Nov. 8, 1927. 1,648,083

C. WALTON ET AL

FEED CONTROLLING MECHANISM FOR CIRCULAR KNITTING MACHINES

Filed April 18, 1922 3 Sheets-Sheet 1

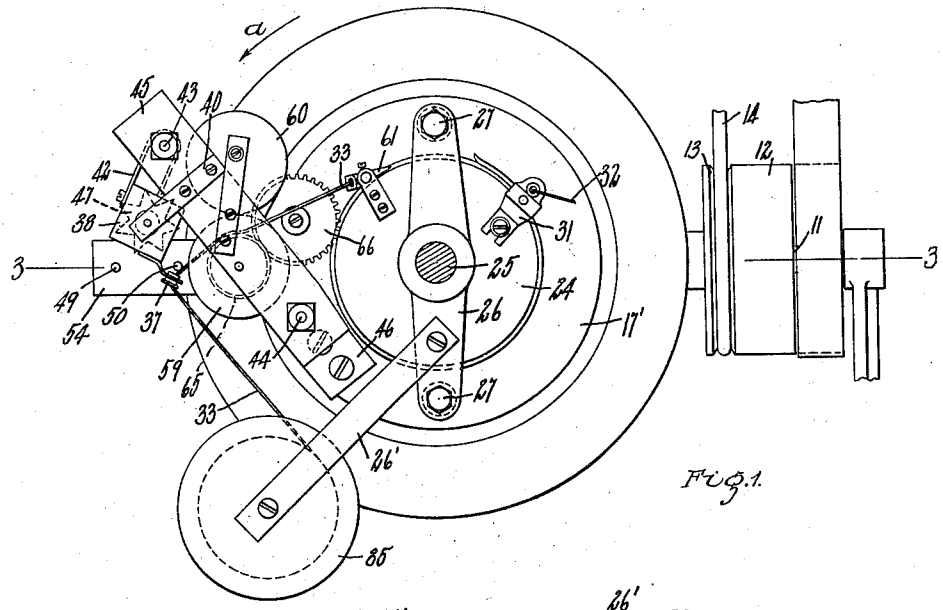


FIG. 1.

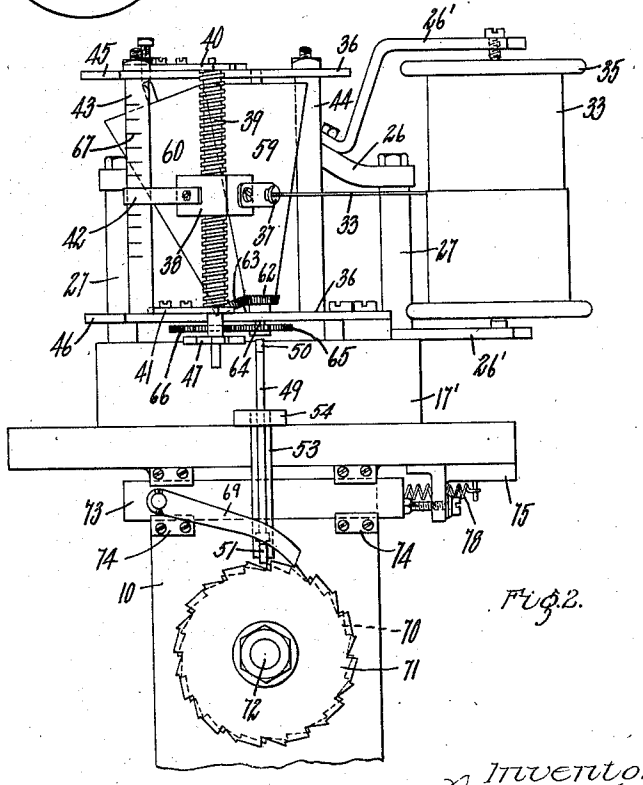


FIG. 2.

Inventors:
Charles Walton
Olive H. Walton
by their attorney, Charles S. Fooding

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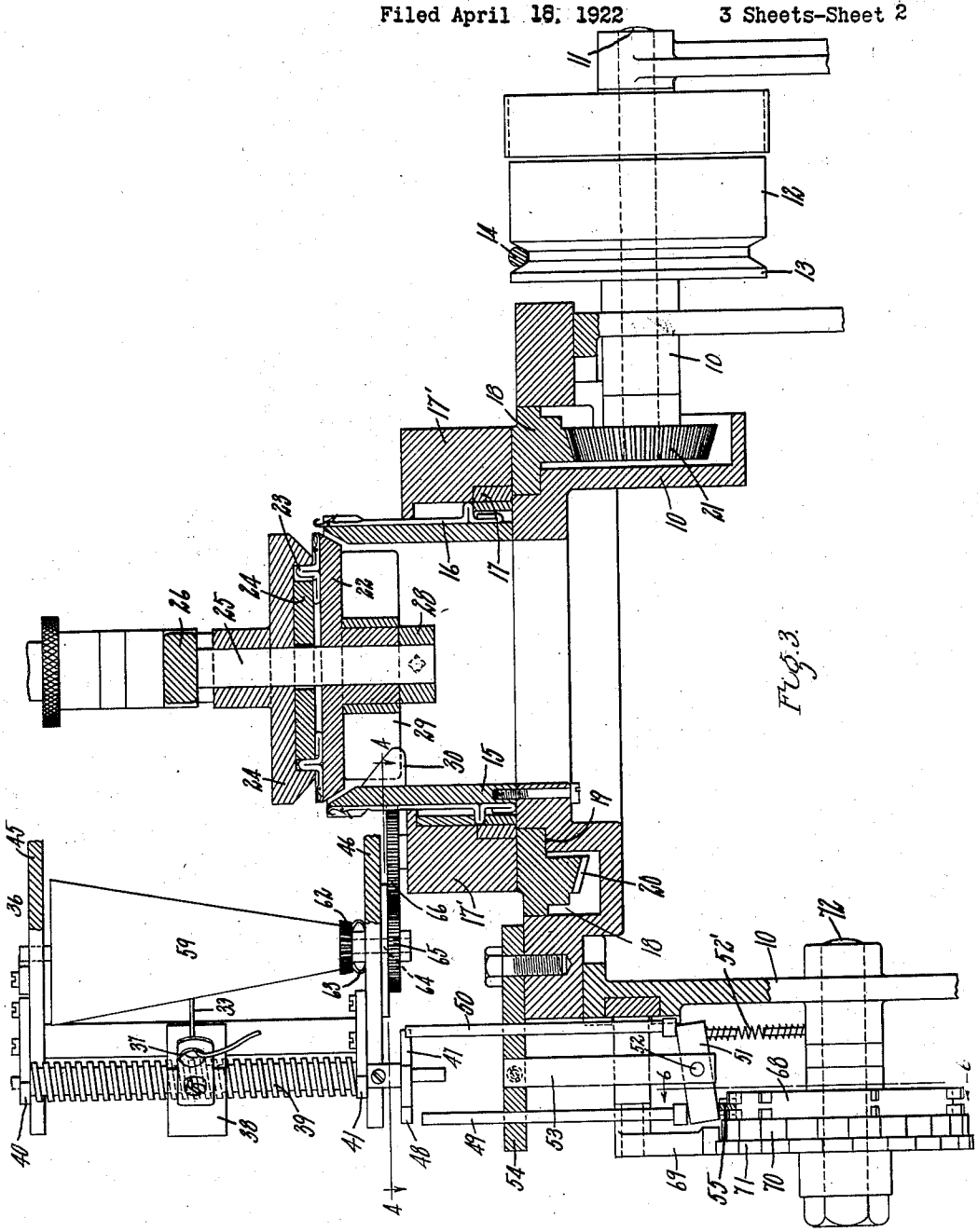


Fig. 3.

Inventors:
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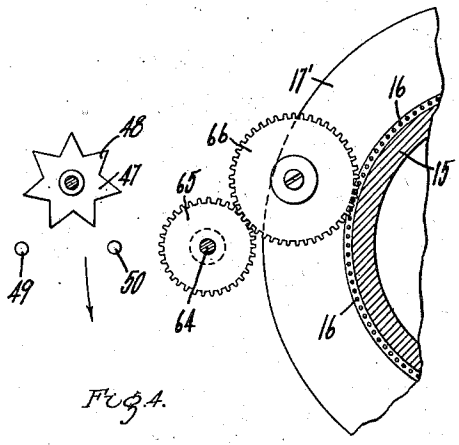


Fig. 4.

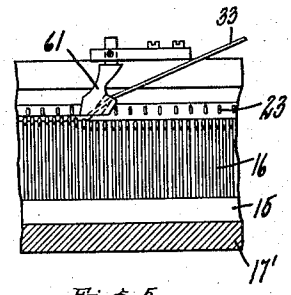


Fig. 5.

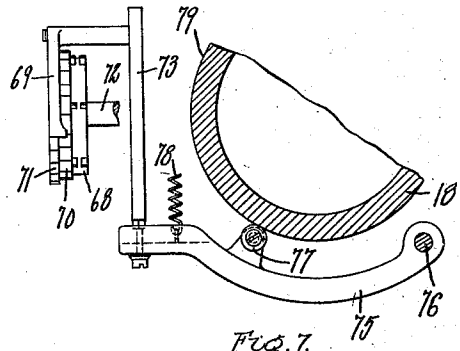


Fig. 7.

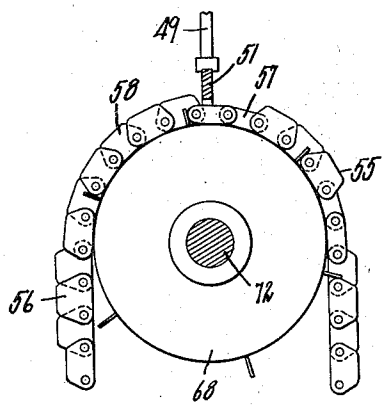


Fig. 6.

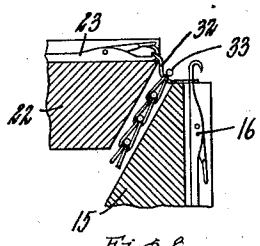


Fig. 8.

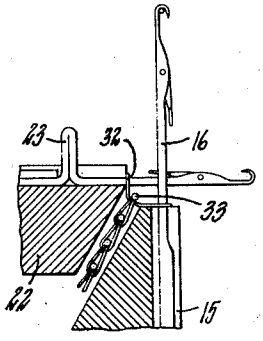


Fig. 9.

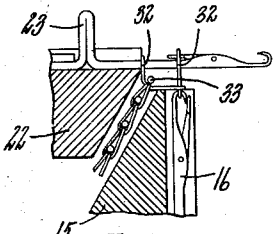


Fig. 10.

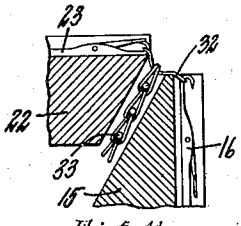


Fig. 11.

Inventors:
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Patented Nov. 8, 1927. 1,648,083

UNITED STATES PATENT OFFICE.

CHARLES WALTON AND OLIVER H. WALTON, OF NEEDHAM HEIGHTS, MASSACHUSETTS; SAID CHARLES WALTON ASSIGNOR TO SAID OLIVER H. WALTON.

FEED-CONTROLLING MECHANISM FOR CIRCULAR-KNITTING MACHINES.

Application filed April 18, 1922. Serial No. 554,969.

This invention relates to circular machines for knitting seamless elastic stockings such as are used by persons having varicose veins and for other supporting purposes.

The object of the invention is to provide a circular knitting machine which will knit a stocking leg in the usual well-known manner, and at the same time automatically knit therein a woof consisting of an elastic strand, preferably rubber, covered with thread. This elastic strand is a continuous piece which extends around the stocking leg and is enclosed in the yarn loops of the knitted fabric.

In the operation of the machine the stocking is shaped of larger diameter in some portions than in others to fit the leg of the wearer by a mechanism which controls the feed of the elastic strand to the fabric so that in some portions, namely, the narrow portions, the tension on the elastic strand is greater than in others, and in the portions of the stocking where the elastic strand is under greater tension, the diameter of the stocking will be less on account of the elastic strand drawing the knitted loops closer together.

The invention consists, therefore, in a circular knitting machine which is provided with mechanism to feed a continuous elastic strand into the knitted fabric and furthermore, the invention consists in the means for so controlling the feed of the elastic strand that the stocking will be automatically shaped to any desired pattern or form, all as hereinafter set forth in the specification and particularly as pointed out in the claims.

Referring to the drawings:

Figure 1 is a plan view of our improved knitting machine.

Fig. 2 is a detail side elevation of the same as viewed from the left of Figure 1.

Fig. 3 is a sectional elevation taken on line 3—3, Figure 1.

Fig. 4 is a sectional plan somewhat diagrammatic in character taken on line 4—4, Fig. 3.

Fig. 5 is a detail elevation of a portion of the needle cylinder and strand guide.

Fig. 6 is a sectional elevation taken on line 6—6, Fig. 3, and illustrating the pattern chain.

Fig. 7 is a detail plan of the mechanism for rotating the pattern wheel with a cam, partly shown in section and with the pivot of a cam lever also shown in section.

Figs. 8, 9, 10 and 11 are detail sectional elevations illustrating the manner in which the stitch is formed.

Like numerals refer to like parts throughout the several views of the drawings.

In the drawings, 10 is the frame of the machine, in which is rotatably mounted a driving shaft 11, said shaft being driven by a pulley 12 which drives a pulley 13 connected by a belt 14 to the take-up mechanism not shown in the drawings, but of usual construction. A primary needle cylinder 15 is fastened to the frame 10 and is provided in the usual manner with vertical sliding needles 16 which are actuated by cams 17. The cams 17 are fastened to a cam cylinder 17′ which is fastened to a running ring 18 which is rotatably mounted upon the frame in an annular bearing 19 and is provided with bevel gear teeth 20 which mesh into a bevel gear 21 fast to the shaft 11, and by this means the running ring 18 is rotated about the needle cylinder 15 with which it is concentric, and the cams 17 impart a vertical movement to the needles 16 in the usual well-known manner.

In this embodiment of our invention we utilize, in combination with the stationary needle cylinder, a needle dial 22 upon which are slidably mounted needles 23, said needles being moved slightly toward and away from the axial center of the dial 22 by a cam 24 which is fastened to a vertical shaft 25. The shaft 25 is rotated by a revolving frame 26 which is fastened by standards 27 to the cam cylinder 17′. The dial 22 is supported upon the shaft 25 and also upon a collar 28 which is fastened to said shaft. The dial is prevented from rotating by wings 29 fastened thereto and engaging ears 30 on the stationary needle cylinder 15. A thread guide 31 is fastened to the cam 24 and guides the thread 32 from the bobbins not shown in the drawings, but supported in the usual manner, above the machine to the needles 16 of the primary cylinder.

All of the mechanism thus far described is old and well known in the art and is of the usual construction of latch needle cylinder and dial cylinder knitting machines.

The novel mechanism of our invention, whereby the elastic strand is fed to the

needles and knitted into the fabric, will now be described. An elastic strand 33 which is of any usual and suitable construction, but preferably consists of a rubber core surrounded by a covering of thread, see Figs. 1 and 2, is fed from a bobbin 35 supported on arms 26′ fast to the rotary frame 26 and rotating therewith, and said elastic strand is fed from the bobbin through a guide 37 which is fastened to an interiorly screw-threaded traveller 38 which has screw-threaded engagement with a vertical screw 39 rotatably mounted at its opposite ends in plates 40 and 41 which are fastened to an auxiliary frame 36. The traveller 38 is prevented from rotating upon the screw 39 by a U-shaped guide member 42, one end of which is fastened to said traveller and the central portion of which forms a sliding contact with a standard 43 which, together with a standard 44 and upper and lower plates 45 and 46, constitute the auxiliary frame 36. An intermittent rotary motion is imparted to the screw 39 in opposite directions by a star wheel 47 which is fast to the lower end of said shaft and provided with teeth 48, see Fig. 4. The running ring 18 and the frame 26, together with the auxiliary frame 36, rotate in a counterclockwise direction and the star wheel 47 is rotated in a clockwise direction by the teeth 48 engaging a contact rod 49, and in a counterclockwise direction by another contact rod 50. This result is accomplished by raising the contact rod 49 into the path of the star wheel, or by lowering said contact rod out of the path of the star wheel and raising the contact 50 into the path of said wheel, and both of said contacts may be lowered out of the path of the star wheel when it is desired that the star wheel should remain stationary and therefore the screw 39 remain stationary. The contact rods 49 and 50 are positioned as hereinbefore set forth by means of a lever 51 pivoted at 52 to a bracket 53 fast to a plate 54 which in turn is rigidly fastened to the frame of the machine, see Fig. 3. The lever 51 is tipped at intervals upon its pivot 52 by a pattern chain 55 against which the outer end of the lever is held by a spring 52′. The pattern chain is provided with links of different heights. When the links 56 engage the lever 51 it is lifted at the extreme outer end thereof and this raises the contact rod 49 into the path of the star wheel 47, so that when the star wheel strikes it, it will rotate the same in a clockwise direction. At the same time the contact rod 50 is lowered out of the path of the star wheel 47. In the position shown in Fig. 3 the lever has its outer end contacting with a link 57 which is the lowest link of the pattern chain and under these conditions the rod 50 is raised into the path of the star wheel and the rod 49 is dropped downwardly out of the path of said wheel. When the lever 51 engages the links 58 it is positioned by them in an intermediate position and the rods 49 and 50 are then both positioned out of the path of the star wheel 47. Thus it will be seen that the traveller 38 and the elastic strand guide 37 fast thereto may be raised intermittently or lowered intermittently or remain in a stationary position, as may be desired, by the operation of the star wheel, the contact rods 49 and 50 and the pattern chain hereinbefore described.

The elastic strand 33 passes from the strand guide 37 between the two vertical conical feed rolls 59 and 60 and from thence through another elastic strand guide 61 to the needles of the primary cylinder. The elastic strand guide 61 is fastened to the cam 24 and rotates therewith. The feed rolls 59 and 60 are substantially duplicates of each other and are rotatably mounted in the auxiliary frame 36. A rotary motion is imparted to the conical feed rolls by bevel gears 62 and 63 which are fastened to the feed rolls 59 and 60 respectively and mesh into each other. The shaft 64 extends downwardly from the lower end of the feed roll 59 and is rotatably mounted in the auxiliary frame 36. At the lower end of the shaft 64 is fastened a gear 65 which meshes into another gear 66 rotatably mounted upon the cam cylinder 17′ and meshing into the primary needles 16 whereby when the machine is in operation the gear 66 is rotated by the needles as it revolves around the needle cylinder and this imparts a rotary motion to the gear 65 and to the gears 62 and 63. The standard 43 is provided with graduations 67 and constitutes a scale indicating the diameter of the tube which is being knitted when the upper edge of the U-shaped member 42 is in alignment therewith, for the diameter of the tube will vary according to the position of the upper edge of the U-shaped member 42, which when varied in position, varies in like manner the position of the strand 33. The U-shaped member performs, therefore, not only the function of a guide to prevent the traveller 38 from rotating, but also performs the function of an indicator arm, so that the operator of the machine can tell just what diameter of tube he is knitting on the machine and before threading up the machine the traveler 38 can be raised or lowered to bring the upper edge of the member 42 in alignment with any desired index line upon the indicator rod 43. The pattern chain 55 is mounted upon a pattern wheel 68 which has an intermittent rotary motion imparted thereto by a pawl 69 and ratchets 70 and 71 in a manner well known to those skilled in this art. The pattern wheel 68 and the ratchets 70 and 71 are rotatably mounted upon a stationary shaft 72 mounted upon the frame 10.

The pawl 69 is pivotally mounted upon a slide 73, Figs. 2 and 7, and said slide is mounted to slide upon the frame of the machine in ways 74. The slide 73 has a reciprocatory motion imparted thereto by a lever 75 pivoted at 76 to the frame of the machine and having a cam roll 77 rotatably mounted thereon, which is held by a spring 78 in contact with the periphery of a cam 79 forming a portion of the running ring 18.

The general operation of the mechanism hereinbefore specifically described is as follows:—Assuming the parts to be in the relative positions illustrated in Figs. 1, 2 and 3, yarn will be fed to the needles and knitted in the usual manner in machines of this character. As the frame 26 rotates in the direction of the arrow *a*, Fig. 1, the elastic strand 33 will be fed through the guide 37 between the feed rolls 59 and 60, through the guide 61 and laid upon the loops which are supported upon the primary and secondary needles when the needles are in the respective positions illustrated in Fig. 8, it being understood that at this time the primary needles are lowered and the dial needles held back by their respective cams properly designed to position said needles as illustrated in Fig. 8. The primary and dial needles are then advanced to the positions illustrated in Fig. 9. The next step in the operation of knitting positions the needles as illustrated in Fig. 10 with the primary needles laying the loop on the secondary needles. The next position illustrates the dial needles withdrawn, as in Fig. 11, thus laying the loops around and enclosing the elastic strand in the knitted fabric. During the knitting operation the feed of the elastic strand is controlled by the mechanism hereinbefore described, that is, when it is desired to knit a straight portion on the stocking or one of the same diameter throughout its length, the feed rolls which control the elastic strand will feed an equal amount of the same to the needles and the guide 37 will remain stationary, the contact rods 49 and 50 being positioned out of the path of the star wheel 47. If it is desired to hold the elastic strand back in order to decrease the diameter of the stocking which is being knitted, the contact rod 50 will be raised to the position illustrated in Fig. 3 and this will cause the traveller 38 and the thread guide 37 to move downwardly bringing the elastic strand 33 into contact with portions of the feed rolls 59 and 60 which are smaller in diameter, and thus a shorter length of the strand 33 will be fed to the needles during each rotation of the cam cylinders. If it is desired to increase the diameter of the tube which is being knitted, the rod 49 will be raised to bring it into the path of the star wheel 47 and the rod 50 will be lowered to move it out of the path of said star wheel then the star wheel and the screw will be rotated in a clockwise direction and the traveller 38 will be moved upwardly together with the strand guide 37, so that the strand 33 will be moved longitudinally of the feed rolls 59 and 60 and relatively to both of said rolls, bringing it into contact with the peripheries of said rolls, where they are of larger diameters than before, in which case there will be a greater length of the elastic strand fed to the needles at each rotation of the cam cylinder, and therefore a larger diameter of tube will be knitted.

It will be understood that the speed at which the mechanism operates and at which the feed rolls rotate is always the same, and that the difference in length of the elastic strand which is fed to the needles is obtained by positioning said strand at different points longitudinally of both feed rolls, whereby although the speed at which the feed mechanism operates is the same, the length of strand which is fed to the needles may be increased or decreased accordingly as the strand is positioned nearer the tops or bottoms of the feed rolls 59 and 60.

We claim:

A circular knitting machine having, in combination, means for guiding an elastic strand to the knitting mechanism, a pair of conical feed rolls for controlling the feed of the elastic strand to the knitting mechanism, a guide adapted to guide said strand between said feed rolls, a screw adapted to move said strand guide longitudinally of and relatively to said feed rolls, a star wheel fast to said screw, a rotary frame upon which said parts are mounted, a pair of contact rods slidably mounted upon a stationary frame and means to move each of said contact rods independently and at predetermined times into and out of the path of said star wheel, whereby an intermittent rotary motion may be imparted to said screw.

In testimony whereof we have hereunto set our hands.

CHARLES WALTON.
OLIVER H. WALTON.