Nov. 21, 1939. H. E. HOUSEMAN 2,180,707

KNITTING MACHINE

Filed July 21, 1938 4 Sheets-Sheet 1

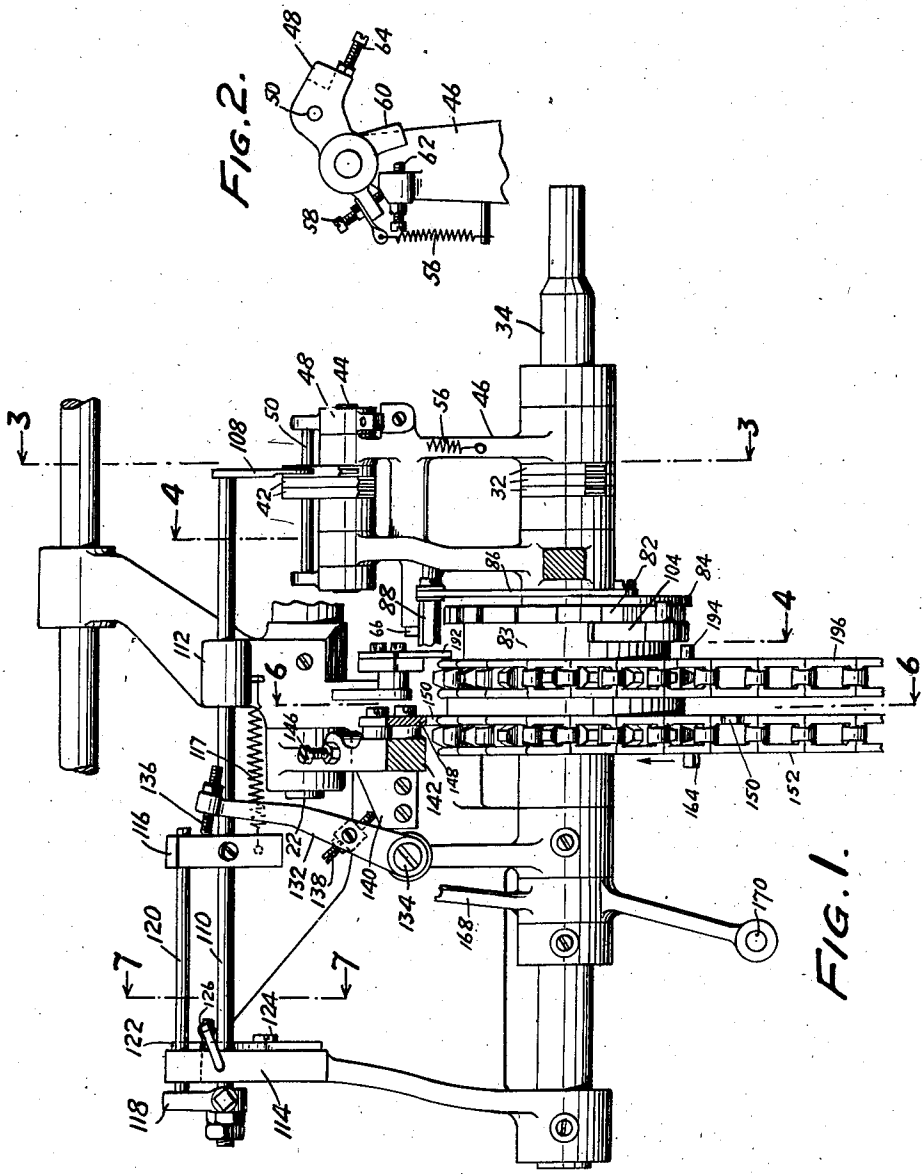


FIG. 1.

FIG. 2.

INVENTOR

Harold E. Houseman

BY

Bussey & Harding

ATTORNEYS.

WITNESS:

Robt. R. Kitchel.

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KNITTING MACHINE

Filed July 21, 1938 4 Sheets-Sheet 2

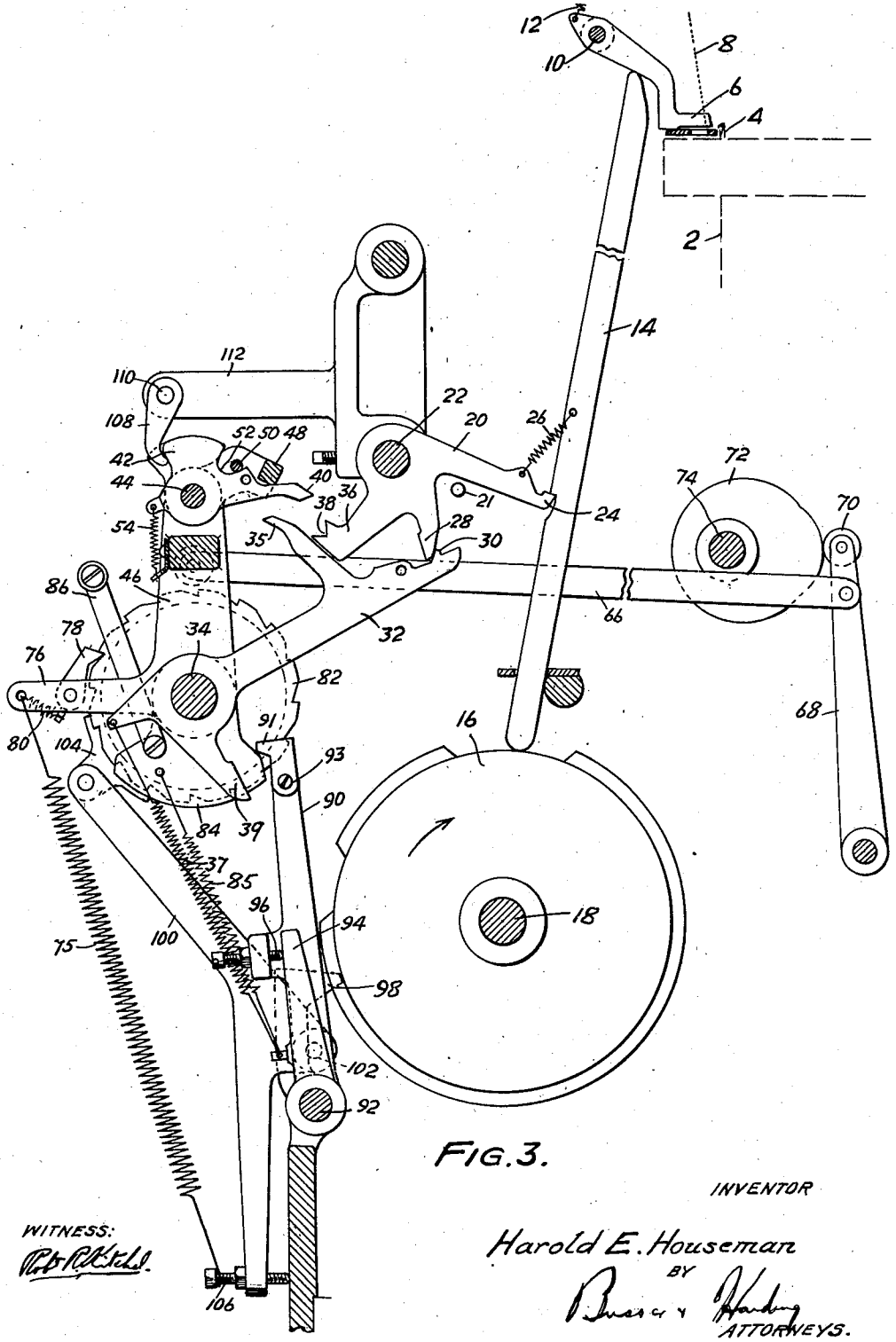


FIG. 3.

INVENTOR

Harold E. Houseman

BY

Bruesch & Harding

ATTORNEYS.

WITNESS:

Nov. 21, 1939. H. E. HOUSEMAN 2,180,707

KNITTING MACHINE

Filed July 21, 1938 4 Sheets-Sheet 3

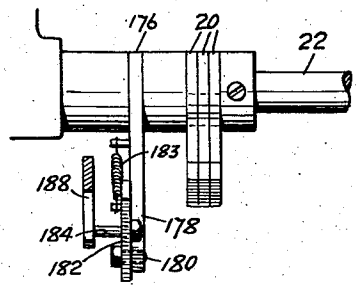


FIG. 5.

FIG. 4.

INVENTOR

Harold E. Houseman

BY

ATTORNEYS.

WITNESS:

Nov. 21, 1939. H. E. HOUSEMAN 2,180,707

KNITTING MACHINE

Filed July 21, 1938 4 Sheets-Sheet 4

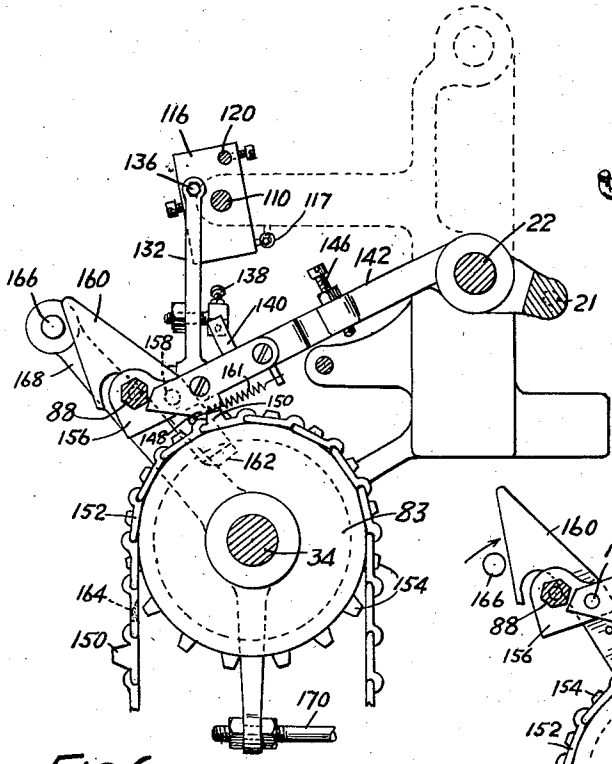


FIG. 6.

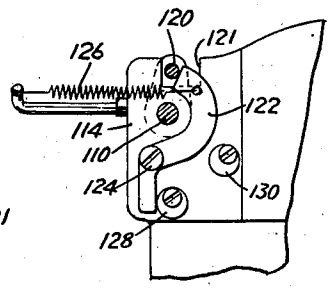


FIG. 7.

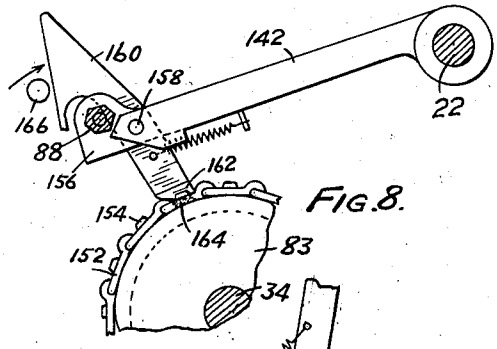


FIG. 8.

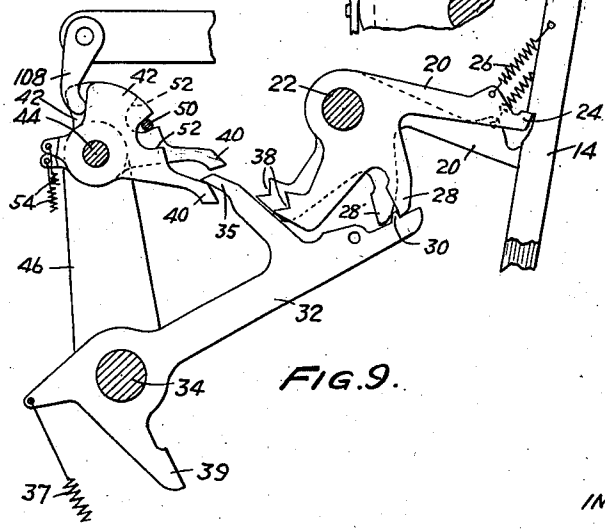


FIG. 9.

WITNESS:

Robt. A. Kitchel.

INVENTOR

Harold E. Houseman

BY

Burns & Harding

ATTORNEYS.

Patented Nov. 21, 1939 2,180,707

UNITED STATES PATENT OFFICE

2,180,707

KNITTING MACHINE

Harold E. Houseman, Laconia, N. H., assignor to Scott & Williams, Inc., Laconia, N. H., a corporation of Massachusetts

Application July 21, 1938, Serial No. 220,422

18 Claims. (Cl. 66—140)

This invention relates to a knitting machine, and particularly to mechanism for providing yarn changes in a knitting machine of the circular type.

It is the general object of the present invention to provide striping control means, specifically of the chain type, in a knitting machine in which yarn fingers are normally urged into active position by spring means and are adapted to be moved out of active position by thrust rods or the like which are positively actuated. In general, in such machines pattern changes have been effected by the use of drums carrying cams. Such arrangements, however, offer relatively limited possibilities in the production of striping because of the limited circumferential space available on a cam drum and are obviously far less adaptable for the production of patterns than striping devices in which chains of indefinite lengths may be provided. The fact that the yarn fingers are normally urged into active position by spring means creates some difficulties inasmuch as yarn changes must be very rapidly made involving a quick removal of yarn fingers from action, and, furthermore, there must be a proper timed relationship between the outgoing and incoming yarns in order to provide an overlap to avoid holes in the fabric. Additionally, even when a pattern chain is used, there must be control of the yarn fingers independent of the pattern chain for the formation of heels and toes during which the patterning is suspended. There must also be provision for timing a pattern chain to a proper position for the formation of striping in a new stocking after the completion of the knitting of a toe. In accordance with the present invention, the requirements imposed by the considerations outlined above are met in a simple fashion, well adapted to a high speed of production.

A further object of the invention is the provision of means for controlling clamping and cutting actions in time with yarn changes and for suspending the normal action of the clamping and cutting means at desired times.

The above and other subsidiary objects relating primarily to details of construction will be apparent from the following description, read in conjunction with the accompanying drawings, in which:

Figure 1 is a rear elevation of certain patterning devices adapted to be associated with a circular knitting machine of substantially conventional type;

Figure 2 is a fragmentary elevation showing details of certain elements of the yarn changing mechanism;

Figure 3 is a vertical section, taken on the plane indicated at 3—3 in Figure 1, with various parts broken away showing the association of the improved striping mechanism with conventional parts of the knitting machine;

Figure 4 is a vertical section taken on the broken plane indicated at 4—4 in Figure 1, showing certain details of the clamping and cutting control means;

Figure 5 is a section taken on the plane indicated at 5—5 in Figure 4;

Figure 6 is a vertical section taken on the plane indicated at 6—6 in Figure 1;

Figure 7 is a vertical section taken on the plane indicated at 7—7 in Figure 1;

Figure 8 is a fragmentary sectional view illustrating particularly the chain set-up devices; and

Figure 9 is a vertical section similar to a portion of Figure 3 illustrating the events occurring in the changing of yarn.

The machine to which the invention is shown applied is of the type illustrated in Page Patent 1,627,337, which patent discloses various details of the machine which need not be described herein. The machine comprises a needle cylinder 2 which, in the present instance, is a rotating cylinder, the needle cylinder carrying the usual independent latch needles 4 with which there cooperate the conventional elements of machines of this type. In the present instance, the machine is shown as provided with three yarn fingers 6, each adapted to lead a yarn 8 to the needles, the yarn fingers being pivoted upon a common pin 10 and being individually urged into feeding position by springs 12. The various yarn fingers are moved to upright inactive positions by means of guided push bars 14 adapted for dual actuation by cams on the main pattern drum 16 and by the striping control devices forming the subject-matter of the present invention. The main pattern drum 16 is stepped about its supporting axis 18 in a clockwise direction, as viewed in Figure 3 by the usual devices and it carries cams of various sorts to control operation of the machine in conventional fashion.

For each of the three thrust bars 14 there is provided an operating lever 20, the levers 20 being pivoted upon a pin 22 and each being provided with an end 24 engaging, as illustrated, within a notch in its corresponding thrust bar 14. Springs 26 cause the bars and operating levers to remain in engagement.

Each operating lever 20 has a depending arm

28, engageable with a lug 30 on a corresponding detent lever 32, of which there are three, pivoted upon a fixed rod 34. Each of the detent levers is provided with a depending arm 39, to which reference will be made hereafter, and is urged in a counter-clockwise direction as viewed in Figure 3 by means of its individual spring 37.

Each of the operating levers 20 is further provided with an arm 36, provided with a notched end as indicated at 38, arranged to be engaged by the nose 40 of its operator 42. The three operators 42 are pivoted upon a common pin 44, which is secured in the upper end of an oscillating bracket 46, journalled on the fixed rod 34. Also pivoted upon the pin 44 is an oscillating yoke 48, which carries a transverse pin 50, located within notches 52 in operators 42, which notches are substantially wider than the pin 50, so that each operator may have a limited degree of movement with respect to the pin 50 and the bracket 48. Each of the operators is urged to a position limited by the pin 50 by means of its individual spring 54.

Referring to Figure 2, some of the devices associated with the bracket 48 are more clearly indicated therein. The bracket 48 is urged in a counter-clockwise direction by a spring 56 to a position limited by engagement of a stop screw 58 with a lug on the bracket 46. Its clockwise movement relative to the bracket 46 is limited by engagement of a lug 60 carried by the yoke 48 with an adjustable stop screw 62, carried by the bracket 46. Additionally, the bracket 48 carries an operating screw 64 to which reference will be made hereafter.

The bracket 46 is adapted to be oscillated continuously during the operation of the machine through the medium of a link 66 pivoted to it and to a lever 68 carrying a cam follower 70 engageable by the cam 72 mounted on the shaft 74, which makes one rotation for every rotation of the needle cylinder. The follower 70 is continuously urged in contact with the cam 72 by means of a spring 75 engaging a laterally extending arm 76 of the bracket 46.

To the arm 76 is pivoted a pawl 78 urged by a spring 80 into engagement with the teeth of a ratchet 82 secured to a chain drum 83 which carries chains serving for the control of the improved striping device. A guard 84 is journalled upon the rod 34 and is of segmental form adapted to engage an overhanging end of the pawl 78 to lift it and prevent its engagement with the teeth of the ratchet 82 at proper times. To this pawl guard 84 there is pivoted a link 86, which is connected with a laterally extending pin 88 carried by a lever which is hereafter described. A spring 85 urges the pawl guard in a counter-clockwise direction, as indicated in Figure 3.

An upwardly extending lever 90 rotatably mounted on a shaft 92 journalled in a bracket secured to the machine frame has a turned upper end 91 adapted to engage and move in a clockwise direction, as viewed in Figure 3, the pawl guard 84. A pin 93 carried by this same lever 90 is adapted to engage the depending arms 39 of the detent levers 32 to lower simultaneously their active ends for the purpose hereafter described. The shaft 92 has secured to it an upwardly extending arm 94 engageable with an adjusting screw 96 carried by the arm 90, so that effectively the arm 90 is adjustably secured to the shaft 92. The shaft 92 also carries a cam following arm 98 engageable with suitable cams, as hereafter described, on the main cam drum 16.

Mounted upon a fixed pivot 102 there is a bell crank lever 100 the upper end of which pivotally carries a brake shoe 104 faced with leather or other friction material engaging a smooth portion of the chain drum 83. The depending arm of the lever 100 has threaded into it an adjustable stop screw 106 engageable with a fixed member of the machine and adapted to be adjusted to vary the pressure upon the chain drum 83 to prevent its overrun or free movement except under the action of the pawl 78.

Adapted to selectively cooperate with the operators 42 there is a finger 108 secured to the right hand end of a rod 110 slidably mounted in bearings 112 and 114 of the frame, as indicated in Figure 1. The rod 110 has fixedly secured to it a block 116 to which is secured a spring 117 normally urging the rod 110 to the right, as illustrated in Figure 1. At its left hand end the rod 110 carries an arm 118 between which and the block 116 extends a pin 120. This pin is free to oscillate to a limited extent in an opening 121 in the left hand bearing member 114. A lever 122 pivoted at 124 engages the pin 120 and serves to urge it in a counter-clockwise direction as viewed in Figure 7 under the action of spring 126. The lever 122 has a movement limited by adjustable eccentric stops 128 and 130 which thereby define the angular movement of the rod 110 and the finger 108.

An upwardly extending arm 132 pivoted at 134 to the frame is provided with an adjustable screw 136 engageable with the block 116 to impart movements to the block in opposition to the spring 117. An adjustable screw 138 carried by the lever 132 is engaged by the upper face of a cam block 140 secured to a lever 142 journalled upon the pin 22 on which are mounted the thrust bar operating levers 20. A screw 146 limits the counter-clockwise movement of the lever 142 by engagement with a portion of the frame. A follower member 148 carried by the lever 142 is adapted to engage lugs 150 of various heights on the striping chain 152, which is mounted upon a sprocket 154 formed on the chain drum 83.

The end 156 of the lever 142 has secured to it the pin 88 heretofore described as connected to the pawl guard 84 through the link 86.

Pivoted upon the lever 142 at 158 is a member 160 urged in a counter-clockwise direction as viewed in Figure 6 by means of a spring 161 to a position in which it engages an extension of the pin 88. The member 160 is provided with an inturned lower end 162 designed to cooperate with a camming lug 164 projecting laterally from the chain 152.

Arranged to engage the upper end of the member 160 is a laterally extending pin 166 carried by the upwardly extending arm of a bell crank 168, the depending arm of which is connected by a thrust link 170 adapted to be rocked at proper times by means of the main pattern chain (not shown).

Clamping and cutting mechanism, shown in conventionalized fashion at 174, is adapted to be actuated by means of a thrust bar 172 which may be actuated at suitable times by means of cams upon the cam drum 16, and which is additionally adapted to be actuated by the improved striping mechanism. To this end it is provided with a notch, within which there engages the end of a lever 176 journalled upon the pin 22 and urged in engagement with the upper edge of

the notch in the bar 172 by means of a spring 177. The lever 176 is provided with a depending arm 178 carrying a pin 180 on which is pivoted a lever 182 urged upwardly by a spring 183 and carrying a pin 184 engaging within a slot 186 in a depending portion of a lever 188 pivoted at 190 to the frame. The forward end of the lever 188 is provided with a follower extension 192 adapted to be engaged by a pin or plurality of pins 194 projecting laterally from a chain 196 trained over a sprocket 198 formed on the chain drum 83. When the lever 188 is in its counterclockwise position, as illustrated in Figure 4, the lever 182 presents an upper end in line with a path of movement of the operating screw 64, to which reference has been heretofore made. On the other hand, when the lever 188 is swung clockwise by the action of a pin 194 the end of the lever 182 is removed from the path of the screw 64, which may pass thereover.

The operation involved in the changing of yarns will be best understood from a consideration of Figures 1, 3 and 9. The finger 108 may be located by the various lugs on chain 152 in four different positions. One of these is an extreme right hand position in which the finger 108 lies to the right of all three of the operators 42 as viewed in Figure 1. This position occurs when the follower member 148 lies above a link which does not carry any lug 150. The lowest lug 150 causes the finger to lie behind the right hand operator 42 while lugs of the next two successive heights cause it to lie behind the next two of these operators. The finger may also be caused to lie to the left of the operators as hereafter described. If more than three yarn fingers are used, the finger 108 will be caused to assume additional corresponding positions under control of lugs on the pattern chain.

Assuming first that the finger 108 lies in its extreme right hand position, as viewed in Figure 1, it will not be engaged by any of the operators 42 as the bracket 46 swings rearwardly, and consequently the ends 40 of the operators will remain in their uppermost positions. Under such circumstances, as the forward movement of the bracket 46 occurs, the ends 40 of all of the opperators will move above the notched portions 38 of the operating levers 20 and no yarn change will result.

In Figure 9, there are illustrated the conditions which exist in effecting a yarn change. In this figure, the parts are illustrated under such conditions that the front operating lever 20 is holding its yarn finger out of action, while a rear operating lever 20 is in a clockwise position corresponding to the active position of its yarn finger. Let it be assumed that a yarn change is to take place and the front operating lever is to be caused to permit its yarn finger to go into operation and that the second yarn finger is to be taken out of operation. Under such conditions, prior to the rearward movement of the bracket 46 the finger 108 will have been positioned behind the operator 42 corresponding to the front operating lever 20. As the bracket moves rearwardly, the upper portion of the operator 42 in line with the finger 108 will engage the finger, and since the action of the spring 126 is made stronger than the action of any of the springs 54 the operator 42 will first swing downwardly, before moving the finger 108, into engagement with the upper end of the arm 35, projecting from the front detent lever 32. Its downward movement being thus arrested, the further movement of the bracket 46 will cause the finger 108 to move rearwardly against the action of the spring 126 until the end 40 of the front operator 42 clears the arm 35, whereupon the spring 126 will move the finger 108 forwardly causing the end 40 of the front operator to drop below the level of the arm 35. As this action takes place, furthermore, the operator 42 will engage the pin 50, thereby swinging the yoke 48 in a clockwise direction, carrying downwardly the operators which have not engaged the finger 108. As the forward movement of the bracket 46 now takes place, the end 40 of the front operator will move below the arm 35, while the ends 40 of the other operators will move above the arm 35 but in lowered positions. This position of the parts is illustrated in Figure 9, wherein the front operator 42 is just about to leave the finger 108, which holds it in lower position until its end 40 is safely below the arm 35 of the front detent 32, which arm thereafter holds it and the other operators in their lowered positions.

As the bracket continues to move forward, two events occur in succession. First the end 40 of the front operator engages the seat portion of the arm 35 of the front detent 32 and rocks it downwardly against the action of spring 37. This releases the corresponding operating lever 20 and its yarn finger drops into action urged by its spring 12. Immediately thereafter, the end 40 of any operator corresponding to a yarn finger which has been in action engages within the notch 38 of the corresponding lever 20 moving it counterclockwise to carry its yarn finger upwards out of action. During this movement the end 28 of any such operating lever cams downwardly the retaining lug 30 on its corresponding detent and after passing such lug the detent snaps upwardly restraining the operating lever from clockwise movement, and thus preventing the corresponding yarn finger from coming into action during the next rearward movement of the bracket 46. Thus it will be seen that one yarn finger corresponding to the position of the finger 108 is put into action and any other yarn finger or fingers previously in action will be moved upwardly out of action.

It is to be noted that the sequence of events is such that an overlap will be provided, since a yarn finger previously in action is moved out of action only after a slight interval following the introduction of a substitute yarn finger. By the arrangement illustrated, this can be readily timed so as to secure a predetermined overlap of definite amount. It will also be noted that the yarn change will take place on substantially the same needles because of the rotation of the cam 72 in time with the needle cylinder. Due to the fact that the pawl 78 operates on the forward stroke, the selective positioning of the finger 108 will take place while the operators are in their forward position and hence clear of its path.

As is usual in machines of this type, it is necessary to control the pattern chains in a two-fold manner. First, during heel knitting, the advance of the pattern chain or chains must be discontinued and then, during the knitting of the ring toe and perhaps a portion of the toe, the pattern chains must be timed, that is, advanced to their proper positions for the beginning of the patterning in the leg of a subsequent stocking.

When the heel is reached, a high cam on the

main pattern drum engages the follower 98, causing the end 91 of the lever 90 to move the pawl guard 84 around its pivot into a position to prevent engagement of the ratchet 82 by the pawl 78. At the same time, the link 86 raises the lever 142 and thus moves the finger 188 to an extreme left hand position as viewed in Figure 1. The bracket 46 then idly rocks without engagement of the finger 188 with any of the operators 42 and without any advance of the ratchet 82. At the same time, the pin 93 engages the tails 39 of the detents 32 rocking all of them clockwise and releasing the operating levers 28. At this time, however, the push rods 14 will be under the control of cams on the main cam drum 16, so that they will be operated wholly independently of the chain set-up. In general, of course, striping yarns will be removed from action at this time, and the main cam drum will permit to come into action a suitable yarn for the formation of the heel. (The heel yarn finger, not shown, may be solely under control of the pattern drum 16.) At the conclusion of the formation of the heel, the pawl guard is released as the follower 98 drops off its actuating cam, and yarn changing is resumed for the formation of instep patterns.

A somewhat different action occurs at the beginning of knitting of the ring toe. A lower cam on the main pattern drum 16 then engages the follower 98 causing the pawl guard 84 to be swung to some extent clockwise, as viewed in Figure 3, but not to a sufficient extent to prevent the normal action of pawl 78 of the ratchet 82. This partial movement of the guard 84 causes the lever 142 to be raised to such extent as to move the finger 188 to the left of the operators 42, but not as far as in the previous instance. The turned end 162 of the member 160 is now raised to a position to be engaged and underridden by the set-up camming lug 164. Again the main cam drum 16 assumes control of the push rods 14, the detents 32 being again lowered so as to release the operating levers 28.

The stepping about of the pattern chain continues until the camming lug 164 engages the inturned lower end 162 of the member 160. By the action of the lug 164 the lever 142 is raised to a height which, as before, will cause the pawl guard 84 to prevent the pawl 78 from engaging the ratchet 82. Thereafter, as operation continues the bracket 46 will swing idly. When patterning is to be resumed again, in the next stocking, the follower 98 is released and the thrust rod 170 is forced rearwardly under control of the main chain of the machine, and the pin 166 will then rock the member 160 to release its end 162 from the lug 164. Thereupon the lever 142 will drop, removing the pawl guard from beneath the pawl 78, and the pattern chain will again assume command of the yarn changes. When yarn changes are made under the control of the chain 152, there are, of course, no cams on the main cam drum 16 controlling the push rods 14.

On the majority of patterns the clamp and cutter would be operated at every yarn change. However, it is desirable that in some instances it should not be operated, and consequently control therefor is provided as indicated in Figure 4.

Normally, the lever 192 remains in its counterclockwise position as illustrated in Figure 4, with the result that the lever 182 is located in its upper position as illustrated. Under such conditions when no yarn changes take place, and the bracket 48 is in its counterclockwise position about its pivot 44, the screw 64 will pass above the lever 182 and consequently impart no movements to the clamp and cutter operating lever 176. On the other hand, when a yarn change is to take place, the screw 64 will engage the lever 182, thereby moving the operating lever 176 counterclockwise, causing an actuation of the clamping and cutting mechanism in timed relationship with the substitution of yarns.

If clamping and cutting is not to take place at any particular yarn change, the pin 194 projecting laterally from the chain 196 engages the reading cam 192 as the yarn change bracket moves forward for the yarn change and during such engagement rocks the lever 182 downwardly so that the screw 64 moves above it. The pin 194 then immediately clears the cam 192, which drops off it so that the lever 182 snaps upwardly under the screw 64, which is then above and overlapping it. Thus no thrusting action takes place and clamping and cutting does not occur.

It is sometimes desirable not to open the clamp if a yarn is going into action, and none is going out. Idle yarns are frequently partially dragged out by one which is going into action, but a tendency in this regard is usually counteracted, if a yarn is going out of action, as the latter draws under the clamp. But, for example, a main backing yarn may be constantly in action, not being controlled by the striping device, and a facing yarn may be added without having any yarn coming out. To withdraw it from action another finger would be selected which, however, wou d not carry any yarn. This would produce a pattern having plated stripes alternating with solid stripes. Under such conditions, whenever the plating yarn was introduced, but no yarn was removed from action, it would be desirable to have the pin 194 prevent the action of the clamp and cutter.

It will be clear that variations in the specific embodiment of the invention may be made without departing from the principles of the invention. While only three yarn fingers have been illustrated under control of a pattern chain, it will be obvious that duplicate yarn finger controlling means may be provided to provide for operation of a larger number, for example, six fingers. Additionally, yarn fingers not under control of the pattern chain may be provided, as, for example, fingers carrying heel and toe yarns or a main backing yarn over which plating is effected by the striping yarn.

What I claim and desire to protect by Letters Patent is:

1. In a circular knitting machine, a needle cylinder carrying independent needles, a plurality of yarn fingers, spring means for urging said yarn fingers towards their yarn feeding positions, a plurality of detents, one for each yarn finger, arranged to hold their respective yarn fingers out of yarn feeding position against the action of said spring means, devices, one for each detent, each arranged to move during the formation of every course of the fabric in one of alternative paths in one of which it engages and trips its detent to render the corresponding yarn finger active to feed its yarn, and means for selectively controlling the paths of movement of said devices.

2. In a circular knitting machine, a needle cylinder carrying independent needles, a plurality of yarn fingers, spring means for urging said yarn fingers towards their yarn feeding positions, a plurality of detents, one for each finger, arranged to hold their respective yarn fingers out of yarn

feeding position against the action of said spring means, devices, one for each detent, each arranged to move during the formation of every course of the fabric in one of alternative paths in one of which it engages and trips its detent to render the corresponding yarn finger active to feed its yarn, and in another of which it positively renders its corresponding yarn finger inactive against the action of its spring means, and means for selectively controlling the paths of movement of said devices.

3. In a circular knitting machine, a needle cylinder carrying independent needles, a plurality of yarn fingers, spring means for urging said yarn fingers towards their yarn feeding positions, a plurality of detents, one for each finger, arranged to hold their respective yarn fingers out of yarn feeding position against the action of said spring means, devices, one for each detent, each arranged to move during the formation of every course of the fabric in one of alternative paths in one of which it engages and trips its detent to render the corresponding yarn finger active to feed its yarn, in another of which it positively renders its corresponding yarn finger inactive against the action of its spring means, and in still another of which it fails to affect the position of its corresponding yarn finger, and means for selectively controlling the paths of movement of said devices.

4. In a circular knitting machine, a needle cylinder carrying independent needles, a plurality of yarn fingers, spring means for urging said yarn fingers towards their yarn feeding positions, a plurality of detents, one for each finger, arranged to hold their respective yarn fingers out of yarn feeding position against the action of said spring means, devices, one for each detent, each arranged to move in one of alternative paths in one of which it engages and trips its detent to render the corresponding yarn fingers active to feed its yarn, in another of which it positively renders its corresponding yarn finger inactive against the action of its spring means, and in still another of which it fails to affect the position of its corresponding yarn finger, and means for selectively controlling the paths of movement of said devices.

5. In a circular knitting machine, a needle cylinder carrying independent needles, a plurality of yarn fingers, spring means for urging said yarn fingers towards their yarn feeding positions, a plurality of detents, one for each finger, arranged to hold their respective yarn fingers out of yarn feeding positions against the action of said spring means, devices, one for each detent, each arranged to move during the formation of every course of the fabric in one of alternative paths in one of which it engages and trips its detent to render the corresponding yarn finger active to feed its yarn, in another of which it positively renders its corresponding yarn finger inactive against the action of its spring means, and in still another of which it fails to affect the position of its corresponding yarn finger, and means for effecting the first mentioned path of movement for one device and simultaneously effecting the second mentioned path of movement for each of the other devices.

6. In a circular knitting machine, a needle cylinder carrying independent needles, a plurality of yarn fingers, spring means for urging said yarn fingers towards their yarn feeding positions, a plurality of detents, one for each finger, arranged to hold their respective yarn fingers out of yarn feeding positions against the action of said spring means, devices, one for each detent, each arranged to move during the formation of every course of the fabric in one of alternative paths in one of which it engages and trips its detent to render the corresponding yarn finger active to feed its yarn, in another of which it positively renders its corresponding yarn finger inactive against the action of its spring means, and in still another of which it fails to affect the position of its corresponding yarn finger, and means for effecting the first mentioned path of movement for one device and simultaneously effecting the second mentioned path of movement for each of the other devices, and for alternatively effecting the third mentioned paths of movement for all of said devices.

7. In a circular knitting machine, a needle cylinder carrying independent needles, a plurality of yarn fingers, spring means for urging said yarn fingers towards their yarn feeding positions, a plurality of detents, one for each finger, arranged to hold their respective yarn fingers out of yarn feeding positions against the action of said spring means, devices, one for each detent, each arranged to move in one of alternative paths in one of which it engages and trips its detent to render the corresponding yarn finger active to feed its yarn, in another of which it positively renders its corresponding yarn finger inactive against the action of its spring means, and in still another of which it fails to affect the position of its corresponding yarn finger, and means for effecting the first mentioned path of movement for one device and simultaneously effecting the second mentioned path of movement for each of the other devices.

8. In a circular knitting machine, a needle cylinder carrying independent needles, a plurality of yarn fingers, spring means for urging said yarn fingers towards their yarn feeding positions, a plurality of detents, one for each finger, arranged to hold their respective yarn fingers out of yarn feeding positions against the action of said spring means, devices, one for each detent, each arranged to move in one of alternative paths in one of which it engages and trips its detent to render the corresponding yarn finger active to feed its yarn, in another of which it positively renders its corresponding yarn finger inactive against the action of its spring means, and in still another of which it fails to affect the position of its corresponding yarn finger, and means for effecting the first mentioned path of movement for one device and simultaneously effecting the second mentioned path of movement for each of the other devices and for alternatively effecting the third mentioned paths of movement for all of said devices.

9. In a circular knitting machine, a needle cylinder carrying independent needles, a plurality of yarn fingers, spring means for urging said yarn fingers towards their yarn feeding positions, a plurality of detents, one for each finger, arranged to hold their respective yarn fingers out of yarn feeding position against the action of said spring means, devices, one for each detent, each arranged to move in one of alternative paths in one of which it engages and trips its detent to render the corresponding yarn finger active to feed its yarn, in another of which it positively renders its corresponding yarn finger inactive against the action of its spring means, and in still another of which it fails to affect the position of its corresponding yarn finger, means

for effecting the first mentioned path of movement for one device, and means arranged so that movement of said one device in the first mentioned path of movement causes each of the other devices to move simultaneously in the second mentioned path of movement.

10. In a circular knitting machine, a needle cylinder carrying independent needles, a plurality of yarn fingers, spring means for urging said yarn fingers towards their yarn feeding positions, a plurality of detents, one for each finger, arranged to hold their respective yarn fingers out of yarn feeding position against the action of said spring means, devices, one for each detent, each arranged to move in one of alternative paths in one of which it engages and trips its detent to render the corresponding yarn finger active to feed its yarn, in another of which it positively renders its corresponding yarn finger inactive against the action of its spring means, and in still another of which it fails to affect the position of its corresponding yarn finger, means for effecting the first mentioned path of movement for one device, and means arranged so that movement of said one device in the first mentioned path of movement causes each of the other devices to move simultaneously in the second mentioned path of movement, and means for alternatively effecting the third mentioned paths of movement for all of said devices.

11. In a circular knitting machine, a needle cylinder carrying independent needles, a plurality of yarn fingers, spring means for urging said yarn fingers towards their yarn feeding positions, a plurality of detents, one for each yarn finger, arranged to hold their respective yarn fingers out of yarn feeding position against the action of said spring means, devices, one for each detent, each arranged to move in one of alternative paths in one of which it engages and trips its detent to render the corresponding yarn finger active to feed its yarn, means for selectively controlling the paths of movement of said devices, and means for rendering said detents inoperative and for controlling the positions of said yarn fingers while said devices are inactive to control said yarn fingers.

12. In a circular knitting machine, a needle cylinder carrying independent needles, a plurality of yarn fingers, spring means for urging said yarn fingers towards their yarn feeding positions, a plurality of detents, one for each finger, arranged to hold their respective yarn fingers out of yarn feeding position against the action of said spring means, devices, one for each detent, each arranged to move in one of alternative paths in one of which it engages and trips its detent to render the corresponding yarn finger active to feed its yarn, in another of which it positively renders its corresponding yarn finger inactive against the action of its spring means, and in still another of which it fails to affect the position of its corresponding yarn finger, means for selectively controlling the paths of movement of said devices, and means for effecting control of the yarn fingers independently of said detents and while said devices are moving in the third mentioned paths.

13. In a circular knitting machine, a needle cylinder carrying independent needles, a plurality of yarn fingers, clamping and cutting means for the yarns, means for selectively effecting striping changes of yarns, means for operating the clamping and cutting means when yarn changes are effected, and pattern controlled means timed with the means for selectively effecting said striping changes of yarns for preventing the operation of the clamping and cutting means when certain striping yarn changes take place.

14. In a circular knitting machine, a needle cylinder carrying independent needles, a plurality of yarn fingers, spring means for urging said yarn fingers towards their yarn feeding positions, a plurality of detents, one for each yarn finger, arranged to hold their respective yarn fingers out of yarn feeding position against the action of said spring means, devices, one for each detent, each arranged to move during the formation of every course of the fabric in one of alternative paths in one of which it engages and trips its detent to render the corresponding yarn finger active to feed its yarn, means for selectively controlling the paths of movement of said devices, clamping and cutting means for the yarns, and means for effecting operations of the clamping and cutting means only when one of said devices moves in said path to render a yarn finger active to effect a yarn change.

15. In a circular knitting machine, a needle cylinder carrying independent needles, a plurality of yarn fingers, spring means for urging said yarn fingers towards their yarn feeding positions, a plurality of detents, one for each yarn finger, arranged to hold their respective yarn fingers out of yarn feeding position against the action of said spring means, devices, one for each detent, each arranged to move in one of alternative paths in one of which it engages and trips its detent to render the corresponding yarn finger active to feed its yarn, means for selectively controlling the paths of movement of said devices, clamping and cutting means for the yarns, and means for effecting operations of the clamping and cutting means only when one of said devices moves in said path to render a yarn finger active to effect a yarn change.

16. In a circular knitting machine, a needle cylinder carrying independent needles, a plurality of yarn fingers, spring means for urging said yarn fingers towards their yarn feeding positions, a plurality of detents, one for each yarn finger, arranged to hold their respective yarn fingers out of yarn feeding position against the action of said spring means, devices, one for each detent, each arranged to move in one of alternative paths in one of which it engages and trips its detent to render the corresponding yarn finger active to feed its yarn, means for selectively controlling the paths of movement of said devices, clamping and cutting means for the yarns, and means for effecting operations of the clamping and cutting means only when one of said devices moves in said path to render a yarn finger active to effect a yarn change, and means for preventing said operation of the clamping and cutting means when certain yarn changes take place.

17. In a circular knitting machine, a needle cylinder carrying independent needles, a plurality of yarn fingers, spring means for urging said yarn fingers toward their yarn feeding positions, a plurality of holding means, one for each yarn finger, arranged to hold their respective yarn fingers out of yarn feeding position against the action of said spring means, devices, one for each finger holding means, each arranged to move during the formation of every course of the fabric in one of alternative paths in one of which it operates its finger holding means to render the corresponding yarn finger active to feed its yarn,

and means for selectively controlling the paths of movement of said devices.

18. In a circular knitting machine, a needle cylinder carrying independent needles, a plurality of yarn fingers, spring means for urging said yarn fingers toward their yarn feeding positions, devices, one for each yarn finger, each arranged to move during the formation of every course of fabric in either an inactive or an active path, means for selectively controlling the paths of movement of said devices, and yarn finger holding means interposed between said devices and said yarn fingers, said devices and yarn finger holding means being arranged so that when a device moves in its active path it causes a corresponding holding means to release its inactive finger so that a spring may render it active, and so that simultaneously a finger which had been active is removed from active position.

HAROLD E. HOUSEMAN.