Feb. 23, 1954 J. L. GETAZ 2,669,952

METHOD AND APPARATUS FOR SEWING THE LOOPS AT THE TOE OF CIRCULAR KNIT HOSE

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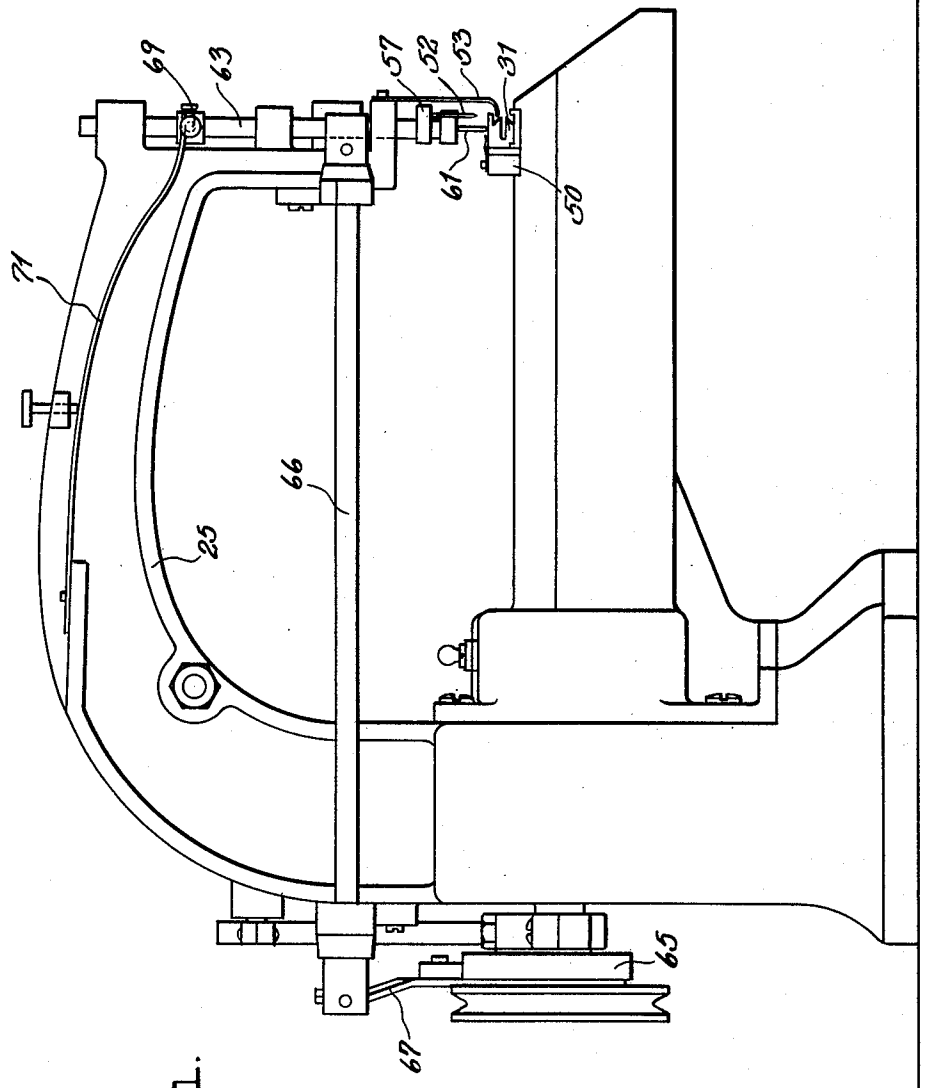


Fig. 1.

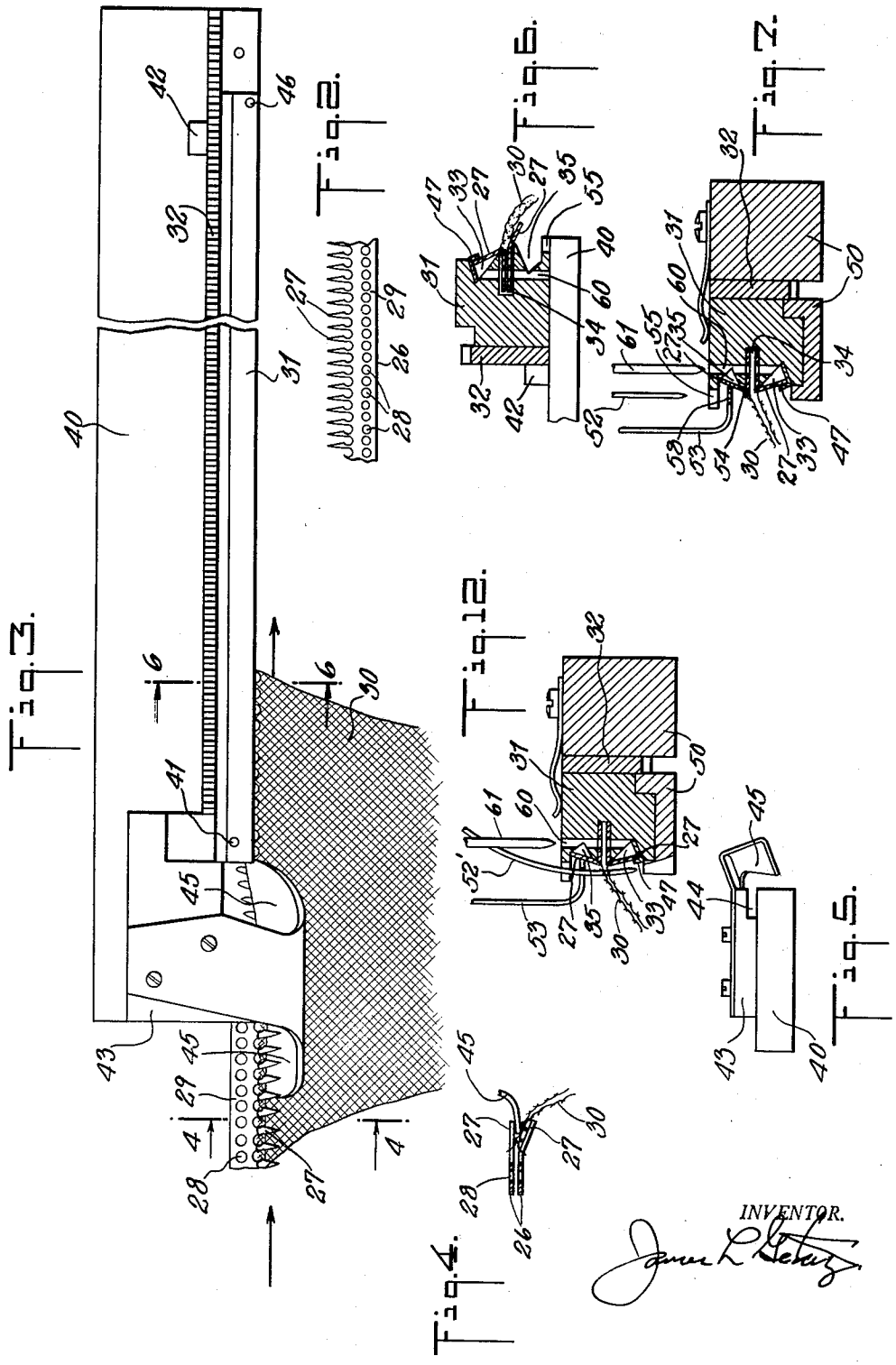
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Fig. 8.

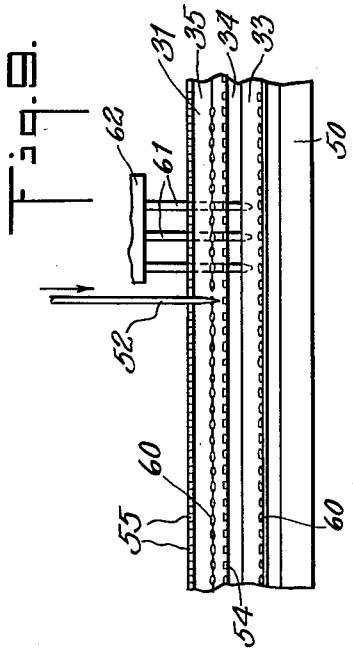


Fig. 11.

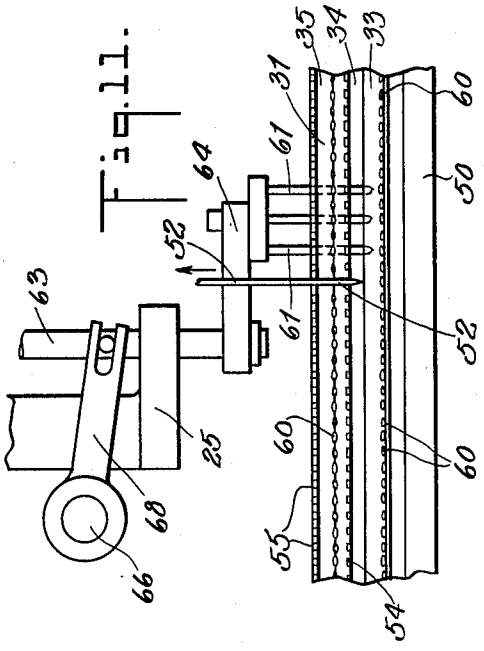


Fig. 9.

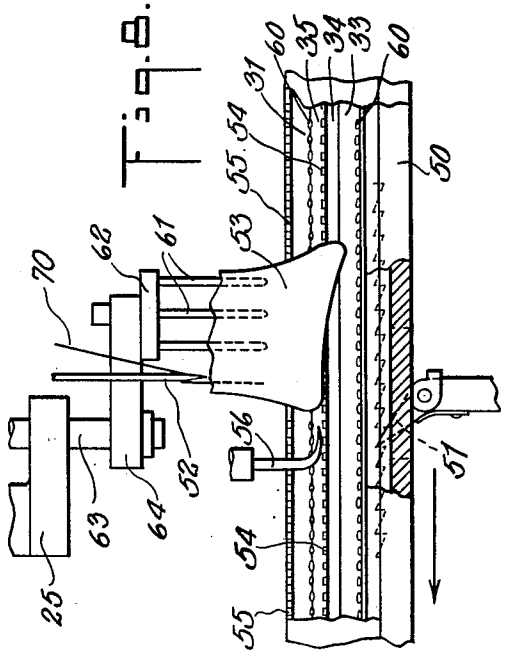
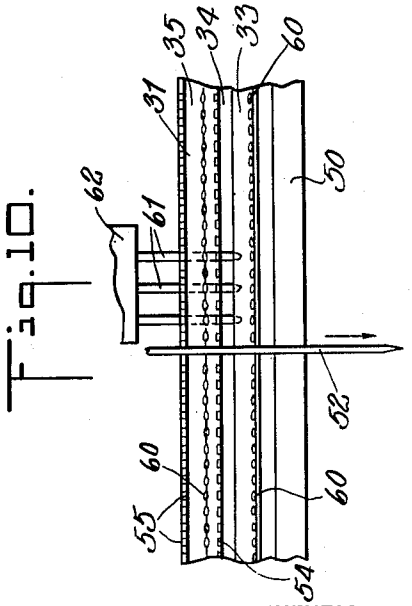


Fig. 10.



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METHOD AND APPARATUS FOR SEWING THE LOOPS AT THE TOE OF CIRCULAR KNIT HOSE

James L. Getaz, New York, N. Y.

Application August 17, 1950, Serial No. 179,980

13 Claims. (Cl. 112—27)

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This invention is related to the manufacture of hosiery, and particularly to the closing of the toe of hosiery which is knitted on circular knitting machines.

This invention is closely related to my Patent No. 2,515,506. In this patent, means and method are shown for closing the toe of circular knit hosiery, and this is accomplished by transferring the loops of the looper course from the knitting needles to the points of a flexible band, with the loops of the instep on one portion of the band and those of the toe pocket on another. After removal from the knitting machine, the two portions of the flexible band are brought into close contact and placed on a looping machine, and the loops of the instep and toe pocket are sewed together to close the toe.

It is the purpose of this invention to provide means for sewing together the loops of fabric in an improved method, after these loops have been transferred to the points of a flexible band, as shown in the patent mentioned above.

It is also the purpose of this invention to provide means in the sewing mechanism which will permit the use of flexible bands which are made of material which is not uniform in its properties and which causes these bands to vary slightly in length.

In the accompanying drawings:

Figure 1 is a side view of a sewing machine which may be used for the sewing operation, such machine being a modification of a standard machine of the type made by the Union Special Machine Co. for sewing a two-thread chain stitch.

Figure 2 shows the flexible band with the points to which the loops of fabric are transferred.

Figure 3 is a top plan view of the mechanism for placing the band with the fabric attached on a carrier which is fed to the sewing machine.

Figure 4 is a sectional view along line 4—4 of Figure 3.

Figure 5 is a view in end elevation looking into the left side of Figure 3.

Figure 6 is a section along line 6—6 of Figure 3.

Figure 7 is an enlarged sectional view of a portion of Figure 1, showing the fabric in place for sewing.

Figures 8–11 are fragmentary end elevational views of the machine in Figure 1, with certain portions of the mechanism omitted for clarity, and showing successive steps in the process of sewing the loops.

Figure 12 is a view similar to Figure 7 but showing an alternative form of needle.

The sewing machine 25 shown in Figure 1 is a

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commercial machine now in use, to which certain parts have been added. The mechanism for operating the needles and the feed, and for forming the stitch are the same as commonly used and are not shown.

The flexible band 26 shown in Figure 2 is similar to that shown in the above mentioned patent and consists of a series of points 27, to which the stitches are transferred, and a series of holes 28 in the base 29 of the band, but the holes in the base of the band in this invention are used for a different purpose.

Instead of placing the two sides of the flexible band 26 with the fabric 30 attached directly on the sewing machine, as in said patent, they are first placed on a carrier 31, which is shown in an inverted plan view in Figure 3 and in cross-section in Figure 6.

This carrier 31 has fastened to it on one side a notched feed bar 32, and on the other side three grooves 33, 34 and 35. In the central groove 34 are placed the bases 29 of the two pieces of band 26. On the points of one piece of band are the loops of the instep side of the fabric, and on the points on the other piece are the loops of the side which contains the toe pocket. These two pieces may be separate or joined at one end and folded together so that the points 27 on the two pieces come opposite each other. In Figures 3 and 6, the carrier 31 is upside down from the position in which it is placed in the sewing machine 25.

The means for placing the fabric 30 on the carrier 31 are shown in Figures 3, 4 and 5. As shown in Figure 3, the carrier 31 is placed on a plate 40 and secured at one end by a pin 41, which passes through a hole in the carrier, and near the other end the carrier rests against the stop 42.

Mounted on plate 40 is a block 43 containing a groove 44 (Figure 5), and on this block is fastened a turning flange 45. As shown in Figure 4, a downward tension on the fabric which may be applied manually or by the weight of the fabric bends down the points 27 on the lower piece of band and causes a separation between fabric 30 and the points 27 in the upper piece of band. The fabric and band are moved manually from left to right with the bases 29 of the piece of band being fed into groove 44 and the turning flange 45 comes between the fabric and the ends of the points 27 of the upper piece of band and turns these points upward. This movement of the fabric is continued until all of these points 27 in the upper piece of band are turned up and

delivered into groove 33 of carrier 31, and the bases 29 of both pieces of band are placed in groove 34 and come against the stop 46 (which extends through groove 34) at the end of this movement. As shown in Figure 6, when the points 27 in the upper piece of band are placed in groove 33, they are held in position by projection 47, and this permits the carrier to be removed with the fabric attached to it.

After this manual movement is completed, the carrier 31 is removed from plate 40, and after being turned over, end for end, it is placed in track 50 on the sewing machine 25, as shown in Figures 7 and 8. The carrier is driven when on this track in the direction of the arrow shown in Figure 8, by the feeding pawl 51 in contact with the notches in the feed bar 32. When the carrier 31 is turned over to be placed on the sewing machine, the groove 33, which was the upper groove when the carrier was on plate 40, becomes the lower groove when the carrier is placed on track 50.

As the carrier 31 is fed past the needle 52, a downward tension on the fabric 30 causes a separation between the fabric and the points 27 of the piece of band 26, which is in the upper side of groove 34 and these points are raised and turned back into groove 35 of carrier 31 by the turning edge 53, as shown in Figures 7 and 8. The function of turning edge 53 is thus to bend the points 27 on one portion of the band 26 into the groove 35 in the same manner as that in which turning edge 45 has previously bent the points 27 on the other portion of band 26 into the groove 33. As the points are turned back into the groove 35 they are placed in notches 54, which are in the projection between grooves 34 and 35. At the upper end of carrier 31, as it is placed on the track 50, are a series of notches 55 just wide enough to receive the needle 52, and in line with notches 54.

As shown in Figure 8, a curved guide 56 is mounted on sewing machine 25 and projects into groove 35 to draw points 27 out of notches 54 after they have passed needle 52.

The point of the needle 52 does not lie in the central axis of the needle but is bent so as to be in line with the surface of the needle which is adjacent to the carrier 31. The action of the needle in sewing together the loops on the two pieces of band is as follows:

Moving from its upward position, as shown in Figures 7 and 8, the needle 52 carried by the bar 57 (Figure 1) passes down through the notches 55, and the hole 58 in turning edge 53. The notches 55 serve as a guide to bring the point of the needle 52 in the center of notches 54 and in contact with the surface of points 27 which have been bent upward by turning edge 53. By coming down along the surface of these points 27, it passes through the first loops of the fabric which are attached to these points, and these are the loops of the looper course on one side of the hose. After passing through the loops attached to the points 27 which are bent upward into groove 35, it passes downward along the surface of the points 27 which are held in groove 33 by projection 47, and passes through the loops attached to these points, and these are the loops of the looper course on the other side of the hose. The needle 52 then completes its stroke, as shown in Figure 10, and a stitch of the seam is formed, and the two loops on the points 27, which are opposite each other on the two pieces of band, are sewed together. After the seam is completed, the two pieces of band 26 are removed from the fabric. The preferred type of stitch is a two-thread chain stitch, which is sometimes referred to as a double-lock stitch.

In order for the needle 52 to engage these loops of the looper course in consecutive order, the travel of the carrier 31 between strokes of the needle while the seam is being sewed must correspond with the spacing of the loops of the fabric. Accordingly, the spacing of the notches on the feed bar 32 and the movement of the carrier by pawl 51 are made to correspond with the spacing of the points on the flexible band.

But it is sometimes desirable to use a material for the flexible band such as a paper or a plastic which is not uniform in its characteristics. Such material may vary slightly in length when the points 27 are punched, or the length may be somewhat affected by changes in temperature or humidity, so that the spacings of points 27 are not always exactly the same.

To compensate for these variations, the following mechanism is used: There are a series of holes 28 in flexible band 26 with the same spacing as points 27, and a series of holes 60 in carrier 31 of the same diameter as holes 28, and the same spacing on the carrier as the notches in feed bar 32. The notches 54 and 55 also have the same spacing as the notches in the feed bar 32.

When the two pieces of flexible band are fully inserted into groove 34, as shown in Figure 3, their further movement is stopped by engagement with pin 46, and at this position holes 28 are in alignment with holes 60 at the right hand end of the carrier. When the carrier 31 is placed on the sewing machine in track 50, this end of the carrier is fed first past the needle 52.

Adjacent to needle 52 are a plurality of plungers 61, which have a vertical reciprocating movement of the same cycle as needle 52, and these plungers are so spaced from each other as to fit into holes 60. These plungers are tapered at their lower ends, and as they pass through holes 60 they come into contact with holes 28 on the two pieces of band in groove 34, and by slipping the pieces of band longitudinally in the carrier they correct discrepancy between the holes 28 and the holes 60 and thus align the points 27 of both pieces of flexible band with the notches 54 and 55.

A plurality of plungers is preferred to one to reduce the strain on holes 28. These plungers are mounted on a block 62, which is fastened to the vertical rod 63 through a bar 64. The rod 63 is supported by the frame of machine 25 and has a reciprocating motion, which is timed with the vertical motion of needle 52. It is raised by cam 65, which is on the driving shaft of machine 25 and which turns shaft 66 by connection 67, and this shaft is connected to rod 63 by an arm 68, as shown in Figures 1 and 11. When released by cam 65, rod 63 is moved downward by the spring 71 pressing on pin 69.

Both the needle 52 and the plungers 61 are shown in their raised positions in Figure 8. In Figure 9, the plungers have moved downward ahead of the needle and have passed through holes 60 in the carrier 31 and through holes 28 in the two pieces of band in groove 34, thus bringing the two sets of holes in alignment before the needle comes in contact with the loops of the fabric. The plungers 61 remain in their downward position while the needle carries the thread 70 below the carrier, as shown in Figure 10, for the completion of the stitch. As the needle completes its upward movement, the plungers are

raised to the position shown in Figure 8, and remain in this position while the carrier is moved one notch by the feeding pawl 51, and then the above cycle is repeated.

As shown in these drawings, the plungers 61 make a cycle in their vertical movement for every stroke of the needle, and the number of holes 28 in the band 26 are equal to the number of points 27. On finer gauges, it may be desirable to make the cycle of the plungers intermittent so that they make one stroke for alternate strokes of the needle, and in this case, the number of holes 28 in band 26 may be only half the number of points 27.

As it may not be practicable, when using certain materials, to have the spacing of the points 27 exactly the same as the spacing of notches 54 and 55, it has been found desirable to make the spacing of the points 27 slightly less than the spacing of notches 54 and 55, so that in the length of the carrier 31, the points 27 might lose half a space. The action of plungers 61 in aligning holes 28 with holes 60 causes the pieces of band to slip away from the stop 46 in groove 34. This slippage is very small and is not perceptible for each stroke of the plungers 61, but it is needed to maintain alignment throughout the length of the carrier.

When the plungers are in their raised position, as shown in Figure 8, and the carrier is being moved by the feeding pawl 51, the pieces of band in groove 34 may have enough friction in groove 34 to hold them in place, but they are held in place by the points 27 in the upper piece of band, which have been bent by turning edge 53 into notches 54. As only a few of these points are in notches 54 at any one time, any discrepancy which exists in the spacing between the points 27 and notches 54 is not sufficient to be apparent.

The plungers 61 also serve to correct any variations in the feeding of carrier 31, and bring the notches 55 and 54 in correct alignment with the needle 52, by the contact of their beveled points with holes 60 in the carrier.

In Figures 1 and 7 the sewing machine 25 has a straight needle 52, and it is moved in a straight line by the vertical rod 57, to which it is attached; but this invention is not limited to a sewing machine of this type. A machine may be used in which a curved needle 52' is moved in a circular path which is in a vertical plane at right angles to the length of carrier 31 as it lies on track 50 in the machine, this path being tangent to the surface of points 29 after these points are placed in the bent positions in grooves 33 and 35, the needle passes through the loops of the looper course which are held by these points, and the seam is formed in the same manner as described above. This curved needle 52' is shown in Figure 12; the actuating mechanism is the same as commonly used, and is not shown.

After the loops have been sewed together to close the toe of the hose, the bands 26 are removed from the hose, for example, by merely pulling the hose to strip the loops off the points 27. The points 27 are straight and smooth on one side so that when the hose are pulled in a direction to cause engagement of the loops with this side of the points, the loops slip easily off of the points. The bands may be made of very inexpensive material, such as heavy paper, so that each length of band may be discarded after only one use without adding materially to the cost of manufacture of the hose.

As many possible embodiments may be made of the above invention, and as many changes may be made in the embodiment above set forth, it is to be understood that all matter hereinbefore set forth or shown in the accompanying drawings is to be interpreted as illustrative only and not in a limiting sense.

I claim:

1. In the manufacture of knitted hosiery, the method of closing the toe of circular knit hose, the loops of the looper course of which are held upon the prongs of a flexible band, which comprises bringing together two portions of said band to superimpose the individual loops on one portion respectively upon those on the other portion, moving said prongs in opposite directions through angles sufficient to expose said loops to a needle, drawing a threaded needle through successive opposing pairs of said loops and forming stitches with said needle.

2. In the manufacture of hosiery, the method of closing the toe of circular knit hose, the loops of the looper course of which are held upon the prongs of a flexible band, which comprises bringing together two portions of said band with said loops superimposed respectively upon each other, bending the prongs on the two portions of said band in opposite directions approximately at right angles to said portions, drawing a threaded needle along the surface of said prongs and through said loops attached to said prongs and forming stitches with said needle.

3. In the manufacture of hosiery, the method of closing the toe of circular knit hose, the loops of the looper course of which are held upon the prongs of a flexible band, which comprises bringing together the two halves of said band with said loops superimposed upon and in contact with each other, placing said band in a carrier in which said prongs are bent approximately at right angles to said band, feeding said carrier past a threaded needle, drawing said needle along the surface of said bent prongs, and through said loops attached to said prongs and forming stitches with said needle.

4. In the manufacture of hosiery, the method of closing the toe of circular knit hose, the loops of the looper course of which are held upon the prongs of a flexible band which comprises bringing together the two halves of said band, with said loops superimposed respectively upon each other, turning said prongs approximately at right angles to said band and inserting said turned prongs in the groove of a carrier, feeding said carrier past a threaded needle and drawing said needle along the faces of said prongs and through said loops attached to said bent prongs and forming stitches with said needle.

5. In the manufacture of hosiery, the method of closing the toe of circular knit hose when the loops of the looper course of said hose have been transferred to the prongs of a flexible band, which comprises, bringing together the two halves of said band, with said loops superimposed respectively upon each other, turning said prongs of one of said halves of said band approximately at right angles to said band, inserting said prongs and said halves of said band in a carrier, feeding said carrier past a threaded needle, turning said prongs in the other half of said band in the opposite direction approximately at right angles to said band as said carrier is fed by said needle and drawing said needle along the face of said bent prongs and through said loops attached to said prongs and forming stitches with said needle.

6. In a sewing machine for closing the toe of

circular knit hose, a reciprocable needle, a carrier, means for indexing said carrier in regular increments past said needle, a flexible band having spaced prongs adapted to engage the loops in the looper course of said hose, said band being adapted for mounting in said carrier for movement therewith past said needle but being capable of slippage longitudinally of said carrier through short distances, regularly spaced elements on said carrier, and a movable member in said machine adapted to engage said spaced elements successively at a fixed position in said machine and thereby move said band in said carrier to properly align said prongs with said needle.

7. In a sewing machine for closing the toe of circular knit hose, a reciprocable needle, a carrier for feeding said hose to said machine, a series of spaced notches in said carrier for indexing said carrier along said machine, a flexible band slidably supported in said carrier, spaced prongs on said band, to which are attached the loops of the looper course of said hose, a series of spaced holes in said band, a reciprocable plunger adjacent said needle, said plunger having a tapered end adapted to penetrate said holes and align said prongs with the path of said needle, as said carrier is fed in said machine.

8. In a sewing machine for closing the toe of circular knit hose, a carrier for feeding said hose to said machine, a flexible band in said carrier, spaced prongs on said band adapted to receive the loops of the looper course of said hose, spaced notches in said carrier to receive said prongs, means for engaging said prongs and pressing them into said notches to align said prongs with said notches as said carrier is fed in said machine, a flexible needle reciprocable through said notches into said loops whereby said notches serve to insure alignment of said needle with said loops.

9. In a sewing machine for closing the toe of circular knit hose, a carrier for feeding said hose to said machine, a flexible band in said carrier, spaced prongs on said band adapted to receive the loops of the looper course of said hose, a needle for sewing said loops driven by said machine, spaced notches in said carrier for guiding said needle, means for aligning said notches and said prongs as said carrier is fed in said machine.

10. In a sewing machine for closing the toe of circular knit hose, a reciprocable needle, a carrier for feeding said hose past said needle, a series of spaced holes in said carrier, a flexible band in said carrier having spaced prongs adapted to receive the loops in the looper course of said hose, a series of spaced holes in said band, a reciprocable plunger adapted to penetrate said holes in said band and said holes in said carrier as said carrier is fed in said machine, to align said carrier and said prongs properly relative to the path of said needle.

11. In a sewing machine for closing the toe of circular knit hose, a reciprocable needle, a flexible band having spaced prongs adapted to hold the loops of the looper course of said hose, a carrier adapted to receive said band and hold the same but allow sliding movement thereof longitudinally of said carrier, a series of notches in said carrier spaced approximately equal to the spacing of said prongs, pawl means for indexing said carrier through said machine intermittently in increments approximately equal to the spacing of said notches, a series of spaced holes in said band, a reciprocable plunger adjacent said needle having a tapered end adapted to enter said holes and properly align said prongs so that the path of said needle passes through the loops on said prongs, and means to drive said plunger and said needle for reciprocation in synchronism during the interval when said carrier is stationary.

12. In the manufacture of knitted hosiery wherein the loops of the looper course are transferred to the prongs of a flexible band, means for arranging said loops for sewing, said means including a carrier having a main longitudinal groove for holding the edges of two portions of said band superimposed one upon the other, a pair of supplementary grooves on opposite sides of said main groove and extending generally parallel thereto for receiving the prongs on the two respective portions of said band, and a holder for supporting said carrier, said holder having a flange and being constructed to permit longitudinal movement of said band relative to said flange and said flange being positioned to engage at least one of the portions of said band in said carrier and being shaped so that such relative longitudinal movement causes said flange to bend the prongs on such portion into one of said supplementary grooves.

13. In the manufacture of knitted hosiery wherein the loops of the looper course are transferred to the prongs of a flexible band, means for arranging said loops for sewing, said means including a carrier having a main longitudinal groove for holding the edges of two portions of said band superimposed one upon the other, a first supplementary groove at one side of said main groove and extending generally parallel thereto for receiving the prongs on one of the portions of said band and having a projection therein for engaging said prongs and holding them in said first supplementary groove, a second supplementary groove on the other side of said main groove and extending generally parallel thereto for receiving the prongs on the other portion of said band, a first holder for supporting said carrier, said first holder having a flange and being constructed to permit longitudinal movement of said band relative to said flange and said flange being positioned to engage the prongs on said one portion of said band and being shaped so that such relative longitudinal movement causes said flange to bend the prongs thereon behind said projection in said first supplementary groove and secure said band in said holder, and a second holder having a flange for similarly engaging and bending the prongs on said other portion of said band into said second supplementary groove to expose the superimposed loops for sewing.

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