

Oct. 11, 1955

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2,720,092

KNITTING MACHINES

Filed Jan. 29, 1953

7 Sheets-Sheet 1

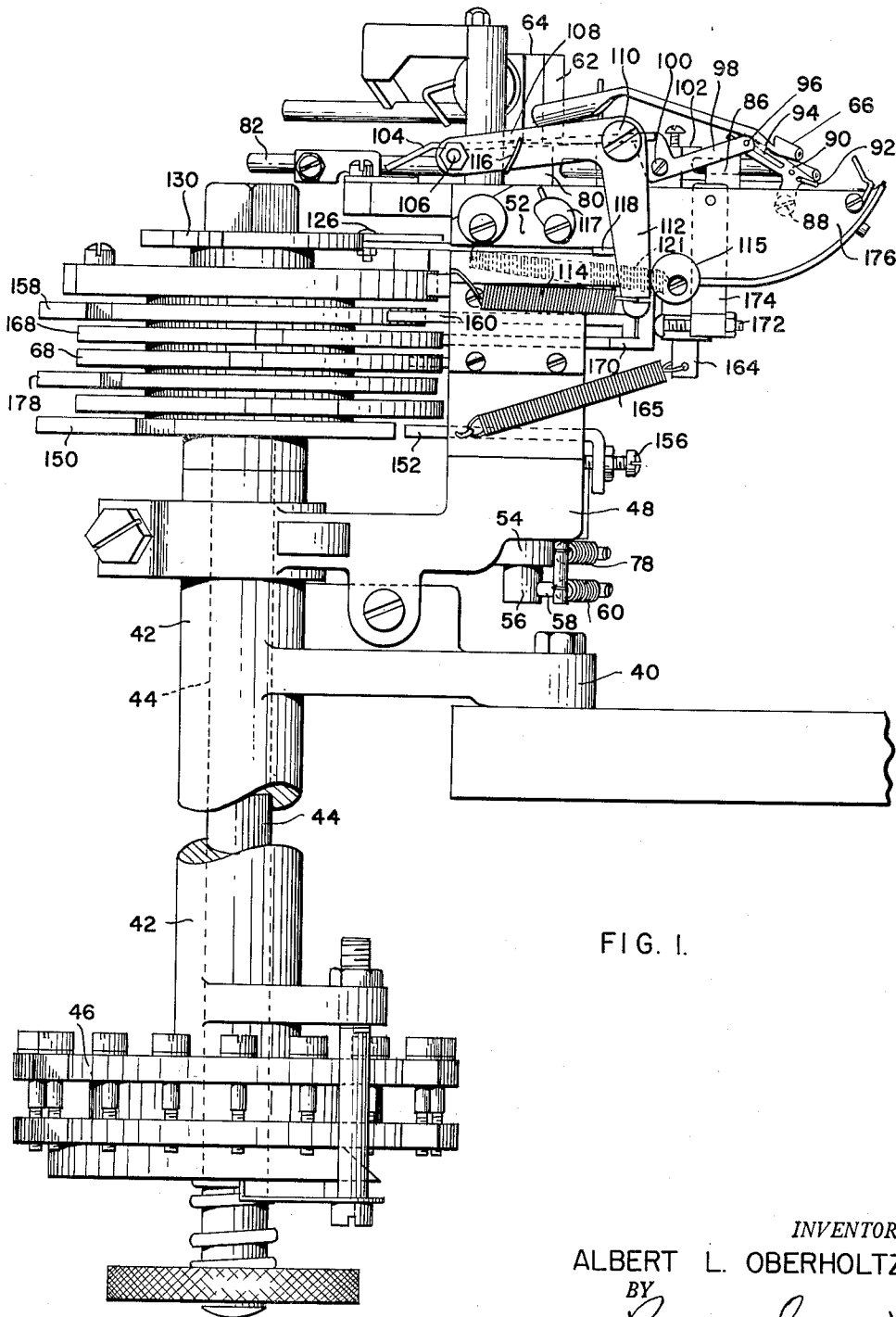


FIG. 1.

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7 Sheets-Sheet 2

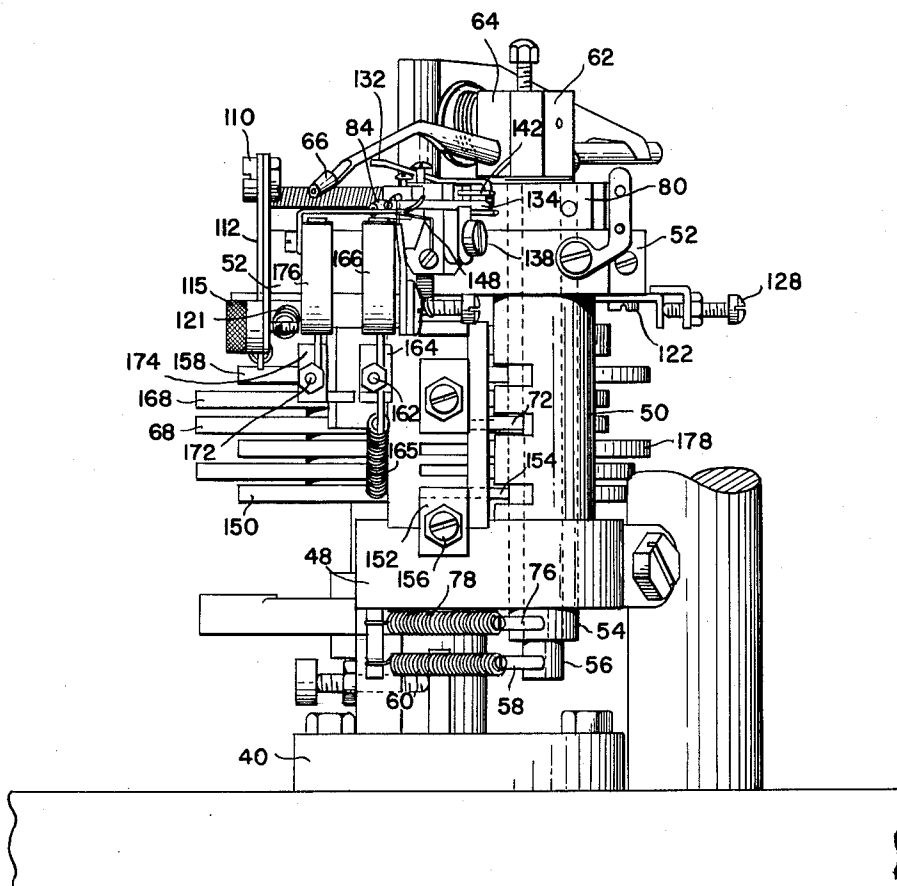


FIG. 2.

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7 Sheets-Sheet 3

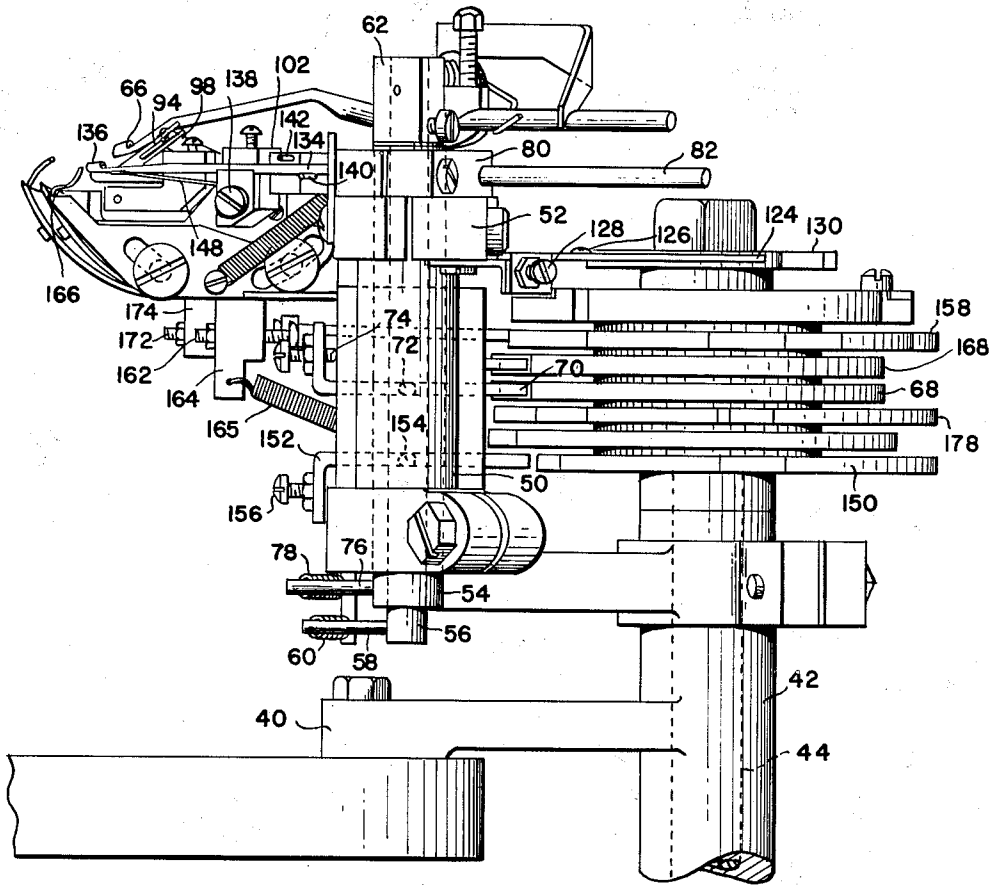


FIG. 3.

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7 Sheets-Sheet 4

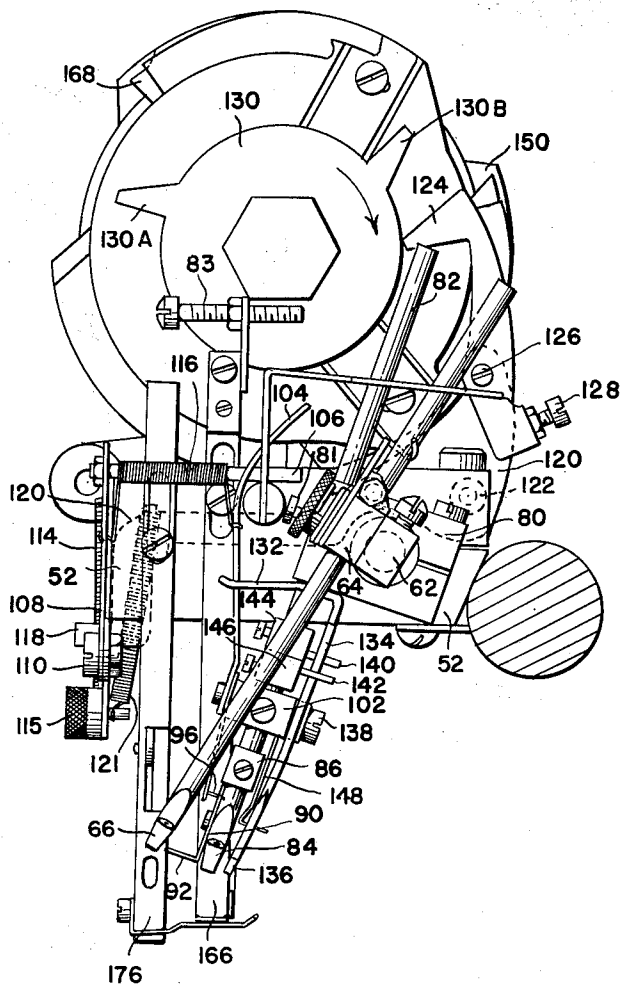


FIG. 4.

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7 Sheets-Sheet 5

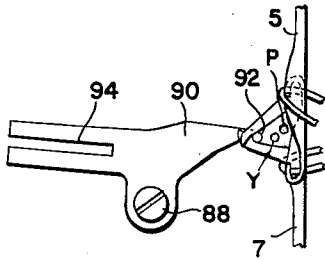


FIG. 7.

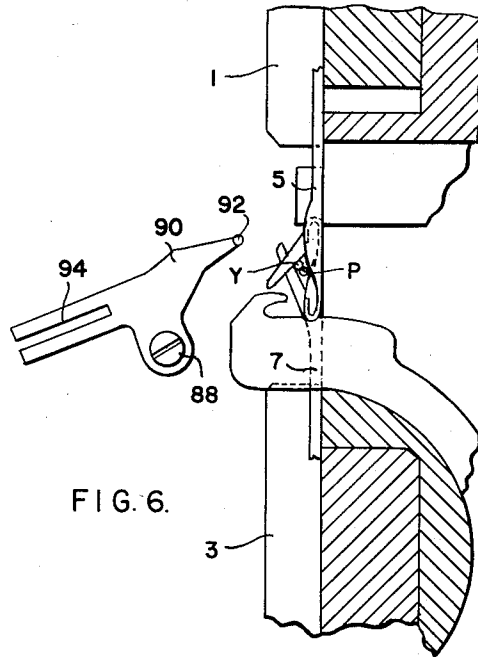


FIG. 6.

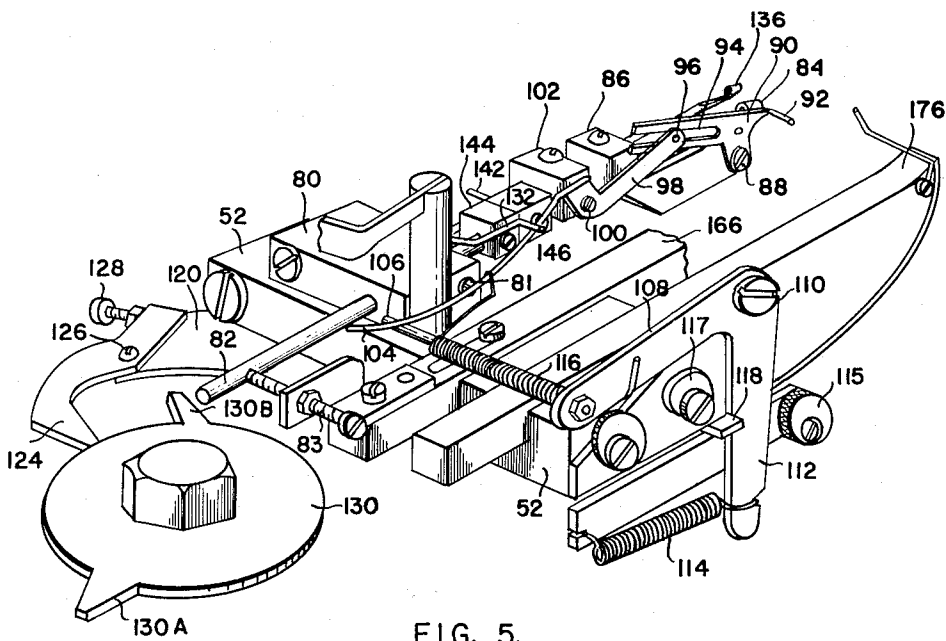


FIG. 5.

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7 Sheets—Sheet 6

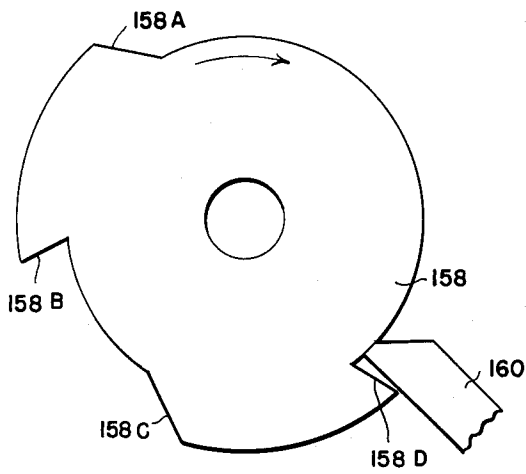


FIG. 9.

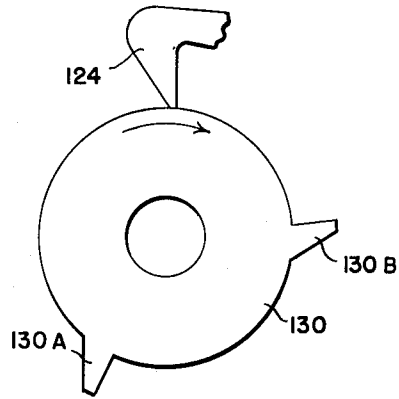


FIG. 8.

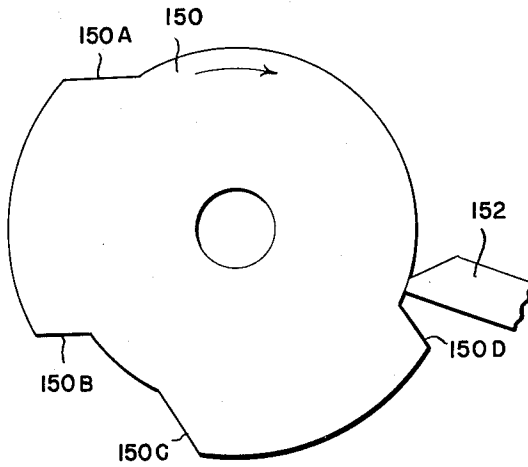


FIG. 10.

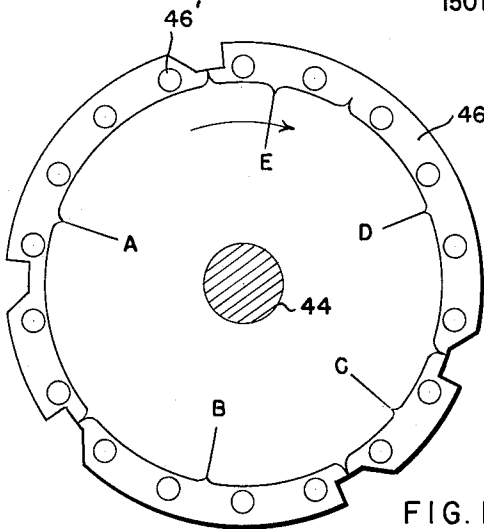


FIG. II.

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7 Sheets-Sheet 7

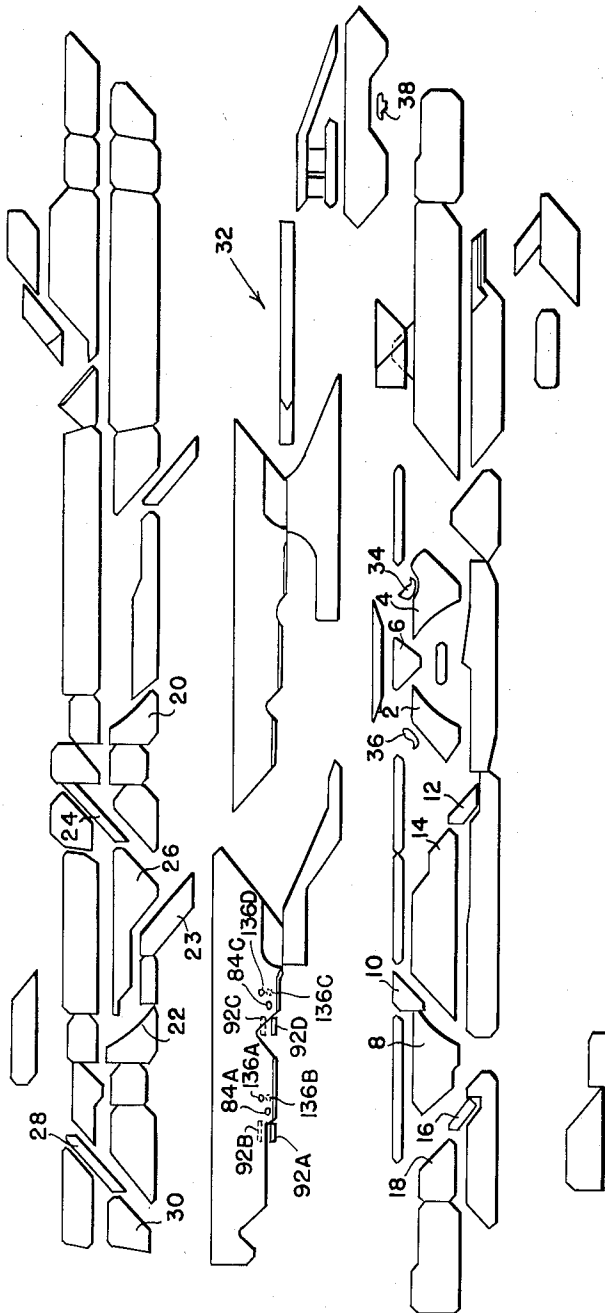


FIG. 12.

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KNITTING MACHINES

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Application January 29, 1953, Serial No. 333,965

10 Claims. (Cl. 66—14)

This invention relates to knitting machines and has particular reference to the control of yarns at the auxiliary feed of a knitting machine of the superposed cylinder type.

In machines of the superposed cylinder type, the feeding of yarns involves particular difficulties in view of the fact that the needles carried by the upper and lower cylinders form a cage precluding the location of clamping and cutting means within the needle circle. When such machines are provided with main and auxiliary feeds, the yarn feeding fingers at the main feed are subject to rather elaborate control of their movements in association with their clamps and cutters to provide for proper introduction and removal of yarns and for the proper relative location of yarns for the purpose of plating. When such machines are hosiery machines having relatively small cylinder diameters, the use of similar elaborate yarn finger controls becomes more difficult at the auxiliary feed due to space restrictions. In particular, difficulties are experienced in plating at the auxiliary feed inasmuch as the facing yarn involves inconsistencies in its positioning when first taken by the needles and when properly located for plating.

The general object of the present invention is the provision of means for effecting proper introduction of the yarns to the needles and for properly effecting controls of the yarns during plating. Specifically, at the time of introduction of the yarns, both the facing and backing yarns are fed at the same level. At this same time the latches of the needles in the upper and lower cylinders normally close at a time to properly trap both yarns. After the yarns are introduced to the needles, the finger feeding the facing yarn is then raised to locate the lead of the facing yarn properly to effect good plating. At the same time a latch retarder is rendered active for the purpose of delaying slightly the closing of the needle latches so that they will not adversely affect the proper relative locations of the yarns in the needle hooks.

As described the device introduces yarn prior to the beginning of knitting and removes it after knitting is completed, but it should be understood that by reshaping the control cams the fingers may be operated to produce an overlapping yarn change, provided the draw thread is also used as a conventional body yarn.

The foregoing general object of the invention as well as subsidiary objects 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 a side elevation, partly in section, of the controlling assembly for the yarns of a superposed cylinder machine at the auxiliary feed thereof;

Figure 2 is an elevation of the same, looking outwardly from the axis of the needle cylinders;

Figure 3 is an elevation of the same but looking from the side opposite that shown in Figure 1;

Figure 4 is a plan view of the same;

Figure 5 is a perspective view of fragmentary type

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serving for the clearer illustration of the parts immediately involved in the control of the yarns;

Figures 6 and 7 are elevational diagrams showing in particular the alternative positions of a latch retarder, respectively at the time of yarn introduction and during plating;

Figure 8 is a plan view of the cam controlling tilting movements of the plating yarn finger and of the latch retarder, together with its follower;

Figure 9 is a plan view of the cam which controls the trapper for the plating yarn, together with its follower;

Figure 10 is a plan view of the cam for controlling the introduction and removal of the fingers feeding the facing and backing yarns, together with its follower;

Figure 11 is a plan view of the cam-advancing ratchet; and

Figure 12 is a development of the cams which control needle movements through their conventional sliders, the cams being shown as they appear looking outwardly from the axis of the needle cylinders.

The elements involved in the present invention are associated with an otherwise conventional superposed cylinder machine having an upper cylinder indicated at 1 and a lower cylinder indicated at 3 which, during the phase of operation herein particularly involved carry the respective upper and lower latch needles 5 and 7 which are conventionally controlled by sliders subject to cam action, the sliders not being shown herein. It will be understood that, as usual, provisions are made for the transfer of the double-ended latch needles from one cylinder to the other for the formation of ribbed fabric or various designs of conventional type. Main yarns are conventionally fed and provisions for their feed are not herein illustrated. As noted above, the present invention is concerned with the feeding of yarns at the auxiliary feed of a two-feed machine, and the present disclosure is accordingly primarily confined to such feeding. However, the device could be applied to any or all feeds of a multi-feed superposed cylinder machine.

Referring particularly to Figure 12, there are illustrated therein the main forward and reverse stitch cams 2 and 4 which act on slider butts for the control of needles in the lower cylinder. The usual center cam is illustrated at 6. The lower stitch cam at the auxiliary feed is indicated at 8, this cam acting upon lower sliders during counterclockwise rotation of the needle cylinders, and being preceded by the radially movable lowering cam 10. Clearing of the needles in the lower cylinder between the main and auxiliary feeds is effected by the cams 12 and 14, while clearing of the lower cylinder needles after the auxiliary feed is effected by the cams 16 and 18.

The stitch cam for the needles in the upper cylinder at the main feed is illustrated at 20, while the corresponding stitch cam at the auxiliary feed is indicated at 22 and is preceded by the radially movable raising cam 23. Clearing following the main feed is effected by the cams 24 and 26, while clearing following the auxiliary feed is effected by the cams 28 and 30.

There are indicated generally at 32 the groupings of cams controlling transfers of needles between the cylinders, these cams and their operations being conventional.

For the formation of heels and toes, there are provided the conventional raising picks 34 and 36 and the lowering picker 38. All of the elements so far described are conventional and further detailed consideration thereof is unnecessary.

Reference may now be particularly made to Figures 1 to 4, inclusive.

A bracket 40 carried by the machine frame provides a bearing 42 for an upright shaft 44 which at its lower end is secured to a ratchet 46 which is stepped about in conventional fashion by a pawl imparting, during its active

periods, a step of the ratchet during each half revolution of the needle cylinders. Controls of conventional type from the main cam drum of the machine produce periods of active stepping of the ratchet with intermediate pauses in its operation. Specific reference will be made hereafter to the sequences of steps involved in operation. The shaft 44 carries at its upper end a series of cams some of which are involved in control of the elements to which the present invention particularly relates. Others are involved with the formation of a draw thread between successive stockings, while still others may be used for other purposes.

Secured to the outside of the bearing 42 is a bracket 48 which mounts the various elements involved herein. A sleeve 50 carried by the bracket 48 serves as a mounting for a pair of nested shafts 54 and 56, the former being in the form of a tube through which the latter extends. Sleeve 50 also mounts a bracket 52. The shaft 56 is provided at its lower end with a laterally extending pin 58 connected by a spring 60 to a fixed pin in the bracket 48. The shaft 56 is thus urged in a clockwise direction as viewed in plan. It carries at its upper end a block 62 on which is pivoted a block 64 providing a mounting for a draw thread finger 66. A cam 68 carried by the shaft 44 operates a slide 70 which engages a pin 72 extending laterally from the shaft 56 through slots in the tubular shaft 54 and the mounting sleeve 50. A stop screw 74 in the slide 70 engages a portion of the bracket 48 to limit movements of shaft 56 under the action of spring 60.

A spring 78 connected between a fixed pin mounted in bracket 48 and a pin 76 secured in the lower end of shaft 54 urges this shaft in a clockwise direction as viewed in plan. To the upper end of shaft 54 there is secured a member 80 in which there is clamped by a screw 81 a rod 82 at the inner end of which there is formed an eye 84 for the feed of the backing yarn used in effecting plating. A block 86 adjustably clamped on rod 82 by a screw provides at 88 a pivotal mounting for a carrier lever 90 of the latch retarder 92 which takes the form of a laterally bent wire-like extension of the inner end of the lever 90. The lever 90 is slotted at 94 to receive a pin 96 carried by the end of a lever 98 which is pivoted at 100 to a block 102 adjustably clamped by a screw upon the rod 82. A curved extension 104 of the lever 98 is provided for its operation and overlies a pin 106 mounted in one arm 108 of a bell crank pivoted at 110 on an extension of the bracket 52, the other arm 112 of the bell crank being connected to a spring 114 which has an end anchored in the bracket extension. A spring 116 wound about the pin 106 and having one of its ends anchored about bell crank arm 108 has its other end overlying the lever extension 104 to maintain the extension in contact with pin 106. Movements of arm 112 are limited by adjustable eccentric stops 115 and 117 secured to bracket 52.

The end 118 of a lever 120 pivoted at 122 to the bracket 52 engages the depending arm 112 of the bell crank. The lever 120 is urged in a counterclockwise direction as viewed in plan by a strong spring 121 which overcomes the relatively lighter spring 114. The end of the lever 120 opposite the end 118 has a cam-following extension 124 pivoted thereto at 126, there being provided an adjustable screw 128 threaded into the extension 124 and bearing upon an ear downwardly extending from lever 120 to set the relative positions of the lever 120 and its extension 124. A cam 130 carried by the shaft 44 serves to actuate the follower extension 124.

A lever 134 is pivoted at 138 to the block 102 and is formed at its inner end to provide a feeding eye 136 for the plating yarn. The outer end of lever 134 is provided with a lateral extension 132 which overlies the lever extension 104. A pair of stop pins 140 and 142 carried by the respective blocks 144 and 146 which are adjustably clamped by screws on the rod 82 limit the rocking movements of the lever 134. A light spring 148 normally urges

the lever 134 in a clockwise direction against the stop 140 as viewed in Figure 3.

A cam 150 carried by the upper portion of shaft 44 is arranged to act upon a slide 152 mounted in the bracket 48 and provided with a slot embracing a pin 154 carried by the shaft 54 and extending through a clearance slot in the sleeve 50. By the action of lobes on the cam 150, the shaft 54 may be rocked counterclockwise against the action of tension spring 78. Movements under the action of spring 78 are limited by an adjustable screw 156 threaded into the slide 152 and arranged to abut the bracket 48.

A cam 158 carried by shaft 44 acts upon a slide 160 which, in turn, is adapted to engage an adjustable screw 162 carried by the actuating lever 164 of a clamp and cutter 166 for the plating and backing yarns. A spring 165 normally acts upon the lever 164 to close the trapper to hold the ends of these yarns. The clamp and cutting arrangement just mentioned is conventional and need not be detailed herein. It will be sufficient to state that it holds the yarn ends closely adjacent to the needle circle and has sequential operations as hereafter described.

A cam 168 carried by shaft 44 is arranged to act upon a slide 170 and through adjustable screw 172 carried by lever 174 this cam serves to control the clamp and cutter 176 for the draw thread. This clamp and cutter is also conventional.

The auxiliary feed raising and lowering cams 19 and 23 respectively, generally known as bolt cams, are controlled by cam 178 carried on shaft 44 through a slide and appropriate levers not shown. The sequence of operation of the bolt cams will be described hereafter.

The cams of Figures 8, 9 and 10 and the ratchet 46 shown in Figure 11 are correspondingly oriented on their sheet of drawing, and their sequences of operation may now be described. The several cams are shown in the positions which they assume at the completion of the ring toe of a stocking. Considering the movement of the pin 46' of ratchet 46 to a position vertically above the axis of the shaft 44 in that figure to constitute the first step of movement of the shaft, the first six steps of movement of the ratchet, indicated by the bracket A in Figure 11, are involved in the formation of a draw thread and starting of the top of a stocking and these steps occur sequentially in successive half revolutions of the needle cylinders. The present invention is not concerned with the draw thread formation and, consequently, the events occurring at this time need not be described except to state that at the end of these steps the needles are not guided to the stitch cams 8 and 22 since the bolt cams 10 and 23 are out of action. The shaft 44 then remains stationary through the knitting of the top of the stocking.

With the completion of the top, the shaft 44 now takes in rapid sequence its seventh, eighth, ninth and tenth steps corresponding to the movements of the pins bracketed at B in Figure 11 into position directly above the axis of shaft 44 as viewed in that figure. As will be evident, two complete revolutions of the needle cylinders occur during these steps. The initial one of this series of steps, the seventh, is an idle one. During the eighth step the following sequence of events occurs:

Cam 178 produces a partial inward movement of the bolt cams 10 and 23 to cause them to engage long slider butts to feed these butts to stitch cams 8 and 22 and begin knitting. Referring to Figure 12, the backing yarn finger 84, the plating yarn finger 136, and the latch retarder 92 occupy the positions 84A, 136A and 92A of Figure 12, the assembly resting in the position illustrated in Figure 4. The trapper assembly at 166 remains closed holding the ends of the auxiliary feed yarns. During the eighth step of shaft 44, the step 130A of cam 130 engages the follower 124 causing extension 118 of lever 120 to release the bell crank 108, 112 for movement by the action of spring 114 to raise the pin 106. The raising of this pin raises the extension 104 of lever 98 producing a

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rise of the latch retarder 92. Near the end of its rise the extension 104 also lifts the lateral projection 132 of lever 134 to move downwardly the feeding eye 136 of the plating yarn. The backing yarn feeding finger retains its position 84A in Figure 12 while the plating yarn finger and the latch retarder respectively move to the positions 136B and 92B. Substantially simultaneously with these tilting movements, the entire assembly is rocked counter-clockwise as viewed in Figure 4 by the action of the step 150A of cam 150 acting upon the follower 152. The result is that the respective elements move to the positions indicated at 84C, 136C and 92C in Figure 12. Before this eighth step is completed, and following the assumption of the last mentioned positions, the follower 124 is released by the step 130A of cam 130, and consequently the yarn feeding eye 136 and the latch retarder 92 are released to the respective positions 136D and 92D in Figure 12. During this eighth step, the rise 158A of cam 158 acts upon the follower 160 to effect slight opening of the trapper 166 to release the plating and backing yarns.

The foregoing events occur in one-half a revolution of the needle cylinders and provide for proper introduction of the plating and backing yarns. The conditions involved when the plating yarn eye 136 and the latch retarder 92 are in the positions 136C and 92C of Figure 12 are illustrated in Figure 6 wherein the plating yarn is indicated by P and the backing yarn is indicated by Y. As will be observed the latch retarder 92 is in a raised position so as not to be engaged by the needle latches. The latches are accordingly free to close under the actions of the loops on their shanks as the needles are respectively raised and lowered by the stitch cams thus providing entrapment of the entering yarns P and Y which are fed at about the same level, the difference being somewhat exaggerated in Figure 6. As the yarn ends are released from the trapper they are withdrawn therefrom and knitting thereof begins in conventional fashion.

Generally speaking, however, if the plating yarn is fed sufficiently low to produce certainty of entrapment, it is too low to provide good plating. Consequently, the position 136D is assumed by the plating yarn eye immediately after entrapment occurs and, at the same time, the latch retarder 92 moves to its lower position 92D giving rise to the conditions illustrated in Figure 7. The latch retarder 92 is now in position to be engaged by the closing latches of both the upper and lower needles. The result is that closure of the latches to such positions as would cause them to engage the yarns is prevented until the yarns have assumed positions in the needle hooks which are proper for effective plating. In other words, the disturbing effect which the latches might otherwise have on the plating yarns are eliminated by holding the latches against closure until closure will have no adverse effect. The complete closing of the latches can only occur as they pass off the free end of the retarder 92.

During the ninth step of the shaft 44, the further action of cam 158 fully opens the clamp and cutter 166 and the bolt cams are moved fully inwardly to take short butt needles. The knitting of the leg of the stocking then proceeds with plating of the auxiliary feed yarns, the tenth step of shaft 44 being an idle one, whereupon the shaft 44 comes to rest.

Following the completion of the leg, the eleventh and twelfth steps of shaft 44 occur. In the first of these the bolt cams at the auxiliary feed are moved outwardly to miss short butt sliders. In the second of these steps the bolt cams at the auxiliary feed are moved fully outwardly to miss long butt sliders. At the same time the plating and backing yarns P and Y are removed from action by the release of cam follower 152 at the termination 150B of the step on cam 150. Follower 160 drops off the end 158B of the lobe on cam 158 causing the yarns at the auxiliary feed to be clamped and cut, the yarns being then held for their next introduction.

Shaft 44 then remains stationary until the end of forma-

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tion of the heel. When the knitting of the foot is to start, four new steps thirteen, fourteen, fifteen and sixteen are given to the shaft 44 in successive half revolutions of the needle cylinders and the same events are repeated as in the case of the steps seven, eight, nine and ten, steps thirteen and sixteen being idle.

At the completion of the foot, shaft 44 is given two steps, seventeen and eighteen, which correspond in their effects to the steps eleven and twelve previously described. In the latter of these steps the followers 152 and 160 are respectively released at 150D and 158D, the various elements being restored to their initial conditions.

What is claimed is:

1. In a knitting machine of the superposed cylinder type having independent latch needles, a pair of yarn feeding fingers for presenting yarns to the needles at the same feed to effect plating, means for changing the active feeding position of one of said fingers in the direction of the axis of the needle cylinders; and means for retarding closing of latches on said yarns beyond the position at which latch closing would normally occur under the action of previously formed loops on the needle shanks.

2. In a knitting machine of the superposed cylinder type having independent latch needles, a pair of yarn feeding fingers for presenting yarns to the needles at the same feed to effect plating, means for moving said fingers together towards and from said needles, means for changing the active feeding position of one of said fingers in the direction of the axis of the needle cylinders, and means for retarding closing of latches on said yarns beyond the position at which latch closing would normally occur under the action of previously formed loops on the needle shanks.

3. In a knitting machine of the superposed cylinder type having independent latch needles, a pair of yarn feeding fingers for presenting yarns to the needles at the same feed to effect plating, means for moving said fingers together towards and from said needles, means for changing the active feeding position of one of said fingers in the direction of the axis of the needle cylinders, and means for retarding closing of latches on said yarns beyond the position at which latch closing would normally occur under the action of previously formed loops on the needle shanks, said retarding means being movable with said fingers towards and from said needles.

4. In a knitting machine of the superposed cylinder type having independent latch needles, a pair of yarn feeding fingers for presenting yarns to the needles at the same feed to effect plating, means for moving said fingers together towards and from said needles, means for changing the active feeding position of one of said fingers in the direction of the axis of the needle cylinders, means for retarding closing of latches on said yarns beyond the position at which latch closing would normally occur under the action of previously formed loops on the needle shanks, said retarding means being movable with said fingers towards and from said needles, and means for moving said retarding means in the direction of the axis of the needle cylinders.

5. In a knitting machine of the superposed cylinder type having independent latch needles, a pair of yarn feeding fingers for presenting yarns to the needles at the same feed to effect plating, means for effecting changes in the relative active positions of said fingers, means for retarding closing of latches on said yarns beyond the position at which latch closing would normally occur under the action of previously formed loops on the needle shanks, and means for moving said retarding means in the direction of the axis of the needle cylinders.

6. In a knitting machine of the superposed cylinder type having independent latch needles, a pair of yarn feeding fingers for presenting yarns simultaneously to the needles at the same feed to effect plating, means for moving said yarn feeding fingers simultaneously to and

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from active yarn-feeding positions, and means for effecting changes in the relative positions of said fingers while both are simultaneously presenting yarns to the needles.

7. In a knitting machine of the superposed cylinder type having independent latch needles, a pair of yarn feeding fingers for presenting yarns simultaneously to the needles at the same feed to effect plating, means for moving said yarn feeding fingers simultaneously to and from active yarn-feeding positions, and means for effecting changes in the relative positions of said fingers at the times of their simultaneous yarn introduction and of simultaneous presentation of yarns for plating thereafter.

8. In a knitting machine of the superposed cylinder type having independent latch needles, a pair of yarn feeding fingers for presenting yarns simultaneously to the needles at the same feed to effect plating, means for moving said yarn feeding fingers simultaneously to and from active yarn-feeding positions, and means for changing the active feeding position of one of said fingers in the direction of the axis of the needle cylinders when both fingers are simultaneously presenting yarns to the needles.

9. In a knitting machine of the superposed cylinder type having independent latch needles, a pair of yarn feeding fingers for presenting yarns simultaneously to the needles at the same feed to effect plating, means for moving said fingers together towards and from active yarn-feeding positions relative to said needles, and means for changing the active feeding position of one of said fingers in the direction of the axis of the needle cylin-

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ders when both fingers are simultaneously presenting yarns to the needles.

10. In a knitting machine of the superposed cylinder type having independent latch needles, a pair of yarn feeding fingers for presenting yarns simultaneously to the needles at the same feed to effect plating, means for moving said yarn feeding fingers simultaneously to and from active yarn-feeding positions, means for effecting changes in the relative positions of said fingers while both are simultaneously presenting yarns to the needles, and means for retarding closing of latches on said yarns beyond the position at which latch closing would normally occur under the action of previously formed loops on the needle shanks.

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