April 1, 1941. H. E. HOUSEMAN 2,237,145

KNITTING METHOD AND MACHINE

Original Filed Nov. 1, 1939 4 Sheets-Sheet 1

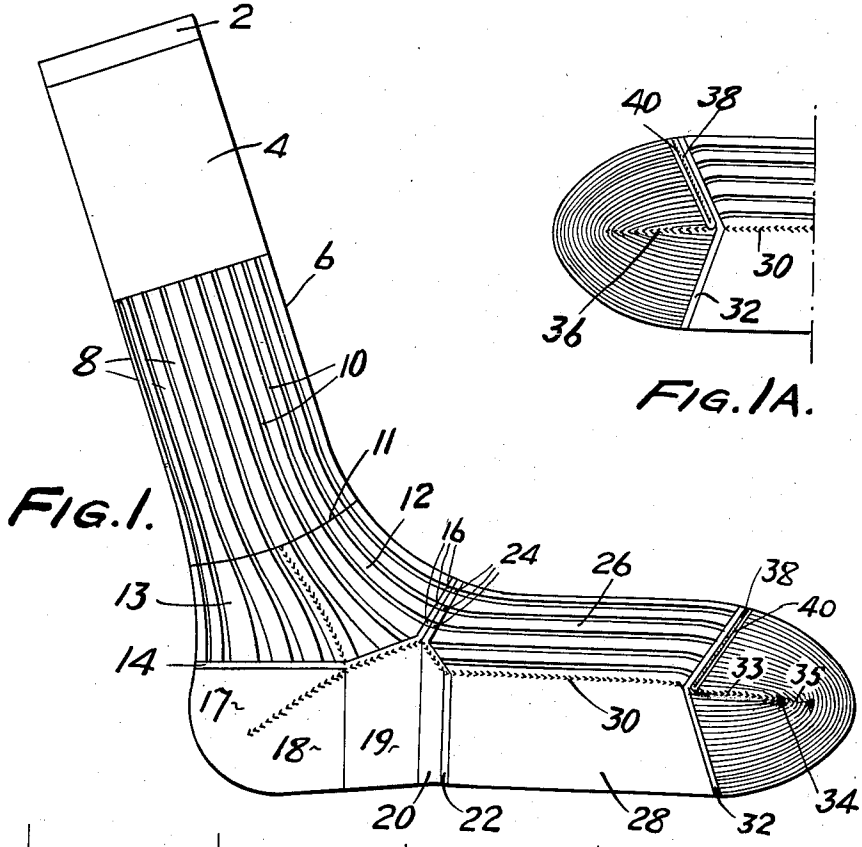


FIG. 1.

FIG. 1A.

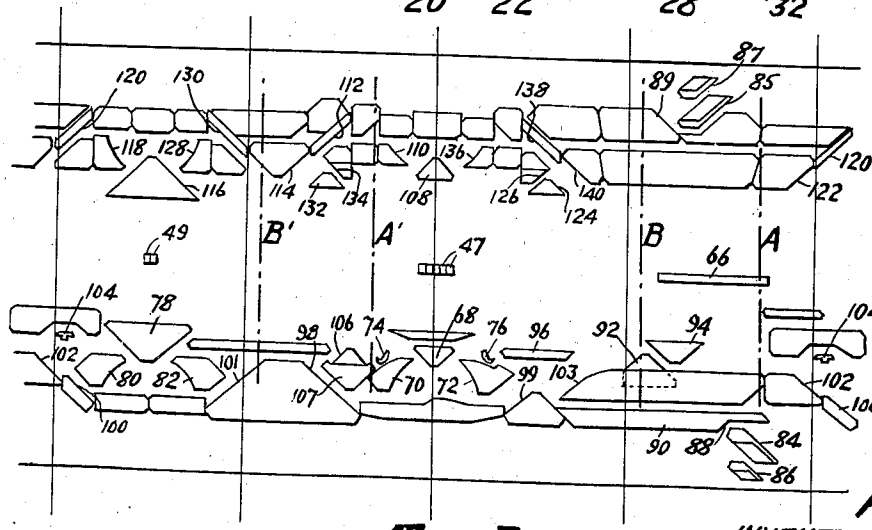


FIG. 3.



FIG. 4.

WITNESS:

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April 1, 1941. H. E. HOUSEMAN 2,237,145

KNITTING METHOD AND MACHINE

Original Filed Nov. 1, 1939 4 Sheets-Sheet 2

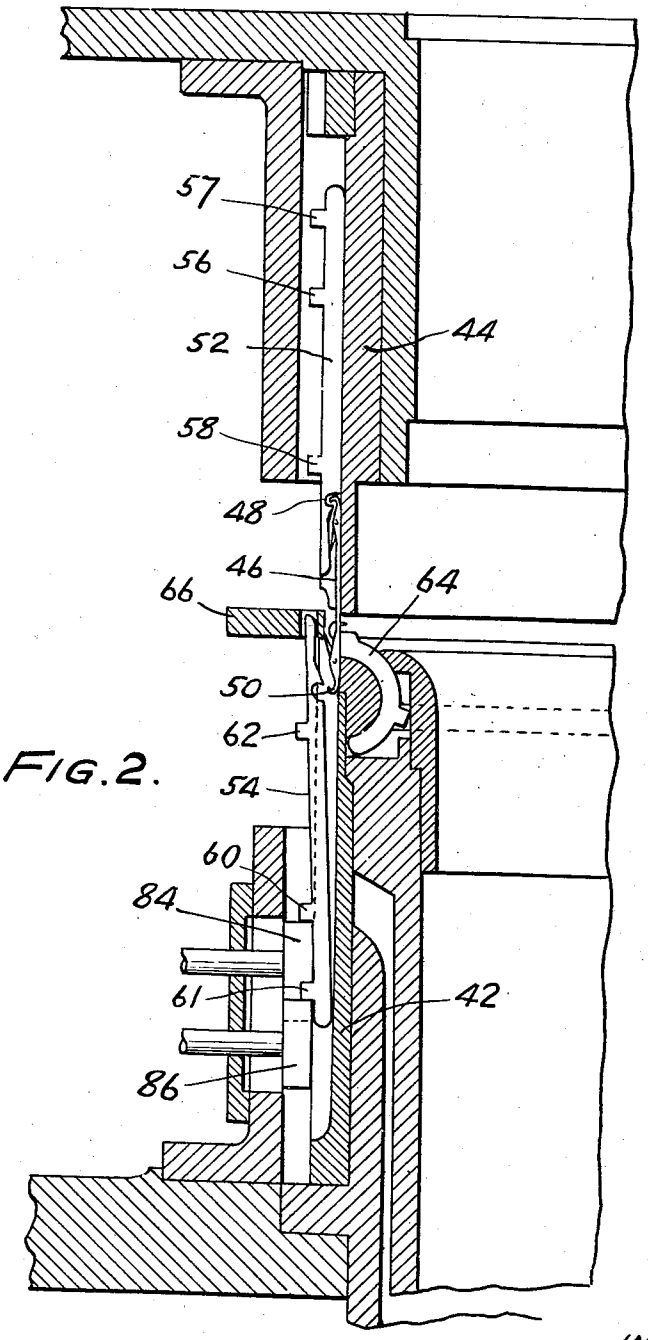


FIG. 2.

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April 1, 1941. H. E. HOUSEMAN 2,237,145

KNITTING METHOD AND MACHINE

Original Filed Nov. 1, 1939 4 Sheets-Sheet 3

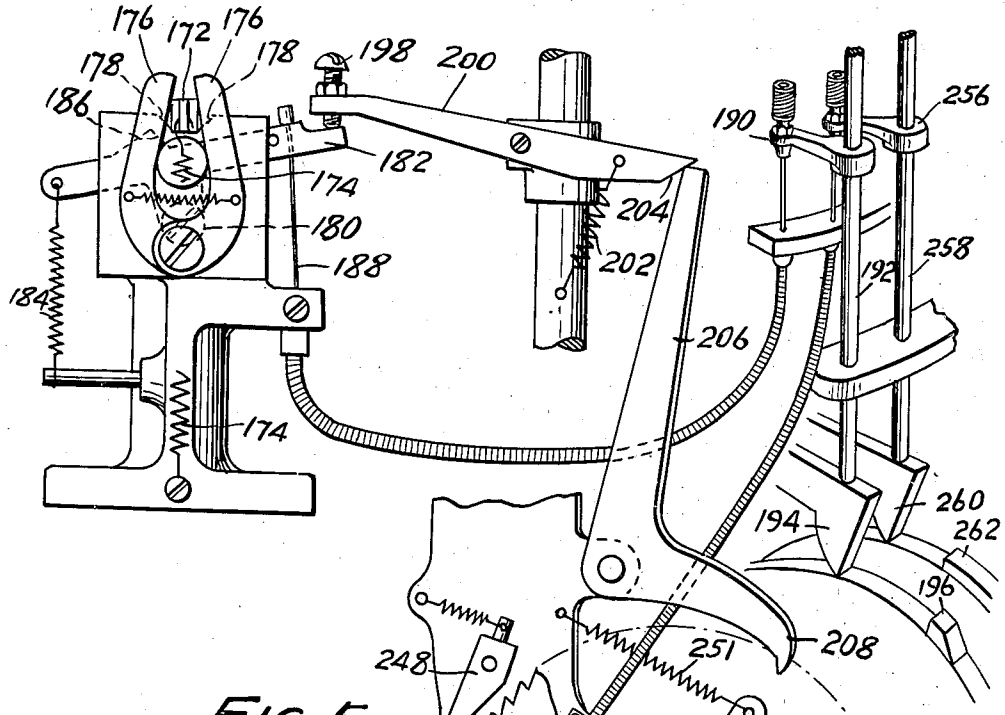


FIG. 5.

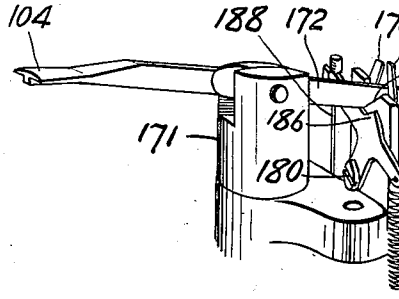


FIG. 6.

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April 1, 1941. H. E. HOUSEMAN 2,237,145

KNITTING METHOD AND MACHINE

Original Filed Nov. 1, 1939 4 Sheets-Sheet 4

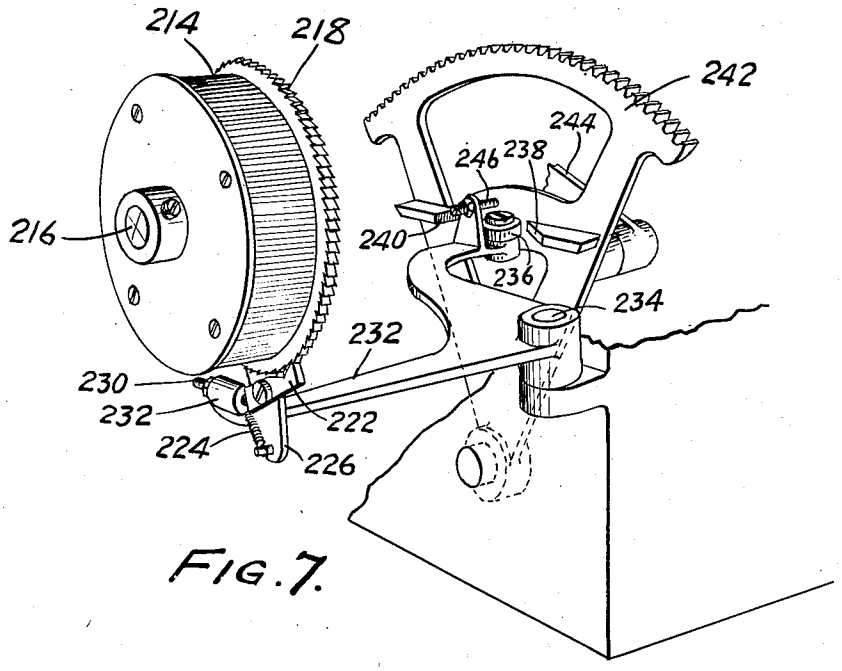


FIG. 7.

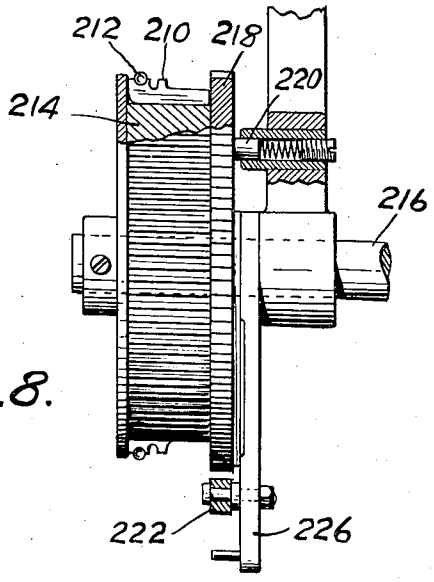


FIG. 8.

WITNESS:

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Patented Apr. 1, 1941 2,237,145

UNITED STATES PATENT OFFICE

2,237,145

KNITTING METHOD AND MACHINE

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Original application November 1, 1939, Serial No. 302,443. Divided and this application April 13, 1940, Serial No. 329,397

10 Claims. (Cl. 66—14)

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.

This application is a division of my application Serial No. 302,443, filed November 1, 1939.

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 reenforcement 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, and as described more fully in said parent application, split knitting of either type may be used, reciprocatory split knitting being specifically disclosed therein.

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 machine, the stockings forming the subject-matter of co-pending application Serial No. 302,444, filed November 1, 1939.

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 diagrammatic perspective view illustrating particularly the controlling means for the lowering picker to enable it to form right and left toes;

Figure 6 is a perspective view showing certain details of the control of the lowering picker;

Figure 7 is a perspective view showing the means for controlling the step by step movements of a trick drum; and

Figure 8 is a vertical sectional view of the same.

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 **10**. The instep is knit using one of the yarns used in the formation of the leg **10**, 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 drawing 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 briefly described 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 Spiers 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.

Referring 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 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 reciprocatory 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 provided just beyond the auxiliary feed will be described in greater detail hereafter. 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 fail to engage any butts and inner 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.

The upper and lower sliders have butts arranged as described in said parent application Serial No. 302,443, and this arrangement need not be specifically described herein, since this application is concerned primarily with the formation of the right and left toes.

For the production of right and left toes special control of lowering picker 104 is necessary. This special controlling means is illustrated in Figures 5, 6, 7 and 8. The picker 104 is in the form of a lever pivoted about a horizontal axis on a member 171 swiveled for movement about a vertical axis in conventional fashion. The tail portion 172 of the picker is pulled downwardly by a spring 174 into engagement with the cam surfaces 178 of a fixed plate. Normally the picker is held in central position by the action of spring controlled fingers 176.

To serve for control of the picker there is pivoted at 180 a lever 182 having a cam surface 186 adapted to engage the tail 172 of the picker to lower its butt engaging end to a position to be engaged by butts of sliders which have been raised out of action. In the present machine the picker 104 is inoperative when it is above such level. When it is lowered to be engaged by the butt of a raised slider and is pushed sidewise thereby it will ride up one or the other of the cam surfaces 178 to effect lowering of its butt engaging end in conventional fashion. The lever 182 is urged in a direction to remove the cam 186 from the picker by a spring 184. A flexible wire 188 is connected to the other end of the lever 182 and to an arm 190 on a rod 192 adapted to be moved upward by a follower 194 engageable by cams 196 on the main cam drum of the machine. By such action the picker 172 may be rendered operative at predetermined periods.

Additionally, the end of the lever 182 is engageable by an adjustable screw 198 carried by a lever 200 urged in a clockwise direction as viewed in Figure 5 by a spring 202. The opposite end of the lever 200 has a beveled surface 204 engageable by the upper end of a lever 206 having a follower portion 208 adapted to be engageable and raised by jacks 210 carried in slots in a drum 214 and held therein by a spring band 212. Thus a dual control may be imparted to the lever 182.

The drum 214 is conveniently journalled loosely upon the shaft 216 of the main cam drum of the machine and is secured to a ratchet disc 218 provided with normal length teeth corresponding to the number of slots in the drum 214 with the exception of diametrically opposite low teeth of which one is illustrated at 250. To prevent overrunning movements of the drum 214, a friction plunger is provided at 220 spring pressed against the surface of the ratchet 218.

The ratchet is adapted to be driven tooth by tooth by a pawl 222 pivoted to an arm 226 journalled on the shaft 216 and urged into engagement with the ratchet by a spring 224. A spring 228 normally urges the arm 226 into engagement with an adjustable screw 230 carried by one arm of the bell crank 232 pivoted at 234, the other arm of which carries a cam following roller 236 adapted to be engaged by cams 238 and 240 carried by the segment 242 adapted to impart reciprocatory motions to the needle cylinders being driven by a link 244 driven by a crank of the usual driving arrangement. This cylinder driving arrangement is conventional and is illustrated, for example, in Figure 7 of my application Serial No. 227,452, filed August 30, 1938, now Patent No. 2,180,708. The position of the roller 236 is adjusted by means of a screw 246 which bears upon a fixed portion of the frame (not illustrated). Thus the stroke of the pawl is adjusted so that it will be greater than one tooth spacing and less than two.

A detent 248 is provided to prevent retrograde movement of the drum 214.

In order to time up the drum there is provided at 252 a guard for the low teeth 250 adapted to hold the pawl 222 outwardly so that it will not engage these teeth. This guard 252 journalled on the shaft 216 is controlled by a spring 251 and a flexible wire 254 secured on an arm 256 on a vertical rod 258 which rests upon the follower lever 260 engageable by cams 262 on the main cam drum. The provision of right and left toes requires action of the picker as the needles move in one direction but not as they move in the other direction during reciprocatory knitting. At other times, as for example, in the formation of the heel, or in the formation of other parts of the toes, the lowering picker must be selectively active or inactive through longer periods. As will be evident from an examination of Figure 5, the two controls of the arm 182 are essentially independent, so that either of the controls may determine the activity of the lowering picker. The cam action on follower 194 is adapted to effect the long control periods of the lowering picker. The jack drum 214, on the other hand, is adapted to control the selective operations at the ends of reciprocatory movements.

This latter operation is effected by the control of the bell crank 232 by the reciprocating segment 242. At the end of each movement of this segment there is imparted to the jack drum an advancing movement. Obviously, therefore, by the location of a jack 210 only in every alternate slot in the drum the picker 104 may be rendered active at the end of a movement in one direction and inactive at the end of the movement in another direction. The particular movements during which the picker should be operative or inoperative will be different depending upon whether a right or left toe is being formed. Consequently, the jack drum is desirably made so that one-half of a revolution thereof will form a right stocking and the other half a left stocking, the two halves being defined by diametrically opposite low teeth 250. To accomplish this each half is provided with alternate jacks bearing the proper relationship to reciprocations of the segment to give the results indicated above. The number of steps of the drum required to effect this will, of course, be less than half the number of slots in the drum. Consequently, there is provided the guard 252. Throughout the formation of the portions of the stocking in advance of the half narrowing portion to form a toe, the guard 252 will be in a position to prevent engagement of the pawl 222 with a low tooth 250 despite reciprocation of the pawl during reciprocatory split knitting or heel knitting. As soon as the selective control of the picker 104 is to occur the guard 252 is moved by the action of a cam on follower 260 to uncover the tooth so that the jack drum will be advanced. After the necessary actions of the jack drum have been completed, the guard 252 will again be moved into guarding position. So long as the normal teeth are engaged by the pawl 222, the advance will continue, but when a tooth 250 is brought into position to be engaged by the pawl, the advance will cease and the drum will then be in a position to begin the formation of the other type of toe in the next stocking. During such setting up movements, no jacks, or at least no active jacks carrying butts, will engage the follower 208. Consequently, the picker may be controlled in-

dependently by the action of the cam follower **194**.

The stocking illustrated in Figures 1 and 2 is formed in the same fashion as described in said parent application, and reference may be made thereto for details. The present application is concerned solely with the formation of the toe of the stocking after completion of the ring toe.

Following the formation of the ring toe by rotary knitting, reciprocatory knitting is again resumed for the formation of the special right or left toe. The cam changes involve the reinsertion of cam **126**, theretofore out of action, 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 above 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 by the action of a cam **196** on follower **194**. 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. The stocking after separation by removal of the draw thread is stitched at **33** and **38**.

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

1. A circular knitting machine comprising a needle cylinder, needles adapted to slide in said cylinder, means for feeding yarns to the needles, means to control needle movements to form stitches, means for imparting reciprocatory movements to the cylinder, a double acting needle picker, and means for rendering said picker active to pick needles only when the needles are moving in one direction during the formation of a part of a pocket by reciprocatory knitting.

2. A circular knitting machine comprising a needle cylinder, needles adapted to slide in said cylinder, means for feeding yarns to the needles, means to control needle movements to form stitches, means for imparting reciprocatory movements to the cylinder, a double acting needle picker adapted to pick two needles upon each of a plurality of succeeding movements of the needles in one direction, and means for returning one of said picked needles in each of such movements before it reaches said needle movement controlling means.

3. A circular knitting machine comprising a needle cylinder, long and short butt needles adapted to slide in said cylinder, means for feeding yarns to the needles, means to control needle movements to form stitches, means for imparting reciprocatory movements to the cylinder, a double acting picker adapted to pick both long and short butt needles, and means for returning picked long butt needles before they reach said needle movement controlling means.

4. A circular knitting machine comprising a needle cylinder, needles adapted to slide in said cylinder, means for feeding yarns to the needles, means to control needle movements to form stitches, means for imparting reciprocatory movements to the cylinder, a double acting needle picker, and means for rendering said picker inactive during movements of the cylinder in one direction in the formation of a part of one stocking, and for rendering said picker inactive during movements of the cylinder in the opposite direction in the formation of the corresponding part of the next stocking, so that stockings having right and left toe pockets will be knit alternately.

5. A circular knitting machine comprising a needle cylinder, needles adapted to slide in said cylinder, means for feeding yarns to the needles, means to control needle movements to form stitches, means for imparting reciprocatory movements to the cylinder, a double acting needle picker, pattern means for controlling the picker at each course during the knitting of a toe pocket, main pattern means controlling the formation of a stocking, and means through which the main pattern means controls the first mentioned pattern means to effect the knitting of right and left toe pockets alternately.

6. A circular knitting machine comprising a needle cylinder, needles adapted to slide in said cylinder, means for feeding yarns to the needles, means to control needle movements to form stitches, means for imparting reciprocatory moments to the cylinder, a double acting needle picker, pattern means for controlling the picker at each course during the knitting of a toe pocket, main pattern means controlling the formation of a stocking, and means through which the main pattern means controls the first mentioned pat-

tern means to effect the knitting of right and left toe pockets alternately, said first mentioned pattern means comprising a drum arranged to make substantially a half revolution to each cycle of the main pattern means, and having one half arranged to control formation of a right toe pocket and one half to control the formation of a left toe pocket.

7. A circular knitting machine comprising a needle cylinder, needles adapted to slide in said cylinder, means for feeding yarns to the needles, means to control needle movements to form stitches, means for imparting reciprocatory movements to the cylinder, a double acting needle picker, and means for controlling said picker to form during reciprocatory knitting a gore below the heel of a stocking, and for controlling said picker selectively in reciprocatory movements of the needles in opposite directions to form right and left toe pockets.

8. A circular knitting machine comprising a needle cylinder, needles of long and short butt series adapted to slide in said cylinder, means for feeding yarns to the needles, means to control needle movements to form stitches, means for imparting reciprocatory movements to the cylinder, a double acting picker adapted to pick needles of both the long and short butt series, and means for controlling said picker to form during reciprocatory knitting a gore extending forwardly of the heel of a stocking and formed in part by needles of the long butt series, and for controlling said picker selectively in reciprocatory movements of the needles in opposite directions to form right and left toe pockets.

9. A circular knitting machine comprising a needle cylinder, needles of long and short butt series adapted to slide in said cylinder, means for feeding yarns to the needles, means to control needle movements to form stitches, means for imparting reciprocatory movements to the cylinder, a double acting picker adapted to pick needles of both the long and short butt series, means for controlling said picker to form during reciprocatory knitting a gore extending forwardly of the heel of a stocking and formed in part by needles of the long butt series, and for controlling said picker selectively in reciprocatory movements of the needles in opposite directions to form right and left toe pockets, and cam means for restoring needles of the long butt series which are picked by said picker so that said picker is effective to control stitch formation on needles of the short butt series only in the formation of said toe pockets.

10. A circular knitting machine comprising a needle cylinder, long and short butt needles adapted to slide in said cylinder, means for feeding yarns to the needles, means to control needle movements to form stitches, means for imparting reciprocatory movements to the cylinder, a double acting picker adapted to pick both long and short butt needles, and a pair of cams for returning picked long butt needles before they reach said needle movement controlling means, one of said cams acting during movements of the needles in one direction in the formation of a right stocking, and the other of said cams acting during movements of the needles in the opposite direction in the formation of a left stocking.

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