Sept. 16, 1947. N. H. KNOWLTON 2,427,356

LAST INSERTING MACHINE

Filed July 14, 1945 3 Sheets-Sheet 1

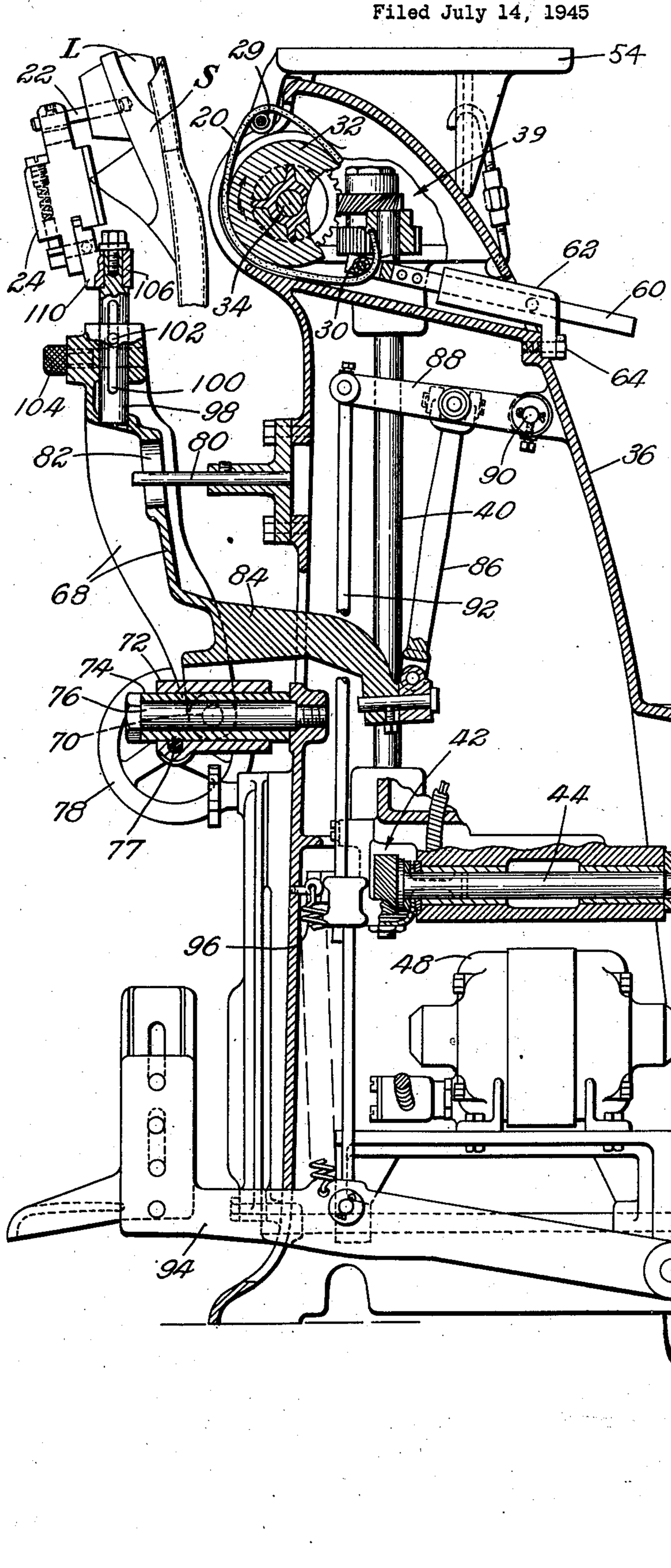

Fig. 1

Inventor
Norwood H. Knowlton
By his Attorney

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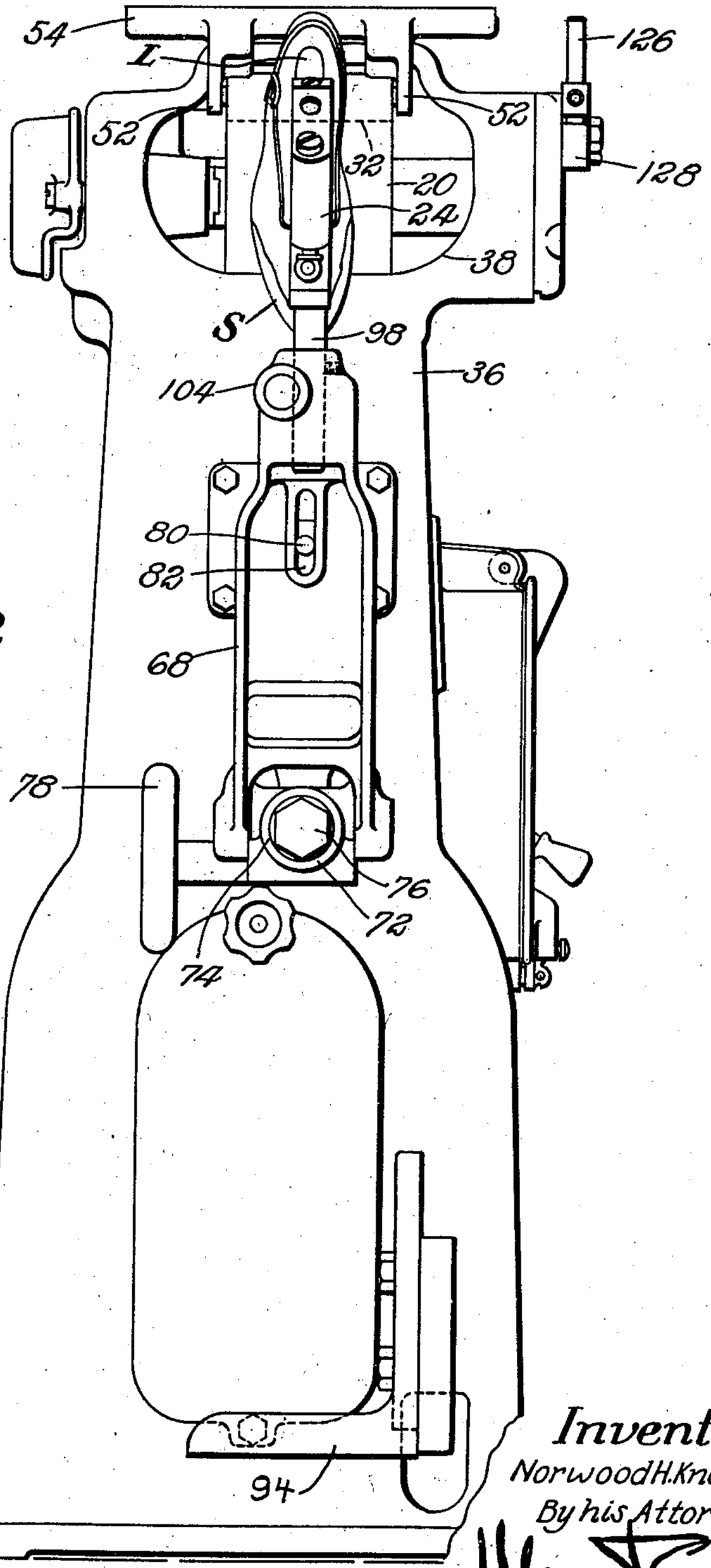

Fig. 2

Inventor
Norwood H. Knowlton
By his Attorney

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Fig. 3

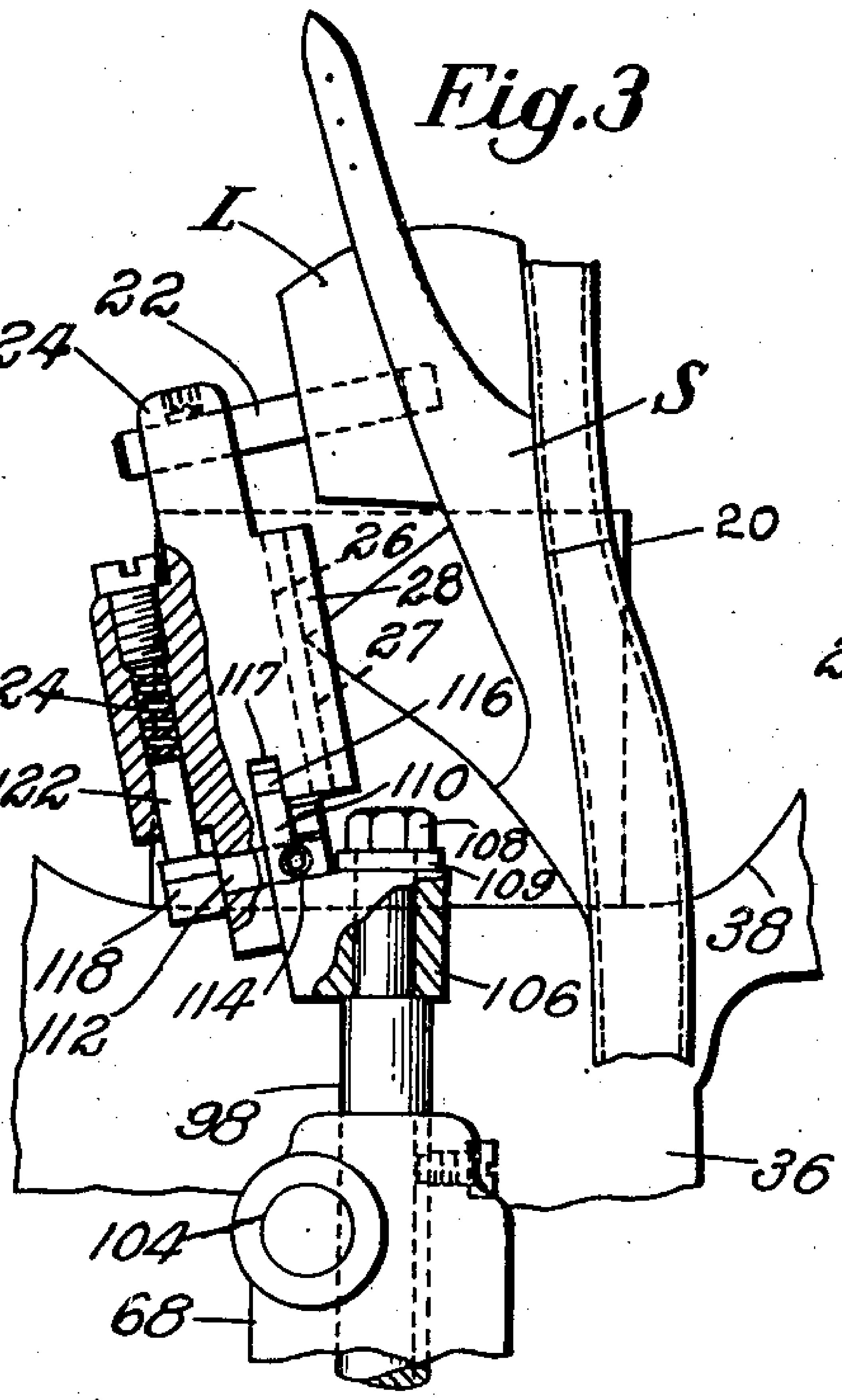


Fig. 4

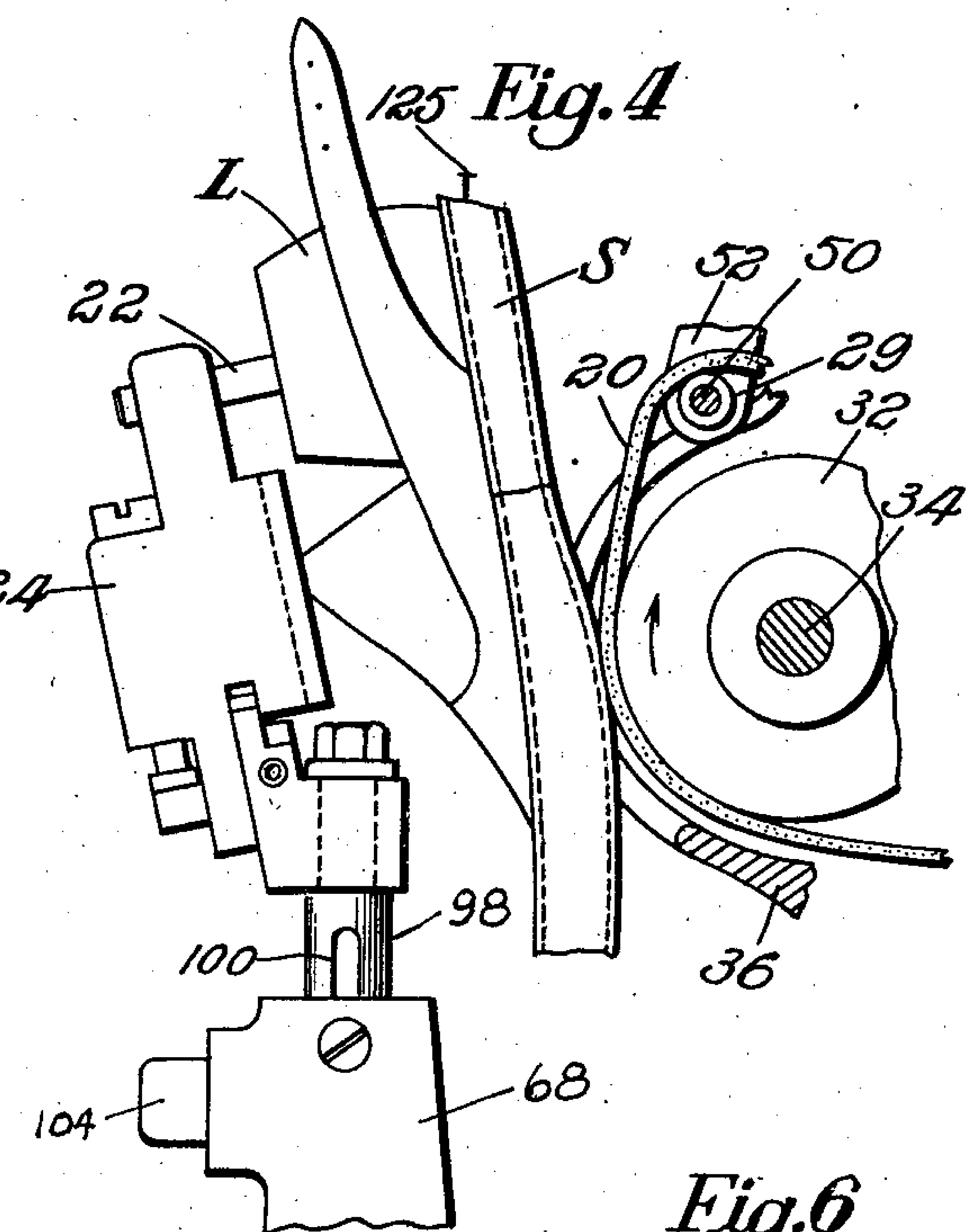


Fig. 5

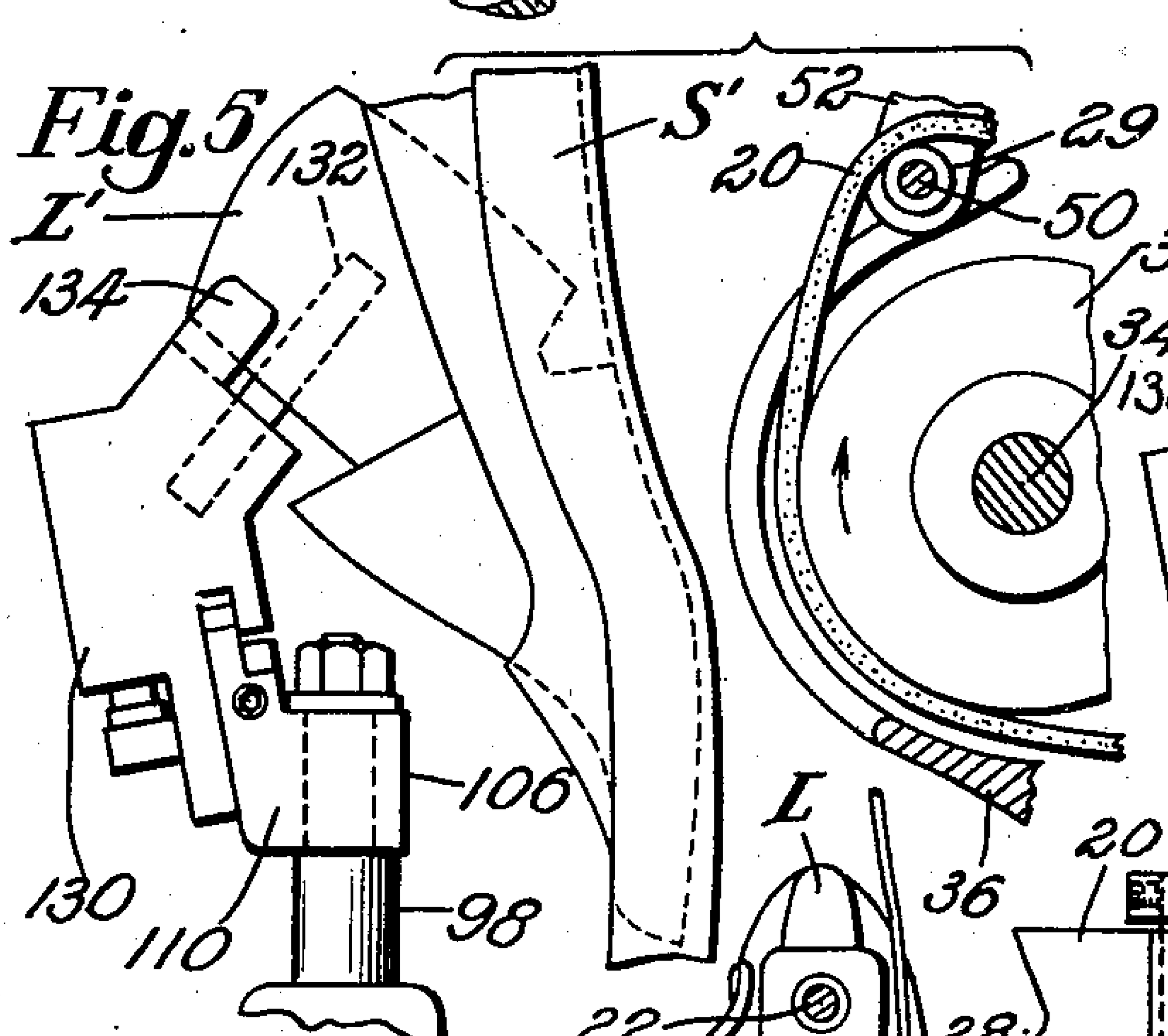


Fig. 6

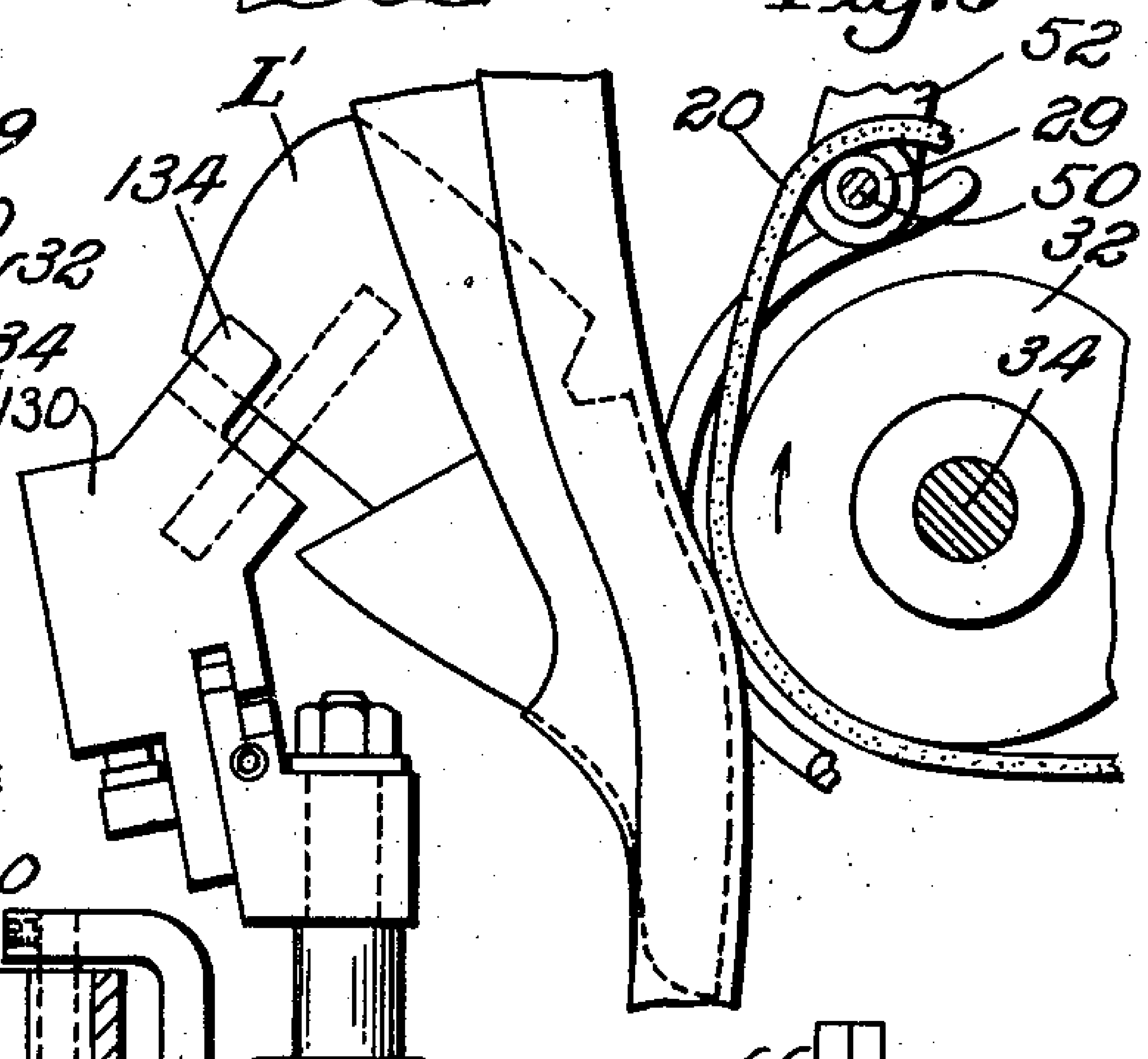


Fig. 7

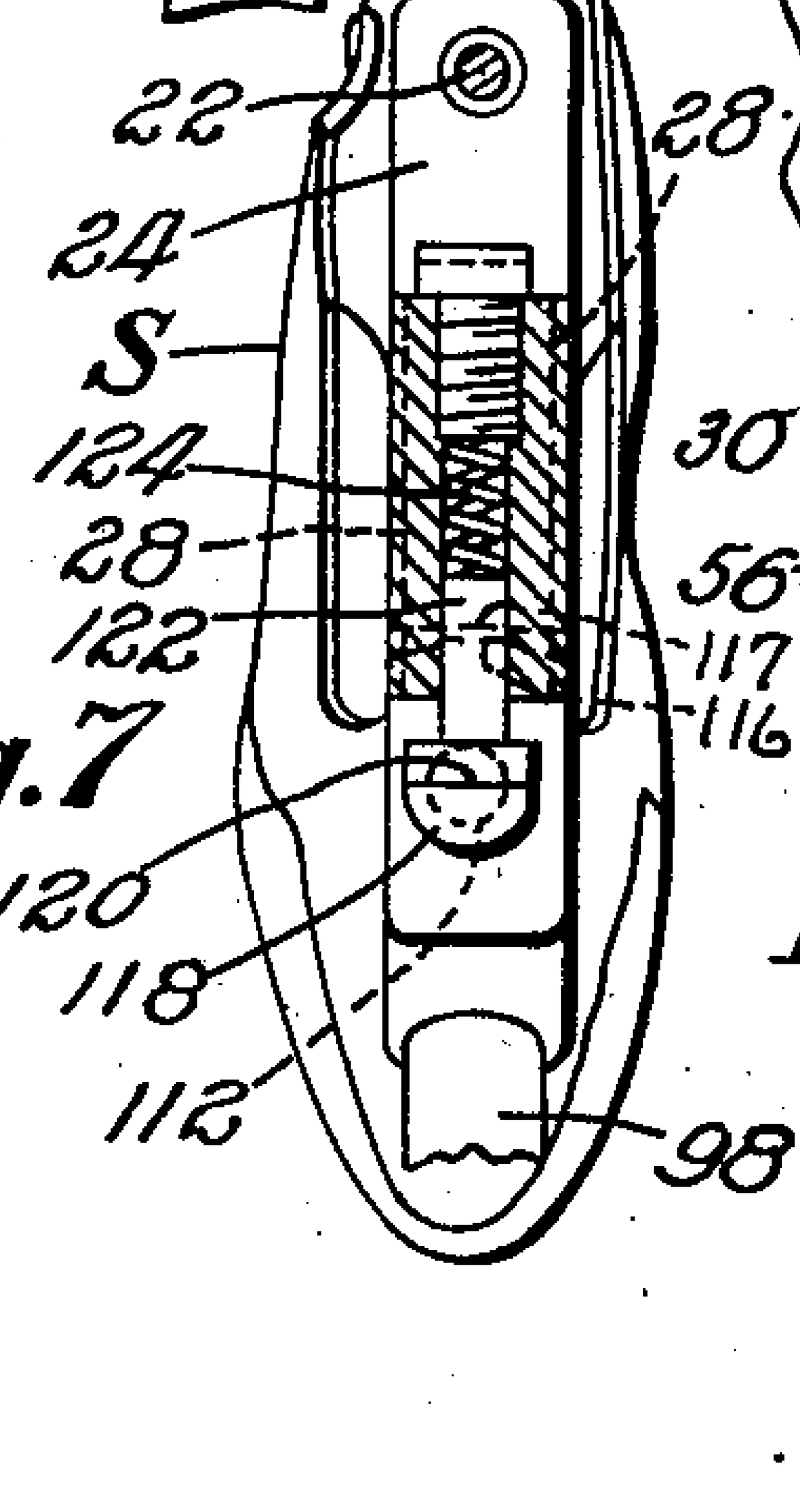
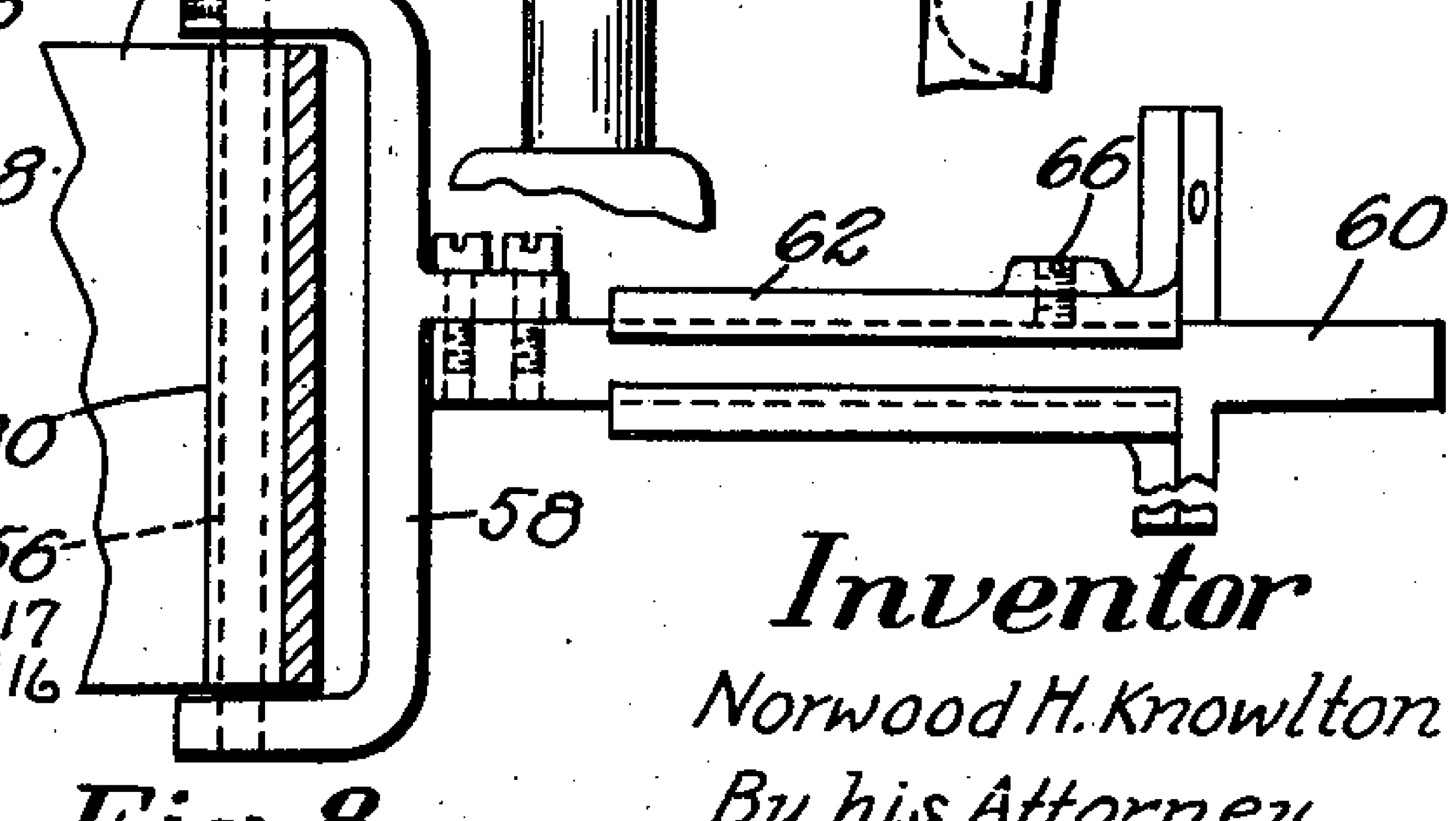


Fig. 8



Inventor

Norwood H. Knowlton

By his Attorney

[signature]

Patented Sept. 16, 1947 2,427,356

UNITED STATES PATENT OFFICE

2,427,356

LAST INSERTING MACHINE

Norwood H. Knowlton, Rockport, Mass., assignor to United Shoe Machinery Corporation, Flemington, N. J., a corporation of New Jersey

Application July 14, 1945, Serial No. 605,149

9 Claims. (Cl. 12—1)

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This invention relates to machines for effecting relative movement between shoes and lasts and is herein disclosed as embodied in a machine for forcing shoes on lasts. The machine shown herein, while intended primarily for use upon shoes of the platform type, will be found convenient for operation upon shoes of other types and also for general use in relasting operations. The illustrated machine is provided with a driven friction tool engageable with the bottom of a shoe, which tool is similar to that disclosed in United States Letters Patent No. 1,882,083, granted October 11, 1932, upon the application of George A. Miner. The illustrated machine further resembles the machine disclosed in the patent to Miner in that it is provided with a treadle-operated last support by which the operator can bring a shoe on a last carried by the last support into engagement with the friction tool.

Although the machine disclosed in the above-mentioned patent to Miner was designed for removing shoes from lasts, it is evident that it may be so used as to exert its shoe moving force in a direction to urge a shoe further upon the last. However, to insure the best results in forcing shoes upon lasts, it is desirable to make provision for a certain freedom of manipulation by the operator in presenting the shoe to the driven friction tool.

It is an object of the present invention, therefore, to provide a machine of the character described, so arranged as to permit such manipulation of the shoe by the operator. In accordance with a feature of the invention, the illustrative machine is provided with a last support which is pivotally mounted for tilting movement about an axis approximately parallel to the longitudinal axis of the shoe bottom. Such a mounting offers several advantages. It enables the operator to turn the last support away from the friction tool to a convenient position for unloading and reloading; it permits the last support to turn freely under pressure of the work against the friction tool and thereby equalize such pressure transversely across the shoe bottom; and it affords the operator an opportunity to tilt the last support forcibly by hand to one side or the other during the operation and thereby shift the center of pressure laterally of the shoe bottom whenever it is desirable to do so.

In accordance with another feature of the invention, the last support is mounted for swinging movement about an axis which is approximately perpendicular to the general plane of the shoe bottom and which passes through the forepart of

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the shoe bottom. The operator is thus enabled to vary the direction of the shoe with respect to the driven friction tool and thereby to vary the relative direction of the force exerted by the friction tool against the shoe bottom. The illustrative machine may further be provided with an abutment engageable with the forepart of a last through which pressure can be exerted to urge the shoe bottom against the friction tool. A pair of abutments may also be provided which are engageable with the opposite sides of the last to hold the last from turning about a last pin which engages the usual thimble hole of the last.

These and other features of the invention, including certain details of construction and combinations of parts, will be set forth in connection with an illustrative machine and will be pointed out in the appended claims.

Referring now to the accompanying drawings,

Fig. 1 is a side elevation, in section, of an illustrative machine embodying the invention;

Fig. 2 is a front elevation of the machine;

Fig. 3 is an enlarged front elevation of a portion of the machine, showing the last support in loading position;

Fig. 4 is a side elevation of the portion of the machine shown in Fig. 3, with the last support in operating position;

Fig. 5 is a side elevation of certain portions of the machine equipped with a modified form of last support, said last support being shown in loading position;

Fig. 6 is a view similar to Fig. 5, showing the last support in operating position;

Fig. 7 is a view of the shoe and last on the last support, looking in the direction of the last pin; and

Fig. 8 is a detail illustrating one of the supports for the friction belt.

The work engaging instrumentalities of the illustrative machine comprise a friction belt **20** of rubber or other suitable friction material and a last pin **22** secured in a block **24**. The last pin **22** is adapted to engage the usual thimble hole of a last L upon which is loosely mounted a shoe S, the toe of the shoe pointing down and the general plane of the shoe bottom being but slightly inclined to the vertical. The block **24** has a channel-shaped portion comprising a base **26** cushioned by a leather pad **27** to form an abutment which engages the top of the forepart of the last L to sustain a thrust against the shoe bottom, and a pair of side walls **28** which loosely engage opposite sides of the top of the forepart of the last to limit the turning movement of the

last about the last pin 22. The machine is so organized as to enable the operator to urge the block 24 toward the belt 20 until the shoe bottom is engaged by the belt, whereupon the belt, which is driven while in frictional engagement with the shoe bottom, will urge the shoe upwardly upon the last.

The belt 20 (Fig. 1) is loosely mounted upon a pair of rolls 29 and 30, and it surrounds a rubber covered roll 32 secured upon a shaft 34 which is journaled in suitable bearings formed in the upper portion of a hollow frame 36. An opening 38 (Fig. 2) is formed in the forward portion of the frame 36 to enable the shoe S to be brought into engagement with the belt 20. The shaft 34 is continuously driven in the direction indicated by the arrow in Fig. 1 through gearing 39, a vertical shaft 40, gearing 42, a horizontal shaft 44, gearing 46, and a motor 48. The roll 29 (see also Fig. 4) is mounted for free rotation upon a rod 50 which is secured between a pair of ears 52 depending from a shelf 54. The roll 30 (see also Fig. 8) is mounted for free rotation upon a rod 56 the ends of which are secured in a fork 58 carried by a rod 60 slidably mounted for purposes of adjustment in a guide bracket 62 secured by screws 64 (Fig. 1) to the frame 36. This arrangement for mounting the rod 56 enables it to be adjusted forwardly and rearwardly to provide as much or as little slack in the belt 20 as may be required. The rod 60 is clamped in its adjusted position by a setscrew 66. The belt 20, when not in use, rests lightly against the roll 32 and is driven idly by such contact, but when pressed against the roll 32 by the shoe bottom it will be driven forcibly by the roll 32 and will, in turn, exert force against the shoe bottom in the direction indicated by the arrow in Fig. 1. The belt 20, the roll 32 together with its driving mechanism, and the frame 36 are all substantially like the corresponding portions of the machine disclosed in Patent No. 1,882,083 above referred to.

The block 24 is mounted, through connecting members later to be described, upon the upper end of a lever 68 having a forked lower end portion which is pivotally mounted upon a pair of trunnion pins 70 (Fig. 1) extending diametrically in a horizontal direction from a sleeve 72. Within the sleeve 72 is a sleeve 74 which, in turn, is freely rotatable upon a horizontal pin 76 secured in and extending forwardly from the front wall of the frame 36. The sleeve 72 is slidable forwardly and rearwardly, for purposes of adjustment, upon the sleeve 74 and it may be secured in any desired position of such adjustment by a clamping bolt 77 operated through a hand wheel 78. The arm 68 is maintained in an upright position and is prevented from rotating about the axis of the pin 76 by a pin 80 secured in and extending forwardly from the front wall of the frame 36 and engaging a longitudinal slot 82 formed in the arm 68. The arm 68 has a portion 84 which extends rearwardly through an opening in the front wall of the frame 36 and which is pivotally connected to the lower end of a link 86 the upper end of which link is pivotally connected to a lever 88 fulcrumed upon a pin 90 secured to and within the frame 36. A treadle rod 92 pivotally connected at its upper end to the lever 88 and at its lower end to a treadle 94 enables the operator to swing the arm 68 rearwardly by depression of the treadle. A spring 96 normally holds the treadle in an upper stop position with the arm 68 swung outwardly away from

the roll 32. The arm 68, together with its supporting and operating instrumentalities, is similar to the corresponding member of Patent No. 1,882,083 above mentioned, except that in the machine illustrated herein freedom of angular movement of the arm 68 about the axis of the pin 76 is prevented by the stationary pin 80 engaging the slot 82.

Slidable for heightwise movement in a guideway formed in the upper portion of the arm 68 and extending upwardly beyond the end of the arm 68 is a rod 98 (see also Fig. 3) having a longitudinal slot 100 which is engaged by a turned-down end of a screw 102 to prevent the rod from turning. Rack teeth (not shown herein but similar to corresponding teeth disclosed in Patent No. 1,882,083) formed on the rod 98 are engaged by a pinion operated by a knurled head 104 to effect heightwise adjustment of the rod 98 in the arm 68. Rotatably mounted upon the upper reduced portion of the rod 98 is a sleeve 106. A screw 108 and a washer 109 retain the sleeve 106 against heightwise movement on the rod 98, and the shoulder formed by the reduction in diameter of the upper portion of the rod holds the sleeve against downward movement. Inclined upwardly from the sleeve 106 is an extension 110 in which a bearing pin 112 is secured by a setscrew 114. The axis of the pin 112 is substantially parallel to the axis of the last pin 22 (both being inclined upwardly from the horizontal at an angle of about twelve degrees) and it passes through the forepart of the shoe bottom at or close to the locality at which the shoe bottom engages the friction belt 20. The block 24 is pivotally mounted upon the pin 112 and is retained thereon by a flange 116 which enters a groove (the bottom of which is numbered 117) formed in the block. The upper surface of the flange 116 may be arcuate about the axis of the pin 112 to enable its corners to clear the bottom 117 of the groove. The flange 116 serves also to brace the block 24 and relieve stress which would otherwise have to be carried by the pin 112. The outer end of the pin 112 has a head 118 upon which is formed a flat surface 120 (see also Fig. 7). Housed within a bore in the block 24 is a plunger 122 pressed downwardly by a spring 124, a lower end of this plunger engaging the flat surface 120 to hold the block in a neutral position about the axis of the pin 112.

It will be observed that the axis of the sleeve 106 is disposed at a considerable angle to that of the last pin 22 and approximately parallel to the longitudinal axis of the shoe bottom. The last pin is so directed as to support the last for presentation of the shoe bottom to the roll 32, and the axis of the sleeve 106 is so directed as to permit the shoe to turn laterally to equalize the pressure of the roll on either side of the longitudinal center line of the shoe bottom and also to permit the operator to turn the block 24 and the last pin 22 to an out-of-the-way position wherein a last may be applied to and removed from the last pin without interference from the roll 32.

The machine is further provided with a stationary upright last pin 126 (see Fig. 2) carried by a bracket 128 secured upon the right hand side of the upper portion of the machine frame.

In the performance of the operation, the last L is placed upon the stationary pin 126 and the shoe S is loosely mounted on the last by hand. The operator then transfers the last L to the pin 22, first swinging the block 24 about the axis

of the sleeve 106 until the last pin extends laterally of the machine, as shown in Fig. 3. Some operators find it more convenient to turn the block 24 even further, until it extends forwardly of the machine. Then, having placed the last L on the pin 22, the operator turns the block 24 back into the position shown in Fig. 1 with the shoe bottom facing the belt 20, and depresses the treadle 94, whereupon the bottom of the shoe is brought into engagement with the belt and the rotation of the roll 32 is transmitted frictionally through the belt against the shoe bottom to force the shoe further upon the last.

As the bottom of the shoe presses against the belt 20, the block 24 may tilt slightly to one side or the other about the axis of the sleeve 106 automatically to balance the pressure and insure its even distribution on opposite sides of the longitudinal center line of the shoe. The operator may sometimes be able to facilitate the movement of the shoe upon the last by attempting to tilt the block 24 forcibly by hand, thereby shifting the center of pressure laterally of the shoe bottom. In most cases, however, he can facilitate the movement of the shoe to greater advantage by swinging the block 24 about the pin 112 to vary the direction of the longitudinal axis of the shoe and thereby to vary the relative direction of the force applied by the belt 20. Such swinging of the block 24 will not appreciably change the locality of engagement between the shoe bottom and the friction belt 20 because the axis of the pin 112 passes through or close to said locality. Good results are often obtained by swinging the block 24 about the pin 112 first in one direction and then in the other to cause the applied force to act successively along the lines of the opposite margins of the shoe bottom. The full force of the belt 20 is thus applied in the direction of one margin of the shoe to force that portion of the shoe upon the last, and then it is applied in the direction of the opposite margin to force the opposite margin upon the last. Such successive applications of pressure in the appropriate directions appear more effective than a single application directed along the longitudinal center line of the shoe. Since the axis of the pin 112 passes through, or close to, the area of contact between the shoe bottom and the belt 20, swinging the shoe support about this axis will not unduly shift the contacting area of the shoe bottom with respect to the belt. As soon as the shoe has been forced far enough upon the last, the operator secures it in position by a tack 125 which he drives through material of the shoe into the heel end of the last.

Certain types of shoe can best be operated upon with the last in broken or collapsed condition, as shown in Figs. 5 and 6. To accommodate such shoes, the machine is provided with a block 130 in place of the block 24, the arrangements for mounting the block 130 upon the extension 110 being in all respects similar to the corresponding arrangements already described for the block 24. Secured in the block 130 is a last pin 132 extending upwardly at an inclination greater than that of the last pin 22 in order to hold a collapsed or broken two-part last L' with a shoe S' loosely mounted thereon in proper relation to the roll 32. The last L' is held against turning about the last pin 132 by a pair of ears 134 extending from the block 130 and engageable with the upper portion of the cone of the last rearwardly of the last pin. In operating the machine with the block 130, it is unnecessary to swing the block about the pin 98 to place the last L' upon the last pin 132. The last may be placed upon the last pin in the position shown in Fig. 5, whereupon depression of the treadle will bring the shoe into operative engagement with the friction belt 20, as shown in Fig. 6. When using the machine fitted with the block 130, the thrust of the shoe against the friction belt is transmitted entirely through the last pin 132 and not through an abutment which engages the forepart of the last, as in the case of the block 24.

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

1. A machine for forcing shoes on lasts comprising a pin for supporting a last, a driven friction tool engageable with the bottom of a shoe loosely mounted on the last, a block in which said last pin is secured, an arm pivotally mounted for swinging movement toward and from said friction tool, a pivotal connection by which said block is mounted on the free end of said arm for rotary movement about an axis disposed at a considerable angle to that of the last pin and approximately parallel to the longitudinal axis of the shoe bottom, and treadle connections for swinging said arm to move the block toward the friction tool to bring the bottom of the shoe on the last into engagement with the friction tool.

2. A machine for effecting relative movement between shoes and lasts comprising a support for a last, a driven friction tool engageable with the bottom of a shoe on the last, a carrier upon which said last support is pivotally mounted for swinging movement about an axis which is approximately perpendicular to the general plane of the shoe bottom, and means for effecting relative movement between the carrier and the friction tool to bring about operative engagement between the shoe bottom and the tool.

3. A machine for effecting relative movement between shoes and lasts comprising a support for a last, a driven friction tool engageable with the bottom of a shoe on the last, a carrier upon which said last support is pivotally mounted for swinging movement about an axis which is approximately perpendicular to the general plane of the shoe bottom, resilient means for yieldably maintaining said last support in a predetermined position about said axis, and means for effecting relative movement between the carrier and the friction tool to bring about operative engagement between the shoe bottom and the tool.

4. A machine for forcing shoes on lasts comprising a pin for supporting a last, a driven friction tool engageable with the bottom of a shoe loosely mounted on the last, a block in which said last pin is secured, an arm pivotally mounted for swinging movement toward and from said friction tool, means for securing said block on said arm with provision for relative pivotal movement of the block about an axis which is approximately perpendicular to the general plane of the shoe bottom and which passes through the forepart of the shoe bottom, and treadle connections for swinging said arm to move the block toward the friction tool to bring the bottom of the shoe on the last into engagement with the friction tool.

5. A machine for forcing shoes on lasts comprising a pin for supporting a last, a driven friction tool engageable with the bottom of a shoe loosely mounted on the last, a block in which said last pin is secured, a second block, a pivotal

connection by which the first-mentioned block is mounted on the second-mentioned block for turning movement about an axis approximately parallel to the longitudinal axis of the shoe bottom, an arm pivotally mounted for swinging movement toward and from said friction tool, a pivotal connection by which the second-mentioned block is mounted on said arm for swinging movement about an axis which is approximately perpendicular to the general plane of the shoe bottom and which passes through the forepart of the shoe bottom, and treadle connections for swinging said arm to move the last toward the friction tool to bring the bottom of the shoe on the last into engagement with the friction tool.

6. A machine for effecting relative movement between shoes and lasts comprising a driven friction tool engageable with the bottom of a shoe on a last to move the shoe relatively to the last, a last support including an abutment engageable with the forepart of the last to sustain a thrust against the shoe bottom, and means for effecting a relative movement of approach between the abutment and the friction tool to cause an operating pressure to be developed between the shoe bottom and the friction tool.

7. A machine for forcing shoes on lasts comprising a last pin engageable with the thimble hole of a last, a driven friction tool engageable with the bottom of a shoe loosely mounted on the last to force the shoe further upon the last, an abutment engageable with the forepart of the last to sustain a thrust against the shoe bottom, a common support for said last pin and said abutment, and means for moving said common support toward the friction tool to cause the shoe bottom to develop an operating pressure against the friction tool.

8. A machine for forcing shoes on lasts comprising a last pin engageable with the thimble hole of a two-part last, a friction tool engageable with the bottom of a shoe loosely mounted on the last to force the shoe further upon the last, a channel-shaped support having a bottom

wall engageable with the top of the forepart of the last and having side walls engageable with the opposite sides of the last to hold the last against turning about the last pin, and means for moving said channel-shaped support toward the friction tool to cause said bottom wall to press against the forepart of the last and thereby cause the shoe bottom to develop an operating pressure against the friction tool.

9. A machine for forcing shoes on lasts comprising a last pin engageable with the thimble hole of a two-part last, a block in which said last pin is mounted, said block having a channel-shaped portion forming a bottom wall engageable with the top of the forepart of the last and having side walls engageable with the opposite sides of the last to hold the last against turning about the last pin, a driven friction tool engageable with the bottom of a shoe loosely mounted on the last to force the shoe further upon the last, a supporting arm for said block pivotally mounted for swinging movement, and treadle connections for swinging said arm to move the block toward the friction tool and thereby to cause the bottom wall of said channel-shaped portion to press against the forepart of the last to develop an operating pressure between the shoe bottom and the friction tool.

NORWOOD H. KNOWLTON.

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