

Nov. 3, 1942.

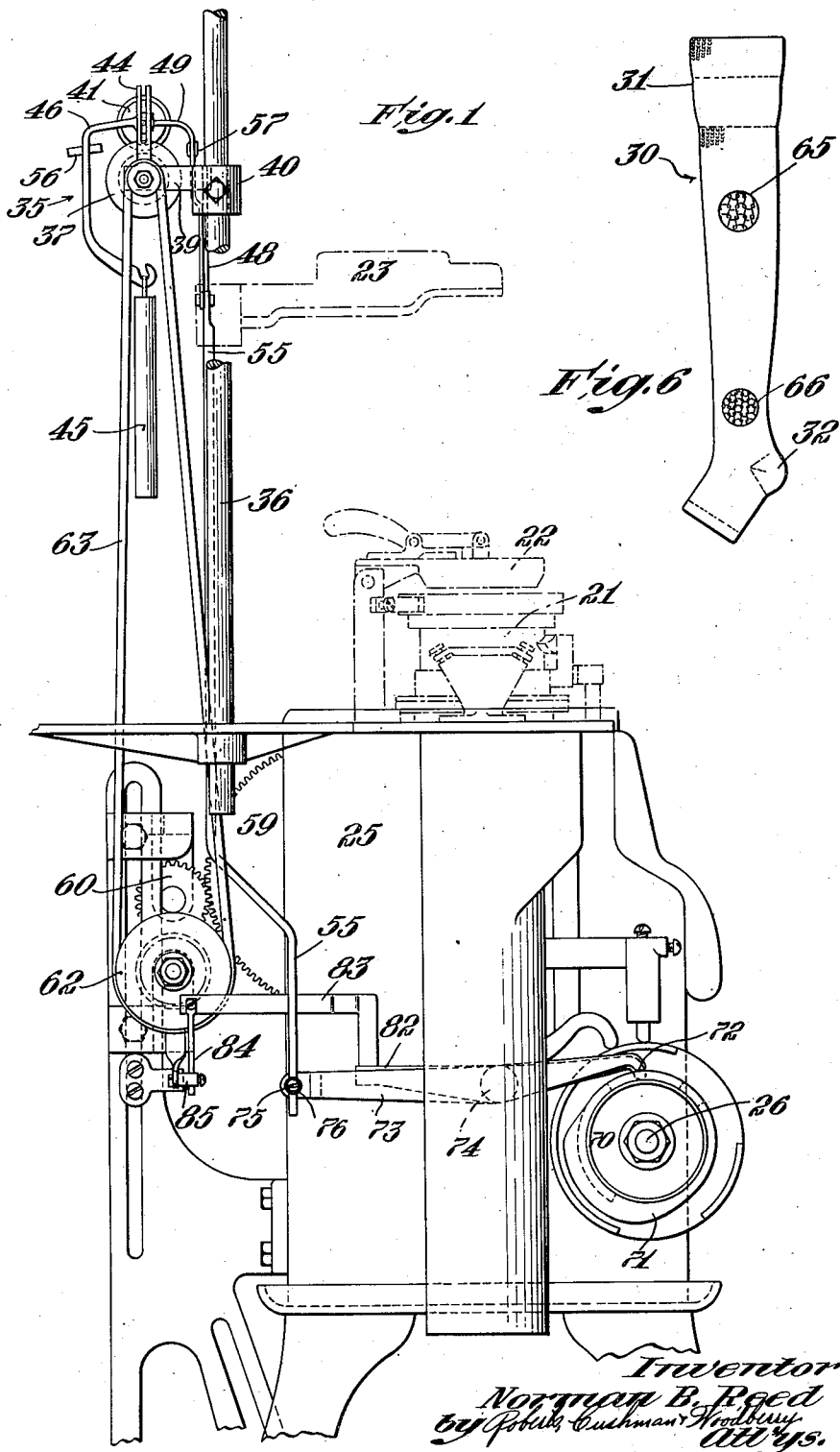
N. B. REED

2,300,808

DEVICE FOR USE IN KNITTING

Filed April 3, 1939

3 Sheets-Sheet 1



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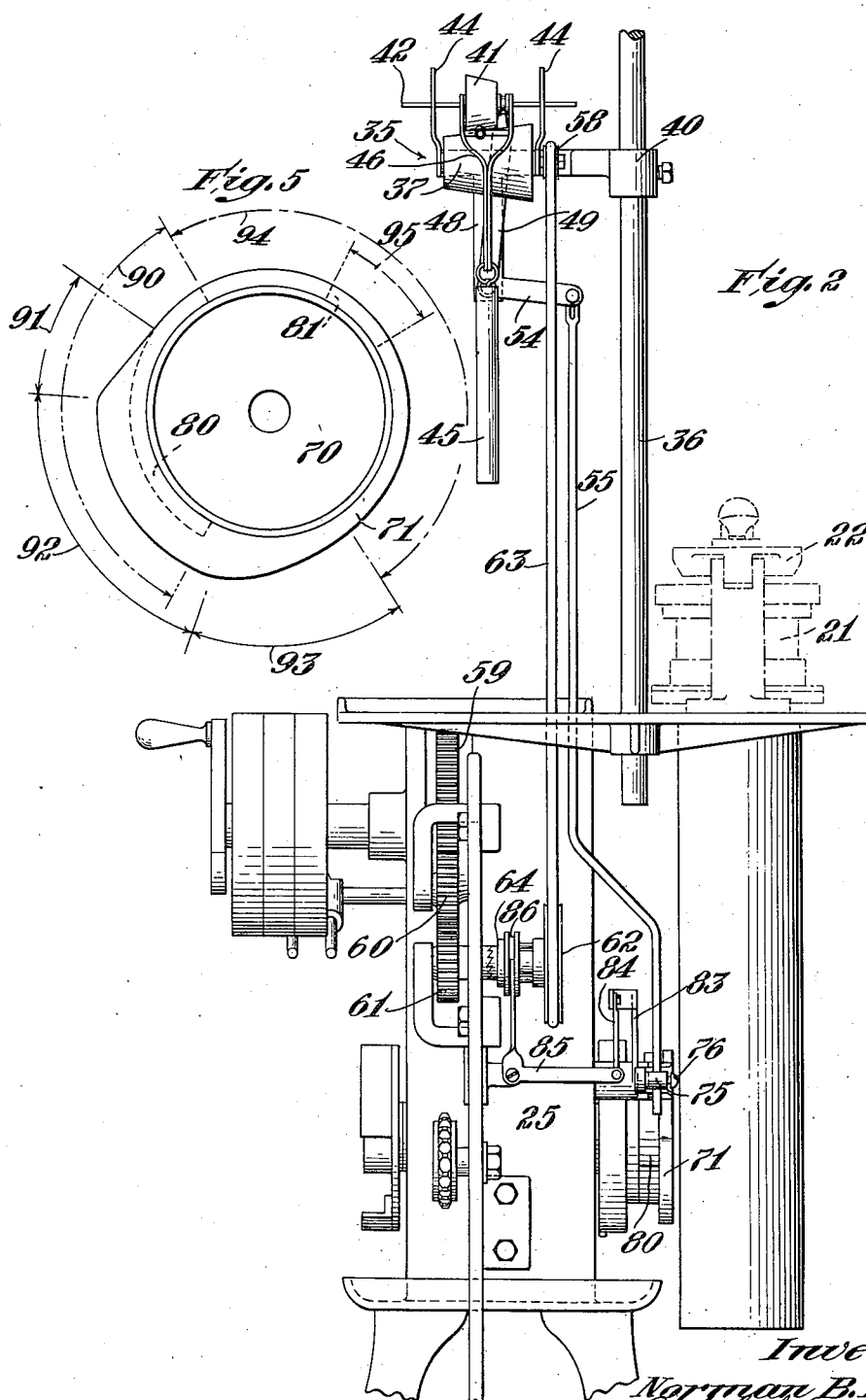
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DEVICE FOR USE IN KNITTING

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3 Sheets-Sheet 2



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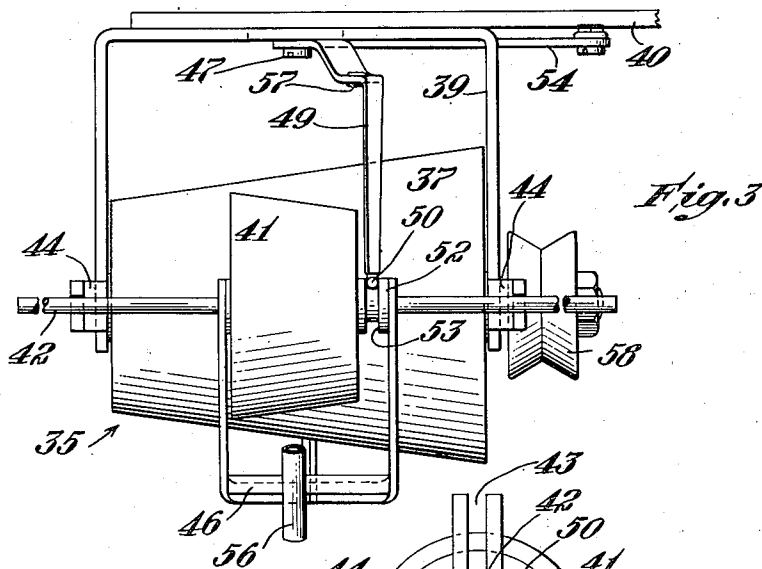
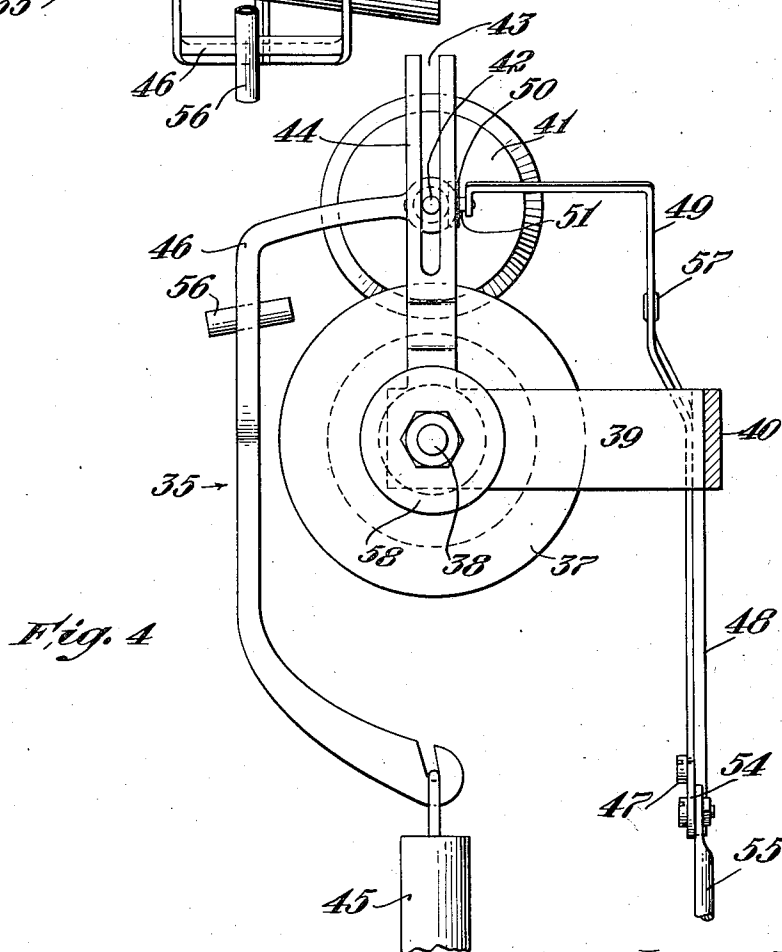
N. B. REED

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DEVICE FOR USE IN KNITTING

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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

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DEVICE FOR USE IN KNITTING

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6 Claims. (Cl. 66—132)

This invention relates to an improvement in the art of knitting an elastic fabric, and more particularly to the method of so knitting, to the apparatus by which the method is carried out, and to the fabric so made.

In the making of seamless garments it is the usual practice to vary the length of the stitch as the garment is being knitted, thereby "fashioning" the garment. When, however, the fabric is made in whole or in part with an elastic yarn which must be maintained under tension as the garment is being knitted, it is essential that the tension be held uniform regardless of the length of the stitch, and the present invention is directed to the attainment thereof whereby the tension of the elastic yarn is at all times under control. "Uniform tension" as here used is to be understood as meaning that the elongation of the elastic yarn per unit of length as it is delivered to the needles is substantially constant.

The following description sets forth the method of attaining such control, the product of that method, and one embodiment of a device adapted to be attached to a knitting machine by which the invention is carried out, and in order to facilitate an understanding of this invention there are presented herewith drawings in which:

Figs. 1 and 2 are side and rear elevations respectively of a knitting machine to which has been attached a device by which this invention is carried out;

Figs. 3 and 4 are views in plan and side elevation of the device shown in Figs. 1 and 2;

Fig. 5 is an enlarged elevation of a cam drum; and

Fig. 6 is a view of a stocking embodying this invention and made in accordance therewith.

This invention has been shown in the drawings and will be described as employed in making fashioned seamless stockings. It will be understood that this type of garment has been selected as illustrative and that the invention is not thus limited thereto.

For the purpose of illustrating the invention there is shown on Figs. 1 and 2 a knitting machine of a suitable well known type whereby fashioned seamless stockings are made. Such machine comprises a knitting cylinder 21, a sinker head 22 and a yarn guide 23, which elements are shown in dotted lines since they carry out their intended function without regard to the application or omission of this invention.

It is understood that in the making of these stockings the length of the stitches are varied, being longest at the widest part, i. e., the top, and

shortest at the narrowest part. This change in the length of the stitches is carried out by pattern mechanism which is enclosed within the base 25 and is not shown in detail, since it forms no part of the present invention. Whatever type of mechanism be employed, it includes a shaft 26, known as the pattern drum shaft which is driven intermittently and completes a single rotation as each stocking is knit.

In the manufacture of the stocking 30 shown in Fig. 6, which embodies this invention, elastic yarn is used, except at the top 31 and heel 32, with or without other yarn. The elastic yarn must be at all times knitted under tension, and in order that this tension be uniform throughout the stocking, the amount of yarn supplied must vary with the length of the stitch, in other words more yarn when the stitch is long than when the stitch is short.

This control of the tension is attained by a device 35 to which the elastic yarn is fed from the usual bobbin stand (not shown) supported by a rod 36. The device 35 includes a pair of conical rollers 37 and 41 arranged in reverse positions (see Fig. 3). The lower roller 37 is keyed to a shaft 38 supported at the ends of the roller in bearings carried by the arms of a yoked bracket 39 mounted upon a bar 40 adjustably secured to the rod 36. The roller 41 is carried on a shaft 42, the ends of which are received in slots 43 of vertical posts 44 supported by the bracket 39. The posts 44 are here shown as integral with the arms of the bracket but they may be separate elements suitably secured thereto. The upper roller 41 rides upon the lower roller 37 and is held yieldably in contact therewith both by the action of the force of gravity and by a weight 45 depending from a yoke 46 which is suspended from the shaft 42, the arms of the yoke 46 enclosing the roller 41. Pivoted upon a pin 47 carried by an arm 48 depending from the bracket 39 is a right angle lever, the arm 49 of which is right angular and carries at its free end a short rod 50 pivotally attached thereto by a pin 51. Fixed on the shaft 42 is a collar 52 having a central peripheral groove 53 which receives the rod 50. Fixed to the other arm 54 of the lever is a rod 55 by which, as will be set forth below, the lever is rocked and the upper roller 41 shifted along the roller 37.

The yarn is guided between the rollers by a tube 56 carried by the yoke 46 and an eye 57 in the lever arm 49. The roller 37 is positively driven by means to be described, through a pulley 58 on the shaft 38, and the roller 41 resting

upon the roller 37 is moved by such contact in unison therewith, thus advancing the yarn.

Mounted in the base 25 is a drive gear 59 which, through an idler gear 60, drives a gear 61. The gear 61 in turn rotates a pulley 62, in line with the pulley 58, and connected therewith by a belt, cable or the like 63. The gear 61 acts through a clutch which includes a slidable clutch collar 64.

From the above description it will be apparent that the tension under which the elastic yarn is knitted is controlled by the device 35. As previously pointed out, it is necessary in order to hold the tension uniform that more yarn be passed to the knitting cylinder when the stitches are long than when they are short. In the stocking 30 (Fig. 6) the area designated by the numerals 65 and 66 show the long stitch employed at the calf and the short stitch employed at the lower smaller part of the stocking and the foot. The rate at which the yarn is fed depends upon the speed of travel of the surface of the roller 37 against which the yarn is held by the roller 41. Thus the location of the yarn is determined by the position of the roller 41 which is moved longitudinally of the roller 37 by the following means, so that the amount of the elastic yarn required is varied in accordance with the length of the stitches being knitted.

Mounted upon a cup-like drum 70 fixed to the intermittently driven pattern drum shaft 26 is a continuous cam 71 upon which rests the tip 72 at one end of a lever 73. The lever 73 is fulcrumed intermediate its ends upon a stud 74 projecting from the base 25. The other end of the lever 73 is connected to the lower end of the rod 55 by a rotatably mounted pin 75 having an opening therein which receives the rod, and a set screw 76 by which the rod is secured in place. The lever 73 is thus actuated by the rotation of the cam 71 to shift the roller 41 longitudinally of the roller 37.

When those portions of the stocking, where the elastic yarn is not used, are being made, the feed of the yarn is cut off by shifting the clutch collar 64 to disengage the clutch, i. e. to the right in Fig. 2. This shifting is automatically controlled by the pattern drum shaft 26 through the provision of cams 80 and 81 on the drum 70 and a lever 82, one end of which rests normally upon the surface of the drum in the path of the cams 80 and 81 and is raised thereby. The lever 82 is fulcrumed upon the stud 74 and connected at the other end through an extension 83 and link 84 to one arm of a right angle lever 85. The other arm of the lever 85 rides in the central groove 86 of the collar 64. Hence when the lever 82 is actuated by one of the cams 80, 81, the clutch is disengaged so that the roller 37 of the device 35 is no longer driven to feed the elastic yarn.

The operation of the elastic yarn control device 35 during the knitting of the stocking 30 (Fig. 6) is as follows: Let it be assumed that the drum 70 is in such position that the lever 82 has been tripped by the cam 80 so that the device is at rest. Until the drum 70, which, under the control of the pattern mechanism, moves intermittently in the clockwise direction, as shown in Figs. 1 and 5, has traveled through the period 90, the elastic yarn is not fed, at which time the top 31 of the stocking is being made. While the drum is moving through the period 90 the cam 71 actuates the lever 73 to shift the roller 41 to the right in Fig. 3 during the period 91. The roller is held in that position during the period 92. The period 90, 75

however, terminates before the period 92, so that the feed of the elastic begins while the roller 41 is so shifted. After passing the period 92 the cam 71 during the period 93 allows the roller 41 to return slowly to the position shown in Fig. 3, thus reducing gradually the amount of yarn fed by the device. As the drum travels through the period 94, the amount of yarn fed remains uniform. The cam 81, which acts during the period 95, cuts off the supply of elastic yarn as the heel 32 of the stocking is being knitted.

From the above description it will be apparent not only that no elastic yarn is fed while the top 31 and heel 32 are being knitted, but also that, as the length of the stitches is changed, the amount of elastic yarn fed to the knitting cylinder is similarly changed. Thus the tension under which the elastic yarn is knitted into the stocking is kept uniform throughout the length of the stocking. Thereby there is no undue pressure of the stocking upon the leg and foot of the wearer at any point so that they are firmly embraced.

Heretofore an elastic stocking having these advantages has been made flat and provided with a back seam. Such a stocking is objectionable due to its bulky appearance, and consequently many who really require the support given by elastic stockings, have been unwilling to wear them. A seamless elastic stocking not fashioned is open to objection because either the pressure at the large parts of the leg is too great for comfort, or the pressure at the small parts of the leg and at the foot is too light and the stocking bags at those points. An elastic stocking made according to this invention, however, is not open to these objections and may be worn under a sheer silk stocking with perfect comfort and without fear of discovery.

While one embodiment of this invention has been shown and described, it will be understood that the invention is not limited thereto and that various changes may be made in the control device and its associated parts, in the method or in the article without departing from the spirit and scope of the invention as set forth in the following claims.

I claim:

1. A device for use with a knitting machine having a knitting cylinder and pattern mechanism by which are made seamless fashioned stockings, which device feeds elastic yarn to the knitting cylinder at uniform tension and in amounts varying in accordance with the length of the stitches of the stockings as determined by the pattern mechanism, said device including a pair of conical rollers arranged in reverse positions and between which the yarn passes, means for driving said rollers to feed the yarn and means for shifting said yarn with respect to one roller whereby the amount of yarn fed to the knitting cylinder is varied.

2. A device for use with a knitting machine having a knitting cylinder and pattern mechanism by which are made seamless fashioned stockings, which device feeds elastic yarn to the knitting cylinder at uniform tension and in amounts varying in accordance with the length of the stitches of the stockings as determined by the pattern mechanism, said device including a pair of conical rollers arranged in reverse positions and between which the yarn passes, means for driving said rollers to feed the yarn and means for shifting said yarn with respect to one roller whereby the amount of yarn fed to the

knitting cylinder is varied, both said means being controlled by the pattern mechanism of the knitting machine.

3. A device for use with a knitting machine having a knitting cylinder and pattern mechanism by which are made seamless fashioned stockings, which device feeds elastic yarn to the knitting cylinder at uniform tension and in amounts varying in accordance with the length of the stitches of the stockings as determined by the pattern mechanism, said device including a pair of conical rollers arranged in reverse positions and between which the yarn passes, means for driving said rollers to feed the yarn and means for shifting said yarn with respect to one roller whereby the amount of yarn fed to the knitting cylinder is varied, said last named means being controlled by the pattern mechanism of the knitting machine.

4. A device for use with a knitting machine having a knitting cylinder and pattern mechanism by which are made seamless fashioned stockings, which device feeds elastic yarn to the knitting cylinder in amounts varying in accordance with the length of the stitches of the stockings as determined by the pattern mechanism, said device including a pair of conical rollers arranged in reverse positions and between which the yarn passes, means for driving one of said rollers to feed the yarn, and means for shifting the other of said rollers with the yarn longitudinally of the driven roller thereby varying the amount of yarn fed by the device to the knitting cylinder.

5. A device for use with a knitting machine

having a knitting cylinder and pattern mechanism by which are made seamless fashioned stockings, which device feeds elastic yarn to the knitting cylinder in amounts varying in accordance with the length of the stitches of the stockings as determined by the pattern mechanism, said device including a pair of conical rollers arranged in reverse positions and between which the yarn passes, means for driving one of said rollers to feed the yarn, and means for shifting the other of said rollers with the yarn longitudinally of the driven roller thereby varying the amount of yarn fed by the device to the knitting cylinder, and connections between said shifting means and the pattern mechanism whereby the movement of the shifting means is controlled by the pattern mechanism in accordance with the length of the stitches taken in knitting the stocking.

6. A device for use with a knitting machine having a knitting cylinder and pattern mechanism by which are made seamless fashioned stockings, which device feeds elastic yarn into the hooks of the cylinder needles at uniform tension and in amounts varying in accordance with the length of the stitches of such yarn in the knitting of the stockings as determined by the pattern mechanism, said device including a pair of rollers between which the yarn passes, means for driving said rollers to feed the yarn and means controlled by the pattern mechanism of the knitting means by which the driving means is rendered inoperative.

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