

April 1, 1941.

H. E. HOUSEMAN

2,237,144

STOCKING AND METHOD OF KNITTING THE SAME

Filed Nov. 1, 1939

4 Sheets-Sheet 1

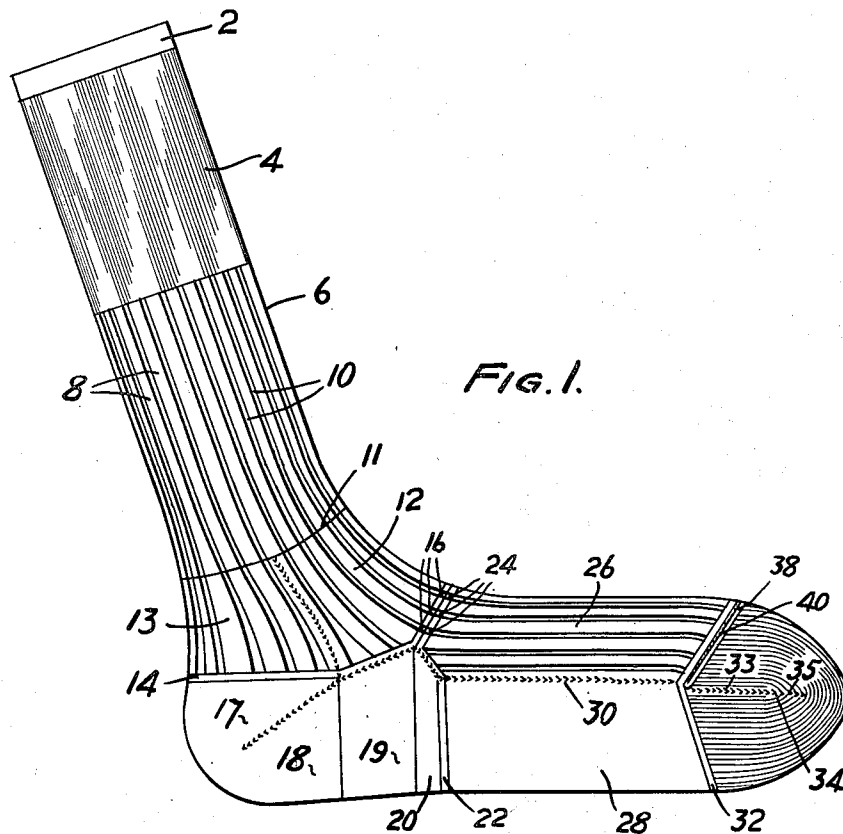
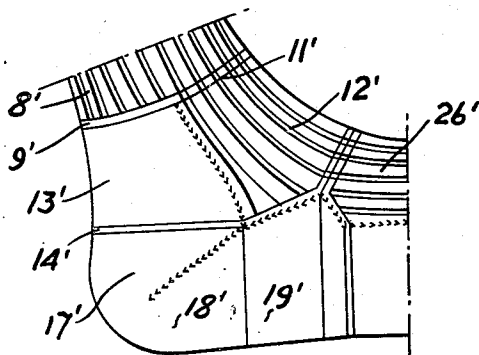


FIG. 8.

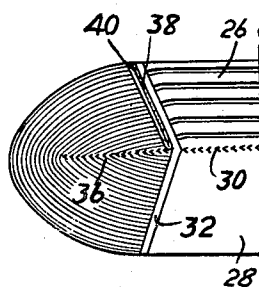


FIG. 1A.

WITNESS:

Pat. P. P. P.

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4 Sheets-Sheet 2

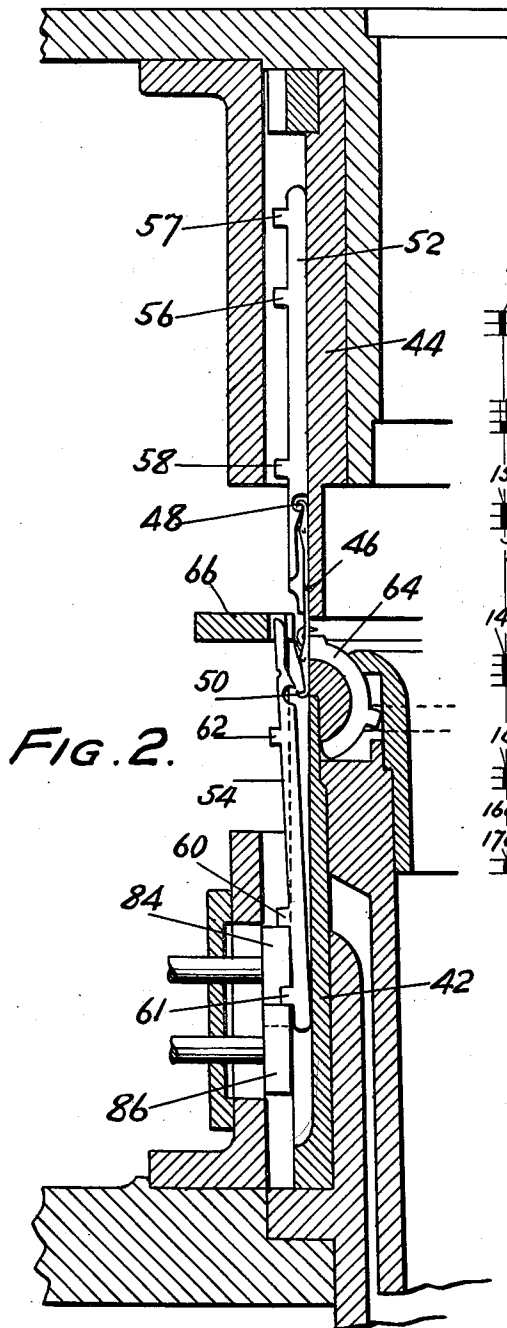


FIG. 2.

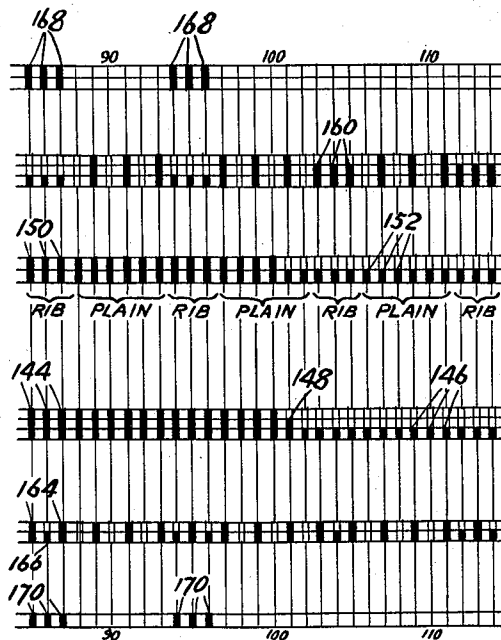


FIG. 7.

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STOCKING AND METHOD OF KNITTING THE SAME

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4 Sheets-Sheet 3

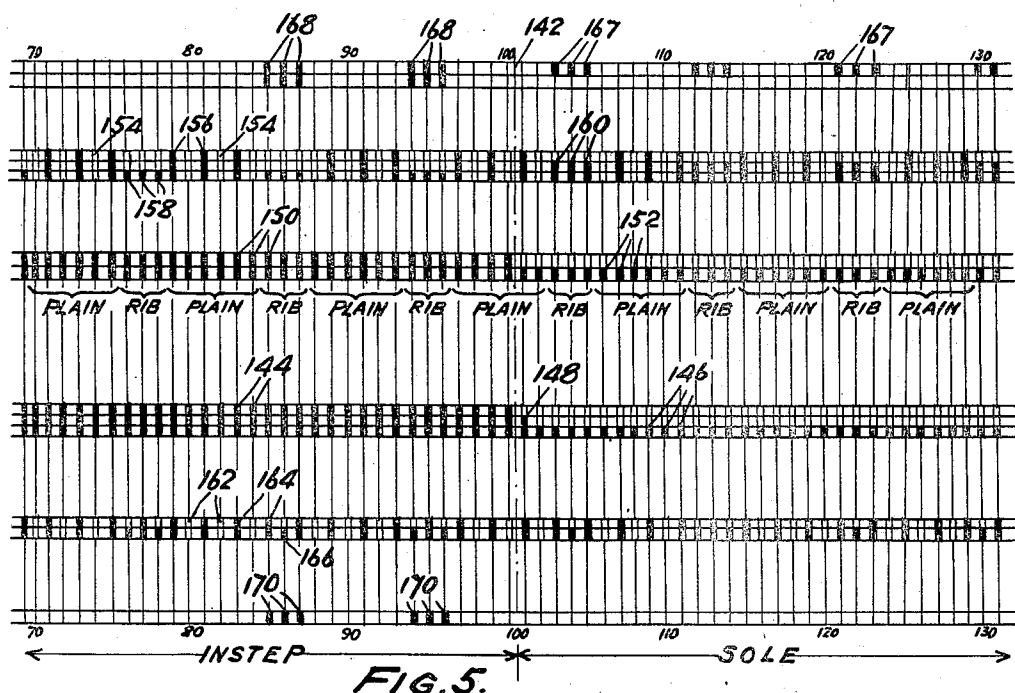
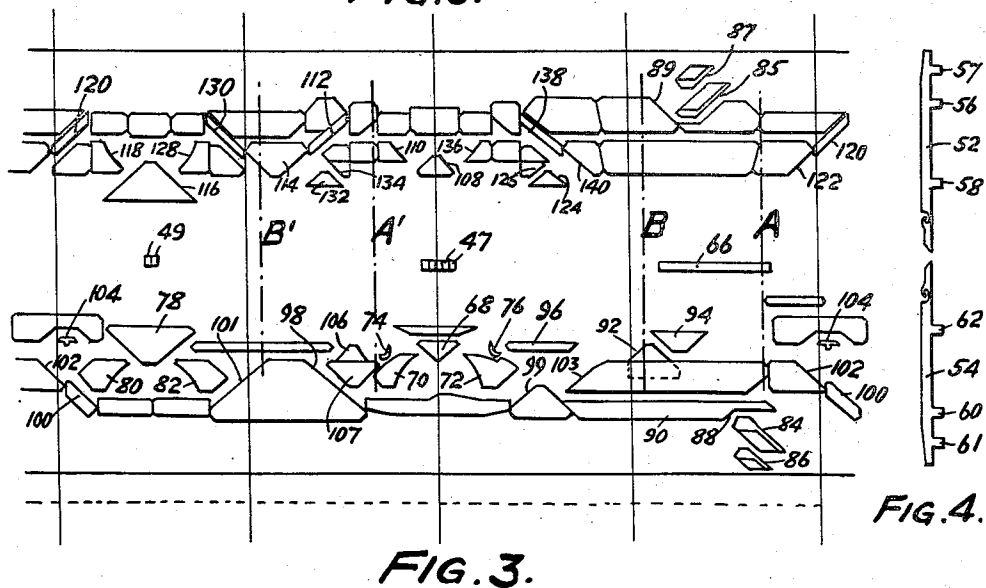


FIG. 4.

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STOCKING AND METHOD OF KNITTING THE SAME

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4 Sheets-Sheet 4

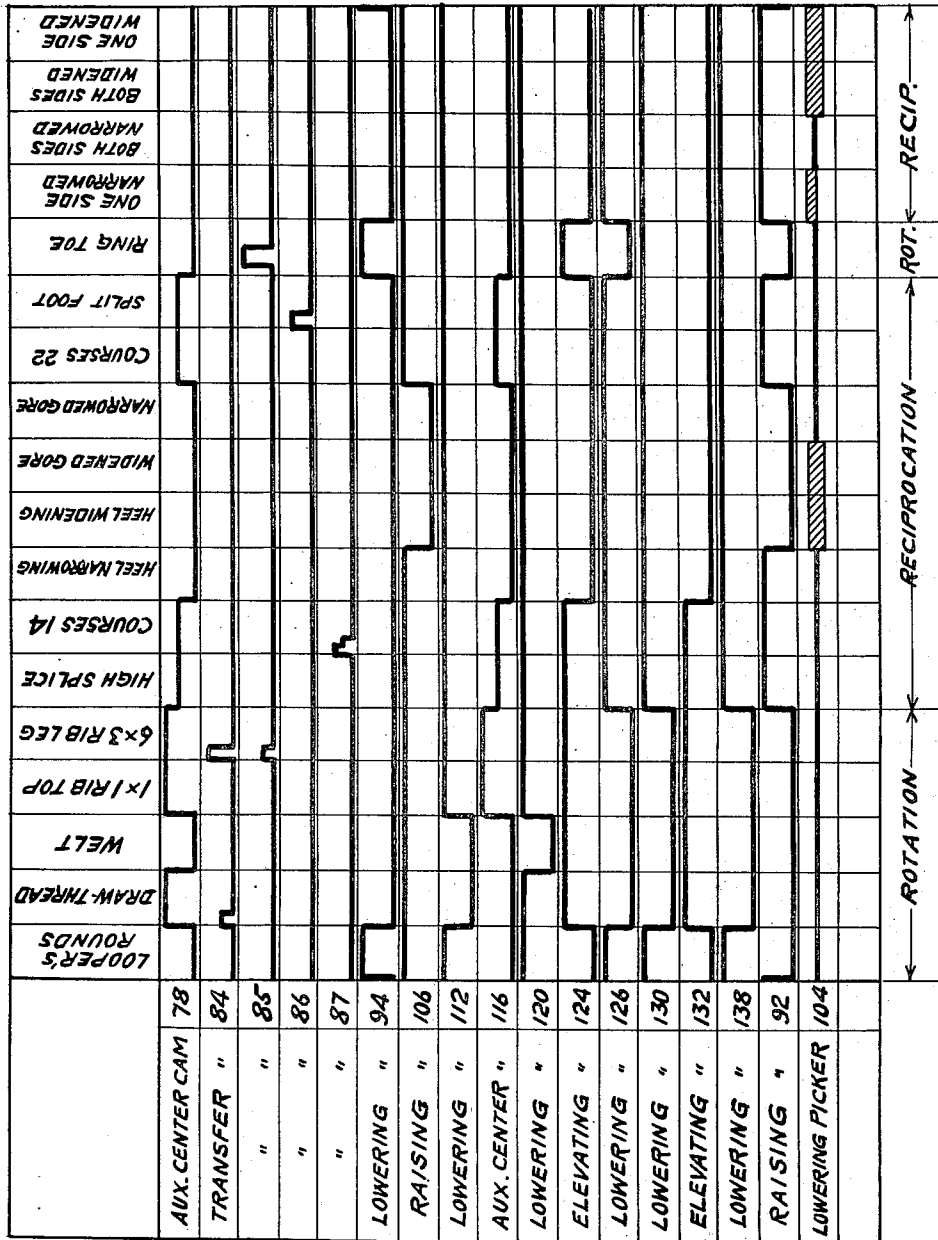


FIG. 6.

WITNESS:

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UNITED STATES PATENT OFFICE

2,237,144

STOCKING AND METHOD OF KNITTING THE SAME

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Application November 1, 1939, Serial No. 302,444

29 Claims. (Cl. 66—179)

This invention relates to an improved type of stocking and the method and machine for making the same, and has particular reference to a split foot type of stocking, the leg and instep of which incorporate patterning achieved by the reverse concatenation of loops and specifically involving broad ribs. The stocking in its most specific form involves knitting to cause the foot portion to approach more closely a right angle with the leg portion than in the case of stockings generally manufactured heretofore, and also involves the provision of right and left toes.

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 ordinary stockings, 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 a stocking about the toes, but the pull is absorbed by the instep, with resulting greater comfort to the wearer when it is pulled tight. Wear at the toes is also reduced.

In my Patent No. 2,170,078, dated August 22, 1939, there is disclosed a stocking embodying the Hirner type of foot and provided with patterning in the leg and instep specifically taking the form of ribs. The entire stocking was knit as a single unit throughout.

It is frequently desirable that stockings should be provided with separate yarn in the sole and instep and also should be provided with reinforcement above the heel in what is known as a high splice. Such stockings are formed in either of two ways, namely, by rotary knitting of the portions above the heel and the sole with change of yarns or by reciprocatory knitting utilizing two feeds. The former of these methods involves so-called rotary knitting, while the latter involves reciprocatory split knitting. In accordance with the present invention, split knitting of either type may be used, reciprocatory split knitting being specifically disclosed herein. The formation of the Hirner type of foot in a split foot

construction involves various complications, the solutions of which will be apparent hereafter.

If two feeds are provided for reciprocatory split knitting, the major portion of the leg of the stocking may be knit two-feed to secure rapidity of production.

To secure a better fitting stocking, and particularly in view of the closer and better fit which results from the use of the Hirner type of foot, it is desirable to provide for the formation of right and left toes. A satisfactory method of formation of right and left toes is described in the patent to Howard No. 461,183, dated October 13, 1891. It is one of the objects of the present invention to provide right and left toes of this type in a stocking of the general type mentioned above.

The various aspects of the invention, and particularly desirable features of construction of a stocking and of operation of a machine will be best understood following consideration of the detailed description herein of the practice of the invention as applied to two specific stocking formations.

This application relates particularly to the stocking. The machine forms the subject-matter of copending application Serial No. 302,443, filed of even date herewith.

In the accompanying drawings, Figure 1 is a diagrammatic elevation of one side of a preferred form of stocking constructed in accordance with the invention;

Figure 1A is a similar elevation of the other side of the toe thereof;

Figure 2 is a vertical sectional view through the cylinders of a double cylinder type of machine illustrating in fragmentary form the fashion in which transfer of needles is accomplished;

Figure 3 is a diagrammatic view illustrating in developed form the inner surfaces of various cams of the machine.

Figure 4 illustrates in elevation the form of upper and lower sliders used in the machine;

Figure 5 is a diagram illustrating the arrangement in the machine of various needle controlling sliders carrying knitting and transfer butts;

Figure 6 is a diagram illustrating the modifications of various cams and control of a lowering picker;

Figure 7 is a view similar to Figure 5, but showing a modified arrangement of sliders for the formation of another type of stocking; and

Figure 8 is a view similar to Figure 1 showing an alternative high splice construction ob-

tained by the utilization of the slider arrangement of Figure 7.

Referring first to Figures 1 and 1A, there is illustrated therein a preferred type of stocking formed in accordance with the invention and to which the disclosure of the method and apparatus 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 and machine, is of the well-known English broad rib or 6 x 3 rib type. The plain stitch 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 fashion in which the loops of the contrasting fabric portions are interlinked. The rib top 4 and the leg in the present instance are formed at two feeds with resulting rapidity of production.

While for purposes of illustration a specific rib formation is described, it will be obvious that by variations in the distribution of needles in the upper and lower cylinders and by changes of these distributions during knitting there may be provided in the stocking numerous design formations such as described, for example, in my Patent No. 2,170,078.

When the point 11 is reached split reciprocatory knitting occurs with the formation of ribs in both the instep 12 and high splice 13 as continuations of the ribs in the leg 6. The instep is knit using one of the yarns used in the formation of the leg 6 whereas a heavier yarn is preferably introduced for the formation of the high splice 13.

After the completion of the ribbed portion of the high splice, reciprocatory knitting is continued, and there are formed several courses, indicated at 14, which contain plain knitting except for the ribs at the upper portion of the instep, indicated at 16. Below these courses the heel, consisting of narrowed and widened portions 17 and 18, respectively, is formed by reciprocatory knitting. In front of this is the widened gore 19 followed by the narrowed gore 20 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, and in my Patent No. 2,170,078, dated August 22, 1939.

Following the narrowed gore 20 are a series of split courses indicated at 22 and corresponding to the courses 14 in that they involve plain knitting except for the rib formation, continuing, at 24, the several ribs knit in the courses 14 at 16. (The lines shown in the drawings extending across the arch are merely to illustrate knitting zones; no visible lines are actually present in the stocking.)

Following the formation of the courses 22, the foot is knit by reciprocatory split knitting to form the instep 26 and sole 28 joined at side sutures indicated at 30. The ribs continued at 16 and 24 are continued through the instep. There is also resumed the formation of the ribs above the suture lines 30 which were interrupted by the widened and narrowed heel extensions 19 and 20 in front of the heel. As contrasted with the high splice region the lower portion of the foot is knit plain, the ribs being confined to the instep. The foot is finished with the usual rotary knit

ring toe 32, following which there is formed by reciprocatory knitting the toe.

In stockings formed in accordance with the present invention, right and left toes are provided which are of the type illustrated in the Howard Patent 461,183, referred to above. The stocking shown in Figures 1 and 1A is for the left foot. On the right side of this stocking during reciprocatory knitting there is at first no narrowing, the courses extending about the bottom of the toe to the selvage edge at 33 formed on the same needle up to the point 34. From this point narrowing occurs along the line 35, needles being successively removed from action. On the left hand side of the stocking, however, narrowing occurs from the beginning of the formation of the toe along the suture 36. Following the completion of the narrowing operation, widening takes place on both sides until the full set of sole needles has been introduced on the right side of the stocking. Thereafter no further widening on that side occurs, a selvage edge being produced, but widening continues on the left side until the top of the toe is completed. Thus there is provided an asymmetrical pocket of the type illustrated in said Howard patent providing an enlarged space at the right side of this stocking. After the completion of the reciprocatory knitting there are formed by rotary knitting the loopers rounds indicated at 38 which are ultimately stitched as indicated at 40. The selvage edges at 33 are also stitched together to provide the finished 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, in Splers Patent 1,210,866, Bentley Patents 1,713,736 and 2,045,938, and Deans Patent 2,101,494. In order to better indicate how the improved stocking is formed, so much of the Bentley machine is illustrated herein in diagrammatic fashion as to show the essential changes in the conventional machine required for carrying out the improved method to produce the stocking illustrated in Figures 1 and 1A.

Referring first to Figure 2, there are illustrated therein the lower cylinder 42 and upper cylinder 44 of a Bentley machine. These cylinders, which are driven in unison during both rotation and reciprocation, are provided with aligned slots in their exterior surfaces within which are adapted to slide double ended needles indicated at 46 having upper and lower hooks 48 and 50, respectively with cooperating latches. Usually such machines have two knitting feeds, with five fingers at the main feed and two at the second feed. One of the fingers at the second feed carries a draw thread and the other a main yarn which knits alternate courses of the leg and foot. Also slidable within the slots, but remaining in their respective cylinders are upper sliders 52 and lower sliders 54, which are held in position by spring bands, not illustrated. The upper sliders 52 carry transfer butts indicated at 56, auxiliary transfer butts indicated at 57 and knitting butts indicated at 58, while the lower sliders carry transfer butts indicated at 60, auxiliary transfer butts indicated at 61 and knitting butts indicated at 62. The 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 indicated at 64 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 66 which has the form indicated in my Patent No. 2,170,078, in which patent there are described in detail the construction and operation of this cam in effecting transfer. The transfer operations, with slight changes described herein, are essentially the same as described in my said patent.

In Figure 3 there is illustrated in interior development the arrangement of cams for controlling the sliders in the upper and lower cylinders. Besides the cams which are illustrated in Figure 3 there are provided the usual latch guarding cams and other conventional cams and devices which have only their conventional functions in the present machine. The sinker cams are also conventional and need not be specifically described.

Adapted to cooperate with the lower sliders there are the main feed center cam 68 adapted to engage short knitting butts and the main feed stitch cams 70 and 72. Above these are respectively located the raising pickers 74 and 76 of conventional type adapted to raise both long and short butt sliders during reciprocary knitting.

At the auxiliary feed there is located a center cam 78 and stitch cams 80 and 82. The center cam 78 is radially movable and adapted to occupy three positions in one of which it is out of action, in the second of which it is adapted to engage long and intermediate length knitting butts of the lower sliders, missing short butts, and in the third of which it is adapted to engage knitting butts of all three lengths.

A main lower transfer cam is illustrated at 84, this transfer cam being similar to the lower transfer cam described in my said patent. Likewise, a conventional upper main transfer cam 85 is provided. Auxiliary transfer cams 86 and 87 are additionally provided in the present case to operate on the auxiliary transfer butts 61 and 57 for the purpose of securing quick transfer during reciprocation. Cam surfaces 88 and 89 serve to restore the sliders to proper positions after a transfer action takes place either through the main or auxiliary transfer cams. It will be noted that the cams 85 and 87 are slightly beyond the position of the cams 84 and 86 and the cam surface of cam 90, with the result that a double transfer may be effected as described hereafter.

A long butt slider raising cam is provided at 92. This cam is radially movable to position it so as to effect no operation on long butt sliders or to raise long butt sliders to an inoperative height so that they will not be engaged by the knitting cams at the main feed. A long butt slider lowering cam 94, which is movable radially, is provided for the purpose of bringing down long butt sliders to an active level.

A guard cam 96 insures the location of slider butts in position to either engage the picker 76 or pass properly through the cams at the main feed.

98 is the forward stitch clearing cam for the main feed, while cams 99 and 103 effect this function in reverse movements at the main feed. 101 is the reverse stitch clearing cam at the auxiliary feed and 100 and 102 together effect stitch

clearing in forward movements at the auxiliary feed. The lowering picker 104 is provided just beyond the auxiliary feed. It must be capable of picking down long as well as short butts.

At 106 there is illustrated the radially movable long butt raising cam operating similarly to cam 92 in reverse movements of the cylinders. This cam is adapted to engage long butts only when the cam is in its inner position. Cam 107 below it serves as a guard cam for cam 106.

The upper set of cams comprises an upper center main feed cam 108 followed by the forward stitch cam 110 and cams 112 and 114 adapted to clear the stitches. At the auxiliary feed there is the center cam 116, which is radially movable to occupy a position in which it engages no upper slider knitting butts, a position in which it engages long butts only, or in a position in which it engages both long and short butts. This is followed by the forward auxiliary upper stitch cam 118 which in turn is followed by cams 120 and 122 to cause the stitches to clear the latches. At 124 there is provided a radially movable slider elevating cam which in its outer position will fail to engage any butts and in its inner position will engage all knitting butts of the upper sliders. Immediately following this is a second movable cam 126 which has a lower recessed portion adapted to engage long butts only when the cam is in its active position. When withdrawn, it fails to engage any butts. Cooperating with the sliders in their reverse movements are the reverse auxiliary stitch cam 128, the latch clearing cam 130 cooperating with 114, the slider raising cam 132 corresponding to cam 124 and the recessed long butt lowering cam 134 corresponding to 126. This cam 134, however, is not radially movable, but occupies a fixed position in which it serves to lower long butt sliders only. A reverse stitch cam 136 is provided at the main feed and clearing of the latches by stitches is effected by cams 138 and 140.

Of the various cams described above, cams 84, 85, 86 and 87 are controlled in conventional fashion from the usual pattern drum cams or, if more elaborate patterns are being produced, from conventional chains. Of the lower series of cams, cams 94, 106 and 78 are radially movable as described, and as will become clear hereafter. The movements of these cams are controlled from the conventional cam drum in the usual fashion. Of the upper cams, cams 116, 124, 126 and 132 have already been described as radially movable. In addition, cams 120, 130, 112 and 138 are radially movable between outer positions in which they may engage butts of either length. These various radially movable cams are controlled in quite conventional fashion from the main cam drum of the machine through links and levers which need not be described. The axial sliding movements of cam 92 are controlled in the same fashion.

In view of the split knitting occurring in the leg, it is essential that the stitches at the various feeds be carefully balanced. For this reason all of the stitch cams 70, 72, 80, 82, 110, 136, 118 and 128 are made axially adjustable to secure fine control of the stitches. Their radial positions, however, remain constantly the same so that they may engage knitting butts of all lengths.

To secure the proper control of needles for the formation of the stocking described herein, the upper and lower sliders have butts provided as indicated in Figure 5. The needles may be considered as divided into two series, a long butt series to form the instep, and a short butt series

to form the sole of the stocking. The needles themselves are not provided with the long and short butts, but rather the sliders associated with them. Preferably, and as indicated specifically herein, equal numbers of needles are provided in the two groups on opposite sides of the center line 142. For illustrative purposes, there may be considered to be two hundred needles provided, one hundred in the instep series and one hundred in the sole series, as indicated at the top and bottom of the diagram in Figure 5.

Referring first to the knitting butts 62 of the lower sliders, all of the instep sliders are provided with long butts 144. Except for the end sliders of the sole series, all of these are provided with short butts 146. The two end sliders, however, are provided with intermediate length butts 148 which as will be evident hereafter, provide for the formation of sutures in the split knitting.

The upper sliders of the instep series are provided with long butts 150, while the upper sliders of the sole series are provided with short butts 152.

The upper sliders are either provided with no main transfer butts, as indicated at 154, with long main transfer butts, indicated at 156, short main transfer butts 158, or intermediate length transfer butts 160. The arrangements of these butts will be apparent from Figure 5, in which it will be noted that long and short transfer butts occur in the instep series and long and intermediate transfer butts in the sole series. Both the short and intermediate transfer butts occur on groups of three sliders separated by groups of six sliders. As will appear hereafter, these short and intermediate butts are found on those sliders which knit the ribs in the leg portion of the stocking. Because of the knitting of 1 x 1 rib, every alternate upper slider must have a main transfer butt. If a short or intermediate transfer butt does not occur thereon, then a long transfer butt is provided.

The lower sliders corresponding to upper sliders which do not carry transfer butts are also lacking in transfer butts, as indicated at 162. Every alternate lower slider carries a long main transfer butt 164. Lower sliders which do not carry the butts 164, but which correspond in position to the broad rib sliders of the upper series carry short transfer butts 166. In Figure 5 the groupings of needles and sliders forming rib and plain stitches in the formation of the leg are so indicated.

The auxiliary transfer butts 57 occur in two lengths, as indicated at 167 and 168. The short butts 167 occur on all the sliders having intermediate length transfer butts 160, and, in the present instance, perform the normal functions of the butts 160, which, in the formation of the stocking of Figures 1 and 1A, are functionless but have been described to clarify the arrangement of the sliders. The longer butts 168 occur only on the two groups of leg rib forming sliders of the instep series on each side of the stocking. The auxiliary transfer butts 51 are provided as indicated at 170 on the corresponding four groups of lower sliders. The various auxiliary transfer butts control the interruption and resumption of the rib formation in the instep portion of the stocking occasioned by the presence of the Hirner heel extension.

The invention will be best understood from specific consideration of these butt set-ups. It will be evident, however, that variations in the product will require obvious changes therein.

For the production of right and left toes special control of lowering picker 104 is necessary. The devices for accomplishing this are specifically described in my said copending application, Serial No. 302,443 referred to above. For the purpose of the present case, it will be sufficient to state that the lowering picker 104 is arranged to be selectively controlled so as to be operative to engage raised needles either during reciprocatory movement in both directions, or during reciprocatory movements in one direction only. To form right and left stockings in succession, control is provided so that in the formation of successive stockings the direction of movement in which the lowering picker is operative is alternated.

The operation of the machine to form a stocking may be best appreciated from consideration of Figure 6 in conjunction with the following description. In this figure there are illustrated diagrammatically the movements of the various controlling cams, etc., to produce the various needle actions incident to the production of the stocking of Figures 1 and 1A.

In considering the operation of the machine, it is most convenient to begin with the formation of the loopers rounds finishing one stocking before proceeding to the next. In the formation of these rounds, the machine is knitting single feed with all of the needles controlled by sliders in the lower cylinder. The auxiliary lower center cam 78 is withdrawn, as indicated in Figure 6, in which figure the positions of all the other cams are also shown. Accordingly, during the formation of the loopers rounds, the knitting butts of the lower sliders controlling movements of all the needles pass down cams 68 and 70 to draw stitches and then up cam 98 passing, without engaging, the center cam 78, and then passing over the reverse stitch cam 72 for subsequent engagement with center cam 68. Plain knitting is thus effected. The knitting butts of the upper sliders move at a low level missing withdrawn cams 124, 132 and 116.

The stockings are formed on this machine in a continuous series, there being provided a draw thread joining the loopers rounds of one stocking with the welt of a succeeding stocking. The knitting and nature of this draw thread arrangement are described in Bentley Patent 2,045,938, and its formation will be briefly described herein merely to show the cam changes of the machine. The knitting of the draw thread is essentially the same as described in said Bentley et al. patent.

At the end of the formation of the loopers rounds, the transfer cam 84 is moved in to engage only the long transfer butts on the lower sliders. Cam 84 may be moved out at this time. The draw thread is introduced at the auxiliary feed, and the yarn for knitting the welt is introduced at the main feed. Center cam 78 and cams 124 and 132 are moved in and cams 112, 130 and 138 are moved out. Cam 120, which has heretofore been in its inner position, though it was not engaging knitting butts, remains in, lowering the upper sliders sufficiently to cause them to receive the transferred needles from the lower cylinder.

The knitting butts of the upper sliders now move up cams 108 and 110, past cams 112 and 130 without engaging these cams and are then depressed by cams 120 and 122 sufficiently to locate them in position to receive the needles which are being transferred. They are then slightly raised

by cam 124 to position to be reengaged by cam 108. They are thus caused to move their needles to knit single feed at the main feed.

The lower sliders which have long transfer butts are raised by transfer cam 84 and immediately lowered by 88 to effect, in cooperation with the cam 66, a conventional transfer operation locating alternate needles in the upper cylinder. Cam 94 then lowers the raised sliders to active level so that they move with the sliders which still control needles. The knitting butts of the lower sliders are depressed by center cam 68 and stitch cam 70, thence rise over cam 98 to be depressed by cams 78 and 80 at the auxiliary feed. The knitting butts then pass up cams 100 and 102 and over the reverse stitch cam 72.

By reason of the above the needles in the lower cylinder take yarn at the main feed and also take the draw thread at the auxiliary feed. The needles in the upper cylinder take yarn only at the main feed, thus producing the draw thread stitches described in the Bentley et al. patent. This draw thread is knit only for approximately one and one-half courses so that it may be readily pulled out to separate the stockings. The welt is then formed by removal of the draw thread and by withdrawal of cams 78 and 120. The result of this is that the needles in the lower cylinder knit single feed taking yarn at the main feed only. They pass through the same wave as in the formation of the loopers rounds, but the yarn is, of course, taken only by alternate needles. The upper sliders move through the central race, missing all cams 120, 138, 112 and 130, their needles holding the loops from their last course of knitting. By the subsequent reengagement of these loops, the conventional welt 2 is formed.

After the formation of, say, four courses, of the welt, the formation of the 1 x 1 rib top 4 is begun with two feed knitting in both the upper and lower cylinders, changes being made to yarns at both feeds suitable for the knitting of the top. To effect this action, cams 78, 112, 116, and 120 are moved into action.

The knitting butts of the lower sliders then move down cams 68 and 70, up cams 98 and 82, down 78 and 80 and up 100, 102, and 72. The knitting butts of the upper sliders move up cams 108 and 110, down cams 112 and 114, up 116 and 118, and down 120 and 122, and are then raised by cam 124 to a position to be reengaged by cam 108.

Following the formation of the rib top, the ribbed leg 6 is knit, the set-up in the present case being suitable to form the usual 6 x 3 rib arrangement. In passing to the formation of the leg, except for yarn changes if yarn changes are desired, there is no variation in the knitting waves, there being merely transfers of needles to secure the desired arrangements in the upper and lower cylinders. Two feed knitting continues for the rapid formation of the leg. To effect the shift of needles both the lower and upper transfer cams 84 and 85, respectively, are moved inwardly, the former to engage all of the lower transfer butts only. As a result of this, all of the butt-carrying sliders in the lower cylinder are moved upwardly to needle transferring position. However, since the needles corresponding to the long butt lower sliders are already in the upper cylinder, the transfer effects shift only of the needles engaged by the short butt sliders. Immediately there are transferred

to the lower cylinder all of the needles engaged by upper sliders having long transfer butts. As will be evident from consideration of Figure 5, this 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 6 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 the purpose of illustration and that there is possible great liberty of variation in the production of structural and design modifications. A "links and links" type of pattern may be produced, using, in conventional fashion, jacks above the upper sliders for controlling their movements under the action of special pattern means.

When the position 11 of the high splice is reached, the rotary motion of the needle cylinder is changed to reciprocatory motion and a heavier yarn is introduced at the main feed to be knit into the high splice at the rear of the stocking, the leg yarn being retained at the auxiliary feed to knit the instep. It may be noted that the sliders having intermediate length butts 148 control needles in the lower cylinder knitting plain fabric. Consequently the matter of formation of the suture is taken care of by the cams controlling the lower sliders.

At this point, cam 78 is moved out to engage long and medium butts only. Cam 116 is moved out to engage long butts, only. Cam 126 is moved in so that its set back portion will engage long butts. Cams 130 and 138 move in. Cam 92 is moved up to raise long butts.

The instep needles now knit at the auxiliary feed and the sole needles at the main feed. In their forward movements the long butt lower sliders carrying the instep needles move down cams 78 and 80, up cams 100 and 102 and are then raised by cam 92 above the level of cams 96 and 68. In their reverse movements they move down cams 78 and 82 and up cam 101 to be engaged by the cam 106 which carries them to a level above cams 68 and 96.

The short butt lower sliders miss cam 92 on their forward movement and passing over cam 72 run down cams 68 and 70 to be raised by cam 98. They then pass cam 78 without engaging it. On their reverse movement they miss cam 106 and after rising slightly over cam 70 pass down cams 68 and 72 to draw stitches, being thereafter raised by cams 99 and 103.

The intermediate butt suture needles provide the suture between the split portions of the fabric by taking yarn at both feeds. The intermediate butt slider which leads the short butt sole series in its forward movement starts from the position indicated at A in Figure 3. It is not raised with the long butt series preceding it by the cam 92 and accordingly engages picker 76 which raises it to the level of the long butt series above the center cam 68 so that on this movement it fails to knit yarn at the main feed. The cam 78 is in a position to engage it as well as the long butt sliders, and consequently it is moved down by cam 78 and then by cam 80 and then upwardly by cams 100 and 102, finally ar-

riding at the position indicated at B. On its reverse movement it engages cam 78 being depressed by this cam and cam 82 and is then raised by cam 101. Passing cam 106, which engages long butt sliders only, it passes beneath the picker 74 which is now riding on the preceding short butts of the short butt sliders. It will accordingly now pass with the short butt sliders through a knitting wave at the main feed, finally arriving at the position A. Thus during a complete reciprocation the corresponding suture needle will knit yarn twice at the auxiliary feed and once at the main feed.

The other suture needle slider leading the long butt series starts from the position indicated at A' in its forward movement, and missing cam 106, is depressed by cams 78 and 80 and raised by cams 100 and 102, then, missing cam 82, it rises over stitch cam 72 and is depressed by cams 68 and 70 and raised by cam 98 reaching its final position at B'. Upon its reverse movement, since it now leads the short butt needles, it will engage picker 74 after passing cam 106 and will be raised thereby above the level of cams 68 and 98 to engage cam 78 which, together with cam 82, lowers it. It then rises over cam 101 to reach its final position A'. Thus the suture needle associated with this slider also knits yarns twice at the auxiliary feed and once at the main feed during each reciprocation.

The upper long butt sliders associated with instep needles, starting from a position approximately above A', will rise over cam 132 and will then move slightly downwardly under the action of cam 114 to engage cam 116. By this cam and cam 118 they will be raised to take yarn at the auxiliary feed and will then move downwardly under cams 120 and 122 to be raised slightly by cam 124, and then moved downwardly by the set-back portion of cam 126. On their reverse movement the leading long butt needle will start from a position above B and the long butt sliders will engage the center cam 116 to be caused to pass through a knitting wave at the auxiliary feed, being then caused to miss center cam 108 by the actions of cams 132 and 134.

The short butt upper sliders in a forward movement start from the position A and are caused to move upwardly by cam 124. The short butts, however, miss the recessed portion of cam 126 and so engage center cam 108 by which together with cam 110, they are caused to have stitch drawing movements at the main feed. They are depressed by cams 112 and 114, and miss the auxiliary center cam 116. On their reverse movements they start from the position B' and are raised by cam 132 to engage cam 108 after missing cam 134. Accordingly, they again take yarn at the main feed, after which they are depressed by cams 136 and 140 and miss cam 116.

It will be noted that the cylinders have a range of reciprocation in excess of 180° so as to bring all of the needles of each series to proper final position to take yarns during the split knitting. This excess range of movement is also necessary for the formation of the Hirner type of heel as described hereafter.

After finishing the ribbed portion of the high splice and before starting the formation of the heel, it is desirable to knit one or more split courses to eliminate the ribs from the portions of the stocking knit by the needles taking part in the heel formation. These courses are indicated at 14. No change is now necessary in the cams which engage the knitting butts of the

sliders. Needles, however, are transferred from the upper to the lower cylinder as follows:

Usually on a machine of this type about two revolutions of the cylinders are used for stepping the transfer cams in and out, whereas in the present instance a quick selective transfer is required during the reciprocatory knitting. Accordingly there is provided the auxiliary transfer cam 87 adapted to occupy three alternative positions. As the short butt series of sliders start moving counterclockwise from the position A, the cam 87 is moved to its innermost position so that it will lower the sliders carrying butts 167, the sliders carrying butts 168 being already to the left of cam 87 as viewed in Figure 3. Following lowering of the sliders of the short butt series there are also lowered the two trailing sets of long butt sliders carrying butts 168. Then the cam 87 is partially withdrawn so as to miss butts 167 but engage during the latter part of this forward stroke the sliders carrying butts 168 leading the short butt sliders and being located at the end of the stroke to the left of position B. At the end of this stroke, cam 87 is fully retracted. Thus short butt sliders do not start through the transfer a second time, and cam 87 does not engage any butts in the next reverse stroke. As a result of these operations, there will remain in the upper cylinder only the needles which form the ribs in the front of the extreme forward limits of the heel structure which is to be formed.

Following the formation of the courses 14, the narrowing for the formation of the heel portion 17 is begun. The heel yarn is introduced at the main feed and cams 78, 116, 124, and 132 now move out of action. Accordingly, all the upper sliders will pass by cam 116 without being raised thereby to cause their needles to take yarn. The short butt upper sliders no longer control any needles and pass idly below the cams. The long butt lower sliders will pass cam 78 and will remain at an idle level. The short butt lower sliders will pass cam 78 and will remain at an idle level. The short butt sliders, on the other hand, continue to knit at the main feed and the pickers 74 and 76 operate in the usual fashion to produce narrowing.

Upon the completion of the narrowing operation, cam 82 is moved down and cam 106 moved out, while the lowering picker 104 is rendered active by a cam acting upon lever 194, which action causes it to move down to the level at which the inactive butts are moving. The widening action now takes place in conventional fashion, two needles being picked down and one picked up at each end of the short butt series upon each reciprocation. To form the Hirner type of heel the widening does not cease when all of the short butt needles have been brought into action, but the widening is continued without any further change in the cam setup, bringing down sufficient long butt sliders to form the widened gore 19. When this has been completed, the lowering picker is again rendered inactive, whereupon the narrowing pickers 74 and 76 continue their action producing the narrowed gore 20. This narrow gore may extend to the position of the suture, as indicated in Figure 1.

At the beginning of the heel narrowing when cams 78 and 116 are withdrawn, the instep yarn which has been knitting at that feed is also withdrawn and is clamped and cut. When the narrowed gore 20 has been completed and split knitting is to be resumed, the instep yarn is rein-

sented. If the Hirner gores are not incorporated in the stocking, then floating the instep yarn under take-up control in the conventional fashion is a satisfactory procedure. However, if long butt needles are picked down to form the special gore in front of the heel, it is preferable to clamp and cut the instep yarn as stated, reinserting it when split knitting is resumed after completion of the gores. The sutures will be interrupted by the gores and will not extend without a break along the corners of the heel sutures. Consequently there will not be a tendency to the formation of an open stitch at the heel corners providing weak points in the stockings.

When the narrowing is completed, there are preferably formed one or more courses, as indicated at 22, as a preliminary step to the formation of the ribs throughout the entire instep. To form these courses, 22, there are moved into action cams 92, 106, 78 (to engage long and intermediate butts only) and cam 116 (to engage long butts only). Reciprocatory knitting then takes place in the same fashion as in the formation of courses 14, plain knitting occurring throughout the sole and also in the instep in the region immediately in front of the Hirner gore.

Following the formation of the courses 22 the only action necessary to continue knitting is the transfer of the two sets of rib needles on each side adjacent the suture line to the upper cylinder by the action of cam 86 on the special butts 170 of the corresponding sliders. The movements of the sliders in the formation of the split foot are essentially the same as in the formation of the high splice with the exception that since no ribs are being formed in the sole the short butt series of sliders in the upper cylinder move idly at a low level, cams 124 and 132 remaining out of action. The sutures between the instep and sole portions are formed as described above. If a sole yarn different from the heel yarn is desired, a yarn change takes place at the main feed.

Following the formation of the foot, the ring toe may be produced, preferably in two steps by rotary knitting single feed. First cams 78, 92, 116 and 126 are moved out of action and cams 94 and 124 are moved into action. The result of this will be cessation of knitting at the auxiliary feed with knitting by yarn at the main feed by needles under the control of both upper and lower sliders. This knitting, which may proceed for one or more courses, will involve the formation of ribs at the instep. Immediately, however, cam 85 is moved in to engage the shortest transfer butts of the upper sliders. Thereafter, plain fabric is knit at the main feed by needles controlled by the lower sliders only. If desired a new yarn may be introduced at the main feed for the formation of this ring toe.

Following the formation of the ring toe, reciprocatory knitting is again resumed for the formation of the special right or left toe. The cam changes involve the reinsertion of cam 126, the removal of cam 124, the raising of cam 92 to its upper position to engage and raise long butt sliders to an inoperative level, and the removal of cam 94. The upper sliders will then move below all of the upper cams. Control of the lowering picker 104 is now effected by the devices described in my copending application Serial No. 302,443, so that it will be operative when reciprocation in one direction takes place. In the direction of reciprocation in which it is inoperative the suture slider leading the short butt series will be raised by a raising picker to

the level of the long butt sliders and with these sliders will fail to cause its needle to take yarn at the main feed. Upon reciprocation in the reverse direction, the lowering picker will be operative to engage the first two sliders of the raised series which will be the suture slider leading the long butt series and the adjacent first long butt slider. Both of these will be brought down to trail the end of the short butt sliders. However, before reaching the center cam 68, the long butt slider thus brought down will be raised by either cam 106 or cam 92, depending upon the direction of movement. The result will be that the suture needle will take yarn at the main feed with the needles of the short butt series. This action will be repeated at the unfashioned side, the suture needle under discussion being raised in one reciprocation and lowered in the next. Thus no narrowing at its side of the short butt series will take place. At the same time, however, narrowing in the usual fashion takes place on the other side of the short butt series, a needle being raised in each reciprocation.

After a sufficient length of straight selvage has been produced along the line 33 reaching the point 34, the lowering picker is rendered inoperative, and consequently narrowing at both sides takes place along the line 35.

Following completion of the narrowing operation, the lowering picker is rendered operative on both sides. Widening will now take place in the usual fashion, there being two needles lowered and one raised at each reciprocation. On the side on which narrowing did not take place during the first part of the toe formation, the lowering picker after the point 34 is again reached is unable to produce any further widening, since while it will lower two needles at each action, one of these will be a suture needle and the other an end needle of the long butt series. The latter is raised immediately after being lowered by the action of either cam 92 or 106, while in the next reciprocation the suture needle is raised by a raising picker, since it leads the short butt series. The result is that another straight selvage is produced at 33. Widening at the other side continues in the usual fashion.

At the end of the widening operation, cam 94 is moved in and cam 92 down and rotary knitting is resumed to form the loopers rounds heretofore described. The stocking after separation by removal of the draw thread is stitched at 33 and 38.

As a matter of styling, it may be desirable to have instead of the ribbed high splice 13 a plain high splice portion above the heel with the ribs continued through the instep. Such a modification is fragmentarily illustrated in Figure 8, which shows only the heel portion of a stocking which, except for the construction at this heel portion, may be identical with the stocking of Figure 1. The leg 8' is similar to the leg 8. Prior to the beginning of the plain high splice the ribs at the rear of the stocking are cut out for one or more courses of rotary knitting at two feeds, as indicated at 9'. The position 11' for beginning the high splice is then reached and split knitting is begun forming the plain high splice 13' while continuing the ribbed instep as at 12'. Following this there may be formed the courses indicated at 14' corresponding to 14 and thereafter the heel 17' is begun.

Assuming the cam arrangement as described above for the formation of the 6 x 3 rib leg,

the formation of the stocking of this modification may be described as follows with reference to the butt diagram of Figure 7 showing the slight modifications required as compared with Figure 5.

It will be noted that butts 167 are no longer required and only one length of auxiliary butts is necessary on the upper sliders, these occurring at 168 on the two groups of broad rib sliders on each side in the instep series.

The courses 9' are knit by rotary knitting with transfer of all the needles of the sole series from the upper to the lower cylinder by moving cam 85 inwardly to engage the intermediate length butts 160. Thus two feed knitting proceeds with plain knitting at the rear of the stocking and broad rib knitting continued at the front thereof.

After a few courses of such knitting, the rotary movement of the needle cylinders is changed to a reciprocatory motion and the cams are changed to substantially the conditions described above used in the formation of the split foot of the stocking of Figure 1. Cam 78 is moved out so that it will engage long and intermediate butts only. Cam 116 is moved out to engage long butts only. Cams 124 and 132 are moved out to avoid putting waves in the upper sliders and to prevent passage of the short butt upper sliders (which now control no needles) through a knitting wave at the main feed. Since cam 124 is moved out the position of cam 126 is immaterial. Cam 130 is moved in to clear stitches in reverse movements at the auxiliary feed. Cam 138 is inactive throughout the formation of this stocking, but if it is controlled to move in with cam 130, such movement does no harm. Cam 92 is moved in to raise long butt sliders over the cams at the main feed. Cam 106 is already in position to perform this same function, during reverse movements.

As a result of the above set-up, knitting of the ankle will take place in substantially the same fashion as the knitting of the foot of the modification of Figure 1, a plain high splice 13' being produced.

Following the formation of the high splice, courses 14' may be formed in the same fashion as the courses 14, transfer cam 87 being moved in to lower the two groups of rib forming needles of the instep series on both sides of the stocking. From this point on, the formation of the stocking is the same as in the modification of Figure 1.

In the formation of a high splice such as 13', it will generally be desirable to use a yarn of the same color as that used for forming the leg, but perhaps heavier. If a reenforced high splice is not desired, however, a true high splice need not be made at this point, but instead knitting as in the courses 9' may be continued to the formation of the courses at 14' immediately preceding the heel.

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 and instep. 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.

The stockings described above are of quite elaborate character, and it will be understood that the principles of the invention are applicable to the formation of stockings of simpler type. For example, the Hirner gores may be omitted and/or conventional toes may be provided instead of the right and left toes described heretofore. Other forms of Hirner gores may also be readily incorporated, for example, the alternative type illustrated in Figure 6 of my Patent No. 2,170,078. From the description of the cam actions above it will be evident how such a modified gore may be produced by slight variation in the handling of the needles.

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 split portion above the heel formed by reciprocatory knitting, the leg portion of said stocking being formed by rotary knitting and being provided with design structure comprising selectively reversely concatenated loops, and the foot portion of said stocking being formed by reciprocatory knitting and having different yarns forming the upper and lower portions thereof, both parts of said split portion being provided with design structure similar to and continuing that of the leg, and the upper portion of the foot containing design structure similar to and continuing that of the front part of said split portion.

2. A knitted stocking comprising integrally knitted leg, heel, foot and toe portions and being provided with ribs of multiple wale width in the leg portion, the ribs in the front of the leg portion extending without interruption substantially to the toe, and the ribs in the rear of the leg portion extending without interruption substantially to the heel, the front and rear sets of ribs each being made by both rotary and reciprocatory knitting.

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, the lower portion of said leg comprising a section knit by reciprocatory knitting the rear of which is knit of one yarn and the front of which is knit of another yarn, the rear and front being joined by side sutures, and the foot portion being formed by reciprocatory knitting, the sole being knit of one yarn and the instep of another, the sole and instep being joined by side sutures, the continuity of the sutures on each side being interrupted by said gore.

4. 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, the lower portion of said leg comprising a section knit by reciprocatory knitting the rear of which is knit of one yarn

and the front of which is knit of another yarn, the rear and front being joined by side sutures, and the foot portion being formed by reciprocatory knitting, the sole being knit of one yarn and the instep of another, the sole and instep being joined by side sutures, the continuity of the sutures on each side being interrupted by said gore, the front of the leg and the instep having longitudinally extending ribs some of which are interrupted by said gore.

5. A knitted stocking comprising a leg, an ankle portion, a heel, a gore below the heel, and a foot below the gore, said ankle and foot portion each being made of two split sections of fabric united at a certain wale on one side of the stocking and at a certain wale on the other side thereof, the heel portion being formed by narrowing from said wales and then widening to said wales, and the gore portion being formed by widening from said wales and then narrowing to said wales.

6. A knitted stocking comprising a leg, an ankle portion, a heel, a gore below the heel, and a foot below the gore, said ankle and foot portion each being made of two split sections of fabric united at a certain wale on one side of the stocking and at a certain wale on the other side thereof, the heel portion being formed by narrowing from said wales and then widening to said wales, and the gore portion being formed by widening from said wales and then narrowing to said wales, said ankle portion, heel, gore and foot being formed by reciprocatory knitting.

7. The method of knitting a stocking comprising knitting a leg portion while selectively reversely concatenating loops to produce a multiple wale rib structure, forming at the end of the formation of the leg portion at least one course containing plain knitting through at least the extent of the heel, forming a heel portion by reciprocatory knitting, during the knitting of the heel failing to interknit yarn with loops at the front of the stocking formed during the last course of knitting preceding formation of the heel, and, following the completion of said heel, starting formation of a foot portion by concatenating loops during reciprocatory knitting with those with which yarn was not interknit during the formation of the heel.

8. The method of knitting a stocking comprising knitting a leg portion while selectively reversely concatenating loops to produce a multiple wale rib structure, forming a heel portion by reciprocatory knitting, during the knitting of the heel failing to interknit yarn with loops at the front of the stocking formed during the last course of knitting preceding formation of the heel, and, following the completion of said heel, starting formation of a foot portion by concatenating loops during reciprocatory knitting with those with which yarn was not interknit during the formation of the heel.

9. The method of knitting a stocking comprising knitting an upper leg portion by rotary knitting while selectively reversely concatenating loops to produce a multiple wale rib structure, knitting a split lower leg portion by reciprocatory knitting while selectively reversely concatenating loops at least at the front of the stocking to produce a multiple wale rib structure, forming a heel portion by reciprocatory knitting, during the knitting of the heel failing to interknit yarn with loops at the front of the stocking formed during the last course of split knitting preceding formation of the heel, and, following the completion of said heel, starting formation of a foot

portion by concatenating loops during reciprocatory knitting with those with which yarn was not interknit during the formation of the heel.

10. The method of knitting a stocking comprising knitting a leg portion while selectively reversely concatenating loops to produce a design 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 knitting of the heel and gore failing to interknit yarn with loops at the front of the stocking formed during the last course of knitting preceding formation of the heel, and, following the completion of said gore, starting formation of a foot portion by concatenating loops during reciprocatory knitting with those with which yarn was not interknit during the formation of the heel and gore.

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

12. 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, the foot portion being knit by reciprocatory knitting and the sole of said foot portion being knit of one yarn and the instep of another joined along side wales, and said gore extending upwardly to terminate at wales other than those forming the junctions between the sole and instep yarns.

13. A knitted stocking having a leg and front and rear split portions, the latter being formed by reciprocatory knitting, and design structure comprising selectively reversely concatenated loops in both the front and rear of the stocking, in each case being formed both by rotary knitting in the leg, and by reciprocatory knitting in the corresponding split portion of the stocking.

14. A knitted stocking having a leg and front and rear split portions, the latter being formed by reciprocatory knitting, and multiple wale ribs in both the front and rear of the stocking, in each case being formed both by rotary knitting in the leg, and by reciprocatory knitting in the corresponding split portion of the stocking.

15. A knitted stocking having a portion formed by rotary knitting and an adjoining portion formed by reciprocatory knitting, said stocking having at least one rib which is continuous through both portions and also at least one other rib in both portions which is interrupted in the portion formed by reciprocatory knitting.

16. A knitted stocking having a portion formed by rotary knitting and an adjoining portion formed by reciprocatory knitting, said stocking having at least one rib which is continuous through both portions and also at least one rib in both portions which is continuous across the junction of said portions and which is interrupted in the portion formed by reciprocatory knitting.

17. A knitted stocking having a portion formed by rotary knitting and an adjoining portion formed by reciprocatory knitting, said stocking having at least one rib which is continuous through both portions and also at least one other rib in both portions which is interrupted by a suture in the portion formed by reciprocatory knitting.

18. A knitted stocking having a portion formed by rotary knitting and an adjoining portion formed by reciprocatory knitting, said stocking having at least one rib extending continuously from one portion into the other portion and interrupted in the portion formed by reciprocatory knitting.

19. A knitted stocking having a portion formed by rotary knitting and an adjoining portion formed by reciprocatory knitting, said stocking having at least one rib extending continuously from one portion into the other portion and interrupted by a suture in the portion formed by reciprocatory knitting.

20. A knitted stocking having a portion formed by reciprocatory knitting and containing a suture, and at least one rib in said portion interrupted by the suture.

21. A circular knit stocking having a portion formed by reciprocatory knitting and having at least one rib interrupted between reciprocatory knit courses of said portion.

22. A circular knit stocking having a portion formed by reciprocatory knitting and having in said portion in at least one wale thereof two loops reversely concatenated in adjacent courses knit in opposite directions.

23. A circular knit stocking having a portion formed by reciprocatory knitting and having at least one multiple wale rib interrupted between reciprocatory knit courses of said portion.

24. A circular knit stocking having a portion formed by reciprocatory knitting and having in said portion in each of a plurality of adjacent wales thereof two loops reversely concatenated in adjacent courses knit in opposite directions.

25. The method of circularly knitting a stocking comprising knitting a pair of successive courses by reciprocatory knitting in opposite directions, and, in at least one wale, concatenating a loop in one direction with a preceding loop in

the formation of the first course of said pair, and concatenating a loop in the opposite direction with the last formed loop in the formation of the other course of said pair.

26. The method of circularly knitting a stocking comprising knitting a leg portion, knitting a heel portion of the stocking by reciprocatory knitting, knitting by reciprocatory knitting a gore extending above the heel portion, and knitting by reciprocatory knitting a split foot portion, the sole of said portion being knit of one yarn and the instep of another.

27. 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, the foot portion being formed by reciprocatory knitting and the sole of said foot portion being knit of one yarn and the instep of another, and said gore extending beyond the wales forming the junctions between the sole and instep yarns.

28. 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, the foot portion being formed by reciprocatory knitting and the sole of said foot portion being knit of one yarn and the instep of another, and said gore extending beyond the wales forming the junctions between the sole and instep yarns.

29. 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, the lower portion of said leg comprising a section knit by reciprocatory knitting the rear of which is knit of one yarn and the front of which is knit of another yarn, the foot portion being formed by reciprocatory knitting and the sole of said foot portion being knit of one yarn and the instep of another, and said gore extending beyond the wales forming the junctions between the sole and instep yarns.

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