May 10, 1955 O. R. HAAS 2,707,926

THREAD TENSIONING DEVICES AND MECHANISMS FOR ACTUATING THE SAME

Filed Feb. 27, 1952

3 Sheets-Sheet 1

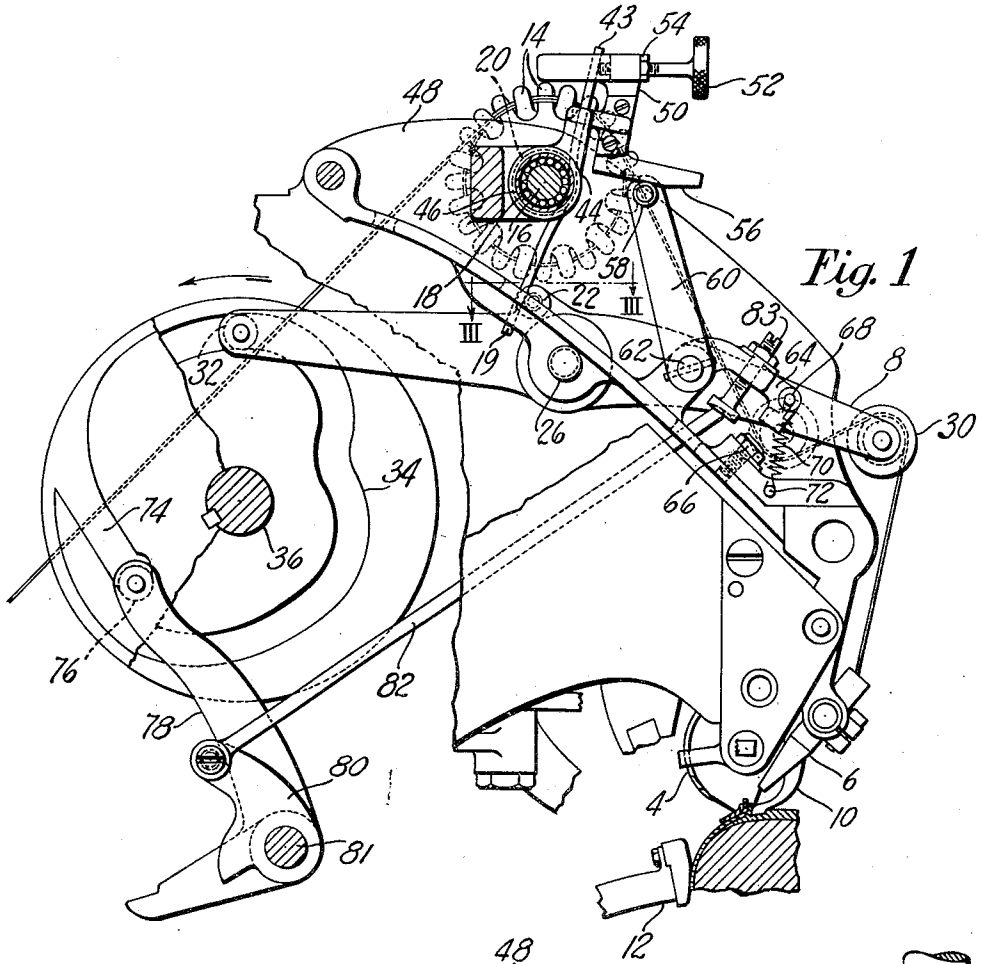

Fig. 1

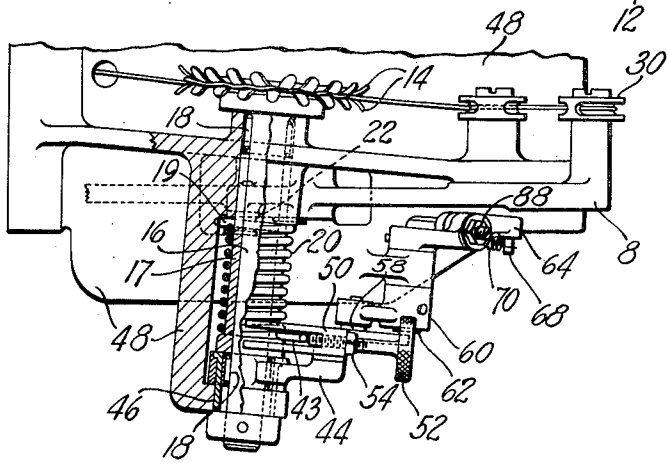

Fig. 2

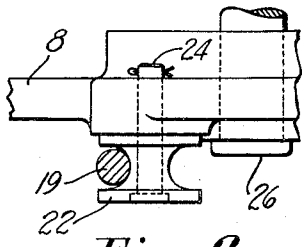

Fig. 3

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3 Sheets-Sheet 2

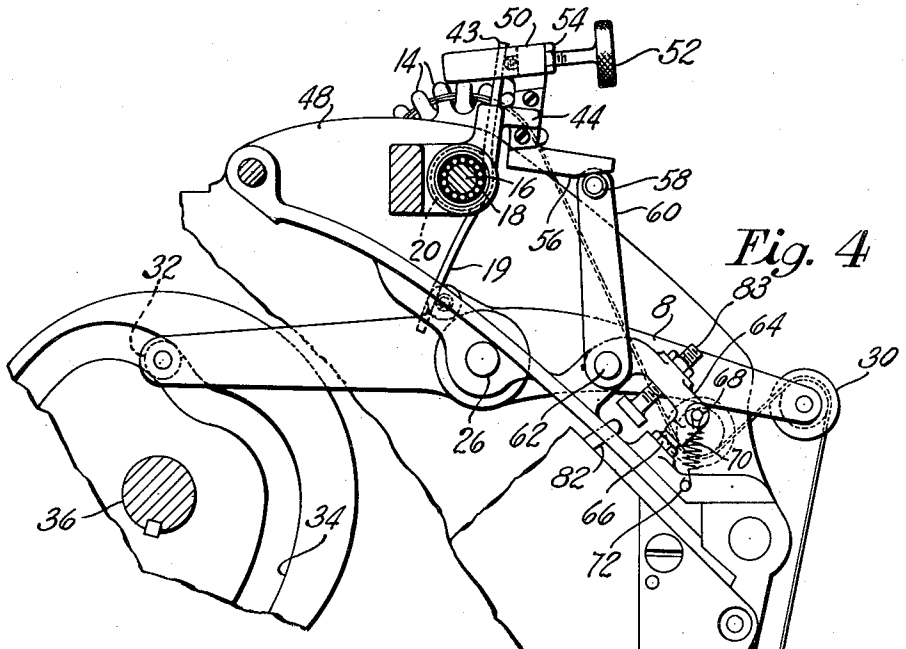

Fig. 4

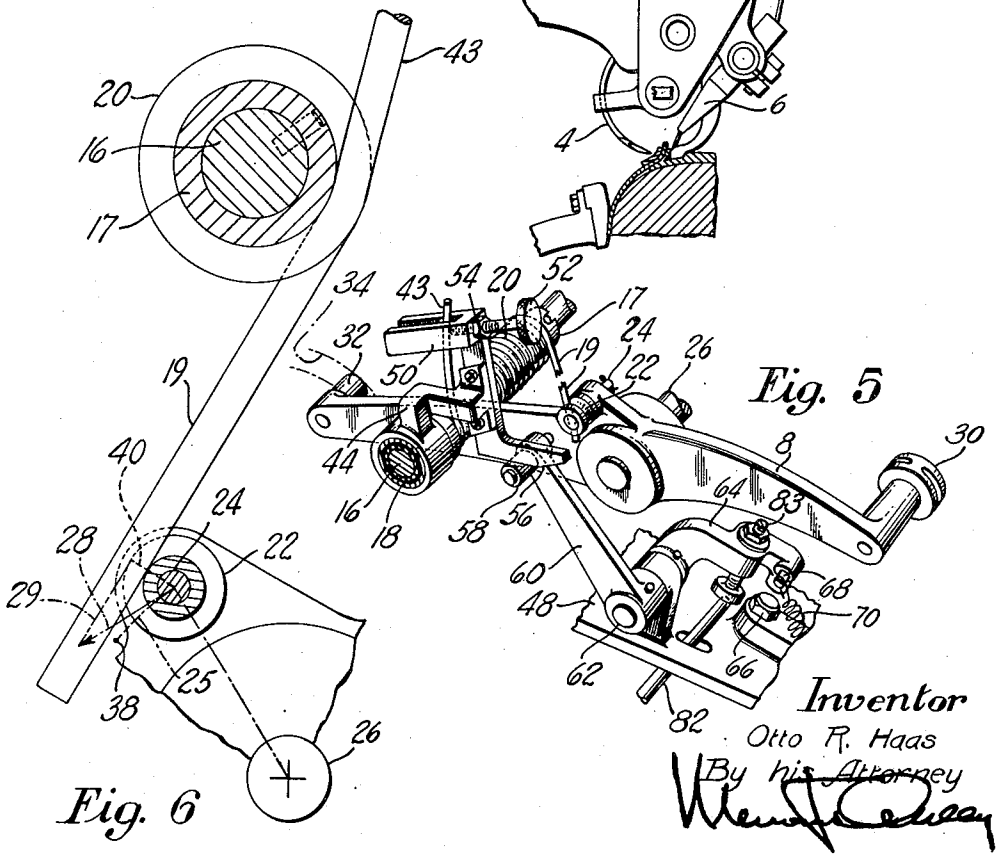

Fig. 5

Fig. 6

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THREAD TENSIONING DEVICES AND MECHANISMS FOR ACTUATING THE SAME

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3 Sheets-Sheet 3

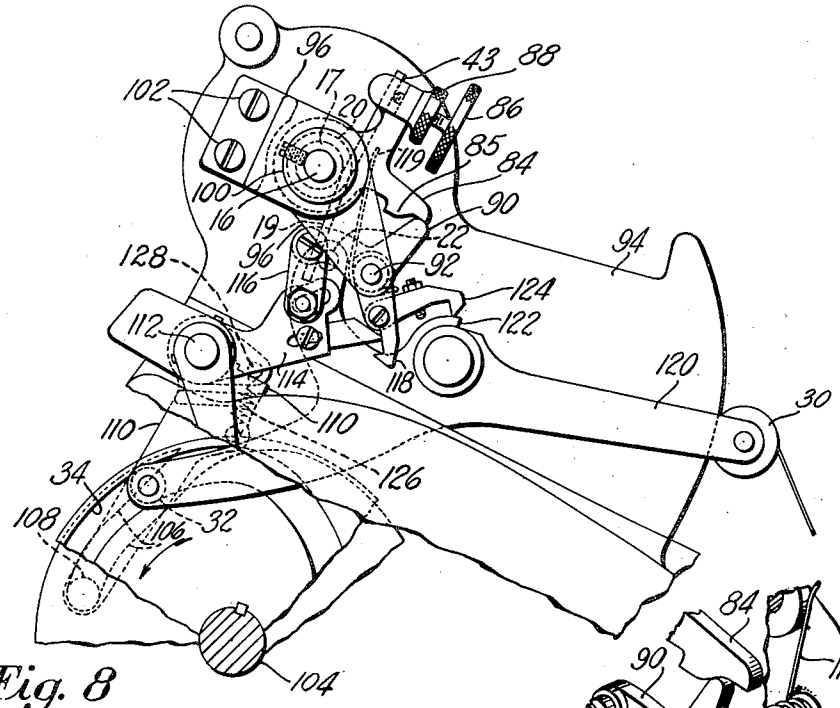

Fig. 8

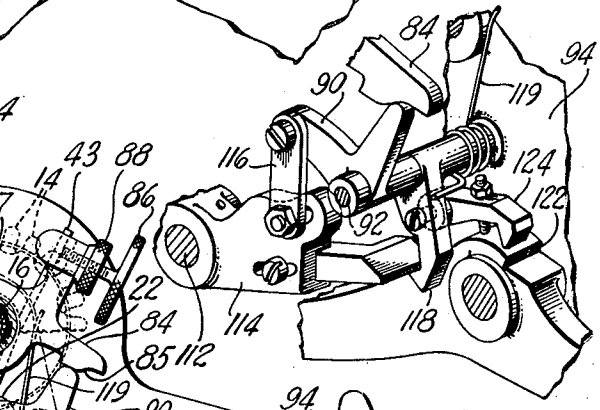

Fig. 9

Fig. 7

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United States Patent Office 2,707,926
Patented May 10, 1955

2,707,926

THREAD TENSIONING DEVICES AND MECHANISMS FOR ACTUATING THE SAME

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Application February 27, 1952, Serial No. 273,701

10 Claims. (Cl. 112—59)

The present invention relates to improvements in thread tensioning devices for hook needle shoe sewing machines, more particularly of the type illustrated in United States Letters Patent No. 2,465,356, granted March 29, 1949, and No. 2,562,175, granted July 31, 1951, both on applications of Frank E. Cole.

In the machine of the prior patents, the stitch forming devices comprise a curved hooked needle and an oscillating take-up acting during each sewing cycle successively to tighten and set each stitch formed by the other devices, to draw from a supply sufficient thread for the formation of the succeeding stitch and thereafter to give up thread to the other stitch forming devices as each succeeding stitch is formed. Stitch setting tension is applied to the thread by a device connected with the take-up acting to impart a maximum resistance to thread movement from the supply during the action of the take-up in tightening and setting each stitch The thread tensioning device of the patented machine comprises a traction member engaging the thread, a brake drum connected to the traction member and a multicoil spring braking band engaging the brake drum. The take-up is connected to the trailing end of the spring braking band, considering the drum as winding up the band as the drum is rotated by the thread passing over the traction device. As the take-up acts to tighten the thread in the machines of both patents, the stress in the leading end of the braking band is increased on the drum and, as the initial increase of stress is applied, the trailing end of the band begins to turn through a small angle, automatically increasing the pressure of succeeding coils in the band progressively. As a result, a relatively high total frictional force is applied to the drum as compared to the initial stress, the tension on the thread engaging the traction member increasing correspondingly. As the take-up reaches the limit of its take-up stroke, the stitch is set and a length of thread is drawn from the supply sufficient for the next stitch. The take-up then begins to give up thread and the stress applied to the trailing end of the braking band is progressively reduced.

For the purpose of increasing and reducing the stress applied to the braking band of the machine in Patent No. 2,562,175, the trailing end of the band engages an anvil mounted in a reciprocating plunger, and to insure that the trailing end of the band will follow closely with the movements of the anvil, it is frictionally engaged with a saddle acting to press it against the anvil and to cause frictional sliding action between the trailing end of the band and the saddle. The frictional pressures of the saddle and anvil improve the operation of the braking band by reducing vibration and shock movements in the band and by increasing the uniformity in tension on the thread as the stress on the trailing end of the band varies.

The use of such braking band on a brake drum is advantageous from the standpoint of effectiveness with which the frictional force may be applied to the drum, the control of the braking band being extremely responsive to slight changes in the stress on and the angular position of the trailing band end. Such responsiveness, however,

still is conducive to some vibration and shock movements of the band, resulting in irregularities in tension of the thread.

An object of the present invention is to prevent in a greater degree than heretofore, all vibration and shock movements in a multicoil spring braking band for a thread-tensioning device of the type above referred to without the necessity of applying a comparatively heavy frictional force to the trailing end of the band and at the same time to improve the responsiveness of the frictional force of the band on the brake drum as the stress on and the angular position of the trailing end of the band are changed. In other respects the objects of the invention are generally to improve the construction and mode of operation of a coil spring braking band in a thread-tensioning device for a shoe sewing machine, particularly by providing useful adjustments for maintaining accurate control of the band throughout a wide range of thread tensioning and sewing conditions.

To the ends noted, in addition to the usual stitch-forming devices and multicoil spring braking band type of tensioning device having integral arms of end coils in the band projecting radially from the band, the shoe sewing machine embodying the present invention, has engaging the trailing arm of the braking coil a control member arranged to impress a frictional component of movement along said arm in the proper direction to insure that the stress will be increased uniformly while each stitch is being tightened. This frictional component of movement, when applied in a direction away from the trailing coil, causes that coil to be tightened effectively against the cooperating brake drum throughout the length of the coil, thus taking full advantage of the trailing coil to tighten the other connected coils correspondingly. Accordingly, the frictional action of the braking band control member may be reduced to an extremely small quantity without in any way increasing the tendency toward vibration and shock movement. The coil control member also acts while the stitch tightening means is giving up thread to the other stitch forming devices with a frictional component along the trailing coil arm toward said coil, so that the stress in the trailing coil is effectively reduced without any tendency to vibrate or change its position suddenly with a shock-like action, the frictional component toward the coil tending to release the pressure of the coil on the drum.

Other features of the invention consist in the use of a support member rotatable about the axis of the thread tensioning brake drum for maintaining the leading arm of the braking band coils against displacement along the axis of the drum and for retaining the end of the trailing coil arm in suitably adjusted angular position about the drum; and in the devices, arrangements, and combinations 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, partly broken away, and in section of the upper forward portion of a chainstitch shoe inseam sewing machine, illustrating one embodiment of the invention and indicating the parts in stopped positions;

Fig. 2 is a detail plan view of the thread tensioning device illustrated in Fig. 1;

Fig. 3 is a detail plan view on an enlarged scale of the coil spring arm engaging and stressing control, comprising the connections between the braking band and the take-up as seen along the line III—III of Fig. 1;

Fig. 4 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. 5 is a perspective view of portions of the tensioning device and take-up showing the control connections;

Fig. 6 is a diagrammatic detail view in end elevation of the braking band and brake drum on an enlarged scale, showing the components of force applied to the trailing end of the band during operation of the machine;

Fig. 7 is a fragmentary view in left side elevation of a machine incorporating a different embodiment of the invention, illustrating the operation of the thread tension control connections with the parts in running position;

Fig. 8 is a similar view of the same machine as shown in Fig. 7, illustrated in stopped position; and

Fig. 9 is a perspective view of the same machine in a position taken during the first stitch of a new seam.

The shoe sewing machine illustrated in Figs. 1 to 6, inclusive, of the drawings is substantially the same, except as hereinafter described as those of the prior patents above-referred to, and is provided with the usual stitch forming and work feeding devices of a welt or turn shoe inseam sewing machine. These devices include a curved hook needle **4**, a needle looper **6**, a take-up **8** acting to tighten each stitch and to give up thread to the other stitch forming devices, a channel guide **10**, and a back rest **12**. Tension on the thread as it passes from a supply reel (not shown) to the stitch forming devices comprises a traction member consisting of a pair of toothed disks **14**, secured together and to a rotatable shaft **16** to provide a grooved tension wheel in the groove of which the thread is engaged. Surrounding the shaft **16** is a brake drum **17** keyed or otherwise connected to the shaft and the shaft is mounted in friction reducing needle bearings **18**.

In the machines of the prior patents, rotation of the tension wheel is resisted frictionally by an elongated braking band wrapped about a brake drum connected to the tension wheel shaft. In that machine the frictional pressure of the braking band which is formed with a plurality of turns in a coil spring is increased or decreased by applying a stress to the band during sewing operations, the ends of the band projecting radially from the brake drum which is disposed within the coils of the band. To apply stress to the band one or more of its ends are rigidly secured by a clamp connection or rest frictionally upon a saddle or notch in a block engaging it. As illustrated in the 2,465,356 patent, the leading end of the coil spring, considering the brake drum as winding up the spring, is actuated by a clamp connection with the take-up. In the machine of the 2,562,175 patent, the trailing end of the braking band is actuated by a reciprocating plunger and the turns of the braking band have a normal unstressed diameter differing sufficiently from that of the brake drum with which they cooperate to clear the drum for free rotation when no stress is applied to the braking band. In either instance it has been found that the action on the radially projecting ends of the band does not always produce uniformly effective results, there frequently being a tendency to impart vibration and sudden shock movements to the tension wheel which impair uniformity of frictional resistance against turning movement in the drum and tension wheel.

As illustrated in the 2,562,175 patent, an effort to overcome vibratory or shock movements of the thread tension wheel has been made by introducing a frictional shock absorbing connection between the radially projecting trailing end comprising an arm of the coil spring band and its actuating plunger. Such arrangement improves the results obtained but does not eliminate the difficulties entirely.

In accordance with its present forms, the illustrated invention provides an extremely simple and effective connection between the take-up **8** and a radially projecting trailing end arm **19** on a coil spring braking band **20**, the band being constructed with a slightly greater normal inside diameter than the outside diameter of the drum as in the machine of the 2,562,175 patent. The improved connection not only reduces previous difficulties of vibration and shock movements in the braking band to an insignificant value, but also increases the durability of the band and the simplicity of manufacture. These advantages are obtained through the provision of an improved actuating member engaged with the projecting arm of the coil spring braking band and arranged in a manner to cause stress to be applied to the coils of the band with certainty and uniformity the instant the take-up moves in a direction to tighten the thread. For these purposes the arm engaging member impresses a frictional component of movement along said arm in a direction away from the coils of the band **20**.

In the patented machine a frictional component of movement acts on the arm of the coil spring band while being tightened in a direction along the arm toward the coils of the band and toward the drum surrounded by the band, the movement being in the wrong direction to impart a frictional component which assists in tightening the band. It has been found that the amount of force transmitted by the frictional component of movement on the coil arm may be extremely small to cause marked results, the principal factor being the direction in which the movement occurs. So far as can be understood, the effect of this frictional component of movement is to loosen or tighten the trailing coil of the band in a manner to affect an application of pressure against the drum through these coils of the band ahead of the trailing one, it being necessary to apply stress initially to the trailing end coil of the band in a manner to insure transference of stress progressively to the coils ahead of it as the turning drum tends to wind up these coils.

Referring to Fig. 3 of the drawings, the illustrated frictional connection member between the take-up **8** and the trailing arm **19** of the coil spring braking band **20**, consists of a relatively small diameter grooved spool **22**, rotatably mounted on a pin **24**, projecting through the take-up **8**. The spool **22** furnishes an adequate internal bearing surface for the pin to eliminate excessive wear and provide substantial durability. The groove in the spool is formed to fit closely with the external contour of the coil arm **19** so that single point contact between the spool and the arm is avoided and the areas of surfaces in engagement between the spool and arm are sufficient to insure rotation of the spool on the stud in spite of the relatively short effective radius at the bottom of the groove in the spool.

The component of frictional movement along the arm of the coil spring band and away from the coils and the surrounded brake drum is illustrated more fully in connection with Fig. 6. In this figure the pin **24** moves through an arc **25** of a circle about the center of a shaft **26** forming a fulcrum for a lever which comprises the take-up **8**. If a tangent **28** is constructed on the arc **26** at the location of the pin **24**, an acute angle will be formed with a line **29** along the center of the trailing arm **19** of the coil spring braking band **20**.

As in prior machines the take-up lever is provided at its forward end with a thread engaging pulley **30** and at its rearward end with a roll **32** engaging a track **34** in a cam on a main sewing shaft **36**. In the illustrated construction the track **34** is so shaped that the tangent **28** never forms with the center line of the arm **19** an angle greater than is shown in Fig. 6, the take-up **8** being shown in Figs. 1 and 6 at the extreme limit of its movement in giving up thread to the other stitch forming devices. As the sewing shaft **36** rotates in the direction of the arrow of Fig. 1, the take-up movement reverses and it begins to tighten the thread, eventually setting each stitch. In so doing, the center of the pin **24** moves from the position of Fig. 6 toward a point **38** with an increasingly greater component of frictional movement along the arm **19**. The smallest possible component of movement thus is indicated by the line **29** as the roll **22** moves away from the position of Fig. 6 along the arm **19** and away from the directly connected trailing coil of the band **20** sur-

rounding the brake drum, this movement impressing its friction component in a manner to stress all the coils of the braking band uniformly throughout their lengths against the brake drum. At the same time, the spool **22** applies direct stress at right angles to the arm **19** through the distance represented by the dotted line **40**, the component of frictional movement imparted through the spool being in the proper direction first to draw the entire turn of the trailing coil in the spring more tightly against the drum **16**.

The effect of the frictional movement component **28** in drawing the trailing coil of the band against the drum may be relatively small as compared to the total retarding force of the braking band, so long as the parts are well lubricated and the spool is free to turn on the stud **24**. The frictional component **29** however, may have a greater effect upon failure of lubrication or entry of extraneous solid materials between the moving surfaces. Nevertheless, in spite of lubrication failure or extraneous materials, the desired results are readily maintained so long as the component **29** is in the proper direction. This follows from uniform action on the band of the trailing coil in triggering all the other coils since the coils ahead of it take up their loads as a result of the stress in the trailing coil.

After tightening each stitch, the take-up begins to give up thread, the component of frictional movement along the arm also being reversed so that it takes a direction which imparts an immediate releasing action in the trailing coil of the band about the drum **17**. Such action facilitates smooth withdrawal of thread by the stitch forming devices under uniform tension past the tension wheel without producing vibration or shock movements.

In order to avoid the necessity of changing the range of angular movement, indicated by the tangent **28**, with respect to the trailing arm **19** of the coil spring braking band when variation in adjustment of braking force is required, the illustrated machine has an adjustable support for the leading arm indicated at **43**, of the band and a mechanism for releasing all stress in the band at the end of a sewing operation. The support for the leading arm **43** of the band comprises a member **44** rotatably mounted on a sleeve **46** (see Fig. 2) secured in a lug on one arm of a bracket **48**. The sleeve **46** supports within it one of the shaft bearings **18**, the other bearing **18** being supported in a lug of the bracket **48**. With this arrangement the support member **44** rotates about the center of the brake drum without itself being affected by the rotaion of the drum.

The outer portion of the coil arm support member **44** includes a Z-shaped screw fastened plate **50** provided at its upper end with an open slot of a width sufficient to receive the leading arm **43** of the braking band. Also threaded into the plate **50** is a thumb adjusting screw **52** engaged with the coil spring arm **43**. Rotation of the adjusting screw **52** causes the leading arm **43** of the band to move relatively to the support plate along the slot in the plate. To lock the adjusting screw in place it is provided with a suitable check nut **54** acting against the plate **50** when tightened. As the adjusting screw is rotated, more or less initial stress is applied to the leading arm **43** of the spring band so as to vary the frictional resistance offered by the band to rotation of the tension wheel during sewing operations.

To hold the support member **44** against the pressure of the coil spring band, the lower end of the plate **50** has a cam surface **56** contacting a roll **58** rotating at the upper end of an arm **60** pinned to a pivot **62** rotating in a lug of the bracket **48**. Also secured to the pivot **62** is a tension releasing arm **64**, the forward end of which is formed with a pad arranged to engage a stop screw **66** threaded in the bracket **48**. When the arm **64** engages the stop screw **66**, the roll **58** takes the position of Fig. 4, raising the cam surface **56** and supporting the coil spring band with the proper initial operating stress. To move the releasing arm **64** to coil stressing

position, it carries a pin **68** to which one end of a tension spring **70** is connected, the other end of the spring being connected to a pin **72** on the bracket **48**.

When the machine comes to rest at the end of a sewing operation, the sewing shaft **36** is rotated in a direction reverse to that indicated by the arrow of Fig. 1 and an open slot **74** in a cam on the shaft **36** acts on a roll **76** on a stop lever **78**, moving the lever in a clockwise direction as seen in Fig. 1. Connected with the lever **78** is an arm **80** rotating on a shaft **81** also forming the fulcrum for the lever **78**. The arm **80** is pivotally connected to a rod **82** sliding at its upper end through an opening of the bracket **48**. As the arm **80** is moved in stopping the machine the rod **82** moves against the enlarged head of an adjusting screw **83** threaded in the stop arm **64**, raising the arm from the stop screw **66** and actuating the roll **58** to lower the cam surface **56** until the stress is fully released in the coils of the band **20** so that thread may be withdrawn freely from the thread tension wheel.

In the form of the invention illustrated in Figs. 7 to 9 inclusive, the coil spring braking band, the tension wheel with its shaft and the brake drum are all identified by the reference numerals employed in Figs. 1 to 6 inclusive. The trailing arm **19** of the braking band is engaged with a spool **22**, similar in construction and mode of operation as that previously described. The coil arm support member and the mechanism for releasing the stress in the coil spring braking band, however, are different from those illustrated in the previous figures.

While the support member and the releasing mechanism of Figs. 7 to 9 are shown as applied to a sewing machine intended for automatic operation in a manner disclosed in Patent No. 2,465,356, they are of more general utility and are capable of advantageous use with machines that are non-automatic in operation. The particular utility of the support and releasing mechanism is of benefit where the thread in a sewing machine is clamped by a gripper at the end of each sewing operation and eventually is freed from the gripper in starting a new seam. It is desirable to release fully the tension in stopping such machine at the end of a seam so that the thread may properly be engaged with the grippers.

In the machine of the 2,465,356 patent the tension on the thread is not applied in starting a new seam until after the first stitch has been completed and the second stitch of the seam has been formed. If no tension is applied to the thread during this time, insufficient control may be obtained for the movements of the thread to insure proper stitch formation. If tension is applied to the thread too soon at the beginning of a new sewing operation, the clamped thread may be pulled free of the thread grippers. To avoid the difficulties encountered in merely releasing the thread tension at the end of a seam, a relatively light intermediate tension is imparted to the thread before formation of the first stitch is completed, and as the formation of the second stitch in a seam is nearing completion, the tension on the thread is increased to regular full sewing intensity.

The member for supporting the coil spring braking band both for intermediate and full intensity sewing tensions and for releasing the stress in the braking band at the end of a sewing operation, in the form of the machine illustrated in Figs. 7 to 9 of the drawings, comprises a lever **84** rotatable about the axis of the brake drum **17**. The lever **84** is provided with a slotted arm, within and against which the leading arm **43** of the braking band rests, a thumb adjusting screw **86** similar to the thumbscrew **52** being provided for regulating the position of the leading arm **43** of the band. The thumbscrew **86** is threaded into the slotted arm of the lever **84** and is surrounded by a locking nut **88**.

To apply a light intermediate tension to the thread during formation of the first stitch in a new seam a lower arm of the braking band supporting and releasing lever **84** is provided with a cam enlargement **85** which

cooperates with mechanism including the forwardly projecting arm of a support lever **90** fulcrumed on a pin **92**. The pin **92** is secured at one end in a bracket **94** in which the tension wheel shaft **16** also rotates and at the other end in a downwardly extending arm of a brace **96** forming a support for a sleeve **100** within which the tension wheel shaft **16** also rotates. As in the machine of the Figs. 1 to 6, the supporting and releasing lever **84** is rotatably mounted on the sleeve **100** in separated relation to the tension wheel shaft **16** and braking drum but rotates about the same axis. The brace **96** in turn is screwed at **102** to the bracket **94** to provide an integral frame structure.

As in the machine of the 2,465,356 patent, the mechanism for supporting and releasing the stress in the coil spring braking band is actuated in part by a stop mechanism for the machine and in part by a stop cam secured to the main sewing shaft, indicated in Figs. 7 and 8 at **104**. The stop cam is formed with a closed ended slot **106** into which moves a follower roll **108**, at the lower end of an arm **110**. The arm **110** is rotatable on a pivot shaft **112** rotatable in turn in the machine frame. During sewing operations the lever **90** engages the cam enlargement **85** of the support lever **84** at the full height of the cam enlargement to apply the regular full sewing tension. At the end of a sewing operation a connection between the arm **110** and a detent supporting arm of a second lever **114** also rotatable on the shaft **112** causes the detent on the arm of lever **114** to be raised as the cam roll engages the slot **106**. As the detent on the lever **114** is raised, it raises a link **116** pivotally connected to the arm and to one arm of the lever **90**, disengaging the forwardly projecting arm of the lever **90** from the cam enlargement on the supporting lever **84**, as illustrated in Fig. 8. Disengagement of the lever **90** from the cam enlargement on the lever **84** releases all stress in the coil spring and correspondingly releases all the tension of the thread. Engagement of the cam roll **108** with the slot **106** occurs in stopping the machine during a partial reverse rotation of the sewing shaft **104** opposite to the direction of the arrow in Fig. 8.

In starting a new seam the sewing shaft rotates in the direction of the arrow of Fig. 8 causing the roll **108** to be disengaged from the slot **106**. This occurs during the first part of the first sewing cycle in a new seam. In disengaging the cam slot **106**, the roll **108** causes the arm **110** and the detent arm of lever **114** to be moved in a clockwise direction from a position where all the tension is released to an intermediate position where the detent rests against the hook of a latch **118** rotatably supported on the pin **92**. The latch **118** is pressed against the detent by a spring **119**, coiled about the fulcrum pin **92**. Movement to the intermediate position by the detent arm causes the lever **90** also to move to an intermediate position with its forward arm engaging a mid-point along the cam enlargement of the lever **84** as illustrated in Fig. 9.

Engagement with the mid-point of the cam enlargement on lever **84** causes a light intermediate stress to be applied to the coil spring braking band and a light intermediate tension to be applied to the thread. After the first stitch of the seam has been formed the take-up, indicated at **120**, is actuated to tighten the stitch against the light intermediate tension. When the take-up **120** reaches its stitch setting position a notch **122** on the hub of the take-up lever is engaged by a second latch **124** having a pivotal mounting on the latch **118**, so that as the take-up begins to give up thread to the other stitch forming devices the latch **124** will be drawn forwardly and will free the detent arm of lever **114** from the latch **118**. As soon as the detent arm of lever **114** is freed from the latch **118**, it moves from its intermediate position of Fig. 9 to its full tension position of Fig. 7 and causes the lever **90** to engage the full height of the cam enlargement on the supporting lever **84**. Release of the detent arm occurs during formation of the second stitch of each new seam so that the first stitch of the seam, being completed, provides a secure fastening between the work and the end of the thread. To actuate the detent arm after release by the latch **118**, the lever **114** is acted upon by a spring **126** (Fig. 8) stretched between a pin **123** on the lever and a pin on the frame of the machine, the pin **128** being engaged by the follower arm **110** to release the tension at the end of a seam in a manner more fully described in United States Letters Patent No. 2,359,662, granted October 3, 1944, upon application of A. R. Morrill (Figs. 61 to 67 of that patent).

At the end of a sewing operation the sequence of movements is reversed, the support member **84** is moved from a position where full sewing tension is applied to the thread and the support lever **90** is moved in a direction away from the cam enlargement **85** on the support member to an intermediate position. The second lever **114** at the same time is moved from the unlatched position in Fig. 7 into latched engagement of the pawl arm with the latch **118** as in Fig. 9 and intermediate tension is then applied to the thread. Thereafter the cam having the slot **106** acts to move the second lever **114** from a position where intermediate sewing tension is applied to the thread further in the same direction to bring its pawl arm beyond latched position, as shown in Fig. 8, releasing all stress in the braking band and tension in the thread. The parts are then in positions for starting a new seam, the second latch **124** engaging the stitch tightening take-up in a manner to free the pawl on the lever **114** from the latch **118** as the machine is restarted.

The nature and scope of the invention having been indicated and specific embodiments having been described, what is claimed is:

1. A shoe sewing machine having stitch-forming devices including a hook needle, a needle looper, means acting to tighten each stitch and to give up thread to the other stitch-forming devices, a thread traction member, a brake drum connected for rotation by the traction member, a coil spring braking band having a plurality of turns of normal diameter differing sufficiently from the diameter of the brake drum with which they cooperate to clear the drum for free rotation and an integral arm projecting radially from the trailing coil of the band, in combination with an arm engaging control member engaging the arm projecting from the trailing coil of the band and acting while the tightening means is tightening each stitch to stress the coils of the braking band against the drum and to move in a direction to impress a frictional component of movement along said arm away from said coils while the stitch tightening means tightens each stitch.

2. A shoe sewing machine having stitch-forming devices including a hook needle, a needle looper, means acting to tighten each stitch and to give up thread to the other stitch-forming devices, a thread traction member, a brake drum connected for rotation by the traction member, a coil spring braking band having a plurality of turns of normal diameter differing sufficiently from the diameter of the brake drum with which they cooperate to clear the drum for free rotation and an integral arm projecting radially from the trailing coil of the band, in combination with an arm engaging control member connected to the stitch tightening means to stress the coils of the braking band against the drum while moving in a direction to impress a frictional component of movement along said arm away from said coils while the stitch tightening means tightens each stitch and in a direction to release the coils from the drum with a frictional component along said arm toward said coils while the stitch tightening means gives up thread to the other stitch-forming devices.

3. A shoe sewing machine having stitch-forming de-

vices including a hook needle, a needle looper, means acting to tighten each stitch and to give up thread to the other stitch-forming devices, a thread traction member, a brake drum connected for rotation by the traction member, a coil spring braking band having a plurality of turns of normal diameter differing sufficiently from the diameter of the brake drum with which they cooperate to clear the drum for free rotation and an integral arm projecting radially from the trailing coil of the band, in combination with an arm engaging control member engaging the arm projecting from the trailing coil of the band and acting while the tightening means is tightening each stitch to stress the coils of the braking band against the drum and to move in a direction to impress a frictional component of movement along said arm away from said coils while the stitch tightening means tightens each stitch and toward said coils while the stitch tightening means gives up thread to the other stitch-forming devices.

4. A shoe sewing machine having stitch-forming devices including a hook needle, a needle looper, means acting to tighten each stitch and to give up thread to the other stitch-forming devices, a thread traction member, a brake drum connected for rotation by the traction member, a coil spring braking band having a plurality of turns of normal diameter differing sufficiently from the diameter of the brake drum with which they cooperate to clear the drum for free rotation and an integral arm projecting radially from the trailing coil of the band, in combination with an arm engaging control member engaging the arm projecting from the trailing coil of the band and acting while the tightening means is tightening each stitch to stress the coils of the braking band against the drum and to move in a direction to impress a frictional component of movement along said arm away from said coils while the stitch tightening means tightens each stitch, said arm engaging member comprising a grooved roll, the groove of which fits closely with the contour of the coil arm.

5. A shoe sewing machine having stitch-forming devices including a hook needle, a needle looper, means acting to tighten each stitch and to give up thread to the other stitch-forming devices, a thread traction member, a brake drum connected for rotation by the traction member, a coil spring braking band having a plurality of turns of normal diameter differing sufficiently from the diameter of the brake drum with which they cooperate to clear the drum for free rotation and an integral arm projecting radially from the trailing coil of the band, in combination with an arm engaging control member acting while the tightening means is tightening each stitch to stress the coils of the braking band against the drum and moving in a direction to impress a frictional component of movement along said arm away from said coils while the stitch tightening means tightens each stitch, a slotted member rotatable about the axis of the drum to support an integral arm of the band projecting radially from a leading coil thereof within the slot during sewing operations and to release the leading arm of the band when the machine is brought to rest, and an adjusting screw threaded into said slotted support member and engaged with said leading arm of the band.

6. A shoe sewing machine having stitch-forming devices including a hook needle, a needle looper, means acting to tighten each stitch and to give up thread to the other stitch forming devices, a thread traction member, a brake drum connected for rotation by the traction member, a coil spring braking band having a plurality of turns of normal diameter differing sufficiently from the diameter of the brake drum with which they cooperate to clear the drum for free rotation and an integral arm projecting radially from the trailing coil of the band, in combination with an arm engaging control member acting while the tightening means is tightening each stitch to stress the coils of the braking band against the drum and moving in a direction to impress a frictional component of movement along said arm away from said coils while the stitch tightening means tightens each stitch, a slotted member rotatable about the axis of the drum to support an integral arm of the band projecting radially from a leading coil thereof within the slot during sewing operations and to release the leading arm of the band when the machine is brought to rest, and an adjusting screw threaded into said slotted support member and engaged with said leading arm of the band, said leading arm of the band being movable by the adjusting screw relatively to the support member along the slot of the support member.

7. A shoe sewing machine having stitch-forming devices including a hook needle, a needle looper, means acting to tighten each stitch and to give up thread to the other stitch-forming devices, and a thread traction member, a brake drum connected to the traction member, a coil spring braking band having radially projecting arms and a plurality of turns of normal diameter differing sufficiently from the diameter of the brake drum with which they cooperate to clear the drum for free rotation when no stress is applied to the braking band and mechanism for supporting one arm of the braking band and for releasing stress in the band at the end of a sewing operation, in combination with a member in said supporting mechanism against which the arm of the band rests, rotatable about the center of the brake drum, and connections in said supporting mechanism for operating the support member to apply stress to the coil spring only after the first stitch of a new seam has been completed and thereafter to increase the stress in the band during the insertion of succeeding stitches in the seam.

8. A shoe sewing machine having stitch-forming devices including a hook needle, a needle looper, means acting to tighten each stitch and to give up thread to the other stitch-forming devices, and a thread traction member, a brake drum connected to the traction member, a coil spring braking band having radially projecting arms and a plurality of turns of normal diameter differing sufficiently from the diameter of the brake drum with which they cooperate to clear the drum for free rotation when no stress is applied to the braking band and mechanism for supporting one arm of the braking band and for releasing stress in the band at the end of a sewing operation, in combination with a support member in said mechanism against which the arm of the braking band rests, having a cam projection, a lever in said supporting mechanism engaging the cam projection of the support member, and a latch in said mechanism for holding the lever in engagement with a midpoint on the cam projection of the support member to impart an intermediate stress to the braking band.

9. A shoe sewing machine having a main sewing shaft, stitch forming devices actuated by the sewing shaft including a hook needle, a needle looper, means acting to tighten each stitch and to give up thread to the other stitch forming devices, a thread traction member, a brake drum connected to the traction member, and a coil spring braking band having radially projecting arms and a plurality of turns of normal diameter differing sufficiently from the diameter of the brake drum with which they co-operate to clear the drum for free rotation when all stress is released from the braking band, in combination with mechanism for supporting one arm of the braking band to apply a full or intermediate sewing tension to the thread and for releasing all stress in the band at the end of a sewing operation to release the tension in the thread, said mechanism including a support member against which the arm of the braking band rests and on which there is a cam enlargement, a support lever engaging the cam enlargement on the support member, a second lever having a pawl connected to the support lever, a latch toward which the pawl on the second lever is moved when the support member is moved from a

position where full tension is applied to the thread and the support lever is moved in a direction to carry it away from the cam enlargement on the support member, said latch acting to hold the second lever in a position where the intermediate tension is applied to the thread, and a cam on the sewing shaft for moving the second lever further in the same direction beyond latched position to release all stress in the braking band and tension in the thread at the end of a seam.

10. A shoe sewing machine having a main sewing shaft, stitch forming devices actuated by the sewing shaft including a hook needle, a needle looper, means acting to tighten each stitch and to give up thread to the other stitch forming devices, a thread traction member, a brake drum connected to the traction member and a coil spring braking band having radially projecting arms and a plurality of turns of normal diameter differing sufficiently from the diameter of the brake drum with which they co-operate to clear the drum for free rotation when all stress is released from the braking band, in combination with mechanism for supporting one arm of the braking band to apply a full or intermediate sewing tension to the thread and for releasing all stress in the band at the end of a sewing operation to release the tension in

the thread, said mechanism including a support member against which the arm of the braking band rests and on which there is a cam enlargement, a support lever engaging the cam enlargement on the support member, a second lever having a pawl connected to the support lever, a latch toward which the pawl on the second lever is moved when the second lever is moved from a position where full sewing tension is applied to the thread and the support lever is moved in a direction to carry it away from the cam enlargement on the support member, said latch acting to hold the second lever in a position where an intermediate tension is applied to the thread, a cam on the sewing shaft for moving the second lever further in the same direction beyond a latched position to release all stress in the braking band and tension in the thread at the end of a seam, and a second latch having a pivotal mounting on the first mentioned latch and engaging the stitch tightening means to free the pawl from the first mentioned latch in starting a seam.

References Cited in the file of this patent

UNITED STATES PATENTS

487,214 Eppler ---------- Nov. 29, 1892