March 19, 1963 P. A. MAHLER 3,081,609

YARN SEVERING IN CIRCULAR KNITTING MACHINES

Filed Jan. 30, 1961

FIG. 1.

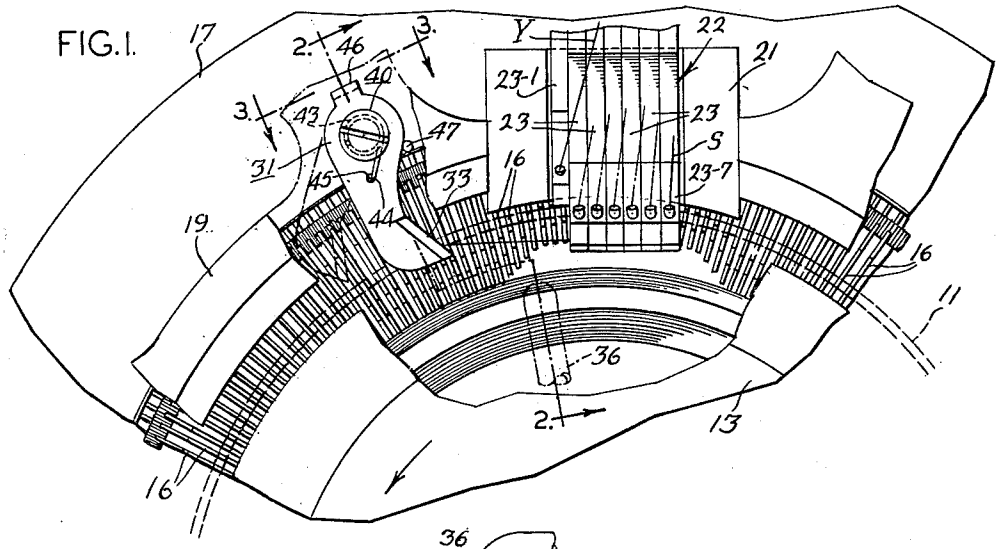


FIG. 2.

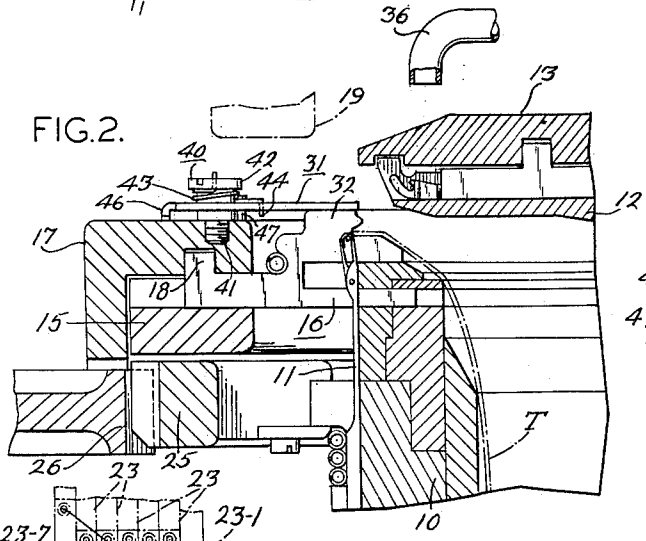


FIG. 3.

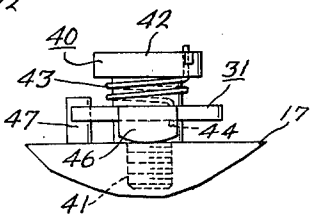


FIG. 4.

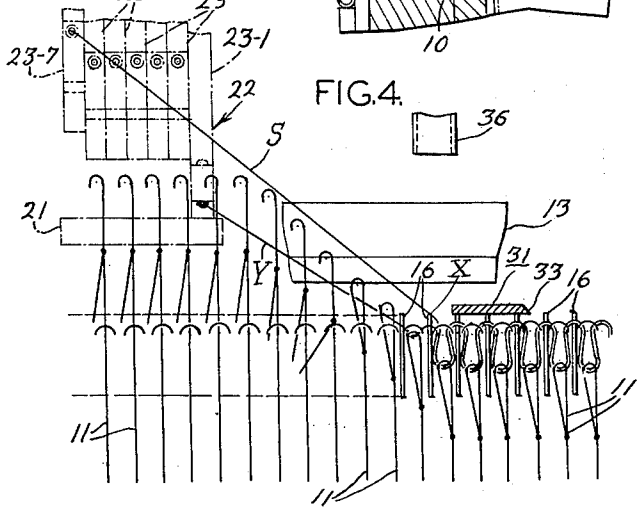
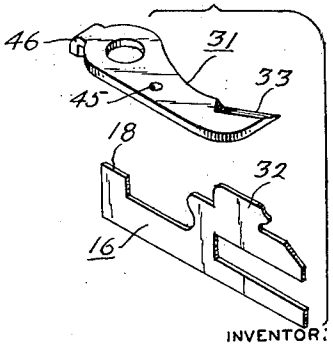


FIG. 5.



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YARN SEVERING IN CIRCULAR KNITTING MACHINES

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The present invention relates to yarn severing in circular knitting machines and has particular application to severing splicing yarns as they are inserted into and withdrawn from action, particularly in the heel, foot and toe of ladies' stockings.

When knitting ladies' stockings on circular knitting machines either by continuous knitting as opposed to reciprocating knitting or by conventional methods where the machine reciprocates to form heels and toes, it is necessary to provide reinforcement in areas of the leg and foot while the machine is rotating continuously. This is particularly important when either the stocking is formed as a continuous tube without provision for making heel pockets, toe pockets and the like and when the pockets are formed during rotary knitting as in British Patent No. 756,841. These reinforced areas are not constant in width but are automatically varied to give the desired shaping or contour to the reinforced area. Normally, the area, represented by part of the needle cylinder, which it is not desired to reinforce, is traversed by the splicing threads which are floated across.

In the past, the floats of the splicing ends have been severed and removed prior to finishing the stocking and after the tube has been knitted and removed from the knitting machine. When trimming the reinforcing ends, it is essential that the "tail" or unknit portion be no longer than 1/16 inch to 3/32 inch, and there has been no mechanism which has been entirely satisfactory to sever such ends automatically because of the requirement for precise timing to coincide with the variable insertion and withdrawal of the reinforcing yarn end to provide the necessary contour.

With the foregoing in mind, the present invention provides a novel mechanism for mechanically severing the splicing ends closely adjacent the knitted tube so as to leave a tail within the required length.

More specifically, the present invention provides a cutter element cooperable with the sinkers of the knitting machine to sever the splicing ends.

All of the objects of the present invention are more fully set forth hereinafter with reference to the accompanying drawing wherein:

FIG. 1 is a fragmentary plan view of a knitting machine with portions broken away illustrating severing mechanism made in accordance with the present invention;

FIG. 2 is an enlarged sectional view taken on the irregular offset line 2—2 of FIG. 1;

FIG. 3 is a further enlarged fragmentary sectional view taken on the line 3—3 of FIG. 1;

FIG. 4 is a schematic development showing the operation of the mechanism of FIG. 1; and

FIG. 5 is an exploded perspective view showing the cutter element and an associated sinker.

Referring to the drawing, the knitting machine comprises a conventional rotary needle cylinder 10 having a circle of needles 11 mounted therein. A dial 12 rotates with the needle cylinder 10 and is covered by a stationary dial cap 13. A sinker dial ring 15 is mounted for rotation with the needle cylinder 10 and carries a plurality of sinkers 16 of special construction positioned intermediate the needles 11. A stationary sinker dial

cap 17 operates on the sinker butts 18 to displace the sinkers radially as the sinker dial ring 15 rotates. A yarn guide ring 19 overlies the sinker dial cap 17 and mounts a throat plate 21 at the yarn feed station 22. In the present instance, the yarn feed station 22 includes seven yarn feed fingers 23, of which the first feed finger 23–1 supplies the leg yarn Y and the last finger 23–7 supplies the splicing end S. The needle cylinder 10 and sinker dial ring 15 are driven in conventional manner by a ring gear 25 and suitable drive means 26.

In the operation of the knitting machine, the knitting instrumentalities cooperate in a conventional manner to form the leg yarn Y into a knitted tube T (see FIG. 2) which passes downwardly through the center of the needle cylinder 10. In the illustrated position of the yarn fingers 23–1 and 23–7, the former yarn finger is in active position to effect knitting with the leg yarn Y and the latter feed finger 23–7 is in inactive position to withdraw the splicing end S from action. When the tube T is to be reinforced, the feed finger 23–7 is displaced into active position to effect knitting of the splicing end S with the leg yarn Y for that portion of the circumference of the tube which is to be reinforced.

In accordance with the invention, a cutter blade 31 cooperates with the sinkers 16 to sever the splicing end S as it is withdrawn from and inserted into action by the feed finger 23–7. To this end, the cutter blade 31 is mounted on the sinker dial cap 17 to project over the sinkers in the area overlying the needles 11 and to engage with the top of the sinkers as shown in FIG. 2. In order to provide improved shearing action, the sinkers 16 are of the special design shown in FIGS. 2 and 5, having an elongated projection 32 with a flat upper surface which cooperates with the cutting edge of the blade 31. When the splicing yarn S is withdrawn from action, as shown in FIG. 4, displacement of the finger 23–7 to the inactive position raises the yarn S to avoid the hooks of the needles 11 and to cause the yarn to pass over the top projection 32 of the sinkers 16 as indicated at X in FIG. 4. As the needles and sinkers are rotated by the drive means 26, the sinker at X engages the cutting edge 33 of the blade 31 to sever the splicing yarn S, closely adjacent the knitted tube.

In the foregoing paragraphs, the splicing end S was described as being inserted and withdrawn by selective displacement of the feed finger 23–7. It is to be understood that the invention is equally applicable to knitting machines wherein the splicing end is inserted into and withdrawn from action by selective displacement of the needles into and out of registry with the splicing feed finger 23–7 which remains stationary in its active position bearing on the throat plate 21 slightly elevated above the level of the main feed finger 23–1.

Means is provided to hold and clamp the severed yarn end extending from the feed finger 23–7. In the present instance, the means comprises a suction tube 36 positioned intermediate the feed station 22 and the cutter 31. Sufficient suction is applied to the tube 36 to draw the severed splicing end S into the tube so that the strand S spans between the tube 36 and the feed finger 23–7. When the finger 23–7 is inserted back into action, the splicing yarn S is displaced downwardly to engage in the hooks of the needles 11 and is therefore carried by the rotation of the needles and sinkers into engagement with the cutting edge 33 of the cutter 31. The yarn S therefore passes from the feed finger 23–7 through the hooks of the needles 11 to the point of insertion and then back over the top projection 32 of the sinkers 16 at that point to the suction tube 36. As the cutting edge 33 engages the projection 32, the yarn is severed closely adjacent the knitted tube and the free severed end is withdrawn

from the dial cap up through the suction tube 36 to a suitable receptacle. It is noted that the sinkers of the special form shown herein are necessary only at the points where the splicing ends are inserted into and withdrawn from the knitted tube, and that the remaining sinkers may be of conventional form.

The cutter blade 31 is mounted on the sinker dial cap 17 by means of a pivot stud 40 threadably engaged in the dial cap as indicated at 41 and having an enlarged head portion 42. A spring element 43 is compressed between the head 42 and the cutter blade 31 to bias the blade 31 against the projections 32 on the sinkers 16. The blade 31 has a depending foot 46 which engages the sinker dial cap to urge the cutting edge 33 against the projections 32 under the bias of the spring 43. The spring 43 also is anchored at one end 44 in an aperture 45 in the cutter blade 31 and at the other end in the head 42 so as to bias the cutter blade counterclockwise as seen in FIG. 1 against a stop element 47 on the dial cap. The spring 43 normally positions the cutter blade 31 in the position shown in full lines in FIG. 1, but in the event that a needle 11 projects upwardly beyond the tops of the sinker 16, the cutter bar 31 may be displaced clockwise to permit passage of the needles without causing a smash.

Thus, the present invention provides mechanism to sever the tail of the splicing ends closely adjacent the fabric during the knitting thereof so as to eliminate the necessity for floating the splicing ends in that portion of the circumference of the tube where the ends are inactive and the resultant necessity for shearing or otherwise removing the floats.

While a particular embodiment of the present invention has been herein illustrated and described, it is not intended to limit the invention to such disclosure, but changes and modifications may be made therein and thereto within the scope of the following claims.

I claim:

1. In a circular knitting machine having a rotary needle cylinder having a needle circle mounted therein, a sinker dial ring rotatable with said cylinder, and a relatively fixed feed station, means to sever splicing ends inserted into and withdraw from action at said feed station comprising sinkers mounted in said sinker dial ring for rotation therewith, a relatively fixed cutter blade spaced from said feed station in the direction of rotation of said needle cylinder and having a cutting edge overlying the needle circle cooperable with said sinkers to sever said splicing ends, and a suction tube mounted intermediate said feed station and said cutter blade operable to engage and withdraw the splicing end severed by said cutter blade.

2. In a circular knitting machine having a rotary needle cylinder having a needle circle mounted therein, a sinker dial ring rotatable with said cylinder, and a relatively fixed feed station; means to sever splicing ends inserted into and withdrawn from action at said feed station comprising sinkers mounted in said sinker dial ring for rotation therewith, at least selected sinkers being formed with an upward extension having a flat upper surface, a cutter blade spaced from said feed station in the direction of rotation of said needle cylinder and having a cutting edge overlying the needle circle cooperable with the flat upper surface of said selected sinkers to sever said splicing ends, means mounting said cutter blade for pivotal displacement in the direction of rotation of said needle cylinder out of overlying relationship with the needle circle therein, and biasing means to simultaneously bias the cutting edge of said cutter blade against said flat upper surface of the sinker extension, and normally bias said cutting edge for pivotal movement on said mounting means in a direction opposite to the direction of rotation of said cylinder into overlying relationship with said needle circle.

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