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3,246,489

DEVICE FOR SHAVING OFF THE LOOSE ENDS OF WOMEN'S
STOCKINGS ON CIRCULAR MACHINES

Filed June 12, 1962

2 Sheets-Sheet 1

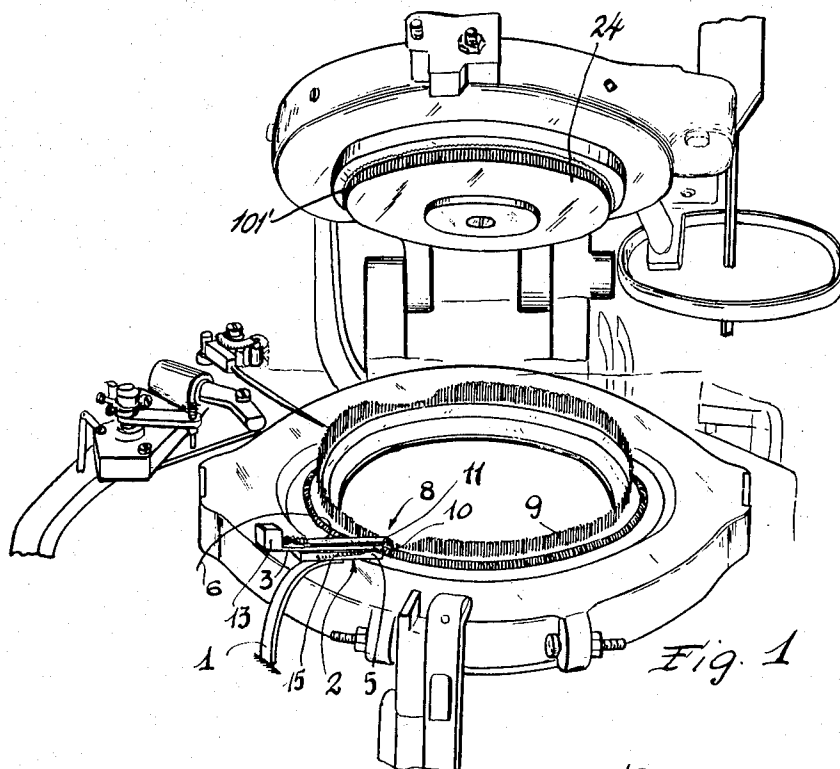


Fig. 1

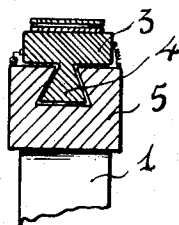


Fig. 6

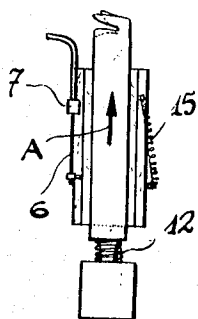


Fig. 3

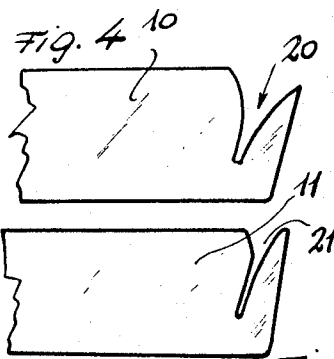


Fig. 4

Fig. 5

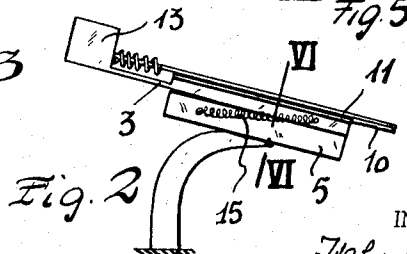


Fig. 2

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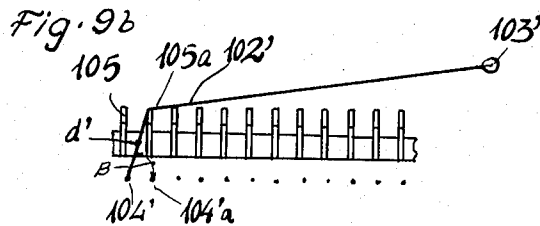
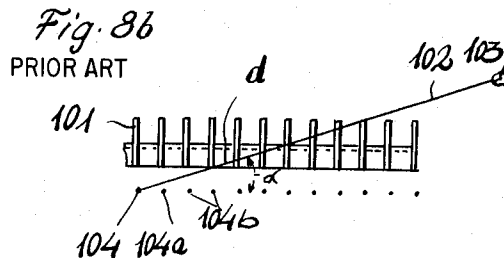
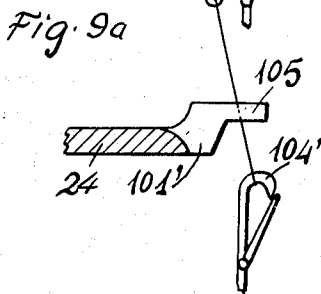
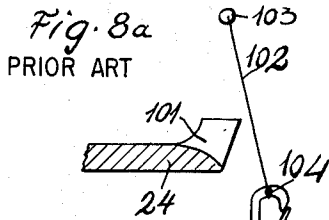
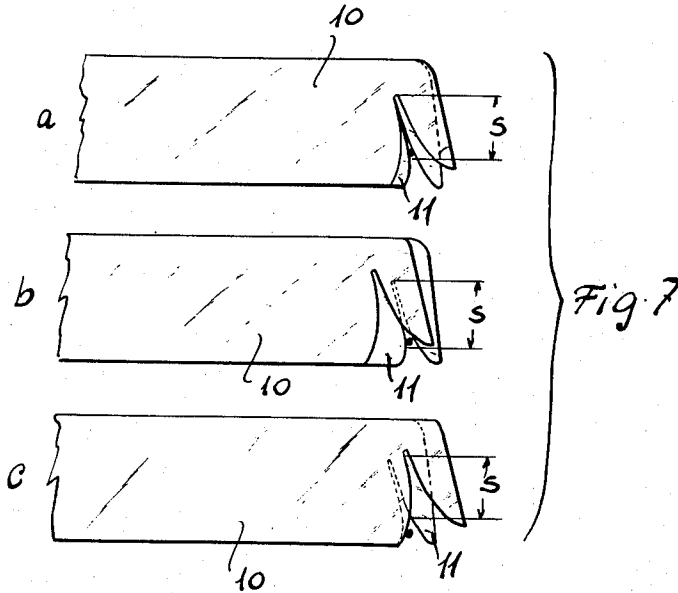
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2 Sheets-Sheet 2



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DEVICE FOR SHAVING OFF THE LOOSE ENDS OF WOMEN'S STOCKINGS ON CIRCULAR MACHINES

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21,216/61; Dec. 28, 1961, 23,434/61

9 Claims. (Cl. 66—134)

This invention relates to a yarn end cutter for circular knitting machines for cutting off the loose yarn ends which women's stockings made on circular knitting machines exhibit in the lateral reinforcing zone.

It is known that, during a reinforcing process in which reinforcement are provided on the heel and on the insole of women's stockings, there remain, in the peripheral zones of said reinforcements, loose yarn ends, and, to be precise, one end for each stitch relating to the reinforcement, commonly called beards, which must obviously be sheared off as closely as possible to the terminal stitches of the reinforcement.

For this particular operation several devices are known, and they can be divided substantially into two groups, namely: a first group consisting of apparatuses which act directly on the stocking during its making, that is to say during the making of the aforesaid reinforcement, and a second group of devices for shaving the "beards" on already manufactured stockings, which devices are manually operated by suitable personnel.

The apparatuses of the first group are generally of the type with electric resistances, rollers, saw-blades or scissors, but these apparatuses leave too long "beards" and the stockings produced thereby are considered of poor quality; the same electrical resistance devices which have been more recently adopted cut off the thread at a relatively large distance from the end of the stitch, which they are compelled to do by the safety margin required to avoid damaging the rest of the stocking being manufactured; furthermore, said electrical resistance apparatuses do not allow a high speed of rotation of the needle drum, and hence their adoption adversely affects the costs of production of the stockings.

With regard to the devices of the second group, i.e., those manually operated, these devices are costly because they involve an extra operation after the knitting of the stocking, and lead to a certain number of discards as a result of the products being damaged, piece-work being generally employed for such operations.

This invention, in order to overcome the drawbacks described, proposes a system of specially shaped knives endowed with a relative back-and-forth motion which enables threads to be cut regardless of the direction of movement of the knives, the thread to be introduced between the cutting edges during each stage of the reciprocal shifting thereof, which results in a very high rate of production. In particular, use is made of two knives, each provided with two cutting edges, which knives are set in reciprocal motion by a high frequency vibrator actuated, for example, electromagnetically or pneumatically or by like means; the preferred vibration frequencies range from 33 to 100 periods per second and, particularly with electromagnetic, alternating current vibrators, industrial frequencies are employed, i.e., 50 or 60 cycles per second.

This invention also provides for a device for the introduction and withdrawal of the knives provided with cutting edges into and from a space above the needle drum, by means of a slide actuated by a mechanical system, such as, for example, a flexible cable controlled by a cam provided on the drum which controls the several

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stages of stocking-making of the circular machine, which cable acts in opposition to a spring which always acts in the sense of withdrawing the slide and its knives from the inside of said needle drum; this has been provided with the object of preventing any breakage or damage of the cable actuating the slide or from causing damage to the rotating needles. It should be noted that the knife device according to this invention cuts off the thread which is kept stretched and brought to the inlet of the cutting edges by a serrated ring normally provided on the platen immediately above the ring of platens and hence at a practically negligible distance from the end part of the stitch; for this purpose specially shaped tops of platens, with lowered heads, can be designed.

Each of the cutting knives is provided with a V-shaped notch forming on each knife a pair of cutting edges extending transverse to the elongation of the knife.

This invention may be better understood from the following detailed description thereof, given purely for illustrative purposes and hence not limiting the invention, with particular reference to the figures in the accompanying sheet of drawings, wherein:

FIG. 1 shows a perspective view of a circular machine for women's stockings with an open head, illustrating the positioning of the yarn end cutter according to this invention;

FIG. 2 shows a side view of the yarn end cutter;

FIG. 3 shows a view from above of FIG. 2;

FIG. 4 shows the configuration of the cutting edges of the knife actuated by the vibrator, on an enlarged scale;

FIG. 5 shows the shape of the cutting edges of the fixed lower cutting knife, on an enlarged scale;

FIG. 6 shows a cross-section taken along the line VI—VI of FIG. 2;

FIG. 7 shows three relative positions of the knives endowed with reciprocating relative motion;

FIGS. 8a and 8b respectively show in a partial side and front view the arrangement of the thread to be cut with normal platen hooks;

FIGS. 9a and 9b respectively show in a partial side and front view the arrangement of the thread to be cut with platen hooks provided with noses according to the invention.

On a circular two feed knitting machine provided with continuous motion for the formation of tubular stockings for women (see FIG. 1): there is fitted, by means of a projecting arm 1 fixed to the frame, the cutting device indicated as a whole by the numeral 2 and described in detail hereinafter, said device being situated in one of the two zones in which the needles are lowered, so that the system of cutting knives is at a tangent to the crown of the sinkers which are provided for forming the reinforcement, e.g., the heel and the insole of the stocking.

The cutting device according to this invention is composed of a slide 3 provided with a dovetailed guide 4 which slides on a support 5 forming a single piece with, or being attached to the projecting arm 1 which is rendered integral with the frame.

The slide 3 is actuated by means of a flexible cable 6 the sheath of which is fastened in an adjustable manner known in itself against a support 7 integral with the frame.

Said cable 6 is actuated, in known and conventional manner, by a cam (not shown in the drawing) appropriately provided on the drum which controls the various stages of the working of the machine, the cable acts in the direction of arrow A to push the slide towards the working position of the lowered needles 9, indicated by the numeral 8 in FIG. 1. The arm 1 and guide 5 fixed thereto form a first support fixed to the knitting machine and the slide 3 forms a second support which is movably

mounted between a working position and an inactive position on the first support.

The slide 3 carries at its top an assembly formed of two knives, 11 and 10 respectively, overlapping each other, the lower one being fixed and the upper one actuated in opposition to a spring 12 by self-contained oscillating means, for example, an electromagnetic vibrator 13 of known construction as for instance shown in the U.S. Patent 2,895,064 which acts so as to attract knife 11; it is manifest that the vibrator will be attached to the assembly of slide 3 and lower knife 10 with its support frame. It should be noted that the movement of slide 3 relative to support 5 caused by cable 6, takes place in opposition to a spring 15 which is attached respectively at 3 and 5, and which is biased so as to tend to move the slide-knives-vibrator assembly in a direction away from the crown of needles.

The two knives 10 and 11 carry laterally at their ends notches 20 and 21 of different shape and such that, when superimposed in any reciprocal positions, the lateral faces always present an aperture for the thread which is brought to it by any means, e.g., by the notched ring 24 forming part of a dial plate provided in this type of machine. The two notches 20 and 21 provided with cutting edges on both sides of the slits, are of different shapes, indicated exactly in FIGURES 4 and 5 on an enlarged scale for the sake of greater clarity, and, to be more precise, both have a V shape, notch 20 being wider than notch 21.

Substantially, the working of the device is as follows: during the normal formation of the reinforcement, the drum controlling the various stages of the process of the machine, causes, by means of a cam, not indicated in the drawings, a pull to be exerted on flexible cable 6 which moves slide 3 and the assembly of knives 10 and 11 and the vibrator 13 towards the crown of needles in the zone where the needles are lowered 8; at the same time the drum itself can actuate a switch which operates the vibrator 13 (e.g., alternating current, electromagnetic vibrator running at 60 cycles per second) which, in opposition to spring 12, moves knife 10 back and forth relative to the fixed knife 11 which is almost tangential to the crown of needles: the thread, entrained by the notched ring 24, is introduced into the aperture which is always present between the notches 20 and 21 and is then cut off by the cutting edges. When the reinforcement has been finished, the same cam on the control drum will release cable 6 and spring 15 will restore the knives and the slide 3 to the rest or inactive position automatically, while the same switch as hereinabove referred to but not illustrated, can interrupt the supply of current to the vibrator.

With the sofar described arrangement, the thread to be cut off is kept stretched in a strongly inclined position (as shown in FIG. 8) towards the plane of rotation of the needles. In this manner it is manifest that the knives cut off the thread at a certain distance from the last needle of the knit being rotated. This is, obviously, a drawback, and to overcome it the arrangement of FIG. 9 is proposed.

In FIG. 7 are indicated three positions *a*, *b* and *c* in which *a* represents the intermediate position, *b* the position in which the upper knife 10 is at the end of its inward travel, and *c* the position in which the upper knife 10 is at the end of its outward stroke.

It should be noted that in the relative movement between the two knives, the thread is obliged to pass along a distance *S*, and that during this time of passing along said distance, the upper knife executes at least two cutting movements.

In FIGS. 8a and 8b the numeral 101 indicates one hook of the normal type of a plurality of hooks carried by the dial plate, which remains in a zone near to a thread 102 which has to be cut off and which is stretched between

threadguide 103 and the head 104 of a needle relating to the knit that has been made.

Since the plurality of needles 104, 104a, 104b, etc. is rotating at high speed, the cutting of thread 102 by knives 10 and 11 can take place only at a point *d* which is at some distance from the head of needle 104, the angle α formed by said thread 102 and the plane of rotation of the needles is rather small.

In order to obtain a more effective cutting, i.e., a reduction in the distance of point *d'* from the top of needle 104' (FIGS. 9a and 9b), it is necessary to provide the device with means suitable for dragging the thread 102' in synchronism with needles 104', 104'a, etc.; for this purpose there are provided noses 105 on each hook 101' of the dial plate 24 so that the thread 102' hooked by corresponding nose 105a placed in rotation with the platen assembly is obliged to follow a broken line between the head of needle 104' and a thread guide 103. The hooks 101' with the noses 105 thereon constitute therefor means on the dial plate for hooking and deflecting the yarn as it passes from the thread guide 103 to the respective needle. In this manner the thread, leaving the plane of the needles, remains stretched at an angle ranging between 75° and 90° relative to said plane of rotation.

In this manner the knives will cut the thread while it is arranged almost perpendicularly to the plane of rotation of the needles. It should be noted that the thread can be carried between the noses of the platen hooks by means of known devices and, in particular, by the thread-guides themselves suitably rotated with a small lifting movement caused, for example, mechanically by means of cams according to a known motion already employed for other processes.

I claim:

1. A yarn end cutter for circular knitting machines comprising, in combination, a first support adapted to be fixed to the knitting machine; a second support mounted on said first support movable between an inactive position and a working position; a pair of knives mounted superimposed upon each other on said second support, one of said knives being fixed to said second support and the other of said knives being reciprocable in one direction with respect to said one knife, said knives having cutting edges extending transverse to said one direction; self-contained oscillating means mounted on said second support and operatively connected to said other knife for oscillating the same in said one direction; and moving means operatively connected to said second support for moving the same between said positions thereof.

2. A yarn end cutter for circular knitting machines comprising, in combination, an elongated support adapted to be fixed to the knitting machine; a slide mounted on said elongated support movable in longitudinal direction thereof between an inactive position and a working position; a pair of knives mounted superimposed upon each other on said slide, one of said knives being fixed to said slide and the other of said knives being reciprocable in one direction with respect to said one knife, said knives having cutting edges extending transverse to said one direction; self-contained oscillating means mounted on said slide and operatively connected to said other knife for oscillating the same in said one direction; and moving means operatively connected to said slide for moving the same between said positions thereof.

3. A yarn end cutter for circular knitting machines comprising, in combination, an elongated support adapted to be fixed to the knitting machine; a slide mounted on said elongated support movable in longitudinal direction thereof between an inactive position and a working position; a pair of knives mounted superimposed upon each other on said slide, the lower of the pair of knives being fixed to said slide and the upper of said knives being reciprocable in one direction with respect to said lower knife, said knives having cutting edges extending transverse to said one direction; self-contained oscillating means mounted

ed on said slide and operatively connected to said other knife for oscillating the same in said one direction; and moving means operatively connected to said slide for moving the same between said positions thereof.

4. A yarn end cutter for circular knitting machines comprising, in combination, an elongated support adapted to be fixed to the knitting machine; a slide mounted on said elongated support movable in longitudinal direction thereof between an inactive position and a working position; a pair of elongated knives mounted superimposed upon each other on said slide and each having a front end portion projecting beyond said slide, the lower one of the pair of knives being fixed to said slide and the upper one being reciprocable in direction of its elongation with respect to the lower one, each of said knives being formed in said front end portion thereof with a substantially V-shaped notch extending transverse to the elongation of said knife and forming a pair of cutting edges, said V-shaped notches in said pair of knives overlapping each other at least in part; self-contained oscillating means mounted on said slide and operatively connected to said other knife for oscillating the same in said one direction; and moving means operatively connected to said slide for moving the same between said positions thereof.

5. A yarn end cutter as set forth in claim 4 wherein the V-shaped notch in said upper knife has a width greater than that in said lower knife.

6. A yarn end cutter as set forth in claim 5 wherein said upper knife is oscillated by said oscillating means through a stroke which is smaller than the maximum width of the V-shaped notch therein and said notches being arranged with respect to each other to always present an opening for the introduction of a yarn to be cut between the cutting edges formed by said notches.

7. A yarn end cutter as set forth in claim 1 wherein said oscillating means are in the form of an electromagnetic vibrator adapted to be operated with alternating current of industrial frequency.

8. A yarn end cutter for circular knitting machines comprising, in combination, an elongated support adapted to be fixed to the knitting machine; a slide mounted on said elongated support movable in longitudinal direction thereof between an inactive position and a working position; a pair of knives mounted superimposed upon each other on said slide, one of said knives being fixed to said slide and the other of said knives being reciprocable in one direction with respect to said one knife, said knives having cutting edges extending transverse to said one direction; self-contained oscillating means mounted on said slide and operatively connected to said other knife for oscillating the same in said one direction; and moving means operatively connected to said slide for moving the same between said positions thereof, said moving means including spring means attached at opposite ends thereof respectively to said support and said slide for yieldably main-

taining said slide in said inactive position, and a flexible cable attached at one end thereof to said slide and adapted to be attached at the other end thereof to a pattern drum of the knitting machine for moving said slide from said inactive to said working position.

9. In a circular knitting machine, in combination, a dial plate; a crown of needles concentric to and adjacent to said dial plate, said needles being movable between a raised and a lowered position; and yarn end cutter means including an elongated support adapted to be fixed to the knitting machine, a slide mounted on said elongated support movable in longitudinal direction thereof between an inactive position and a working position, a pair of elongated knives mounted superimposed upon each other on said slide and each having a front end portion projecting beyond said slide, the lower one of the pair of knives being fixed to said slide and the upper one being reciprocable in direction of its elongation with respect to the lower one, each of said knives being formed in said front end portion thereof with a substantially V-shaped notch extending transverse to the elongation of the knife and forming a pair of cutting edges, said V-shaped notches in said pair of knives overlapping each other at least in part, self-contained oscillating means mounted on said slide and operatively connected to said upper knife for oscillating the same in direction of its elongation, and moving means operatively connected to said slide for moving the same between said positions thereof, said support connected to said knitting machine and said moving means operated in such a manner that said front end portions of said knives are located, when said slide is in said working position, adjacent said dial plate in a region where said needles are lowered with said cutting edges extending substantially tangential to said crown of needles.

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