

Aug. 22, 1933.

E. E. WINKLEY

1,923,562

SHOE SEWING MACHINE

Original Filed May 14, 1929

10 Sheets-Sheet 1

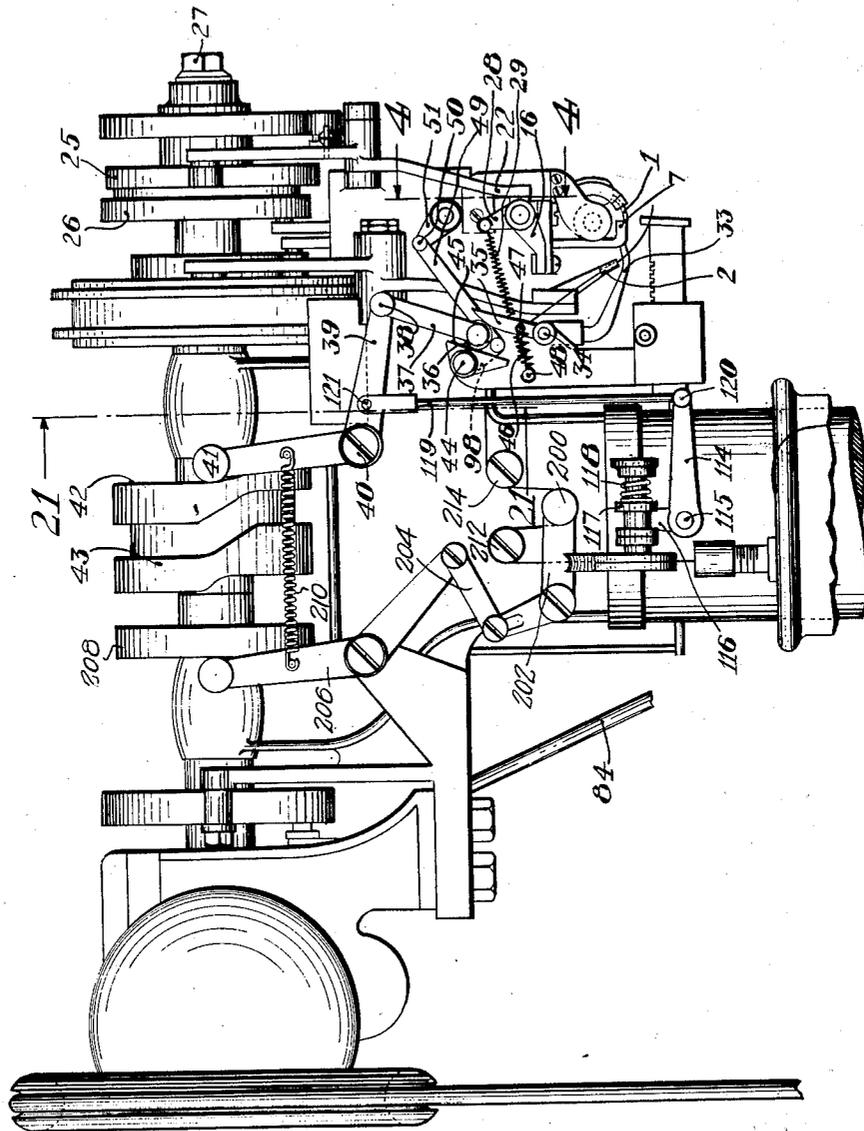


Fig. 1

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SHOE SEWING MACHINE

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10 Sheets-Sheet 2

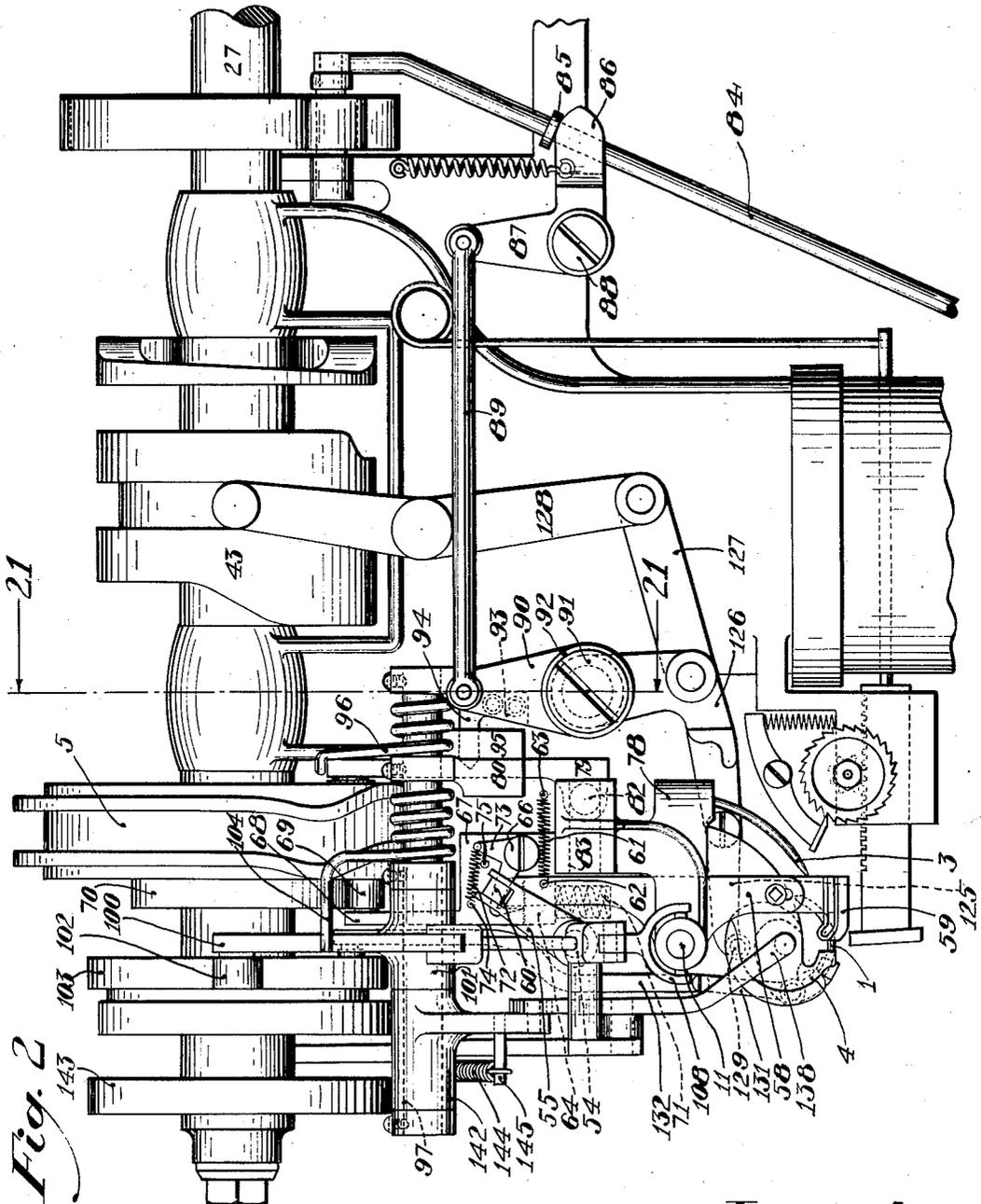


Fig. 2

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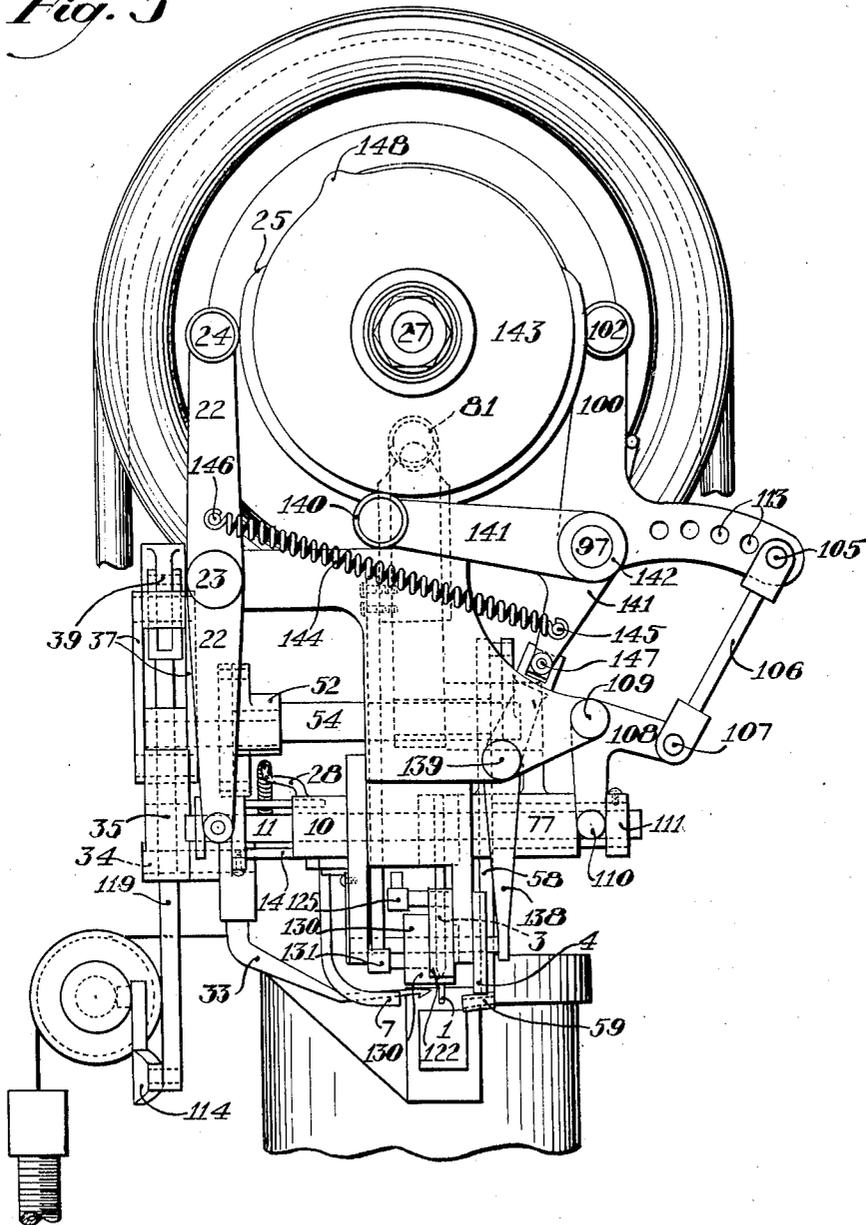
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SHOE SEWING MACHINE

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10 Sheets-Sheet 3

Fig. 3



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SHOE SEWING MACHINE

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10 Sheets—Sheet 4

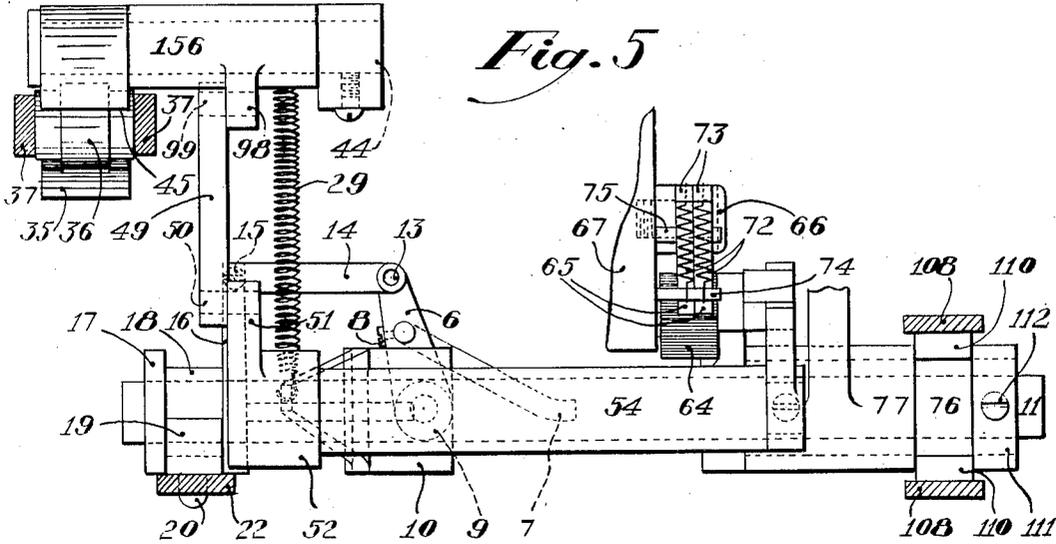


Fig. 5

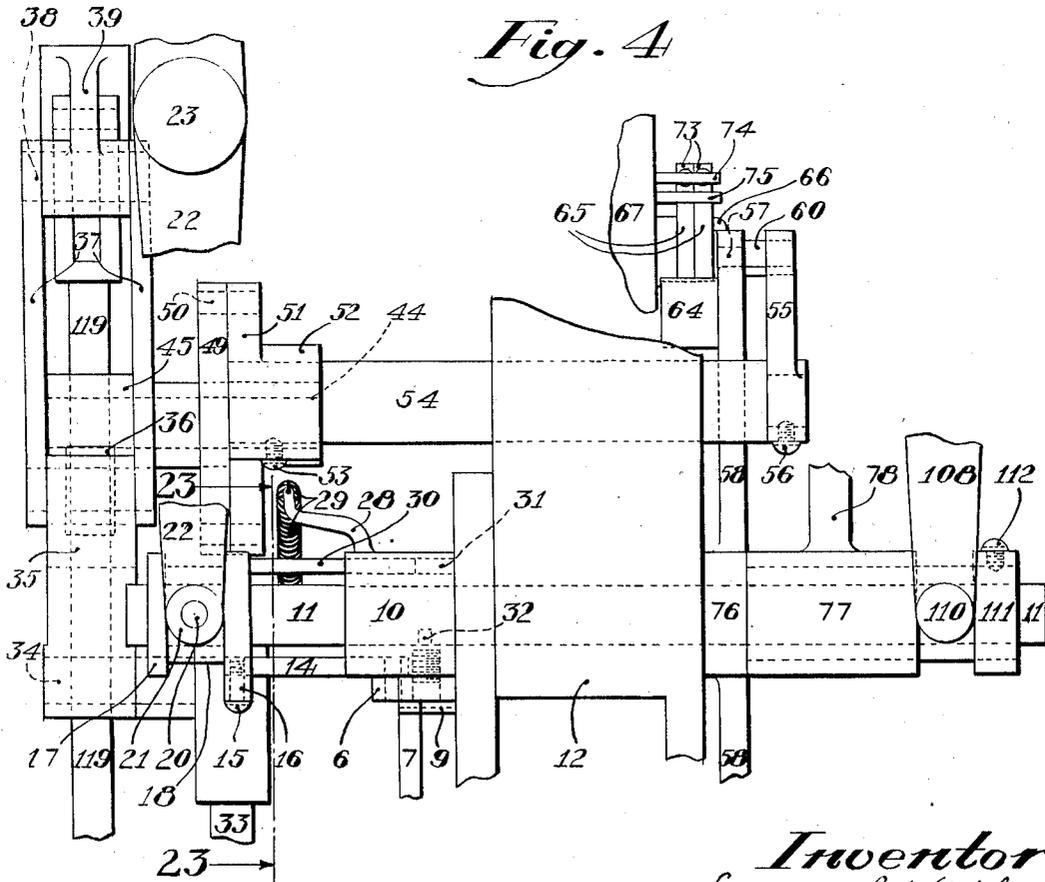


Fig. 4

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SHOE SEWING MACHINE

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Fig. 6

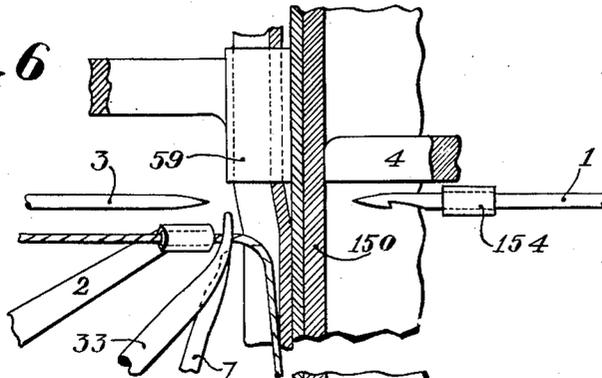


Fig. 7

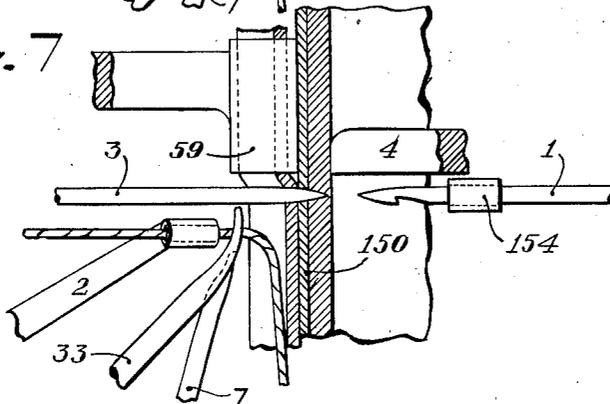


Fig. 8

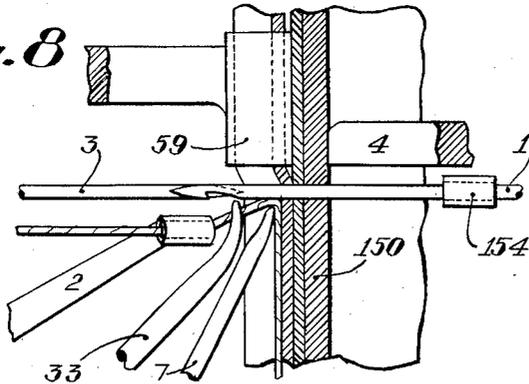
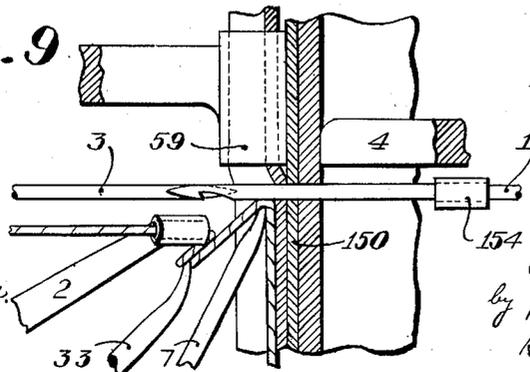


Fig. 9



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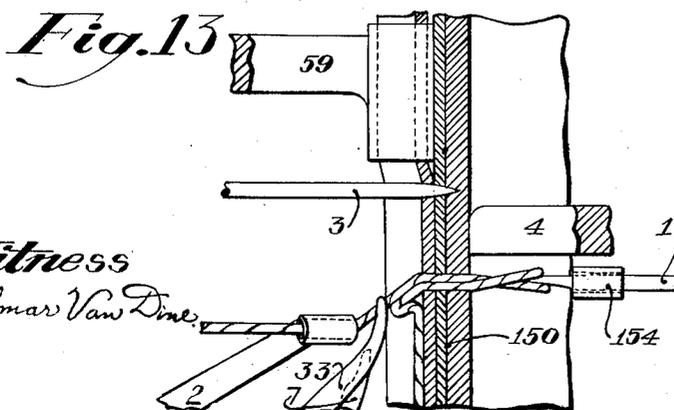
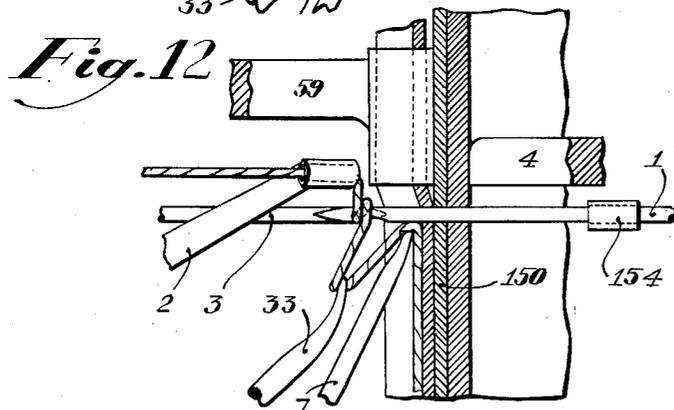
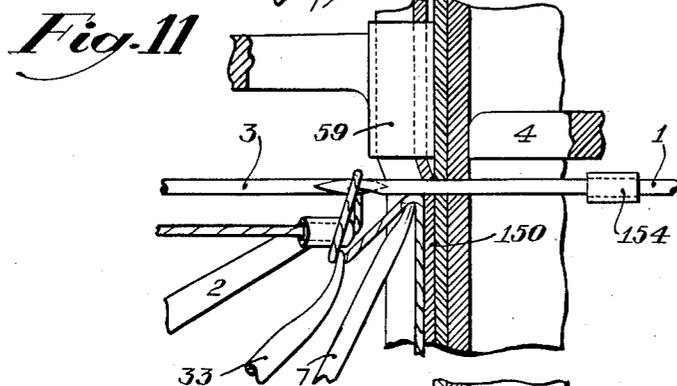
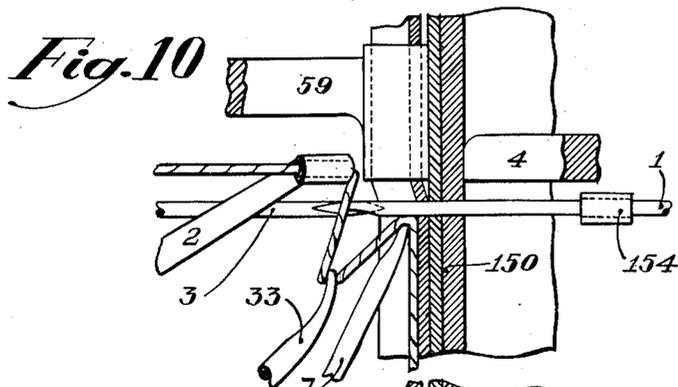
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SHOE SEWING MACHINE

Original Filed May 14, 1929

10 Sheets-Sheet 6



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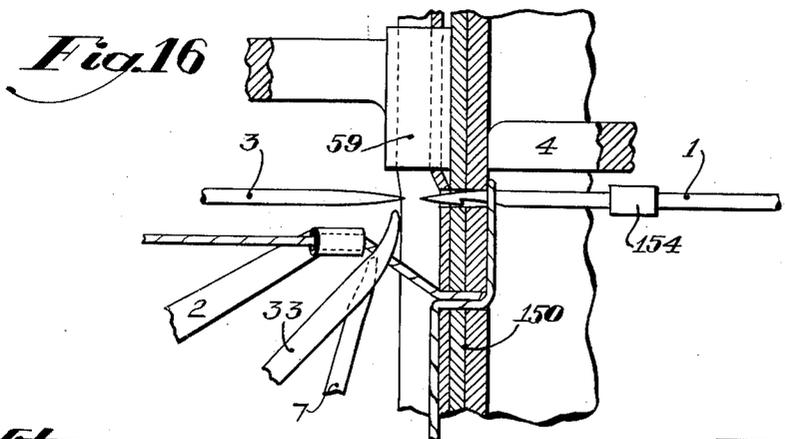
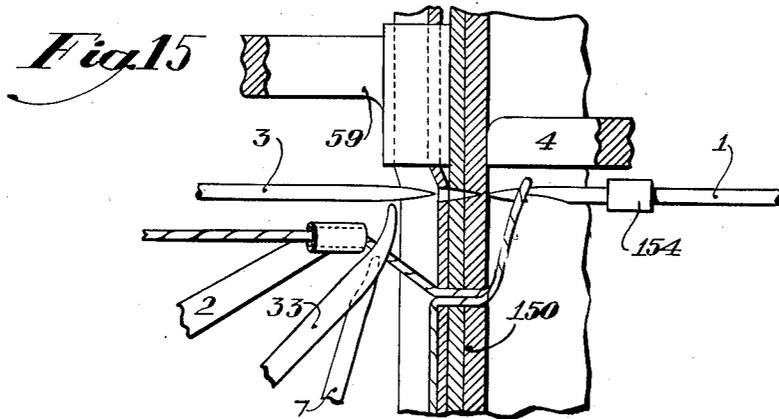
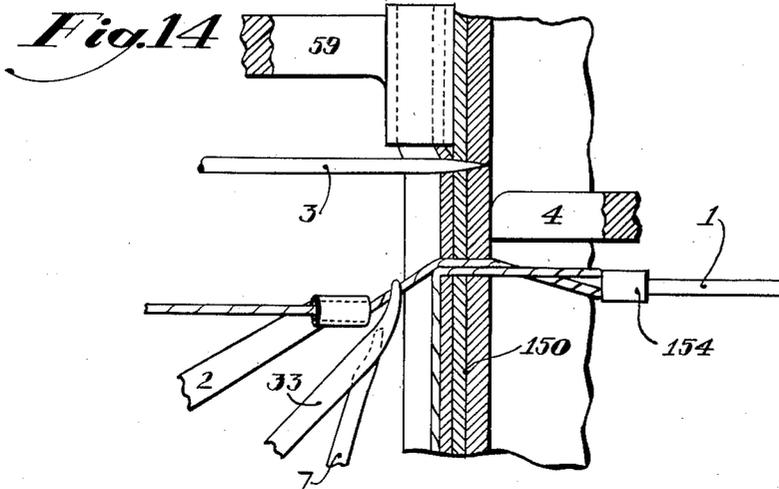
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SHOE SEWING MACHINE

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SHOE SEWING MACHINE

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Fig. 17

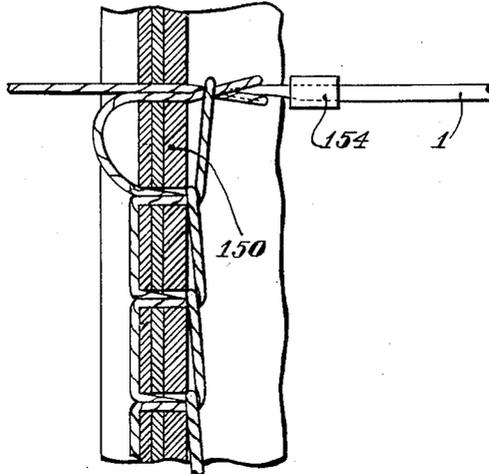


Fig. 18

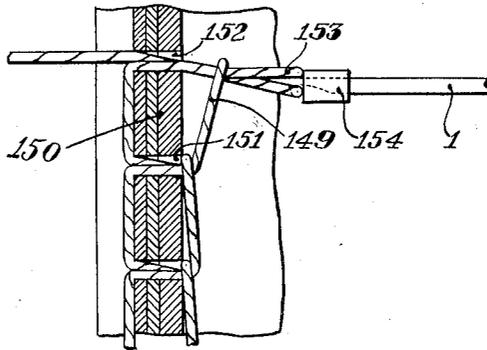


Fig. 19

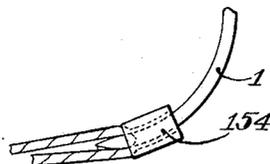
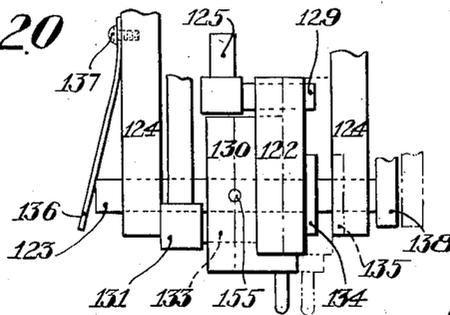


Fig. 20



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SHOE SEWING MACHINE

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Fig. 21

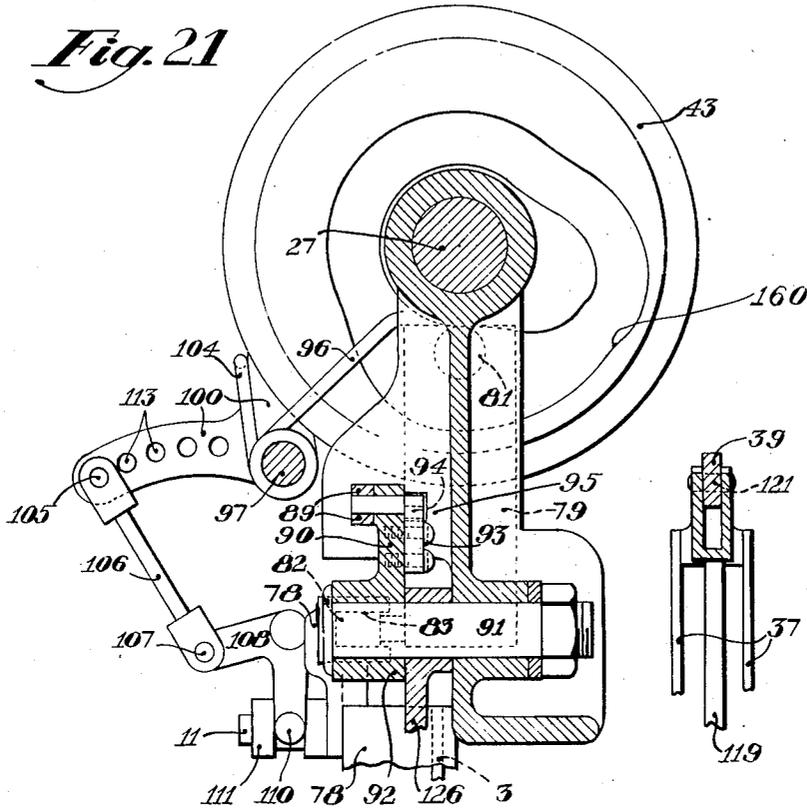


Fig. 22

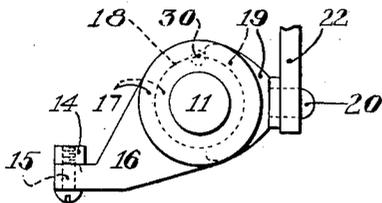
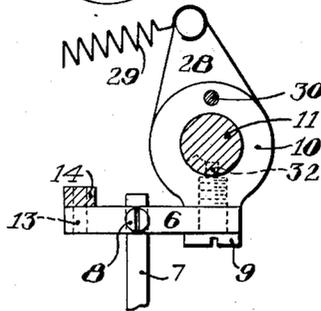


Fig. 23



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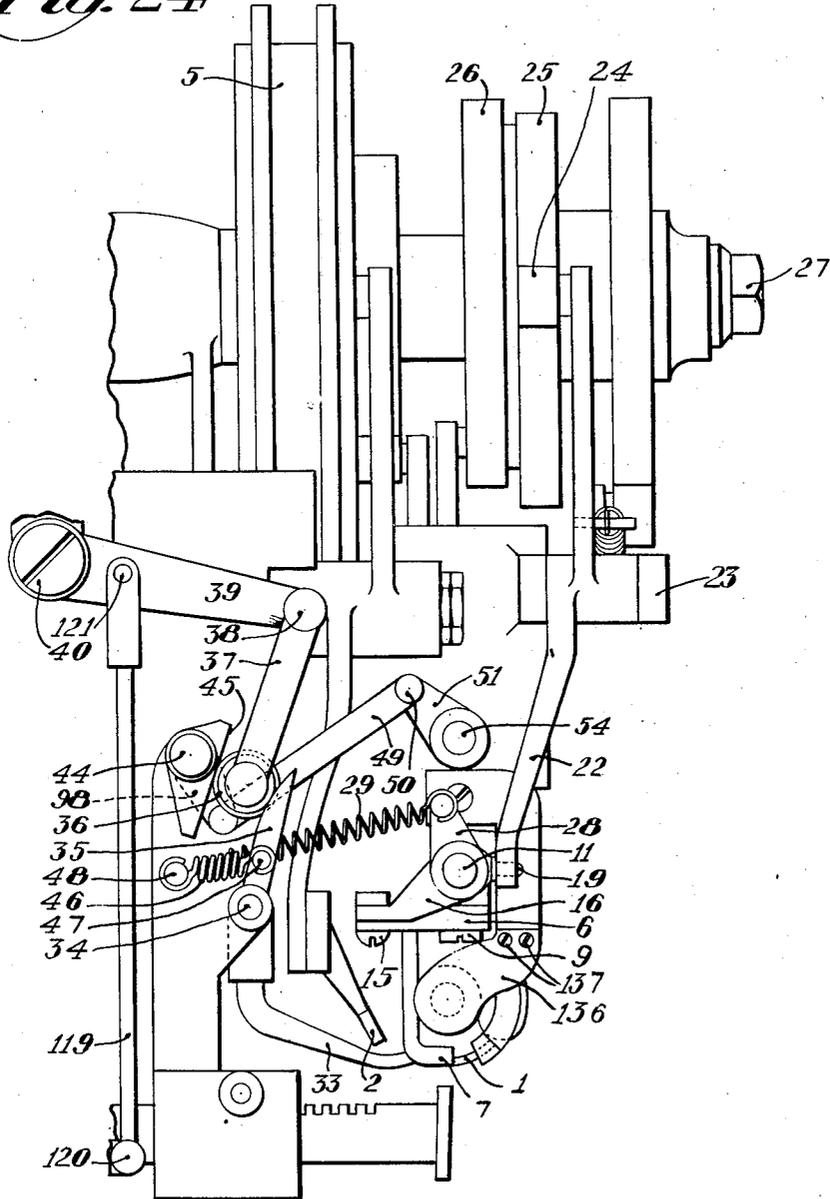
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SHOE SEWING MACHINE

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Fig. 24



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UNITED STATES PATENT OFFICE

1,923,562

SHOE SEWING MACHINE

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Application May 14, 1929, Serial No. 362,952
Renewed December 1, 1932

17 Claims. (Cl. 112—35)

The present invention has relation to sewing machines and more especially to in-seam welt shoe sewing machines of the type provided with a curved hook needle, adapted to form a chain stitch, and employed to sew the in-seams of shoes.

The invention refers particularly to machines of the said type which are designed to lay the chain in the channel of the insole, through entering the needle into the work from the channel side thereof. The placing of the chain in the channel has practical advantages over the more common practice of putting the chain upon the welt, as the doubled thread of the chain is less apt to cut the insole when made of soft material, and the single thread on the welt permits the outseam to be brought in close to the upper without danger of cutting the in-seam in the stitching, and at the same time allows the in-seam to be put more nearly under the exact edge of the insole. The in-seam thus made can be trimmed more closely, so that the insole and outsole come closer together and less filler need be used between them, thus making the shoe more flexible. Also, the needle enters the channel and can more easily be made to strike it accurately without tearing up the insole.

It is the preferred practice to control the formation of the stitches of an in-seam having its chain laid upon the welt by the use of stitch forming devices comprising a take-up and a thread finger, the take-up being timed to draw a loop of thread tight around the shank of the needle while the needle is in the work, and the thread finger being timed to measure off thread between the looper and the work while the needle is through the work in order to provide sufficient thread for the work-side of the next loop to avoid reeving through the hook of the needle during the retracting stroke of the needle. For the reasons hereinafter stated, however, this practice has not been followed in controlling the formation of the stitches of an in-seam having its chain laid in the channel, although it is well recognized that an in-seam formed by stitch-forming devices comprising a take-up and a thread finger is tighter, more uniform and more satisfactory than when the stitches are formed and tightened in any other manner.

When the chain is laid upon the welt, the needle pulls a loop of thread from the channel through the between substance and out from the welt, drawing the work-side of its loop snug against the bottom of the channel. Then the needle again enters the work, and the take-up pulls upon the supply end in the opposite direc-

tion from the needle-pull, drawing the loop tight about the shank of the needle and thereafter drawing thread from the supply for the next stitch. The channel side of the between substance is always at a fixed distance from the needle-hook when the needle is in its farthest retracted position, because the bottom of the channel is held against the channel guide, and the channel guide is always at a fixed distance from the needle when the latter reaches its point of greatest retraction. Hence, with stitches of equal length, the work-side of the loop drawn through by the needle does not need to be varied in length in order to prevent reeving and consequent breaking of the thread in the hook of the needle, in spite of variations in the thickness of the between substance, the compensation for variations in the thickness of the between substance being effected by the take-up in taking up the loop standing loosely around the shank of the needle, and then pulling more or less thread from the supply after the needle reenters the work.

When the chain is laid in the channel, however, the conditions are quite different. To lay the chain in the channel it is necessary to enter the needle into the work from the channel side thereof. Then when the needle is retracted, it draws out from the channel a loop of thread, and pulls the work-side of such loop tight against the welt. This welt-surface of the work varies in distance from the channel guide in direct proportion to the variations in thickness of the between substance. Hence this welt-surface also varies in distance from the needle when the latter is at its farthest retracted position, in direct proportion to the thickness of the between substance. Consequently, the length of thread forming the work-side of the loop pulled through by the needle varies in proportion to the variation in thickness of the between substance at various points in the circuit of the shoe.

To permit the needle to retract without causing the thread to reeve and cut in the hook of the needle, it is necessary to provide the needle, during its retracting stroke, with more or less thread from the work side of the needle loop as the thickness of the between substance varies. A take-up and thread finger arranged to operate as in a machine which lays the chain on the welt will not accomplish this result, as will be apparent from the description of the operation of such a machine given above, and for this reason other means have heretofore been relied

upon in previous attempts to improve the operation of machines laying the chain in the channel.

Having in mind the state of the art as above outlined, the object of the present invention is to provide a novel and improved inseam shoe sewing machine laying the chain in the channel and insuring a tight seam by pulling the thread tight each time it is laid along either the welt or the channel side of the between-substance, without objectionable reeving of the thread through the needle-hook.

To this end a feature of the invention contemplates the provision in a chain stitch inseam shoe sewing machine having a curved hook needle arranged to enter the work from the channel side of a take-up acting to draw tight the loop of thread around the shank of the needle while the needle is in the work and a thread finger arranged to engage the thread between the looper and the work and acting to measure off between the looper and the work a length of thread varying with the thickness of the work. Broadly considered, this feature of the invention contemplates the provision of any suitable construction and arrangement of parts which will cause the thread finger to measure off between the looper and the work, a length of thread varying with the thickness of the material through which the inseam passes. In the illustrated embodiment of the invention herein-after described, this result is secured by an arrangement of parts which causes the thread finger to have a thread measuring stroke proportioned to the thickness of the material. This construction comprises suitable connections whereby the movement of the thread finger is controlled by the position of the welt guide which bears against the welt side of the between substance and therefore changes its position with relation to the fixed channel guide with variations in the thickness of the between substance.

Preferably, an element which may be termed a thread placer, is provided to cooperate with the thread finger in measuring off the desired amount of thread. This thread placer is arranged to act in advance of the thread finger and operates to lay the thread along the welt from its point of emergence to the point where the needle has last pierced the welt, so that the thread which is drawn out by the thread finger is measured from the point where the needle has last pierced the work and the amount of thread measured off by the thread finger is not affected by variations in the length of the stitch or by variations in the position of the shoe produced by manipulation by the operator. This thread placer in and of itself is believed to be new and accordingly is considered to constitute a feature of the present invention which is not limited to use in connection with a variable throw thread measuring finger or in an inseam shoe sewing machine arranged to lay the chain in the channel, although in the preferred embodiment of this feature of the invention it is combined with the variable throw thread finger of an inseam shoe sewing machine of this type.

The invention also comprises means for imparting a lateral component of motion to the needle in the direction of feed of the work as it draws its loop of thread through the next preceding loop, so as to shorten said preceding loop and equalize the tension in its two legs,

and to enable it to be drawn more tightly into the channel with its bend accurately located over the needle-hole. In this connection, the needle-guide is caused to take a position with respect to the hook of the needle such as to clamp the thread therein during the retraction of the needle and prevent all reeving of the thread therethrough. This clamping action insures greater uniformity of the effects obtained through the lateral movement of the needle.

The invention also includes means for holding the awl in retracted relation with respect to the work, when the machine is stopped. It is preferable that the feeding of the work be extended over as much of the cycle of the stitching operation as is available during the time when the needle is out of the work, in order to lessen vibration and reduce the jerking-along of the work through avoiding the use of a sharp-shouldered feed cam. Hence, the awl is timed to enter the work as soon as the needle leaves it, when following its normal cycle, and in order to permit of easy entry and removal of the between substance at the beginning and at the completion of the stitching operation, provision is made for modifying this cycle by the action of a detent which is actuated from the starting treadle and which locks the awl slide in a position holding the awl back in spaced relation to the needle when said treadle is positioned to stop the machine.

While the invention is illustrated and described in connection with a machine for sewing welt shoes, it is to be understood that the principles of the invention are not to be limited in their application to such machines, but are equally applicable to turn shoe sewing machines, and in other connections within the scope of the claims appended hereto.

The invention will be readily understood upon reference to the accompanying drawings illustrating a machine embodying the invention in its preferred form, and the following detailed description of the construction therein shown.

In the drawings, Fig. 1 is a side elevation of a welt shoe sewing machine including the improvements of the invention, certain parts not essential to the invention being omitted; Fig. 2 is a side elevation showing certain of the parts in Fig. 1, as viewed from the opposite side of the machine; Fig. 3 is a front elevation showing details of the means for shifting the needle laterally and also of the means for operating the thread placer; Fig. 4 is a view in elevation taken on line 4-4 of Fig. 1 showing the actuating mechanism for the thread finger and the thread placer; Fig. 5 is a plan view of the parts shown in Fig. 4; Figs. 6 to 16 inclusive illustrate the progressive steps in the complete stitch forming cycle; Figs. 17 and 18 illustrate the action of the needle and the needle guide cooperating therewith in shortening the previously formed loop of thread; Fig. 19 is a detail view in elevation showing the action of the needle guard in clamping the thread within the hook of the needle; Fig. 20 is a detail view in elevation and on an enlarged scale, showing the parts effecting the lateral movement of the needle during its retraction; Fig. 21 is a view in vertical section on line 21-21 of Figs. 1 and 2, looking in the direction of the arrows; Figs. 22 and 23 are detail views of certain of the parts actuating the thread-placer, viewed from the side of the machine; and Fig. 24 is an en-

larged view of a portion of Fig. 1, showing the actuating means for the thread-finger and thread-placer.

Having reference to the drawings, the invention is shown embodied in an Eppler type welter, such as is shown and described in U. S. Letters Patent No. 950,616, granted to Andrew Eppler on March, 1, 1910, for shoe sewing machine. The present machine is organized to lay the chain in the channel, as in the patent, and in respect to the parts not specifically described hereinafter, the arrangement and operation are similar to such parts in said patent, to which reference may be had for a full and complete description of these parts.

The take-up of the illustrated machine comprises a roll 200, see Figure 1, upon the outer end of one arm of the take-up lever 202, the other arm of which is connected by a link 204 to the lower end of a cam actuated lever 206. The upper arm of the lever 206 is provided with a roll bearing against the face of a cam disc 208 upon the cam shaft of the machine and is acted upon by a spring 210 connecting the lever arm with the arm of a cam lever 39 forming a part of the thread finger actuating mechanism hereinafter described. The spring 210 thus acts to hold both levers 206 and 39 in contact with their actuating cams.

The take-up roll 200 operates between two fixed thread guides 212 and 214, and is actuated during each stitch-forming cycle to draw tight the loop of thread which is around the shank of the needle while the needle is in the work.

In accordance with one feature of the invention, there is combined with the take-up and other thread handling devices of the machine a member 7, the function of which is to engage the thread between the welt and the looper 2 with the edge of its relatively broad lower extremity and to lay the thread along the surface of the welt up to a point in closest possible proximity to the needle hole being formed. The operation is shown in Figs. 6 and 7, and 8, the relation of the parts at the moment when the work is inserted in the machine being that shown in Fig. 6. Thereafter, the awl 3 is entered into the between substance as shown in Fig. 7 and immediately following its retraction the needle 1 pierces the work and the thread member 7 moves forward into engagement with the thread, carrying the latter into contact with the surface of the welt, and into close proximity to the needle, as shown in Fig. 8. From its function, the member 7 may be termed a thread-placer, for purposes of reference. The thread-placer 7 is carried by an arm 6 (Figs. 4, 5, and 24) being adjustably fixed therein by a clamping screw 8. The arm 6 is pivoted upon a cap screw 9 fixed in the under surface of a sleeve 10 which rotates freely upon a shaft 11 fixed in the portion 12 of the frame of the machine. The free end of the arm 6 is pivotally connected at 13 with a link 14 pivoted at 15, (Figs. 22 and 23) to the end of an arm 16 integrally formed upon a sleeve 17 also mounted upon the shaft 11 with capacity for free rotation and sliding movement lengthwise with respect thereto. A circumferential groove 18 is formed in this sliding sleeve 17, within which fits a shoe 19 having a tang 20 extending through a central hole in a hub 21 at the lower end of a cam lever 22 (Figs. 3 and 24) which is pivoted at 23 upon the machine frame and provided at its upper end with a roll 24 which is caused to follow the cam surface

25 upon a cam disc 26 mounted on the main shaft 27 of the machine. The actuation of the cam lever 22 by means of the cam surface 25 imparts a sliding movement to the sleeve 17 along its supporting shaft 11 which acts through link 14 to rotate the arm 6 about its pivot 9 and carry the lower end of the thread-placer 7 forward to lay the thread along the welt and into close proximity to the needle 1, as shown in Fig. 8.

Since variations in the thickness of the between substance change the distance between the channel guide 4 occupying the channel and the surface of the welt, the forward movement of the thread-placer 7 will vary in proportion to the thickness of the between substance, as the extremity of the thread-placer is brought to rest through contact with the surface of the welt. To provide a yielding construction permitting the thread-placer to be checked in its forward movement while the cam lever and sleeve 17 and the parts linking the latter with the thread finger continue to move in a direction tending to advance the thread finger, the sleeve 10 is provided with an upwardly and outwardly extending arm 28 to the end of which is attached a contracting spiral spring 29 anchored to the frame of the machine. The sleeve 10 is coupled to the sleeve 17 which slides along the shaft 11, by means of a pin 30 fixed in the latter sleeve 17 and received slidably within a recess 31 formed in the wall of the sleeve 10 parallel to its axis, said pin 30 serving to cause the two sleeves 10 and 17 to rotate in unison about their common shaft 11 upon occasion. The cap-screw 9 threaded into sleeve 10 is provided with a pin 32 which fits in a groove extending partway around shaft 11, and brings up against one end of this groove to act as a stop determining the limit of rotation of the combined sleeves 10 and 17 under the pull of spring 29. With this arrangement, in the event that the forward movement of the engaging end or the thread-placer 7 is checked upon encountering the surface of the welt before the cam lever 22 has completed its full extent of movement, the continued movement of such cam lever will serve to rotate the thread-placer about its point of engagement with the welt in a horizontal plane and simultaneously to effect a rotation of the combined sleeves 10 and 17 and the arm 6 bearing the thread-placer in a vertical plane about the shaft 11 in a direction expanding the spring 29. Thus, the final portion of the movement of the cam lever 22, imparts an idle movement to the members actuating the thread-placer without disturbing its point of engagement with the welt, in close proximity to the needle 1.

A thread finger 33 is employed to provide the needle with sufficient slack thread to enable it to be drawn back through the work to its farthest retracted position while engaged with the thread without reeving of the thread through the hook of the needle. This thread finger engages the thread between the point at which it is held down against the welt by the thread-placer as aforesaid, and the point where it emerges from the looper 2. The thread finger operates by drawing aside a bend or loop of thread and retaining such bend or loop while the looper is making its circuit of the needle-point to place the thread within the hook of the needle. As the needle starts to recede, the thread finger moves out of engagement with the thread, thus delivering to the needle an amount of slack thread entering into the formation of the work-

side of the needle loop which should be of a length just sufficient to enable the needle to reach its point of farthest retraction as the work-side of the loop is pulled tightly against the welt.

The invention provides means for actuating the thread finger 33 in a manner causing it to vary the amplitude of its slack-providing movement, in order to meet the peculiar conditions arising through variation of the thickness of the material in a sewing machine laying the chain in the channel. Herein, the thread finger is pivotally mounted at 34 (Figs. 1 and 24) upon the frame and is provided with a tail portion 35 beyond said pivot which is adapted to be engaged by a roll 36 carried by the lower end of a link 37 which is pivotally connected at 38 with one arm of a cam lever 39 pivotally mounted at 40 on the frame and having its cam follower 41 held against a cam surface 42 upon one end of a cam 43 upon the shaft 27 of the machine. There is pivoted upon a stud 44 fixed in the frame of the machine in close proximity to the tail portion 35 of the thread finger a hub 156 (Figs. 5 and 24) having integrally formed upon it a portion provided with a surface or edge 45 which serves as a cam surface between which and the tail portion 35 aforesaid is confined the roll 36 at the lower extremity of the link 37 attached to the end of the cam lever 39. The roll 36 is formed of three separate rollers, to permit each to roll upon the surface with which it contacts, and the tail portion 35 is slotted to receive the large middle roller. In the operation of the machine, the cam lever 39 is given periodic oscillation, which thrusts the roll 36 down between the cam surface 45 and the opposing surface of the tail portion 35 of the thread finger. The result is to force the tail portion 35 of the thread finger forwardly as the roll 36 descends, thereby swinging the thread engaging end of the thread finger 33 downwardly and rearwardly and causing it to pull aside a loop or bend of thread as shown in Figs. 9 to 12. Upon reverse movement of the cam lever 39, the upward movement of roll 36 permits the thread finger to swing reversely under the impulse of a contracting spring 46, combined with a pin 47 upon the tail portion 35 thereof and anchored to the frame at 48, which causes the engaging end portion of the thread finger to be swung upwardly and forwardly, releasing the thread subsequent to the latter's engagement with the hook of the needle through the intervening action of the looper.

The angle of the cam surface 45 with respect to the opposing surface of the tail portion 35 of the thread finger determines the amplitude of the movement imparted to the thread finger by the roll 36. This angle of the cam surface 45 is controlled by an arm 98, also integrally formed upon the hub 156 pivoted on stud 44, such arm being pivotally connected at 99 with a link 49 pivoted at 50 to an arm 51 upon a hub 52 which is secured by a clamping screw 53 (Fig. 4) upon one end of a shaft 54 extending transversely across the machine with capacity for rotation and bearing upon its reduced opposite end an arm 55 which is fixed thereon by a clamping screw 56 put through its hub portion and bearing against said reduced end portion of the shaft. The free end portion of the arm 55 is forked, (Fig. 2) and within the wide rectangular slot thus provided fits a block 60

which is pivoted at 57 upon the upper end of a lever 58 constituting the carrier for the welt guide 59, which is actuated in a direction to be pressed against the work by means of a contracting spring 61 secured to the carrier 58 at 62 and anchored to the frame at 63. Thus, the welt guide is operatively combined through the linkage just described with the cam surface 45, the result being that the angle of inclination of the cam surface 45 is determined by the spacing of the welt guide away from the channel guide 4, which spacing in turn is determined by the thickness of the between substance. Hence, when the between substance is of increased thickness, the welt guide will be positioned at a correspondingly increased distance away from the channel guide 4 and the cam surface 45 will be brought more nearly into perpendicular relation, which will cause the roll 36 to travel in a more nearly perpendicular path when thrust down by the action of its cam lever 39, and this in turn will increase its deflecting effect upon the tail portion 35 of the thread finger 33, giving to the thread-engaging end of the thread finger an increased amplitude of movement which is directly proportional to the increase in thickness of the between substance. The length of the bend or loop of thread drawn aside by the thread finger prior to the looping operation thus is increased to compensate for the greater length of thread needed for the work side of the needle loop to permit the needle to reach its point of farthest retraction just as such work-side of the loop is drawn tightly against the welt.

To facilitate the action of the thread finger in drawing aside its bend or loop of thread in measuring the slack provided to the needle during its retracting movement, it is preferred to release the tension upon the thread and allow it to be drawn from the supply through the looper and the take-up with the utmost facility. Hence, provision is made for releasing the tension during the operation of the thread finger. This is effected by providing a bell crank 114 (Fig. 1) pivotally mounted at 115 upon the machine base, the shorter arm 116 of which bell crank engages a collar 117 which transmits the pressure of the tension spring 118 serving to thrust the friction or braking disc against the tension wheel over which the thread passes as it emerges from the wax pot. The other arm of such bell crank is connected with a link 119 pivoted thereto at 120 and pivotally attached at 121 to the lower arm of the cam lever 39 which serves to actuate the thread finger. Thus, simultaneously with the beginning of the drawing off movement of the thread finger, the tension is entirely released enabling the thread finger to secure the necessary length of thread without having to overcome the opposition of the tension devices.

The welt guide 59 is secured against rearward movement while the needle is penetrating the welt by locking means acting during this portion of the cycle of the machine and located at the upper end of the carrier 58 on which the welt guide is mounted. Such means comprise a block 64, shown in dotted lines in Fig. 2, and also in Figs. 4 and 5, fixed upon the inward side of such carrier 58 and having its upward surface formed with ratchet teeth extending across its entire width. The pawls 65, of uneven length to give more selective engagement

with said ratchet teeth, are pivotally mounted upon the shank of a cap screw 66 that is threaded into an enlarged portion 67 at the lower end of a slide 68 working in vertical guideways in the frame of the machine and having at its upper end a cam follower 69 carried upon a stud fixed in the slide 68 and caused to follow the periphery of a cam 70 on main shaft 27 by the upward pressure of a spring 71 confined in a suitable chamber in the frame and bearing against the bottom of said portion 67. The pawls are rotated in a direction to bring their engaging ends into contact with the ratchet teeth on the block 64 by means of springs 72 attached to tail portions 73 in connection with the respective pawls and anchored by means of a pin 74 fixed in said portion 67 of the slide. During the working of the machine, the cam 70 thrusts the slide downward, compressing its spring 71 and bringing the pawls into engagement with the ratchet teeth on the portion 64 attached to the welt guide carrier, locking the welt guide in the position in which it has been arrested through contact with the between substance. Continued downward movement of the slide 68 causes the pawls 65 to rotate slightly about their pivot 66 through contact of their engaging ends with the ratchet 64. This rotative action effects a shortening of the distance between the ratchet 64 and the pivot 66 and causes the welt guide to compress the between substance an amount determined by the distance the slide 68 moves downward after the pawls make contact with the ratchet. At the completion of the feeding movement of the work, the cam 70 permits the slide 68 to rise under the push of its spring 71 and the tails 73 of the pawls are brought into contact by their springs 72 with a stop pin 75 fixed in the portion 67 of the slide, which checks their rotation about their pivot screw 66 and causes them to be lifted out of engagement with the ratchet teeth in connection with the carrier 58, releasing the carrier and permitting the welt guide and its carrier to be swung freely about its pivotal mounting upon shaft 11 to conform to the thickness of the between substance interposed between it and the channel guide 4 at the close of the feeding movement.

To provide for the feed of the work, the carrier member 58 for the welt guide is mounted slidably upon its shaft 11, and is provided with a sleeve 76 of considerable length, (Figs. 4 and 5) upon which is fitted rotatably the hub 77 of the awl carrier 78. This awl carrier 78 receives its actuation through a slide 79, (Fig. 2) mounted in vertical guideways in a depending portion 80 of the frame and having at its upper end the roll 81 engaging with a cam groove in the face of the cam 5. The lower end of such slide 79 has a roll 82 received within a slot 83 in the awl carrier 78, so that when the slide 79 is moved down by its cam, the awl carrier swings about the axis of said sleeve 76 in connection with the welt guide carrier, driving the awl 3 into the between substance.

A feature of the present invention is the arrangement providing for retraction of the awl when the machine is brought to rest out of its advanced position which it would otherwise normally occupy in the cycle of operation of the machine. According to such normal cycle, the awl would be advanced into the work at this stage. Such relation would prevent removal

and insertion of the work. Hence the groove in the face of cam 5 receiving the roll 81 at the top of slide 79 is enlarged at the point in its circuit occupied by said roll when the machine is brought to rest, this relation being shown in Fig. 21. The rod 84 (Fig. 2) connecting the starting treadle (not shown) with the stopping mechanism is provided with a collar 85 cooperating with the forked end 86 of a bell crank 87 pivoted at 88 upon the frame and joined by a link 89 with the free end of an arm 90 (Figs. 2 and 21) pivoted upon the shank of a stud 91 in the frame. The sleeve 92 upon which said arm 90 is formed has an angularly shaped member combined with it at its upper end by means of the screws 93, a portion of said member forming a detent in the shape of a bolt 94 working through a guideway in a portion 95 serving as a cover plate to hold the slide 79 in its guideway formed in the frame, said bolt being adapted to enter a suitable notch formed for it in the slide 79 before the roll 81 at the upper end of such slide has reached the widened part of its cam path. During the last portion of rotation of the cam 5, the roll is brought into the portion of the cam groove having its width increased radially outward, so that the roll is supported in said cam groove by the engagement of the bolt 94 with its slot in the slide 79, with the roll in spaced relation to the outer surface of its cam groove at the point where the latter has been materially widened. A spring 96 is coiled about longitudinal shaft 97 supported in the frame of the machine, and said spring has one of its ends anchored against the frame and its other exerting a downward pressure upon the top of the awl carrier slide 79. Thus when the operating treadle is depressed to start the machine, after the work has been inserted, the downward movement of rod 84 rocks bell crank 87 and the arm 90 to withdraw the bolt 94 from its place within the notch in the slide 79, and the spring 96 forces said slide downward with its cam roll moving radially across the widened portion of its cam groove 160, and drives the awl 3 into the work to begin the operation of the machine at the proper point in its cycle.

To accomplish the feeding of the work, the long sleeve 76 (Figs. 4 and 5) formed in connection with the carrier 58 for the welt guide, is connected with a cam lever 100 (Figs. 2 and 3) pivotally supported by means of its hub 101 upon the shaft 97 extending fore-and-aft the machine. This cam lever has a roll 102 at its upper end which is pressed against the exterior of the cam 103 upon the main shaft 27 by means of a spring 104 coiled about the shaft 97 and having one of its ends engaged with said cam lever while the other is confined against rotation through engagement with the frame of the machine. The lower end of the cam lever is pivotally connected at 105 with a link 106 which in turn is pivoted at 107 to a bell crank 108 rotatably supported at 109 in the frame and having its lower extremity formed as a yoke the studs 110 (Fig. 5) of which are confined between the outer end of the sleeve 77 of the awl carrier 78 and a collar 111 fixed upon the extreme end of the sleeve 76 in connection with the welt guide carrier. A clamping screw 112 threaded through the collar 111 bears against said sleeve to hold it in place, the construction thus enabling the awl and the welt guide to be moved laterally in unison, after the awl has penetrated the work, to effect the feeding there-

of when the cam lever 100 is moved in the proper direction, and to enable the awl and welt guide to be brought back to their former position upon reverse movement of the cam lever. Provision for varying the length of the feed and consequently the length of the stitches comprises a series of holes 113 in the arm of the cam lever, in the appropriate one of which the pivot 105 combining such arm with the link 106 may be placed to secure the desired amplitude of movement.

In accordance with another feature of the invention, the needle is given a lateral component of movement after it has been withdrawn and while it is retracting to its farthest retracted position. This is effected by mounting the needle segment 122, (Figs. 3 and 20) with capacity for free rotation upon a short transverse shaft 123 supported at each of its ends in bearings in the frame members 124. The needle segment is connected with the link 125 (Fig. 2) through which it receives its driving movement from the arm 126, the link 127 and the cam lever 128, by means of a pivot pin 129 of considerably greater length than the thickness of the needle segment, so that lateral movement of the needle segment may occur without interfering with such pivotal coupling. Similarly, the needle guide segment 130, which is fixed upon shaft 123 by a pin 155 is capable of lateral movement with respect to the link 131 through which it receives its actuation from its cam actuated slide 132, without interfering with its pivotal connection with said link through its respective pivot pin 133.

Upon the laterally movable shaft 123, adjacent the needle segment 122, there is affixed a collar 134 which normally occupies a recess 135 formed for its reception in the proximate face of the frame member 124. The shaft is held normally thrust toward the right hand side of the machine by the pressure against its opposite end of a leaf spring 136 secured to the frame member 124 by a screw 137, the various parts occupying the positions indicated in dotted lines in Fig. 20. A lever 138 (Fig. 3) is pivotally mounted at 139 in the frame of the machine so that its lower end will cooperate with the protruding right hand end of the transverse shaft 123. Its upper end is connected with a cam lever 141 mounted by means of its sleeve 142 upon the shaft 97, and a roll 140 borne by said cam lever is held in contact with the periphery of a cam 143 by means of a contracting spiral spring 144 having one end attached at 145 to the cam lever 141 and the other end attached at 146 to the cam lever which actuates the thread placer 7. The upper end of the lever 138 is forked and receives within a wide rectangular slot formed therein a rectangular block pivotally connected at 147 with the end of the cam lever 141, in order to provide the sliding movement necessary in such linkage of the two levers. Through this mechanism, when the high-point 148 of the cam 143 passes over the roll 140 on cam lever 141, the lower extremity of arm 138 presses the shaft 123 toward the left and the collar 134 secured thereon forces the needle segment 122 and its needle guide segment 130 laterally in the direction of feed of the work. The mechanism is timed to effect this lateral movement of the needle shortly after the needle leaves the work, the lateral deflection increasing until it reaches its maximum when the needle arrives at its farthest retracted position. The

effect of such movement of the needle is shown in Figs. 17 and 18, in the latter of which it will be seen that the previously formed loop 149 of thread comprising the chain being laid in the channel has been shortened by the pull on the needle combined with the lateral movement imparted to the latter, so that it is slightly shorter than the length of the stitch, while the tension of such previous loop 149 has bent the two legs of the loop held by the needle slightly out of the direct line between the needle hook and the needle hole from which the needle has just emerged. The material advantage achieved by such handling of the two loops lies in the fact that when next the needle is entered into the work and the take-up acts to pull tight the loop of thread which lies about its shank, the bend of the loop 149 will be exactly aligned with the needle hole from which the needle has just emerged as shown in Fig. 18, and the stitch will be pulled tight in the most satisfactory manner, while the tension in the two legs of the loop 149 will have been equalized as a result of the reeving of the thread around the between substance 150 lying between the two adjacent needle holes 151 and 152 and also by the sliding action of the bend of the loop 149 when moving along the loop 153 which extends through it, as said needle loop 153 is drawn tight by the take-up subsequent to the feed of the work. Upon reverse movement of lever 138, the spring 136 restores the parts to their normal relation, with the needle again in line with the awl.

In connection with the lateral component of movement imparted to the needle, provision is made for clamping the thread within the hook of the needle as the latter is retracted. This is effected in novel manner by delaying the retraction of the needle guide 154 until the needle hook has arrived at the nearer end of such guide, as shown in Fig. 19. During the continued retraction of the needle, the two parts move away from the between substance in unison. The result is to cause the needle guide to act as a clamp wedging the bend of the needle loop within the hook of the needle sufficiently to prevent reeving of the thread through said hook as the needle reaches its point of farthest retraction and draws the work side of its loop tightly against the surface of the welt. The end of the passage through the needle guide is flared slightly to prevent cutting of the thread as it is jammed between the hook and the proximate end of such passage. This provision for clamping the thread makes it possible to apply to each stitch an exactly uniform degree of tension in pulling the thread tightly against the welt surface and in shortening the preceding loop 149 through reeving around the between substance 150, resulting in the production of a seam of marked regularity characterized by an equal degree of tension in both legs of the respective loops forming the chain which is laid within the channel.

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

1. A hook needle chain stitch inseam shoe sewing machine having, in combination, a needle, a looper, a take-up acting to tighten a loop of thread around the shank of the needle while the latter is through the material, and means for delivering to the needle a measured length of thread to form the work-side of the

needle-loop comprising a thread-placer laying the thread along the work for the length of the stitch being formed, and a thread-finger drawing aside a bend of thread between the thread-placer and the looper.

2. A hook needle chain stitch inseam shoe sewing machine having, in combination, a needle and a channel guide located on the same side of the material to be sewed, a looper, a take-up, and means for delivering to the needle a measured length of thread to form the work-side of the needle-loop comprising a thread-placer and a thread-finger coacting to deliver to the needle a measured length of thread to form the work-side of the needle-loop, said length being proportioned to the thickness of the work being stitched.

3. A hook needle chain stitch inseam shoe sewing machine having, in combination, a needle and a channel guide located on the same side of the material to be sewed, a looper, a take-up acting to tighten a loop of thread around the shank of the needle while the latter is through the material, and means for delivering to the needle a measured length of thread to form the work-side of the needle loop comprising a thread-finger having an amplitude of movement varying in accordance with the thickness of the material and drawing aside a bend of thread proportionate to said thickness.

4. A hook needle chain stitch inseam shoe sewing machine having, in combination, a needle and a channel guide located on the same side of the material being sewed, a welt guide, a looper, a take-up, and means for delivering to the needle a measured length of thread to form the work-side of the needle-loop comprising a thread-placer laying the thread along the welt for the length of the stitch being formed, and a thread-finger drawing aside a bend of thread and operatively combined with the welt guide to vary the length of such bend in proportion to the thickness of the material being sewed.

5. A hook needle chain stitch inseam shoe sewing machine having, in combination, a needle and a channel guide located on the same side of the material being sewed, a welt guide, a looper, a take-up, and means for delivering to the needle a measured length of thread to form the work-side of the needle-loop comprising a thread-finger drawing aside a bend of thread and operatively combined with the welt guide to vary the length of such bend in proportion to the thickness of the material being sewed.

6. A hook needle chain stitch inseam shoe sewing machine having, in combination, a needle and a channel guide located on the same side of the material being sewed, a looper, a welt-guide, a cam-surface operatively combined with said welt-guide and having its position determined by the working relation of the welt-guide with respect to the channel-guide, and a thread-finger adapted to provide the needle with a length of slack thread for its retracting stroke, said thread-finger being controlled as to the amplitude of its thread-providing movement by the position of said cam-surface.

7. A hook needle chain stitch inseam shoe sewing machine having, in combination, a needle and a channel guide located on the same side of the material being sewed, a looper, a welt-guide, a surface having its angle of inclination determined by the working position of the welt-guide, a thread-finger adapted to draw

from the supply a length of thread for the retracting stroke of the needle, and a member periodically entered between said surface and the thread-finger to impart movement to the latter of an amplitude determined by the angle of inclination of said surface.

8. A hook needle sewing machine having, in combination, a needle, actuating means therefor, and a needle-guide through which the needle passes and by which the needle is supported, the needle and needle-guide cooperating during the retraction of the needle to clamp the thread in the hook of the needle to prevent reeving therethrough.

9. A chain stitch inseam shoe sewing machine having, in combination, a hook needle, actuating means moving the needle to and from the material being sewed and also imparting a lateral movement to the needle, and means for clamping the thread in the hook of the needle to prevent reeving therethrough.

10. A chain stitch inseam shoe sewing machine having, in combination, a hook needle, means for advancing and retracting the needle and also for imparting to it a lateral component of motion during its retraction to effect a shortening of the previous thread-loop through which the needle is pulling the loop of thread now engaged within its hook, and a needle-guide adapted to clamp the thread within the hook of the needle to prevent reeving through said hook during the shortening of said previous loop.

11. A hook needle chain stitch inseam shoe sewing machine having, in combination, means to clamp within the hook of the needle a loop of thread engaged therewith, and means to impart lateral movement to the needle in the direction of feed of the work while the needle is pulling upon such engaged loop, to afford opportunity for relative tension-equalizing movement of the two legs of the previously formed loops surrounding the engaged loop.

12. A hook needle chain stitch inseam shoe sewing machine having, in combination, a needle and a channel guide located on the same side of the material to be sewed, an awl adapted normally to enter the material closely following the retraction of the needle from the latter, and means operating as the machine is stopped to position the needle and the awl in spaced relation to the material to permit removal of the latter.

13. A hook needle chain stitch inseam shoe sewing machine having, in combination, a needle and a channel guide located on the same side of the material to be sewed, an awl adapted normally to enter the material closely following the retraction of the needle from the latter, and means operating as the machine is stopped to restrain the awl from advancing in its normal manner to enter the material.

14. A hook needle chain stitch inseam shoe sewing machine having, in combination, a needle and a channel guide located on the same side of the material to be sewed, an awl adapted normally to enter the material closely following the retraction of the needle from the latter, control means for starting and stopping the machine, and means actuated through the control means when stopping the machine to restrain the awl from advancing in its normal manner to enter the material.

15. A hook needle chain stitch inseam shoe sewing machine having, in combination, a needle and a channel guide located on the same side

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of the material to be sewed, awl mechanism comprising an awl, a carrier therefor, an awl-slide combined with said carrier, and means acting upon said awl-slide to actuate the awl toward and from the material, treadle controlled means for starting and stopping the machine, and a detent combined with said treadle controlled means and adapted to engage said awl-slide to prevent the advance of the awl when the treadle controlled means is positioned to stop the machine.

16. A hook needle chain stitch inseam shoe sewing machine having, in combination, a needle and a channel guide located on the same side of the material to be sewed, a looper, a take-up, thread tensioning means, means for delivering to the needle a measured length of thread to form the work-side of the needle loop comprising a thread placer and a thread finger

coacting to deliver to the needle a measured length of thread to form the work side of the needle loop, and means for releasing the tension upon the thread while the thread finger is acting.

17. A hook needle chain stitch inseam shoe sewing machine having, in combination, a needle, a looper, a take-up acting to tighten a loop of thread around the shank of the needle while the latter is through the work, and means for delivering to the needle a measured length of thread to form the work side of the needle loop comprising a thread placer arranged to lay the thread against the work in proximity to the needle while the needle is through the work and a thread finger acting to draw aside a bend of thread between the thread placer and the looper.

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