Nov. 24, 1953 P. SCHMIDT 2,660,041

THREAD TENSION ARRANGEMENT FOR KNITTING MACHINES

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FIG. 1.

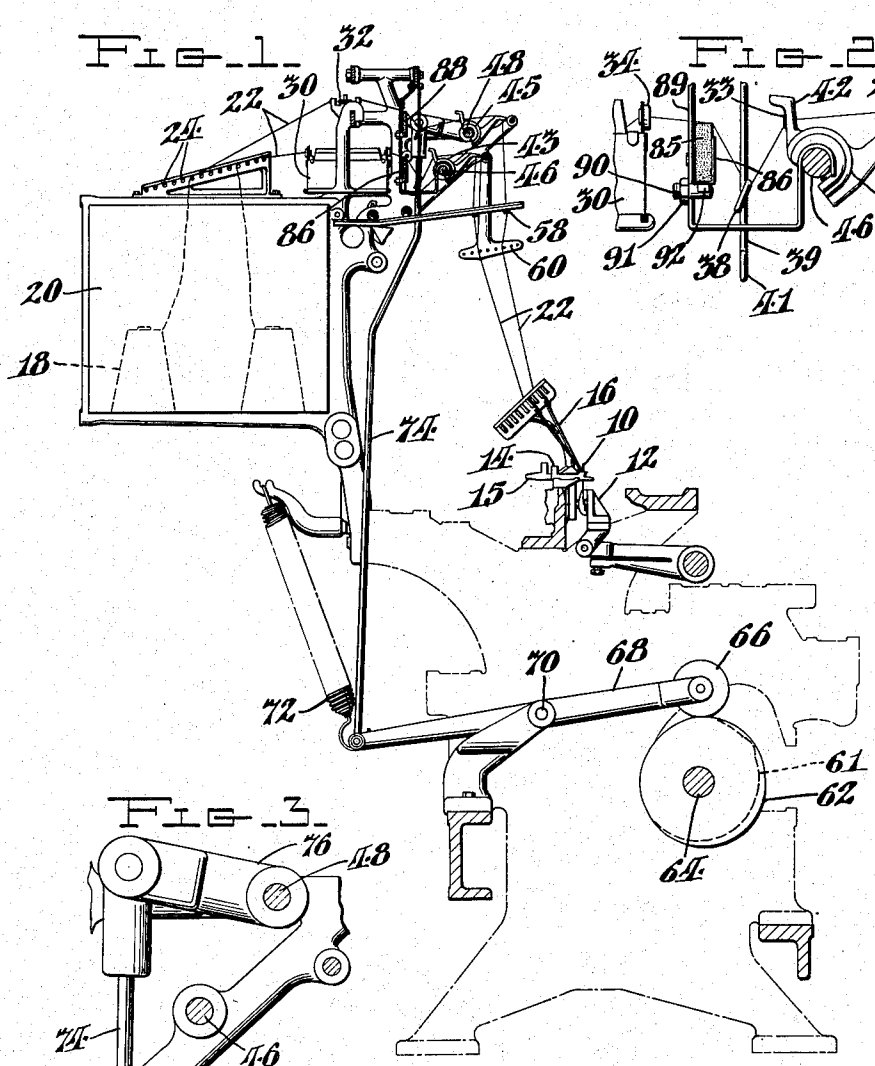
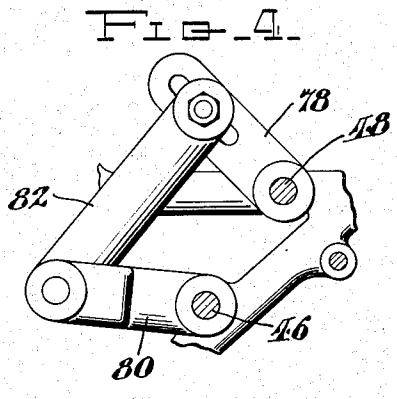


FIG. 2.

FIG. 3.

FIG. 4.



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FIG. 5.

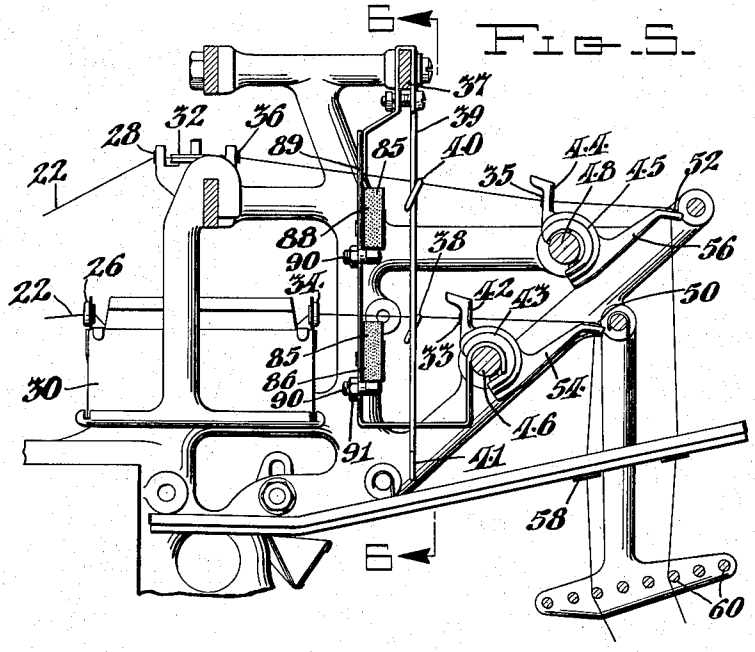


FIG. 6.

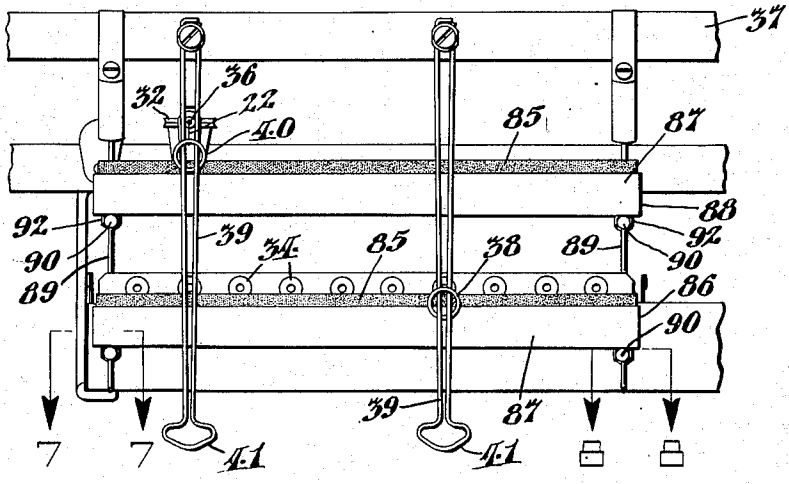


FIG. 7.

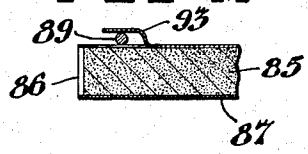


FIG. 8.



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THREAD TENSION ARRANGEMENT FOR KNITTING MACHINES

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Application December 22, 1950, Serial No. 202,219

7 Claims. (Cl. 66—146)

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The present invention relates to yarn tensioning means and more particularly to such means for maintaining the yarn taut to the needles of a full-fashioned knitting machine during operating periods of the needles in which no yarn is fed thereto.

In full-fashioned knitting machines, the yarn passes from supply cones or packages through various tensioning devices including a moistening trough, weighted rings and snapper devices to and through yarn carriers and to the needles of the machine, the tensioning devices applying sufficient tension on the yarn as it is fed to the sinkers of the machine by the carrier to form loops of the required size. The yarn carrier is stopped at the end of its yarn feeding movement and remains stationary while the new loops are divided and knitted into the fabric. The yarn carrier also remains stationary during narrowing cycles of the machine and during such periods in which the yarn carrier is stationary, the snapper devices and rings act to take up and maintain the yarn taut between the rings and the needles so as to form normal size loops at the outer selvage edges of the fabric knitted. However, when using the finer denier yarns and particularly the mono-filament "nylon" yarns, the rings instead of maintaining the yarns taut to the needles withdraw sufficient yarn from the supply packages to permit the rings to drop to a stop position at the lower end of the ring supports. With this condition the rings no longer function to take up the slack as the needles go through their knitting in and narrowing movements thereby resulting in abnormally loose selvage loops and ragged selvage edges.

It is accordingly an object of the invention to provide a means for overcoming the difficulty hereinbefore set forth.

It is another object of the invention to provide means applying a drag to the yarn between the yarn supply and the usual tensioning ring whereby the ring will function normally to take-up the slack in and maintain the yarn taut between the ring and the needles.

Still another object of the invention is to provide a simple and readily replaceable means for maintaining tension on the yarn to the needles when the yarn carrier is stationary.

With these and other objects in view, which will become apparent from the following detailed description of the illustrative embodiment of the invention shown in the accompanying drawings, the invention resides in the novel elements, features of construction and arrangement of parts in cooperative relationship as hereinafter more particularly pointed out in the claims.

In the drawings:

Figure 1 is a sectional elevation of a portion of a full-fashioned knitting machine having the invention applied thereto;

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Fig. 2 is a detail view of a portion of the mechanism of Fig. 1 and shown on an enlarged scale relative thereto;

Fig. 3 is a detail view of a portion of the mechanism of Fig. 1 and shown on an enlarged scale relative thereto;

Fig. 4 is a view similar to Fig. 3 showing further details of certain of the mechanism shown in Fig. 1;

Fig. 5 is a view of the upper portion of Fig. 1 on an enlarged scale relative thereto, parts being omitted for purposes of illustration;

Fig. 6 is an elevational view of a portion of Fig. 5 looking in the direction of the arrows 6—6 of Fig. 5;

Fig. 7 is a sectional view taken substantially on the line 7—7 of Fig. 6; and

Fig. 8 is a sectional view taken substantially on the line 8—8 of Fig. 6.

In the drawings and description, only the means necessary to a complete understanding of the invention are specifically set forth; further information as to the construction and operation of other related, usual and well known knitting machine elements, mechanisms, etc., may be found in one or more of the following publications:

1. Pamphlet entitled—Full-Fashioned Knitting Machines—published and copyrighted by the Textile Machine Works, Reading, Pennsylvania, in 1920.

2. Four catalogs entitled—The "Reading" Full-Fashioned Knitting Machine Parts Catalog—published and copyrighted by the Textile Machine Works, in 1929, 1935, 1940 and 1947, respectively.

3. Booklet entitled—The "Reading" High Production Full-Fashioned Knitting Machine—which, forming a supplement to the above noted 1940 Parts Catalog of the Textile Machine Works, is a publication of the Textile Machine Works, copyrighted by the latter in 1940.

4. Pamphlet entitled—Knitting Machine Lectures—published by the Wyomissing Polytechnic Institute, Wyomissing, Pennsylvania, in 1935.

In a machine having the invention applied thereto, a usual yarn carrier is employed for laying yarn to the needles and the yarn supply for the carrier is in the form of a cone or other convenient package in a yarn box from which the yarn passes over a guide rod and thence either to and through a moistening trough, if the yarn is to be moistened before being knitted or above the moistening trough if it is not to be moistened. Certain tensioning means are usually provided in the moistening trough for yarn passing therethrough and tensioning means in a comparable location is provided also for yarn by-passing the moistening box. In either case, the yarn passes forward horizontally toward the yarn carrier from said tensioning means through a ring whose

weight is supported by the yarn at least as long as yarn is being drawn by the yarn carrier. From the ring the yarn passes also generally horizontally forward through a pair of guide eyes in an oscillatory snapper device and then downwardly through fixed guide means to the yarn carrier the various elements through and over which the yarn passes providing a predetermined tension in the yarn at the time it is fed or laid to the needles to form the required size loops. With this arrangement, the normal function of the ring is to take up the slack in the yarn between the moistening trough and the needles when the carrier comes to a stop between yarn feeding strokes and during narrowing cycles of the machine. However, in many instances, and particularly where the finer gauge mono-filament "nylon" yarns are used, the tension in the yarn between the ring and the yarn supply is less than the tension in the yarn between the ring and the needles. Under these conditions the ring, instead of taking up the slack in the yarn to the needles, withdraws sufficient yarn from the yarn supply to permit the ring to drop to a fixed position at the lower end of the ring support whereby the normal function of the ring is lost. In accordance with the invention, this difficulty is avoided by providing a means adapted under certain circumstances to tension the yarn at a point between said tension ring and the yarn package and under other circumstances to be inactive or inoperative as to applying tension to the yarn. Said last means is arranged so that it does not apply additional tension to the yarn when the yarn carrier is laying yarn to the needles but will act to increase the drag on the yarn only when the carrier is stationary and the ring has caused the yarn to sag from its highest position.

Referring to the drawings in detail, there is shown in Fig. 1 a needle 10 of a row of needles held on a needle bar 12 of a full-fashioned knitting machine. Sinkers 14 and dividers 15, cooperate with the needles in forming loops of knitted fabric by pushing yarn between the stems of the needles in the usual manner. The yarn or yarns on which the sinkers, dividers and needles operate is or are laid by means of a yarn carrier or yarn carriers 16 of which each full-fashioned machine may have as many as nine per knitting section and which are reciprocated in a path parallel to the needle row. Yarn is supplied to each yarn carrier from a yarn package such as one of cones 18 mounted in a yarn box such as 20. From each of the cones 18 or other suitable yarn packages a yarn 22 passes upward around one of rods 24 and thence forward through eyelets 26 or 28 best shown in Fig. 5. Eyelets 26 guide certain of the yarns 22 to tensioning and moistening means of known form inside a moistening box or trough 30 while eyelets 29 guide others of the yarns 22 beneath tensioning plates one of which is shown at 32. From the tensioning means in box 30 and the one comprising plate 32, the yarns pass respectively through guide eyelets 34 and 36 and thence through tensioning rings 38 and 40 respectively. These rings are guided to move in vertical lines on supports 39, mounted in fixed position on a member 37 carried on the machine frame. Each support 39 is provided with a portion 41 forming a stop for a ring when no yarn passes through the ring or when the carrier for the yarn is idle and no tension required on the yarn. The yarns pass from the rings through guide eyelets 33 and 35 in arms 42 and 44 respectively of snapper devices 43 and 45, respectively, mounted on oscillatory shafts 46 and 48, respectively. From the eyelets 33 and 35 in arms 42 and 44, the yarns pass to eyelets 50 and 52 in arms 54 and 56 respectively which also form parts of the snapper devices 43 and 45 on shafts 46 and 48. The eyelets 50 and 52 are set to cause the yarn to turn from a substantially horizontal position to a substantially vertical position. From eyelets 50 and 52 the yarns pass downwardly through guide means such as eyelets 58 and over rods 60 and thence to the yarn carriers 16.

As shown in Fig. 1, means for oscillating shafts 46 and 48 and thereby the snapper arms thereon comprises cams 61 and 62 on a main cam shaft 64 of the machine, cam 61 acting during knitting cycles and cam 62 acting during narrowing cycles of the machine. A cam follower 66 is mounted for rotation at one end of a lever 68 pivotally mounted at 70 on the frame of the machine, the other end of lever 68 having a tension spring 72 attached thereto so as to hold the cam follower 66 in contact with the cams 61 or 62. Near its point of attachment to spring 72, lever 68 is pivotally connected to a link 74 which is pivotally connected to a lever arm 76 which is fixed to shaft 48, as shown in Fig. 3, whereby the end of arm 76 is lifted each time cam 61 or 62 presents a high spot to follower 66 and shaft 48 thereby is turned in a clockwise direction as viewed in Figs. 1 and 5. Spring 72 causes shaft 48 to turn counterclockwise as follower 66 moves from a high to a low spot on the cams. In order that shaft 46 may be turned correspondingly to shaft 48, shaft 48 has a second lever arm thereon shown at 78. Arm 78 is shown in Fig. 4 as connected to a lever arm 80 by a link 82, arm 80 being fixed to shaft 46 so that shafts 46 and 48 turn together.

In accordance with the invention, devices 86 and 88 are provided, device 86 cooperating with the yarns 22 passing through the moistening trough 30 and device 88 cooperating with the yarns 22 passing beneath the tension plates 32, as hereinafter set forth. Devices 86 and 88 comprise a felt strip or block 85 carried in a receptacle 87 of substantially U-shape, as shown in Figs. 2, 5 and 6, the receptacles being supported by bolts 90 on hangers 89. As shown in Fig. 5, one end of each hanger 89 is carried on the member 37 and the other end thereof is formed to fit over and be supported on the shaft 46. The bolts 90 are slotted to receive the hangers 89 and are adjustably secured to the hangers by nuts 91. The receptacles 87 are maintained in predetermined relation on the hangers 89 by wing projections 92 formed on the receptacles to fit over the bolts 90, Figs. 6 and 8, and by projections 93 also formed on the receptacles to fit around the hangers, as shown in Figs. 5 and 7. With this arrangement, the devices 86 and 88 may be readily adjusted on the hangers 89 to vary the drag applied to the yarns 22 and the receptacles 87 are readily removable to clean or replace the felts 85.

In operation, when a yarn carrier 16 is moving parallel to the row of needles 10, the carrier draws the yarn 22 from its cone 18 with sufficient tension in the yarn, due to the drag provided by the plate 32 or an equivalent means in the trough 30, to lift the ring 38 or 40 to the position shown in Fig. 5 and in which the yarn extends in a substantially straight line from the eyelet 34 or 36 to the eyelets 33 and 35 in the arms 42 and 44

of the snapper devices 43 and 45, respectively. In this condition, the yarns freely pass above and out of contact with the felt strips 85 of the devices 86 and 88. However, when the carrier is stationary during the loop forming movement of the needles the snapper devices 43 and 45 are turned in a counterclockwise direction by the action of the cam 61 which gives a tug to the yarn to remove any slack in the yarn between the needles and the eyelets 50 and 52 of the snapper devices, the rings 38 and 40 immediately dropping by gravity to take up the slack. As the rings 38 and 40 drop, the yarn portion extending between the ring 38 and the eyelet 34 in the trough 30 is drawn into engagement with the felt strip 85 of the device 86, as shown in Fig. 2, the felt strip acting as a brake resisting withdrawal of yarn from the yarn supply side of the ring, and the ring thereby acting to hold the yarn taut to the needles. The ring 40 acts in like manner to draw the yarn against the felt strip 85 of the device 88 thereby resisting withdrawal of yarn from the supply side of the ring. The rings 38 and 40 thereby function to maintain the yarn taut to the needles throughout the loop forming movement of the needles in each knitting cycle. Likewise, the rings 38 and 40 act to maintain the yarn taut to the needles during narrowing cycles of the machine, the rings being assisted by slight tugging movements of the snapper devices 43 and 45 through the action of the narrowing cam 62. Therefore, during both knitting and narrowing movements of the needles in which the carriers 16 remain stationary, the felt strips 85 resist withdrawal of the yarns from the yarn supplies and thereby permit the rings 38 and 40 to function in a normal manner to take up and maintain the yarn taut to the needles resulting in the formation of normal size selvage loops in the next knitted course.

Of course, the improvements specifically shown and described by which I obtain the above results, can be changed and modified without departing from the invention herein disclosed and hereinafter claimed.

What I claim is:

1. In a full-fashioned knitting machine, means for supplying yarn, a snapper arm through an aperture in which the yarn passes to a yarn carrier, a tensioning ring through which the yarn passes on its way to the snapper aperture and a tensioning device on the yarn supply side of the said ring and which is out of contact with the yarn when the yarn is under maximum tension but which contacts the yarn when the yarn tension slackens to cause the ring to maintain a tension on the yarn at the delivery side of the yarn carrier.

2. In a full-fashioned knitting machine, means for tensioning yarn between a yarn supply and a yarn carrier comprising a freely floating tensioning ring through which the yarn passes to said yarn carrier, a block beneath the yarn on the far side of said ring from the carrier and composed of material adapted to place a drag on the yarn when in contact therewith, and guide means for the yarn acting to hold it free of said block when under sufficient tension to hold the ring at its highest level but permitting the yarn to sag at times against said block when such tension is relieved.

3. In combination with a yarn feeding system, a tensioning ring guided for free vertical motion and through which a yarn passes from a yarn supply to a fabric being knitted, members one on each side of the line of movement of said ring and forming guides through which yarn passes to and from said ring and a tensioning device between the vertical line of movement of said ring and the yarn supply, said ring being adapted to draw the yarn into contact with said tensioning device to produce drag on the yarn to cause a tension in the yarn equal to at least half of the weight of the ring.

4. In a knitting machine, a yarn tensioning means comprising a freely movable tensioning ring guided for vertical movement and through which a yarn is threaded in use and a friction device arranged to be free of the yarn when the ring is in its topmost position but adjustable to a position in which it contacts and places a drag on the yarn when the weight of the ring causes the yarn to sag.

5. In combination with a yarn feeding system for a knitting machine, a tensioning device comprising a part having a high coefficient of friction with respect to the yarn, a bolt on which said part is supported and a vertical wire-like support for said bolt, said bolt having a slot at its threaded end to receive said wire-like support, and a nut on said bolt to clamp the wire-like support against the end of said slot.

6. In a knitting machine, in combination with a system for feeding yarn from a supply to the needles of the machine to form knitted loops, a ring guided for free vertical movement through which the yarn passes, said ring being adapted to drop by gravity from a position controlled by the yarn during feeding thereof to a position to take-up slack in the yarn, guide means for the yarn between the ring and supply, guide means for the yarn between the ring and needles, said guide means and ring applying a predetermined tension to the yarn as it is fed to the needles and means between the supply and ring normally out of engagement with the yarn during feeding thereof to the needles and adapted to be engaged by the yarn when the ring drops in its take-up action to thereby increase the tension on the yarn between said supply and ring.

7. In a full-fashioned knitting machine, means for supplying yarn, a tensioning ring guided for vertical movement, a yarn guide between said yarn supply means and said ring, a second yarn guide between said ring and knitting instrumentalities of the machine, said yarn passing through said first guide, said ring and said second guide and means having a high coefficient of friction with respect to the yarn supported between said first mentioned yarn guide and said ring and below the straight line path between said guides to exert a drag on said yarn when said yarn is drawn into contact therewith by downward movement of said ring.

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