Dec. 20, 1938. A. A. LAWSON 2,140,532

TRIMMING MACHINE

Filed June 14, 1937 3 Sheets-Sheet 1

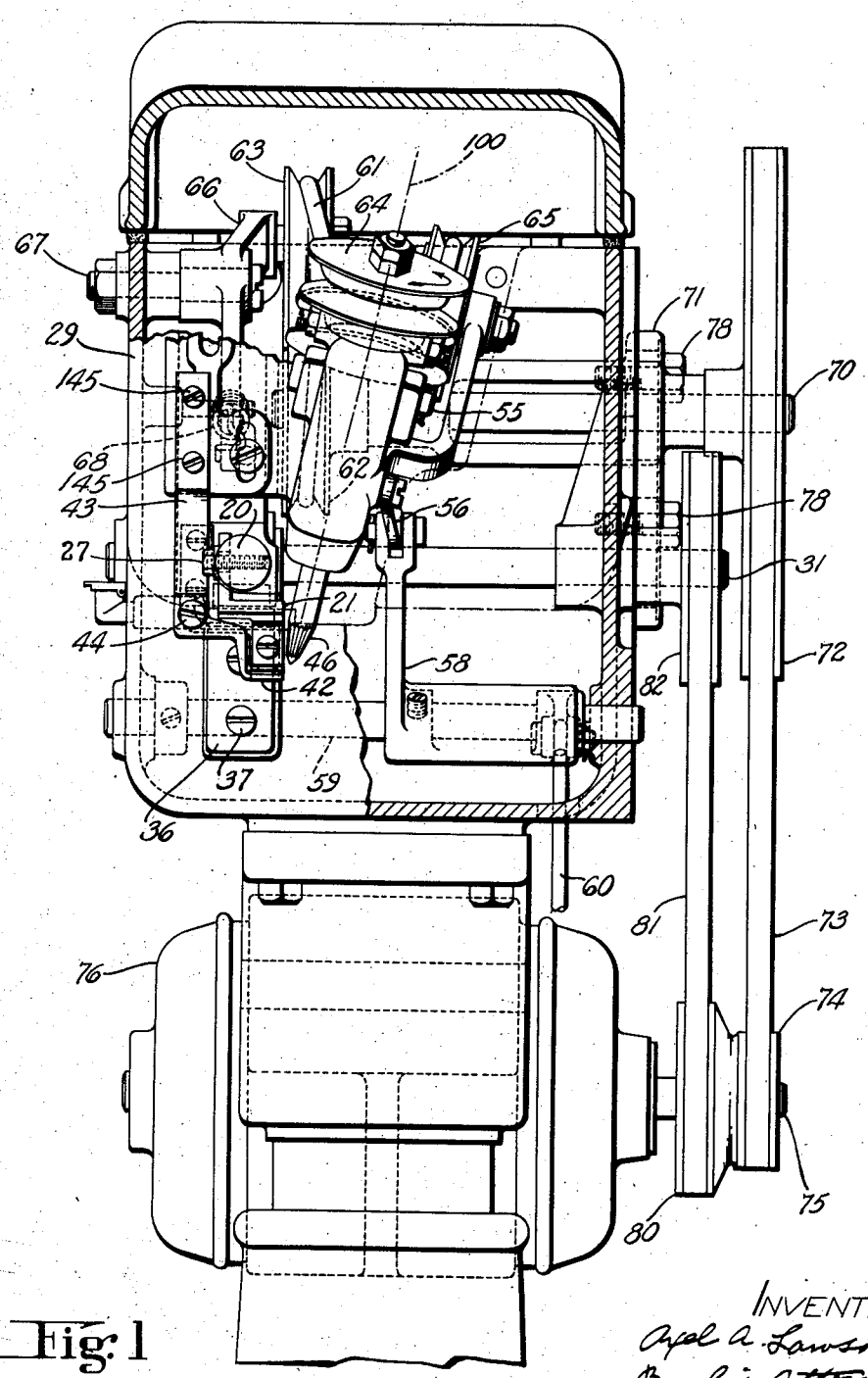


Fig. 1

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TRIMMING MACHINE

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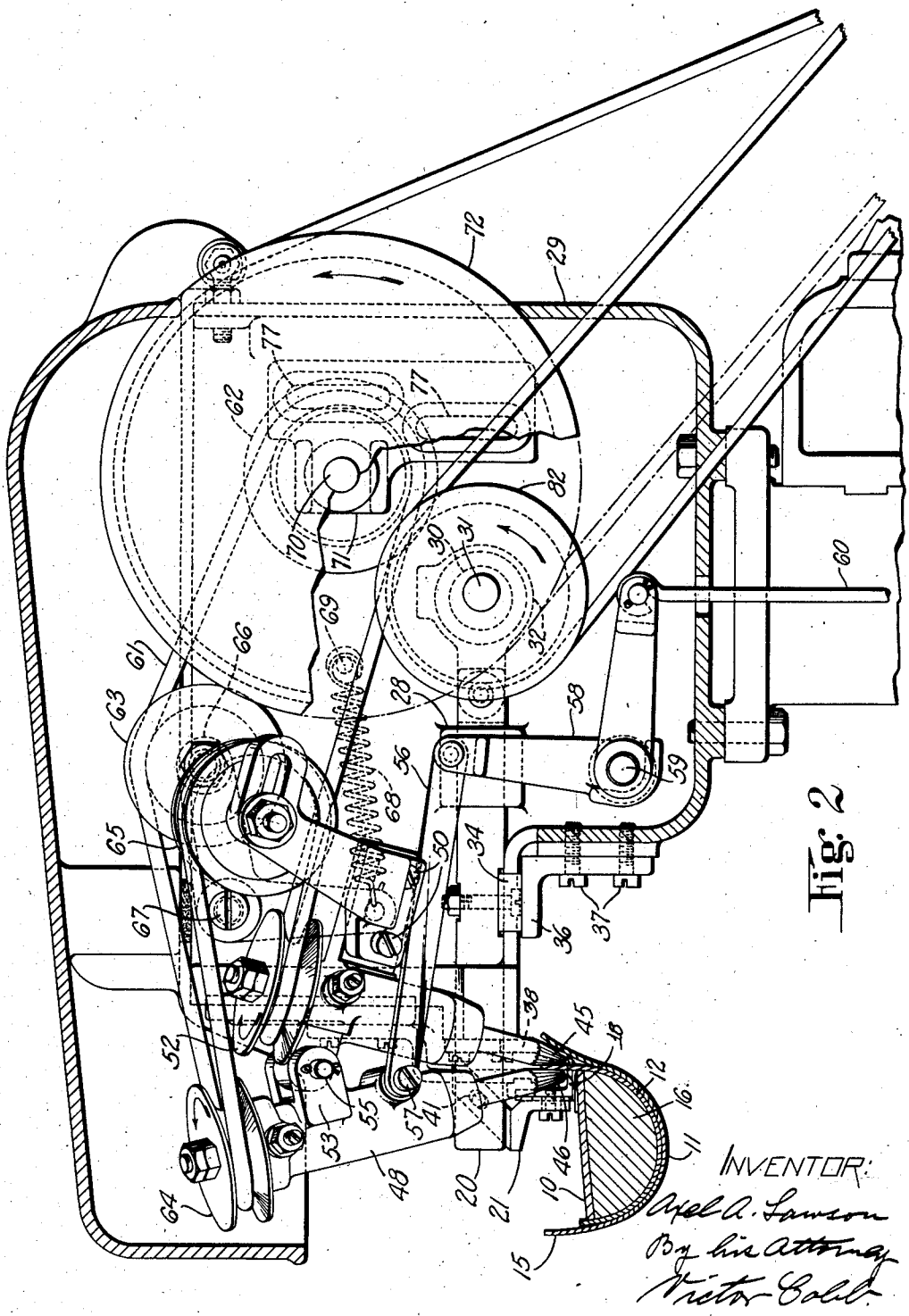


Fig. 2

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TRIMMING MACHINE

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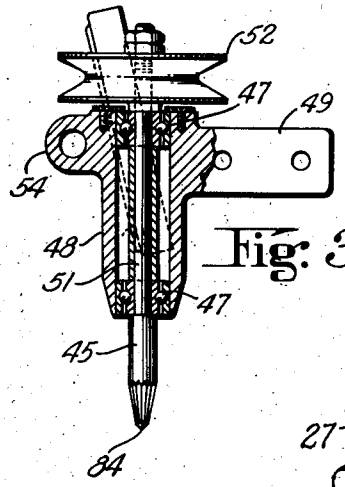


Fig. 3

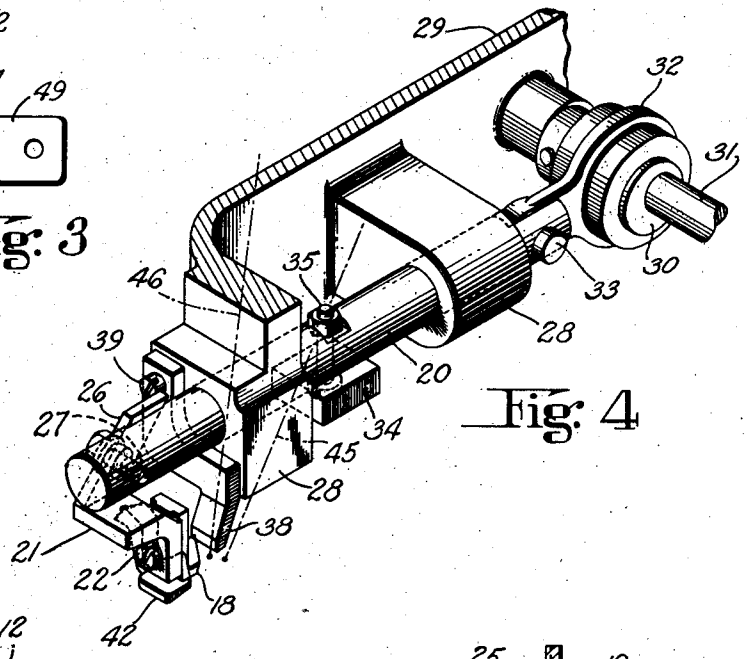


Fig. 4

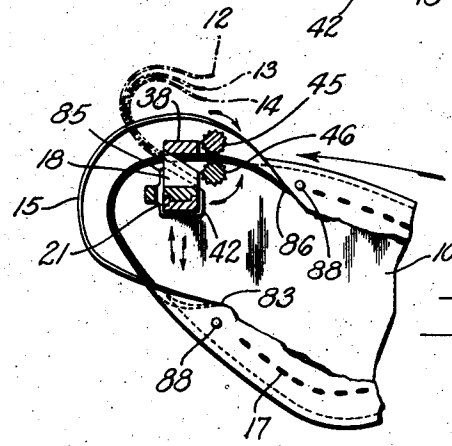


Fig. 5

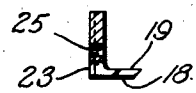


Fig. 6

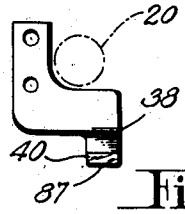


Fig. 8

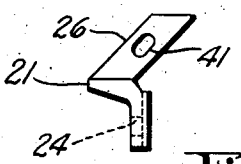


Fig. 7

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Patented Dec. 20, 1938

2,140,532

UNITED STATES PATENT OFFICE

2,140,532

TRIMMING MACHINE

Axel A. Lawson, Beverly, Mass., assignor to United Shoe Machinery Corporation, Paterson, N. J., a corporation of New Jersey

Application June 14, 1937, Serial No. 148,079

13 Claims. (Cl. 12—83.5)

This invention relates to shoe-trimming machines and is illustrated as embodying improvements designed to facilitate the operation known as toe-lining trimming.

This operation is now common in the manufacture of shoes of the type in which the toe-lasting is done with cement instead of tacks, and in which the outsoles are to be attached with cement. To obtain satisfactory toe-lasting and a strong bond of adhesion between the toe of an insole and the overlasted margin of the outer layer of the upper, the operation above mentioned consists in severing a strip from the corresponding margin of the inner layer and one or more intermediate layers of materials that would, if not so trimmed, lie between the insole and the overlasted margin of the outer layer. This trimming operation is now being performed in many shoe-factories by bed-lasting operators with a knife held in the hand, and at a considerable sacrifice of economy, since it takes the time of bed-lasting operators and retards the production of bed-lasting machines. This procedure and its attendant conditions are more fully set forth in a co-pending application Serial No. 48,535, filed November 6, 1935, in the name of Claud D. Merritt, which application sets forth an improved method of procedure whereby the trimming operation above mentioned and the cement-applying operation for preparing the shoes for toe-lasting may both be performed before the shoes are delivered to the bed-lasting operators.

A trimming machine of the type herein disclosed may be used to perform the trimming step of the aforesaid improved method, since it provides for severing the aforesaid strip of all the layers except the outer layer more rapidly and more evenly than it can be done by hand, and without requiring a bed-lasting machine or the time of a bed-lasting operator. Moreover, one trimming machine is sufficient to keep pace with a battery of four or five bed-lasting machines. When the partially fabricated shoes reach that stage that calls for the trimming operation above mentioned, they are commonly side-lasted with staples, or otherwise, up to points slightly behind the tip-line, but the toes are merely pulled over. The trimming operator must first pull out the temporary toe-tack of each shoe to release the unlasted upper materials at the toe. Although these materials then loosely envelop the toe of the last, the lasted condition near the tip-line presents serious difficulties in beginning and ending a trimming operation without cutting or otherwise damaging the margin of the outer layer, which should be left intact for toe-lasting.

To deal with these conditions the present invention provides a trimming machine in which a finger is arranged to project into the space between the inner and outer layers or margins of unlasted upper materials loosely enveloping the toe of the insole of a partially fabricated shoe, and in which a reciprocatory cutting blade that confronts the bottom of the insole is reciprocated to cut through the inner layer or margin toward the outer margin while the finger braces the inner margin close to the line of cutting. Preferably the finger is provided with a sharp edge with which the reciprocatory blade cooperates to sever the strip with successive shearing cuts. In any event, the outer margin runs behind the finger and the latter has sufficient thickness adjacent to the line of cutting to maintain that margin beyond the range of the reciprocatory blade.

The invention also provides power-driven means arranged to tension the inner layer by drawing its margin away from the plane of the insole at a point just ahead of the cutting locality, to the end that the course of the trimming cut will be even and uniformly close to the insole, however much or little the materials to be trimmed may have been wrinkled by being pulled over before being trimmed. As herein illustrated, the tensioning means comprises a pair of driven rolls arranged to grip the margin to be severed and to feed the work thereby, the diameters of the rolls being small and one of the rolls being arranged to project between the inner and outer margins of the upper materials. This one of the rolls is preferably provided with a pointed end which, being ahead of the aforesaid finger and projecting beyond the end of the latter, is the first to enter between the inner and outer margins. The pointed end facilitates the beginning of a trimming operation by wedging apart the inner and outer margins far enough to enable the finger to enter between them. The pointed roll thereafter deflects the outer margin so that it must pass behind the finger while the inner margin passes in front of the finger and into the path of the cutting blade. The tensioning effect of the rolls is obtained by arranging their axes in oblique relation instead of normal relation to the path of travel of the materials passing between them.

Referring to the drawings,

Fig. 1 is a front elevation, partly in section, of a trimming machine embodying the present invention;

Fig. 2 is an elevation partly in section, as viewed from the right-hand side, and includes a cross-section of a partially fabricated shoe in process of being trimmed;

Fig. 3 is an elevation of one of the feed-rolls and a sectional view of its bearing structure, the vertical arrangement of the roll, as drawn, instead of its actual inclined arrangement in the machine, being merely for the sake of convenience of execution;

Fig. 4 is a perspective view of the parts that constitute the cutting mechanism;

Fig. 5 is a top-plan view of the forepart of a partially fabricated shoe in process of being trimmed, and includes portions of the cutting members, a trimming guide and the feed-rolls in section;

Fig. 6 is a side elevation, partly in section, of the movable cutter;

Fig. 7 is a side elevation of the holder that carries the movable cutter; and

Fig. 8 is a front elevation of a stationary finger that cooperates with the movable cutter.

The type of shoe that requires the trimming operation under consideration comprises an insole 10 made without lip, feather, or rib and having a smooth uninterrupted bottom surface against which the overlasted margins of upper materials may be secured with metallic fasteners, cement or both. The upper materials comprise an outer layer 11, usually of leather, an inner layer or lining 12 of woven fabric or leather, and one or more intermediate layers at the toe-end. These intermediate layers usually include a relatively stiff toe-box 13 and a doubler 14, the doubler being arranged between the outer layer 11 and the toe-box, and the latter being arranged between the doubler and the inner layer 12. Although the layers 12, 13, and 14 are represented in Fig. 5 as separated one from another in the strip of waste in process of being severed, the separation is merely to give the layers individual identity for purposes of description. In practice, the toe-box 13 commonly comprises woven or felted fabric impregnated with a substance capable of being rendered tacky by a solvent, and the tacky condition is usually brought about prior to the pulling-over operation. Consequently, it is to be understood that the layers 12, 13, and 14 will, or may, be united by bonds of adhesion due to the tacky impregnant in the toe-box 13 and that these elements constitute, in effect, a three-ply lining from which a marginal strip is to be severed close to the insole without severing the corresponding margin 15 of the outer layer.

According to common practice, after the above-described elements have been pulled over on a last 16, the shoe is side-lasted with staples 17 (Fig. 5) which extend through the overlasted margins of the outer layer 11 and the inner layer 12 and are anchored in the insole. At this stage of fabrication, the toe of the shoe is left in a pulled-over condition with a single tack, not shown, securing the pulled-over margins of the several layers to the insole near the middle of the toe, the nearest side-lasting staples or temporary tacks 88 being a short distance behind the tip-line. The shoe is ready for the trimming operation hereinafter described, except that it is necessary to pull out the toe-tack to release all the layers at the toe-end. The margins of these layers then loosely envelop the toe of the insole and are more or less distorted in consequence of having been pulled over and secured by the toe-tack while the toe-box 13 is under the influence of a solvent.

The operation to be described consists in severing a strip from the margin of the lining (layers 12, 13, and 14) close to the insole, to the end that when the margin 15 of the outer layer is subsequently lasted, it will lie in contact with the bottom of the insole to which it will be secured with cement.

The mechanism for severing this strip as pictured in Fig. 5 is shown in its entirety in Figs. 2 and 4. The actual cutting is done by a blade 18 provided with an acute cutting edge 19 that extends in oblique relation to its lines of movement and in oblique relation to the direction in which the work is fed at the cutting locality. This cutting blade is carried by a reciprocatory bar or plunger 20 and is arranged in underslung relation thereto, the bar being far enough above the blade to overhang and clear the margins of the upper materials. The blade is directly attached to a holder 21 by a clamping screw 22, the shank of the blade being provided with a vertical rib 23 (Fig. 6) and the holder 21 being provided with a corresponding groove in which the rib is fitted to provide for vertical adjustment of the blade and to prevent its turning about the axis of the screw. A slot 24 is formed in the holder 21 to enable the blade and the screw to be adjusted up and down. The thread of the screw engages an internal thread 25 in the shank of the blade. The holder 21 is provided with a shank 26, and this shank is mortised into a groove in the bar 20 and is secured to the latter by a cap-screw 27.

The bar 20 is arranged to slide lengthwise in bearings 28, 28 formed in the main frame 29 of the machine and is reciprocated at high speed by an eccentric 30 carried by a driven shaft 31. An eccentric strap 32 is connected to the rear end of the bar 20 by a pivot pin 33. Since the bar 20 is cylindrical, it is preferably provided with a device to prevent its turning, ever so little, about its axis. For this purpose, a flat bearing block 34 is secured to the under side of the bar by a bolt 35 and is seated on a stationary bearing piece 36 affixed to the frame 29 by screws 37.

The strip to be severed is braced against the cutting thrust of the blade 18 by a finger 38 arranged to project downwardly into the space between the outer margin 15 and the inner margin of upper materials. This finger is affixed to the front face of the forward bearing 28 by screws 39. Its lower extremity is blunt and of the same width as the blade 18 and is arranged in register therewith, the cutting bed or work-engaging face 40 of the finger having a sharp edge 87 arranged to lie parallel with the path in which the work is fed and to extend across and touch the cutting edge 19 to have a shearing effect as the blade 18 moves in the cutting direction. The adjustable connection between the blade 18 and the holder 21 provides for establishing a shearing relation.

As the blade 18 grows shorter in consequence of being sharpened, it may be advanced toward the finger 38 by sliding the shank 26 of the blade-holder along its bearing in the bar 20 when the cap-screw 27 is loosened. As shown in Fig. 2, the mortise connection between the shank and the bar is inclined, and the slot 41 formed in the shank to provide a range of adjustment is correspondingly inclined. This inclined arrangement of the shank and the abutting walls of the groove formed in the bar relieves the cap-screw 27 of virtually all stress

except that required to clamp the shank against the bar. To counteract up and down components of adjusting movement of the blade-holder 21 the connecting screw 22 may be loosened whenever it is necessary to locate the blade at the correct level to insure a true shearing relation with the stationary finger 38. In practice the blade should be so adjusted that its point (see Fig. 4) will underlie the finger 38 when the bar 20 is at its forward limit of reciprocation, to the end that the cooperative edges of the blade and the finger will remain in contact with each other and maintain a V-shaped throat for the reception of the materials to be severed.

The machine is also provided with an underslung trimming guide, the work-engaging portion of which is a thin, flat plate 42 arranged to underlie the blade 18 and bear on the margin of the insole as shown in Figs. 2 and 5. The shank of this trimming guide is mortised into a holder 43 and is secured thereto by a screw 44. The holder 43 is affixed to the front face of the frame 29 by screws 145. The guide 42 maintains the insole at a level slightly below the blade 18, to the end that the trimmed materials will project slightly above the insole to be folded over on the latter when the toe of the shoe is subsequently lasted, and at the same time to enable the untrimmed margin 15 of the outer layer to lie in contact with the insole and thereby derive the full benefit of the bond of adhesion by which it is to be secured to the insole.

The margin comprising the layers to be severed may be gripped, fed, and tensioned with a component of updraft by a pair of feed-rolls 45, 46 arranged ahead of the finger 38 and the blade 18 only far enough to clear them. The work-engaging portions of the feed rolls are preferably fluted to render their feeding effect virtually positive. Because the feed-rolls are necessarily of small diameter to enable them to operate in narrow spaces, their axes are arranged in converging relation to provide clearance for mountings and driving means as pictured in Fig. 2 (see also the broken lines 45 and 46 in Fig. 4 which represent their axes). Moreover, to counteract this converging relation, the work-engaging portions of the rolls are tapered with the result that the portions that actually grip the layers of the work will lie virtually in parallel relation to each other as shown in Fig. 2. The axis of the roll 45 is fixed but that of the roll 46 is movable to provide for separation of the rolls when it is desired to introduce the work between them. Again, the work-engaging portion of the roll 45 is tangent to the plane of the cutting bed 40 (Fig. 8) of the finger 38. The details of the bearing structure in which the roll 45 is mounted are shown in Fig. 3. This structure comprises ball-bearings 47 enclosed in a sleeve 48. An ear 49 formed on the sleeve is affixed to the frame 29 by screws 50. The spindle 51 of the feed-roll 45 extends upwardly through the ball-bearings and is provided with a pulley 52 by which the roll may be driven.

The bearing structure for the feed-roll 46 is similar to that shown in Fig. 3 except that instead of being provided with an ear 49 it is provided with two confronting ears 53 arranged to straddle a boss 54 projecting from the sleeve of the feed-roll 45. The ears 53 and the boss 54 are connected by a hinge-pin 55 about which the feed-roll 46 and its bearing structure may swing sufficiently to provide for introducing the work between the feed-rolls. A link 56 for imparting movement of approach to the feed-roll 46 is connected to the corresponding bearing sleeve by a pivot-stud 57 and extends therefrom to a bell-crank lever 58. This lever is affixed to a fulcrum-pin 59 the ends of which are journaled in bearings in the frame 29. A rod 60 provides an operating connection of the lever 58 with a treadle (not shown) whereby the roll 46 may be moved toward the roll 45 with as much or as little force as the operator may wish to apply to grip the materials between them.

Continuous rotation is imparted to the feed-rolls by a belt 61 that runs over a driving pulley 62 (Fig. 2), an idler 63, a pulley 64 affixed to the feed-roll 46, an idler 65 and the pulley 52 of the feed-roll 45, and thence back to the driving pulley 62. The idler 63 is mounted on one arm of a bell-crank lever 66, the fulcrum-stud 67 of which is screwed into the frame 29. The other arm of this lever is stressed by a tension spring 68 in a direction such as to tension the belt 61 and thereby retract the feed-roll 46 normally from the feed-roll 45 but to yield in response to depression of the treadle by which the feed-roll 46 is shifted toward the feed-roll 45 to grip the interposed work. One end of the spring 68 is attached to an anchoring pin 69 affixed to the frame 29. The driving pulley 62 is affixed to a countershaft 70, journaled in a bearing member 71 and provided with a larger pulley 72 to which rotation is transmitted by a belt 73. This belt is driven by a pulley 74 carried by the shaft 75 of an electric motor 76. The bearing member 71 is provided with slots 77 through which clamping bolts 78 (Fig. 1) extend to secure the member to the frame 29, the slots 77 affording a range of adjustment for tightening the belt 73. The small diameter of the pulley 74, the large diameter of the pulley 72 and the small diameter of the pulley 62 afford a great reduction in the speed of rotation of the feed-rolls with respect to that of the motor shaft 75.

The shaft 75 is also provided with a driving pulley 80 from which rotation is transmitted by a belt 81 to a driven pulley 82 affixed to the shaft 31 that carries the eccentric of the cutting mechanism. This transmission operates the cutter 18 at high speed.

As shown in Fig. 2, the tapering formation of the feed-roll 45 and the small diameters of its work-engaging portion enable it to project readily into the space between the outer margin 15 and the corresponding inner margin of the upper materials while the inner margin lies between the feed-rolls. Thus, while the feed-roll 45 is effective to grip and feed the inner margin, it is also effective to deflect the outer margin 15 to the rear so that it must pass behind the stationary finger 38 while the inner margin in process of being trimmed passes in front of the finger. The thickness of the lower end of the finger and the range of reciprocation of the blade 18 are coordinated to insure that the point of the blade will be continually masked by the finger when the blade is correctly adjusted.

Referring to Fig. 1, the feed-rolls are driven to feed the work from right to left. Since the insole of a shoe must pass under the trimming guide 42, the work-engaging surface of which is virtually horizontal and parallel to the plane of the trimming cut, the feeding movement of the shoe will be virtually horizontal so long as the bottom of the insole is held in contact with this trimming guide. The axes of the feed-rolls lie in a plane indicated by a broken line 100, which, instead of being exactly normal to the direction of feeding movement, is oblique with respect thereto. Moreover, the pitch of this plane is

such as to develop a slight component of updraft of the margin that is gripped and being fed by the rolls, the result being that the layer or layers being trimmed are drawn against the last at a point slightly ahead of the cutting locality. Consequently, one effect of the feed-rolls is to take up slack in these layers to insure an even course of trimming and a virtually uniform projection of the trimmed margin above the level of the bottom of the insole.

Assuming that the operator is about to present a shoe to be trimmed by the described machine, the feed-roll 46 will stand initially away from the feed-roll 45 by reason of the tension of the belt 61 due to the applied force of the spring 63. The shoe will be presented not as shown in Fig. 5 but will be held first with its heel end at the left of the cutting blade 18 and with the starting point 83 in register with the lower end 84 of the feed-roll 45, which, as shown in Figs. 1 and 3, is pointed to facilitate its entrance between the outer margin 15 and the corresponding inner margin. At this stage the operator will tip the shoe to the rear to insert the point of the roll 45 between the inner and outer margins, and, having done so, he will depress the treadle to shift the feed-roll 46 toward the roll 45. The feed-rolls now grip the inner margin and bend it to an erect position while feeding it into the V-shaped throat formed by the cutting edge 19 and the lower edge of the surface 40 of the stationary finger 38.

Once the feeding operation takes effect, the roll 45 enters farther the space between the inner and outer margins, thus spreading them apart far enough to admit the finger 38, whereupon the trimming cut runs into the inner margin. The operator thereupon tips the shoe forward to level the toe portion of the insole. The margin of the insole is thus brought face to face with the trimming guide 42 and the trimming cut progresses around the toe end of the insole, the margin of which is maintained in contact with the trimming guide not only by the operator but also by the updraft of the feed-rolls on the margin gripped thereby. As the trimming progresses around the toe, the operator swings the heel end of the shoe toward him and thence to the right, the margin in process of being trimmed being guided meanwhile by the feed-rolls, the front face 40 of the finger 38 and the rounded corner 85 (Fig. 5) of the trimming guide 42. At the same time the outer margin 15 is deflected by the feed-roll 45 so that it must pass behind the finger 38. As the trimming cut approaches the terminal point 86 (Fig. 5), the operator will again tip the shoe toward the rear to enable the cut to run out at this point where both margins are overdrawn upon the insole and secured thereto.

In addition to bending the inner margin to an erect position, the feed-rolls smooth out wrinkles therein, including the two major wrinkles (dog-ears) usually formed at the toe incidentally to pulling over the inner and outer margins before the toe-tack is driven. Since the wrinkles are removed before the materials enter the V-shaped throat between the cutting edge 19 and the finger 38, the progress of the trimming is rendered smooth and even.

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

1. A shoe-trimming machine comprising a stationary finger formed and arranged to project into the space between the outer margin and the inner margin of unlasted upper materials loosely enveloping the toe of the insole of a partially fabricated shoe on a last, and power-driven cutting means including a reciprocatory cutting blade arranged to cut through said inner margin toward the outer margin, said finger being arranged to brace the inner margin close to the line of cutting and having sufficient thickness adjacent to said line to maintain the outer margin beyond the range of said blade.

2. A trimming machine as defined in claim 1, comprising also a slender, pointed member arranged ahead of said finger to effect initial separation of said inner and outer margins and thereby facilitate the insertion of said finger between the margins.

3. A trimming machine as defined in claim 1 in which said finger is provided with a sharp shearing edge arranged to cooperate with the cutting edge of said blade to sever the inner margin.

4. A trimming machine as defined in claim 1, comprising also power-driven means arranged to tension the inner margin with draft away from the plane of the insole ahead of, but close to, the cutting locality.

5. A shoe-trimming machine comprising power-driven cutting means and a stationary cutting bed arranged to sever an inner margin without severing an outer margin of unlasted upper materials loosely enveloping the toe of the insole of a partially fabricated shoe on a last, a pair of rolls arranged to grip said inner margin ahead of but close to the cutting locality, one of said rolls being formed and arranged to project between said margins, and power-driven means by which said rolls are rotated to feed the uncut stock of said inner margin to said cutting means.

6. A trimming machine as defined in claim 5, in which the axes of said rolls are oblique and so pitched with respect to the path of the work at the cutting locality as to tension said inner margin away from the plane of the insole.

7. A trimming machine as defined in claim 5 in which the axes of said rolls converge toward the work-engaging portions of the rolls and in which said work-engaging portions are tapered to counteract the converging relation of the axes.

8. A trimming machine as defined in claim 5 comprising manually operable means by which the work-engaging portions of said rolls may be given relative movement of approach to grip the inner margin.

9. A trimming machine as defined in claim 5 in which the work-engaging portions of said rolls are arranged to maintain the inner margin in a plane virtually normal to the cutting plane of said cutting means.

10. A trimming machine as defined in claim 5 in which said cutting means comprises a reciprocatory blade and a stationary finger, the blade being arranged to cut through the inner margin toward the outer margin, and said finger being arranged to project between the margins to brace the inner margin against the thrust of said blade.

11. A trimming machine as defined in claim 5 comprising also a trimming guide the work-engaging portion of which is a smooth plate formed and arranged to bear on the bottom of the insole abreast of the cutting locality and to engage the inner surface of the upper material lying against the perimeter of the insole.

12. A shoe-trimming machine comprising a virtually horizontal bar and power-driven mechanism for reciprocating it lengthwise, an under-

slung cutting blade carried by said bar and spaced therefrom far enough to enable the bar to overhang and clear the unlasted margins of layers of upper materials loosely enveloping and projecting above the insole of a partially fabricated shoe presented bottom-up for trimming, and a stationary finger arranged to project downwardly between the margin of the outer layer and that of an inner layer to brace the latter margin against the cutting thrust of said blade and to maintain the outer margin beyond the range of said blade.

13. A shoe-trimming machine comprising a stationary finger one surface of which constitutes a cutting bed and is provided with a sharp shearing edge, power-driven cutting means including a reciprocatory blade having a cutting edge in oblique relation to said shearing edge to form a V-shaped throat, and a pair of power-driven rolls arranged to grip the material to be trimmed and feed it into said throat, one of said rolls being behind but tangent to the plane of said cutting bed surface and so mounted as to be capable of projecting between the margin of an outer layer and the margin of an inner layer of unlasted upper materials loosely enveloping the toe of the insole of a partially fabricated shoe on a last.

AXEL A. LAWSON.