July 31, 1951 F. E. COLE 2,562,175

THREAD TENSIONING DEVICE AND MECHANISM FOR ACTUATING THE SAME

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Fig. 1

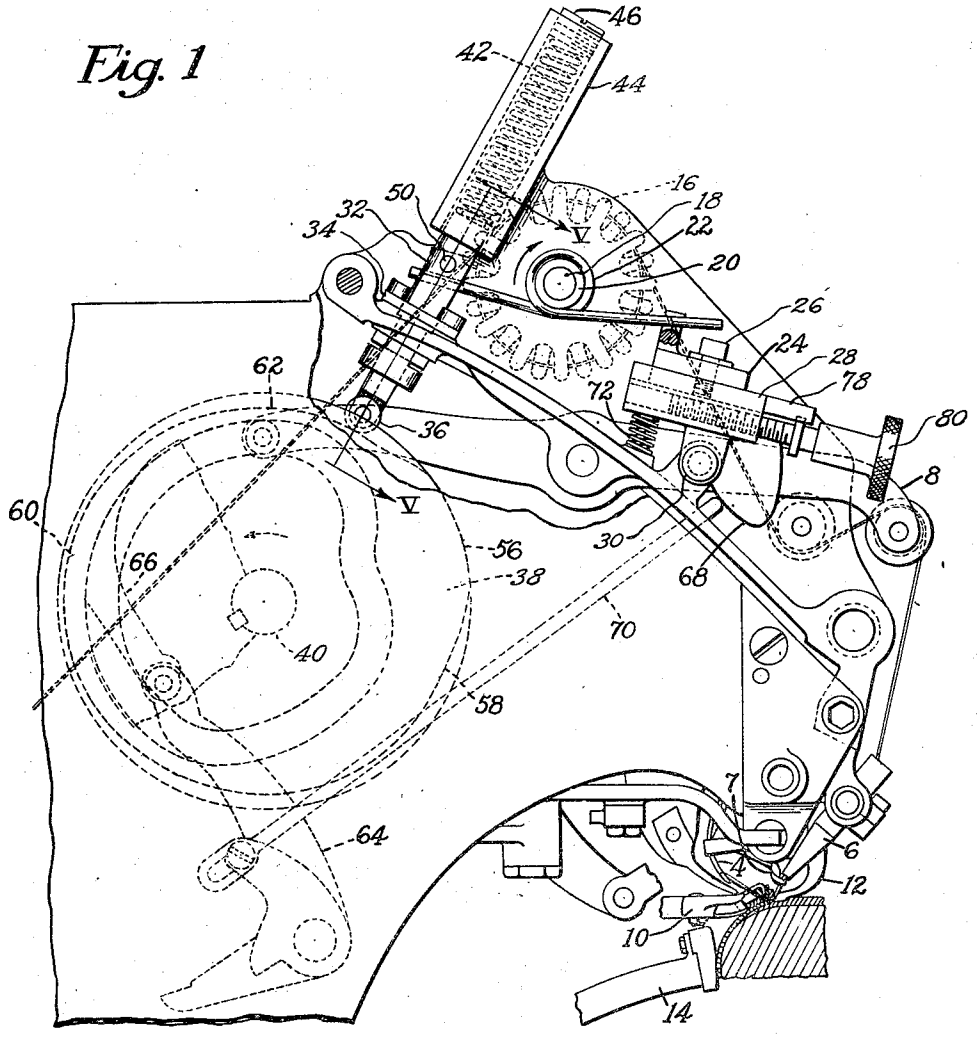
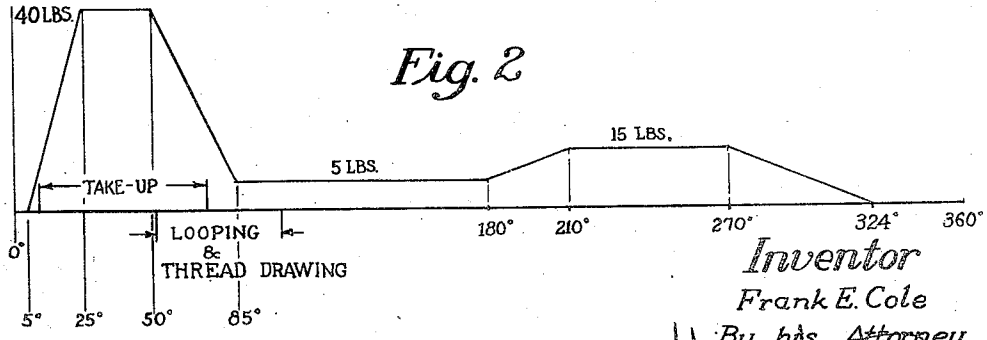



Fig. 2




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THREAD TENSIONING DEVICE AND MECHANISM FOR ACTUATING THE SAME

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Fig. 3

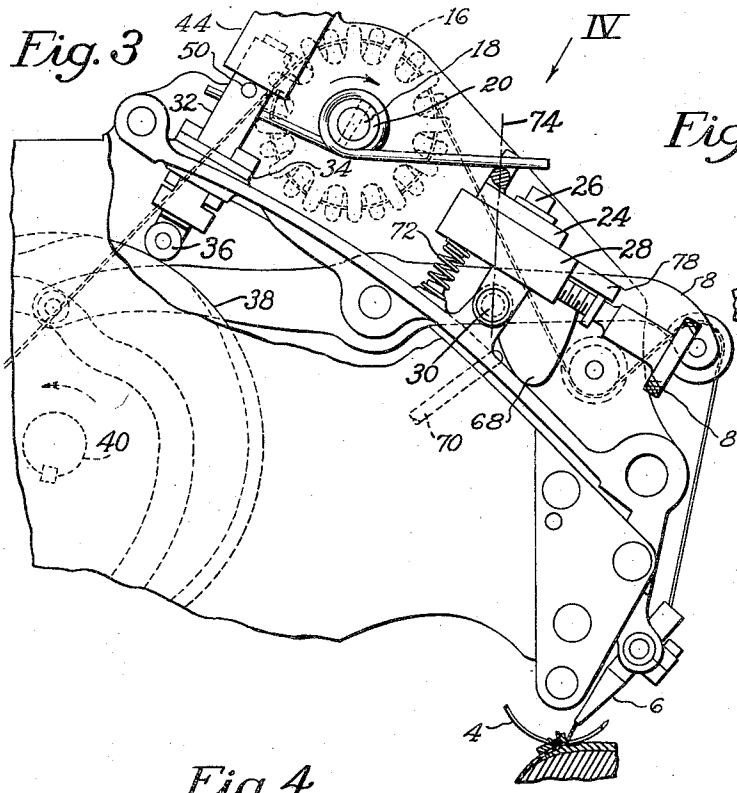



Fig. 5

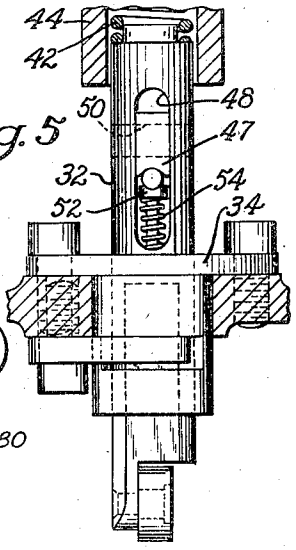
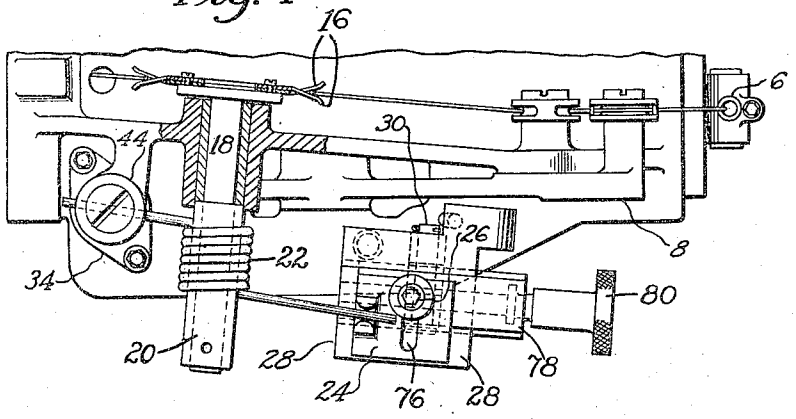


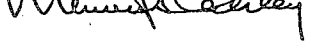

Fig. 4




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Patented July 31, 1951 2,562,175

# UNITED STATES PATENT OFFICE

2,562,175

## THREAD TENSIONING DEVICE AND MECHANISM FOR ACTUATING THE SAME

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Application September 29, 1948, Serial No. 51,712

18 Claims. (Cl. 112—59)

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The present invention relates primarily to thread tensioning devices for hook needle shoe sewing machines and more particularly to improvements in chainstitch sewing machines of the curved needle type illustrated in an application for United States Letters Patent Serial No. 696,786, filed September 13, 1946 in the name of the present inventor, now Patent No. 2,465,356, granted March 12, 1949, and United States Letters Patent No. 2,359,662, granted October 3, 1944, upon application of Alfred R. Morrill.

The sewing machine of the application and patent, above identified, is operated to attach a welt and upper to the insole of a lasted shoe. In machines of this type, besides the curved hook needle, the stitch forming devices comprise an oscillating take-up acting successively during each sewing cycle to give up thread for the formation of each stitch, to tighten and set the stitch by exerting a predetermined tension on the thread and thereafter to draw from the supply sufficient thread for the formation of the succeeding stitch. The tension is applied by a device connected with the take-up acting to impart maximum resistance to thread movement during the action of the take-up in tightening and setting each stitch. The tensioning device of the machine illustrated in the said Patent No. 2,465,356 comprises a traction member in the form of a pair of toothed disks providing between them a peripheral groove within which the thread passes and a friction brake drum connected to the traction member. To resist rotation of the brake drum with the traction member, in the machine of Patent No. 2,465,356, the drum is surrounded by a multi-coil spring braking band of an internal size slightly smaller than the diameter of the brake drum and so mounted that the band normally grips the drum by its own inherent force with an initial pressure which is first automatically increased progressively along the length of the band as the drum is turned. The band then begins to turn with the drum. When the tension on the thread reaches a predetermined intensity the braking band finally is actuated by engagement with an abutment to cause it to reduce its grip progressively along the band, maintaining the thread under uniform tension, thereafter, as the traction member moves. The amount of tension in the thread also is controlled throughout each sewing cycle by connecting one end of the braking band to the take-up which, while a stitch is being set, increases the initial pressure of the band on the drum. In so doing, an additional pressure is applied periodically to the braking band beyond that obtained in its initial position surrounding the shaft and the pressure is reduced after each stitch is set.

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While the arrangement of a coil spring braking band disclosed in the said Patent No. 2,465,356 is effective for the purposes intended, it has been found that there is a tendency under certain conditions for vibratory action between the ends of the band and wide variations in dimentions and strengths occasionally are found between different spring bands as a result of manufacturing inequalities, thus affecting adversely the uniformity of thread tension obtainable with this type of thread tensioning device.

An object of the present invention is to simplify the construction and improve the mode of operation of a thread tensioning device for a shoe sewing machine.

Another object of the present invention is to provide a sewing machine with a thread tensioning device of the type referred to comprising a traction member and a brake drum connected with the traction member and surrounded by a coil spring braking band arranged in such a way that vibratory tendencies and manufacturing inequalities are substantially reduced and, as a result, it is possible to keep the tension on the thread more uniform and reliable under all circumstances than has been found possible heretofore.

A still further object of the invention is to improve the construction of a coil spring braking band particularly for use with a sewing machine but also for other applications whenever uniformity of action and ease of adjustment are essential. In this connection the invention has for its purpose the provision of a coil spring braking band which may readily be manufactured on a production basis with substantial uniformity of results in use, both in applying a braking action to a brake drum as well as in releasing the braking band from such engagement as will offer any substantial resistance to rotation of the drum.

To the ends above set forth the present invention is embodied in a hook needle shoe sewing machine having a looper, means acting to tighten each stitch and to draw thread from the supply past a tensioning device comprising a traction member and a brake drum, in which a coil spring braking band engages the brake drum to resist its rotation only when the band is stressed by an outside force against the brake drum, the band being formed with a dimension to enable

free rotation of the brake drum when no stress is applied to the band. By this construction, a predetermined pressure of the band against the drum and a positive release of the band from frictional engagement with the brake drum are more readily obtained than heretofore, it being possible to construct a spring band with a uniform normal unstressed shape by easy manufacturing procedure such that no binding action on the drum will occur while the stress on the band is released and yet for a given relative movement between the ends of the band a predetermined pressure will be exerted on the drum. This construction is an improvement over that of inventor's prior Patent No. 2,465,356, above referred to, in which it is necessary to stress the spring band in order to release it from the drum, inasmuch as in stressing the band to release it the alinement of the coils in the band may be upset to such an extent as to prevent complete release from a close fitting drum. This feature of the invention includes the use of a shock absorbing connection for the band actuating mechanism. Such connection reduces irregularities in the thread tension, particularly when tension is applied suddenly to the thread or when there is a tendency to set up a jerky periodic vibration in the band or its actuating mechanism.

Heretofore, machines of the type above referred to have been constructed to apply two intensities of tension to the thread. Another feature of the present invention, which is particularly useful with a coil spring braking band type of thread tensioning device, but which is of more general application with any other form of thread tensioning device, relates to mechanism for actuating the tensioning device to apply two or more different intensities of tension to the thread. In the illustrated machine beneficial results have been obtained by applying at least three definite degrees of tension to the thread during each sewing cycle and for some purposes a substantial release of all tension is advantageous at least once in each sewing cycle in order to bring the thread and the thread engaging devices uniformly to a predetermined unstressed relationship regardless of lost motion, yield and friction in the machine.

Other features of the invention consist in the devices, combinations and arrangements of parts hereinafter described and claimed which, together with the advantages to be obtained thereby, will readily be understood from the following description taken in connection with the accompanying drawings, in which

Fig. 1 is a view in left side elevation of the upper forward portion of a chainstitch shoe inseam sewing machine illustrating a preferred embodiment of the invention and indicating the parts in stopped positions;

Fig. 2 is a time chart of the tension controlling mechanism;

Fig. 3 is a view in left side elevation, similar to that of Fig. 1, showing the positions of the parts while the machine is running;

Fig. 4 is a sectional plan view of a portion of the thread tensioning device and take-up of the machine looking in the direction of the arrow IV in Fig. 3; and

Fig. 5 is a detail sectional view on an enlarged scale of a tension actuating and controlling plunger in the machine, taken along the line V—V of Fig. 1.

The shoe sewing machine illustrated in the drawings is provided with the usual stitch forming devices of a welt or turn inseam sewing machine comprising a curved needle **4**, a looper **6**, a thread finger **7**, a take-up **8**, a welt guide **10**, a channel guide **12**, and a back rest **14**. During operation of the machine the needle enters the work, the thread is laid in its hook by the looper, and the take-up gives up thread to the needle during its retracting stroke. Thereafter the work is fed a stitch length and the needle again enters the work, passing through the loop formed during its first work entering movement and the take-up sets the stitch by tightening the loop about the shank of the needle. After setting each stitch, the take-up draws thread past a tensioning device sufficient in length to form the succeeding stitch. The parts thus briefly referred to and their actuating mechanisms are, except as hereinafter described, of the same construction and mode of operation as in the machine of inventor's application and the Morrill patent above referred to. The machine of the patents, however, is an automatic machine as distinguished from the present hand controlled machine in which the machine is started and stopped and the shoe presented by an operator.

The thread tensioning device of the present machine, as in the machine of the application and patent, comprises a traction member consisting of a pair of toothed disks **16** secured together and to a rotatable shaft **18** to provide a grooved tension wheel about which the thread passes from the supply (not shown) to the stitch forming devices. In the machine of inventor's Patent No. 2,465,356 rotation of the tension wheel is resisted frictionally by an elongated braking band wrapped about a brake drum secured to the tension wheel shaft. In that machine the braking band consists of a coil spring having a pluralitp of turns so constructed that its normal internal diameter is less than that of the brake drum which it engages so that it must be expanded to bring it into surrounding relation to the brake drum. In order to control the frictional braking pressure of the prior spring band, it is necessary to increase or decrease the inherent spring force of the band as it grips the brake drum. In order to release the brake drum entirely from the grip of the spring band the band must be stressed away from the shaft. In so doing, the band may be so deformed as to distort the coils from axial alinement with each other and with the axis of the drum. Bringing the coils out of alinement may result in a failure to release the drum properly, different spring bands having different characteristics in this respect even though close attention is given during their manufacture and essential heat treatment.

To avoid difficulties in manufacture of a tension wheel braking band consisting of a plurality of turns of coil spring wire, such as employed in the machine of inventor's Patent No. 2,465,356, according to a feature of the present invention, the illustrated tension wheel shaft **18** has secured to one end a tension wheel drum **20** in the form of a sleeve fixed to the shaft and the braking band, in the form of a wire coil spring, indicated at **22**, is illustrated as having seven turns surrounding the brake drum. For best results it has been found that the use of seven to twelve turns is effective. The normal inside diameter of the coil spring **22** is slightly greater than the external diameter of the brake drum and the ends of the spring extend in a general direction

radially to the drum. Accordingly, when the braking band is actuated to apply a frictional pressure on the drum, it is given a spring stress by the application of a predetermined external force between radially disposed ends of the spring in a direction to wind up the coils and tighten them into engagement with the drum. To release the spring from the drum it is only necessary to permit the spring to expand to its normal size by removing the spring stressing force. If the spring is originally manufactured with its coils in alinement, a uniform releasing action always will occur without any tendency to cause a frictional resistance to be imparted to the drum 22. Furthermore, the only manufacturing requirement in the production of such a coil spring for use as a braking band is in careful construction to insure an accurate normal unstressed diameter and alinement of its coils.

To stress the coil spring 22 against the brake drum with a predetermined force applied periodically between its ends during operation of the present machine and to bring the spring into uniform frictional engagement with the drum 20, the forwardly directed leading end, considering the drum as winding up the spring, is engaged in the notch of a block 24 secured by a bolt 26 to an arm 28 rotatably mounted on a pin 30 carried by the frame of the machine. To support the leading end of the spring against the rotating action of the tension wheel brake drum during operation of the machine, the arm 28 remains stationary. The rearwardly directed trailing end of the spring is connected to actuating mechanism for stressing and releasing the spring. For this purpose the trailing end of the spring passes diametrically through an actuating and controlling plunger 32 slidably mounted for reciprocation is a guide 34 clamped to the machine frame to direct movements of the plunger transversely to and at one side of the axis of the tension wheel shaft 18 and of the brake drum mounted thereon.

The mechanism for stressing and releasing the spring includes the plunger 32 which extends through the frame of the machine and is held yieldingly in a downward direction to maintain a cam follower roll 36 at its lower end in engagement with the open face of the four-position cam 38 secured to a sewing shaft 40 in the machine. The plunger 32 constitutes a carrier for the cam roll 36 and is pressed downwardly by a compression spring 42 retained within a sleeve-shaped boss 44 projecting upwardly from the machine frame. At the upper end of the boss 44 is a screw plug 46 acting against the upper end of the spring, the lower end of the spring surrounding the upper end of the plunger and bearing against a shoulder formed by a reduced portion of the plunger within the spring.

In some instances, particularly when a relatively light frictional force is being exerted by a braking band comprising a coil spring, it has been found that there is a tendency for the spring to vibrate or to be subject to sudden shock movements which impair uniformity of retarding action on the brake drum surrounded thereby. As a result, irregularities in thread tension and stitch formation may occur.

To avoid variations in thread tension as a result of vibratory movements and irregular frictional drag of the illustrated braking band, the leading and trailing ends of the band 22 have a shock absorbing connection with the block 24 and the plunger 32, respectively, the notch in the block 24 engaging and supporting the leading end of the spring in such a way that frictional sliding movement occurs between the spring and the block as the leading end of the spring is bowed and straightened in stressing and releasing the spring. The trailing end of the spring is similarly frictionally engaged with the plunger 32 against a saddle 47 pivotally mounted in a slot 48 in the plunger, a pivot pin 50 for the saddle passing across the slot. The saddle 47 is grooved along its undersurface to control the trailing end of the band and the band is pressed against the saddle by an anvil 52 yieldingly mounted in the plunger. The anvil 52 forms the upper enlarged end of a pin surrounded by a coil spring 54 compressed between the lower end of the slot 48 in the plunger and the anvil. The strength of the spring 54 is such as to maintain the spring 22 constantly in engagement with the saddle, regardless of the position of the plunger but with a decreasing pressure as the frictional engagement of the coil spring 22 is increased on the brake drum 20. The plunger moves in a straight line path but the trailing end of the spring moves in an arcuate path about the brake drum, thus causing frictional sliding between the spring and the saddle 47. With an increase of frictional pressure of the spring on the brake drum, a greater proportion of the vibration or tendency to vibrate is absorbed by direct frictional action against the brake drum, whereas with relatively small frictional pressure on the brake drum a greater proportion of the vibratory tendency in the band is absorbed between the saddle and anvil of the actuating and controlling plunger.

The four-position cam 38 for controlling the tensioning means is formed with a high bulging portion 56 (Fig. 1) to increase the tension on the thread to a maximum intensity while each stitch is being set, a lower portion 58 to decrease the tension on the thread to a minimum intensity during the action of the looper in laying the thread in the hook of the needle and a portion 60 between the bulging and lower portions, of a height to apply tension intermediate the maximum and minimum intensities during each retracting stroke of the needle. The cam is also provided with a portion 62 of a height less than that of the portion 58 and is so formed that all of the stress in the spring 22 will be released at that time in each sewing cycle after the needle has been retracted to disengage it from the work and after the take-up has set each stitch. It is at this time in a sewing cycle in which the machine also is brought to rest by a stopping mechanism consisting in part of a stop arm 64 having a cam roll engaging a closed ended slot 66 in a cam on the sewing shaft, the cam roll on the arm 64 entering the slot during a final reverse movement of the cam shaft.

The operation of the machine will be apparent from the time chart of Fig. 2 which shows the thread tension in pounds plotted against the rotation of the main sewing shaft in degrees. At the starting position of the main sewing shaft the stress in the braking band is released so that no tension is applied to the thread for the first five degrees. Thereafter the maximum tension of approximately 40 pounds is applied during the take-up stroke of the take-up. It is at this time that the needle engages the work and at the end of the take-up stroke a new loop of thread is laid in the hook of the needle and the thread finger is actuated to measure sufficient thread to enable the threaded needle to be retracted from the work without causing the thread to slide in the needle

hook. During the looping and measuring movements the tension is reduced to approximately five pounds. The needle then retracts from the work and at the end of the retracting movement the thread tension is increased to the intermediate intensity of fifteen pounds so that a previously formed stitch will be tightened securely. As the needle again starts to move toward the work the tension is entirely relieved, no tension being applied until the next succeeding sewing cycle. If the machine is brought to rest during the time of thread tension release it is possible to remove the shoe from the machine without withdrawing the the stitches inserted by reason of the pull of the thread remaining in the machine. Further than this, all of the thread engaging parts are relieved of forces of reaction ordinarily produced by the tension on the thread so that there is an opportunity for them to seek their naturally related unstressed positions before the start of the new sewing cycle. Such release of thread tension is of advantage in correcting any tendency toward overthrow of the thread engaging parts during the formation of each stitch.

Whenever the machine is brought to rest, substantially all of the stress is released from the spring brake band **22** by the control plunger acting on the trailing end of the spring and in order to avoid any possibility of frictional pressure between the band and the drum **20** the leading end of the band also is disengaged from the support of the block **24** by connections with the stopping mechanism, as illustrated in Fig. 1. For this purpose the arm **28** on which the block **24** is mounted has a downwardly extending lug **68** engaged by a rod **70** slidingly mounted at its upper end in the machine frame and pivotally connected at its lower end with the stop arm **64**. Movement of the stop arm while the cam roll thereon is entering the slot **66** forces the arm **28** in a direction to disengage the block **24** from a supporting position for the spring. To return the parts to operative position when the machine is restarted the upper end of the arm **28** is acted upon by a compression spring **72** mounted between the machine frame and the arm. Movement of the arm **28** by the spring is limited by the engagement of the lug **68** with the upper surface of the machine frame (as shown in Fig. 3). In this position of the arm a dot-dash line, indicated at **74**, connecting the point of engagement of the block **24** with the spring **22** and the pivot **30** is substantially at right angles to the portion of the spring engaging the block.

To shift the point of engagement of the block **24** with the spring **22** to suit the operating conditions and the characteristics of the spring **22** particularly when more or less turns are employed, the bolt **26** passes through a slot **76** (see Fig. 4) extending in the block **24** lengthwise of the brake drum **20**. The bolt **26** is threaded into engagement with a slide **78** carried by a guideway in the arm **28**. The position of the slide **78** along the arm **28** transversely of the brake drum **20** is readily shifted by means of a thumb adjusting screw **80** threadedly received by an opening in the arm and having a collar engaging a slot in the undersurface of the slide **78**. Movement of the slide **78** along the arm **28** not only affects the released position of the forward end of the spring **22** but also increases or decreases the effective length of the forwardly projecting end of the spring, thus providing means to compensate for a change in the wire size or stiffness of the spring in a desirable manner.



The nature and scope of the invention having been indicated, and a particular embodiment having been described, what is claimed is:

1. A shoe sewing machine having stitch forming devices including a hook needle, a looper, means acting to tighten each stitch and to draw thread from the supply, a thread traction member, and a brake drum connected to the traction member, in combination with a coil spring braking band of a normal inside diameter greater than the external diameter of the brake drum, a plurality of turns of which engage the brake drum to resist its rotation when the band is stressed against it.

2. A shoe sewing machine having stitch forming devices including a hook needle, a looper, means acting to tighten each stitch and to draw thread from the supply, a thread traction member, and a brake drum connected to the traction member, in combination with a coil spring braking band of a normal inside diameter greater than the external diameter of the brake drum, a plurality of turns of which engage the brake drum to resist its rotation when the band is stressed against it, and mechanism for stressing the band to engage the drum during each sewing cycle while the tightening means is acting.

3. A shoe sewing machine having stitch forming devices including a hook needle, a looper, means acting to tighten each stitch and to draw thread from the supply, a thread traction member, and a brake drum connected to the traction member, in combination with a coil spring braking band of a normal inside diameter greater than the external diameter of the brake drum, a plurality of turns of which engage the brake drum to resist its rotation when the band is stressed against it, and mechanism for stressing the band to engage the drum during each sewing cycle while the tightening means is acting and for releasing the stress after the needle is disengaged from the work.

4. A shoe sewing machine having a main sewing shaft, stitch forming devices including a hook needle, a looper, means acting to tighten each stitch and to draw thread from the supply, a thread traction member, and a brake drum connected to the traction member, in combination with a coil spring braking band of normal internal diameter greater than the external diameter of the brake drum, a plurality of turns of which band engage the brake drum when the band is stressed, and mechanism for stressing and releasing the band during each sewing cycle comprising a cam on the sewing shaft and a cam follower operatively connected to one end of the band.

5. A shoe sewing machine having a main sewing shaft, stitch forming devices including a hook needle, a looper, means acting to tighten each stitch and to draw thread from the supply, a thread traction member, and a brake drum connected to the traction member, in combination with a coil spring braking band of normal internal diameter greater than the external diameter of the brake drum, a plurality of turns of which band engage the brake drum when the band is stressed, and mechanism for stressing and releasing the band during each sewing cycle comprising a cam on the sewing shaft, a cam follower operatively connected to one end of the band, and a shock absorbing connection between the cam follower and the coil spring band.

6. A shoe sewing machine having a main sewing shaft, stitch forming devices including a hook

needle, a looper, means acting to tighten each stitch and to draw thread from the supply, a thread traction member, and a brake drum connected to the traction member, in combination with a coil spring braking band of normal internal diameter greater than the external diameter of the brake drum, a plurality of turns of which band engage the brake drum when the band is stressed, and mechanism for stressing and releasing the band during each sewing cycle comprising a cam on the sewing shaft, a plunger connected to one end of the brake band at one side of the axis of rotation of the brake drum and a saddle on the plunger engaging frictionally with the band to absorb vibratory movements of the band.

7. A shoe sewing machine having a main sewing shaft, stitch forming devices including a hook needle, a looper, means acting to tighten each stitch and to draw thread from the supply, a thread traction member, and a brake drum connected to the traction member, in combination with a coil spring braking band of normal internal diameter greater than the external diameter of the brake drum, a plurality of turns of which band engage the brake drum when the band is stressed, and mechanism for stressing and releasing the band during each sewing cycle comprising a cam on the sewing shaft, a plunger connected to one end of the brake band at one side of the axis of rotation of the brake drum, a saddle on the plunger engaging frictionally with the band, and a yielding anvil in the plunger for pressing the band against the saddle to absorb vibratory movements of the band.

8. A shoe sewing machine having a main sewing shaft, stitch forming devices including a hook needle, a looper, means acting to tighten each stitch and to draw thread from the supply, a traction member and a brake drum connected to the traction member, in combination with a coil spring braking band, a plurality of turns of which engage the brake drum, mechanism acting on one end of the band for stressing and releasing the band during each sewing cycle, and mechanism connected to the other end of the band for releasing the stress on the band when the machine is brought to rest.

9. A shoe sewing machine having a main sewing shaft, stitch forming devices including a hook needle, a looper, means acting to tighten each stitch and to draw thread from the supply, a traction member and a brake drum connected to the traction member, in combination with a coil spring braking band, a plurality of turns of which engage the brake drum, mechanism acting on one end of the band for stressing and releasing the band during each sewing cycle, and mechanism connected to the other end of the band for releasing the stress on the band when the machine is brought to rest comprising a pivoted arm, and a block on the arm engaging one end of the band arranged to move toward and from a position with the line connecting its point of engagement with the band and its pivot at right angles to that portion of the band engaging the block.

10. A shoe sewing machine having a main sewing shaft, stitch forming devices including a hook needle, a looper, means acting to tighten each stitch and to draw thread from the supply, a traction member and a brake drum connected to the traction member, in combination with a coil spring braking band, a plurality of turns of which engage the brake drum, mechanism acting on one end of the band for stressing and releasing the band during each sewing cycle, and mechanism connected to the other end of the band for releasing the stress on the band when the machine is brought to rest comprising a pivoted arm, a block on the arm engaging one end of the band arranged to move toward and from a position with the line connecting its point of engagement with the band and its pivot at right angles to that portion of the band engaging the block, and yielding means for retaining said arm with the band in its right angle relation.

11. A shoe sewing machine having a main sewing shaft, stitch forming devices including a hook needle, a looper, means acting to tighten each stitch and to draw thread from the supply, a traction member and a brake drum connected to the traction member, in combination with a coil spring braking band, a plurality of turns of which engage the brake drum, mechanism acting on one end of the band for stressing and releasing the band during each sewing cycle, and mechanism connected to the other end of the band for releasing the stress on the band when the machine is brought to rest comprising a pivoted arm, a block on the arm engaging one end of the band arranged to move toward and from a position with the line connecting its point of engagement with the band and its pivot at right angles to that portion of the band engaging the block, yielding means for retaining said arm with the band in its right angle relation, and a connection for actuating the arm against the force of the yielding means to release the band.

12. A shoe sewing machine having stitch forming devices including a hook needle, a looper, means acting to tighten each stitch and to draw thread from the supply, a thread traction member, and a brake drum connected to the traction member, in combination with a coil spring braking band, a plurality of turns of which engage the brake drum, mechanism connected to one end of the band to apply a heavy tension on the thread while each stitch is being tightened, to decrease the tension on the thread while the looper lays the thread in the needle hook and to decrease still further the tension on the thread when the threaded needle is disengaged from the work, and mechanism connected to the other end of the band for releasing all the stress on the band when the machine is brought to rest.

13. In a machine for handling thread having devices acting to draw thread from a supply, a traction member moved by the thread and a brake drum connected to the traction member, in combination with a coil spring braking band, a plurality of turns of which engage the brake drum and one end of which projects radially from the brake drum, means for stressing the band against the brake drum comprising an arm, a block on the arm having a slot extending lengthwise of the brake drum, a clamp bolt in the slot to enable the position of the block to be shifted along the drum.

14. In a machine for handling thread having devices acting to draw thread from a supply, a traction member moved by the thread and a brake drum connected to the traction member, in combination with a coil spring braking band, a plurality of turns of which engage the brake drum and one end of which pdojects radially from the brake drum, means for stressing the band against the brake drum comprising an arm, a slide on the arm, a block on the slide engaging the band and means for shifting the slide along the arm to enable the effective length of the projecting portion of the band to be increased or decreased.

15. A shoe sewing machine having stitch forming devices including a hook needle, a looper, a take-up acting to tighten each stitch and to draw thread from the supply, and thread tensioning means, in combination with mechanism for actuating the tensioning means to at least three positions to apply a heavy tension on the thread while each stitch is being set, to decrease the tension on the thread while the looper is acting to lay the thread in the hook of the needle and to apply a tension to the thread intermediate the stitch setting and looping intensities during each retracting stroke of the threaded needle.

16. A shoe sewing machine having stitch forming devices including a hook needle, a looper, a take-up acting to tighten each stitch and to draw thread from the supply, and thread tensioning means, in combination with mechanism for actuating the tensioning means comprising a cam having a high bulging portion to increase the tension on the thread to a miximum intensity while each stitch is being set, a lower portion to decrease the tension on the thread to a minimum intensity thereafter and a portion of a height between the bulging and the lower portions to apply a tension to the thread intermediate the maximum and minimum intensities during each retracting stroke of the needle.

17. A shoe sewing machine having a main sewing shaft, stitch forming devices actuated thereby including a hook needle, a looper, a take-up acting to tighten each stitch and to draw thread



from the supply, and thread tensioning means, in combination with mechanism for actuating the tensioning means to increase the tension on the thread to a maximum intensity while each stitch is being set, to decrease the tension on the thread to a minimum intensity thereafter and to apply tension to the thread intermediate the maximum and minimum intensities during each retracting stroke of the needle comprising a cam on the sewing shaft and a member actuated by the cam connected to the tensioning means.

18. A shoe sewing machine having stitch forming devices including a hook needle, a looper, a take-up acting to tighten each stitch and to draw thread from the supply, a thread traction member, a brake member connected to the traction member and a spring braking band having a plurality of turns engaging the brake drum, in combination with mechanism for actuating the braking band comprising an open cam, a cam roll and a yieldingly actuated carrier for the roll connected to the one end of the band.

FRANK E. COLE.


**REFERENCES CITED**

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