May 7, 1957 T. B. WALKER 2,791,108

SHOGGING-ATTACHMENT APPARATUS FOR KNITTING TWO-BY-TWO RIBBED-TOP HOSE ON AUTOMATIC-TRANSFER CIRCULAR KNITTING MACHINES

Filed May 14, 1953 2 Sheets-Sheet 1

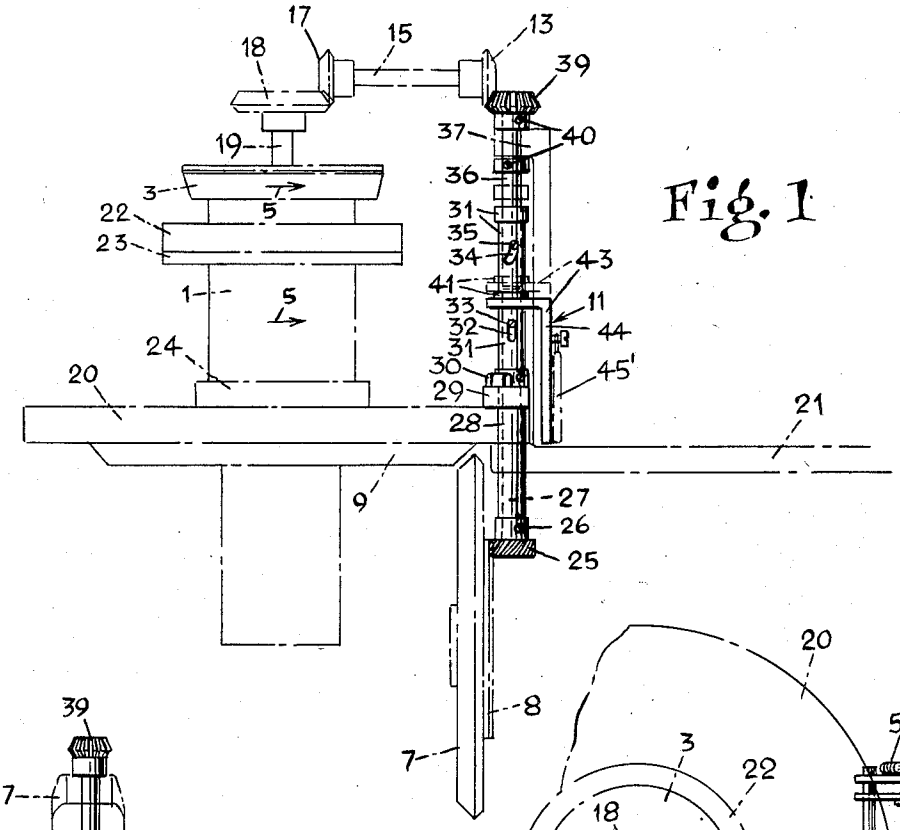


Fig. 1

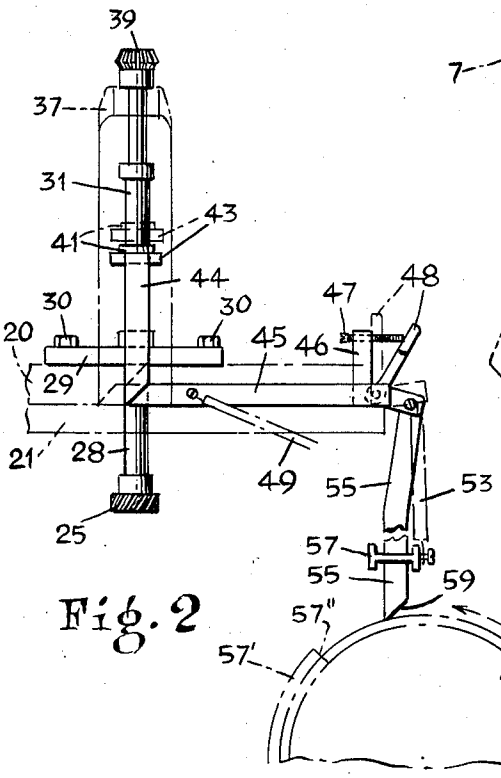


Fig. 2

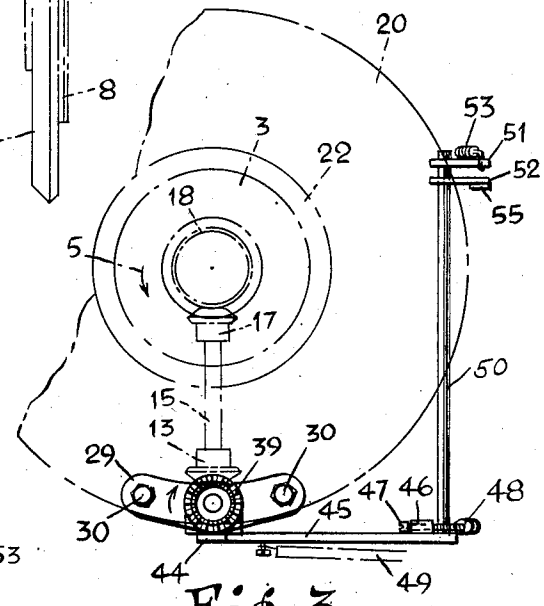


Fig. 3

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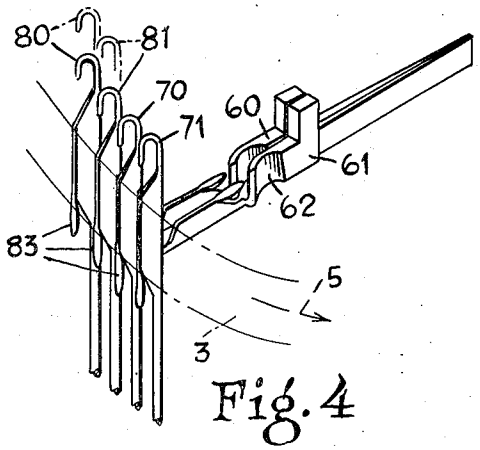


Fig. 4

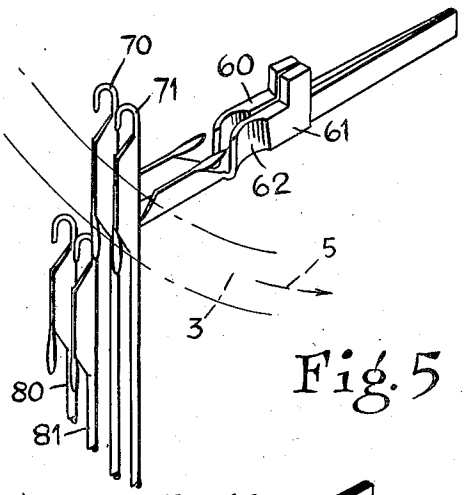


Fig. 5

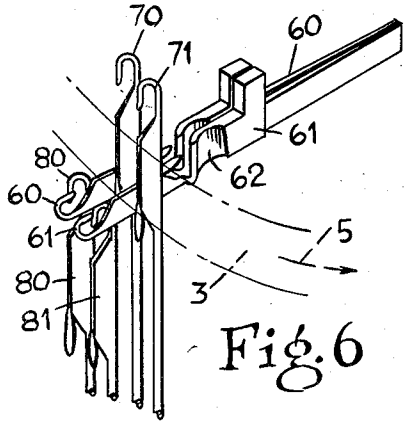


Fig. 6

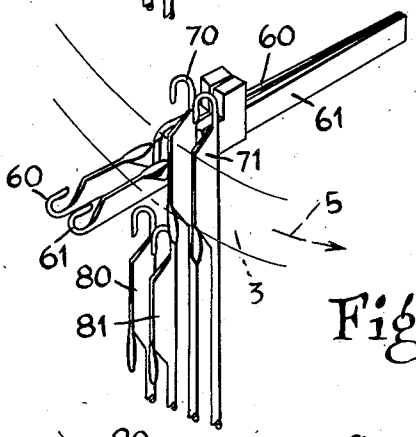


Fig. 7

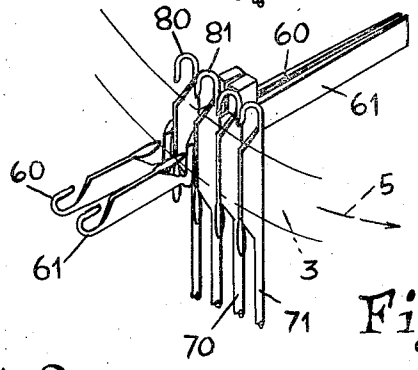


Fig. 8

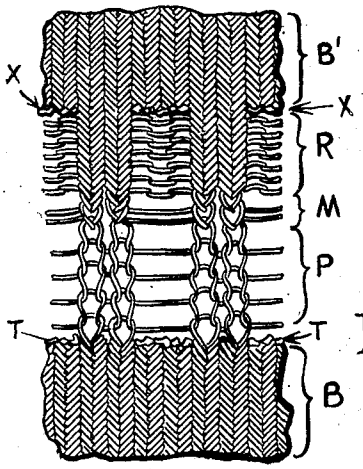


Fig. 9

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2,791,108

SHOGGING-ATTACHMENT APPARATUS FOR KNITTING TWO-BY-TWO RIBBED-TOP HOSE ON AUTOMATIC-TRANSFER CIRCULAR KNITTING MACHINES

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Application May 14, 1953, Serial No. 355,021

8 Claims. (Cl. 66—24)

This invention relates to shogging-attachment apparatus for knitting two-by-two ribbed-top hose on automatic-transfer circular knitting machines. More specifically it relates to an arrangement, including a dial-shogging attachment, whereby two-by-two ribbed-top hosiery can be knit on circular knitting machines without requiring a manual transfer.

The knitting of two-by-two ribbed tops requires knitting on pairs of cylinder needles alternating with pairs of dial needles. However, new stitches must be formed on the dial needles before each ribbed top can be knit (the stitches previously thereon having been transferred to cylinder needles at the end of the top-knitting part of the preceding cycle) and new stitch loops cannot be formed on the dial needles automatically unless there is a cylinder needle between each dial needle to pull the yarn around said dial needle. In the needle arrangement needed for knitting two-by-two rib tops, the two side-by-side dial needles would cause the yarn to float over said needles without making-up stitches thereon. The herein disclosed invention contemplates providing automatic means for "shogging," shifting or "racking" the dial relative to the cylinder, whereby the dial and cylinder needles may be placed in a one-by-one ribbing relationship for the purpose of "make-up," and then be shogged to their alternating-pairs relationship for knitting the two-by-two ribbed top of the hose.

Accordingly, it is an object of this invention to provide an attachment and arrangement whereby an automatic-top-transfer knitting machine can knit a two-by-two ribbed top on plain-knit hosiery.

It is another object to provide a simple, effective, yet inexpensive attachment for insertion in the driving mechanism of a circular-type knitting machine for shogging the dial thereof to and from a first one-by-one position relative to the cylinder needles, for the purpose of make-up of stitches on the dial needles, to a second two-by-two position for knitting the ribbed top.

These and other objects and advantages of the invention will become apparent as the following detailed description of the invention proceeds.

In the drawings, which illustrate a preferred embodiment of my invention and in which like reference characters designate the same parts thruout the several views:

Fig. 1 is an elevational view of the attachment to be substituted for the conventional drive shaft for rotating the dial of a circular-type knitting machine.

Fig. 2 is an elevational view of the apparatus of Fig. 1 from the right side thereof.

Fig. 3 is a plan view of the showing of Fig. 2.

Fig. 4 is a perspective view showing the relationship of the cylinder and dial needles during the knitting of the body of the hose.

Fig. 5 is a perspective view showing the relationship of the needles during knitting of the pull-top, or just before "make-up."

Fig. 6 is a perspective view of the needles in their relative positions during make-up.

Fig. 7 is a perspective view of the needles in their relative positions for knitting the two-by-two ribbed top.

Fig. 8 is a perspective view showing the relationship of the needles while the stitches on the dial needles are being transferred to the pairs of cylinder needles that were idle during the knitting of the ribbed top.

Fig. 9 is a fragmentary elevational view of a fabric showing in sequence the various stitch patterns produced by a machine embodying the present invention.

With reference now to Figs. 1–3 of the drawings, the numeral 1 designates the cylinder of a conventional circular knitting machine, which also has the usual rib-knitting dial 3. Cylinder 1 and dial 3 are synchronously rotated in the direction of the arrows 5, being driven from connected gears 7 and 8 in generally conventional manner. Gear 7 engages cylinder-rotating gear 9, while gear 8 drives the dial 3 thru the attachment generally designated 11 (which, embodying a major portion of the novelty, will be described below in detail), bevel gear 13, shaft 15, bevel gears 17 and 18 and shaft 19. Plates 20 and 21 are parts of the frame structure of the knitting machine. Parts 22 and 23 and 24 are, respectively, conventional sinker cap, sinker head and cam plate.

The attachment 11 takes the place of the usual shaft and pair of gears by which gear 13 would conventionally be driven from gear 8. It additionally provides for a slight relative racking or shogging of the dial in the manner and for the purpose of this invention.

The attachment 11 comprises a gear 25 fastened by set screw 26 to a vertical shaft 27, which is journaled in a bearing sleeve 28. Bearing sleeve 28 extends downwardly thru an opening in bed plate 20 and frame plate 21, and is anchored to plate 20 by bracket 29 cast integrally therewith, or welded or otherwise attached thereto. Screws 30 fasten bracket 29 to plate 20.

Shaft 27 extends upwardly into, and terminates near the center of a coupling sleeve 31. Coupling sleeve 31 has a vertically elongated slot 32 to receive a screw pin 33, which permits sleeve 31 to be lifted slightly while being rotatably driven by shaft 27.

The upper half of coupling sleeve 31 is provided with a curved or camming slot 34 in which a screw pin 35 rides. Pin 35 screws into shaft 36; shaft 36 is axially alined with shaft 27 by which it is driven thru sleeve 31 and screw pins 33 and 35. It is the curvature, or camming effect, of slot 34 that produces the slight racking or shogging of the dial 3 relative to the cylinder 1, required for the novel results of this invention.

The upper end of shaft 36 is journalled in a bearing bore in the shaft-support 37, being held against vertical movement by the hub portion of beveled gear 39 and by a collar fastened thereto, as by set screws 40.

It is thus apparent that the lifting of coupling sleeve 31 will rack or shog the dial forwardly relative to the cylinder thru a small angle. The mechanism for lifting and lowering the sleeve 31 will now be described.

Sleeve 31 has welded or otherwise rigidly attached near its center a flange or ring 41, adapted to ride on the top face of a horizontal lifting fork (or apertured plate) 43. Fork 43 is integrally joined to a vertical lift bar 44. Lift bar 44 is movably guided by any suitable means (not shown) and may be provided with a spring 45′ for its positive downward retraction. The lower end of lift bar 44 is beveled, as shown in Fig. 2, for camming engagement with a horizontal slide bar 45, which has a beveled surface complemental to that of lift bar 44.

Slide bar 45 has welded thereto an upwardly extending boss 46, carrying a horizontally extending adjustable screw 47. Screw 47 is adapted to engage arm 48 by which slide bar 45 is moved back and forth to raise and lower lift bar 44. A spring 49 or the like may be used to retract slide bar 45.

Arm **48** is fixedly mounted on a shaft **50** carried by conventional bearings (not shown). Shaft **50** also carries a pair of arms **51** and **52** anchored thereto adjacent its other end. Arm **51** connects with a tension spring **53** that tends to pull the arms **48**, **51** and **52** downwardly.

Arm **52** is positively raised (to shog the dial forwardly) by a vertical push bar **55** mounted in a slotted guide member **57**, in conventional manner. An extra circular cam **57'** of conventional construction is added to the main cam drum **58** to raise (or lower) the beveled end **59** of the push bar **55**.

The mode of operation will now be described with reference to Figs. 4–9 of the drawings.

In Figs. 4–8 the dial **3** is shown in phantom and its direction of rotation is indicated by the arrows **5**. For clarity only four cylinder needles and a pair of dial needles are shown, it being understood that these six needles are repeatedly duplicated around the cylinder and dial at equally spaced intervals to complete the circular knitting arrangement in well-known manner. It should be noted that the dial needles **60** and **61** are spaced from each other on centers an angular distance approximately equal to the angular spacing between adjacent cylinder needles, while the on-center spacing between pairs of dial needles is equal to approximately three cylinder-needle spaces. This permits pairs of dial needles **60** and **61** to alternate with pairs of cylinder needles **70** and **71** (Fig. 7) to knit the two-by-two ribbed top.

The dial needles **60** and **61** are herein disclosed as being of the novel "double-width" construction disclosed and claimed in a co-pending application of James A. Jarvis, S. N. 146,505, filed Feb. 27, 1950, Patent No. 2,677,257, May 4, 1954. The Jarvis needle because of its sturdy construction and its reliability in effecting an automatic transfer of a stitch held thereon to its mating cylinder needle, is admirably adapted for use with the present invention. Briefly, the Jarvis needle approximately alines with or lies substantially directly over its mating cylinder needle, which latter needle at transfer passes upwardly thru the conical recess **62** in the wide stitch-opening part of the dial needle to transfer the stitch to the cylinder needle by a withdrawal of the dial needle thru the stitch and back into the dial, as is fully described in the Jarvis application.

Fig. 4 shows a set of four cylinder and two dial needles, with the dial needles pulled back into the dial and with the cylinder needles in their operative position for knitting the ankle, heel, foot and toe represented by letter B ("body") in Fig. 9. In this general position, the needles also knit the tuck stitches T in well-known manner. It is preferable that the dial be in its shogged-forward position during most of the body-knitting operation in order to prevent its whipping back and forth during heel or toe knitting. (Also it is obvious that the fork **43** could be made double so as to positively force the shogging in both directions if desired. In the disclosed species, the natural drag of the dial causes it to shog back when the positive forward-shogging forces are released as cam-follower **59** drops off the end **57''** of circular cam **57'**.)

After the body B, including tuck stitches T, is knitted, needles **80** and **81** are raised in well known manner to the dotted-line positions (Fig. 4) to carry the lower (tip) ends of their latches **83** above the stitch loops surrounding their shanks. Needles **80** and **81** are then pulled down to their inoperative positions, casting off their stitches during their downward movement. This leaves only needles **70** and **71** holding and knitting stitches, to fabricate the conventional "pull-top" P, which is unraveled to separate the continuous circular-knit fabric into separate pieces of hosiery. The letter M designates the "make-up" stitches, and X designates the automatic transfer point (Fig. 9).

In the operations represented by Figs. 4, 5 and 6 the dial, as was mentioned above, is in its forwardly shogged (tightly and positively held) position relative to the cylinder. In this position the dial needles **60** and **61** are held so that when they are cammed out to their operative positions of Fig. 6 they straddle the rear needle **70** of the pair of cylinder needles that always have stitches thereon. This straddling position permits "make-up" since the cylinder needles alternating with the dial needles pull loops around the dial needles whereby stitches can be formed thereon. If the needles were in a two-by-two ribbing position, make-up could not occur since the yarn would float over the two dial needles without looping around either of them.

In the Fig. 6 positions of the needles, one, two or more courses of the make-up stitches are knitted. Then the dial needles are momentarily retracted enough so that their outer ends will clear the inner edges of the cylinder needles. At this point cam-follower **59** drops off the rear end of circular cam **57'** on cam drum **58**. The natural drag on the dial causes it to drop or shog back a controlled distance such that the pairs of dial needles **60** and **61** will center between the pairs of up cylinders **70** and **71** to knit the two-by-two ribbed top R. For uniform fabric and maximum needle clearance, it is preferable that the shogging angle be close to one and one-half needle spaces (on centers) so that dial needles **60** and **61** would lie directly over downwardly retracted cylinder needles **80** and **81** during ribbing, and would evenly straddle needle **70** in make-up position. However, the amount of the shogging is not too critical, it being merely necessary that the dial needles move from a straddling position relative to the cylinder needle **70** and **71**, or in other words a minimum distance equal to a cylinder-needle-clearance width.

After the ribbed top is knitted for the desired number of courses (Fig. 7 positions of needles), the dial needles are cammed out to their transfer positions of Fig. 8 and the idle cylinder needles **80** and **81** are cammed up thru the stitch-opening conical recesses **62** to transfer the stitches on the dial needles to themselves. The dial needles are then quickly pulled back into the dial to shed or transfer their stitches onto the cylinder needles, and the cycle is back to the "plain-knitting" condition of Fig. 4 to fabricate the body of the hose.

After transfer (at point X, Fig. 9) the plain-knitting of the ankle, heel, foot and toe resumes to start a repeating at B' of the B portion of the knitting cycle, preferably soon after which the forward shog occurs. Thus a fully automatic cycle for knitting a two-by-two ribbed top on a flat-knit tubular hose is produced.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. A circular hosiery-knitting machine comprising: synchronously driven cylinder and dial; said cylinder having first spaced pairs of contiguous needles, adapted to have stitches thereon constantly thruout operation of the machine, alternating with second spaced pairs of needles adapted to co-operate with said first pairs of needles to plain-knit the body of a hose and to be idle during knitting of the top of said hose; said dial having spaced pairs of dial needles adapted to extend between and co-operate with said first pairs of cylinder needles to knit a two-by-two ribbed top; said dial needles being adapted at transfer to hold the stitches carried thereon open and alined with said second pairs of cylinders needles whereby the latter may pass upwardly thru said stitches for automatic transfer thereof to said second pairs of cylinder needles at the completion of said ribbed top; and automatic means for shogging said dial and cylinder relative to each other to and from a first position in which each pair of dial needles will straddle one of the needles of each of said first pairs of cylinder needles whereby the later will pull loops of yarn around the dial needles alternated therebetween and provide an automatic make-up of stitches

thereon, and a second position in which said pairs of dial needles will lie between said first pairs of cylinder needles for cooperation therewith in knitting said two-by-two ribbed top.

2. Apparatus according to claim 1 and in which said dial needles have stitch-opening wide shank portions having recesses therein to receive cylinder needles passing upwardly thru stitches opened therearound.

3. Apparatus according to claim 1 and in which said positions are separated by an angle at least wide enough to insure clearance of each straddled cylinder needle by the dial needle that passes on both sides thereof selectively.

4. Apparatus according to claim 1 and in which said positions are separated by an angular amount of approximately one and one-half center-to-center cylinder-needle spaces.

5. In a continuous operation circular hosiery-knitting machine, including a cylinder, a dial, co-ordinated cylinder-driving means and dial-driving means synchronously rotating the same, spaced pairs of cylinder needles and spaced pairs of dial needles for co-operatively knitting two-by-two ribbed tops, additional pairs of cylinder needles alined with said dial needles when the latter are in ribbing position, said dial needles being adapted to move out to open stitches held thereon and aline the same with said additional pairs of cylinder needles to transfer their stitches thereonto when the latter needles pass upwardly thru said stitches at the completion of said ribbed top; the improvement comprising automatic shogging means associated with at least one of said driving means for moving said cylinder and dial relatively to each other by an amount sufficient to cause each pair of said dial needles in one position to straddle one of the needles of each of said first-mentioned pairs of cylinder needles for makeup, and in another position to lie between adjacent pairs of said first-mentioned cylinder needles to knit a two-by-two ribbed top in co-operation therewith.

6. Apparatus according to claim 1 and in which said automatic shogging means comprises a subcombination including a drive shaft in the mechanism for rotating said dial, said shaft being broken centrally thereof, a sleeve slidable over both portions of said shaft, camming means keying said sleeve to at least one of said shaft portions against relative rotation only, said camming means being adapted upon longitudinal movement of said sleeve over said shaft to rotate one portion thereof relatively to the other portion to effect said shogging of the dial and cylinder relative to each other, and automatic means for longitudinally moving said sleeve in desired manner.

7. A circular hosiery-knitting machine comprising: synchronously driven cylinder and dial; said cylinder having a first set of needles adapted to have stitches thereon constantly thruout operation of the machine, and a second set of needles regularly interlaced with said first set of needles and adapted to co-operate with said first set of needles to plain-knit the body of a hose and to be idle during knitting of the top of said hose; said dial having spaced dial needles adapted to interlace with and co-operate with said first set of cylinder needles to knit a ribbed top; said dial needles being adapted at transfer to hold the stitches carried thereon alined with said second set of cylinder needles whereby the latter may pass thru said stitches for automatic transfer thereof to said second set of cylinder needles at the completion of said ribbed top; and automatic means for shogging said dial and cylinder relative to each other to and from a first position in which each pair of adjacent dial needles will straddle one of said co-operating top-knitting cylinder needles to cause the latter to pull a lop of yarn about the former for providing an automatic make-up, and a second position in which said each pair of dial needles will lie to one side of its said co-operating top-knitting cylinder needle for co-operation therewith in knitting said ribbed top, thereby producing a welt in which said stitches are crossed and drawn so as to create a tighter welt.

8. An automatic transfer knitting machine for the continuous knitting of hose, separated by a pull top between adjacent hose, said machine comprising synchronously driven cylinder and dial, said cylinder having first spaced pairs of contiguous needles, adapted to have stitches thereon throughout operation of the machine, alternating with second spaced pairs of cylinder needles adapted to co-operate with said first pairs of needles to plain-knit the body of a hose and to be idle during knitting the top of said hose, said dial having spaced pairs of dial needles adapted to extend between and co-operate with said first pairs of cylinder needles to knit a two-by-two ribbed top, said dial needles being adapted to have the stitches carried thereon automatically transferred to said second pairs of cylinder needles at the completion of said ribbed top and automatic means for shogging said dial and said cylinder relatively to each other to and from a first position in which each pair of dial needles will straddle one of the needles of each of said first pairs of cylinder needles whereby the first pairs of cylinder needles will pull loops of yarn around the dial needles and provide an automatic make-up of stitches thereon and a second position in which said pairs of dial needles will lie between said first pairs of cylinder needles for co-operation therewith in knitting said two-by-two ribbed top.

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