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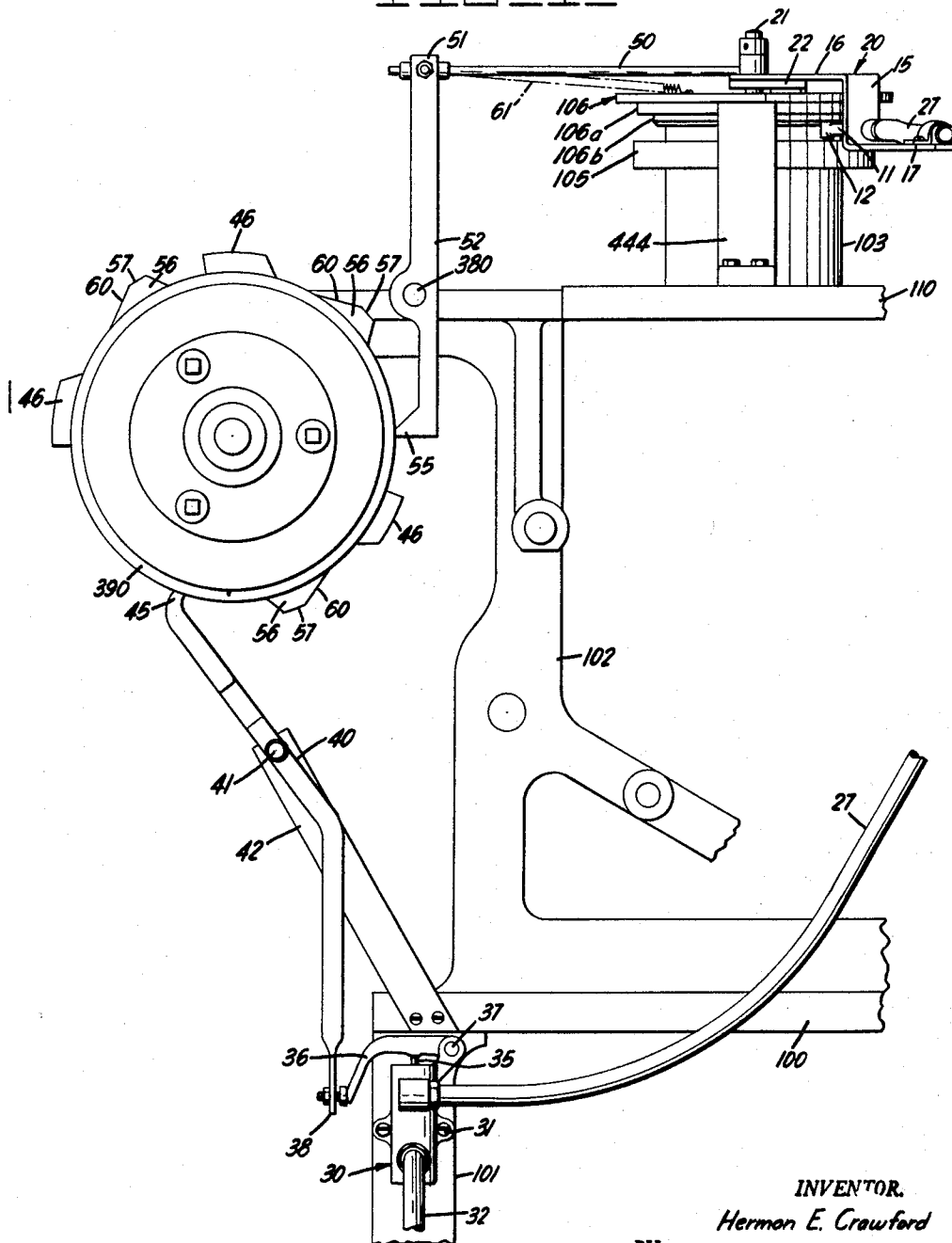
2,959,949

YARN CONTROL MEANS FOR KNITTING MACHINES

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2 Sheets-Sheet 1

Fig. 1



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FIG. 2

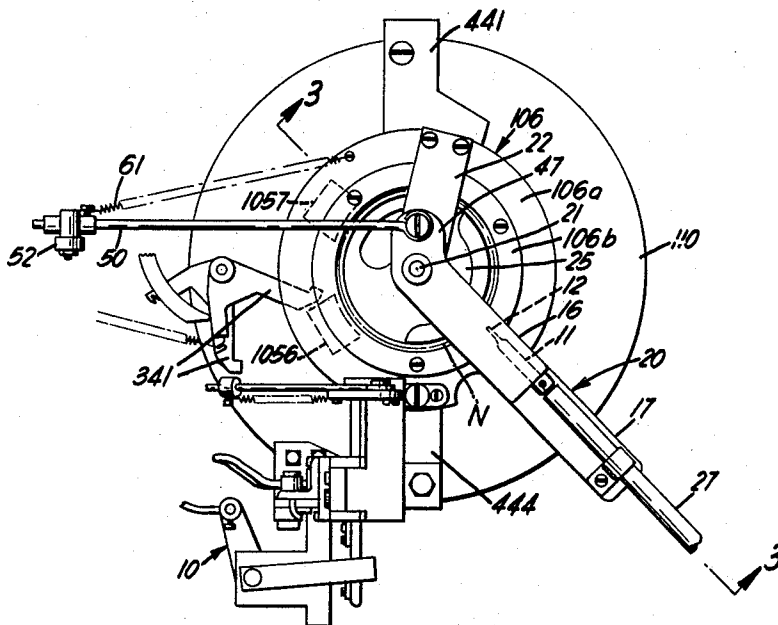
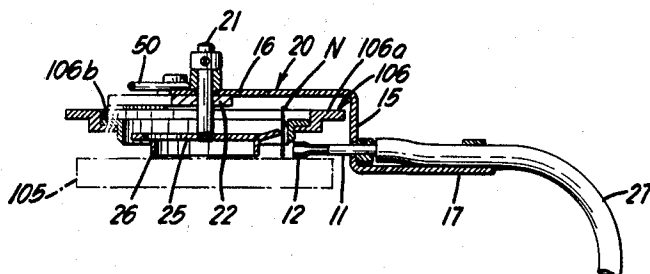


FIG. 3



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YARN CONTROL MEANS FOR KNITTING MACHINES

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5 Claims. (Cl. 66—125)

This invention relates to circular knitting needles for knitting patterned areas in tubular fabrics such as for hosiery and more particularly to means for moving the ends of yarns from a position outside of the needle cylinder through the needle circle to the interior of the cylinder.

In knitting machines having means for forming different colored pattern areas in tubular fabric or hosiery, yarn fingers for the yarns are moved between an active position in which the yarns are fed to a circle of needles carried in a needle cylinder and inactive non-knitting positions. When a yarn finger is moved to its active position, the end of the yarn carried thereby is released from clamping and severing means commonly positioned within the circle of needles which results in the yarn end extending inwardly of the needle circle to lie inside the fabric tube. Likewise, when a yarn is moved to non-knitting position and the yarn is clamped and severed, the loose end of the yarn extends inwardly of the needles to the interior of the fabric. In both cases the yarn ends cause no difficulties as they extend from the inner surface of the fabric. However, in machines having the yarn clamping and severing means outside of the needle cylinder, the ends of both the ingoing and outgoing yarns extend outwardly from the needle circle with the result that the loose ends of the yarns not only appear at the outside of the completed fabric tube but in some instances are also caught and knitted into an adjacent pattern area. Subsequently these loose ends must be manually withdrawn to the inside of the fabric which not only increases the cost of the completed fabric but also very often results in damage thereto.

It is therefore an object of the invention to provide means in a circular knitting machine of the type having means for clamping and severing the yarns at a point outwardly of the needle circle for overcoming the above mentioned and other difficulties occurring in the production of fabric on such machines.

Another object of the invention is the provision of means in a circular knitting machine of the type in which the yarns are clamped and severed outwardly of the circle of needles for transferring the loose ends of both the ingoing and outgoing yarns to the interior of the needle circle.

A still further object of the invention is the provision of means in a circular knitting machine for transferring the yarn ends from a position outwardly of the circle of needles to the interior thereof, which means includes means for directing a stream of air or the like under pressure inwardly toward the circle of needles and means for moving the air directing means to different radial positions relative to the needle cylinder.

With these and other objects in view which will become apparent from the following detailed description of the illustrative embodiment of the invention shown in the accompanying drawings, the invention resides in the novel elements, features of construction and cooperation of

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parts, as hereinafter more particularly pointed out in the claims.

In the drawings:

Figure 1 is an elevational view of the portion of a circular knitting machine having mechanism according to the invention incorporated therein;

Fig. 2 is a plan view of a portion of the machine of Fig. 1; and

Fig. 3 is a cross-sectional view taken substantially along the line 3—3 of Fig. 2.

Referring to the drawings there is shown portions of a knitting machine of the type for forming solid color pattern areas in tubular fabrics such as stockings. The machine is preferably that disclosed in my United States Patent No. 2,757,526, issued August 7, 1956, to which reference may be made. The machine includes a main base or frame 100 having suitable legs 101, a frame 102, a bed plate 110, a needle cylinder 103 which is carried in the bed plate for rotary and reciprocatory movement, and a circle of needles N carried in slots in the needle cylinder (Figs. 1 and 3). Cooperating with the needles N are usual sinkers (not shown) carried in a sinker head 105, and a latch ring 106 including outer and inner annular members 106a and 106b, respectively. The outer member 106a is supported concentrically of the needle cylinder 103 by a plate 441 and a bracket 444 which are carried in fixed position on the bed plate 110. Also provided are yarn fingers 341 for feeding yarns to the needles N and yarn severing and clamping means, indicated generally at 10 (Fig. 2), which is mounted on the bed plate 110 outwardly of the circle of needles N.

The yarn fingers 341 are movable between an active yarn feeding position and an inactive non-feeding position and the yarn severing and clamping means 10 is operable to clamp and sever the yarns when the yarn fingers 341 are moved to inactive position and to release the yarns when the fingers are moved to active position. The machine of said patent is also provided with stitch cams 1056 and 1057 for operating the needles through knitting movements, means for selecting the groups of needles to form the different pattern areas and means for shogging the needle cylinder (not shown herein) to select the center of reciprocatory movement of the needle cylinder to carry the selected groups of needles equi-distant past the stitch cams.

As set forth in said Patent No. 2,757,526, in forming a particular pattern area in the hosiery, the group of needles selected, usually two in number, to knit the first course of the area are moved to active position to be reciprocated equi-distant past the stitch cams and the remaining needles are moved to inactive position to pass above the stitch cams. The yarn finger 341 selected to operate is moved to active position so that its yarn will be taken by the active needles, and the end of this yarn is released from its clamping means. During knitting of the first course of loops with the selected yarn in which the needle cylinder 103 moves in a counterclockwise direction, the yarn is taken and knitted by the active group of needles and these needles then continue to the end of the counterclockwise movement which is at a point around the needle circle diametrically opposite from the stitch cams, with the loose end of the yarn extending outwardly through the circle of needles between the leading needle of the active group and the trailing needle of the inactive group. Likewise, when the yarn is again moved to inactive position and clamped and severed following knitting of the last course of the area, which also occurs when the cylinder is moving counterclockwise, the loose end of yarn trailing from the last needle of the active needles extends outwardly through the circle of needles between this last needle and the leading needle

of the inactive group. Consequently with each yarn change made in forming the pattern areas both the leading end of the incoming yarn and the trailing end of the outgoing yarn extends to the outside of the fabric and must be subsequently withdrawn through the fabric tube to the inside thereof.

In order to avoid the time consuming and costly operations required to place the free ends of the pattern yarns inside of the fabric after the knitting has been completed, means are provided, according to the instant invention, operable during the the knitting operation to automatically move or transfer the loose yarn ends through the circle of needles to the interior thereof so that these yarn ends will be held at the inside of the fabric by subsequently formed fabric portions. For this purpose there is provided means for directing a stream of compressed air inwardly toward the circle of needles N along a substantially radial line at a point between the lower edge of the inner member 106b of the latch ring 106 and the upper surface of the sinker head 105 (Fig. 3), such means including a nozzle 11 which is flattened at 12 to provide a narrow elongated vertically disposed opening adjacent the needle circle. The flattened end 12 of the nozzle 11 is supported for movement to different positions along a path concentric to the needle cylinder 103 by means and for purposes hereinafter set forth. For so supporting it, the nozzle 11 is carried in fixed position in a vertically disposed portion 15 connecting upper and lower horizontal portions 16 and 17, respectively, of a member 20. The upper portion 16 of the member 20 is pivotally mounted on a pin 21 which is carried in fixed coaxial relation to the needle cylinder 103 in a plate 22 secured to the upper surface of the outer member 106a of the latch ring 106. At its lower end the pin 21 carries a disk 25 having a downwardly extending flange 26 to deflect the stream of air after it passes through the needles.

Air is supplied to the nozzle 11 through a flexible tube or conduit 27 connected to the outlet side of a valve 30 which is secured to the leg 101 by bolts 31. The inlet side of the valve is connected to a source of air under pressure by a conduit 32 (Fig. 1). The valve 30 is provided with a valve stem 35 which is normally biased to closed position to close the source of air to the nozzle 11. The valve stem 35 is adapted to be moved to open position by a lever 36 which is pivotally mounted on a pin 37 carried by the valve 30 as shown in Fig. 1. The lever 36 is adapted to be engaged and operated by one end 38 of a lever 40 which is pivotally mounted on a stud 41 carried in a bracket 42 secured to the frame 100. At its other end the lever 40 is provided with a follower portion 45 which is adapted to be engaged by a row of cams 46 on a pattern drum 390, the pattern drum being indexed as set forth in said Patent No. 2,757,526 to move the cams into engagement with the follower portion. Engagement of a cam 46 with the follower portion 45 turns the lever counterclockwise, as viewed in Fig. 1, to engage and move the lever 36 counterclockwise to operate the valve stem 35 and open the valve 30. Each movement of the drum 390 to effect the opening of the valve 30 is followed by another movement of the drum to close the valve.

As hereinbefore set forth, the nozzle 11 is supported in the member 20 for movement to different positions along a path which is concentric to the needle cylinder 103. For so moving the nozzle 11, a projection 47, extending from the upper portion 16 of the member 20 at the opposite side of the pin 21 from the nozzle, is connected by a link 50 to an upper end 51 of a lever 52. The lever 52 is pivotally mounted on a shaft 380 which is carried in the machine in parallel relation to the axis of the drum 390. At its lower end, the lever 52 is provided with a follower portion 55 for engagement with a row of cams 56 carried on the drum 390. As shown

in Fig. 1, each of the cams 56 are provided with a high surface 57 and a trailing camming surface 60 extending from the high surface to the periphery of the drum 390. When no cam 56 is beneath the follower portion 55, a spring 61 connected between the link 50 and the latch ring 106 holds the follower portion in engagement with the outer periphery of the drum 390 and positions the member 20 and nozzle 11 as in Fig. 2. When the high portion 57 of a cam 56 is moved beneath the follower portion 55, the member 20 is turned counterclockwise around the needle cylinder to a point diametrically opposite to the stitch cams to thereby align the nozzle with the center of the active group of needles as these needles reach the end of their reciprocating movement. When the cam 56 is again moved from beneath the lever 52, the camming surface 60 acts to gradually return the member 20 and nozzle 11 to their position of Fig. 2.

In the operation of the machine to form a pattern area, the needles selected to knit the first course are moved to active position while the unselected needles remain in their inactive position, the yarn finger 341 for the selected yarn is moved to active position and the end of this yarn is released from the means 10, and the shogging means is conditioned to carry the active needles equi-distant past the stitch cams 1056 and 1057. Also at this time a cam 46 is moved beneath the lever 40 to open the valve 30 and a cam 56 is moved beneath the lever 52 to move the member 20 counterclockwise to position the nozzle 11 diametrically opposite to the stitch cams. Thereupon, as the needle cylinder 103 is operated through its first reciprocatory movement in the counterclockwise direction, the active needles pass through the stitch cams to knit the yarn. As the cylinder completes this first reciprocatory movement the active needles are aligned with the nozzle 11 and the stream of air from the nozzle blows or transfers the free end of the yarn, extending from the leading needle of the active group, through the needles to the interior of the cylinder. During the last reciprocatory movement of the cylinder 103 and after the selected group of needles has passed through the stitch cams to form the last knitted course of the pattern area, the yarn finger 341 is moved to inactive position to take the yarn out of action and the yarn is clamped and severed. Also during this last reciprocatory movement of the cylinder 103, a cam 46 is moved beneath the lever 40 to open the valve 30 and the shogging means is operated to stop the cylinder and to select a different center of reciprocation to form another of the pattern areas. At times this stopping of the cylinder 103 occurs before the last active needles reach the nozzle 11. At such times the cam 56 is removed from beneath the lever 52 to move the member 20 and nozzle 11 to the position of Fig. 2 during which movement the loose end of the yarn is blown between the needles as the nozzle passes the last active needles forming the last course of the completed pattern area.

It will be obvious from the foregoing that the means of the instant invention effectively functions to blow the free ends of each yarn from a position outside of the needle circle to the interior of the needle cylinder when the yarn is moved to knitting position and again when the yarn is moved to non-knitting position.

It will be understood that the improvements specifically shown and described by which the above described results are obtained can be changed and modified in various ways without departing from the invention herein disclosed and hereinafter claimed.

I claim:

1. In a circular knitting machine having means for forming patterns areas in a tubular fabric including a needle cylinder, needles in said needle cylinder, yarn feeding means movable between an active position in which the yarns are fed to said needles to be knitted thereby and an inactive position in which the yarns are in non-knitting position, and means for clamping and

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severing said yarns at a point outwardly of said needle cylinder when said yarn feeding means is moved to inactive position and acting to release said yarns when said feeding means is moved to active position, in combination with means for moving the ends of said yarns attached to said fabric inwardly through said needles to the interior of said cylinder following movement of said feeding means between active and inactive positions, including means for directing a stream of air under pressure inwardly along a substantially radial line toward said needles, and means for mounting said air directing means for movement along a path concentrically of said needle cylinder.

2. In a circular knitting machine having means for forming pattern areas in a tubular fabric including a needle cylinder, needles in said needle cylinder, yarn feeding means movable between an active position in which the yarns are fed to said needles to be knitted thereby and an inactive position in which said yarns are in non-knitting position, and means for clamping and severing said yarns at a point outwardly of said needle cylinder when said yarn feeding means is moved to inactive position and acting to release said yarns when said feeding means is moved to active position, in combination with means for moving the ends of said yarns attached to said fabric inwardly along a substantially radial line through said needles to the interior of said needle cylinder following movements of said feeding means between active and inactive positions including means for directing a stream of air under pressure inwardly toward said needles, means for mounting said air directing means for movement along a path concentrically of said needle cylinder, and means for moving said mounting means to different positions along said path.

3. In a circular knitting machine for forming pattern areas in a tubular fabric including a needle cylinder, needles in said cylinder, yarn feeding means movable between an active position in which the yarns are fed to said needles to be knitted thereby and an inactive position in which said yarns are in non-knitting position, and means for clamping and severing said yarns at a point outwardly of said needle cylinder, when said yarn feeding means is moved to inactive position and acting to release said yarns when said yarn feeding means is moved to active position, in combination with means for moving the ends of said yarns attached to said fabric inwardly along a substantially radial line through said needles to the interior of said cylinder following movements of said feeding means between said active and inactive positions including means for directing a stream of air from a

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source of air under pressure inwardly toward said needles, valve means for controlling the flow of air from said source to said directing means, means for mounting said air directing means for movement along a path concentrically of said needle cylinder, means for moving said mounting means to different positions along said path, and pattern means for operating said valve means and said moving means.

4. In a circular knitting machine having a needle cylinder, latch needles in said cylinder, a latch ring cooperating with said needles, yarn feeding means movable between an active position in which the yarns are fed to said needles to be knitted thereby and an inactive position in which said yarns are in nonfeeding position, a sinker head having sinkers cooperating with said needles, means for clamping and severing said yarns at a point outside of said cylinder, and means for moving the ends of the yarns through said needles to the interior of said cylinder including means for directing a stream of air under pressure inwardly along a substantially radial line toward said needles at a point between said latch ring and said sinker head, means for mounting said directing means for movement along a path concentric to said cylinder, and means for moving said mounting means to different positions along said path.

5. In a circular knitting machine having a needle cylinder, latch needles in said cylinder, a latch ring cooperating with said needles, yarn feeding means movable between an active position in which the yarns are fed to said needles to be knitted thereby and an inactive position in which said yarns are in non-knitting position, a sinker head having sinkers cooperating with said needles, means for clamping and severing said yarns at a point outside of said cylinder, and means for moving the ends of the yarns inwardly through said needles to the interior of said cylinder including means for directing a stream of air under pressure inwardly along a substantially radial line toward said needles at a point between said latch ring and said sinker head, means for mounting said air directing means for movement along a path concentric to said needle cylinder, means for moving said mounting means to different positions along said path, and means mounted centrally of said cylinder in the path of said stream of air.

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