Sept. 13, 1960 E. F. RATHER 2,952,148

LAP YARN END CUTTING ATTACHMENT FOR CIRCULAR KNITTING MACHINE

Filed April 20, 1955 4 Sheets-Sheet 1

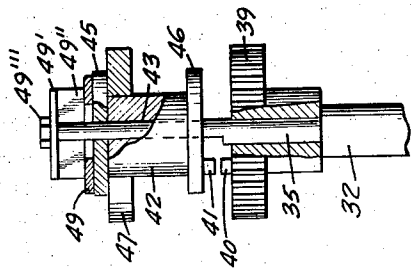


Fig. 1A

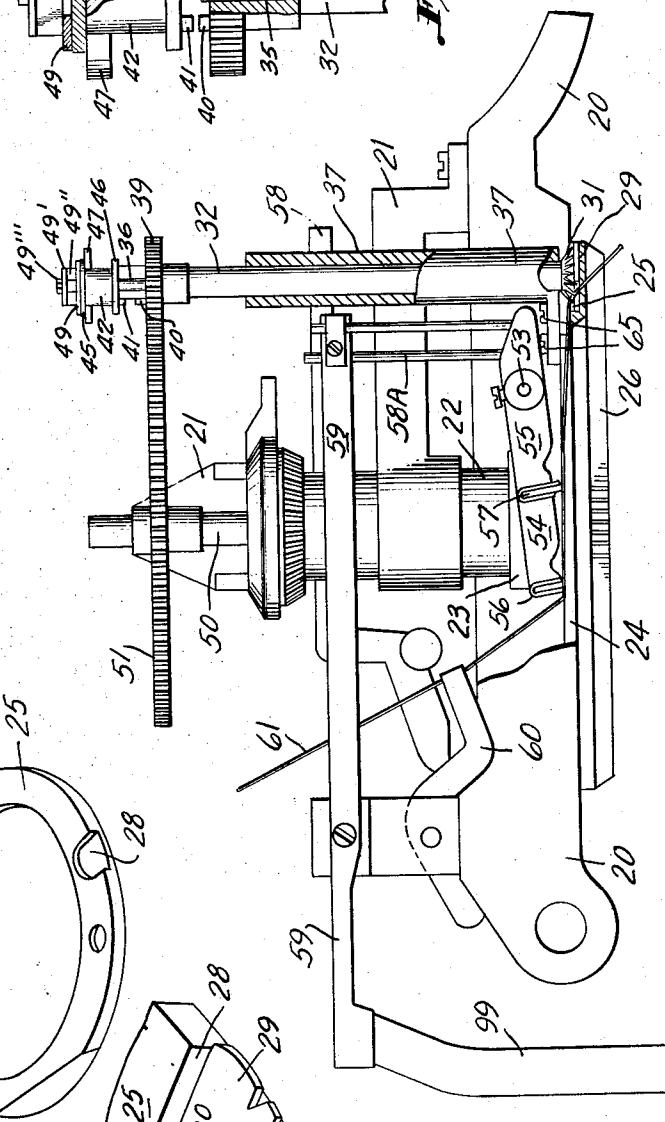


Fig. 1

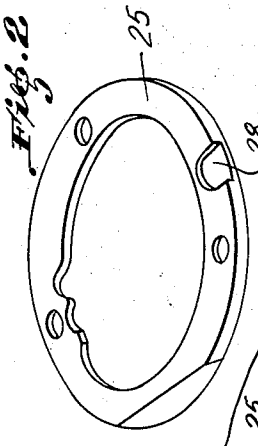


Fig. 2

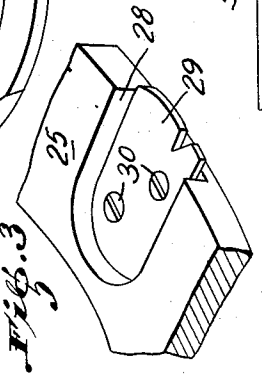


Fig. 3

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Fig. 10

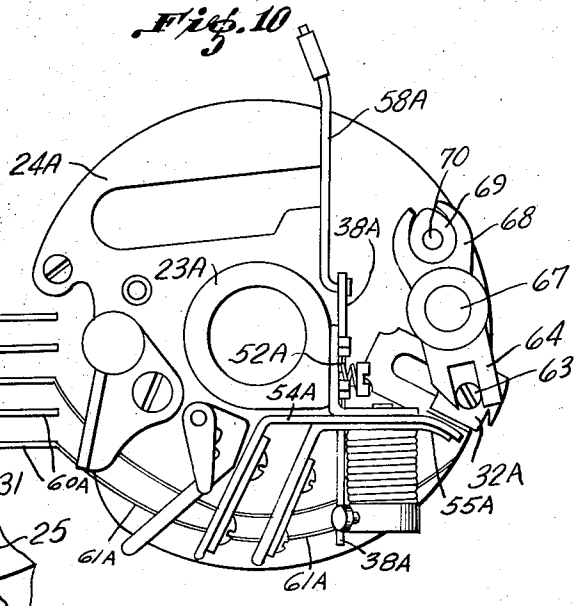
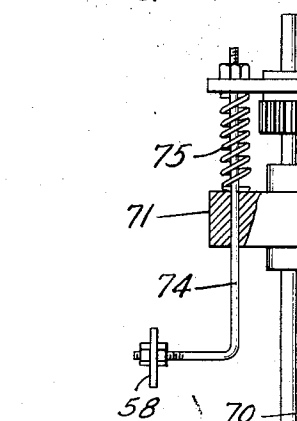


Fig. 5



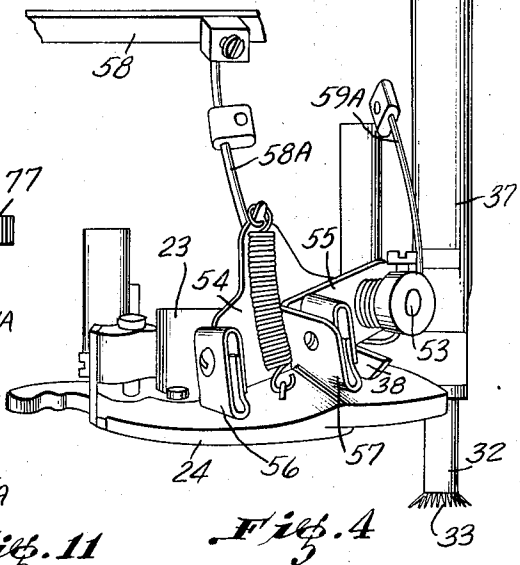
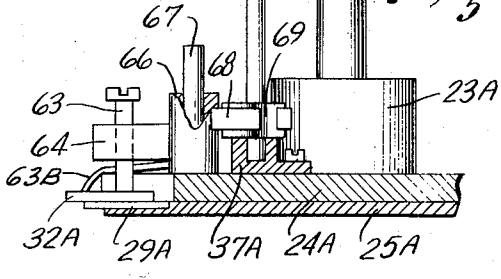


Fig. 4

Fig. 11



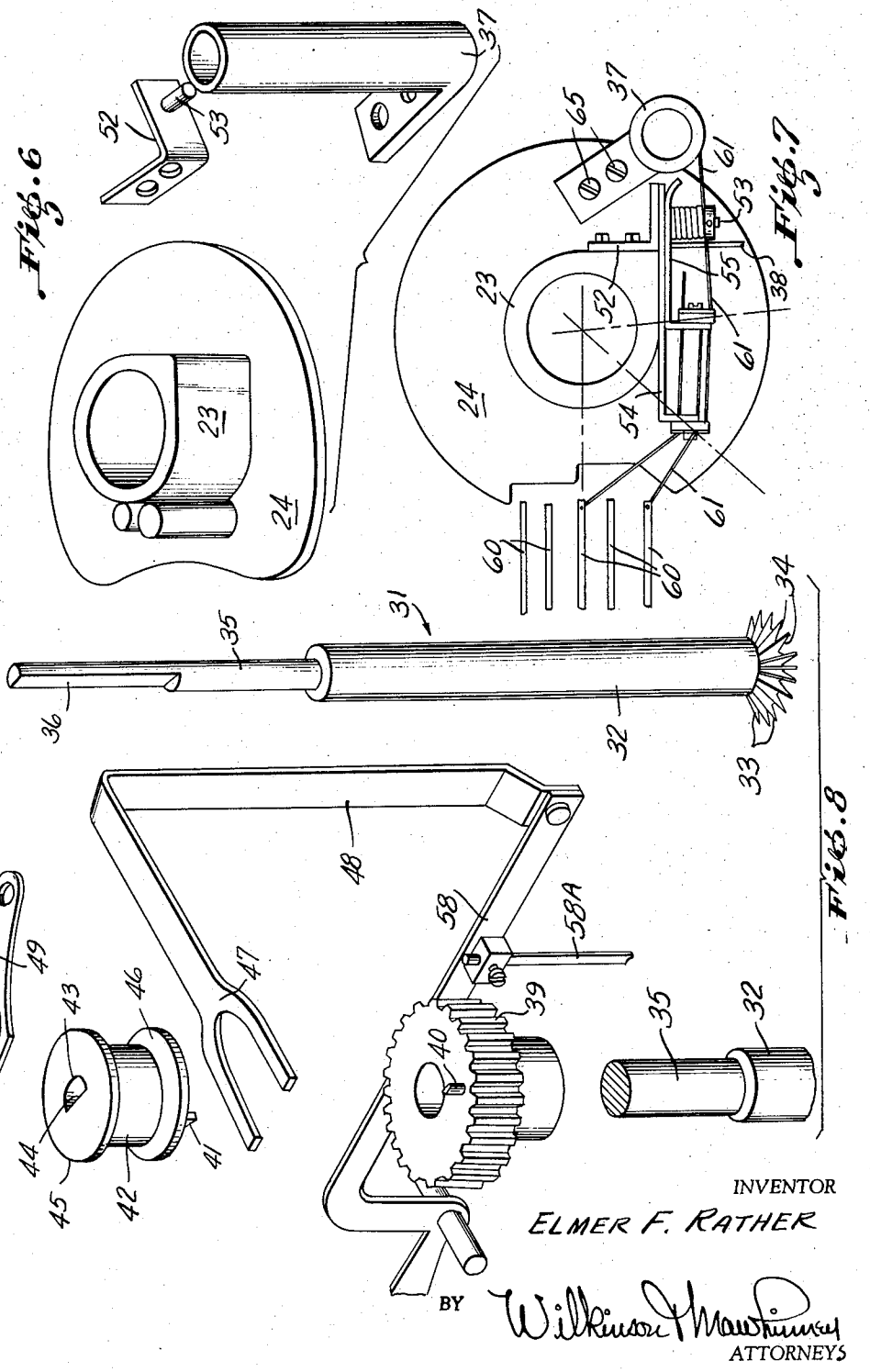
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Sept. 13, 1960 E. F. RATHER 2,952,148

LAP YARN END CUTTING ATTACHMENT FOR CIRCULAR KNITTING MACHINE

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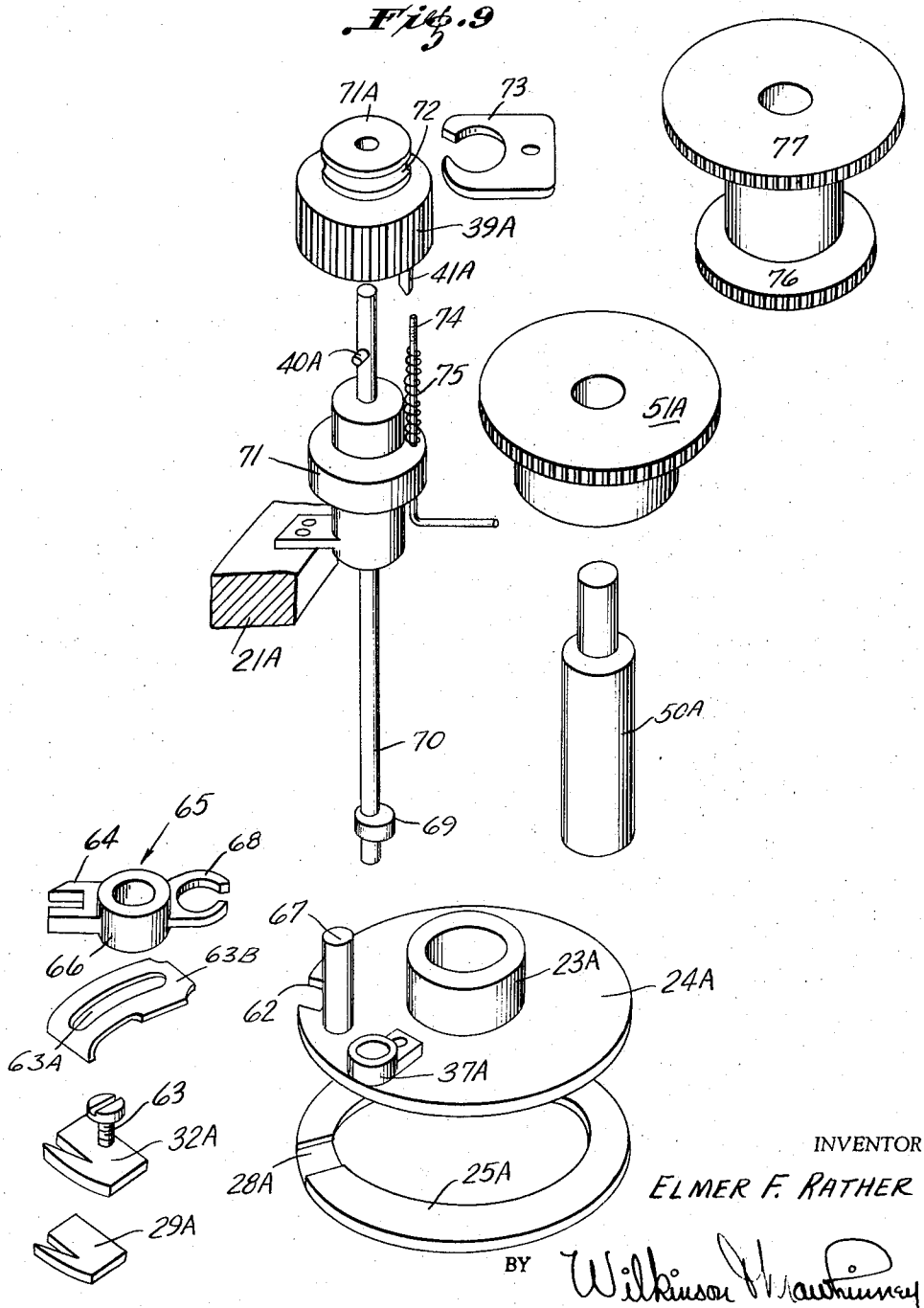
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Fig. 9



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2,952,148

LAP YARN END CUTTING ATTACHMENT FOR CIRCULAR KNITTING MACHINE

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Filed Apr. 20, 1955, Ser. No. 502,623

11 Claims. (Cl. 66—140)

The present invention relates to lap yarn end cutting attachments for circular knitting machines and has for an object to provide an attachment for circular knitting machines of the kind shown and described in the R. W. Scott Patent No. 1,282,958 also known as the Scott and Williams model K type circular knitting machine to the industry.

In the knitting of circular or seamless ladies' hosiery prior to the instant invention the lap yarns were cut by a stationary cutter on the transfer cap leaving a free end from two to four inches in length which required subsequent removal by hand labor. After the stocking was knit it was taken from the machine and pulled over a form mounted on rollers at which time it was visually inspected and the form and stocking rolled until the lap ends appeared at which time they were either manually cut by scissors or pneumatic clippers. This of course slowed down production by addition of this step and increased the cost by reason of the additional manual labor involved.

In order to speed up the production cycle and reduce the cost per unit knit the present invention is now employed which removed this objectionable lap yarn end during the knitting of the stocking or other fabric.

A lap yarn occurs when a different yarn is added or taken out of a seamless stocking and/or when yarns are changed. For instance, at the beginning of the body of the stocking, the shadow welt yarn or yarns are removed and the body yarn is inserted, each having a beginning or an ending end which extends several inches from the piece being knit.

The present invention provides an attachment which may be readily applied to the existing machine in addition to the stationary cutter in a minimum of time, at a minimum of cost and which is rugged or durable in use lending itself to a minimum of maintenance.

With the foregoing and other objects in view, the invention will be more fully described hereinafter, and will be more particularly pointed out in the claims appended hereto.

In the drawings, wherein like symbols refer to like or corresponding parts throughout the several views:

Figure 1 is a side elevational view having parts broken away and parts shown in sections of the latch ring assembly of a Scott and Williams model K circular knitting machine having the lap yarn end cutter of the present invention installed thereon.

Figure 1A is a side elevational view with parts broken away and parts shown in section of the drive mechanism of the lap yarns cutter of Figure 1 in driving engagement taken at an enlarged scale.

Figure 2 is a perspective view of an outside transfer cam modified in accordance with the present invention.

Figure 3 is a fragmentary perspective view of a section of the transfer cam of Figure 2 at an enlarged scale showing the placement of the stationary cutter blade.

Figure 4 is a perspective view of a transfer cap having the rotary cutter of the present invention mounted thereon.

Figure 5 is a view similar to Figure 3 showing the positioning of the two cutter blade members.

Figure 6 is an exploded perspective view of the transfer cap and rotary cutter journal assembly.

Figure 7 is a top plan view of the transfer cap, yarn clamps and journal assembly for the rotary cutter.

Figure 8 is an exploded perspective view of the rotary cutter tool, its drive and clutch mechanism.

Figure 9 is an exploded perspective view of a modified form of the present invention.

Figure 10 is a top plan assembled view of the form of the invention illustrated in Figure 9.

Figure 11 is a side elevational view of the form of the invention illustrated in Figure 9 in assembled condition.

Referring more particularly to the drawings and for the moment to the form of the invention illustrated in Figures 1 through 8, **20** designates a conventional latch ring having a cross arm **21** through which passes a bush **22** which is received into the bore of the hub **23** of the transfer cap **24**. Secured to the underside of the transfer cap **24** is the outside transfer cam **25** beneath which is the rotatably driven dial **26** driven by the conventional dial spindle all of which to this point are well known and standard with all Scott-Williams circular knitting machines model K. The transfer cap **24** and transfer cam **25** form an assembly and with cross arm **21** and latch ring **20** are secured against rotary movement.

As shown in Figure 2 the transfer cam **25** is provided with a recess **28** opening into the periphery of the cam and receives, as shown in Figure 3, a lower stationary yarn severing means in the form of a cutter element or blade **29** which may be retained in place by screws **30**.

Cooperating with the stationary cutter **29** is a rotary cutter **31** which may consist of a shaft **32** having a cutting wheel comprising radially extending spike like teeth **33** having sharp cutting edges **34**. The shaft **32** has a stepped down portion **35** and a flat portion **36**, as best shown in Figure 8.

The rotary cutter **31** is maintained in cutting relationship with the stationary blade **29**, shown in Figure 3, by a long bearing guide **37** affixed by screws **65** or otherwise secured to the top of the transfer cap **24**. Receivable over the stepped down portion **35** of the rotary cutter shaft **32** is a drive pinion **39** freely rotatable with respect to portion **35** of the shaft. The drive pinion **39** has an upstanding projection **40** of a clutch driving element which is positioned in the path of a complemental projection **41** secured to the under side of a clutch drum **42**. The clutch drum **42** has a bore **43** therethrough having a flat side **44** complemental in cross section to the flat portion **36** of the rotary cutter shaft **32**. The clutch drum **42** has two flanges **45**, **46** which have a diameter slightly greater than that of the drum **42**. Between these flanges **45**, **46** is received an operating fork yoke **47** of the drive actuating mechanism. The yoke **47** is carried by an arm **48** connected at its lower end to the conventional shear lever **58** and operated thereby. A bias leaf spring **49** is provided which fits over the top of the shaft **32** and bears against the drum assembly tending to keep it seated. This leaf spring **49** is provided with a hole for receiving a screw or the like by means of which the spring **49** is secured to the yoke **47**. A second spring **49'** is secured adjacent one end to a cover **49''** by a fastening element **49'''**. The cover **49''** is secured to the cross arm **21** in any suitable manner. The free end portion of the spring **49'** bears directly on the upper end of the shaft **32** so as

to exert a down pressure on the cutter 33 which is carried at the lower end of the shaft 32.

The dial spindle has an extension 50 to which is secured a drive or head gear 51 having teeth engageable with the rotary cutter drive pinion 39.

Secured to the hub 23 of the transfer cap 24 is a bracket 52 having a stub shaft 53 thereon for pivotally mounting two yarn clamps 54, 55. As shown in Figures 1 and 4 each clamp has a foot 56, 57 respectively for engaging the yarn and holding same to the top of the transfer cap 24. Clamp 54 is connected to the conventional shear lever 58 which is connected to the conventional cutter 38 by rod 58A which is standard on all machines and is operated from the main cam drum of the machine in a manner well known to this art. The relationship of the cutter 38 to the clamp is such that when shear lever 58 is actuated it moves cutter 38 and the cutter in turn lifts or rocks clamp 54. Clamp 55 is connected to a clamp actuating rod 59 which is actuated by a thrust rod 99 from the main cam drum 100 of the machine in a conventional manner. As shown in Figure 7 the two clamps 54, 55 are spaced from the yarn guides 60 in a direction counterclockwise therefrom. Clamp 54 is longer than clamp 55 and is first to engage the lap end. The bearing guide 37 for the rotary cutter is also arcuately removed from both clamps and the yarn guides 60. The foot 57 of clamp 55 is about midway between the yarn guides 60 and the cutters 29, 31. This relationship permits clamp 55 to retain the end of the yarn 61 when clamp 54 has released the yarn to hold the in-going yarn taut when it is presented to the cutters 29, 31.

Referring to the modified form of the invention shown in Figures 9 et seq. the transfer cap 24A is provided with a slot 62 in registry with the recess 28A in the top of the outside transfer cam 25A. The transfer cam 25A is adapted to be secured to the under side of the transfer cap 24A. Secured in the recess 28A of the cam 25A is a stationary cutter blade 29A the leading edge of which extends slightly beyond the periphery of the cam 25A. Slidable over the cutter blade 29A and being horizontally reciprocable in the slot 62 of the transfer cap 24A is a movable cutter blade 32A having an upstanding screw 63 receivable in the drive yoke 64 of the drive arm 65 as best seen in Figure 10. The arm 65 has a bearing 66 receivable over a pivot post 67 carried by the transfer cap 24A and an oscillating yoke 68 adapted to receive and be driven by an eccentric 69 secured to drive shaft 70 which is journaled at its base in a bearing 37A secured to the top of the transfer cap 24A.

The drive shaft 70 is journaled at its upper end in a bearing 71 secured to the cross arm 21A. A drive projection 40A is secured to the shaft 70 and extends radially to be engaged by a projection 41A carried by drive pinion 39A which is vertically shiftable and freely rotatable over the upper end of shaft 70. The pinion 39A has a collar 71A having an annular groove 72 engageable by an operating yoke 73. The yoke 73 is secured at its upper end to an operating rod 74. The rod 74 is biased to a raised position by spring 75 normally elevating the drive pinion 39A out of driving engagement with the shaft 70. The lower end of the rod 74 is adapted to be connected to the machine shear lever 58.

The dial spindle extension 50A has a head gear 51A which drives the pinion 39A through suitable reduction gearing 76, 77.

As shown in Figure 10, the relationship between the yarn clamps 54A and 55A, cutters 29A, 32A and the yarn guides 60A are the same as that of the first form of the invention, that is to say the clamp 55A holds the in-going yarn taut while it is presented to the cutters when the clamp 54A has released the yarn.

In both forms of the invention the two cutter elements described are in addition to the conventional yarn end cutter 38 or 38A present on all machines of this type and the cutters of the present invention are so positioned as not to interfere with the normal knitting operation nor affect the yarn except to remove the lap end.

Assembly and operation

The lap yarn end cutter of Figures 1 through 8 may be assembled by first securing the stationary cutter blade 29 in the recess 28 of the outside transfer cam 25 and securing the cam 25 to the under side of the transfer cap 24. The bracket 52 is then secured to the hub 23 of the transfer cap 24. The two yarn clamps 54, 55 are then pivotally mounted on the stub shaft 53 of bracket 52. The rotary cutter shaft 32 is inserted upwardly through the bottom of the bearing guide 37 and the bearing guide 37 is secured to the top of the transfer cap 24 so that the rotary cutting head of shaft 32 will rest upon the lower stationary cutter blade 29 carried by the cam 25.

The transfer cap is secured to the latch ring assembly 20 in the conventional manner. The head gear 51 is secured to the extension 50 of the dial spindle for rotation therewith after which the cutter shaft drive pinion 39 is slipped over shaft 32 and intermeshed with the head gear 51. The yoke 47 is applied to the drum 42 between the flanges 45, 46 and the drum 42 and the spring 49 are applied over the upper end portion of the shaft 32 to bring the spring 49' into contact with the upper end of the shaft 32. The arm 48 is then secured to the shear lever 58.

The yarn 61 is passed through the yarn guides 60 in the conventional manner and the yarn ends are placed beneath the clamps 54, 55 on the transfer cap 24. The knitting operation is then begun in the conventional manner. All yarn 61 not in use is under both clamps 54, 55 and extends from the yarn guides 60 beneath both clamps. The incoming yarn or yarn to be knit into the work piece being knit is given slack by elevating clamp 54 which elevation is secured through the action of shear lever 58. This slack permits the yarn to continue around the needle cylinder (not shown) over the outer top surface of the transfer cam 25 toward and on into the rotary cutter. Clamp 55 continues to hold the in-coming yarn until it has been cut. Clamp 55 is then raised by the control lever 59 through the rod 99 from the main cam drum 100. While clamp 55 is still in a raised position, the outgoing yarn is permitted to come under both clamps 54 and 55 and into the conventional cutter 38. This takes place while the out-going yarn (being attached to the fabric) is drawn around the circumference of the cylinder and into the new rotary cutter where it is cut within approximately one-half inch of the fabric. The rotary cutter first cuts and the conventional cutter follows quickly thereafter. The actuation of the shear lever 58 which opens cutter 38 and which cutter in turn rocks the clamp 54 simultaneously depresses the clutch drum 42, bringing the drum projection 41 into driving engagement with the projection 40 of the drive pinion 39 thereby imparting rotation from the drive spindle extension 50 to the rotary cutter as shown in Figure 5 drawing the yarn into the blades and cutting same. When this in-coming yarn has been cut clamp 55 raises actuated by control lever 59 permitting the outgoing yarn to come under both clamps 54, 55, and into both conventional cutter 38 and rotary cutter 32 each of which cuts the out-coming yarn and produces a loose yarn end approximately 1½ inches long between the two cutters. Both forms of this invention cut both the in-coming and the out-going yarns very near (one-half inch) the work piece whereas the conventional cutter cuts only the out-coming yarn. The yarn end which is attached to the yarn source or the one not attached to the fabric on this out-coming yarn produces the tail which is cut by this invention when it next becomes an in-coming yarn.

Different yarns are fed into and out of the work piece

being knitted as required by cam controlled patterns. When ever there is a change of yarn into and out of the work piece being knit the lap end occurs and the stationary cutter and rotary cutter sever this end at the work piece and not two to four inches therefrom as is presently done by the conventional yarn cutter **38** on all transfer caps.

The clutch drum driving arrangement is employed to cut down the wear between the stationary cutter blade **29** carried by the transfer cam **25** and the rotary cutting head of shaft **32**, for while the stationary blade **29** acts as an end thrust plate or bearing for the shaft **32** wear can be reduced to a minimum by rotating the shaft **32** only when yarn is being fed into or taken out of the work piece being knit.

Referring now to the form of the invention shown in Figures 9 through 11, the stationary cutter blade **29A** is secured in recess **28A** of the outside transfer cam **25A** and the cam **25A** is secured to the under side of the transfer cap **24A**. The bearing guide **37A** is then secured in place on the top of the transfer cap **24A**. The drive shaft **70** is then passed through the bearing block **71** which block is then secured to the cross arm **21A** inserting the base of shaft **70** into the bearing guide **37A**. The clutch pinion **39A** is then passed over the top of the shaft and the yoke **73** is placed in the groove **72** of the pinion collar **71A**. The yoke **73** is then connected to the operating rod **74** which in turn is secured to the shear lever **58**.

The movable cutting blade mechanism is then set in place by placing the bearing **66** of arm **65** over the pivot post **67** of the transfer cap **24A** so that the eccentric **69** enters the yoke **68**. The upstanding screw **63** carried by the movable blade **32A** is then passed through the slot **63A** in the spring **63B** and enters the yoke **64** whereby upon rotation of shaft **70** the blade **32A** will be reciprocated. The leaf spring is between the top of blade **32A** and yoke **64** to urge the two cutting blades **29A**, **32A** into contactual engagement. The pinion drive is adapted to be engaged with the head gear **51A** through suitable reduction gearing. The speed of reciprocation of blade **32A** can be controlled by the selection of the reduction gears.

In the manner above described with respect to the first form of the invention, as the yarn is fed into and out of the workpiece being knit with the elevation of clamp **54A** and depression of the shear lever **58** the rod **74**, and yoke **73** will bring the pinion **39A** into driving engagement with the shaft **70** rotating same causing the eccentric **69** through yokes **68** and **64** to impart a reciprocating drive to the upper cutter blade **32A** whereby the yarn riding over the top outer surface of the transfer cam **25A** will be presented to the cutting blades **29A** and **32A** shearing the yarn proximate the workpiece being knit.

Although I have disclosed herein the best forms of the invention known to me at this time, I reserve the right to all such modifications and changes as may come within the scope of the following claims.

What is claimed is:

1. A lap yarn end cutter for a circular knitting machine having a dial driven by a rotary spindle comprising a pair of cutting elements, positioning means adapted to be operatively associated with said machine and cutting elements to position said cutting elements proximate the work to be knit and adapted to be positioned to engage and cut the lap yarn ends fed into and out of the work piece to be knit, clamp means operatively associated with said positioning and cutting means and being located so as to receive the incoming and outgoing lap yarn ends and clamp same to said positioning means whereby said lap yarn ends are presented to said cutting elements under tension to facilitate their being cut, and selective drive means adapted to be operatively associated with the rotary spindle of said machine and one of said cutting elements to impart relative cutting movement between said cutting elements only when a lap end is fed into or out of the work piece to be knit.

2. A lap yarn end cutter for a circular knitting machine comprising an outside transfer cam having a recess therein opening to the periphery thereof, said cam being adapted to be secured to the machine transfer cap, a stationary cutter blade secured in the recess of said cam and extending slightly beyond the periphery of said cam, a toothed headed rotary cutter having a shaft and being adapted to be positioned with the toothed head against and rotated upon said stationary cutter blade, journal means for said rotary cutter shaft adapted to be secured to said transfer cap, and drive means on said rotary cutter adapted to be driven from the machine drive to impart rotary motion to said rotary cutter.

3. A lap yarn end cutter as claimed in claim 2 further comprising clutch means on the shaft of said rotary cutter and being adapted to selectively engage the drive means on said shaft with the drive of said machine to compel rotation of said rotary cutter.

4. A lap yarn end cutter for a circular knitting machine having a dial and a drive mechanism therefor comprising an outside transfer cam having a recess therein opening to the periphery thereof, said cam being adapted to be secured to the machine transfer cap, a stationary cutter blade secured in said recess and extending slightly beyond the periphery of said cam, a movable cutter blade receivable in said recsss and being movable over and upon said stationary blade, reciprocating means adapted to be operatively associated with said movable cutter blade and transfer cap for imparting a reciprocatory motion to said movable blade along the major axis of said slot, and drive means adapted to be carried by said transfer cap and being operatively associated with said reciprocating means and the drive mechanism of the dial of said machine to impart a driving motion from the machine to the movable cutter blade for cutting lap yarn ends.

5. A lap yarn end cutter for a circular knitting machine as claimed in claim 4 further comprising clutch means operatively associated with said drive means for selectively driving said reciprocating means and movable cutter blade.

6. Yarn clamping and severing mechanism for a circular knitting machine having a rotating cylinder with a complement of needles, a stationarily-supported retractable yarn feeding finger, and a stationary disk axially within the needle circle at the top of the cylinder, said mechanism including a vertical axis cutting wheel disposed substantially diametrically opposite the yarn feeding finger and rotatively supported adjacent the periphery of the disk with the ends of its blades sweeping beyond the disk periphery into close proximity to the needle circle; a cooperative cutting edge at the bottom of the disk; and a retractable clamp element positioned on the disk in the interval between the yarn feeding finger and the cutting wheel beneath which, upon each retraction or re-insertion of the finger from or to feeding position, the yarn is drawn by rotation of the cylinder incident to being brought into the range of the cutting wheel for severance by the latter close to the needle circle.

7. A lap yarn end cutter for a circular knitting machine comprising a transfer cap and cam assembly, a stationary yarn severing means carried by said assembly, a rotatable cutting wheel having teeth extending from the periphery thereof with the teeth in operative cutting relationship against said stationary yarn severing means, and drive means for said rotary cutter adapted to be driven from the machine drive to impart rotary motion to said rotary cutter.

8. A lap yarn end cutter as claimed in claim 7 further comprising yarn clamping means carried by said assembly

located on said assembly adjacent said yarn severing means.

9. A lap yarn end cutter as claimed in claim 7 wherein said rotatable cutting wheel rotates about a vertical axis.

10. A lap yarn end cutter as claimed in claim 7 wherein said rotatable cutting wheel and said stationary severing means are located on said cap assembly in yarn severing relationship proximate the periphery of said cap.

11. A lap yarn end cutter for a circular knitting machine comprising a transfer cap assembly, at least two cutting members associated together to constitute yarn severing means, one at least of said members being a rotatable cutting wheel having teeth about its periphery in operative cutting relationship with the other member,

drive means for rotating the wheel, and means for mounting the members relatively to the outer periphery of the assembly close to the needle cylinder to sever the yarn ends approximately at the tubular fabric being knitted.

References Cited in the file of this patent

UNITED STATES PATENTS

1,382,958	Scott	Oct. 29, 1918
1,863,720	Lawson et al.	June 21, 1932
2,295,450	Cole	Sept. 8, 1942
2,375,473	Holmes et al.	May 8, 1945
2,667,053	St. Pierre et al.	Jan. 26, 1954
2,669,765	Auton	Feb. 23, 1954
2,713,254	Minton	July 19, 1955