

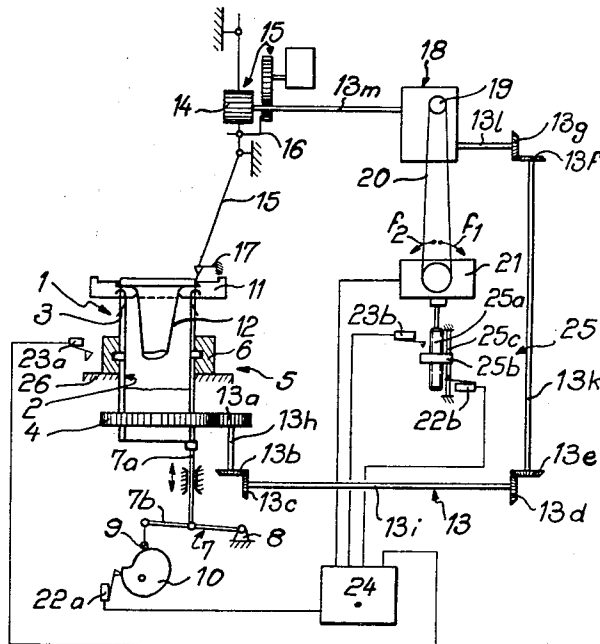
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[54] **DEVICE FOR CONTROLLING THE DELIVERY OF
THREAD TO A KNITTING MACHINE**
3 Claims, 1 Drawing Fig.

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66/132
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(T), 55, 54

ABSTRACT: A device for controlling the delivery of thread to a knitting machine comprises a speed variator which is connected to a mechanical transmission extending between a cylinder and thread furnisher of the knitting machine, and a motor which controls the variator. The motor is reversible in forward and reverse directions and has two pairs of switches which start and stop the motor in both directions. The starting switches are operated by a control cam and programming element of the knitting machine. A follower device is provided whose travel corresponds to a predetermined length of fabric produced by the knitting machine and this follower device operates the stopping switches.



DEVICE FOR CONTROLLING THE DELIVERY OF THREAD TO A KNITTING MACHINE

The invention relates to a device for controlling the delivery of thread to a knitting machine and, in particular, although not so restricted, to a continuous stocking knitting machine.

In a known device for controlling the delivery of thread to a knitting machine a thread dispenser, having two rotating truncated cones in contact with each other along one of their generators, is provided. Thread is guided by means of thread guides which are adjustable by a control cam of the knitting machine so that it passes between the two rotating truncated cones. According to whether the thread is located on a part of the thread dispenser with larger or smaller diameter, it is supplied to the needles at greater or lesser velocity respectively.

The drawback of this arrangement is that it is not possible to place several threads on the same spot of the thread dispenser so that each of these threads is delivered to the needles of the knitting machine at a different speed.

In another known device for controlling the delivery of thread to a knitting machine there is provided a speed variator positioned between the cylinder of the machine and a feed roller so that the speed variator is adapted to be actuated in either of two directions as a function of the difference between a reference signal and a measuring signal indicating a desired and actual denier of the knitted fabric made on the knitting machine respectively.

This device does not permit a constant thread tension to be maintained when the dimensions of the knitted fabric are reduced, because of the delay in transmitting the difference signal to the speed variator. Thus, this device can be used only when an article with constant diameter is knitted. However, where the diameter of the article is progressively reduced, such as in the case of knitting the body of a stocking and especially the calf portion, in spite of the provision of locking means which progressively reduce the length of the thread and a speed variator acting on the thread delivery, it is impossible to prevent that the thread tension varying frequently between one stitch and another.

According, therefore, to the present invention there is provided a device for controlling the delivery of thread to a knitting machine having a cylinder, a programming element, progressive locking means, a sensor cooperating with a control cam, and a thread delivery device for supplying a plurality of needles with thread as a function of the position of the control cam, the device comprising a speed variator operatively connected to a mechanical transmission which is adapted to be disposed between the cylinder and the thread furnisher of the knitting machine, a motor operatively connected to control the variator, said motor being rotatable in forward and reverse directions, a first starting switch and a first stopping switch which, in operation, start and stop the motor in the forward direction respectively, a second starting switch and a second stopping switch which, in operation, start and stop the motor in the reverse direction respectively, the first and second starting switches being adapted to be operated by the control cam and the programming element of the knitting machine respectively and a follower device whose travel corresponds to a predetermined length of fabric produced by the knitting machine, said follower member, in operation, operating the first and second stopping switches.

The invention is illustrated, merely by way of example in the accompanying drawing which shows diagrammatically an embodiment of a device for controlling the delivery of thread according to the present invention in cooperation with a continuous stocking knitting machine.

A continuous stocking circular knitting machine 1 which may be of any known type comprises a hollow needle cylinder 2 carrying at its upper end latch needles 3 and at its lower end a toothed ring 4 connected to a drive motor (not shown). The knitting machine 1 is also equipped with progressive locking means 5, comprising a plurality of annular cams 6, mounted on member 26, which cooperate with the latch needles 3 and a sensor 7. The sensor 7 has a vertical arm 7a which is guided

axially and engages the bottom of the hollow cylinder 2, and a substantially horizontal arm 7b which is hinged at one end to a fixed pivot and carries at its other end a cam follower engaging a rotating control cam 10. The control cam 10 is rotated by the knitting machine 1 so as to control the progressive vertical positioning of needle cylinder 2 and thus sinkers 11 to change the relative position between the latch needles 3 and sinkers 11 and to reduce the length of the thread taken up by the latch needles 3. Stocking fabric 12 made by the knitting machine 1 passes from the latch needles 3 through the hollow cylinder 2.

A mechanical transmission 13, formed by a gear 13a, pinions 13b, 13c, 13d, 13e, 13f and 13g and connecting shafts 13h, 13i, 13k, 13l, 13m connects a cylinder or roller 14 of a thread furnisher 15 with the toothed ring 4 of the hollow cylinder 2. A thread 16, coming from a bobbin (not shown) is applied to the roller 14 of the thread furnisher 15 by means of a thread guide and is directed towards the latch needles 3 by means of a fixed thread guide 17.

A speed variator 18 is mounted in the mechanical transmission 13, for example between the connecting shafts 13l and 13m. A speed ratio variation member 19 of the speed variator 18 is connected mechanically, for example between the connecting shafts 13l and 13m. A speed ratio variation member 19 of the speed variator 18 is connected mechanically, for example by a belt 20, to an output shaft of an electric motor 21 which may rotate either in the direction of the arrow f_1 , or the arrow f_2 . The motor 21 may be a micromotor. The rotation of the motor 21 in the direction of the arrow f_1 , may effect, for example, a reduction in the rotational speed of the connecting shaft 13m of the speed variator 18, whilst rotation of the motor 21 in the direction of the arrow f_2 may effect an increase in the rotational speed of the connecting shaft 13m.

Starting and stopping of the motor 21 is controlled by two pairs of switches 22a, 22b and 23a, 23b respectively which are all connected electrically to the motor 21 via an electric control box 24. Thus, rotation of the motor 21 in the direction of the arrow f_1 (reduction of the output speed of the variator 18) is effected by means of the switch 22a which cooperates with the control cam 10, so that the switch 22a controls the motor 21 during the start of the operation of the progressive locking means 5. When the motor 21 rotates in the direction of the arrow f_1 , it is stopped by the switch 22b which is actuated by a follower member 25 after a given number of revolutions of the motor 21. The rotation of the motor 21 in the direction of the arrow f_2 is effected by the switch 23a which is actuated by a programming member (not shown) on the knitting machine 1, when the knitting of the stocking fabric 12 has been finished. The switch 23b is actuated i.e. stopping the motor 21, by the follower member 25 when the motor 21 has made the same number of revolutions as mentioned above, but in the opposite direction.

The follower member 25 comprises an endless screw spindle 25a, driven by the motor 21, a nut 25b mounted on the screw 25a. The screw spindle 25a is prevented from rotating by a guide rod 25c disposed parallel to the axis of the screw spindle 25a, and along which the nut 25b may travel. The two switches 22b and 23b control the stopping of the motor 21 which when it rotates in the direction of the arrow 8, or arrow f_2 respectively are disposed substantially at opposite ends of the screw spindle 25a.

The functioning of the control device for the thread delivery for the knitting machine 1 is as follows:

In order to supply the knitting machine 1 with a given delivery of thread 16, the initial speed V_1 of the thread is controlled by means of the speed variation member 19 of the speed variator 18. During the working of the knitting machine 1, a stocking fabric of a certain denier is made, that is to say, a fabric in which the length of thread taken up per mesh is a predetermined constant and the transmission ratio between the rotational speed of the hollow cylinder 2 and the roller 14 of the thread furnisher 15 is constant. After the knitting of the first part of the stocking, the control cam 10 through sensor 7 causes the progressive reduction of the diameter of the

stocking along its length, especially in the part corresponding to the calf and towards the heel of the stocking. At this moment, the control cam 10 closes the switch 22a which causes, via the control box 24, the motor 21 to rotate in the direction of the arrow f_1 , so that the transmission ratio is progressively reduced. Thus the roller 14 of the furnisher 15 turns more and more slowly and supplies thread at a progressively reduced rate, but at a constant tension, which is suited to the knitting of the part of the stocking corresponding to the calf. During this period of the knitting, the nut 25b entrained by the screw spindle 25a of the follower member 25 is displaced downwards until it closes the switch 22b which stops the motor 21. The thread 15 is then supplied at a constant speed V_2 which is slower than the speed V_1 . In other words, the decreasing variation in the speed is effected during the operation of the progressive locking means 5, so that the variation of the speed and the duration over which it occurs are constant regardless of speed V_1 .

The remainder of the knitting up to the ankle part of the stocking are effected at a thread speed equal to V_2 . When the knitting of the next stocking is started, the thread 16 must have again the speed V_1 . To this end, the speed variator 18 is returned to its starting position during the knitting of the point and of the welt of the next stocking these parts being made with other threads than those used for the stocking. The motor 21 is actuated to revolve in the reverse direction, that is to say, in the direction of the arrow f_2 , by the closure of the switch 23a, which is actuated at the end of the stocking by a programming member. The screw spindle 25a turns in the reverse direction and moves the nut 25b towards the switch 23b which stops the motor 21 when the nut reaches it. The speed variator 18 is thereby returned to its starting position and the thread 15 may again be delivered at the speed V_1 by the thread furnisher 15.

It will be appreciated that the invention is not limited to endless stocking knitting machines and may be used in conjunction with knitting machines which produce articles where changes in the amount of thread used and the thread tension are necessary.

In this manner it is possible when knitting a stocking for example not only to control the initial velocity of the thread, its final velocity and the intermediate velocities of the zone corresponding to the calf but also to ensure that at the same time the supply of thread is at constant tension regardless of the part of the stocking which is being knitted. Thus the dimensions of the knitted article are exactly the same from one article to the other.

We claim:

1. A device for controlling the delivery of thread to a knitting machine having a needle cylinder, a programming ele-

ment, progressive locking means, a sensor cooperating with a control cam, to vertically position the needle cylinder, and a thread delivery device for supplying a plurality of needles with thread as a function of the position of the control cam, the device comprising a speed variator, mechanical transmission which is adapted to be disposed between the cylinder and the thread delivery device of the knitting machine, and to which the speed variator is operatively connected, a motor operatively connected to control the variator, said motor being rotatable in forward and reverse directions, a first starting switch and a first stopping switch which, in operation, start and stop the motor in the forward direction respectively, a second starting switch and a second stopping switch which, in operation, start and stop the motor in the reverse direction respectively, the first and second starting switches being adapted to be operated by the control cam and the programming element of the knitting machine respectively and a follower member whose travel corresponds to a predetermined length of a truncated portion of fabric produced by the knitting machine, said follower member, in operation, operating the first and second stopping switches.

2. A device as claimed in claim 1 in which the follower member comprises an endless screw or spindle drivingly connected to the motor, a nut mounted on the said spindle and a guide rod arranged parallel to the screw or spindle and cooperating with the nut to prevent rotation thereof, first and second stopping switches being disposed substantially at opposite ends of the screw or spindle.

3. In a knitting machine having a needle cylinder, a programming element, progressive locking means, a sensor cooperating with a control cam, to vertically position the needle cylinder, and a thread delivery device for supplying a plurality of needles with thread as a function of the position of the control cam, the improvement comprising: a device having a speed variator, a mechanical transmission which is adapted to be disposed between the cylinder and the thread delivery device of the knitting machine and to which the speed variator is operatively connected, a motor operatively connected to control the variator, said motor being rotatable in forward and reverse directions, a first starting switch and a first stopping switch which, in operation, start and stop the motor in the forward direction respectively, a second starting switch and a second stopping switch which, in operation, start and stop the motor in the reverse direction respectively, the first and second starting switches being adapted to be operated by the control cam and the programming element of the knitting machine respectively and a follower device whose travel corresponds to a predetermined length of fabric produced by the knitting machine, said follower member, in operation, operating the first and second stopping switches.

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