Nov. 30, 1948. R. H. LAWSON 2,454,876

GRIPPER MECHANISM

Filed Feb. 28, 1947

3 Sheets-Sheet 1

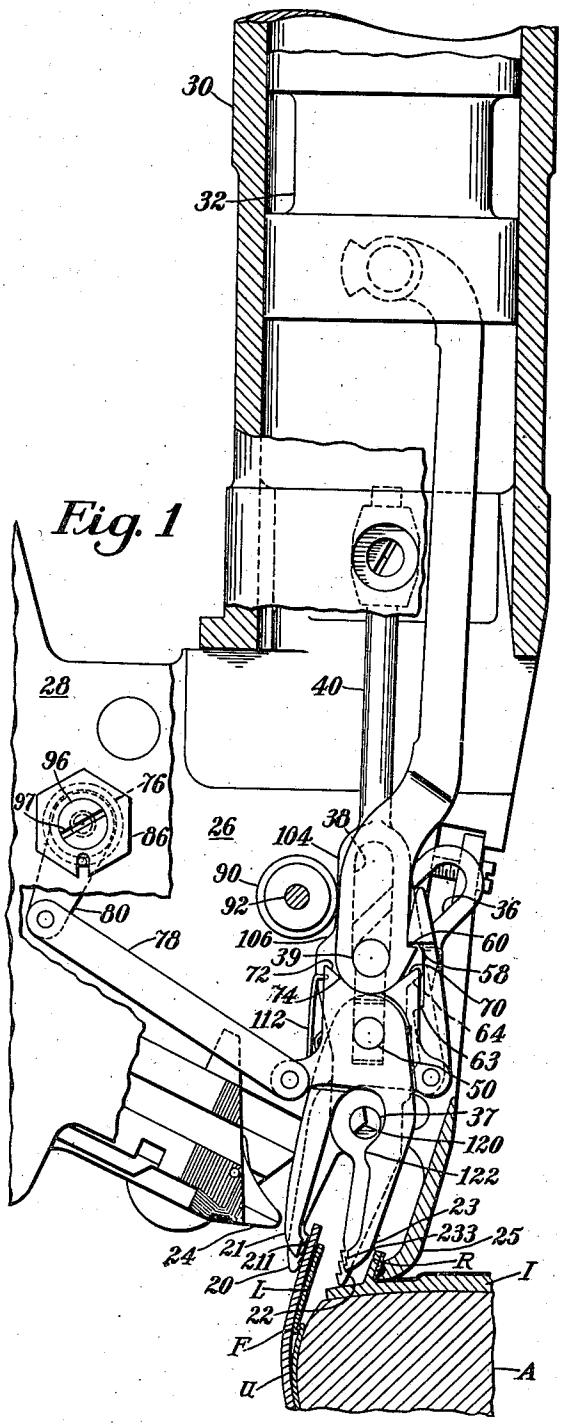


Fig. 1

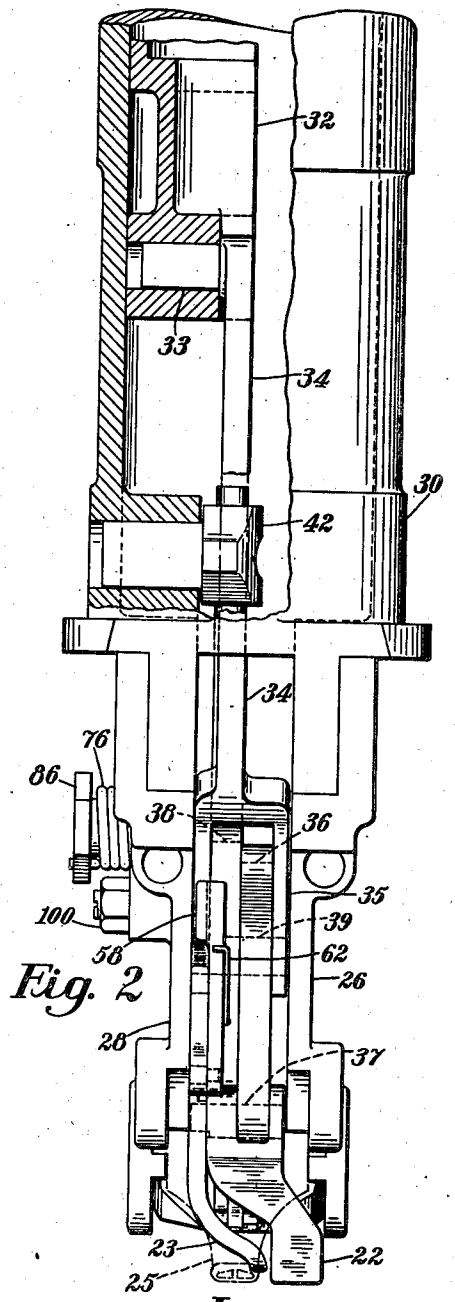


Fig. 2

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Fig. 3

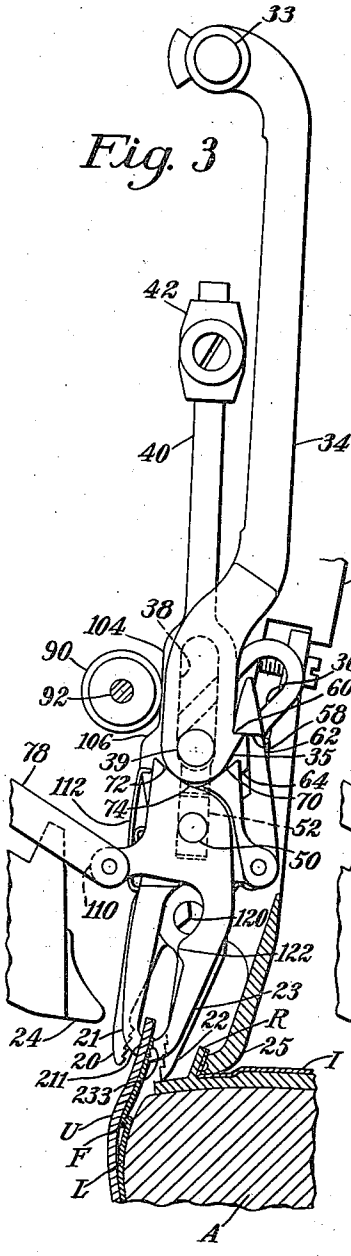


Fig. 4

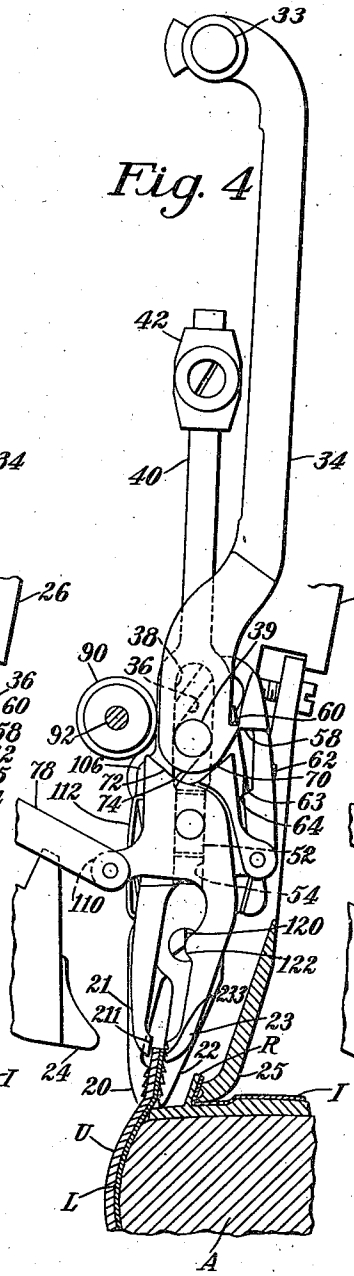
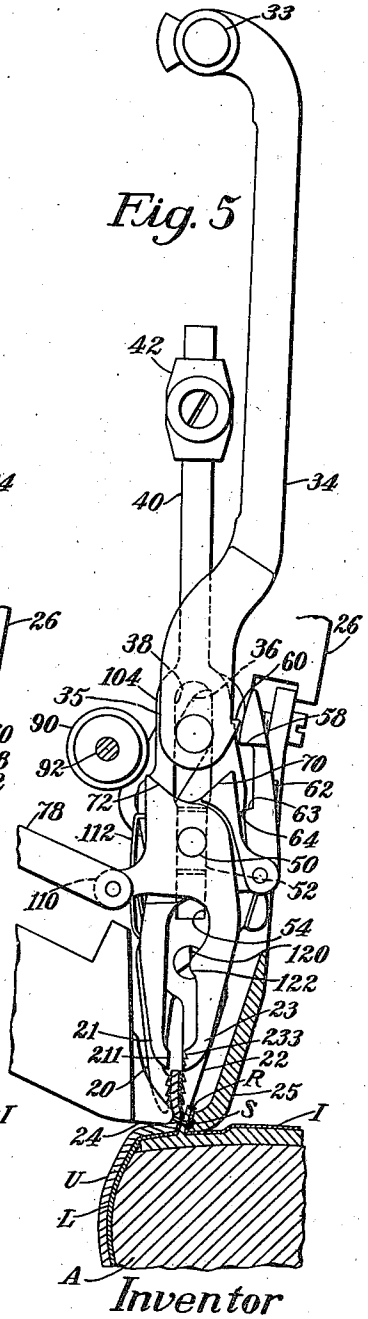


Fig. 5



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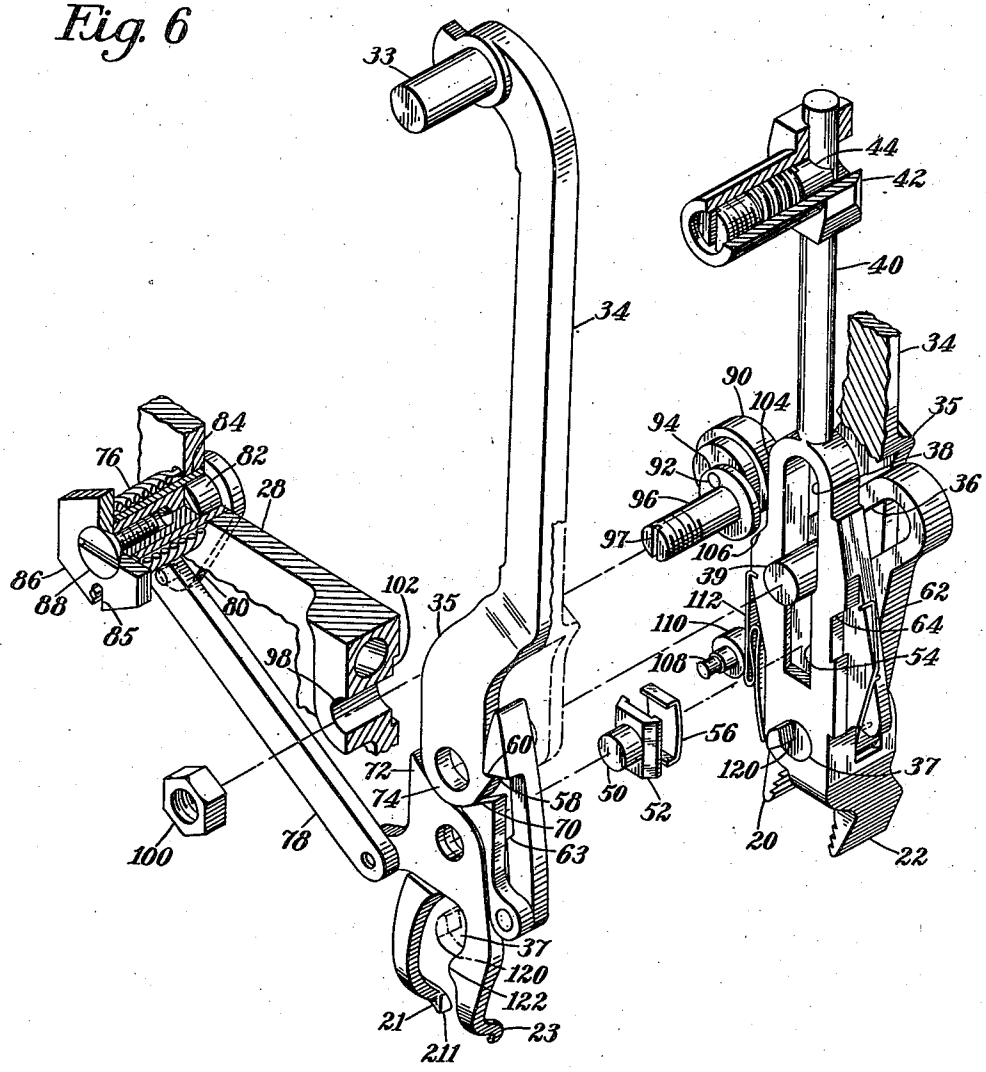
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Fig. 6



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Patented Nov. 30, 1948

2,454,876

UNITED STATES PATENT OFFICE

2,454,876

GRIPPER MECHANISM

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Application February 28, 1947, Serial No. 731,489

12 Claims. (Cl. 12—4)

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This invention relates to gripper mechanism for tensioning multi-ply shoe uppers over lasts, and is herein illustrated as applied to upper-tensioning mechanism of the type disclosed in United States Letters Patent No. 2,201,866, issued in my name on May 21, 1940. However, it is to be understood that in various novel aspects the invention is more generally applicable to gripper mechanisms of other types, and in some aspects also to gripper mechanisms for performing operations other than lasting operations.

In the lasting of multi-ply shoe uppers, for example those including an upper formed of leather and a fabric lining, either in a machine which, like that of the aforementioned patent, operates simultaneously at the opposite sides of a shoe, or in a machine that operates at one side of the shoe at a time, it is frequently difficult, if not impossible, properly to tension the upper materials over the wooden last by means of a single gripper which grips both the upper and the lining. This is partly due to the different elastic characters of the two materials out of which the upper and lining are formed and also because, when the upper materials are assembled on the last, the lining being less stiff than the upper may become wrinkled or folded and more loosely fitted to the last. Thereafter, when the upper materials are tensioned, the leather upper may not stretch sufficiently, under the pull applied by the gripper, to permit movement of the gripper necessary to remove the wrinkles from the lining and tension it smoothly over the last. Inasmuch as such wrinkles or folds in the lining will be visible in the finished shoe, it is essential to satisfactory lasting that they be removed.

It is, therefore, an object of this invention to provide a novel gripper mechanism for tensioning a multi-ply shoe upper, including an upper and a lining, over a last, in such a manner that all looseness in the lining will be eliminated and all wrinkles or folds therein removed before the upper materials are finally tensioned over the last. With this end in view and in accordance with a feature of this invention, the herein illustrated gripper mechanism comprises two grippers, each adapted to engage both the lining and the upper, together with a common operating means and connections between this operating means and the two grippers so constructed and arranged as to cause the grippers, successively, to close on the upper materials and move in a heightwise direction away from the bottom of the last to tension the materials. More particularly, the improved gripper mechanism comprises an upper-tensioning gripper having a pair of jaws each provided with a toothed, or otherwise roughened, operating face for engaging the upper materials and movable to tension the materials over a last, herein illustrated as being of the type associated with the lasting machine illustrated in the above-mentioned patent, and a lining-pulling gripper including a pair of jaws one of which has a smooth face for engaging the upper and the other a toothed, or otherwise roughened face, for engaging the lining and operable to tension the lining before the operation of the upper-tensioning gripper.

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Preferably, and as herein illustrated in accordance with further features of the invention, the jaws of the lining-pulling gripper, which are pivotally connected and slidably supported on the upper-tensioning gripper, are operatively connected to the common operating means by means of a latch. These jaws are movably held in open position, against the action of yieldable closing means, by means of a cam portion formed on the operating means, which cooperates with inclined surfaces on the jaws and the latch is arranged to afford a lost motion connection so that, as a result of the movement of the operating means these jaws are first yieldingly closed on the upper materials and then moved bodily in a heightwise direction away from the bottom of the last, to tension the lining, before the upper-tensioning gripper is closed on the upper materials. Separate cam means are also provided for releasing the latch, to disconnect the lining-pulling gripper from the operating means, and for opening these jaws just as the upper-tensioning gripper is closed and moved bodily away from the bottom of the last by the continued movement of the operating means. Upon reversal of the direction of movement of the operating means, both pairs of jaws are opened and returned to positions for engaging the next succeeding portion of the upper materials. As a result of the above arrangement, the lining is first tensioned so as to eliminate all looseness therefrom and to remove all wrinkles or folds, by the lining-pulling gripper, the lining, gripped by the roughened surface of one jaw, then moving relatively to the upper over which the smooth surface of the other jaw readily slips, before the upper-tensioning gripper is closed and, thereafter, moved by the operating means to tension the materials over the last with both the upper and lining firmly gripped by the roughened surfaces of both of its jaws.

These and other objects and features of the invention will appear in the following detailed description of the preferred embodiment thereof illustrated in the accompanying drawings and will be pointed out in the claims.

In the drawings,

Fig. 1 is a view in side elevation of a lasting unit embodying the improved tensioning mechanism of this invention;

Fig. 2 is a view in front elevation of the lasting unit illustrated in Fig. 1;

Figs. 3, 4 and 5 are views illustrating different successive positions of the parts of the tension-

ing mechanism in the operation of the machine; and

Fig. 6 is an exploded view, in perspective, of the tensioning mechanism.

Referring to the drawings, the lasting unit therein illustrated comprises tensioning mechanism, including an upper-tensioning gripper having jaws 20 and 22 for seizing and tensioning the upper materials, herein illustrated as an upper U and lining L assembled with an insole I on a last A, and a lining-pulling gripper having jaws 21 and 23 for tensioning the lining; a fastener-inserting nozzle 24 for driving a fastening such, for example, as a staple *s*, through the tensioned upper materials and a rib R of the insole; and an anvil 25 for supporting the rib and for positioning the lasting unit during the operation of the lasting unit and for clenching the ends of the staple legs on the inner face of the rib. These various elements are mounted on a head construction formed by embracing side plates 26, 28 which are joined to a cylindrical supporting member 30.

The gripper jaws 20, 22 and 21, 23 are operated by means of the vertical reciprocation of a slide 32 to which is connected, by a stud 33, an operating link 34 having a bifurcated lower end 35. The gripper jaws 20, 22 are pivotally connected, near their lower ends, by means of a pin 37 and are provided, at their upper ends respectively, with slots 36 and 38 which are angularly related. A pin 39, carried by the bifurcated lower end 35 of the operating link 34 which embraces the upper ends of these gripper jaws, extends through these two slots. The jaw 22 is provided with an upwardly extending rod 40 which engages a friction device 42, carried by the supporting member 30 and including a spring-pressed plunger 44, for controlling the opening and closing movements of the gripper jaws 20 and 22 in the same manner as in the tensioning mechanism of the above-mentioned patent and as will presently appear.

The lining-pulling gripper jaws 21, 23 are pivotally mounted on a pin 50 which is carried by a block 52. This block is slidably mounted in a groove 54, formed in the gripper jaw 22 below the slot 38 therein, and a spring friction plate 56 shaped to embrace this block bears against the bottom of the groove 54 so as to hold the pin 50 in place and also to urge the gripper jaws 21, 23 yieldingly against the inside face of the side plate 28. A latch 58, pivotally mounted on the gripper jaw 21, is arranged to be moved into position for engagement with a cooperating shoulder 60, formed on the lower end 35 of the operating link 34, by means of a leaf spring 62 supported on the gripper jaw 22 when the parts are in the positions shown in Figs. 1, 2, 3 and 6. This latch is provided with a camming lug 63 which, at a predetermined time in the cycle of operation of the tensioning mechanism, rides over an inclined cam surface 64, formed on the gripper jaw 22, to cause the latch 58 to move out of engagement with the shoulder 60 and thereby to disconnect the gripper jaws 21, 23 from the operating link 34.

At their upper ends the gripper jaws 21, 23 are provided, respectively, with outwardly and upwardly diverging cam surfaces 70, 72 and the lower end of one of the bifurcated portions 35 of the operating link 34 is rounded off at 74 to act as a cam for cooperating with these cam surfaces to hold these jaws open when the parts are in the positions shown in Figs. 1 and 6. These gripper jaws are yieldingly closed through the action of a coil spring 76 mounted on the side plate 28, see Fig. 6, which acts through a link 78 that is pivotally connected at one end to the gripper jaw 23. At its other end this link is connected to an arm 80 formed integrally with a shaft 82. This shaft is journaled in a sleeve 84, pressed into the side plate 28, which sleeve also supports the coil spring 76. One end of this spring is anchored in this side plate while the other end thereof engages a notch 85 formed in a hexagonal nut 86 which is adjustably secured to the shaft 82 by means of a clamping screw 88. When this clamping screw is loosened, the nut 86 may be rotated to vary the tension of the spring 76 and hence the pull exerted on the gripper jaw 23 by the link 78.

In addition to its action in closing the gripper jaws 21, 23 the pull exerted by the spring 76 through the link 78 also holds the primary gripper jaws in engagement with a guide roll 90. This guide roll is journaled on a stud 92 that is press-fitted into a flange 94 formed on a bolt 96. The bolt 96 passes through a hole 98 formed in the side plate 28 and a nut 100 is provided for holding the roll in any position of adjustment to which it may be moved by rotating the bolt 96 which is provided with a slot 97, for this purpose. It will be understood that the roll 90 is mounted eccentrically with respect to the axis of the bolt 96 and that its lateral position will be changed when the bolt is rotated. The hole 98 is counterbored at 102 to receive the flange 94. The guide roll 90 cooperates with a cam surface 104 having an inclined portion 106 formed on the gripper jaw 22 for guiding the vertical movement of the tensioning mechanism in a manner to be explained below.

The link 78 is connected to the gripper jaw 23 by means of a pin 108 on which there is mounted a roll 110. This roll is arranged to bear against a leaf spring 112, supported on the gripper jaw 22 and which serves to augment the action of the coil spring 76 without, however, adding to the pressure of the cam surface 104 against the guide roll 90. For opening the gripper jaws 21, 23 the pin 37 which connnects the jaws 20, 22 is provided with an angularly shaped projection 120 and the jaw 23 has a rounded camming lug 122. As will presently appear, at the completion of the tensioning action of the lining-pulling jaws 21, 23, and substantially at the time when the main jaws 20, 22 close on the upper materials, this camming lug will strike the projection 120 and cause the jaw 23 to swing away from the jaw 21 thereby releasing the grip of these jaws on the material.

A complete operating cycle of the lasting unit and particularly of the improved tensioning mechanism will now be described. Referring first to Fig. 1 of the drawings, in which the various parts are shown in positions assumed at the beginning of the operating cycle, the shoe on the last A is held upwardly by the operator, or by means of the shoe-supporting jack shown in the above-mentioned patent, against the anvil 25 which enters the inside angle formed by the rib R, the lasting margin of the upper materials enters between the opened gripper jaws 20, 22 and 21, 23, and the nozzle 24 is withdrawn. For the purpose of illustrating the action of the lining-tensioning gripper jaws 21 and 23, the lining L is shown as having a definite fold F.

The latch 58 is spaced somewhat above the shoulder 60, when the parts are in the positions shown in Fig. 1, so that, during the initial portion of the upward movement of the slide 32, the

rounded end 74, on the lower part of the link 34, will move away from the inclined surfaces 70, 72, sufficiently to permit the jaws 21, 23 to close. After the lost motion, afforded by this space between the latch 58 and the shoulder 60 has been taken up, as the slide 32 and link 34 continue to move upwardly, the jaw 21 is swung in a counterclockwise direction toward the jaw 23 by the action of the latch 58, which is now in engagement with the shoulder 60 on the upwardly moving link 34, while the jaw 23 is swung, in a clockwise direction and toward the jaw 21, by means of the spring 76 and also the spring 112 and these jaws are yieldingly closed on the upper material, as shown in Fig. 3. The friction device 42 at this time prevents upward movement of the jaws 20 and 22 so that the pin 39, acting in the slots 36 and 38, begins to close these jaws also.

As the slide 32 continues its upward movement, the jaws 21 and 23, now yieldingly closed on the material, are elevated to exert an upward pull thereon. The jaw 21 has a smooth face 211 which can slip over the upper U but the jaw 23 is provided with teeth 233, or otherwise roughened, so as to grip the lining L firmly and, as a result of the upward movement of these two jaws the lining will be tensioned and the fold F removed as the parts approach the positions shown in Fig. 4. At this stage in the cycle, the jaws 20, 22 will have been closed on the upper materials, by the continued upward movement of the slide 32 and the pin 39, to grip both the upper and lining firmly, these two jaws each being provided with a toothed, or otherwise roughened operating face, as shown. Just as the jaws 20, 22 are thus closed, the camming lug 122 engages the projection 120 to open the jaws 21, 23, sufficiently to release their grip on the upper materials and, at substantially the same time, the latch 58 is moved out of engagement with the shoulder 60, by the action of the cam surface 64 on the lug 63, to disconnect the jaws 21, 23 from the operating link 34.

Now, as the slide 32 completes its upward movement, the upper materials, i. e., the upper U and the lining L are both further tensioned by the grippers 20, 22 and these tensioned materials are then laid inwardly against, and secured to, the rib R by means of the fastener-inserting nozzle through which the staple *s* is driven and clenched against the anvil 25. Fig. 5 shows the operating parts in the positions assumed just after the staple has been driven. As the gripper jaws 20, 22 are elevated after they have been closed to tension the upper materials, they are swung inwardly over the shoe bottom, to the right in Fig. 5, first by the action of the guide roll 90 as it engages the inclined portion 106 of the cam surface 104, and finally by the engagement of the nozzle 24 with the upper materials.

Immediately, after the staple has been driven, the slide 32 is moved downwardly and, during the initial portion of this downward movement, the gripper jaws 20 and 22 are opened, the friction device 42 now holding these jaws against downward movement and the pin 39 acting on the slots 36 and 38. When the rounded end 74 of the operating link 34 comes into engagement with the camming surfaces 70 and 72, the jaws 21, 23 will be opened, the resistance to downward movement of these jaws provided by the friction plate 56 being sufficient to cause this opening action. Thereafter, and when the jaws 20, 22 and 21, 23 have been fully opened, these jaws are all moved downwardly as a unit and the parts are returned to their original positions as shown in Fig. 1 when the slide 32 has completed its downward movement.

Having described the invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. Mechanism for tensioning upper materials, including an upper and a lining, over a last comprising two grippers, each having a pair of jaws adapted to engage both said upper and said lining, the jaws of one pair having a smooth face, for engaging the upper, and a roughened face, for engaging the lining, and the jaws of the other pair each having a roughened face for engaging the upper and lining, respectively, operating means common to both grippers, and connections between said operating means and the grippers constructed and arranged to cause said grippers, successively, to close on the upper materials and to move in a heightwise direction away from the bottom of the last.

2. Mechanism for tensioning upper materials, including an upper and a lining, over a last comprising an upper-tensioning gripper and means for operating said gripper to cause it to close on the upper and then to move in a heightwise direction away from the bottom of the last, a lining-pulling gripper associated with the upper-tensioning gripper, said gripper having a jaw with a smooth face for engaging the upper and a jaw with a roughened face for engaging the lining, and connections between said operating means and the lining-pulling gripper arranged to cause said lining-pulling gripper to be operated to tension the lining before said upper-tensioning gripper is closed on the upper materials.

3. Mechanism for tensioning upper materials, including an upper and a lining, over a last comprising an upper-tensioning gripper and means for operating said gripper to cause it to close on the upper materials and then to move in a heightwise direction away from the bottom of the last, a lining-pulling gripper slidably mounted on the upper-tensioning gripper, and connections including a latch between said operating means and the lining-pulling gripper arranged to cause said lining-pulling gripper to be operated to tension the lining before said upper-tensioning gripper is closed on the upper materials.

4. Mechanism for tensioning upper materials, including an upper and a lining, over a last comprising an upper-tensioning gripper and means for operating said gripper to cause it to close on the upper materials and then to move in a heightwise direction away from the bottom of the last, a lining-pulling gripper slidably mounted on the upper-tensioning gripper, said gripper having a jaw with a smooth face for engaging the upper and a jaw with a roughened face for engaging the lining, and connections including a latch between said operating means and the lining-pulling gripper arranged to cause said lining-pulling gripper to be operated to tension the lining before said upper-tensioning gripper is closed on the upper materials.

5. Mechanism for tensioning upper materials, including an upper and a lining, over a last comprising an upper-tensioning gripper and means for operating said gripper to cause it to close on the upper materials and then to move in a heightwise direction away from the bottom of the last, a lining-pulling gripper slidably mounted on the upper-tensioning gripper, connections including a latch between said operating means and the lining-pulling gripper arranged to cause said lining-pulling gripper to be operated to tension the lining,

and means associated with the upper-tensioning gripper for disengaging said latch to terminate the tensioning action of said lining-pulling grippers substantially at the time when the upper-pulling grippers are closed on the upper materials.

6. Mechanism for tensioning upper materials, including an upper and a lining, over a last comprising an upper-tensioning gripper, operating means connected to said gripper and movable first to effect closing of the gripper and, thereafter, movement thereof in a direction to tension the upper materials about the last, a lining-pulling gripper including a pair of pivotally connected jaws slidably mounted on the upper-tensioning gripper, means tending to close said jaws, means associated with said operating means for opening said jaws, and connections between said operating means and said jaws so constructed and arranged that upon movement of said operating means said pair of jaws are first closed and then moved bodily with said operating means to tension the lining prior to the operation of said upper-tensioning gripper.

7. Mechanism for tensioning upper materials, including an upper and a lining, over a last comprising an upper-tensioning gripper, operating means connected to the gripper and movable first to effect closing of said gripper and, thereafter, movement thereof in a direction to tension the upper materials about the last, a lining-pulling gripper including a pair of pivotally connected jaws slidably mounted on the upper-tensioning gripper, yieldable means tending to close said jaws, means associated with said operating means for opening said jaws, and connections between said operating means and said jaws so constructed and arranged that upon movement of said operating means said pair of jaws are first yieldingly closed and then moved bodily with said operating means to tension the lining prior to the operation of said upper-tensioning gripper.

8. Mechanism for tensioning upper materials, including an upper and a lining, over a last comprising an upper-tensioning gripper, operating means connected to the gripper and movable first to effect closing of said gripper and, thereafter, movement thereof in a direction to tension the upper materials about the last, a lining-pulling gripper including a pair of pivotally connected jaws slidably mounted on the upper-tensioning gripper, yieldable means tending to close said jaws, one of said jaws having a smooth face for engaging the upper and the other said jaw having a roughened face for engaging the lining, means associated with said operating means for opening said jaws, and connections between said operating means and said jaws so constructed and arranged that upon movement of said operating means said pair of jaws are first yieldingly closed and then moved bodily with said operating means to tension the lining prior to the operation of said upper-tensioning gripper.

9. Mechanism for tensioning upper materials, including an upper and a lining, over a last comprising an upper-tensioning gripper, operating means connected to the gripper and movable first to effect closing of said gripper and, thereafter, movement thereof in a direction to tension the upper materials over the last, a lining-pulling gripper including a pair of pivotally connected jaws slidably mounted on the upper-tensioning gripper, yieldable means tending to close said jaws, cam means associated with said operating means for opening said jaws, and connections between said operating means and said pair of jaws so constructed and arranged that upon movement of said operating means said pair of jaws are first yieldingly closed and then moved bodily with said operating means to tension the lining prior to the operation of said upper-tensioning gripper.

10. Mechanism for tensioning upper materials, including an upper and a lining, over a last comprising an upper-tensioning gripper, operating means connected to the gripper and movable first to effect closing of said gripper and, thereafter movement thereof in a direction to tension the upper materials over the last, a lining-pulling gripper including a pair of pivotally connected jaws slidably mounted on the upper-tensioning gripper, yieldable means tending to close said jaws, cam means associated with said operating means for opening said jaws, connections between said operating means and said pair of jaws so constructed and arranged that upon movement of said operating means said pair of jaws are first yieldingly closed and then moved bodily with said operating means, and means associated with said upper-tensioning gripper for opening said pair of jaws upon a predetermined movement of said operating means.

11. Mechanism for tensioning upper materials, including an upper and a lining, over a last comprising an upper-tensioning gripper, operating means connected to the gripper and movable first to effect closing of said gripper and, thereafter, movement thereof in a direction to tension the upper materials over the last, a lining-pulling gripper including a pair of pivotally connected jaws slidably mounted on the upper-tensioning gripper, yieldable means tending to close said jaws, cam means associated with said operating means for opening said jaws, a latch for connecting said jaws to said operating means upon movement thereof sufficient to permit closing of said jaws, and means associated with said upper-tensioning gripper for disengaging said latch to arrest movement of said jaws.

12. Mechanism for tensioning upper materials, including an upper and a lining, over a last comprising an upper-tensioning gripper, operating means connected to the gripper and movable first to effect closing of said gripper and, thereafter, movement thereof in a direction to tension the upper materials over the last, a lining-pulling gripper including a pair of pivotally connected jaws slidably mounted on the upper-tensioning gripper, yieldable means tending to close said jaws, cam means associated with said operating means for opening said jaws, a latch connected to said jaws and adapted to engage a shoulder on said operating means upon movement thereof sufficient to permit closing of said jaws by the yieldable means, means for disengaging said latch after a predetermined movement of said jaws by said operating means, and means associated with said upper-tensioning gripper for opening said jaws substantially as said upper-tensioning gripper is closed.

ROBERT H. LAWSON.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
460,394	Lake	Sept. 28, 1891
1,396,005	Ashton	Nov. 8, 1921