April 23, 1946. B. F. COILE 2,399,002

CIRCULAR KNITTING MACHINE

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Fig. 1.

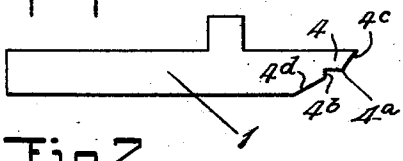


Fig. 2.



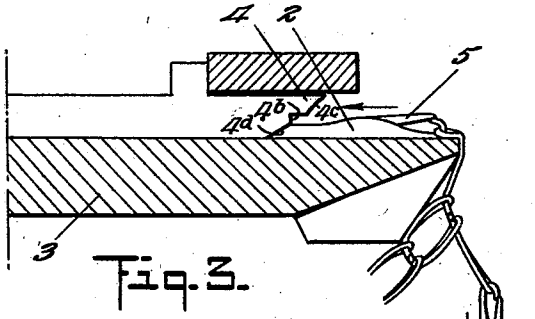
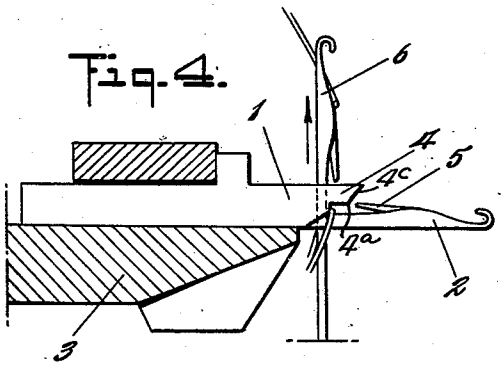


Fig. 3.

Fig. 4.



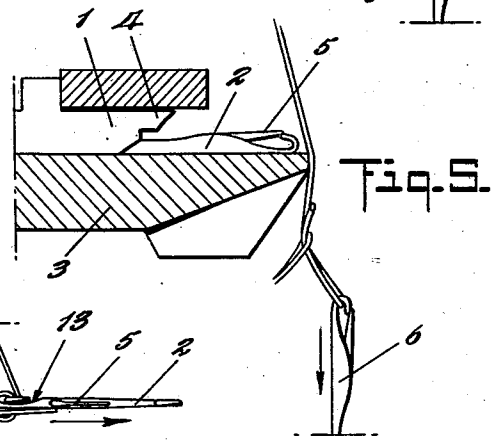


Fig. 5.

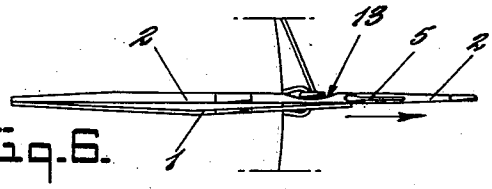


Fig. 6.

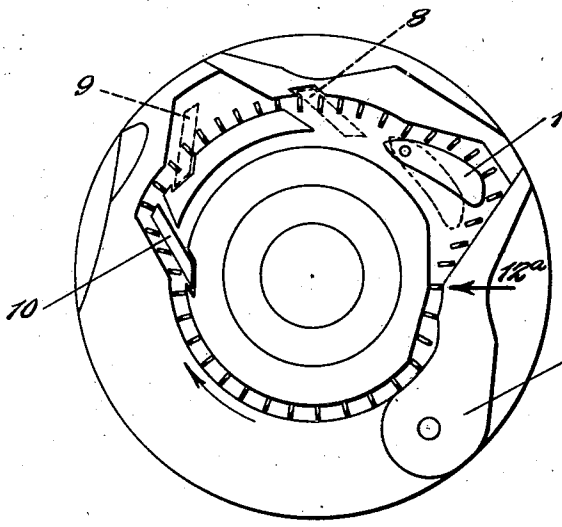


Fig. 7.

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CIRCULAR KNITTING MACHINE

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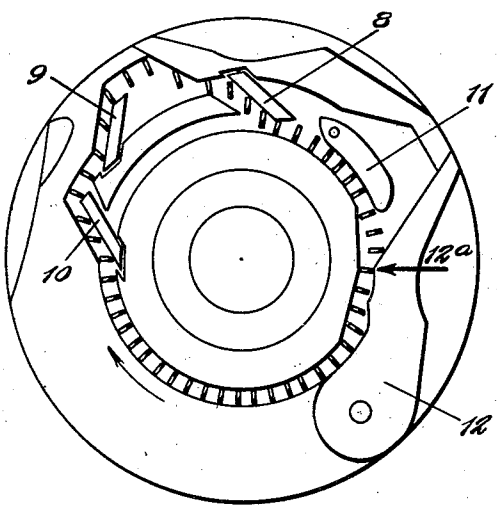


Fig. 8.

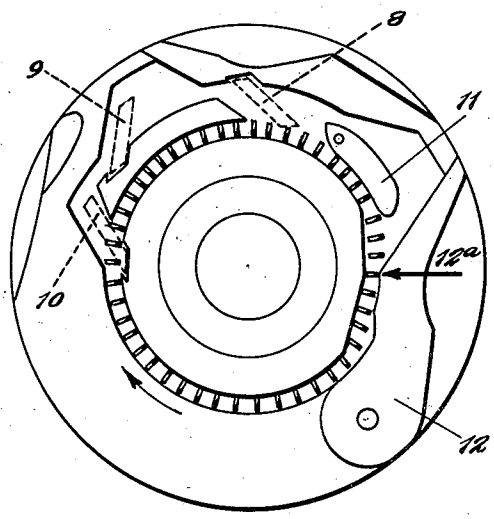


Fig. 9.

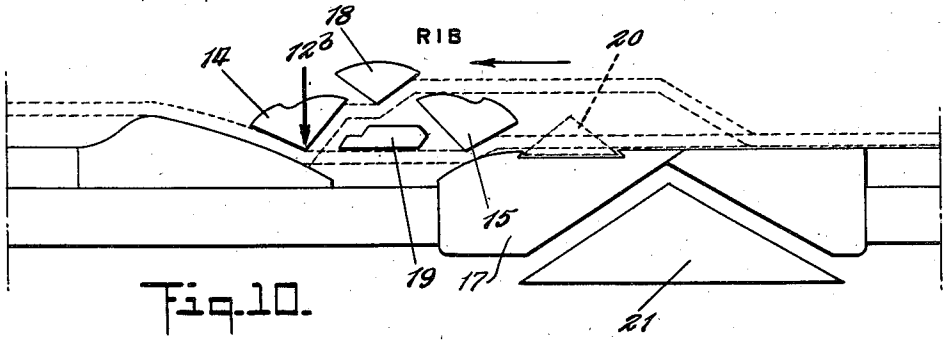


Fig. 10.

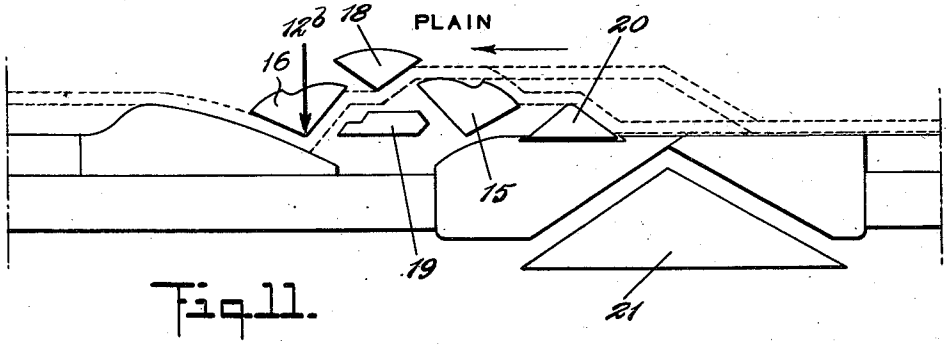


Fig. 11.

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2,399,002

CIRCULAR KNITTING MACHINE

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Application September 23, 1943, Serial No. 503,477

7 Claims. (Cl. 66—24)

The invention relates to improvements in circular knitting machines of the type comprising a set of cylinder needles and a set of dial needles, and more particularly to novel means employed on the machine for effecting the knitting of true rib fabric, and which also permits the automatic transfer of the knitting from the dial needles to the cylinder needles, after the rib fabric has been completed.

The principal object of the invention is to provide means cooperating with the dial needles of a circular knitting machine for effecting the efficient knitting of true rib fabric, and which means will eliminate the use of take-up weights in the machine to tension the web and to hold it on the dial needles.

A further object is to provide, in lieu of the customary take-up weight mechanism on a circular knitting machine, presser devices which are adapted to cooperate with latches of the dial needles to hold the thread down on said needles.

A further object is to provide a dial needle construction for circular knitting machine wherein the dial needles are formed straight instead of bent in shape, and so that said needles will always be maintained in true alignment with the cylinder needles when the stitches of the knitting are transferred to said cylinder needles.

A further object is to provide novel presser devices which cooperate with the dial needles of a circular knitting machine and function to frictionally hold said needles in their dial slots.

A further object is to provide means on a circular knitting machine for knitting a true rib fabric with latch needles in the vertical cylinder and in the horizontal dial of the machine.

Other objects of the invention will appear more fully hereinafter.

Although the novel features of the invention will be particularly pointed out in the appended claims, the invention itself, as to its objects and advantages, may be better understood by referring to the following description taken in connection with the accompanying drawings forming a part hereof and in which:

Figure 1 is a side view of a presser device used in conjunction with the dial needles in carrying out the objects of my invention;

Figure 2 is a top plan view of the presser device;

Figure 3 is a fragmentary sectional view through the dial of the circular knitting machine and showing a dial needle assembled with a presser device in dial needle slot, said dial needle being shown carrying a loop of the thread which is to be transferred to a vertical cylinder needle;

Figure 4 is a similar view through the dial of the machine and showing the loop of thread about to be transferred to the vertical cylinder needle which is indicated in its upward position;

Figure 5 is a similar view through the dial of the machine and showing the dial needle retracted and the vertical cylinder needle moving downwardly and engaging the loop of thread which has been transferred to it from the dial needle;

Figure 6 is a top plan view of the dial needle, presser device and the vertical cylinder needle, as it appears in Figure 4;

Figure 7 is an underside view of the dial cam plate and indicates the travel of the dial needles and presser butts while the machine is knitting inside rib;

Figure 8 is a similar view showing the travel of the butts of the needle and presser when certain of the dial cams are lowered to push the dial needle in position to transfer the stitch on to the vertical cylinder needles also to put the dial needles and pressers back into a neutral position;

Figure 9 is a similar view and shows the travel of the dial needle and presser butts when said dial needles are operating at a neutral position with certain of the cams raised and one cam moved to a neutral position;

Figure 10 is a developed view of the cylinder cam box and indicates the travel of the vertical cylinder needles when knitting in the rib fabric; and

Figure 11 is a similar view and indicates the travel of the vertical cylinder needles when knitting plain knit work.

The present invention provides a novel means which simplifies and makes more efficient in operation the mechanism of circular knitting machines designed to knit true rib fabric.

The construction and operating characteristics of circular knitting machines are so well known in the art that it is deemed unnecessary to illustrate the entire mechanism, nor to describe it in detail herein. For the purpose of understanding the present invention it is sufficient to say that a circular knitting machine for knitting a true rib fabric to which it is applied includes the usual mechanism present in such a machine, such as a cylinder; a dial construction; a set of cylinder needles; a set of dial needles; and means for feeding yarn to the needles. The cylinder of the machine would have the usual

grooves for receiving the cylinder needles and the dial would include the usual dial bed keyed to a drive shaft arranged concentric to the cylinder. Also, of course, the dial would be provided with radial grooves within which the dial latch needles would be reciprocably slidable. Also, as is well known, the dial needles are not operative upon the knitting yarn during the knitting of plain fabric which is accomplished solely or almost wholly upon the cylinder needles. However, during the rib knitting of the seamless fabric the alternate cylinder needles are elevated into position to take the knitting in the grooves of the cylinder.

In previous types of circular knitting machines for knitting true rib fabric, the mechanism thereof almost universally includes a web take-up attachment employing take-up weights which function to tension the web during the knitting and also to remove the stitch from the vertical and horizontal needles during the knitting of the rib fabric. Another type web take-up also is used in these machines. At the bottom of the dial there is provided fins which project below the hook and cast off slots. These fins function to take off the work from the hooks and cast offs and this is accomplished by placing the sinkers in the machine with one plain and one saw toothed sinker. In operation the fin on the dial drops down on the top of the plain sinker and the saw tooth sinker then protrudes up in the slot of the dial and the teeth thereof will hook the thread and then the sinker is pressed in by a cam. This action places a pressure on the stitch to pull it off the hook. In view of the fact that the saw tooth sinker is only .006 to .010 of an inch thick, if there is any weak place in the yarn, or if the teeth of the sinker have become nicked, it will result in a hole being cut and when this occurs the following stitch will have nothing to pull it from the hook for, as a general rule, the machines are set up with approximately three stitches between the hook of the needle and the tooth on the sinker. Furthermore, when a hole is thus produced the tension of the web is released and this causes the following stitches to pile up on the needles, and if the stop motion fails to stop the machine immediately it results in a smashing up of the machine.

It is the main object of the present invention, in addition to its purpose of simplifying the mechanism of the machine as a whole, to eliminate these faults in a machine for knitting rib fabric.

In carrying out the objects of my invention I utilize the usual type of dial as employed on a circular knitting machine. However, said dial is made plain under the bottom and the above mentioned fins which protrude between the sinkers are eliminated. I also utilize the plain sinkers as employed with this type of machine, and I dispense with the use of the take-up weights to tension the web and hold it on the dial needles.

In accordance with the invention I accomplish the purposes intended principally by using a presser device which is indicated at 1, in Figures 1 and 2. This presser device is used in conjunction with the dial needles (indicated at 2, in Figures 3, 4, 5 and 6). The presser device is a strip of metal so shaped that it is slightly bent or bowed, whereby when it is used with the dial needle in the needle slot in said dial, it functions to frictionally hold the needle in said slot. The bent feature of the presser makes it possible to form the dial needle 2 straight, instead of bent, as is the usual practice, and hence said needles can then be maintained in better alignment with the vertical cylinder needles in effecting the transfer of the stitches from the same to the said vertical cylinder needles. The straight shape of the dial needle 2, and the bent shape of the presser device 1, when they are associated with each other, is clearly shown in Figure 6. The presser device and needle when assembled in the dial slot is shown in Figures 3, 4 and 5, the dial bed being shown at 3.

It will also be noted by reference to Figures 1 to 5, that the presser device is formed with a hooked or projecting finger portion at its outer end generally indicated by the numeral 4 which is adapted to hold down the thread and to force it to pass under the latch 5 of the dial needle 2 during the knitting operation, as will be explained later. The hook or finger 4 at the outer end of the presser device 1 is formed by undercutting said device and forming a notch N defined by a horizontal edge portion 4^a and an upright or vertical edge forming a shoulder 4^b. The finger 4 is adapted to overlie a loop or thread on the dial needle 2 during a given stage of knitting, as illustrated in Figure 4. The end of the finger 4 terminates in a downwardly and inwardly inclined face 4^c extending from the upper edge of the presser device 1 to the horizontal wall portion 4^a. The angularity or inclination of the face 4^c is such that the end of the latch 5, in swinging from the position shown in Figure 3 to that shown in Figure 4, clears the same sufficiently to allow the loop on the needle 2 to pass from the latch to a position under the finger 4. The inclination of the face 4^c is also such as to aid in directing the loop into a position under the finger 4. The shoulder 4^b limits inward movement of the loop on the dial needle 2. It will be particularly noted from Figure 4 that the edge portion 4^a of the finger 4 lies in approximately the same horizontal plane as the free end of the fully open latch 5, so that when the loop is later removed from the dial needle 2 by the cylinder needle 6, it must move outwardly under the finger 4 and engage the underside of the latch 5, instead of being snagged on the point of said latch or passing over the latch and getting caught on the hook of the dial needle 2, as frequently occurs in conventional knitting machines. It will be still further noted that the presser device 1 includes a second bevelled portion 4^d which extends downwardly and inwardly from the shoulder 4^b. The object of the bevel 4^d is to provide clearance that will eliminate any tendency of the thread or yarn, when it assumes a position corresponding to that shown in Figure 4, to enter the space between the adjacent faces of the presser device 1 and the dial needle 2 and being "pinched" therebetween, or from catching on the lower outer corner of the presser device 1 (as would be the case if the bevel 4^d were omitted and the presser device 1 was formed with a right angular corner at this point).

In Figures 3, 4 and 5 there is illustrated the operation of the dial needles 2, and the presser device 1, as the dial needle transfers a stitch to the vertical cylinder needles. From these figures it will be seen that in Figure 3 the dial needle is carrying a loop of thread which is to be transferred to a vertical cylinder needle, the vertical cylinder needle, indicated at 6, being shown in its down position. In Figure 4, the dial needle 2 has moved outwardly and the loop of thread thereon has been deposited under the hook por-

tion 4 of the presser device as the vertical cylinder needle has been raised to its upward position. In Figure 5, the dial needle is shown in its original receded position and the vertical cylinder needle has moved to its downward position carrying the loop of thread transferred to it from the dial needle.

For a complete understanding of the operation of the dial needles, pressers, and the dial cam mechanism, used in carrying out the objects of my invention, reference is now made to Figures 7, 8 and 9 of the drawings.

In Figure 9 I have shown the travel of the dial needle and presser butts, when the dial needles are running at a neutral position with cams 8, 9 and 10 raised and cam numbered 11 moved to a neutral position.

In Figure 7 there is shown the needle and presser butts while the machine is knitting inside rib, and showing cam 10 lowered to pass needles into the upper race, putting them into position to pass over cam 11, which is shown raised to shed the stitch, and also to pick up the yarn on the hook of the needle.

After the yarn is laid in the hook of the dial needle the former stitch is passed behind the latch and under the presser as shown in Figure 4, and the needle is drawn in by cam numbered 12, shown in Figure 9. The point of this cam, indicated at 12^a, is timed with cam point indicated at 12^b in Figure 11, by the method of setting these two stitch points, 12^a being the dial needle stitch cast off point, and 12^b the vertical cylinder needle stitch cast off point. This will effect the regulation of the amount of yarn drawn by the two needles.

In Figure 8, there is indicated the travel of the dial needle and presser butts when cams 8 and 9 are lowered, pushing the dial needle in position to transfer the stitch onto the vertical cylinder needle, also to put needles and pressers back in neutral position, as illustrated in Figure 9. This transfer of the stitch is accomplished when the needles pass over cam 9, pushing the needle forward, exposing the concave in the needle (indicated at 13 in Figure 6), and at this point the vertical cylinder needle 6 is pushed up through the stitch. At this point in the operation the presser 1 is very essential, as it prevents the vertical cylinder needle 6, if from some cause it has been thrown out of line, from catching the yarn and pushing it high and causing it to pass over the latch 5, of the dial needle, and catching the hook of said needle. If this should happen it would cause the machine to hold on to the stitch, and a loading up would occur which in turn would cause a smashup in operation.

In Figures 10 and 11 there is shown a development of the cam box of the machine in which my invention is employed, and indicates the usual cams ordinarily used in a circular knitting machine, such as the stitch cams 14 and 15, the side cams 16 and 17, the top center cam 18, the bottom center cam 19, and the cam 20.

In Figure 11 the cam box shows all of the usual cams with the exception of cam 20 which has been changed from a stationary cam to a floating cam. The dotted lines in this figure show the travel of the vertical cylinder needles when they are knitting plain knit work.

Figure 10 illustrates the travel of the vertical cylinder needles when they are knitting in the rib fabric and shows said needles pushed up by jacks when passing over cam 21, and certain of the needles, where the jacks and cam 20 have been removed, passing under cam 15. This prevents the vertical cylinder needles without jacks from raising over the cam 15 and taking on yarn, these unjacked needles being replaced at this stage of the operation by the horizontal dial needle.

By means of the present invention above described, a method is provided for making a true rib fabric on a circular footer knitting machine with a method for automatically transferring from the dial needles to the cylinder needles after completing the rib fabric. The true rib fabric is knit with latch needles in the vertical cylinder and in the horizontal dial, and this is accomplished by reason of the use of the presser device 1, above described. By utilizing the means described in the specification the knitting of true rib fabric may be accomplished without the use of the customary take-up weights to tension the thread and to hold it on the dial needles. As will be noted from the description and drawings, the presser device used in conjunction with the dial needle, prevents the vertical cylinder needle from catching the yarn and raising it over the latch of the dial needle, or from catching on the end of the latch and thereby it prevents loading up of the yarn on the dial needle which eventually would cause a smashup necessitating the loss of considerable time in getting the machine back into production. Furthermore, the presser members function to hold the dial needles in their slots, and this permits said dial needles to be made straight instead of bent, as in the past. This gives better alignment of the dial needles with the cylinder needles during the knitting process. Also, the invention simplifies the mechanism of the machine and increases its efficiency in operation.

While the improvement I have made has been described for use on a machine for knitting true rib fabric, it is adaptable for use on most any other standard make circular knitting machine.

Having thus described my invention, I claim:

1. In a circular knitting machine having latched cylinder needles and a slotted dial, latch needles in the slots of said dial, presser members in the same slots with each dial needle for frictionally holding or retarding the movement of said needles in said slots, said presser members being provided with fingers at their outer ends for holding down the loops of the yarn being knitted so that auxiliary tensioning means for the fabric is not required.

2. In a circular knitting machine having cylinder needles and a slotted dial, latch needles in the slots of said dial, and a presser device in the same slot with each dial needle for frictionally holding or retarding movement of said needles in said slots, said presser device having its outer end terminating in a projecting finger and an upright shoulder spaced inwardly from the end of said finger which is adapted to overlie a loop on a dial needle to hold the same down during transfer to a cylinder needle.

3. In a circular knitting machine the combination of a cylinder, needles operating in said cylinder, a slotted dial, latch needles operating in the slots of said dial, a presser device in the same slot with each of the dial needles and slidable in said slot alongside and independently of its corresponding needle in a path substantially parallel with that of the needle, said presser devices frictionally holding said needles in said slots and each formed with a finger at its outer end for overlying

a loop of yarn on a dial needle and holding it down during the time of its transfer to a cylinder needle.

4. In a circular knitting machine having cylinder needles and a slotted dial, a latch needle in each of the slots of said dial, and a presser device in the same slot with each dial needle, each of the needles and presser devices having operating butts whereby movement thereof in predetermined relative relation may be effected, each of said presser devices having its outer end terminating at a point slightly inwardly of the free end of the latch when said latch is in its full open position, and being undercut to provide a projecting finger and shoulder with the lower edge of said finger lying in approximately the same plane as the free end of said fully open latch, whereby a loop on said dial needle is prevented by said finger from being raised by the cylinder needles during transfer to such height as to snag on the end of said latch or override said latch and catch on the hook of said dial needle as said cylinder needle pulls said loop off said dial needle.

5. In a circular knitting machine having cylinder needles and a slotted dial, a latch needle in each slot of said dial, and a presser device in the same slot with each dial needle, each of the needles and presser devices having operating butts whereby movement thereof in predetermined relative relation may be effected, each of said presser devices being slightly bowed in shape to frictionally hold its corresponding needle in the dial slot and having its outer end terminating at a point slightly inwardly of the free end of the latch when said latch is in its full open position, and being undercut to provide a projecting finger and shoulder with the lower edge of said finger lying in approximately the same plane as the free end of said fully open lacth, whereby a loop on said dial needle is prevented by said finger from being raised by the cylinder needles during transfer to such height as to snag on the hook of said dial needle as said cylinder needle pulls said loop off said dial.

6. A device for use with a dial needle of a circular knitting machine, comprising a strip of metal slightly bowed in shape to frictionally hold the needle in the dial of the machine and being undercut at one end thereof to provide a projecting finger and an upright shoulder spaced inwardly from the end of said finger, said projecting finger being adapted to overlie a loop on a dial needle to hold the same down during transfer to a cylinder needle, and said shoulder being adapted to serve to limit inward movement of said loop on said dial needle.

7. A presser device for use with a dial needle of a circular knitting machine, comprising a bowed strip of metal undercut at one end thereof to provide a projecting finger having an inclined face and an upright shoulder spaced inwardly from the end of said finger, and a bevel extending downwardly and inwardly from said shoulder, said projecting finger being adapted to overlie a loop on a dial needle to hold the same down during transfer by a cylinder needle, said shoulder being adapted to serve to limit inward movement of said loop on said dial needle, and said downwardly extending bevel from said shoulder being adapted to prevent the yarn of the loop from entering the space between the adjacent faces of the presser device and the dial needle and being pinched therebetween.

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