

Aug. 5, 1941.

J. S. KAMBORIAN

2,251,284

LASTING FOOTWEAR

Filed June 7, 1938

4 Sheets-Sheet 1

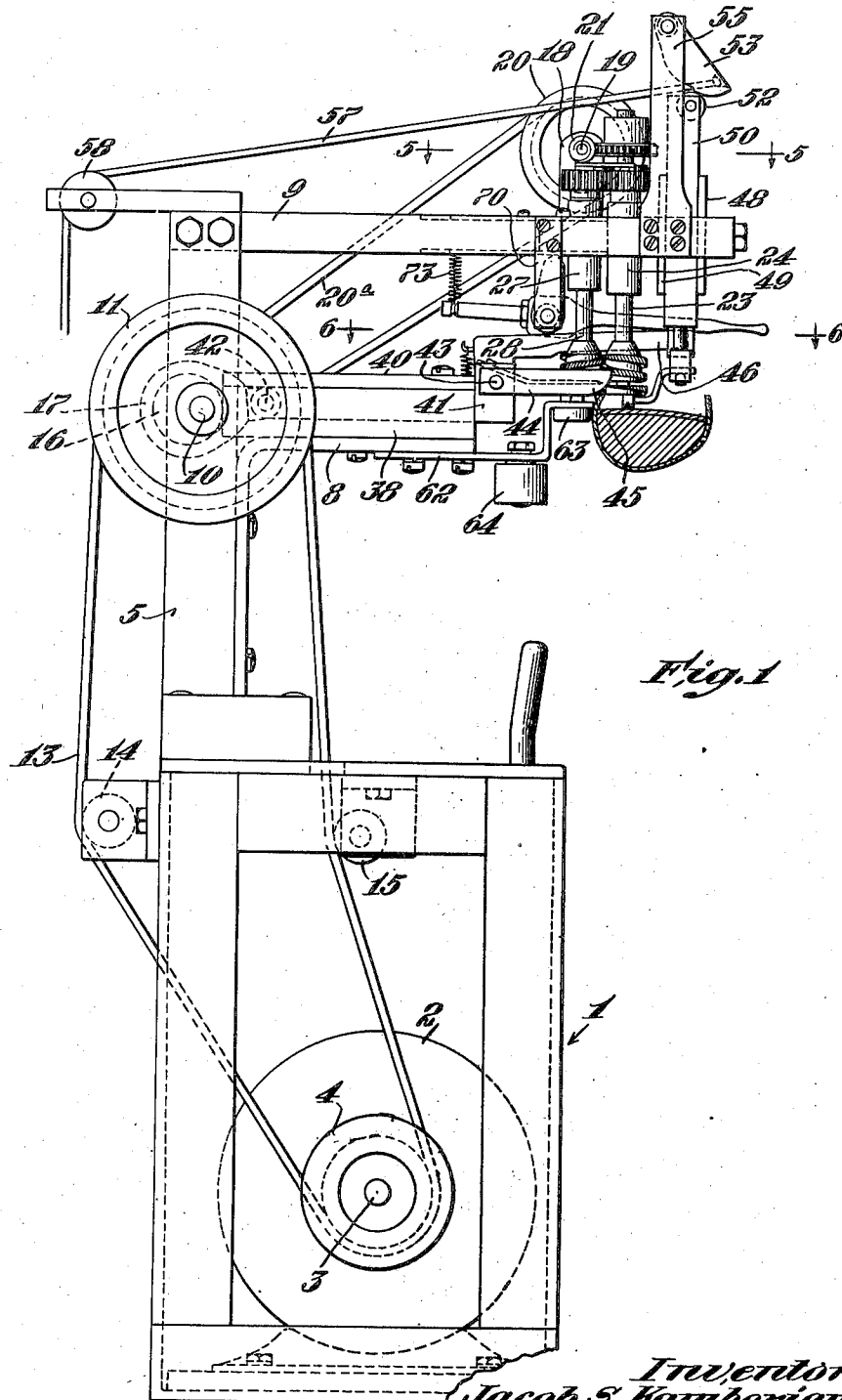


Fig. 1

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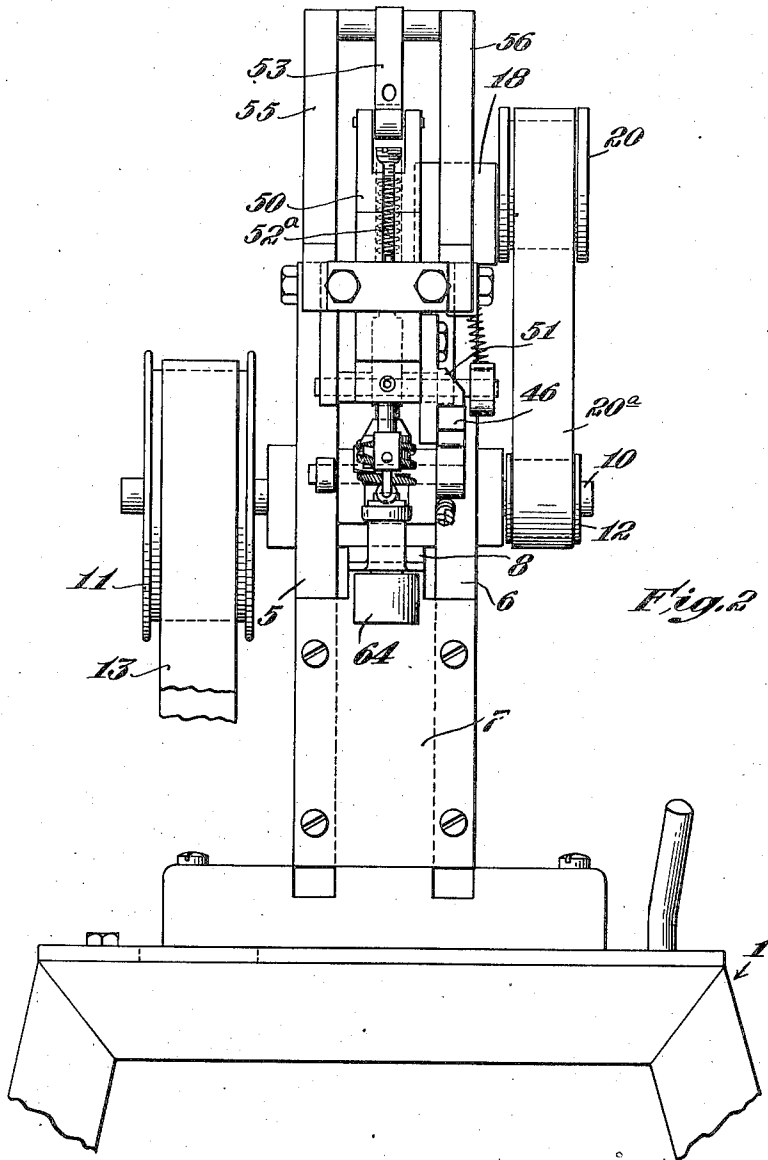
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4 Sheets—Sheet 2



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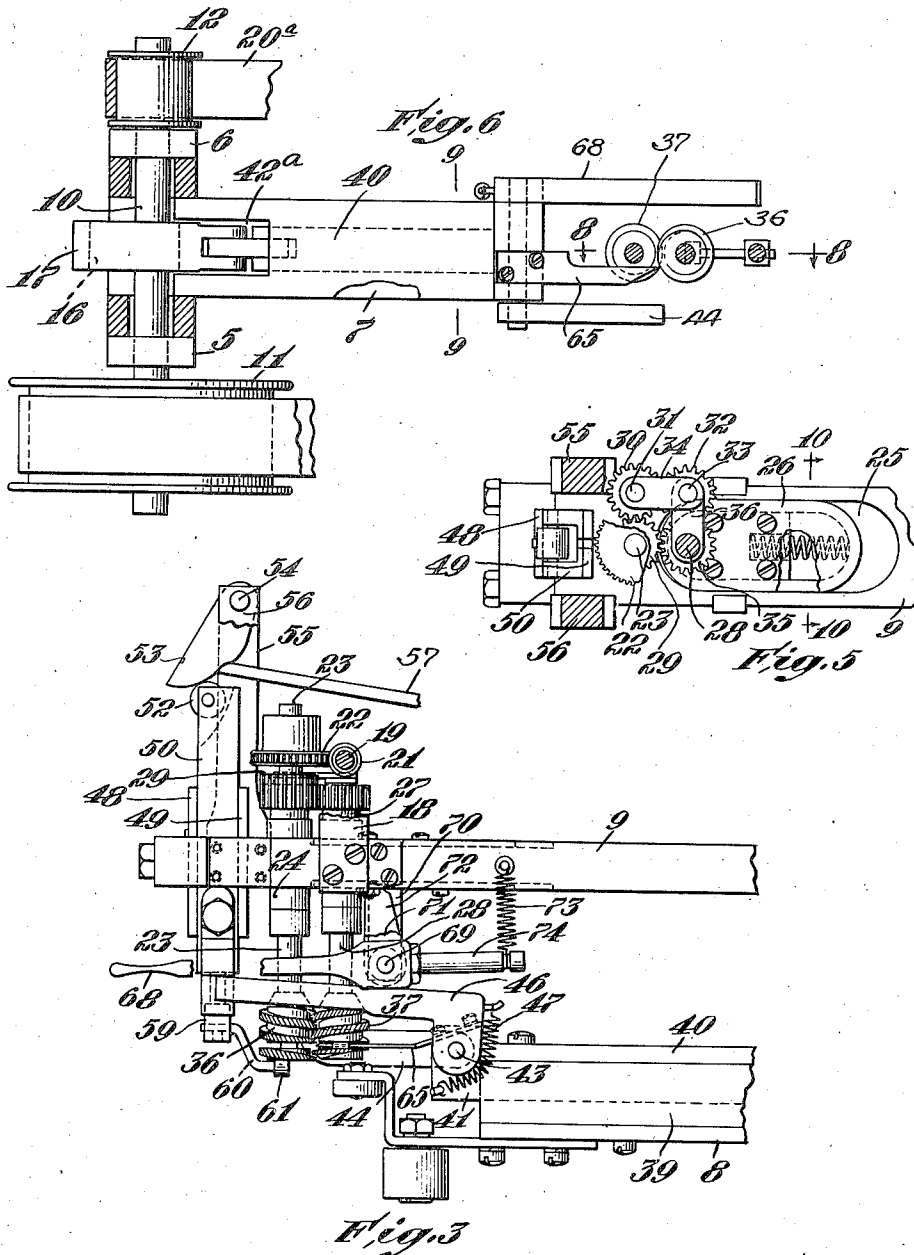
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LASTING FOOTWEAR

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4 Sheets-Sheet 3



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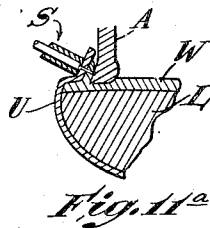
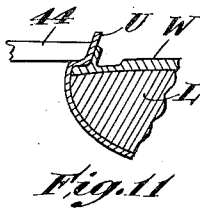
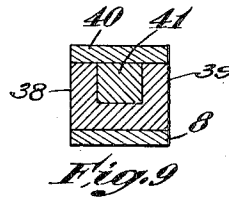
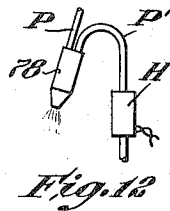
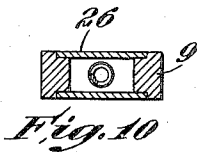
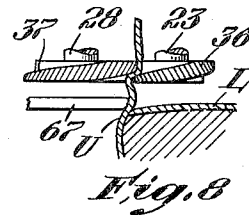
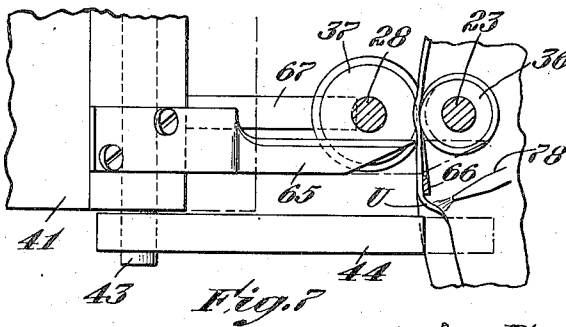
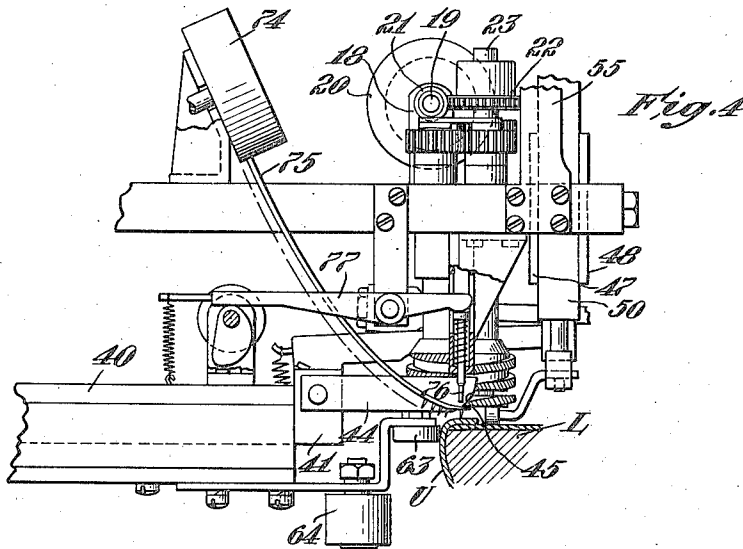
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LASTING FOOTWEAR

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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

2,251,284

LASTING FOOTWEAR

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Application June 7, 1938, Serial No. 212,236

31 Claims. (Cl. 12-7)

This invention pertains to the manufacture of footwear and relates more especially to apparatus for use in lasting shoes, being particularly useful in side and forepart lasting although useful, if desired, for lasting the entire shoe.

While this improved apparatus contemplates the use of fasteners such as tacks or staples for retaining the lasted-in marginal upper material in place, certain features of the invention are of especial value in the manufacture of cement lasted shoes in which it is highly desirable to lay the marginal portion of the upper smoothly in position against the bottom of the insole; to remove surplus material at the edge of the lasted-in margin; to anchor the lasted-in margin firmly to the insole; and to provide a level, smooth and uniform surface for the reception of the outer sole.

Among the objects of the invention are to provide an apparatus for stretching the upper snugly about the last and of lasting its margin smooth and level against the under surface of the insole; in which the marginal material of the forepart and sides is first drawn upwardly in a direction substantially perpendicular to the bottom of the insole and then, after the full lasting stress has been applied, is wiped in over the edge of the insole into smooth contact with the latter; in which the upper is progressively stretched from point to point along the edge of the insole with a concomitant wiping-in action also progressing from point to point along the edge of the insole; to provide for stressing the upper, trimming its edge, and wiping it in over the margin of the insole, all as component steps in a progressive lasting of the shoe from point to point along its margin; to provide for applying fastener means, for example adhesive, metal fasteners or the like as a step in the lasting operation; and to provide mechanism of simple, inexpensive and durable character for use in attaining the above objects and which may be successfully actuated by a relatively unskilled operator.

Other and further objects and advantages of the invention will be pointed out in the following more detailed description and by reference to the accompanying drawings in which—

Fig. 1 is a fragmentary elevation, to small scale, showing the apparatus as viewed from the left side;

Fig. 2 is a fragmentary front elevation of the apparatus shown in Fig. 1;

Fig. 3 is a fragmentary elevation illustrating part of the apparatus of Fig. 1 as viewed from the right side;

Fig. 4 is a fragmentary side elevation similar to Fig. 1, but showing the machine equipped with fastener inserting means;

Fig. 5 is a fragmentary horizontal section, with some parts omitted and others broken away, substantially on the line 5-5 of Fig. 1;

Fig. 6 is a fragmentary horizontal section, with certain parts omitted, substantially on line 6-6 of Fig. 1;

Fig. 7 is a fragmentary sectional view on substantially the same plane as Fig. 6, but to larger scale, illustrating a modification;

Fig. 8 is a fragmentary diagrammatic vertical section, substantially on the line 8-8 of Fig. 6, illustrating the mode of operation of the gripping means;

Fig. 9 is a fragmentary section on line 9-9 of Fig. 6;

Fig. 10 is a fragmentary section on line 10-10 of Fig. 5;

Figs. 11 and 11^a are diagrammatic vertical sections illustrating the possibility of applying the present method and apparatus to the manufacture of welt shoes; and

Fig. 12 is a diagrammatic view showing means for applying preheated adhesive.

Referring to the drawings, the numeral 1 designates generally a base or support within which, if desired, may be housed a motor 2 having a drive shaft 3 and a main drive pulley 4. However, it is to be understood that the power for driving the lasting devices may be derived from any other suitable source if preferred.

Vertical posts 5 and 6 (Fig. 2) extend upwardly from the rear part of the base. At their lower parts these posts are rigidly united by a plate 7 from whose upper edge (Fig. 1) projects a substantially horizontal, forwardly directed integral bracket or shelf 8.

Above and spaced from the bracket 8 is a second horizontal bracket or arm 9 rigidly united to the posts 5 and 6 near the upper ends of the latter, the rear end of the arm 9 being interposed between the posts and constituting a spacer for holding the latter in parallel relation.

Journalled in the posts 5 and 6, with its axis substantially in the horizontal plane of the arm 9, is a jack shaft 10 having a pulley 11 fixed to its left-hand end and a smaller pulley 12 fixed to its right-hand end. An endless belt 13, guided by idler pulleys 14 and 15, transmits power from the relatively small main drive pulley 4 to the larger jack shaft pulley 11. An eccentric 16 (Fig. 1) having an eccentric strap 17, is fixed to the jack shaft at a point intermediate the posts 5

and 6 (Fig. 6) and actuates certain of the last-mentioned devices as hereinafter more fully described.

A bearing bracket 18 (Figs. 1 and 2) projects upwardly from the arm 9 near the right-hand end of the latter and spaced from its front end, and in this bracket is journaled a shaft 19 having a pulley 20 fixed to its outer end. An endless belt 20^a transmits power from the jack shaft pulley 12 to the pulley 20. At its inner end the shaft 19 carries a worm 21 (Figs. 1 and 4) which meshes with a worm wheel 22 fixed to a vertical shaft 23 journaled in a vertically elongate bearing sleeve 24 (Fig. 3) fixed to the forward part of the arm 9.

Near its forward end the arm 9 is provided with an elongate opening or slot 25 (Fig. 5) which receives and guides a slide 26. Near its forward end the slide is provided with a vertically elongate bearing sleeve 27 (Fig. 1) in which is journaled a vertical shaft 28 (Fig. 3) which is thus bodily movable toward and from the shaft 23 (with which it is always parallel) by movement of the slide 26 in its slot 25.

A pinion 29 (Fig. 5) is secured to shaft 23 below the worm wheel 22. This pinion normally meshes with a similar pinion 35 on the shaft 28, thereby to drive the shaft 28 in timed relation to the shaft 23. In a preferred construction (illustrated in Fig. 5) the pinion 29 always meshes with a pinion 30 turning on a stud 31 having its axis parallel to shaft 23. The pinion 30, in turn, meshes with a pinion 32 rotating on a stud 33 fixed to a link 34 pivoted at one end to turn on the stud 31. The pinion 32 meshes with the pinion 35. To ensure constant meshing of the pinions 32 and 35, a link 36 pivoted, at one end to stud 23, has a journal opening at its opposite end for the reception of the shaft 28. Thus when the shaft 28 is moved away from the shaft 23 so as to separate the pinions 29 and 35, said pinions are always maintained at the same relative orientation as though they had remained in mesh. Thus, even though the shaft 23 continues to rotate when these pinions are separated, they will go into mesh properly, without relative slippage having taken place between them, when the shaft 28 is restored to the normal operative position, so that maintenance of the proper relation of the helical ribs of the gripper rolls is assured.

To the lower ends of the shafts 23 and 28 gripper rolls 36 and 37 (Fig. 3) are fixed, respectively. These gripper rolls have helical ribs of opposite pitch respectively, the ribs of the two gripper rolls normally meshing. Preferably the outer edges of these helical ribs are knurled so as to grip the material firmly between the rolls. The shafts 23 and 28 are rotated in opposite directions and the helical ribs are so arranged that if flexible material, for example the margin of a shoe upper, be introduced between them, the grippers exert an upward stress and concomitantly therewith tend to move or feed the material in a direction substantially perpendicular to a plane passing through the axes of the rolls.

A channel member resting on bracket arm 8 has spaced parallel upright walls 38 and 39 (Fig. 9) to the upper edges of which a cover plate 40 is secured. The channel member and the cover plate constitute an elongate guideway and housing for the wiper supporting bar 41 which is pivotally connected by a pin 42 (Fig. 1) at its rear end to the eccentric strap 17. The plate 40 has an aperture 42^a (Fig. 6) at its rear end to accommodate the forward end of the eccentric strap.

The forward end of the bar 41 has a transverse horizontal journal opening for a shaft 43, to the left-hand end of which is fixed a wiper member 44 (Fig. 3) having a smoothly curved or beveled forward end 45 (Fig. 4). This wiper member preferably is rigid, although it may be of resiliently yielding character if preferred. Preferably this wiper is quite narrow in horizontal section, for example, being of the order of one-quarter inch in width. If desired, this wiper may be heated, either electrically, as by having a heating unit embedded within it, or for example by an external gas flame. If desired, the inward motion of the wiper may be so limited that the extreme inner edge of the wiped-in margin is not firmly struck down so as thereby to facilitate trimming, if for example the trimming devices hereinafter described are not used.

To the opposite or right-hand end of the shaft 43 is secured a forwardly directed lever arm 46 (Fig. 3). A spring 47 tends to swing the forward end of this arm upwardly.

Parallel rigid guides 48 and 49 (Fig. 5) are mounted at the forward end of the bracket 9 and guide a vertically movable slide 50 (Fig. 3) having a lateral arm 51 (Fig. 2) at its right-hand side which overlies and engages the forward portion of the lever arm 46. A coiled spring 52^a (Fig. 2) having provision for adjusting its tension, tends to hold the slide 50 in its uppermost position.

The upper end of the slide 50 is provided with an anti-friction roll 52 (Fig. 3) which is engaged by a cam 53 arranged to swing on a shaft 54 mounted at its opposite ends in rigid parallel posts 55 and 56 (Fig. 5) secured to the bracket 9 near its forward end. To this cam 53 is secured the forward end of an actuating element, for instance, a flexible cable or chain 57, which passes over a suitable guide pulley 58 (Fig. 1) and then down to a treadle (not shown) by means of which the cam 53 may be rocked downwardly, thereby forcing the slide 50 down and rocking the lever 46 so as to turn shaft 43 and move the forward end of the wiper 44 downwardly.

To the lower end of slide 50 is secured a holder 59 (Fig. 3) in which is mounted an arm 60 provided at its rear end with a hold-down element, for example an anti-friction roll 61, designed to rest upon the bottom of the insole of the shoe being lasted. Preferably the hold-down device is disposed substantially directly below the lower end of shaft 23.

The bracket arm 8 supports a secondary bracket 62 on which are mounted anti-friction guide rolls 63 and 64 (Fig. 1) designed successively to engage the outer surface of the upper at the forepart and shank portions respectively of the latter.

Preferably a trimming knife 65 (Fig. 7) is secured to the forward end of the bar 41 which carries the wiper, this knife being disposed in the space between the zone of action of the gripper rolls 36 and 37 and the zone of action of the wiper 44. As illustrated in Fig. 7, a fixed abutment 66 may be arranged to engage the inner surface of the margin of the upper U at the zone of action of the knife 65 so as to facilitate the trimming operation.

Preferably, though not necessarily, a clamping member or secondary wiper 67 (Figs. 7 and 8) carried by the bar 41 is arranged to engage the upper just above the level of the inner sole, said member 67 being disposed in the vertical plane of the axes of the rolls 36 and 37 and

acting to press the stressed upper firmly against the edge of the insole so as to hold it in place as the grippers let go and before the wiper 44 has fully engaged the upper.

To separate the rolls 36 and 37 temporarily, thereby to allow the margin of the upper to be introduced between them, a manually actuable lever 68 (Fig. 3) is provided. This lever is fixed at its rear end to a shaft 69 journaled in brackets 70 and 71 depending from the arm 9. To this shaft is fixed an arm 72 having a finger at its upper end which fits loosely within an opening in the slide 26. A spring 73 secured to a rearwardly directed arm 74 fixed to shaft 69 tends to depress the forward end of the lever 68 and to move the slide 26 and the shaft 28 forwardly, thereby yieldingly to retain the rolls 36 and 37 in opposite relation. However, by lifting the forward end of lever 68, the slide 26 may move rearwardly thereby to separate the gripper rolls. Obviously, instead of the hand lever 68, a conventional form of connection to a foot treadle may be used to rock the shaft 69.

As illustrated in Fig. 6, for example, the rolls 36 and 37 are of substantially equal diameter, but as illustrated in Figs. 7 and 8, the forward roll may be of smaller diameter than the rear roll if desired, thereby to facilitate the feeding of the work when sharp bends in the contour of the insole are encountered.

In Fig. 4 the machine is shown as provided with fastener inserting means comprising a magazine 74, a runway 75, a driver 76 and actuating mechanism including a lever 77, it being contemplated that this fastener inserting means may be of any conventional or usual type and may be driven in consonance with the other machine parts by any suitable means. Preferably the fastener inserting device is arranged closely adjacent to the wiper 44, and, if preferred, the wiper may be so devised as to permit the fasteners to be inserted through a slot in the wiper.

As illustrated in Fig. 7, the machine may be provided with means for delivering adhesive against the inner surface of the margin of the upper preferably just prior to the operation of the wiper 44. For example, a suitable adhesive such as rubber latex may be delivered by a nozzle 78 located intermediate the zones of action of the trimming knife 65 and the wiper 44, although the adhesive may be applied at some other point if preferred, or, in fact, the adhesive may be applied to the inner surface of the margin of the upper before the beginning of the lasting operation if such a procedure be preferred.

The operation of the apparatus is substantially as follows, it being assumed that the motor 2 is in operation thus rotating the shaft 10 and by means of the eccentric 16 and the eccentric strap 17 rapidly reciprocating the bar 41 in its guideway. It is further assumed that the upper and insole of the shoe have been assembled upon the last L and that the upper has been pulled over in usual manner, and if preferred end-lasting. Also to assist in getting the several elements of the upper, including the lining, in proper relative position, the operator may perform the usual pin-coring operation.

Now taking the assembled parts in his hands, the operator first lifts the lever 68, thereby pushing back the slide 26 and separating the gripper rolls 36 and 37. He then introduces the upstanding marginal portion of the upper near one end

of the shoe (for example near the toe of the shoe) between the rolls 36 and 37, and then releases the lever 68 so as to allow the rolls to grip the marginal material of the upper between them. At the same time the operator depresses the treadle thereby pushing the hold-down device 61 into contact with the lower surface of the insole, so as to prevent the shoe from rising in response to the upward stress exerted by the rotating gripper rolls. Assuming that the margin of the upper has been gripped at a point near the toe, the anti-friction guide roll 63 now engages the outer surface of the upper at the forepart of the shoe and at a point close to the edge of the insole. As the gripper rolls 36 and 37 rotate, they exert a strong upward stress, by reason of their helical ribs, tending to stretch the upper about the last. However, upward movement of the shoe as a whole is prevented by the hold-down device 61 while lateral movement of the shoe is only possible as permitted by the operator. Thus the rolls not only exert upward pull but also tend to move the material of the upper in a direction substantially parallel to the edge of the insole, in other words to exert a feeding action upon the work tending to move the last and upper in a direction longitudinal of the last.

In moving the hold-down device 61 downwardly the operator at the same time turns the shaft 43 and thus brings the free end of the wiper member 44 into position to engage the marginal portion of the upper just rearwardly (in the direction of movement of the last) of the point at which the gripper rolls grasp and stretch the upper. As the gripper rolls feed the work along they stretch it and then release it and as it is released it is engaged by the rapidly vibrating wiper 44 and is wiped in smoothly over the bottom of the insole. When a trimming knife 65 is provided, it trims off the surplus material at the extreme edge of the upper just as the material is released by the gripper rolls and before it is wiped in by the wiper 44. If adhesive is to be used, it may be directed against the inner surface of the marginal material by the nozzle 78 just prior to the engagement of the upper by the wiper. Preferably, as indicated in Fig. 12, the adhesive is delivered as a spray by air supplied under pressure through a pipe P, and in order to make the adhesive substantially instantaneous in action, the supply pipe P' which conducts the adhesive to the nozzle is provided with a heater H which heats the adhesive to a point such that it will gel as soon as it touches the upper material.

If the upper is to be secured to the insole by metallic fasteners, these fasteners are delivered by the fastener inserting means above described, preferably at a point just beyond that at which the wipers act, so that the fasteners are introduced while the material is still held snugly by the wipers and before it can retract away from the last. Under some circumstances the fastener inserting means may be dispensed with, or alternatively fastener inserting means may be provided and the adhesive applying means may be dispensed with, dependent upon the type of shoe being made.

After the operation has progressed until the shank of the shoe is reached, the guide roll 63 no longer engages the side of the shoe and the latter comes into contact with the guide roll 64 which continues to guide the work until the rear part of the shoe is reached, at which time the roll 63 may again come into action. After one side of the shoe has thus been lasted, the shoe

is released from the grippers by manipulation of the lever 68 and, after being reversed, the other side of the shoe is presented to the machine and the operation repeated upon that side. However, under some procedures it may be preferred to employ two machines, one operator lasting one side of the shoe and the second operator lasting the other side of the shoe. Moreover, while the operation may proceed from one end of the shoe to the other, as above described, it is contemplated that the operator may last-in a portion of the length of the shoe, then release the work and then grip the marginal material at another point either on the same side or at the opposite side of the shoe, as may be most convenient for obtaining the desired result. In making certain types of shoe, for instance shoes having rubber soles such as tennis shoes, the present apparatus and method have been found highly desirable in lasting the entire shoe, that is to say, not only side and forepart lasting, but also end lasting.

As illustrated in Fig. 11, the apparatus may be used in lasting welt shoes. In this instance the wiper 44 wipes in the marginal material against the rib of the insole W and immediately thereafter, a staple driving mechanism S, preferably including an anvil element A, inserts staples through the upper and rib to secure the upper in place.

While a certain desirable apparatus has been described in detail, it is to be understood that the invention is to be regarded as inclusive of any and all equivalent constructions. The method herein disclosed is claimed in application Ser. No. 300,929 filed June 7, 1938.

I claim:

1. Shoe lasting apparatus comprising upper-gripping means constructed and arranged to seize a narrow area of the margin of the upper and positively to stress it in a direction substantially perpendicular to the bottom of the last thereby to stretch the upper snugly about the last, wiping means closely adjacent to but spaced from the gripping means, said wiping means being constructed and arranged to wipe a narrow area of the marginal material inwardly over the insole, and gripper actuating means operative to cause the gripping means to grip, stress, and release the upper, and means for actuating the wiping means, the wiping means being so located relatively to the gripping means as to engage the upper material only after the latter has been released by the gripping means.

2. Shoe lasting apparatus comprising upper-gripping means constructed and arranged to seize a narrow area of the margin of the upper and to stress it in a direction substantially perpendicular to the bottom of the last thereby to stretch the upper snugly about the last, wiping means closely adjacent to but spaced from the gripping means, said wiping means being constructed and arranged to wipe a narrow area of the marginal material inwardly over the insole after it has been stressed and released by the gripping means, the gripping means being designed to exert a work feeding stress concomitantly with its stretching action thereby progressively to move successive points in the margin of the upper past the wiping means, and means operative to actuate the gripping and wiping means, the wiping means being so related to the gripping means as to engage the upper material only after the latter has been released by the gripping means.

3. Shoe lasting apparatus comprising upper-gripping means constructed and arranged to seize a narrow area of the margin of the upper and to stress it in a direction substantially perpendicular to the bottom of the last thereby to stretch the upper snugly about the last, wiping means closely adjacent to but spaced from the gripping means, said wiping means being constructed and arranged to wipe a narrow area of the marginal material inwardly over the insole after such material has been stressed and released by the gripping means, trimming means operative to trim away surplus stock at the edge of the marginal material before it is engaged by the wiping means, and means operative concomitantly to actuate the gripping, trimming and wiping means.

4. Shoe lasting apparatus comprising upper-gripping means constructed and arranged to seize a narrow area of the margin of the upper and to stress it in a direction substantially perpendicular to the bottom of the last thereby to stretch the upper snugly about the last, wiping means closely adjacent to but spaced from the gripping means, said wiping means being constructed and arranged to wipe a narrow area of the marginal material inwardly over the insole after said material has been stressed and released by the gripping means, trimming means operative to trim away surplus stock at the edge of the marginal material, the gripping means being designed to exert a work feeding stress concomitantly with its upper stretching action thereby progressively to move successive points in the margin of the upper past the trimming and wiping means, and means operative to actuate the trimming and wiping means.

5. Shoe lasting apparatus comprising a pair of complementary right and left pitch, normally meshing, helical upper-gripping elements arranged to turn about normally, substantially parallel axes, means for turning said gripping elements simultaneously in opposite directions, means normally urging said gripping elements radially toward each other, said gripping elements being so designed and arranged as to stress the margin of an upper gripped between them in a direction substantially perpendicular to the last bottom, and limiting means operative to prevent the last and insole from moving with the margin of the upper in said direction.

6. Shoe lasting apparatus comprising a pair of complementary right and left pitch, normally meshing, helical upper-gripping elements arranged to turn about normally, substantially parallel axes, means for turning said gripping elements simultaneously in opposite directions, means normally urging said gripping elements radially toward each other, said gripping elements being so designed and arranged as concomitantly to stress the margin of the upper in a direction substantially perpendicular to the last bottom and in a direction substantially parallel to the edge of the insole, and hold-down means operative by engagement with the insole to prevent movement of the last and insole with the margin of the upper in a direction perpendicular to the last bottom.

7. Shoe lasting apparatus comprising a pair of complementary right and left pitch, normally meshing, helical upper-gripping elements arranged to turn about normally, substantially parallel axes, means for turning said gripping elements simultaneously in opposite directions, means normally urging said gripping elements

radially toward each other, said gripping elements being so designed and arranged as concomitantly to exert a stretching stress upon the margin of the upper in a direction substantially perpendicular to the last bottom and to exert a work feeding stress upon said margin in a direction substantially parallel to the edge of the insole, hold-down means engaging the bottom of the insole, and guide means engageable with the outer surface of the upper, said guide means being designed and arranged to allow the upper and last to move bodily in response to the work feeding stress.

8. Shoe lasting apparatus comprising a pair of complementary right and left pitch, normally meshing, helical upper-gripping elements arranged to turn about normally, substantially parallel axes, means for turning said gripping elements simultaneously in opposite directions, means normally urging said gripping elements radially toward each other, said gripping elements being so designed and arranged as concomitantly to exert a stretching stress upon the margin of the upper in a direction away from the bottom of the last and to exert work feeding stress upon said margin in a direction substantially parallel to the edge of the insole, hold-down means engaging the bottom of the insole, and a plurality of work guides operative successively to engage the outer surface of the forepart and shank portions of the upper as the work is fed along by the gripping and feeding means.

9. Shoe lasting apparatus comprising a pair of complementary right and left pitch, normally meshing, helical upper-gripping elements arranged to turn about normally, substantially parallel axes, means for turning said gripping elements simultaneously in opposite directions, means normally urging said gripping elements radially toward each other, said gripping elements being so designed and arranged as, at the same time, to exert a stretching stress upon the margin of the upper in a direction substantially perpendicular to the last bottom and a work feeding stress in a direction substantially parallel to the edge of the insole, hold-down means engageable with the bottom of the insole, and a plurality of anti-friction work-guiding rolls operative successively to engage the outer surface of the forepart and shank portions of the upper as the work is fed along by the gripping means.

10. Shoe lasting apparatus comprising a pair of complementary right and left pitch, normally meshing, helical upper-gripping elements arranged to turn about normally, substantially parallel axes, means for turning said gripping elements simultaneously in opposite directions, means normally urging said gripping elements radially toward each other, and separating means operative temporarily to move said gripping elements apart thereby to permit introduction of the margin of the upper between them, said gripping elements being so designed and arranged as concomitantly to stress the marginal material gripped between them in directions substantially perpendicular to the last bottom and substantially parallel to the edge of the insole respectively.

11. Shoe lasting apparatus comprising a pair of complementary right and left pitch, normally meshing, helical upper-gripping elements arranged to turn about normally substantially parallel axes, means for turning said gripping elements simultaneously in opposite directions, means normally urging said gripping elements radially toward each other, and separating means

operative temporarily to move said gripping elements apart thereby to permit introduction of the marginal material between them, the drive means for said helical gripping elements being so designed and arranged as to maintain the same relative orientation whether they are separated or in normal operative position.

12. Shoe lasting apparatus comprising a pair of complementary right and left pitch, normally meshing, helical upper-gripping elements arranged to turn about normally, substantially parallel axes, means for turning said gripping elements simultaneously in opposite directions, means normally urging said gripping elements radially toward each other, and means actuable by the operator temporarily to move said gripping elements apart thereby to permit introduction of the marginal material between them, the drive means for said helical elements comprising a train of gears which remain in mesh whether the helical elements are in normal operative position or separated.

13. Shoe lasting apparatus comprising upper-stretching and feeding means constructed and arranged to grip the margin of the upper and concomitantly to exert a stretching stress upon such margin in a direction substantially perpendicular to the bottom of the last and a work feeding stress in a direction substantially parallel to the edge of the insole, a movable wiping element closely adjacent to but spaced from said stretching and feeding means, and means for moving said wiping element in a path substantially parallel to the last bottom and transverse of the edge of the insole, the wiping element being so located with reference to the stretching and feeding means as to engage the upper material only after the latter has been stressed and released by the stretching means.

14. Shoe lasting apparatus comprising upper-stretching and feeding means constructed and arranged to grip the margin of the upper and concomitantly to exert a stretching stress upon such margin in a direction substantially perpendicular to the bottom of the last and a work feeding stress in a direction substantially parallel to the edge of the insole, a movable wiping element closely adjacent to but spaced from said stretching and feeding means, and drive means operative to impart a rapid vibratory movement to said wiping element in a path substantially parallel to the bottom of the last and transverse to the edge of the insole, the upper stretching means and the wiping means being so related that the upper material is released by the stretching means before it is engaged by the wiping means.

15. Shoe lasting apparatus comprising upper-stretching and feeding means constructed and arranged to grip the margin of the upper and concomitantly to exert a stretching stress upon such margin in a direction substantially perpendicular to the bottom of the last and a work feeding stress in a direction substantially parallel to the edge of the insole, a movable wiping element closely adjacent to but spaced from said stretching and feeding means and so related to the latter as to engage only that portion of the upper material which has been stretched and released by the stretching means, and drive means operative rapidly to reciprocate said wiping element in a path substantially parallel to the last bottom and transverse to the edge of the insole.

16. Shoe lasting apparatus comprising upper-

stretching and feeding means constructed and arranged to grip the margin of the upper and concomitantly to exert a stretching stress upon such margin in a direction substantially perpendicular to the bottom of the last, and a work feeding stress in a direction substantially parallel to the edge of the insole, a movable wiping element closely adjacent to but spaced from said stretching and feeding means, means operative to move said wiping element toward the plane of the bottom of the insole, and drive means operative to reciprocate said wiping element transversely across the edge of the insole while it is disposed closely adjacent to the bottom of the latter, the upper stretching means and the gripping means being so relatively arranged that the wiping means engages the upper material only after the latter has been released by the stretching means.

17. Shoe lasting apparatus comprising upper-stretching and feeding means constructed and arranged to grip the margin of the upper and concomitantly to exert a stretching stress upon such margin in a direction substantially perpendicular to the bottom of the last and a work feeding stress in a direction substantially parallel to the edge of the insole, means operative to engage attaching means with the marginal material as the latter is released by the stretching means, a movable wiper element closely adjacent to but spaced from the stretching and feeding means and past which successive points of the margin of the upper are moved by the action of the feeding means, drive means operative rapidly to vibrate the wiper element transversely of the edge of the insole, and means operative to force the wiper element toward the bottom of the insole, the wiping means being arranged to engage the upper material subsequent to the engagement of the attaching means therewith.

18. Shoe lasting apparatus comprising upper-stretching and feeding means constructed and arranged to grip the margin of the upper and concomitantly to exert a stretching stress upon such margin in a direction substantially perpendicular to the bottom of the last and a work feeding stress in a direction substantially parallel to the edge of the insole, a movable wiper element closely adjacent to but spaced from the stretching and feeding means and past which successive points of the margin of the upper are moved by the action of the feeding means, drive means for reciprocating the wiper element transversely of the edge of the insole, means operative to move the wiper element toward the bottom of the insole, the wiper element being so related to the upper stretching means as to engage the upper material only after the latter has been stressed and released by the stretching means, and means operative to insert metallic fasteners for anchoring the wiped-in material to the insole.

19. Shoe lasting apparatus comprising upper-stretching and feeding means constructed and arranged to grip the margin of the upper and concomitantly to exert a stretching stress upon such margin in a direction substantially perpendicular to the bottom of the last and a work feeding stress in a direction substantially parallel to the edge of the insole, a movable wiper element closely adjacent to but spaced from the stretching and feeding means and past which successive points of the margin of the upper are moved by the action of the feeding means, drive means for moving the wiper element back and

forth transversely of the edges of the insole, means operative to force the wiper element toward the bottom of the insole while it is so moving back and forth, the wiper element being so related to the upper stretching means as to engage the upper material only after the latter has been stressed and released by the stretching means, and means operative to accomplish permanent union of each successively wiped-in portion of the marginal material with the bottom of the insole.

20. Shoe lasting apparatus comprising a narrow wiper element movable transversely of the edge of the insole, an elongate support for the wiper element, a fixed guide for said elongate support, means operative to vibrate said elongate support with the wiper element and concomitantly to force it toward the plane of the last bottom, and work feeding means comprising concomitantly rotating rolls engaging the upper material between them and operative bodily to move the last and upper thereby progressively to present successive portions of the margin of the upper for contact by the wiper element, said upper feeding means being designed and arranged to release the margin of the upper before it is engaged by the wiper element.

21. Shoe lasting apparatus comprising a narrow heated wiper element movable transversely of the edge of the insole, an elongate support for the wiper element, a fixed guide for said elongate support, means operative to vibrate said elongate support with the wiper element and concomitantly to force the wiper element toward the plane of the last bottom, thereby to wipe a narrow area of the margin inwardly onto the bottom of the insole, and work feeding means comprising a pair of constantly rotating rolls operative to cause relative movement between the wiper element and shoe upper such as progressively to present successive points of the margin, peripherally of the upper, to the field of action of the wiper element, said work feeding means being designed and arranged to release the upper material prior to its engagement by the wiper element.

22. Shoe lasting apparatus comprising a narrow wiper element movable transversely of the edge of the insole, means operative to vibrate said wiper element and concomitantly to force it toward the plane of the last bottom, thereby to wipe a narrow area of the margin inwardly over the bottom of the insole, trimming means operative to remove surplus stock from the edge of the marginal material, and work feeding means operative to advance the margin of the upper relatively to the trimming and wiping means thereby to cause the trimming and wiping means, in order, progressively to engage successive points of the margin peripherally of the upper.

23. Shoe lasting apparatus comprising a narrow wiper element movable transversely of the edge of the insole, means operative to vibrate said wiper element and concomitantly to force it toward the plane of the last bottom, and work stretching and feeding means, the stretching and feeding means being constructed and arranged progressively to grip narrow areas of the marginal material, peripherally of the upper, and to exert a stretching stress upon each such area in a direction substantially perpendicular to the last bottom while concomitantly exerting a feeding stress operative to move point after point of the marginal material past the zone of action of

the wiping element, the wiper element being arranged to engage the upper material only after the latter has been released by the stretching and feeding means.

24. Shoe lasting apparatus comprising a narrow wiper element movable transversely of the edge of the insole, means operative to vibrate said wiper element and concomitantly to force it toward the plane of the last bottom, work stretching and feeding means constructed and arranged progressively to grip narrow areas of the marginal material, peripherally of the upper, and, while exerting a stretching stress upon each such area in a direction substantially perpendicular to the bottom of the insole, concomitantly exerting a feeding stress operative to move point after point of the marginal material past the zone of action of the wiping element, said wiper element being arranged to engage the upper material only after the latter had been released by the stretching and feeding means, secondary wiper means operative to exert pressure upon the outer surface of the upper substantially at the plane of the insole and within the zone of action of the gripping means, anti-friction guide means engageable with the outer surface of the upper at the forepart and shank portions of the shoe as the shoe is advanced by the feeding means, and hold-down means engageable with the bottom surface of the insole to prevent bodily movement of the last and insole in a direction perpendicular to the last bottom.

25. Shoe lasting apparatus comprising upper stretching means comprising a pair of concomitantly rotating work gripping rolls and in-wiping means, the stretching means being operative positively to grip a narrow area of the margin of the upper and temporarily to stress the latter in a direction substantially perpendicular to the last bottom and then to release the gripped area, the wiping means being so designed and arranged as to wipe in said released area only after it has escaped from the stretching means.

26. Shoe lasting apparatus comprising upper stretching means and in-wiping means, the stretching means being designed and arranged positively to grip a narrow area of the margin of the upper and, after stressing the gripped portion of the margin in a direction substantially perpendicular to the last bottom, to release the gripped area while concomitantly gripping an adjacent area, the wiping means being constructed and arranged to wipe in each area of the margin only after such area has escaped from the stressing means.

27. Shoe lasting apparatus comprising upper gripping and stressing means, trimming means, and wiping means for wiping marginal upper material inwardly over the bottom of the last, each of said means being operative to act upon a narrow area of the margin of the upper, and

means operative concomitantly to actuate the gripping and stressing means, the trimming means and the wiping means, the stressing, trimming and wiping means being so constructed and arranged as to act one after the other, in order, upon successive areas of the margin of the upper.

28. Shoe lasting apparatus comprising upper gripping means operative to seize a narrow area of the margin of the upper and positively to stress such margin in a direction substantially perpendicular to the bottom of the last thereby to stretch it snugly about the last, means operative to wipe in a narrow area of the marginal material which has already been stressed and released by the gripping means and closely adjacent to but spaced from a point at which said stress is being concomitantly applied, and means operative to cause relative movement of said stressing and wiping means and the last whereby the points of stressing and wiping progress along the edge of the insole.

29. Shoe lasting apparatus comprising restraining means operative to restrain the insole and last from movement in a direction perpendicular to the last bottom, and gripping means comprising concomitantly moving gripping elements operative positively to grip the margin of the upper at a selected point and to apply stress thereto tending to stretch the upper about the last, said gripping elements always moving in the same direction and being constructed and arranged to exert a component of stress longitudinally of the shoe thereby to cause the point of application of stretching stress to progress continuously from point to point along the edge of the insole.

30. Shoe lasting apparatus comprising in combination, a pair of complementary right and left pitch, normally meshing, rotary, helical, upper-gripping rolls, and means for turning said rolls simultaneously in opposite directions, said rolls being so constructed and arranged as concomitantly to stress the margin of the upper in a direction substantially perpendicular to the last bottom and in a direction substantially parallel to the edge of the insole.

31. Shoe lasting apparatus comprising a pair of oppositely rotating, upper gripping rolls, so constructed and arranged as positively to grip the margin of the upper at a selected point and to apply stress thereto tending to stretch the upper about the last, said rolls always turning in the same direction and being constructed and arranged to exert a component of stress longitudinally of the shoe thereby to cause the point of application of stretching stress to progress continuously from point to point along the edge of the insole, and cutting means operative to incise the marginal material of the upper closely adjacent to the place where the upper is gripped by said rolls.

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