Jan. 29, 1963 E. ST. PIERRE 3,075,374

YARN CLAMPING AND SEVERING MECHANISM FOR KNITTING MACHINES

Filed Oct. 4, 1960 3 Sheets-Sheet 1

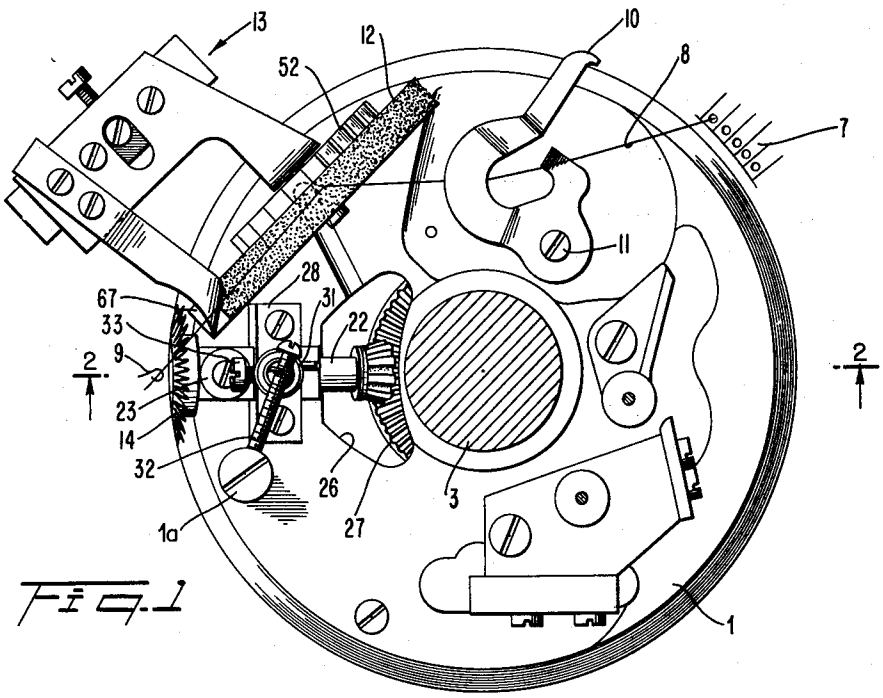

Fig. 1

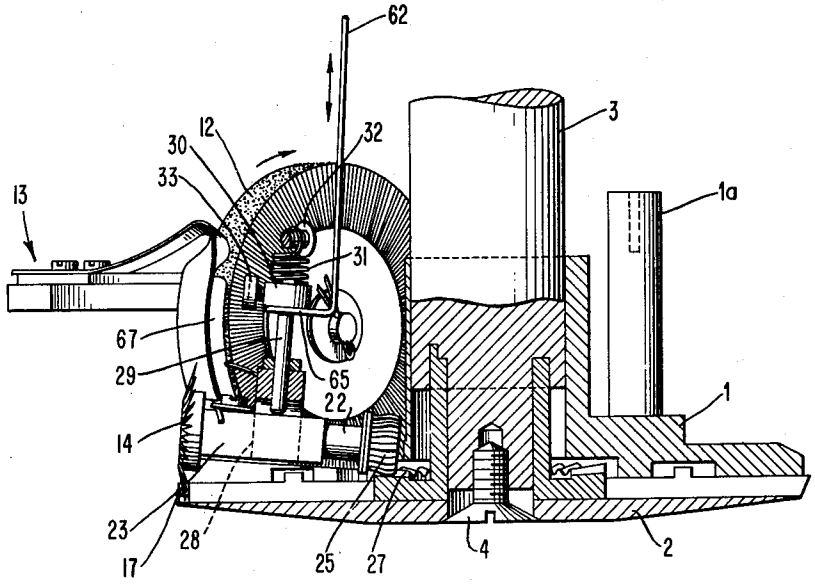

Fig. 2

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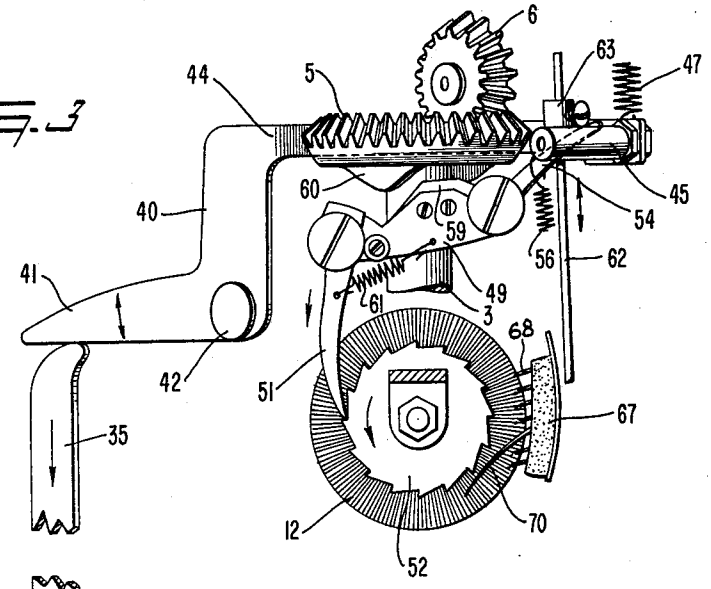
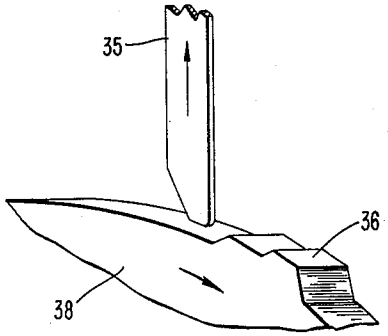
Fig. 3





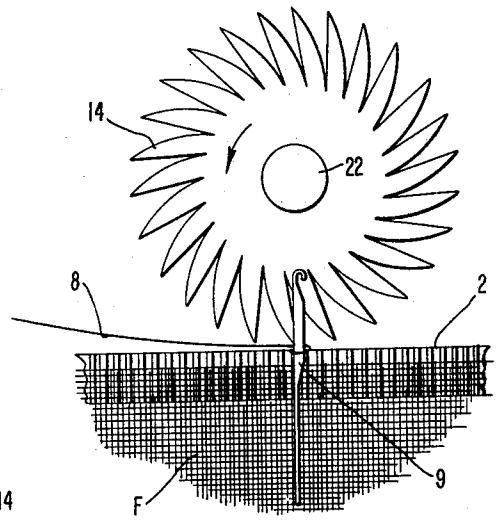


Fig. 5

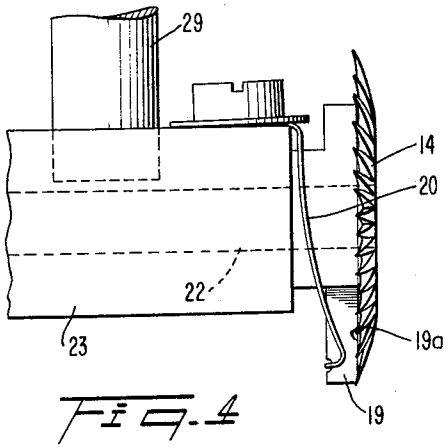


Fig. 4

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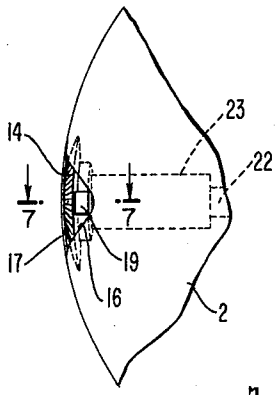
Fig. 6



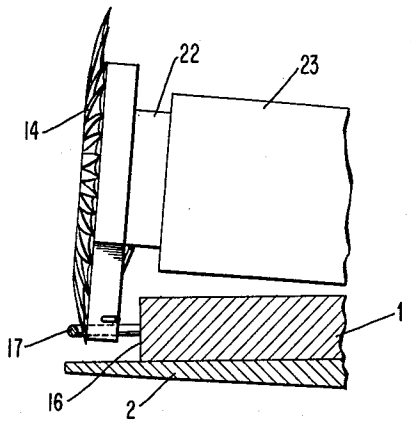


Fig. 7

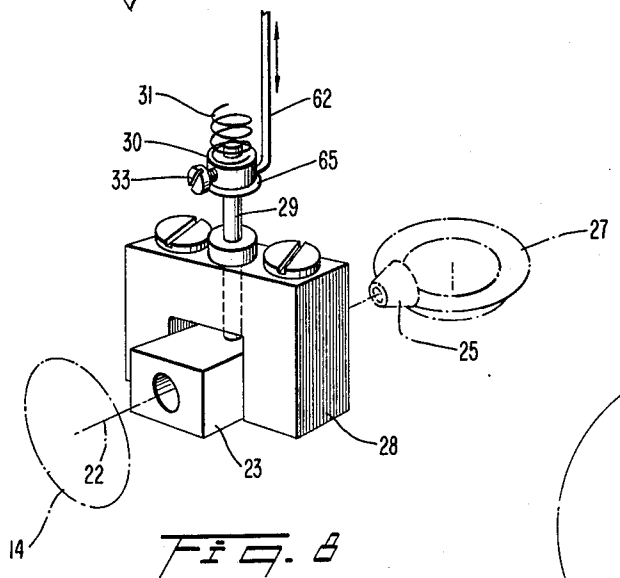


Fig. 8

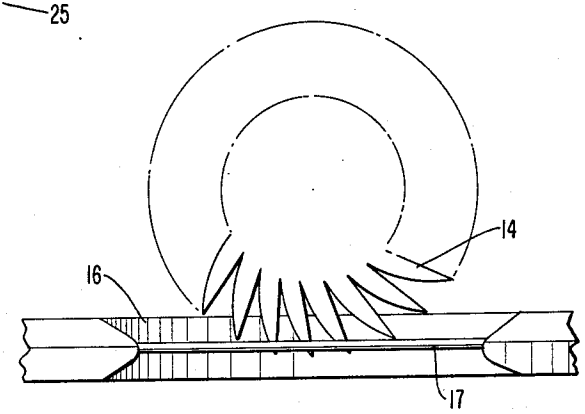


Fig. 9

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YARN CLAMPING AND SEVERING MECHANISM FOR KNITTING MACHINES

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Filed Oct. 4, 1960, Ser. No. 60,428
12 Claims. (Cl. 66—145)

This invention relates generally to yarn clamping and severing mechanism for knitting machines and in particular for circular knitting machines for knitting hosiery in which long ends of yarn are undesirable and unsightly.

Until recently the hosiery knitting industry had universally accepted the limitation of circular knitting machines operative such that when any yarn is taken out of action and bound and cut, an end of considerable length extended between the binder and the yarn feed fingers or yarn levers so that when the yarn is again used an end of considerable length remained on the inside of the tubular knitted fabric.

It is a principal object of the present invention to eliminate such long yarn ends and to make it possible to bind and cut both incoming and outgoing yarns close to the first or last needle respectively to which it is fed so that the yarn ends which are left are very short.

Another object is to provide yarn clamping and severing mechanism so effective as to eliminate the need of subsequent trimming operations, thereby reducing manufacturing costs and avoiding excessive handling of the fabric so that the number of seconds or other imperfect fabric is reduced.

In known circular knitting machines when a yarn is taken out of action it is carried around immediately above the binder plate to a binder and a cutter where it is severed. A feature of the clamping and severing mechanism, according to the present invention, is the elimination of the usual type of binder and cutter. According to the invention the yarn is carried around the needle circle by the last needle to knit it and over the binder plate above which is mounted a small circular brush with the bristles thereof bearing substantially normal to the binder plate and under which the yarn is guided. The brush is intermittently rotated stepwise by a ratchet mechanism.

As the yarn is guided under the brush, which functions as a binder, and continues to be carried around by the aforementioned needle it encounters a severing mechanism comprising a small, rotatable cutter wheel positioned tangentially to the peripheral edge of the binder plate and at the extreme edge thereof which is slightly recessed to receive it. The severing mechanism includes a thin wire guard spanning the binder plate recess conforming to the original contour of the binder plate and forming a continuation thereof to insure that the yarn will not pass under the cutter wheel. A sharp edge block bears against the side of the cutter wheel so that the two jointly form a cutter mechanism.

Other features and advantages of the yarn clamping and severing mechanism in accordance with the present invention will be better understood as described in the following specification and appended claims, in conjunction with the drawings in which:

FIG. 1 is a plan view of a portion of a circular hosiery knitting machine illustrating the relative positions of the members of the yarn clamping and severing mechanism, according to the invention, as disposed on a stationary binder plate of a circular knitting machine;

FIG. 2 is an elevation view partly in section taken along line 2—2 of FIG. 1;

FIG. 3 is a fragmentary and more or less diagrammatic elevation view of the binder according to the invention and the mechanism for intermittently rotating it stepwise and for operating the severing mechanism;

FIG. 4 is an enlarged side view of the severing mechanism according to the invention;

FIG. 5 is an end view of the cutter wheel shown in FIG. 4 and illustrates the manner in which the yarn is delivered to the intermittently driven cutter wheel for a severing operation;

FIG. 6 is a fragmentary plan view of the binder plate of the machine and the severing mechanism according to the invention as seen from below;

FIG. 7 is an elevation view partly in section taken along line 7—7 of FIG. 6;

FIG. 8 is a perspective view partly diagrammatic illustrating mechanism for intermittently operating the severing mechanism; and

FIG. 9 is an end elevation view of the cutter wheel of a severing mechanism and illustrates the manner in which the binder plate on the hosiery knitting machine is recessed to receive the cutter wheel.

While the yarn clamping and severing mechanism according to the invention will be described as applied to a circular knitting machine for knitting sheer ladies nylon hosiery it will be understood that the invention is equally applicable to other types of knitting machines and machines in which a yarn binding and severing function takes place.

According to the drawings the circular knitting machine for hosiery portion is shown as having a stationary binder plate 1 having mounting means comprising a post 1*a* mounted thereon for securing the plate to a suitable member (not shown) of the knitting machine. Beneath the binder plate is located a rotatable dial 2 and attached to a driving shaft 3 by a screw 4. The shaft 3 extends upwardly through the binder plate and is provided with an end gear 5 rotatably driven by a gear 6 rotatably driven from the machine by means, not shown.

The knitting machine is provided in known manner with yarn feed means shown diagrammatically as a plurality of retractable feed fingers or yarn levers 7 from which yarn, as for example yarn 8, is fed to a circle of needles operable in a cylinder not shown. A knitting needle 9 of the circle is shown in transit (FIG. 1) carrying the yarn 8 under a guard clip 10 fixed by a screw 11 on the top surface of the binder plate 1 into the yarn clamping and severing mechanism according to the invention. The needle 9 is representative of the last needle to which the yarn 8 is fed during the knitting operation on a tubular hosiery fabric F.

The yarn clamping and severing mechanism comprises a brush 12 disposed so that the ends of its bristles bear on a top surface of the binder plate 1 and the yarn 8 is guided under the brush as it is carried around the needle circle by the last needle 9 to knit it. This brush is held in position by a mount 13 and intermittently operable stepwise in a manner later herein described and functions as a binder for the yarn.

As the yarn is guided under the brush 12 and continues to be carried around the needle circle by the needle 9 it encounters, as shown in FIG. 5, a small rotatable cutter disc 14 positioned substantially tangentially to the edge of the binder plate 1 and at a marginal edge portion thereof having a recess 16 to receive it as shown in FIGS. 2, 7 and 9. The cutter 14 rotates about a substantially horizontal axis parallel to the binder plate. To insure that the yarn will not pass under the cutter a thin, arcuate wire guard 17 spans the recess 16. The wire guard 17 is configured to in effect restore the original peripheral contour of the binder plate. The rotatable disc may have a smooth edge or have peripheral teeth of any preferred shape by which it delivers the yarn to a cutter blade 19 having a

cutting edge 19*a* adjacent the teeth of the cutter disc and which jointly with the cutter wheel 14 forms the yarn severing mechanism. A spring 20 constantly urges the blade 19 in a direction toward the cutter 14.

The cutter 14 is mounted on one end of a rotatable shaft 22 passing through a bearing block 23 and at the opposite end of which is provided a gear portion 25 extending through a cut-away portion 26 of the binder plate 1 and intermittently driven, as hereinafter described, by a gear 27 formed on the dial 2 as the dial is rotatably driven.

The bearing block 23 is movable upwardly and downwardly in a U-shaped guide block 28 so that the gear portion 25 on the shaft 22 can be selectively separated from the gear 27 on the dial, as later herein described. An operating rod 29 fixed to the bearing block 23 is provided extending upwardly through the guide block 28 and is movable axially therein. A collar 30 is attached to the rod 29. One end of a compression spring 31 bears on the collar and the opposite end thereof is connected or fixed to a stationary screw 32 mounted in any suitable stationary machine part. The collar 30 is adjustable axially on the rod 29 by set screw 33 to variably adjust the tension of the spring 31 which constantly urges the rod 29 downwardly thereby to move the bearing block 23 downwardly and consequently the cutter wheel 14 and its associated gear portion 25 downwardly into an operating position. When the bearing block 23 is moved into a downward position the gear 25 engages the gear 27 of the dial plate 2 and the cutter is thereby rotatably driven. It may be desirable to cause the cutter 14 to rotate at a higher rate than provided by the arrangement shown and described. It should be understood that cutter 14 may be driven by any suitable means and from any suitable source to obtain the desired speed.

It will be realized that the yarn clamping and severing mechanism according to the invention needs to operate only when the yarn is being withdrawn from or being put into use and at other times it may remain idle in order to avoid unnecessary wear. In order to operate the brush 12 and cutter 14 intermittently and in timed relationship with each other and with the yarn feed means or yarn levers 7 operating mechanism is provided.

To operate the brush and cutter a thrust bar 35 shown schematically in FIG. 3, is operatively driven in opposite directions by cams, as for example a cam 36, suitably positioned on the usual control drums, as for example a drum 38, to reciprocably operate the lever 35 at the proper time. The lever 35 rocks a pivotally mounted lever 40 and bears against an arm 41 thereof rocking the lever 40 about its pivot 42 so that an arm 44 is rockably moved thereby moving a finger 45 upwardly and downwardly. The arm 44 is constantly urged in a counterclockwise direction by a spring 47 so that arm 41 is constantly urged into a cooperating operative position with the thrust bar lever 35.

In order to rotatably drive the brush 12 as indicated heretofore a pivotally mounted pawl 49 having a pivoted pawl portion 51 for engagement with the teeth of a ratchet 52 fixed to the brush is provided. The pawl 49 is provided with a tail 54 constantly urged downwardly, in a clockwise direction, by a spring 56 secured at one end to the tail 54 and having an opposite end secured to a stationary part of the knitting machine, not shown. When the finger 45 is in a raised position the pawl 49 is moved into an operative position for successive engagement of a camming surface 59 thereof by a plurality of cams or lobes 60 provided on the lower side of the drive gear 5 thereby rocking the pawl 49 and stepping the ratchet 52. The number and design of the lobes is so chosen as to suitably drive the brush at the desired speed. When the finger 45 is in a depressed position the tail is depressed moving the surface 59 into a position in which the lobes 60 are ineffective to rock the pawl 49. A spring 61 constantly urges the pawl portion 51 into engagement with the teeth of the ratchet 52 so that the mechanism is in constant readiness to drive the brush under control of the drum 38.

The operating mechanism also controls the severing mechanism. A wire 62, provided with a collar 63 bearing on finger 45, extends through the finger 45 and is operable axially by the movement of the finger 45. The wire 62 is provided with a loop 65 on the underside of the collar 30 so that when the arm 40 moves the finger 45 upwardly the wire rod 62 is moved upwardly compressing the spring 31 and raises the operating rod 29 thereby to pick up the cutter disc 14 and its associated gear 25 so that it is not driven from the dial. When the finger 45 is in a downward position the spring 31 drives the collar 30 downwardly placing the gear 25 in engagement with the dial gear 27 so that the cutter disc 14 is rotatably driven during the period of time that the finger 45 is in a downward position. Thus, the operation of the brush and cutter are substantially concurrent with the operation of the yarn levers and in timed relationship with each other and continue for a period sufficient to insure that the incoming or outgoing yarn will be carried far enough around the needle circle to be bound and cut. It will be understood that the teeth of the dial gear 27 are suitably constructed substantially as sawteeth to permit easy and smooth engagement and disengagement with the gear portion 25.

The brush 12 acts as a binder for the yarn and also gathers the loose cut ends of the yarn which become entangled in its bristles and are removed from time to time by a comb 67 held radially of the brush by the mount 13 and comprising a plurality of small teeth 68 so positioned that they lie parallel with the inside and outside bristles of the brush. The comb teeth pick up the loose ends of the yarn gathered by the brush. A long tooth 70 moves the yarn ends toward the outer circumference of the brush from which they can be readily removed by the machine operator.

The yarn clamping and severing mechanism according to the invention is very simple and can be easily manufactured. It provides a simple and effective way that incoming and outgoing yarns can be cut close to the operating needles and only very short ends of yarn are left on the inside of the tubular fabric F being knitted. The yarn ends are so short that they are unobjectionable and scarcely noticeable.

While the invention has been described as particularly applicable to knitting of sheer ladies nylon hosiery which are so transparent that any free yarn ends of considerable length are clearly visible through the fabric and would normally heretofore require a trimming operation at the completion of knitting it is readily apparent that the invention is equally applicable to the knitting of fabrics usable in other fine products in which free yarn ends of considerable length are unacceptable.

While a preferred embodiment of the yarn clamping and severing mechanism has been shown and described it will be understood that many modifications and changes can be made within the scope of the invention.

What I claim and desire to secure by letters patent is:

1. In a yarn binding and severing mechanism for a knitting machine having knitting needles rotatable in a circle, retractable means for feeding yarn to said needles, and a binder plate, yarn binding means comprising a brush having bristles the free ends of which make contact with said binder plate, said binder plate and brush being positioned relative to the path of travel of said needles so that yarn fed to said circle of needles is caused to pass beneath said free brush ends and said binder plate to be bound thereby when said yarn feeding means is retracted, and means for rotating said brush automatically when the yarn is disposed between said free brush ends and said binder plate.

2. A yarn binding and severing mechanism for a knitting machine according to claim 1, which includes cutter

means to sever a yarn which has been bound by said brush.

3. A yarn binding and severing mechanism for a knitting machine according to claim 2, in which said cutter means comprises a rotatable cutter wheel.

4. A yarn binding and severing mechanism for a knitting machine according to claim 3, in which said cutter wheel is disposed to rotate substantially tangentially of the binder plate.

5. A yarn binding and severing mechanism for a knitting machine according to claim 3, including means for rotating said cutter wheel when said brush is rotated.

6. A yarn binding and severing mechanism for a knitting machine according to claim 5, which includes common means for controlling rotation of said brush and said cutter wheel.

7. In a knitting machine having a circle of knitting needles rotatable in operation in a circle, retractable means for feeding yarn to said needles and a binder plate, a yarn binding and severing mechanism comprising, a rotatable brush having bristles the free ends of which make contact with said binder plate, said binder plate and brush being positioned relative to the path of travel of said needles so that the yarn received by the last needle to receive yarn when said yarn feeding means is retracted is caused to pass by said last needle between said free brush ends and said said binder plate during travel of said last needle around said circle, and means effective for rotating said brush when said yarn is disposed between said free brush ends and said binder plate so that the yarn is bound thereby.

8. In a knitting machine having a circle of knitting needles, rotatable in a circle, retractable means for feeding yarn to said needles, and a binder plate, a yarn binding and severing mechanism comprising, a rotatably driven brush having bristles the free ends of which make contact with said binder plate, said binder plate and brush being positioned relative to the path of travel of said needles so that yarn fed to said circle of needles is caused to pass between said free brush ends and said binder plate to be bound thereby when said yarn feeding means is retracted and a cutter to sever yarn between said brush and the first needle of said needles to receive the yarn and disposed to sever said yarn received by said first needle close

to said first needle when said yarn feeding means is retracted.

9. In a knitting machine according to claim 8, including automatic means for rotating said brush when said yarn feeding means is retracted.

10. In a knitting machine according to claim 9, in which said means for rotating said brush comprise means for rotating said brush in steps.

11. In a knitting machine according to claim 9, including a comb disposed relative to said brush to remove severed portions of yarn gathered by said brush when said yarn is severed.

12. In a knitting machine having a circle of knitting needles, rotatable in a circle, retractable means for feeding yarn to said needles, and a binder plate, a yarn binding and severing mechanism comprising, a periodically driven brush having bristles the free ends of which make contact with said binder plate, said binder plate and brush being positioned relative to the path of travel of said needles so that yarn fed to said circle of needles is caused to pass between said free brush ends and said binder plate to be bound thereby when said yarn feeding means is retracted, a cutter to sever yarn between said brush and the first needle of said circle of needles to receive the yarn and disposed to sever said yarn received by said first needle close to said first needle when said yarn feeding means is retracted, means to gather cut yarn ends comprising means to drive said brush periodically when the yarn is severed, and means cooperative with the brush to move the cut yarn ends radially outwardly of the brush toward said free ends thereof, whereby the cut yarn ends can be readily removed from the periphery of said brush.

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