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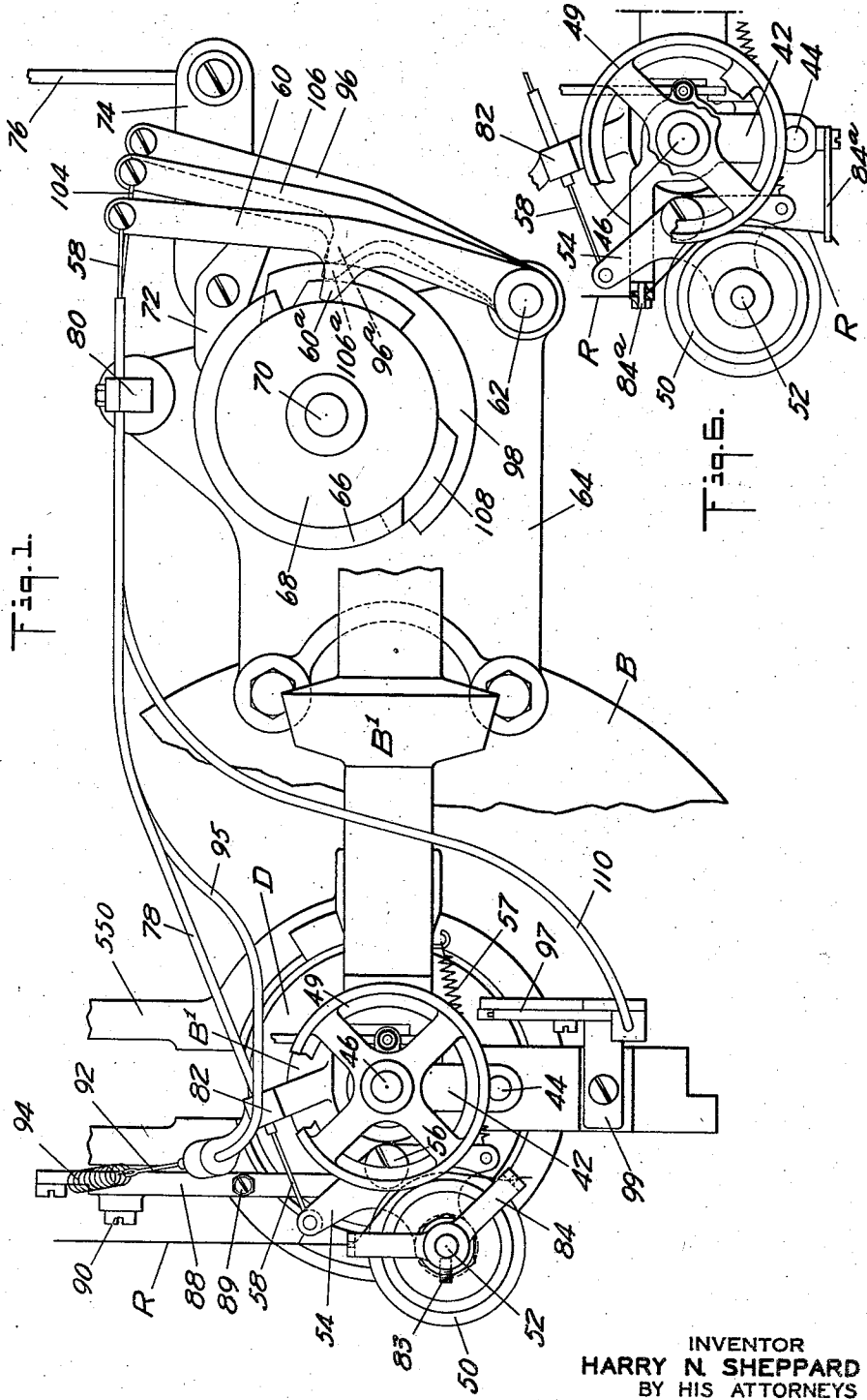
H. N. SHEPPARD

2,087,820

MACHINE FOR KNITTING FABRIC WITH RUBBER INLAY

Filed Dec. 11, 1935

3 Sheets-Sheet 1



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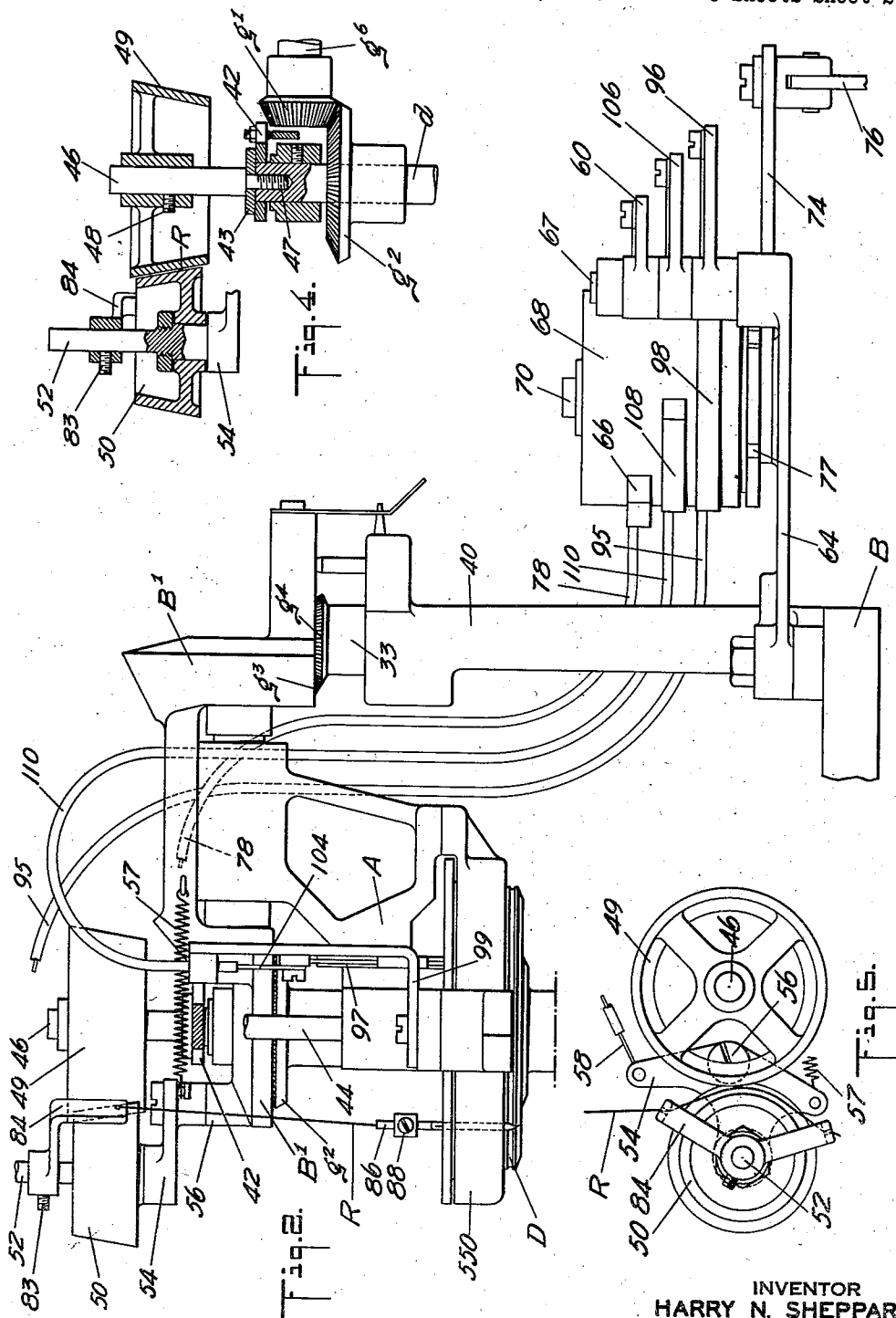
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3 Sheets-Sheet 2



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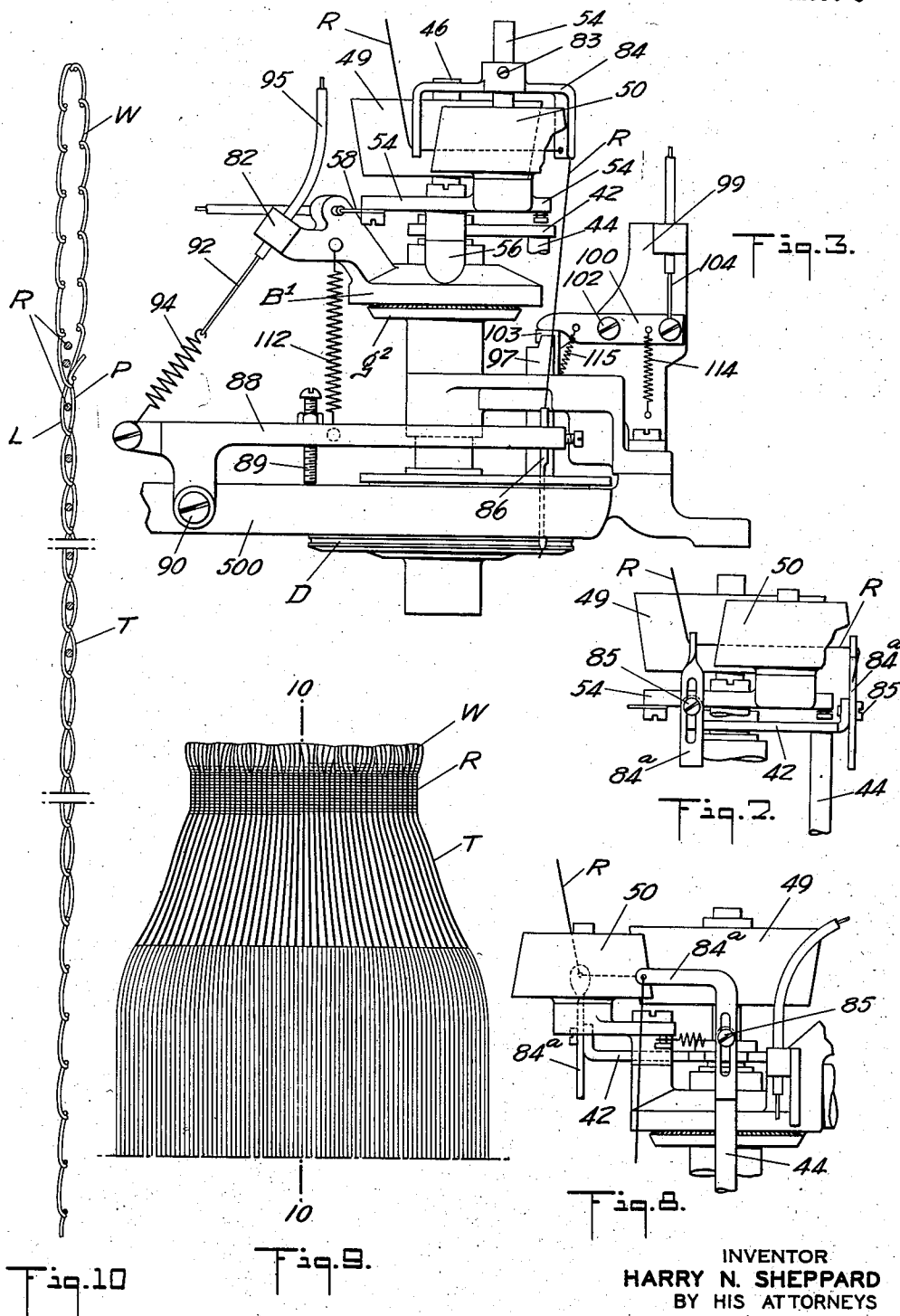
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MACHINE FOR KNITTING FABRIC WITH RUBBER INLAY

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3 Sheets-Sheet 3



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2,087,820

MACHINE FOR KNITTING FABRIC WITH RUBBER INLAY

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Application December 11, 1935, Serial No. 53,965

12 Claims. (Cl. 66—9)

This invention relates to a knitted fabric having a rubber thread inlaid therein and to means for supplying a rubber thread to knitting machines and more particularly to positively driven means for drawing a rubber thread from a cone or spool and it is an object to provide an improved fabric of the type described and an improved thread drawing means of such construction that the rubber thread may be drawn from the supply to be fed at a substantially uniform rate for a number of courses and the feeding then stopped and it is a further object of this invention to provide a positively driven thread drawing means so arranged that the thread is not chafed or rubbed when it is not being fed to the machine.

In the drawings—

Fig. 1 is a plan view of a Scott & Williams circular knitting machine equipped with a rubber thread drawing means in accordance with this invention, parts being broken away to show other parts more clearly and the rubber thread drawing means being shown in operative position;

Fig. 2 is a view in elevation of the head of the knitting machine shown in Fig. 1;

Fig. 3 is a view in elevation of the machine shown in Figs. 1 and 2 looking from the left in Fig. 2;

Fig. 4 is a fragmentary view in vertical section taken through the drawing rolls;

Fig. 5 is a top plan view of the rubber thread drawing rolls shown in Figs. 1 to 4, the rolls being shown in inoperative relation;

Fig. 6 is a top plan view of a thread drawing means of modified construction;

Figs. 7 and 8 are views in elevation, taken at right angles to each other, of the rubber feeding means of Fig. 6;

Fig. 9 is a plan view of a stocking top constructed in accordance with this invention; and

Fig. 10 is a sectional view taken on line 10—10 of Fig. 9 and drawn to a larger scale to show the relative positions of the fabric loops and rubber thread in the stocking of Fig. 9.

In the drawings the invention is shown applied to a circular machine for knitting ribbed hosiery having a welt such as is shown in the patent to Scott No. 1,641,101, August 30, 1929. The machine shown comprises a dial D, the needles of which cooperate with the needles of the needle cylinder, not shown, in knitting the ribbed fabric. The dial D is supported by a shaft *d* having a slidable driving engagement with a bevelled gear *g*² which meshes with a bevelled gear *g*¹ fixed on an end of a shaft *g*⁶ journaled in a bracket A

supported from the latch guard ring 550. A bevelled gear *g*³, fixed on the other end of the shaft *g*⁶, meshes with a bevelled gear *g*⁴ fixed on a shaft 33 which extends through a vertical bearing bracket 40 to mesh with a gear, not shown, mounted upon the main drive shaft of the machine so that the dial D is driven in synchronism with the needle cylinder. The bevelled gears are protected by a housing B¹ secured to the bracket A. The bevelled gear *g*² is rotatably supported upon an extension of the bracket A and the shaft *d* is reciprocated vertically with respect to the gear *g*² to vary the position of the dial by means of an arm or a plate 42 which engages a shoulder or projection at the top of the shaft *d* and extends outwardly to be engaged by a push rod 44 which is operated from a pattern drum by suitable means. Mounted in the upper end of the shaft *d* so as to form an extension thereof and be driven therewith is a shaft portion 46 having an end thereof reduced and screw threaded, as at 47, to engage in a correspondingly threaded opening in the end of the shaft *d* and forming with the main portion of the shaft extension 46 a shoulder which serves as a seat for a washer 43 which is engaged by the arm or plate 42 which raises the shaft *d* and dial D.

Fixed on the shaft *d*, as by a set screw 48, is a tapered roll 49 which, through its connection with the shaft *d*, is driven continuously while the machine is in operation. Cooperating with the roll 49 is a reversely tapered roll 50 rotatably supported upon an upright bearing pin 52 mounted in an arm of a bell-crank lever 54 which is pivotally supported upon a stud 56 projecting upwardly from the gear housing B¹. The lever 54 is so positioned and shaped that movement of the lever 54 on its pivot on the stud 56 moves the roll 50 toward or away from the roll 49. A spring 57 connected to a projection from the lever 54 and to a distant point of the housing B¹ tends to hold the lever 54 in a position which causes the rolls 50 and 49 to engage. To operate the lever 54 to disengage the roll 50 from the roll 49 a Bowden wire 58 is connected from the end of the other arm of the lever 54 to an end of a lever 60, the other end of which is pivotally mounted upon a stud 62 carried by a plate or bracket 64 supported from the bed plate B. The Bowden wire 58 is inserted in a protective tube 78 which is secured in a bracket 80 fixed on the plate 64 and in a bracket 82 fixed on the gear housing B¹. The lever 60 is formed with a projecting cam 60^a positioned to be engaged by a cam 66 upon a pattern drum 68 which is rotatably mounted upon a stud

70 also mounted upon a plate 64. The pattern drum 68 is operated by means of a pawl 72 pivotally mounted upon a lever 74 which is pivoted upon the stud 70 beneath the pattern drum 68 and has its free end connected by a link 76 to a suitable operating part of the machine so that by a reciprocation of the lever 74 pawl 72 is brought into engagement with ratchet teeth 77 on the lower portion of the pattern drum 68 to shift the drum 68 in a counter-clockwise direction.

Fixed on the bearing pin 52 by a set screw 83 is a bracket 84 having arms extending outwardly and downwardly at opposite sides of the roll 50, the angle between the oppositely disposed arms being less than 180 degrees. Adjacent the lower ends of the arms of the bracket 84 the arms are perforated providing guide openings for a rubber thread R which rubber thread extends from a suitable source of supply through one arm of the bracket 84, thence between the engaging faces of the rollers 50 and 49, through the other arm of the bracket 84 and downwardly from the bracket 84 to a guide tube 86 adjustably mounted in the arm 88. Mounting the guide bracket 84 for the rubber thread on the bearing pin 52 with the roll 50 causes the rubber thread to be moved with the roll 50 away from the positively driven roll 49 and the set screw 83 permits of adjusting the position of the guide bracket 84 with respect to the rolls 50 and 49 in order that the rate of feed of the rubber thread and the tension thereon in the finished garment may be adjusted.

The lever 88 which supports the rubber thread guide 86 is pivotally mounted, as at 90, on the latch guard ring 550. To an end of the lever 88 there is connected one end of a Bowden wire 92 by means of a spring 94, the other end of the Bowden wire being connected to the outer end of a lever 96 which is pivotally mounted on the stud 62 on the plate 64. For its operation the lever 96 is provided with a cam 96^a which is engaged by a cam 98 on the pattern drum 68. The Bowden wire 92 also extends through a flexible cover 95 which is held by the bracket 80 on the plate 64 and by an arm of the bracket 82 on the gear housing B¹. An adjustable screw 89 limits the downward movement of the lever 88 by engagement with the ring 550.

To cut the rubber thread when it is withdrawn from the fabric and to clamp it while it is not being fed there is provided a cutter and clamp mechanism 97 which may be of any usual or suitable construction, which cutter and clamp mechanism is mounted on an angle bracket 99 fixed to the latch guard ring 550. To operate the cutter and clamp mechanism a lever 100, pivotally mounted on the bracket 99 as at 102, has an end thereof positioned to engage the upper end of the plunger 103 of the cutter and clamp mechanism 97 and its opposite end connected to one end of a Bowden wire 104. The opposite end of the Bowden wire 104 is connected to the outer end of a lever 106, the other end of which is pivotally mounted upon the stud 62 carried by the plate 64. For its operation the lever 106 is provided with a cam 106^a which cooperates with a cam 108 on the pattern drum 68. As with the other Bowden wires the Bowden wire 104 is protected by a cover 110 which is mounted in the bracket 80 on the plate 64 and on the bracket 99.

The apparatus above described is arranged for introducing a rubber thread during the knitting of the welt and for continuing to supply it during the knitting of a portion of the ribbed top,

the timing of the machine being such that the pattern drum 68 is operated to position the cams thereon to release the lever 60 and engage the levers 106 and 96 so that the roll 50 is drawn into engagement with the roll 49 by the spring 57 to draw the rubber thread from the cone and to feed it to the rubber thread guide 86; the lever 88 is operated against the action of the spring 112 to lower the rubber thread guide 86 to a position such as shown in Figure 3 in which the thread guide extends downwardly below the needles of the dial so as to deliver the rubber thread in back of the cylinder needles and below the dial needles; and to operate the cutter and clamp mechanism against the action of springs 114 and 115 to release the rubber thread as the feed of the rubber is started and the arm 88 is positioned to deliver the rubber thread. This operation takes place one or more courses before the completion of the welt and the rubber thread may be taken by one of the needles which is inactive during the knitting of the welt and which is raised to take the yarn as shown in the application of Page, Page and Sheppard, Serial No. 13,328, filed March 27, 1935, or the rubber thread may be taken by an active needle. The rubber thread being placed behind the cylinder needles it is not knit in by the needles or engaged by the loops of the fabric of the welt and upon completion of the welt and the starting of rib knitting for the knitting of the stocking top the rubber thread is in position to be engaged between the loops of the plain and ribbed wales of the fabric and to be held in position thereby. Feeding of the rubber continues for a plurality of courses during the knitting of the ribbed top whereupon the pattern drum 68 is operated to release the levers 96, 106 and to engage the lever 60 so that the roll 50 will be withdrawn from the roll 49 against the action of the spring 57; the spring 112 will raise the lever 88 and the thread guide 86 withdrawing the rubber thread and placing it in position to be engaged and cut and clamped by the cutter and clamp mechanism 96 as the plunger 103 is operated by the spring 115 and the lever 100 is returned by spring 114.

A stocking top as knit by this machine will have one or more turns of the rubber thread R lying between the front and back walls of the welt W as shown in Figure 10 and will have the rubber R lying between the rib wales L and plain wales P of the rib fabric top T. The rubber is continued as shown in Figures 9 and 10 for a plurality of courses of the ribbed fabric and gives a garter effect owing to the tension under which the rubber is supplied during the knitting of the ribbed fabric portion of the top.

In the arrangement as shown in Figures 1 to 5 the vertical adjustment of the dial for rib and plain knitting will make a slight change in the rate at which the yarn is fed owing to the movement of the roll 49 vertically with the dial while the guide arm 84 remains fixed. This change in rate of feed is very slight and makes but an inappreciable change in the tension at which the rubber is supplied. However, this change in the rate of feed of the rubber may be avoided, as shown in Figures 6, 7 and 8 wherein the arms 84^a which guide the rubber are adjustably mounted upon extensions of the plate 42 which serves to regulate the vertical position of the dial. By mounting the guide for the rubber thread in this way it is held in fixed relation with the drive roll 49 so that changes in the elevation of the

dial and the roll 49 make no change in the rate at which the rubber thread is fed.

The arms 84^a are so positioned, as shown in Figure 6, that upon movement of the roll 50 away from the roll 49 the elasticity of the rubber thread will carry the thread away from the continuously rotating roll 49 and thus prevent rubbing or chafing of the thread by the roll 49 when the rubber thread is not being fed to the machine. The adjustment of the arms 84^a permitted by the set screws 85 which secure these arms to the plate 42 permits of adjusting the rate at which the rubber thread is fed by the rolls.

What is claimed is:—

1. In a thread feeding device for knitting machines, thread drawing rolls and pattern controlled means controlling the relative positions of said rolls for starting and stopping the drawing of the thread by said rolls.

2. In a thread feeding device for knitting machines, thread drawing rolls and pattern controlled means for relatively displacing said rolls for operatively engaging said rolls with a thread and for stopping operative engagement of said rolls with the thread.

3. In a thread feeding device for knitting machines, thread drawing rolls and pattern controlled means for shifting said rolls relatively to engage and disengage said rolls to start and stop the drawing of the thread.

4. In a thread feeding device for knitting machines, a positively driven roller, a second roller movable toward and away from said first roller, means guiding a thread in contact with said second roller and pattern controlled means governing the engaging and separation of said rollers to control the drawing of the thread.

5. In a thread feeding device for knitting machines, a positively driven roller, a second roller movable toward and away from said first roller, means guiding a thread for driving engagement between said rollers and pattern controlled means for shifting said second roller to and from said first roller to control the drawing of the thread.

6. In a knitting machine, a yarn guide, means for operating said yarn guide for presenting a thread, rolls for drawing thread for said guide and pattern controlled means for adjusting the relative positions of said rolls to start the drawing of the thread when said guide is operated to present the thread.

7. In a knitting machine, a yarn guide for presenting and withdrawing a thread, rolls for drawing thread for said guide and pattern con-

trolled means for adjusting the relative positions of said rolls to start the drawing of the thread as said yarn guide presents the thread and for stopping the drawing of the thread as the yarn guide withdraws the thread.

8. In a knitting machine, a yarn guide for presenting and withdrawing a thread, rolls for drawing thread for said guide, a pattern drum, means controlled by said pattern drum for adjusting the relative positions of said rolls to draw thread as said guide presents the thread and for stopping the drawing of the thread as said guide withdraws the thread and cutter and clamp means for the thread controlled by said pattern drum to release the thread as said guide presents the thread and to cut and clamp the thread as said guide withdraws the thread.

9. In a circular knitting machine having a dial and a shaft for driving said dial arranged for movement vertically, a tapered thread drawing roll driven by said shaft and movable vertically with said dial and guide arms for maintaining the thread in a fixed position with respect to said thread feeding roll.

10. In a circular knitting machine having a dial and a shaft for driving said dial arranged for movement vertically, a tapered thread drawing roll driven by said shaft and movable vertically with said dial, guide arms for maintaining the thread in a fixed position with respect to said roll and means for varying the position of the thread with respect to said roll.

11. In a circular knitting machine arranged to knit a turned welt of plain fabric and a rib fabric top, a yarn finger for feeding a rubber thread, a positively driven roll means for delivering the rubber thread to the yarn finger and pattern controlled means operating said yarn finger to supply rubber thread during courses of the welt and the rib fabric top and for operatively engaging said roll means and thread upon operation of the yarn finger.

12. In a circular knitting machine arranged to knit a turned welt of plain fabric and a rib fabric top, a yarn finger for feeding a rubber thread during courses of the welt and the rib fabric top, feeding rolls supplying the rubber thread to said yarn finger and pattern controlled means controlling the feeding action of said rolls and the movements of the yarn finger to start and stop the drawing of the thread by said rolls upon presentation and withdrawal of the thread by said yarn finger.

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