C. CLARINGBURN.

CIRCULAR KNITTING MACHINE.

APPLICATION FILED MAR. 3, 1915.

1,166,434.

Patented Jan. 4, 1916.

2 SHEETS—SHEET 1.

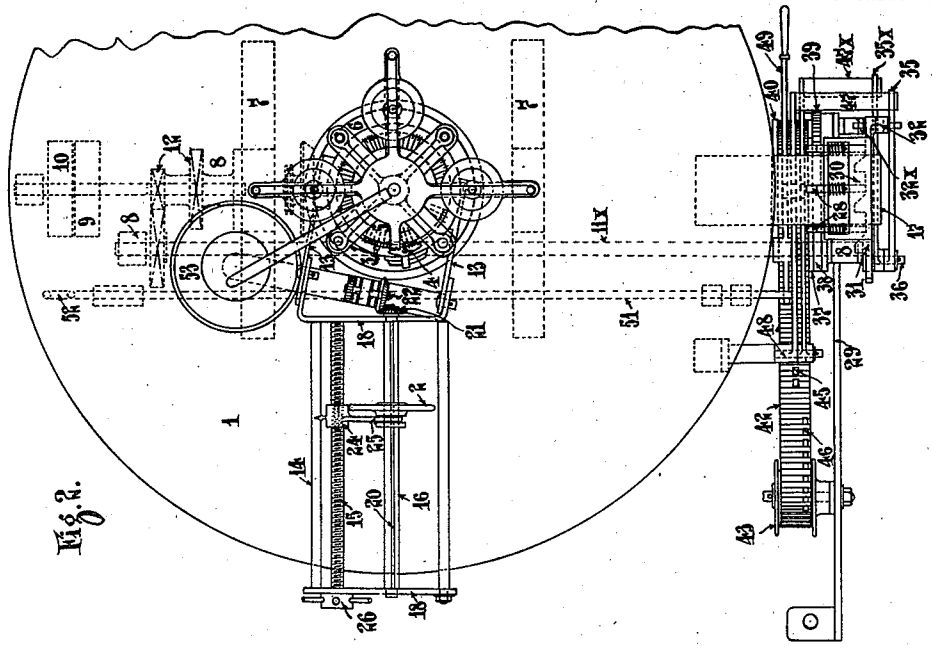

Fig. 2.

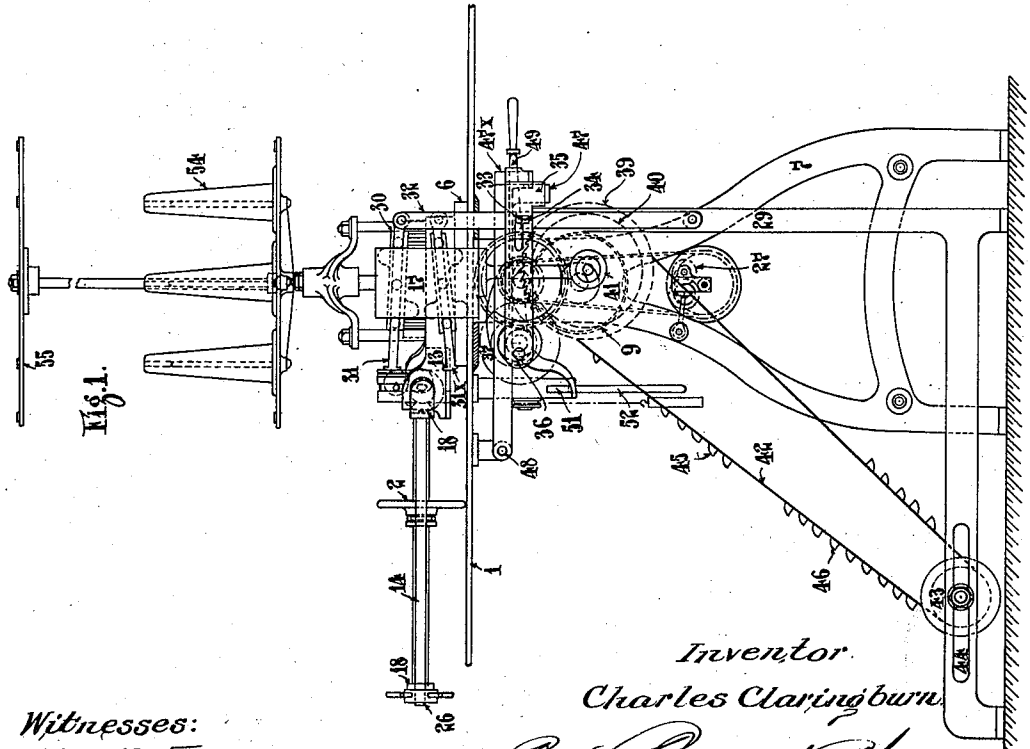

Fig. 1.

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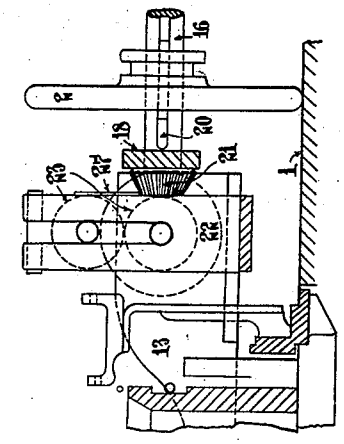

Fig. 5.

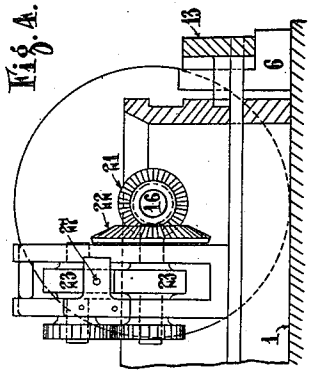

Fig. 4.

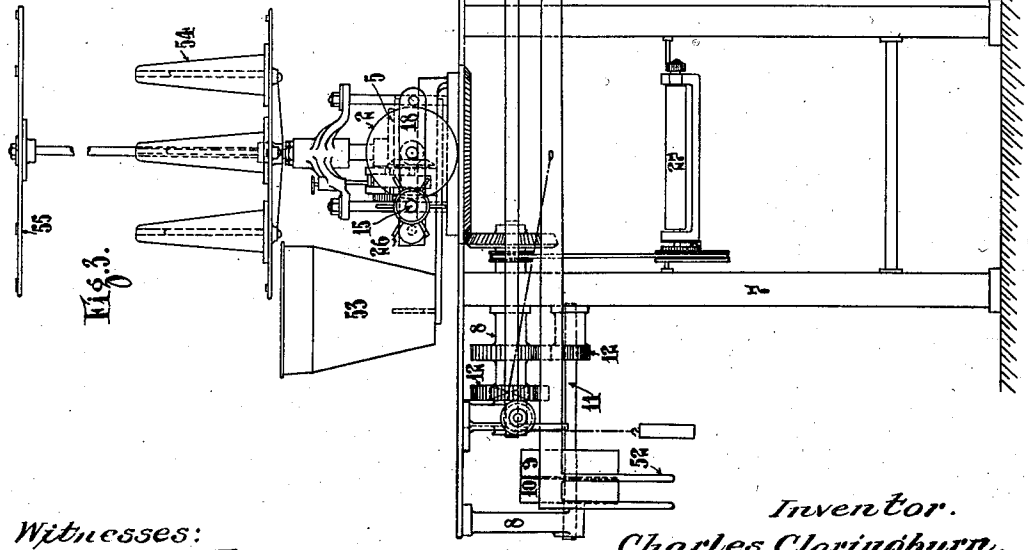

Fig. 3.

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UNITED STATES PATENT OFFICE.

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CIRCULAR-KNITTING MACHINE.

1,166,434. Specification of Letters Patent. Patented Jan. 4, 1916.

Application filed March 3, 1915. Serial No. 11,781.

To all whom it may concern:

Be it known that I, CHARLES CLARINGBURN, citizen of Great Britain, residing at No. 194 Noel street, Hyson Green, in the city and county of Nottingham, England, have invented certain new and useful Improvements in or Relating to Circular-Knitting Machines, of which the following is a specification.

This my invention relates to improvements in or relating to circular knitting machines such as are used for making seamless knitted elastic stockings and the like or other articles in which the shape and size of the stocking or the like is varied by regulating the pull or tension of the elastic thread fed into the fabric in course of manufacture, and the main object of this my invention is the provision of the means by which any required length of elastic thread can be definitely fed into the fabric for every course knitted—all in such a manner that the length of this elastic thread which is fed into the machine can be automatically varied as required to suit the variations necessary to form the varying size and shape of the article being made in the knitting machine. For this purpose the knitting machine is fitted centrally at its base to a horizontal circular table supported by standards carrying the driving mechanism underneath. This driving mechanism—in addition to operating the knitting machine—drives a revolving arm above the circular table around and at the base of the machine. This revolving arm is fitted with a long regulating screw, and a plain shaft placed parallel with each other, and both turning in a bearing at each end of the arm. The plain shaft is fitted with a disk resting on and driven by the circular table and is capable of sliding backward and forward on the shaft and of driving the shaft by means of a key or feather attached to the disk sliding in a keyway formed the full length of the shaft between the bearings. The inner end of the shaft is fitted with a bevel wheel fixed to same for driving a pair of positive feed rollers, between which the elastic thread is fed to the needles of the knitting machine at varying speeds according to the position of the driving disk as it revolves on the circular table, the feed being faster as the disk revolves at the outer circumference of the table, and slower as it revolves inward on the table. The position of the disk on the table is regulated by the regulating screw named above, which carries on it a nut formed with a claw which engages in a groove formed on the boss of the driving disk. The outer end of this regulating screw is fitted with a star wheel, which in revolving comes in contact with one or more sliding studs arranged in a frame fixed at the periphery of the circular table. This frame is fitted with one or more sliding studs arranged to come into action when coming in contact with the upper arms of the star wheel when it is required that the regulating screw be partially rotated to move the driving disk in one direction; and with one or more lower studs when the driving disk is required to be partially rotated in the opposite direction, one stud or set of studs only being in operation at one time.

The propulsion of the upper or lower stud or studs is effected by connecting them by suitable mechanism so as to be operated alternately by buttons or cams placed at desired intervals on each edge of an endless flexible chain passing around two chain wheels, one of which is driven from the knitting machine driving gear by suitable means—all arranged in such a manner that when the buttons on one edge of the chain come in contact with the lever or levers actuating the upper stud or studs these are pushed forward for turning the star wheel in one direction, and when the buttons on the other edge come in contact with the lever or levers actuating the lower stud or studs they are pushed forward to turn the star wheel in the other direction. In each case after the buttons have passed the levers on either side the studs are automatically withdrawn from action by springs or other suitable means.

I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is an end elevation of a circular rib knitting machine such as is used for making seamless knitted elastic stockings and the like, showing my improved elastic thread varying appliance. Fig. 2 is a plan of the same machine. Fig. 3 is a side elevation of the same. Fig. 4 is an enlarged end elevation of the elastic thread feed rollers. Fig. 5 is a side elevation of the same.

Similar figures of reference refer to similar parts throughout the several views.

The circular rib knitting machine shown

in the drawings has a fixed needle cylinder, with a fixed ribber dial and rotating cams carried by the cam cylinder 6, and cam plate 5. It is also fitted with a knitting thread carrier 4, an elastic thread carrier 3, work rollers 27, and other usual parts of the machine as now used and constructed to operate in ordinary circular rib knitting machines for the production of seamless knitted elastic stockings and the like.

For the purpose of my invention I fit the knitting machine centrally at its base with a circular table 1 supported by the two standards 7. This table carries from bearing brackets 8 the driving mechanism comprising the fast and loose pulleys 9—10, shafts 11 and 11×, gear wheels 12 for driving the cam cylinder 6, to which is fitted two arms 13, at the outer ends of which is pivoted the revolving arm or frame 14, comprising the regulating screw 15 and the plain shaft 16, both turning in bearings formed in the carrying plates 18 at each end, these plates being rigidly held apart by the stay rods 14. The shaft 16 is fitted with the regulating disk 2 which rests on and is rotated by the table 1 as it revolves thereon when rotating with the revolving arm or frame 14, and the disk 2 is arranged to slide backward and forward on the shaft 16, and to drive same by means of a key or feather attached to the disk 2 and sliding in the keyway 20 formed the full length of the shaft between the bearings. The shaft 16 is fitted with the bevel wheel 21 gearing into bevel wheel 22, which in turn drives the positive feed rollers 23, between which the elastic thread is fed to the needles of the knitting machine at varying speeds according to the position of the driving disk 2 as it revolves on the circular table 1, the feed being faster as the disk revolves at the outer circumference of the table, and becomes gradually slower as it revolves inward on the table 1.

The position of the disk 2 on the table 1 is determined by the regulating screw 15, which carries on it the nut 24 formed with a claw arm 25, the outer end of which engages in a groove formed on the boss of the driving or regulating disk 2. The outer end of this screw is fitted with the star wheel 26, which in rotating comes in contact as required with either the upper or lower set of sliding studs 28 or 28× which slide in the slide frames 30 attached to the angle plate 17 carried from table 1. The sliding studs 28 and 28× which slide in the frames 30, are propelled forward to come into contact at their inner ends with the arms on the star wheel 26 by their outer ends sliding up the wedge pieces 31 and 31× sliding in the slide frames 30 as these wedge pieces are moved to the right hand by the levers 32 and 32× to the upper end of which they are pivoted. The levers 32 and 32× are pivoted at their lower ends to the framing 29 fixed at the top to the table 1, and at its base to the floor. Either of the levers 32 and 32× are brought into action as required by the stud 33 fixed to same engaging with the small lower part of the slot 34 formed in the horizontal connecting rods or crank arms 35 and 35× which are driven horizontally backward and forward by the crank and pin 36 fixed to the end of the driving shaft 11× and brought into action as described below.

The shaft 11× carries on the other side of the bearing 8 an eccentric 37 which actuates an oscillating pawl 38, the free end of which engages with the teeth formed on the ratchet wheel 39 which is rotated thereby along with the chain wheel 40 to which it is attached, both rotating on an axle fixed to the bracket 41. This chain wheel is fitted with a spring friction brake, and drives by suitable teeth formed on same the endless chain 42 carried at its lower end by the wheel 43 turning on an axle carried from the framing 29, in which it can be adjusted along the slot 44.

The chain 42 is fitted with a series of studs 45 in the center, another series 46 on the outer side, and one or more studs on the inner side. These studs come in contact at the top of the chain wheel 40—as the chain is driven upward—with the lower edges of levers 47 and 47× fulcrumed at 48 from the table 1; stud series 45 lifts up lever 47×, and stud series 46 lifts up lever 47. Each of these levers is formed at its outer end with a foot or lifter piece arranged to bear under the outer ends of levers 35 and 35× respectively, and which they raise at suitable times. When either lever 35 or 35× is raised the pin 33 in lever 32 or 32× engages with the small lower part of the slot 34 formed in same, and by this means either wedge piece 31 or 31× is moved to the right hand so as to push forward pins 28 or 28× until they come in contact with the upper or lower arms of the stud wheel 26 for varying the speed of the elastic thread feed rollers 23 as explained before.

The series of one or more studs on the inner side are for stopping the machine by actuating the right hand end of lever 49 and disengaging the left hand end from the slot 50 under the sliding bar 51 of the belt striking gear 52, which then moves to the right and transfers the driving belt from the fast pulley 9 to the loose pulley 10.

The elastic thread is carried in the tin 53 which rotates with and is carried by the revolving arm 14, and the thread is suitably guided through the hole in the eye plate 27 to the feeding rollers 23, and from there to the elastic thread carrier 3. The other knitting threads on the bobbins 54 are carried by the frame 55, where they are suitably ten-

sioned and are thence guided to the thread carrier 4 in the usual manner.

The whole of the variable feeding mechanism described above is so arranged and devised that the tension at which the elastic thread is fed to the machine is varied as required according to the length of the elastic thread it is desired to feed at each course knitted. If the length of the elastic thread fed into the machine is less than the circumference of the needle cylinder, the thread—by reducing the speed of the feed rollers—is stretched as it is knitted into the fabric, and after it has left the machine the elastic thread contracts and so reduces the size of the stocking or the like. If on the other hand the length of the elastic thread fed into the machine equals the circumference of the needle cylinder—the speed of the feed rollers is increased accordingly—so that the fabric after it has left the machine is practically the same size as the needle cylinder.

When it is desired to produce on the machine shaped stockings or the like, it is necessary to vary the speed of the elastic thread feed rollers at every one or more courses without stopping the machine—to attain which the star wheel comes into action every revolution or more, and the studs 45 and 46 are so arranged on the chain as to effect this.

The different levers, slides, pins, and the like described may be fitted with adjustable stops and springs to bring them back to their normal positions after each movement.

What I do claim as my invention, and desire to secure by Letters Patent, is—

1. In a circular rib knitting machine as used for making seamless knitted elastic stockings and the like, in combination, a circular feed table, a disk rolling thereon at varying diameters and elastic thread feed rollers driven therefrom at varying speeds for the purpose herein described.

2. In a circular rib knitting machine as used for making seamless knitted elastic stockings and the like, in combination, a feed table, a disk rolling thereon at varying speeds, an automatic means for positioning said disk radially on said table.

3. In a circular rib knitting machine as used for making seamless knitted elastic stockings and the like, in combination, a circular feed table, a disk rolling thereon at varying speeds, a frame carrying said disk revolving around said table, a disk shaft, elastic thread rollers driven therefrom, and automatic means including a regulating screw for positioning said disk radially on said table.

In testimony whereof I have affixed my signature in presence of two witnesses.

CHARLES CLARINGBURN.

Witnesses:

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THOS. H. COOK.