

July 13, 1965

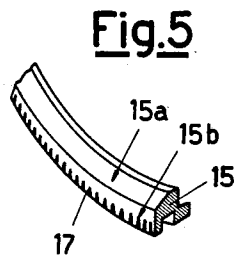
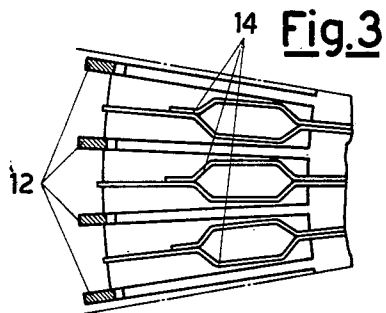
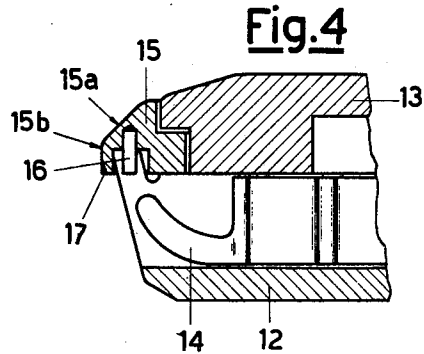
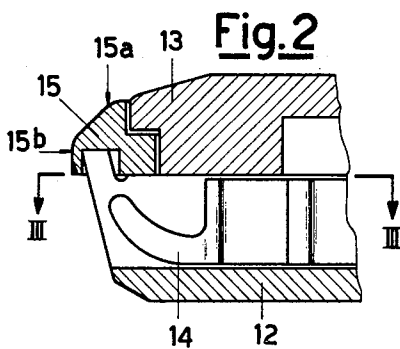
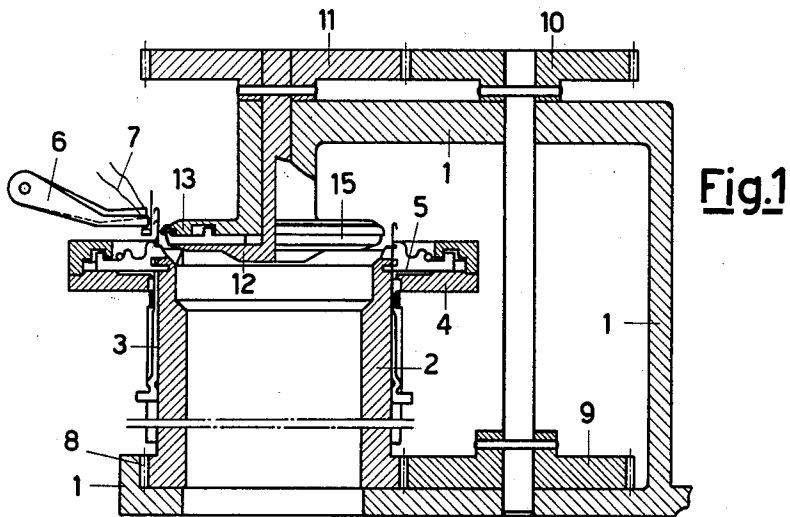
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3,194,029

YARN CONTROLLING DEVICE FOR CIRCULAR HOSIERY KNITTING MACHINES

Filed June 26, 1962

3 Sheets-Sheet 1



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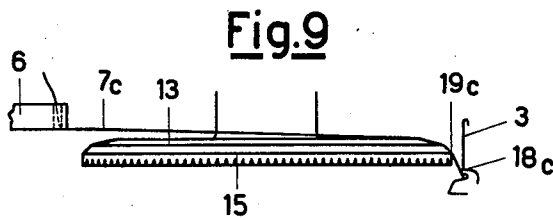
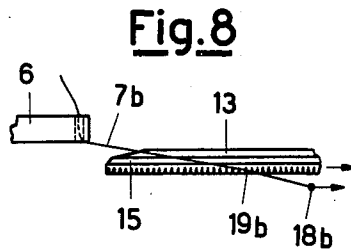
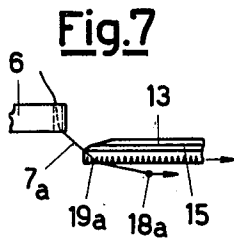
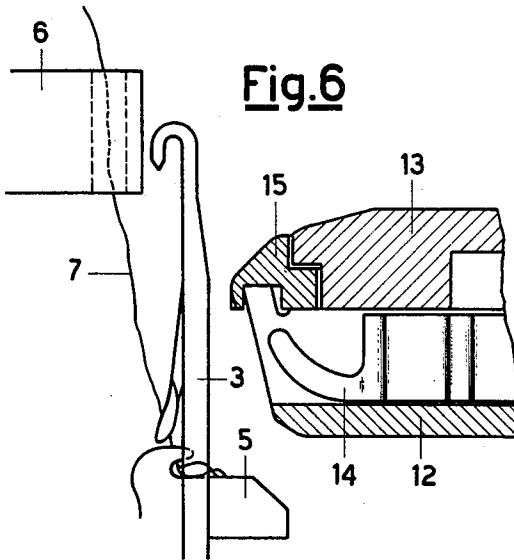
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YARN CONTROLLING DEVICE FOR CIRCULAR HOSIERY KNITTING MACHINES

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3 Sheets-Sheet 2



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YARN CONTROLLING DEVICE FOR CIRCULAR HOSIERY KNITTING MACHINES

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3 Sheets-Sheet 3

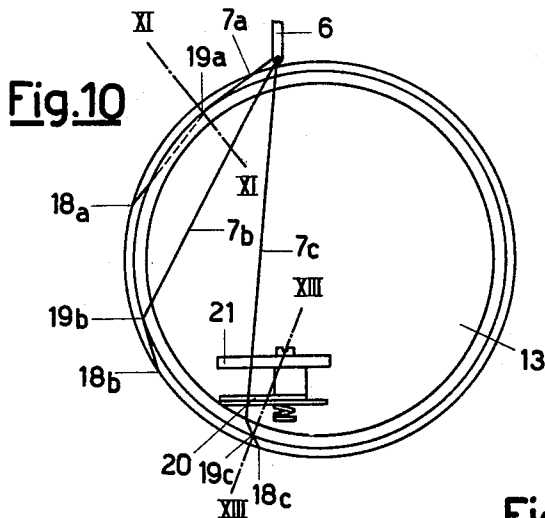


Fig.11

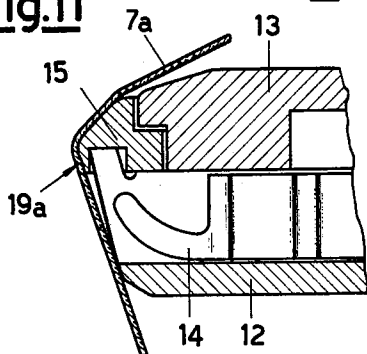


Fig.12

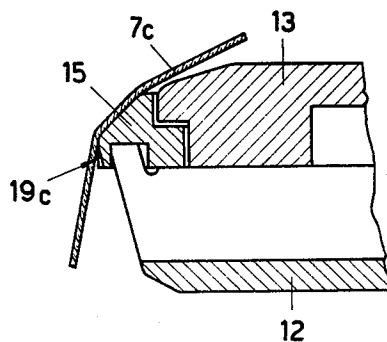
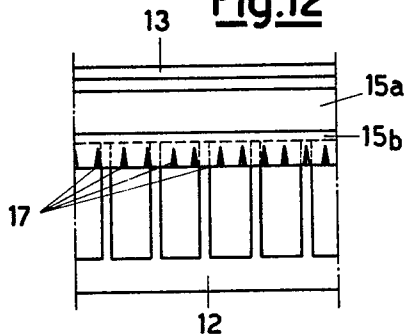


Fig.13

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3,194,029

YARN CONTROLLING DEVICE FOR CIRCULAR HOSIERY KNITTING MACHINES

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11,878/61, Patent 655,564

6 Claims. (Cl. 66—140)

This invention relates to circular hosiery knitting machines, particularly for producing ladies' stockings, and is directed to a yarn controlling device operative during pressoff or when a yarn is taken out of action to bring the yarn from the feeding station, i.e. from the position at which each yarn is formed into a stitch for knitting the fabric, onto the top surface of the dial cap where it is gripped by a suitable mechanical or pneumatic device while waiting to be inserted into action.

There have already been proposed yarn controlling devices which consist mainly in a saw-toothed wheel or ring mounted around the dial cap to turn in synchronism with the rotary motion of the needle cylinder, so that, when a yarn guide is raised to take the related yarn out of action or when the needles are so controlled that they cannot grip the yarn, the yarn can be caught by a tooth of the ring or wheel and conveyed to a point far from the point at which the stitch was formed, to be then severed by a cutting device after being clamped or held by the mechanical or pneumatic device.

It has been observed that these known devices with saw-tooth wheels have certain disadvantageous characteristics during normal operation of the knitting machine. The saw-tooth of the ring or wheel, once they have caught the yarn, retain it and do not allow it to be released from engagement therewith until the yarn is severed by the cutter. Therefore, the distance is fixed between the point at which the yarn is caught on the toothed wheel and the point of stitching thereof in the fabric that is, the location of the last needle to knit. This fixed distance is rather long and consequently, after the yarn has been cut, relatively long trailing ends of the yarn are left in the hosiery and have to be removed by a subsequent operation after the knitting of the stocking.

Another and even more serious drawback, and one which can cause defective stockings, the stoppage of the machine and some times even the breaking of machine parts, is that in certain cases the yarn to be taken out of action is not reliably passed onto the dial cap, where it should be held by the mechanical or pneumatic clamping device, but rather passes therebelow and becomes wrapped round the transfer bits on the dial. This disadvantage may occur especially during those stages of the knitting of a stocking when the yarn is not taken out of action by the raising of its guide from the operative position, but rather by the needles being controlled so that they cannot catch the yarn fed by the yarn guide which may still be in the operative position or only partly raised from said position.

The device to which this invention relates has the object of eliminating the above drawbacks of known devices and, more precisely, of guaranteeing, in the first place, that the yarn to be taken out of action is surely passed onto the dial cap, and also of allowing the yarn to be cut at a point very near to the point at which it is stitched into the fabric so that the ends of yarn protruding from the knitted fabric will be of greatly reduced length.

In accordance with an aspect of this invention, the yarn controlling device substantially consists of a ring mounted

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on the dial and formed with an outer surface divided into an upper part which is smooth and of frusto-conical shape and a lower part, which is connected to the major base of the frusto-conical part, and is substantially cylindrical and provided with a rough surface as, for example, by knurling or nicking.

The roughness of the lower part of the outer surface of the ring mounted on the dial is such as to frictionally constrain the yarn to move with the ring when the yarn comes into contact with said part of the surface, but without hooking the yarn as is the case with known saw-toothed wheels. The yarn is thus entrained by this roughness while the smooth upper part of the ring at the same time induces the yarn to pass over the dial cap. After the yarn has been dragged round through a certain angle from the point at which it entered into contact with the nicked or knurled part of the ring, the yarn passes over the dial cap and because of the change in the distribution of the forces acting on the yarn, between the point of stitching into the fabric (which point rotates in synchronism with the dial and hence with the yarn controlling ring) and the fixed feeding station, the yarn is released from the roughened part of the surface of the ring and moves along the latter closer to the point at which the yarn is stitched into the fabric. The excess length of yarn which is thus created is recovered by the ordinary take-up with which all feeds are normally provided.

In this manner the desired result is obtained, i.e. the reliable passage of the yarn over the dial cap and the shortening of the yarn end which remains attached to the fabric after cutting. It is manifest that this result is attained by reason of the special shape of the surface of the yarn controlline ring, and that the same result can not be obtained with a saw-toothed or any other type of deep-toothed wheel, because in such case, once the yarn has been caught on a tooth, it can no longer be easily released therefrom.

The above, and other objects, features and advantages of the invention will be apparent in the following detailed description of an illustrative embodiment thereof which is to be read with reference to the accompanying drawings, wherein:

FIG. 1 is a vertical sectional view of a circular hosiery knitting machine provided with a yarn controlling device in accordance with this invention;

FIGS. 2 and 4 are fragmentary sectional views, on an enlarged scale, in radial, angularly spaced planes of the dial;

FIG. 3 is a horizontal cross-section taken along the line III—III of FIG. 2;

FIG. 5 is a perspective view of a sector of the yarn controlling device;

FIG. 6 shows, partly in section, the relative positions of the dial, the yarn guide and a needle and sinker;

FIGS. 7, 8 and 9 show three successive stages in the entraining of the yarn by the yarn controlling device;

FIG. 10 is a schematic plan view of the dial cap;

FIG. 11 and FIG. 13 are partial sections of the dial, taken along the lines XI—XI and XIII—XIII respectively of FIG. 10; and

FIG. 12 is a fragmentary elevational view of the dial with the yarn controlling device thereon, as viewed from the periphery.

Only those parts of the circular knitting machine for the production of ladies' stockings are schematically shown which are necessary to understanding of the invention. In other respects, the machine itself is of a well

known type and familiar to those skilled in the art, so that it is not necessary to give a detailed description of its structure and operation.

With reference to FIG. 1, it will be seen that the machine comprises a frame 1 in which there is rotatably mounted a needle cylinder 2 carrying, in peripheral slots thereof, a circle of needles 3 and also carrying, at its top, a crown 4 with sinkers 5. Cylinder 2 is rotated about its own axis and the usual cams (not shown) cause the needles 3 to be raised and lowered in their slots in order to knit the fabric in the conventional manner in co-operation with the sinkers 5. Yarn guides 6 are provided for feeding a plurality of yarns so that the type of yarn used in the several stages of knitting of the stocking can be varied.

Cylinder 2 is integral with a toothed wheel 8 which, through intermediate gears 9, 10 and 11, causes the synchronized rotation of a dial 12 disposed coaxially with cylinder 2 under the stationary dial cap of the machine. Dial 12 has radial slots receiving transfer bits 14 which, as is known, are used for forming the welt of the stockings. A yarn cutter 20 with a clamp 21 are placed in a suitable position (FIG. 10) on the dial cap 13.

The parts so far described are common to existing circular hosiery knitting machines and operate in the usual manner.

The yarn controlling device according to the invention consists substantially of a ring 15 fastened by means of pins 16 or the like to the top of dial 12 containing transfer bits 14, so as to concentrically surround the fixed dial cap 13. Ring 15 therefore rotates in synchronism with dial 12 and also with cylinder 2. The ring 15 mounted on dial 12 has an upper, smooth, frusto-conical part 15a, and a lower, substantially cylindrical part 15b.

The lower part 15b of the outer surface of ring 15 has a roughened surface in the form of shallow nicks, notches or knurling, indicated by the numeral 17 (FIGS. 4, 5 and 12).

The operation of the yarn controlling device is as follows: When the yarn guide 6 is lowered and needles 3 are controlled to take yarn 7 so as to form the stitch, the yarn passes a long way from the outer surface of ring 15 and cannot come into contact therewith.

However, during pressoff, or when the needles are so controlled that they cannot take the yarn 7, which is fed by one of the yarn guides, or when the guide itself is raised sufficiently so that its yarn is taken out of action, the knitted fabric rotating with cylinder 2 entrains the yarn behind it and this yarn comes out of the fabric at the point at which the last stitch was made, that is, at the location of the last needle to knit at the related feeding station.

After a certain angular displacement of the cylinder, the yarn stretched between the feeding station at which it leaves guide 6 and the last needle to knit at that station comes in contact with the outer surface of ring 15. This movement of initial contact is schematically illustrated in FIGS. 7 and 11, the thread being indicated by the numeral 7a and the location of the last needle to knit being indicated by the numeral 18a. FIG. 10 shows the same situation in a plan view. As may be seen, thread 7a touches the roughened part 17 of ring 15 at point 19a and is frictionally conveyed by the ring itself.

As ring 15 continues to rotate, its smooth, upper frusto-conical part 15a induces the yarn to pass over dial cap 13; and the last needle to knit moves to position 18b (FIGS. 8 and 10) while the point of contact of yarn 7b with the roughened part of ring 15 moves to position 19b.

Finally, upon further rotation of ring 15 (see FIGS. 9, 10 and 13), the yarn 7c is brought, almost completely, over the dial cap so as to be engaged by the clamp 21 and the cutter 20, and, owing to the changed distribution of the forces acting on the yarn, the point of contact of the yarn with the ring 15 has been moved from 19b to 19c. It will be seen that the point 19c is relatively close

to the last needle to knit which has moved to 18c. The yarn remains stretched thanks to a take-up (not shown) which takes up the excess of its length.

In this last stage, i.e. once the yarn has been taken substantially over the dial cap, for example from position 7b (FIG. 10) onwards, the conveying ring 15 has practically finished its task and the yarn is dragged up to the location 18c by the last needle which made a stitch. As a result of the special shape of ring 15 and the geometrical position taken up by the yarn, the yarn moves out of engagement with the roughened part 17 (see FIG. 13) and remains in contact with the smooth part 15a of ring 15 so that it can slide forward on this smooth part in the direction of turning of the dial. The yarn thus tends to arrange itself on the straight line joining the point at which it leaves guide 6 and the point at which the last needle to knit is located (see position 7c of FIG. 10).

This fact is very important and sharply distinguishes the device according to the invention from known devices with saw-toothed wheels or rings. By reason of the described movement of the point of contact between the yarn and ring 15 toward the location of the last needle to knit, the yarn can be cut at a point very near to the last stitch or needle effective to knit, thus eliminating the more or less long pieces of yarn which normally remain attached to the stocking and require a further finishing operation.

The device according to the invention has been described in an illustrative embodiment thereof and it is intended that it may undergo numerous variations without departing from the spirit of the invention. In particular, the roughness provided on the yarn controlling ring can be of widely varying nature so long as it is not formed of too deep notches or nicks which do not allow the yarn caught therein to be released and further so long as the roughness provides sufficient frictional resistance for the yarn to be entrained by it. It is important that this roughness should not extend over the whole outer surface of the ring but be confined to the lower part thereof which can also be slightly out of true, that is, undercut, so as not to impede or in any way interfere with the passage of the yarn over the dial cap. The smooth, frusto-conical part of the upper surface of the ring induces the yarn to pass upwards instead of being dragged downwards where it would become wound round the transfer bits.

In this connection, it is also important that the ring be fastened on top of the dial and not below it.

I claim:

1. In a circular hosiery knitting machine having a rotatable needle cylinder, a dial mounted above the needle cylinder and rotatable with the latter, a stationary dial cap above the dial, yarn guides at a feeding station and yarn clamping and cutting means on the dial cap operative to clamp and sever a yarn when the latter is taken out of action and passed over the dial cap from the related yarn guide; a yarn controlling member mounted on the dial for rotation with the latter, said yarn controlling member having an outer annular surface for contact with a yarn taken out of action and which includes an upper smooth, frusto-conical part inducing the contacted yarn to move onto the top of the dial cap and a lower, substantially cylindrical part of superficial roughness which extends from said upper part of the surface and frictionally urges the contacted yarn to move with said annular surface.

2. In a circular hosiery knitting machine, a yarn controlling member as in claim 1; wherein said lower part of the surface is knurled to provide said superficial roughness.

3. In a circular hosiery knitting machine, a yarn controlling member as in claim 1; wherein said lower part of the surface has nicks therein to define said superficial roughness.

4. In a circular hosiery knitting machine, a yarn controlling member as in claim 1; wherein said lower part

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of the surface has shallow notches therein to define said superficial roughness.

5. In a circular hosiery knitting machine, a yarn controlling member as in claim 1; wherein said substantially cylindrical lower part extends downwardly from the large diameter end of said frusto-conical upper part of the surface.

6. In a circular hosiery knitting machine, a yarn controlling member as in claim 1; wherein said member is in the form of a ring disposed on top of the dial and extending around the dial cap.

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