Oct. 13, 1936. J. GOULDBOURN ET AL 2,056,964

SEWING MACHINE

Original Filed Sept. 7, 1933

Fig. 3

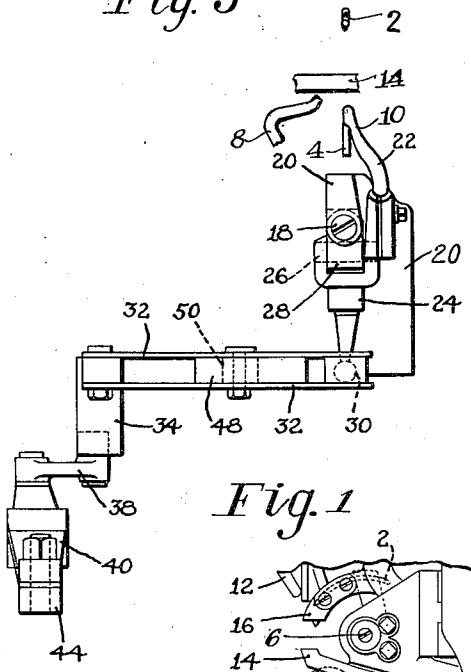


Fig. 1

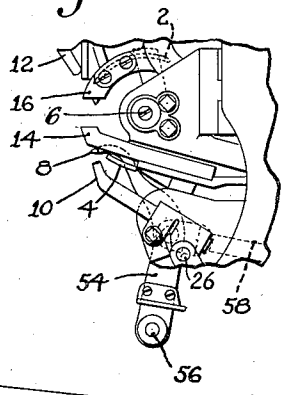


Fig. 2

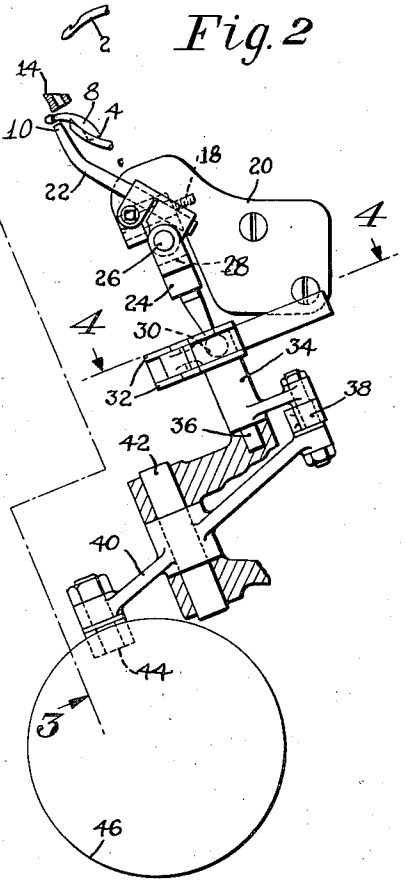


Fig. 4

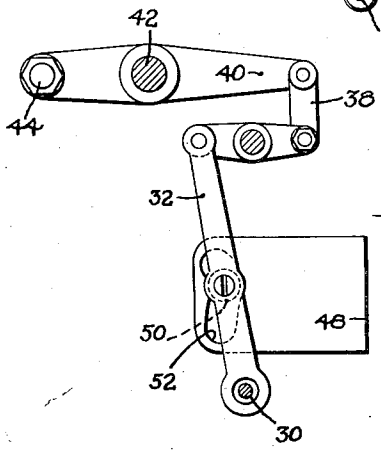
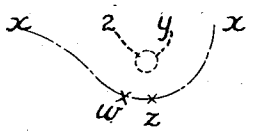


Fig. 5



Witness

Charles J. Olson

Inventors

Joseph Gouldbourn

Thomas A. Restell

by Fish Hildreth

Carr & Janney Attys.

Patented Oct. 13, 1936 2,056,964

UNITED STATES PATENT OFFICE

2,056,964

SEWING MACHINE

Joseph Gouldbourn and Thomas Aubrey Kestell, Leicester, England, assignors to United Shoe Machinery Corporation, Paterson, N. J., a corporation of New Jersey

Original application September 7, 1933, Serial No. 688,480. Divided and this application May 4, 1935, Serial No. 19,810. In Great Britain October 11, 1932

16 Claims. (Cl. 112—55)

This invention is concerned with improvements in or relating to sewing machines and is particularly, but by no means exclusively, concerned with sewing machines for operating on thick stubborn materials such as leather.

In the boot and shoe industry, for example, machines are used for sewing the outsoles of welted shoes (which term is used herein as including also boots) to their welts by a lockstitch seam and such machines make use of a curved hooked needle, a rotary shuttle, a looper, thread lock and thread lifter to cooperate in handling thread to form the stitches in a manner well known.

An illustrative machine of this kind is disclosed in United States Patent No. 1,169,909 granted to Fred Ashworth February 1, 1916, and also in the present inventors' co-pending application Serial No. 688,480 filed September 7, 1933 for Sewing machines of which application the present application is a division.

Usual machines of this kind employ mechanism for actuating the sewing instrumentalities which, while satisfactory for enabling the machine to sew efficiently, up to a speed of say five hundred stitches per minute or thereabouts, is not suited for enabling the machine to run at a relatively high speed, for example, to sew a thousand stitches per minute. In arranging a sewing machine to run at a high speed, it is important that both the individual speeds of movement of the sewing instrumentalities in relation to the machine cycle and their relative timing be settled with a high order of accuracy so that the absolute time taken by the various instrumentalities in carrying out their individual functions may be made as small as is consistent with smoothness of operation and in order that they may cooperate one with another in complete harmony.

Prior machines of the type referred to rely, for the feeding of the work through the machine, on an awl which rises from below the work to pierce the latter at a point to the right of the needle, looking at the machine from the front, and which while it is still in the work moves towards the left to carry the work towards the needle. When the awl has come into line with the needle, it is withdrawn downwardly from the work (the needle being thereafter lowered to pass through the hole punched for it in the work by the awl) and while in its retracted position moves across to the right to be once more ready to rise again to pierce the work and to feed it a further step towards the needle. When the needle has passed downwardly through the said hole, the looper and thread hook cooperate to lay the thread in the needle barb and the latter then rises through the work, taking a loop of thread with it. As the needle rises, the loop of thread which it carries is engaged and held open by the thread lifter ready to be engaged by the beak of the shuttle and carried over the shuttle and over the thread extending between the same and the stitch last set.

The objects of the invention are to provide novel looper mechanism well suited to operation at high speed, and to cooperation with a machine having a curved hook needle arranged to oscillate in a common plane with a curved awl in which the work is fed by a clamping device, and also to provide a curved hooked needle sewing machine having timings in the machine cycle of its various thread handling and work feeding instrumentalities which lend themselves particularly well to performing the sewing operation at very high speed without radical departure from the general principles of the conventional and well tried stitch forming cycle represented by that of the machine disclosed in the specifications aforesaid. In order that the nature of the present invention may be more clearly understood, an illustrative embodiment including the principal features of the invention will now be described and the above and other objects of the invention and its several features will become apparent to those skilled in the art from said description.

In the drawing Figure 1 is a view from the right hand side of a portion of the machine embodying the invention; Figure 2 is a right hand side view on an enlarged scale illustrating the means for operating a looper of the machine; Figure 3 is a view taken along the line 3—3 of Figure 2 showing certain of the parts seen in Figure 2; Figure 4 is a view taken along the line 4—4 of Figure 2, showing certain parts of the mechanism for actuating the looper; and Figure 5 is a diagram illustrating the path of the looper relatively to the needle.

The said illustrative embodiment of the invention is a machine designed for sewing the outsoles of welted shoes to their welts and comprises a curved hook needle 2 and a curved awl 4 mounted to oscillate about a stud 6, a thread finger or hook 8, a looper 10, a shuttle 12, a work support 14 and a presser foot 16. The presser foot and work support are arranged to grip and release the work and to move while gripping the work from right to left, thus feeding the work past the needle and awl towards the left. The needle 2 with its barb or hook on the outer forward side and awl 4 are clamped to needle and

awl segments which are mounted on the stud 6 so that they shall oscillate always in one and the same vertical plane about a horizontal axis extending across the machine when viewed from the front, the awl moving up from below the work to pierce it and the needle moving downwards to enter the hole punched for it in the work by the awl.

The thread looper 10 in the machine embodying the invention is supported by a short and fixed pivot pin 18 secured to an extension 20 projecting forwardly from the machine head, and so positioned that its axis lies substantially in the vertical plane in which the movements of the needle and awl take place and the pin lies just rearwardly of the vertical plane containing the axis about which the needle and awl move and considerably below the said axis. The pin is inclined forwardly and downwardly at an angle of about 22 degrees to the horizontal.

The looper comprises a short stem 22 (extending downwardly from its thread passage) which is fast in a short lever 24 which extends below pin 18 and is freely pivoted (between its ends) on a stud 26 which is secured in a block 28 freely pivoted on the pin 18 which thus supports the looper. This arrangement provides a universal joint to enable desired forward and rearward and transverse movements of the upper end of the looper to be obtained in a manner hereinafter described. The looper stem 22 extends from lever 24 upwardly and forwardly so that the thread passage at its upper end lies in front of the barb of the needle (which barb is positioned in the forward side of the needle) when the needle has descended through the work and just before it reaches its lowest position. The length of the stem is such that at this time the upper end of the stem (which has a short bore extending upwardly through it constituting the thread passage) is substantially in the same horizontal plane at the barb of the needle.

The lower end of lever 24 is formed as a ball 30 which is received within a bore or socket in one end of a lever 32 which at its other end is pivotally connected to a lever 34 which is rotatably mounted on a fixed and upwardly extending shaft 36, and connected by a link 38 to a cam lever 40 which is pivoted on a shaft 42. This shaft 42 and the shaft 36 are arranged parallel to each other and extend downwardly and rearwardly at an angle of about twenty degrees to the vertical. The lever 40 has a roll 44 which enters a cam groove in a cam member 46, rotating on one of the main shafts of the machine.

The connections to the lever 40 just described operate to impart to the upper end of the looper rocking movement transversely of the machine about the pin 18. For imparting to the upper end of the looper movement forwardly and rearwardly about stud 26 lever 32 comprises two plates arranged one above the other and above and below a stationary plate 48 projecting forwardly from the head casting and a cam roll 50 secured between and bridging the plates passes through a cam slot 52 formed in plate 48. The cam slot has such a shape that, when looked at in plan, it is curved forwardly slightly at its left end and curved rearwardly slightly at its right end so that as lever 32 is pulled bodily transversely towards the right by the cam member 46 to rock the upper end of the looper about pin 18 towards the left, the cam roll 50 and the cam slot 52 cooperate to rock the upper end of the looper about pin 26 from a position rearward of that which the barb of the needle will occupy when it is in a position to have the thread laid in it forwardly. Thus, as the upper end of the looper moves across towards the right of the machine, it passes across in front of the needle in a curved path which, at its right hand, lies once more behind the needle barb. It will be understood that the mechanism described causes the thread delivery end of the looper to return along the same path as that along which it moves to effect looping, this path being, in view of the shape of the cam slot 52, a somewhat S-shaped path seen from above the right hand, the more pronounced concavity of the S thus seen being so oriented as to embrace the path of the needle, as seen in Fig. 5.

The thread hook 8 cooperates with the looper 10 to lay the thread in the needle barb when the latter has almost reached the bottom of its work-piercing stroke. The thread hook is at the upper end of an arm 54 (Fig. 1) which is mounted to swing forwardly and rearwardly at the left of the needle being mounted on a pin 56 secured in the machine head. The upper end of arm 54 forming the thread hook 8 is so bent (Figs. 2 and 3) that it extends horizontally close to the plane in which the needle moves and just above the level at which the upper end of the looper moves and it has a notch in its rear side to engage the thread passing upwardly from the looper as the thread hook moves rearwardly about its pivot.

The arm 54 is connected by a link 58 to a suitable cam operated mechanism for giving to the thread hook its forward and rearward movements to assist the looper in laying the thread in the needle barb in a manner hereinafter more fully described.

The thread hook 8 has a purely forward and rearward movement and remains in its forward inoperative position during the first part of each stitching cycle. The thread hook is then moved rearwardly to engage and draw back the thread and remains in its rearward position (as the looper moves across the needle in front of the latter), after which it moves forwardly again to release the thread and remains idly in its forward position throughout the remainder of the cycle.

Immediately at the start of each stitch cycle the looper 10 commences to move towards the left from in front of the awl, reaching its extreme left hand position to the left of the needle shortly thereafter. The looper starts to move rearwardly from its forward position at the beginning of each cycle and continues to move rearwardly where it remains in its rearward and extreme leftward position until it starts to move forwardly and to the right. The forward movement of the looper continues until the looper lies just in front of the needle and the looper thereafter moves rearwardly once more until it is in its rearmost right position having laid the thread in the needle barb. It then moves forwardly and to the left once more into its forward position and remains in this position until the end of the stitching cycle.

The movement of the looper towards the right continues until it passes across the front of the needle. Immediately after the looper has reached its extreme right hand position, it commences to move towards the left until it lies once more in front of the needle awl path. The looper remains at rest in this position practically through the remainder of the cycle but commences to move almost imperceptibly towards the left at

the extreme end of the cycle. The fact that the looper has been returned from its extreme right hand and rearward position to be in front of the awl path as the awl commences to rise towards the work (which it does during the latter portion of a stitching cycle) ensures that the bight of thread extending between the looper and the work will not occupy such a position as would render it liable to be pierced by the rising awl. In Figure 5, the dotted line X—X indicates the path of the eye of the looper with relation to the needle, viewing this path perpendicularly to the general plane in which the eye moves, the position in which the needle intersects this plane being shown at Y. At the central part Z of the needle embracing concavity of the looper path shows the position in which the looper eye, as indicated, dwells until the end of the cycle.

To provide still further safeguard against the possibility of the awl piercing the thread, the looper-actuating mechanism may be timed so that, as the awl rises to pierce the work and during the long dwell of the looper, the looper will be positioned at *w* slightly to the left of the path of the awl movement (i. e. to the left in the direction of feed to the point Z in Fig. 5) thereby further ensuring that the thread passing from the looper will be positioned well out of the rising path of the awl. It is a virtue of the peculiar movement given to the looper in the illustrative machine that as the laying of the needle thread in the needle barb is accomplished without the looper eye moving in a looped path about the needle path, the legs of the loop drawn up by the needle are not crossed and consequently there is not only a reduced tendency for standing of the thread, but a more attractive appearance is given to the completed stitch.

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

1. An outsole shoe sewing machine having, in combination, stitch forming devices including a hook needle, a looper acting to lay thread in the hook of the needle, comprising a looper carrying lever having a thread eye at one end, a pivotally mounted block on which the looper lever is pivotally mounted to swing about an axis at right angles to the pivotal axis of the block, an actuating lever mounted for swinging and bodily endwise movements in a plane parallel to the axes of the block and looper lever, and a pivotal connection between said actuating lever and the end of the looper lever remote from the thread eye.

2. An outsole shoe sewing machine having, in combination, stitch forming devices including a hook needle, a looper acting to lay thread in the hook of the needle comprising a looper lever having a thread eye at one end and being pivotally mounted to swing about two axes at right angles to each other, an actuating lever mounted for swinging and bodily endwise movements in a plane parallel to the axes of the looper lever, and a pivotal connection between said actuating lever and the end of the looper lever remote from the thread eye.

3. An outsole shoe sewing machine having, in combination, stitch forming devices including a hook needle, a looper acting to lay thread in the hook of the needle comprising a looper lever having a thread eye at one end and being pivotally mounted to swing about two axes at right angles to each other, an actuating lever, a pivotal connection between said actuating lever and the end of the looper lever remote from the thread eye, means for imparting bodily endwise movements to the actuating lever in a plane parallel to the axes of the looper lever, and means comprising a cam slot and cam follower for imparting swinging movements in said plane to said actuating lever during its endwise movements.

4. An outsole shoe sewing machine having, in combination, stitch forming devices including a hook needle and a looper, and mechanism for actuating the looper from one side of the needle to the other along a path in the general line of feed, curving forwardly and rearwardly of the needle to loop the needle and along a path coinciding with the looping path to return the looper to its starting position.

5. An outsole shoe sewing machine having, in combination, stitch forming devices including a hook needle and a looper, mechanism for moving the looper from one side of the needle to the other in the general line of feed, and a stationary cam for causing the looper to pass forwardly and rearwardly of the needle in laying the thread in the needle hook.

6. An outsole shoe sewing machine having, in combination, stitch forming devices including a hook needle and a looper, mechanism for moving the looper from one side of the needle to the other in the general line of feed, and a stationary plate having a curved cam slot for causing the looper to pass forwardly and rearwardly of the needle in laying the thread in the needle hook as the looper is moved from one side of the needle to the other.

7. An outsole shoe sewing machine having, in combination, stitch forming devices including a curved hook needle having a hook opening on the outer side of the curve and a looper, mechanism for moving the looper from one side of the needle to the other in the general line of feed, and a stationary cam for causing the looper to pass from a position rearwardly of the needle to a position forwardly and then again rearwardly as the looper is moved from one side of the needle to the other.

8. An outsole shoe sewing machine having, in combination, stitch forming devices including a curved hook needle having a hook opening on the outer side of the curve and a looper, mechanism for moving the looper from one side of the needle to the other in the general line of feed, and a stationary cam for causing the looper to pass from a position rearwardly of the needle to a position forwardly and then again rearwardly as the looper is moved from one side of the needle to the other in looping the needle, and for causing the looper to return along the same path to starting position.

9. A lockstitch sewing machine having, in combination, a curved hooked needle and a curved awl arranged always to lie in a common plane, and a shuttle, the needle and shuttle both being arranged above a work support of the machine and the awl being arranged below the work support, a work gripping device for feeding the work past the needle and awl, and a looper arranged to move in a path extending across the plane of the needle, when the latter has penetrated the work, to lay thread in the needle barb and thereafter to return along the same path.

10. A lockstitch sewing machine having, in combination, a curved hooked needle and a curved awl arranged always to lie in a common plane, and a shuttle, the needle and shuttle both being arranged above a work support of the ma-

chine and the awl being arranged below the work support, a work gripping device for feeding the work past the needle and awl, and a looper arranged to move from one side of the needle to the other along a curved open path in the general line of feed to lay the thread in the needle hook and thereafter to return along the same path.

11. An outsole shoe sewing machine having, in combination, stitch forming devices including a hook needle, a thread finger at one side of the needle and a looper, mechanism for actuating the thread finger forwardly and rearwardly to withdraw and yield up thread between the needle and the last formed stitch, and mechanism for actuating the looper from the thread finger side of the needle along an S-shaped path, one concavity of which embraces the path of the needle, and for returning the looper along said path to starting position.

12. An outsole shoe sewing machine having, in combination, stitch forming devices including a hook needle, a thread finger at one side of the needle and a looper, mechanism for actuating the thread finger forwardly and rearwardly to withdraw and yield up thread between the needle and the last formed stitch, and mechanism for actuating the looper from the thread finger side of the needle along an S-shaped path, one concavity of which embraces the needle during the looping movement and along the same path to starting position during the return movement and for causing the looper to dwell in the central part of the needle embracing concavity portion of the looper path.

13. An outsole shoe sewing machine having, in combination, stitch forming devices including a hook needle, a thread finger at one side of the needle and a looper, mechanism for actuating the thread finger forwardly and rearwardly to withdraw and yield up thread between the needle and the last formed stitch, and mechanism for actuating the looper from the thread finger side of the needle along an S-shaped path, one concavity of which embraces the needle during the looping movement and along the same path to starting position during the return movement and for causing the looper to dwell during the return movement in the central part of the needle embracing concavity portion of the looper path.

14. An outsole shoe sewing machine having, in combination, stitch forming devices including a hook needle, a thread finger at one side of the needle and a looper, mechanism for actuating the thread finger forwardly and rearwardly to withdraw and yield up thread between the needle and the last formed stitch, and mechanism for actuating the looper from the thread finger side of the needle along an S-shaped path, one concavity of which embraces the needle during the looping movement and along the same path to starting position during the return movement and for causing the looper to dwell in front of the awl as the awl commences to rise towards the work.

15. An outsole shoe sewing machine having, in combination, stitch forming devices including a hook needle, a thread finger at one side of the needle and a looper, mechanism for actuating the thread finger forwardly and rearwardly to withdraw and yield up thread between the needle and the last formed stitch, and mechanism for actuating the looper from the thread finger side of the needle along an S-shaped path, one concavity of which embraces the needle during the looping movement and along the same path to starting position during the return movement and for causing the looper to dwell in front and slightly on the thread finger side of the awl as the awl commences to rise towards the work.

16. An outsole shoe sewing machine having, in combination, stitch forming devices including a hook needle, a thread finger at one side of the needle and a looper, mechanism for actuating the thread finger forwardly and rearwardly to withdraw and yield up thread between the needle and the last formed stitch, and mechanism for actuating the looper from the thread finger side of the needle along an S-shaped path, one concavity of which embraces the needle during the looping movement and along the same path to starting position during the return movement and for causing the looper to dwell in front of and slightly to the side of the awl in the direction of feed as the awl commences to rise towards the work.

JOSEPH GOULDBOURN.
THOMAS AUBREY KESTELL.