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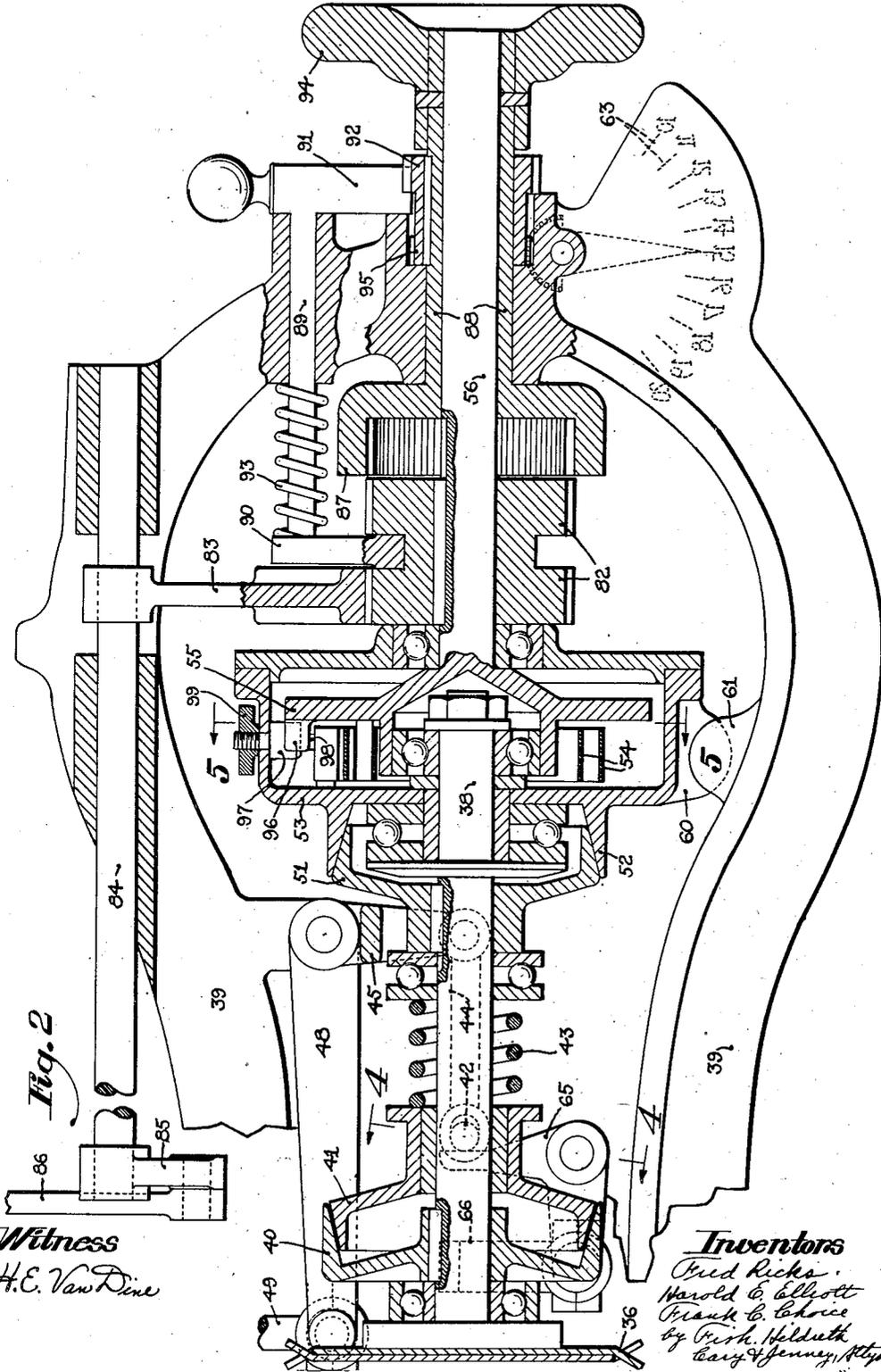
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2,000,613

SEWING MACHINE

Filed Oct. 25, 1933

4 Sheets-Sheet 2



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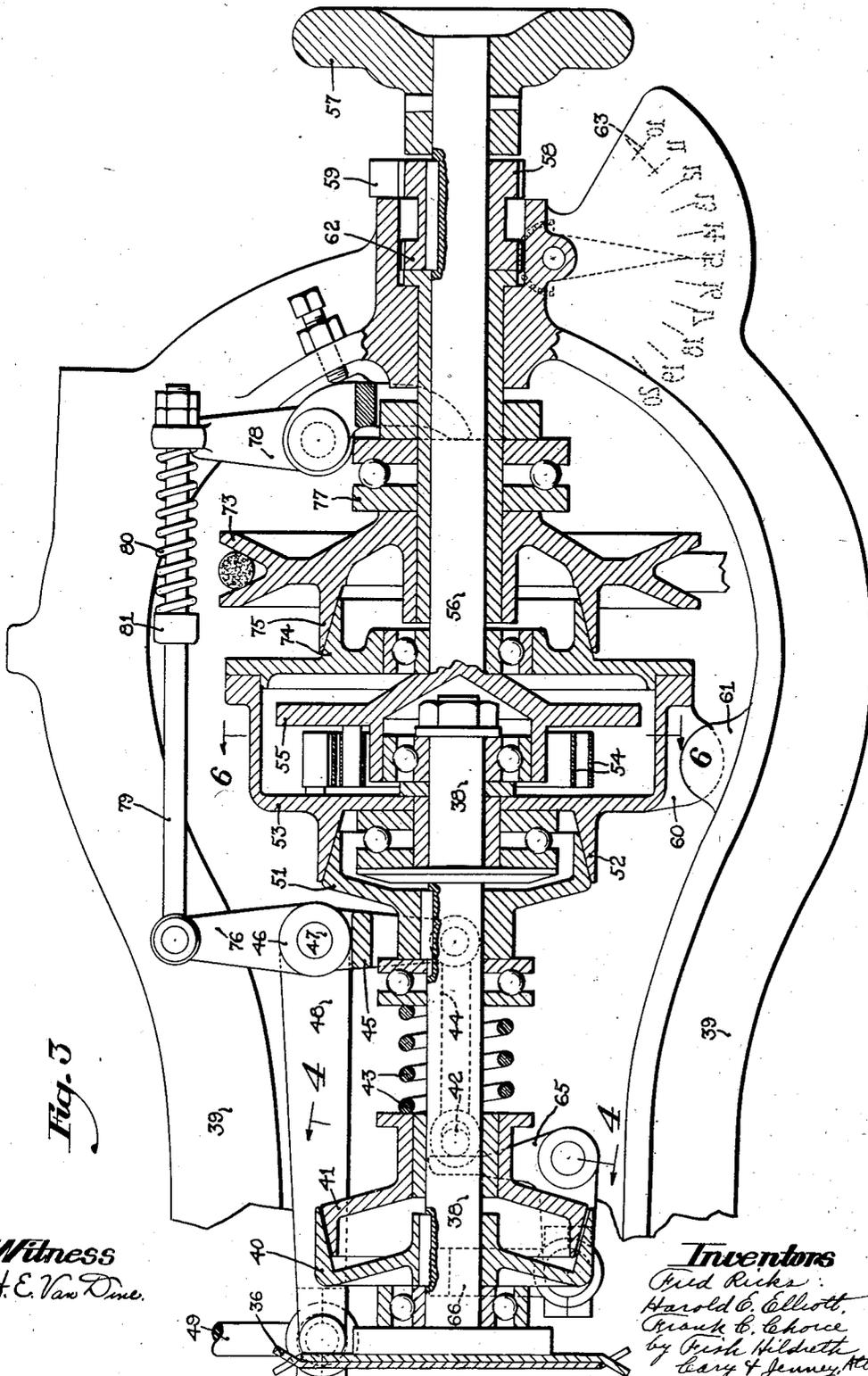


Fig. 3

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Fig. 4

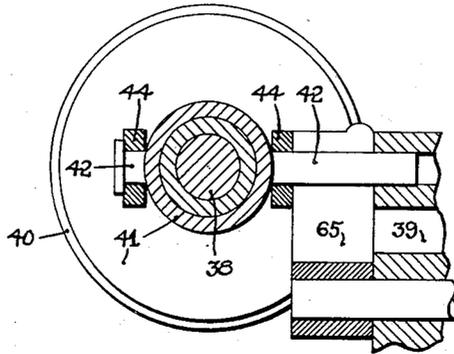


Fig. 5

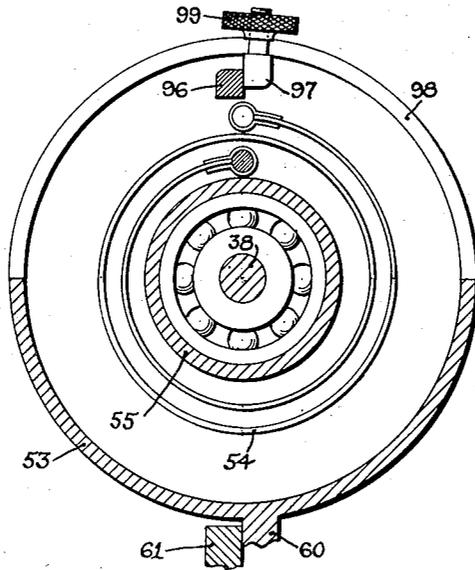
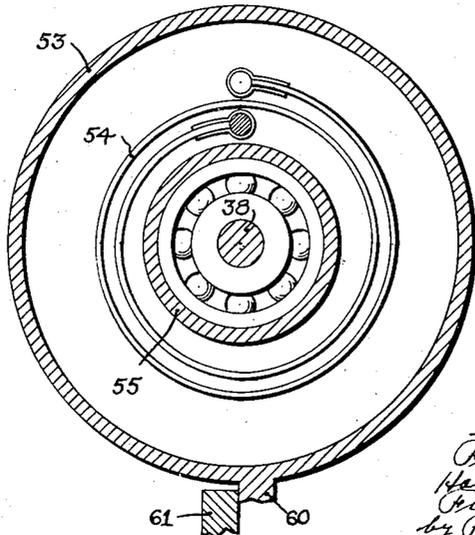


Fig. 6



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UNITED STATES PATENT OFFICE

2,000,613

SEWING MACHINE

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Application October 25, 1933, Serial No. 695,140
In Great Britain November 4, 1932

16 Claims. (Cl. 112—59)

The present invention relates to sewing machines, and particularly, but by no means exclusively, to hooked needle sewing machines such as are used, for instance, in the manufacture of shoes.

The invention will be explained by way of illustration and not of limitation in connection with curved hooked needle chain stitch sewing machines of which the machine illustrated and described in the patents to Eppler No. 1,108,560 dated August 25, 1914 and Topham No. 1,099,328 dated June 9, 1914 is an example.

In machines of the type disclosed in the patents above referred to the tension exerted on the thread by the agency of the usual tension device plays an important part in determining the proper formation of the seam and requires to be adjusted with some nicety to deal with changing work conditions. The usual tension device is a friction device and the actual tension being exerted in any given circumstances of adjustment is not, therefore, reliably constant or readily ascertainable by the operator of the machine and the disturbance, to meet other conditions, of a condition of adjustment found by trial and error appropriate to one class of work makes it a matter of no small difficulty for the operator to restore the same tension conditions when he so desires.

It is one of the several objects of the present invention to provide much increased facilities for effecting such restoration of conditions previously determined as appropriate to a given case while it is another of the several objects of the invention to provide tension devices for such machines which shall reliably create, as desired, tension of a determinate amount.

With the above objects in view one of the several features of the invention contemplates the provision in a sewing machine of a thread tension device having a novel and improved construction and mode of operation, which device acts to create tension by the storage of energy in the device under the pull of the thread.

Other features of the present invention contemplate the provision of a novel and improved means for adjusting a thread tension device, and a novel and improved means for indicating to the operator of the machine the condition of the adjustment or, in other words, the amount of tension exerted by the tension device on the thread.

The above and other objects, and the several features of the invention will become evident to those skilled in the art from the following

description of illustrative constructions according to the invention given by way of example.

Referring to the drawings, Figure 1 is a view in side elevation, partly in section, of a curved hooked needle chain stitch shoe sewing machine of the type illustrated in the patents above referred to embodying a form of the present invention; Figure 2 is a vertical sectional view of the thread tension mechanism illustrated in Figure 1, taken substantially on a plane indicated by the line 2—2; Figure 3 is a view similar to Figure 2 illustrating a slightly different form of thread tension mechanism; Figure 4 is a detail sectional view taken on a plane indicated by the lines 4—4 in Figures 2 and 3; Figure 5 is a detail sectional view taken on a plane indicated by the line 5—5 on Figure 2; and Figure 6 is a detail sectional view taken on a plane indicated by the line 6—6 in Figure 3.

The machine illustrated in Figure 1, except as hereinafter described, is the same in the construction and mode of operation of its various parts as the machine disclosed in the patents above referred to. The curved hooked needle of the machine is indicated at 31, the looper at 32, the thread finger at 33, the take-up at 34 and the auxiliary take-up at 35. During the operation of these devices in forming a stitch the take-up acts to draw the last needle loop tight around the shank of the needle while the needle is through the work and then to draw thread from the supply, the tension wheel, indicated at 36, being rotated by the pull of the thread during this action of the take-up. During the loop drawing stroke of the needle 31, thread is given up to the needle by the take-up and, as the needle reaches the limit of its backward movement, a yielding strain is exerted on the thread by the engagement of the auxiliary take-up 35 with a spring supported plunger indicated at 37.

Referring now to the construction illustrated in Figure 3, the tension wheel 36 is of well known construction and comprises a pair of discs, the margins of which are notched to form projections which are bent to furnish a V-shaped groove to receive the thread. The discs are secured to the right hand end of a horizontal spindle 38 extending from right to left of the machine, which spindle is rotatably mounted in a bracket 39 secured to the rear of the machine frame.

The tension wheel spindle has secured to it close to the tension wheel an internally coned clutch member 40 which is engaged at a certain

time in the cycle of the machine, as will hereinafter appear, by an externally coned clutch member 41 slidably mounted on a sleeve surrounding the spindle. The externally coned clutch member 41 is prevented from rotating by pins 42 which project from each side of it and one of which enters a horizontal slot in the said bracket 39 so that when the clutch members are in engagement, the tension wheel is prevented from rotating. The externally coned clutch member is urged by a spring 43 surrounding the spindle into engagement with the internally coned member and is withdrawn by links 44 which are connected to the pins 42 extending from the member, said pins entering slots in the links. The links extend from the pins to the left substantially parallel to the tension wheel spindle and at their other ends are pivotally connected to a forked downwardly extending arm 45 of a three-armed lever 46 pivoted on a horizontal shaft 47 extending forwardly and rearwardly of the machine and fixed in the said bracket above the tension wheel spindle. Another arm 48 of the three-armed lever extends to the right from the hub of the lever and is connected by a link 49 to a cam lever 50 of the machine which controls the thread tension, as hereinafter described. A second externally coned clutch member 51 is keyed to the tension wheel spindle so as to slide thereon and rotate therewith and is arranged to the left of the first clutch members. The second externally coned clutch member is urged by the spring 43 into engagement with a second internally coned clutch member 52. The second externally coned clutch member is withdrawn by the same forked arm 45 of the three-armed lever aforesaid which controls the first externally coned clutch member, which forked arm carries blocks engaging a flange on the second clutch member, and the arrangement is such that when one externally coned clutch member is allowed to be moved by the spring 43 into clutching engagement with its internally coned member, the other clutch member is withdrawn. The second internally coned clutch member is formed on the right-hand side of a drum 53 which is freely rotatable on the tension wheel spindle. Arranged inside the drum about the axis of the spindle is a clock spring 54 one end of which is secured to the drum and the other end of which is secured to a member 55 within the drum. The latter member is formed on the right-hand end of a shaft 56 mounted in bearings in the aforesaid bracket 39 in axial alignment with the tension wheel spindle. The latter shaft has at its left hand end a hand-wheel 57 by which it may be rotated to wind up the clock spring and a ratchet wheel 58 on the shaft and a hand releasable pawl 59 prevent the shaft from returning except as and when desired. The drum is prevented from rotating under the influence of the spring when the spring is wound up by the engagement of a lug 60 on the drum with a lug 61 on the bracket. The shaft 56 has on it a spiral gear 62 which meshes with a spiral gear segment on an indicator arm pivoted on the bracket and the indicator arm is arranged to swing over a scale 63 on the bracket when the shaft is rotated to adjust the spring to indicate to the operator on the scale which is situated to be readily visible from the front of the machine the actual tension of the spring.

When, during the operation of the machine

the take-up lever is setting the previously formed stitch and is pulling thread from the supply the second externally coned clutch member 51 is in engagement with the second internally coned clutch member 52 and the first clutch is disengaged. The tension wheel is therefore connected through the second clutch and drum to one end of the clock spring which, as the take-up is moving in a direction to set the previous stitch and draw thread from the supply is further wound up (it being understood that the thread lapped round the wheel cannot slip around the same) and through the tension wheel exerts tension on the thread, the final amount of tension being primarily dependent upon the previous adjustment of the hand-wheel and to a lesser degree on the extent of rotation of the tension wheel. After the take-up has finished its movement to set the previous stitch and draw thread from the supply, the second clutch is opened and the first clutch is closed (so that in effect the tension wheel is locked) and the drum is returned by the clock spring until the lug 60 on the drum engages the lug 61 on the bracket. At the time in the machine cycle when the needle is moving back and pulling a loop of thread through the work and exerting a pull on the preceding loop, the first clutch is closed and the second clutch is open and the tension wheel is prevented from rotation. To allow the needle to obtain thread during its backward movement without drawing thread from the supply, the stop plunger 37 against which the auxiliary take-up is moved by the pull of the needle on the thread before the needle reaches its fully back position is in the construction being described arranged to yield at this time against a light spring indicated at 620 so that the needle may obtain by such yield thread during its final backward movement by movement of the auxiliary take-up. To insure a certain and uniform yielding strain on the thread as the needle reaches the limit of its loop drawing stroke without pulling thread from the supply, means are provided in the illustrated construction for locking the auxiliary take-up against yielding movement during the action of the take-up in drawing thread from the supply. As illustrated in Figure 1, the auxiliary take-up is held against the yielding movement during the thread drawing action of the take-up by means of a locking slide 630 arranged in a horizontal guideway above a pin 64 projecting from the stop plunger 37. The slide 630 is pivotally connected at its rear end to an arm 640 projecting upwardly from the hub of the take-up lever 34. The lower surface of the slide 630 is provided with a notch which, during the backward loop drawing stroke of the needle, allows the stop plunger 37 to yield to the desired extent. During the loop drawing stroke of the take-up, however, the notch in the slide 630 is moved out of the path of the pin 64, and the stop plunger is locked so as to prevent the auxiliary take-up from rising under the pull of the thread. In this way drawing of the thread from the supply is effected solely by the main take-up and the needle does not have to pull any thread from the supply and is not subject to the heavy pull of the clock spring.

As in the case of the machines disclosed in the patents above referred to, the illustrated machine may be stopped, either manually or automatically when sewing is discontinued, with

the needle retracted and, accordingly, it becomes necessary to provide means for opening the clutch 40 on the stop of the machine so that thread may be drawn from the supply when the shoe is drawn away from the machine. The opening of the clutch 40 when the machine stops is effected by a bell crank lever 65 pivoted on the bracket 39. One arm of the bell crank lever 65 engages one of the pins 42 extending from the clutch member 41 and the other arm of the bell crank lever carries a latch 66 pivotally mounted at its lower end on the horizontal arm of the bell crank and extending upwardly into a position to be engaged by a projection on the hub of a lever 67 (see Fig. 1) mounted on the frame of the bracket 39. A leaf spring 68 attached to the lever 67 bears upon the latch 66 and holds it in the path of the projection from the hub of the lever. The upper end of the lever 67 is connected by a link 69 to the lower end of an arm 70 projecting downwardly from a rock shaft 71 extending across the machine at the rear of and below the main cam shaft 72. As fully described in the patents above referred to, the shaft 71 is rocked in a clockwise direction as viewed in Figure 1 upon stopping the machine. This movement of the rock shaft through the connections above described swings the bell crank lever 65 in a direction to open the clutch 41. This movement of the clutch 41 is permitted by the slotted connection between the links 44 and the pins 42.

To insure the necessary quick return of the drum 53 by the clock spring 54 it may be desirable to additionally drive the drum in its return movement and this may be effected by a continually rotating pulley 73 rotatably and slidably mounted on the shaft 56 which pulley, when the clutch 51 is open, is automatically clutched momentarily to the drum 53 by clutch members 74 and 75 formed respectively on the drum 53 and the pulley. The clutch 74, 75 is conveniently controlled by connections to the third arm 76 of the three-armed lever 46. As illustrated in Figure 3, the hub of the pulley 73 bears against a thrust bearing 77 which is engaged by the lower forked end of a lever 78, the upper end of which is yieldingly connected to the upper end of the arm 76 of the three-armed lever 46 by means of a link 79 and spring 80, the link 79 being pivotally connected at one end to the arm 76 and at its other end passing loosely through the upper end of the lever 78, and the spring 80 being interposed between the lever 78 and a collar 81 fast on the link. With this construction, the pulley 73 is yieldingly forced towards the drum 53 when the clutch member 51 is moved away from the clutch member 52. The drum 53 is thus returned against its stop with certainty after which the clutch members 74, 75 are allowed to slip until they are permitted to separate upon the movement of the clutch member 51 towards the member 52.

During each stitch forming cycle of the machine the tension wheel 36 is rotated about 130° as the take-up draws thread from the supply, and such movement may be found to unduly tension the clock spring 54 which will be wound up by the rotation of the tension wheel. To prevent such undue tensioning of the spring 54, the tension mechanism illustrated in Fig. 2 may be used, which mechanism, except as hereinafter described is the same in the construction and arrangement of its various parts as the mech-

anism illustrated in Fig. 3, and above described. In the construction illustrated in Fig. 2, the tension adjusting member 55 to which one end of the clock spring 54 is connected, instead of being held in fixed position in the bracket 39, is driven by connections to the main take-up cam lever in such a manner that as the rotation of the tension wheel, when the take-up is setting the previous stitch and drawing thread from the supply, tends to wind up the clock spring 54 by, in effect, a pull on one end of the spring, the other end of the spring is moved round in the same direction, but at a slightly higher speed so that the initial tension of the clock spring is maintained substantially constant during the rotation of the tension wheel. As illustrated in Figs. 1 and 2, the connections between the main take-up cam lever and the tension adjusting member 55 comprise a pinion 82 mounted to rotate with and slide longitudinally on the shaft 56, a gear segment 83 meshing with the pinion 82, a rock shaft 84 to which the gear segment 83 is secured, an arm 85 secured to the rock shaft 84, and a link 86 connecting the arm 85 with the main take-up lever.

In order to permit the adjustment of the spring 54 in the construction illustrated in Fig. 2, means are provided whereby the tension adjusting member 55 may be disconnected from the main take-up lever and rotated independently to a new position of adjustment. To this end, in the construction illustrated in Fig. 2 the pinion 82 is mounted to be capable of sliding longitudinally on the shaft 56 so as to disengage the pinion from the gear segment 83 and bring it into mesh with an internal gear 87 formed on the inner end of a sleeve 88 mounted on the shaft 56. The pinion 82 may be moved back and forth on the sleeve 56 by a manually operable rod 89, the inner end of which is provided with a yoke 90 engaging a slot in the pinion 82 and the outer end of which is provided with a locking projection 91 arranged to engage any one of a series of locking notches formed in a sleeve 92 fast on the sleeve 88. A spring 93 coiled around the rod 89 and interposed between the yoke 90 and a shoulder on the fixed bracket 39 tends to force the rod 89 to the left, as viewed in Fig. 2 and holds the pinion 82 in mesh with the gear segment 83. With the parts in their normal position, as illustrated in Fig. 2, the locking projection 91 is in engagement with the notches on the sleeve 92 and thus this sleeve, together with the sleeve 88 is held from rotation. With the parts in this position, however, the shaft 56 together with the tension adjusting member 55 is free to rotate under the control of the main take-up through the connections including the gear segment 83 and the pinion 82. When the rod 89 is moved outwardly the pinion 82 engages the internal gear 87 and, at the same time, the locking projection 91 moves out of engagement with the notches on the locking sleeve 92. The sleeve 88 is now free to be rotated by the hand wheel 94 at its outer end, and this rotation through the internal gear 87 and pinion 82 rotates the tension adjusting member 55 to secure the desired adjustment of the spring 54. After the desired adjustment has been secured the pinion 82 is returned into engagement with the gear segment 83 and the locking projection 91 again engages the notches of the sleeve 92.

To indicate to the operator the tension to which the spring has been adjusted, a spiral

gear 95 is formed on the sleeve 92 which meshes with a spiral gear segment on an indicator arm pivoted on the bracket 39 and arranged to swing over the scale 63 on the bracket when the sleeve 88 is rotated to adjust the spring. As above stated, this scale is situated so as to be readily visible to the operator from the front of the machine.

In the construction illustrated in Fig. 2, the rotating pulley 73 of the construction illustrated in Fig. 3 is dispensed with and the drum 53 is returned by means of a finger 96 on the tension adjusting member 55 arranged to engage a lug 97 on the drum. To permit the finger 96 and lug 97 to cooperate properly under all adjustments of the spring 54, the lug 97 is adjustably mounted in a circumferential slot 98 in the periphery of the drum and is held in adjusted position by a locking nut 99 having a screw threaded engagement with a stud projecting outwardly from the lug 97 through the slot 98.

As has been stated, the connections from the main take-up lever to the tension adjusting member 55 are arranged to move the member 55 at a slightly higher speed than that of the drum 53. The tension adjusting member is moved in this manner in order that the finger 96 on the tension adjusting member shall move with certainty in advance of the lug 97 on the drum as these two move when the take-up is drawing thread from the supply, and not impede movement of the drum due to the pull of the thread as it passes around the tension wheel, which if it occurred, might cause breaking of the thread.

In the thread tension mechanisms above described, it will be observed that friction between any of the parts is not depended upon to create tension in the thread, with the result that a definite and known tension may readily be obtained by a suitable adjustment of the clock spring and this tension, the amount of which is indicated to the operator by the scale referred to, will remain constant until further adjustment of the spring is required according to the nature of the work being operated upon or a change in the thread being used.

The nature and scope of the invention having been indicated and mechanisms embodying the invention having been specifically described, what is claimed is:

1. A sewing machine having, in combination, stitch forming devices, a thread tension wheel, a rotatable member, a spring yieldingly holding the member from rotation and tensioned by rotation of the member, and means for clutching and unclutching the tension wheel and member during each stitch forming cycle to cause the member to be rotated with the wheel against the force of the spring by a pull on the thread and to be returned independently of the wheel.

2. A sewing machine having, in combination, stitch forming devices, a thread tension wheel, a spring to restrain the rotation of the wheel arranged to be tensioned by the rotation of the wheel, and means acting in timed relation to the stitch forming devices for connecting and disconnecting the wheel and spring during each stitch forming cycle.

3. A chain stitch shoe sewing machine having, in combination, a hooked needle, a looper, a take-up acting while the needle is in the work, a thread tension wheel, a spring to restrain

the rotation of the wheel, means for connecting the wheel and spring during the take-up action of the take-up, and means for locking the wheel from rotation during the loop drawing stroke of the needle.

4. A chain stitch shoe sewing machine having, in combination, a hooked needle, a looper, a take-up acting while the needle is in the work, a spring pressed auxiliary take-up, a thread tension wheel, a spring to restrain the rotation of the wheel, means for connecting the wheel and spring during the take-up action of the take-up, means for locking the wheel from rotation during the loop drawing stroke of the needle, and means for preventing yielding movement of the auxiliary take-up during the take-up action of the take-up.

5. A sewing machine having, in combination, stitch forming devices, a thread tension wheel, a rotatable member, a spring yieldingly holding the member from rotation, means for clutching and unclutching the tension wheel and member during each stitch forming cycle to cause the member to be rotated with the wheel against the force of the spring by a pull on the thread, and means in addition to the spring for returning the member.

6. A sewing machine having, in combination, stitch forming devices, a thread tension wheel, a rotatable drum, a spring yieldingly holding the drum from rotation, means for clutching and unclutching the tension wheel and drum during each stitch forming cycle to cause the drum to be rotated with the wheel against the force of the spring by a pull on the thread, a rotating member, and means for clutching said member and drum to return the drum.

7. A sewing machine having, in combination, stitch forming devices, a thread tension wheel, a rotatable drum, a coil spring yieldingly holding the drum from rotation and having one end connected to the drum, a rotatable disk to which the other end of the spring is secured, means for clutching and unclutching the tension wheel and drum during each stitch forming cycle to cause the drum to be rotated with the wheel against the force of the spring by a pull on the thread and to be returned independently of the wheel, a shaft carrying said disk manually rotatable to adjust the tension of the spring, and an indicating device actuated by said shaft for indicating the amount of tension placed on the thread by the tension wheel when clutched to the drum.

8. A chain stitch shoe sewing machine having, in combination, a hook needle, a looper, a take-up acting while the needle is in the work, a thread tension wheel, a spring to restrain the rotation of the wheel, means for connecting the wheel and spring during the take-up action of the take-up, means for locking the wheel from rotation during the loop drawing stroke of the needle, and means operative upon stopping the machine for unlocking the wheel.

9. A sewing machine having, in combination, stitch forming devices, a thread tension wheel, a spring to restrain the rotation of the wheel, means acting in timed relation to the stitch forming devices for connecting and disconnecting the wheel and spring during each stitch forming cycle, and means for maintaining the spring tension substantially constant during the rotation of the wheel while connected to the spring.

10. A chain stitch shoe sewing machine hav-

ing, in combination, a hook needle, a looper, a take-up acting while the needle is in the work, a thread tension wheel, a spring to restrain the rotation of the wheel, means for connecting the wheel and spring during the take-up action of the take-up, and a connection between the take-up and spring for maintaining the spring substantially constant during the take-up action of the take-up.

10 11. A chain stitch shoe sewing machine having, in combination, a hook needle, a looper, a take-up acting while the needle is in the work, a thread tension wheel, a rotatable drum, a coil spring yieldingly holding the drum from rotation having one end connected to the drum, a rotatable disk to which the other end of the spring is connected, and means for clutching the wheel and drum during the take-up action of the take-up, and a connection between the take-up and disk for rotating the disk to maintain the tension of the spring substantially constant during the take-up action of the take-up.

15 12. A chain stitch shoe sewing machine having, in combination, a hook needle, a looper, a take-up acting while the needle is in the work, a thread tension wheel, a rotatable drum, a coil spring yieldingly holding the drum from rotation having one end connected to the drum, a rotatable disk to which the other end of the spring is connected, means for clutching the wheel and drum during the take-up action of the take-up, and means for rotating the disk to maintain the tension of the spring substantially constant during the take-up action of the take-up.

20 13. A sewing machine having, in combination, stitch forming devices, a thread tension wheel, a spring to restrain the rotation of the wheel arranged to be tensioned by the rotation of the wheel, means acting in timed relation to the stitch forming devices for connecting and disconnecting the wheel and spring during each stitch forming cycle, and means for adjusting the tension of the spring.

14. A sewing machine having, in combination, stitch forming devices, a thread tension wheel, a spring to restrain the rotation of the wheel, means acting in timed relation to the stitch forming devices for connecting and disconnecting the wheel and spring during each stitch forming cycle, means for maintaining the spring tension substantially constant during the rotation of the wheel while connected to the spring, and means for adjusting the initial tension of the spring.

15 15. A chain stitch shoe sewing machine having, in combination, a hooked needle, a looper, a take-up acting while the needle is in the work, a thread tension wheel, a rotatable drum, a coil spring yieldingly holding the drum from rotation having one end connected to the drum, a rotatable disk to which the other end of the spring is connected, means for clutching the wheel and drum during the take-up action of the take-up, means for rotating the disk to maintain the tension of the spring substantially constant during the take-up action of the take-up, and means for disconnecting the disk from its rotating means and for actuating the disk to adjust the initial tension of the spring.

20 16. A sewing machine having, in combination, stitch forming devices, a thread tension wheel, a spring to restrain the rotation of the wheel, means acting in timed relation to the stitch forming devices for connecting and disconnecting the wheel and spring during each stitch forming cycle, means for maintaining the spring tension substantially constant during the rotation of the wheel while connected to the spring, means for adjusting the tension of the spring, and an indicating device actuated by said adjusting means for indicating the tension of the spring.

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