W. FISCHER.

KNITTING MACHINE.

APPLICATION FILED OCT. 26, 1914.

1,309,124.

Patented July 8, 1919.

3 SHEETS—SHEET 1.

Fig. 1.

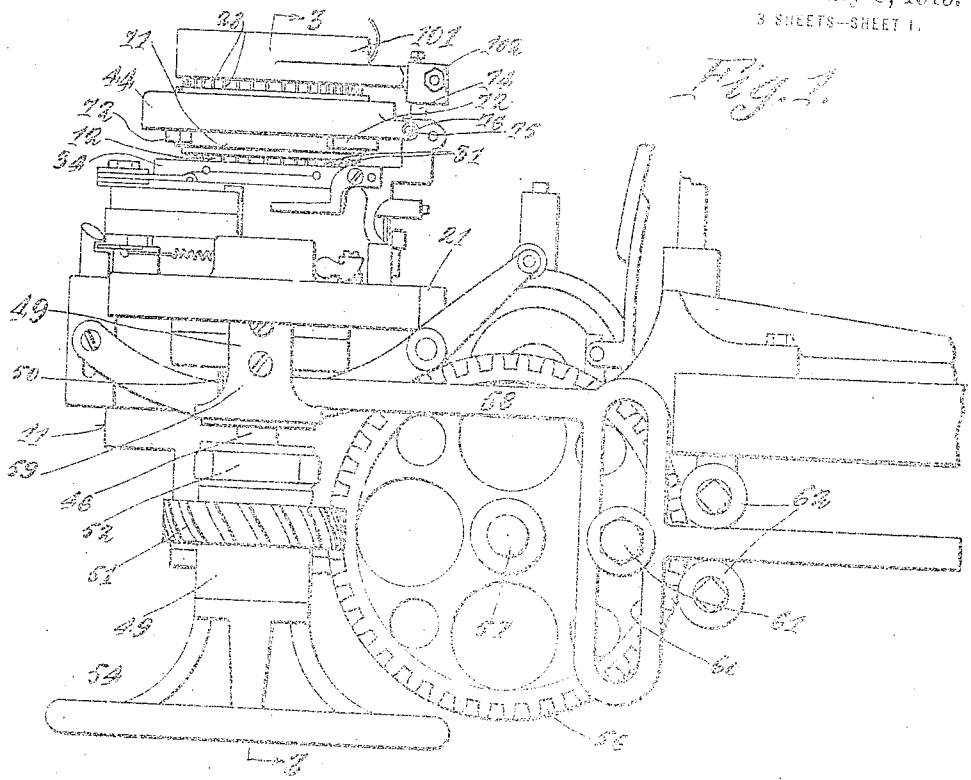
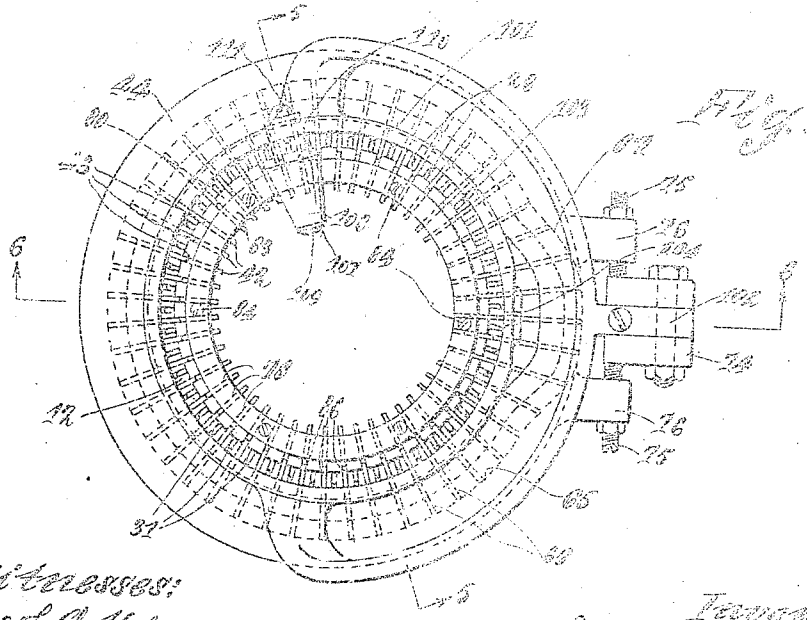


Fig. 2.



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3 SHEETS—SHEET 2.

Fig. 3.

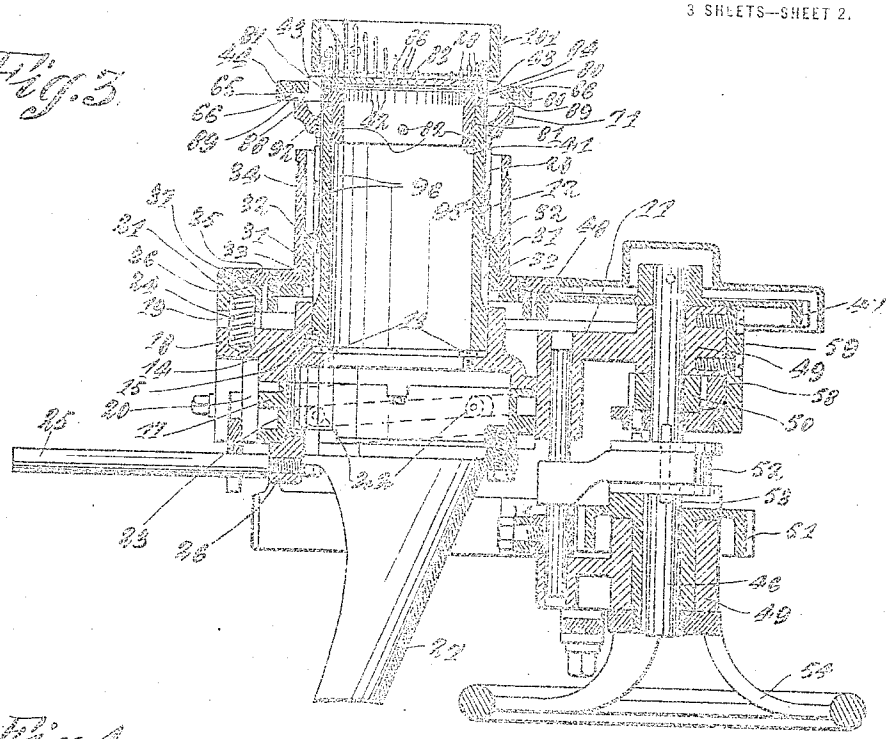


Fig. 4.

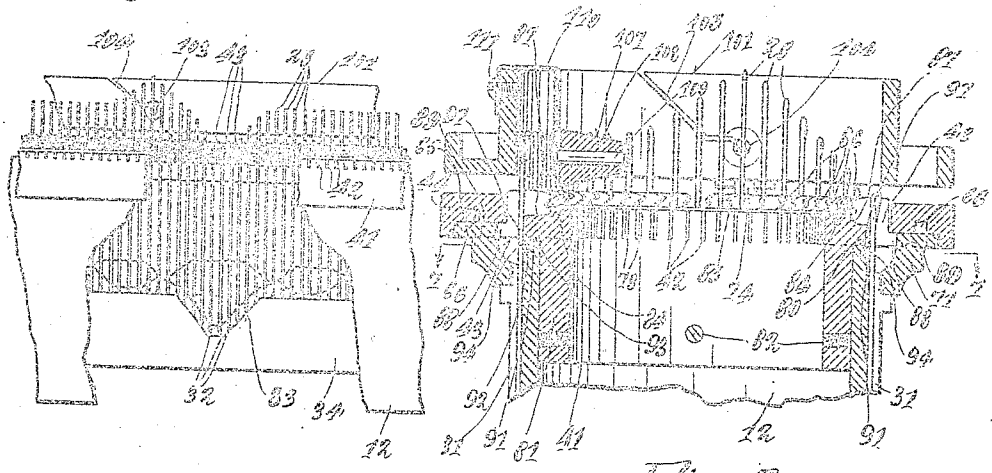


Fig. 5.

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3 SHEETS—SHEET 3.

Fig. 7.

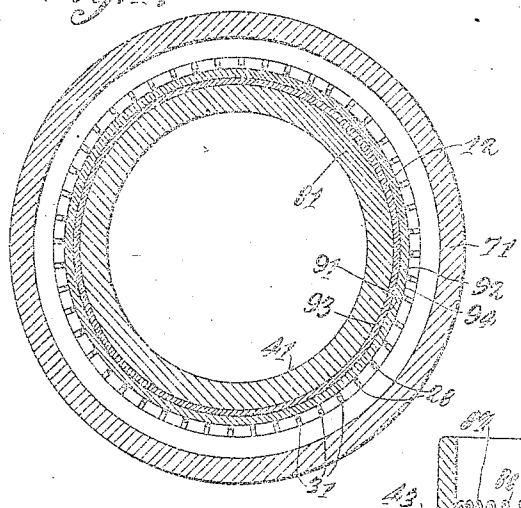


Fig. 8.

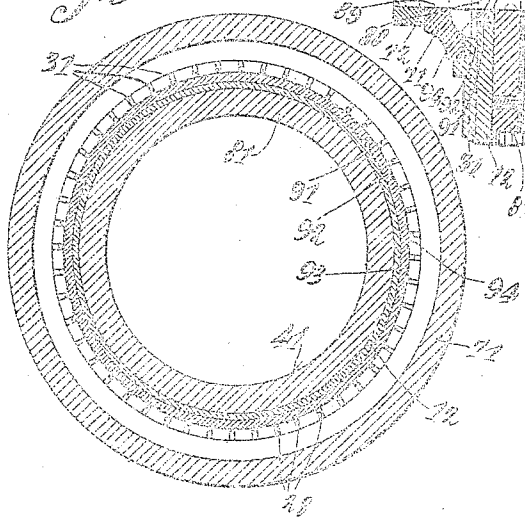
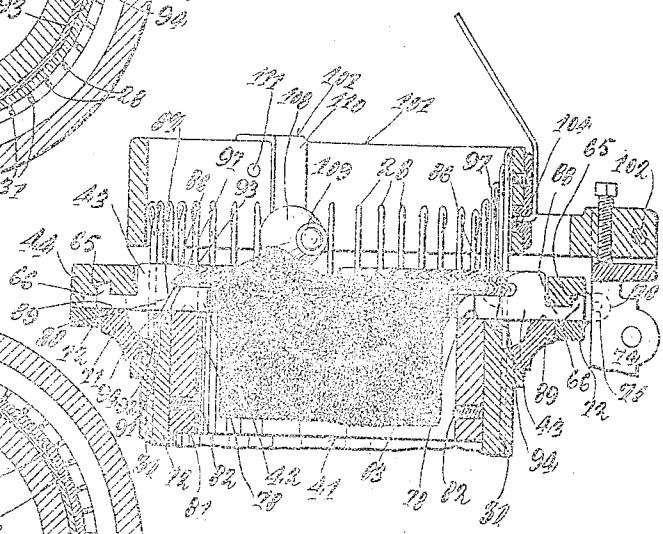


Fig. 6.



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UNITED STATES PATENT OFFICE.

WILLIAM FISCHER, OF NEW RICHMOND, OHIO, ASSIGNOR OF ONE-HALF TO LOUIS BENTKENSTEIN, OF NEW RICHMOND, OHIO.

KNITTING-MACHINE.

1,309,184. Specification of Letters Patent. Patented July 8, 1919.

Application filed October 26, 1914. Serial No. 868,604.

To all whom it may concern:

Be it known that I, WILLIAM FISCHER, a citizen of the United States, residing at New Richmond, in the county of Clermont and State of Ohio, have invented certain new and useful Improvements in Knitting-Machines, of which the following is a specification.

My invention relates to circular knitting machines employed primarily in knitting stockings and like articles. Knitting machines of this character ordinarily comprise a pair of cylinders, one of which is a needle-cylinder and the other a cam-cylinder, one of the cylinders being rotated during the knitting of the foot and the leg of the stocking, and being given an oscillating movement during the knitting of the toe and heal of the stocking.

It has been the practice in knitting machines of this character when knitting a stocking, to hang a weight from the end of the knitted portion of the stocking which depends downwardly into or through the needle-cylinder, in order to draw the stocking as made into the needle-cylinder to prevent its bunching adjacent to the web-holders or sinkers. When the heel-portion of the stocking is being made by the oscillating movement of the cam-cylinder, the knitting taking place principally at one side of the stocking, causes unequal strain by the weight upon the respective sides of the stocking, whereby there is a tendency created at the heel side of the stocking to permit the knitted portion being formed to bulge outwardly above the row of needles, thus permitting improper piercing of the formed fabric by the needles.

It is one of the objects of my invention to provide new and improved means whereby to control the direction of movement of the knitted portion being formed, acting adjacent to the knitting line and preferably adjacent to the portion being formed, irrespective of whether that portion is formed by complete rotations between the needle-cylinder and the cam-cylinder or by an oscillating movement between the same. It is a further object of my invention to provide new and improved means for maintaining the needles in their true paths of longitudinal travel, and it is a further object of my invention to provide novel sinkers and means for mounting the same, whereby the sinkers are maintained in their true paths of movement, and are maintained free of the clogging action of lint, and the invention will be further readily understood from the following description and claim, and from the drawings, in which latter:

Figure 1 is a side elevation of so much of a knitting machine as is necessary to illustrate my invention.

Fig. 2 is a plan view of the cylinders.

Fig. 3 is a vertical cross-section taken on the line 3—3 of Fig. 1.

Fig. 4 is a detail in inside side elevation, showing the needle-cylinder partly broken away for exposing the needles and the cam-cylinder at the knitting-wave portion of the same.

Fig. 5 is a vertical cross-section on the line 5—5 of Fig. 2.

Fig. 6 is a vertical cross-section on the line 6—6 of Fig. 2, showing a portion of the stocking being knitted and the action thereon by the hold-down device.

Fig. 7 is a horizontal cross-section on the line 7—7 of Fig. 5, showing the bearing-ring in a given position.

Fig. 8 is a similar view showing the bearing-ring after the same has been worn at one point shifted for presenting new surfaces to the action of the needles.

11 represents the stationary frame of the machine in which there is a needle-cylinder 12, removably but rigidly supported by carrying-screws 13 in a cup-ring 14, in which the needle-cylinder is positioned by a pin 15. The cup-ring rests upon an adjusting ring 17, and is prevented from turning in the frame by suitable means while permitting vertical movement thereof. Thus the cup-ring 14 is provided with a series of laterally projecting lugs 18, which pass through slots 19 in the frame and prevent the cup-ring from turning while allowing vertical movement thereof.

The adjusting-ring and cup-ring are mounted within a cylindrical casing 20 depending from the base-plate 21, a series of rollers 22 being journaled on pins extending inwardly from the cylindrical casing and received in a spiral cam-groove 23 in the adjusting-ring. Springs 24 hold the cup-ring firmly down upon the adjusting-ring.

The adjusting-ring may be turned by a rod 25 which projects laterally from a ring 26 secured to the under side of said adjust-

ing-ring. The ring 26 may also carry a guard 27 for directing the knit fabric down past the usual motion-changing mechanism. Turning of the rod 25 causes vertical movement of the cup-ring and needle-cylinder for varying the length of the stitches drawn by the needles 28.

The needles are mounted in grooves 31 in the needle-cylinder 12 and are provided with butts 32 which are acted on by cams indicated at 33 of a cam-cylinder 34 in the usual manner. The cam-cylinder is provided with a flange 35 which is held in a recess 36 in the base-plate 21 by a ring 37.

A throat-ring 41 is secured to the upper end of the needle-cylinder and is grooved to receive the inner shanks 42 of the sinkers 43 which are operated by the sinker cam-ring 44.

Motion is transmitted to the cam-cylinder from a clutch-shaft 46 through a gear 47, secured to the upper end of said shaft, which engages a gear 48, secured to said cylinder. The clutch-shaft 46 is mounted in vertical bearings 49 in the main frame and has mounted thereon an oscillating pinion 50 and a rotating pinion 51. A clutch 52 is splined, as shown by the spline 53, to slide on the shaft 46 between the pinions 50 and 51. Said shaft is given a continuous rotary movement or an oscillating movement according as to which pinion is engaged by said clutch. By means of a hand-wheel 54 the pinion 51 may be turned for operating the machine manually.

The pinion 51 is a spiral pinion and is driven continuously by a spiral gear 56 secured to the end of the main shaft 57. The oscillating pinion 50 is driven by a rack formed on a bar 58 which is held in engagement with said pinion by a plate 59. The bar 58 is provided with a transverse slot 60 which is engaged by a crank-pin 61 on the side of the gear 56, and the bar beyond said slot is guided between two rolls 62. The clutch 52 may be shifted by any suitable mechanism for causing either a continuous rotary movement of the cam-cylinder, or an oscillating movement thereof.

The cam-cylinder causes movements of the needles past the sinkers in both directions of movements of the needles for forming the loops in connection with the sinkers, the in and out movements of the sinkers being controlled by the cam-ring 44, which is provided with a closed channel 65 about the same, in which the heels 66 of the sinkers are received, the cam-portion 67 of said closed cam-channel causing inward and outward movement of the sinkers at the knitting-wave in the formation of the loops in usual manner.

The cam-ring 44 rides upon a guide-ring 71 and is guided thereon by depending lugs 72. The guide-ring is formed as an annular shelf extending from the needle-cylinder with which it is rigid for forming a needle-space. The cam-ring is rotated and oscillated by having connection with the lower cam-cylinder, the latter being provided with an upwardly extending post 74. Set-screws 75 are threaded in lugs 76 of the cam-ring, and are arranged to be set to impinge the post for causing rotation of the cam-ring with the cam-cylinder, the set-screws furnishing adjusting means for adjusting the times of actuation of the sinkers with relation to the longitudinal movements imparted to the needles by the cams of the cam-cylinder.

The inner ends of the sinkers are shown as shanks 42 which ride in radially arranged slots 78 of a throat-ring 41. The throat-ring has an outwardly extending flange 80 and a depending cylinder-portion 81, the cylinder-portion being received in the cam-cylinder and rigidly secured thereto by means of set-screws 82.

The inner ends of the walls of the slots 78 are of substantially the height of the shanks 42, a hold-down ring 83 resting on said inner ends of said walls and arranged to hold down the sinkers. The hold-down ring is shown secured to said walls by screws 84. The sinkers are provided with fingers 86 arranged to push the fabric inwardly at the knitting line so that the next succeeding row of loops may be properly formed.

The outer end of the walls of the slots 78 are recessed as shown at 87, at the knitting line, so as to provide clearance between the shanks of proximate sinkers for the reception of the material when forming the loops. The slots 78 are open at both their ends. The heels 66 of the sinkers are located on outer shanks 88 of the sinkers which ride in radial slots 89 of the guide-ring 71, the slots being open at both their ends.

The upper end of the needle-cylinder is provided with an outer annular rabbet 91 in which a hardened steel bearing-ring 92 is received, the hardened bearing-ring being preferably rigidly set in the rabbet, as by being pressed about the annular upper reduced end 93 of the needle-cylinder.

The outer peripheral face 94 of this bearing-ring is preferably in line with the paths of movement of the inner faces of the needles, so that the needles will impinge this outer peripheral face in their upward and downward movements. The needles are held in the needle-slots by means of annularly arranged spiral springs 95 located in annular grooves 96 in the peripheral face of the needle-cylinder.

The needles are further forced inwardly by the engagement of the loops of the fabric being formed for causing substantial friction between the inner faces of the

needles and the bottoms of the grooves in which they are located, this friction in devices of this character as heretofore made causing rapid wear of the bottoms of the grooves and the upper end of the needle-cylinder. This wearing caused change in the directions of movements of the needles, which resulted in causing the needles to miss loops and form a poor fabric and in other detrimental results.

By means of my improved hardened bearing-ring, which is positioned at the upper end of the needle-cylinder, the life of the parts is very materially lengthened and a better fabric is obtained, and furthermore, breaking of the needles due to their distortion in machines as previously constructed is avoided by maintaining the needles in their true lines of movement. In case wear of the bearing-ring does take place, the ring is readily shifted for presenting different peripheral surfaces to the needles, the only part requiring renewal in any event being this single hardened steel bearing-ring. The bearing-ring has the further advantage that by its use the needles are maintained in their proper lines of travel for registering accurately with the quills of the usual transfer-quill head employed in making ribbed ends of half-hose.

The upper end of the bearing-ring further forms a bearing-surface 97 for the lower edges of the sinkers for maintaining the sinkers in their true lines of travel. The bearing-ring is located in the angle between the paths of movements of the needles and sinkers. My improved device therefore provides means whereby both the sinkers and the needles are maintained in their true lines of travel for producing a superior fabric and preventing excessive wear of the parts.

My improved device has the further advantage that the ends of the sinkers are arranged to pass entirely through their radial bearing-slots in both directions, these radial slots being open at their inner and outer ends, the effect being that the sinkers maintain the slots clear of lint for providing full and clear movements of the sinkers.

101 represents the usual guard and thread-guide, which is pivoted to the post 74 on a hinge 102 and is arranged to be thrown backwardly away from the sinkers and needles. It is provided with a thread slot 103 connecting with a thread hole 104, at which point the thread is guided to the needles in usual manner.

I provide a hold-down device 107, which directs the fabric immediately after being formed, in the proper direction into the interior of the needle-cylinder for directing it away from the needles and sinkers without strain either upon the fabric or upon the sinkers or needles, and in such manner as to maintain all parts of the knitting line in proper relation with the needles and sinkers. This hold-down device acts in adjacency to the knitting line.

I have shown the hold-down device in the form of a roller 108 on a shaft 109 on a depending arm 110 secured to the guard and thread-guide 101, as by means of a screw 111. This roller is preferably a frusto-conical roller extending crosswise of the knitting line with its end of larger diameter extending outwardly and tapering toward its inner end. It acts to roll the fabric being formed curve-like into the needle-cylinder.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent, is:

In a circular knitting machine, the combination of knitting instrumentalities annularly arranged in a closed path, a cam-ring and a thread-ring connected together for combined rotation, means for rotating said rings, means including said cam-ring for actuating said knitting instrumentalities for forming a knitting line having a knitting wave therein, an arm secured to said thread-ring and having a depending portion spaced therefrom depending into the space within said thread-ring, the upper ends of the knitting instrumentalities reciprocating up and down in the space between said thread-ring and said depending portion of said arm, a frusto-conical hold-down roll of greater length than average diameter journaled on said arm in a horizontal plane having its larger end adjacent to said knitting line with the periphery of said roll receding from the horizontal plane in which said knitting line is located toward the middle portion of said thread-ring, to cause upward bulging of the knitted fabric adjacent said knitting wave and downward curving of said bulged portion of knitted fabric toward the middle of said closed path, and means for swinging said thread-ring and hold-down roll upwardly away from said knitting instrumentalities and knitting-line.

In testimony whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

WILLIAM FISCHER.

Witnesses:
THERESA M. SILBER,
CHARLES E. WEBER.