, and is, therefore, not so desirable as the modifications previously described.

What I claim and desire to protect by Letters Patent is:

1. A knitted stocking comprising integrally knitted leg, heel and foot portions with a gore formed by reciprocatory knitting located between the heel and foot portions and extending above the heel portion, said leg being provided with design structure comprising selectively reversely concatenated loops.

2. A knitted stocking comprising integrally knitted leg, heel and foot portions with a gore formed by reciprocatory knitting located between the heel and foot portions and extending above the heel portion, knitting wales extending continuously from the leg portion into the instep part of the foot portion above said gore, and said leg being provided with design structure comprising selectively reversely concatenated loops.

3. A knitted stocking comprising integrally knitted leg, heel and foot portions with a gore formed by reciprocatory knitting located between the heel and foot portions and extending above the heel portion, knitting wales extending continuously from the leg portion into the instep part of the foot portion above said gore, and said leg being provided with longitudinally extending ribs.

4. The method of circularly knitting a stocking comprising knitting a leg portion by rotary knitting while selectively reversely concatenating loops to produce a design structure, forming by rotary knitting at least one course of plain knitting at the end of the formation of the leg, forming a heel portion by reciprocatory knitting, forming a gore extending above the heel portion in front of the heel portion by reciprocatory knitting, during the reciprocatory knitting failing to interknit yarn with loops formed during the last course of rotary knitting of the front of the stocking, and, following the completion of said gore, starting formation of a foot portion by concatenating loops with those with which yarn was not interknit during the reciprocatory knitting.

5. The method of circularly knitting a stocking comprising knitting a leg portion by rotary knitting while selectively reversely concatenating loops to produce a design structure, forming by rotary knitting at the end of the formation of the leg at least one course containing plain knitting through at least the extent of the heel and a gore to be subsequently formed, forming a heel portion by reciprocatory knitting, forming a gore extending above the heel portion in front of the heel portion by reciprocatory knitting, during the reciprocatory knitting failing to interknit yarn with loops formed during the last course of rotary knitting of the front of the stocking, and, following the completion of said gore, starting formation of a foot portion by concatenating loops with those with which yarn was not interknit during the reciprocatory knitting.

6. The method of circularly knitting a stocking comprising knitting a leg portion by rotary knitting while selectively reversely concatenating loops to produce a rib structure, forming a heel portion by reciprocatory knitting, forming a gore extending above the heel portion in front of the heel portion by reciprocatory knitting, during the reciprocatory knitting failing to interknit yarn with loops formed during the last course of rotary knitting of the front of the stocking, and, following the completion of said gore, starting formation of a foot portion by concatenating loops with those with which yarn was not interknit during the reciprocatory knitting.

WILBUR L. HOUSEMAN.