Sept. 18, 1956 P. W. BRISTOW 2,763,144

KNITTING MACHINE AND METHOD OF KNITTING

Filed Aug. 11, 1951 11 Sheets-Sheet 1

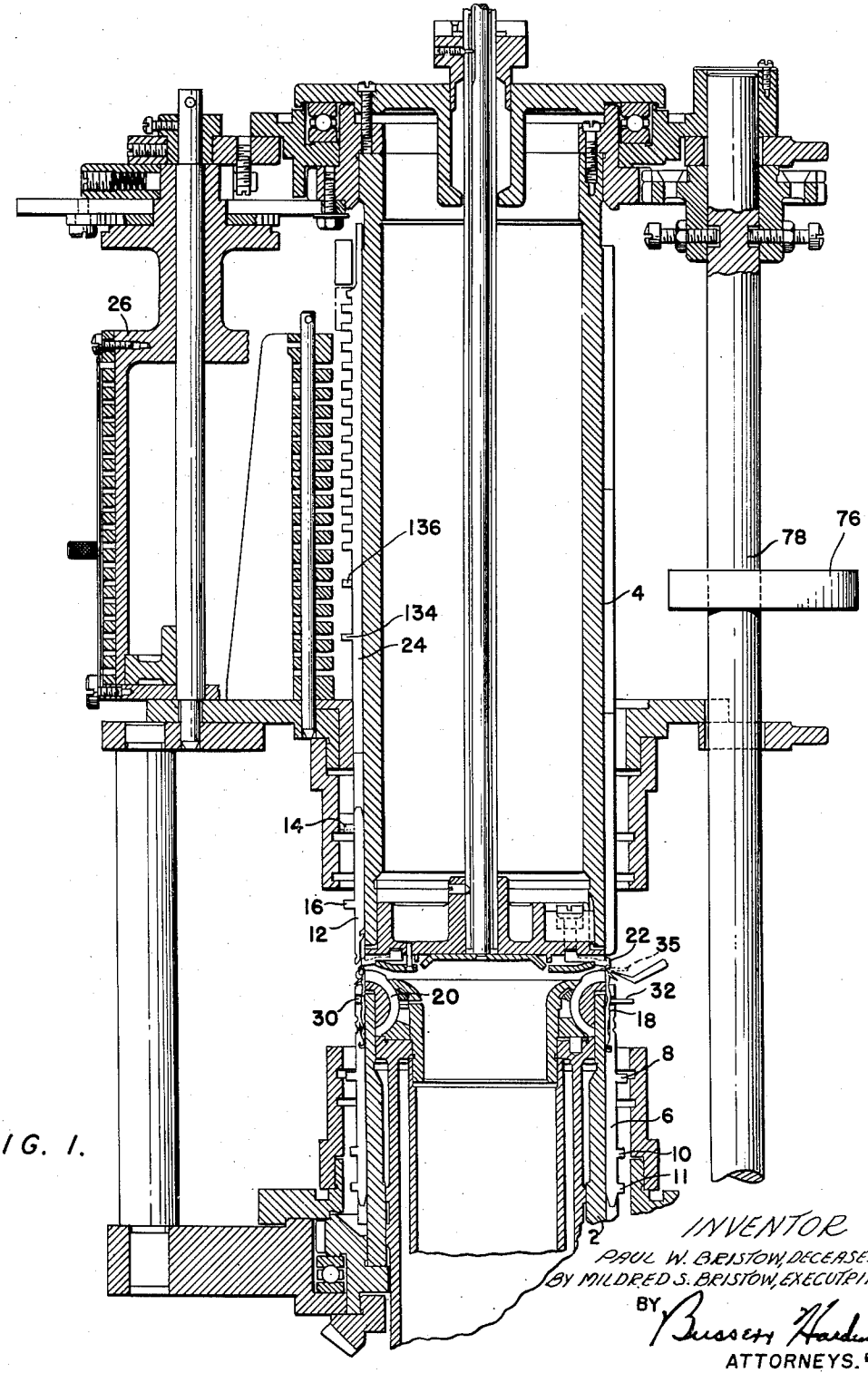


FIG. 1.

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KNITTING MACHINE AND METHOD OF KNITTING

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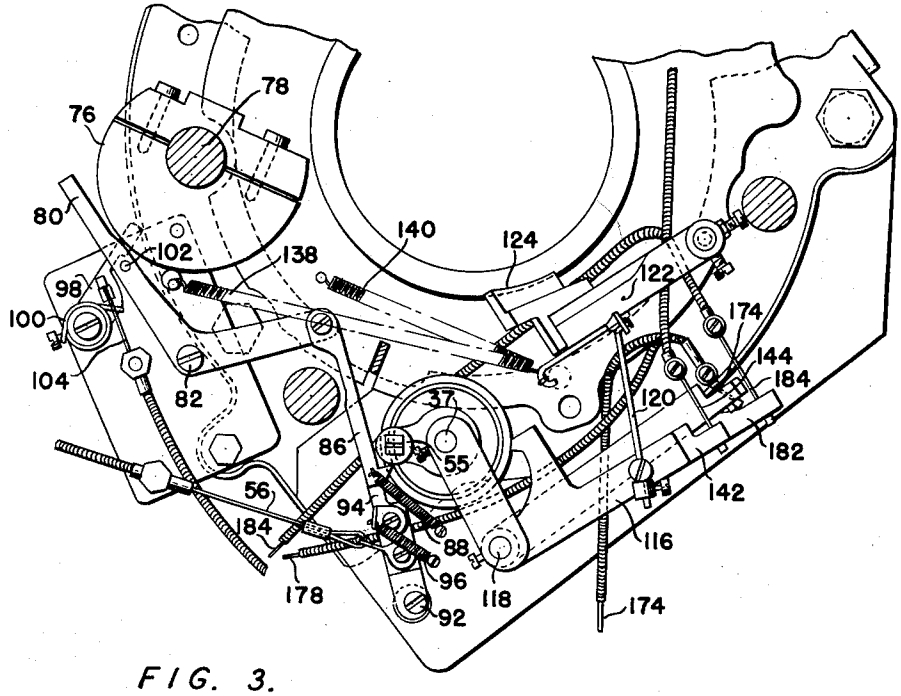


FIG. 3.

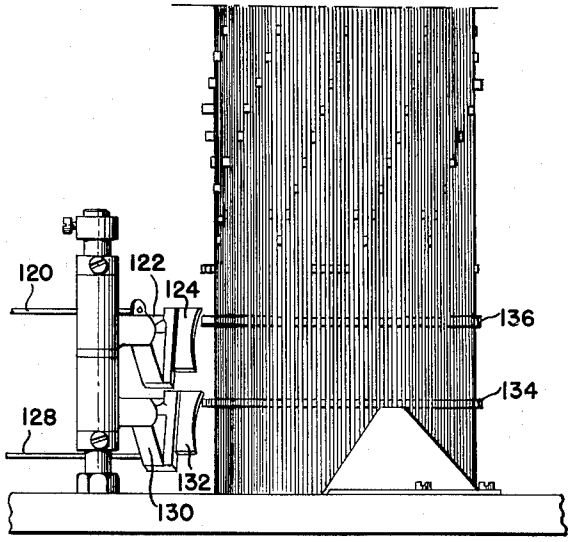


FIG. 2.

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KNITTING MACHINE AND METHOD OF KNITTING

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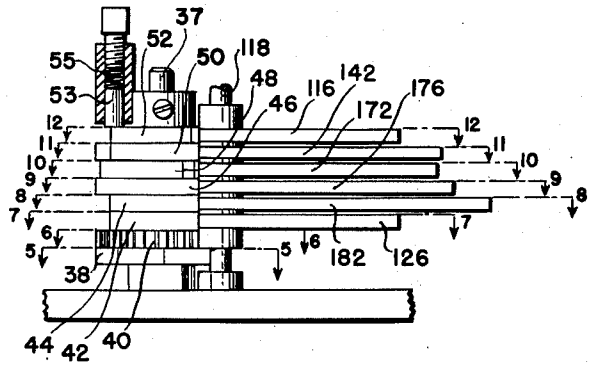


FIG. 4.

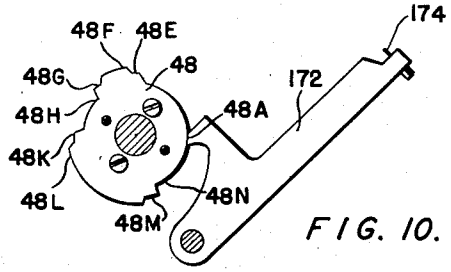


FIG. 10.

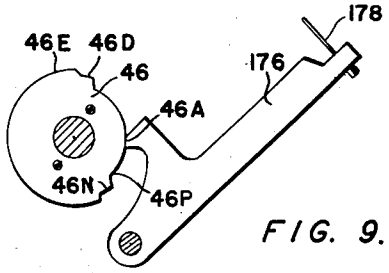


FIG. 9.

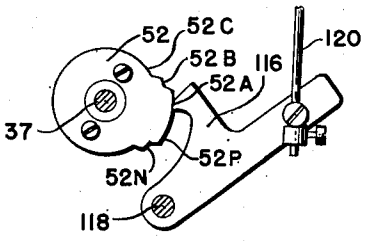


FIG. 12.

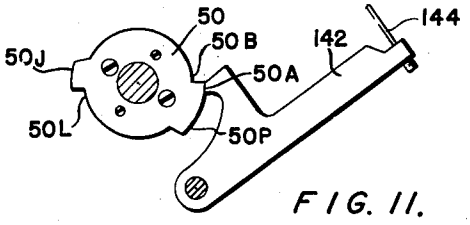


FIG. 11.

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Sept. 18, 1956 P. W. BRISTOW 2,763,144

KNITTING MACHINE AND METHOD OF KNITTING

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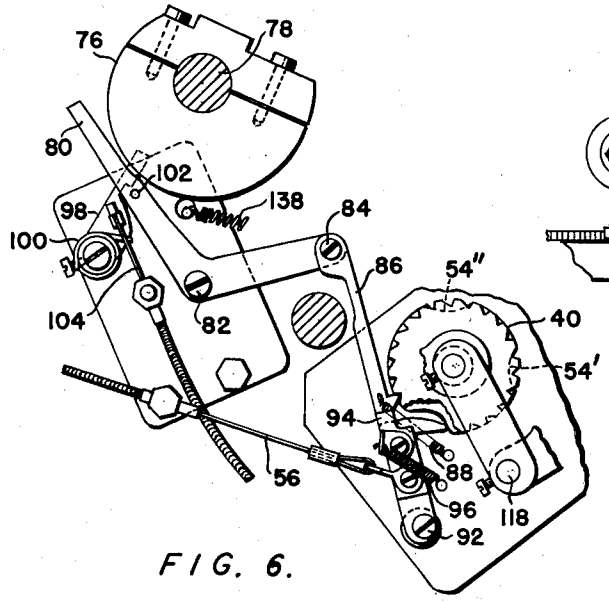


FIG. 6.

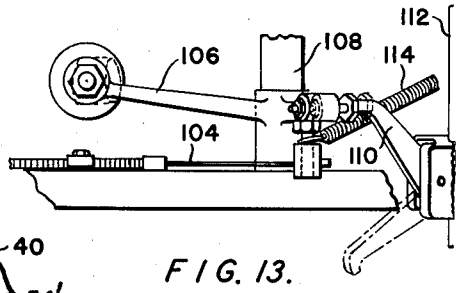


FIG. 13.

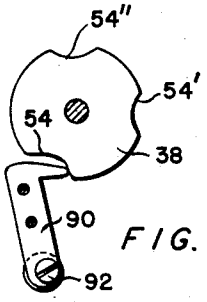


FIG. 5.

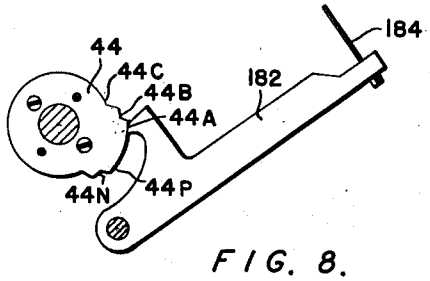


FIG. 8.

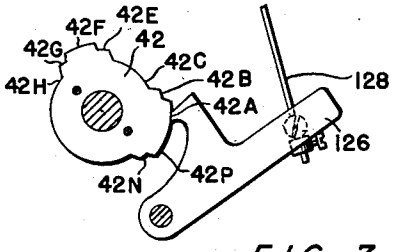


FIG. 7.

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KNITTING MACHINE AND METHOD OF KNITTING

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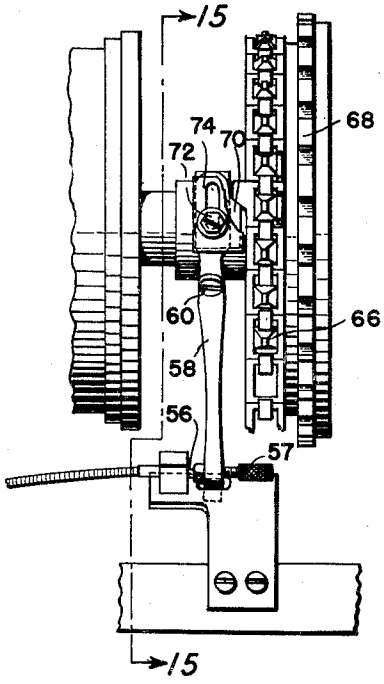


FIG. 14.

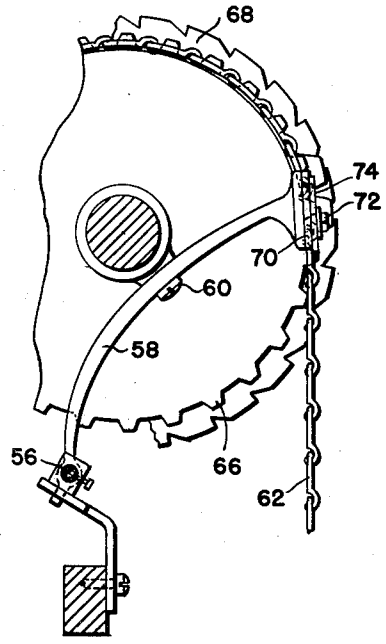


FIG. 15.

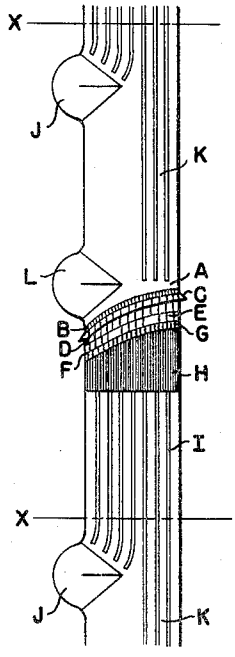


FIG. 25.

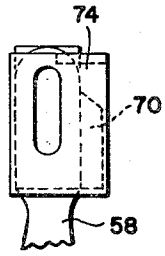


FIG. 17.

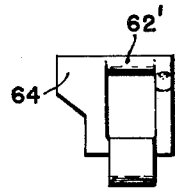


FIG. 16.

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KNITTING MACHINE AND METHOD OF KNITTING

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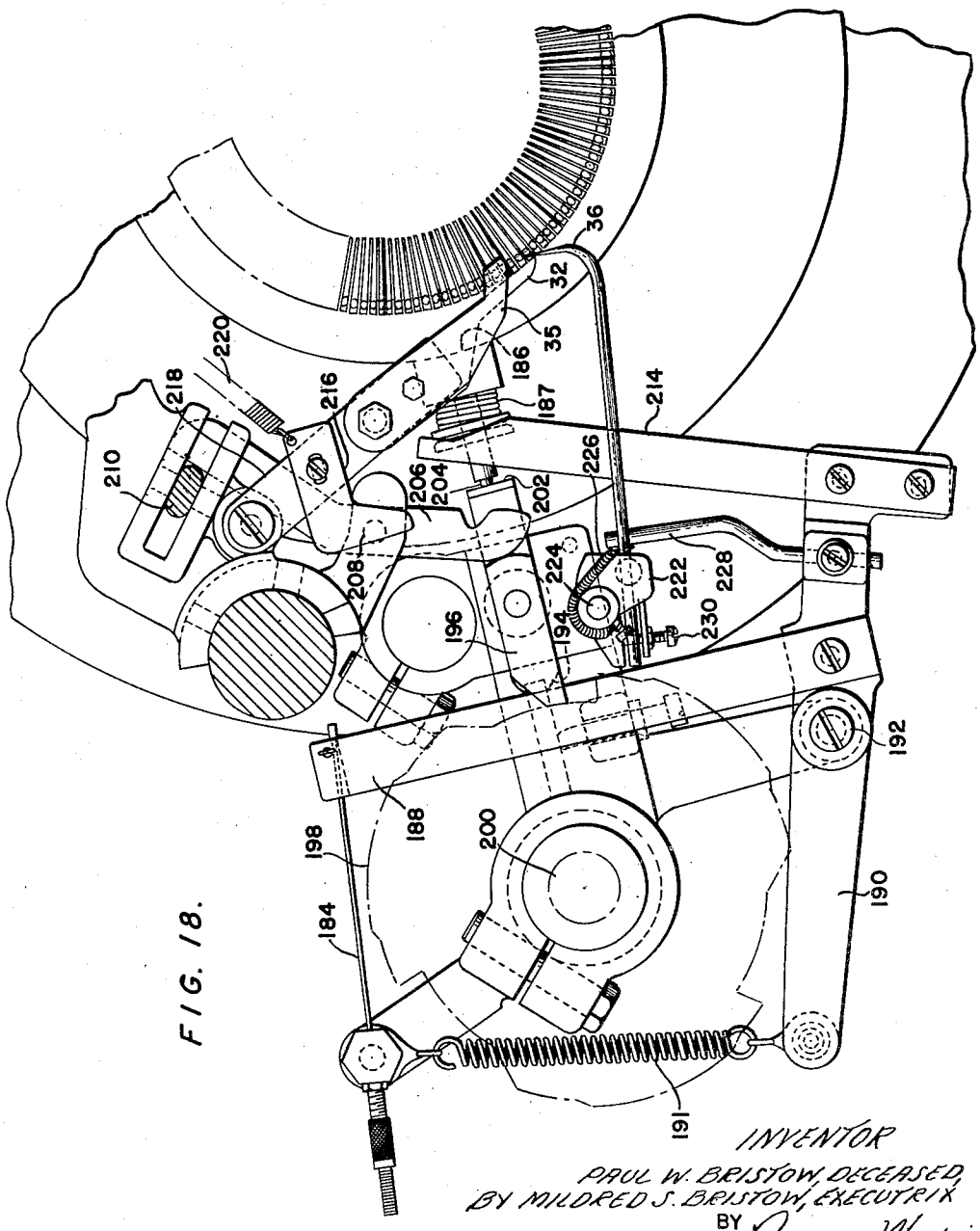


FIG. 18.

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KNITTING MACHINE AND METHOD OF KNITTING

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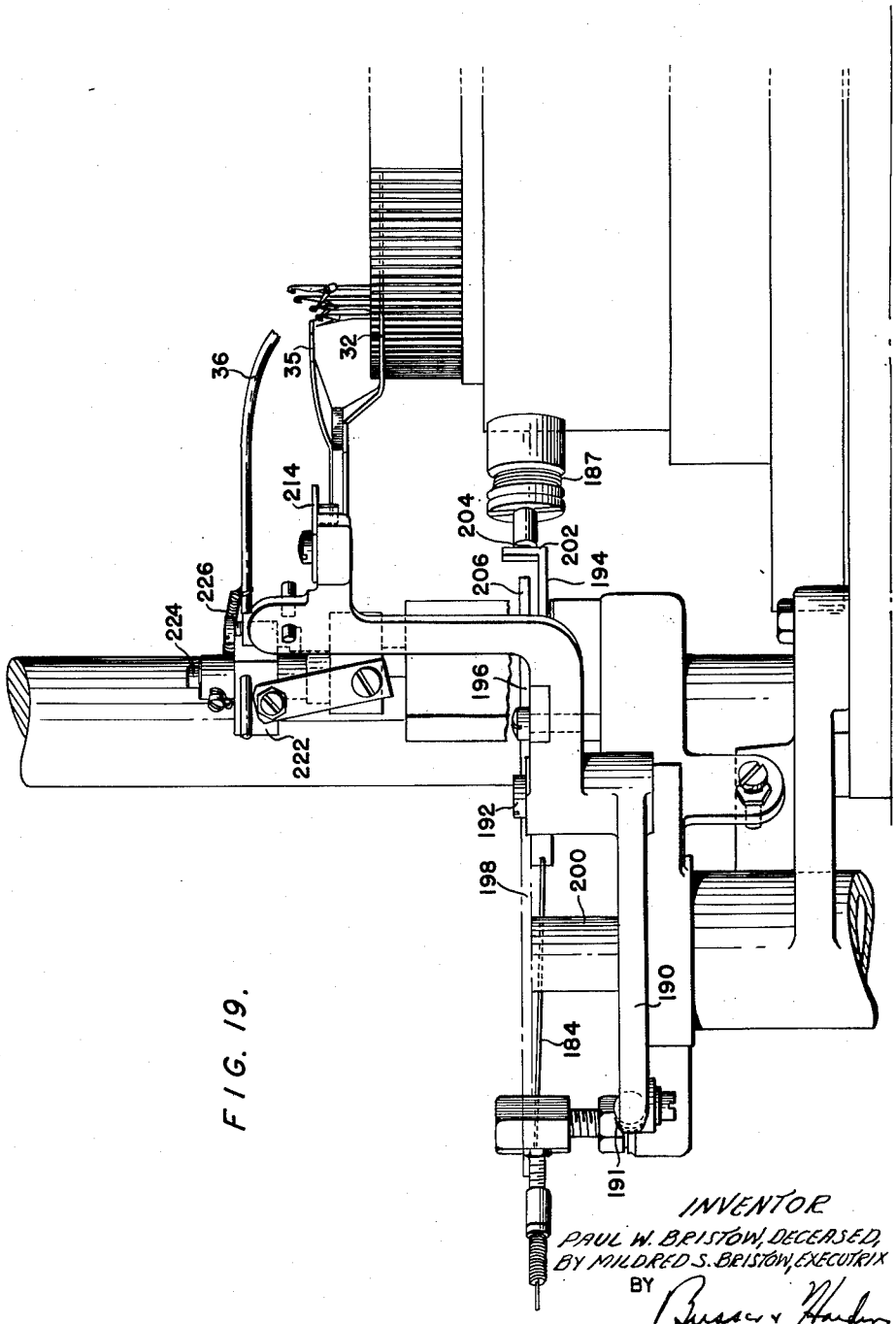


FIG. 19.

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Sept. 18, 1956 P. W. BRISTOW 2,763,144

KNITTING MACHINE AND METHOD OF KNITTING

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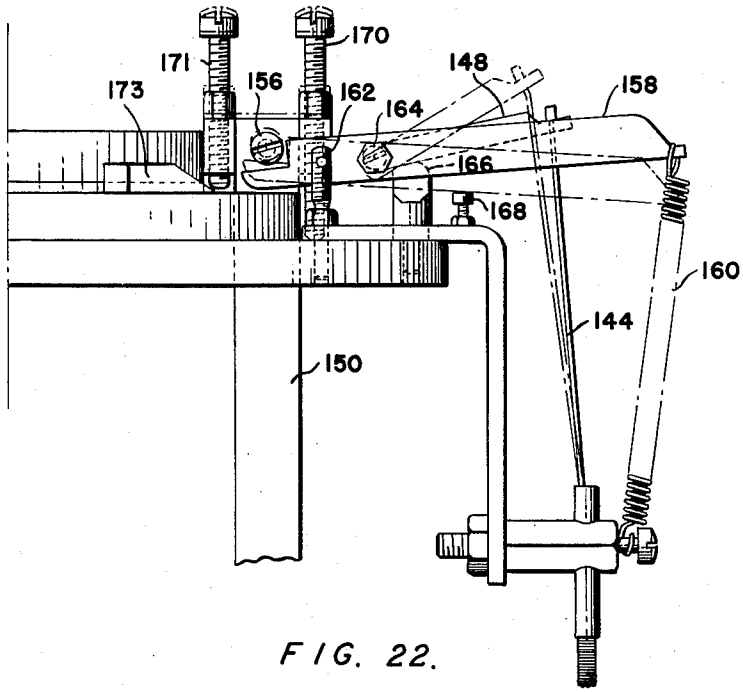


FIG. 22.

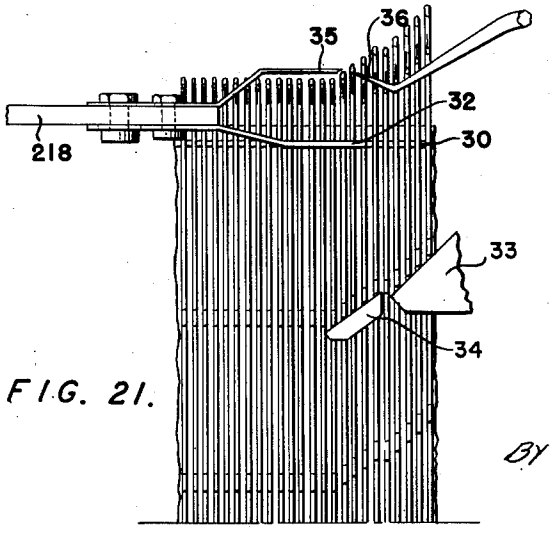


FIG. 21.

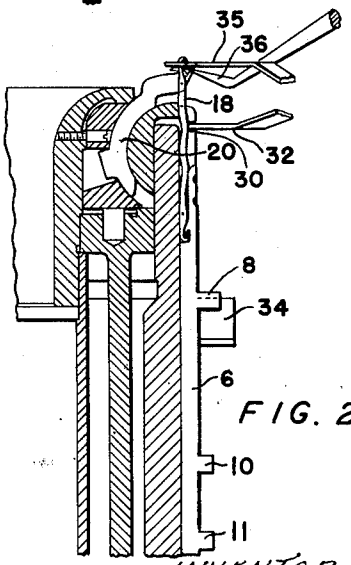


FIG. 20.

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KNITTING MACHINE AND METHOD OF KNITTING

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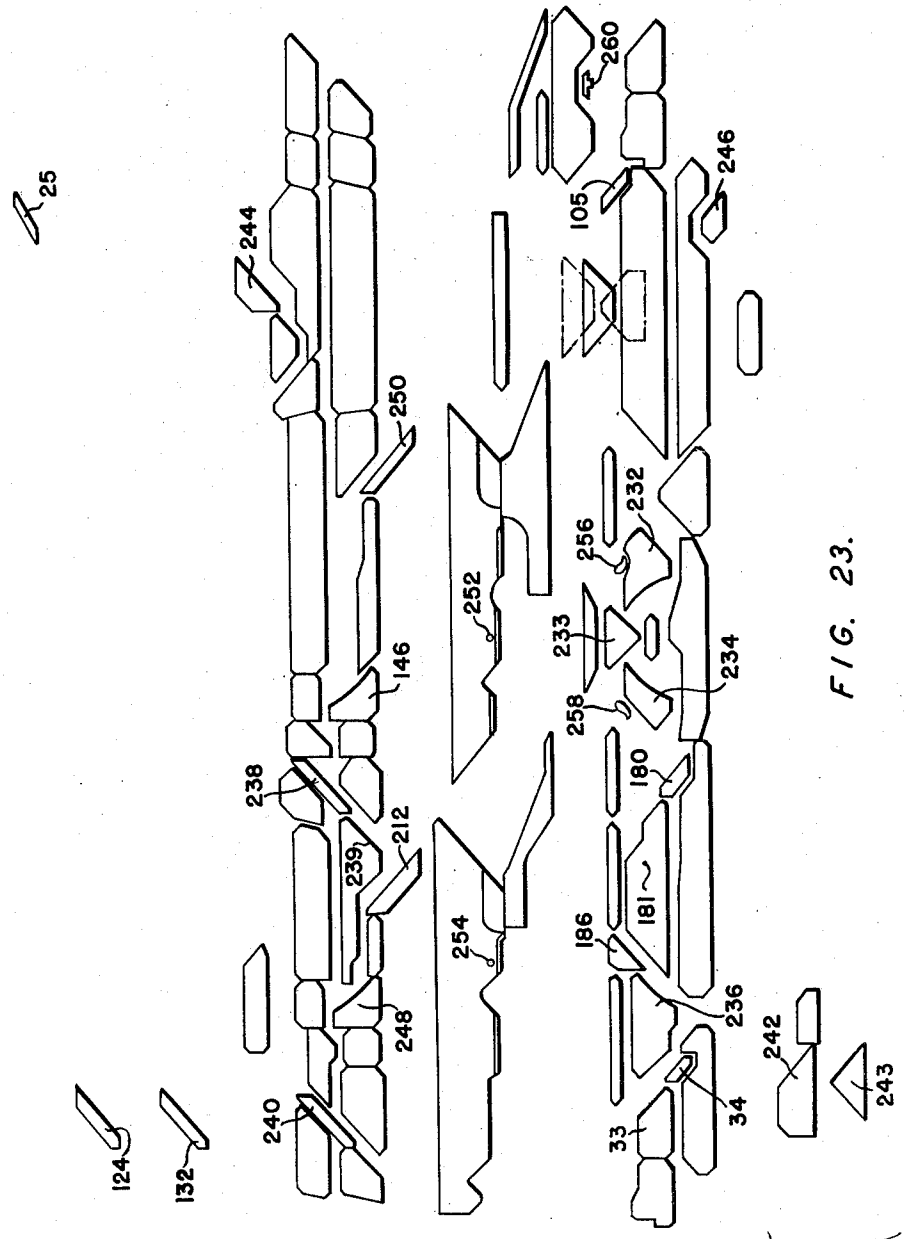


FIG. 23.

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KNITTING MACHINE AND METHOD OF KNITTING

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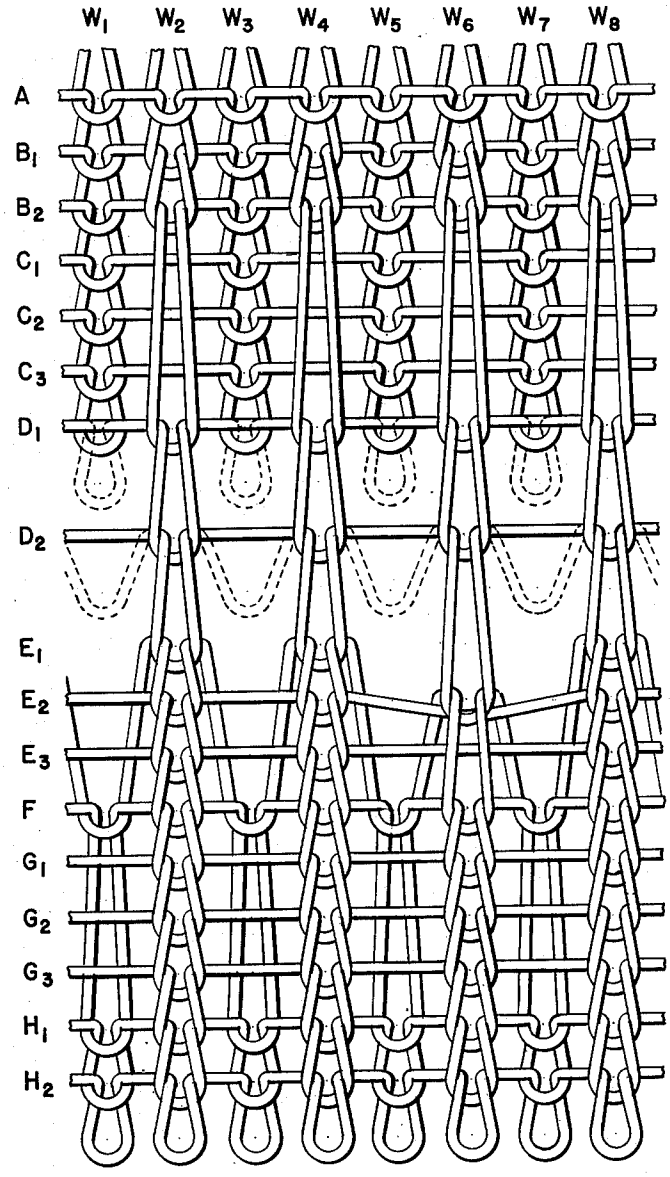


FIG. 24.

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KNITTING MACHINE AND METHOD OF KNITTING

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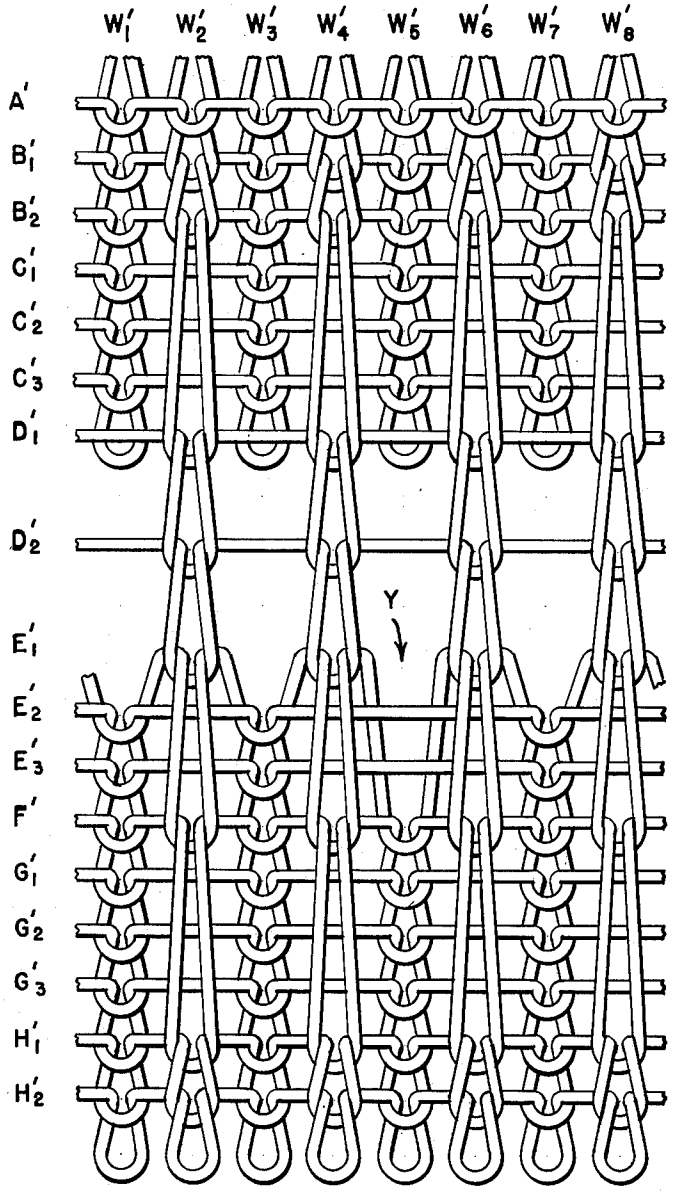


FIG. 26.

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ATTORNEYS

United States Patent Office 2,763,144 Patented Sept. 18, 1956

2,763,144

KNITTING MACHINE AND METHOD OF KNITTING

Paul W. Bristow, deceased, late of Laconia, N. H., by Mildred S. Bristow, executrix, Laconia, N. H., assignor to Scott & Williams, Incorporated, Laconia, N. H., a corporation of Massachusetts

Application August 11, 1951, Serial No. 241,434

31 Claims. (Cl. 66—14)

This invention relates to knitting machines and methods of knitting, and has particular reference to the provision of an auxiliary pattern controlling mechanism in a knitting machine and the knitting procedures involve therein and the products thereof.

One object of the invention is to provide for the formation of elaborate stitch arrangements without requiring the utilization of steps on the main control drum of the machine which would normally be required therefor. In accordance with the invention an auxiliary drum arrangement is provided which is normally stationary but which is started by a link on the main pattern chain of the machine. This auxiliary drum is stepped about in timed relationship with the formation of courses, preferably having two steps for each course to provide for proper entry and withdrawal of needle-controlling cams. After a predetermined number of steps of this auxiliary drum, it stops under its own control leaving parts in proper positions for the formation of particular stitches which may be repeated in a number of courses. The number of repeated stitches then formed is determined by the delay prior to another action of a link on the main pattern chain to restart the stepping of the drum. Another stepping sequence may then occur which, in turn, is stopped under control of the drum when the parts are positioned for another stitch sequence. This action may be repeated one or more times before the auxiliary drum returns to its initial position whereupon it will be stopped until the proper time during the formation of a subsequent stocking.

The invention is particularly applicable for the formation of a press-off draw thread and accompanying welt structures. In addition there may be picot formation. Provisions of the stitch structures just mentioned would normally require a relatively large number of steps of the main cam drum. By the adoption of the present invention, such steps of the main cam drum are not wasted, leaving such steps available for the formation of other stitch structures in the stocking.

In connection with press-off draw thread formation, the auxiliary drum not only controls needle operating cams but also controls a needle leveler, a latch opener and a needle presser.

A further object of the invention is to provide a knitting machine capable of knitting a two feed top and/or a two feed leg consistently with the provision of a press-off draw thread and one or more welts connecting successive stockings.

Another object of the invention is to provide for use of a needle leveler as a welt presser, an action which is particularly useful when making reverse welts.

Still another object of the invention is the provision of a novel continuous multiple stocking blank from which individual stocking blanks may be removed by withdrawal of draw threads leaving non-ravelling upper edges for the tops of the individual blanks. The methods involved in the formation of such a multiple stocking blank are also objects of the invention.

In the following description reference will be particularly made to the use of the invention in a superposed cylinder type of machine, though it will be recognized that certain aspects of the invention are of more general applicability to knitting machines of other types.

The foregoing and other objects of the invention particularly 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 an axial section through the upper portion of a superposed rotary cylinder machine showing, in particular, the upper and lower cylinders and their associated parts including a pattern drum for the control of jacks in the upper cylinder;

Figure 2 is a fragmentary elevation showing in particular the set-up of selector jacks and a pair of cams operating thereon;

Figure 3 is a horizontal section showing various controlling elements;

Figure 4 is a fragmentary elevation showing in particular the elements constituting an auxiliary control drum and its associated parts;

Figures 5 to 12, inclusive, are, respectively, fragmentary horizontal sections on the planes indicated at **5—5**, **6—6**, **7—7**, **8—8**, **9—9**, **10—10**, **11—11** and **12—12** in Figure 4;

Figure 13 is a fragmentary elevation showing in particular certain connections associated with a lower transfer cam;

Figure 14 is a fragmentary elevation showing various elements controlled by the main pattern chain of the machine;

Figure 15 is a vertical section taken on the surface the trace of which is indicated at **15—15** in Figure 14;

Figure 16 is a plan view showing an operating link of the chain;

Figure 17 is a plan view showing the arrangement of a follower actuated by a lug on the link of Figure 16;

Figure 18 is a fragmentary plan view showing certain operating elements particularly associated with a needle leveler, a needle presser and a latch opener and with a press-off bolt cam;

Figure 19 is a fragmentary elevation illustrating the parts shown in Figure 18;

Figure 20 is a fragmentary axial section showing in particular the arrangement of a needle leveler, needle presser, a latch opener with respect to a needle;

Figure 21 is a fragmentary elevation showing the parts illustrated in Figure 20;

Figure 22 is a fragmentary elevation showing certain operating parts for control of the axial position of a stitch cam acting on upper cylinder sliders;

Figure 23 is a developed view of the needle-controlling cams of the machine;

Figure 24 is a stitch diagram, showing the inside of a fabric, illustrating the formation of various portions of a stocking under special control of the mechanism involving the present invention;

Figure 25 is a diagram showing the nature of a multiple stocking blank produced in accordance with the invention; and

Figure 26 is a stitch diagram generally similar to Figure 24 but showing an alternative welt formation.

The machine is basically a superposed cylinder machine arranged for the production of broad rib or links-links work provided with a main pattern chain, a conventional main pattern drum (not shown) and other parts of conventional type. Accordingly, many of the parts need not be specifically described. The lower and upper cylinders are respectively illustrated at **2** and **4**. Within grooves in the lower cylinder there slide the sliders **6** provided

with the usual upper butts 8 and lower butts 10. In addition most of the sliders carry butts 11 at a third lowermost level. In the upper cylinder there are similar sliders 12 provided with upper butts 14 and lower butts 16. The various butts are differentiated as to length in the usual fashion for sole and instep formation and for transfer selections. The sliders control double-ended latch needles 18 in the usual fashions and provisions of conventional type, in part described hereafter, are made for the transfer of needles from one cylinder to the other. With the needles in the lower cylinder there cooperate the usual arcuate sinkers 20, while with the needles in the upper cylinder there cooperate in conventional fashion the verge bits 22. Mounted in the slots in the upper cylinder 4 above the sliders 12 are selector jacks 24 which are provided with butts at a series of levels, which butts may be selectively removed depending upon the patterning to be accomplished. The butts at various levels on the jacks 24 are acted upon by cams such as 25 (Fig. 23) of conventional type controlled by pins selectively arranged in a pattern drum which is partially indicated in Figure 1 at 26. In particular, this pattern drum is adapted for the production of links-links work. As will be evident hereafter the patterning possibilities offered by the drum are relatively independent of the elements and operations constituting the present invention, and it will become clear that the invention is equally applicable to machines which do not involve patterning of the links-links type. As will appear hereafter butts on jacks 24 at two lower levels are subject to special cam control in accordance with the invention.

The lower cylinder 2 is provided with annular groove 30 in which there can operate a needle presser 32 to push needles in the lower cylinder to the back of each slot to support them at the time the sliders are being raised during press-off by the cam 34 (Figures 20, 21 and 23). A needle leveler 35 and a latch opener 36 are provided which function generally in the same fashion as the corresponding elements described in the patent to Oberholtzer No. 2,557,137, dated June 19, 1951. Briefly stated, the needles are raised by cam 34 to a level such that the upper ends of their hooks just clear the under side of the leveler 35 which prevents any overrun of the needles and insures substantial engagement of their lower hooks with the ledges of their sliders if that engagement does not already exist. At the resulting level the latch opener enters behind the latches to effect opening. Further rise then occurs due to the action of cam 33. As will more fully appear hereafter the needle presser, needle leveler and latch opener are simultaneously controlled in the operations of formation of a press-off draw thread. The needle leveler has an additional novel function as a welt presser as hereafter described.

A fixed upright stud 37 serves for the mounting of an assembly of elements particularly illustrated in Figures 4 to 12, inclusive. The assembled elements just referred to provide, in effect, an auxiliary control drum, hereafter so-called, which is designed to provide relatively complex controlling operations without wasting steps of the conventional main control drum of the machine. The lowermost of these elements is a cam 38 above which there are a ratchet 40 and successive cams 42, 44, 46, 48, 50 and 52. These various elements are assembled together in proper angular relationships and are, in particular, illustrated in the various horizontal sections the planes of which are marked on Figure 4. The laminated drum which is formed by the stack of the elements just described is prevented from overrunning during ratcheting by a plunger 53 frictionally bearing on the top of the cam 52 under the action of spring 55.

As indicated particularly in Figure 5 the cam 38 is provided with three notches 54, 54' and 54''. A Bowden wire 56 is connected at 57 to a lever 58 which is pivoted at 60 to a sleeve mounted on a cam shaft but held against rotation by engagement of the lower end of lever 58 within a slot in a fixed bracket (see Figures 14 and 15). The main pattern chain 62 of the machine, which is trained over the sprocket wheel 66 secured to the usual chain-advancing ratchet 68, is provided at proper positions, as will appear hereafter, with special links 62' provided with laterally extending lugs or cams 64. As indicated in Figure 16, the cam 64 is provided at the trailing end of the link but, if desired, this cam may be located at the leading end so that the action of the cam may occur at any course, the pattern chain, as is usual, being advanced one link for every two revolutions. The lever 58 carries a follower 70 engageable by the cam 64, the follower being adjustably secured to lever 58 by a screw 72 which passes through an elongated slot in the follower. A second member 74 is provided to prevent disengagement of the cam 64 and follower 70 in the event of tilting of a link 62'. The arrangement just described serves, when cam 64 engages follower 70, to pull the Bowden wire 56 which at its distant end is connected to a follower 90 for the cam 38 pivoted on an eccentric stud 92, the stud being adjustable to provide an accurate positioning of the pivot (see Figure 5).

The vertical shaft 78 which serves to drive the upper cylinder makes two revolutions for each revolution of the cylinders. As illustrated in Figures 3 and 6, this shaft 78 carries a cam 76 which is arranged to act on a bell crank 80 pivoted at 82 to the frame and connected at 84 to a pawl 86 arranged for the advance of ratchet 40. A spring 88 urges the pawl 86 into engagement with the teeth of ratchet 40 and in a direction to bring the bell crank 80 into contact with the cam 76. Secured to the upper side of the follower 90 is a member 94 which is arranged to obstruct the path of pawl 86 against movement under the action of spring 88. A spring 96 normally urges the follower 90 and member 94 toward the positions illustrated in Figures 5 and 6. Under these conditions, when the bell crank 80 is released by the cam 76 the pawl 86, nevertheless, cannot move to engage another tooth of the ratchet 40.

The operations of the elements just described may now be given as follows:

When the Bowden wire 56 is pulled by the action of a cam 64 of a link 62' on follower 70, the follower lever 90 is pulled outwardly from a notch 54 of cam 38. When this action occurs the member 94 is pulled toward the left, as viewed in Figure 6, out of the path of pawl 86 which, at this time, will be in the position occasioned by engagement of the high portion of cam 76 on bell crank 80. When the cam now releases the bell crank the pawl 86 is free to move downwardly as viewed in Figure 6 to engage the next tooth of ratchet 40 and then, as the pawl is again advanced by the action of cam 76 on bell crank 80, the entire assembly connected to the ratchet 40 will advance by one step so that the follower 90 will ride on a portion of the surface of cam 38 beyond the notch 54 in which it originally reposed. The follower 90 will remain in this position and the pawl will accordingly remain operative to impart step by step movements to the ratchet and its associated elements even though the cam 64 will have passed the follower 70 and will have released the pull on Bowden wire 56. The result is continued stepping of the ratchet 40 until the next notch 54' moves into position to permit the follower 90 to drop therein. When this occurs, the member 94 will again move into the path of pawl 86 and prevent it from moving under the action of spring 88 sufficiently to take a new tooth. The cam and ratchet assembly accordingly stops until another link 62' affects pull on Bowden wire 56 to remove follower 90 from notch 54'. As will be evident, there will be three periods of operation of the assembly if there are three notches 54, 54' and 54'' in cam 38, though, if desired, there may be provided additional or fewer steps or periods of operation. The duration between the periods of operation

is determined by the spacing of links 62' on the pattern chain.

A latch 98 pivoted to the frame and urged counterclockwise, as viewed in Figure 6, by a spring 100 is arranged to engage a pin 102 carried by bell crank 80 to retain the bell crank in its outer position to prevent its following the cam 76. To move the latch into engaging position, it is connected to a Bowden wire 104 which, as illustrated in Figure 13, is connected to the lever 106 which operates a transfer cam 105 (Figure 23). The lever 106 is pivoted on a post 108 and is normally arranged to be acted upon by a toggle 110 connected to a plunger 112 following cams on the main cam drum of the machine, to move the transfer cam 105 into operative position against the action of a strong spring 114. At times, particularly in setting up the machine, it is desirable to disconnect the toggle 110, dropping it to the construction line position illustrated in Figure 13. Under these circumstances, cam 105 is retracted, with the result that subsequent operation would involve the upper sliders' being empty. Under such circumstances, the operating of the press-off draw thread sequences would result in press-off of the fabric and considerable damage. Consequently, whenever the toggle 110 is released and the spring 114 then becomes free to operate on lever 106, the Bowden wire 104 will be pulled producing a latching of the bell crank 80 in position to prevent racking of the ratchet wheel 40 despite the action of a link 62' which otherwise would initiate racking.

As illustrated in Figure 12, the uppermost cam 52 is arranged to act on the uppermost lever 116 of a stack of such levers pivoted on a common post 118. Through a wire link 120 the lever 116 controls the lever 122 which carries a selector cam 124 (Figures 2 and 23). In similar fashion, as indicated in Figure 7, the lowermost cam 42 of the stack above the ratchet wheel 40 controls a lever 126, also pivoted on pin 118, which lever through a link 128 controls the lever 130 carrying a second selector cam 132 located immediately below the cam 124. Springs 138 and 140 normally urge the cams 124 and 132 toward their operating positions.

At this point, attention may be drawn to the butts indicated at 134 and 136 in Figure 2 which are respectively arranged to be acted upon by the cams 132 and 124 to provide movements of the jacks 24 for the performance of the operations described hereafter. Every tenth jack in the upper cylinder lacks a butt at the level 136, and all intermediate jacks are provided with butts 136, while all jacks are provided with butts 134. Both sets of butts comprise long and short butts, the long butts being over long knitting butts of sliders in the lower cylinder and the short butts being over short knitting butts of sliders in the lower cylinder.

Referring now to Figure 11, the cam 50 acts upon a lever 142 which is connected to one end of Bowden wire 144 the other end of which is connected, as illustrated particularly in Figure 22, to control the height of the upper stitch cam 146 at the main feed of the machine. To this end the Bowden wire is connected to a lever 148. The cam 146 is carried by a slide 150 in usual fashion and is under the usual control by the main cam drum for vertical movement. The slide 150 carries a stud 156 under which lies the left-hand end of a lever 158 pivoted at 162 to the frame and normally urged downwardly by a spring 160. The lever 148 is pivoted to the lever 158 at 164 and overlies a member 166 carried by the frame so that when the Bowden wire 144 is pulled the lever 148 rocks about 166 as a fulcrum lifting the right-hand end of lever 158 against the tension of spring 160 to release the slide 150 to a lowered position. It may be noted that the uppermost position of slide 150 is determined by engagement of lever 158 with an adjustable stop 168 while the lowermost position of this same slide is determined by engagement of an adjustable stop screw 170 carried thereby with a fixed portion of the frame. A second adjustable stop screw 171 is engageable by a cam 173 to raise cam 146 during broad rib knitting.

As shown in Figure 10, the cam 48 acts on a lever 172 which through Bowden wire 174 controls the position of the frame bolt cam 34 shown in Figures 20, 21 and 23. This cam 34 is normally in operating position and is pulled out against a conventional spring (not illustrated) by the Bowden wire 174.

As shown in Figure 9, the cam 46 operates on lever 176 which through Bowden wire 178 controls a second frame bolt cam 180, the pull on the Bowden wire withdrawing this cam against the action of a conventional spring which normally maintains cam 180 in active position.

As shown in Figure 8, cam 44 acts on a lever 182 which is connected to a Bowden wire 184. This Bowden wire serves through the mechanism illustrated in Figures 18 and 19 to control the cam 186 shown in Figure 23, the needle presser 32, the needle leveler 35 and the latch opener 36.

The Bowden wire 184 is connected to one arm 188 of a composite lever 190 pivoted at 192 to the frame and urged clockwise, as viewed in Figure 18, by a spring 191. A slide 196 is mounted in the frame and is provided with a follower end engageable with a cam 198 which is secured to the shaft 200 of the usual two feed mechanism which is stepped about under control of the main pattern drum during the operation of the machine. Beneath the slide 196 is an independent slide 194 engageable with the right-hand side of the arm 188. The slide 194 has an upwardly turned end 202 engaging the stem 204 through which the cam 186 is yieldingly pressed inwardly in conventional fashion against the normal urge of a spring 187 to remove it from action. Between the end of slide 196 and the upturned end of slide 194 there extends one end of a lever 206 which is pivoted to the frame at 208 and acts on an upright lever 210 which controls the position of the two-feed bolt cam 212 shown in Figure 23. The result of this arrangement is that when cam 198 acts on slide 196 lever 206 is rocked to move inwardly cam 212 and at the same time by engaging the upturned end 202 of slide 194, cam 186 is moved inwardly. However when Bowden wire 184 is released and spring 191 rocks arm 188, that arm acts directly on slide 194 to move cam 186 inwardly without moving cam 212, such action occurring during the formation of the press-off draw thread.

For the purpose of controlling the needle presser and needle leveler an arm 214 of lever 190 is arranged to engage an adjustable portion 216 of the lever 218 which supports both the needle leveler 35 and the needle presser 32. When the Bowden wire 184 is relaxed, the arm 214 moves out of engagement with 216 and under these conditions the needle presser and needle leveler are moved to operative positions by the action of spring 220 acting on the arm 218. The inner position of the lever 218 is determined by engagement of needle presser 32 with the needles. When, however, the Bowden wire 184 is pulled by the action of cam 44, the arm 214 engages the member 216 and moves both the needle leveler and the needle presser against the action of spring 220.

The latch opener 36 is also subjected to control at the same times as the needle leveler and needle presser. To this end it is mounted on a carrier 222 pivoted on a post 224 and normally urged counterclockwise, as viewed in Figure 18, by a spring 226 to a position limited by an adjustable stop 230. When the lever 190 is in the clockwise position under the action of spring 191 during relaxation of Bowden wire 184, a wire 228 forming a further arm of lever 190 is removed from engagement with the latch opener carrier 222. When, however, the Bowden wire 184 is pulled, the wire 228 engages the carrier 222 to withdraw the latch opener from the needles against the action of spring 226.

Before proceeding with a description of the operation, reference may be made to certain elements in Figure 23. 234 and 232 are respectively the forward and reverse lower stitch cams at the main feed. At 236 there is shown the lower stitch cam at the second feed. A pair of rib bolt cams are shown at 238 and 240, these being operated from the main cam drum in usual fashion. A fixed reverse welt cam is provided at 242. It extends inwardly sufficiently far to engage medium transfer butts on the lower sliders but misses short transfer butts. The sliders having the medium and long transfer butts are those which are empty after the 1 x 1 transfer, but by the action of cam 242 they continue to rise to the knitting race and guard the latches of the needles in the upper cylinder during the knitting of reverse welts.

Cam 242 is removable from action may be replaced by a cam 243 which is involved in the formation of picot regular welts by acting on lower slider butts at the lowermost level 11. When cam 242 is used, 243 is removed from action. In other words, cams 242 and 243 are alternatively used as described hereafter.

The upper transfer cam is provided at 244. This is operated in the usual fashion by the main cam drum to transfer sole sliders down just ahead of the heel and the rest of the sliders at the ring toe portion of a stocking.

There is also a lower transfer cam provided at 246 to act on transfer butts 10. The upper stitch cam at the second feed is shown at 248. An upper heel bolt cam is provided at 250. It is operated in usual fashion by the main cam drum, being stepped out to level all of the upper cylinder sliders at cleared level during heel and toe knitting.

A plurality of interchangeable yarns are fed at the main feed at the position generally indicated at 252 while a plurality of interchangeable yarns are fed at the second feed at the position generally indicated at 254. In the present machine, heels and toes are formed in conventional fashion, and in their formation there enter, as usual, the raising pickers 256 and 258 and the lowering picker 260.

The present invention is principally concerned with the knitting of the portion of a sock or stocking beginning with the looper's waste course and ending with the formation of the regular rib top. Accordingly, only the operations involved in this portion of a stocking need be considered, it being understood that the remaining portions of the stocking may be formed in conventional fashion. There will first be considered the knitting of a stocking having, in sequence following the looper's waste course, a regular welt formation, press-off draw thread structure, a picot reverse welt and a second reverse welt, preceding the beginning of a 1 x 1 rib top.

Following the completion of the toe of the stocking all of the needles will be in the lower cylinder sliders knitting the plain fabric which forms the usual looper's waste or ravel courses. In all of the operations which are here particularly involved, knitting takes place at the main feed only and this will be assumed in what follows. As will become evident, in other portions of the stocking, particularly the top and the leg, knitting may be carried out at the two feeds and, in fact, the invention is primarily concerned with making this possible consistently with the formation of those features of construction about to be described leading to the making of a continuous multiple stocking blank. During the plain knitting of the looper's waste courses the needles passing from right to left as viewed in Figure 23 ride under the forward stitch cam 234 taking yarn at 252 and are then raised by cam 180 to be cleared at the level attained as they move over the following cam 181. The last course of plain knitting is indicated at A in Figure 24. In this figure the wales which are knit, following the plain knitting, by needles in the lower cylinder are indicated at W_1, W_3, W_5 and W_7 while the wales knit by needles in the upper cylinder are indicated at W_2, W_4, W_6 and W_8.

Following the course A there may be knit one or more courses of 1 x 1 rib fabric, two such courses being illustrated at B_1 and B_2. A main drum move takes place to effect the transition from plain fabric to the 1 x 1 rib, and by this movement of the main drum cams 246 and 105 are brought into action to transfer alternate needles to the upper cylinder in conventional fashion. At this time, cams 240, 238 and 250 are in active position but cam 240 is not in the path of butts on the upper sliders. Cams 124 and 132 are withdrawn. The lower butts on the upper sliders accordingly take a path which rises over cam 250 and then over stitch cam 146, passing under the action of cam 238 and the following cam 239 to clearing level. At the same time, lower cam 180 is active while cam 34 is in active position but ineffective, being out of the path of the upper butts of the lower sliders. Cam 186 is withdrawn so as to be inactive. The result is that the lower sliders move down the center cam 233 and stitch cam 234, taking yarn at the main feed, and are then raised by cam 180 and cam 181 to clear their stitches.

A regular welt is then produced by the action of cams on the main cam drum which act, during the next step, to withdraw cams 246 and 105 from action and to step out the cams 238 and 240. This is the last move of the main pattern drum until completion of the multiple welts. Varying numbers of courses may be now formed and as illustrated in Figure 24 there are three courses C_1, C_2 and C_3 now produced. Of the movable cams acting on upper sliders, only cam 250 is active. After once being raised by this cam 250, however, the upper sliders move in the welt race above the stitch cams 146 and 248 holding the stitches last taken by their needles. Cams 180 and 34 remain in active positions, but the lower sliders only engage the cam 180, following the same path which was followed during the formation of the 1 x 1 rib.

After the formation of a suitable number of courses of this regular welt, a side lug or cam 64 on a link 62' of the main chain acts upon the lever 58 to effect the beginning of racking of the auxiliary drum. As soon as the member 94 is removed from the path of pawl 86, the pawl is free to engage teeth of ratchet 40 to start the stepping of this auxiliary drum. Once started, the follower 90 is held by the cam member 38 in position so that the racking continues until the next cut-out portion 54' of the cam 38 is presented for reception of the end of the follower 90. Figures 7 to 12, inclusive, show the positions of the various cams 42, 44, 46, 48, 50 and 52 at the time stepping of the auxiliary drum begins. Under these conditions, the various follower levers bear against the respective portions 42A, 44A, 46A, 48A, 50A and 52A of these cams. The first step of the auxiliary drum takes place as short butts of lower cylinder sliders are passing the location of cam 186. By the movement of cam 44 so that follower lever 182 drops on step 44B of this cam, the cam 186 is caused to move partway inwardly to miss the passing short butts but to engage the first long butt reaching it so that the long butt sliders ride under the cam 186. At the same time, follower 142 drops to surface 50B of cam 50, causing cam 146 to rise under the action of spring 160 to be in position to draw longer rib stitches. At the same time as the described movement of cam 186 occurs, cams 124 and 132 are stepped partway in as there pass by them short butts of the selector jacks at the levels 136 and 134, respectively. The stepping in of cams 124 and 132 is effected by movement of the followers 116 and 126, respectively, to the intermediate steps 52B and 42B of cams 52 and 42.

As will be evident from the description of the mechanism involved, the movement inwardly of cam 186 is accompanied by the inward movements of the needle leveler, the latch opener and the needle presser. The needles in the lower cylinder carried by the short butt sliders will, however, not be depressed by cam 186 and.

consequently, the needle leveler will engage the shanks of these short butt needles preventing the needle presser from moving inwardly all the way. However, as soon as the short butt sliders pass the position of the needle leveler it is free to move inwardly to its operating position above the needles carried by long butt lower sliders as they rise over the cam 34. As the long butt series of needles climb up the cam 34 they are pressed toward the bottoms of their slots by the needle presser 32 and the needle leveler keeps them from bouncing so that they are properly aligned with the latch opener which opens the latches of the needles which became closed during the pressing off of their loops. This operation of the needle leveler and latch opener need not be described in detail herein inasmuch as it is fully described in the Oberholtzer patent referred to above. It may be noted that at this time the inward position of the needle leveler is determined by engagement of the needle shanks by the needle presser.

The selector jacks, when their butts are acted upon by the cam 132 (and cam 124, the action of which, however, is now superfluous), move the upper sliders and the needles which they carry downwardly to the knitting raceway so that 1 x 1 loops are drawn at the main feed.

During the passage of the long butt series of sliders in both the upper and lower cylinders past the cams 186, 124 and 132, the auxiliary drum takes another step and these cams are then stepped sufficiently inwardly to engage all of the sliders and selector jacks. This action occurs by the dropping of the followers to the surfaces 44C, 52C and 42C of the respective cams 44, 52 and 42. As will be evident, courses are now formed in which 1 x 1 loops are drawn at the main feed, clearing of the needles in the lower cylinder occurring because of the presence of cam 180 in active position and press-off then occurring due to depression of the needles under the action of cam 186, the needles being thereafter raised by the action of cam 34 so as to pass through the knitting cams to take the yarn at 252. In the case of the upper sliders, the sliders are raised by cam 250 which is active and are then raised by stitch cam 146, the upper cylinder needles then being cleared by the actions of cams 124 and 132 on the selector jack butts. Under these conditions there may be knit two or more courses, two courses being illustrated at D_1 and D_2 in Figure 24. The loops and bights indicated in dotted lines in wales W_1, W_3, W_5 and W_7 of courses D_1 and D_2 are shown to indicate the initial drawing of yarn by the corresponding needles. As press-off occurs, however, the yarn lengths thus drawn are absorbed in the loops in the intermediate wales providing the elongated stitches shown. It may be noted that the loops of course C_3 are the last formed of a portion of fabric consisting of courses C_1, C_2 and C_3 and that this portion of fabric normally curls outwardly after press-off of the loops of course D_1 from the lower cylinder needles, and also that previously formed fabric is supported by upper needle loops in W_2, W_4, W_6 and W_8 formed at course D_2.

At the end of these press-off draw thread courses, three successive movements of the auxiliary drum occur bringing into action in the first movement step 46D of cam 46, in the second movement steps 42E, 46E and 48E of cams 42, 46 and 48, and in the third movement steps 42F and 48F of cams 42 and 48. The final result is the full withdrawal of cams 34, 180 and 132, each of these cams being, as is usual, partly withdrawn as long butts are passing it and then fully withdrawn as short butts pass it. As the last of these three steps occurs, the next notch 54' comes into coincidence with the end of the follower 90 so as to stop the racking of the auxiliary drum.

The results of the foregoing may be described as follows:

Of the movable cams which may act on lower sliders only the cam 186 is now in active position. Cam 242, however, is also active. (In the present operation cam 243 is withdrawn from action.) The result is that the needles carried by lower sliders follow a welt race below the stitch cams at both feeds holding the last stitches taken thereby.

The lower medium butt sliders which do not carry needles are raised by cam 242 to the knitting raceway to act as latch guards.

The needles which are associated with selector jacks not having butts in the upper position 136 move in the upper welt race, since the cam 132 which operates at a level in which butts on all sliders are present is withdrawn and, consequently, the needles are not lowered to clearing position. These last named needles, therefore, also hold the loops last taken by them.

The other needles in the upper cylinder, however, are cleared due to the action of cam 124 on the selector butts at the upper level 136. Accordingly, rib stitches are formed by the last mentioned needles with the resulting production of the picot reverse welt structure illustrated in the courses E_1, E_2 and E_3 of Figure 24. Wales W_2, W_4 and W_8 are those formed by needles associated with jacks having selector butts 136, while wale W_6 is typical of the wales produced by every fifth rib needle associated with a jack not having a selector butt 136.

During the formation of this picot reverse welt the needle leveler has a second function. On regular welts knit by needles in the lower cylinder with the sinkers performing the knocking over function, there is no difficulty in making plain or picot welts. When plain reverse welts are knit with needles in the upper cylinder without benefit of sinkers, there is some limitation to the number of courses that can be knit due to the fact that the lower cylinder needles hold loops and limit the fabric take-up pull. On reverse picot welts where certain of the rib needles are also in the welt race holding stitches, this problem is still more serious. It has been found that the needle leveler functions very well as a welt presser to push the fabric well inside the circle of needles before the upper cylinder needles start down to clear their stitches. In performing this additional function, there is an increase in the possible number of courses which may be provided in reverse welts and especially in picot reverse welts. While only three courses are shown as involved in the picot reverse welt it is possible to provide more courses with the resulting accentuation of the picot edge which attains its final form when the stockings are separated by the cutting and pulling out of course D_2.

As was stated the last movement referred to of the auxiliary drum resulted in its being brought to rest with the follower in notch 54'. The next portion of its cycle of movement is again initiated by the action of a lug or cam 64 on a link 62' of the main chain. The position of this lug determines the extent of the picot, the formation of which will continue until such a lug becomes active to restart the auxiliary drum.

The first active step which occurs after the auxiliary drum is restarted involves the bringing into operation on the followers 126 and 172 of the portions 42G and 48G of cams 42 and 48, respectively. The result is to bring partly into active position, during the passage of short butts, the cams 132 and 34. Remembering that cam 250 is already in operative position, it will be evident that this effects the production of 1 x 1 rib fabric by all of the long butt needles and as these needles pass the cam positions the next step brings into operation the portions 42H and 48H of cams 42 and 48, the result being to produce 1 x 1 rib fabric by all of the short butt needles following the long butt series. A full course F of 1 x 1 rib fabric is thus produced. Immediately following this, follower 142 rises on step 50J of cam 50 to effect lowering of stitch cam 146 to cause it to draw proper length stitches for the 1 x 1 knitting.

Immediately following this a further step takes place bringing the surface 48K of cam 48 in position engaging follower 172 to result in stepping partway out the cam 34 as long butts pass this cam, the next step bringing the surface 48L of cam 48 into operation as the short butts pass so that cam 34 will then miss both long and short butts. The result is that the lower sliders which carry needles are again levelled off in the welt race to hold the stitches which they last drew, the empty lower sliders being raised by cam 242 for latch guarding purposes as heretofore described. At the same time, however, cam 132 is active to cause the needles carried by the upper sliders to clear and draw stitches. The result is the formation of a reverse welt comprising the courses G_1, G_2 and G_3 and which has no picot edge since knitting now occurs in the wales such as W_6. At this time, by reason of the fact that follower 142 drops on surface 50L of cam 50 the rib stitch cam 146 is again raised to draw extra long stitches for the formation of the reverse welt. The needle leveler remains in position to act as a welt presser as previously described.

Following the operations to initiate reverse welt formation, the auxiliary drum is again stopped by the fact that notch 54'' of cam 38 comes into position to receive the end of follower 90. The formation of the reverse welt may, therefore, continue as long as the action of a further lug 64 of a link 62' on lever 58 is delayed.

When the desired number of courses of the reverse welt has been formed, the auxiliary drum is again started by a lug 64. Cam 34 is again put into action in successive steps, as short and then long butts pass it, by the actions of the surfaces 48M and 48N of cam 48. Cam 180 is similarly stepped into action by steps 46N and 46P of cam 46. The surfaces 44N, 42N and 52N of cams 44, 42 and 52 come into action as long butts pass to partially withdraw the respective cams 186, 132 and 124. Then as short butts pass, surfaces 44P, 42P and 52P of these cams come into action to effect full withdrawal of cams 186, 132 and 124. The surface 50P of cam 50 restores the stitch cam 146 to its normal lowered position. It will be evident that all of the parts are thus restored to conditions to provide 1 x 1 single feed rib, courses of which are indicated at H_1 and H_2 in Figure 24. After the parts are thus restored, the auxiliary drum stops in its original position. The production of 1 x 1 rib fabric then continues until there occurs in usual fashion a step of the main cam drum.

It may be noted that when reverse welts as described are knit on the upper cylinder needles, it is important to raise the stitch cam 146 because of the shift to and from 1 x 1 rib stitch drawing. By shifting only cam 146 and not cam 248, there is avoided the tendency to cut the stitches drawn at the main feed by stretching them at the auxiliary feed.

A single feed 1 x 1 top of conventional type may then be knit or, if desired, the selector jacks may be controlled by their pattern drum to provide any other desired type of top, for example 2 x 2 or other type as desired. Furthermore, as will be evident a two-feed top may now be knit under normal control from the main pattern drum of the machine, which again becomes active, yarns being fed at both feeds 252 and 254.

The use of the auxiliary drum not only saves steps of the main pattern drum and makes possible elaborate stitch formation as just described, but it also renders unnecessary the use of a finger at the second feed to produce a draw thread so that this finger becomes available to provide a special yarn in the further knitting of a stocking. In this way, for example, the top may be knit two-feed with one weight or kind of yarn and the leg and foot can be knit two-feed with another weight or kind of yarn.

Following the stitch formations which have been detailed above, the knitting of the remainder of the stocking may proceed in conventional fashion, either single feed or two feed as desired, with the formation of leg patterns continued into the instep, for example patterns of links-links type, broad rib, or otherwise. The formation of heels and toes is conventional in this machine and need not be particularly described, the formations of heels and toes utilizing the narrowing pickers 256 and 258 and the widening picker 260.

In Figure 25 there is illustrated a multiple stocking blank of the type to which the invention relates. This blank may be of indefinite length and consists of repeats of knitted structure as, for example, of that included between the lines marked X. Letters corresponding to those in Figure 24 are applied to corresponding portions of the fabric. A indicates the loopers' waste courses, knit single feed as described or, if desired, two feed; B is the portion of 1 x 1 rib formation; C is the regular welt which, as described above, curls outwardly after press off of stitches formed in the lower cylinders; D is the press-off draw thread portion of the fabric; E is the picot reverse welt; F is the 1 x 1 rib course preceding the reverse welt G; and H is the rib top, shown in Figure 24 as 1 x 1 but which may be knit two feed as 1 x 1 or other rib, for example 2 x 2. The foregoing structures have already been detailed with reference to Figure 24.

Following the rib top, the leg I is knit. This may be knit two feed, and of yarns different from those used in the two feed knitting of the rib top so that the top and leg may be of different thickness or weight, and embodies structure provided by selection of needles between the cylinders. A broad rib leg is illustrated but this may, of course, be of links-links type.

Prior to forming the heel J, all needles in the rear of the stocking are transferred to the lower cylinder interrupting pattern formation at the rear of the stocking, and the heel J is then formed in usual fashion by narrowing and widening on the sole needles while the instep needles are raised to inactive level holding stitches of the instep.

Following completion of the heel, the foot K is formed and, as shown, the leg pattern is carried only through the instep, the sole being knit plain by needles in the lower cylinder only. The foot may be knit two feed the same as the leg.

All of the needles are then transferred to the lower cylinder and the toe pocket L is then knit in usual fashion. Following this the loopers' waste courses A are produced.

Repetition of the foregoing provides individual stocking blanks in a multiple stocking blank, the individual blanks beng separable by cutting and pulling out the draw thread course corresponding to D_2.

The foregoing description has been specifically directed to the formation of a stocking in which following the loopers' waste course there is produced a regular welt and then a press-off draw thread structure followed by a picot reverse welt and a plain reverse welt. Alternatively, there may be produced in accordance with the invention a structure including, in succession following the loopers' waste course, a regular welt, a press-off draw thread structure, a picot regular welt and a plain regular welt. The structure involved in this last alternative is illustrated in Figure 26 which is generally similar to Figure 24 but in which generally corresponding courses and wales are designated by the same reference characters primed.

The courses A', B_1', B_2', C_1', C_2', C_3', D_1' and D_2' correspond respectively to the correspondingly unprimed courses of Figure 24 and their formations may be carried out in the fashions previously described.

Following the foregoing, however, courses E_1', E_2', and E_3' are formed to provide a picot regular welt. In these courses which, except for picot formation, resemble those which formed the regular welt preceding the press-off draw thread structure, the lower cylinder needles with the exception of the picot-forming needles form regular stitches as in the wales W_1', W_3' and W_7', while the upper cylinder needles move in their welt race holding stitches last taken by them. The picot-forming needles in the lower cylinder move in a welt race to hold yarn taken by them but

to provide long drawn loops such as indicated at Y in the wale W_5'.

This is followed by the formation of a course F' of 1 x 1 rib fabric which is then followed by regular welt formation in the courses G_1', G_2' and G_3' as previously described. Following this, the 1 x 1 rib top is begun as indicated by the courses H_1' and H_2', this 1 x 1 rib top being knit either single feed or two feed as desired.

If both of the regular welts refererd to are to be plain knit without picot formation, the formations thereof would be carried out precisely as described in connection with the regular welt of Figure 24. However, if picot formation is desired, then some special handling of the picot-forming needles is required involving simple changes in the mechanism which may be described as follows:

Inasmuch as the picot-forming needles in the lower cylinder must be differentiated from the other needles knitting in the lower cylinder, the sliders **6** may be provided with a third lowermost set of butts as indicated at **11** in Figure 20, these butts being provided on those sliders which are to provide knitting by the lower cylinder needles during the formation of the regular picot welt. The sliders corresponding to the picot-forming needles have butts missing at this level. It may be noted that the same sliders, having butts **11**, may be used for both reverse and regular picot welt formation, but in the former case the butts **11** are inactive.

In order to provide differentiation of the two sets of lower sliders and their needles, the cam **243** is put into action, cam **242** being withdrawn. Cam **132** is active, cam **240** being withdrawn. The use of cam **132** insures corresponding starting points in both cylinders. Cams **180** and **34** are withdrawn.

Comparing the result with regular plain welt formation, it will be evident that those sliders which do not form the picot depressions will follow the welt race after moving down stitch cam **234** and will pass withdrawn cam **180**. They will then be raised to clearing level by the action of cam **243** on their butts **11** and then by cam **33**, being again lowered as they pass the main feed. On the other hand, the sliders lacking butts **11** will not be raised by cam **243** and will move in the welt race, their knitting butts missing withdrawn cam **34** and their transfer butts missing withdrawn cam **242**. The result is that spaced needles will hold stitches to provide the picot structure. During the formation of the second regular welt the operation may, of course, be as previously described with cams **180** and **34** restored to active position, cam **186**, of course, remaining out of action.

It will be evident that these various auxiliary operations of cams **180** and **34** may be controlled by the auxiliary drum with suitable changes in intermediate connections, the controls being generally similar to those involved in the case of cams **124** and **132** as previously described.

It will be evident that, when regular welts are thus provided in place of reverse welts, the stocking structural arrangement will be essentially similar to that of Figure 25 previously described.

What is claimed is:

1. A knitting machine comprising means for knitting a multiple feed leg and foot, each containing both forwardly and reversely concatenated stitches, means for knitting a welt following completion of the foot, means for knitting a press-off draw thread structure following said welt, means for knitting after said press-off draw thread structure at least one welt, and means for then knitting a top having both forwardly and reversely concatenated stitches.

2. A knitting machine comprising means for knitting a multiple feed leg and foot, each containing both forwardly and reversely concatenated stitches, means for knitting a welt following completion of the foot, means for knititng a press-off draw thread structure following said welt, means for knitting after said press-off draw thread structure a picot, and means for then knitting a top having both forwardly and reversely concatenated stitches.

3. A knitting machine comprising means for knitting a multiple feed leg and foot, each containing both forwardly and reversely concatenated stitches, means for knitting a welt following completion of the foot, means for knitting a press-off draw thread structure following said welt, means for knitting after said press-off draw thread structure a plurality of welts, and means for then knitting a top having both forwardly and reversely concatenated stitches.

4. A knitting machine comprising means for knitting a multiple feed leg and foot, each containing both forwardly and reversely concatenated stitches, means for knitting a welt following completion of the foot, means for knitting a press-off draw thread structure following said welt, means for knitting after said press-off draw thread structure a plurality of welts, the first of which is a picot welt, and means for then knitting a top having both forwardly and reversely concatenated stitches.

5. A knitting machine comprising means for knitting a multiple feed leg and foot, each containing both forwardly and reversely concatenated stitches, means for knitting a single feed welt following completion of the foot, means for knitting a press-off draw thread structure following said welt, means for knitting after said press-off draw thread structure at least one welt, and means for then knitting a top having both forwardly and reversely concatenated stitches.

6. A knitting machine comprising means for knitting a multiple feed leg and foot, each containing both forwardly and reversely concatenated stitches, means for knitting a welt following completion of the foot, means for knitting a press-off draw thread structure following said welt, means for knitting after said press-off draw thread structure at least one single feed welt, and means for then knitting a top having both forwardly and reversely concatenated stitches.

7. In a knitting machine, a main pattern device, an auxiliary pattern device having a cycle of operation comprising a plurality of subcycles of operation, means carried by said main pattern device for initiating one subcycle of operation of the auxiliary pattern device, means controlled by the auxiliary pattern device during said subcycle to form a press-off draw thread structure and to initiate the formation of a picot welt, means controlled by the auxiliary pattern device for terminating said subcycle of operation, means carried by said main pattern device for determining the number of courses of said picot welt to be formed and for initiating a second subcycle of operation of the auxiliary pattern device, means controlled by the auxiliary pattern device during said second subcycle to form a rib structure and to initiate the formation of a second welt, means controlled by the auxiliary pattern device for terminating said second subcycle of operation, means carried by said main pattern device for determining the number of courses of said second welt to be formed and for initiating a third subcycle of operation of the auxiliary pattern device, means controlled by the auxiliary pattern device during said third subcycle to initiate the formation of a rib structure, and means controlled by the auxiliary pattern device for terminating said third subcycle of operation.

8. In a knitting machine, a main pattern device, an auxiliary pattern device having a cycle of operation comprising a plurality of subcycles of operation, means carried by said main pattern device for initiating one subcycle of operation of the auxiliary pattern device, means controlled by the auxiliary pattern device during said subcycle to form a press-off draw thread structure and to initiate the formation of a picot reverse welt, means controlled by the auxiliary pattern device for terminating said subcycle of operation, means carried by said main

pattern device for determining the number of courses of said picot reverse welt to be formed and for initiating a second subcycle of operation of the auxiliary pattern device, means controlled by the auxiliary pattern device during said second subcycle to form a rib structure and to initiate the formation of a second reverse welt, means controlled by the auxiliary pattern device for terminating said second subcycle of operation, means carried by said main pattern device for determining the number of courses of said second reverse welt to be formed and for initiating a third subcycle of operation of the auxiliary pattern device, means controlled by the auxiliary pattern device during said third subcycle to initiate the formation of a rib structure, and means controlled by the auxiliary pattern device for terminating said third subcycle of operation.

9. In a knitting machine, a main pattern device, an auxiliary pattern device having a cycle of operation comprising a plurality of subcycles of operation, means carried by said main pattern device for initiating one subcycle of operation of the auxiliary pattern device, means controlled by the auxiliary pattern device during said subcycle to form a press-off draw thread structure and to initiate the formation of a welt, means controlled by the auxiliary pattern device for terminating said subcycle of operation, means carried by said main pattern device for determining the number of courses of said welt to be formed and for initiating a second subcycle of operation of the auxiliary pattern device, means controlled by the auxiliary pattern device during said second subcycle to form a rib structure and to initiate the formation of a second welt, means controlled by the auxiliary pattern device for terminating said second subcycle of operation, means carried by said main pattern device for determining the number of courses of said second welt to be formed and for initiating a third subcycle of operation of the auxiliary pattern device, means controlled by the auxiliary pattern device during said third subcycle to initiate the formation of a rib structure, and means controlled by the auxiliary pattern device for terminating said third subcycle of operation.

10. In a knitting machine, a main pattern device, an auxiliary pattern device having a cycle of operation comprising a plurality of subcycles of operation, means carried by said main pattern device for initiating one subcycle of operation of the auxiliary pattern device, means controlled by the auxiliary pattern device during said subcycle to form a press-off draw thread structure and to initiate the formation of a reverse welt, means controlled by the auxiliary pattern device for terminating said subcycle of operation, means carried by said main pattern device for determining the number of courses of said reverse welt to be formed and for initiating a second subcycle of operation of the auxiliary pattern device, means controlled by the auxiliary pattern device during said second subcycle to form a rib structure and to initiate the formation of a second reverse welt, means controlled by the auxiliary pattern device for terminating said second subcycle of operation, means carried by said main pattern device for determining the number of courses of said second reverse welt to be formed and for initiating a third subcycle of operation of the auxiliary pattern device, means controlled by the auxiliary pattern device during said third subcycle to initiate the formation of a rib structure, and means controlled by the auxiliary pattern device for terminating said third subcycle of operation.

11. In a knitting machine, a main pattern device, an auxiliary pattern device having a cycle of operation comprising a plurality of subcycles of operation, means carried by said main pattern device for initiating one subcycle of operation of the auxiliary pattern device, means controlled by the auxiliary pattern device during said subcycle to form a press-off draw thread structure and to initiate the formation of a picot welt, means controlled by the auxiliary pattern device for terminating said subcycle of operation, means carried by said main pattern device for determining the number of courses of said picot welt to be formed and for initiating a second subcycle of operation of the auxiliary pattern device, means controlled by the auxiliary pattern device during said second subcycle to form a rib structure and to initiate the formation of a second welt, and means controlled by the auxiliary pattern device for terminating said second subcycle of operation.

12. In a knitting machine, a main pattern device, an auxiliary pattern device having a cycle of operation comprising a plurality of subcycles of operation, means carried by said main pattern device for initiating one subcycle of operation of the auxiliary pattern device, means controlled by the auxiliary pattern device during said subcycle to form a press-off draw thread structure and to initiate the formation of a picot reverse welt, means controlled by the auxiliary pattern device for terminating said subcycle of operation, means carried by said main pattern device for determining the number of courses of said picot reverse welt to be formed and for initiating a second subcycle of operation of the auxiliary pattern device, means controlled by the auxiliary pattern device during said second subcycle to form a rib structure and to initiate the formation of a second reverse welt, and means controlled by the auxiliary pattern device for terminating said second subcycle of operation.

13. In a knitting machine, a main pattern device, an auxiliary pattern device having a cycle of operation comprising a plurality of subcycles of operation, means carried by said main pattern device for initiating one subcycle of operation of the auxiliary pattern device, means controlled by the auxiliary pattern device during said subcycle to form a press-off draw thread structure and to initiate the formation of a welt, means controlled by the auxiliary pattern device for terminating said subcycle of operation, means carried by said main pattern device for determining the number of courses of said welt to be formed and for initiating a second subcycle of operation of the auxiliary pattern device, means controlled by the auxiliary pattern device during said second subcycle to form a rib structure and to initiate the formation of a second welt, and means controlled by the auxiliary pattern device for terminating said second subcycle of operation.

14. In a knitting machine, a main pattern device, an auxiliary pattern device having a cycle of operation comprising a plurality of subcycles of operation, means carried by said main pattern device for initiating one subcycle of operation of the auxiliary pattern device, means controlled by the auxiliary pattern device during said subcycle to form a press-off draw thread structure and to initiate the formation of a reverse welt, means controlled by the auxiliary pattern device for terminating said subcycle of operation, means carried by said main pattern device for determining the number of courses of said reverse welt to be formed and for initiating a second subcycle of operation of the auxiliary pattern device, means controlled by the auxiliary pattern device during said second subcycle to form a rib structure and to initiate the formation of a second reverse welt, and means controlled by the auxiliary pattern device for terminating said second subcycle of operation.

15. In a knitting machine, a main pattern device, an auxiliary pattern device having a cycle of operation comprising a plurality of subcycles of operation, means controlled by said main pattern device for initiating the formation of a regular welt, means carried by said main pattern device for determining the number of courses of said regular welt to be formed and for initiating one subcycle of operation of the auxiliary pattern device, means controlled by the auxiliary pattern device during said subcycle to form a press-off draw thread structure and to initiate the formation of a picot welt, means controlled

by the auxiliary pattern device for terminating said subcycle of operation, means carried by said main pattern device for determining the number of courses of said picot welt to be formed and for initiating a second subcycle of operation of the auxiliary pattern device, means controlled by the auxiliary pattern device during said second subcycle to form a rib structure and to initiate the formation of a third welt, means controlled by the auxiliary pattern device for terminating said second subcycle of operation, means carried by said main pattern device for determining the number of courses of said third welt to be formed and for initiating a third subcycle of operation of the auxiliary pattern device, means controlled by the auxiliary pattern device during said third subcycle to initiate the formation of a rib structure, and means controlled by the auxiliary pattern device for terminating said third subcycle of operation.

16. In a knitting machine, a main pattern device, an auxiliary pattern device having a cycle of operation comprising a plurality of subcycles of operation, means controlled by said main pattern device for initiating the formation of a regular welt, means carried by said main pattern device for determining the number of courses of said regular welt to be formed and for initiating one subcycle of operation of the auxiliary pattern device, means controlled by the auxiliary pattern device during said subcycle to form a press-off draw thread structure and to initiate the formation of a picot reverse welt, means controlled by the auxiliary pattern device for terminating said subcycle of operation, means carried by said main pattern device for determining the number of courses of said picot reverse welt to be formed and for initiating a second subcycle of operation of the auxiliary pattern device, means controlled by the auxiliary pattern device during said second subcycle to form a rib structure and to initiate the formation of a second reverse welt, means controlled by the auxiliary pattern device for terminating said second subcycle of operation, means carried by said main pattern device for determining the number of courses of said second reverse welt to be formed and for initiating a third subcycle of operation of the auxiliary pattern device, means controlled by the auxiliary pattern device during said third subcycle to initiate the formation of a rib structure, and means controlled by the auxiliary pattern device for terminating said third subcycle of operation.

17. In a knitting machine, a main pattern device, an auxiliary pattern device having a cycle of operation comprising a plurality of subcycles of operation, means controlled by said main pattern device for initiating the formation of a regular welt, means carried by said main pattern device for determining the number of courses of said regular welt to be formed and for initiating one subcycle of operation of the auxiliary pattern device, means controlled by the auxiliary pattern device during said subcycle to form a press-off draw thread structure and to initiate the formation of a welt, means controlled by the auxiliary pattern device for terminating said subcycle of operation, means carried by said main pattern device for determining the number of courses of said welt to be formed and for initiating a second subcycle of operation of the auxiliary pattern device, means controlled by the auxiliary pattern device during said second subcycle to form a rib structure and to initiate the formation of a third welt, means controlled by the auxiliary pattern device for terminating said second subcycle of operation, means carried by said main pattern device for determining the number of courses of said third welt to be formed and for initiating a third subcycle of operation of the auxiliary pattern device, means controlled by the auxiliary pattern device during said third subcycle to initiate the formation of a rib structure, and means controlled by the auxiliary pattern device for terminating said third subcycle of operation.

18. In a knitting machine, a main pattern device, an auxiliary pattern device having a cycle of operation comprising a plurality of subcycles of operation, means controlled by said main pattern device for initiating the formation of a regular welt, means carried by said main pattern device for determining the number of courses of said regular welt to be formed and for initiating one subcycle of operation of the auxiliary pattern device, means controlled by the auxiliary pattern device during said subcycle to form a press-off draw thread structure and to initiate the formation of a reverse welt, means controlled by the auxiliary pattern device for terminating said subcycle of operation, means carried by said main pattern device for determining the number of courses of said reverse welt to be formed and for initiating a second subcycle of operation of the auxiliary pattern device, means controlled by the auxiliary pattern device during said second subcycle to form a rib structure and to initiate the formation of a second reverse welt, means controlled by the auxiliary pattern device for terminating said second subcycle of operation, means carried by said main pattern device for determining the number of courses of said second reverse welt to be formed and for initiating a third subcycle of operation of the auxiliary pattern device, means controlled by the auxiliary pattern device during said third subcycle to initiate the formation of a rib structure, and means controlled by the auxiliary pattern device for terminating said third subcycle of operation.

19. In a knitting machine, a main pattern device, an auxiliary pattern device having a cycle of operation comprising a plurality of subcycles of operation, means controlled by said main pattern device for initiating the formation of a regular welt, means carried by said main pattern device for determining the number of courses of said regular welt to be formed and for initiating one subcycle of operation of the auxiliary pattern device, means controlled by the auxiliary pattern device during said subcycle to form a press-off draw thread structure and to initiate the formation of a welt, means controlled by the auxiliary pattern device for terminating said subcycle of operation, means carried by said main pattern device for determining the number of courses of said welt to be formed and for initiating a second subcycle of operation of the auxiliary pattern device, means controlled by the auxiliary pattern device during said second subcycle to form a rib structure and to initiate the formation of a third welt, and means controlled by the auxiliary pattern device for terminating said second subcycle of operation.

20. In a knitting machine, a main pattern device, an auxiliary pattern device having a cycle of operation comprising a plurality of subcycles of operation, means controlled by said main pattern device for initiating the formation of a regular welt, means carried by said main pattern device for determining the number of courses of said regular welt to be formed and for initiating one subcycle of operation of the auxiliary pattern device, means controlled by the auxiliary pattern device during said subcycle to form a press-off draw thread structure and to initiate the formation of a reverse welt, means controlled by the auxiliary pattern device for terminating said subcycle of operation, means carried by said main pattern device for determining the number of courses of said reverse welt to be formed and for initiating a second subcycle of operation of the auxiliary pattern device, means controlled by the auxiliary pattern device during said second subcycle to form a rib structure and to initiate the formation of a second reverse welt, and means controlled by the auxiliary pattern device for terminating said second subcycle of operation.

21. The method of knitting a multiple stocking blank comprising repeating cycles of knitting, each cycle including knitting a multiple feed leg and foot containing both forwardly and reversely concatenated stitches, knitting a welt following completion of the foot, knitting a press-off draw thread structure following said welt, knitting after said press-off draw thread structure at least one welt, and then knitting a multiple feed top having both forwardly and reversely concatenated stitches.

22. The method of knitting a multiple stocking blank comprising repeating cycles of knitting, each cycle including knitting a multiple feed leg and foot containing both forwardly and reversely concatenated stitches, knitting a welt following completion of the foot, knitting a press-off draw thread structure following said welt, knitting after said press-off draw thread structure a picot welt, and then knitting a multiple feed top having both forwardly and reversely concatenated stitches.

23. The method of knitting a multiple stocking blank comprising repeating cycles of knitting, each cycle including knitting a multiple feed leg and foot containing both forwardly and reversely concatenated stitches, knitting a welt following completion of the foot, knitting a press-off draw thread structure following said welt, knitting after said press-off draw thread structure a plurality of welts, and then knitting a multiple feed top having both forwardly and reversely concatenated stitches.

24. The method of knitting a multiple stocking blank comprising repeating cycles of knitting, each cycle including knitting a multiple feed leg and foot containing both forwardly and reversely concatenated stitches, knitting a welt following completion of the foot, knitting a press-off draw thread structure following said welt, knitting after said press-off draw thread structure at least one welt, and then knitting a multiple feed top having both forwardly and reversely concatenated stitches, said leg and rib top being knit of different yarns.

25. The method of knitting a multiple stocking blank comprising repeating cycles of knitting, each cycle including knitting a multiple feed leg and foot containing both forwardly and reversely concatenated stitches, knitting a welt following completion of the foot, knitting a press-off draw thread structure following said welt, knitting after said press-off draw thread structure at least one welt, and then knitting a top having both forwardly and reversely concatenated stitches.

26. In a knitting machine, superposed cylinders, needles slidable in said cylinders, means for controlling needles in the respective cylinders so that knitting occurs on at least some of the needles in the upper cylinder while stitches are held, through the formation of a plurality of courses, by needles in the lower cylinder to form a reverse welt, and a member extending across needles in the lower cylinder to engage fabric being knitted during said reverse welt formation.

27. In a knitting machine, superposed cylinders, needles slidable in said cylinders, means for controlling needles in the respective cylinders so that knitting occurs on at least some of the needles in the upper cylinder while stitches are held, through the formation of a plurality of courses, by needles in the lower cylinder and also by spaced needles in the upper cylinder to form a picot reverse welt, and a member extending across needles in the lower cylinder to engage fabric being knitted during said reverse welt formation.

28. In a knitting machine, superposed cylinders, needles slidable in said cylinders, means for controlling needles in the respective cylinders so that knitting occurs on at least some of the needles in the upper cylinder while stitches are held, through the formation of a plurality of courses, by needles in the lower cylinder to form a reverse welt, and a member extending across needles in the lower cylinder to engage fabric being knitted during said reverse welt formation, said member being in the form of a flat blade adapted at other times to limit upward movements of needles in the lower cylinder.

29. A knitting machine comprising means for knitting a leg and foot, each containing both forwardly and reversely concatenated stitches, means for knitting a welt following completion of the foot by holding stitches on certain needles while concatenating loops by other needles, means for knitting a press-off draw thread structure following said welt including pressing off stitches from said other needles, means for knitting after said press-off draw thread structure at least one welt, and means for then knitting a multiple feed top having both forwardly and reversely concatenated stitches.

30. A knitting machine comprising means for knitting a leg and foot, each containing both forwardly and reversely concatenated stitches, means for knitting a welt following completion of the foot, means for knitting a press-off draw thread structure following said welt, means for knitting after said press-off draw thread structure a picot, and means for then knitting a multiple feed top having both forwardly and reversely concatenated stitches.

31. A knitting machine comprising means for knitting a leg and foot, each containing both forwardly and reversely concatenated stitches, means for knitting a welt following completion of the foot, means for knitting a press-off draw thread structure following said welt, means for knitting after said press-off draw thread structure a plurality of welts, and means for then knitting a multiple feed top having both forwardly and reversely concatenated stitches.

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