March 5, 1946. C. RICHTER 2,395,908

MANUFACTURE OF FULL FASHIONED HOSIERY

Filed March 14, 1942 6 Sheets-Sheet 1

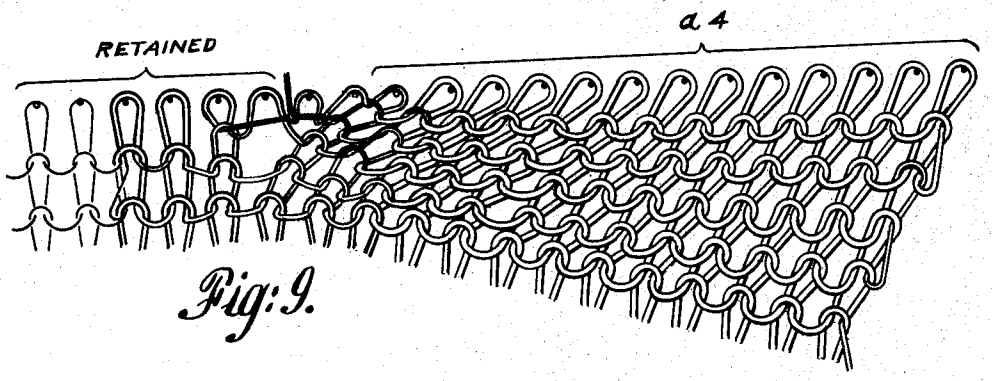


Fig: 9.

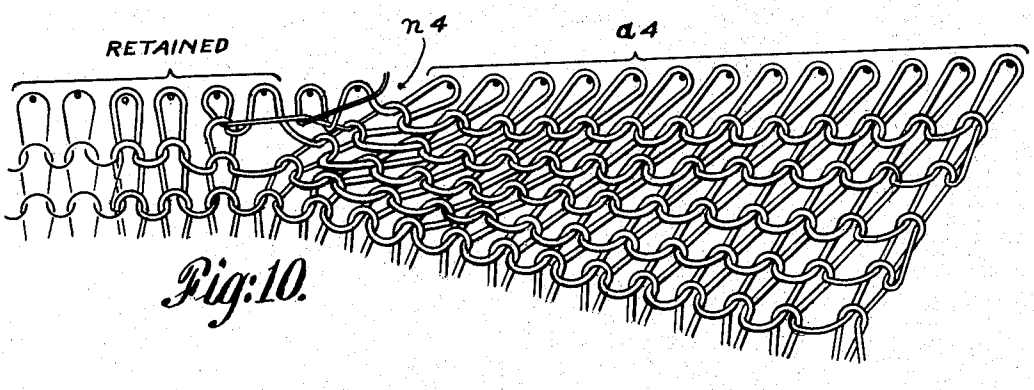
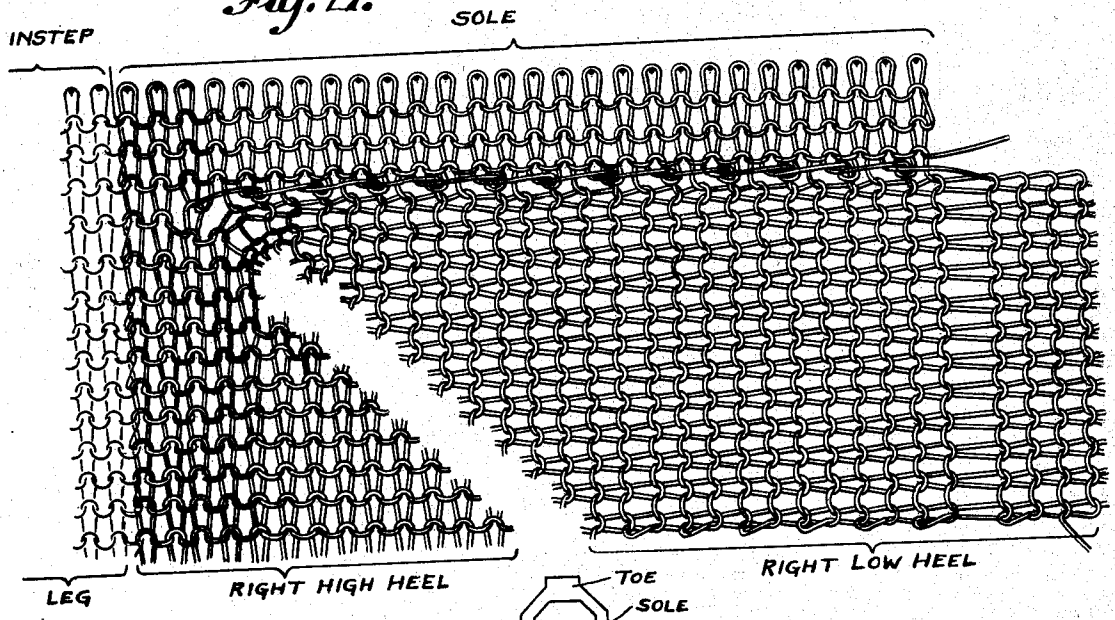


Fig: 10.

Fig: 2.



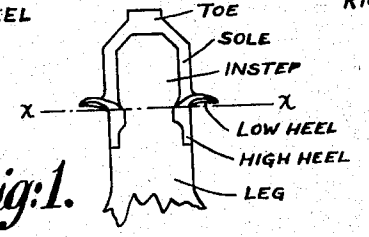


Fig: 1.

INVENTOR
Carl Richter
BY
Synnestvedt & Lechner
ATTORNEYS

March 5, 1946. C. RICHTER 2,395,908

MANUFACTURE OF FULL FASHIONED HOSIERY

Filed March 14, 1942 6 Sheets-Sheet 2

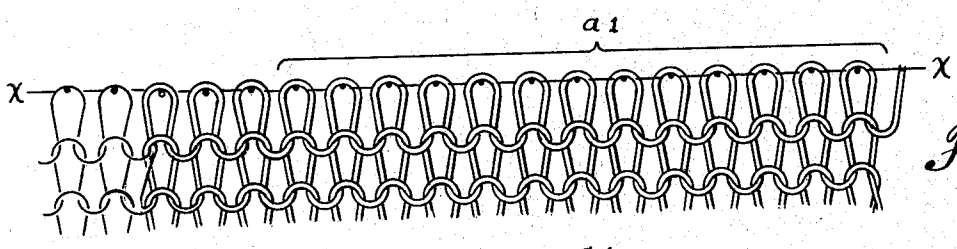


Fig:3.

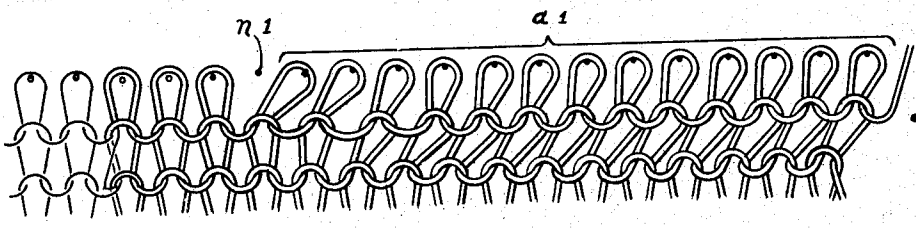


Fig:4.

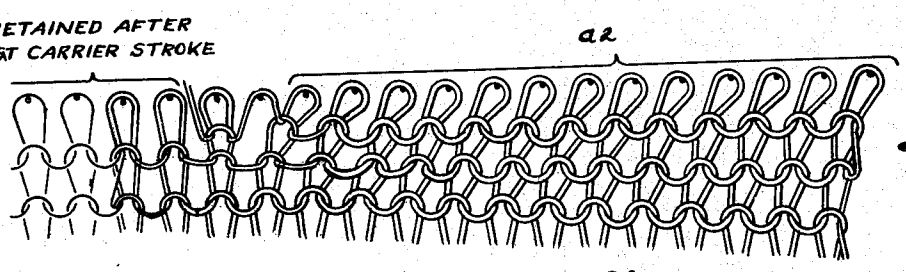


Fig:5.

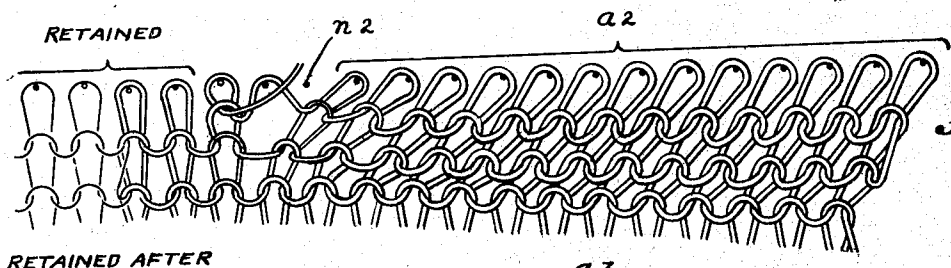


Fig:6.

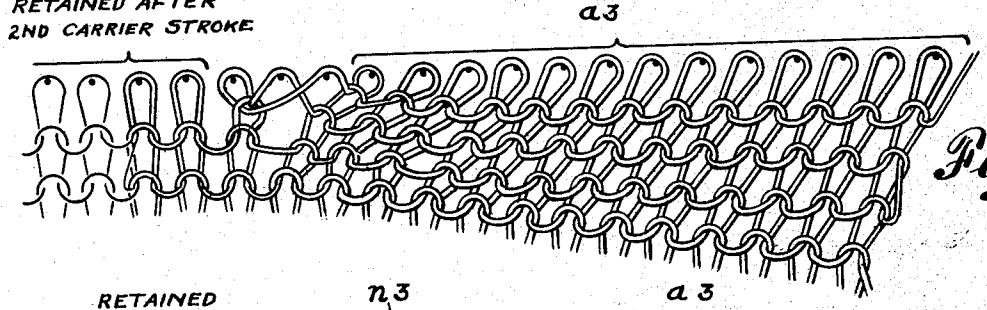


Fig:7.

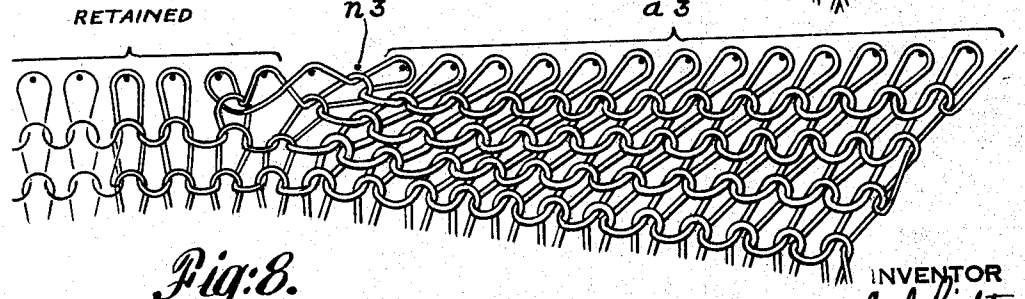


Fig:8.

INVENTOR
Carl Richter

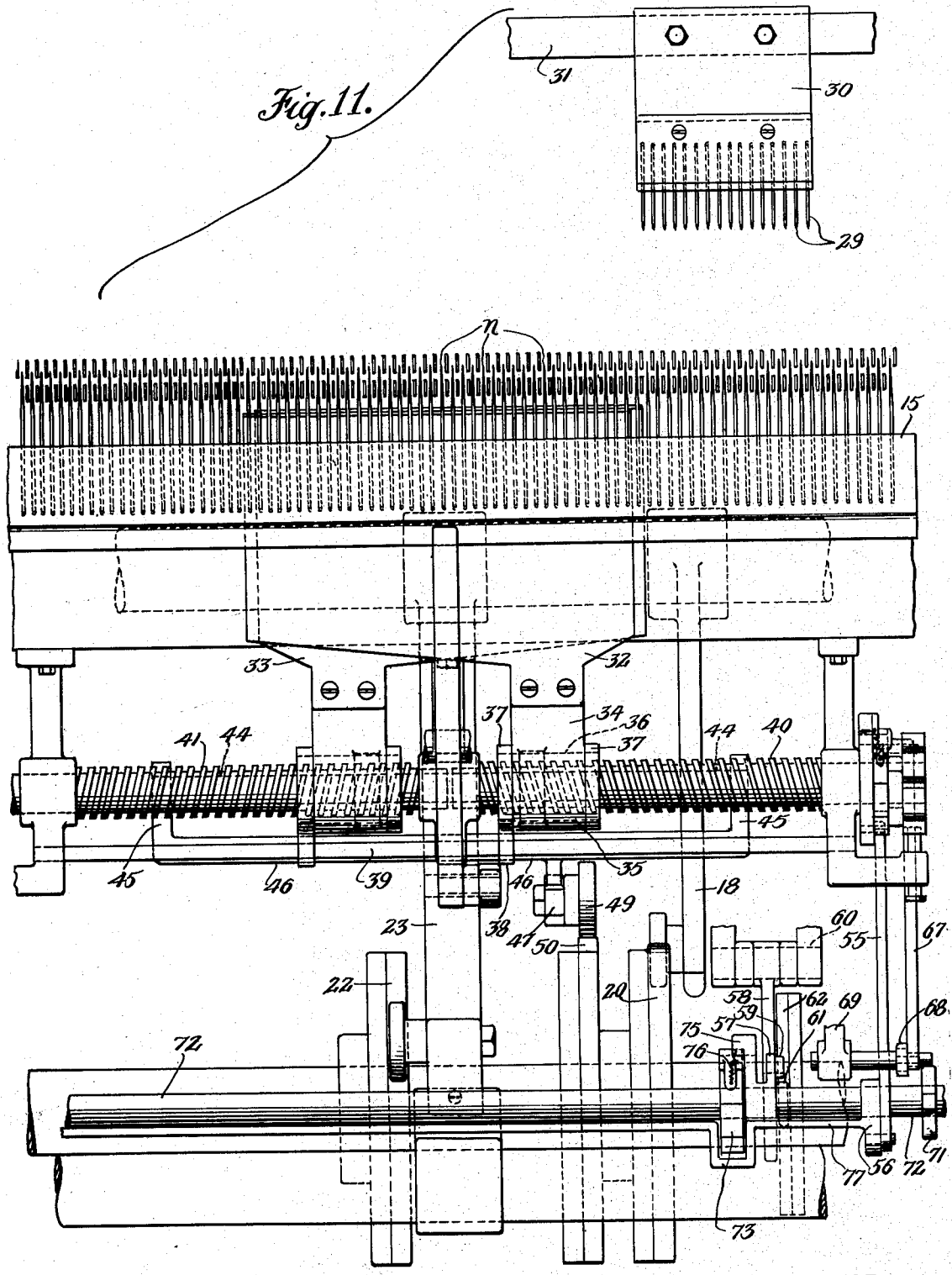
BY: Symmes, Maier & Lechner
ATTORNEYS

March 5, 1946. C. RICHTER 2,395,908

MANUFACTURE OF FULL FASHIONED HOSIERY

Filed March 14, 1942 6 Sheets-Sheet 3

Fig. 11.



INVENTOR
Carl Richter
BY
Symmetrical Scheme
ATTORNEY

March 5, 1946. C. RICHTER 2,395,908

MANUFACTURE OF FULL FASHIONED HOSIERY

Filed March 14, 1942 6 Sheets-Sheet 4

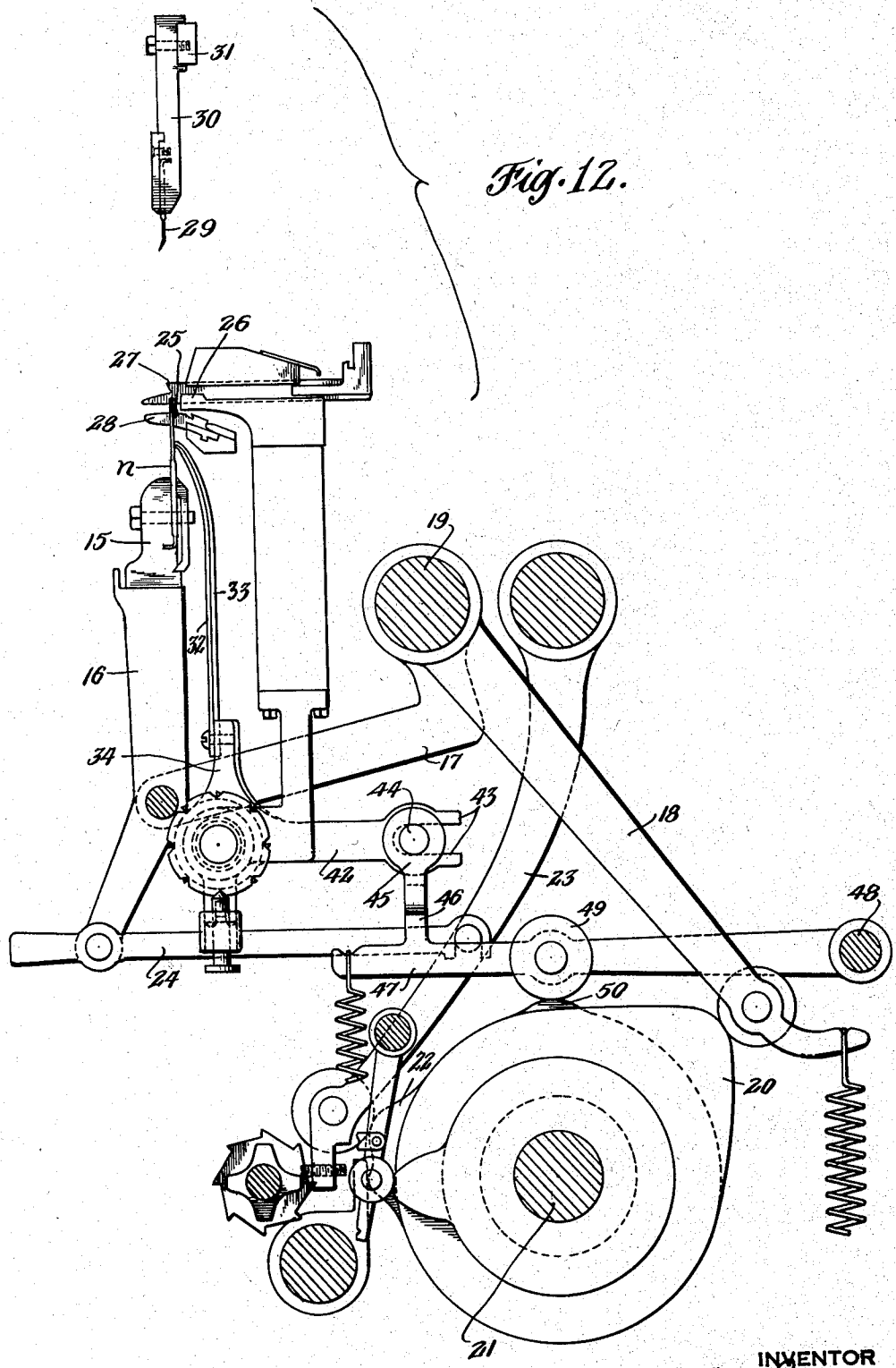


Fig. 12.

INVENTOR
Carl Richter
BY
Symmes & Lehmann
ATTORNEYS

March 5, 1946. C. RICHTER 2,395,908

MANUFACTURE OF FULL FASHIONED HOSIERY

Filed March 14, 1942 6 Sheets-Sheet 5

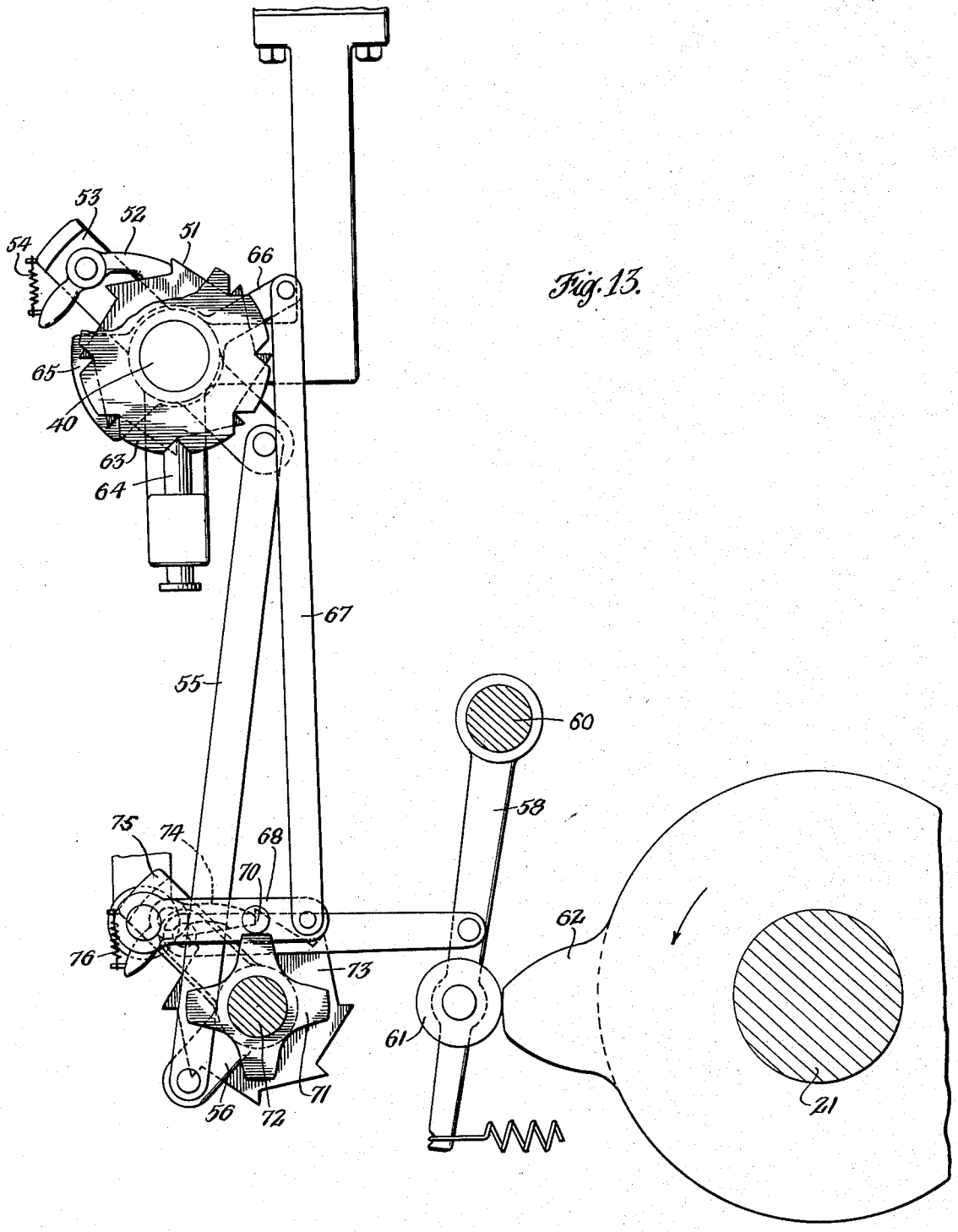


Fig. 13.

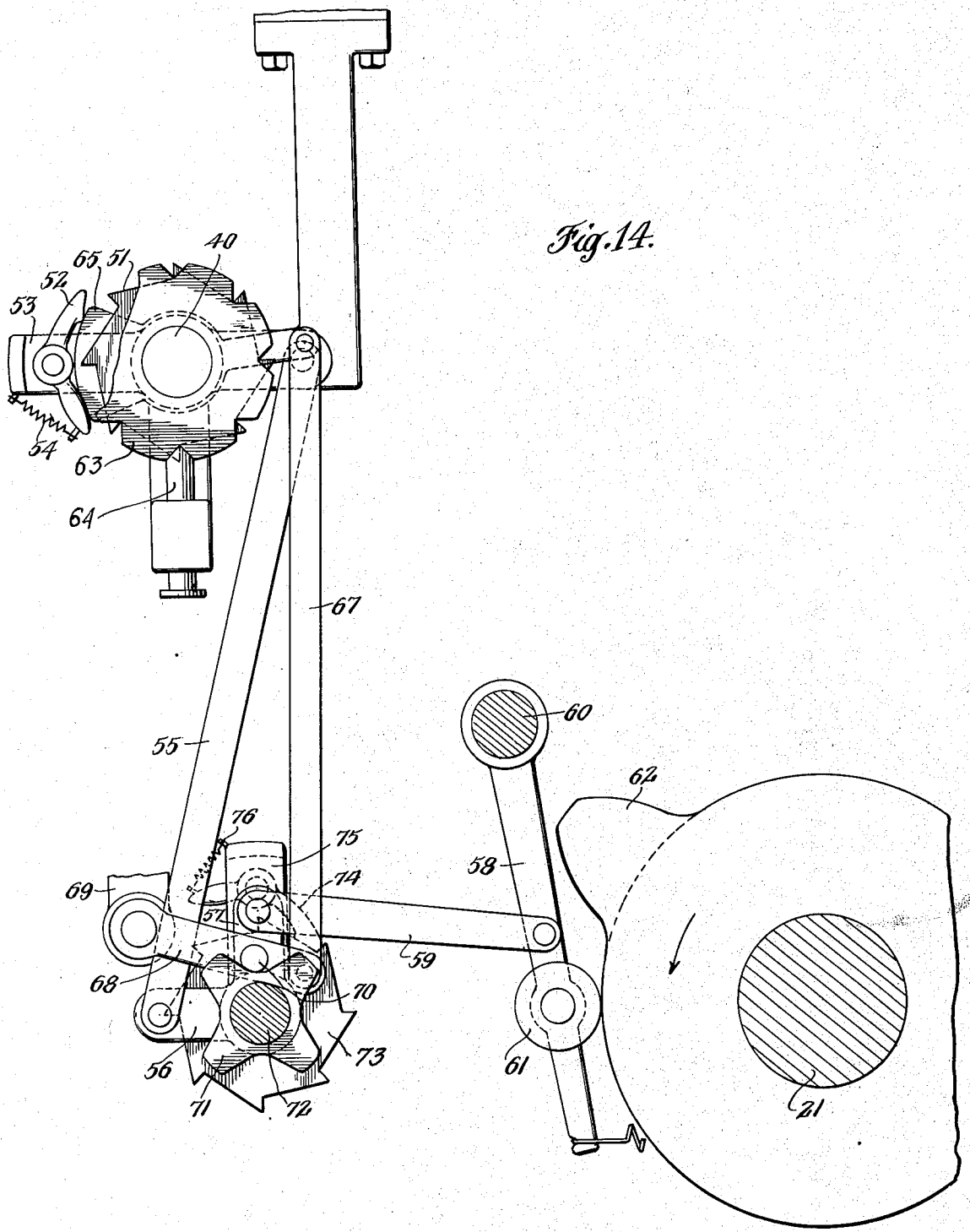
INVENTOR
Carl Richter
BY
Symmes & Lachmann
ATTORNEYS

March 5, 1946. C. RICHTER 2,395,908

MANUFACTURE OF FULL FASHIONED HOSIERY

Filed March 14, 1942 6 Sheets-Sheet 6

Fig. 14.



INVENTOR
Carl Richter
BY
Synnestvedt & Lechner
ATTORNEYS

Patented Mar. 5, 1946 2,395,908

UNITED STATES PATENT OFFICE

2,395,908

MANUFACTURE OF FULL-FASHIONED HOSIERY

Carl Richter, Chicago, Ill.

Application March 14, 1942, Serial No. 434,689

8 Claims. (Cl. 66—89)

This invention relates to the manufacture of full fashioned hosiery, especially to the knitting of flat, full fashioned stockings, such flat, full fashioned stockings being herein referred to as "stocking blanks."

Generally stated, the invention is concerned with improvement in the uniformity of knitting, particularly at the line of junction between the leg and foot portions at the instep; and provision for automatic continuous knitting through the turn of the heel, with the starting edges of the sole parts directly knitted to the inner edges of the low heel parts, thereby eliminating certain operations and handling heretofore required. Thus, the invention eliminates the necessity for employing a separate "footer" machine, or the topping or looping operations heretofore required to join the sole and low heel parts of stocking blanks produced on "single unit" machines.

Still further, the invention eliminates the relatively bulky seams heretofore formed in the stocking where sewing or looping was employed, subsequent to the knitting, to join the sole and low heel parts.

The sequence of knitting operations employed in accordance with the present invention may be briefly outlined as follows:

In the first place, it is noted that the invention contemplates employment of a machine of the single unit type capable of knitting not only the leg portion of the stocking blank, but also the foot portion thereof. The single unit machine of this invention incorporates certain new features and mechanisms illustrated in the drawings and described more fully hereinafter, all of which are arranged to achieve the general objects hereinbefore recited.

It may here be mentioned that even a machine of the standard "legger" type may be modified to incorporate the invention thereby, in effect, converting the standard legger to a single unit machine.

In either case (either with a standard legger or with a single unit machine), the knitting, as is customary, begins at the welt and continues through the leg or boot portion, toward the lower end of which the common high spliced heel parts are also knitted, one adjacent each side of the blank.

At the transverse junction line between the leg and foot portions at the instep (in the intermediate portion of the blank), and between the high and low heel parts (at the sides of the blank), the present invention provides continuation of knitting, as follows:

First, the leg loops at the instep (from which the foot portion is subsequently knitted) are retained on their respective needles, and while so retained a multiplicity of courses are knitted in each of the two low heel parts, as continuations of the high heel parts.

During this knitting of the low heel parts, the loops of the low heel parts are transferred outwardly. Although this outward transference of low heel loops may be effected on every second or third carrier stroke, preferably it is effected after each stroke of the thread carriers. The outward transference of the low heel loops is effected by means of "narrowing" fingers, which transfer the loops outwardly at each side, in a manner generally similar to a widening operation. After each stroke of the thread carriers, each low heel loop is moved outwardly to the next adjacent needle, thereby providing a blank needle at the inner edge of each low heel part. The traverse of the thread carriers is arranged so that on the next stroke thereof a loop is laid on the blank needles, these operations being repeated throughout the formation of the several courses of the low heel parts.

As a result of the foregoing, loops are progressively introduced at each side of the leg loops (which are being retained on their needles), to which newly added loops the sole parts are directly knitted, following completion of the low heel parts. Thus, the sole parts are directly knitted to the selvedge wale of the low heel parts, thereby eliminating the ridge heretofore commonly formed at the junction of the low heel parts and sole.

In contrast with the foregoing, the practices of the prior art resulted in the production of ridges at the junction of the low heel parts and the sole. For instance, in machines where the low heel loops were topped back onto needles at the sides of the instep loops, that topping operation was ordinarily effected at the line of the second or third wale of stitches, because of the impossibility of spreading the stitches (to form a loose wale) at the selvedge wale. On the other hand, a similar ridge was heretofore formed in cases where the low heel loops were topped onto a looping machine, for the purpose of joining the low heel parts with the sole.

During continuance of knitting through the foot parts, a thread carrier traverses not only the instep loops, but also the loops introduced at the sides of the sole loops (these added loops, in effect, constituting sole loops). Second or re-

enforcing thread carriers for each sole part operate in the side portions of the blank.

In contrast with certain prior types of knitting and machines therefor, the present invention eliminates the necessity for topping the instep loops at the line of junction between the high and low heel parts, this being of considerable importance for a number of reasons, including improvement of uniformity of knitting at the junction of the leg portion and the instep portion. An objectionable visible line or marking was frequently produced heretofore where the instep loops were topped and then the blank placed in a separate footer.

As compared with prior processes and equipment, the present invention eliminates the necessity for sewing or looping the sole parts to the low heel parts, and provides a smoother junction between the sole and low heel parts, thereby making the stocking more comfortable to the wearer and, in addition, eliminating the handling required in looping operations.

Reduction of handling is of especial importance in reducing the total number of "seconds" produced and, as compared with most previous types of knitting and knitting machinery, less time, labor and equipment are required. At the same time, the invention produces a stocking of the conventional full fashioned type, which is generally regarded as the most desirable and highest quality.

How the foregoing and other objects and advantages are attained will be clear from the following description referring to the accompanying drawings, in which

Figure 1 is a fragmentary plan diagram or outline view of a full fashioned stocking blank in accordance with the invention;

Figure 2 is a stitch diagram, on an enlarged scale, of portions of a stocking blank adjacent the turn of the heel, this diagram illustrating the right-hand side only;

Figures 3 to 10 inclusive are enlarged views of the stitching in the right low heel portion of the blank, illustrating the manner in which loops are introduced between the instep and right low heel;

Figure 11 is a front view of a portion of a knitting machine constructed in accordance with the invention;

Figure 12 is a view taken from the right of the machine shown in Figure 11; and

Figures 13 and 14 are enlarged views of parts of the mechanism shown in Figure 12, the views showing different positions of the parts.

Before considering the drawings in detail, it is first pointed out that Figures 1 to 10 inclusive are presented for purposes of illustration of the manner in which the improved knitting herein contemplated is effected, it being understood that certain variations may be adopted while still retaining the essentials of the invention. Moreover, as to Figures 11 to 14, it should be kept in mind that many features of the machine are illustrated merely by way of example, since the important features of the invention are applicable to a wide variety of machines. Still further, because of the complexity of knitting machines, Figures 11 to 14 have been simplified by extensive omission of parts of well known construction and/or operation.

In describing the method and apparatus, it is thought that an understanding of the features of the invention can best be disclosed by first considering the knitting steps as illustrated in Figures 1 to 10 inclusive.

In considering the stocking blank, as shown in Figure 1, it is noted that the knitting commences with the welt (not shown) and continues through the leg, high spliced heel parts, low heel parts, instep and sole parts, and the toe. Because of the "shaping" of the stocking blank to fit the heel of the wearer, the blank is not completely flat, and in view of this, in Figure 1, portions of the blank adjacent the turn of the heel are illustrated as being furled. The line x—x applied to Figure 1 indicates the general region of which the right-hand portion is shown greatly enlarged in Figure 2.

In Figure 2, the diagonal break is located in the region of the junction between the high and low heel parts at the right side of the blank. It may also be mentioned that the diagram is not intended to indicate any exact number of courses of stitches knitted in the heel parts, since this may be varied according to the fineness of the knitting, size of the stocking being made, etc.

As above indicated, the knitting commences with the welt and continues down through the leg or boot portion, with the usual variations in width of the blank to fit the leg contour. At the commencement of the high spliced heel parts, additional or reenforcing thread carriers are introduced at the sides so as to produce reenforced sections at the heel. In the knitting diagrams single thread knitting is indicated by a single line and reinforced knitting is indicated by double lines. At the turn of the heel, designated by the line x—x in Figure 1, reenforced low heel parts are continuously knitted although, at this time, the loops at the junction of the leg and instep parts are retained on their needles until completion of the low heel parts. It is at the line (x—x) representing the turn of the heel at which, in accordance with the present invention, the knitting effects introduction of new loops between the low heel parts and the instep, which new loops (at each side) constitute the inner selvedge wale of the low heel parts, the reenforced sole parts being subsequently directly knitted to this selvedge wale. The manner in which the newly added loops are introduced is illustrated in Figures 3 to 10.

In considering Figures 3 to 10, note first that legends have been applied not only to these figures, but also to Figures 1 and 2 so as to identify that small portion of the stocking being knitted in Figures 3 to 10. Thus, Figures 3 to 10 are concerned with the knitting of the right low heel, beginning at the turn of the heel (line x—x).

Figure 3 indicates the condition at the right heel, at the conclusion of the knitting of the right high heel part. (Note that two threads are here shown, since this portion of the stocking is reenforced.) The first step in making the turn of the heel and in commencing the knitting of the right low heel is represented by Figure 4, indicating the transference of a group $a1$ of low heel loops outwardly (to the right) to the next needle. This transference is effected by a manipulation known per se in this art, leaving a blank needle $n1$ for the introduction of a new loop intermediate the low heel loops and the leg loops which are being retained on their needles.

The thread carrier now moves to the left and the machine is actuated to knit another course of stitches, as is illustrated in Figure 5. At this time the instep loops and two of the inner heel loops are retained on their needles, as is indicated by the bracket in Figure 5. The thread carriers are then caused to move outwardly a dis-

tance of two needles, and simultaneously the group of stitches *a2* is transferred outwardly as shown in Figure 6, leaving another blank needle *n2*. The outward movement of the carriers just mentioned takes place while the sinkers hold the thread in back of the plane of the needles (which are at that time at the bottom of their stroke). The thread, therefore, is properly positioned to lay a new loop on the new blank needle (*n2*) when the next following thread carrier stroke occurs.

The stroke of the carriers just mentioned has been completed in Figure 7, which illustrates a new course of stitches in the low heel part. After this carrier stroke, two additional loops are retained on their needles, as is indicated by the bracket in Figure 7.

Proceeding to Figure 8, it will be seen that a group of stitches *a3* has again been transferred outwardly to leave a blank needle *n3* on which a loop is laid after the next inward stroke of the carriers, as is illustrated in Figure 9. Outward movement of the carriers and outward transference of loops *a4*, as shown in Figure 10, provides another blank needle *n4* in a manner similar to that described above. During the succeeding knitting operation, two additional loops are retained on their needles.

The foregoing series of steps is repeated sufficiently to provide the desired number of courses in the low heel parts. At the outer end of each low heel part the knitting is preferably continued to provide a few raveling courses by means of which the two low heel parts may be looped or sewed together, in accordance with known practice.

It will be observed in connection with the foregoing that a progressively increasing number of loops are retained on their needles adjacent each side of the instep, these retained loops, in effect, constituting the marginal wale of the low heel part. In continuance of knitting, i. e., in knitting the foot, the reenforced sole parts are knitted directly from these added or interposed loops. In knitting the instep and sole parts, the instep and adjacent newly added loops are no longer retained on their needles, so that the knitting thereafter progresses in a manner similar to known practice, where low heel loops are topped and then returned to needles adjacent to the instep needles.

While the full description above of Figures 3 to 10 inclusive referred only to the knitting of the right low heel part, it may be mentioned that a generally similar but inverted series of steps takes place in the formation of the left low heel part. Certain differences in timing of operations are required, as is mentioned hereinafter in connection with the equipment illustrated in Figures 11 to 14.

In connection with the foregoing described method of knitting at the turn of the heel, it is mentioned that on the inward strokes of the thread carriers, at both sides of the blank, it is important that the carriers move at least one needle beyond the blank needle (note Figures 5 and 9). It is also of importance, on the subsequent widening, that the carriers move outwardly at least two needles, so as to position the thread to form a loop on the newly provided blank needle (see Figures 6 and 10).

Equipment for effecting the foregoing knitting may be of relatively simple construction, readily adaptable to existing knitting machines of various types. A preferred form of equipment for this purpose is illustrated in Figures 11 to 14 as being applied to a machine of the Wildman type. As above mentioned, the drawings do not show many of the usual or standard parts of the knitting machine, such parts being unnecessary to an understanding of the present invention. For further details, reference may be made, for example, to Patents 1,986,577, 2,036,143, 2,076,127 and 2,170,278.

In Figures 11 and 12 the needles are indicated at *n*, it being mentioned that for clarity of illustration, the spacing of the needles is greater than employed in most current stocking knitting. In any event, the invention is applicable to coarse as well as fine yarn and also to knitting with any number of stitches to the inch.

The needles are carried by a bar 15 which is mounted by means of member 16 to which the desired needle motion is imparted through links and arms, including levers 17 and 18 which move together about the axis of shaft 19, arm 18 being swung by cam 20 mounted on the cam shaft 21, which ordinarily is employed in machines of this type to carry a series of cams adapted to effect many of the operations of the machine. Cam 22 also imparts movement to the needles through arm 23 and link 24.

The details of the needle motion and the actuating mechanism therefor need not be considered herein since they form no part of the present invention per se. It may be mentioned, however, that when the needles "go to press" the normally open beards 25 are closed by engagement with the press bar 26, so as to permit the loops on the needles at that time to be disengaged.

The mechanism further includes sinkers 27 and knock-over bits 28, which parts may be of conventional construction and arrangement, and may be operated in the known manner, these parts cooperating with the needles in effecting the several operations and steps involved in the knitting.

Narrowing fingers are arranged at each side of the machine, one being shown at the top right of Figure 11. As there seen, each narrowing finger has a set of narrowing points 29 carried by a plate 30, mounted on a bar 31, which bar, as is well understood in this art, is arranged for movement so as to bring the narrowing fingers downwardly and into engagement with needles *n*, so as to lift off the loops carried by the needles, whereupon the bar 31 is shifted lengthwise of the needle bar and again brought downwardly into engagement with other needles, to replace the loops thereon. This type of narrowing finger, and the actuating mechanism therefor, is commonly employed to effect the leg and foot narrowings. Although only one narrowing finger is illustrated, it will be understood that ordinarily one is located toward each end of the needle bar. As brought out more fully hereinafter, these sets of narrowing fingers are employed in the novel heel knitting herein contemplated to transfer groups of stitches outwardly.

Turning again to the action of the needles *n* when going to press, it is now pointed out that in accordance with the present invention, for the purpose of preventing the instep loops (along line *x—x* in Figure 1) from being disengaged from the needles (as would occur when the needles go to press), provision is made for holding the needles away from the press bar 26. This is accomplished by means of plates 32 and 33. As viewed in Figure 11, these plates substantially completely overlap each other, each having an

upwardly curved portion presenting an edge adapted to abut the needles intermediate the beards 25 and the needle bar 15. When these plates come into action, those needles which are engaged thereby are deflected as the needle bar 15 is moved toward the press bar 26. The beards of the needles in the central region are, therefore, kept open and the loops carried thereby are retained thereon.

The plate 32 is supported by a member 34 carried by a bearing 35 which, in turn, is mounted on an internally threaded sleeve 36 having end flanges 37—37. Sleeve 36 is restrained as against rotation about its axis by means of an apertured lug 38 projecting therefrom and engaging a guide rod 39. Sleeve 36 is threaded onto a screw 40 upon rotation of which the sleeve and the plate 32 carried thereby are caused to move lengthwise of the needle bar, thereby shifting the position of the plate 32 to engage different needles.

Similar mechanism is provided for mounting plate 33, but since this mechanism is essentially the same as that described for plate 32, repetition of the description is not thought necessary. It should be noted, however, that the screw 41 for plate 33 is threaded in the opposite sense, the necessity for which will appear more fully hereinafter in the description of certain other parts of the mechanism.

The bearing 35 on which plate 32 is mounted (and also the corresponding bearing for plate 33) further carries a rearwardly projecting arm 42 having a forked end 43—43 embracing rod 44 which extends between and is mounted in a pair of spaced arms 45—45 rigid with member 46, which latter is integral or rigid with a lever 47 pivoted at 48. Lever 47 carries a cam follower 49 positioned to cooperate with cam 50, so that upon rotation of cam 50 the lever 47 is caused to oscillate upwardly and downwardly about the axis of pivot 48. This movement of the lever is transmitted through rod 44 to arms 42, with which latter the plates 32 and 33 are rigidly connected (through bearings 35). The oscillative movement of the plates 32 and 33 brings the upper edges of these plates into and out of operative position, i. e., into and out of that position in which the plates will keep the adjacent needles from going to press.

Any of various known mechanisms may be adopted for the purpose of rendering the plates 32 and 33 effective and ineffective, it being mentioned that in certain portions of the knitting, operation of the plates is not desired. For example, at the time when a narrowing is effected, as by bodily shift of the entire cam shaft 21 in the known manner, the follower roller 49 will then ride on the so-called "narrowing side" of the cooperating actuating cam, the said "narrowing side" being round and being shown in Figure 11 just to the left of cam 50. During normal knitting the plates 32 and 33 may be placed into and out of operation by employment of various known types of cam roller shifters such as those used in the Wildman type of machine above mentioned, for example as illustrated in Patent 2,076,127 above referred to.

During the knitting of each stocking blank the plates 32 and 33 are initially positioned in overlapping relation in the manner illustrated in Figure 11. As the knitting progresses through the stages described above in relation to Figures 3 to 10, these plates 32 and 33 are successively moved outwardly, one toward one end of the needle bar and the other toward the other end, so as to progressively retain an increased number of loops on the needles as the low heel parts are knitted. The mechanism for effecting this progressive, step-by-step outward movement of the plates 32 and 33 is described just below.

It is first noted that the movement of each plate (32 or 33) is effected by rotation of the screw (40 or 41) on which that plate is mounted. For this purpose ratchet mechanism is arranged at the outer ends of the two screws, the mechanism being illustrated only at the right hand end in Figure 11, since the parts at both ends are essentially similar.

Turning now to Figures 13 and 14, it will be seen that a ratchet 51 is mounted on the screw 40, this ratchet being engageable by a pawl 52 carried by an oscillating double ended bar 53 rotatively mounted about the axis of screw 40. Spring 54 urges the pawl toward engaged position. The double ended bar 53 is caused to oscillate by means of a link 55, the lower end of which is pivoted to one arm 56 of a bell crank, the other arm 57 of which is connected to lever 58 by a link 59. Lever 58 is pivoted at 60 and carries a cam follower 61 adapted to engage cam 62 mounted on the cam shaft 21. It will be seen that rotation of cam 62 causes lever 58 to swing back and forth, thereby transmitting an oscillating motion to the double ended bar 53 and advancing the ratchet 51 step-by-step. This movement of the ratchet, in turn, rotates the screw 40 and effects progressive step-by-step movement of plate 32.

To ensure advancement of ratchet 51 and screw 40 in steps of the desired angular distance, a notched wheel 63 is also rigidly mounted on screw shaft 40 and a spring-pressed plunger 64 is positioned to cooperate with the notches in this wheel, the notches and plunger both being of angular "self-centering" shape.

On alternate revolutions of the cam shaft 21 (to provide for the desired sequence of knitting operations) advancement of the ratchet 51 by pawl 52 is not desired. Mechanism is, therefore, provided for rendering the pawl 52 ineffective to advance the ratchet on every alternate revolution of the cam shaft 21. This mechanism includes a shroud 65 oscillatively mounted about the axis of the threaded shaft 40 and movable by means of an arm 66 which is actuated by link 67 extending downwardly and coupled with arm 68, this arm being pivotally mounted on a fixed part, as indicated at 69, to provide freedom for upward and downward swinging movement of the arm. Arm 68 carries a pin 70 adapted to ride on the surfaces of a cam or star wheel 71 fixed to shaft 72. A ratchet 73 is also keyed to shaft 72, this ratchet being engageable by a pawl 74 mounted on arm 75, which is rigid and moves with the two arms 56 and 57 of the bell crank above described. Spring 76 urges the pawl into engagement with the ratchet.

From the foregoing it will be seen that actuation of arm 58 by cam 62 not only oscillates the double ended lever 53 (to advance the screw thread 40) but also causes pawl 74 to advance ratchet 73, carrying star wheel 71 therewith and thereby causing link 67 to move upwardly and downwardly. It will be observed that the number of projections from the star wheel 71 is equal to one-half the number of teeth on ratchet 73, in view of which one actuation of cam follower 61 (one revolution of cam shaft 21) causes the link 67 to move downwardly, and the next actuation of the cam follower 61 causes the link 67 to move

upwardly. Figure 13 illustrates the parts in the latter position (link 67 moved upwardly), and Figure 14 illustrates the parts in the former position.

The action of the shutter 65 will be clear from inspection of Figure 14, in which the link 67 is in its lower position, the shutter 65 being raised so as to abut the active end of pawl 52 and prevent it from engaging the teeth of ratchet 51. In this way pawl 52 advances ratchet 51 only upon alternate revolutions of the cam shaft 21, this being desirable in order to secure the desired timing of the rotation of screw 40 with respect to other knitting operations.

With the foregoing in mind, attention is now called to Figure 11, which also illustrates certain of the parts described just above. From Figure 11 it will further be seen that shaft 72 extends across the machine, the star wheel 71 being mounted toward one end thereof. A similar star wheel would, of course, be mounted toward the opposite end of shaft 72 for actuation of parts associated with screw 41 for plate 33.

In addition, it should be noted that arms 56 and 57 of the bell crank hereinbefore referred to project in different planes (transversely of shaft 72), although these arms are interconnected by a bar 77 which extends throughout the length of shaft 72, being provided at the opposite end with a counterpart of arm 56 with which another link (counterpart of link 55) is associated for the purpose of actuating the ratchet for advancing screw 41. Thus, similar parts may be used at opposite ends of the machine, and the description of the parts at the right of Figure 11 will suffice for the present purposes.

With further reference to the arrangement of parts toward opposite ends of the machine for actuating screws 40 and 41, respectively, it should be mentioned that the star wheels 71 are keyed to shaft 72 in positions angularly offset from each other by 45°, so that the pawls which actuate the screws 40 and 41 operate on alternate rotations of the cam shaft 21, this being necessary since all of the thread carriers of the machine move in the same direction on any one stroke and since (in accordance with the discussion above referring to Figures 3 to 10) the plates 32 and 33 must be moved outwardly to restrain additional needles from going to press alternately and not simultaneously. In further explanation, attention is again directed to Figures 3 to 10 and the above description bringing out that additional loops are retained on the needles adjacent the instep at the time of each outward movement of the thread carriers on the right-hand side. The same is true for the left-hand side, i. e., additional needles must be prevented from going to press when the carriers move outwardly on the left-hand side.

I claim:

1. In the knitting of a full fashioned stocking blank, the steps which comprise retaining the instep loops on the needles during the knitting of a multiplicity of courses of stitches in low heel parts, one at each edge of the blank, progressively introducing and retaining new loops on needles at the junctions between the low heel parts and the instep loops originally retained, said new loops constituting selvage wale loops of the low heel parts, and thereafter forming stitches at all of said retained loops to simultaneously continue the knitting of the instep and of sole parts, one at each side of the blank, the said sole parts being directly knitted to said selvage wale loops.

2. In the knitting of a full fashioned stocking blank, the steps which comprise (*a*) knitting the leg and high heel parts; (*b*) retaining the instep loops on their respective needles during the knitting of a multiplicity of courses of stitches to form low heel parts, one adjacent each side of the blank; (*c*) shifting the low heel loops outwardly to provide a blank needle adjacent the inner edge of each low heel part; (*d*) on a single thread carrier stroke forming a course of stitches in each low heel part including a loop on each blank needle; (*e*) retaining said last loops on their needles, along with said instep loops; (*f*) again shifting the course of loops for each low heel part outwardly to provide a blank needle at the inner edge of each low heel part; (*g*) on the return thread carrier stroke forming a course of stitches in each low heel part and laying a loop on each blank needle; (*h*) retaining said last loops on their needles along with the loops previously retained; (*i*) repeating steps *c* to *h* inclusive a multiplicity of times to conjointly knit the low heel parts and to dispose the inner selvage wales of the low heel parts on needles adjoining the instep needles and thereby provide wale loops for knitting sole parts to the inner edges of the low heel parts; and (*j*) thereafter conjointly knitting courses of stitches to continue the instep portion and to form sole parts, the courses of stitches forming the sole parts being knitted from the inner edge wales of the low heel parts.

3. In the knitting of a full fashioned stocking blank, the steps which comprise (*a*) knitting the leg and high heel parts; (*b*) retaining the instep loops on their respective needles during the knitting of a multiplicity of courses of stitches to form low heel parts, one adjacent each side of the blank; (*c*) shifting the low heel loops outwardly to provide a blank needle adjacent the inner edge of each low heel part; (*d*) effecting a stroke of two thread carriers for each low heel part, to form a course of stitches in each low heel part including loops on each blank needle; (*e*) retaining said last loops on their needles along with said instep loops; (*f*) again shifting the loops for each low heel part outwardly to provide a blank needle at the inner edge of each low heel part; (*g*) on the return stroke of said thread carriers for each low heel part forming a course of stitches in each low heel part including loops on each blank needle; (*h*) retaining said last loops on their needles along with the loops previously retained; (*i*) repeating steps *c* to *h* inclusive a multiplicity of times to conjointly knit the low heel parts and to dispose the inner selvage wales of the low heel parts on needles adjoining the instep needles and thereby provide wale loops for knitting sole parts to the inner edges of the low heel parts; and (*j*) thereafter conjointly knitting courses of stitches to continue the instep portion and to form the sole parts, the courses of stitches forming the sole parts being knitted from the inner edge wales of the low heel parts.

4. In a stocking machine having a multiplicity of needles and a press bar for closing the needle beards to permit knitted loops to be disengaged therefrom, means for progressively shifting the low heel loops at each side outwardly during the knitting of the low heel parts, mechanism for restraining certain needles from going to press including a pair of overlapping members

positioned adjacent instep needles, said members being mounted for movement respectively toward opposite sides of the machine whereby to restrain additional needles from going to press, and means for moving said members as aforesaid in step-by-step fashion during the knitting of the low heel parts.

5. A construction in accordance with claim 4 in which the mounting means for each of said members includes a screw threaded element adapted upon rotation to move the members carried thereby outwardly to engage and restrain additional needles from going to press.

6. In a stocking knitting machine having a multiplicity of needles, a press bar for closing the needle beards to permit loops to be disengaged therefrom, and further having narrowing fingers adapted to transfer groups of loops outwardly at each side of the stocking, mechanism for restraining needles from going to press intermediate those with which the narrowing fingers are positioned to cooperate, including a pair of overlapping members movable outwardly one toward one side of the stocking and the other toward the other side of the stocking, whereby to prevent additional needles from going to press after each outward transference of loops by said narrowing fingers.

7. A construction in accordance with claim 6 and further incorporating a screw thread mounting for each of said members, and means for alternately actuating said screw thread mountings to alternately move said members outwardly.

8. In a stocking knitting machine having a multiplicity of needles, mechanism for use in knitting the turn of the heel including means for restraining instep needles from going to press, separate means toward each side of the machine providing for progressive increase in the number of needles restrained from going to press during the knitting of the low heel parts of the stocking, and actuating mechanism for said last means operating alternately thereon to provide for alternate progressive increase in the number of needles restrained from going to press at opposite sides of the center of the machine.

CARL RICHTER.