Oct. 4, 1932. O. H. WALTON 1,880,304

MACHINE FOR KNITTING ELASTIC FABRIC

Filed Feb. 16, 1932 6 Sheets-Sheet 1

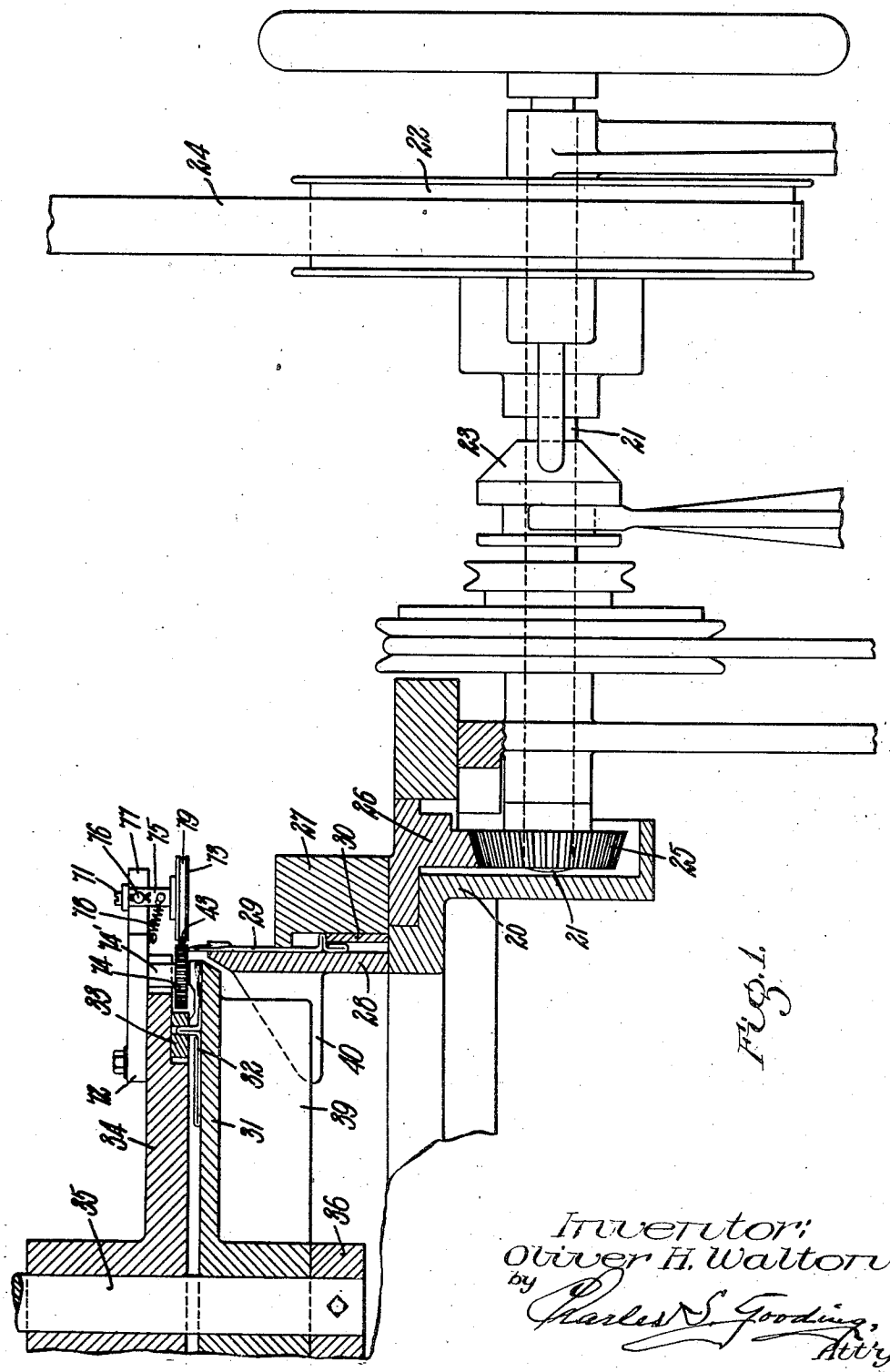

Fig. 1.

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MACHINE FOR KNITTING ELASTIC FABRIC

Filed Feb. 16, 1932 6 Sheets-Sheet 2

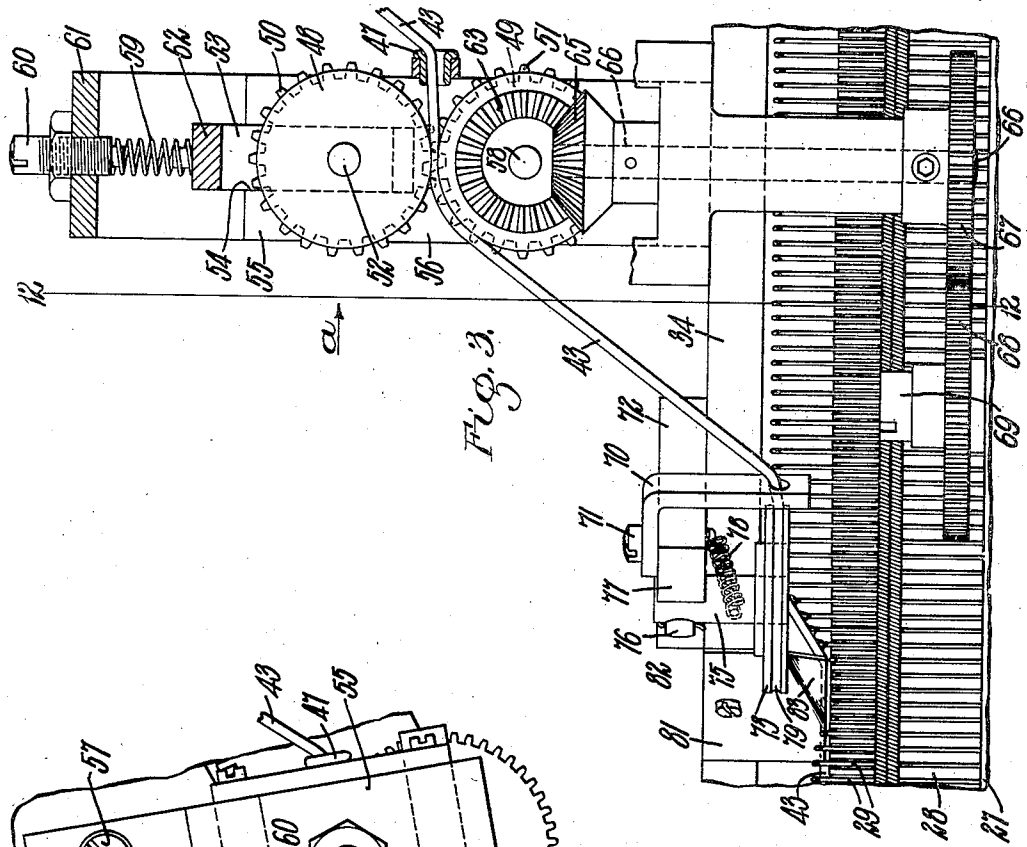

Fig. 3.

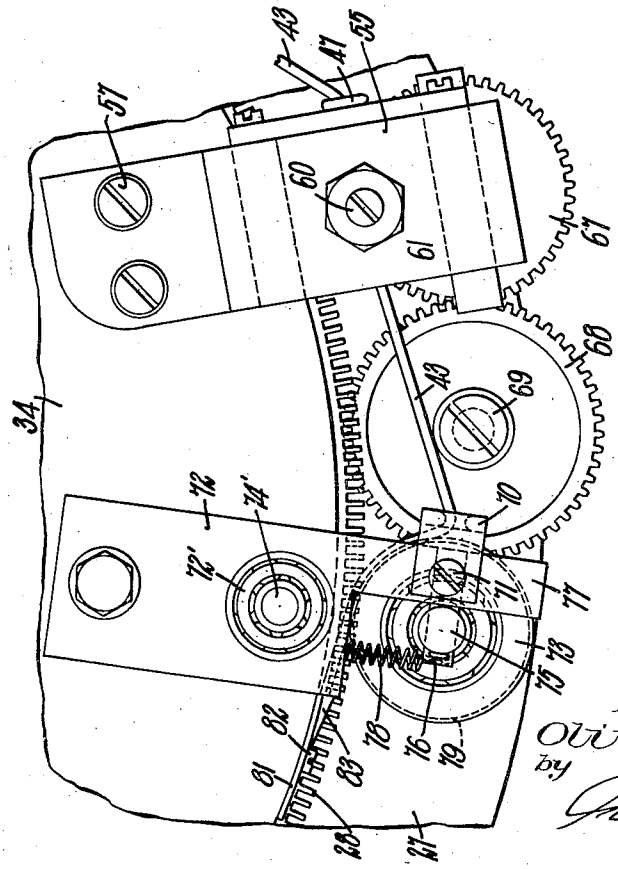

Fig. 2.

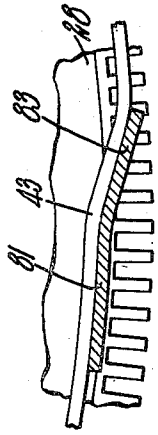

Fig. 4.

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MACHINE FOR KNITTING ELASTIC FABRIC

Filed Feb. 16, 1932 6 Sheets-Sheet 3

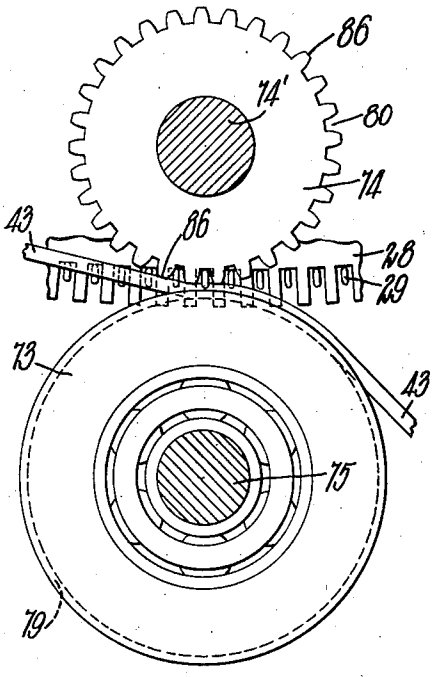

Fig. 5.

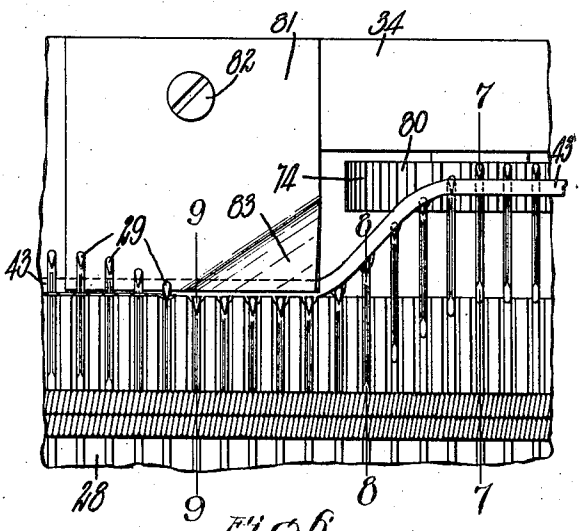

Fig. 6.

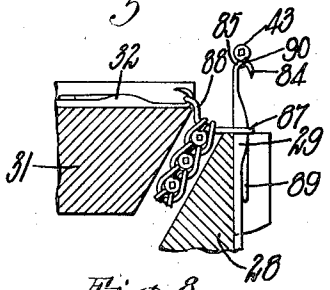

Fig. 8.

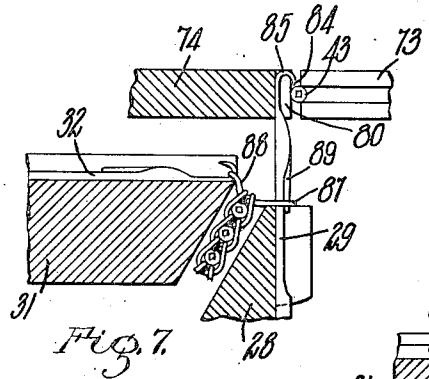

Fig. 7.

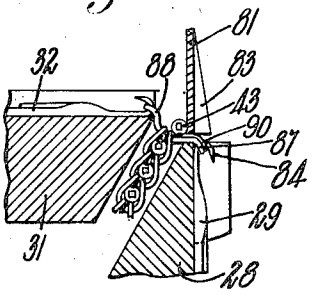

Fig. 9.

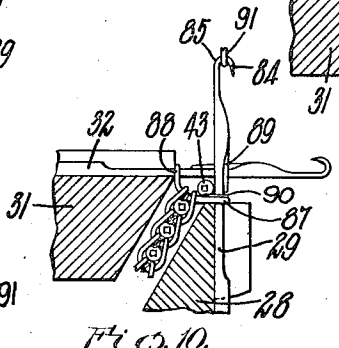

Fig. 10.

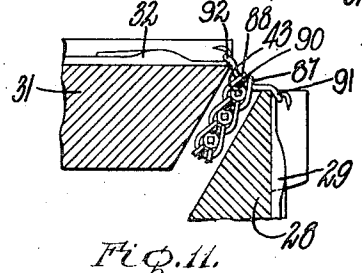

Fig. 11.

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MACHINE FOR KNITTING ELASTIC FABRIC

Filed Feb. 16, 1932 6 Sheets-Sheet 4

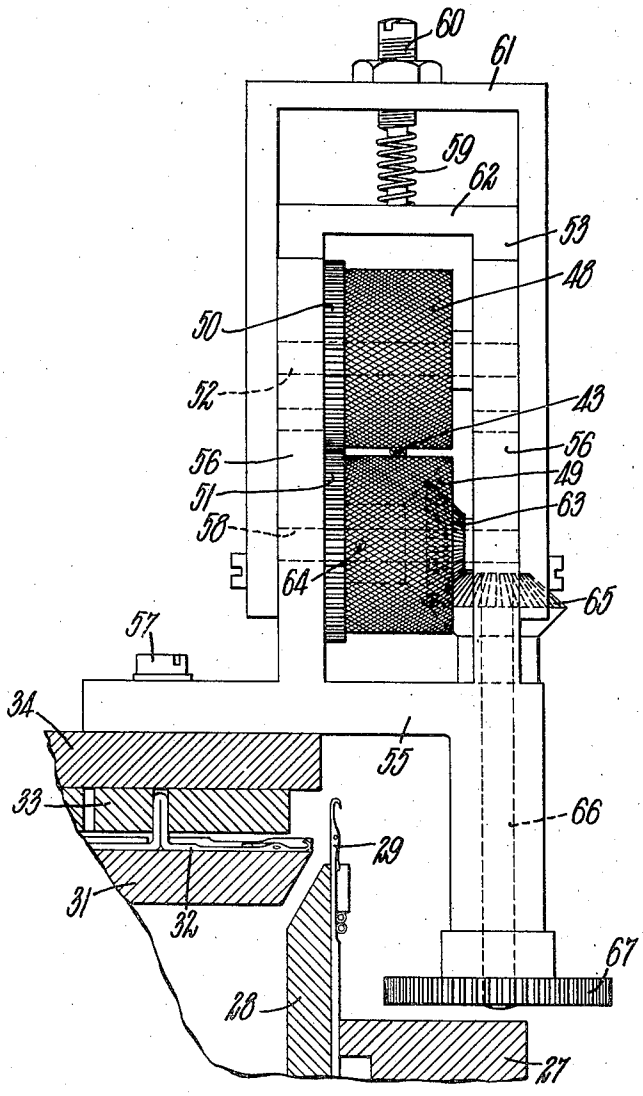

Fig. 12.

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MACHINE FOR KNITTING ELASTIC FABRIC

Filed Feb. 16, 1932 6 Sheets-Sheet 5

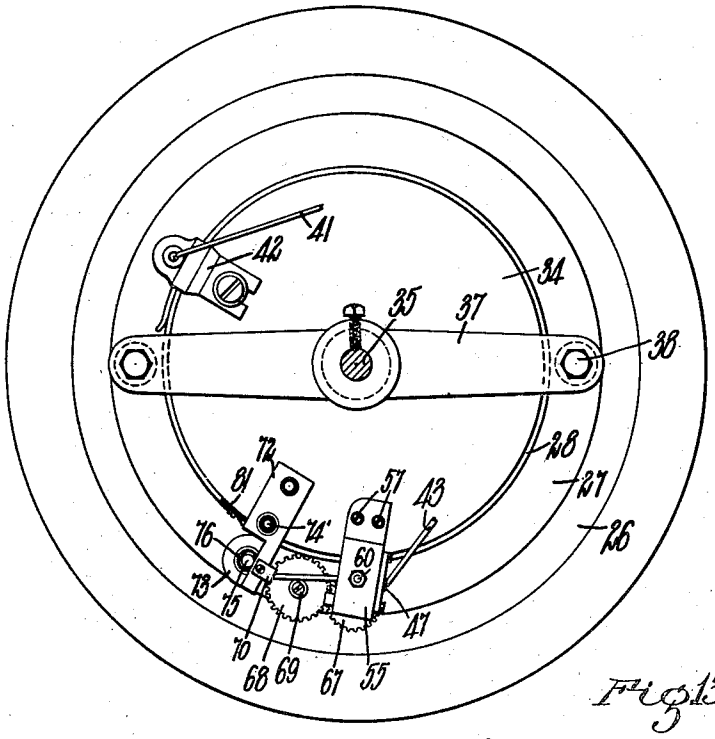

Fig. 13.

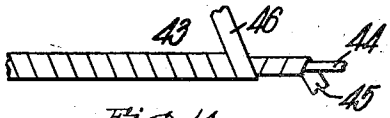

Fig. 14.

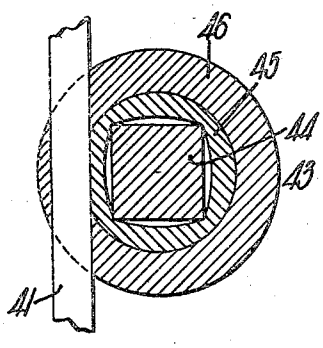

Fig. 15.

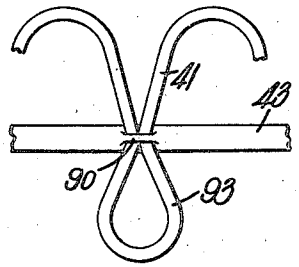

Fig. 16.

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MACHINE FOR KNITTING ELASTIC FABRIC

Filed Feb. 16, 1932 6 Sheets-Sheet 6

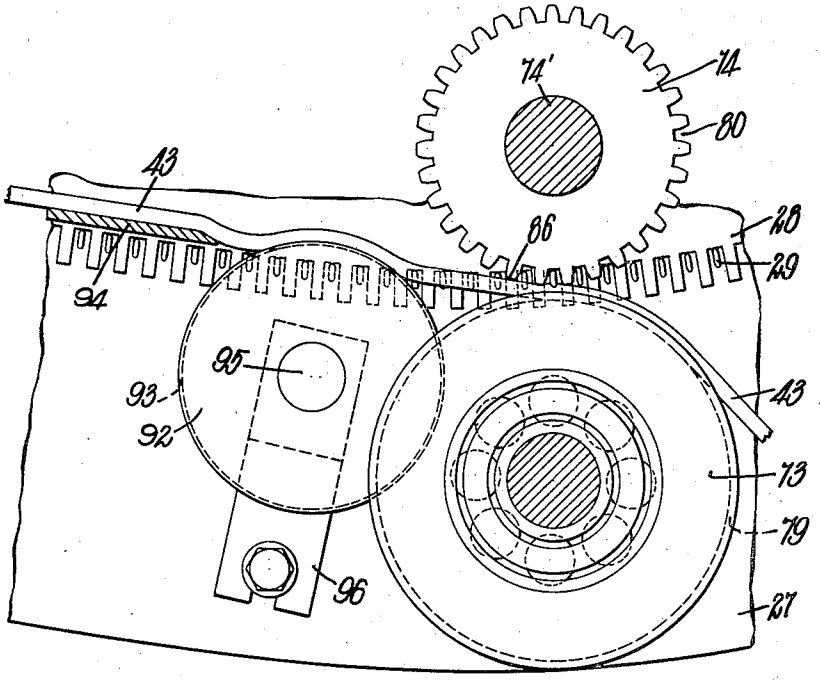

Fig. 17.

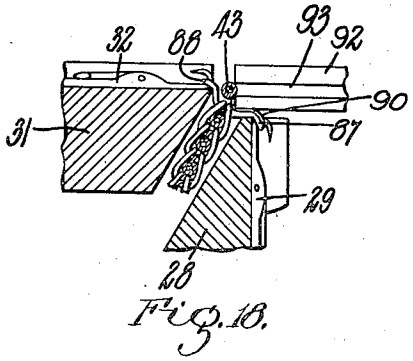

Fig. 18.

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UNITED STATES PATENT OFFICE

OLIVER H. WALTON, OF NEEDHAM, MASSACHUSETTS

MACHINE FOR KNITTING ELASTIC FABRIC

Application filed February 16, 1932. Serial No. 593,264.

This invention relates to machines for knitting elastic fabric.

The object of the invention is to provide a knitting machine which will knit a piece of fabric in the usual well-known manner and at the same time automatically knit therein a woof consisting of an elastic strand preferably of rubber covered with thread or yarn, the elastic strand being locked to the knitted fabric by loops of the fabric extending through the covering of the elastic strand, so that the elastic strands cannot be withdrawn and cannot work loose from the fabric.

The invention consists in a knitting machine embodying the combination of elements set forth in the following specification and particularly pointed out in the claims.

In the particular embodiment of my invention herein disclosed a circular dial machine is shown and described, but it is to be understood that the invention is not restricted to a circular dial machine, but may be used in any kind of a knitting machine wherein the elastic strands extending transversely of the fabric are locked to the fabric by loops of the knitted fabric extending through the strands, preferably through the covering of the strands. The invention therefore embodies in a machine for knitting fabric a needle bed, knitting needles thereon, means to guide yarn or thread to the needles, and means to feed an elastic strand transversely of the needles, together with means to cause the needles to carry loops of said yarn or thread through said elastic strand.

In the following specification and in the claims the word "yarn" is employed, but a strand of any yarn or thread may be considered as equivalents of each other in the specification and claims.

Referring to the drawings:

Fig. 1 is a sectional elevation broken away and illustrating the mechanism by which the needle cam ring is rotated, also illustrating the needle dial upon which are slidably mounted the dial needles by the dial needle cams.

Fig. 2 is a plan view on an enlarged scale of the mechanism for feeding and for guiding the elastic strand to the needles.

Fig. 3 is a front elevation of a portion of the needle cylinder and needles, illustrating in connection therewith the mechanism for feeding and guiding the elastic strand to the cylinder needles.

Fig. 4 is a detail plan of a portion of the needle cylinder, a guide being shown in section for guiding the elastic strand.

Fig. 5 is a plan view partly in section and broken away of the means for guiding the elastic strand beneath the points of the hooks of the needles of the primary cylinder.

Fig. 6 is a front elevation illustrating a portion of the needle cylinder with needles thereon, a portion of the dial cam plate or disc, and means for guiding the elastic strand.

Fig. 7 is an enlarged sectional elevation taken on line 7—7, Fig. 6, and illustrating a cylinder needle in its elevated position just about to pierce the covering of the elastic strand on its downward movement.

Fig. 8 is a sectional elevation taken on line 8—8, Fig. 6, similar to Fig. 7 and illustrating the relative position of the strand to the needle upon a further downward movement of the needle from the position illustrated in Fig. 7, that is, with the strand on top of the hook of the needle and the pierced portion of the covering of the strand within the hook.

Fig. 9 is another sectional elevation taken on line 9—9, Fig. 6, illustrating the cylinder needle in its depressed position just below the upper edge of the needle cylinder, with the pierced portion of the covering of the elastic strand and with the loop of the preceding course of loops of the fabric held within the hook of the needle and with the dial needle retracted and holding its loop of the preceding course of the knitted fabric.

Fig. 10 is a sectional elevation similar to Figs. 7, 8 and 9 illustrating the cylinder needle in its elevated position taking a new loop of thread and the dial needle in its forward position with the pierced portion of the covering of the elastic strand and with the loop of the last course of the knitted fabric on the shank of the needle just below the latch in position to have the new loop drawn through said pierced portion of the covering

and the old loop and pierced portion cast off.

Fig. 11 is another sectional elevation similar to Figs. 7 to 10 inclusive illustrating the cylinder needle lowered, the dial needle retracted, each holding its new loop, and the elastic strand which has been pierced enclosed by the loops of the fabric which have just been knitted.

Fig. 12 is an enlarged sectional elevation taken on line 12—12 and viewed in the direction of the arrow *a*, Fig. 2.

Fig. 13 is a plan view partly in section illustrating the means for rotating the dial cam plate, also illustrating the mechanism for feeding and guiding the strand to the needles and the guide for guiding the thread to the needles.

Fig. 14 is an enlarged detail view illustrating the elastic strand.

Fig. 15 is an enlarged sectional elevation through the elastic strand and illustrating the yarn of the knitted fabric extending through the covering of said strand.

Fig. 16 is a detail front elevation of a portion of an elastic strand with a loop of the fabric projecting through the covering thereof.

Fig. 17 is a sectional plan illustrating a modified form of strand guide.

Fig. 18 is a sectional elevation taken on line 18—18, Fig. 17, illustrating the operation of the modified form of strand guide.

Like numerals refer to like parts throughout the several views of the drawings.

In the drawings, 20 is the frame of the machine, in which is mounted a driving shaft 21, said shaft being driven by a pulley 22 which may be connected thereto by a clutch 23, the pulley 22 being driven by a belt 24 and the shaft 21 having a bevelled gear 25 fast to its inner end which meshes into an annular gear 26 rotatably mounted on the frame 20 and having a cam ring 27 for the cylinder needles, fast thereto. A needle cylinder 28 is mounted upon and fast to the frame 20 and is provided with vertical latch needles 29 to which a reciprocatory motion is imparted by cams 30 on the inner face of the cam ring 27. It will thus be seen that the needle cylinder in this type of machine is stationary, while the cam ring rotates about it imparting a reciprocatory motion to the needles 29.

In this embodiment of my invention I utilize in combination with the stationary needle cylinder a needle dial 31 upon which are slidably mounted dial needles 32, said needles being moved toward and away from the axial center of the dial 31 by dial cams 33 fast to a dial cam plate 34 which is fast to a vertical shaft 35. The lower end of the shaft 35 projects downwardly through the dial plate 31 and has a collar 36 fast thereto. The upper end of said shaft 35 is fastened to a cross head 37, see Fig. 13, which in turn is fastened by posts 38 to the rotary cam ring 27, thus a rotary motion is imparted by the cam ring 27 through the posts 38 and cross head 37 to the vertical shaft 35 and to the dial cam plate 34 and the cams 33 mounted thereon. The dial plate 31 is prevented from rotating by wings 39 thereon which engage ears 40 on the stationary needle cylinder 28.

The thread or yarn 41 for the knitted fabric is fed to the cylinder needles 29 through a thread guide 42 which is fastened to the dial cam plate 34 and is fed from a bobbin carried by the shaft 35 in a manner well known to those skilled in the art but not shown in the drawings.

The elastic strand 43, which is knitted into the fabric, consists of a core of rubber 44, see Fig. 14, around which is wrapped a covering consisting of yarns 45 and 46. The yarn 45 is wound around the rubber core 44 in one direction and the yarn 46 is wound around the outside of the yarn 45 in the opposite direction. The elastic strand is fed from a bobbin or spool carried by the shaft 35 and passes from the said spool through a guide eye 47 and between a pair of feed rolls 48 and 49 which constitute not only feed rolls but tension rolls, that is, they feed the elastic strand from the spool and hold it under proper tension as it passes from the feed rolls to the needles in a manner hereinafter described.

The feed rolls 48 and 49 are geared together by gears 50 and 51, see Figs. 3 and 12. The feed roll 48 and gear 50 are fastened together or integral with each other and are rotatably mounted upon a shaft 52 which is supported at its opposite ends in a slide frame 53 slidably mounted in ways 54 provided in a bracket 55. The bracket 55 has uprights 56 thereon in which the ways 54 are formed and said bracket is fastened by screws 57 to the dial cam plate 34. The feed roll 49 and gear 51 are fastened together or integral with each other and are mounted upon a shaft 58 which is supported in the uprights 56 of the bracket 55. The roll 48 is pressed toward the roll 49 to grip the strand 43 therebetween with a yielding pressure by means of a spring 59 and screw 60, the screw 60 having screw-threaded engagement with a cross bar 61 forming a part of the bracket 56, the lower end of the screw bearing against the spring 59 and the lower end of the spring 59 bearing against a cross bar 62 on the sliding frame 53.

A rotary motion is imparted to the roll 49 and to the gear 51 by a bevel gear 63 fastened to the roll 49 by a pin 64 which also projects through the shaft 58. The bevel gear 63 meshes into another bevel gear 65 which is fastened to a vertical shaft 66 rotatably mounted in the bracket 55, and to the lower end of the shaft 66 is fastened a gear 67 which meshes into another gear 68 rotat-

ably mounted upon a stud 69 which is fastened to the needle cam ring 27. The gear 68 meshes into the cylinder needles 29 and as the needle cam ring 27 rotates about these needles the gear 68 is caused by them to rotate, thus rotating the gear 67, the bevel gears 65 and 63, the roll 49 and gear 51 and the roll 48 and gear 50.

From the feed rolls 48 and 49 the elastic strand 43 passes downwardly through a guide bracket 70 which is fastened by a screw 71 to a bracket 72 which is fastened to the dial cam plate 34. The strand 43 passes from the guide plate 70, see Figs. 2, 3, 5 and 6, between a presser roll 73 and a rotary strand support roll 74. The presser roll 73 is rotatably mounted upon a vertical pin 75, see Figs. 2 and 3, and the pin 75 projects upwardly from the presser roll 73 and is pivotally mounted upon a horizontal pin 76 which projects into an arm 77 on the bracket 72 and is fastened thereto by the screw 71.

A spring 78 is connected at one end to the pin 75 and at the other end to the bracket 72, thus acting to hold the presser roll which is provided with an annular groove at 79 against the strand and to press the strand against the strand supporting roll 74. The strand supporting roll 74 has vertical grooves 80 in its periphery which receive the upper ends of the cylinder needles 29 when they are in their advanced position as particularly shown in Fig. 7. The strand supporting roll 74 is fast to a pin 74′ which is rotatably mounted in a ball bearing member 72′ fast to the bracket 72, see Fig. 2.

As the strand 43 passes beyond or to the left, Figs. 2 and 3, of the rolls 73 and 74, it is guided inwardly with relation to the needle cylinder by a guide plate 81 which is fastened by a screw 82 to the rotary dial cam plate 34. This guide plate has an inclined portion 83 which guides the elastic strand from the position illustrated in Fig. 8 over the top and to the rear of the needle which has pierced it as illustrated in Fig. 9.

The general operation of the mechanism hereinbefore specifically and to some extent in general described is as follows:—The knitting of the fabric is performed in the usual well-known manner of dial rib knitting machines.

Figs. 7 to 11 inclusive illustrate in detail the manner in which the covering of the strand is pierced by the cylinder needles and the thread of the fabric loops carried down through the pierced portion of the covering and the strand enclosed within the loops of the knitted fabric. Referring to these drawings, Fig. 7 illustrates the cylinder needle in its advanced position with the point 84 of the hook 85 just in position and ready upon the downward movement of the cylinder needle to pierce the covering of the strand 43. The strand is positioned laterally thereof in this exact position by the strand supporting roll 74 and by the presser roll 73, that is, the strand is held by the presser roll 73 against the outer edges of the teeth 86 in said supporting roll 74 while the needle 29 projects upwardly through one of the grooves 80 between the teeth 86. Thus the strand is exactly positioned with the point 84 of the hook of the needle in alignment with the inner side of the covering of the strand. Referring to Fig. 7 it will be seen that the dial needle 32 is in its retracted position and the cylinder needle 29 is in its advanced position, it being understood that the needles in this embodiment of my invention are latch needles. The loops of the last course knitted, namely, 87 and 88, are on the cylinder and dial needles respectively and the latch 89 of the needle 29 is still within the loop 87.

The next position of the needles during this part of the knitting operation is in Fig. 8, shown in front elevation on the line 8—8, Fig. 6. The cylinder needle 29 is shown as having pierced a portion 90 of the covering of the strand 43 and the strand is positioned above the hook of the needle. The loops 87 and 88 are still held by the needles 29 and 32 respectively.

The next step in this knitting operation is illustrated in Fig. 9 and in front elevation in Fig. 6 along the line 9—9. At this time the inclined portion 83 of the guide 81 has engaged the strand 43 and pushed it over the top of the needle and over the upper edge of the needle cylinder 28. The pierced portion 90 of the covering of the strand and the loop 87 are now held within the hook of the needle 29 while the loop 88 is still held by the dial needle 32.

In Fig. 10 the needle 29 is shown as having moved upwardly again and a new thread 91 has been fed thereto and the dial needle 32 is moved forwardly. The loop 87 and the pierced portion 90 of the covering of the strand are still held upon the shank of the needle 29 and have passed below the lower edge of the latch of said needle ready to be cast off upon the next downward movement of the needle 29.

In Fig. 11 the needle 29 is moved downwardly carrying the new loop of thread 91 through the pierced portion 90 of the strand and through the loop 87, and the dial needle 32 has received its new loop 92 which has been fed to it by the primary needle 29 in its descent. Thus it will be seen that the loop 91 has been drawn through the pierced portion 90 of the covering of the strand and also through the loop 87 of the previous course, while the dial needle has carried its new loop 92 through the loop 88 of the previous course, and thus the strand 43 is enclosed within the loops of the fabric and locked thereto by the loop 91 of the primary needle.

In Fig. 15 the strand is shown very much

enlarged illustrating the rubber core 44, the yarn coverings 45 and 46 and a loop of thread 41 extending therethrough, and in Fig. 16 an enlarged front elevation is shown illustrating the strand 43 with a loop 93 of the thread 41 extending through the pierced portion 90 of said strand.

Referring to Figs. 17 and 18, the presser roll 73 and strand supporting roll 74 are the same in operation as hereinbefore described. The strand 43, however, instead of passing directly from the presser roll 73 and strand supporting roll 74 to the guide plate 81 passes along the periphery at the rear of a strand guide roll 92 which is provided with an annular groove 93 in its periphery and is positioned adjacent the tops of the cylinder needles 29 and projects rearwardly beyond said needles so that the strand 43 is carried over the tops of the needles 29 and to the rear thereof as illustrated in Fig. 18. The strand 43 passes from the guide roll 92 along the rear face of a guide plate 94 which is similar to the guide plate 81 and is fastened to the dial cam plate. The roll 92 is rotatably mounted upon a vertical stud 95 which is fastened to a bracket 96 which in turn is fastened to the cylinder cam ring 27.

Fig. 18 shows the needles and the knitting instrumentalities in the same relative positions as Fig. 9, except that the guide roll 92 is illustrated as pushing the strand backwardly over the tops of the needles instead of the guide plate 81 and the knitting operation is the same in both cases except as to the guiding of the strand by a rotary roll instead of by a stationary plate.

While the specification and claims recite an elastic strand, it is evident that without departing from the spirit of this invention a non-elestic strand may be used in lieu of an elastic strand.

I claim:

1. A machine for knitting elastic fabric having, in combination, a needle bed, knitting needles thereon, means to guide yarn to said needles, means to feed an elastic strand transversely of said needles, and means to cause said needles to carry loops of said yarn through said elastic strand.

2. A machine for knitting elastic fabric having, in combination, a needle bed, knitting needles thereon, means to guide yarn to said needles, means to feed an elastic strand with a covering thereon transversely of said needles, and means to cause said needles to carry loops of yarn through said covering.

3. A machine for knitting elastic fabric having, in combination, a needle bed, knitting needles thereon, means to guide yarn to said needles, means to feed an elastic strand comprising a core of rubber and a covering of yarn transversely of said needles, and means to cause said needles to carry loops of yarn through said covering.

4. A machine for knitting elastic fabric having, in combination, a needle bed, knitting needles slidably mounted thereon, means to guide yarn to said needles, means to feed an elastic strand with a covering thereon transversely of the needles, and means co-operating with the needles to cause loops of said yarn to be passed through the covering, whereby the elastic strand may be locked to the fabric knitted by the knitting needles.

5. A machine for knitting elastic fabric having, in combination, a needle cylinder, knitting needles mounted thereon, means to impart a reciprocatory motion to the knitting needles, means to guide yarn to the needles, means to feed an elastic strand with a covering thereon transversely of the needles, and means co-operating with the needles to cause loops of said yarn to be passed through the covering, whereby the elastic strand may be locked to the fabric knitted by the knitting needles.

6. A machine for knitting elastic fabric having, in combination, a needle cylinder, knitting needles mounted thereon, means to impart a reciprocatory motion to the knitting needles, means to guide yarn to the needles, means to feed an elastic strand with a covering thereon to said needles beneath the points of the hooks thereof when in their advanced position, whereby said covering may be pierced by the hooks on the return movement of the needles, and means to guide said strand over the top and to the rear of said hooks while the pierced portion of said covering and the knitted loops of the last course of fabric are within said hooks.

7. A machine for knitting elastic fabric having, in combination, a needle cylinder, knitting needles mounted thereon, means to impart a reciprocatory motion to the knitting needles, means to guide yarn to the needles, means to feed an elastic strand with a covering thereon to said needles beneath the points of the hooks thereof when in their advanced position, whereby said covering may be pierced by the hooks on the return movement of the needles, and means to guide said strand over the top and to the rear of said hooks while the pierced portion of said covering and the knitted loops of the last course of fabric are within said hooks and whereby, upon a subsequent reciprocatory motion of the needles, loops of another course may be carried through said pierced portion of the covering and the knitted loops of the last course and the elastic strand thereby locked to the knitted fabric.

8. A machine for knitting elastic fabric having, in combination, a needle cylinder, knitting needles mounted thereon, means to impart a reciprocatory motion to the knitting needles, means to guide yarn to the needles, means to feed an elastic strand with a covering thereon to said needles beneath and in

alignment with the hooks thereof when in their advanced position, means to position the elastic strand laterally thereof with a covering on one side thereof in alignment with the points of said hooks, whereby said covering may be pierced by said hooks on the return movement of the needles, and means to guide said strand over the top and to the rear of said hooks while the pierced portion of said covering and the knitted loops of the last course of fabric are within said hooks.

9. A machine for knitting elastic fabric having, in combination, a needle cylinder, knitting needles mounted thereon, means to impart a reciprocatory motion to the knitting needles, means to guide yarn to the needles, means to feed an elastic strand with a covering thereon to said needles beneath the points of the hooks thereof when in their advanced position and comprising a support with grooves therein to receive the upper ends of said needles, and a presser roll adapted to press the strand against said support whereby said covering may be pierced by the hooks on the return movement of the needles, and means to guide said strand over the top and to the rear of said hooks while the pierced portion of said covering and the knitted loops of the last course of fabric are within said hooks.

10. A machine for knitting elastic fabric having, in combination, a needle cylinder, knitting needles mounted thereon, means to impart a reciprocatory motion to the knitting needles, means to guide yarn to the needles, means to feed an elastic strand with a covering thereon to said needles beneath the points of the hooks thereof when in their advanced position and comprising a rotary support with vertical grooves in its periphery to receive the upper ends of said needles, and a presser roll adapted to press the strand against said support, whereby said covering may be pierced by the hooks on the return movement of the needles, and means to guide said strand over the top and to the rear of said hooks while the pierced portion of said covering and the knitted loops of the last course of fabric are within said hooks.

11. A machine for knitting elastic fabric having, in combination, a needle cylinder, knitting needles mounted thereon, means to impart a reciprocatory motion to the knitting needles, means to guide yarn to the needles, means to feed an elastic strand with a covering thereon to said needles beneath the points of the hooks thereof when in their advanced position and comprising a rotary support with vertical grooves in its periphery to receive the upper ends of said needles, and a pivotally mounted presser roll and spring adapted to press the strand against said support with a yielding pressure, whereby said covering may be pierced by the hooks on the return movement of the needles, and means to guide said strand over the top and to the rear of said hooks while the pierced portion of said covering and the knitted loops of the last course of fabric are within said hooks.

12. A machine for knitting elastic fabric having, in combination, a needle bed, knitting needles slidably mounted thereon, means to guide yarn to said needles, a pair of feed rolls adapted to feed an elastic strand with a covering thereon transversely of said needles, and means co-operating with the needles to cause loops of said yarn to be passed through the covering, whereby the elastic strand may be locked to the fabric knitted by the knitting needles.

13. A machine for knitting elastic fabric having, in combination, a needle bed, knitting needles slidably mounted thereon, means to guide yarn to said needles, a pair of feed rolls adapted to feed an elastic strand with a covering thereon transversely of said needles, a gear meshing said needles, and gearing connecting said gear to said feed rolls, and means co-operating with the needles to cause loops of said yarn to be passed through the covering, whereby the elastic strand may be locked to the fabric knitted by the knitting needles.

14. A machine for knitting elastic fabric having, in combination, a needle bed, knitting needles slidably mounted thereon, means to guide yarn to said needles, a pair of feed rolls adapted to feed an elastic strand with a covering thereon transversely of said needles, means to adjust the pressure of said feed rolls on said elastic strand, and means co-operating with the needles to cause loops of said yarn to be passed through the covering whereby the elastic strand may be locked to the fabric knitted by the knitting needles.

15. A machine for knitting elastic ribbed fabric having, in combination, a primary and secondary needle bed, knitting needles slidably mounted on each of said beds, means to impart a reciprocatory motion to said needles, means to guide yarn to the primary needles, means to feed an elastic strand with a covering thereon transversely of said primary needles, and means co-operating with the primary needles to cause loops of said yarn to be passed through said covering, whereby said elastic strand may be locked to the fabric knitted by said knitting needles.

16. A machine for knitting ribbed elastic fabric having, in combination, a primary needle bed, a secondary needle bed, knitting needles on each of said beds, means to guide yarn to the primary needles, means to feed an elastic strand transversely of said primary needles, and means to cause said primary needles to carry loops of said yarn through said elastic strand.

17. A machine for knitting ribbed elastic fabric having, in combination, a primary needle bed, a secondary needle bed, knitting needles on each of said needle beds, means to

guide yarn to the primary needles, means to feed an elastic strand with a covering thereon transversely of said primary needles, and means to cause said primary needles to carry loops of yarn through said cover.

18. A machine for knitting ribbed elastic fabric having, in combination, a primary needle bed, a secondary needle bed, knitting needles slidably mounted on each of said needle beds, means to guide yarn to said primary needles, means to feed an elastic strand comprising a core of rubber and a covering of yarn thereon transversely of said primary needles, and means to cause said primary needles to carry loops of yarn through said covering.

19. A machine for knitting ribbed elastic fabric having, in combination, a primary cylindrical needle bed, a secondary dial needle bed, knitting needles slidably mounted on each of said needle beds, means to guide yarn to the primary needles, means to feed an elastic strand and a covering thereon transversely of said primary needles, and means co-operating with the primary needles to cause loops of said yarn to be passed through said covering, whereby said elastic strand may be locked to the fabric knitted by said knitting needles.

20. A machine for knitting elastic fabric having, in combination, a needle cylinder, knitting needles mounted thereon, means to impart a reciprocatory motion to the knitting needles, means to guide yarn to the needles, means to feed an elastic strand with a covering thereon to said needles beneath the points of the hooks thereof when in their advanced position, whereby said covering may be pierced by the hooks on the return movement of the needles, and a rotary guide roll positioned adjacent the tops of said needles and adapted to guide said strand over the tops and to the rear of said hooks while the pierced portion of said covering and the knitted loops of the last course of said fabric are within said hooks.

21. A machine for knitting elastic fabric having, in combination, a needle cylinder, knitting needles mounted thereon, means to impart a reciprocatory motion to the knitting needles, means to guide yarn to the needles, means to feed an elastic strand with a covering thereon to said needles beneath the points of the hooks thereof when in their advanced position, whereby said covering may be pierced by the hooks on the return movement of the needles, and a rotary guide roll positioned adjacent the tops of said needles and adapted to guide said strand over the tops and to the rear of said hooks while the pierced portion of said covering and the knitted loops of the last course of said fabric are within said hooks and whereby, upon a subsequent reciprocatory motion of said needles, loops of another course may be carried through the pierced portion of said covering and the knitted loops of the last course and the elastic strand thereby locked to the knitted fabric.

In testimony whereof I have hereunto set my hand.

OLIVER H. WALTON.