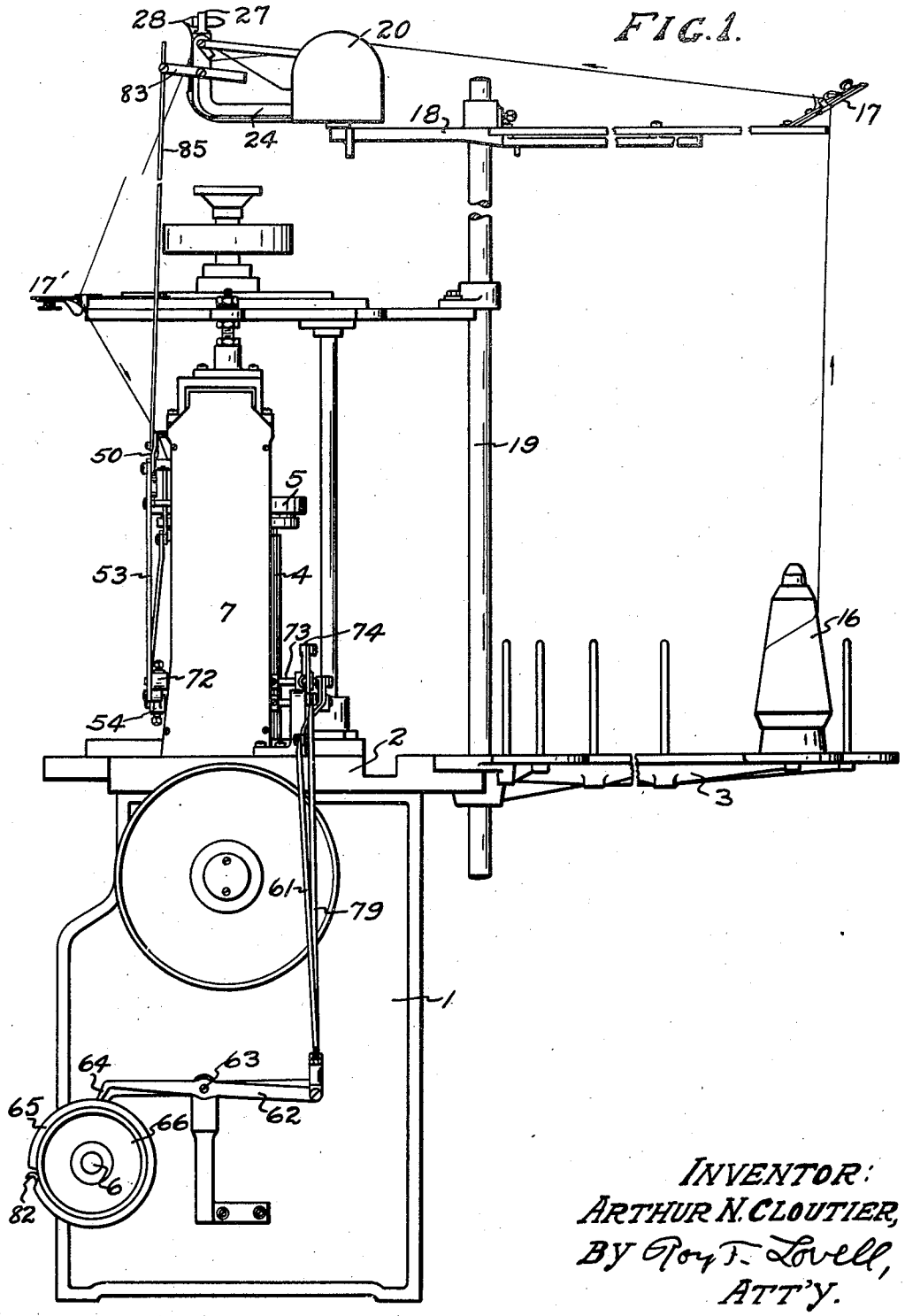
June 16, 1942. A. N. CLOUTIER 2,286,955

ELASTIC YARN FEEDING MEANS FOR KNITTING MACHINES

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FIG. 1.



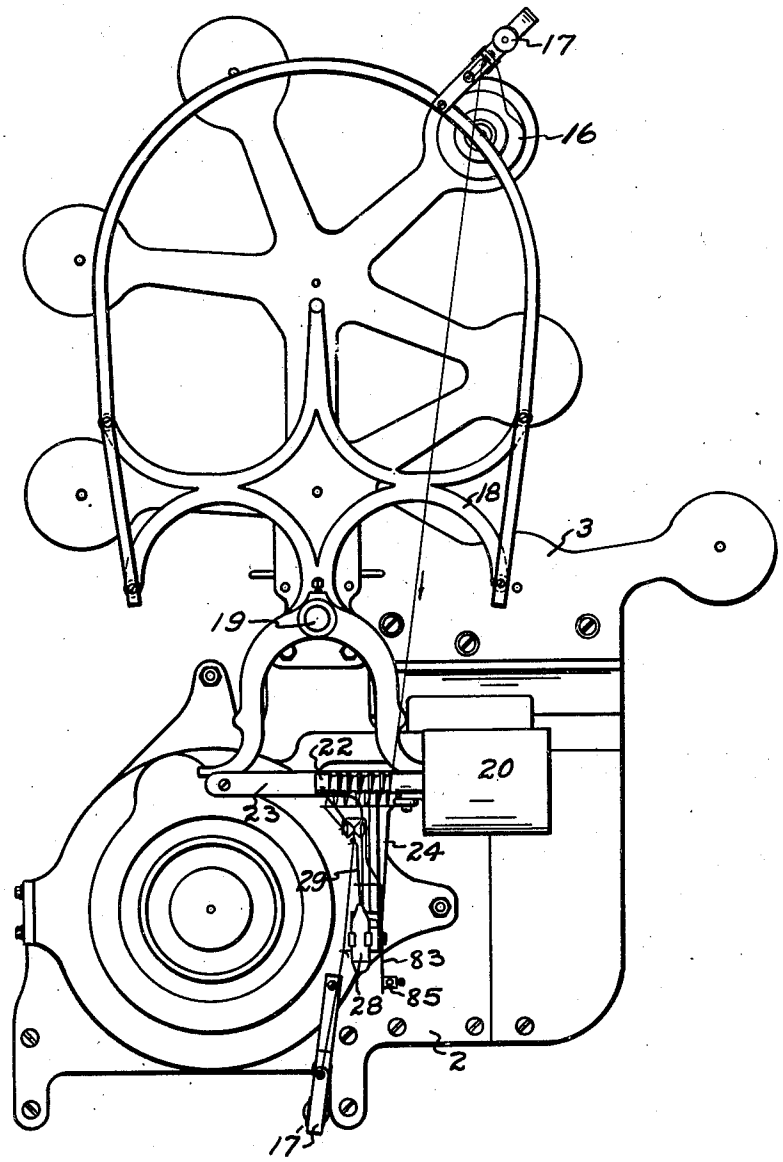
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ELASTIC YARN FEEDING MEANS FOR KNITTING MACHINES

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FIG. 2.



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ELASTIC YARN FEEDING MEANS FOR KNITTING MACHINES

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FIG. 3.

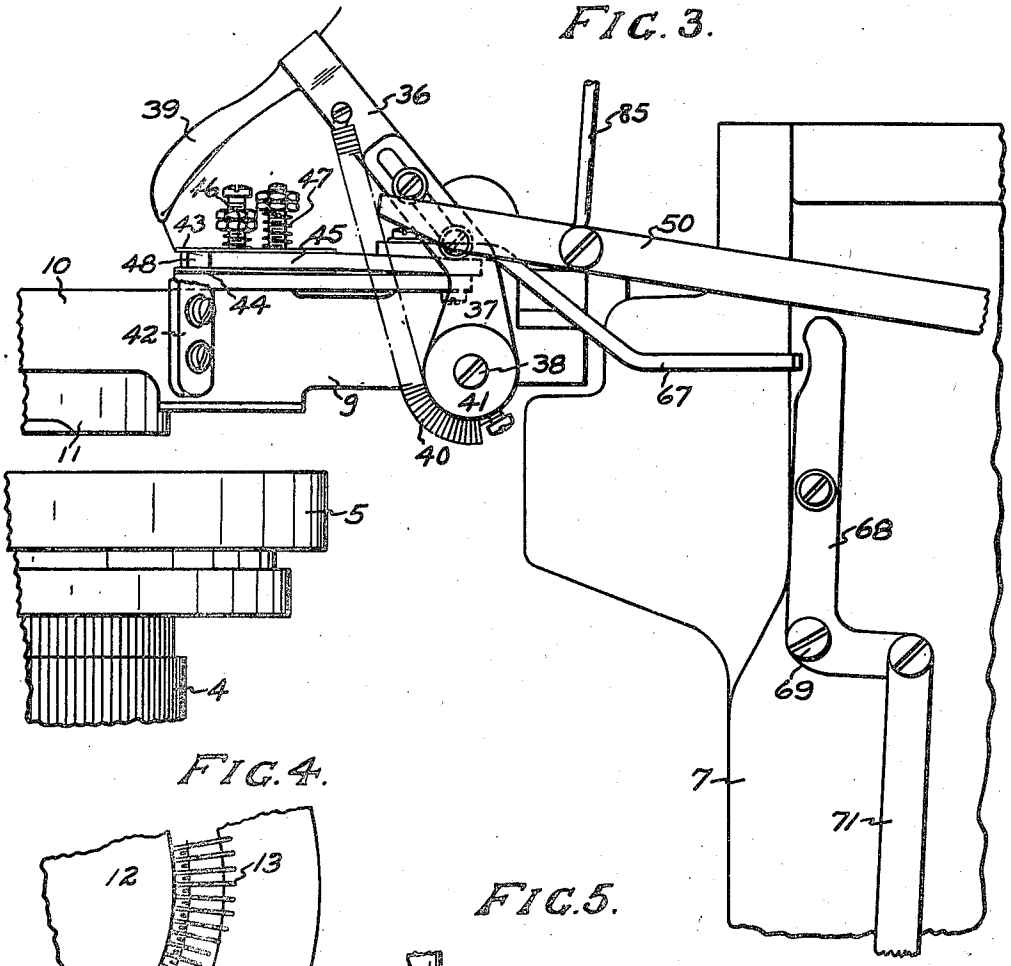


FIG. 4.

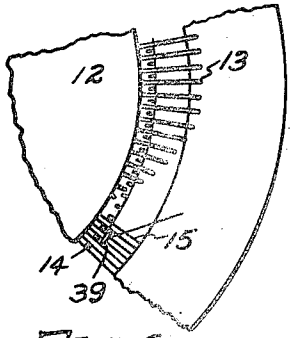


FIG. 5.

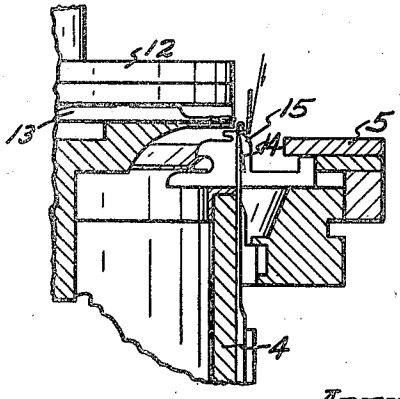
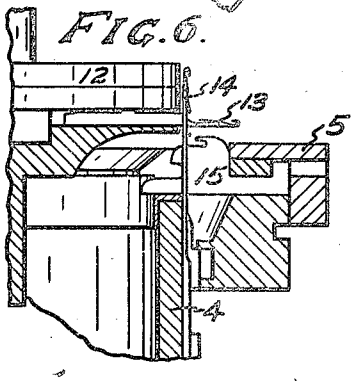


FIG. 6.



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ELASTIC YARN FEEDING MEANS FOR KNITTING MACHINES

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FIG. 8.

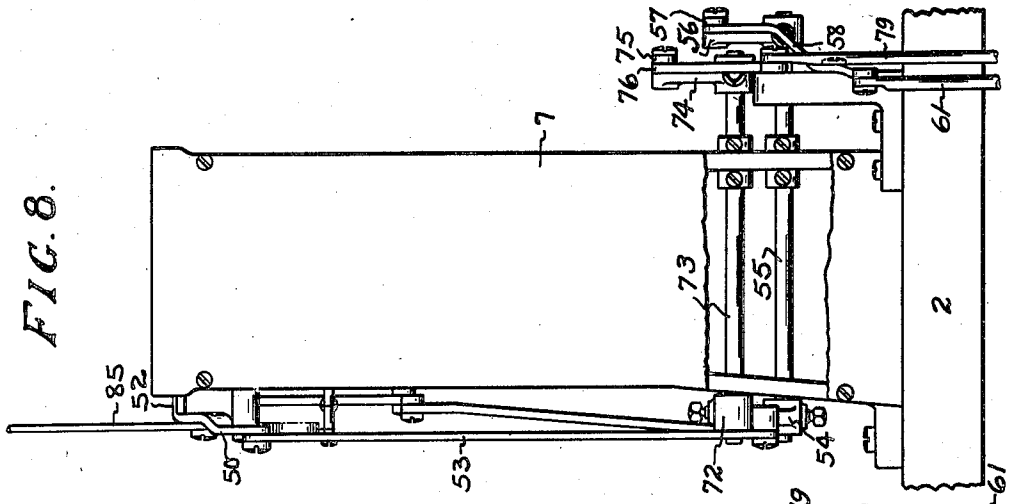
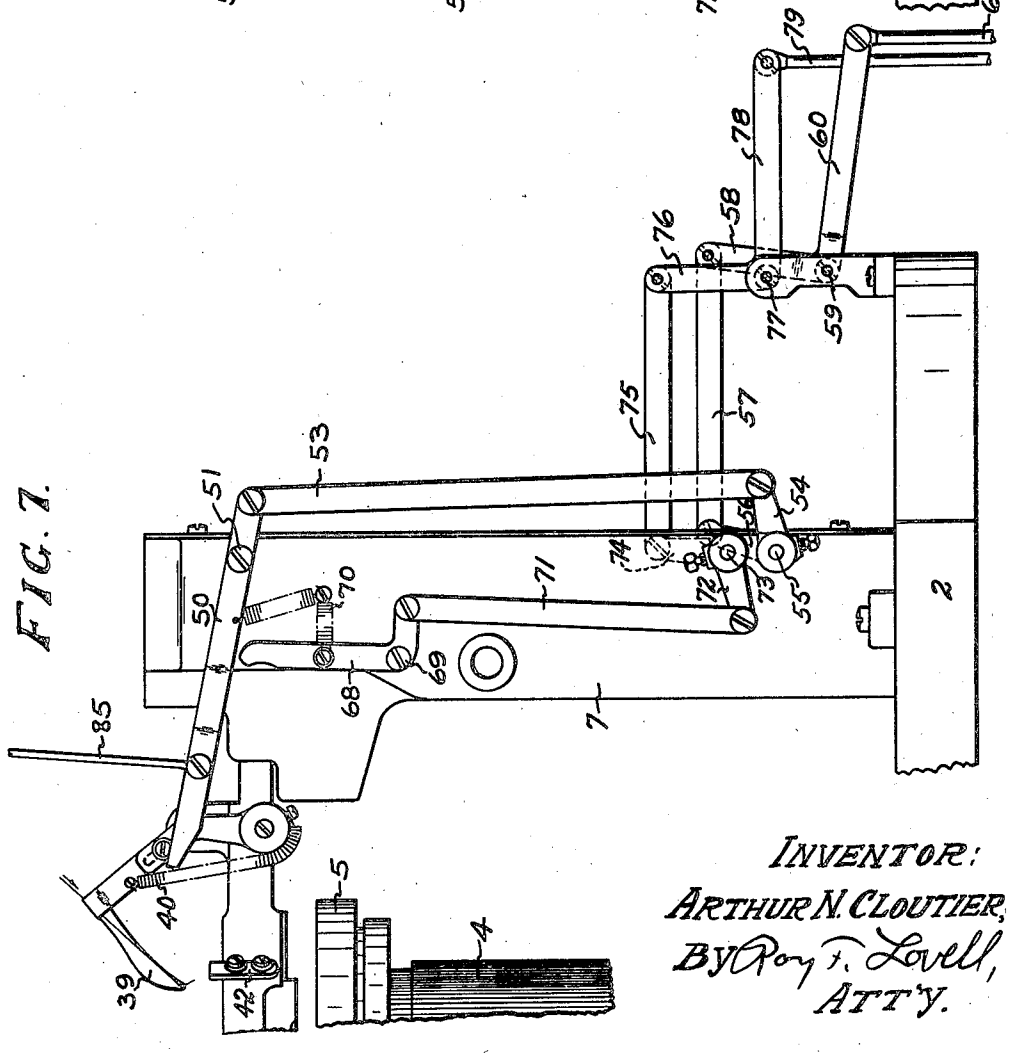


FIG. 7.



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ELASTIC YARN FEEDING MEANS FOR KNITTING MACHINES

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FIG. 9.

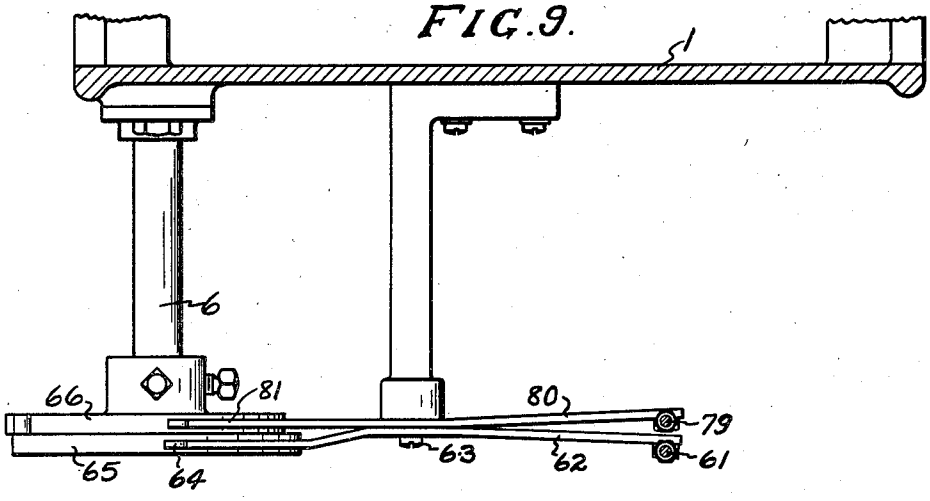
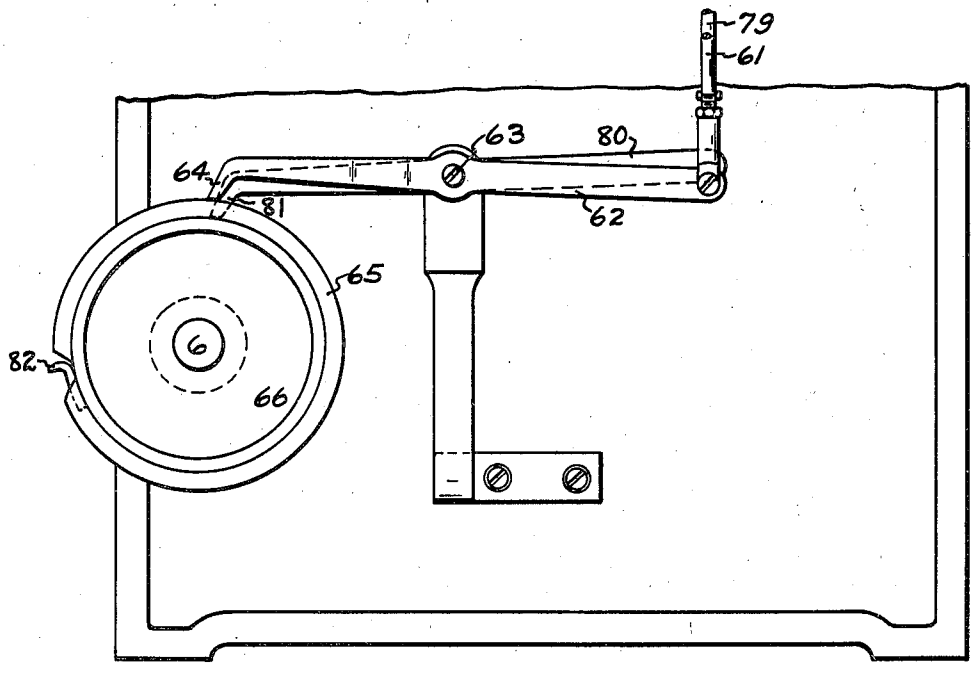


FIG. 10.



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FIG. 11.

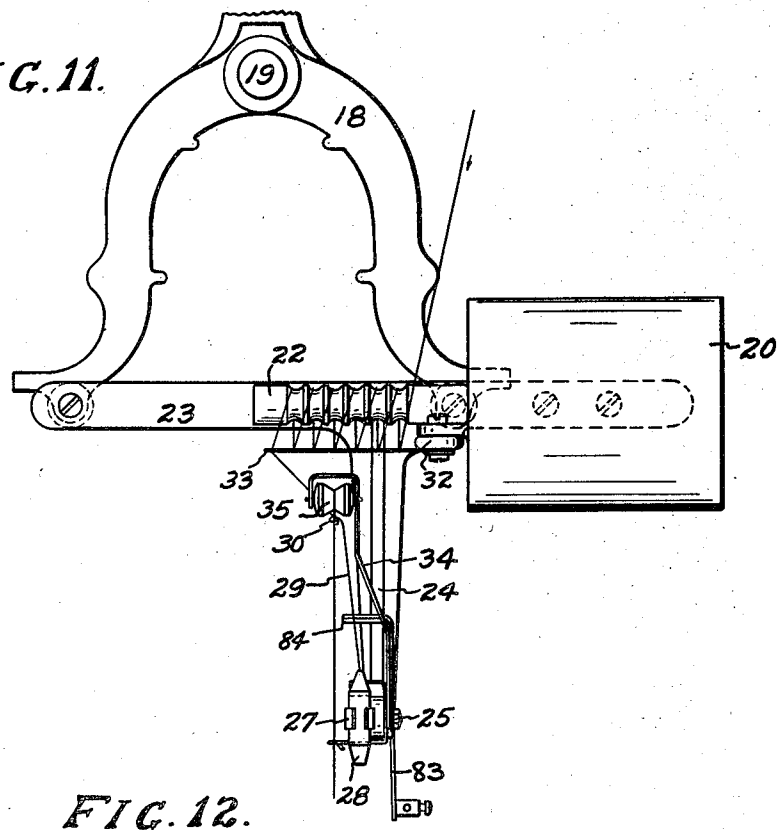


FIG. 12.

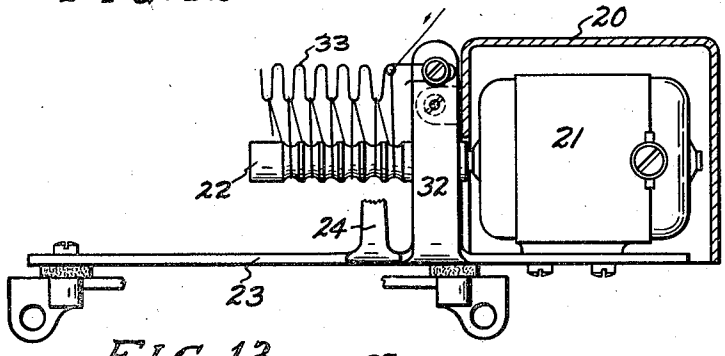
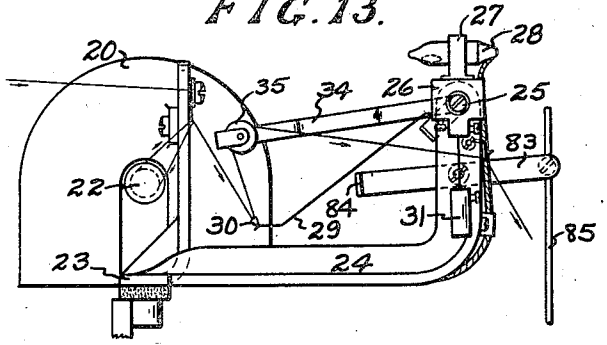


FIG. 13.



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ELASTIC YARN FEEDING MEANS FOR KNITTING MACHINES

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FIG. 14.

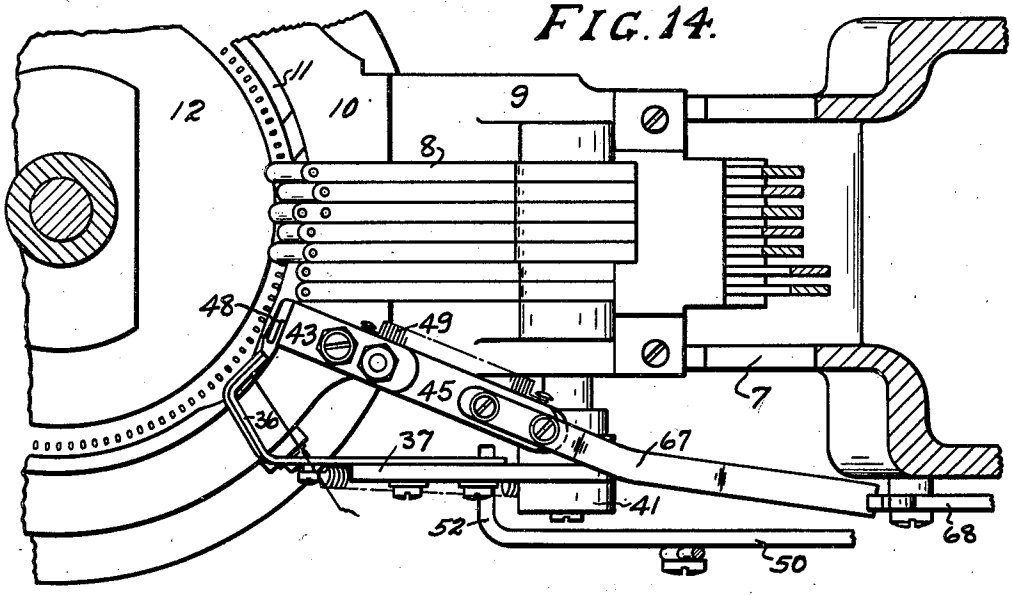
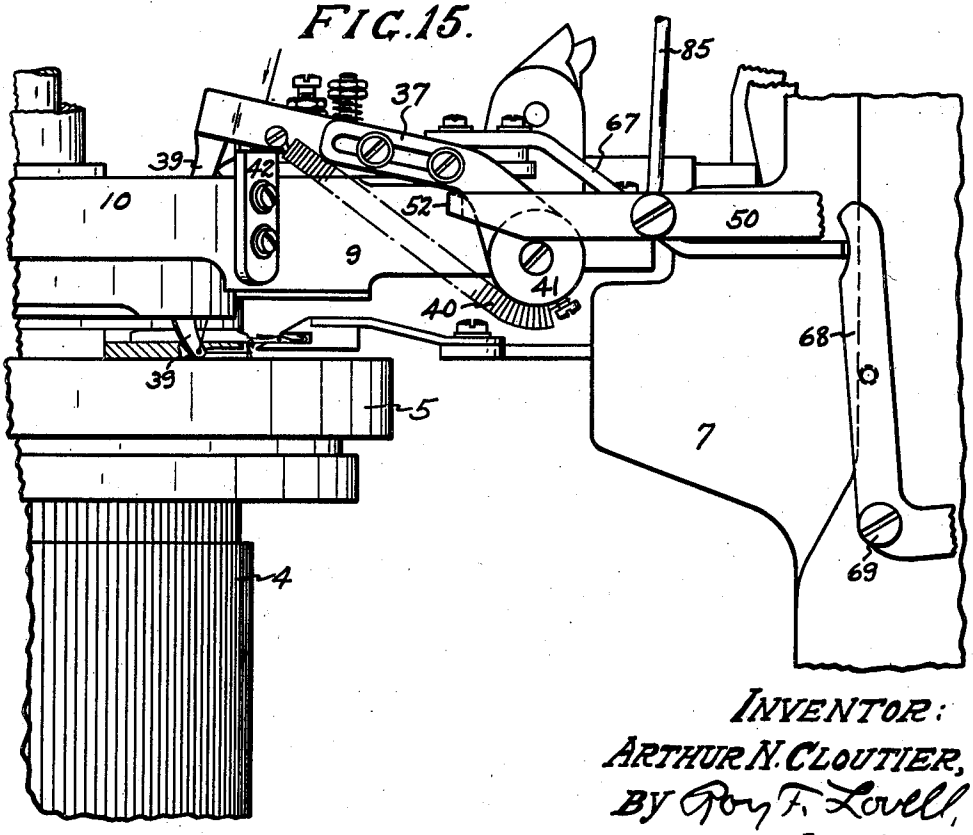


FIG. 15.



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ELASTIC YARN FEEDING MEANS FOR KNITTING MACHINES

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FIG. 16.

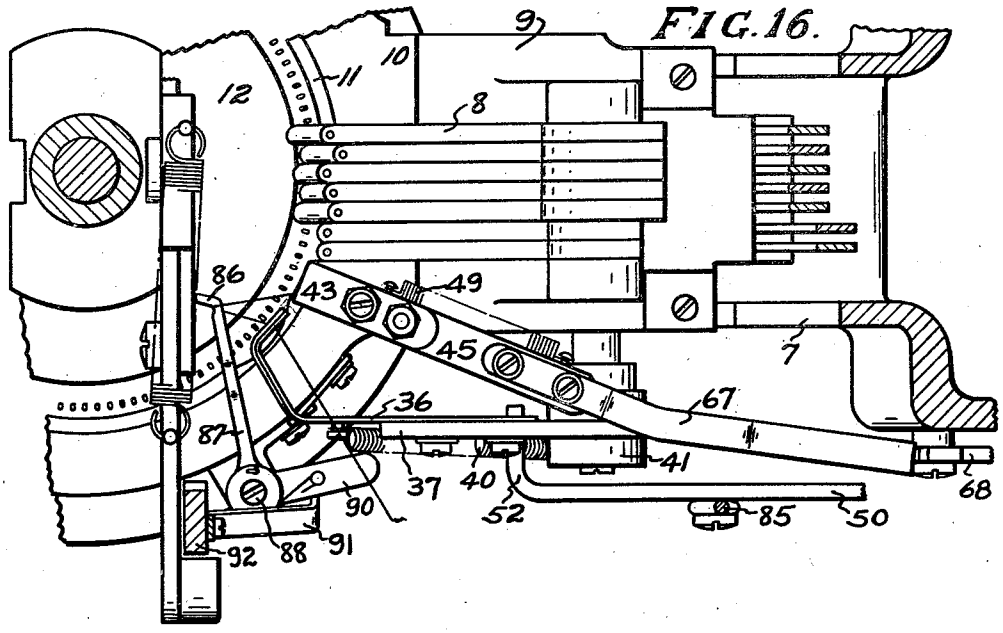
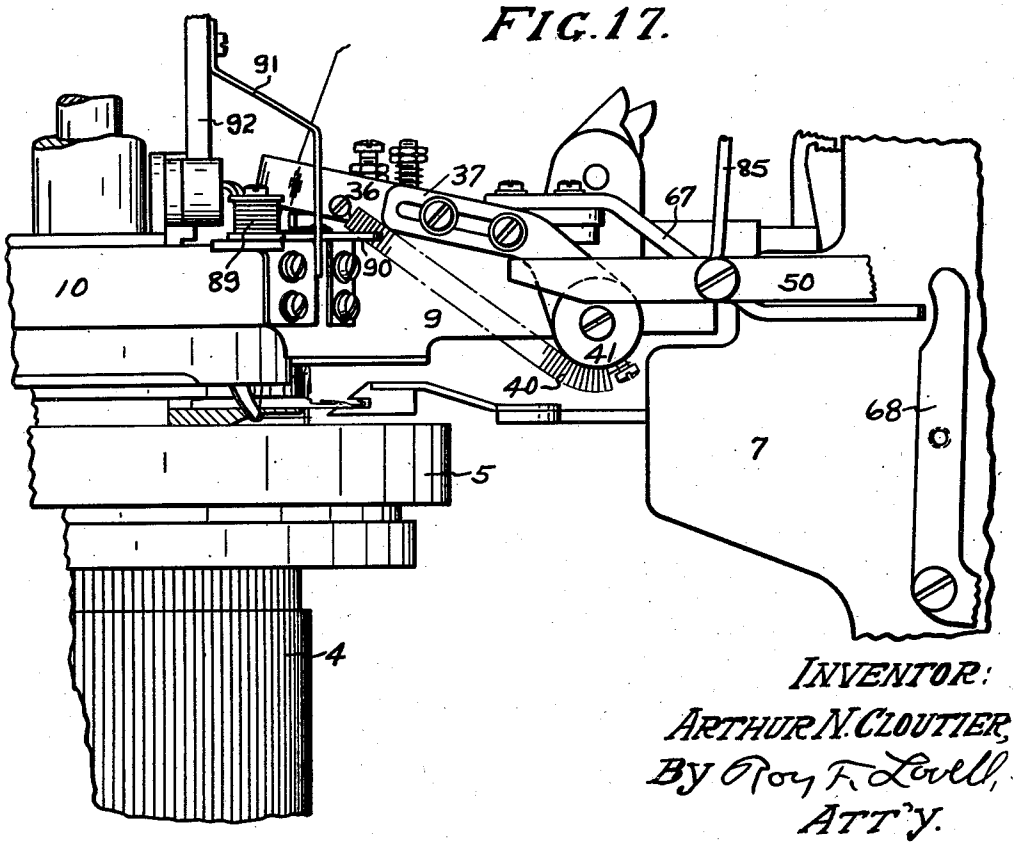


FIG. 17.



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ELASTIC YARN FEEDING MEANS FOR KNITTING MACHINES

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FIG. 18.

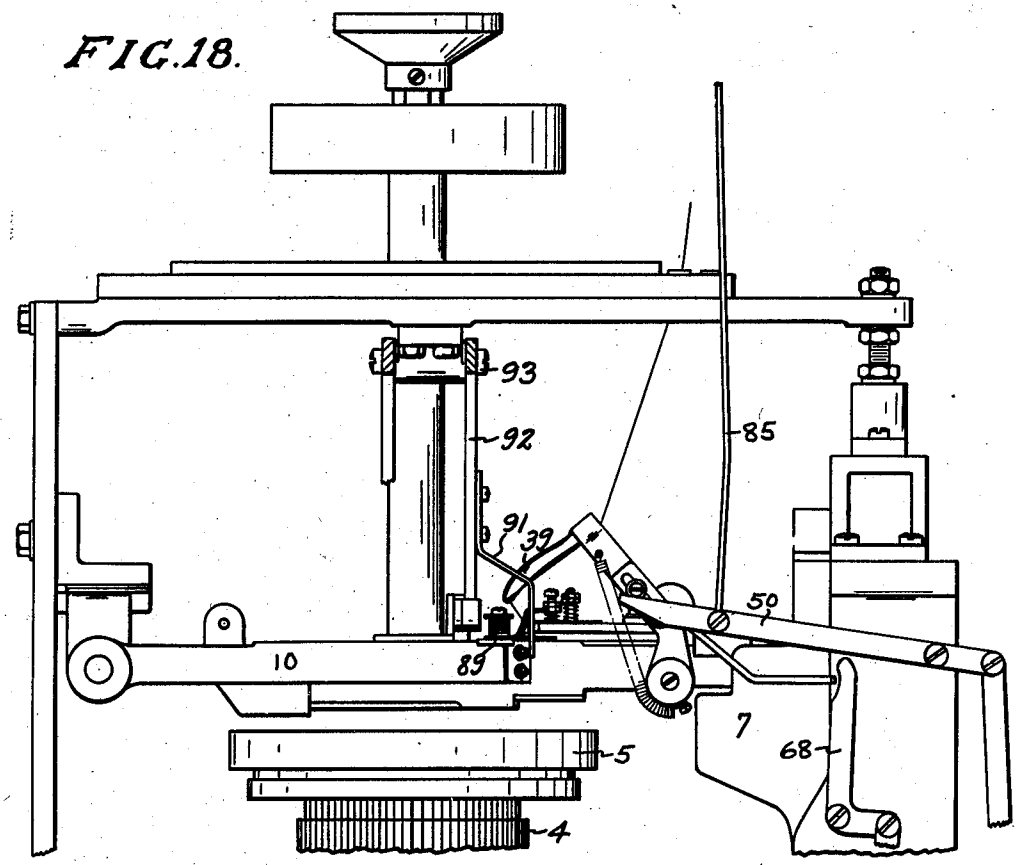


FIG. 20.

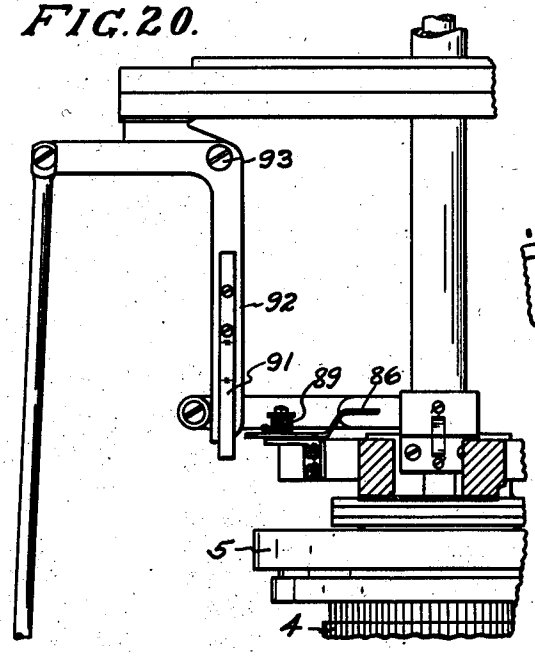
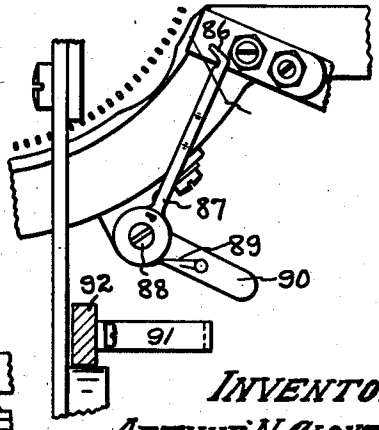


FIG. 19.



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Patented June 16, 1942 2,286,955

UNITED STATES PATENT OFFICE

2,286,955

ELASTIC YARN FEEDING MEANS FOR KNITTING MACHINES

Arthur N. Cloutier, Lonsdale, R. I., assignor to Hemphill Company, Central Falls, R. I., a corporation of Massachusetts

Application February 1, 1940, Serial No. 316,787

6 Claims. (Cl. 66—132)

This case deals with elastic yarn feeding mechanism and control therefor for use in knitting machines. More especially, the invention involves such mechanism as employed in circular, independent needle machines of rib type, either for producing rib fabric only with elastic incorporated therein, or automatic hosiery machines adapted to knit a true rib top and wherein yarn is incorporated throughout a portion at least of the rib top.

In the figures of drawings:

Fig. 1 is an elevation showing some parts of an automatic hosiery machine adapted to knit a true rib top, and in continuation thereof, the plain leg and foot of a stocking, and to which the invention has been applied;

Fig. 2 is a plan of such parts of the machine as have been illustrated in Fig. 1;

Fig. 3 is a plan showing the general disposition of the elastic yarn feeding means and immediate control for the same;

Fig. 4 is a plan of a fragment of the machine wherein elastic yarn is shown feeding to cylinder needles, beneath dial needles, thus in a position to be inlaid between plain and rib stitches, intermediate cylinder needles being omitted;

Fig. 5 is a section of such machine taken in a radial plane projecting through the center of the cylinder and outwardly through the yarn feeding means;

Fig. 6 is a similar section, but taken at a more advanced position, that is, at a point just before approaching the main mouthpiece or feeding station and showing the position of the elastic as it is fed on the shanks of cylinder needles and beneath dial needles;

Figs. 7 and 8 are detail elevations showing connecting linkage for operating the yarn feeding mechanism and the binder and cutter;

Figs. 9 and 10 are a section and elevation, respectively, showing cams and levers operable through the mechanism illustrated in Figs. 7 and 8 to control the elastic feeding and other controlling means;

Fig. 11 is a plan of positive furnishing means for the elastic and control therefor;

Fig. 12 is an elevation of part of the mechanism shown in Fig. 11;

Fig. 13 is an elevation showing mechanism for control of the feeding of the yarn by said furnishing means as seen from a different angle;

Fig. 14 is a plan, some parts being shown in section, illustrating the elastic feeding means in active or inactive position and the binder and cutter in partially open position;

Fig. 15 is an elevation showing mechanism of Fig. 14;

Fig. 16 is a plan similar to Fig. 14 but showing a modification wherein additional controlling means is provided for the elastic yarn to assure that it is taken by a few needles upon its introduction;

Fig. 17 is an elevation showing the parts illustrated in Fig. 16;

Fig. 18 is an elevation taken from the front of the machine showing control for the yarn feeding means and further control for this additional mechanism to assure original taking of the elastic upon being introduced;

Fig. 19 shows the additional elastic controlling mechanism in a position prior to movement for projecting the elastic yarn into the pathway of approaching needles; and

Fig. 20 shows said controlling mechanism as seen from a different viewpoint.

The basic machine to which the invention may be applied, although it is applicable to all rib knitting machines whether for knitting hosiery or otherwise, is of the Banner half hose type of automatic machine, an example of which is fully disclosed in applications Serial #86,814 filed June 23, 1936 now Patent #2,255,068 and #269,671 filed April 24, 1939. These machines are adapted to knit a true rib top, thereafter to transfer from rib to plain and then to continue in the knitting of a conventional article of hosiery including the leg and foot. Such machines are adapted to knit in string work, although they may knit independent articles, running on and casting off at the start and end of each knitted stocking as the case may be. In the true rib top it is sometimes desirable to incorporate an elastic yarn so as to render the stocking self-supporting, said elastic yarn being incorporated in true rib work by inlaying. The general method of production and details of construction of such inlaid elastic between plain and dial stitches is well-known and so commonly practiced that further details need not be given at this time.

The present invention includes positive furnishing means operable to draw elastic yarn from a cone or other supply and to advance it to the needles under a minimum of controlled tension, automatic means for moving the elastic yarn to a position to be taken by needles and to start said furnishing means, a binder and cutter for the elastic yarn in which it may be held when not knitting and special elastic control and projecting means operable when said elastic is to be taken initially at any or each point at which it commences to feed for rendering more positive its introduction to the needles, especially the particular needles by which it is first to be taken.

Referring to the figures of drawings, the type of machine used merely for illustrative purposes has a frame 1, circular base 2, bobbin stand 3, cylinder 4 and a sinker cap assembly 5. A main cam shaft 6 has several drums all equipped with cams of various shapes and extents for

governing the operation of the machine throughout the various phases in the cycle of knitting a stocking. These are for the most part described in detail in the applications above mentioned and need not be illustrated or described in the present case. As shown in Figs. 1–6, a yarn lever control box 7 projects upwardly from the base of the machine and encloses the usual yarn feeding lever control means operable on a plurality of such levers 8, Fig. 14. These levers 8 are mounted to swing to and from feeding position in an extension 9 to a carrier ring 10 having a latch ring 11. This carrier ring pivots at the left side of the machine and may be swung upwardly in a manner well-known to those familiar with hosiery machines.

A dial and dial cap generally indicated at 12 carry and control a plurality of dial needles 13 which function with cylinder needles 14, it being understood that there are in this particular machine twice as many cylinder needels as dial needles. During the knitting of rib work alternate cylinder needles only function, dial needles taking the place of the intermediate cylinder needles which are temporarily inactive. Sinkers 15 of more or less conventional construction work during knitting of plain fabric with the cylinder needles, dial needles being inactive at that time. The cylinder and dial are preferably rotatable, although not necessarily so as the invention may be applied to the type of machine in which these elements would be stationary, cams and feeding means then constituting the rotating part of the mechanism, the characteristics of these two types of machines being generally understood. At the main feeding station at which yarn levers 8 are adapted to feed knitting yarns of various types, both the cylinder and dial needles have imparted thereto the usual stitch drawing wave, dial needles drawing what are generally termed the dial or rib stitches and cylinder needles drawing the plain stitches of a 1 x 1 rib fabric. This general description is merely illustrative of a type of machine to which the invention may be applied and is not to be taken as limiting in any respect.

Again referring to Fig. 1 a supply of elastic yarn 16 is positioned so that upon being drawn from the cone the elastic will pass upwardly through a tension generally indicated by numeral 17, this tension being of any satisfactory type to impose upon the yarn a reasonably light tension. The tensions illustrated herein are similar to that described and claimed in Patent #2,124,001. The purpose of this tension 17 is to prevent elastic from being drawn from the cone too rapidly, it being commonly understood that this material does not draw steadily from the cone but holds back at times, and at other times, is released while under tension and has a tendency to overrun or produce considerable slack. This tension 17 is mounted upon supporting structure generally indicated by numeral 18 and secured at the upper end of a post 19 fixed at the back of the circular base of the machine.

A yarn feeding or furnishing device, Figs. 11 and 12, is mounted at the forward end of the support 18 and includes a casing 20, electric motor 21 and a rotating roller 22 fixed to the shaft of the motor and by means of which the elastic yarn is frictionally advanced as will hereinafter be explained. A bracket 23 supports the motor casing and extends forwardly as at 24 to support a switch mechanism which rotates about a pivot or bearing 25. On this pivot 25 is mounted for oscillation a block 26 carrying in a suitable holder 27 a mercury switch element indicated at 28. A wire arm 29 projects from one side of the block 26 and has the elastic yarn threaded through an eyelet 30 at its outer end. A weight 31 is adjustably fixed to hang from the block 26 and tends to maintain the switch, arm 29, etc., in such a position that the switch will not allow current to flow through to the windings of the motor.

A post 32 projects upwardly adjacent the roller 22 and supports a wire guide 33 adapted to space and control convolutions of the elastic yarn which are wrapped around the feeding roller 22. The elastic may be wrapped as many times as desired or essential for proper feeding, this depending upon the elastic material itself and upon the degree of tension and other pertinent factors. An arm 34 carries a guiding roller 35 over which the elastic is threaded after it has passed through the eyelet 30.

The natural tendency upon being drawn tight as when knitting is started is for the elastic to raise arm 29 whereupon the motor will start and begin to draw the material from the cone or supply 16 and to feed it to the needles. When the reverse takes place arm 29 will fall and the switch will shut off current to the motor whereupon positive furnishing of the yarn will cease. A further control for this feeding means will be described in a later paragraph.

After passing from the furnishing means the elastic is guided through a second tension device 17' and then to a yarn feeding means illustrated in Fig. 3. This feeding means includes a two-part arm composed of elements 36 and 37. This arm pivots at 38 on the extension of the carrier ring and is adjustable along its length by means of a slot and screw connection. At the outer end the arm carries a depending guiding finger 39 having an eyelet at its lower end through which the elastic is threaded. A spring 40 attaches to the element 36 and to a collar 41 on the pivot 38. Said spring tends to draw the arm downwardly so that the yarn will move to feeding position. In Fig. 3 this elastic yarn guide is shown in completely withdrawn position whereas in Figs. 14 and 15 it is shown in active or feeding position. When in feeding position as shown in Figs. 4, 5, 6 and 15, the eyelet is at such a level that elastic yarn feeds to the hooks of cylinder needles but below dial needles. It is true that at the feeding point, Fig. 4, dial needles are not projected, however, they do move outwardly shortly after that and will hold the elastic yarn down as cylinder needles move upwardly to the position of Fig. 6. A stop 42 is adjustable vertically and limits downward movement of the yarn feeding means.

The binder and cutter are located closely adjacent the feeding finger 39 and include upper binder element 43 and a lower cutting element 44. Between these two a slide 45 serves to grip the elastic and to cut it against the element 44 and bind it against the element 43. These three elements are pressed together by springs 46 and 47 adjustable as shown and by means of which proper binding effect may be obtained. The sliding element 45 has a notch 48 adjacent its outer end by means of which the elastic is caught upon withdrawal and which serves as above explained in the cutting and binding. A spring 49 normally tends to move the element 45 to the position of Fig. 3. Other mechanism later to be described serves to open the binder and cutter against the tension of that spring.

A lever 50, Figs. 3, 7 and 8 is pivoted to the side of the box 7 at 51 and has an inwardly bent end 52, Fig. 14, which engages beneath the arm 37 to raise the same as the first mentioned arm is swung about its pivot. At the outer end of lever 50 is connected a link 53 which in turn connects to a short lever 54 fixed to one end of a spindle 55, Figs. 7 and 8, which projects through the box 7 to the opposite side having a second arm 56 fixed at that end. A link 57 runs from the free end of arm 56 and connects to an arm 58 of a bell crank lever pivoted at 59. The other arm 60 of that lever projects outwardly and connects to a depending link 61 which attaches at its lower end to a lever 62 pivoted at 63 and having a cam engaging toe 64 which is shown in Fig. 1 and also in Figs. 9 and 10. This toe is adapted to ride upon a cam 65 on a drum 66 at the end of shaft 6. Cam 65, through the mechanism just described, will maintain the elastic yarn feeding lever in the position of Fig. 3 at which time the elastic yarn is also held in the binder except at such times as the toe 64 draws from the cam into the opening shown in both Figs. 1 and 10. The extent of that opening governs the length of time through which the elastic is to be fed. Obviously the elastic may be fed through a narrow zone or bands in the rib material or throughout a considerable extent thereof. If it is to be inserted and withdrawn more than once in each knitted article then more than one space or opening in the cam 65 would be desirable.

The binder and cutter are operated by similar connections including an extension 67 to the movable element of the cutter, Fig. 3, and a bell crank lever 68 pivoted at 69 and drawn by a spring 70, Fig. 7, in one direction, and against which spring a cam controlled mechanism will move the said lever to push inwardly on extension 67 and thereby open the binder. Bell crank lever 68 has connected to the horizontal arm thereof a depending link 71, Figs. 3, 7 and 8, which in turn connects to a short arm 72 fixed to a spindle 73. This spindle extends through the box 7 and is rotatable therein as was the spindle 65. At the opposite end of that spindle is fixed a second lever or arm 74 to which is connected a link 75 extending outwardly and connecting to arm 76 of another bell crank lever pivoted at 77. The second arm 78 of this lever is connected by means of a link 79 which extends downwardly as in Figs. 1, 7, 8, 9 and 10, to connect at one end of lever 80 also pivoted at the point 63. This lever likewise has a toe 81 engageable upon the surface of drum 66 or by a cam 82 by means of which the said toe on the lever is raised moving the remainder of the mechanism just described in such a manner as to open the binder for receiving the elastic yarn. Cam 82 is rapid in its action opening the binder just in time to receive the elastic yarn but allowing the said binder to close very quickly whereupon the elastic is cut and clamped as the last needles taking the same pass so that a short end of elastic yarn projects from the fabric. The actual timing of these parts is, of course, such that when feeding of the elastic ceases, the binder opens, thereupon the yarn feeding means including the finger 39 is raised as the last needle to take the elastic passes so that it will be drawn taut from said last needle to the raised finger 39 and will be held in such a pathway as to be caught by the notch 48 of the binder whereupon the binder will immediately close.

The feeding of the elastic in certain types of stocking tops is controlled by tension on the elastic yarn itself. As the elastic yarn passes through the eyelet 30 in the tension arm 29, Figs. 2, 11, 12 and 13, the tension in the yarn would raise or lower that arm and will start and stop the motor according to the demand for the yarn as it is taken by the needles. In inlaying in rib work as herein described, it is more desirable for the furnishing means to start just as soon as the elastic is to be taken and to continue in steady operation throughout that portion of the rib top in which elastic yarn is incorporated. To accomplish this a lever 83, Figs. 1, 2 and 13, has a bent end 84 which engages beneath the tension arm 29. This lever is pivoted on the bracket 24 and connects to a depending wire or link 85 which in turn connects to the lever or arm 50, Figs. 3, 7, 8, 15, 17 and 18. When the yarn feeding finger 39 is raised as shown in Fig. 3, wire 85 is pushed upwardly moving lever 83 to the position of Fig. 13. That allows the tension arm 29 to drop and thus to stop the motor. When yarn is to be fed lever 50 moves downwardly from the position of Fig. 3 to the position of Fig. 15, for example, and lever 83 will then be swung in a direction to raise the tension arm 29 high enough to start the motor and will hold that arm in that raised position during inlaying elastic yarn. Thus the furnishing of the yarn is positively started at the very beginning of the inlaying process and continues steadily throughout that function. The yarn does not have to be stretched so as to raise the tension arm 29 before starting the motor, and further, said motor is not subject to periodic starting and stopping and varying of tension in the elastic all of which would tend to make the inlaid portion of the true rib top uneven in appearance since tension in the elastic would vary whereas it should be kept constant.

Now referring to Figs. 16–20, a yarn engaging hook 86 at the end of an arm 87 pivoted at 88 is adapted to engage the elastic yarn between the binder and end of finger 39 and to project that elastic yarn across the needle circle into the pathway of needles which are initially to take the same. This arm 87 is pivoted at 88 and is spring tensioned by a spring 89 so that normally it will be withdrawn to a position such as illustrated in Fig. 19. An extension 90 is to be contacted at certain times by an angular projection 91 connected at the side of a depending part 92 of a bell crank lever pivoted at 93, the purpose of this bell crank lever being to control certain dial cams through other mechanism not herein shown in detail nor necessarily described. They are a part of this type of machine and since the said bell crank lever is moved upon the start of rib work and again at the end of rib work, it makes one convenient source from which to derive movement for the hook 86 in case elastic is to be incorporated throughout the entire rib top. Obviously movement for the hook 86 might be derived from any desired part of the machine, or special control from one of the cam drums might be provided whereby said hook might move at any part or parts of that portion of a knitted article in which elastic was incorporated.

The hook 86 moves at the start of projecting a yarn into the pathway of needles and might immediately return to the position of Fig. 19. It is not necessary that said hook return at once since it might remain in the position of Fig. 16, and in fact, as herein constructed can not return until the feeding finger 39 is raised. The timing is such that hook 86 must be moved to the

position of Fig. 16 before the feeding means is dropped to the position of Fig. 17, and alternately the finger must be raised before the hook can be returned. As the hook is returned to the position of Fig. 19, the bevelled outer edge thereof allows it to snap past the elastic and engage it prior to functioning again at the start of knitting another top in which elastic is to be incorporated. While the hook is not entirely essential to the operation of the mechanism previously disclosed, it does improve the performance thereof since it determines the exact point at which elastic will be introduced, otherwise, the point of introduction may vary throughout a considerable extent as the feeding means and binder and cutter are both located outside the needle circle.

The elastic yarn is moved across the needle circle by the hook 86, this assuring that the elastic will be so taken in the hooks of cylinder and dial needles as to be knitted in for a number of stitches. Obviously the elastic will feed above the dial needles at such time. The dial needles are then withdrawn temporarily so as to let the elastic drop below them after which it will feed in an inlaying position.

The mechanism herein disclosed is illustrative of a preferred embodiment of the invention and is not to be taken as limiting thereof, the invention being limited only by the scope of the appended claims.

I claim:

1. A rib knitting machine having a dial and cylinder and dial needles and cylinder needles adapted to knit rib fabric and to inlay an elastic yarn between rib and plain stitches of said fabric, a supply of elastic yarn, yarn furnishing means including an electric motor, a feeding element about which the elastic yarn is wrapped, means for starting and stopping said motor, one tension means in advance of said furnishing means and another operable upon the elastic yarn after leaving the furnishing means, feeding means including a swingable arm carrying a depending finger through which the elastic yarn is threaded, means for moving said feeding means to and from feeding position, means for controlling the starting and stopping means of said motor connected to the means for moving said yarn feeding mechanism and a common control whereby as the feeding means is moved to active position the motor is started and upon movement of the feeding means to inactive position, the motor will be stopped.

2. A knitting machine having in combination means for feeding an elastic yarn to be inlaid including an elastic yarn feeding means movable to and from a yarn feeding position adjacent a circle of independently movable needles, a binder and cutter located outside the circle of needles and adapted to cut and retain an end of elastic yarn whenever the elastic yarn feeding means is raised to inactive position, means for catching the elastic yarn extending between the binder and cutter and inactive feeding means and for projecting it into the path of approaching needles including a hooked arm having a path of movement between the binder and cutter and feeding means and above passing cylinder needles and means for operating said hooked arm prior to moving the feeding means to active position.

3. A knitting machine having in combination means for feeding an elastic yarn to be incorporated in a fabric including elastic yarn feeding means constructed to be moved to and from a yarn feeding position adjacent a circle of needles, a binder and cutter positioned outside the circle of needles and being constructed to cut and retain an end of elastic yarn whenever the said elastic yarn feeding means is raised to inactive position, means for catching the elastic yarn as it extends between the binder and cutter and feeding means and operable to project said yarn into the path of approaching needles, means for positively drawing the elastic yarn from a supply and advancing it toward the needles and pattern means operable simultaneously to start said positive feeding means with movement of the yarn feeding means to feeding position and to stop it simultaneously with movement of the said feeding means from feeding position.

4. A rib knitting machine having in combination means for feeding an elastic yarn to be inlaid in rib fabric including an elastic yarn feeding means movable to and from yarn feeding position adjacent a circle of needles, a binder and cutter positioned outside the circle of needles and adapted to cut and retain an end of elastic yarn whenever the feeding means is moved to active position, means projectable in a pathway between the inactive yarn feeding means and the binder and cutter and constructed to engage elastic yarn extending between them and projecting said yarn into the pathway of needles including a hooked arm movable to a position outside the circle of needles and upon engagement of the elastic yarn, to a position inside of said circle of needles and above them, yarn furnishing means including an electric motor, a roll driven by said motor and about which the elastic yarn is wrapped, guiding means for said yarn, and a switch for starting and stopping said motor and pattern controlled means connected to act upon both the switch for said motor and the said yarn feeding means simultaneously, said last mentioned means being constructed and operable to start said motor as the yarn feeding means is moved to active position and to stop said motor simultaneously with the movement of said yarn feeding means from active position.

5. A rib knitting machine having a dial, a cylinder, dial needles and a circle of cylinder needles in said cylinder, means for inlaying elastic yarn between rib and plain stitches, a binder and cutter outside the circle of cylinder needles and means adapted to move the elastic yarn held in the binder and cutter across the said circle of cylinder needles for the purpose described.

6. A rib knitting machine having in combination means for knitting fabric, means for feeding an elastic yarn to be inlaid in said rib fabric including elastic yarn feeding means movable by lowering and raising it to and from a yarn feeding position adjacent a circle of cylinder needles, a binder and cutter outside the circle of needles and adapted to retain a cut end of elastic yarn when the feeding means is raised to inactive position and means for catching elastic yarn extending between the binder and cutter and feeding means and for projecting it in the path of approaching needles including a hooked arm capable of moving between said binder and cutter and feeding means and over the path of cylinder needles and means for operating said hooked arm prior to lowering the feeding means to feeding position.

ARTHUR N. CLOUTIER.