Sept. 5, 1944. R. N. TOONE 2,357,708

KNITTING MACHINE

Filed June 5, 1942 3 Sheets-Sheet 1

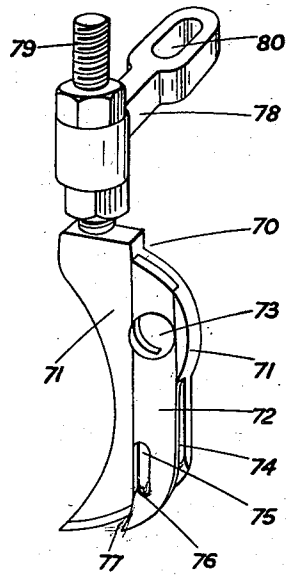


FIG. 1.

FIG. 2.

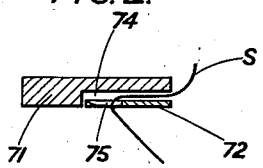
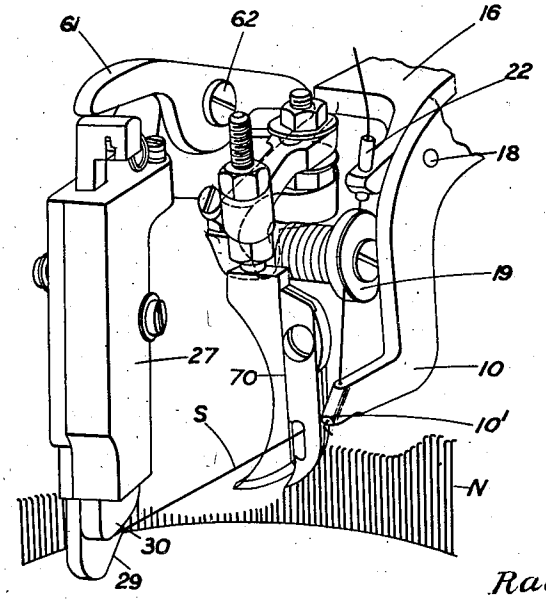


FIG. 3.



INVENTOR
Ralph N. Toone,
BY
B. B. Collings
ATTORNEY

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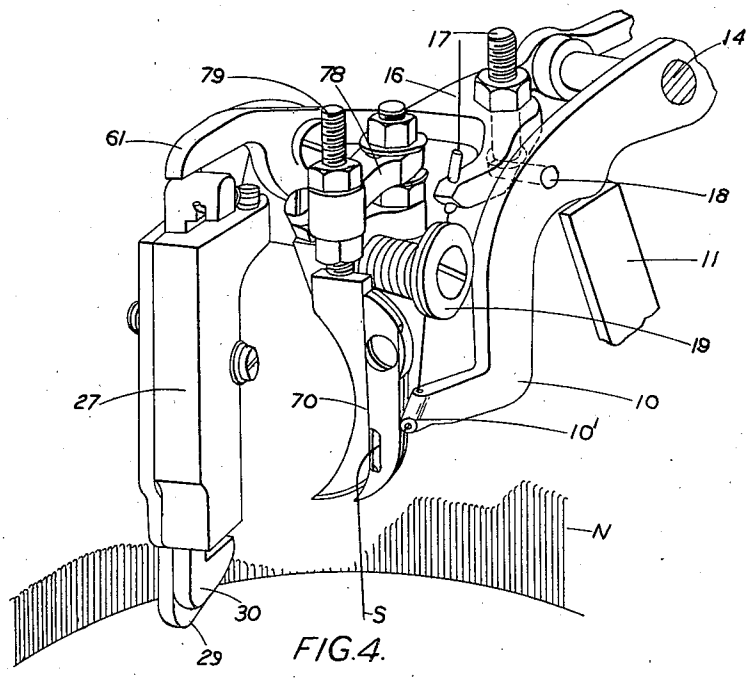
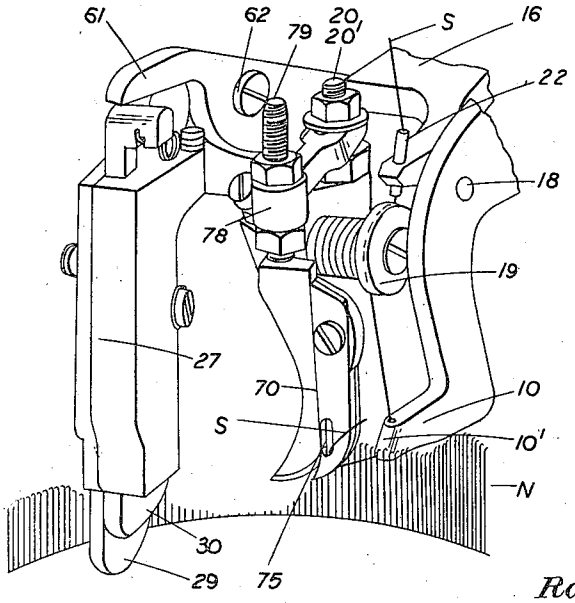


FIG.4.

FIG.5.



INVENTOR
Ralph N. Toone,
BY
B. B. Collings
ATTORNEY

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FIG 6

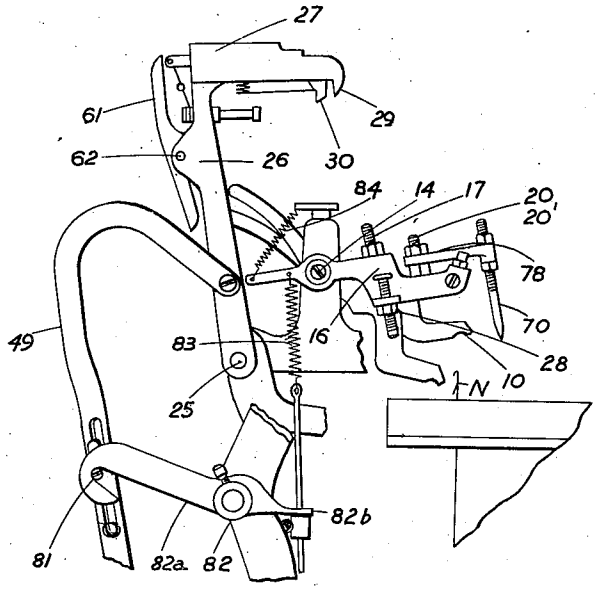
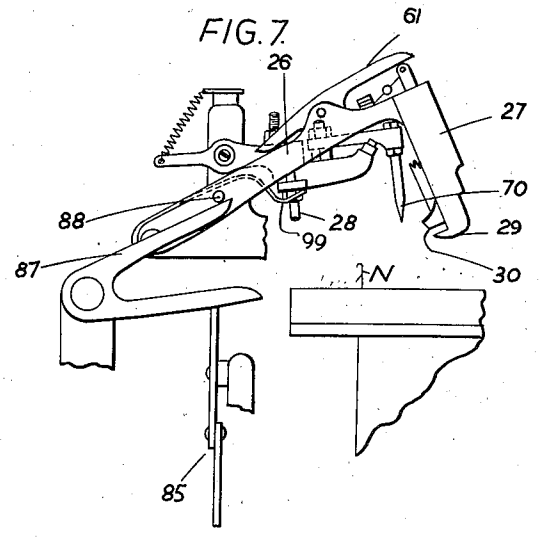


FIG. 7.



INVENTOR
Ralph N. Toone,
BY
B. B. Collings
ATTORNEY

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UNITED STATES PATENT OFFICE

2,357,708

KNITTING MACHINE

Ralph Norman Toone, Wollaton Park, Nottingham, England, assignor to B. Toone (Nottingham) Limited, Nottingham, England

Application June 5, 1942, Serial No. 445,906
In Great Britain May 21, 1941

10 Claims. (Cl. 66—134)

This invention is for improvements in or relating to knitting machines, and is particularly, but not exclusively, concerned with splicing mechanism in seamless hose and half hose machines. In producing splicing on a circular knitting machine it is usual to introduce the splicing thread into knitting activity for a predetermined portion of each course, the splicing thread floating chord-like in the interior of the needle circle for that portion of each course during which it is not knitted. These floats are in the majority of instances subsequently cut out by hand, although prior U. S. Patent No. 2,295,450 granted September 8, 1942, on an application filed by Bernard T. Cole describes mechanism wherein the thread or yarn is severed at each withdrawal so that the formation of floats is obviated. It is desirable that each reintroduction of the yarn or thread to the needles said thread shall be fed with accuracy to a predetermined needle, and the present invention has for its object to provide means whereby the withdrawn thread is so positioned that this accurate re-introduction results. It will be appreciated, however, that the present invention is not restricted in its application to splicing mechanism, but may be applied to other mechanisms wherein a thread or yarn is introduced into the fabric at intervals. Specific examples are mechanisms for the production of split work or plating.

This invention provides in or for a knitting machine, particularly a circular knitting machine, the combination with means, including a feeder, for feeding a yarn for incorporation in the fabric at intervals, and means for severing the withdrawn yarn at each withdrawal; of a device, located at the plain side of the needles between the feeder and the severing means, for receiving the withdrawn yarn upon relative movement occurring in or upon said withdrawal between the device and yarn in a direction laterally of the length of the latter and for positioning said yarn for re-introduction, which device comprises two members having between them a narrow gap, extending in the general direction of said relative movement, for the entry of said yarn upon said withdrawal, and a catch for preventing the discharge of the yarn from the gap in the reverse direction when the yarn is re-introduced to the fabric, wherein the arrangement is such that the yarn end draws out of said device lengthwise upon said re-introduction. In general the relative movement aforesaid will be effected by the displacement of the feeder from the feeding to the inoperative position and in circular knitting machines employing a displaceable feeder this displacement is usually an upwards one from a low feeding position in which the feeder eye lies outside the needle circle to a raised non-feeding position in which said eye lies inside the needle circle. It is, however, known to cause selected needles to take a yarn and others to miss it, not by moving the feeder, but by modifying the path of the movement of the needles so that some of them take and others miss the yarn when fed from a stationary feeder. In such a case the aforesaid relative movement may be effected by moving the device itself. It will be understood, however, that irrespective of which ever of these two alternatives is adopted the withdrawn yarn extends across the needle line from the feeder to the said device at the time of re-introduction and is therefore re-introduced with certainty at the required point in the line of needles.

Preferably the two members overlap and are located face to face in such manner that the aforesaid gap between them is L-shaped or otherwise non-rectilinear in cross section, and one of the members has a recess in one edge so arranged that the tendency of the yarn to straighten from the bent formation imposed on it by the aforesaid shape of the gap carries it into said recess.

The foregoing and other features of the invention set out in the appended claims are incorporated in the construction now to be described with reference to the accompanying drawings, in which

Figure 1 is a perspective view of the aforesaid device;

Figure 2 shows a section therethrough;

Figures 3, 4 and 5 are perspective views, showing the device incorporated in mechanism according to the aforesaid patents, and respectively illustrating its action at the moment the withdrawn yarn is cut, immediately afterwards, and while the yarn is being re-introduced to the needles;

Figure 6 is a fragmentary elevational view illustrating the adaptation of the present device to the well known Scott & Williams "B-5" seamless hose machine, the parts being shown in the inoperative positions, while

Figure 7 shows the corresponding mechanism for another well known form of seamless hose machine.

In a specific embodiment the device, indicated generally by the reference 70, comprises a substantially vertical plate-like member 71 which

is cut with a vertically-extending rebate or groove 71a in one face and along one margin. When looking at the device 70 from the interior of the needle circle (as in Figs. 1 and 3–5) and assuming the needle cylinder to rotate in an anti-clockwise direction (that is to say, assuming the needles N to travel from right to left at the back of said device) the aforesaid face is directed towards the centre of the needle cylinder and the aforesaid margin is the right-hand margin. In this rebate a narrow vertical plate 72 is located by means of a screw 73 or otherwise. There is, however, a small space between the rear face of said second plate 72 and the front face of the rebate of the first plate 71, and between the left-hand vertical edge of said second plate and the left-hand edge of the rebate. Thereby a narrow gap 74 is formed which in horizontal section is L-shaped, as is shown in Fig. 2. In addition the second plate 72 is cut in its left-hand edge, at a small distance from its lower end, with a recess 75, the lower edge of which is downwardly inclined from the entry of said recess so that thereby at the said lower edge of the recess a small catch 76 is provided. The bottom edge of the first plate 71 is curved downwards towards the left and is chamfered front and rear. The bottom edge of the second plate is likewise curved downwards to the left and is provided with a nose which extends slightly to the left of the left-hand vertical edge of the rebate and is located below the bottom edge of plate 71 so that a throat or entry 77 is provided between the two plates; the said bottom edge of the second plate is chamfered at the rear.

Thus there is formed a guide which, assuming that the yarn S is raised by upward movement of the feeder at the withdrawal of the yarn from the needles, causes said withdrawn yarn to enter the throat 77 and to travel upwards into the L-shaped gap 74. The yarn thus entered into the device is bent to a substantially L-shaped formation within the gap, but as the yarn travels up the gap 77, it eventually reaches the entry to the recess 75 and it thereupon springs into the latter so that its L-shaped formation is slightly modified (Fig. 2). In this recess 75 the yarn is positioned. When the feeder is lowered again, however, to re-introduce the yarn to the needles the said yarn is prevented from being discharged from the gap 74 in the reverse direction to that in which it entered it because said yarn is retained in the recess 75 by the catch 76. The yarn therefore draws out of the device endwise. It is important to note that although the device may be constructed to grip the yarn, in the foregoing embodiment it does not. It does not in any way act as a trapper, but is more in the nature of a support for the short loose end of the yarn protruding from the feeder eye 10'.

It may here be mentioned that the gap 74 may be made of curved formation in section by an appropriate formation of the two plates 71, 72, and that a curved sectional formation of the gap may be arranged so as to give the same effect as an angular or L-formation.

The application of the device 70 to mechanism forming the subject-matter of the aforesaid patent will now be described, and although for fuller details of said mechanism reference is to be made to the patent brief particulars are hereinafter given. The feeder 10 (e. g. a splicing feeder) is operated by push rod 11 (Fig. 4) in known manner; it carries a pin 18 which as the feeder is raised to the non-feeding position eventually engages a screw 17 projecting from an arm 16 pivoted at the feeder axis 14. The rest position of this arm 16 is determined by an adjustable tappet screw 20 normally bearing on a part of the feeder bracket, and the arm carries a yarn eye 22 and a yarn-retarding device 19 (conveniently in the form of a pair of spring-pressed cymbals), the yarn S running from said eye 22, through the cymbals 19, to the eye 10' of the feeder 10. A cutter block 27 carrying knives 29, 30 is supported inside the needle circle by a knife arm 26 pivoted at 25. The movable blade 30 is operated to cut, by a lever 61 pivoted on the knife arm 26 at 62; the inner end of this lever 61 overlies an adjustment screw 28 on arm 16, see Figs. 6 and 7. As the feeder 10 is raised to withdraw the yarn S from the needles the withdrawn yarn is carried round into the cutter 29, 30; the feeder raises arm 16 through the medium of pin 18 and screw 17 and the arm rocks the cutter lever 61 (through the medium of screw 28) to operate the cutter. Obviously, the timing of the cutter in relation to the withdrawal of the yarn can be adjusted by screws 17, 20 and 28. When the feeder 10 is lowered to re-introduce the free end of yarn to the needles the arm 16 descends with it until brought to rest by screw 20. Thereafter the feeder descends alone and the grip of the cymbals 19 on the yarn causes the free yarn end to be drawn back through the feeder eye 10'. The extent of this draw-back, and the length of yarn end, can be predetermined by adjustment of screw 20.

The device 70 is mounted on the arm 16 and is suspended inside the needle circle. To this end a plate 78 is fixed on top of said arm 16 by the screw 20, or by a screw 20' adjacent thereto, extending through an adjustment slot 80 in the plate. This plate extends inwards across the needle circle and is transfixed by a screw 79 extending upwards from the top of the device, said screw being provided with lock nuts above and below the plate. Thus the device 70 is adjustable in the vertical direction and towards and away from the circle of needles. It is located between the eye 10' of the feeder 10 and the cutter 29, 30, which cuts the yarn S at each withdrawal of the latter. When the feeder 10 commences to rise to withdraw the yarn S from the needles N the yarn is carried round into the cutter 29, 30, Fig. 3. In this upward movement the feeder eye 10' travels close to the right hand edge of the device 70 and the yarn is carried into the cutter. Further upward movement of the feeder 10 is accompanied by slight upward movement of the device 70 and the yarn is simultaneously cut, so that the loose end of the withdrawn yarn extends from the cymbal device 19, through the eye 10' of the feeder, over the top of the needles N, and thence through the device 70 as shown in Fig. 4. The cut end of yarn is thus positioned in such manner that when the feeder 10 is lowered to re-introduce it to the needles (Fig. 5), it will be re-introduced with certainty at a predetermined needle. In said re-introduction the device 70 accompanies the feeder 10 at least a part of its downward movement (until the yarn is lowered to the needles) and immediately after the yarn has been taken by the needles, its loose end draws out endwise from the device 70.

It is desirable that the device 70 shall be raised to an inoperative position when the cutter 29, 30, is raised to an out of action position for threading up, and in order to permit the yarn to pass under said device 70 when a change of feeders is effected. To this end in a machine of the type

illustrated in Fig. 6 the push rod **49**, controlling the cutter arm **26** is provided with a pin **81** which is located beneath the rearwardly-extending arm **82***a* of a two-armed lever **82**, the other arm **82***b* of which is connected by a tension spring **83** to the tail of lever **16**. Therefore when the push rod **49** is raised the said tension spring **83** is tensioned to such an extent that it overcomes the tension of the spring **84** which normally biases the cymbal device **19** to the lowered position, with the result that the arm **16** rises. In a machine of the type shown in Fig. 7, the push rod **85** for raising the cutter arm **26** is not connected directly to the latter, but operates through the medium of a bell-crank-lever **87**, one arm of which is adapted to engage underneath a pin **88** projecting from said arm **26**. In such a construction a spring wire **99** is provided which is pivoted about the pivot for said cutter arm **26** and extends therefrom over the aforesaid pin **88** and underneath the arm **16**. In a still further alternative the device according to this invention may be mounted on an arm such as **66** in the aforesaid patent or may be attached to the cutter arm **26**.

I claim:

1. In a circular knitting machine, the combination with means, including a feeder, for feeding a yarn for incorporation in the fabric at intervals, and means for severing the withdrawn yarn at each withdrawal; of a device, located at the plain side of the needles between the feeder and the severing means, for receiving the withdrawn yarn upon relative movement between the device and yarn in a direction laterally of the length of the latter concomitant with said withdrawal and for positioning said yarn for re-introduction, which device comprises two members having between them a narrow gap, extending in the general direction of said relative movement, for the entry of said yarn upon said withdrawal, and a catch for preventing the discharge of the yarn from the gap in the reverse direction when the yarn is re-introduced to the fabric, whereby the yarn end draws out of said device lengthwise upon said re-introduction.

2. In a knitting machine, the combination with a series of needles, means including a feeder for feeding and withdrawing a yarn thereto for incorporation into the fabric at intervals, and means for severing the yarn at each withdrawal; of a device, located at the plain side of the needles between the feeder and the severing means, for receiving the withdrawn yarn upon relative movement between the device and yarn in a direction laterally of the length of the latter concomitant with said withdrawal, and for positioning said yarn for re-introduction, said device comprising two members located face to face with an overlap between them affording a narrow gap of non-rectilinear cross section and extending in the general direction of said relative movement, for the reception of the yarn upon said withdrawal, one of said members being provided with a recess in one edge constituting a catch, into which the yarn is carried by its tendency to straighten from the bent formation imposed upon it by the aforesaid shape of the gap, for preventing the discharge of the yarn from the gap in the reverse direction when the yarn is re-introduced to the fabric, the yarn end thereupon drawing lengthwise out of said device.

3. In a knitting machine having needles, a feeder movable between feeding and non-feeding positions for feeding a yarn thereto for incorporation in the fabric at intervals, and means for severing the withdrawn yarn at each withdrawal; a device, located at the plain side of the needles between the feeder and the severing means, for receiving the withdrawn yarn upon movement of the feeder to non-feeding position and for positioning said yarn for re-introduction to the needles, which device has a narrow gap for the entry of the yarn upon movement of the feeder to non-feeding position but permitting said yarn to draw out endwise upon re-introduction to the needles, a catch for supporting the yarn, and means for directing the yarn into said catch; and means for moving said device to and fro, in the same direction as and with the feeder, to offer the yarn extending between it and the feeder to the needles as the feeder moves to feeding position.

4. In a knitting machine having hooked needles, means including a feeder for repeatedly feeding a yarn, with its end free, to said needles for incorporation in the fabric at intervals, and means for severing the withdrawn yarn at each withdrawal to leave an untrapped yarn end protruding from the feeder for reintroduction to the needles; a device for receiving the yarn upon withdrawal and for locating the untrapped end for reintroduction to the needles, which device comprises two members providing a gap between them for the reception of the yarn, a catch for engaging the yarn extending through the gap, and means for directing said yarn into the catch, said device being located at the plain side of the needles between the feeder and the severing means, and said catch causing the yarn to draw out endwise from the gap upon said re-introduction.

5. In a knitting machine having needles, means for operating them to knit, means including a feeder for introducing a yarn to the needles for a predetermined period and for then withdrawing it, means for severing the withdrawn yarn, and means for reducing, subsequent to severance and while the end of the yarn is free, the length of yarn extending from the feeder to the severed end; a device for receiving the yarn concomitant with its withdrawal, positioning the severed end for reintroduction to the needles and causing said yarn to draw out endwise therefrom when introduced to the needles, which device comprises a catch for supporting the yarn, and surfaces for directing the yarn into the support catch and for preventing displacement of the supported yarn in the direction of relative movement between needles and feeder; and means for supporting said device, at the opposite side of the needles from the feeder, between the feeder and the severing means.

6. In a circular knitting machine of the type having a rotatable circle of hooked needles, a yarn feeder adapted to be raised and lowered repeatedly between non-feeding and feeding positions to incorporate the yarn in the fabric at intervals, and severing means for severing the withdrawn yarn at each movement of the feeder to non-feeding position: the combination of a yarn-positioning device, located at the plain side of the needles between the feeder and the severing means, for receiving the withdrawn yarn and for locating its loose end protruding from the feeder for reintroduction in such manner that upon said reintroduction it pulls out endwise therefrom, which device comprises a support catch for the yarn, and a yarn-receiving cleft, leading in the direction of movement of the

feeder to the non-feeding position to said catch, for guiding the withdrawn yarn to the catch.

7. For a combination according to claim 1, a device comprising two plate members whereof one has a rebate near one margin and the other is disposed in said rebate with its face spaced from the face of the rebate and an edge spaced from the edge of the rebate whereby there is formed between said members a narrow yarn-receiving cleft of substantially L-shaped cross section extending from the said margin to the edge of the rebate; and a yarn receiving catch or notch in said edge of the second member.

8. In a knitting machine having a series of needles, a yarn feeder for supplying yarn to and withdrawing it from said needles at intervals whereby it may be intermittently incorporated into a fabric being knit, and means for automatically severing said yarn at each withdrawal: the combination therewith of means for insuring re-engagement of the yarn by a predetermined needle upon its presentation for re-introduction into the fabric, comprising a device disposed between the yarn feeder and severing means for receiving the yarn through transverse movement thereof prior to severance and thereafter supporting the loose end protruding from the feeder adjacent the needles, said device having means for insuring withdrawal of the yarn therefrom only in a direction longitudinal of the yarn.

9. A combination according to claim 8, wherein the device is provided with a non-rectilinear passage into which the yarn is received through said transverse movement.

10. A combination according to claim 8, wherein the device is provided with a non-rectilinear passage for receiving the yarn through said transverse movement, and with a catch for insuring said longitudinal withdrawal from said passage.

RALPH NORMAN TOONE.