Feb. 7, 1933. E. H. STEERE 1,896,431

KNITTING MACHINE

Original Filed Dec. 4, 1928 4 Sheets-Sheet 1

Fig. 8.

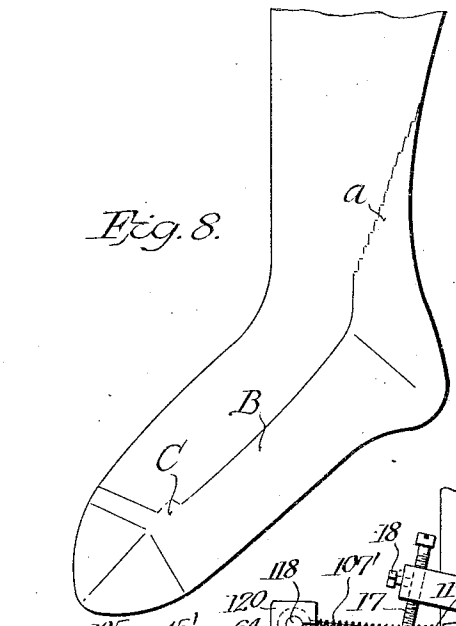


Fig. 1.

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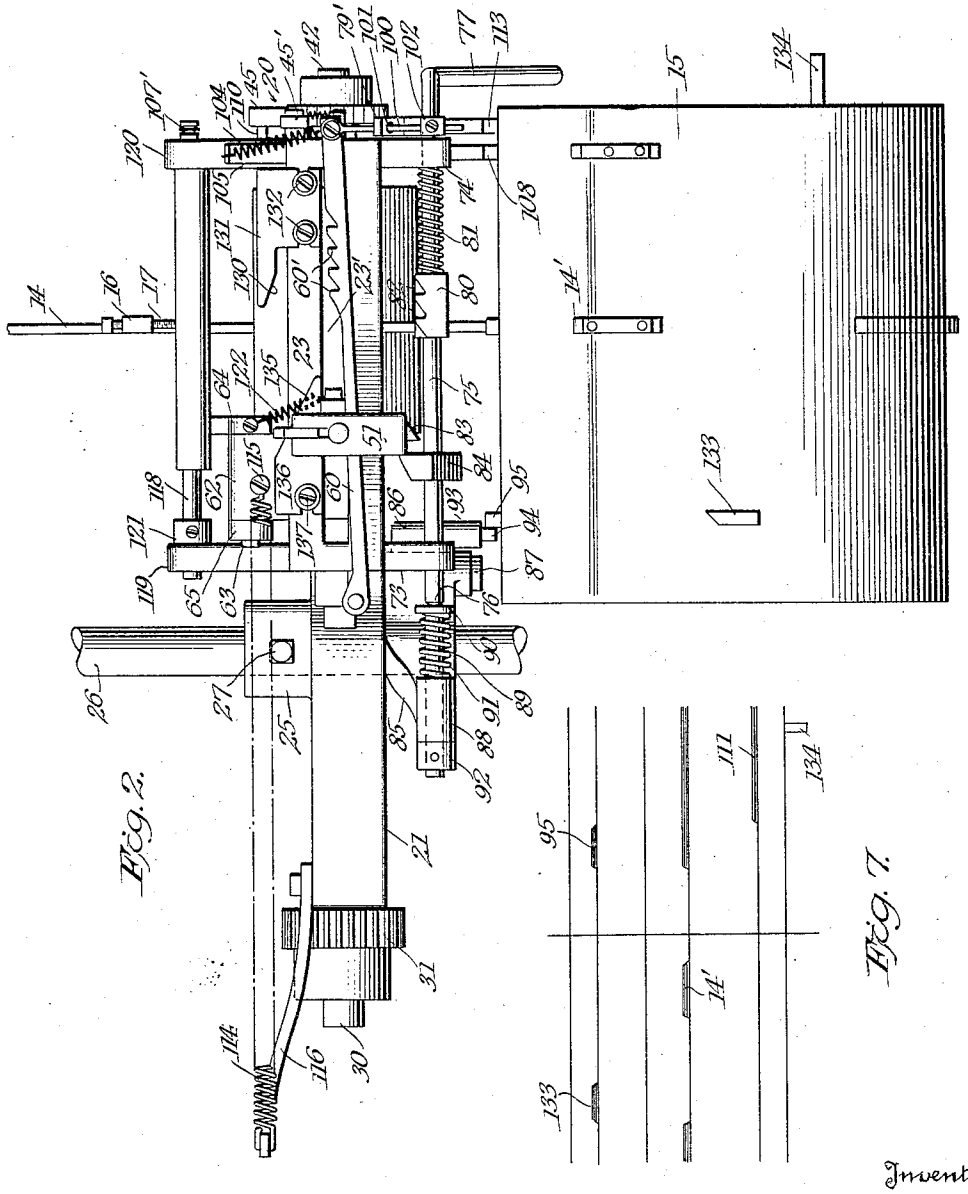


Fig. 2.

Fig. 7.

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Fig. 3.

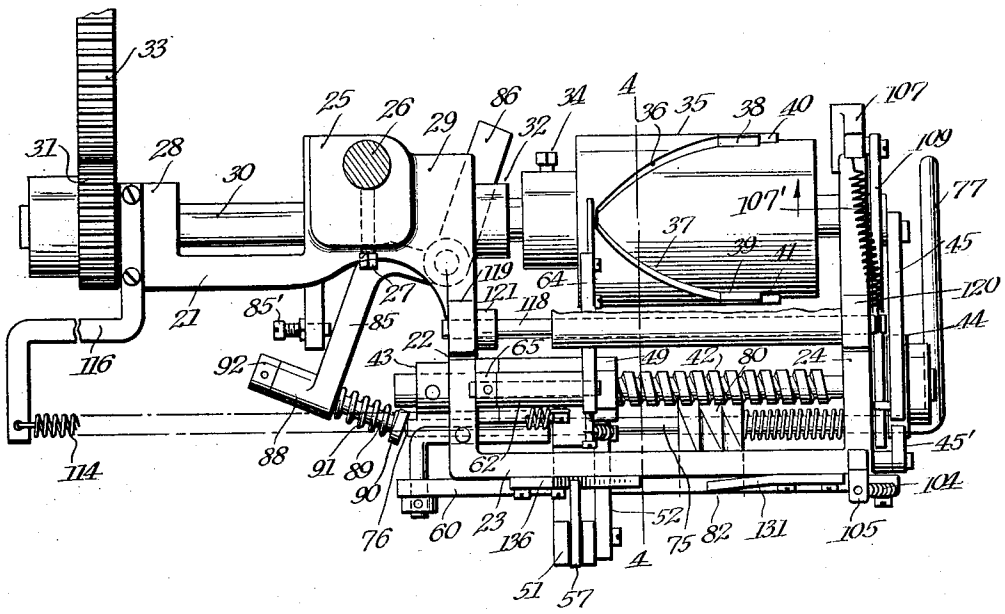
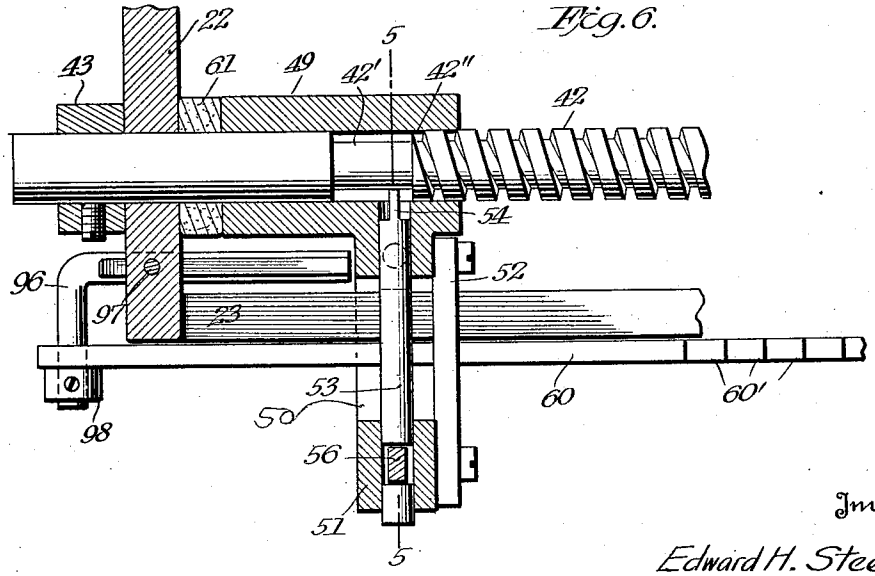


Fig. 6.



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Fig. 4.

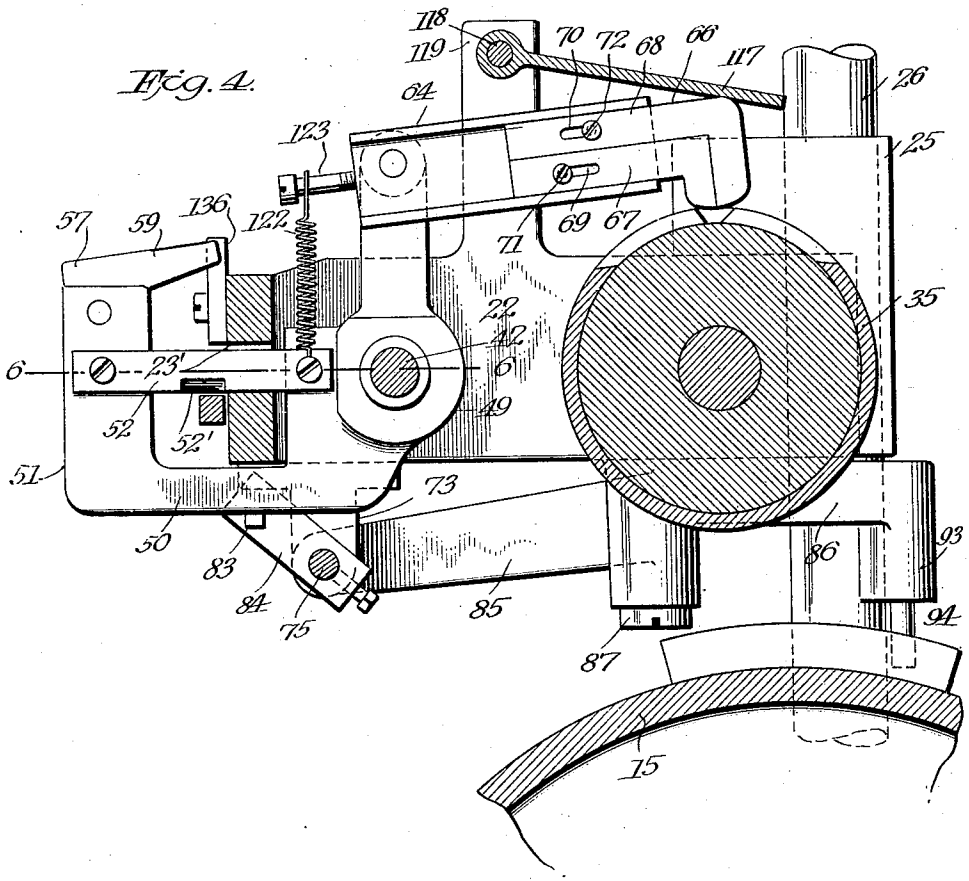
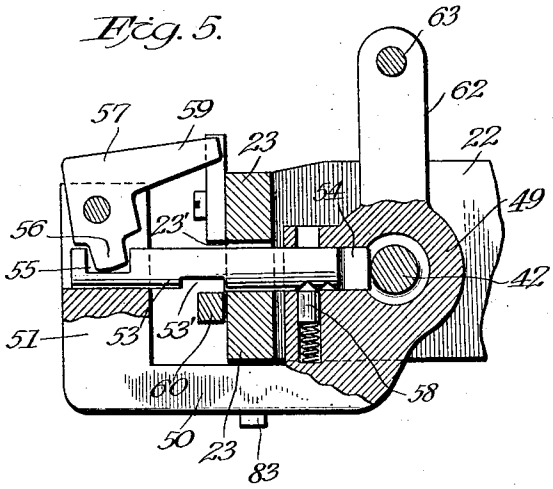


Fig. 5.



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UNITED STATES PATENT OFFICE

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KNITTING MACHINE

Application filed December 4, 1928, Serial No. 323,638. Renewed August 27, 1932.

The present invention relates to an attachment for standard circular hosiery knitting machines, for example the Scott and Williams Model K, the purpose of the attachment being to control the feeding of the splicing yarn to the needles so as to secure a stocking having a high splice heel of any preferred design, a double sole, and a toe guard.

It is generally old in the art to provide a knitting machine attachment comprising an auxiliary cam or pattern drum, and a drum follower through which movement is transmitted to a yarn guide to control the feed of the splicing yarn or thread. My present invention has particular reference to the relative arrangement and coaction of such a drum and follower and also includes novel mechanism, whereby, as stated above, the toe guard knitting operation may be controlled. In order to make clear the various phases of the invention, I shall proceed to describe a typical embodiment of the same with reference to the accompanying drawings. In these drawings:

Figure 1 is a side elevation partly in section of a portion of a standard type rotary cylinder knitting machine with the attachment according to the present invention shown in operative position.

Figure 2 is an elevation of the attachment and of the cam or pattern drum of the knitting machine.

Figure 3 is a plan view of the attachment.

Figure 4 is a section on the line 4—4 of Figure 3.

Figure 5 is a section on the line 5—5 of Figure 6.

Figure 6 is a section on the line 6—6 of Figure 4.

Figure 7 is a developed view of the cam drum, and

Figure 8 is a side elevation of the lower portion of a stocking showing the reinforced portions as made under the control of the new attachment.

Referring to the drawings, and first to Figure 1, 10 indicates, as a whole, the knitting head of a standard circular hosiery knitting machine, the machine chosen for the sake of convenience being the Scott and Williams Model K. The reference numeral 11 indicates a knitting needle, while at 12 is shown a yarn guide for the splicing yarn, this guide being pivotally mounted, and its operating end being yieldingly pulled downwardly by a spring 13. A thrust rod 14 of the ordinary type, is adapted to control the movements of yarn guide 12 as determined by thrust bar actuating cams disposed on the main pattern drum 15 of the knitting machine. According to the present invention, the thrust bar 14 has rigidly secured thereto at an appropriate point an arm 16 provided at its free end with an abutment screw 17 adapted to be retained in adjusted position by a set screw 18. The new attachment is designated as a whole by the numeral 20, Fig. 2.

The attachment 20, as is most clearly evident from Figure 2, consists primarily of a frame comprising a horizontal arm 21, a wall 22 integral with arm 21 at one end thereof and extending at right angles thereto (see also Figures 3 and 4), an integral wall 23 extending from the outer extremity of wall 22 at right angles to the latter and in the opposite direction from arm 21, and a wall 24 integral with wall 23 and extending in parallel relation to wall 22.

Arm 21 has integrally formed thereon a vertically extending boss 25 provided with a vertical bore through which passes a vertical rod 26 supported on the main machine frame. A set screw 27 engages in a threaded counterbore of the boss and bears with its inner end against rod 26 to maintain the attachment frame in proper relation to its cooperating instrumentalities.

Arm 21 is provided with aligned journal bearings 28 and 29, which, in turn, are in alignment with a bearing bore formed in the end of wall 24. A shaft 30 is disposed in these aligned bearings, and is secured in position by means of a pinion 31 and a collar 32 fixed to the shaft on the opposite sides of bearings 28 and 29, respectively. Pinion 31 is in engagement with high speed gear 33 of the knitting machine.

Fixed to shaft 30 by means of an integral collar provided with a radial threaded bore in

which is engaged the set screw 34, is a pattern drum 35, Fig. 3. This pattern drum or cam is provided with an axially extending peripheral depression bounded by the divergent walls 36 and 37, which at their divergent ends are continued for a distance as walls 38 and 39, whose faces lie substantially in axial planes of the drum. The depression terminates in walls 40 and 41, which are abruptly circumferentially stepped back from walls 38 and 39, and whose faces lie substantially in axially planes of the drum. Through mechanism to be hereinafter described, walls 36 and 37 are adapted to determine the shape of the high splice at the heel of the stocking, walls 38 and 39 control the feed of the reinforcing yarn when the foot of the stocking is being knitted, and walls 40 and 41 control the knitting of the toe guard. As a matter of convenience, walls 36 and 37 have been illustrated merely as simply divergent, but it is obvious that these walls may assume various conformations and relations without departing from the spirit of the invention.

When the machine is in operation, drum 35 is rotated in the direction of the arrow Fig. 3, through the intermediary of gear 33 and pinion 31, and the relation of these transmission elements is such that the central longitudinal line of the drum depression will always lie in a vertical plane passing through the axis of shaft 30 when the rear, central longitudinal line of the stocking is reached by the high splice needles.

Journalled in walls 22 and 24 in parallel relation with shaft 30 is a screw shaft 42, this shaft being retained in position by a set collar 43 and a ratchet wheel 44 fixed thereto, the collar and wheel being disposed just outwardly of walls 22 and 24, respectively. Rotation is adapted to be imparted to ratchet wheel 44 by means of a pawl 45 connected by means of a crank pin 46 to a block 47 adjustably disposed in a diametrically extending recess in the end of shaft 30 and set by means of a screw 48, Fig. 1. It is obvious that by this arrangement, the extent of angular movement of ratchet 44 at each rotation of shaft 30 may be varied by suitably adjusting block 47 radially of shaft 30. A spring-pressed pawl 45′ prevents counter-rotation of the ratchet.

A traveller 49, Figs. 3, 4, 5 and 6, has a smooth bore through which worm shaft 42 passes. Near one end of traveller 49 is formed an integral arm 50 passing below wall 23 of the frame, and at the outer end of arm 50 is an integral, upwardly extending arm 51. Wall 23 is provided with a longitudinally extending slot 23′, Figs. 2, 4 and 5, and through this slot is passed a bar 52, which is secured by means of screws to the body of traveller 49 and to arm 51. The bar 52 is thus guided between the upper and lower walls of slot 23′, so as to maintain the traveller in a constant angular position relative to shaft 42.

In aligned bores in arm 51 and the body of traveller 49 is disposed a sliding pin 53, whose inner end 54 is so shaped as to be adapted to engage between the threads of the screw shaft. In a recess 55 in the upper side of pin 53 near its outer extremity engages the nose 56 of a bell crank lever 57 pivoted in the upper bifurcated end of arm 51 to oscillate about an axis parallel to the axis of the worm shaft. Pin 53 is provided with two serrations on its lower side just to the rear of nose 54, these serrations being so disposed as to cooperate with a spring pressed detent 58 to yieldingly maintain pin 53 in either one of two positions. These instrumentalities also serve to prevent rotation of pin 53 if the latter is of circular cross section, as is the case in the present instance.

From the above description, it will be obvious that upon depressing nose 59 of lever 57, pin 53 can be moved from a forward position, in which its nose 54 is adapted to engage between the threads of shaft 42, to a rearward position, in which nose 54 will be entirely withdrawn from the influence of the threads. In either of the described positions, the pin is yieldingly retained by the spring pressed detent. In order that an oscillatable bar 60 which runs along the outside of wall 23 beneath pin 53 may not interfere with the reciprocating movements of the latter, the lower side of the pin is provided with a recess 53′ of adequate proportions.

In Figure 6, traveller 49 is shown in its normal or initial position adjacent wall 22, a damping washer 61 separating the two elements. It will be noted from this figure that shaft 42 is provided with a reduced portion 42′ from which the thread starts, this end of the latter diverging from a sharp, initial edge 42″ to the normal thread width. When the traveller is in the described end position, the nose 54 of pin 53 lies in its inwardly projected position in the annular recess existing between reduced portion 42′ and the wall of the traveller bore. The means whereby the nose 54 is caused to take its inwardly projected position when the traveller is in what will be termed its left hand limit position, will be presently described.

The traveller 49 is provided with an integral vertical projection 62 which is most clearly visible in Figures 2, 3, 5 and 6. This projection is provided with a bore parallel to the bore which receives shaft 42, and in this bore is disposed a rock shaft 63 to the right hand end of which is rigidly secured a finger 64. The rock shaft is secured against longitudinal movement by the finger 64 on the one hand, and by a set collar 65 on the other hand. The finger 64 is provided on one side with a guide groove in which is disposed a drum follower designated at 66. This

drum follower is preferably composed of two nested L-shaped elements 67 and 68 provided with longitudinal slots 69 and 70 in their leg portions through which they are adjustably secured in the guideway of finger 64 by means of screws 71 and 72. It will be seen that the foot portions of the L-shaped members are adapted to separate away from their line of contact (which is substantially a radial line of drum 35) so as to form a drum following portion proper of variable size.

Journalled in downward extensions 73 and 74 of walls 22 and 24, is a rock shaft 75, this shaft terminating somewhat to the left of extension 73 in a chamfered head 76, and to the right of extension 74 in a rearwardly and downwardly extending tail 77 (see Fig. 1). Secured to shaft 75 by means of a set screw 78 and bearing against the outer face of projection 74, is a block 79. Also secured to the shaft 75 is a block 80, this block being positioned in spaced relation to extensions 74 on the opposite side thereof to block 79, and interposed between block 80 and extension 74 is a compression spring 81 which normally yieldingly holds shaft 75 in the position indicated in Fig. 2. The upper face of block 80, at a position laterally removed from shaft 75, is provided with a number of teeth 82 arranged to cooperate with a tooth 83 disposed on the underside of arm 50 of traveller 49. An abutment pin 74′, Fig. 1, limits the upward swing of block 79 and thereby insures the proper positioning of teeth 82 relative to tooth 83. Block 79 is normally held against the abutment by the weight of tail 77. Shaft 75 also carries a lug 84 which, when the traveller is in the position of Figs. 2 and 6, lies immediately to the left of arm 50 of the traveller and in potential abutting relation thereto. A lever comprising arms 85 and 86, Figs. 3 and 4 is secured to the lower surface of arm 21 by means of a screw 87 about which it is adapted to oscillate. In a bearing 88 integral with the free end of arm 85 is a horizontal bore in which is disposed a pin 89 having a head 90 lying normally in close proximity to head 76 of shafts 75 as may be clearly seen in Figs. 2 and 3. A compression spring 91 of considerable strength is interposed between head 90 and arm 85, the movement of pin 89 under the influence of this spring being limited by a set collar 92 secured to the end of the pin opposite head 90. The arm 86 has a downward extension 93, Figs. 1 and 2, this extension supporting a pin 94 extending downwardly in position to be engaged and displaced to the left by a starting cam 95 carried by the main pattern drum 15. An abutment screw 85′ cooperates with head 76 to normally hold the pin in such position.

The oscillatable bar 60 referred to above as extending along the outer face of wall 23 is most clearly shown in Figs. 2 and 6. Referring to the latter figure, it will be noted that the bar 60 is supported at one end on the short arm of a round angle rod 96. The long arm of this angle rod is squared off on top, and is adapted to be retained in a bore in wall 22 parallel to shaft 42 by means of a set screw 97. Bar 60 is positioned on rod 96 by contact with wall 23 on the one hand, and by means of a set collar 98 on the end of arm 96 on the other hand. Near its opposite end, bar 60 is provided with a number of teeth 60′, these being adapted to cooperate with a tooth 52′, Fig. 4, formed by appropriately bevelling a portion of the lower edge of bar 52. The tooth 52′ faces in the same direction as the tooth 83, Fig. 2. To the right hand end of bar 60, Fig. 2, is pivoted a link 100, which extends through an aperture 101 formed in a projecting finger 79′ of block 79, and an abutment collar 102 is secured to the lower end of link 100 by means of a set screw 103, Fig. 1. Bar 60 is yieldingly retained in the position indicated in Fig. 2 by means of a tension spring 104 interposed between it and a standard 105 mounted at the junction of walls 23 and 24.

In order to interrupt rotation of worm shaft 42 through the intermediary of the pawl and ratchet, means are provided for throwing the pawl out of engagement with the ratchet so as to arrest the latter in a predetermined angular position. Mounted on a downwardly extending bracket 106 of wall 24, Fig. 1, is a bell crank lever 107 having a nose 108 on its lower arm normally resting in proximity to the surface of drum 15. To the upper arm of lever 107 is pivoted a finger 109 whose free end is adapted to ride on an inner hub of ratchet 44. The upper edge of finger 109 is so recessed relative to an overlying pin 110 on pawl 45 that upon engagement of nose 108 by an appropriately disposed cam or drum 15 and finger 109 being thereby drawn to the right, its free end will engage pin 110 and lift the pawl when a pin 44′ mounted on the ratchet rises under and lifts the free end of the finger. Thus, action of the bell crank lever merely places finger 109 in an operative position relative to pin 110, and the latter will not be engaged to release the pawl until the end of the finger is engaged by pin 44′. The result is that upon actuation of the bell crank lever, ratchet wheel 44 and therewith worm shaft 42 will always be arrested in predetermined angular position. This position is such that the end 42″ of the thread will lie immediately in advance of and in a position to engage nose 54 of pin 53 when the latter has been displaced to the right of the position shown in Figure 6, in a manner to be presently described. It is also desirable that pawl 45 be disengageable irrespective of the

angular position of ratchet 44, and for this purpose a two-armed lever 112 is also pivoted to bracket 106, the lower arm of this lever being provided with a nose 113 projecting in the path of appropriately disposed cams on the periphery of drum 15. The free end of the upper arm of the lever normally lies immediately below pawl 45 so that when nose 113 is lifted, the lever will be swung to immediately disengage the pawl. The weight of the upper arm of the lever normally holds the latter in the position shown in Figure 1.

Traveller 49 is normally retained in the illustrated left hand position by means of a tension spring 114 connected at one end to the traveller by means of a screw 115, and at the other end to the free end of an angle bracket 116 secured to arm 21. When the traveller is in this position, the follower 66 rests on a full circular portion of drum 35 at the extreme left of the latter, as will be clearly seen in Fig. 3. In a manner to be presently described, the traveller is adapted to be moved from its left hand position to a right hand position adjacent wall 24, and as it thus moves, the follower moves into and out of the peripheral drum depression as the drum rotates. This vibratory movement of the follower is to be transmitted to thrust bar 14, and for this purpose I provide a swinging plate 117 mounted on a shaft 118 journalled in upward extensions 119 and 120 of walls 22 and 24. The plate is rigidly fixed to shaft 118, and bears at one end against extension 120. Displacement of the shaft and plate in the opposite direction is prevented by a set collar 121. The free margin of plate 120 overlies and bears on follower 66 throughout the travel of the latter, and consequently the vibratory movements of the follower induced by its engagement with the pattern drum will be directly transmitted into vibratory or oscillatory movements of the plate. These movements are transmitted to the yarn guide 12 by means of thrust rod 14 through the intermediary of arm 16 and abutment screw 17, which latter rests on the upper surface of the plate. When thrust bar 14 is lifted by a cam on main drum 15, follower 66 and therewith plate 117 will be lifted through the intermediary of a tension spring 122 which connects a screw 123 in the rear of finger 64 with the traveller body. The right hand projecting end of shaft 118, Fig. 2, is annularly grooved, and in the groove is engaged one end of a tension spring 107'. The other end of this spring is engaged with the upper arm of lever 107 to yieldingly maintain the latter in its above described normal position.

As the stocking in knitting head 10 approaches the heel portion, the bevelled face of cam 95 on drum 15 strikes pin 94, thus swinging head 90, Figs. 2 and 3, and impacting it against the end 76 of shaft 75, so that the latter is displaced to the right. Lug 84 being fixed to the shaft partakes in its movement and being positioned behind arm 50 of the traveller carries the latter with it, thereby bringing nose 54 yieldingly (due to spring 91) against the end of the thread of shaft 42. Nose 108 of bell crank lever 107 which has previously been engaged by the actuating cam 111 of drum 15, is released so that finger 109 which has been cooperating with pin 44' to hold pawl 45 out of engagement with ratchet 44, moves forward, thereby permitting the pawl to engage and rotate the ratchet. Due to the prior positioning of end 42'' of the thread of screw shaft 42, the thread immediately engages nose 54, and the traveller is moved to the right. This travel is continued intermittently until a V-shaped reinforced heel has been completed on the stocking, and thrust bar 14 has been lifted by a cam 14' on drum 15 to permit the knitting of the heel pocket. At this juncture, the follower moves beyond the divergent walls 36 and 37 into cooperating position with walls 38 and 39, and thereupon end 59 of lever 57 strikes a cam surface 130 formed on a plate 131 adjustably secured to wall 23 by means of screws 132. As a result of the enforced movement of lever 57, nose 54 of pin 53 is withdrawn from engagement with screw shaft 42, so that the coupling between the latter and the traveller is broken. Prior to the interruption of this coupling, however, tooth 52' of bar 52 has passed over the first tooth 60' of bar 60, and similarly tooth 83 has passed over and is engaged by one of the teeth 82, these latter teeth being held in engagement by the weight of tail 77. Consequently, when the coupling between traveller 49 and shaft 42 is broken, the traveller is held in its advanced position through the engagement of the described parts.

When thrust bar 14 is now released after the completion of the heel pocket, the reinforced sole is knitted under the control of follower 66, which, as has been explained, is now positioned so as to cooperate with walls 38 and 39 of the drum depression.

When the double sole has been completed, a cam 133 on drum 15 abuts pin 94 and shaft 75, in the manner described above, is again quickly displaced to the right. This time, however, it will be remembered that tooth 83 is engaged by one of the teeth 82 of block 80, which is fixed to shaft 75. Consequently, the traveller partakes in the displacement of shaft 75, and follower 66 is instantaneously brought into position to cooperate with walls 40 and 41 of the drum depression. This means that the double sole will be abruptly expanded to form the toe guard.

After the toe guard has been completed, a pin 134 projecting from drum 15, Figs. 1 and 2, will come under and engage tail 77 to rock

shaft 75. During the knitting of the toe guard, the traveller has been retained in its right hand limit position through the engagement of tooth 52′ with one of the extreme right hand teeth 60′. When shaft 75 is rocked as above described, finger 79′ will abut collar 102 of link 100, whereby the end of bar 60 will be swung downwardly to release teeth 52′ and 60′. Hereupon the traveller is instantaneously returned to its initial position by spring 114. As the traveller moves into this position, however, nose 59 of lever 57 will be engaged by a cam surface 135 of a plate 136, adjustably secured to wall 23 as by screw 137, and as a consequence pin 52 will be projected inwardly so that the parts will again be in the position illustrated in Fig. 6.

Screw shaft 42 is still being rotated by pawl 45 engaging ratchet 44. At any appropriate time before the heel of the next stocking is reached, but preferably at the completion of the welt of that stocking, cam 111 comes under and lifts nose 108 of lever 107, and shaft 42 is arrested in predetermined angular position in the manner and for the purpose above described.

In Figure 8, I have shown the lower portion of a stocking as reinforced under the control of my improved device. In this figure, A represents the high splice heel whose edges, as shown, are somewhat serrated or stepped. In order that these serrations shall be symmetrically disposed, the arrangement of the drive mechanism from shaft 30 to shaft 42 is such that the follower will be advanced only during the period when it is outside of the drum depression.

If it is desired to knit a narrower heel with more pronounced steps, cams are appropriately arranged on drum 15 for cooperation with the nose 113 of lever 112. By actuating lever 112 as the heel is being knitted, the follower may be arrested for a desired period at any position during its cooperation with walls 36 and 37 of the drum depression. By thus arresting the follower, it is obvious that a number of courses may be knitted with the high splice bounded by parallel edges. Under these circumstances, the time taken by the machine in knitting the heel pocket will be sufficient to permit the traveller to move up into cooperating position with walls 38 and 39 so as to be able to control the knitting of a full width double sole. In Fig. 8, B represents the double sole and C the toe guard.

If it is desired to knit a high splice heel similar in design to the cam depression, but smaller than that which would normally result, follower 66 may be enlarged in the manner which has been described above. It will be obvious that if the follower is enlarged, it will remain in the drum depression for a shorter period than under normal conditions, and the width of the high splice section will be correspondingly reduced.

As a further advantage of the present device, plate or flap 117, it will be noted, has a considerable longitudinal extent and can, therefore, cooperate with the pins 17 of a number of rods 14 so as to control, in part at least, the knitting of high splice sections of varied design.

It is to be understood that while I have necessarily described a specific embodiment of my invention, I do not intend to be limited except as determined in the following claims.

I claim:

1. The combination with a circular hosiery knitting machine having a series of needles and a yarn guide adapted to control the feeding of yarn to the needles, of means for controlling the yarn guide including a rotatable drum element having a peripheral depression, a drum follower element adapted to move into and out of said depression upon rotation of the drum element, said follower element being of variable size whereby to vary the period during which it rests in said depression, and means for transmitting vibratory movements of the follower to the yarn guide.

2. The combination with a circular hosiery knitting machine having a series of needles and a yarn guide adapted to control the feeding of yarn to the needles, of means for controlling the yarn guide including a rotatable drum element having a peripheral depression, and a drum follower element adapted to move into and out of said depression upon rotation of the drum element, said follower element being split on a substantially radial line of the drum to form two portions relatively adjustable to vary the period during which the follower element rests in said depression.

3. The combination with a circular hosiery knitting machine having a series of needles and a yarn guide adapted to control the feeding of yarn to the needles, of means for controlling the yarn guide including a rotatable drum element having an elongated axially extending peripheral slot of varying circumferential extent, a drum follower element adapted to move into and out of the drum element, means for displacing one of said elements relative to the other in the axial direction of said drum element, said follower element being of variable size whereby to vary the period during which it rests in said depression at any given longitudinal position of the latter, and means for transmitting vibratory movements of the follower to the yarn guide.

4. In a machine of the class described, a rotating drum having a peripheral depression, and a follower therefor, said follower comprising a pair of nested substantially L-

shaped members, said members bearing on the drum surface to be moved in and out of said depression upon rotation of the drum, said members being relatively adjustable to vary the distance between their foot portions, as and for the purpose described.

5. The combination with a circular hosiery knitting machine having a series of needles and a yarn guide adapted to control the feeding of yarn to the needles, of means for controlling the yarn guide including a rotating pattern drum element having an axially extending peripheral depression, the circumferential extent of said depression being abruptly varied at a predetermined longitudinal position, a follower element for the drum, means for moving one of said elements relatively slowly relative to the other in the axial direction of the drum to bring the follower element and the abruptly varied portion of the drum depression into juxtaposition, and means to relatively rapidly relatively displace the elements to bring the follower element and said abruptly varied portion into cooperating relation.

6. The combination with a circular hosiery knitting machine having a series of needles and a yarn guide adapted to control the feeding of yarn to the needles, of means for controlling the yarn guide including a rotating pattern drum element having an axially extending peripheral depression, the lateral walls of said depression being oppositely circumferentially stepped at a predetermined longitudinal position, a follower element for the drum, means for moving one of said elements relatively slowly relative to the other in the axial direction of the drum to bring the follower element and the stepped portion of the drum depressions into juxtaposition, and means to relatively rapidly relatively displace the elements to bring the follower element and said stepped portion into cooperating relation.

7. The combination with a circular hosiery knitting machine having a series of needles and a yarn guide adapted to control the feeding of yarn to the needles, of means for controlling the yarn guide including a rotating pattern drum element having an axially extending peripheral depression, the circumferential extent of said depression being abruptly varied at a predetermined longitudinal position, a follower element for the drum, screw means for moving one of said elements relative to the other in the axial direction of the drum to bring the follower element and the abruptly varied portion of the drum depression into juxtaposition, and a quick-acting motive device adapted to continue the relative movement of the elements independently of said screw means to bring said follower element and said abruptly varied portion into cooperating relation.

8. The combination with a circular hosiery knitting machine having a series of needles and a yarn guide adapted to control the feeding of yarn to the needles, of means for controlling the yarn guide including a rotating pattern drum element having an axially extending peripheral depression, the circumferential extent of said depression being abruptly varied at a predetermined longitudinal position, a follower element for the drum, screw means for moving one of said elements relative to the other in the axial direction of the drum to bring the follower element and the abruptly varied portion of the drum depression into juxtaposition, and an impact device adapted to continue the relative movement of the elements independently of said screw means to instantaneously bring said follower element and said abruptly varied portion into cooperating relation.

9. The combination with a circular hosiery knitting machine having a series of needles and a yarn guide adapted to control the feeding of yarn to the needles, of means for controlling the yarn guide including a rotating pattern drum element having an axially extending peripheral depression, the lateral walls of said depression being oppositely circumferentially stepped at a predetermined longitudinal position, a follower element for the drum, screw means for engaging and moving one of said elements relative to the other in the axial direction of the drum to bring the follower element and the stepped portion of the drum depression into juxtaposition, means for disengaging said screw means when the elements reach the described relative position, and a quick-acting motive device adapted to continue the relative movement of the elements to bring said follower element and said stepped portion into cooperating relation.

10. The combination with a circular hosiery knitting machine having a series of needles and a yarn guide adapted to control the feeding of yarn to the needles, of means for controlling the yarn guide including a rotating pattern drum element having an axially extending peripheral depression, the lateral walls of said depression being oppositely circumferentially stepped at a predetermined longitudinal position, a follower element for the drum, screw means for engaging and moving one of said elements relative to the other in the axial direction of the drum to bring the follower element and the stepped portion of the drum depression into juxtaposition, means for disengaging said screw means when the elements reach the described relative position, a quick-acting motive device adapted to continue the relative movement of the elements to bring said follower element and said stepped portion into cooperating relation, catch means for retaining

the elements in the last described position, means for releasing said catch means, and spring means for returning the elements to their original relative position.

11. The combination with a circular hosiery knitting machine having a series of needles and a yarn guide adapted to control the feeding of yarn to the needles, of means for controlling the yarn guide including cooperating pattern drum and drum follower elements relatively movable in the axial direction of the drum element, a screw shaft adapted to move one of said elements, means for rotating said shaft, a pin on the relatively movable element adapted to cooperate with the thread of said shaft and means for arresting rotation of said shaft in a predetermined angular position of the latter with the leading end of its thread slightly to the rear of said pin.

12. The combination with a circular hosiery knitting machine having a series of needles and a yarn guide adapted to control the feeding of yarn to the needles, of means for controlling the yarn guide including cooperating pattern drum and drum follower elements relatively movable in the axial direction of the drum element, a screw shaft adapted to move one of said elements, means for rotating said shaft, a pin on the relatively movable element adapted to cooperate with the thread of said shaft, means for arresting rotation of said shaft in a predetermined angular position of the latter with the leading end of its thread slightly to the rear of said pin, and other means operable to arrest rotation of the shaft irrespective of the angular position of the latter.

13. The combination with a circular hosiery knitting machine having a series of needles and a yarn guide adapted to control the feeding of yarn to the needles, of a machine attachment for controlling the yarn guide including a pattern drum having an axially extending peripheral depression, the lateral walls at one end of the depression being oppositely circumferentially stepped, a follower for cooperation with said drum, means for relatively displacing the follower and drum in the axial direction of the latter and substantially throughout the axial extent of said depression, means for transmitting to the yarn guide vibratory movements of the follower induced upon drum rotation to effect feed of the yarn, and means for controlling the relative displacing movement of the drum and follower to cause the yarn guide to feed for a high splice, double sole and toe guard.

14. The combination with a circular hosiery knitting machine having a series of needles and a yarn guide adapted to control the feeding of yarn to the needles, of a machine attachment for controlling the yarn guide including a pattern drum having an axially extending peripheral depression, the lateral walls at one end of the depression lying substantially in axial planes of the drum and being oppositely circumferentially stepped, a follower for cooperation with said drum, means for relatively displacing the follower and drum in the axial direction of the latter and substantially throughout the axial extent of said depression, means for transmitting to the yarn guide vibratory movements of the follower induced upon drum rotation to effect feed of the yarn, and means for controlling the relative displacing movement of the drum and follower to cause the yarn guide to feed for a high splice, double sole and toe guard.

15. The combination with a circular hosiery knitting machine having a series of needles and a yarn guide adapted to control the feeding of yarn to the needles, of means for controlling the yarn guide comprising cooperating pattern drum and drum follower elements relatively movable in the axial direction of the drum element, the follower element being relatively light as compared to the drum element, means for imparting sudden movement to the following element, means for limiting such movement, and means for instantaneously returning the last named element from a limit to an initial position.

16. The combination with a circular hosiery knitting machine having a series of needles and a yarn guide adapted to control the feeding of yarn to the needles, of means for controlling the yarn guide including a pattern drum revolving in constant transaxial planes, a relatively light drum follower bearing against the cam surface to be vibrated upon drum rotation, impact means for moving said follower relative to the drum in the axial direction of the latter, and means for affecting the position of the yarn guide in dependence upon vibratory movement of the follower.

In testimony whereof I have hereunto set hy hand.

EDWARD H. STEERE.