Oct. 24, 1933. H. N. SHEPPARD 1,932,292

KNITTED STOCKING AND PROCESS FOR MAKING SAME

Filed Sept. 8, 1932 3 Sheets-Sheet 1

Fig. 2.

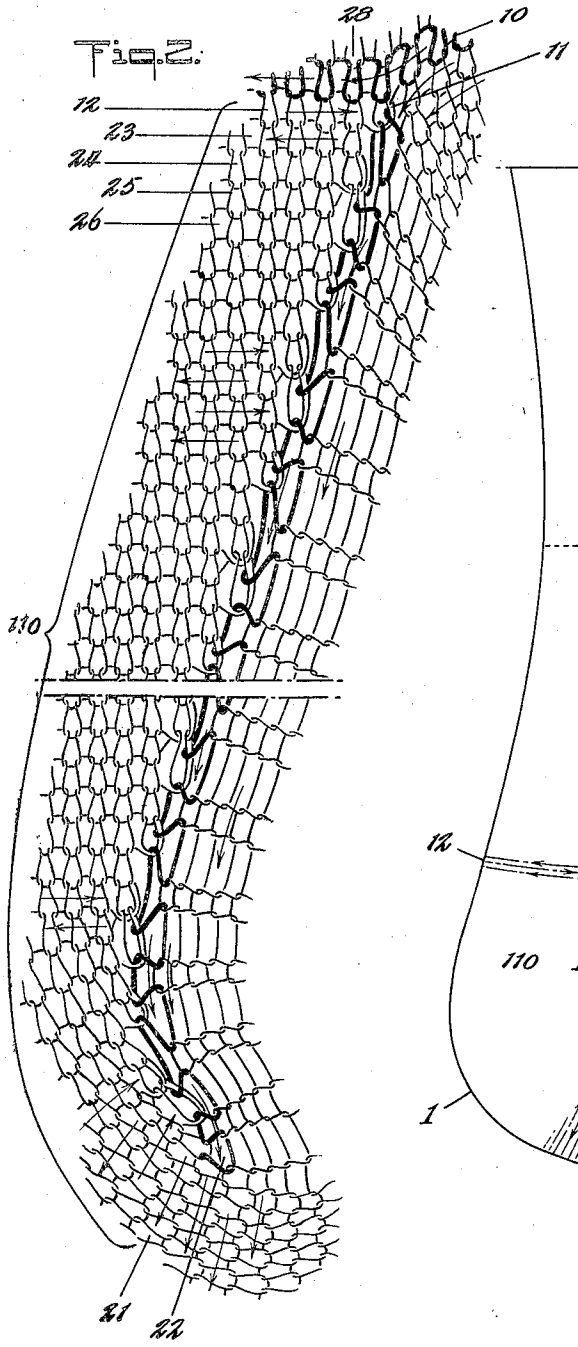
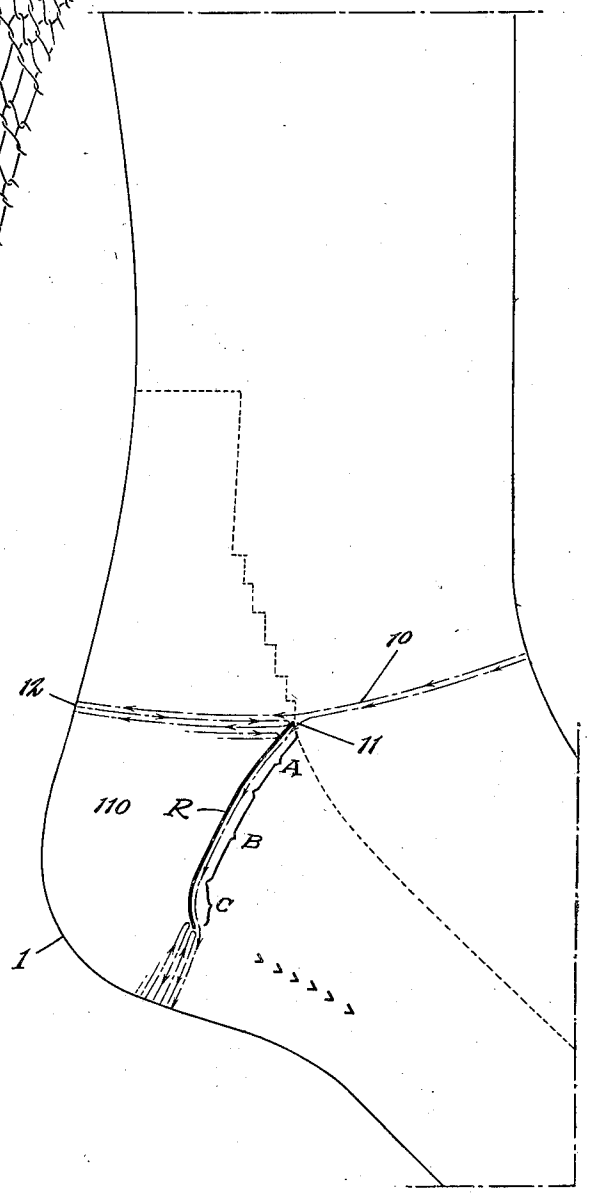


Fig. 1.



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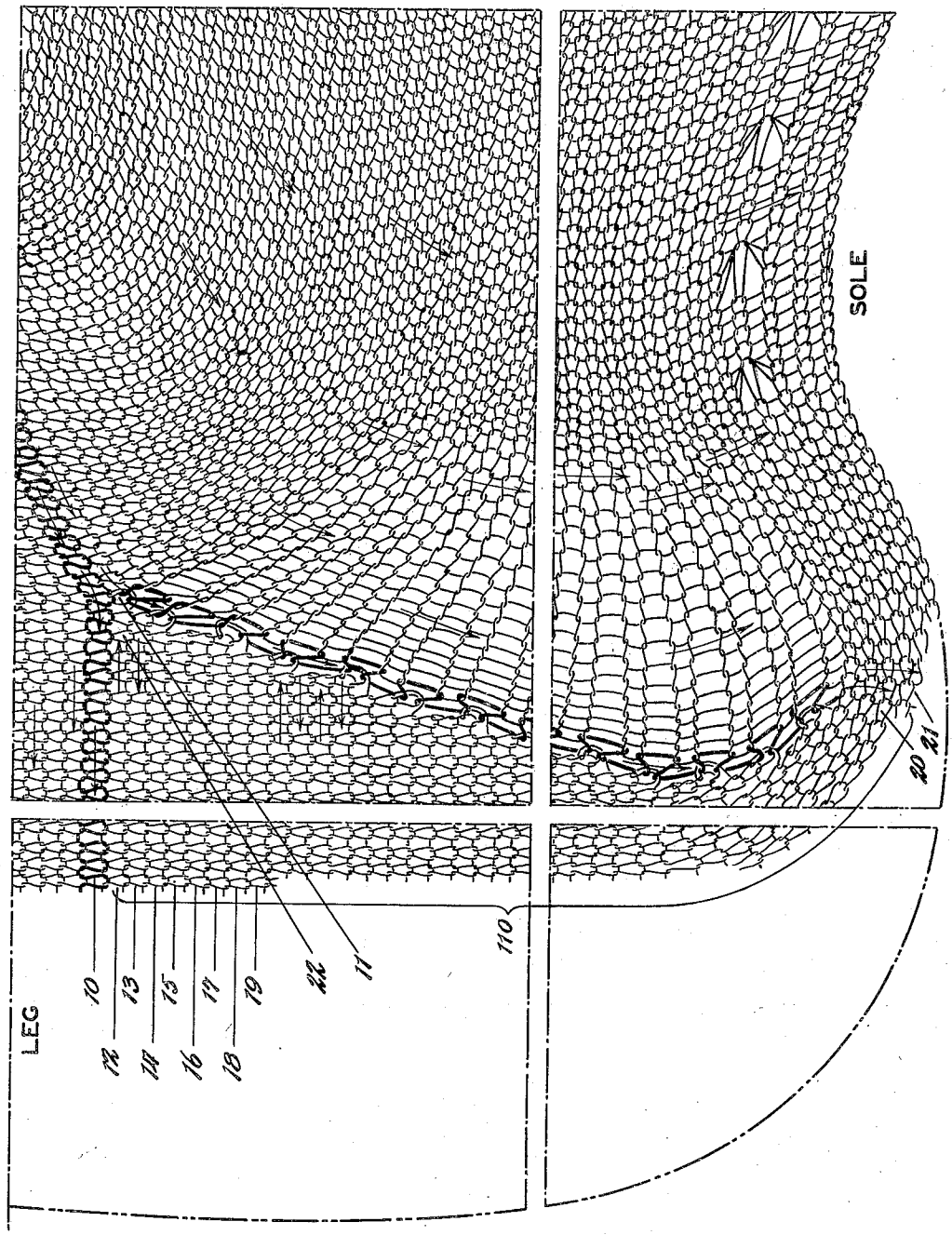


Fig. 2.

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Filed Sept. 8, 1932 3 Sheets-Sheet 3

Fig.4.

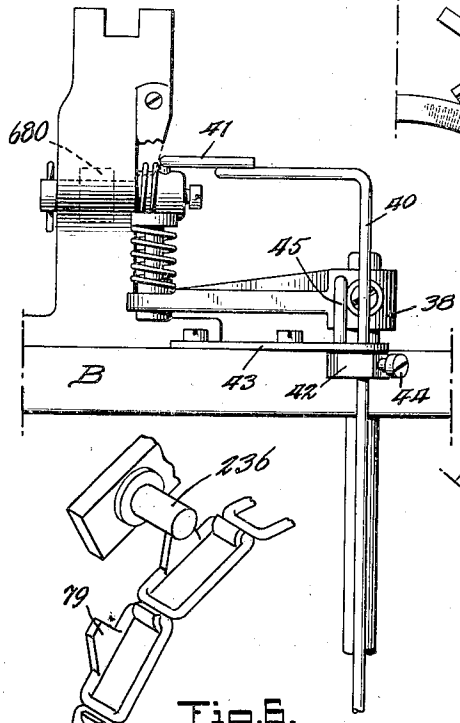


Fig.5.

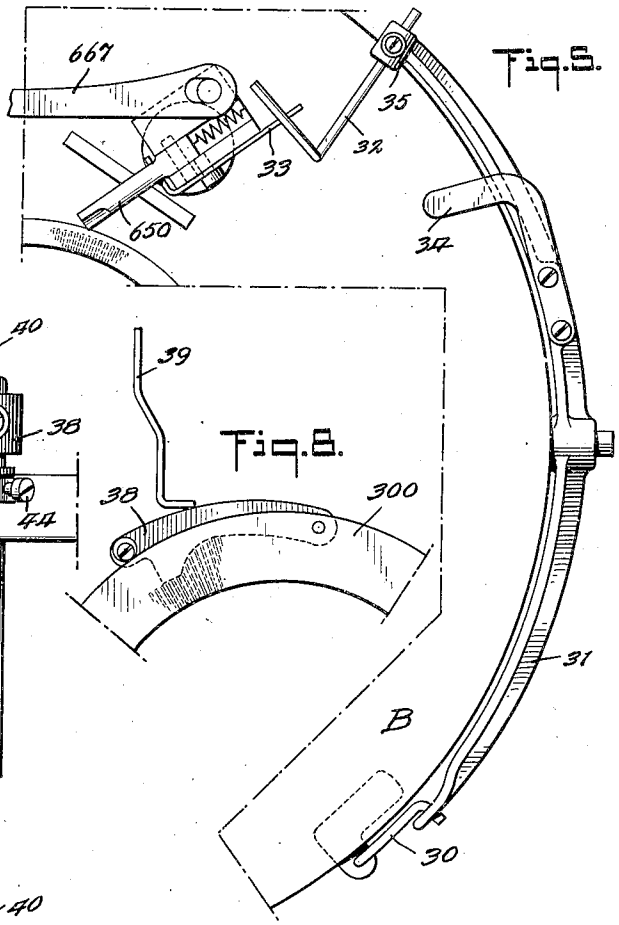
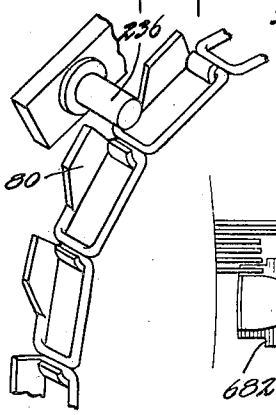


Fig.8.

Fig.6.

Fig.9.



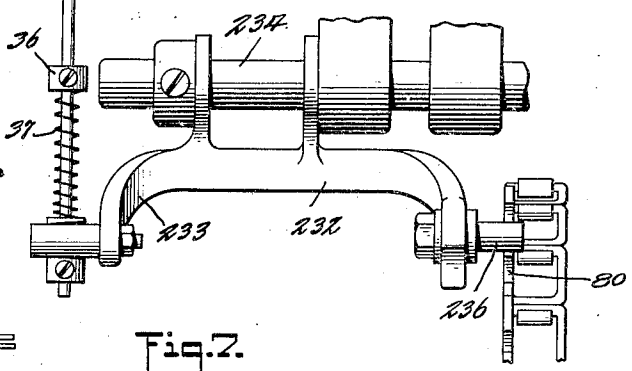
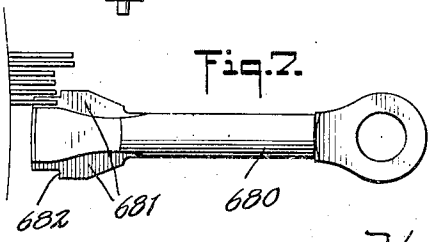


Fig.7.



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Patented Oct. 24, 1933 1,932,292

UNITED STATES PATENT OFFICE

1,932,292

KNITTED STOCKING AND PROCESS FOR MAKING SAME

Harry N. Sheppard, Maplewood, N. J., assignor to Scott & Williams, Incorporated, New York, N. Y., a corporation of Massachusetts

Application September 8, 1932. Serial No. 632,213

9 Claims. (Cl. 66—187)

This invention relates to seamless stockings and the method of their manufacture, and more particularly to an improved heel structure in the stocking. The machine for making this stocking is claimed in my divisional application Ser. No. 688,014, filed September 2, 1933.

The ordinary seamless heel pocket is composed of a narrowed segment followed by a widened segment, the narrowed segment being knit first. The entire pocket is made by reciprocatory knitting, during which the machine runs at a lower speed than when making round and round or rotary knitting. This heel pocket has a diagonal suture on each side of the heel pocket in between the narrowed and widened segments pointing toward the point of the heel and extending inwardly to what may be termed the corner of the heel, i. e., the portion where the segments forming the heel come to a point and touch the instep. According to my invention the heel pocket is formed of a narrowed segment only, that segment preferably being formed in a novel manner and the subsequent knitting of the sole being altered slightly to conform thereto. Among the advantages of my invention are the increased strength of the stocking, the increased speed of manufacture, the increased adaptability of the machine, and the improved appearance and wearing qualities of the stocking. In a stocking manufactured according to this invention the number of courses in the narrowed segment is increased over the number ordinarily found in the narrowed segment of a seamless heel or toe pocket without increasing the number of needles involved in the making of the segment. This changes the shape of the heel by increasing the angle of the narrowed segment at the corner of the heel, so that the necessity for the widened segment is done away with. By increasing the number of courses in the narrowed segment without increasing the number of needles on which it is made, the heel is made compact and solid and, in fact, the congestion of stitches near the point of the heel is so great as to cause the lower end of the suture between the narrowed segment and the sole to turn forward slightly toward the toe of the stocking. In this way the necessary extent of reinforced fabric is produced for the bottom of the heel, but the amount of reinforcement on the side of the heel is reduced slightly. Furthermore it should be noted that owing to the increased angle formed by the segment at the corner of the heel, the suture line of the heel is practically vertical where it is subject to very much less strain than if it were directed toward the point of the heel. The angle formed between the suture line and the direction of the wales in the narrowed segment, combined with the increased number of courses in the narrowed segment, causes the fabric to pucker where the narrowed segment is joined to the sole. In this connection, it is necessary to join together an unequal number of courses, there being more courses in the heel than wales in the sole. In order to avoid puckering along the suture line, it is therefore proposed to slacken some stitches in the sole, the preferred form being the slackening of all the stitches along the suture line for one to four courses in the sole adjacent the suture. There is no need to slacken the first few courses in the sole adjacent the bottom of the heel where there is no suture line.

The increased number of courses in the narrowed segment constituting the heel is produced by manipulation of the narrowing or widening mechanism. Two ways of manipulating the narrowing and widening mechanism of the usual circular seamless hosiery machine to produce this increased number of courses in a desirable manner are, firstly, to interrupt the narrowing operation intermittently, or, secondly, to have the narrowing conducted at the regular intervals and to widen intermittently. In this form the widening picker is shaped and located in a novel manner. In this manner the number of courses which it takes to narrow the usual or requisite number of needles is increased to any desired extent.

Referring now to the drawings,

Fig. 1 is a diagrammatic view of the outline of a portion of a stocking showing a heel manufactured in accordance with my invention, the arrowheads on the dot and dash lines indicating the direction in which the knitting is proceeding and the courses being indicated by the dot and dash lines;

Fig. 2 is a diagrammatic showing of the interlooping of the stitches along the suture line of a heel made in accordance with my invention, the particular interlooping shown in this figure being different from Fig. 1;

Fig. 3 is a diagrammatic view of the interlooping of the stitches in a third form of heel made in accordance with my invention;

Fig. 4 is a front elevation of sufficient of the ordinary well-known Scott & Williams type of revolving needle cylinder hosiery machine to show mechanism for intermittently operating the novel widening picker to produce the interlooping of Fig. 2;

Fig. 5 is a plan view of part of the bedplate

of a Scott & Williams machine showing mechanism to interrupt the narrowing operation intermittently to produce the structure shown in Fig. 3, the narrowing picker being shown swung horizontally to inoperative position;

Fig. 6 is a perspective view of the links on the main pattern chain of the machine, suitable for causing the intermittent stopping of the narrowing operation by the mechanism shown in Fig. 5, the pin 236 being shown in a position to interrupt the narrowing;

Fig. 7 is a plan view from the underside of an improved form of dropper or widening picker used in the mechanism shown in Fig. 4, together with its relation to the needle butts operated thereby;

Fig. 8 is a plan view of a portion of the sinker cam cap with a pivoted cam for pushing sinkers in selectively to cause local slackening of the stitches after the heel is completed, while

Fig. 9 is a perspective view similar to Fig. 6, showing the pattern chain used in Fig. 4 to control the operation of the widening picker, the pin 236 being shown in a position to bring it into operation.

This invention relates to an improvement on the stocking shown in the McNary Patent Reissue No. 428, dated February 17, 1857, in which the heel pocket consists solely of a widened segment knit by narrowing one needle at each end of the active group on each reciprocation. The manufacture of the stocking will be described as if it were being carried out on the Scott & Williams machine shown and described in the patent to A. E. Page and F. R. Page No. 1,841,205, dated January 12, 1932, modified as described below. In that machine the heel and toe pockets are knit on opposite sides of the circle of needles, the heel pocket being knit on the short butt side. The Scott & Williams type of machine is shown and described in the patent to Robert W. Scott No. 1,152,850, dated September 7, 1915.

In the ordinary manufacture of the narrowed segment of a seamless heel or toe pocket, the active group of needles is shortened one needle at each oscillation of a reciprocation. Thus, as an oscillation starts and before the active group of needles reaches the knitting cams, the leading needle meets a narrowing picker 650 (Fig. 5) and is raised to idle position. On the oscillation in the opposite direction the other narrowing picker 650 will raise the leading needle at the other end of the active group. By thus narrowing one needle on each course in the segment, the number of courses in the segment is kept equal to the number of needles on which the segment is knit, but this produces a segment which, at the corner 11 of the heel where the point of the segment meets the instep, covers an arc of only about 45°, the lower edge of the segment therefore when completed being at approximately the point 1 of the heel. Such a segment is, of course, of very little use because it does not protect against the wear which occurs on the bottom of the heel at the position where the widened segment of the ordinary present day heel and toe pocket is located. By delaying the narrowing operation so that the heel includes a larger number of courses than there are needles knitting the segment, the segment is made wider and extends underneath the foot a sufficient distance without taking all the additional time necessary to knit a widened segment.

Referring now to the method of manufacture of the structure shown in Fig. 3, where the narrowing is slowed down by interrupting the action of the narrowing pickers, the construction shown in that figure is obtained by omitting the narrowing operations on every third reciprocation, that is to say, by failing to narrow the usual one needle at one end on one course and on the other end of the following course, then narrowing as usual on two complete reciprocations and repeating the cycle of operations.

The course of stitches shown with a heavy black line near the top of this figure is the last complete or rotary course 10 knit before beginning reciprocation of the heel, the course being knit in the direction of the small arrows in that course. In Fig. 3 only one side of the stocking is shown. The first reciprocatory course 12 is in the reverse direction, being from left to right, as shown in this figure, and the last needle to knit on this course is the one which is knitting at the corner 11 of the heel. Being the last needle to knit in this course, it becomes the leading needle of the active group in the first reciprocatory course 13 in the forward direction and therefore meets one of the narrowing pickers 650 before it takes the yarn or knits and is thrown out of action by that picker. The needle which knits the stitch at the corner 11 of the heel gets a bight of yarn around its shank as it is raised, and does not knit in course 13. On the second reciprocatory course 14 in the reverse direction the needle adjacent to the one which knit the stitch at the corner 11 now knits for the last time and is then thrown out of action at the beginning of course 15, in the same manner in which the needle that knit at the corner 11 was thrown out of action on course 13. Course 16—which is the third course in the reverse direction—is knit in the same manner as courses 12 and 14 but the picker 650 is removed from the path of the needle in the second wale 22 from the corner 11, so that on course 17 the first needle to knit is the last needle to knit in course 16. In course 18, namely, the fourth course in the reverse direction, the needle in wale 22 knits but is thrown out of action at the beginning of course 19 with the loop and bight on its shank, as in the case of the previous needles thrown out of action, and this cycle of operations is kept up, picking out of action for two reciprocations and missing the picking after the third course in the reverse direction. At the same time, of course, the complemental cycle is being carried out on the other side of the stocking with the needles being picked out of action at the beginning of the even numbered courses, namely, those in the reverse direction.

When the segment 110 has been narrowed to the desired point, namely, the course numbered 20, the machine changes back to rotary knitting and course 21 is knit all the way around the stocking. This course is indicated by a heavy line with small arrows indicating the direction of knitting therein. It will be observed that this yarn interloops with all the loops and bights on the shanks of the needles which have been thrown out of operation, as well as knitting on the ever active group of needles at the bottom of the heel.

As already mentioned, it is desirable to avoid puckering along the suture line R formed by this course 21 made at the close of the heel and this can be accomplished by slackening the stitches along the suture. Mechanism which can cause this local slackening is well known, and reference is made to the Robert W. Scott Patent No. 1,189,220, dated June 27, 1916, where by using

sinkers having different heights of operating butts, certain sinkers can be pushed further in to cause slackening at any desired point in the circle of needles. Such slackening should be caused at the stitches along the suture R on each side of the heel. While in Fig. 3 I have shown fifteen or sixteen courses so slackened, it is generally not necessary to slacken more than three or four courses.

If desired, the rate of narrowing during the making of the segment 110 may be altered from time to time, giving a different shape and causing the suture line R to bend in a different manner. Thus, for instance, the rate of narrowing may be changed twice, the first portion A (Fig. 1) being knit with one rate of narrowing and the next portion B being knit with a different rate of narrowing, and the portion C being knit with still a third rate of narrowing. The rate of narrowing may be increased or decreased as the knitting of the segment 110 progresses. An example of the decreased rate of narrowing would be to make the portion A by interrupting the narrowing at every third reciprocation, making the portion B by interrupting the narrowing on every other reciprocation, and making the portion C by allowing narrowing to proceed in the ordinary manner, narrowing at each end on each reciprocation.

Mechanism for interrupting the operation of the narrowing pickers is shown in Figures 5 and 6 and the lower part of Fig. 4. This mechanism is actuated from lugs 79 (Fig. 6) on the left side of the main pattern chain of the machine to lift one of the narrowing pickers out of operative position every third reciprocation. In the Scott & Williams type of revolving needle cylinder hosiery machine, during reciprocation the machine knits six courses for each link of the chain, this representing three complete reciprocations of the machine. As shown in Fig. 6 of the drawings, there is a lug 79 on the left side of the pattern chain covering one-third of the length of the link and adapted to raise one of the narrowing pickers. In the Scott & Williams type of revolving needle cylinder machine the narrowing pickers are tied together by a lost motion link 667 in such a manner that when one of the narrowing pickers 650 is moved from operative to inoperative position by contact with the butt of the leading needle of the active group, the link will pull the other narrowing picker into operative position, ready to pick up the leading needle on the next oscillation in the opposite direction. As long as this picker which has just been moved into operative position is not swung in a horizontal plane, the other picker will remain out of action and therefore if the operative picker is elevated to inoperative level without being turned in a horizontal plane, both pickers will be out of operative position. Therefore mechanism is provided transmitting the indication of the lug on the pattern link to one of the pickers. This mechanism consists of a bracket 232 pivoted on a stud 234, having a pin 236 overlying the lugs 79 on the left side of the pattern chain, the bracket 232 also having an arm 233 connected to a vertical rod 30 (Fig. 5), the upper end of that vertical rod underlying the front end of a lever 31 pivoted on the edge of the bedplate D of the machine. The rear end of this pivoted lever 31 contains a finger 32 overlying the rear end of a pivoted idling catch 33. The front end of this idling catch 33 underlies the narrowing picker 650 and when the rear end of that idling catch 33 is pushed downwardly the narrowing picker 650 is lifted to inoperative position. When the pin 236 on the bracket 232 is raised by a lug 79 on the pattern chain, the vertical rod 30 is raised, lowering the rear end of the lever pivoted on the bedplate D, tipping the idling catch 33 and raising the picker 650 to idle position.

In order to insure the narrowing picker 650 not being raised to inoperative level except upon positive indication from a lug on the pattern chain, there is a flat spring 34 on the bedplate lever 31 tending to hold the rear end of that pivoted lever 31 in its up position. In addition the connection between the bracket and the vertical rod is a spring-compressed connection (exactly like that shown in the lower part of Fig. 4), in order that the exact extent of the movement of the narrowing picker 650 may be determined by a stop 35 on the rear end of the bedplate lever 31 rather than by the exact height of the lug 79 on the pattern chain. This spring-compressed connection between the bracket 232 and the rod 30 consists of a sleeve 36 fastened on the rod 30 in the same manner in which it is fastened to rod 40 in Fig. 4, a short distance above the bracket arm 233, and a compression spring 37 between that sleeve 36 and the arm 233, the rod 30 passing through the end of the arm. The raising of the arm 233 of the bracket therefore causes spring pressure upward on the rod.

In Fig. 8 is shown means for slackening the stitches locally in the general manner of the Scott Patent 1,189,220 above identified, these means consisting of a cam 38 in the sinker cam cap 300 adapted to press radially inwards sinkers having butts of the proper height, the lever 39 tending to press said pivoted cam 38 radially inward, and any suitable mechanism (not shown) may be provided for operating the lever 39 or acting directly on the cam 38.

In the preferred method of manufacture of my heel as illustrated in Fig. 2, the narrowing operation of the machine is permitted to take place without interruption and the rate of narrowing in the segment is varied by means of intermittent use of the novel widening picker. According to this method, at intervals a needle which has been raised out of action by a narrowing picker is returned into action by a widening picker 680. It is found that by varying the active segment of needles in this manner a particularly strong suture is obtained.

Still referring to Fig. 2, the last circular course 10 before the heel, indicated by a heavy line at the top of the figure, is knit toward the left hand side of the heel as shown in the drawings, and the first reverse course, i. e., the course marked 12, is knit toward the right, as shown in this figure. The last needle to knit in this course is at the corner 11 of the heel, as defined near the opening of the specification. As soon as the oscillation for the first forward reciprocatory course 23 of the heel starts, the leading needle of the active segment, which is the one knitting the wale at the corner of the heel, is met by the narrowing picker 650 and raised out of action. On the next or second course 24 in the reverse direction, the last needle to knit is the needle in the wale 28 next to the corner 11 of the heel, and on the second forward reciprocatory course 25 that needle is raised out of action before it can knit. On the next course, i. e., the third course 26 in the reverse direction, the manipulation is different from that of Fig. 3 in that the dropper or widening picker 680 comes into action. On the oscillation in this direction the needle knitting

the wale 28 next to the corner 11 which was raised out of action on the previous course 25 before it reached the yarn in the knitting cams, is now the leading needle of the inactive segment following the active segment, and therefore meets the dropper or widening picker 680 and is pushed down into position as the last needle of the active group before it reaches the yarn of the cams. Therefore the loop left around the shank of the needle in the wale 28 next to the corner 11 when that needle was raised out of action at the beginning of course 25, is now knit as the stitch in course 26. Thus the rate of narrowing is the same as in Fig. 3, namely, a net narrowing of two needles at each end of the segment in three complete reciprocations. In this way a stronger suture line is obtained. The cycle just described is repeated throughout the fabric shown in Fig. 2 until the narrowed segment is completed, and the first complete circular course 22 after the knitting of the heel starts on the side of the heel (not shown in the drawings) at the corner 11 of that other side and as a continuation of the partial course 21 near the bottom of the heel. This first complete circular course 22 is indicated in the drawing by a heavy line, as in the case of Fig. 3. As in the case of the production of the stocking by means of interrupting the narrowing without the use of the widening picker, it is possible when narrowing at a regular rate and using the widening picker intermittently, to vary the rate of narrowing by varying the intermittency of the use of the dropper or widening picker.

A mechanism suitable for operating the widening picker or dropper is shown in Figs. 4, 7 and 9, consisting of means actuated from lugs on the left side of the pattern chain to push the widening picker 680 into inoperative position during the making of the heel except when it is desired to slow down the rate of narrowing. The type of lug for causing intermittent operation of the widening picker is indicated in Figs. 4 and 9 by the reference character 80. It will be noted that while the lugs 79 interrupt the narrowing of the segment by the narrowing pickers 650 (Fig. 3), it is the absence of the lugs 80 which causes the widening picker to interrupt the narrowing of the segment in Fig. 2. As shown in the drawings, the mechanism for operating the widening picker 680 consists of a bracket 232 on the stud 234 of the machine, identical with the bracket used with the mechanism of Fig. 5, having a pin 236 overlying the left side of the pattern chain, a vertical rod 40 somewhat similar to the rod for interrupting the narrowing pickers but calculated to underlie a bent tail 41 on the widening picker 680, the picker being adapted to be lowered to inoperative position by the raising of the vertical rod 40. The spring-pressed connection between the bracket 232 and the vertical rod 40, as in the case of the construction used with the narrowing picker interrupting mechanism shown in Fig. 5, consists of a sleeve 36 fixed on the vertical rod 40 and a compression spring 37 between that sleeve 36 and the arm 233 of the bracket, the lower end of the rod passing through the arm 233 of the bracket. The exact amount of movement of the widening picker is determined by a stop rather than by the height of the lugs on the left side of the pattern chain, the stop in this instance being a sleeve 42 fastened on to the vertical rod 40 just below a guide plate 43 on the bedplate B of the machine. The sleeve 42 can be adjusted in proper position by means of a screw 44 therein and the sleeve has a pin 45 projecting upwardly from one side of it through the guide plate 43, this pin 45 being long enough to stay in the hole in the bedplate when the vertical rod 40 is in its lowermost position. The function of this pin in the sleeve is to keep the vertical rod from turning, which would have the effect of bringing its bent upper end out from under the bent tail 41 of the widening pick.

It will be noted that the lugs 80 on the chain (Fig. 9) occupy two-thirds of the length of each link, the widening picker 680 being arranged in such a manner that when the rod 40 is raised it is moved to inoperative position and therefore the absence of a lug at this portion of the chain corresponds to the activity of the widening picker 680 which lengthens the narrowing of the segment of the fabric.

In the fabric shown in Fig. 2, it will be noted that the widening picker returns only one needle to activity at a time. In the modern seamless hosiery machines, however, it is customary to make the widened segment of both the heels or toes by the so-called "two down and one up" method, this requiring that the widening picker lower two needles at a time. It therefore is necessary that the widening picker, when making a stocking according to my invention, be able to lower two needles at a time during the making of the widened segment of the toe, but only one needle at a time during the making of the narrowed segment which constitutes my improved heel.

In the machine shown in the Page Patent 1,841,205 above identified, the heel is manufactured on the short butt side of the circle of needles and the toe is manufactured on the long butt side. I therefore have devised a picker 680 which is shown in Fig. 7, adapted to perform all the operations required to make my heel and toe in the machine of that Page Patent 1,841,205. This picker 680 has lips 681 on each side which are wide enough to take two needles but, as shown in the drawings, the portions of those lips at the end of the picker have notches 682 therein which reduce their width so that at the end of the picker the lips 681 are wide enough to take only one needle each at a time. As shown in Fig. 7, these notches in the ends of the lips 681 are long enough so that the butts of the needles on the short butt side of the needle circle, i. e., on the needles which are active during the making of the heel, will not project far enough from the needle cylinder to reach the wide portion of the lips. It therefore will be obvious that during the making of the heel the picker will take only one needle at a time. On the other hand, during the making of the toe the needles which are to be picked back again into action have butts which are long enough to lie in the path of the wide portions of the lips, and therefore during the making of the toe the dropper will be effective to take two needles at a time. These notched lips can be availed of in making other seamless fabrics to vary any picking in any desired manner by the corresponding arrangement of needle butt lengths. Thus, needles can be picked down one and two in alternation or if the wide portion of the lip is wide enough to take three needles then it is possible to pick down a short or long butt needle, skip the next short butt needle and take an adjacent long butt needle. The usual fashion marks can be placed in the foot if desired.

Many modifications of my invention which do

not depart from the scope of my invention will occur to those skilled in the art.

I claim—

1. A stocking having a seamless heel pocket consisting of a narrowed segment joined to the sole on each side of the stocking by a suture line, the stitches on the sole along the suture line being slackened for a plurality of courses.

2. A stocking having a seamless heel pocket consisting of a narrowed segment joined to the sole by a suture line on each side, the sutures joining a number of wales in the sole to a greater number of courses in the narrowed segment.

3. A stocking having a seamless heel pocket consisting of a narrowed segment joined to the sole on each side of the stocking by a suture line, there being more courses in the suture portions of the narrowed segment than wales in the portions of the sole joined thereto, and these portions of the sole containing slackened stitches adjacent the suture.

4. A stocking having a seamless heel pocket consisting of a single segment forming a larger angle at the corner than would be obtained by a segment of a regular seamless heel pocket, said pocket being formed by narrowing an average of less than one needle at each course in combination with slackened stitches on the sole adjacent said heel.

5. A stocking having a seamless heel pocket consisting solely of a narrowed segment joined to the sole by a suture line on each side of the stocking, the number of courses in the narrowed segment at the sutures being greater than the number of wales in the sole joined thereto.

6. A method of knitting a seamless stocking, comprising knitting the leg by circular knitting, forming a heel by reciprocatory knitting on less than the entire number of needles and gradually narrowing the segment, interrupting the narrowing intermittently while continuing to knit, and thereafter knitting a foot to the leg and the heel, slackening the wales of the sole joined to the heel along the suture for a plurality of courses adjacent the heel.

7. A method of knitting a seamless stocking comprising knitting the leg and thereafter forming the heel by knitting a narrowed segment to the leg, interrupting the narrowing at each side of the stocking on recurrent courses so as to produce more courses in the segment than there are needles knitting it, and thereafter joining the heel to the foot by means of a suture and slackening the stitches in the sole in the wales opposite the suture for a plurality of courses but not the other stitches in those courses.

8. Method of knitting a seamless stocking, comprising knitting the leg, then forming a heel by reciprocatory knitting while picking needles out of action at regular intervals, and offsetting the narrowing action intermittently by picking needles back into action, and thereafter knitting a foot to the leg and heel while slackening the wales of the sole joined to the heel along the sutures on either side for a plurality of courses adjacent the heel, but not slackening the other stitches in said courses.

9. Method of knitting a seamless stocking, comprising knitting the leg, then forming a heel by reciprocatory knitting while picking needles out of action at regular intervals, and offsetting the narrowing action intermittently by picking needles back into action, and thereafter knitting a foot to the leg and heel while slackening the wales of the sole joined to the heel along the sutures on either side for a plurality of courses adjacent the heel.

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