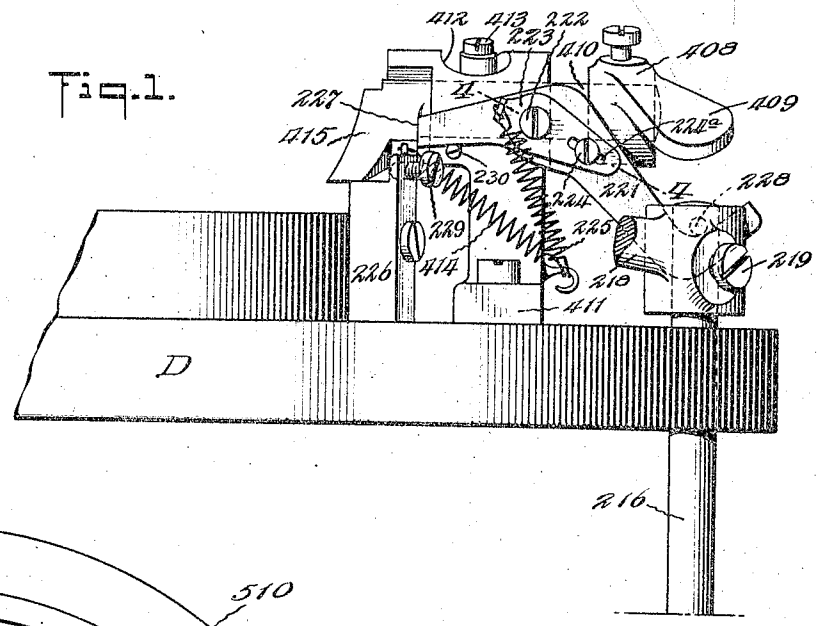
Dec. 21, 1926. 1,611,668

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KNITTING MACHINE

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Fig. 1.



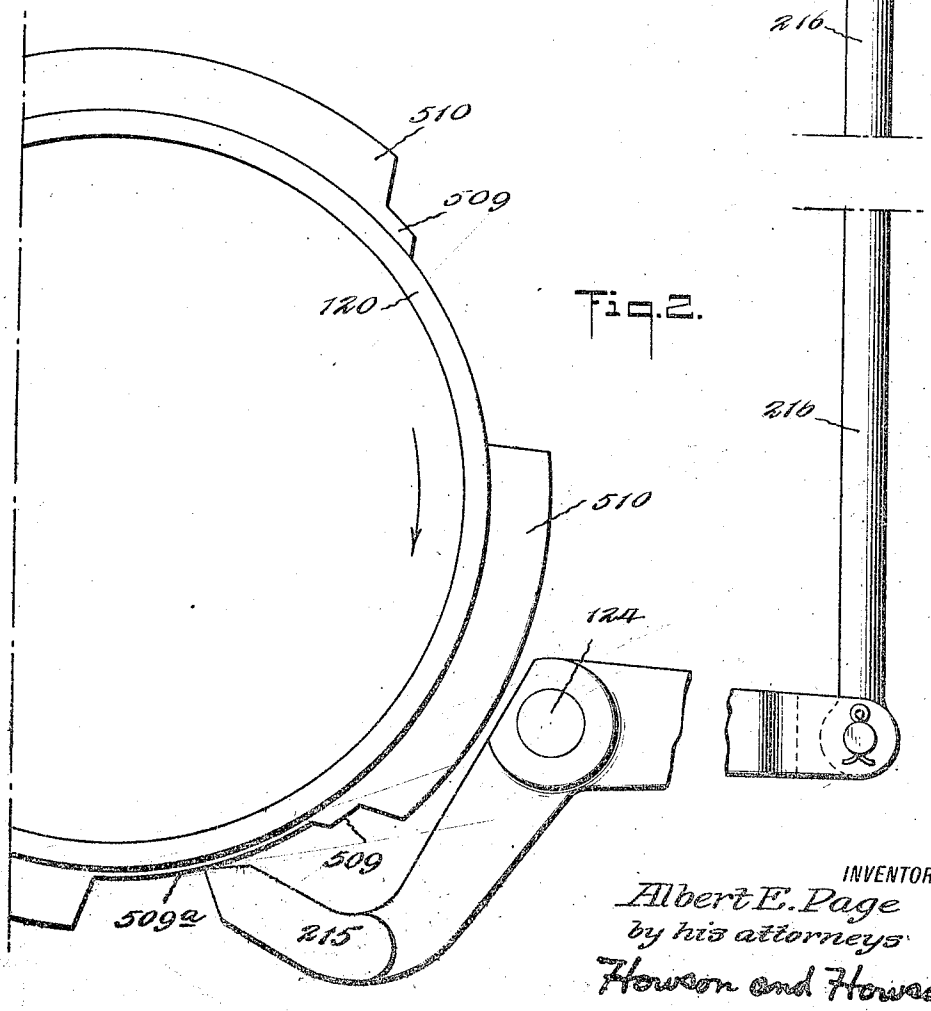


Fig. 2.

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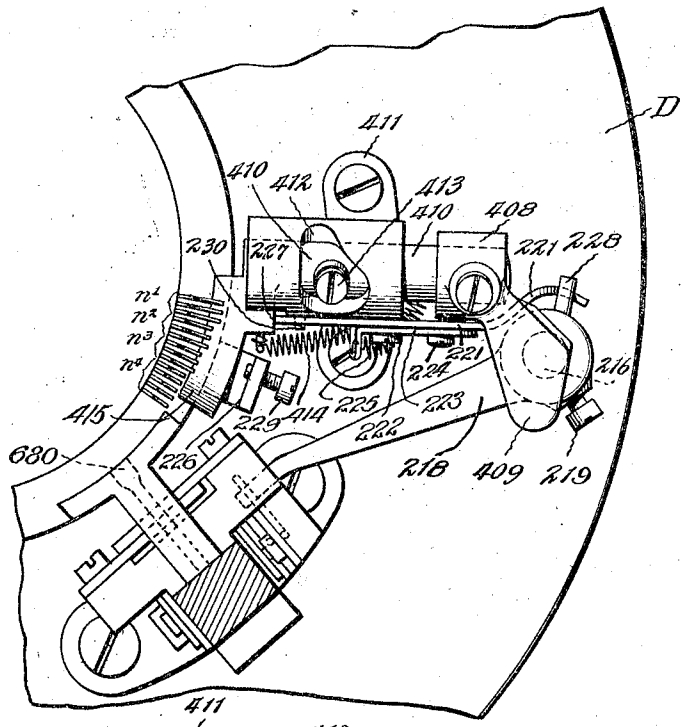
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Fig. 3.



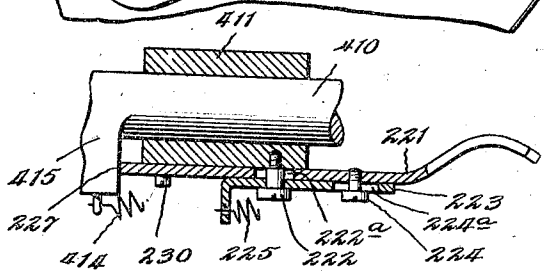


Fig. 4.

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KNITTING MACHINE

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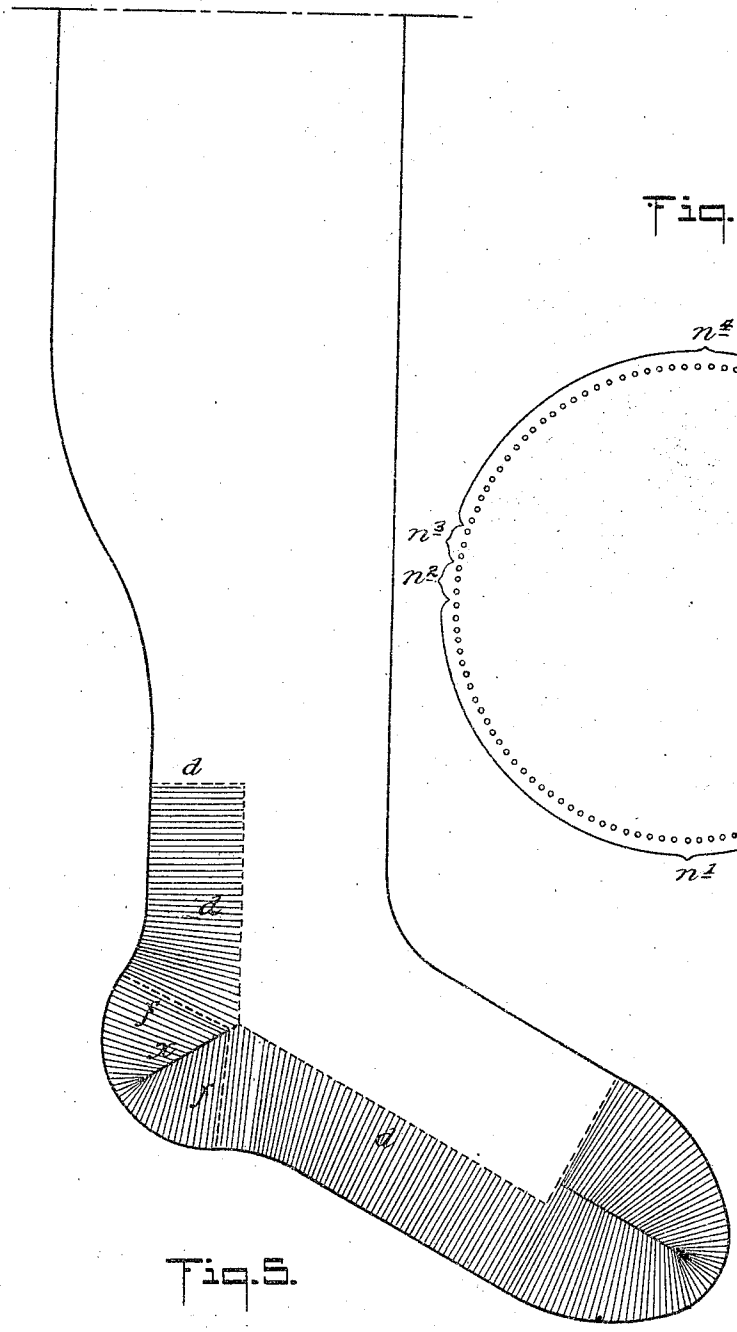


Fig. 5.

Fig. 6.

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UNITED STATES PATENT OFFICE.

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KNITTING MACHINE.

Application filed May 13, 1925. Serial No. 30,025.

My invention relates to circular knitting machines adapted to make seamless hosiery and more particularly to the means for controlling the switch cam. One object of my invention is to provide a machine which will produce a seamless stocking which is more acceptable than those now made. Another object is to effect economy in the production of such stockings, especially when a portion of the stocking is spliced by feeding extra yarn to certain of the needles, as, for instance, to those employed in knitting the rear portion of the ankle, heel and the toe of the stocking.

For purposes of illustration I will show and describe my invention embodied in the well-known Scott & Williams type of automatic hosiery machine for the purpose of making what is known as a small heel.

In the drawings, Fig. 1 is an elevation from the front of the machine showing the switch cam and its control elements made according to my invention;

Fig. 2 is an elevation from the side of the machine showing the main pattern drum and the switch cam lever;

Fig. 3 is a plan view corresponding to Fig. 1 showing the widening picker;

Fig. 4 is an enlarged section of the trigger taken on the line 4—4 of Fig. 1;

Fig. 5 is a side view of the foot and ankle portions of a stocking produced on my machine; and

Fig. 6 is a diagram of the circle of needles in my machine.

The ordinary method of knitting a seamless stocking upon a circular knitting machine is to start the knitting upon all of the needles of the machine and to produce tubular web, by round and round knitting upon said needles, until the point is reached at which the heel is to be produced. A switch cam is then dropped down causing all the needles having high butts (i. e., the half of the circle of needles corresponding to the instep portion of the web) to ride up over the switch cam completely out of action though retaining their loops. Reciprocating knitting is then conducted upon the remaining or short butt needles, with alternate widening and narrowing of the web caused by the usual narrowing and widening pickers.

The effect of this is to produce upon the rear half of the tubular leg web a pocket having on each side tapered webs united on the diagonal line x extending from the upper corner of the pocket down towards the center of the same.

The heel pocket being completed, the switch cam is swung up to bring the instep or high butt needles down into action again, and round-and-round knitting is resumed for the production of the foot web of the stocking. Upon completion of said foot web a seamless toe pocket is formed upon the end of the same by a method of knitting similar to that resorted to for the production of the heel, the terminal stitches around the mouth of this toe pocket being united to the terminal stitches at the front end of the instep web of the foot in order to close the toe and complete the stocking.

I have invented a machine which knits a stocking having a much smaller heel than usual by using considerably less than one-half of the circle of needles for the production of the heel. I prefer to use needles having four lengths of butts in carrying out my invention, for a reason which will be mentioned later. In the drawings I have shown a half circle of needles n^1 having high butts, three needles n^2 having medium butts at each end of the semi-circle of high butt needles, three needles n^3 having medium short butts next to each group of medium butt needles, the balance being needles n^4 having short butts.

For the purpose of throwing into and out of action such needles as are not needed during the formation of the heel and toe pockets I provide the usual switch cam 415 mounted in a bracket 411 on the bedplate D by means of an actuating spindle 410 lying in the bracket 411. There is a cam or roller slot 412 in the bracket in which lies a screw 413 having a roll thereon. The slot 412 is so shaped that when the switch cam is turned upward the screw 413 forces the spindle and switch cam toward the needle butts, but the slot does not prevent limited rotary movement in that forward position. For the purpose of turning the spindle 410 a collar 408 with a wing 409 is mounted on the rear end of the spindle in such a manner that the wing

overlies a vertical gravity rod 216 passing down through an opening in the bedplate D to one end of a lever 215 pivoted on a stud 124 projecting from the frame of the machine. The other end of this lever 215 projects into the path of cams 509, 509ª and 510 on the usual main pattern drum 120. These cams are of different heights, that numbered 509ª being very low, that numbered 509 being medium, and that numbered 510 being of full height. These cams are all in one path on the drum. The cam control mechanism which I have just described serves, amongst other things, to raise the switch cam to its up position where it can bring down such needles as have been out of action in the upper position. There is a spring 414 stretched between the switch cam bracket 411 and the switch cam itself which tends both to keep the latter in its down position as determined by the screw 413 and slot 412 and by a stop post 226 mounted vertically on the bedplate D, and also to keep it retracted as far as possible from the needle butts. The stop post also serves as horizontal stop for the switch cam when in its retracted position. This horizontal adjustment is obtained by a screw 229 passing horizontally through a vertical lug on the top of the stop post and should be such that when the cam rests against the screw, the former lies in the path of the long butt needles only.

As is customary in the Scott & Williams type of machine, (see the R. W. Scott Patent 1,152,850 dated September 7, 1915), the gravity rod 216 also operates the dropper or widening picker 680 (Fig. 3) by means of a dropper finger 218 fixed above the bedplate D on the gravity rod 216 by a set screw 219.

I provide the following mechanism to cooperate with the elements already described in obtaining the manipulation of the switch cam necessary to the production of the small heel. Projecting horizontally from the sleeve of the dropper finger 218 is a pin 228, and taking under the pin is the lower end of a trigger 221. This trigger 221 is pivoted on the switch cam bracket 411 by a shouldered pivot screw 222 (see Fig. 4).

In order to make this trigger horizontally adjustable with relation to the switch cam I make the opening in the trigger through which the pivot screw 222 passes in the form of a slot 222ª, and fasten an adjusting plate outside the trigger by means of the pivot screw 222 and an adjusting screw 224 (see Fig. 4). While the pivot screw lies in a slot in the trigger it passes through a fitted hole in the adjusting plate, and in distinction thereto, the adjusting screw 224 is threaded in the trigger, does not take into the switch cam bracket and lies in a slot 224ª in the adjusting plate. This alternation of slots and fitted holes with the pivot screw taking into the switch cam bracket at once gives the trigger a pivot point and a simple adjustment of the length of its arms all in a very small space.

There is a lug 227 on the switch cam which is horizontally opposite the near end of the trigger when the cam is down. This end of the trigger is adapted to act as a stop against the pull of the switch cam spring 414 and to hold the cam in an intermediate retracted position. There is a spring 225 tending to hold the trigger down in the position just described where it rests against a trigger stop 230 on the switch cam bracket (see Fig. 3). The adjustment of the trigger with relation to the lug 227 on the switch cam is such that when the lug rests against the end of the trigger the switch cam lies in the path of the butts of medium short butt needles n^3 and medium butt needles n^2 as well as those having long butts. The gravity rod 216 is so located with respect to the pivot screw of the trigger that when the rod is pulled down till the sleeve of the dropper finger 218 touches the bedplate D the trigger is tipped up by pin 228 till it slips off the lug 227 and the switch cam is retracted by spring 414 till it engages only the long butt needles n^1. When the drum cam 510 is under the lever 215 the adjustment is such that the switch cam is in its up position but when the lever rests on cam 509 or 509ª or the surface of the main pattern drum 120 the switch cam is in its down position. When the main pattern drum is racked till the switch cam lever is off all three cams then the trigger releases the switch cam to its fully retracted position and the widening picker or dropper is lowered to inoperative position. By the above construction the gravity rod is given four positions for the control of the dropper and switch cam combined. It will be observed that while passage of the rod 216 between the intermediate positions caused by cams 509ª and 509 moves the widening picker or dropper, this passage in no way affects the switch cam. On the other hand the dropper is not affected by any other movements of the rod.

I shall now describe the operation of my machine when making the foot and feeding splicing yarn to a lesser number of needles than usual.

When making the ankle the needle cylinder is rotating and the main or body yarn is fed to all the needles. The additional or splicing yarn is fed to the short butt needles n^4 and medium short butt needles n^3, these needles knitting for the back of the stocking but constituting less than half of the circle of needles (see Fig. 6). The separation of the needles n^3 and n^4 from the needles n^1 and n^2 in order that the latter may not take the splicing yarn can be obtained by

the use of a thin fixed cam on the following stitch cam adapted to engage the butts on the needles n^1 and n^2 and draw those needles down before they engage that yarn, but to miss the shorter butts on needles n^3 and n^4. Such an arrangement is shown and described in the patent to Robert W. Scott Number 1,256,062 dated February 12, 1918. At this time the switch cam lever 215 is on cam 510 and the gravity rod 216 is at its highest point and the widening picker or dropper is in its highest position but idle because there have been no needle butts in the upper path to encounter it since the completion of the heel. As the machine changes to reciprocating knitting going into the heel the switch cam lever 215 drops down onto cam 509^a and the switch cam is lowered till it contacts with the upright stop post 226 and the end of the trigger 221 (see Figs. 1, 2 and 3). In this position the switch cam raises the long butt needles n^1, the medium butt needles n^2 and the medium short butt needles n^3 out of action, and the heel is formed by the usual alternate narrowing and widening but only on the short butt needles n^4. At the same time that the switch cam was lowered the widening picker or dropper was lowered to an idle intermediate position between the upper and lower paths of the needle butts, but when it is time for the widening picker or dropper to come into action to widen the web the main pattern drum moves cam 509 under the lever 215 which lifts the rod 216 sufficiently to release the widening picker or dropper to the upper needle butt path, but not far enough to turn the switch cam up. When all the short butt needles n^4 have been restored to action by the widening picker or dropper the pattern drum 120 moves again bringing the cam 510 under the lever 215 and causing the switch cam to bring down the medium short butt needles n^3, the medium butt needles n^2 and the long butt needles n^1. The machine simultaneously resumes rotary knitting and the foot is formed with the splicing yarn fed to the medium short butt needles n^3 as well as the short butt needles n^4. Upon going into the toe the lever 215 rides off the cam 510 onto drum 120, the rod 216 lowers the widening picker or dropper finger 218 to the bedplate tripping the trigger and releasing the switch cam which is at once pulled to its fully retracted position where it comes in contact with the screw 229 in the post 226, the screw 413 resting on the edge of the slot 412, and the cam 415 resting on the top of post 226 during the movement. In this position the switch cam raises only the long butt needles n^1 which form just half the circle of needles on the instep side. The pocket is formed by the same alternate narrowing and widening of the fabric, but the operation is performed on half the needles instead of less than half as was done at the heel.

It will be obvious that a small heel may be produced by using only three lengths of needle butts, though by using four lengths the reinforced portion of the stocking is extended say three wales on each side beyond the corner of the heel joint into the instep portion, thus strengthening said corner, the outline of the reinforced portions of the sole and ankle being represented by the dotted lines *d* in Fig. 5 and the outline of the heel by the dotted lines *f*.

By the compact construction which has been described I am able to add an additional function to the switch cam and still have a single cam-controlled means to control the widening picker or dropper and switch cam.

What I claim is:

1. In a knitting machine, a switch cam adapted to raise and lower needles, in combination with a longitudinally movable rod adapted to move the switch cam radially and rotatably, and means controlled by said rod adapted to hold said switch cam in two retracted positions.

2. In a knitting machine, a switch cam adapted to raise and lower needles, in combination with a longitudinally movable rod adapted to move the cam toward the needles and raise same, means tending to retract and lower the cam, and trigger means adapted to hold said cam in an intermediate retracted position, said rod being adapted to trip said trigger means.

3. In a knitting machine, a switch cam adapted to raise and lower needles and to be placed in two adjustable retracted positions, a spring tending to retract said cam, and a trigger tending to hold said cam in an intermediate retracted position, in combination with a single cam controlled means adapted to actuate said cam and trip said trigger, substantially as described.

4. In a knitting machine, a switch cam adapted to raise and lower needles, a widening picker, and a single cam-controlled means adapted to control said widening picker and switch cam, in combination with trigger means adapted to hold said cam in an intermediate retracted position, said cam-controlled means being adapted to trip said trigger means.

5. In a knitting machine, needles, a switch cam adapted to raise and lower needles, a spring tending to retract said cam, and a widening picker, in combination with a longitudinally movable rod and trigger means adapted to hold said switch cam in an intermediate retracted position with respect to said needles, said rod being adapted to position said widening picker, and in passage to one position to actuate the switch cam, in passage to another to permit the switch cam

to be moved by the spring, and in passage to another to trip said trigger means.

6. In a knitting machine, a switch cam adapted to raise and lower needles and to be placed in two adjustable retracted positions and a widening picker, in combination with a single cam-controlled means having four positions and adapted to actuate said widening picker and switch cam, passage of said means between its two intermediate positions affecting only said widening picker, and its other movements affecting only said switch cam; substantially as described.

In testimony whereof I have signed my name to this specification.

ALBERT E. PAGE.