July 30, 1940. J. E. GARRETT 2,209,398

YARN TENSION DEVICE FOR KNITTING MACHINES

Filed May 12, 1938

Fig. 1

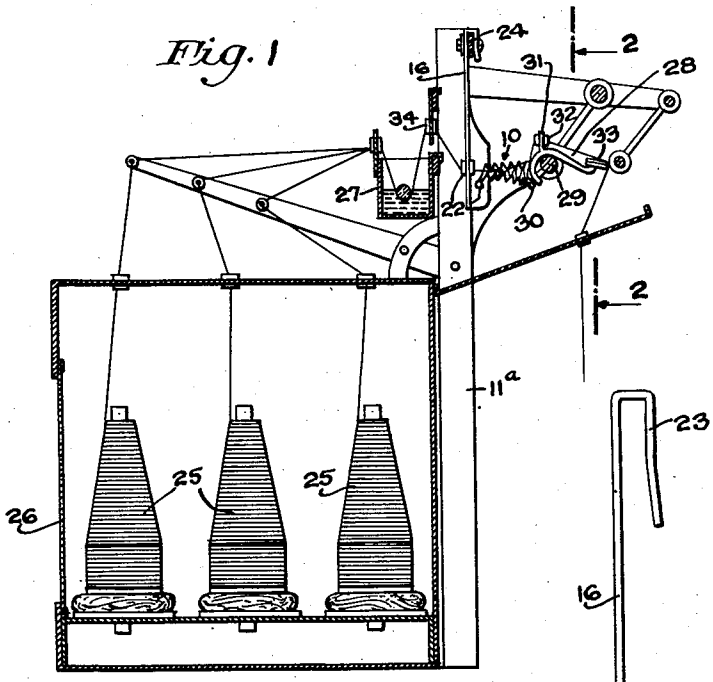


Fig. 2

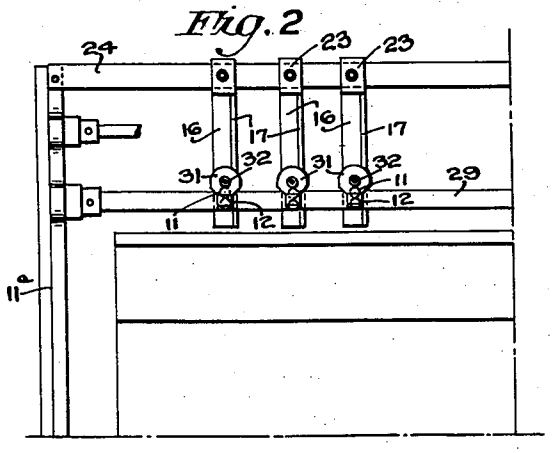


Fig. 3

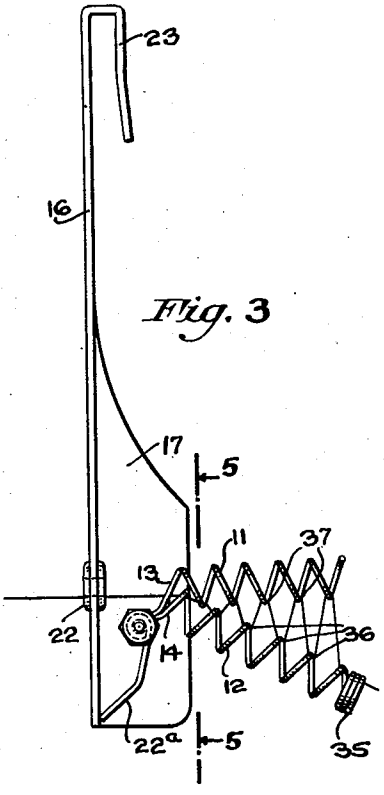


Fig. 4

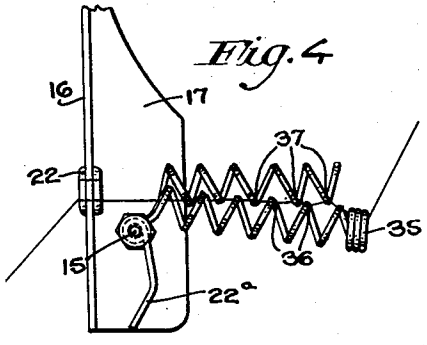
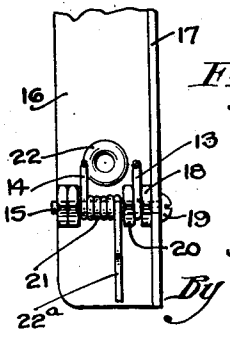


Fig. 5



Inventor:
JOSEPH EARNEST GARRETT
By Leon Edelson
Attorney.

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YARN TENSION DEVICE FOR KNITTING MACHINES

Joseph Earnest Garrett, Philadelphia, Pa., assignor to Artcraft Silk Hosiery Mills, Inc., Philadelphia, Pa., a corporation of Delaware

Application May 12, 1938, Serial No. 207,476

1 Claim. (Cl. 242—153)

This invention relates to improvements in knitting machines and more particularly to an improved yarn tensioning mechanism for insuring even tension of the yarn as it is laid across the noses of the sinkers and dividers of the knitting machines.

As is well appreciated in the knitting art, particularly in the full-fashioned hosiery art, correct yarn tension is an important factor in the production of loops of uniform size and shape and in the formation of a perfect selvedge along the longitudinal edge of the knitted stocking blank. It frequently occurs that during the process of knitting the stocking fabric, especially when the yarn carrier rod strikes its end stop at the completion of its stroke in a given direction, the tension of the yarn is so disturbed as to result in the production of an irregularly formed and unsightly selvedge. Also, during the narrowing process, unless the tension on the yarn is properly maintained, the loops may be dropped from the narrowing points with the result that the knitted fabric is spoiled.

In addition to the foregoing, difficulties have been encountered due to the natural tendency of the yarn, particularly when composed of silk, to curl and twist to form what are known as "snarls" in the yarn, which interfere with the proper knitting operations and render the fabric so unsightly that it must be rejected as irregular.

It is among the objects of the present invention to provide a yarn tensioning mechanism which obviates the aforementioned difficulties, which insures the constant maintenance upon the yarn of the requisite tension, which automatically takes up the slack in the yarn whenever the knitting operation is interrupted, as when the yarn carriers reverse in their directions of movement, and which maintains sufficient tension upon the yarn during the narrowing process as to prevent the loops being displaced from the narrowing points.

A further object of the invention is to provide a yarn tensioning device which not only insures the constant maintenance of requisite tension on the yarn to thereby produce loops identical in shape and size, but which also serves to smooth out of the yarn all such curls and twists which ordinarily result in the formation of snarls in the knitted fabric.

Other objects of the invention will appear more fully hereinafter.

The invention consists substantially in the combination, construction, location and relative arrangement of parts, all as will appear more fully hereinafter, as shown in the drawing, and as finally pointed out in the appended claim.

In the accompanying drawing:

Figure 1 is a side elevational view of a portion of a knitting machine equipped with the yarn tensioning device constructed in accordance with and embodying the principles of the present invention;

Figure 2 is a front elevational view thereof;

Figure 3 is a side elevational view of the yarn tensioning device per se, showing the position assumed by it when the knitting operation is interrupted;

Figure 4 is a similar view showing the position assumed by the tensioning device during the knitting operation; and

Figure 5 is a front elevational view of a portion of the device shown in Figure 4.

Referring now more particularly to the drawing, it will be observed that the yarn tensioning mechanism of the present invention, designated generally by the reference numeral 10 in Figure 1, is shown incorporated in a knitting machine 11[a], only so much of the latter being illustrated as is deemed necessary for a clear understanding of the construction and operation of the yarn tensioning mechanism. It will be understood, of course, that the latter mechanism may be incorporated in any of the conventional knitting machines, it being particularly adapted for installation in and as part of the flat-bed full-fashioned type of knitting machines such as are conventionally employed in the production of full-fashioned hosiery. These knitting machines are usually provided with yarn-tensioning devices suitably located between the source of yarn supply and the knitting head of the machine and generally embody an intermittently operated yarn tension device, commonly known as a "snapper," and operating cams for automatically actuating the snappers to provide for proper tensioning of the yarn while the yarn carriers are being moved across the knitting field, particularly during the narrowing operations. The snappers heretofore employed as yarn tensioners have been in the form of cast metal fixed elements fitted with porcelain eyes and having operatively associated therewith leaf springs which press upon the yarn as the latter passes through the porcelain eyes to produce the required yarn tension. In addition, these conventional yarn tensioning devices or snappers have had operatively associated therewith a ring tension device generally embodying a ring loosely fitted upon a vertically disposed rod or holder therefor in such manner that

when the yarn was projected through the ring the latter was free to drop by gravity along its supporting rod to take up the slack between the source of yarn supply and the snapper.

As will presently appear, the yarn tensioning mechanism of the present invention eliminates these snappers, their operating cams and the ring tension assembly operatively associated therewith and in lieu thereof employs an exceedingly simple and inexpensive arrangement of elements which are automatically self-operative to insure the maintenance of a constant tension upon the yarn at the same time that they operate automatically to take up the slack in the yarn between the point where the yarn enters the knitting machine in advance of the tensioning device and the point where it enters the knitting field to be formed into loops.

As appears most clearly in Figures 3 to 5, inclusive, the yarn tensioning device of the present invention includes a pair of helical wire coils 11 and 12 each formed with the convolutions thereof spaced well apart. The inner ends 13 and 14 of these helical coils are secured to a common supporting pin 15 carried by a suitable bracket 16 adapted to be fixedly attached to the upper frame of the knitting machine 11a. Preferably, this supporting bracket 16 is provided with a forwardly projecting flange 17 to which the pin 15 is secured in any suitable manner, as by a nut 18 threaded upon the threaded shank 15 of the pin to clampingly engage the bracket flange 17 between it and the head 19 of the pin. The rear extremity 13 of the helical coil 11 is clamped between said nut 18 and a second locking nut 20 to immovably secure the helical coil 11 in the position shown, while the rear extremity of the coil 12 is loosely mounted upon the pin 15, as at 21, in such manner as to permit the coil 12 to move freely about said pin 15 as an axis. In order to limit the downward movement of the coil 12, the rear or inner extremity thereof is provided with a free extension 22a which is adapted to abut against and engage the base plate of the bracket 16 (see Figure 3).

The coil 12 is thus relatively movable with respect to the coil 11. In addition, these coils are so mounted relatively to each other that the longitudinal axes thereof lie in a common vertical plane, the convolutions of the coils being relatively so arranged that when the lower coil 12 is moved upwardly from the position shown in Figure 3 into that shown in Figure 4 the convolutions of one coil respectively nest within the spaces between the proximate convolutions of the other coil. In order to eliminate any possibility of interference between convolutions of the juxtaposed coils such as would prevent free movement of the coil 12 relatively to the coil 11, the convolutions of the two coils are spirally wound in opposite directions. Secured in the vertically disposed base plates of the bracket 16 is a porcelain eye 22 the opening through which is in substantial coaxial alignment with the longitudinal axis of the stationary upper coil 11. The upper extremity of the bracket is reversely bent, as at 23, to provide a hook-like support by which the bracket 16 may be suspended from the upper longitudinally extending bar 24 of the knitting machine frame.

It will be understood, of course, that a tensioning unit such as is shown in Figures 3 and 4 is employed in conjunction with each yarn carrier of the knitting machine, the yarn being delivered from its source of supply to and through the tensioning device and thence to the yarn carrier. As appears in Figure 1, the yarn is delivered from its source of supply, namely, the bobbin 25 disposed within a conventional humidifier 26 located to the rear of the knitting machine to and through the usual moistening trough 27, thence through the coils 11 and 12 of the tensioning device (see Figure 4) and thence over a suitable yarn guiding bracket 28 from which the yarn is finally delivered to the knitting head of the machine. The yarn guiding bracket 28, one of which is provided for each coiled wire tensioning device, is mounted upon a fixed element of the knitting machine frame such as the bar 29, the bracket 28 being adapted to be fixed in angularly adjusted position upon said bar 29 by means of a set screw 30. This bracket 28 is provided with an upstanding lug 31 which is fitted with a porcelain eye 32 while its outer or forward free extremity is fitted with a porcelain shoe 33. The yarn, as it emerges from the moistening trough 27, passes through a porcelain eye 34 and thence through the porcelain eye 22 of the tensioning device from whence it is threaded through the bores of the coiled wire elements 11 and 12. Upon emergence from these latter elements, the yarn is fed through the porcelain eye 32 and thence over the porcelain shoe 33 of the bracket 28 from whence it is delivered to the knitting head of the machine.

In threading the yarn through the coiled wire elements 11 and 12, the coil 12 is lifted upwardly with respect to the coil 11 so that the convolutions of one coil overlap or nest with the convolutions of the other with the result that the bores of the two coils are brought into substantial registry one with the other. The yarn may then be threaded commonly through the registering bores of the coils 11 and 12. Upon release of the coil 12 so that it drops into the position shown in Figure 3, the yarn will be found to be interlaced between the proximate convolutions of the separated coils 11 and 12. It will be apparent that when the coil 12 drops into its lowered position shown in Figure 3 due to its own weight, any slack in the yarn between the delivery end 35 of the coil 12 and the knitting head of the machine is immediately taken up. Of course, during the operation of the knitting machine and while the yarn carrier is moving in either direction to lay the yarn upon the sinkers and dividers along the knitting needles, there is no appreciable slack in the yarn in consequence of which the yarn exerts sufficient pull on the coil member 12 to lift it into the position shown in Figure 4. However, immediately that the knitting operation is interrupted sufficiently for the yarn to become slack, the lower coiled member 12 drops of its own weight to the extent permitted by the slack in the yarn with the result that all such slack is substantially eliminated. Upon resumption of the knitting operation so that the yarn is again drawn positively across the knitting elements of the machine, the pull of the yarn through the coils 11 and 12 tends to straighten it out and in so doing causes the lower coil 12 to lift into partial registry with the stationary upper coil 11 as shown in Figure 4.

It will be noted that at all times during the knitting operation, the weight of the lower coil 12 is suspended from the yarn at the points 36, as a result of which the yarn is caused to bear more or less firmly, at the points 37, against the bottom edges of the convolutions of the upper coil 11. Accordingly, successive portions of the yarn, as

they traverse the coils 11 and 12, are constantly subjected to positive tensions which tend to straighten and smooth the yarn free of all such curls and twists as might result in the formation of snarls during the knitting operation. Also, during those intervals when the knitting operation is interrupted for any cause, the weight of the lower coil element 12 suspended from the points 36 of the yarn is sufficient to draw the yarn into the sinuous shape shown in Figure 3, the slack in the yarn in advance of the delivery end 35 of the coil 12 being absorbed by the increased length of the yarn embraced within and between the coils 11 and 12.

It will be understood, of course, that the invention is susceptible of various changes and modifications without departing from the general principles or real spirit thereof, and accordingly it is intended to define the invention broadly, as well as specifically, as indicated by the appended claim.

What is claimed as new and useful is:

A yarn tensioning device comprising, in combination, a relatively fixed open-coiled member, a second open-coiled member operatively associated with said fixed member and adapted to shift in the plane of the axis of said fixed member, the inner ends of said members being mounted upon a common support while the outer ends thereof project freely with respect to said support, said members being relatively so arranged as to permit a length of yarn to be threaded through the interjacent convolutions of said members, the positional relation of said shiftable member with respect to said fixed member being varied to compensate for changes in the tension or pull upon the yarn as it passes through said members, said device being further characterized in that the convolutions of said operatively associated members are oppositely wound to permit said convolutions to be freely brought into or out of interjacent relation as the pull on the yarn delivered through said members is increased or decreased.

JOSEPH EARNEST GARRETT.