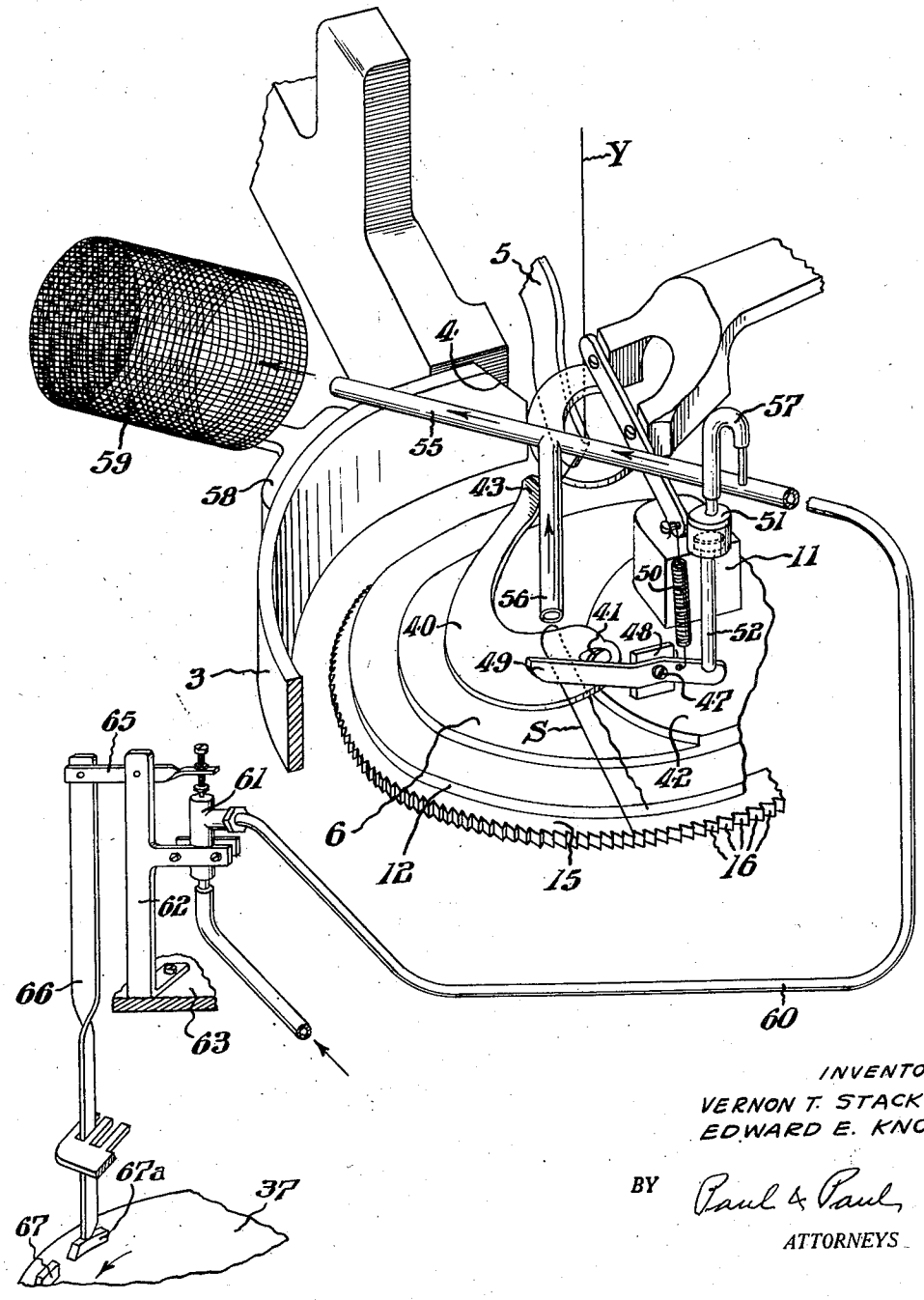
RE. 25584

Feb. 25, 1958 V. T. STACK ET AL 2,824,436

YARN CLAMPING AND SEVERING MECHANISM FOR KNITTING MACHINES

Filed Feb. 27, 1957 4 Sheets-Sheet 1

FIG. 1



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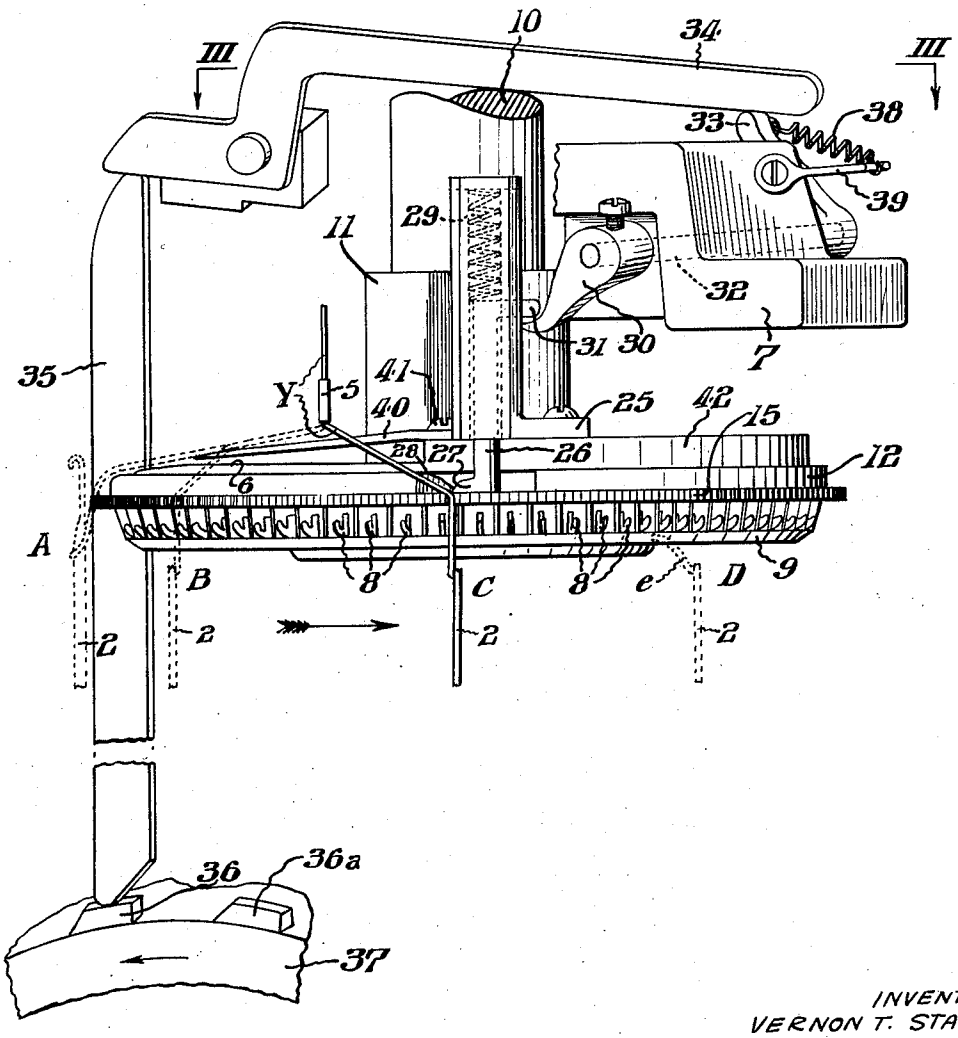
Filed Feb. 27, 1957 4 Sheets-Sheet 2

FIG. 2



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Filed Feb. 27, 1957 4 Sheets-Sheet 3

FIG. 3.

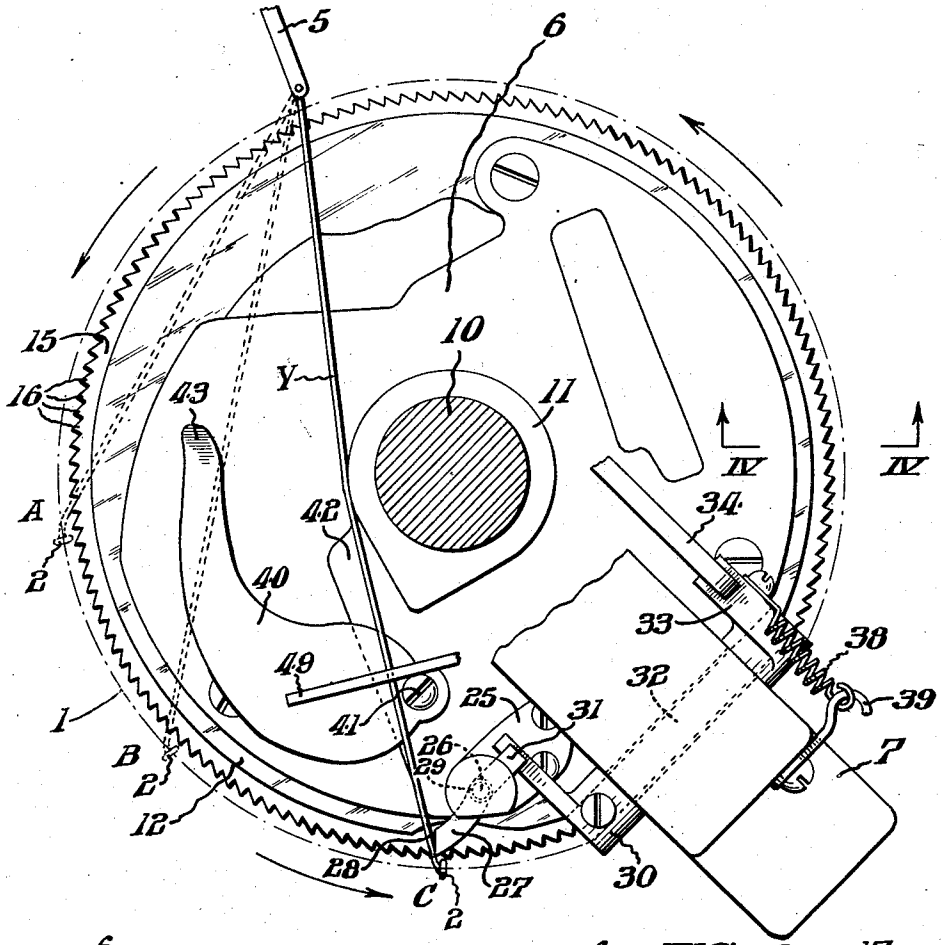


FIG. 4.

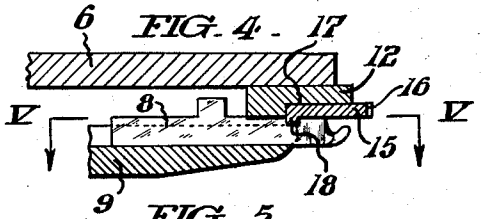


FIG. 5.

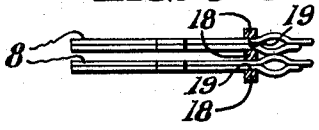
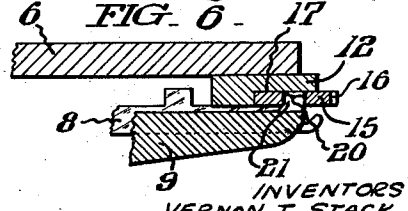


FIG. 6.



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Filed Feb. 27, 1957 4 Sheets-Sheet 4

FIG. 7.

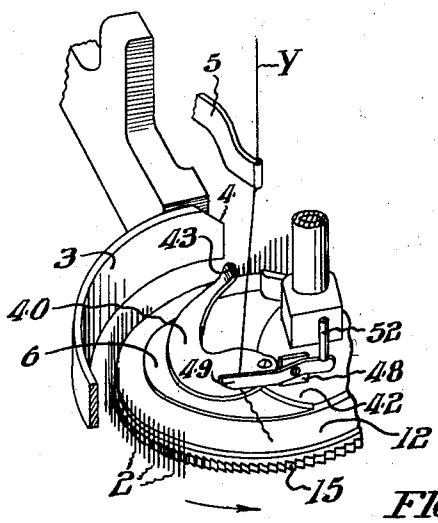


FIG. 8.

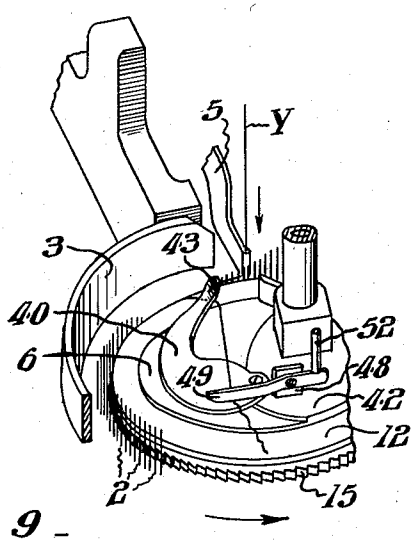
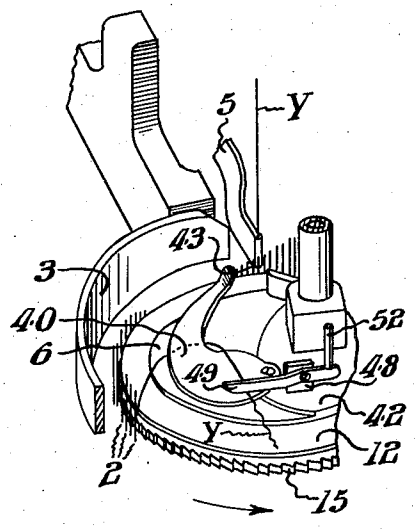


FIG. 9.



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2,824,436

YARN CLAMPING AND SEVERING MECHANISM FOR KNITTING MACHINES

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Application February 27, 1957, Serial No. 642,705

10 Claims. (Cl. 66—140)

This invention relates to yarn clamping and severing mechanism for knitting machines. More particularly, it is concerned with mechanism useful in connection with circular hosiery knitting machines for severing the trailing ends of the yarns as they are introduced into or withdrawn from the knitting, and for clampingly holding the yarns from reeving back through the feeds after the feeds are withdrawn.

With such mechanism as ordinarily constructed, long trailing ends of the yarn are left in the hosiery which ends must be individually removed from the stockings after they are dropped from the knitting machine. This additional step adds considerably to the cost of producing the stockings.

The chief aim of our invention is to overcome the above mentioned drawbacks. This objective is realized in practice, as hereinafter more fully disclosed, through provision of a simple and reliable automatic mechanism whereby the yarns are severed close to the needles of the machines as the stockings are knitted, incident to both insertion and withdrawal of the yarn feeds so that but relatively short negligible ends thereof are left at the insides of the stockings; and whereby the yarns, upon being cut and withdrawn, are received and releasably held in readiness, for re-insertion into the knitting.

Other objects and attendant advantages will appear from the following detailed description of the attached drawings, wherein:

Fig. 1 is a fragmentary and more or less diagrammatic view in perspective of a portion of a circular stocking knitting machine conveniently embodying the yarn clamping and severing mechanism of our invention.

Fig. 2 is a fragmentary elevational view of the machine.

Fig. 3 is a horizontal section taken as indicated by the angled arrows III—III in Fig. 2 and showing how the yarn is controlled and severed upon withdrawal of the yarn feed.

Fig. 4 is a fragmentary detail section taken as indicated by the angled arrows IV—IV in Fig. 3.

Fig. 5 is a fragmentary detail view in horizontal section taken as indicated by the angled arrows V—V in Fig. 4.

Fig. 6 is a detail view similar to Fig. 4 showing a modification.

Figs. 7, 8 and 9 are perspective views similar to Fig. 1, showing successive stages in the control of the yarn prior to being severed upon insertion of the yarn feed.

The knitting machine herein partly illustrated for the exemplification of our invention is generally of the construction disclosed in U. S. Patent 1,282,958 granted to R. W. Scott on October 29, 1918, having a rotary cylinder which is indicated by the dash and dot circle **1** in Fig. 3, with a complement of latch needles such as designated by the numeral **2** in Fig. 2; a latch guard ring **3** with a gap **4** therein at which an upwardly and outwardly retractable yarn feed finger **5** is located; and a welting mechanism whereof the cap plate **12** is stationarily supported within the circle of the needles at the top of the cylinder by an

overreaching bracket arm **7**. The welting mechanism comprises a series of transfer instrumentalities **8** (Figs. 2 and 4) slidable in radial guide grooves of an underlying dial plate **9** which is rotated in unison with the needle cylinder in the direction of the arrow in Fig. 2, said dial plate being secured to the lower end of a vertical shaft **10** which extends upwardly through a bearing boss **11** on the disk **6** to a drive means (not illustrated) therefor. The outside circumferential cam **12** for retracting the transfer bits **8** is affixed, as usual, to the bottom face of the disk **6** as shown in Fig. 4.

The improved yarn clamping and severing mechanism of our present invention includes an annulus **15** having sharp-edged ratchet-like peripheral teeth **16** pitched in the direction of cylinder rotation. As shown in Fig. 4, the underside of the cam **12** is circumferentially undercut as at **17** to receive the annulus **15**, and said annulus is provided, at its inner periphery, with a pendent lug **18** which is notched, as at **19** in Fig. 5, for passage through it of a few of the transfer bits **8**. As a result of this construction, the annulus **15** is caused to rotate in unison with the dial plate **9** and hence with the needle cylinder **1**.

In the modification of Fig. 6, the annulus **15** is provided with a few slots **20** for engagement by upward projections **21** on the transfer dial **9** to insure its rotation with the dial plate **9** and the needle cylinder **1**.

Mounted on a slightly raised embossment **42** on disk **6** adjacent the circumferential edge thereof at a point approximately 180 degrees from or substantially diametrically opposite the feed finger **5** is a small bracket **25** having a vertical bore in which is slidingly constrained, a stem **26** whereto is affixed, at the bottom end, a cutting element **27** arranged to cooperate with the teeth of the annulus **15** in severing the knitting yarn Y in a manner hereinafter explained. As shown, the element **27** is in the form of a finger whereof the distal end has an edge **28** which overlies the teeth **16** of the annulus **15** and which is sharpened to shear with said teeth. A spring **29** (Fig. 2) in the upper part of the bore in the bracket **25** serves to urge the cutter element **27** downward into shearing relation to the annulus **15** during yarn severance. Normally, the element **27** is raised clear of the annulus by a finger **30** which underreaches a lateral projection **31** on the stem **26**, said finger being affixed to one end of a rock shaft **32** borne crosswise in the bracket **7** previously mentioned. An arm **33** affixed to the opposite end of the shaft **32** in turn underreaches a lever **34** which is arranged to be actuated, through the medium of a thrust rod **35** (Fig. 2), by spaced cam rises **36** and **36*a*** on the usual intermittently rotated pattern drum **37** of the knitting machine. A relatively heavy spring **38**, connected at one end to the arm **33** and at the other end to a fixed anchorage **39** on the bracket **7**, is relied upon to keep the cutter element **27** normally elevated from the annulus **15**.

The mechanism of our invention further comprises an arcuate yarn restraining element **40** which is fashioned from thin sheet metal and which, at one end, is secured by a screw **41** to the slightly raised embossment **42** of the disk **6** in the interval between the yarn feed **5** and the cutter element **27** so as to overhang the main surface of said disk. As shown, the restraining element **40** has a terminal tongue **43** which is curved upwardly toward the yarn feed. Medially fulcrumed at **47** to an upstanding lug **48** on the embossment **42** of the disk **6**, see Figs. 1 and 3, is a clamp element **49** by which the yarn is held upon being severed, said clamp element being urged downward upon the base portion of the restraining element **40** by the spring indicated at **50**. For actuating the clamp element **49**, I have provided a small pneumatic

cylinder **51** of which the piston rod **52** bears upon the tail end of said element.

To remove the trailing segment S of the yarn (Fig. 1) from the machine after severance upon insertion of the feed finger **5** as also hereinafter more fully explained, we have further provided an air tube **55** which is fixedly supported horizontally at an elevation above the disk **6**, said tube having an open-ended pendent suction branch **56** that terminates adjacent the inner edge of the base portion of the restraining element **40**, and a separate pendent pressure branch connection **57** with a cylinder **51** of which the piston rod bears upon the tail of the clamp element **49**. Supported in alignment with the tube **55** by a bracket **58** on the latch guard ring **3**, is a basket **59** for receiving the yarn segments severed upon insertion of the yarn feeding finger **5**. The tube **55** (see Fig. 1) is in communication with a supply source of compressed air (not illustrated) by way of a flexible hose **60** wherein is interposed a control valve **61** which is suitably supported by a bracket **62** on a part **63** of the knitting machine frame. The valve **61** is arranged to be actuated, through a lever **65** medially fulcrumed on the bracket **62** and a thrust rod **66**, by other spaced cam rises **67** and **67***a* on the pattern drum **37** of the machine.

Operation

As the feeding finger **5** is retracted, the yarn Y is drawn down by the last needle **2** fed and is caught between a pair of adjacent teeth of the annulus **15** as shown in dotted lines at A in Fig. 3. By continued rotation of the cylinder **1**, the yarn Y is dragged about as the needle advances through the dotted line position B to the full line position C in Fig. 3, to overpass the restraining element **40** and to slide under the clamp element **49**. Concurrently with this action, the thrust rod **35** is lifted as the cam rise **36** on the drum **37** passes beneath it as shown in Fig. 2, the lever **34** being thereby actuated and the finger **30** moved counterclockwise against the action of the spring **38** and the cutter element **27** is released and depressed by its spring **29** into engagement with the annulus **15**. Consequently, as the needle reaches the position C in Fig. 3, the yarn is severed by shearing of the cutter element **27** with the teeth of the annulus **15** between which the yarn is engaged. The yarn is thus cut close to the last needle to which it is fed upon retraction of the feed finger with but a short end *e* projecting from such needle as at D in Fig. 2. Upon impartation of a subsequent rotative shog to the drum **37** and movement of the cam **36** from beneath the thrust rod **35**, the cutter element **27** is raised by lift of the finger **30** under the influence of the spring **38**.

Upon re-insertion of the feed finger **5**, the yarn Y is drawn down by the first needle to which it is served and, as during retraction, is incidentally caught between adjacent teeth of the annulus **15**. By continued rotation of the needle cylinder **1**, the yarn is dragged, this time, beneath the restraining element **40** and over top of the disk **6** as shown in Fig. 8 while held by the clamp **49**, and as the needle approaches the yarn severing station, said yarn is gradually formed into a loop about said restraining element as shown in Figs. 9 and 1. Prior to arrival of the first needle fed at the severing station, the cam drum **37** is given another rotary shift to bring the cam rise **36***a* beneath the thrust rod **35** for release of the cutter element **27** into engagement with the annulus **15** in exactly the same manner as above described in connection with yarn retraction.

After severance of the yarn, the cam drum **37** is given another rotary shift whereby cam rise **36***a* is moved from beneath the thrust rod **35** to raise the cutter element **27** from engagement with the annulus **15**. By a subsequent rotary shift of cam drum **37**, the cam rise **67***a* is brought beneath thrust rod **66**, with consequent admission of compressed air into the tube **55** by the opening of the valve **61**. This compressed air causes the depression of the

piston rod of the cylinder **51** and lifting of the clamp element **49** against the pull of the spring **50**. Concurrently with this action, the suction created in pendent branch **56**, caused by the discharge of air through tube **55**, causes the remaining loop segment S to be picked up by this suction and to be eventually blown from the open terminal end of tube **55** into the receiver **59**. By a subsequent rotative shog of the drum **37** and movement of cam **67***a* from beneath the thrust rod **66** the valve **61** is closed to shut off the compressed air and the cylinder **51** to allow the clamp **49** to be depressed by the spring **50** to its normal clamping position in engagement with the top surface of the restraining element **40**.

Knitting machines of the type herein referred to usually have several feed fingers for as many individual yarns, and it is to be understood that, in accordance with our invention, the drum **37** is provided, in practice, with as many additional cam rises as may be required to effect severance of the yarn, as the different feed fingers are withdrawn or re-inserted in the same manner as hereinbefore described in connection with the single feed finger **5** shown in the drawings.

It is to be further understood that we do not consider ourselves limited to the precise details of construction and arrangement shown in the drawings by way of example since they are capable of considerable modification as will be readily understood by those schooled in the knitting art.

Having thus described our invention, we claim:

1. Yarn clamping and severing mechanism for a circular knitting machine having a rotating cylinder with a complement of needles, a stationarily-supported retractable yarn feed, and a stationary disk axially within the needle circle at the top of the needle cylinder, said mechanism including an annulus at the bottom of the disk capable of rotation with the cylinder, said annulus having sharp edged peripheral teeth extending into close proximity to the needles; a cooperative cutter element positioned substantially diametrically opposite the feed, and adapted to bear downwardly upon and shear with the teeth of the annulus; and a clamp positioned in the interval between the feed and the cutter element whereby, upon retraction of the feed, the yarn is carried down by the last needle to which it is fed and incidentally caught between adjacent teeth of the annulus, drawn beneath the clamp, and eventually severed close to the needle by shearing action of the cutter element with said teeth as said needle passes said cutter element.

2. Yarn clamping and severing mechanism according to claim 1, including means for yieldingly urging the cooperative cutter element into shearing engagement with the toothed annulus; means for normally holding the cutter element raised clear of the annulus; and means for actuating the holding means for release of the cutter element into activity in readiness to sever the yarn just before the needle last fed upon retraction of the feed or the first needle fed upon feed insertion arrives at said cutter element.

3. Yarn clamping and severing mechanism, according to claim 2, for a circular knitting machine having a cam drum, and wherein the means for normally holding the cooperative cutter element in inoperative position includes a lift finger, and wherein the means by which the lift finger is actuated to release the cutter element into activity comprises a cam rise on the cam drum and interposed instrumentalities connected to said lift finger.

4. Yarn clamping and severing mechanism, according to claim 1, wherein the clamp is normally held closed by spring means; and further including means for actuating the clamp in opposition to the spring means, comprising a pressure fluid cylinder with its piston connected to the clamp; a normally open valve, and means for closing the valve to interrupt flow of pressure fluid to said cylinder to open the clamp as the last needle fed, during insertion of the yarn feed, approaches said cutter element.

5. Yarn clamping and severing mechanism for a circular knitting machine having a rotating cylinder with a complement of needles, a stationarily-supported retractable yarn feed; a stationary disk axially within the needle circle at the top of the cylinder, and a radially grooved dial plate for sliding transfer bits rotated in unison with the cylinder, said mechanism including an annulus at the bottom of the dial plate capable of rotation with the cylinder; a cooperative cutter element supported adjacent the periphery of the disk substantially diametrically opposite the feed and adapted to bear downwardly upon and shear with the teeth of the annulus; and a clamp positioned in the interval between the feed and the cutter element whereby, upon retraction of the feed, the yarn is carried down by the last needle to which it is fed and incidentally caught between adjacent teeth of the annulus, drawn beneath the clamp, and eventually severed close to the needle as said needle passes said cutter element.

6. Yarn clamping and severing mechanism according to claim 5, wherein the toothed annulus is provided at its inner periphery with a pendent projection notched for passage of some of the transfer bits and thereby caused to rotate with the dial.

7. Yarn clamping and severing mechanism, according to claim 5, wherein the toothed annulus is provided with a radial slit; and wherein the dial has an upstanding projection adjacent the periphery of the dial engaged in the slit of the toothed annulus which is thereby caused to rotate with said dial.

8. Yarn clamping and severing mechanism for a circular knitting machine having a rotating cylinder with a complement of needles, a stationarily-supported upwardly retractable yarn feed and a stationary disk axially within the needle circle at the top of the needle cylinder, said mechanism including an annulus at the bottom of the disk capable of rotation with the cylinder, said annulus having sharp edge peripheral teeth in close proximity to the needles; a cooperative cutter element supported adjacent the periphery of the disk substantially diametrically opposite the feed, and adapted to bear downwardly upon and shear with the teeth of the annulus; and a clamp supported in the interval between the feed and the cutter element by which the yarn is held while the feed is retracted; and a yarn restraining element supported, with intervening clearance therebeneath, on the disk between the feed and the clamp over which restraining element the yarn extends while the feed is retracted, whereby, upon insertion of the feed, the yarn is carried down by the first needle to which it is fed and incidentally caught between adjacent teeth of the annulus, the trailing end thereof drawn beneath and looped about the restraining element, and the yarn eventually severed close to the needle as said needle passes said cutter element.

9. Yarn severing and clamping mechanism according to claim 8, further including means for actuating the clamp after the severance to release the severed yarn segment looped about the restraining element; and means for removing the severed segment from the restraining element upon release from the clamp.

10. Yarn clamping and severing mechanism, according to claim 9, wherein the means for removing the severed segment of the yarn comprises a tube in communication with a source of compressed air and having a suction branch which reaches to the bend of the severed yarn segment looped about the restraining element, said tube being open at its terminal end; and further including a fixedly supported reticulate receiver into which the yarn segment, drawn through the suction branch into the tube, is discharged.

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