June 23, 1942. B. C. REDEEN 2,287,131

COMBINATION CUTTER AND BINDER FOR CIRCULAR KNITTING MACHINES

Filed March 5, 1941 4 Sheets-Sheet 1

Fig. 2.

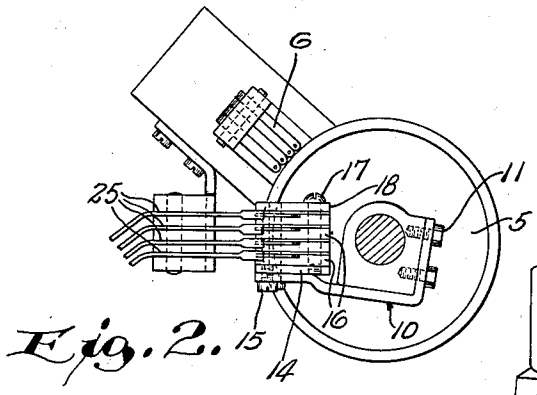
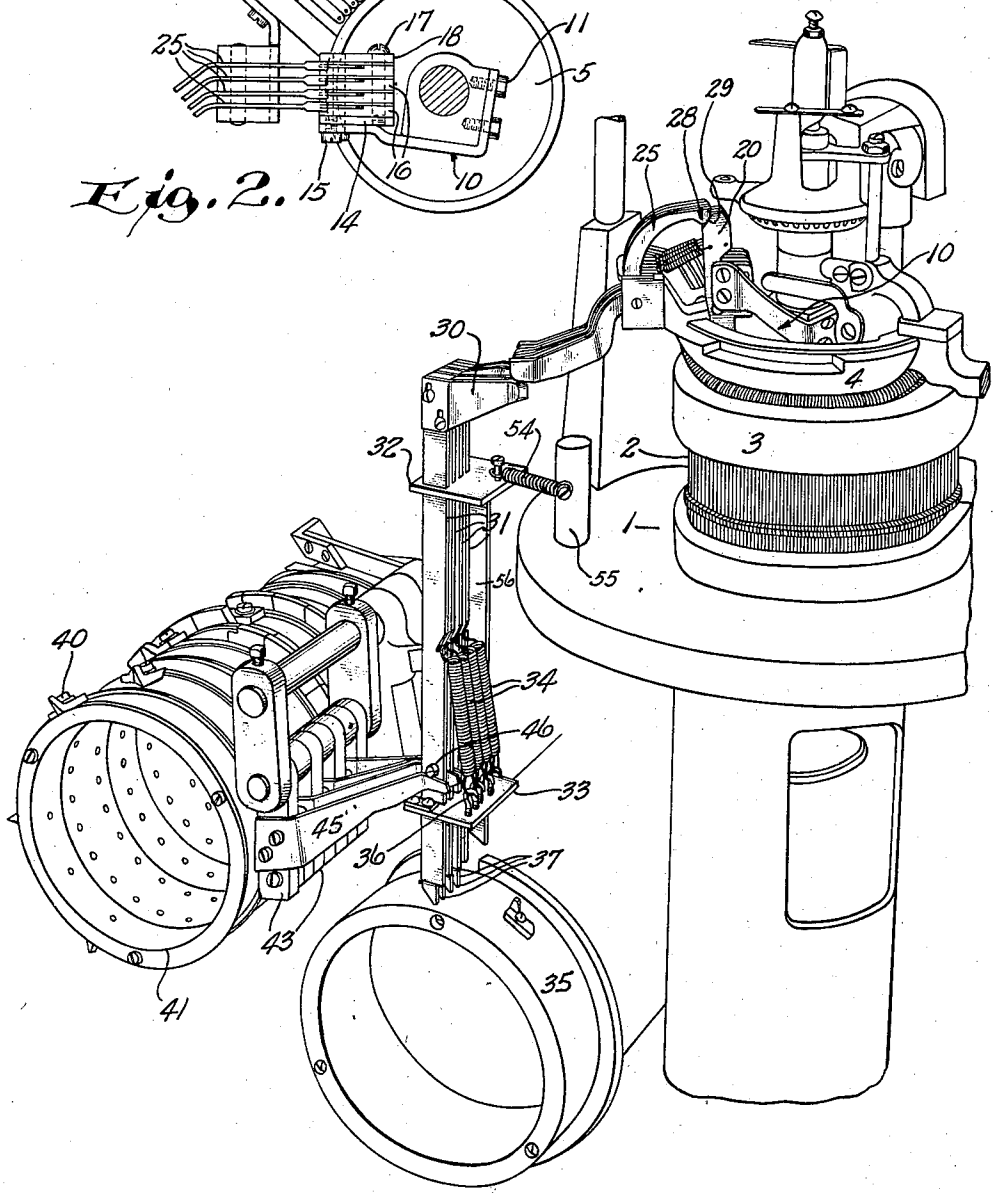


Fig. 1.



INVENTOR
BYRON C. REDEEN.
BY John W. Michael
ATTORNEY.

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COMBINATION CUTTER AND BINDER FOR CIRCULAR KNITTING MACHINES

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Fig. 4.

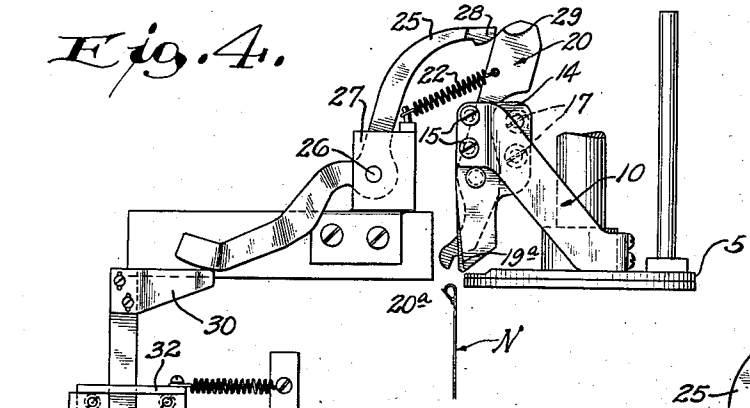


Fig. 3.

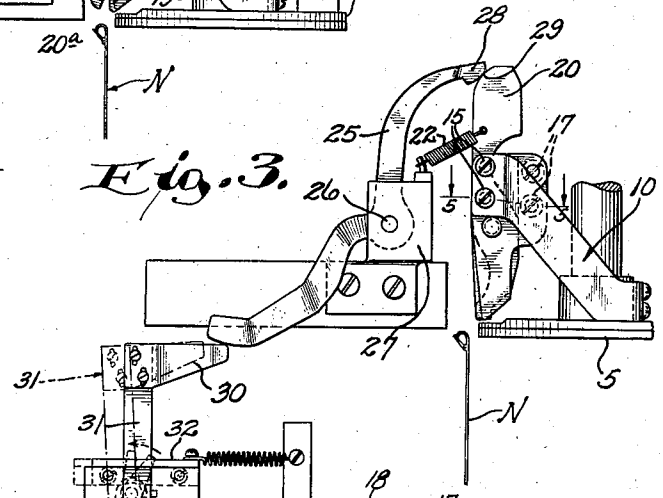
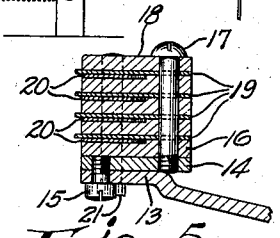
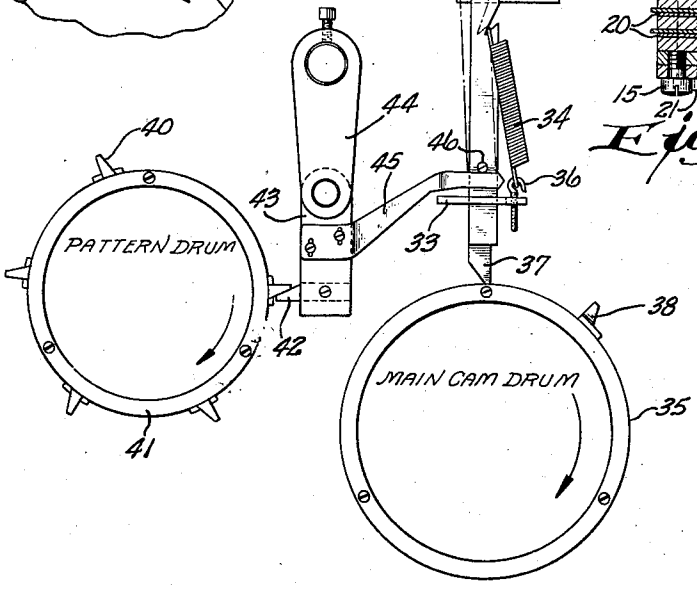


Fig. 5.





INVENTOR
BYRON C. REDEEN.
BY John W. Michael
ATTORNEY.

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COMBINATION CUTTER AND BINDER FOR CIRCULAR KNITTING MACHINES

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Fig. 8.

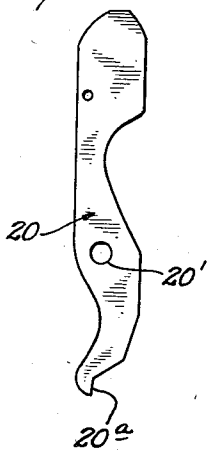


Fig. 6.

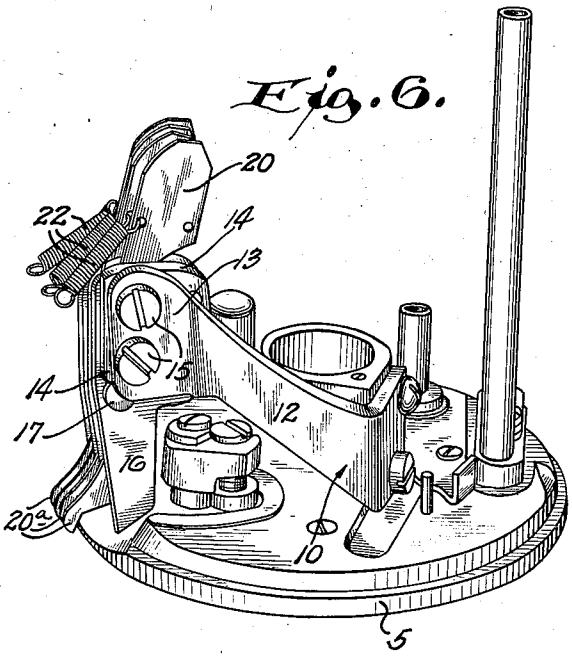


Fig. 9.

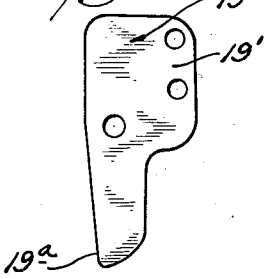
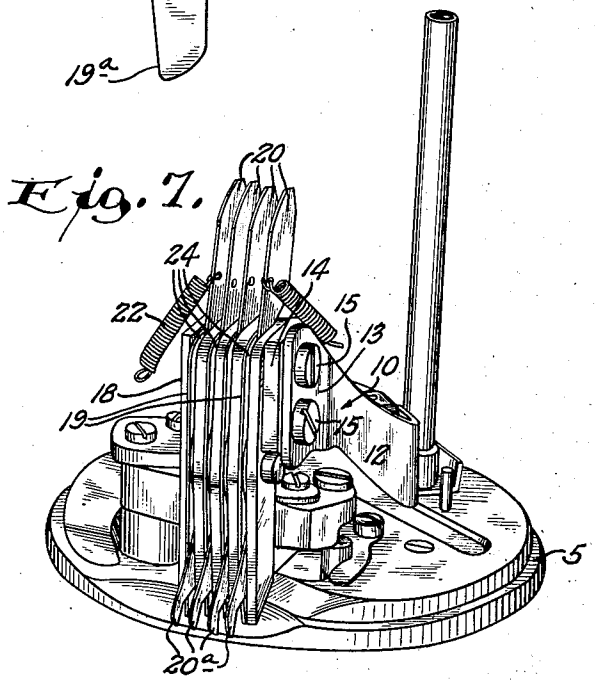


Fig. 11.

Fig. 7.



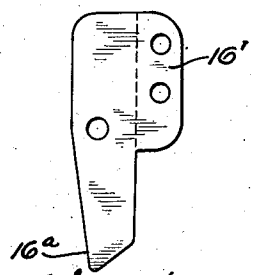


Fig. 10.

INVENTOR
BYRON C. REDEEN.
BY John W. Michael
ATTORNEY.

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COMBINATION CUTTER AND BINDER FOR CIRCULAR KNITTING MACHINES

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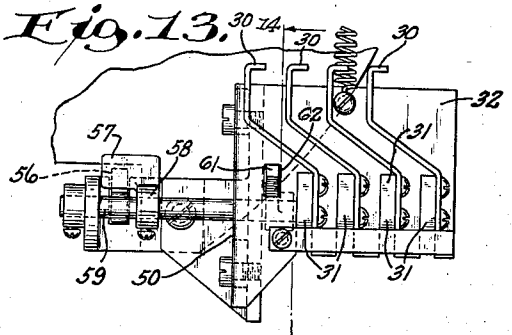
Fig. 13.



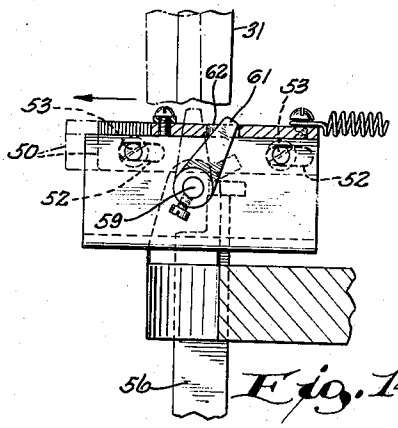
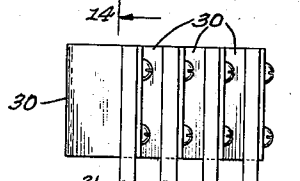


Fig. 14.



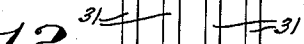
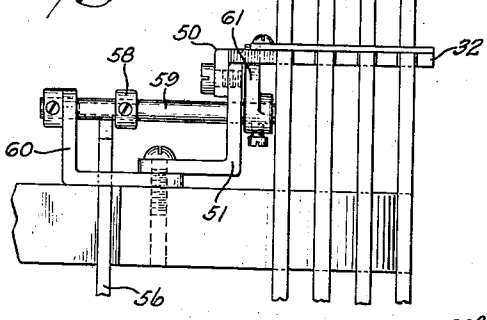


Fig. 12.



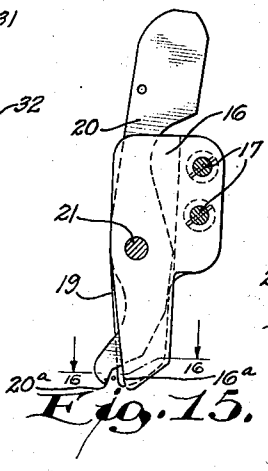


Fig. 15.

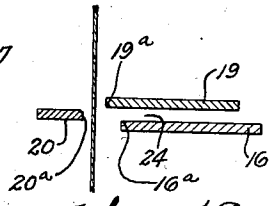


Fig. 16.

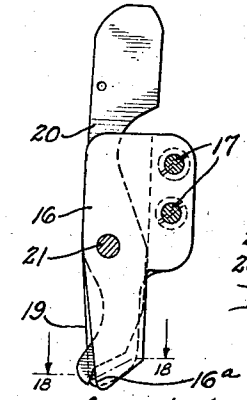


Fig. 17.

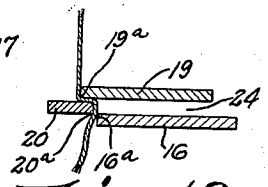


Fig. 18.

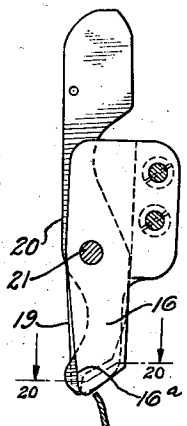


Fig. 19.

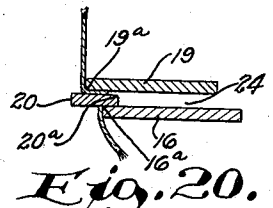


Fig. 20.

INVENTOR
BYRON C. REDEEN.
BY John W. Michael
ATTORNEY.

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UNITED STATES PATENT OFFICE

2,287,131

COMBINATION CUTTER AND BINDER FOR CIRCULAR KNITTING MACHINES

Byron C. Redeen, Milwaukee, Wis., assignor to Phoenix Hosiery Company, Milwaukee, Wis., a corporation of Wisconsin

Application March 5, 1941, Serial No. 381,825

9 Claims. (Cl. 66—140)

This invention relates to a combined cutter and binder for use on circular knitting machines of the type employed to knit stockings or similar articles having a pattern knit of a plurality of different threads, frequently of different colors. In such machines as heretofore constructed, when changing over from one colored thread to another, the yarn finger thrown out of action will retain a length of thread, or so-called yarn end, which will subsequently be knit back into the fabric so that after the knitting of the article has been completed it becomes necessary to trim or cut off these yarn ends by hand. This, of course, involves additional expense and slows up production.

One of the objects of the present invention is to provide a combination cutter and binder, which has an individual cutter and binder for each thread or strand used, and which functions when any thread is thrown out of action to cut off such thread and bind it, thereby so effectively shortening the yarn ends so as to avoid the necessity of hand-trimming although retaining the thread in position to be again brought into the knitting field when the knitting operation so requires.

Another object of the invention is to provide a combination cutter and binder of this character which is automatically operated by means of a cam-actuated link and lever system, the pattern drum having the cams which automatically control the cutting and binding of the threads for all pattern changes, and the main cam drum having cam means which effect cutting and binding of the thread at the finishing of the heel and toe.

Another object of the present invention is to provide a cutter and binder, which is simple, durable, and compact in construction, reliable, efficient and speedy in operation, which may be readily manufactured with economy, and which may be conveniently installed on a conventional circular knitting machine in such manner that its action is properly and effectively coordinated with other machine operations.

Other objects and advantages reside in certain novel features of the construction, arrangement, and combination of parts, which will be hereinafter more fully described and particularly pointed out in the appended claims, reference being had to the accompanying drawings forming a part of this specification, and in which:

Figure 1 is a fragmentary perspective view showing a portion of a circular knitting machine equipped with a combination cutter and binder attachment embodying the present invention;

Figure 2 is a diagrammatic view in top plan to illustrate the relative position of a cutter and binder attachment embodying the present invention and the yarn fingers;

Figure 3 is a diagrammatic view in side elevation illustrating the cam-actuated motion transmission mechanism between the pattern and main cam drums and the movable cutter blades of the combined cutter and binder attachment, the movable blades being shown as they are positioned after cutting and when cooperating with the fixed cutter blades and clamping members to clamp the severed thread in the attachment;

Figure 4 is a fragmentary view similar to Figure 3 but showing a movable blade as it is positioned just prior to cutting and clamping a thread;

Figure 5 is a view in horizontal section taken on line 5—5 of Figure 3;

Figures 6 and 7 are perspective views taken from different sides of the attachment and illustrating how the cutter and binder attachment is combined with the dial plate;

Figure 8 is a detail view in side elevation of one of the movable cutter blades of the attachment;

Figure 9 is a similar view of one of the fixed yarn clamps;

Figure 10 is a similar view of one of the fixed cutter blades;

Figure 11 is a detail view in top plan of the fixed cutter blade shown in Figure 10;

Figure 12 is a fragmentary view in elevation illustrating the shiftable guide structure for moving the operating bars for the movable blades of the cutter and binder attachment into and out of operative position.

Figure 13 is a fragmentary view in top plan of the structure shown in Figure 12;

Figure 14 is a fragmentary sectional view taken on the line 14—14 of Figure 13;

Figure 15 is a view partly in side elevation and partly in vertical cross section illustrating one set of fixed and movable cutters and their cooperable yarn clamp, these parts being shown as positioned when the thread which they control is about to be thrown out of action;

Figure 16 is a view in transverse cross section taken on the line 16—16 of Figure 15;

Figure 17 is a view similar to Figure 15 but illustrating the movable blade in the position which it occupies to initially clamp the yarn;

Figure 18 is a view in transverse cross sec-

tion taken on line 18—18 of Figure 17 and showing how the yarn is initially clamped between the movable blade and the fixed yarn clamp;

Figure 19 is a view similar to Figures 15 and 17 but illustrating the movable blade in the position into which it is moved to effect rupturing or severing of the yarn controlled thereby while maintaining the same clamped; and

Figure 20 is a view in transverse cross section taken on line 20—20 of Figure 19.

Referring to the drawings, and more particularly to Figure 1, it will be seen that the invention is shown applied to a circular knitting machine, the machine illustrated being known in the industry as a Scott & Williams RI machine. The invention, however, is applicable to various types of circular knitting machines, and the machine diagrammatically shown has been selected merely for the purposes of illustration.

As illustrated in Figure 1, the machine comprises a circular base 1, the usual knitting cylinder 2, sinker head and cap 3, and latch ring 4. In the type of machine shown, one bed of needles is vertically disposed and the needles N thereof slide lengthwise of the cylinder 2, whereas the other bed of needles lie flat or horizontal and the needles thereof move back and forth radially of the dial, the plate 5 of which is shown in the drawings. The yarns or threads are conducted into or withdrawn from the field of action of the needles under the control of yarn fingers 6, illustrated diagrammatically in Figure 2. In the construction illustrated, there are four of these yarn fingers 6 since the machine is frequently used for knitting patterns employing a plurality of colored threads, and while more than four may be employed, usually not less than four are employed. These yarn fingers 6 are operated in a manner well-known in the art and the operating and control devices therefor need not be described.

As indicated, the present invention proposes to provide an individual cutter and binder for each thread that is fed into and thrown out of the field of action of the needles. In carrying out this purpose a mounting bracket 10 is supported on and is rigidly secured to the dial plate 5 by means of screws 11. The bracket 10 has an arm 12 which extends upwardly and outwardly and terminates in an enlarged attaching portion 13 overlying the periphery of the dial plate 5 at one side of the yarn fingers 6. A mounting plate 14 is rigidly attached to the portion 13 by means of two screws 15. Four similar fixed cutter blades 16 are supported on the mounting plate 14 by means of two screws 17 and a cap or cover plate 18.

The blades 16 are constructed as shown in Figures 10 and 11 with their upper portions laterally or rearwardly enlarged and thickened as at 16'. Three fixed clamping blades or plates 19 are interposed between adjacent fixed cutter blades 16 and a fourth fixed blade 19 is interposed between the cap plate 18 and the adjacent fixed cutter blade 16 (see Figure 5). The blades 19 also have lateral or rearward enlargements 19' (see Figure 9) corresponding in contour with the enlargements 16' of plates 16 and in surface-to-surface engagement therewith. The enlargements 19' are not thickened.

The mounting plate 14, blades 16, cap plate 18, and blades 19 have alined openings therein through which the shanks of the screws 17 pass, the heads of the screws 17 bearing tightly against the cap plate 18 and the ends of their shanks being interthreaded with the mounting plate 14 to hold these parts in secure and rigid assembly.

Due to the thickening of the enlargements 16' of plates 16 there is a slot-like guide structure 24 defined between the main portion of each fixed blade 19 and the spaced confronting body portion of each blade 16. Movable blades 20 are interfitted with the slot-like guide structures 24 for swinging movement in planes parallel to the planes of the fixed blades 19. A pivot pin 21 is extended through registering openings provided therefor in fixed blades 16, plate 18, and blades 19 and 20 to support the blades 20 for pivotal movement about a common axis.

The fixed blades 16 have their lower edges 16*a* fashioned to constitute fixed cutting or rupturing edges.

The movable blades 20 are shaped as shown in detail in Figure 8 and have their lower ends offset and formed with cutting edges 20*a*, the blade 20 functioning as movable cutting blades and also coacting with the fixed blades 19 to clamp the severed ends of the yarn or thread between them.

With the construction as thus far described, when the yarn or thread is about to be thrown out of action, the movable cutter blade is positioned as shown in Figures 4, 15, and 16 with the cutting edge 20*a* of the movable cutting and clamping blade 20 in spaced relation to the clamping edge 19*a* of its cooperable fixed clamping blade 19. The yarn, when thrown out of action, comes into the space between these edges and immediately the blade 20 is rotated from the position shown in Figures 4, 15, and 16 to the position shown in Figures 17 and 18, whereupon the yarn thrown out of action is clamped between the edges 19*a*, and the adjacent side face of the blade 20 (see Figure 18). Clamping of the yarn is immediately followed by severing or rupturing thereof due to the continued movement of the blade 20 and the coaction of its cutting edge 20*a* with the cutting edge 16*a* of the cooperable fixed cutter 16 (see Figures 3, 19, and 20). When such yarn is again thrown into action by its yarn finger, the end clamped between the edges 19*a* and 20*a* automatically pulls out from between these edges, but the blades 19 and 20 remain in the position shown in Figures 3, 19, and 20 until just prior to the time when the yarn is again to be thrown out of action and severed.

Each movable cutting blade 20 is biased to cutting and clamping position by means of a retractile coil spring 22, each spring 22 having one of its ends connected to the upper portion of its movable cutting blade and its opposite ends suitably anchored on a stationary part of the machine.

Mechanism is provided for automatically operating the movable blades 20, and this operating mechanism comprises an individual operating lever 25 for each movable blade 20. The operating levers 25 are supported intermediate their ends for swinging movement in a vertical plane by means of a common pivot pin 26, which is in turn supported on a supporting block 27 for the levers 25. The supporting block 27 is slotted so as to guide or constrain the levers to swinging movement in a vertical plane and thereby insure proper wiping contact between the cam member 28 provided at the upper and outer end of each lever 25 and the cooperable cam surface 29 provided on the upper end of each movable blade 20. The lower end of each lever 25 has wiping con-

tact with the outer and upper end of a driving lug 30 which is fixed to and projects laterally from the upper end of an operating bar 31. The operating bars 31 are fitted for vertical sliding movement in slotted guide-plates 32 and 33 carried by any suitable stationary part of the machine. A retractile coil spring 34 is combined with each operating bar 31 so as to bias it downwardly into engagement with the main cam drum 35. Each spring 34 has one end suitably connected with its operating bar 31 and has its opposite end suitably anchored as at 36 on the lower guide 33. A cam follower 37 is provided at the lower end of each operating bar 31 and is shaped and designed to have appropriate engagement with an operating cam 38 provided on the main cam drum. The cam 38 on the main cam drum is used to actuate the bars for cutting thread at the finish of the heel and toe. Except when each cam follower 37 is elevated by cam 38 it rides on the periphery of the main cam drum 35.

Cams 40 on the pattern drum 41 are employed for actuating the operating bars 31 for cutting thread for all pattern changes. These cams 40 of the pattern drum cooperate at the proper time with cam followers 42 provided on the lower ends of rock levers 43 pivotally supported for swinging movement on a suitable supporting frame 44. There is one such cam 42 and rock lever 43 for each lift bar. Each rock lever 43 is provided with a laterally extending arm 45, the outer end of which engages under a stud or pin 46 fixed to and projecting laterally from one side face of its operating bar 31. The arrangement is thus such that while the pattern drum may at the proper time actuate the operating bars 31, and appropriately manipulate their cutters and clamps, they leave the operating bars free to be actuated by the cam 38 of the main cam drum at other times. In other words, the arms 45 and pins 46 provide a one way or lost motion driving connection between the pattern cam drum 41 and the operating bars 31.

In the operation of the machine, just prior to a yarn change, the movable blade 20 for the yarn to be thrown out of action is swung from the position shown in Figures 3, 19, and 20 to the position shown in Figures 4, 15, and 16, by virtue of the action of the cam 38, or of one of the cams 40, as the case may be. This properly positions the movable blade 20 to coact with the yarn to be thrown out of action, and when the yarn is thrown out of action the main or pattern cam drum advances a step to allow the spring 22 of the movable cutting blade in question to swing such blade from the position shown in Figures 4, 19, and 20, first to the position shown in Figures 17 and 18 and then to the position shown in Figures 3, 19, and 20, thereby first clamping and then severing or rupturing the yarn thrown out of action. The yarn is cut off close to the stocking, or the article being produced, so that the necessity for hand-trimming to cut away yarn ends is precluded, and the severed yarn is held between the blades 19 and 20 so that it is under the control of its yarn finger and will be thrown back into the field of action of the needles upon appropriate actuation of such yarn finger. When the yarn is taken into the control of the needles its end is pulled or slips from between the blades 19 and 20. The blades 19 and 20 remain in the position shown in Figures 3, 19, and 20, until just prior to the time that they are again to function in the manner described.

The slotted guide plate 33 is fixed to any suitable stationary part of the machine and has slots which guide the bars 31 but which are of sufficient length to allow them to be tilted from the operative position shown in full lines in Figure 3 to the inoperative position illustrated in dot and dash lines in the same figure. The slotted guide plate 32 has slots in which the upper end portions of the bars 31 are a working sliding fit so that when this guide plate 32 is in operative position the slots thereof constrain the bars 31 to vertical sliding movement and into proper cooperative engagement with their levers 25. The plate 32 is, however, supported for shifting movement into and out of operative position for the reason that at times it is necessary that the cam drum 41 revolve without affecting the cutter and binder attachment.

In carrying out this purpose, the guide plate 32 is formed along one edge with a depending flange 50 which slidably engages the face of a supporting bracket 51 suitably secured to a stationary part of the machine. The flange 50 is provided with spaced slots 52. Screws 53 coact with these slots and with the bracket 51, and with the flange 50, to constrain the guide plate 32 to sliding movement into and out of operative position. The guide plate 32 is biased to operative position by means of a contractile spring 54 having one end connected to the plate and the other end connected to a fixed abutment 55 provided on a stationary part of the machine.

Means is provided for automatically shifting the guide plate to inoperative position at the proper time and comprises an actuating bar 56 having its lower end riding on the main cam drum and controlled by suitable cams provided thereon while the upper end of the bar engages under a lateral enlargement 57 of a crank arm 58 fixed to an operating shaft 59. The shaft 59 is supported for rotation in bearings provided therefor in the bracket 51 and a companion bracket 60, and it has a second crank arm 61 fixed to one end thereof and having its outer end in driving engagement with a slot 62 provided in the horizontal portion of the guide plate 32. With this construction the various machine operations involved in knitting may occur without disturbing the desired action of the cutter and binder attachment.

While I have shown and described one construction in which the invention may be advantageously embodied, it is to be understood that the construction shown has been selected merely for the purpose of illustration or example, and that various changes in the size, shape, and arrangement of the parts may be made without departing from the spirit of the invention or the scope of the subjoined claims.

I claim:

1. A cutting and binding attachment for circular knitting machines having knitting needles and a plurality of yarn fingers for selectively throwing any one of a plurality of yarns into and out of the field of action of the needles and comprising an individual cutter and binder for each yarn, said individual cutters and binders being grouped together in cooperative relation to the knitting field adjacent the point where the yarn fingers throw the yarn into and out of the field of action of the needles, each cutter and binder including a combined movable clamping and cutting blade, spring means biasing said movable blades to cutting position, an operating

lever for each movable blade, each operating lever and its movable blade having interengageable camming surfaces cooperable when the lever is swung to control the position of the blade, and cam means for selectively swinging said levers.

2. A cutting and binding attachment for circular knitting machines having knitting needles and a plurality of yarn fingers for selectively throwing any one of a plurality of yarns into and out of the field of action of the needles and comprising an individual cutter and binder for each yarn, said individual cutters and binders being grouped together in cooperative relation to the knitting field adjacent the point where the yarn fingers throw the yarn into and out of the field of action of the needles, each cutter and binder comprising a combined clamping and cutting blade, an operating lever for each movable blade, a lift bar for each operating lever, a cam follower on the lower end of each lift bar adapted to coact with the main cam drum, a pin projecting laterally from each lift bar, a bell crank lever for each lift bar having an arm engageable under each pin, and an arm provided with a cam follower adapted to cooperate with the pattern cam drum.

3. A cutting and binding attachment for circular knitting machines having knitting needles and a plurality of yarn fingers for selectively throwing any one of a plurality of yarns into and out of the field of action of the needles and comprising an individual cutter and binder for each yarn, said individual cutters and binders being grouped together in cooperative relation to the knitting field adjacent the point where the yarn fingers throw the yarn into and out of the field of action of the needles, each cutter and binder comprising a fixed cutting blade, a fixed clamping blade, and a combined movable clamping and cutting blade having an offset lower end with the portion thereof presented to the fixed clamping blade constituted as a clamping member and with the edge of the offset end presented to the fixed cutting blade constituted as a cutting edge.

4. A cutting and binding attachment for circular knitting machines having knitting needles and a plurality of yarn fingers for selectively throwing any one of a plurality of yarns into and out of the field of action of the needles and comprising an individual cutter and binder for each yarn, said individual cutters and binders being grouped together in cooperative relation to the knitting field adjacent the point where the yarn fingers throw the yarn into and out of the field of action of the needles, each cutter and binder comprising a fixed cutting blade, a fixed clamping blade, and a combined movable cutting and clamping blade, and supporting means for said blades, said fixed cutting blades having enlargements coacting with the fixed clamping blades to define guide slots for the movable blades, the movable blades being swingably fitted in said slots and pivotally supported on said fixed blades.

5. A cutting and binding attachment for circular knitting machines comprising a plurality of fixed and movable blades, and supporting means for the fixed and movable blades, certain of said fixed blades having lateral thickened enlargements coacting with adjacent fixed blades to define guide slots for the movable blades, said movable blades being fitted in said slots, and a common pivot pin for said movable blades carried by said fixed blades.

6. A cutting and binding attachment for circular knitting machines comprising a plurality of fixed and movable blades, and supporting means for the fixed and movable blades, certain of said fixed blades having lateral thickened enlargements coacting with adjacent fixed blades to define guide slots for the movable blades, said movable blades being fitted in said slots, a common pivot pin for said movable blades carried by said fixed blades, the upper ends of the movable blades projecting above the slots, an operating lever for each movable blade, each operating lever and its movable blade having interengageable camming surfaces acting when the lever is swung to control the position of its movable blade, and means for swinging the levers.

7. A cutting and binding attachment for circular knitting machines, comprising a plurality of fixed and movable blades supported for relative pivotal movement, certain of said fixed blades having clamping portions and other of said fixed blades having cutting edges, the lower end of each movable blade being offset and having a cutting edge cooperable with the cutting edge of a fixed blade and also having a clamping portion cooperable with the clamping portion of a fixed blade.

8. A cutting and binding attachment for circular knitting machines having knitting needles and a plurality of yarn fingers for selectively throwing any one of a plurality of yarns into and out of the field of action of the needles and comprising an individual cutter and binder for each yarn, said individual cutters and binders being grouped together in cooperative relation to the knitting field adjacent the point where the yarn fingers throw the yarn into and out of the field of action of the needles, each cutter and binder including a combined movable clamping and cutting blade, spring means biasing said movable blades to butting position, an operating lever for each movable blade, each operating lever and its movable blade having interengageable camming surfaces cooperable when the lever is swung to control the position of the blade, cam means for selectively swinging said levers, and cam drum controlled mechanism for automatically throwing said cam means into and out of operative interrelation with said levers at predetermined times.

9. A cutting and binding attachment for circular knitting machines having knitting needles and a plurality of yarn fingers for selectively throwing any one of a plurality of yarns into and out of the field of action of the needles and comprising an individual cutter and binder for each yarn, said individual cutters and binders being grouped together in cooperative relation to the knitting field adjacent the point where the yarn fingers throw the yarn into and out of the field of action of the needles, each cutter and binder comprising a combined movable clamping and cutting blade, an operating lever for each movable blade, a lift bar for each operating lever, a slotted guide plate for said lifting bars, means for mounting said slotted guide plate for shifting movement whereby in one position it maintains the upper ends of the lift bars in cooperative engagement with their respective levers and in its other position it shifts the lift bars out of cooperative engagement with said levers, cam means for actuating the lift bars and cam drum controlled mechanism for automatically shifting said slotted guide plate.

BYRON C. REDEEN.