March 5, 1935. N. M. SCHLOTTERER 1,993,248

RIB KNITTING MACHINE

Filed July 22, 1930 8 Sheets-Sheet 1

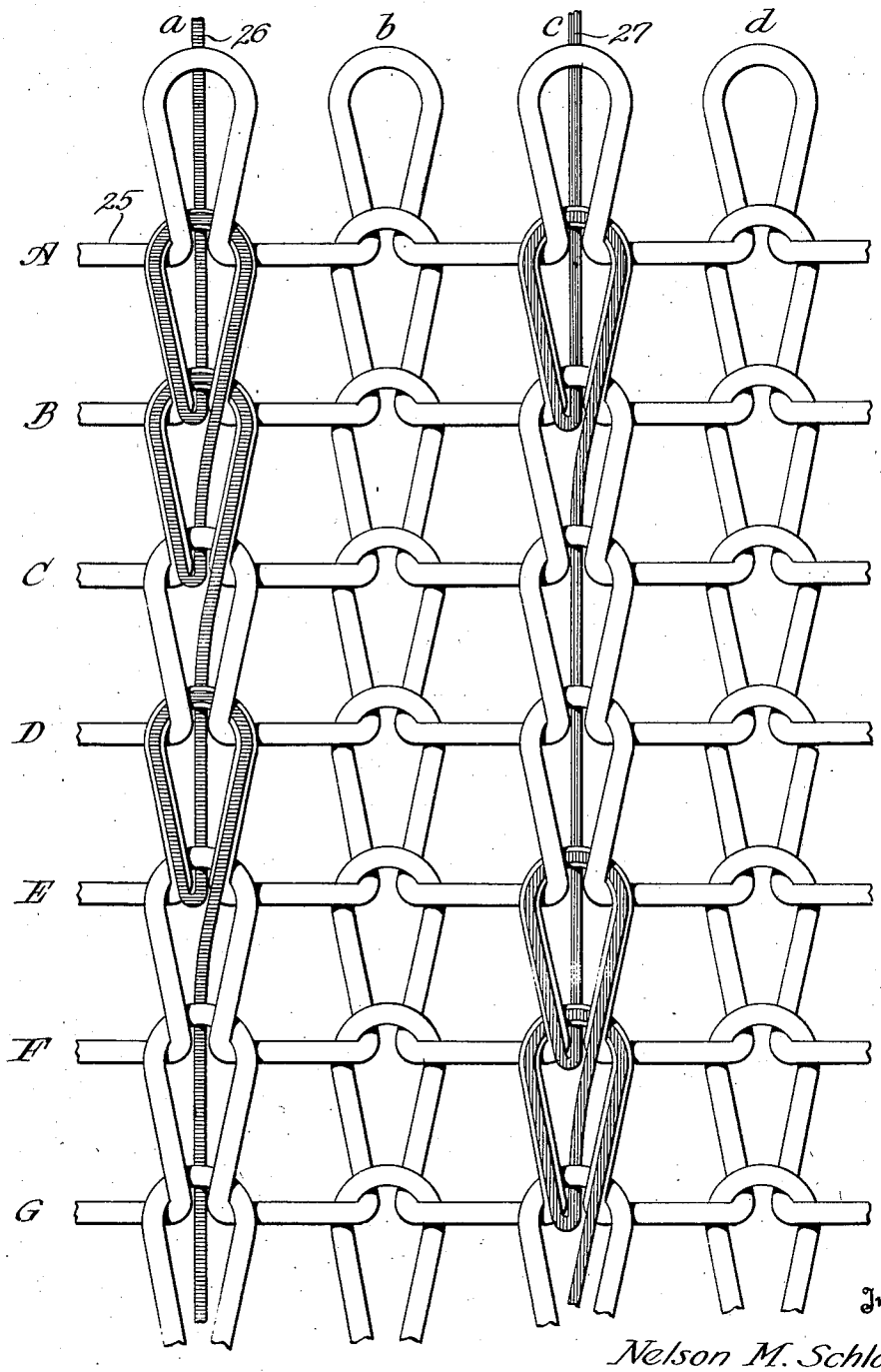


Fig. 1.

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By

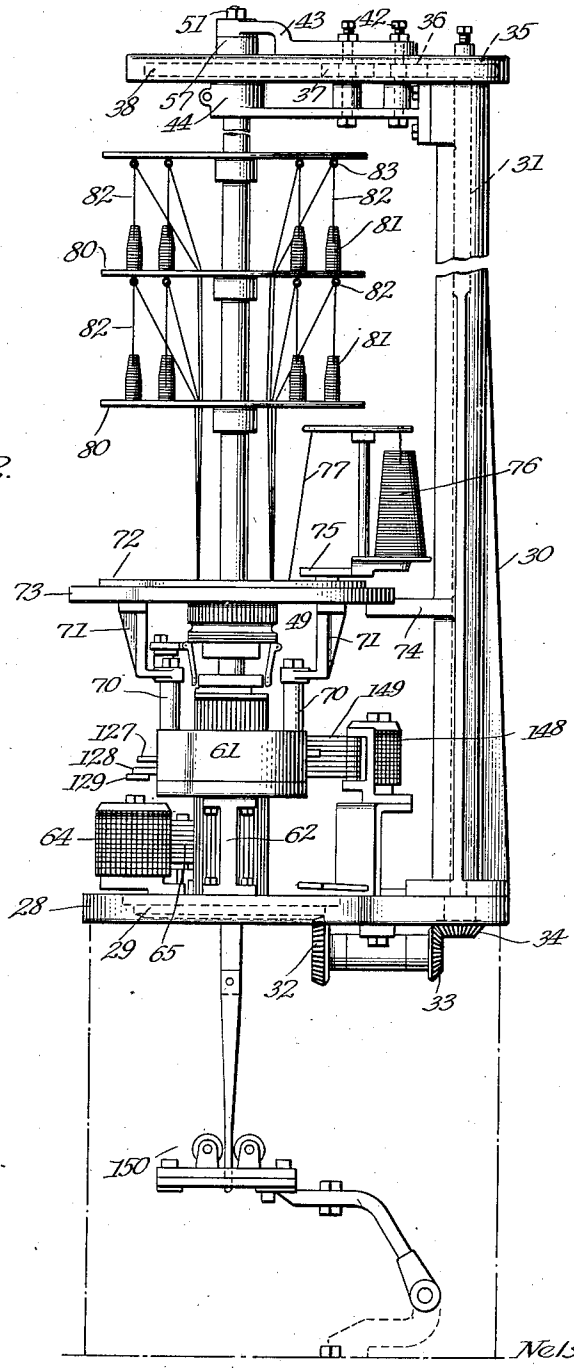
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March 5, 1935. N. M. SCHLOTTERER 1,993,248

RIB KNITTING MACHINE

Filed July 22, 1930 8 Sheets-Sheet 2

Fig. 2.



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March 5, 1935. N. M. SCHLOTTERER 1,993,248

RIB KNITTING MACHINE

Filed July 22, 1930 8 Sheets-Sheet 3

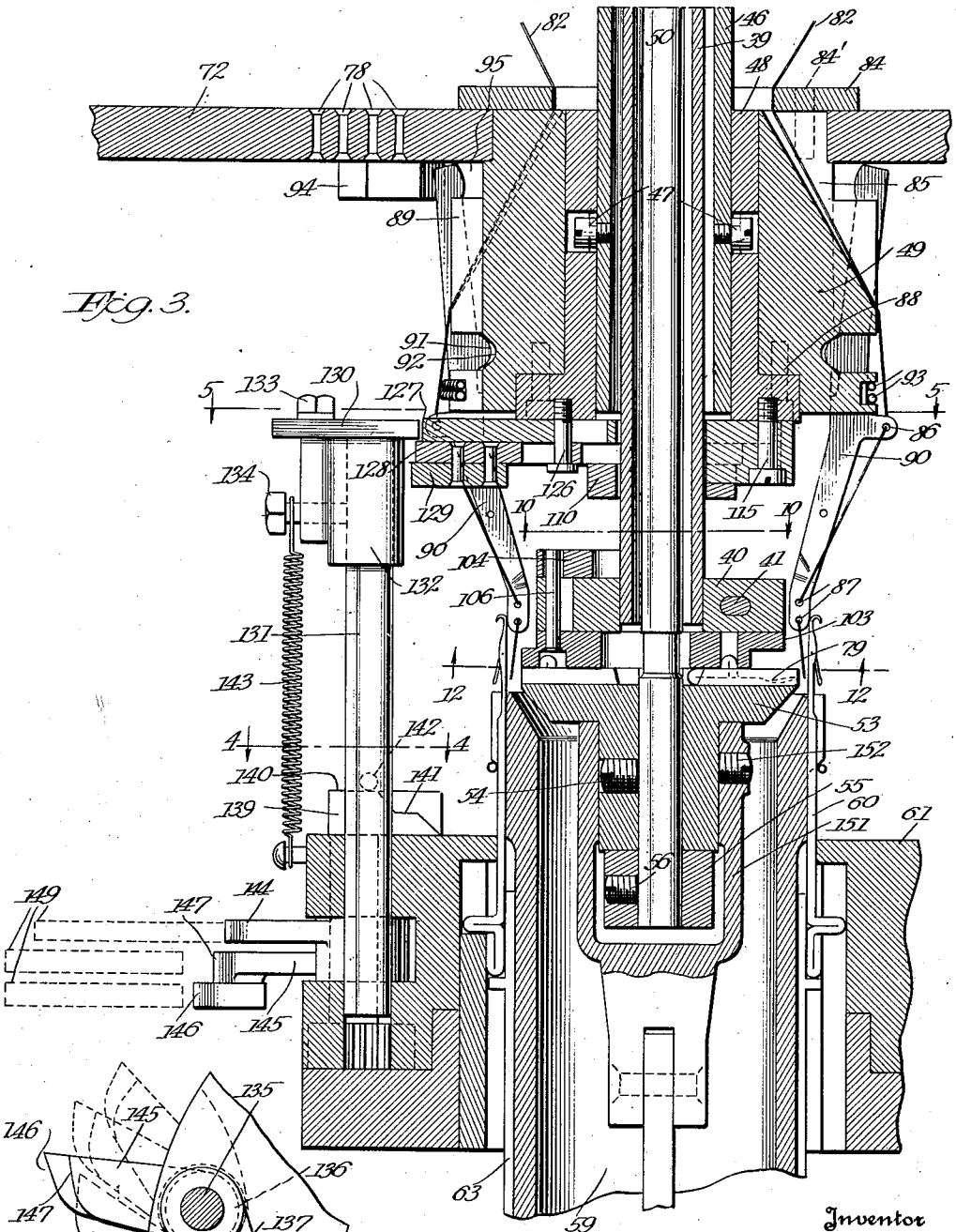


Fig. 3.

Fig. 4.

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March 5, 1935. N. M. SCHLOTTERER 1,993,248

RIB KNITTING MACHINE

Filed July 22, 1930 8 Sheets-Sheet 4

Fig. 5.

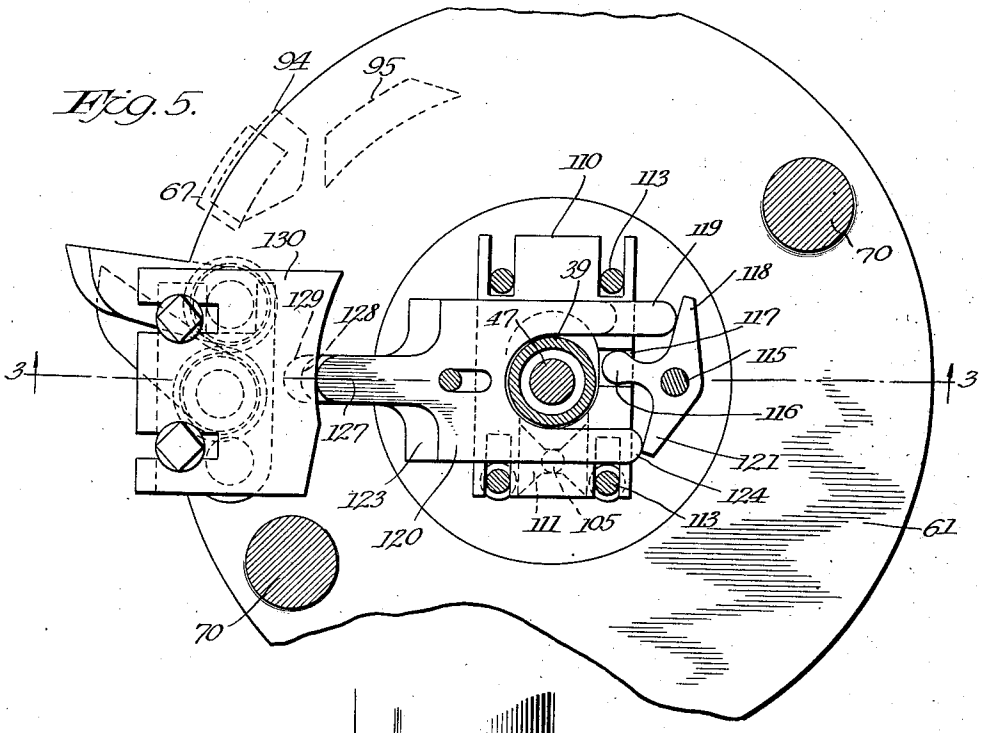
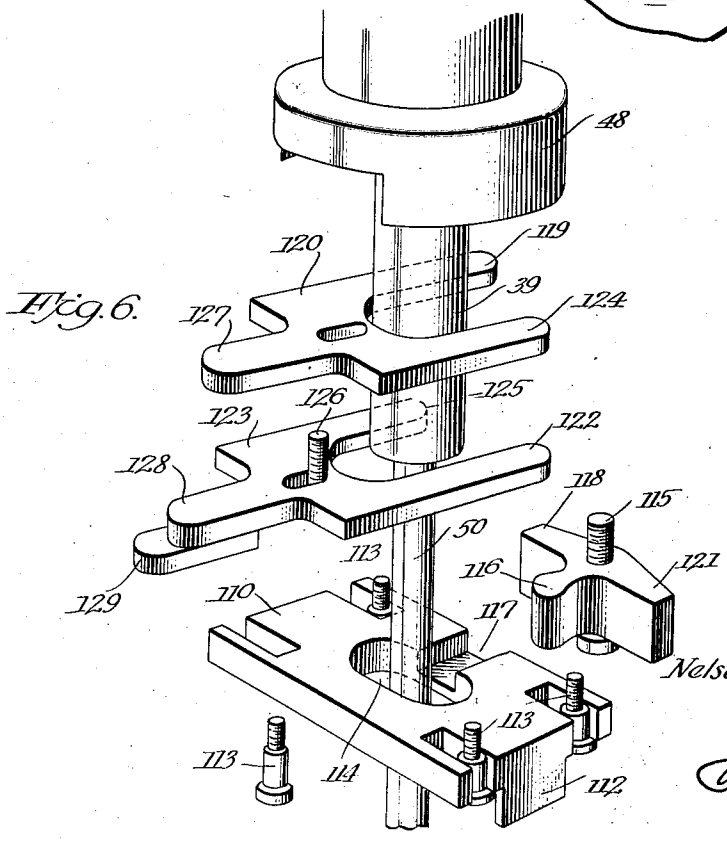


Fig. 6.



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March 5, 1935. N. M. SCHLOTTERER 1,993,248

RIB KNITTING MACHINE

Filed July 22, 1930 8 Sheets-Sheet 5

Fig. 7.

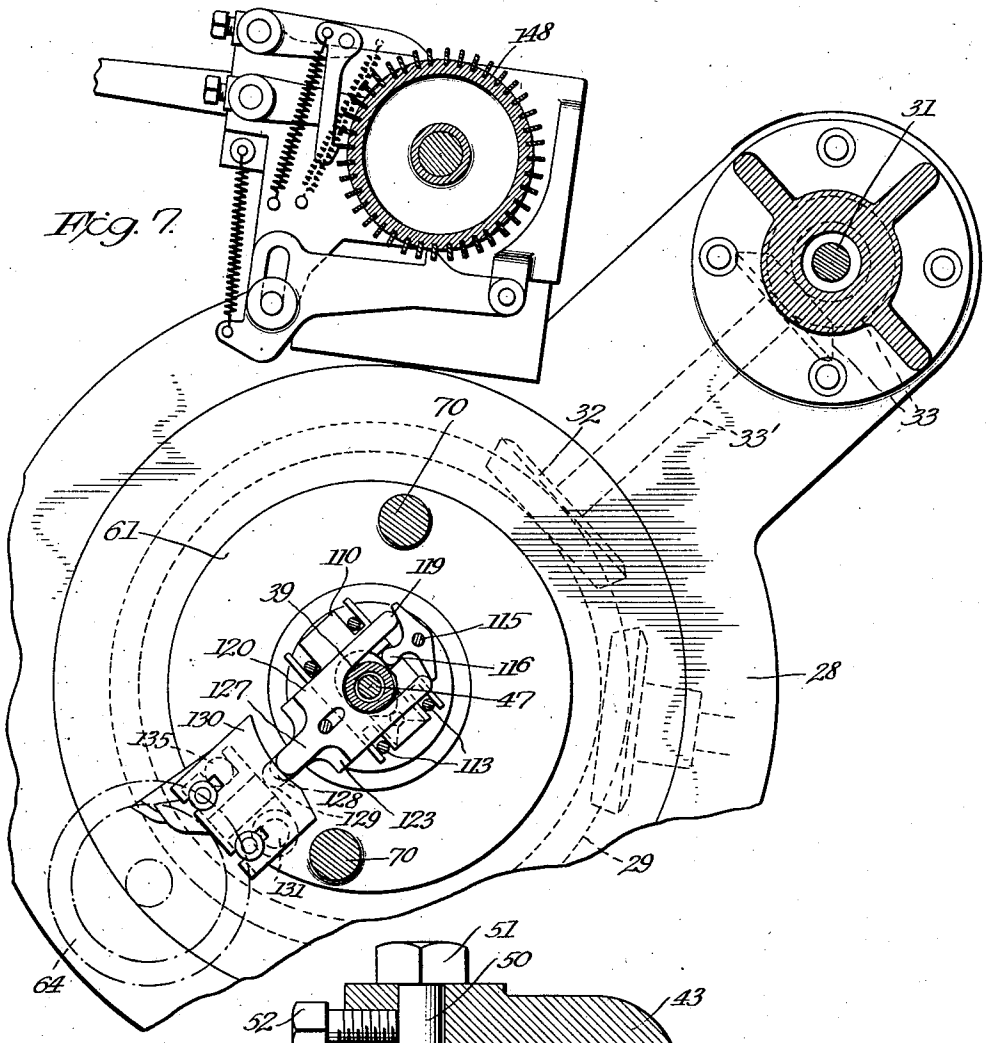
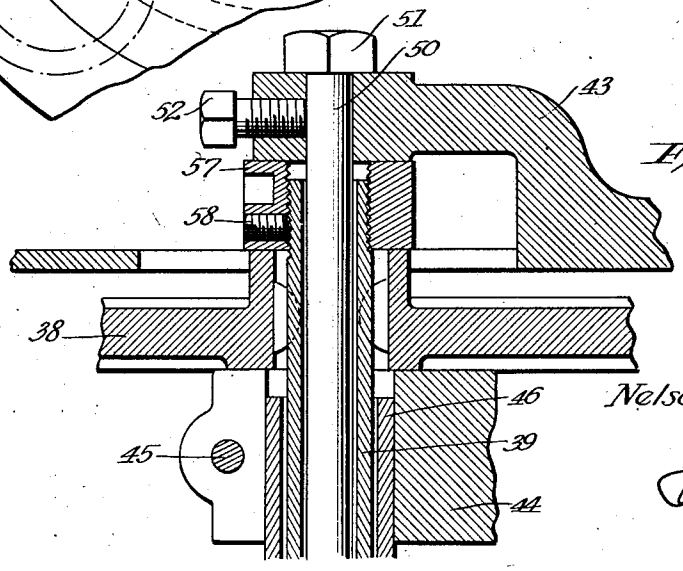


Fig. 8.



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March 5, 1935. N. M. SCHLOTTERER 1,993,248

RIB KNITTING MACHINE

Filed July 22, 1930 8 Sheets-Sheet 6

Fig. 9.

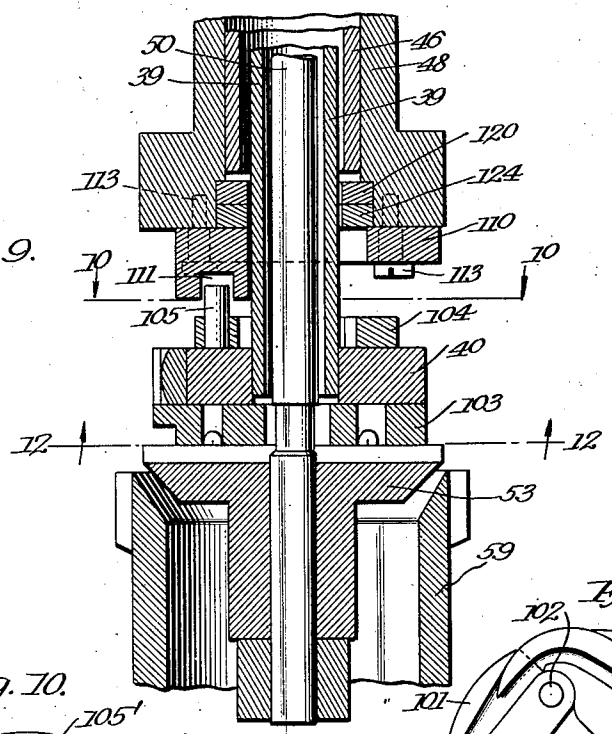


Fig. 10.

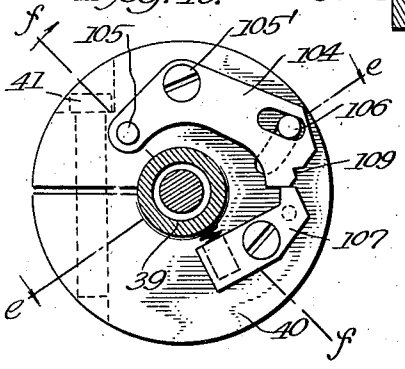


Fig. 11.

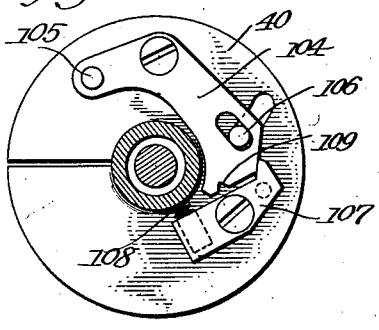


Fig. 12.

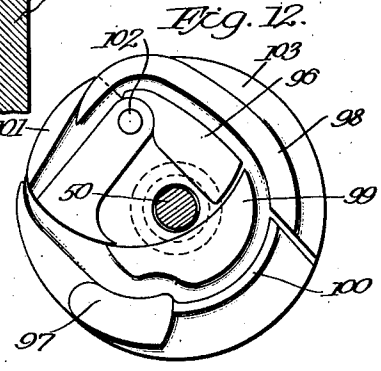
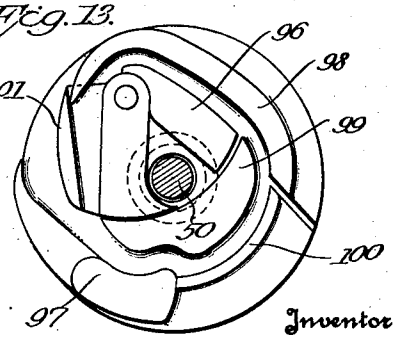


Fig. 13.



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RIB KNITTING MACHINE

Filed July 22, 1930 8 Sheets-Sheet 7



Fig. 14.

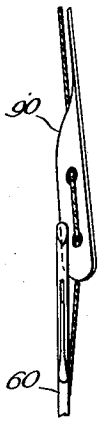


Fig. 15.



Fig. 16.

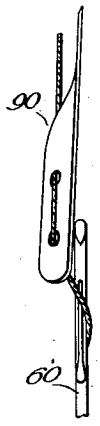
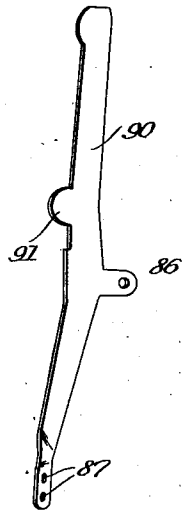


Fig. 17.



Fig. 21.

Fig. 18.



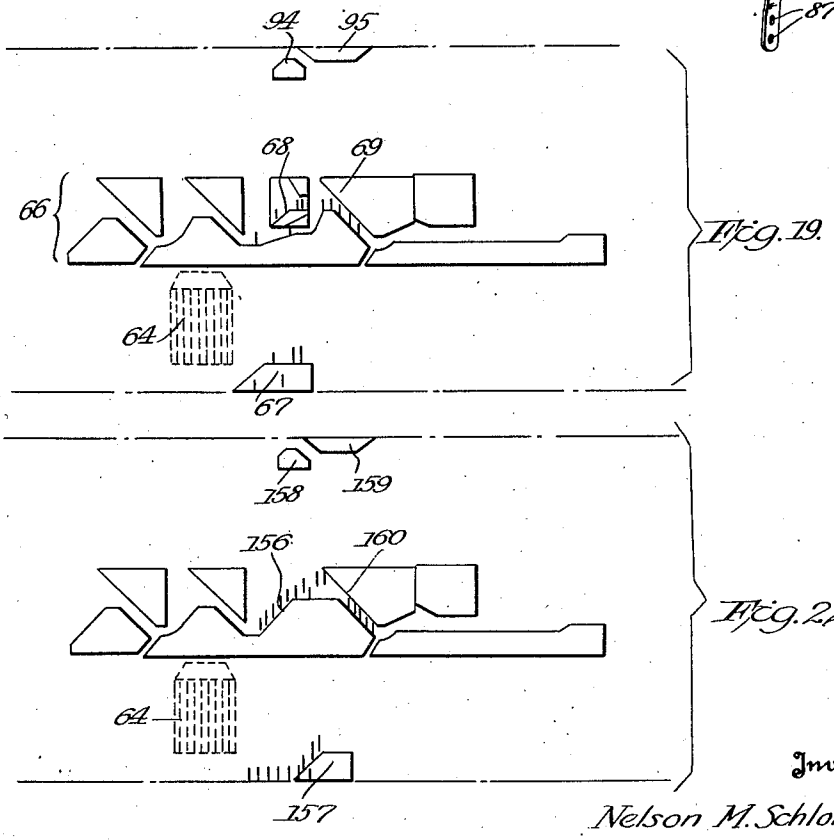


Fig. 19.

Fig. 22.

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RIB KNITTING MACHINE

Filed July 22, 1930 8 Sheets-Sheet 8

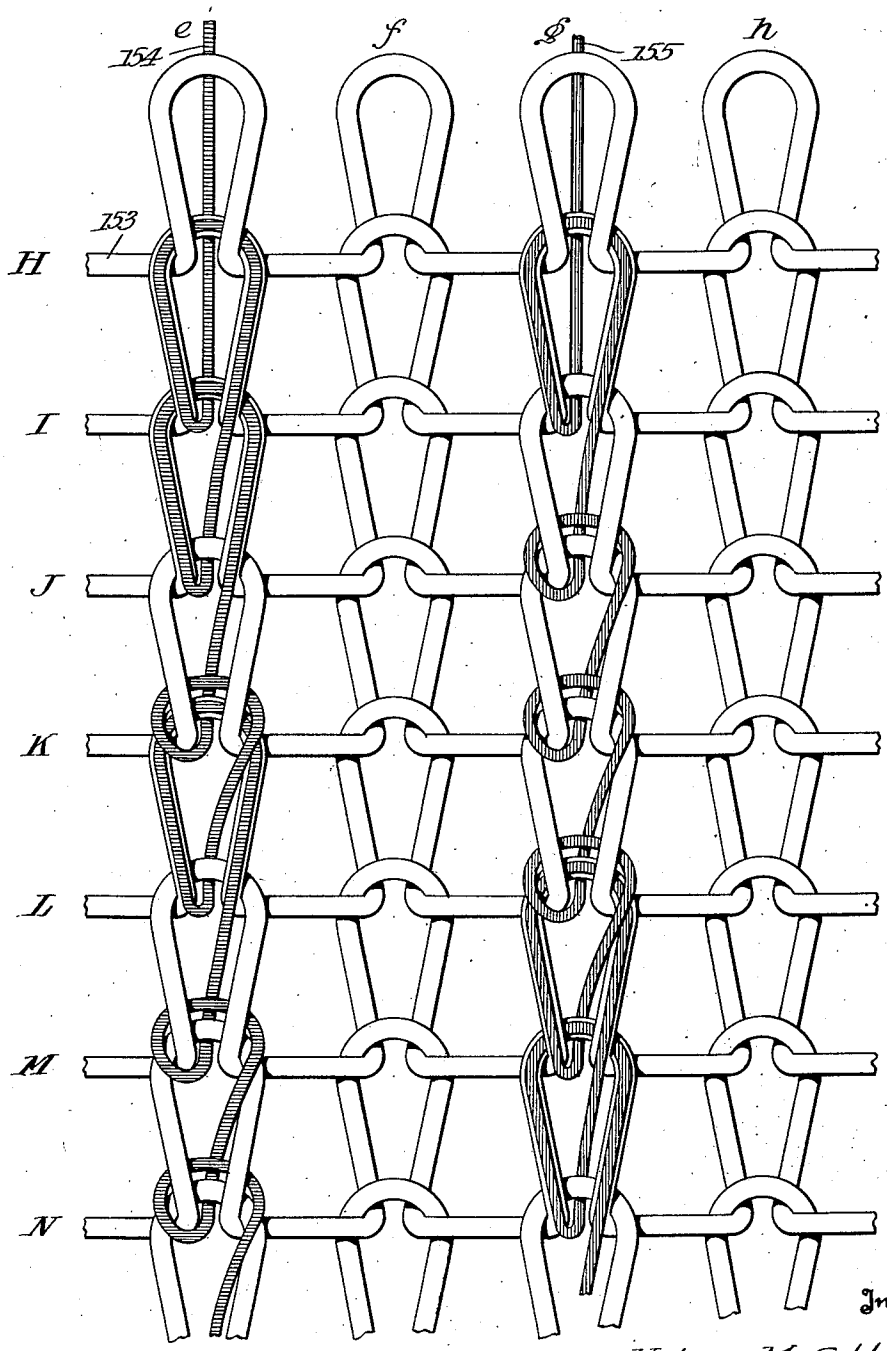


Fig. 20.

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Patented Mar. 5, 1935 1,993,248

UNITED STATES PATENT OFFICE

1,993,248

RIB KNITTING MACHINE

Nelson M. Schlotterer, Norristown, Pa., assignor to H. Brinton Company, Philadelphia, Pa., a corporation of Pennsylvania

Application July 22, 1930, Serial No. 469,781

13 Claims. (Cl. 66—135)

My said invention relates to a rib knitting machine embodying means for incorporating wrap-around yarns in the fabric, primarily for ornamental purposes. It is an object of the invention to provide means for appropriately knitting in the wrap-around yarns at desired courses and floating them at other courses in order to produce ornamental designs in the fabric, it being understood that wrap-around yarns of different color or character may be used in different wales and that they will ordinarily differ from the foundation fabric as well. Another object of the invention is to provide means of the character above described whereby the floats of wrap-around yarn can be tied into the courses where they are not knitted, instead of floating them past such courses.

In the drawings which are made a part of this application and in which similar reference characters indicate similar parts,

Fig. 1, illustrates a rib fabric including two wrap-around yarns,

Fig. 2 is an elevation of the working parts of the knitting machine as a whole, illustrating the relative positions of such parts,

Fig. 3, a vertical section on line 3—3 of Fig. 5,

Fig. 4, a section on line 4—4 of Fig. 3,

Fig. 5, a section on line 5—5 of Fig. 3,

Fig. 6, a perspective of unassembled parts of the dial-cam controlling means, indicating their relative positions in the machine when assembled,

Fig. 7, a section similar to Fig. 5 but on a smaller scale to permit inclusion of parts not shown in Fig. 5, including a sectional view of a trick wheel and associated parts,

Fig. 8, a vertical section of driving mechanism shown in elevation in Fig. 2, this view being in the plane of line 3—3 of Fig. 5 and showing the relation of the three vertical shafts to the driving gears and to the upper stationary members,

Fig. 9, a vertical section on line 9—9 of Fig. 5,

Fig. 10, a section on line 10—10 of Figs. 3 and 9,

Fig. 11, a view similar to Fig. 10 but showing the cap lever in another position,

Fig. 12, a section on line 12—12 of Figs. 3 and 9,

Fig. 13, a section similar to Fig. 12 but showing the swing cam in another position (Fig. 12 shows the same cam in the position corresponding to that of the cap lever in Fig. 10, and Fig. 13 shows the swing cam in a position corresponding to the position of the cap lever in Fig. 11. Fig. 3 corresponds to a section on line *e—e* in Fig. 10 and Fig. 9 corresponds to a section on line *f—f* of Fig. 10).

Figs. 14, 15, 16 and 17 illustrate four positions assumed by a wrap-around finger in laying the yarn around the needle,

Fig. 18 is a perspective of a wrap-around finger,

Fig. 19 is a lay-out showing the relative positions of the needle actuating cams, the trick-wheel, the jack cam and the cams operating the wrap-around fingers,

Fig. 20, illustrates a modified form of fabric similar to that of Fig. 1 except that the float threads are tied in,

Fig. 21, shows the relative positions of the wrap-around finger and a needle for making the fabric of Fig. 20, so far as concerns the tied in floats,

Fig. 22 is a cam lay-out similar to Fig. 19 but modified for tying in the floats, as illustrated in Fig. 20.

Fig. 1 of the drawings illustrates one type of rib fabric which may be made on the machine of my invention, this figure includes four wales *a*, *b*, *c*, and *d*, and seven courses A, B, C, D, E, F and G in such wales. The rib fabric proper is formed from a body or foundation yarn 25 and has incorporated therewith two wrap-around yarns 26 and 27, the yarn 26 being incorporated at wale *a* and the yarn 27 in wale *c*. The yarn 26 floats past the first course in wale *a*, is knitted in at courses B and C, floats past course D, is knitted in at course E and floated past courses F and G. Wrap-around yarn 27 floats past course A, is knitted in at course B, floats past courses C, D and E and is knitted in at courses F and G. For purposes of illustration the yarn 26 is indicated as being blue and the yarn 27 as being red while the yarn 25 is of some other color. It will be seen that various designs may be formed by changing the order in which the wrap-around yarns are floated in the various courses and by changing the number and relation of wales in which wrap-around yarns are incorporated.

Referring primarily to Fig. 2, the bed plate of the machine is illustrated at 28, the usual ring gear being indicated by dotted line at 29. An upright standard 30 rises from the bed plate, in which standard a vertical shaft 31 is journaled. The shaft 31 is driven from the ring gear 29 by means of beveled pinions 32 and 33 on a common shaft 33' (Fig. 7), the pinion 33 meshing with pinion 34 on shaft 31. Shaft 31 drives the dial cam cap through mechanism including gears 35, 36, 37 and 38 (Figs. 2 and 8). The gear 38 is splined to a hollow shaft 39 which is the intermediate one of three concentric shafts and which is connected to the dial cam cap 40 (Figs. 3, 9, 10 and 11) as best shown in Figs. 10 and 11 where the dial cam cap is shown as being in the form of a split ring slitted on one side of the shaft 39, with a screw 41 for drawing the split ring together and clamping it on the shaft. The gears 36 and 37 are journaled respectively on bolts 42 which extend through a gear cover 43 and an extension bracket 44 secured at its inner end to the upright frame member 30. At its outer end the extension 44 is split and clamped by a

bolt 45 (Fig. 8) to the stationary outer member 46 of the set of three concentric shafts above referred to. At its lower end the hollow shaft 46 is secured by screws 47 to a bushing 48 (Fig. 3) supporting a finger cylinder 49 more fully described hereinafter.

A solid shaft 50 comprises the inner member of the group of three concentric shafts and this shaft is secured to the gear box cover 43 by a nut 51 (Figs. 2 and 8) and a set screw 52. The shaft has secured to its lower end a dial 53 by means of a screw 54, said dial resting on a collar 55 fixed to the shaft 50 by a screw 56. It will be seen that the dial may be adjusted vertically with reference to the dial cams hereinafter described by loosening the screw 52 and turning the nut 51. The dial cam cap and its cams may also be adjusted vertically by means of a nut 57 engaging the threaded upper end of shaft 39 and locked against rotation by a locking screw 58, the nut being held against up and down movement between the stationary gear cover 43 and the gear 38, which in turn rests on the stationary extension bracket 44.

In the embodiment of the invention here illustrated the needle cylinder 59 is stationary and needles 60 are moved up and down by cams on a revolving cam ring 61 supported on the ring gear 29 by uprights 62, only one of which is shown in Fig. 2. Jacks 63 are located in extensions of the needle slots of the cylinder 59, these jacks serving to control the needle actuation as dictated by the operation of a trick wheel 64 rotating with the ring gear and connections in the form of cam levers 65 (Fig. 2), all as more fully disclosed in the patent to Ames 1,722,289. The relation of the needle cams and the jack cam to the trick wheel and to the cams (hereinafter described) for the wrap-around fingers is illustrated in Fig. 19 wherein reference character 66 indicates generally needle cams below which there is a jack cam 67 for lifting jacks to elevate selected needles high enough so that they will engage and pass over a split cam 68, after which all the needles are retracted to a given level by the stitch cam 69.

Posts 70 extend upward from the cam ring and these posts support brackets 71 carrying a rotating table 72 having an outer bearing surface in a stationary ring 73 secured to an extension 74 on the upright frame member 30. The rotating table 72 supports a bobbin stand 75 for the main yarn bobbin 76 from which the yarn 77 passes through any one of a plurality of holes 78 (Fig. 3) in the rotary table 72 to yarn feeding means (not shown) of any suitable character for supplying it to the cylinder needles 60 and the dial needle 79. Above the rotating table 72 there is a pair of bobbin plates 80 fastened to stationary shaft 46 providing means for supporting a plurality of small bobbins 81 for the wrap-around yarns 82. The yarns from these bobbins are led up from the bobbins, then through the eyes 83, then down through openings in the plates and thence through a central opening in a ring 84 resting on the rotating table 72 and fixed to the finger cylinder 49 by screws 84', from which they pass through slots 85 in the finger cylinder 49, then to eyes at 86 and 87 in the fingers and so to the needles.

The finger cylinder, as shown in Fig. 3, rests on a shoulder of the bushing 48 and is secured thereto by screws 88, this bushing being fixed to the hollow outer shaft 46 by screws 47. In addition to the angularly cut slots 85 the finger cylinder is provided with radial grooves at 89 which grooves are preferably equal in number to the cylinder needles of the machine and also equal to the yarn grooves 85. Yarn fingers 90 are provided with rounded projections at 91 adapted to fit in a groove 92 to provide a rocking bearing for each finger and are held in place by spring rings 93 located below the parts 91 whereby the fingers are normally thrown to a position inside the cylinder needle circle. Cams 94 and 95 (Figs. 3, 5 and 19) on the rotating table 72 serve respectively to move the upper ends of the yarn fingers inward and outward, thereby to move the lower ends outward and inward correspondingly. It will be understood that each yarn finger moves in a radial plane except as the twisted lower end is flexed by cam engagement with the corresponding cylinder needle.

For making a welt in the fabric it is necessary to provide means for moving the dial needles to three different positions, to wit; the knitting position, the cast-off position and the welt position, the knitting position being intermediate the welt and cast-off positions. Figs. 12 and 13 illustrate the arrangement of the dial cams, including advancing cam 96, retracting cam 97, guard cams 98, 99, 100 and a swing cam 101 pivoted at 102. In Fig. 12 the swing cam is shown in the cast-off position, i. e., in a position where the needles are retracted to throw off their loops, the needles having previously been advanced by swing cam 101 to clear their latches. Fig. 13 illustrates the welt position of the swing cam, where the needles are not advanced to take yarn, and the knitting position machine is intermediate these two extreme positions. All these cams are mounted or formed on a cam plate 103 secured to the dial cam cap 40. A lever 104 is pivoted at 105' upon the cam cap 40, this lever having at one end an upwardly projecting pin 105 and near the other end a slot to receive a pin 106 which extends down through the cam cap and is secured to the swing cam 101. It will be seen that oscillation of the lever 104 about its pivot will cause the pin 106 and cam 101 to be moved from the cast-off position corresponding to Figs. 10 and 12 to the welt position corresponding to Figs. 11 and 13 or back. A pivoted detent 107 is biased by a spring 108 in a direction to hold the lever 104 in either of its three positions, engagement of the pointed end of the detent with the notch at 109 holding it in knitting position.

For controlling the position of the pin 105 to adjust the swing cam for welt, knitting and cast-off positions as above described I provide means shown in Figs. 3, 5, 6, 7 and 8, said means comprising parts carried by the bushing 48 which supports the finger cylinder 49, other parts carried by the revolving cam ring and still other parts mounted on the stationary bed plate of the machine.

The parts carried by the stationary finger cylinder include a horizontally slidable member 110 having a channel at 111 to engage pin 105, thereby to control the position of the lever 104 for determining the position of the swing cam 101, this channel being at the inner side of the downward projection indicated at 112 in Fig. 6. It will be noted that the channel has a very wide opening or mouth and a narrow central passageway or throat so that the pin 105 may enter the wide opening and then be moved by the cam walls of the narrow passageway during the rotary movement of the dial cap past the slidable mem-

ber 110. The slidable member 110 is slidably secured to the bushing 48 by means of screws 113 and it will be seen that member 110 has an elongated central opening at 114 to permit sliding movement relatively to the shaft 50. A three-armed rocker is mounted for oscillatory movement upon a screw 115 which secures the rocker to the bushing 48. Arm 116 of the rocker engages in a slot 117 in the member 110 (Figs. 5 and 6). Another arm 118 is positioned for engagement with the long finger 119 of a slide 120 while the third arm 121 is positioned for engagement with the long finger 122 of a slide 123. Each of the slides 120 and 123 embrace hollow shaft 39, the slide 120 having a short finger 124 and the slide member 123 having a short finger 125 for guiding the slides in this manner. The screw 126 passes through both slides and into the bushing 48 for holding the slides in place. The slide 120 also has a finger 127 at the right side in Figs. 3, 5 and 6 while slide 123 has a finger 128 with a projection 129 formed on the bottom thereof and extending farther to the right. As seen in Figs. 6 and 9 the shouldered lower end of bushing 48 has a diametrical slot at its under side to receive the slides 120 and 123.

The parts of the dial-cam-controlling mechanism which are supported upon the cam ring include a plate 130 which revolves with the cam ring and may be positioned at various elevations to act selectively upon the fingers 127 and 128 and projection 129 for moving the slides 120 and 123. Plate 130 is mounted on a vertically movable rod 131, it being fixed to a hub 132 by a set screw 133, the hub being fixed to the rod by a set screw 134. The plate is guided in its up and down movement by a rotary shaft 135 in known manner, this shaft serving merely as a guide for plate 130 and as a support for a pinion 136 meshing with the pinion 137 on a post 138. Pinion 136 is fixed to shaft 135 as is also an arm 139 having cam surfaces providing levels 140 and 141 (Fig. 3) adapted to ride under a stud 142 projecting from rod 131 and thus raise the rod against the tension of spring 143 to two different levels, the third level being that at which the stud 142 rests on the cam ring 61. A dog 144 is fixed to shaft 138 and a dog 145 is fixed to shaft 135, the latter dog having two operating faces at 146 and 147 respectively, said faces extending to different distances radially.

The elements of the dial-cam controlling mechanism supported on the bed-plate of the machine include a trickwheel 148 (Figs. 2 and 7) and cam levers 149, more fully disclosed in the copending application of Ames 352,503, April 4, 1929, certain of these levers being indicated in Fig. 3 in dotted lines merely to show their relative vertical position.

Below the bedplate 28 there is shown in a general way a device 150 for holding the dial against rotation relatively to the cylinder such as is shown in detail in the patent to McNamee, 1,571,855. The upper end 151 of this device is shown in Fig. 3 as being secured to the depending end of the dial cap by means of a screw 152. While the dog device is not in itself new the combination of a bottom dog device is believed to be of much importance in combination with the wrap-around mechanism, the wrap-around mechanism being located above the dial cap and therefore precluding the use of upper dogless attachments such as are well known in the art. In the operation of the machine the cam ring 61, the table 72 and the dial cam cap 40 revolve while the needle cylinder 59, the dial 53 and the finger cylinder 49 are stationary, though the invention is not limited to such arrangement of parts. The cams 94 and 95 being fixed to the table 72 revolve with it and actuate all the fingers 90 at each revolution of the machine, these fingers moving radially only. The butts of the needles follow the dash line in Fig. 19, the trick-wheel 64 being so made up that the cam levers 65 press the jacks radially inward except in the case of those needles which are to be wrapped with the wrap-around yarn. It will be evident that the jacks so pressed inward are not raised by the jack cam 67. In cases where the jacks are not thus forced inwardly the jacks and the corresponding needles will be raised by the jack cam so as to cause the needle butts to follow the course indicated in Fig. 19, i. e., they pass up over the split cam 68 whereby their hooks are brought into position to be wrapped by the corresponding fingers. Figs. 14 to 17 illustrate the operation of wrapping a needle. In Fig. 14 the lower end of finger 90 is behind the needle; in Fig. 15 it is being moved outward by the action of the cam 94 and it will be seen that the lower end of the wrap-around finger is being cammed laterally, due to the fact that the lower end of the finger is inclined to the radial plane of movement of the finger; in Fig. 16 the wrap-around finger is at its outermost position and in Fig. 17 it is moving back toward normal position illustrated in Fig. 3, under the influence of cam 95. Here the finger is camming itself laterally past the other side of the needle due to the inclined plane of the lower part of the finger and after passing the needle it returns to the position of Fig. 14. It should be noted that the inclined yarn slots in the finger cylinder are located between two fingers in each instance and that by reason of the number of fingers and the construction of the finger cylinder the yarn has to pass transversely only a very short distance between the yarn slot and the finger slot, at the same time passing down from the end of the yarn slot to the eye 86. When it is not desired to form a design the trickwheel 64 is held stationary, the trick which is operatively positioned at that time having its lugs so arranged as not to force cam lever 65 radially inward. When a design is to be made the trickwheel is started and it will be evident that the location of the butts on the tricks determines the end of the pattern by determining which needles will be raised, the wrap-around yarn floating where the needles are not raised. It should also be noted that spring bands 93 aid in the return movement of the fingers. In the case of such needles as are not raised the fingers continue to move radially outward and back and the yarn does the same but is not wrapped around the needles.

The series of wrap-around fingers is continuous except for a small segment in which the dial cam controlling means is located. In the normal position of rod 131 with its stud 142 on the level 140 the plate 130 is at the same altitude as finger 127 which is the normal rib knitting position.

When the dog 144 is in solid line position (Fig. 4) the dog 145 will be in its solid line position, the relative solid line positions being those corresponding to the highest position of the rod 131, with stud 142 on the level 140. To bring the parts to tuck rib knitting position the intermediate one of three levers 149 indicated in dotted lines in Fig. 3 is moved inward by the trickwheel so as to strike face 147 of lever 145 thereby turning post 135 and cam arm 139 sufficiently to bring

the level 141 under stud 142. The plate 130 will now move to its intermediate position and will strike finger 128 of slide 123. The movement of slide 123 to the right in Fig. 6 causes finger 122 to press against arm 121 of the three-armed lever and move the same in a counter-clockwise direction so as to move the sliding member 110 downward in Fig. 5 so as to bring pin 105 to its intermediate position whereby the lever 104 and the cam 101 are also moved to intermediate position, this being the tuck knitting position of the cam.

For idling the dial needles the lowermost cam lever 149 is moved laterally by the trickwheel into position to strike the face 146 of dog 145, thereby turning the dog clockwise into the extreme dotted line position of Fig. 4 and so moving the cam arm 139 out from under the stud 142 so as to permit the stud to come to rest upon the upper face of the cam ring 61. Spring 143 thereupon coacts with gravity to pull the plate 130 down into its lowermost position where, in the ensuing revolution of the machine it will strike the projection 129 and force the slide 123 to the right in Figs. 3, 5 and 6 whereupon the finger 122 will press against the arm 121 of the three-armed rocker, (such movement being permitted by the short finger 125 of the slide) and the ball-end 116 will then force the slidable member 110 transversely (downward in Fig. 5) so as to move the pin 105 outward into the position of Fig. 11, thus swinging lever 104 to move pin 106 with the swing cam 101 to the innermost or welt position of the swing cam, where the needles are not advanced to take yarn, so that knitting proceeds only on the cylinder needles until the position of the swing cam is again changed to permit resumption of rib knitting on all the needles.

For clearing the latches of the dial needles the uppermost cam lever 149 (Fig. 3) is moved inward by trickwheel 148 so as to strike the face of dog 144, turning this dog clockwise from the dotted line position to the position shown in full lines in the drawings. This causes post 135 to be moved counter-clockwise by way of gearing 136, 137, from the extreme dotted line position to the solid line position so as to bring the level 140 of cam lever 139 under the stud 142 and thus lift rod 131 and plate 130 to their highest position against the tension of spring 143. In the next rotation of the machine the plate 130 strikes finger 127 and forces slide 120 to the right in Fig. 5, pressing its finger 119 against arm 118 of the three-armed lever to cause its ball-end 116 to slide member 110 transversely (or upward in Fig. 5) thus pulling pin 105 radially inward and swinging lever 104 to the position of Fig. 10, whereby swing-cam 101 is moved outward to the position of Fig. 12, i. e., to the knitting position illustrated in Figs. 3, 5, 8, 10 and 12 wherein the needles are in their normal rib knitting position. It will be evident that short finger 124 is made short so as not to interfere with the rocking movement of the three-armed rocker, and that each of slides 120 and 123 is moved back by the rocker as the other slide moves forward.

The movement from latch-clearing position to welting position (or vice versa) will ordinarily be in two steps, the intermediate cam lever 149 being positioned to strike cam face 147 and move dog 145 from the full line position of Fig. 4 to the first dotted line position, then after one or two rotations of the machine the lowest cam lever is moved to strike face 146 and move dog 145 to its extreme dotted line position which also brings dog 144 to lower (dotted) position. In returning upper cam lever 149 first strikes dog 144 to move both dogs from extreme dotted position to full line position and then middle cam lever 149 strikes cam face 147 of dog 145 to carry the dog, plate 130, etc., to knitting position.

In the modified form of the fabric illustrated in Fig. 20 the wales *e, f, g, h,* and the courses H, I, K, L, M and N correspond to those shown in Fig. 1 so far as concerns the foundation fabric knitted from yarn 153. The wrapping yarns 154 and 155 instead of being merely floated past the courses where they are not knitted in, however, have their floats tied into the adjacent courses of the fabric. The wrapping yarn 154 is knitted in at courses I, J and L in wale *e* and tied in at courses K, M and N whereas yarn 155 is knitted in at courses I, M, N and tied in at courses J, K, L.

The mechanism heretofore described, in order to produce this variation, is modified as illustrated in Fig. 22, wherein needle lifting cam 156 raises all needles to the level at which all the wrap-around fingers wrap all of the needles after the manner shown in Figs. 14 to 17. Thereupon the jack cam 157, which is higher than the jack cam 67 raises needles which are selected by the trickwheel mechanism or in any other suitable manner. These needles being raised to a level higher than that illustrated in Fig. 19 cause the wrap-around yarns to pass below the latch of the needle as illustrated in Fig. 21, the action of the yarn fingers being controlled by cams 158 and 159, which may be identical in form and operation with cams 94 and 95 previously described. When the needles now reach the stitch cam 160 they will all be moved downward to a common level and the wrap yarns which are below the latches on the specially raised needles will be cast off. The needles in the wales in which designs are to be formed will have designs consisting of wrap yarn stitches like those in the modification previously described, but in the wales which are not to show the design the pattern yarns are tied in by wrapping them around the base of the corresponding loop of the fabric instead of floating. In the first case the cams of Fig. 19 raise specially only those needles which are to be wrapped whereas in the second case of Fig. 22 all the needles are wrapped and then certain of them upon which the design is not to be formed are raised to a higher level to clear their latches of the pattern yarn and so to cast the same off when the latch is closed in knocking over its stitch of the body fabric. Yarn 154 is lined to indicate the color blue and yarn 155 to indicate the color red, while the yarn 153 is indicated as being of any conventional color. It will be understood, however, that these yarns may be of any desired color or character and that any desirable number of different pattern yarn of color or character may be used.

It will be obvious to those skilled in the art that many changes may be made in the devices herein illustrated and described all without departing from the spirit of my invention and therefore I do not limit myself to what is shown in the drawings and described in the specification except as set forth in the appended claims.

Having thus fully described my said invention, what I claim as new and desire to secure by Letters Patent is:

1. In a rotary knitting machine, a finger cylinder having closely spaced parallel radial longitudinal slots about its periphery, yarn fingers rockably mounted in said slots and having eyes located outside the cylinder near their pivots,

and yarn guiding slots between the finger slots said yarn guiding slots having inclined bottoms opening out near said eyes, substantially as set forth.

2. In a circular knitting machine, a slotted needle cylinder, needles therein, a finger cylinder above the needle cylinder having finger slots spaced approximately as the needle slots, said finger cylinder also having yarn guiding slots intermediate said finger slots for leading pattern yarns to fingers in said finger slots, substantially as set forth.

3. In a rib knitting machine, a needle cylinder, a dial, needles therein, cylinder and dial cams including an adjustable welt cam, a dial cam cap carrying said dial cams, a finger cylinder above said cam cap, a set of pattern yarn fingers in the finger cylinder, means for adjusting the welt cam including an upright rod on the cam ring of the machine, a plate on said rod, pattern-controlled means for elevating the rod to varying extents, and connections from said rod to the welt cam including relatively movable elements carried on the finger cylinder, substantially as set forth.

4. In a rib knitting machine, a dial, a cylinder, a cam ring, a dial cam cap, an adjustable welting cam on said cap, pattern controlled means for adjusting the welting cam including an upright rod on the cam ring, selective connections from the upper portion of the rod to the welt cam, a stud on the rod, a cam mounted for movement relatively to said stud to lift the rod and pattern mechanism for moving said cam to predetermined extents, substantially as set forth.

5. In a rib knitting machine, a dial, a cylinder, a cam ring, a dial cam cap, an adjustable welting cam on said cap, pattern controlled means for adjusting the welting cam including an upright rod on the cam ring, selective connections from the upper portion of the rod to the welt cam, a horizontally movable cam, and connections from said cam for lifting said rod to varying heights.

6. In a rib knitting machine, a needle cylinder, a dial, sets of needles in the cylinder and dial, needle cams for said sets of needles rotating relatively to the cylinder and dial and including means for elevating selected cylinder needles abnormally, a finger cylinder coaxial with said needle cylinder and dial, yarn fingers in said finger cylinder individual to cylinder needles, finger actuating cams in fixed relation to said cylinder cams and to said dial cams for rocking said fingers across the cylinder needle circle, means for imparting lateral movements by abnormally elevated needles to corresponding yarn fingers for causing them to wrap their pattern yarns about such needles, a rotating annular table on which said finger cams are mounted, and fixed supporting means engaging the periphery of the table said table at its inner edge engaging and supporting said finger cylinder.

7. A device as in claim 6, including means on said table for supporting one or more main yarn masses, means for guiding yarns from said masses through said table, means above said table for supporting pattern yarn masses, and slots in the finger cylinder between said fingers for guiding said pattern yarns, substantially as set forth.

8. In a rib knitting machine, a dial, a cylinder, a cam ring, a dial cam cap, an adjustable needle cam on said cap, an upright rod supported on the cam ring for vertical movement, a stud on the rod, a cam on the cam ring movable relatively to said stud for elevating said rod, a plurality of arms at different levels each arm being operatively connected to said cam, a rotary trick wheel having operating projections at levels corresponding to those of said arms, and horizontally movable levers between said trick wheel and said arms each lever being movable by said correspondingly positioned projections on said trick wheel to actuate a correspondingly positioned arm, and connections from said rod to said movable cam for varying its action on the dial needles.

9. In a dial and cylinder knitting machine, a dial cam cap, a welting cam thereon, a pin on the welting cam projecting above the cam cap, a lever on the cam for moving said welting cam, a support above said cam cap for needle wrapping fingers, a pair of slides at different levels on the support, a rocker on the support having means engaging said slides whereby the respective slides oscillate the rocker in opposite senses, a slide on the support movable at right angles to said first-named slides, a third arm on the rocker engaging said slide for reciprocating the same, connections from said slide to said lever for adjusting said cam and pattern means including a plate movable vertically to engage the respective slides.

10. A device as in claim 9, one of said slides having a depending lug for engagement by said plate at a third level whereby said welting cam may be moved into three different positions.

11. In a rib knitting machine, a needle cylinder, a dial, needle cams rotating relatively to the cylinder and dial, a set of pattern yarn fingers above the dial, means for moving the fingers across the needle circle at each rotation of the machine at a level above the normal idle level of the upper ends of the cylinder needles, means for abnormally elevating cylinder needles selectively into position to have the pattern yarns wrapped around them, said yarn fingers consisting of substantially straight unitary strips of metal pivoted intermediate their length and having yarn guiding apertures at their lower ends, and revolving cams acting on the upper ends of said fingers to move them to-and-fro across the circle of cylinder needles substantially as set forth.

12. In a rib knitting machine, a dial, a cylinder, a rotary cam ring, a dial cam cap, an adjustable welting cam on said cap, a pin on said welting cam projecting through said cap, slides above the cam cap, a slide movable by each of said first mentioned slides in a direction at right angles to the movement of said first-mentioned slides, cams on said second-named slide providing a wide mouth and a short narrow throat for engaging said pin, and pattern controlled means for moving said first-named slides selectively transversely of the machine while the pin is out of engagement with said cams on the second-named slide.

13. In a rib knitting machine, a dial, a cylinder, a rotary cam ring, a dial cam cap, an adjustable welting cam on the dial cam cap, a pin on the welting cam, a non-rotary cam movable radially of the machine, said cam having a slot with a short narrow throat and a mouth for guiding said pin into the throat to adjust the welting cam, the mouth being of sufficient width to engage the pin at any radial position of said radially movable cam, and pattern controlled means for pre-setting said non-rotary cam by moving it radially of the machine while said pin is out of engagement with said non-rotary cam.

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