

April 8, 1958

G. I. FOLSOM

2,829,508

KNITTING METHOD AND MACHINE

Filed Aug. 27, 1956

6 Sheets-Sheet 1

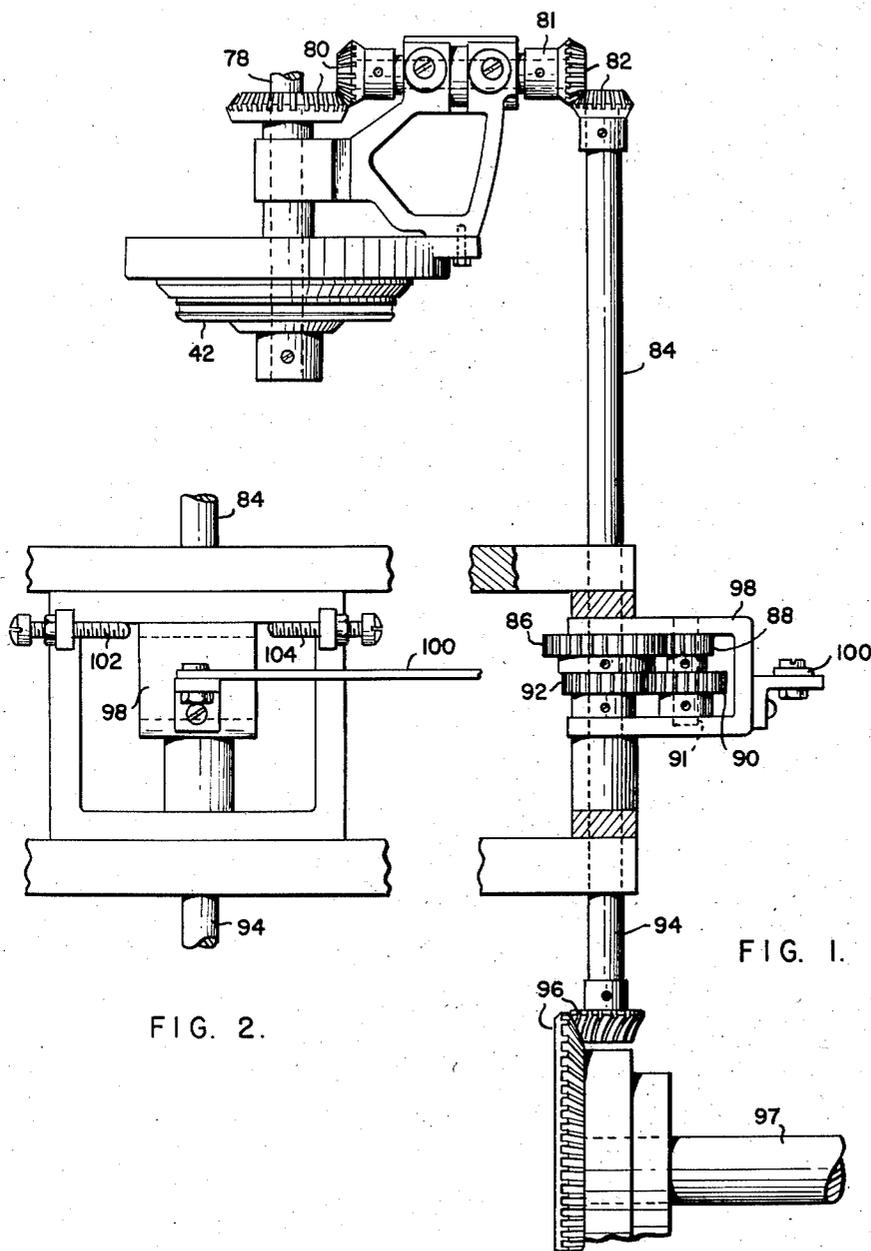


FIG. 2.

FIG. 1.

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6 Sheets-Sheet 2

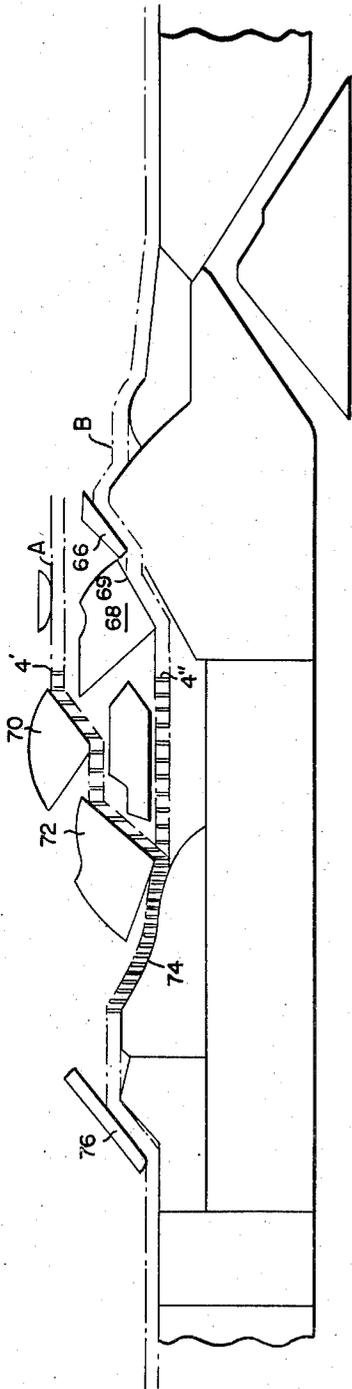


FIG. 3.

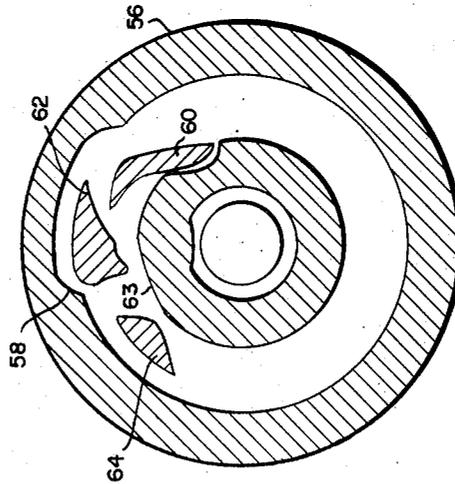


FIG. 4.

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6 Sheets-Sheet 3

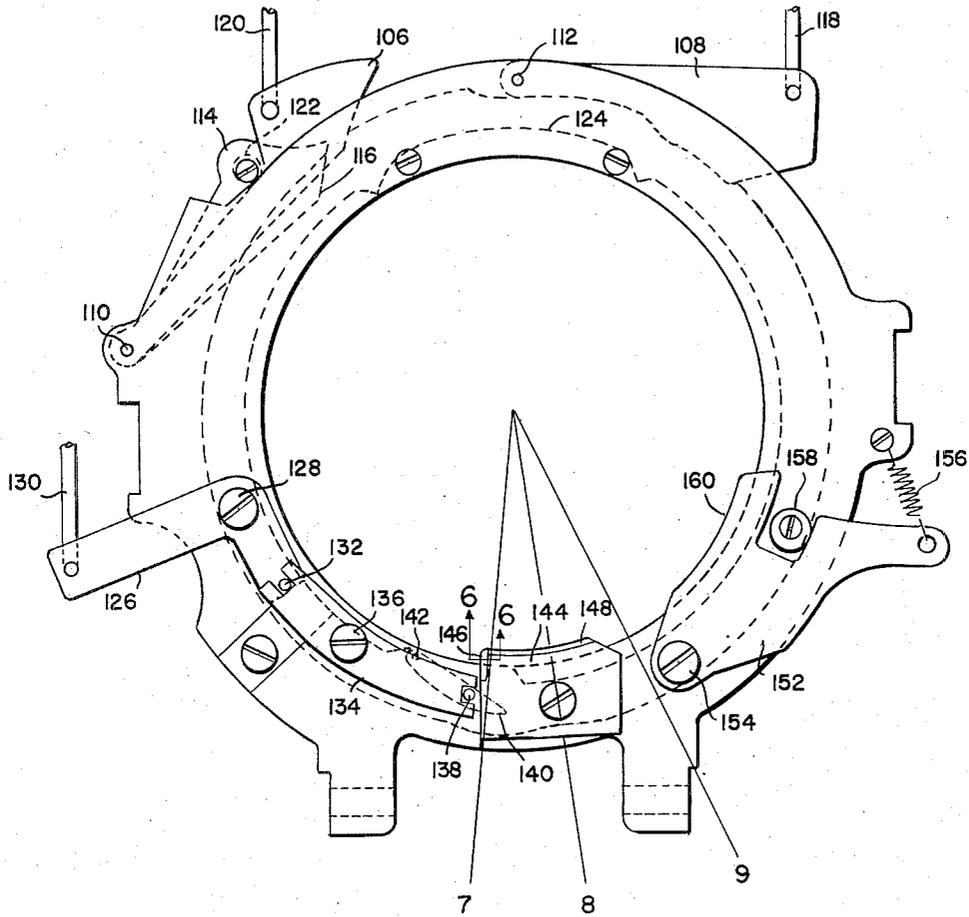


FIG. 5.



FIG. 6.

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6 Sheets-Sheet 4

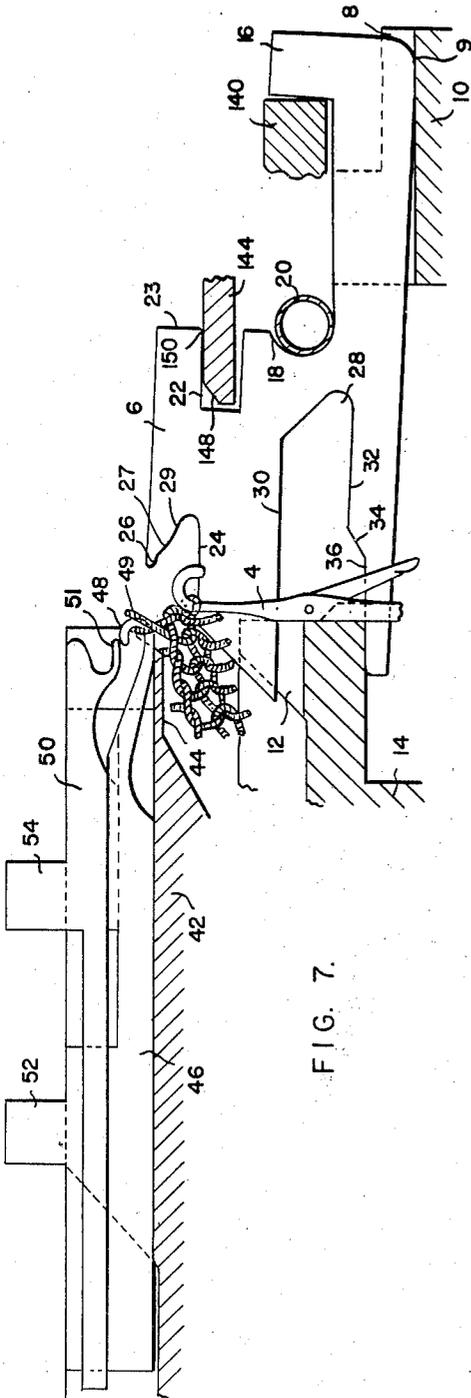


FIG. 7.

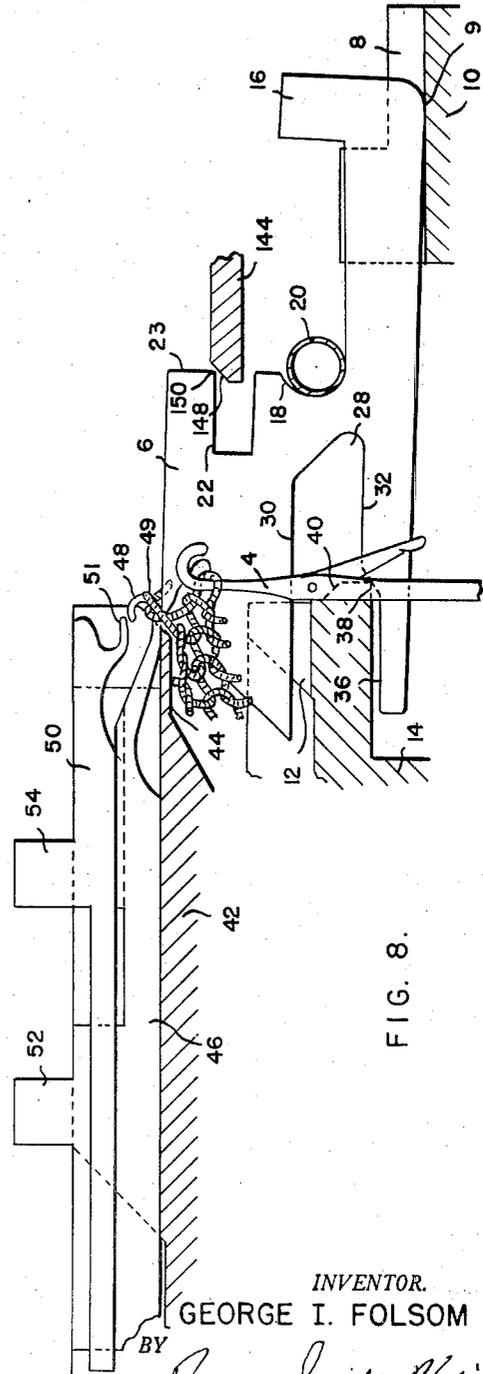


FIG. 8.

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KNITTING METHOD AND MACHINE

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6 Sheets-Sheet 5

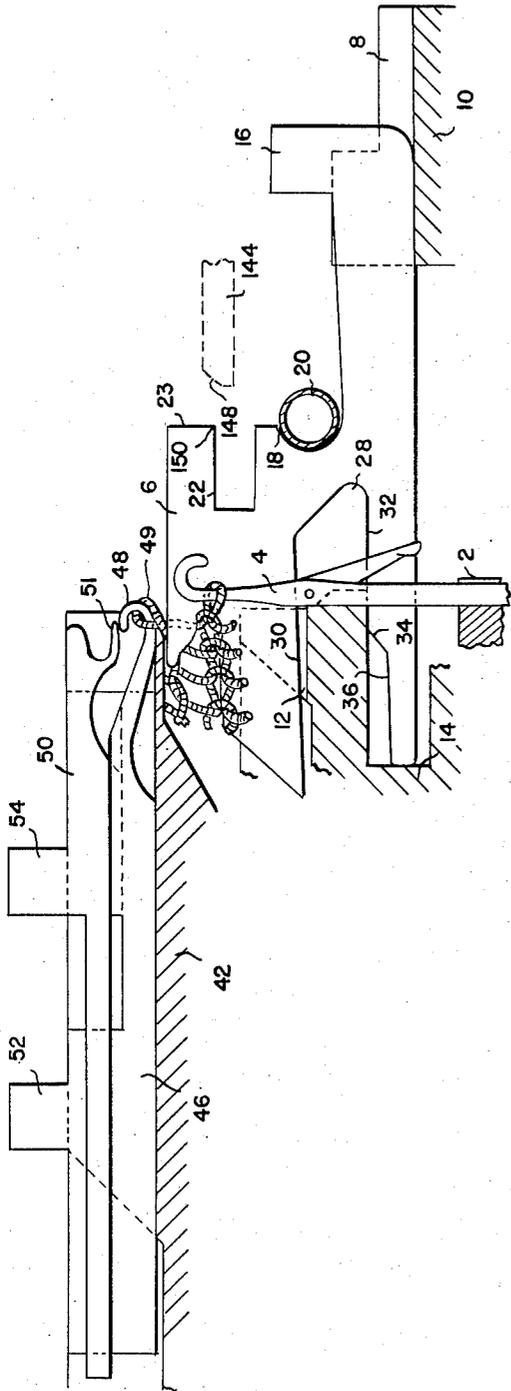


FIG. 9.

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6 Sheets-Sheet 6

FIG. 10.

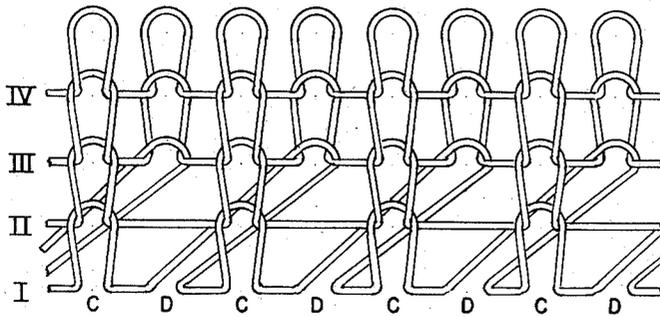


FIG. 11.

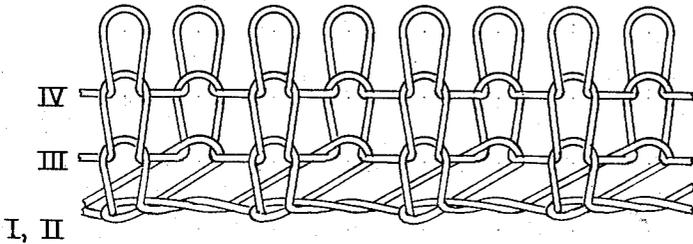


FIG. 12.

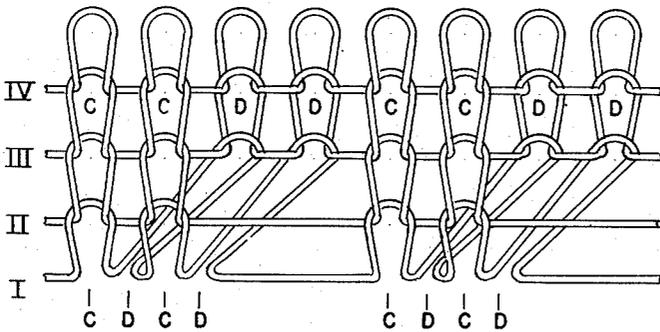
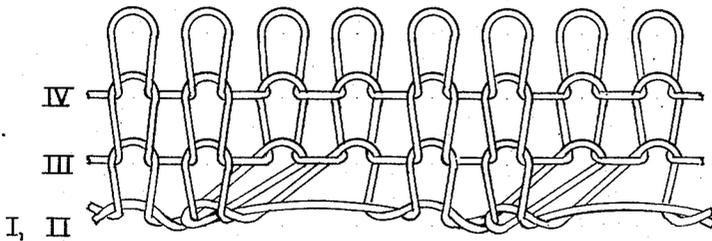


FIG. 13.



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2,829,508

KNITTING METHOD AND MACHINE

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Application August 27, 1956, Serial No. 606,507

16 Claims. (Cl. 66—13)

This invention relates to a knitting method and machine and has particular reference to the formation of rib tops or other ribbed bands on half-hose or other circular machines having cylinder and dial needles.

The patent to R. W. Scott, No. 1,641,101, dated August 30, 1927, described in detail the mechanism and procedure which has been involved, starting on bare needles, in the formation of rib tops of half-hose and the transfer of loops from dial needles to cylinder needles which were inactive during the formation of the rib tops.

The patents to R. H. Lawson, No. 2,719,415, dated October 4, 1955, and No. 2,783,629, dated March 5, 1957, disclose improvements in methods and mechanisms for the formation of rib tops and in particular the formation of rib tops having improved characteristics of both appearance and elasticity. The present invention relates to the same general subject matter as the Lawson patent and application and involves further improvements in the matter of starting with a complete set of bare needles and knitting rib tops not only of 1 x 1 rib type but of other types of which 2 x 2 rib tops may be considered examples.

In accordance with the present invention the makeup does not involve the welt of the tubular type particularly described in the Scott patent. Simpler rack or shog welts starting from a complete set of empty needles are produced in accordance with the invention.

It will be understood that the machine of the above mentioned patents and application, as well as that of the present invention do not require the use of a take-up or tensioning device of conventional design and are therefore capable of releasing each stocking as knitting is completed. However, as pointed out, the latter makes possible a rack or shog welt which permits starting rib knitting from bare needles only after two courses of preliminary or makeup knitting.

The invention particularly concerns the use of special sinker movements for the proper tensioning of rib fabric as it is produced, the sinkers not being of the saw-tooth type such as have heretofore been used in the formation of rib top half-hose. In accordance with the invention sinkers are moved not only inwardly but downwardly to effect proper takeup consistent with the formation of satisfactory rib tops and with the further advantages of production of uniform stitches and the avoidance of tucking.

The objects of the invention relating to the attainment of the foregoing results and other objects relating to details of construction and operation will become apparent from the following description read in conjunction with the accompanying drawings, in which:

Figure 1 is a fragmentary elevation showing dial driving connections including shogging means of the type illustrated in said Lawson Patent 2,719,415;

Figure 2 is a fragmentary elevation looking at the right hand side of Figure 1 and showing adjustable means for limiting shogging movements;

Figure 3 is an inside development of the cams for acting upon the butts of cylinder needles;

2

Figure 4 is a horizontal section showing the cams for acting upon the hook and point members constituting the two-part dial needles;

Figure 5 is a plan view showing, in particular, various sinker-controlling cams and the operating devices therefore;

Figure 6 is a fragmentary section taken on the plane indicated at 6—6 in Figure 5;

Figures 7, 8 and 9, inclusive, are enlarged axial sections showing the relationships of cylinder and dial needles and sinkers during rib knitting, the various sections being taken on the axial planes indicated at 7, 8 and 9, respectively, in Figure 5;

Figure 10 is a diagrammatic view showing the formation of a welt for a 1 x 1 rib fabric in accordance with the invention;

Figure 11 is a similar view but showing the welt in the form which it takes in the completed stocking;

Figure 12 is a view similar to Figure 10 but showing a desired form of welt formation for a 2 x 2 rib top; and

Figure 13 is a view similar to Figure 11 showing the final form of the welt of Figure 12 as it appears in a completed stocking.

The half-hose which is produced in accordance with the invention is essentially as described in said Scott and Lawson patents, and, accordingly, there are illustrated only those changes and parts which are particularly concerned with the attainment of the objects of the present invention. As will more fully appear hereafter, transfer operations are carried out precisely as described in said Scott patent, and, hence, have not been illustrated.

The half-hose machine comprises the slotted needle cylinder 2 in which are mounted latch needles indicated at 4. As is usual, these needles are provided with butts arranged to be acted upon by suitable cams, there being made provision for differentiating the needles to render selectively active and inactive groups thereof in the knitting of rib fabric, the differentiation being obtained through the use of jacks which are not illustrated herein but are as shown in said Scott patent.

In accordance with the disclosures of said patents, saw-tooth sinkers alternate with plain sinkers between pairs of adjacent cylinder needles. In accordance with the present invention saw-tooth sinkers are not used, but instead between each pair of cylinder needles there is located a sinker of the type illustrated at 6, the sinker being guided for radial movements by reception in slots 8 of the sinker dial 10 and by reception in slots 12 in the cylinder top 14. Each sinker is provided with a butt 16 which is acted upon by cams as hereafter described in greater detail to impart radial movements thereto. Each sinker is also provided with a socket 18 in which there engages the spring band 20 which serves to urge the sinkers yieldingly inwardly. The sinker is provided with a slot 22 which, as will appear hereafter, is arranged for cam engagement for the control of vertical movements of the sinker. Above the slot 22 is an edge 23 which is also engaged by a cam as will appear hereafter.

Each sinker is provided with a ledge 24 over which stitches are drawn by the needle hooks during plain knitting, and with a neb 26 which, as most clearly shown in Figure 7, is sloping and is provided with angular ledges 27 and 29 for the proper engagement of bights of yarn extending between adjacent cylinder and dial loops.

Each sinker is also provided with an opening or slot indicated generally at 28 which has a straight upper edge 30 but which has a lower edge comprising two straight portions 32 and 36 jointed by a sloping portion 34 which is arranged to be cammed by a corresponding corner 38 at the outer lower edge of a wall 40 defining needle guiding slots in the periphery of the cylinder top 14. The

3

spacing between the edges 30 and 32 is just slightly greater than the vertical thickness of the flange portion of the cylinder top 14, as will be clear from Figure 9.

A radially slotted dial is provided at 42 and is automatically vertically movable as described in the Scott patent. Within radial slots in the dial there are mounted for relative sliding movements the hook members 46 and the cast-off or point members 50 constituting the dial needles. The hook members 46 are provided with the usual hooks 48 while the point members 50 are provided with the usual points 51. Butts 52 and 54 on the respective members are arranged to be acted upon by dial cams such as indicated in Figure 4, including the member 56 provided with the cam surface 58 and cams 60, 62, 63 and 64.

The butts of the cylinder needles are arranged to be acted upon by the switch cam 66, the reverse stitch cam 68, the center cam 70, the forward stitch cam 72, the rise cam 74 and the lowering cam 76. In Figure 3 the needle butts are shown differentiated as they would be in 1 x 1 rib knitting, the needle butts shown being arranged in two groups 4' and 4'', the former being active during rib knitting and the latter being inactive. Those which are active during rib knitting pass the cams which have been described along the butt path A, the butts passing over the reverse stitch cam 68 and being depressed by cams 70 and 72 to take yarn at the feed of the machine, then being raised by cam 74 and lowered by cam 76. The butts 4'' of needles which are in active during rib knitting enter the butt path B and are depressed below the leading point of the reverse stitch cam 68 by switch cam 66 and lowered by cam surface 69, thereafter moving horizontally to join the butts 4' to be raised by cam 74 and then lowered by cam 76.

The various structural matters heretofore described, except for the sinkers, will be found to be essentially as disclosed in said Scott patent and details need not be particularly described herein. However, reference may be made to two matters which contribute to the securing of best results and are described in said Lawson patents. First, it is desirable that the dial needles draw their stitches during rib knitting somewhat later than the cylinder needles, which action aids in widening the bites between the rib and plain loops. Secondly, it is preferable to effect cast-off by means of an outside point 51 rather than by an inside hook as described alternatively in said Scott patent, the result being less stretching of the dial stitches with a resulting tendency to production of wider bites between the rib and plain loops.

Reference may now be particularly made to Figures 1 and 2 which show shogging means of the type illustrated and described in said Lawson Patent 2,719,415. The dial 42 is connected to a shaft 78 which is driven through a pair of bevelled gears at 80 from a shaft 81 which is in turn driven by a pair of bevelled gears 82 from a vertical shaft 84. In said Scott patent, the shaft corresponding to 84 was driven in unison with the needle cylinder by direct gear drive. In the present case, however, there is secured to the lower end of shaft 84 a gear 86 meshing with a pinion 88 secured to a second pinion 90 through a stub shaft 91, the pinion 90 meshing with a gear 92 secured to a shaft 94 coaxial with the shaft 84 and driven through bevelled gears 96 from the shaft 97 which drives a needle cylinder. A yoke 98 bounded coaxially with the shafts 84 and 94 serves to mount the stub shaft 91 to provide a planetary gear arrangement, the yoke being connected through a linkage including the link 100 so as to be angularly shiftable by cams on the main cam drum of the machine between positions limited by the adjustable stop screws 102 and 104. The linkage, including the link 100, has sufficient spring so that at the extremes of its movement the yoke 98 may be definitely arrested by the screws 102 and 104 in the two extreme positions.

While the shogging mechanism just described is identi-

4

cal with that shown in said Lawson Patent 2,719,415, its purpose in connection with the present invention is quite different as will appear hereafter.

Reference may now be made particularly to Figure 5 which shows the cams for control of sinker movements. The regular forward and reverse knock-over cams are illustrated at 106 and 108, respectively. The former of these is pivoted at 110 and the latter at 112. A rib knock-over cam 114 having its active rise at 116 is pivoted also at 110 independently of cam 106. The reverse knock-over cam 108 is controlled by a link 118 from the main cam drum of the machine in conventional fashion while the forward knock-over cam 106 is similarly controlled by a link 120. The inner position of cam 114 is adjusted by means of the eccentric 122 which abuts a portion of the sinker cap which carries all of the parts of the sinker control system. The cam 114 is urged inwardly by the action of a spring, not shown, as described in said Scott patent.

A sinker withdrawing cam 124 arranged to act on the sinker butts 16 is fixed in position as described in said Lawson application.

A bell crank 126 pivoted to the sinker cap at 128 is arranged to be controlled from the main cam drum through a push rod 130 and is provided with a pin 132 engaging a slot in one end of a lever 134 pivoted to the sinker cap at 136. The other end of this lever 134 is slotted to embrace a pin 138 extending upwardly through a slot in the sinker cap and carried by a cam 140 which is pivoted to the sinker cap at 142. The cam 140 is also illustrated in Figure 7.

Overlapping the position of the cam 140 and extending there beyond in the direction of needle rotation during rotary knitting is the fixed cam 144 which is provided with two bevels 146 and 148, the former being arranged to engage the upper edge of the slots 22 in the sinkers to raise the nebs 26 of the sinkers as they reach this cam, while the latter bevel 148 is arranged to act upon the corners 150 of the sinkers where the edges of 22 and 23 meet.

Beyond the position of the cam 144 in the direction of needle rotation is a lever 152 pivoted to the sinker cap at 154 and urged by a spring 156 to an inner position limited by an adjustable eccentric stop 158 carried by the sinker cap. A cam edge 160 of the lever 152 is arranged to engage the edge 23 of each sinker to aid in moving it inwardly, the cam 160 serving to augment the action of the spring band 20.

It may be here noted that the sinker and cylinder needle cams are so related that that the position of the lowermost point of the forward stitch cam 72 just precedes the innermost point of the cam 106. The cams 140, 144 and 160 are, accordingly, active in that region in which the needles in the cylinder are at the level determined by their downward movement under cam 76. The cylinder needles shown in Figures 7, 8 and 9 are shown in this position. The dial needles in these figures are in the position attained following the action of cams 58 and 63.

As a preliminary to description of the operation, reference may first be made to the normal position of dial needles relative to cylinder needles during rib knitting. Irrespective of the type of rib which is being formed, the number of dial needles set up in the dial is equal to the number of cylinder needles inactive during rib knitting. In 1 x 1 rib knitting, for example, the number of dial needles is one-half the total number of cylinder needles. During rib knitting in accordance with the present invention the dial needles are substantially in precise alignment with the inactive cylinder needles with the result that wherever a cylinder needle is adjacent to a dial needle a sinker is midway between them. It will be noted that in accordance with the present invention, the dial is not provided with fins such as are conventionally used when saw-tooth sinkers are used.

There may now be described the makeup for the knit-

5

ting of 1 x 1 rib with particular reference to Figure 10. This illustrates the fabric in the region of makeup, and the wales are designated C and D, respectively, to correspond to the cylinder and dial wales involved during the rib knitting. In the makeup operation the dial is shogged backward with respect to the cylinder to a position in which each dial needle is substantially aligned with that inactive cylinder needle which follows the inactive cylinder needle with which it will be aligned during rib knitting; i. e., the dial is shogged rearwardly with respect to the direction of needle cylinder rotation to the extent of two cylinder needle spacings from the position which will be assumed during rib knitting.

In the formation of the first course I, active cylinder needles and dial needles take yarn. In the formation of the second course II, only cylinder needles take the yarn and knit, the dial needles remaining inactive and holding the loops taken during the first course. During this course the dial is advanced to its normal position for rib knitting, the dial needles carrying the loops which were drawn during the first course.

Then during the third and fourth and subsequent courses, as indicated at III and IV, both the dial and active cylinder needles take yarn, knitting in conventional fashion except for the special sinker actions which will be later described.

The result of the foregoing is the formation of a rack or shog welt involving an ultimate twisted arrangement of the yarn such as illustrated in Figure 11. The welt thus provided is of good appearance, not involving the small eyelets which result from a non-shog welt formation. Consistent with the use of other advantages of the invention, however, other welts may be formed.

Similar, but slightly inferior results are obtained if the dial is first advanced rather than retarded with respect to normal rib knitting position. If advance rather than retardation is provided, the advance is desirably of the same extent as that involved in the retarded condition already described.

Before proceeding with a description of rib knitting in detail, reference may be made to Figure 12 which illustrates the desirable operations involved in the formation of a welt when a 2 x 2 rib is desired. In this case the normal positions of the needles during rib knitting are such that in the cylinder two active needles alternate with two inactive needles and pairs of dial needles are axially aligned with the pairs of inactive cylinder needles. For the formation of the welt the dial needles are again retarded from their normal rib knitting positions to an extent which might be well described as one and one-half times the spacing between adjacent cylinder needles. The dial needles accordingly initially occupy the positions indicated at D at the bottom of Figure 12, the pairs of active cylinder needles occupying the positions indicated by C. In the formation of the first course I, yarn is fed to the active cylinder needles and the dial needles. In the formation of the second course II, only the active cylinder needles take and knit the yarn while during the formation of this course the dial is advanced relatively to the cylinder to bring the dial needles, which carry their loops taken on the first course, into axial alignment with the inactive cylinder needles. The knitting then continues for courses III and IV and subsequent courses with both dial needles and active cylinder needles taking and knitting the yarn.

The result of the foregoing is the formation of a welt as illustrated in Figure 13, the welt having a highly satisfactory appearance.

In this case also the dial may be advanced rather than retarded with respect to the cylinder and with respect to its normal position for the rib knitting. The welt resulting from such advance is essentially as satisfactory and has very much the same appearance as that resulting from retardation.

During the formation of the welt since only two courses are involved prior to the beginning of rib knitting it is

6

immaterial whether the sinkers are or are not operated in the fashion involved in rib knitting as will now be described. In other words, it is not material whether the came 140 is active or inactive, since the sinker nebs 26 do not attempt to lower the dial loops until actual rib knitting begins.

It will be evident that other types of welt formation may be used consistently with the invention and in accordance with known practices. For example, there may be 1 x 1 makeup without shog; or tucked makeup may be used. Various types of broad rib constructions may be produced following makeup.

The function of the sinkers in accordance with the invention during rib knitting is essentially the same irrespective of the type of rib which is being produced, and accordingly the description may be made common to any desired type of rib knitting. What is involved particularly in knitting 1 x 1 rib fabric are the actions of the sinkers which lie between the adjacent active cylinder and dial needles, the sinkers acting particularly on the bights of yarn extending between the cylinder and dial loops; while in knitting 2 x 2 rib fabric, the sinkers while lie between adjacent dial needles are also involved.

Aside from the special sinker actions, the operations involved in rib formation are conventional, the dial and cylinder needles moving in the usual fashion, the cams 106 and 108 being withdrawn so that the cam 116 is active on the sinkers following the drawing of stitches in the usual fashion. The special sinker actions start with the withdrawal of the sinkers by the action of cam 140 which is active during rib knitting. Referring first to Figure 7, the cam 140 has been moved to its active position as seen in Figure 5, and while the sinkers are still engaged by the cam 140 they reach the position of the bevel 146 of cam 144 so that the upper edge of slot 22 rides over the cam 144 lifting the inner ends of the sinkers with their outer ends resting on fulcrums 9 as illustrated, with the edge 36 just clearing the lower surface of the flange of the cylinder top 14. When the cam 140 releases a sinker, the spring band 20 is free to act thereon to start the sinker moving inwardly. This inward movement is, of course, gradual since the spring band must extend from the last sinker engaged by cam 140 tangentially to the position corresponding to the innermost positions of the sinkers. As the sinkers thus move inwardly they continue engagement with the cam 144 until the position indicated approximately at 8 in Figure 5 where the corners 150 start to ride down the bevel 148. At the same time the bevel 34 reaches the position of the corresponding corner 38 of wall portion 40. The slopes at 148 and 34 correspond so that as the sinker moves inwardly it moves downwardly under substantially full control against any appreciable free upward or downward movements. Thus its neb 26 moves inwardly and downwardly in a predetermined sloping path. As this movement takes place the neb just clears the peripheral edge 44 of the dial and overlies and moves downwardly the bight of yarn which extends between the flanking cylinder and dial needles or that extending between adjacent dial needles. After the cam 144 is cleared by the sinker at a position approximately that indicated at 9 in Figure 5, it moves substantially radially as illustrated in Figure 9, being held against rise by the flange of the cylinder top which engages the edge 32. Any excessive downward movement is limited by the edge 30 which extends over the top of this flange. As this inward movement occurs the neb 26 cams downwardly the bight of yarn extending between the flanking needles and the neb passes above one or more additional bights previously formed. The angular ledges 27 and 29 provide, respectively, means for lowering the bight with its connected dial stitch and for holding down the cylinder stitch against the action of rising cylinder needles.

By referring to Figures 7, 8 and 9, it will be seen that except for the lowering action just described, the

previously formed stitch 49 would remain as shown in Figure 7 to be entered and caught by the dial hook 48 as it moved out to take yarn, and result in a "loading up" or non-knitting condition.

From what has been described it will be evident that the action on the formed loops satisfies the requirements which are discussed in said Lawson Patent 2,719,415, i. e., that the bights between loops should be engaged by a takeup or tensioning element during rib formation rather than any of the needle loops. The result is a fabric which is highly satisfactory and elastic having substantially the characteristics of rib fabric knit with benefit of a conventional takeup.

In this discussion of rib knitting the inward movements of the sinkers were described as to their functions in rib knitting. However, the sinkers have the further function of maintaining tension on rib stitches during transfer. Since the strain at this time is substantially greater due to the dial stitch being taken from the hook 48 by point 51 and carried out to enlarge the stitch sufficiently to be entered by a previously inactive cylinder needle, it is desirable to augment the action of the spring band, and this is accomplished by the action of cam 160 which, urged by spring 156, acts on edges 23 of the sinkers to insure their complete inward movement, if that has not been attained by the action of the spring band, and to maintain them against outward movement against the tension of the spring band. The transfer operation itself is conventional and may take place as described in said Scott patent. It may be noted, however, that since shogging is possible it is desirable during the transfer to advance the dial slightly though this is only to insure that the inactive cylinder needles will with certainty pass to the rear of the dial needles during the transfer operation, the dial needles having desirably been substantially in direct alignment with the cylinder needles during the rib knitting. The dial needles are provided with bevels designed to guide the inactive cylinder needles properly during the transfer operation, but while such bevels will normally properly act even when the dial and inactive cylinder needles are directly aligned, the action is desirably assured by the slight advance mentioned.

It will be obvious that various details may be varied from what has been described without departing from the invention which is accordingly not to be construed as limited except as required by the following claims.

What is claimed is:

1. In a circular knitting machine, a cylinder, a dial, cylinder and dial needles respectively carried thereby, cams for imparting stitch drawing movements to said cylinder and dial needles, sinkers having nebs for effecting inward movements of fabric during rib knitting by said cylinder and dial needles, and means for imparting to the sinkers movements having an inward component and a component in the axial direction in which cylinder needles are moved to draw stitches, said sinker movements occurring during rib knittings at a point following the location of drawing of stitches.

2. In a circular knitting machine, a cylinder, a dial, cylinder and dial needles respectively carried thereby, cams for imparting stitch drawing movements to said cylinder and dial needles, sinkers having nebs for effecting inward movements of fabric during rib knitting by said cylinder and dial needles, and means for imparting to the sinkers movements having an inward component and a component in the axial direction in which cylinder needles are moved to draw stitches, said sinker movements occurring during rib knittings at a point following the location of drawing of stitches, the last mentioned sinker movements causing their nebs to move closely adjacent to the periphery of the dial.

3. In a circular knitting machine, a cylinder, a dial, cylinder and dial needles respectively carried thereby, cams for imparting stitch drawing movements to said cylinder and dial needles, sinkers having nebs for effect-

ing inward movements of fabric during rib knitting by said cylinder and dial needles, and means for imparting to the sinkers, in succession, outward movements, movements in an axial direction opposite that in which cylinder needles are moved to draw stitches, and movements having an inward component and a component in the axial direction in which cylinder needles are moved to draw stitches, said sinker movements occurring during rib knitting at a point following the location of drawing of stitches.

4. In a circular knitting machine, a cylinder, a dial, cylinder and dial needles respectively carried thereby, cams for imparting stitch drawing movements to said cylinder and dial needles, sinkers having nebs for effecting inward movements of fabric during rib knitting by said cylinder and dial needles, and means for imparting to the sinkers, in succession, outward movements, movements in an axial direction opposite that in which cylinder needles are moved to draw stitches, and movements having an inward component and a component in the axial direction in which cylinder needles are moved to draw stitches, said sinker movements occurring during rib knitting at a point following the location of drawing of stitches, the last mentioned sinker movements causing their nebs to move closely adjacent to the periphery of the dial.

5. A knitting machine according to claim 1 in which the sinkers are urged inwardly by a spring band and in which said movements are effected by the action of the spring band.

6. A knitting machine according to claim 2 in which the sinkers are urged inwardly by a spring band and in which said movements are effected by the action of the spring band.

7. A knitting machine according to claim 3 in which the sinkers are urged inwardly by a spring band and in which the last mentioned movements are effected by the action of the spring band.

8. A knitting machine according to claim 4 in which the sinkers are urged inwardly by a spring band and in which the last mentioned movements are effected by the action of the spring band.

9. The method of effecting rib knitting in a circular knitting machine having a cylinder, a dial, cylinder and dial needles respectively carried thereby, cams for imparting stitch drawing movements to said cylinder and dial needles and sinkers having nebs, which comprises imparting to the sinkers during rib knitting movements having an inward component and a component in the axial direction in which cylinder needles are moved to draw stitches so that the nebs of the sinkers engage and impart tension to the completed stitches to prevent their seizure by the needles.

10. The method of effecting rib knitting in a circular knitting machine having a cylinder, a dial, cylinder and dial needles respectively carried thereby, cams for imparting stitch drawing movements to said cylinder and dial needles and sinkers having nebs, which comprises imparting to the sinkers during rib knitting, in succession, outward movements, movements in an axial direction opposite that in which cylinder needles are moved to draw stitches, and movements having an inward component and a component in the axial direction in which cylinder needles are moved to draw stitches so that the nebs of the sinkers engage and impart tension to the completed stitches to prevent their seizure by the needles.

11. In a circular knitting machine, a cylinder, a dial, cylinder and dial needles respectively carried thereby, sinkers having nebs, cams for imparting stitch drawing movements to said cylinder and dial needles, means for locating said dial needles between positions of active cylinder needles, means for effecting drawing of loops in one course by said dial needles and active cylinder needles, all of said needles being without loops at the beginning of said course, means for effecting drawing of loops in the next course by active cylinder needles only, means for shogging the dial needles relative to the cylinder needles

while the dial needles hold loops drawn in the first mentioned course so that the last mentioned loops are moved across the loops drawn by cylinder needles in the second mentioned course, means effecting drawing of loops in a third course by both dial needles and cylinder needles to initiate the knitting of rib fabric, and means for operating sinkers to cause their nebs to cast off completed stitches from said dial and cylinder needles.

12. A circular knitting machine according to claim 11 in which the cylinder needles are, during the operations referred to, in a 1 x 1 rib setup with alternate cylinder needles active and intermediate cylinder needles inactive.

13. A circular knitting machine according to claim 11 in which the cylinder needles are, during the operations referred to, in 2 x 2 rib setup with pairs of adjacent active needles alternating with pairs of adjacent inactive needles, and in which one of each pair of dial needles is located during the first course between active cylinder needles of a pair.

14. The method of effecting makeup on bare needles in a circular knitting machine having a cylinder, a dial, cylinder and dial needles respectively carried thereby, sinkers having nebs and cams for imparting stitch drawing movements to said cylinder and dial needles, comprising locating said dial needles between positions of active cylinder

needles, effecting drawing of loops in one course by said dial needles and active cylinder needles, all of said needles being without loops at the beginning of said course, effecting drawing of loops in the next course by active cylinder needles only, shogging the dial needles relative to the cylinder needles while the dial needles hold loops drawn in the first mentioned course so that the last mentioned loops are moved across the loops drawn by cylinder needles in the second mentioned course, effecting drawing of loops in a third course by both dial needles and cylinder needles to initiate the knitting of rib fabric, and operating sinkers to cause their nebs to cast off completed stitches from said dial and cylinder needles.

15. A method according to claim 14 in which the cylinder needles are, during the operations referred to, in a 1 x 1 rib setup with alternate cylinder needles active and intermediate cylinder needles inactive.

16. A method according to claim 14 in which the cylinder needles are, during the operations referred to, in a 2 x 2 rib setup with pairs of adjacent active needles alternating with pairs of adjacent inactive needles, and in which one of each pair of dial needles is located during the first course between active cylinder needles of a pair.

No references cited.