Feb. 24, 1970 P. CONTI 3,496,738

THREAD CUTTING DEVICE FOR CIRCULAR KNITTING HOSIERY MACHINES

Filed Sept. 20, 1967 3 Sheets-Sheet 1

Fig. 1

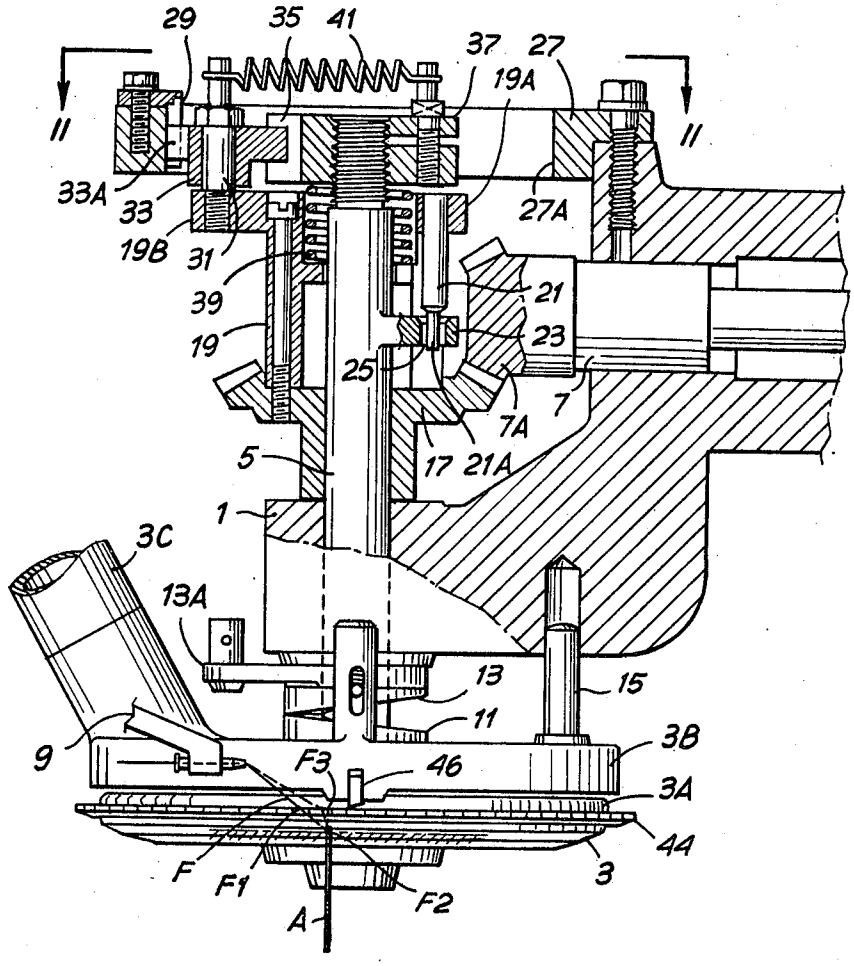

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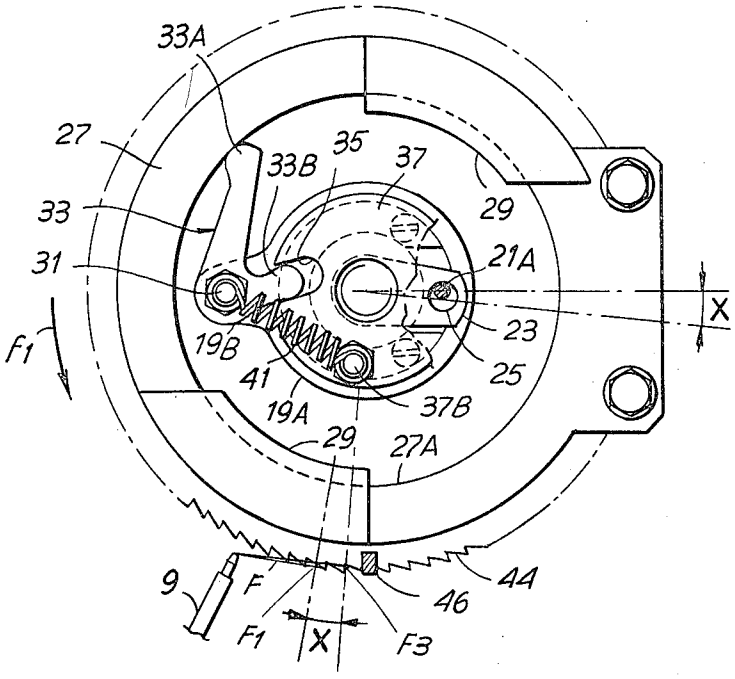
Fig. 2



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THREAD CUTTING DEVICE FOR CIRCULAR KNITTING HOSIERY MACHINES

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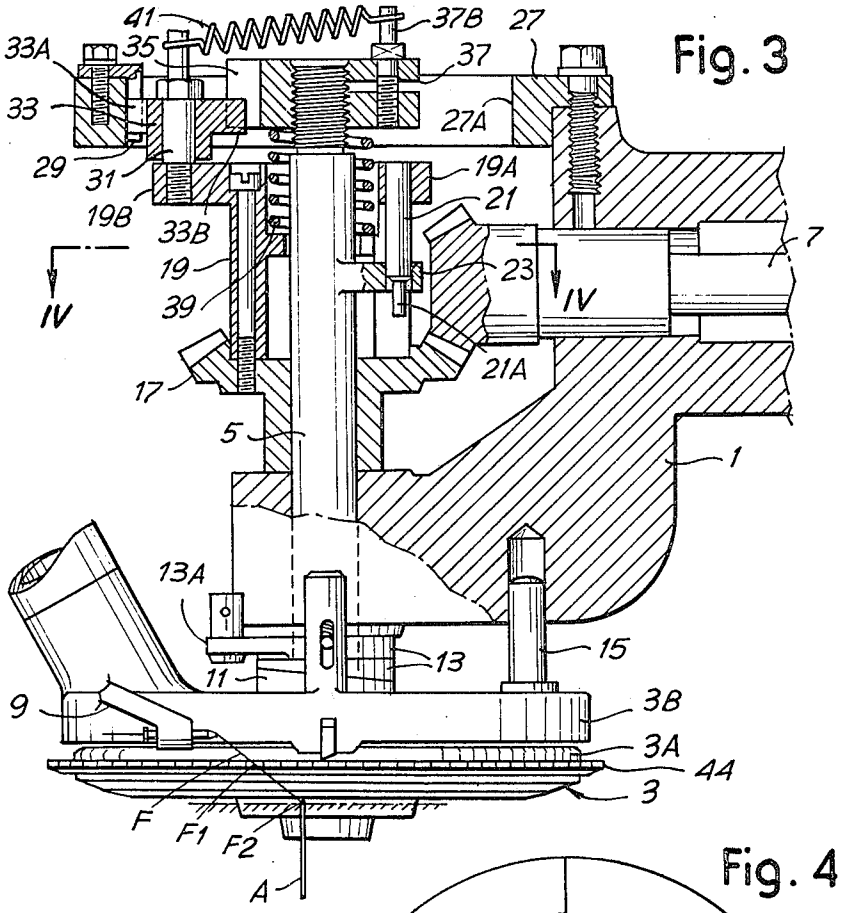

Fig. 3

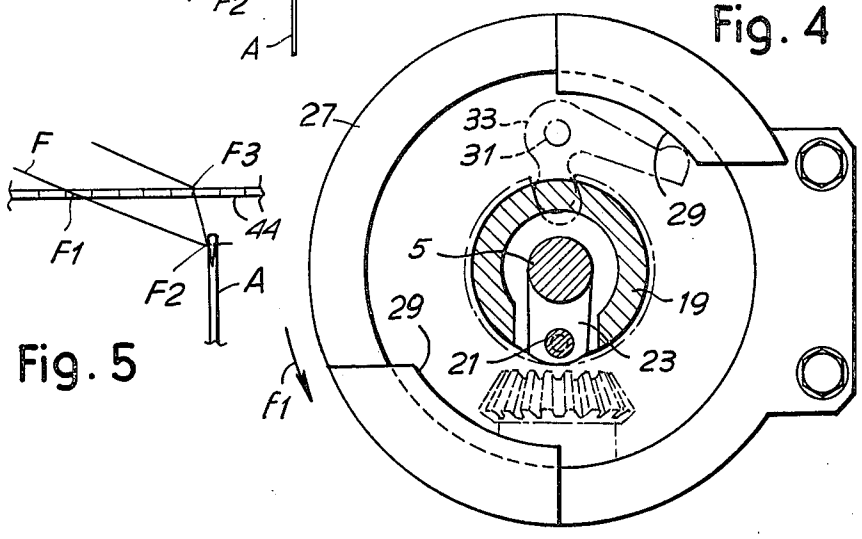

Fig. 4

Fig. 5

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THREAD CUTTING DEVICE FOR CIRCULAR KNITTING HOSIERY MACHINES

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Int. Cl. D04b 9/46
U.S. Cl. 66—140 5 Claims

ABSTRACT OF THE DISCLOSURE

A circular knitting machine for hosiery and the like having a rotatable welt-hooks plate and needle cylinder, has a thread cutting device comprising a peripherally toothed member rotatable with the welt-hooks plate for engagement with a thread to be cut, a stationary blade cooperative with the toothed member to shear a thread extending between a needle of the needle cylinder and a thread guide of the machine and means movable to advance the toothed member relative to the needle cylinder when the thread has been engaged by the toothed member thereby to decrease the inclination, relative to an axial plane of the machine through the needle, of the portion of thread extending from the needle to the toothed member and so to shorten the thread portion.

The invention relates to a thread cutting device for a circular knitting hosiery machine or the like.

According to the present invention there is provided a circular knitting machine for hosiery and the like, having a rotatable welt-hooks plate and needle cylinder and a thread cutting device, said device comprising a peripherally toothed member rotatable with the welt-hooks plate and capable of engagement with a thread to be cut, a stationary blade cooperative with said toothed member to shear a thread extending between a needle of the needle cylinder and a thread guide of the machine, and means movable to advance the toothed member relative to the needle cylinder when the thread has been engaged by the toothed member thereby to decrease the inclination, relative to an axial plane of the machine through said needle, of the portion of thread extending from the needle to the toothed member and so to shorten said thread portion.

The invention will now be described by way of example with reference to the accompanying diagrammatic drawings, in which:

FIGURE 1 is a partly sectioned side view on a plane passing through two control shafts of a welt-hooks plate and a thread cutting device in accordance with the invention;

FIGURE 2 is a plan view taken in the direction of arrowed line II—II of FIGURE 1;

FIGURE 3 is a side view similar to that shown in FIGURE 1 but illustrating the device in its usual operational arrangement with the hooks plate in a raised position rather than a lowered position as shown in FIGURE 1;

FIGURE 4 is a view similar to that shown in FIGURE 2, but partly sectioned; and

FIGURE 5 illustrates a detail of FIGURE 1 to an enlarged scale.

In the drawings, a structure **1** carries a welt-hooks plate **3** which is rotated by a shaft **5** substantially synchronously with a needle cylinder (not shown) coaxial

with the plate **3**. The shaft **5** is driven from a shaft **7** which, in the plate actuation arrangement, is in a horizontal position. The plate **3** lies adjacent to and is associated with a stationary structure **3A**, which, in turn, lies adjacent to and is associated with an intake mouth **3B** of a pneumatic intake conduit **3C** for the picking of thread, from the thread guide **9**, which has been cut. The thread ends are picked up in a space defined between the members **3A** and **3B** by suction. In a known arrangement, the thread can be taken by, a needle when the thread guide is lowered, and the plate **3** can be raised and lowered according to the various stages of a knitting cycle of a stocking. In particular the plate **3** is lowered (see FIGURE 1) in the stages during which cutting of the thread occurs and is raised (see FIGURE 3) during the stages wherein no such cutting occurs. Thread cutting, when the plate is lowered, is effected nearer the end of the thread engaged by the last needle which has taken the thread, and thus the sheared thread ends extending from the knitted fabric are relatively short. In such an arrangement, the residual thread lengths are not always acceptable from the aesthetic viewpoint in stocking manufacture and the like. The raising and lowering control of the plate (which plate must continue to rotate while the members **3A**, **3B** must remain stationary) is effected for example by means of two opposed cam-like profiles **11** and **13**, one of which (for example the profile **13**) is movable by a control lever **13A** in such a manner to cause vertical movement of the plate between the two positions shown in FIGURES 1 and 3. The stationary members **3A**, **3B**, to which the profile **11** is joined, are retained against rotation by a rod **15**, which is axially slidable within a seat in the body **1**. The shaft **5** is axially slidable and can be driven rotationally. As in arrangements hitherto known, there is provided a sliding coupling between the shaft **5** and a bevel gear **17** which meshes with a bevel pinion **7A** on the shaft **7**. The control lever **13A** is operable to move the shaft **5** and members **3**, **3A**, **3B** in one axial direction and a return spring is provided which tends to maintain the two profiles **11** and **13** in contact with one another.

In the embodiment shown in the drawings, the bevel gear **17** is coaxial with and idly mounted on the shaft **5**, and is rigid with a member **19** having an upper flange portion **19A** and an extension **19B**. The flange **19A** carries a rod **21** parallel to the shaft **5** which has an end portion **21A** of reduced diameter which is suitably joined to the rod **21**. The shaft **5** has an extension **23** having a hole **25** whose diameter substantially corresponds to the diameter of the rod **21**. The extension **23** moves axially with the shaft **5** so that when the plate **3** is in its raised position, the rod **21** extends into the hole **25** of the extension **23** and, consequently, the shaft **5** is located in a fixed angular position with respect to the member **19** and flange **19A** and thus to the bevel gear **17**. When the plate **3** is in its lowered position, the reduced diameter end portion **21A** of the rod **21** is located in the hole **25** of the extension **23** (see FIGURES 1 and 2), and thus the shaft **5** and the plate can undergo limited angular movement with respect to the member **19**, flange **19A** and bevel gear **17**, this movement being possible due to the differences between the diameter of the hole **25** and the reduced diameter of the end portion **21A** of the rod **21**.

At its upper end, the structure **1** carries a substantially annular member **27** which has two cam-profile projecting zones **29**, which project radially inwardly with respect to the inner circumferential profile **27A** of the member **27**. On the extension **19B** of the member **19**,

there is provided a pivot pin **31** of a lever **33** capable of oscillatory movement and having a first arm **33A** which defines a tappet which cooperates with the profiles **27A**, **29**, and a second arm **33B** which extends into a recess **35** of a disc-like member **37** secured to the upper end of the shaft **5**. A spring **39** is disposed between the member **19**, which is in a stationary axial position, and the member **37**, which is secured to the shaft **5** and thus capable of being moved therewith. The spring **39** therefore urges the unit **5**; **11**; **3** upwardly and assures contact between the profile **11** and the profile **13**. A spring **41** extends between the pin **31** (and thus the extension **19B** of the member **19**) and a pin **37B** carried by the member **37**. The spring **41** urges the arm **33B** of the lever **33** towards the leading side of the recess **35** when the unit **17**, **19** is rotating in the direction indicated by the arrow f_1 of FIGURE 2. Therefore, as the plate **3** and shaft **5** rotate counterclockwise, the spring **41** tends to rotate the lever **33** counterclockwise around the pin **31** thus ensuring contact between the end of the arm **33A** and the profile **27A**, **29**.

In order to effect cutting of the thread, a circular member **44** having a serrated periphery is carried by the plate **3** and the serrated member engages thread coming from each thread-guide **9** as the thread-guide is moved out of its feed position. The thread is engaged between two adjacent teeth of the member **44** and is entrained by the member during rotation until a cutting knife **46** which cooperates with the substantially radial leading edge of a tooth of the serrated member **44** effects shearing of the thread. The knife **46** is urged against the serrated periphery of the member **44** by a small spring.

In previously proposed circular knitting machines, the serrated member **44** engages a length of thread F extending between a thread-guide **9** coming out of the working and the last needle A which has engaged the thread, which length of thread is highly inclined with respect to the perpendicular to the horizontal plane containing the serrated member **44**. When the thread is sheared by the stationary knife **46**, a residue of thread is left which extends from the surface of the fabric, the length of which residue is defined by the length of the thread F between the point F_1, at which the thread engages the serrated member **44**, and the point F_2, at which the thread engages the needle A. Owing to the high inclination of the thread F, this residue of thread extending from the surface of the fabric is relatively long, as shown by F_1–F_2 of FIGURE 5.

In order to avoid this disadvantage, the device shown in the drawings provides—during the stages in which the thread is to be sheared—for an advance of the serrated member **44** and thus of the plate **3** with respect to the needle cylinder after the thread (which has ceased to be fed) has engaged the teeth of the serrated member **44**, and before the shearing of the thread. Then (see particularly FIGURE 1) the length of thread extending between the needle A and the serrated member **44** is not the length included between the points F_1 and F_2, but the relatively short length included between the points F_3 and F_2 (see FIGURES 1 and 5). In other words, the plate **3** together with the member **44** is rotated relative to the needle cylinder (and thus with respect to the needle A) so that the point F_1 is advanced to the position of the point F_3. In order to effect such relative rotation, the device is caused to move from the position shown in FIGURE 3. Firstly, the plate **3** and associated structure are lowered to the position shown in FIGURE 1. In the position shown in FIGURE 3, there is a firm angular engagement between the shaft **5** and the member **17** by means of the rod **21**, but when the plate **3** together with the shaft **5** is lowered to the position shown in FIGURE 1, there is angular play between the assembly **17**, **19** and the shaft **5** owing to the difference between the diameter of the hole **25** of the extension **23**, which has been lowered, and the reduced diameter of the end portion **21A** of the rod **21**, which has not been lowered. This angular play permits a cyclic advance of the plate **3** and, in particular, the serrated member **44**, after the thread F has been entrained between adjacent teeth of the serrated member, relative to the needle cylinder and other stationary structure. After shearing of the thread, the plate **3** and member **44** are returned to their original positions. The cyclic advance and return are effected by the sequential action of the cam-profiles **29** and **27A** on the lever member **33**, which lever member **33** causes the relative angular movements between the unit **17**, **19** and the unit **5**, **37**, **3**, **44**. These angular movements have maximum amplitude of angle X indicated in FIGURE 2 and this angle is defined by the angular play of the reduced diameter of the end-portion **21A** of the rod **21** within the hole **25** of the extension **23**.

I claim:

1. In a circular knitting machine for hosiery and the like, including a rotating needle cylinder having a plurality of needles therein, a thread guide, a welt-hooks plate mounted coaxially with the needle cylinder to rotate in synchronism therewith, a flat member mounted on the welt-hooks plate and having a toothed periphery for engagement with a thread, to be sheared, extending between the thread guide and a needle of the needle cylinder, and a stationary blade cooperable with said toothed member to shear the thread between the thread guide and the needle of the cylinder: the improvement comprising, in combination, driving means for said welt-hooks plate including a tubular input drive shaft coaxial with said welt-hooks plate, an output drive shaft telescoped within said tubular input drive shaft and secured to said welt-hooks plate, and a drive coupling interconnecting said input shaft and said output shaft; said coupling including an advancing member mounted on one of said shafts for rotation therewith and operably engaged with the other of said shafts, said advancing member being movably mounted on said one shaft and operable, when moved, to advance said output shaft relative to said input shaft; stationary cam means around said welt-hooks plate driving means cooperable with said advancing member to advance said output shaft angularly relative to said input shaft to advance said toothed member angularly relative to said needle cylinder, when the thread has been engaged by the toothed member, thereby to decrease the inclination, relative to an axial plane of the machine extending through said needle, of that portion of the thread extending from the needle to the toothed member, to shorten said thread portion; and resilient means operatively associated with said input shaft and said output shaft and biasing said output shaft away from the advanced position.

2. In a circular knitting machine for hosiery and the like, the improvement claimed in claim **1**, including means operable to raise and lower said output shaft together with said welt-hooks plate thereby to move said toothed member out of and into its thread cutting position; and a locking means comprising first and second locking members secured for rotation, respectively, with said input shaft and said output shaft; said locking members cooperating, in the raised position of said welt-hooks plate, to interlock said shafts positively against relative angular displacement and, in the lowered position of said welt-hooks plate, to provide for angular displacement, relative to said input shaft, and to said advanced position, of said output shaft and said toothed member.

3. In a circular knitting machine for hosiery and the like, the improvement claimed in claim **2**, in which said second locking member comprises a radial extension on said output shaft having an aperture therethrough; said first locking member comprising a rod having a main portion dimensioned to fit closely through said aperture when said welt-hooks plate is in its raised position, and having a reduced portion dimensioned to allow play of said rod within said aperture, thereby to provide for limited ad-

vance of said output shaft relative to said input shaft, when said welt-hooks plate is in its lowered position.

4. In a machine according to claim 1,

a plate secured to said output shaft for rotation therewith, said last-named plate having a peripheral slot therein,

said advancing member comprising a double-arm lever pivotally secured to said input shaft, one arm of said lever being cooperative with said cam means and the other arm of said lever engaging in said slot.

5. In a machine according to claim 1,

a thread-sucking system disposed above said welt-hooks plate and having an elongate mouth extending adjacent the position at which the thread is cut by the cutting arrangement.

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