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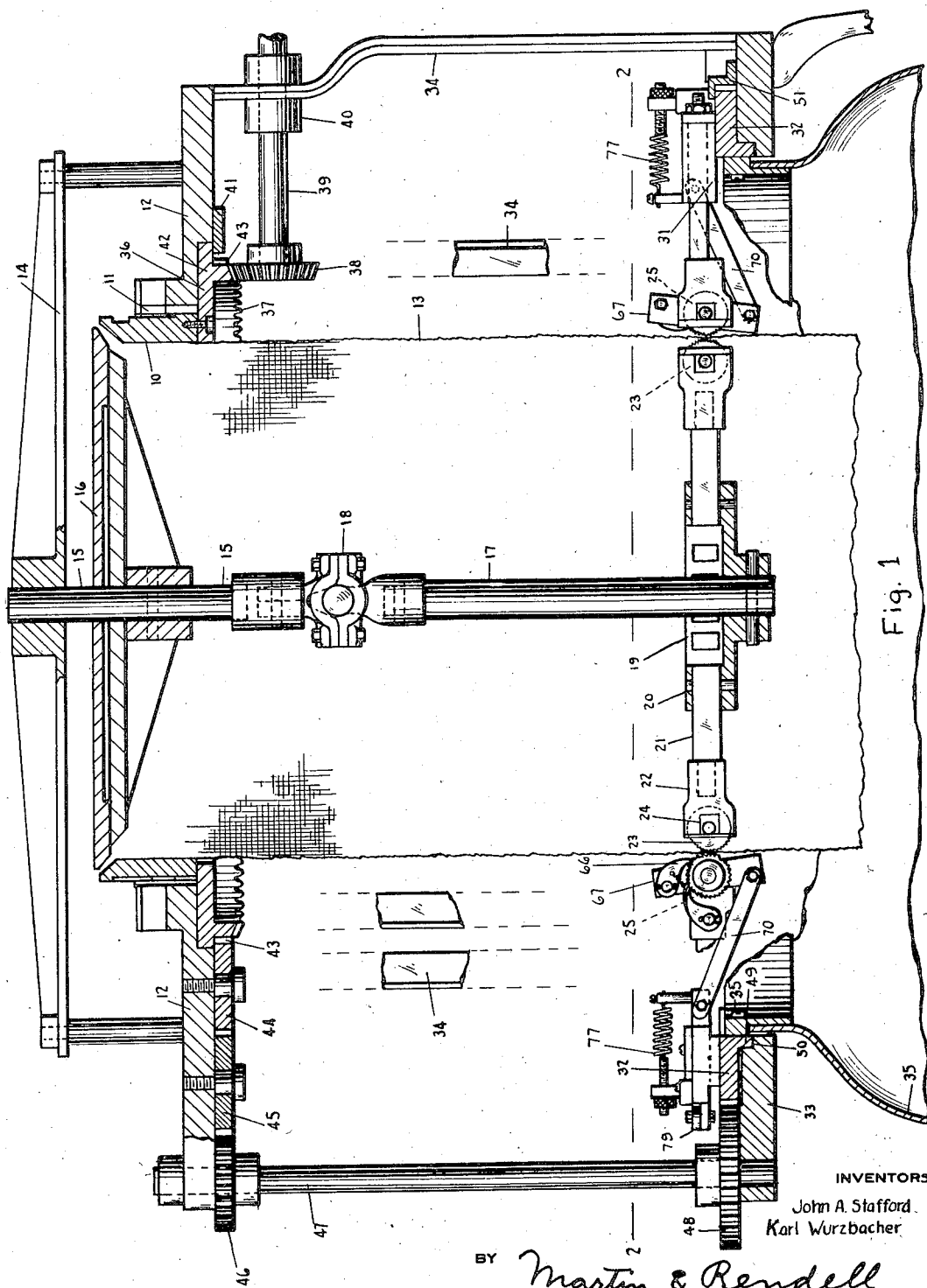
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2,037,282

TAKE-UP DEVICE FOR KNITTING MACHINES

Filed April 18, 1935

4 Sheets-Sheet 1



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4 Sheets-Sheet 2

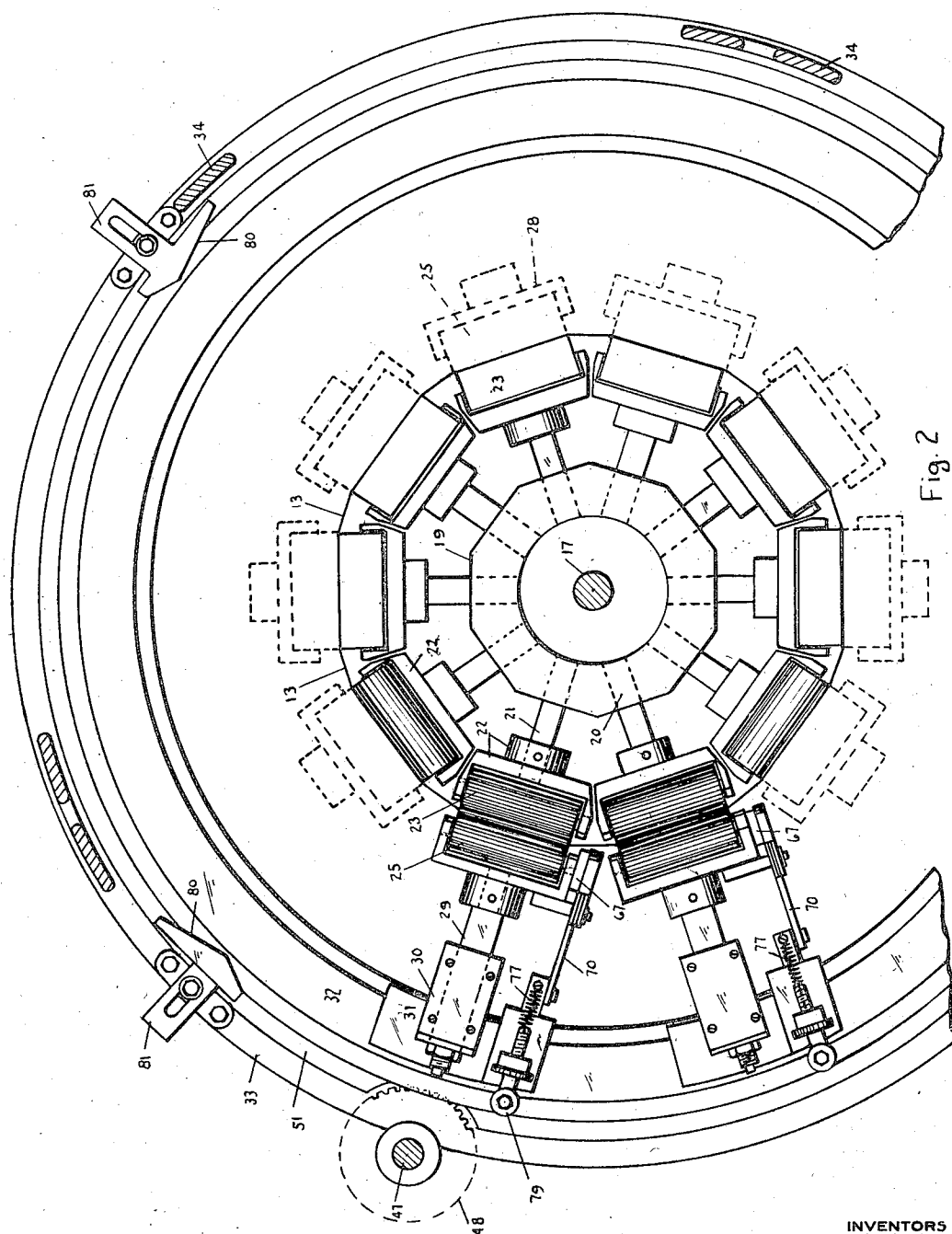


Fig. 2

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4 Sheets-Sheet 3

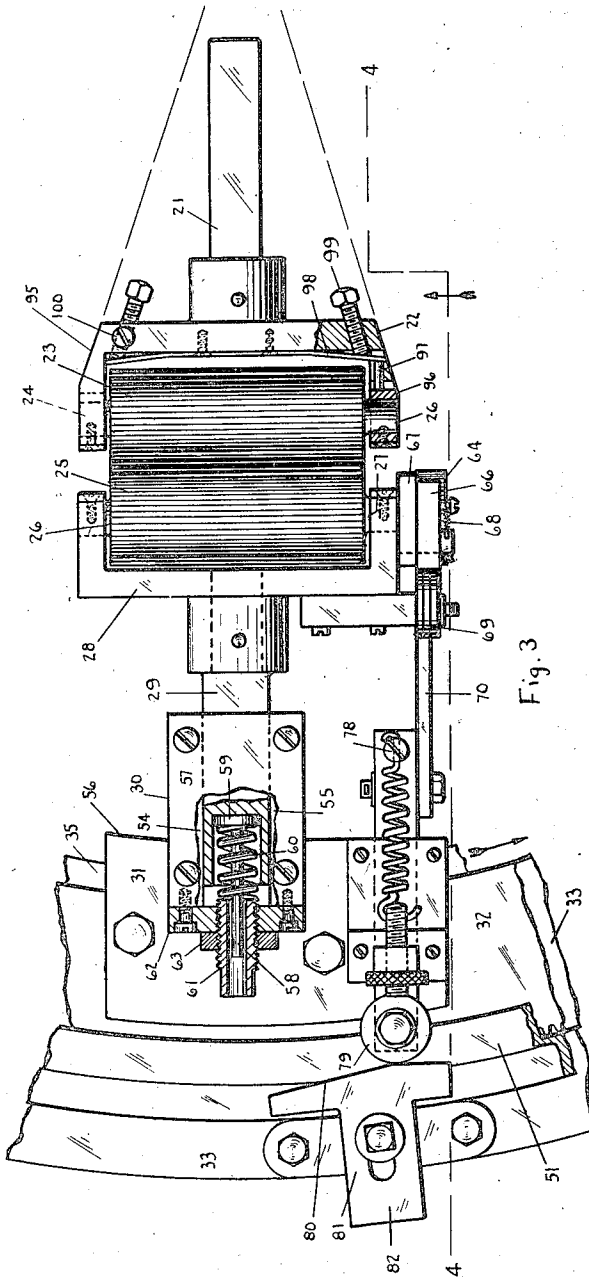


Fig. 3

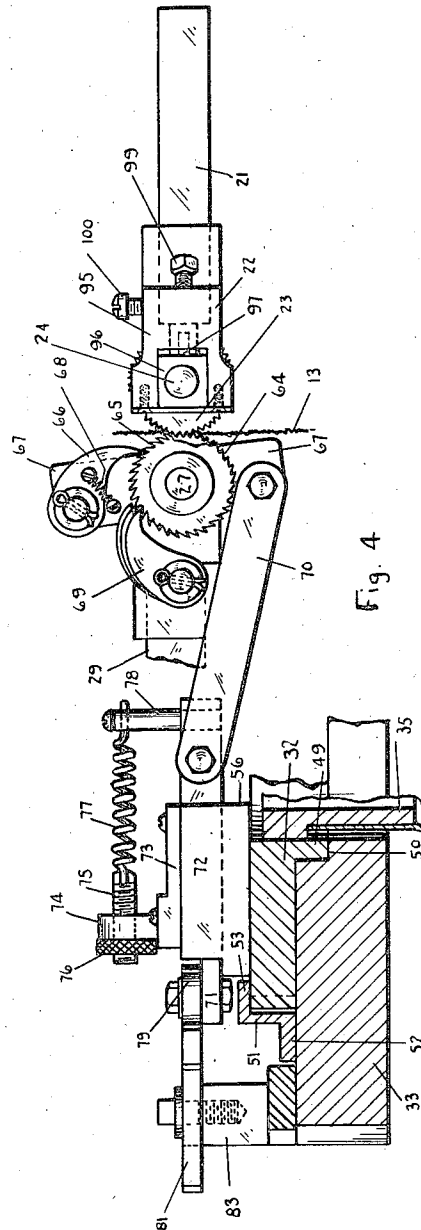


Fig. 4

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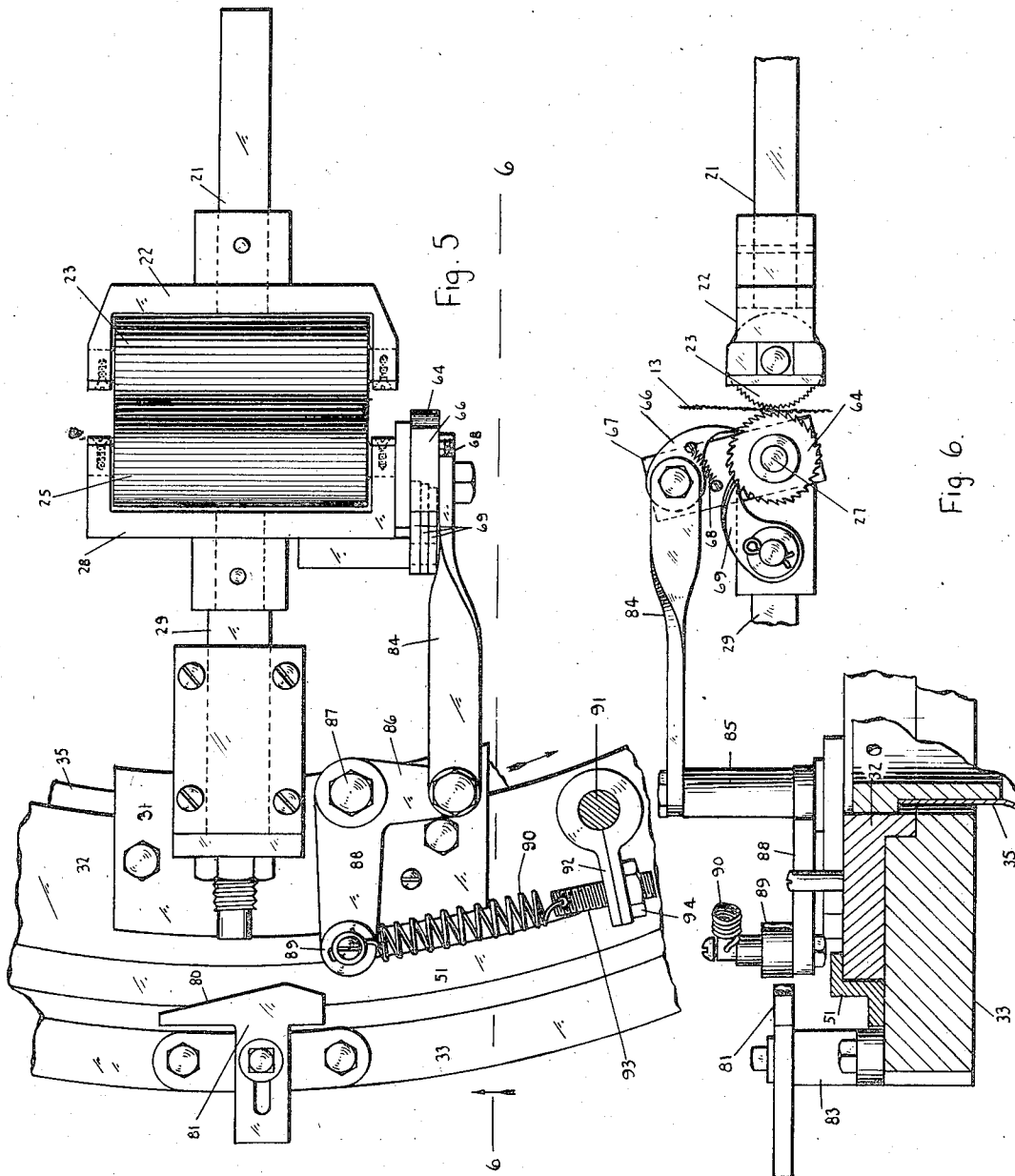
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2,037,282

TAKE-UP DEVICE FOR KNITTING MACHINES

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Application April 18, 1935, Serial No. 17,090

7 Claims. (Cl. 66—151)

Our present invention relates to a take-up device for circular knitting machines.

The purpose of this invention is to provide such a take-up device of new and improved construction and operation.

In circular knitting machines a take-up device is used to draw the tube of knitted fabric away from the needles under proper tension. Heretofore the common form of such take-up device has consisted of two closely disposed oppositely arranged rollers slowly rotated and drawing the tube of fabric therethrough by pressing the tube into doubled flat form after which the fabric is ordinarily wound up in a roll. The flattening of the circular tube of fabric done by this common form of take-up device distorts the fabric, that is the cross rows of stitches in the tube are not straight in the roll but are on a curve of from a quarter of an inch to over an inch in the width of the folded tube of fabric. With most fabrics this distortion does not make much difference, but with some special knitted types of fabric this non-straight condition of the rows of stitches in the fabric is very troublesome. For instance, there is a knitted fabric wherein relatively large cords of covered rubber are laid into some or all of the rows of stitches so as to make an elastic fabric suitable for corsets, surgical stockings or bands and the like. When this fabric is to be cut up for making it into such articles the fabric should be cut crosswise along a row of stitches; that is, between two adjoining rubber cords. If this fabric has been distorted so that the rows of stitches and the rubber cords lie in a decided curve due to being drawn through the said two take-up rolls, the cutting up of the cloth into pattern pieces is rendered much more difficult and the formation of articles accurately and easily therefrom is prevented. It is the main purpose of this present invention to provide a take-up device which is especially adapted to operate satisfactorily upon such special fabrics and give the requisite tension to the fabric as it comes away from the needles and to exert such tension with the fabric still in substantially a circular form and with the tension exerted practically all about the circle. A specific purpose and advantage of this construction is to provide a take-up device for circular knitting machines wherein a considerable number of pairs of co-operating cloth tensioning members are arranged in a circle corresponding to the circumference of the tube of fabric being knitted upon the machine with the length of the tensioning members of such extent and with the number of tension

members such as to form an almost uninterrupted circle of fabric tensioning means.

A further purpose is to provide a device of the character mentioned wherein the pairs of fabric-engaging members are arranged so closely next to each other about the circle as to engage the entire circle of the fabric with only slight interruptions between adjacent pairs and so that the required tension is given to the entire circle of the cloth resulting in an evenness of knitting which is desirable and has not heretofore been attained with some fabrics.

A further purpose of our invention is to provide a take-up device of the character described wherein the fabric engaging members of each pair are constructed and adapted to grasp the fabric with sufficient pressure and wherein one member of each pair of the fabric-engaging members is a roller preferably corrugated or fluted and is constantly subjected to a spring tension tending to rotate it in the direction to draw down the fabric engaged thereby and also to provide means for intermittently renewing the tension upon said yielding tensioned means so that an even and regulated tension may be constantly had upon every part of the circle of fabric.

Fig. 1 is a central vertical sectional view through a circular latch needle knitting machine equipped with a take-up device embodying our invention but showing only the units in the immediate foreground.

Fig. 2 is a horizontal sectional view through said machine on line 2—2 of Fig. 1 showing a top or plan view of the take-up device, said view showing in full lines all of the ten inside fabric-engaging rollers and their supporting yokes used in this particular machine but showing in full lines only some of the co-operating outside rollers and their supporting yokes and only some of the mechanisms used to transmit a rotating tension to the outside rollers.

Fig. 3 is a top or plan view of one of the take-up units shown in Figs. 1 and 2 in connection with the adjacent portion of the knitting machine but on a larger scale.

Fig. 4 is a side elevation of the unit shown in Fig. 3, but omitting for the sake of clearness the outer portion of the stem of the outer yoke and its connection to the bracket upon the gear case. In said view the gear case and its supporting ring upon the machine is shown in vertical section.

Fig. 5 is a plan view similar to Fig. 3 of a unit of the take-up device, but having a modified form of mechanism for transmitting the yielding

rotating tension to the outside fabric-engaging roller.

Fig. 6 is a side elevation of the unit shown in Fig. 5 but for the sake of clearness omitting the outer end of the stem of the outside yoke and its attachment to the bracket upon the gear case.

Referring to the drawings in a more detailed description it will be seen that our take-up device is shown in connection with a circular knitting machine of the latch needle type and one wherein the needle cylinder 10 rotates while the needle cams 11 and the head 12 of the machine remain stationary as do also the various feeds of the machine, all resulting in the tube 13 of the knitted fabric descending down through the inside of the cylinder 10 and constantly rotating in unison with said cylinder.

From the arch 14 bridging the head of the machine there depends the centrally-arranged vertically-disposed dial shaft 15 carrying the dial 16 and its attached parts not necessary to be described further herein. Said dial shaft and dial are rotated in unison with the cylinder. To the end of the dial shaft projecting below the dial there is connected a length of vertical shaft 17 by means of a universal joint generally denoted by the numeral 18 whereby the shaft 17 is supported and rotated in a general vertical position but may swing slightly in any direction as required. This depending rotated shaft 17, hereafter called the take-up shaft, supports and carries therewith the other parts of the take-up mechanism that are within the tube of fabric 13. The part directly attached to the shaft is a disk 19 having radiatingly arranged sockets 20 therein corresponding in number to the take-up units of the machine. In the machine illustrated these take-up units are ten in number. It will be understood, however, that this number is simply representative of a thoroughly practical embodiment of the invention and that the number of the units may be increased considerably or decreased somewhat as long as the fabric-engaging members are sufficient in number to hold the cloth throughout practically its entire circle.

In each socket 20 there is adjustably mounted in a horizontal radiating position the inner end of the stem 21 of an inner yoke 22 between the opposite and outwardly projecting arms of which is revolubly mounted an inside or interior roller 23 as by the projecting journals 24 at the opposite ends of said roller rotating in bearings 26 provided in the arms of said interior yoke. Preferably the face of said inside rollers is corrugated or fluted as by having formed thereon relatively fine teeth extending lengthwise of the roller and adapted to aid in readily exerting a downward pull upon the tube of knitted fabric in conjunction with the directly rotated and similarly corrugated or fluted outside rollers 25. These outside fabric-engaging rollers 25 are preferably similar in size and shape to the inside rollers 23 but are located each respectively outside of the tube of fabric, but directly opposite its respective inside roller 23. Each outside roller is provided with two journals projecting from its ends, one journal 26 being relatively short and the other journal 27 being longer. These journals are revolubly mounted in suitable bearings in the opposite arms of an outside yoke 28. To the outwardly extending hub of each outside yoke 28 is rigidly secured a yoke stem 29 the outer part of which is square and slidably mounted in a square socket 30, three sides of which are formed prefer-

ably integral with the bracket 31 of this unit of the take-up mechanism.

The brackets 31 for the several units are secured to the upper face of the annular large gear 32 rotatably mounted in turn upon the top and inner portion of the lower platform 33 of the knitting machine some distance down from the head 12 which is carried above this lower platform by means of a plurality of suitable uprights 34. The lower platform 33 in turn is carried some distance above the floor by suitable legs (not shown) but spaced well out relative to the lower platform 33 so as to provide ample room for the can or other container 35 commonly provided to receive the tube of knitted fabric. This receiving can 35 is supported by suitable screws 35' connecting the upper part of the can to the inner face of the annular gear 32 which gear it will be understood rotates in unison with the rotating tube of fabric 13 coming down from the rotated cylinder 10 and in unison also of course with the inner fabric engaging rollers 23.

As is common with knitting machines of this type the cylinder 10 is rotatively carried by being secured at its lower end to a large annular gear 36 which has a downwardly facing circle of teeth 37 engaged by a beveled gear 38 carried at the inner end of a horizontal shaft 39 hung in a suitable bearing 40 conveniently provided upon one of the head-supporting uprights 34. This horizontal shaft 39 is driven in any convenient manner as by power applied to a pulley not shown but provided upon the outer end of shaft 39. The annular gear 36 is held in its position beneath the head 12 by an annular gib 41.

In our machine the teeth 37 are provided upon the lower edge of a downwardly projecting flange 42 provided upon the said annular gear 36. Upon the outwardly facing vertical surface of this flange there is provided another set of gear teeth 43. These teeth engage and drive a small gear 44 mounted below the head 12 of the machine conveniently upon the opposite or left hand side of the machine as it is seen in Fig. 1.

Beyond the gear 44 or to the left thereof as the parts are seen in Fig. 1 there is provided and suitably suspended from the head 12 another gear 45 meshing with gear 44 to the inside and meshing to the outside with gear 46 rigidly fastened to vertical shaft 47. The upper end of this shaft is mounted in a suitable bearing provided in the head 12 and its lower end is mounted in the lower platform 33. Just above this lower platform there is rigidly fastened to said shaft 47 a gear 48 which at its inner side meshes with the teeth provided upon the outside vertical edge of the lower large annular gear 32 already mentioned as carrying the several brackets 31. It will thus be seen that the lower gear 32 is thus rotated in unison with and in the same direction as the needle cylinder 10.

Preferably a downwardly projecting flange 49 is provided upon the inner edge of the wide ring gear 32 which flange fits into a correspondingly shaped step 50 provided at the inner and upper side of the lower platform 33. Preferably the toothed outer edge of this gear 32 is covered and protected by a gear casing 51. This gear casing is Z-shaped when seen in vertical section as in Figs. 1 and 4 with its lower flange 52 resting upon and secured to the lower platform 33 outside the gear 32 and with its upper flange 53 projecting inwardly over the teeth and onto the flat upper face of the gear 32. The gear casing 51 is of course

annular in shape and extends all the way around the outside of the gear 32 except for necessary interruption thereof where the gear 48 engages the large gear 32 as at the left hand side of Fig. 1.

5 The brackets 31 are rigidly fastened in suitable and evenly spaced position about the top of the large ring-like gear 32 with the outer edge of each bracket spaced clear of the inner edge of the inwardly projecting upper flange 53 of the gear casing 51. As already mentioned each bracket 31 carries a socket 30 in which is slidably mounted the square stem 29 of the outer yoke 28 of a unit. The socket 30 may be conveniently formed with three of its walls integral with the bracket 31 as by providing two upstanding spaced walls 54 and 55 respectively upon the bracket and by utilizing the general upper level of the bracket therebetween for the bottom of the socket. Preferably this socket extends inwardly of the general inward curved side 56 of the bracket as appears particularly in Fig. 3. The fourth side of the socket is provided by a flat cover 57 suitably fastened to the tops of the two walls 54 and 55.

In order to mount the outer roller 25 with a yielding and an adjustable yielding tension, suitable spring tensioned means are provided to bear against the end of stem 29 of the outer roller. These spring tensioned means consist of a spring pressed plunger 58 the enlarged head 59 of which fits into a round recess extending inwardly of the stem 29 from its outer end. About the shank of the plunger 58 is mounted a coiled spring 60 the inner end of which bears against the adjacent face or left hand face of the head 59 of the plunger 58 as the parts are seen in Fig. 3. The other or outer end of this spring bears against the inner face of a sleeve 61. Part way through the bore of this sleeve extends the shank of the plunger 58 while the exterior surface of the inner end of the sleeve is screw-threaded into a bridge piece 62 rigidly attached to the outer end of the socket 30. By screwing the sleeve 61 inward or outward by means of its squared outer end it will be seen that greater or less tension will be imparted to the coiled spring 60 and thus the outer yoke and the outer roller carried thereby will be given a greater or less inward tension as required to keep the outer roller 25 pressed closely enough towards the inner roller 23 to grasp the section of the tube of fabric engaged between the said rollers of a unit. Preferably a lock nut 63 is provided upon the sleeve 61 engaging the outer face of the bridge piece 62 and thereby allowing the said sleeve to be locked in position to which it has been set.

Upon the outer end of the longer journal 27 of the outer fabric-engaging roller 25 is rigidly secured a ratchet wheel 64 which is of about the same diameter as the fabric-engaging roller 25. As this machine is organized and as both types of means for getting a spring-tensioned rotation of the outer fabric-engaging roller are constructed, the ratchet teeth 65 are arranged to face in an anticlockwise direction as seen in Fig. 4 and are adapted to be engaged by a working ratchet 66 mounted at the upper end of a lever 67 conveniently loosely mounted upon the journal 27 of said roller. As these parts are seen in Fig. 4 it will be obvious that movement of the ratchet 66 bodily to the left will simply cause the point of said working ratchet 66 to ride over one or two teeth 65 without imparting the necessary clockwise movement to the said ratchet wheel and thereby to the said outer fabric-engaging roller 25. Preferably a small coiled spring 68 yieldingly holds the work-

ing ratchet 66 downward against the teeth 65 but allows the ratchet to swing outwardly during the retroactive or outward movement of the upper end of the lever 67. To overcome the liability of the ratchet wheel moving backward due to the strong tension normally kept upon the tube of knitted fabric, locking dogs 69 are provided, preferably three in number, and of different effective lengths as appears in Fig. 4 so that one of said dogs will operate quickly to prevent any backward or anticlockwise movement of the ratchet wheel 64 when the working ratchet 66 is retracted.

In Figs. 1 to 4 inclusive there is shown one type of spring mechanism for imparting a spring-tensioned forward movement to the working ratchet 66. This form of spring-operated mechanism for moving the working ratchet 66 (and which form may for the purpose of convenience be called the Type A form) will now be described. In this type A of spring mechanism as appears particularly in Figs. 3 and 4, the lever 67 is provided with a downward extension 67' which extends some distance below the pivoting journal 27 and has pivotally connected to its lower end the inner end of a link 70. The outer end of this link is pivoted to the side of a sliding rod 71 towards the inner end of said sliding rod 71. This sliding rod 71 is slidably mounted in a housing 72 provided upon the near end of the bracket 31 already mentioned as supporting the socket 30 of this unit. The housing 72 is conveniently formed by a bottom integral with the said bracket 31 and two upstanding spaced walls. The housing is completed by a separate cover 73 secured to the top of said walls. Upon the outer end of the cover 73 is provided an upstanding ear 74 having a horizontally disposed inwardly facing aperture in which is slidably mounted the outer portion of a screw-threaded pin 75 adjustably held in place by a nut 76 engaging the outer end of the pin 75 outside the ear 74. To the inner end of said pin 75 is secured the outer end of the roller operating spring or main spring 77 of the unit. The inner end of this spring is secured to the upper end of a post 78 upstanding from the inner end of the sliding rod 71. The outer end of the sliding rod 71 projects a sufficient distance beyond the housing 72 to have mounted upon said rod on a vertical axis an antifriction roller 79. This roller is adapted to be engaged by the face 80 of cam device 81 of which a plan view is shown in Fig. 3. This cam device has its outwardly extending shank 82 adjustably secured to the top of a short post 83 fastened to the outer portion of the top face of the lower platform 33. Assuming that as this machine is organized the large lower gear 32 carries the outer parts of the different units of the take-up mechanism in an anticlockwise direction the small roller 79 when so brought into contact with the face 80 of the fixed cam device 81 will move the sliding rod 71 inwardly and thereby carry inwardly the link 70 and accordingly the lower end 67' of the lever 67. Such inward movement of lever 67' will obviously swing the upper end of the main lever 67 outwardly and thus retract the working ratchet 66 past one or several of the ratchet teeth of ratchet wheel 64. This inward movement of the sliding rod 71, however, has been accomplished only against the tension of the main spring 77 operatively connected thereto and said spring has been placed under greater tension than before due to its inner end attached to the post 78 being carried inwardly while its outward end is held stationary by the

stationary ear 74, that is stationary against any radial inward motion such as is imparted to the inner end of the spring. It will be understood of course that the ear 74 in common with all of the rest of the unit of the take-up mechanism is rotating with gear 32.

As soon as any given unit has carried its anti-friction roller 79 past the cam device 81 the said roller and the sliding rod 71 upon which it is mounted are free to again move outwardly due to the contractile power of the main spring 77 which has been placed under tension by the inward travel of the said sliding rod and anti-friction roller. Such outward movement, however, of the sliding rod 71 and the link 80 will be arrested as soon as the working ratchet 66 mounted upon the upper end of the lever 67 travels far enough along the slanting side of a tooth to engage the active side of the next tooth upon the ratchet wheel 64. Thereupon the main spring 77 is exerting its tension through link 70, lever 67 and ratchet 66 to rotate the ratchet wheel 64 in clockwise direction as seen in Fig. 4 and so tending to move in a similar direction the outer fabric-engaging roll of this unit. It will be understood that the strength of spring 77 is such and the arrangement and adjustment of the parts and the tension placed upon said spring 77 by the tension nut 76 is such as to tend to rotate the outer-fabric engaging roll with sufficient spring tension to draw the engaged portion of the tube of fabric downwardly from the needles with a proper power and at the proper speed.

It will be seen that if the fabric is not being knitted and drawn down fast enough to allow the swinging lever 67 and the working ratchet 66 to move the limit of their working stroke by the time the rotation of the knitting machine brings this unit opposite the cam device 81 for the next engagement, the sliding rod 71 and roller 79 will not have moved outwardly under the tension of spring 77 the full amount. Then upon the engagement of the roller 79 with the cam device 81 the sliding rod 71 will be moved inwardly only the extent that they have moved out from their inward position. The ratchet 66 will, therefore, only be retracted one or two teeth instead of a longer travel and the spring tension of this take-up unit will be maintained at the desired strength. In other words, it will be seen that each unit of the take-up device is so constructed and so tensioned as to tend to move the take-up roller constantly with sufficient power and movement to keep the fabric drawn down from the cylinder in the proper manner. The spring-tensioning means are such as to tend to impart the proper rotation to the take-up roll and the mechanism for re-tensioning the spring is so arranged as to re-tension the spring before its power has been exhausted or its limit of travel made. It will be understood, furthermore, that where there are many feeds upon a machine and the fabric is knitted rapidly, the spring-tensioning device may be re-tensioned more than once during a rotation of a given unit of the take-up device. For instance the cam device 81 shown in Figs. 3 and 4 may be duplicated at one or more other places upon the circle of the lower platform 33 so that as a given unit of the take-up mechanism rotates once the main spring 77 may be re-tensioned two or more times if necessary.

In order to get the members of each pair of fabric-engaging members accurately spaced apart and so giving the same pressure upon the

fabric throughout the width of the fabric-engaging rollers we provide means for accurately adjusting the journals 24 of the interior roller 23 relative to the inner yoke. Each arm 95 of this yoke is supplied with a horizontal slideway in which is slidably mounted a bearing 96 adapted to be pushed outward by a short plunger 97 slidably mounted in the arm 95 and having its inner end yieldingly engaged by one outer end of a leaf spring 98 secured to the yoke as appears in Fig. 3. The spring slightly back from the plunger 97 is engaged from within by an adjusting screw 99 mounted in the yoke. A set screw 100 in the top of the yoke holds the adjusting screw 99 at the position to which it has been set.

Figs. 5 and 6 show a top or plan view and a side view respectively of a modified form of device for imparting a spring tension to the working ratchet 66 pivoted to the upper end of lever 67.

This form of device which for convenience will be called Form B has a connecting link 84 pivotally connected at its inner end to the upper end of lever 67 carrying the ratchet 66. Conveniently the pivot carrying the ratchet 66 may be used to connect the inner end of said link 84 to the lever 67. The outer end of this link is pivotally secured to the upper end of a post 85 upstanding from the outer end of arm 86 of a bell crank pivoted by pin 87 to the bracket 31 of the unit. The other arm 88 of this bell crank extends outwardly and there carries an anti-friction roller 89 which is in the path of and adapted to be engaged by the cam face 80 of the cam device 81 already mentioned as being secured upon the outer part of the lower platform 33 beyond the gear casing 51. Above the anti-friction roller 89 the pin securing said roller to the outer end of arm 88 is extended above the roller and upon this extended upper end has attached thereto one end of the main coiled spring 90 of this form of spring tension mechanism. This coil spring extends forwardly as the parts are seen in Fig. 5 or more or less parallel with the arm 86. The near end of this spring 90 as seen in Fig. 5 is operatively connected to a rigid support upon the large ring gear 32. This may be conveniently accomplished by providing an upstanding post 91 upon said annular gear 32 and securing to said post a bracket having an outstanding arm 92. Through a hole in this arm extends a screw-threaded rod 93 extending towards spring 90 and attached to said spring as by the near end of the spring having a hook caught into a hole in that end of the rod 93. On the side of bracket arm 92 away from the spring the rod 93 is provided with a nut 94 whereby in an obvious manner the tension upon the working spring 90 may be adjusted as required.

As already mentioned this machine is organized to have the ring gear 32 and all of the take-up mechanisms carried thereby rotate in an anticlockwise direction. Accordingly as a unit using one of these Form B spring-tensioning mechanisms comes into contact with the slanting cam face 80 of the cam device 81 secured upon the stationary lower platform 33 the anti-friction roller 89 carried upon the outwardly extending arm 88 of the bell crank will be to a certain extent held from advancement and will in effect be swung backward relative to the steadily advancing post 87 upon which the bell crank is mounted. This will move the other arm 86 outwardly and thereby carry the connecting link

84 outwardly which in turn will retract the ratchet 66 past one or more teeth of the ratchet wheel 64. As soon as the continued rotation of the unit has carried the roller 89 past its co-operating cam device 81 the spring 90 which was stretched and placed under tension by the said backward swinging movement of arm 88 will be free to contract again and this will place a spring tension upon the ratchet 66 and lever 67 tending to advance the ratchet 66 and therewith the ratchet wheel 64 and the fabric-engaging roll 25 rigidly connected to said ratchet wheel. As already explained in connection with Form A, this spring tension will operate to gradually draw down the portion of the tube of knitted fabric engaged by this unit. As the working spring 90 thus gradually rotates ratchet wheel 64 in this manner, the arm 88 and its roller 89 will gradually swing towards the bracket arm 92 and will be in position to be again engaged by the cam device 81 when the unit completes one cycle about the machine if only one cam device 81 is being used or until it completes the fractional part of a rotation to meet another cam device if more than one cam device is used on that particular machine. It will be understood that in this form of spring mechanism the ratchet wheel 64 will be prevented from backward movement from the tension of the fabric during retraction of the ratchet 66 through one of the three dogs 69 soon coming into engagement with a tooth of said ratchet wheel.

It will now be seen that we have provided a take-up device for circular knitting machines which is well adapted to attain the purposes and objects pointed out at the beginning of this specification. It will be seen particularly that our take-up device avoids any distortion of a circular tube of knitted fabric and operates while the tube of fabric is still in a circle by having a plurality of pairs of fabric-engaging members disposed substantially in a circle and with the members of said pairs engaging the knitted fabric through substantially its whole circumference. It will be noticed particularly that the pairs of fabric-engaging members are of sufficient number and are arranged as closely as possible to each other and that each pair of fabric-engaging members grasps the fabric throughout the width of said members so that the entire circle of fabric is subjected to a substantially equal and proper take-up tension. It will be seen also that the fabric is actually engaged by said take-up rolls through its complete circumference except for the short spaces between adjacent pairs of take-up rollers and that this space is reduced to the minimum by the special shaping and arrangement of the parts. The narrow zones of fabric not mechanically grasped by the take-up rollers are so narrow that the tension from the two adjoining pairs of take-up rollers is distributed to these narrow zones sufficiently to keep the whole circle of fabric under sufficient tension as it leaves the cylinder needles. It will be seen further that each pair of take-up rollers can be separately adjusted to exert the proper spring tension upon the fabric engaged thereby and that each pair of take-up rollers is at frequent intervals having its spring-tensioned power restored or retensioned automatically during the operation of the machine.

What we claim as new and desire to secure by Letters Patent is:

1. In a take-up device for a circular, knitting machine, the combination of a needle-cylinder

from which the tube of fabric being knitted descends, a shaft depending within the tube of fabric, a plurality of members supported by the said shaft and engaging the interior surface of the tube of fabric below the level of the cylinder, rollers supported outside the tube of fabric and frictionally engaging its outer surface on the level of said interior fabric-engaging members and similar in number to said interior fabric-engaging members and severally aligned therewith, means revolubly mounting said outside rollers, said pairs of oppositely disposed fabric engaging members having their fabric-engaging faces of such length and the pairs being of sufficient number and so closely arranged next to each other as to engage the entire circle of fabric with only slight interruptions between adjacent pairs, and separate and separately adjustable and independently operating spring-tensioned means located outside the tube of fabric for separately rotating each of said outside rollers whereby the fabric is drawn down evenly all about the circle.

2. In a take-up device for a circular knitting machine, the combination of a needle-cylinder from which the tube of fabric being knitted descends, a shaft depending within the tube of fabric, a plurality of members supported by the said shaft and engaging the interior surface of the tube of fabric below the level of the cylinder, rollers supported outside the tube of fabric and frictionally engaging its outer surface on the level of said interior fabric-engaging members and similar in number to said interior fabric-engaging members and severally aligned therewith, means revolubly mounting said outside rollers, said pairs of oppositely disposed fabric-engaging members having their fabric engaging faces of such length and the pairs being of sufficient number and so closely arranged next to each other as to engage the entire circle of fabric with only slight interruptions between adjacent pairs, separate means outside the tube of fabric for independently imparting an adjustable spring-tension to each of said outside rollers tending to rotate them in the direction to draw the fabric down and means for periodically renewing the tension on said separate spring-tension means.

3. In a take-up device for a circular knitting machine, the combination of a needle cylinder from which the tube of fabric being knitted descends, a shaft depending within the tube of fabric, a plurality of yokes supported by the said shaft in radiating arrangement below the level of the cylinder, a roller revolubly mounted in each of said interior yokes and engaging the inside of the tube of knitted fabric, a similar number of rollers supported outside the tube of fabric and frictionally engaging its outer surface on the level of said interior rollers and severally aligned therewith, means revolubly mounting said outside rollers, said pairs of oppositely disposed fabric-engaging members having their fabric-engaging faces of such length and the pairs being of sufficient number and so closely arranged next to each other as to engage the entire circle of fabric with only slight interruptions between adjacent pairs, and separate spring-tensioned means outside the tube of fabric for rotating each of said outside rollers independently whereby the fabric is drawn down evenly all about the circle.

4. In a take-up device for a circular knitting machine the combination of a needle cylinder from which the tube of fabric being knitted de-

scends, a shaft depending within the tube of fabric, a plurality of yokes supported by the said shaft in radiating arrangement below the level of the cylinder, a roller revolubly mounted in each of said interior yokes and engaging the inside of the tube of knitted fabric, a similar number of rollers supported outside the tube of fabric and frictionally engaging its outer surface on the level of said interior rollers and severally aligned therewith, means revolubly mounting said outside rollers, said pairs of oppositely disposed fabric-engaging members having their fabric-engaging faces of such length and the pairs being of sufficient number and so closely arranged next to each other as to engage the entire circle of fabric with only slight interruptions between adjacent pairs, separate means outside the tube of fabric for imparting a spring tension to each of said outside rollers tending to rotate them in the direction to draw the fabric down and independently operated means for periodically renewing the tension on said respective tension means.

5. In a take-up device for a circular latch-needle knitting machine, the combination of a rotated needle-cylinder from which the tube of fabric being knitted descends, a shaft depending within the tube of fabric and rotating in unison with the said cylinder and the fabric, a plurality of rollers supported by the said shaft and engaging the interior surface of the tube of fabric below the level of the cylinder, rollers supported outside the tube of fabric and frictionally engaging its outer surface on the level of said interior rollers and similar in number to said interior rollers and severally aligned therewith, means including brackets carrying said outside rollers, said pairs of oppositely disposed rollers having their fabric-engaging faces of such length and the pairs being of sufficient number and so closely arranged next to each other as to engage the entire circle of fabric with only slight interruptions between adjacent pairs, a ring carrying said brackets in unison with the cylinder and said inside shaft and separate and separately adjustable, spring-tensioned means located outside the tube of fabric for rotating each of said outside rollers whereby the fabric is drawn down evenly all about the circle.

6. In a take-up device for a circular latch-needle knitting machine, the combination of a rotated needle-cylinder from which the tube of fabric being knitted descends, a shaft depending within the tube of fabric and rotating in unison with the said cylinder and the fabric, a plu-

ality of interior rollers supported by the said shaft and engaging the interior surface of the tube of fabric below the level of the cylinder, rollers supported outside the tube of fabric and frictionally engaging its outer surface on the level of said interior rollers and similar in number to said interior rollers and severally aligned therewith, means including brackets carrying said outside rollers, said pairs of oppositely disposed fabric-engaging rollers having their fabric-engaging faces of such length and the pairs being of sufficient number and so closely arranged next to each other as to engage the entire circle of fabric with only slight interruptions between adjacent pairs, a ring carrying said brackets in unison with the cylinder and said inside shaft, separate and separately adjustable spring-tensioned means located outside the tube of fabric for rotating each of said outside rollers whereby the fabric is drawn down evenly all about the circle and means operated by the rotation of said ring for periodically renewing the tension on said separate spring-tension means for rotating the outer rollers.

7. In a take-up device for a circular knitting machine, the combination of a needle-cylinder from which the tube of fabric being knitted descends, a two-part shaft depending within the tube of fabric and having the lower portion connected to its upper portion by a universal joint, a plurality of members supported by the lower portion of said shaft and engaging the interior surface of the tube of fabric below the level of the cylinder, rollers supported outside the tube of fabric and frictionally engaging its outer surface on the level of said interior fabric-engaging members and severally aligned therewith, means revolubly mounting said outside rollers, said pairs of oppositely disposed fabric-engaging members having their fabric-engaging faces of such length and the pairs being of sufficient number and so closely arranged next to each other as to engage the entire circle of fabric with only slight interruptions between adjacent pairs, spring-tensioned means for pressing each outer roller inwardly towards the opposite inner fabric-engaging member, and separate spring-tensioned means outside the lines of fabric for rotating separately each of said outside rollers whereby the fabric is drawn down evenly all about the circle thereof.

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