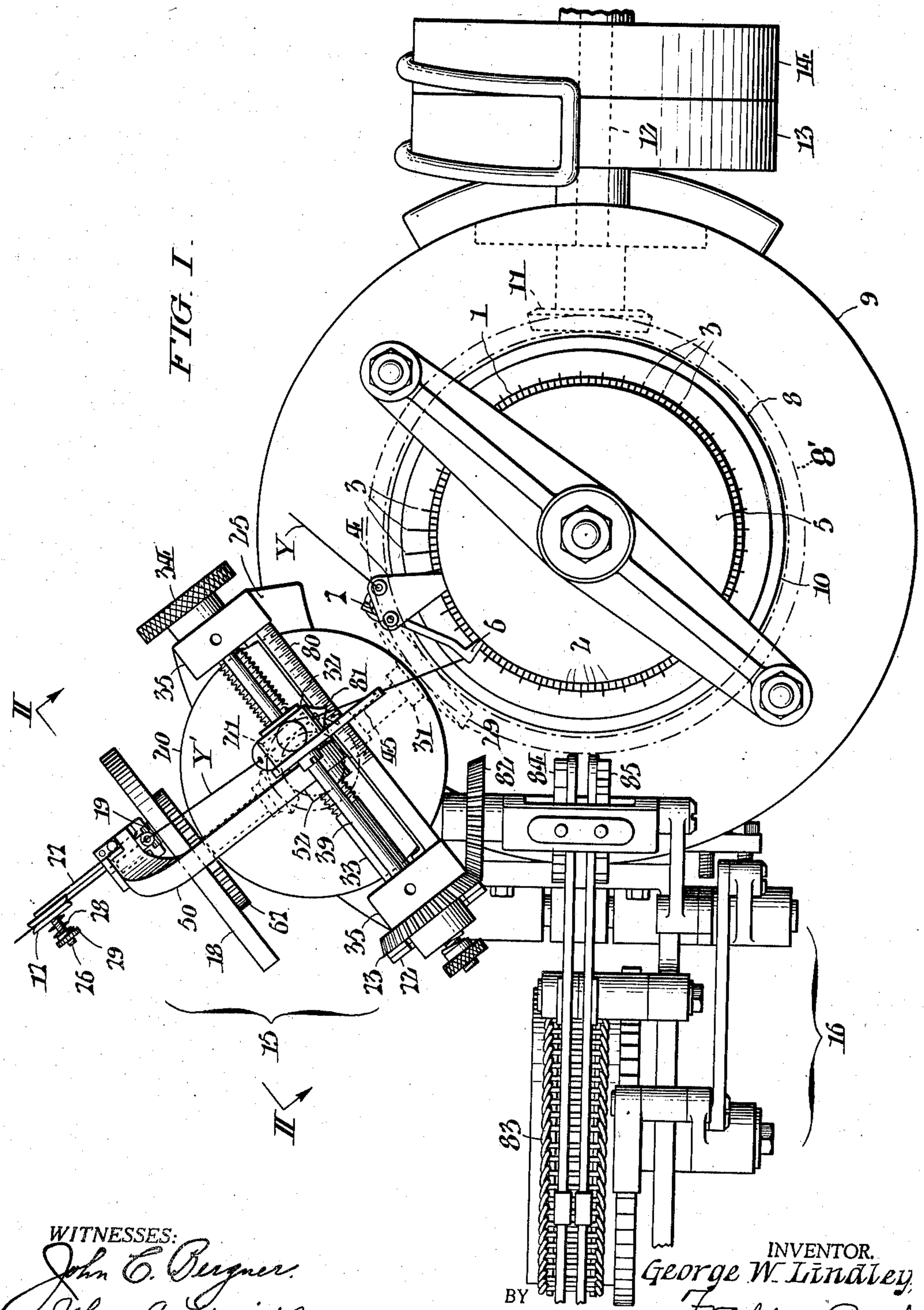
July 12, 1938. G. W. LINDLEY 2,123,174

ELASTIC YARN FEEDING AND TENSIONING MECHANISM FOR KNITTING MACHINES

Filed Oct. 19, 1936 3 Sheets-Sheet 1

FIG. I.



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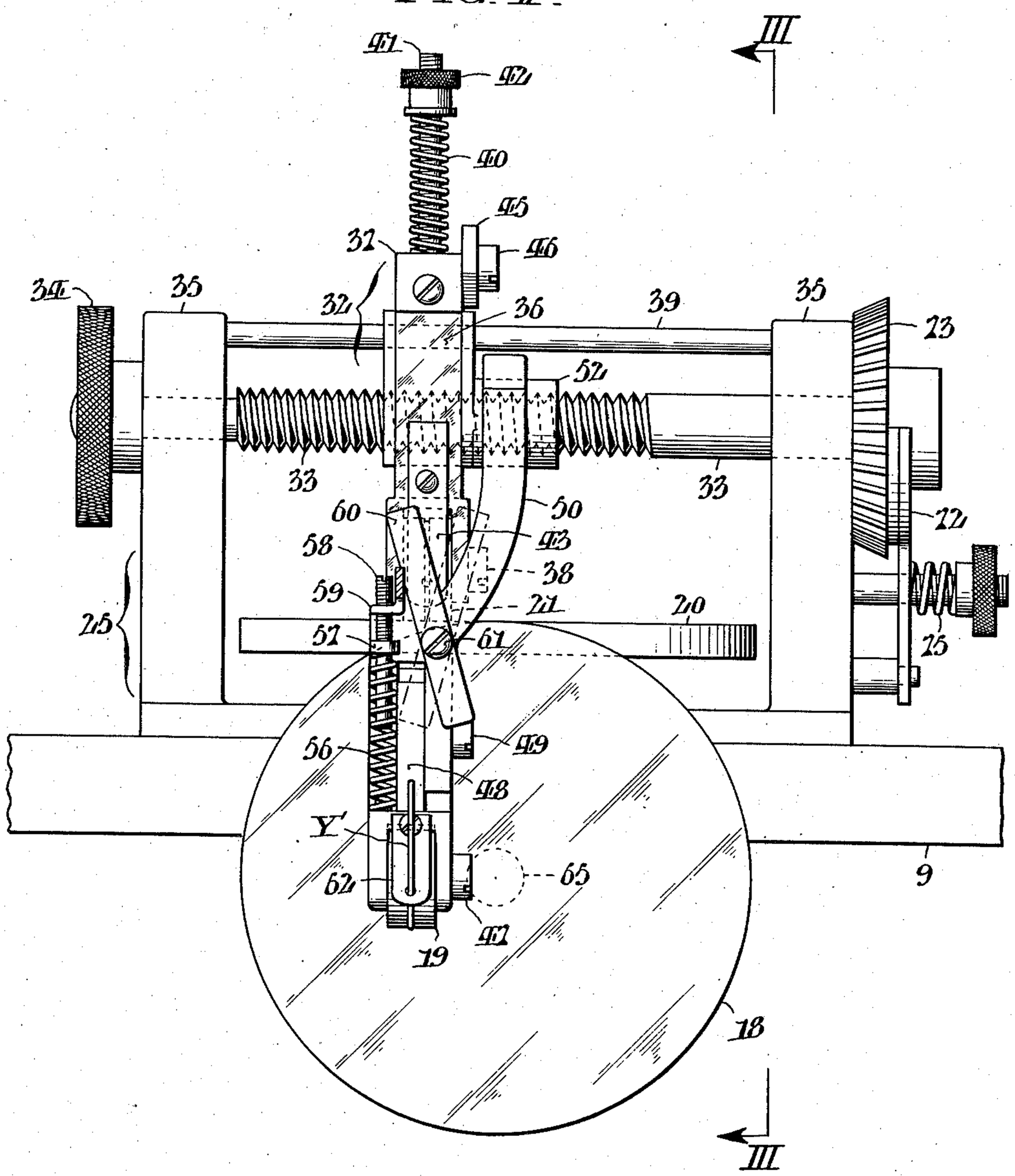
Filed Oct. 19, 1936 3 Sheets-Sheet 2

FIG. II.



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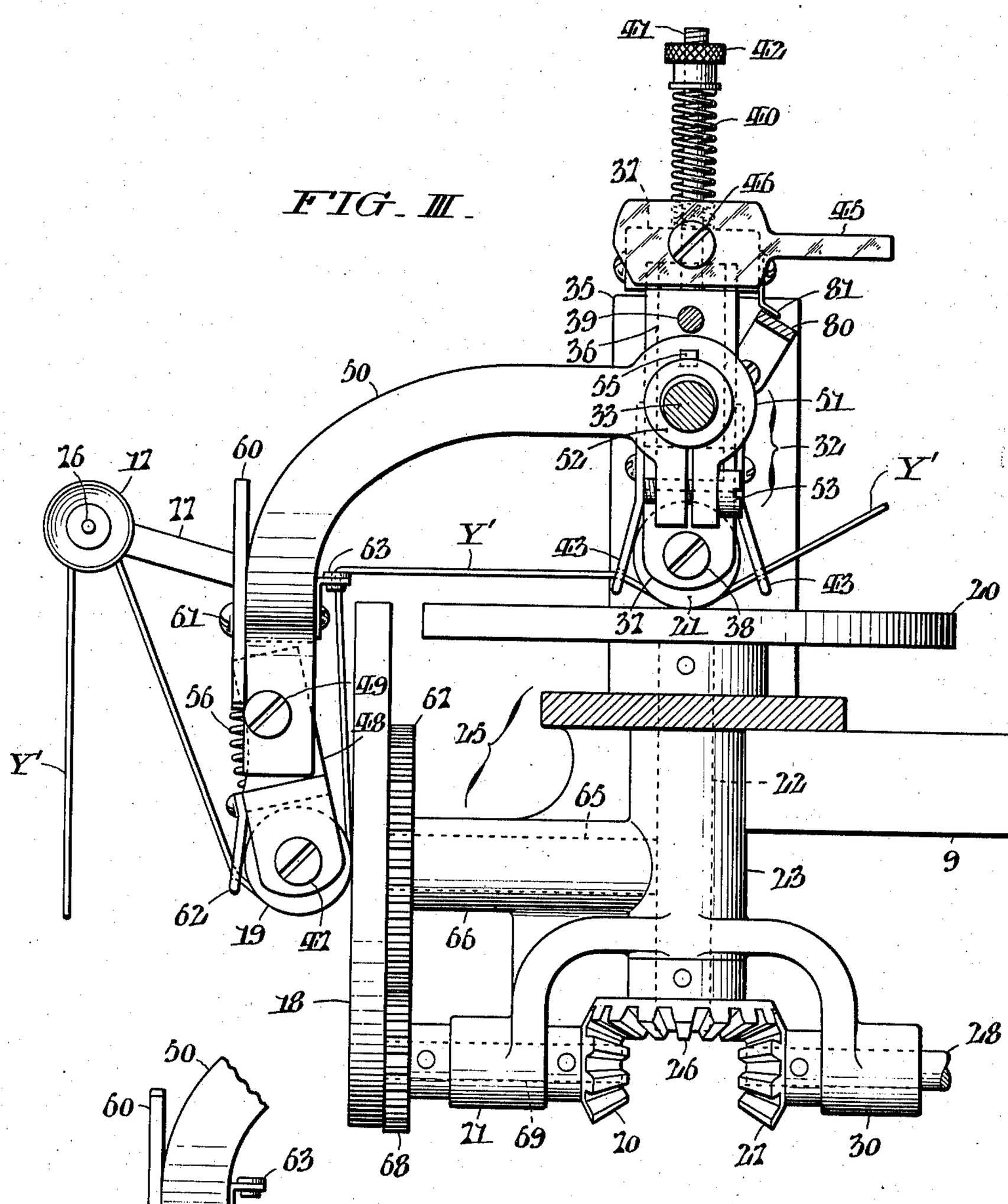
Filed Oct. 19, 1936 3 Sheets-Sheet 3

FIG. III.



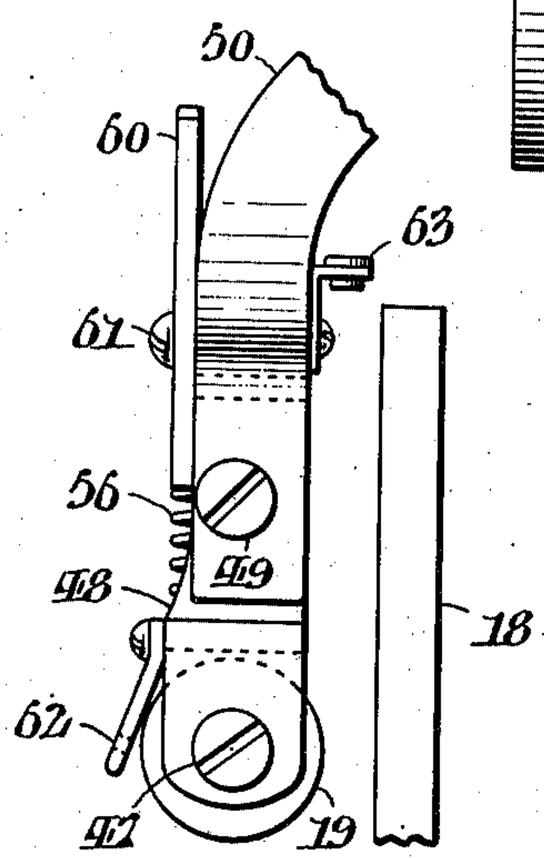


FIG. IV.

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UNITED STATES PATENT OFFICE

2,123,174

ELASTIC YARN FEEDING AND TENSIONING MECHANISM FOR KNITTING MACHINES

George W. Lindley, Philadelphia, Pa.

Application October 19, 1936, Serial No. 106,392

17 Claims. (Cl. 66—132)

This invention relates to mechanism for tensioning elastic yarn incident to feeding it to the needles of a knitting machine. More particularly, my invention is concerned with elastic yarn tensioning mechanism for circular knitting machines used in the production of shaped or fashioned seamless tubular work.

Elastic yarns, including both those wholly of rubber alone and those with rubber cores and a textile wrapping, have a tendency to curl, twist, and snag, and are therefore difficult to control incident to being fed to the needles of a knitting machine, this being especially true of elastic yarns of the finer gauges.

My invention is directed toward overcoming the above indicated difficulties: that is to say, I aim to make it possible to deliver elastic yarn to the needles of a knitting machine at any desired predeterminable tension which may be constant, or which may be variable within prescribed limits in order to shape or fashion the work being produced in the machine.

The foregoing desiderata I attain in practice as hereinafter more fully disclosed, through provision of tensioning mechanism with means whereby snags or other irregularities are eliminated therefrom incident to its being withdrawn from a loose supply coil or skein; and with a plurality of separately-adjustable, automatically-regulated devices whereby the yarn is progressively tensioned enroute to the needles of the knitting machine.

Other objects and attendant advantages will appear from the following detailed description of the attached drawings, wherein

Fig. I shows a top plan view of a circular knitting machine embodying my improved elastic yarn feeding and tensioning mechanism.

Fig. II is a sectional view taken as indicated by the arrows II—II in Fig. I and drawn to a larger scale.

Fig. III is a sectional view taken as indicated by the arrows III—III in Fig. II with portions broken out to better illustrate important features of construction; and

Fig. IV is a fragmentary detail view corresponding to Fig. III with certain of the parts differently positioned.

The knitting machine which I have chosen for convenience of illustrating my invention is of the rotary type designed for producing seamless ribbed work, the same having a rotating cylinder 1, and a co-axially-superposed dial (not shown) respectively for the cylinder and dial needles 2 and 3 which cooperate at right angles in a well known manner. A non-elastic main or foundation yarn Y of cotton, rayon, silk, or other textile fiber is fed to the knitting needles 2, 3 through a guide 4 which is adjustably secured to the dial cam plate 5; while an elastic yarn Y′ is at the same time directed to the needles by a guide 6, so as to be inlaid between the loops respectively drawn by said cylinder and dial needles. As shown, the guide 6 for the elastic yarn Y′ is supported by a stud or post 7 upstanding from the cylinder needle cam block 8 which latter is mounted on the top of the bed plate 9 of the knitting machine.

The feeding and tensioning mechanism with which the present invention is more especially concerned comprises a tensioning means comprehensively designated by the numeral 15 in Fig. I, and automatic control means therefor generally designated by the numeral 16 in said figure. As shown in Figs. II and III, the tensioning means 15 includes a snag-removing device which consists of a pair of opposing disks 17; an intermediate tensioning device consisting of a vertically-positioned rotary disk 18 and a cooperating peripherally-grooved roller 19 running in pressure contact therewith; and a second or final tensioning device consisting of a horizontally-positioned disk 20 and a peripherally-grooved contact roller 21 which respectively are exact duplicates of the disk and roller of the intermediate tensioning device aforesaid. The horizontal disk 20 is affixed to the top end of a vertical shaft 22 journaled in a bearing boss 23 of a bracket 25, which latter is bolted or otherwise rigidly secured to the edge of the bed plate 9 of the knitting machine and constitutes the main support for the tensioning means 15. A bevel gear 26 at the lower end of the shaft 22 meshes with a bevel pinion 27 at the outer end of a radially-arranged shaft 28, driven through a bevel gear 29 (Fig. I) at its inner end, from the toothed ring 8′ at the bottom of the needle cylinder 1 of the knitting machine. Immediately adjacent the bevel pinion 27, the radial shaft 28 is journaled in a bearing boss 30 of the bracket 25; and adjacent the gear wheel 29, said shaft is journaled in a fixed bearing 31 beneath the bed plate 9. The roller 21 cooperating with the horizontal disk 20 is supported by a carriage or follower which is shiftable radially of said disk by a reversely-rotatable horizontal screw spindle 33 having journal support in spaced bearing standards 35 on the bracket 25, said spindle being provided at one end with a hand wheel 34 by means of which it can be manually rotated. The follower 32

comprises a nut block component 36 with which the screw spindle 33 directly engages; and a yoke component 37 which is vertically slidable on the block, and which, at its lower end, carries the axis pin 38 for the roller 21. The nut block 36 is restrained against rotation with the screw spindle 33 by virtue of its engagement with a guide rod 39 which extends between the bearing standards 35 above and in parallel relation with said spindle. A helical spring 40 bearing downward on the top of the yoke 37 serves to maintain the roller 21 in firm but yielding contact with the drive disk 20, said spring surrounding a vertical stem 41 upstanding from the yoke 37 and being regulatable by a thumb nut 42 engaging screw threads at the top end of said stem. By means of guides 43 at opposite sides of the yoke member 37, the elastic yarn Y' is held to the peripheral groove of the roller 21 as it passes between the latter and the drive disk 20 as shown in Fig. III. By means of a cam lever 45 pivoted at 46 on the yoke component 37 of the follower 32 and adapted to cooperate with the top of the nut block 36, the roller 21 can be lifted clear of the disk 20 to facilitate threading of the elastic yarn Y'. The roller 19 cooperating with the vertical disk 18 revolves freely about an axis pin 47 guided at the free, clevised end of a lever 48 which is fulcrumed at 49 to the outer end of a curved supporting bracket arm 50. This bracket arm 50, it will be noted from Fig. III, extends horizontally outward and downward from the follower 32, and, as shown, is formed with a split anchorage collar 51 which embraces a lateral boss 52 on the block component 36 of the follower 32, and which is securable by a clamp screw 53. Due to this construction, the supporting arm 50 can be adjusted along the boss 52 of the follower 32 and the roller 19 thereby set at a different distance from the center of the disk 18 as compared with the positioning of the roller 21 relative to the axis of the disk 20. A spline 55 serves to prevent rotation of the bracket arm 50 about the boss 52 on the follower 32 while the above adjustment is being made. The roller 19 is held in running contact with its driving disk 18 by a helical compression spring 56 whereof the lower end bears against the clevised shoulder of the lever 48, and whereof the upper end abuts against a collar 57 on an adjusting screw 58 which threadedly engages a lug projection 59 on the bracket arm 50. The lever 48 can be locked in the retracted position shown in Fig. IV with the roller 19 clear of the disk 18 for convenience in threading the elastic yarn Y', by a manually-operable latch or keeper 60 which is pivoted at 61 on the bracket arm 50. A guide 62 on the lever 48 is relied upon to direct the elastic yarn Y' into the peripheral groove of the roller 19. After rounding the roller 19, the elastic yarn Y' passes upward to a directional guide 63 on the bracket arm 50, and from thence horizontally to the roller 21 as shown in Fig. III. From Fig. I, it will be noted that the shaft 65 for the vertical disk 18 lies in the same radial plane (considered in respect to the axis of the needle cylinder 1 of the machine) with the shaft 2 of the disk 20, and is journaled in a horizontal boss 66 of the bracket 25 as shown in Fig. II. The disk 18 is rotated in synchronism with the disk 20 by drive connections which include a pair of intermeshing spur gears 67, 68 whereof the latter is mounted on one end of a short shaft 69 aligned with the radial shaft 28 hereinbefore referred to; and a bevel pinion 70 on the other end of said short shaft which receives its motion from the bevel gear 26. As further shown in Fig. III, the short shaft 69 is journaled in another bearing boss 71 on the bracket 25. Overthrow of the screw spindle 33 incident to intermediate actuation as hereinafter explained, is prevented by a brake 72 (Fig. II) which bears upon the outer face of a bevel gear 73 on said spindle. As shown, the brake 72 is subject to a regulatable spring 75. The snag-eliminating disks 17 are axially and rotatively free on a stud 76 at the end of an outward extension 77 of the bracket arm 50, and subject to the pressure of a spring 78 which is regulatable by means of an adjusting nut 79 engaging screw threads on said stem.

For the purpose of indicating the degree of tension induced in the elastic yarn Y' there is affixed to the bearing standards 35 of the bracket 25 a graduated scale 80 which is for coordination with a pointer 81 on the follower 32.

The illustrated means 16 for automatically controlling the tensioning means 15 is exactly like that disclosed in U. S. Patent No. 1,725,150 granted me on Aug. 20, 1929, to which reference may be had for details. As shown in Fig. I, the bevel gear 73 on the screw spindle 33 meshes with the bevel gear 82 of the control means 16, the latter shaft being intermittently rotated in opposite directions under governance of the pattern chain shown at 83, through racking of ratchet wheels 84 and 85 with oppositely directed teeth the same manner as described in the patent supra.

In the use of my invention, the bracket arm 50 is ordinarily adjusted on the boss 52 of the carriage 32 so that the roller 19 is positioned somewhat farther away from the axis of its driving disk 18 than the roller 21 from the center of its driving disk 20. As a consequence of such adjustment, the roller 19 will operate to feed the elastic yarn Y' at a correspondingly faster rate than the roller 21, whereof the speed is such as to induce in that portion of the yarn extending from the latter roller to the needles of the machine a higher tension than that induced on the portion of said yarn between the rollers 19 and 21. Thus it will be seen that the elastic yarn Y' is progressively tensioned as it is delivered to the needles of the knitting machine. In practice, the supply of the elastic yarn Y' is taken from a supply in the form of a free loose coil placed horizontally in a suitable basket or other container so as to be substantially free of tension. As each convolution of the coil is released, twisting action is set up with attendant formation of snarls in the yarn which are removed as the latter passes between the opposing spring-influenced disks 17. In the absence of the roller 19, the yarn would be delivered to the roller 21 at a varying rate due to the slack occasioned as each snag loop is opened. However, since the roller 19 runs at a slightly faster rate than the roller 21, this slack is compensated for with the result that the yarn Y' is delivered to the last mentioned roller at a uniform rate with assurance of feeding of said yarn to the needles of the knitting machine under a constant tension.

Obviously, the number of disk and roller tensioning devices may be increased if a more gradual progressive tensioning of the elastic yarn is desired. Furthermore, while I have herein shown and described my invention in association with a rib knitting machine, it is to be understood that it is not necessarily limited to such use since it can be employed, with attainment of advantages

equal in all respects to those hereinbefore pointed out, with other types of knitting machines to feed tensioned elastic yarn either alone or in conjunction with other yarns.

Having thus described my invention, I claim:

1. Elastic yarn feeding and tensioning mechanism for knitting machines comprising a plurality of serially-arranged devices by which the yarn is tensioned enroute to the knitting needles, each such device consisting of a drive disk and a contacting roller between which the yarn is passed; and means whereby the rollers can be shifted radially of the disks to vary the tension and the rate of feeding of the yarn as the knitting proceeds.

2. Elastic yarn feeding and tensioning mechanism for knitting machines comprising a plurality of serially-arranged devices by which the yarn is tensioned enroute to the knitting needles, each such device consisting of a drive disk and a contacting roller between which the yarn is passed; means whereby the rollers can be set at different distances from the centers of the drive disks for progressive tensioning of the yarn; and means whereby the rollers can be concurrently shifted radially of the disks to vary the tension and rate of feeding of the yarn as the knitting proceeds.

3. Elastic yarn feeding and tensioning mechanism for knitting machines comprising a plurality of serially-arranged devices by which the yarn is tensioned enroute to the knitting needles, each such device consisting of a drive disk and a contacting roller between which the yarn is passed; and reversely-rotatable screw means whereby the rollers can be concurrently shifted radially of the disks to vary the tension and the rate of feeding of the yarns as the knitting proceeds.

4. Elastic yarn feeding and tensioning mechanism for knitting machines comprising a plurality of serially-arranged devices by which the yarn is tensioned enroute to the knitting needles, each such device consisting of a drive disk and a contacting roller between which the yarn is passed; a common support for the several rollers; and means whereby the support can be moved to concurrently shift the rollers radially of the drive disks for the purpose of varying the tension and the rate of feeding of the yarn as the knitting proceeds.

5. Elastic yarn feeding and tensioning mechanism for knitting machines comprising a plurality of serially-arranged devices by which the yarn is tensioned enroute to the knitting needles, each such device consisting of a drive disk and a contacting roller between which the yarn is passed; a common support for the several rollers; and reversely-rotatable screw-means whereby the support can be moved to concurrently shift the rollers radially of the drive disks for the purpose of varying the tension and the rate of feeding of the yarn as the knitting proceeds.

6. Elastic yarn feeding and tensioning mechanism for knitting machines comprising two tensioning devices by which the yarn is tensioned enroute to the knitting needles, each such device consisting of a rotating disk and a contacting roller between which the yarn is passed; a carriage for one of the rollers; a support for the other of said rollers adjustable on said carriage so that the latter can be set at a different distance from the center of its drive disk with relation to the position of the first roller to its drive disk for progressive tensioning of the yarn; and means whereby the carriage can be moved to concurrently shift the rollers radially of their drive disks for the purpose of varying the tension and the rate of feeding of the yarn as the knitting proceeds.

7. Elastic yarn feeding and tensioning mechanism for knitting machines comprising two tensioning devices by which the yarn is tensioned enroute to the knitting needles, each such device consisting of a rotating disk and a contacting roller between which the yarn is passed; a carriage for one of the rollers; a support for the other of said rollers adjustable on said carriage so that the latter can be set at a different distance from the center of its drive disk with relation to the position of the first roller to its drive disk for progressive tensioning of the yarn; and a reversely-rotatable screw spindle whereby the carriage can be moved to concurrently shift the rollers radially of their drive disks for the purpose of varying the tension and the rate of feeding of the yarn as the knitting proceeds.

8. Elastic yarn feeding and tensioning mechanism for knitting machines comprising a plurality of duplicate serially-arranged devices by which the yarn is tensioned enroute to the knitting needles, each such device consisting of a rotating disk and a contacting roller between which the yarn is passed; means for synchronously driving the several disks; and means whereby the rollers can be shifted radially of the disks to vary the tension and the rate of feeding of the yarn as the knitting proceeds.

9. Elastic yarn feeding and tensioning mechanism for knitting machines comprising a plurality of duplicate serially-arranged devices by which the yarn is tensioned enroute to the knitting needles, each such device consisting of a rotating disk and a contacting roller between which the yarn is passed; means for synchronously driving the several disks; means whereby the rollers can be set at different distances from the centers of the disks for progressive tensioning of the yarn; and means whereby the rollers can be concurrently shifted radially of the disks to vary the tension and the rate of feeding of the yarn as the knitting proceeds.

10. Elastic yarn feeding and tensioning mechanism for knitting machines comprising means for eliminating snags and snarls incident to drawing the yarn from a loose supply; a plurality of serially-arranged devices by which the yarn is thereafter tensioned enroute to the knitting needles, each such device consisting of a drive disk and a contacting roller between which the yarn is passed; and means whereby the rollers can be shifted radially of the disks to vary the tension and the rate of feeding of the yarn as the knitting proceeds.

11. Elastic yarn feeding and tensioning mechanism for knitting machines comprising a plurality of serially-arranged devices by which the yarn is tensioned enroute to the knitting needles, each such device consisting of a drive disk and a contacting roller between which the yarn is passed; and automatic means for shifting the rollers radially of the disks to vary the tension and the rate of feeding of the yarn as the knitting proceeds.

12. Elastic yarn feeding and tensioning mechanism for knitting machines comprising a plurality of serially-arranged devices by which the yarn is tensioned enroute to the knitting needles, each such device consisting of a drive disk and a contacting roller between which the yarn is passed; means whereby the rollers can be set at different distances from the centers of the

drive disks for progressive tensioning of the yarn; and automatic means for concurrently shifting the rollers radially of the disks to vary the tension and the rate of feeding of the yarns as the knitting proceeds.

13. Elastic yarn feeding and tensioning mechanism for knitting machines comprising a plurality of serially-arranged devices by which the yarn is tensioned enroute to the knitting needles, each such device consisting of a drive disk and a contacting roller between which the yarn is passed; reversely rotatable screw means for shifting the rollers radially of the disks to vary the tension and the rate of feeding of the yarns as the knitting proceeds; and automatic means for controlling said screw means.

14. Elastic yarn feeding and tensioning mechanism for knitting machines comprising a plurality of serially-arranged devices by which the yarn is tensioned enroute to the knitting needles, each such device consisting of a drive disk and a contacting roller between which the yarn is passed; means whereby the rollers can be set at different distances from the centers of the drive disks for progressive tensioning of the yarns; screw means for shifting the rollers radially of the disks to vary the tension and the rate of feeding of the yarns as the knitting proceeds; and automatic means for controlling said screw means.

15. Elastic yarn feeding and tensioning mechanism for knitting machines comprising a plurality of duplicate serially-arranged devices by which the yarn is tensioned enroute to the knitting needles, each such device consisting of a rotating disk and a contacting roller between which the yarn is passed; means for synchronously driving the several disks; and automatic means for shifting the rollers radially of the disks to vary the tension and the feeding rate of the yarn as the knitting proceeds.

16. Elastic yarn feeding and tensioning mechanism for knitting machines comprising a plurality of duplicate serially-arranged devices by which the yarn is tensioned enroute to the knitting needles, each such device consisting of a rotating disk and a contacting roller between which the yarn is passed; means for synchronously driving the several disks; means whereby the rollers can be set at different distances from the centers of the disks for progressive tensioning of the yarn; and automatic means for concurrently shifting the rollers radially of the disks to vary the tension and the rate of feeding of the yarns as the knitting proceeds.

17. Elastic yarn feeding and tensioning mechanism according to claim 1, including means ahead of the first of the aforesaid devices with regard to the direction of feeding for eliminating snags in the yarn.

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