

J. A. MILLS.
KNITTING MACHINE.
APPLICATION FILED MAR. 9, 1912.

1,084,559.

Patented Jan. 13, 1914.

3 SHEETS—SHEET 1.

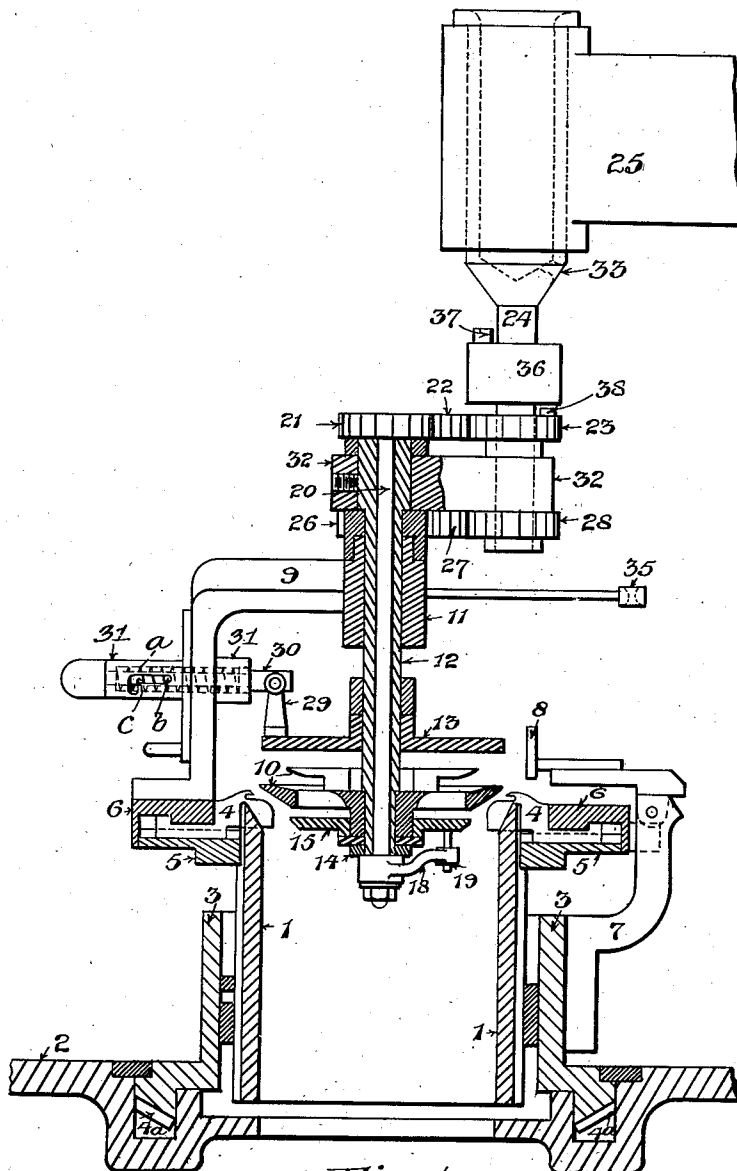


Fig 1

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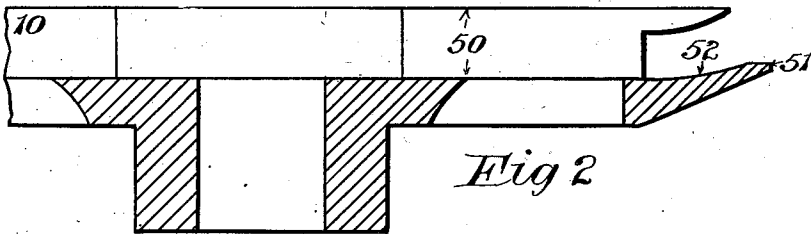


Fig 2

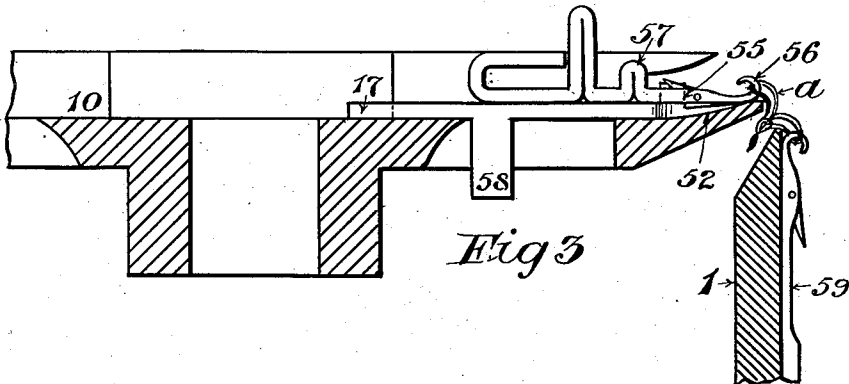


Fig 3

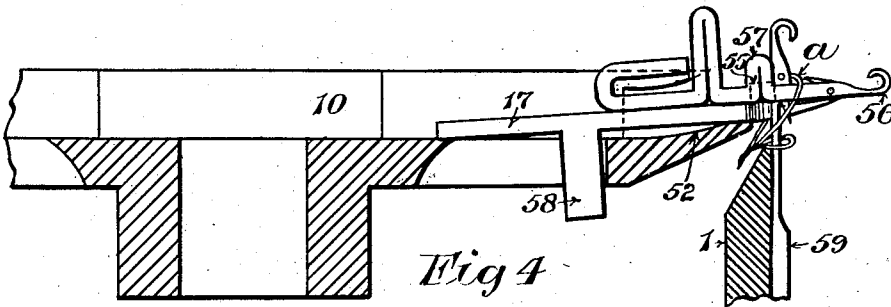


Fig 4



Fig 5

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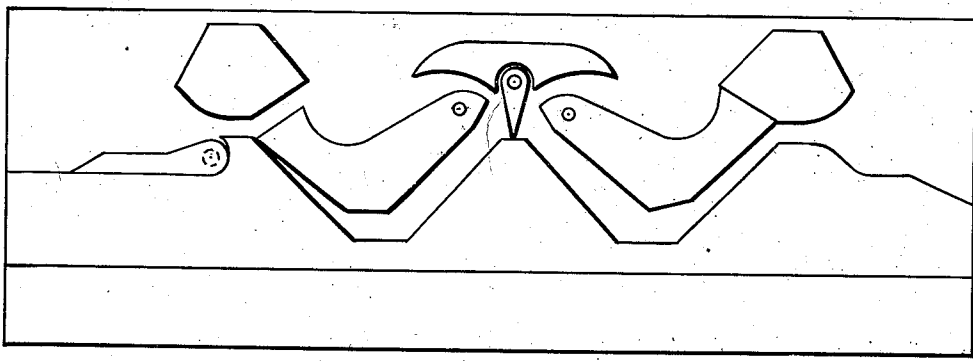


Fig. 6.

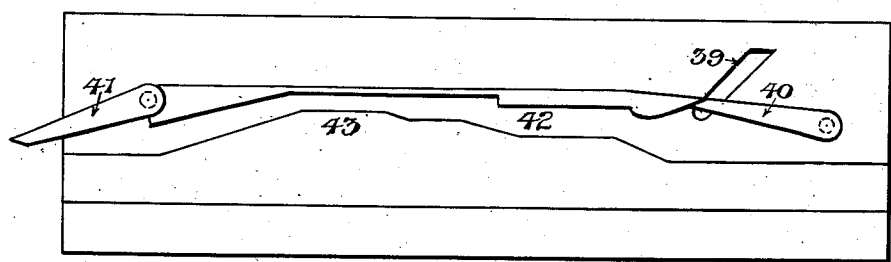


Fig. 7.

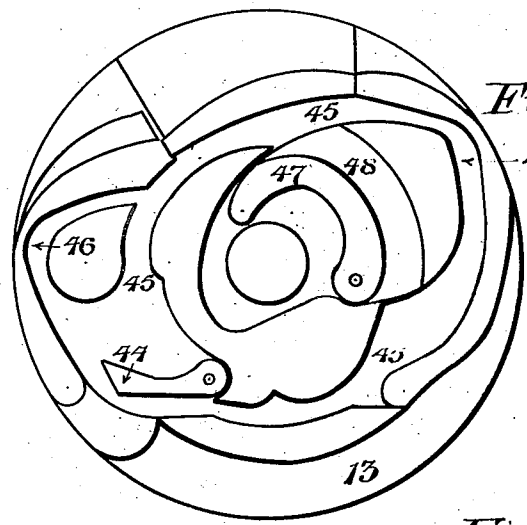


Fig. 8.

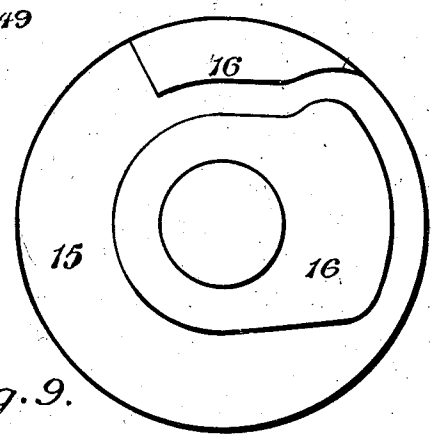


Fig. 9.

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UNITED STATES PATENT OFFICE.

JOSEPH ALFRED MILLS, OF LOUGHBOROUGH, ENGLAND, ASSIGNOR OF ONE-HALF TO
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KNITTING-MACHINE.

1,084,559.

Specification of Letters Patent.

Patented Jan. 13, 1914.

Application filed March 9, 1912. Serial No. 682,568.

To all whom it may concern:

Be it known that I, JOSEPH ALFRED MILLS, a subject of the King of Great Britain, and resident of Loughborough, in the county of Leicester, England, have invented new and useful Improvements in Knitting-Machines, of which the following is a specification.

This invention relates to improvements in circular latch needle rib knitting machines of the cylinder and dial type and in which the character of the work is changed from rib to plain by decreasing the number of loops in a course and in which the character of the work can be changed from one kind of rib to another kind of rib by increasing or decreasing the number of loops in a course.

The present invention has for its object improvements in the means for and in the method of automatically transferring loops from the ribber needles to the cylinder needles, improvements in the means for and in the method of operating the needles and points at the transfer of the loops and improvements in the general construction and arrangement of the improved knitting machine.

In the drawings, Figure 1 is the sectional elevation of a circular knitting machine as constructed for the purpose of carrying out this invention, Fig. 2 is a part section of the ribber dial, Fig. 3 is a section through the dial and cylinder illustrating the position of the needles and transfer point for ordinary knitting, Fig. 4 is a similar view illustrating the position of the needles and points when loops are being transferred, Fig. 5 is a plan of a transfer point, Fig. 6 is a development of the ordinary knitting cams, Fig. 7 is a development of the cylinder transfer cams, Fig. 8 is a plan of the ribber dial knitting and transfer cams, and Fig. 9 is a plan of the cams for the transfer points.

The needle cylinder 1, Fig. 1, is carried from the machine table 2 in the usual manner and is surrounded by the knitting cam ring 3 which is provided with gear teeth 4^a by and through which it is driven. The sinkers 4 are fitted to slide in the sinker ring 5 which is attached to the cylinder 1 and there is a sinker cam ring 6 for actuating the sinkers and such ring is rotated by an arm 7 which is attached to the cam cylinder 3 and carries the yarn guide 8. The knitting cams are shown in Fig. 6 and are of the

type usually employed in machines which are adapted to reciprocate for the knitting of the heel and toe. Attached to the sinker cam ring 6 there is an arm 9 which carries the ribber dial 10 and its connected mechanisms. Passing through the boss 11 of the arm 9 there is a hollow spindle 12 on which the ribber dial cam plate 13 is fitted to revolve, and mounted on the reduced end of the spindle there is the ribber dial 10 which is secured thereto by the nut 14. Fitted to revolve freely on the boss of the dial 10 there is a disk 15 which carries the cams 16 Fig. 9 for actuating the transfer points 17 Fig. 5. For rotating the disk 15 whenever it is desired to effect a transfer of loops there is an arm 18 which engages with a pin 19 on the underside of the disk 15 and is carried by a central spindle 20 at the upper end of which there is a toothed gear wheel 21 which is geared by an intermediate wheel 22 to a toothed wheel 23 which is free to revolve on an axle 24, and this axle is free to rotate in a fixed bracket 25. Fixed to the upper end of the boss 11 there is another toothed gear wheel 26 which is geared by an intermediate toothed wheel 27 to a toothed wheel 28 which is fixed upon the spindle 24 and by this arrangement the spindle 24 makes one revolution for each revolution of the machine. The ribber cam plate 13 is revolved from the frame 9 through an arm 29 and a pin 30, the said pin being fitted to slide in a boss 31 clear of the arm 29 so that the cam plate 13 remains at rest when plain circular work is being made. The movements of the pin 30 are controlled in any suitable way. For instance, I have represented it as being acted upon by a spring *a* that tends to force the pin outward and into the path of the arm 29. A peg or projection *b* carried by the pin is seated in an angular slot *c* formed in the hollow boss 31. When the peg *b* lies in the angular portion of the slot the pin is retracted and held clear of the arm 29 so that then the cam plate 13 remains at rest and plain circular work will be knitted. The intermediate wheels 22 and 27 revolve on axles carried by an arm 32 which forms a bearing for the lower end of the axle 24 and is attached to the enlarged end of the spindle 12 by which means the spindle is held stationary. The enlarged upper end of the spindle 24 is

made hollow and has a hole 33. The knitting yarn is threaded through the hollow end of the spindle 24 and through the hole 33 and is then passed through an eye 35 to the yarn guide 8. By this arrangement the yarn is guided clear of the mechanism on the arm 9 and since the axle 24 rotates at the same speed as the machine the hole 33 is always maintained in the same position relatively to the eye 35 and the yarn guide. The spindle 24 is also provided with a boss 36 which carries a pin 37 which can be depressed to engage with a lug 38 on the wheel 23 and when this is done the wheel 23 is coupled to the spindle 24 and motion is given to the cam disk 15 below the ribber dial.

The knitting cams Fig. 6 occupy about one-half of the cam cylinder and the transfer cams Fig. 7 the other part. These transfer cams comprise a slide 39 which can be pushed into the path of the butts on the cylinder needles and two spring switches 40 and 41. During ordinary knitting all the needles pass over the switches 40 and 41 but when a transfer is to be effected the slide 39 is pushed into the path of the needle butts, which are then directed downward to depress the switch 40 and pass into the transfer cam race 42. The action of the slide 39 draws the cylinder needle below the ribber needles which are then advanced and the cylinder needles are afterward raised through the loops on the ribber, at the point 43. The cylinder needles are then depressed and pass under the switch 41 back to the ordinary knitting cams.

The ribber dial cams Fig. 8 are shown in the position they occupy during the transfer of the loops and as arranged for transferring the loops from the needles in, say, one-half of the dial, and the butts on such needles are shorter than the butts on the other needles. The cam disk 13 is provided with a switch 44 by which all the needles are directed from the knitting path 45 to the transfer position 46 and there is also a pivoted half thickness cam 47 which is moved to the position shown, so that the short butted needles pass through the groove 48 instead of following the knitting track to the feeding position 49.

The knitting and transfer cams herein described are constructed and arranged in the same manner as other similar cams in this type of machine, and they may be fitted with catches for holding them in their transfer position, and with springs for returning the cams to their normal position and there may be, any usual mechanism for automatically releasing the cams from their holding catches.

The ribber dial 10, Fig. 2 is provided with the usual radial needle tricks or grooves 50 and there is a lower flange 51 the upper surface 52 of which is inclined or curved up-

ward. At the bottom of the tricks and fitted to slide therein there are the transfer instruments 17 the front ends of which are curved or shaped on the underside to fit the curve 52 of the flange 51. These transfer instruments terminate in a point 53 which is in a line with the center line of the shank and there is a bend or crank 54 upon which is a loop retaining projection 55. These transfer points form the bottoms of the needle tricks and support the ribber needles 56 which are also provided with loop retaining projections 57. On the underside of the transfer point there is a butt 58 which engages with the cam on the disk 15 below the dial.

During ordinary knitting the transfer points remain at rest and the needles slide to and fro upon them. When however the loops are to be transferred the transfer cams are brought into operation and the cylinder needles 59 are lowered below the ribber needles 56. These latter are then moved forward until the needle latch is clear of the loop *a* and at or about the same time the transfer point is advanced, and as it rises up the flange 52 toward the position shown in Fig. 4 the loop *a* upon the needle is stretched, so that the transfer point can enter such loop with certainty. The needle and point are then advanced until the loop is opened or stretched horizontally between the loop retainers 57 and 55 and has been carried beyond the front part of the needle 59. The needle 59 is then raised through the stretched loop *a* after which the needle 56 is withdrawn and the loop left upon the point and the needle 59. The point may then be withdrawn and the loop be left upon the cylinder needle, or this needle may first be lowered until it is clear of the point so that the point can be withdrawn without being strained as it passes the cylinder needle and without tending to bend this needle.

It will be seen that the transfer instrument operates in immediate conjunction with that needle from which the loop is to be transferred. This enables me to arrange the point of the transfer instrument in line with the needle or in such relation to the loop that it enters the center thereof, as distinguished from entering at one side of the center, as has been proposed in other machines.

My invention is particularly adapted for use in fine gage knitting machines where the needles are fine and arranged close together and the loops about the needles are small. This makes it extremely desirable, if not imperative, that the transferring instrument shall be inserted into the loop at its very center and that the end of such instrument shall be small or sharp, and, as stated, that the instrument shall be arranged in proximity to and associated with the needle that

carries the loop which is to be transferred, as distinguished from the needle to which the loop is to be transferred.

In operating the machine herein described, the needle carrying the loop that is to be transferred is moved vertically at the same time that it is thrust forward longitudinally so as to stretch the loop it carries, opening it sufficiently to receive the end of the transfer instrument. This latter is then moved and operates to stretch the loop in a direction transverse to the stretching or opening imparted by the vertical movement of the needle just referred to, so that the other needle,—the one to which the loop is to be transferred, and which must necessarily be to one side of the center of the loop as originally carried by the first mentioned needle, in order that it may pass such needle,—may freely pass through the open loop and assume position to receive the loop when the first mentioned needle and transferring instrument are withdrawn.

Claims.

1. In a circular knitting machine, the combination of a ribber dial having radial needle tricks, the bottoms of which are curved upwardly toward their outer ends, ribber needles in the said tricks, means for operating the needles, transfer instruments also mounted in the said tricks and shaped on their under sides to correspond with the curved bottoms of the tricks, the said instruments serving as supports for the needles, on which they slide, and means for moving the transfer instruments forwardly after the needles have been moved forward, whereby the needles are moved vertically to stretch the loops and the ends of the transfer instruments caused to enter the stretched loops.

2. In a circular latch needle rib knitting machine, the combination of a grooved cylinder, knitting needles supported in the grooves thereof, means for operating said needles, a grooved ribber dial, ribber needles arranged in the grooves of the ribber dial, means for operating the ribber needles, transfer instruments mounted in the grooves along with the needles of one of the said sets, the said transfer instruments having pointed ends adapted to enter the loops on the needles at the centers thereof, and being provided with lateral projections, means for moving the needles in the grooves with the transfer instruments vertically after being thrust through the loops they carry, in order to stretch the loops, and means for operating the transfer instruments to cause their ends to enter the said stretched loops, and to open them further by the engagement of the said lateral projections with the loops, the said transfer instruments being arranged to receive the loops cast off by the said needles and hold them stretched for the entry of the needles of the other set.

3. In a circular latch needle rib knitting machine, the combination of ribber needles, plain knitting needles, means for operating the said sets of needles, respectively, transfer instruments associated with the needles of that set from which the loops are to be transferred, having pointed ends arranged in line with and in immediate proximity to the said needles and having also lateral projections, means for moving the last said needles vertically when a transfer is to be made whereby the loops which they carry are stretched in one direction, and means for inserting the transfer instruments into the said stretched loops whereby they operate to further stretch the loops in a different direction from what they were stretched by the said vertical movements of the needles.

4. In a circular latch needle rib knitting machine, the combination of a set of ribber needles, a set of plain knitting needles, means for operating the said sets of needles, respectively, transfer instruments associated with the needles of one set, each transfer instrument consisting of a bar arranged parallel with the needle with which it is associated and having a pointed end in line with and in proximity to the said needle, and having also a laterally bent portion back of the pointed end and a loop-retaining projection carried by the said laterally projecting portion, and means for operating the transfer instruments independently of the needles.

5. In a circular latch needle rib knitting machine, the combination of a set of plain knitting needles, a set of ribber needles, grooved supports in which the said sets of needles are respectively mounted, the grooves of one set being curved near their outer ends, means for operating the sets of needles respectively, transfer instruments associated with the needles of that set which are in the grooves having curved bottoms, the parts of the said instruments engaging therewith being shaped to correspond with the said curved bottoms of the grooves and the transfer instruments serving as bottoms or supports on which the needles rest, and independent means for operating the said transfer instruments, the parts cooperating as described whereby, when the transfer instruments are moved forward they first move the needles associated with them vertically to stretch the loops which they carry and then enter the said loops at the centers thereof.

6. In a circular knitting machine the combination of a ribber dial, a transfer instrument working below the dial needles and adapted to raise the needle and stretch the loop upon it when moved forward, the dial needles, loop retainers on the needles and transfer instruments adapted to carry the loop beyond the cylinder needle, a crank

on the transfer instrument for opening the loop and transfer cams for actuating the needles and the transfer instruments substantially as herein set forth.

- 5 7. In a circular knitting machine the combination of the ribber dial, needles and transfer instrument in such dial, knitting
10 cams for actuating the needles, cams for actuating the transfer instruments, a fixed spindle to which the dial is attached, a central spindle for driving the cams for the transfer instruments, a toothed gear wheel which rotates with the machine, a

toothed gear fixed on an axle which rotates in a fixed bearing, an intermediate wheel 15 by which the said wheels are coupled together, other gear wheels between the said axle and the central axle, and means by which one of the said wheels can be coupled to the axle for driving the cams below the 20 ribber dial substantially as herein set forth.

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Witnesses:

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