June 25, 1946. O. FREGEOLLE 2,402,745

WRAP HORN MECHANISM

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FIG. 3.

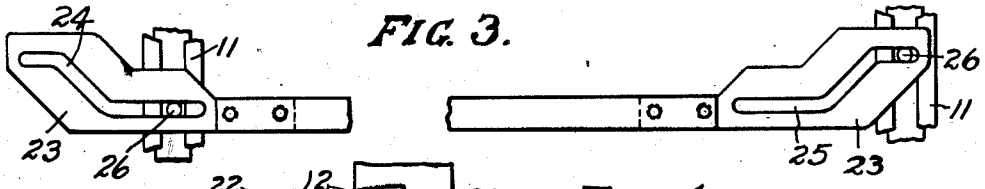


FIG. 1.

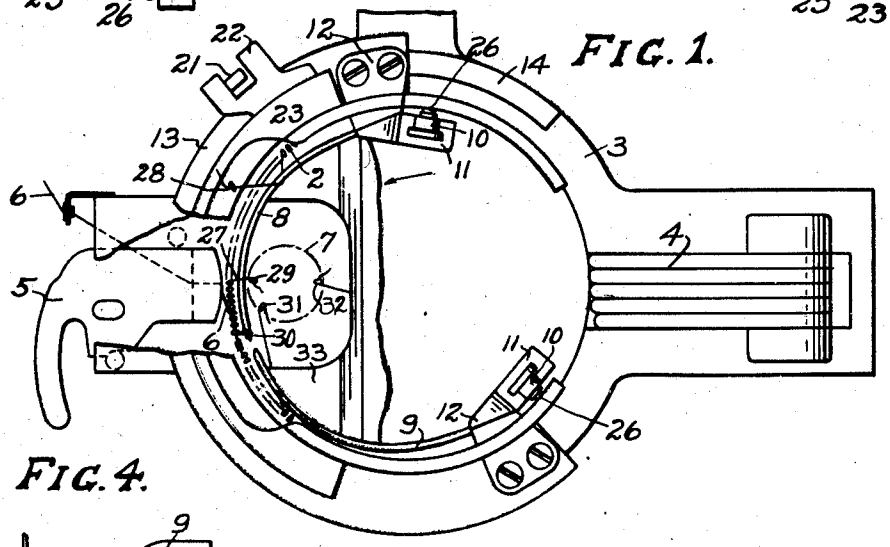


FIG. 4.

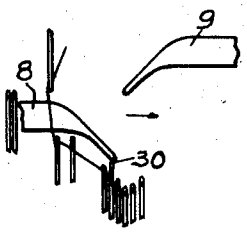


FIG. 2.

FIG. 6.

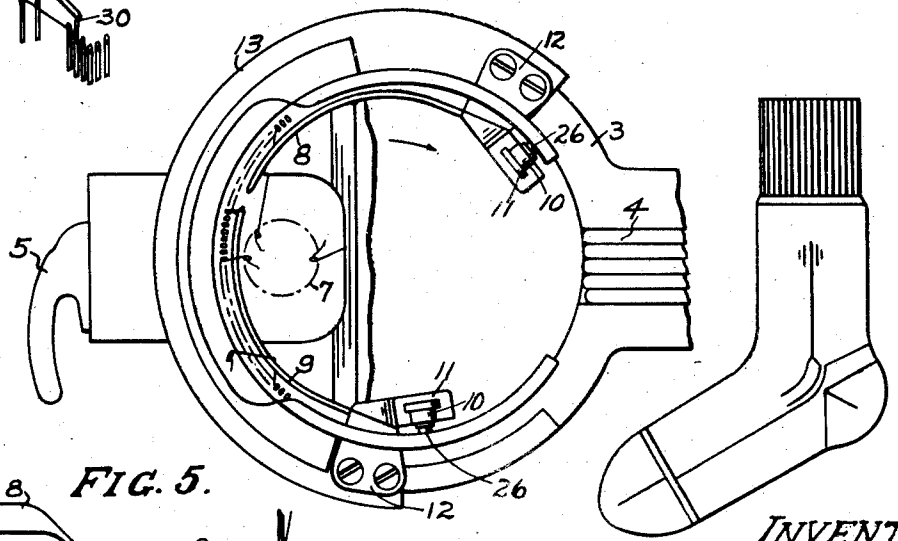
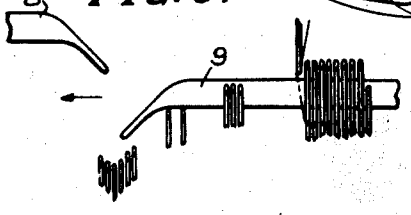


FIG. 5.



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FIG. 7.

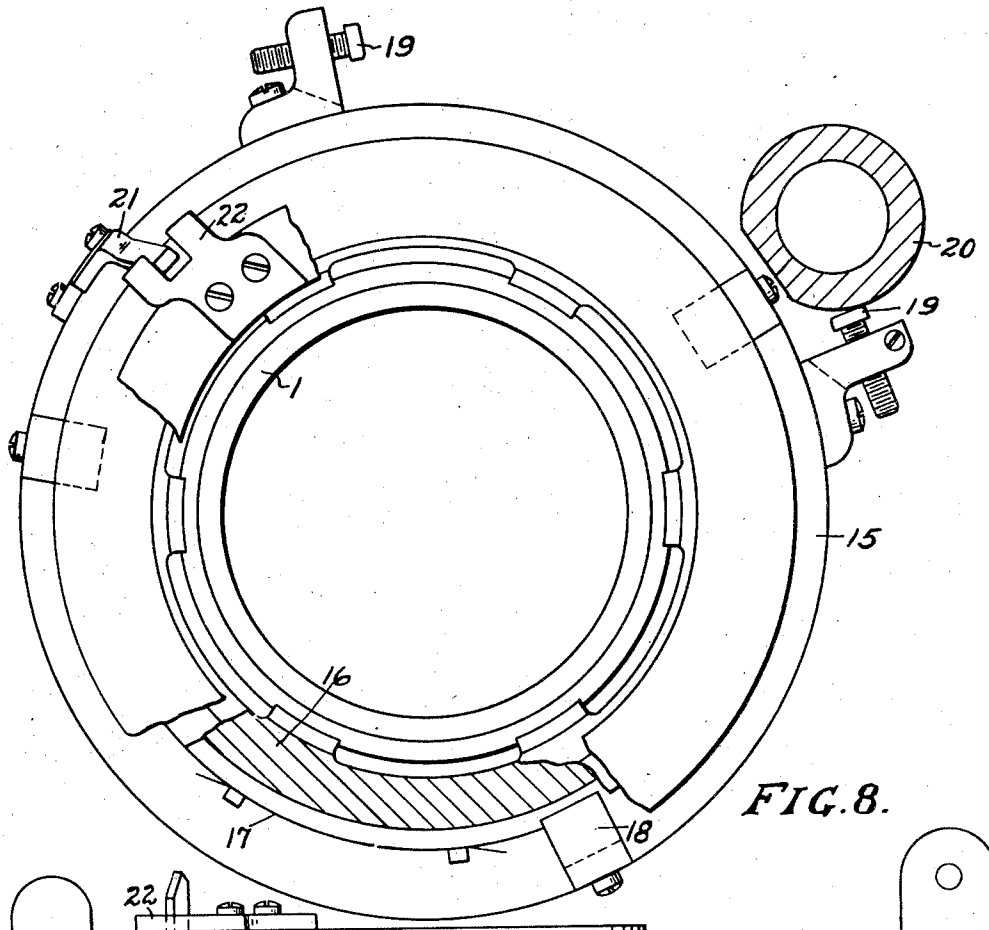
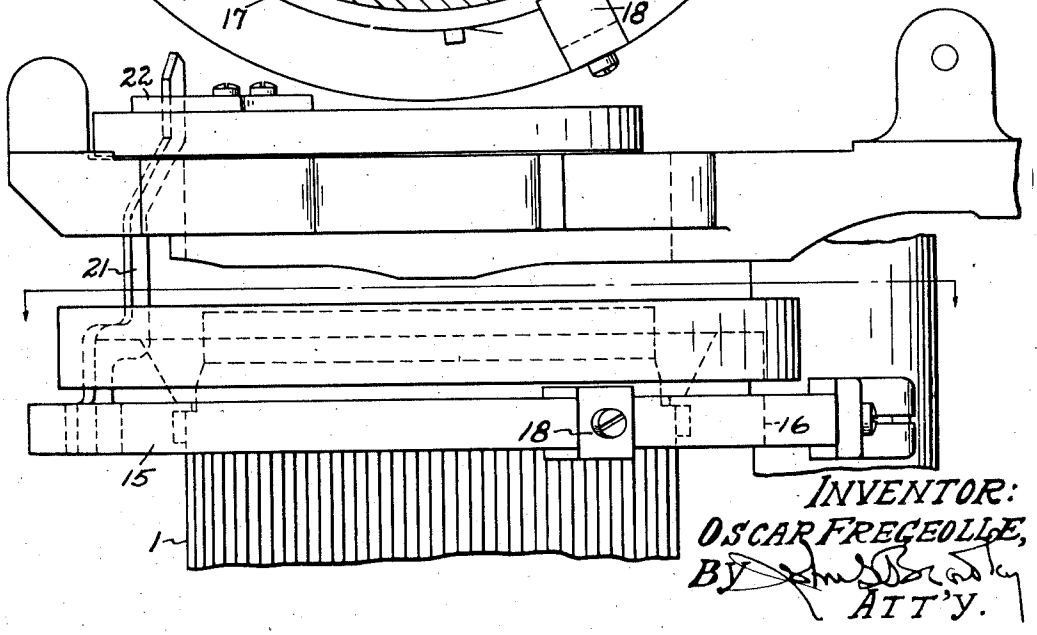


FIG. 8.



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WRAP HORN MECHANISM

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Application November 23, 1944, Serial No. 564,775

12 Claims. (Cl. 66—135)

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This invention relates to a new and useful improvement in knitting machines of the circular, independent needle, type and more particularly to wrap horns and mechanisms for operating them while making wrap patterns in consecutive courses of reciprocatorily knit fabric.

Reciprocatorily knit fabric with wrap patterns in consecutive courses has never been practical because means for properly feeding and controlling the wrap yarns in both directions of knitting have never been devised. By this invention wrapping in both directions of reciprocatory knitting is made not only possible but entirely practical and results in wrap patterns of the highest quality, particularly if the method of knitting the body fabric in which the yarns are drawn over the backs of the sinkers is included.

The most satisfactory mechanism for feeding a wrap yarn or yarns to selected needles is the wrap spindle mounted eccentrically of the needle cylinder and caused to rotate at the same angular speed as the cylinder. This spindle is so positioned that it will feed yarns to certain needles selected by raising them above the other needles. As is well-known, each eyelet or finger of such a spindle moves out beyond the needle circle before the first needle to be wrapped reaches the point at which it is to take the yarn and moves to the inside of the needle circle again after the last needle to be wrapped has received the yarn.

It is also well-known that the yarn cannot be fed directly to the needles from a loop of a previous course for several reasons. In the first place, the needles to be raised are considerably below their yarn receiving position when the wrap spindle eyelet or finger moves outward across the needle circle. Therefore, if the wrap yarn extends directly from the last wrap loop of a preceding course to the eyelet of the wrap spindle the chances that it would be taken by the needle for a single needle wrap or by the first needle of a multi-needle wrap are problematical. It positively could not be taken by the remaining needles used for a multi-needle wrap.

In addition, there is no control over the wrap yarn loop between the time it is fed to a needle and the time this same needle takes the body yarn and both yarns are knit and cast off. The result of this lack of wrap yarn control is an uncertainty and irregularity of loop length and a pattern so full of imperfections as to be commercially valueless.

These difficulties are completely overcome by the use of a horn positioned closely within and substantially concentric with the needle circle

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with its tip as close as possible to the knitting point. This horn is placed at such an elevation that a wrap yarn passing around it from a previous course is raised to approximately the same level as the eyelet of the wrap spindle so that it is fed, substantially horizontally, directly across the needle circle at a height which insures that it will be cleared by all of the needles except those which are raised excessively in order to take it and will not pass below the latches of the selected needles with the loops which are to be cast off.

One form of the invention is shown in the drawings of which:

Fig. 1 is a plan view of the latch ring of a circular, independent needle, knitting machine of the Banner type, the wrap horns and the horn operating mechanism. This view also illustrates certain steps in the making of wrap patterns in counterclockwise direction of reciprocatory knitting;

Fig. 2 is a similar view illustrating similar things in clockwise direction of reciprocatory knitting;

Fig. 3 is a view of a part of the wrap horn operating mechanism;

Figs. 4 and 5 are diagrammatic views illustrating the manner in which the horns function and their position with respect to the knitting point;

Fig. 6 is a view illustrating a stocking having a circularly knit leg and split foot both of which are ornamented by a wrap pattern in consecutive courses;

Fig. 7 is a plan view of the sinker head and friction ring from which the wrap horns are operated; and

Fig. 8 is a front elevation of the sinker head and friction ring showing also the carrier ring and arcuate segment upon which the wrap horns are mounted.

As shown in Figs. 1 and 2 the machine is provided with the usual rotatable needle cylinder indicated by the broken lines 1 having the usual complement of needles 2 and a carrier ring 3 equipped on the main side of the machine with the usual yarn levers 4. On the auxiliary side is another yarn lever 5 mounted on the underside of the carrier ring so that it will feed a yarn at a low angle. Also this yarn lever is centrally positioned so that it feeds the yarn to the needles in exactly the same way in both directions of reciprocatory knitting. This yarn lever 5 feeds the body yarn 6 to the needles.

The machine is also provided with a wrap spindle 7 symmetrically positioned with respect to

yarn finger 5 and preferably provided with a plurality of outwardly displaceable yarn feeding fingers, and two wrap yarn horns 8 and 9 for guiding the wrap yarn as will be explained later. Horns 8 and 9 are each provided with rollers 10 sliding in a vertical guide 11 in the inner end of a bracket 12 which is attached to an arcuate segment 13 adapted to swing through a definite arc on a suitable guide ring 14 forming a part of or attached to carrier ring 3.

The swinging of arcuate segment 13 is controlled from the sinker head (Figs. 7 and 8) by a friction ring 15 surrounding the sinker head 16 and maintained in engagement therewith by a spring 17. Ring 15 is held in its proper alignment with sinker head 16 by clips 18 which project inside of ring 15 and loosely engage the edge of sinker head 16. Because of the frictional engagement between ring 15 and sinker head 16 provided by spring 17 ring 15 will rotate with the sinker head and, consequently, with the needle cylinder to which the sinker head is attached, unless it is restrained. The amount of rotation of ring 15 in either direction is restricted by adjustable stops 19 which are engageable with a fixed part 20, which in Fig. 2 is the post which supports the wrap spindle and other mechanisms of the upper part of the machine.

Ring 15 is connected to segment 13 on the carrier ring by means of a finger 21 attached to ring 15 and extending into a fork 22 in an extension of ring 13. Since segment 13 is free to swing upon carrier ring 3 it will follow the movements of ring 15 as it swings one way or the other under the influence of the sinker head and within the limits imposed.

Since wrap horns 8 and 9 are each mounted in a guide 11, which in turn is attached to segment 13, the horns will also swing about the needle circle in a corresponding manner and degree. All of these mechanisms are so positioned that the horns will be swung an equal distance on either side of the feeding eyelet of auxiliary yarn finger 5 to assume, in alternation, corresponding operating positions. Of the two wrap horns 8 and 9, horn 8 is used for wrapping in counter-clockwise direction and horn 9 in clockwise direction. The one not in use must be moved out of the way. In this instance it is raised above its working level. To accomplish this there is mounted on the carrier ring an arcuate plate 23 the ends of which are provided with zig zag slots 24 and 25 as shown in Fig. 3. These slots are identical in shape but oppositely directed as shown. A pin 26, extending from each roller 10, projects into one of slots 24 and 25. Slots 24 and 25 are so positioned and of such length that as ring 13 is swung upon carrier ring 3 by friction ring 15 carrying horns 8 and 9 with it, pins 26 will move from one end of the slots to the other. Since the two slots are opposed in direction the result is that one pin moves from the high to the low part of its slot as shown at the left in Fig. 3 and the other pin moves from the low to the high part of its slot as shown at the right in Fig. 3. Thus horns 8 and 9 will always be in opposite positions. During rotary knitting and reciprocatory knitting in counter-clockwise direction, horn 8 will be down in operating position and horn 9 will be up in its inoperative position. When knitting in clockwise direction horn 9 will be down in operating position and horn 8 will be up. These two positions are shown in Figs. 4 and 5, respectively.

When knitting the leg by the usual rotary method in counter-clockwise direction a body yarn is fed to the needles by means of lever 5 on the auxiliary side as shown in Fig. 1 and is knit on that side.

If this part of the stocking is to be provided with a wrap pattern such, for example, as that shown in Fig. 6 the wrap yarn 27 is fed from a previous course inside of and over horn 8 which is in its low position (Fig. 4) to the needle or needles to be wrapped by wrap spindle 7, one finger of which has been swung out so that its eyelet 28 is outside of the needle circle as shown in Fig. 1. The needles to be wrapped are, of course, selected and elevated to a position higher than the usual yarn receiving height by a suitable selector of any preferred type. After the wrap yarn has been fed to the selected needles finger 28 moves back to a position inside the needle circle indicated at 29 in Fig. 1, the wrap yarn dropping off the end of horn 8 just before the knitting point is reached as indicated at 30 in Figs. 1 and 4. Upon further rotation of the needle cylinder and wrap spindle, eyelet 28 assumes positions indicated by 31 and 32, the wrap yarn passing under the usual binder plate 33 and under horn 9 and so on until the cycle is completed.

The operation is the same for reciprocatory knitting in counter-clockwise direction, ring 13 being swung in that direction by friction ring 15 so that horn 8 is in operating position and horn 9 is raised. When knitting in the other or clockwise direction segment 13 is swung in that direction with the result that horn 9 is now in its low operating position. The body yarn 6 is fed to the needles by yarn lever 5 in the same way as before but in the opposite direction and the wrap yarn is also manipulated in the same way but also in the opposite direction as shown in Fig. 2.

By this simple and reliable mechanism it becomes possible to include wrap patterns of high quality of any desired type in consecutive courses of both rotary and reciprocatory knitting without altering in any essential respect methods of wrapping.

If the method of knitting is employed in which the yarns are drawn over the backs of the sinkers instead of in their throats even more perfect results can be secured. This method is fully described both for rotary and reciprocatory knitting in Patent #2,360,668 and co-pending application #508,693, filed November 2, 1943, now Patent No. 2,376,044. This method not only produces a more perfect fabric as a basis for the wrap pattern but also improves the wrap itself. Since the yarns are drawn over the backs of the sinkers, the horns 8 and 9 can be positioned at a level sufficiently high that they cannot be struck by the sinkers. Therefore, their tips can be moved even closer to the knitting point with the result that the wrap yarn loops are kept under complete control almost to the instant of knitting which insures a very uniform loop. The wrap horns illustrated in Figs. 1, 2, 4 and 5 are positioned upon this assumption. It will be noted particularly from Figs. 4 and 5 that their points would almost touch if they could both be lowered at the same time.

I claim:

1. For a circular, independent needle, knitting machine, wrap mechanism which includes a pair of opposed, substantially arcuate, wrap horns and automatically operated means for moving each of said horns in alternation from an inoperative to an operative position.

2. For a circular, independent needle, knitting

machine, wrap mechanism which includes a pair of opposed, substantially arcuate, wrap horns and means for swinging said horns in clockwise and counter-clockwise directions and for simultaneously raising one horn and lowering the other.

3. For a circular, independent needle, knitting machine, wrap mechanism which includes a pair of opposed, substantially arcuate, wrap horns, means for swinging them in clockwise and counter-clockwise directions and means for simultaneously raising one horn and lowering the other, said last mentioned means being operated by said swinging means.

4. For a circular, independent needle, knitting machine having a needle cylinder, wrap mechanism according to claim 1 in which the means for moving each of said horns is operated in timed relation to the rotation of the needle cylinder in either direction.

5. For a circular, independent needle, knitting machine having a sinker head, wrap mechanism according to claim 1 in which the means for moving each of said horns is operated by an element frictionally engaged with the sinker head.

6. For a circular, independent needle, knitting machine having a needle cylinder, wrap mechanism which includes a pair of opposed, substantially arcuate, wrap horns, a vertically movable support for each of said horns, said support also being capable of swinging in an arc concentric with the cylinder and automatically operated means for so swinging said support.

7. For a circular, independent needle, knitting machine having a needle cylinder, wrap mechanism which includes a pair of opposed, substantially arcuate, wrap horns, a common support for both of said horns, means for swinging said horns in the same direction that the cylinder is rotating and means to limit the extent to which said swinging means can swing said wrap horns.

8. For a circular, independent needle, knitting machine according to claim 2 in which the means

for simultaneously raising one horn and lowering the other consists of two fixed oppositely positioned cams having camming surfaces for imparting to said horns motions having both horizontal and vertical components.

9. For a circular, independent needle, knitting machine having a needle cylinder wrap mechanism which includes a pair of opposed substantially arcuate wrap horns, a common support for both of said horns freely swingable, within limits, concentrically with the needle cylinder and means for swinging said common support in the direction of rotation of the needle cylinder, said last mentioned means being in constant frictional engagement with an element rotating in harmony with the needle cylinder.

10. For a circular, independent needle, knitting machine having a needle cylinder, wrap mechanism which includes a pair of opposed, substantially arcuate, wrap horns, each of said horns being mounted upon a support which is swingable concentrically with and in the direction of rotation of the needle cylinder, frictionally driven means for so swinging each of said horns and said support, said support also including means which cooperate with fixed means to raise a horn and lower the other when said support is so swung.

11. For a circular, independent needle, knitting machine having a needle cylinder, wrap mechanism which includes a substantially arcuate wrap horn and means for swinging it in the direction of rotation of the needle cylinder and concentrically therewith and means for moving it vertically to establish it in operating position.

12. For a circular, independent needle, knitting machine having a needle cylinder, wrap mechanism which includes a pair of opposed, substantially arcuate, wrap horns and means for simultaneously raising one and lowering the other in each direction of rotation of the needle cylinder.

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