Sept. 2, 1941. J. S. KAMBORIAN 2,254,224

METHOD OF LASTING FOOTWEAR

Original Filed June 7, 1938 4 Sheets-Sheet 1

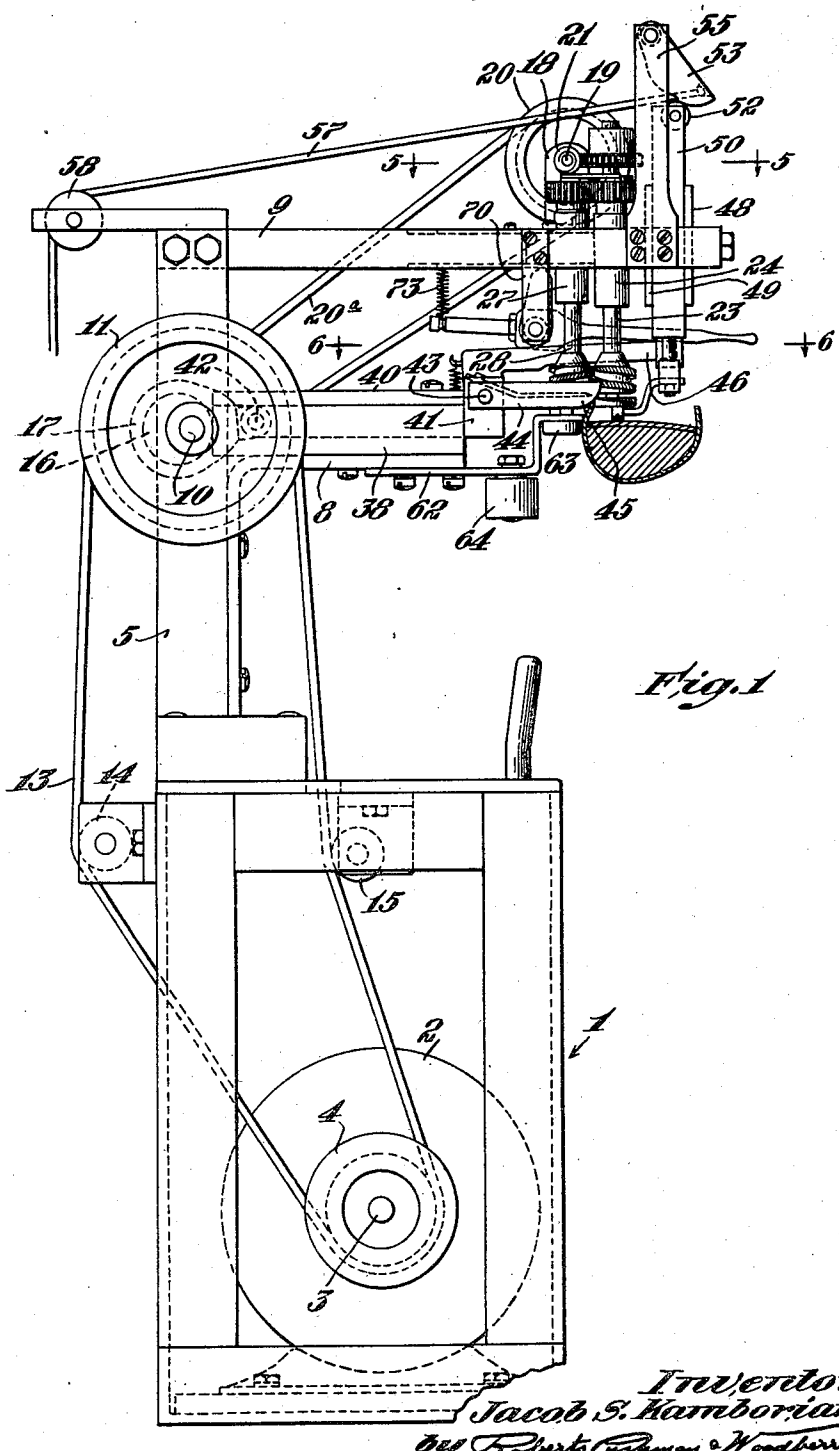


Fig. 1

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METHOD OF LASTING FOOTWEAR

Original Filed June 7, 1938 4 Sheets-Sheet 2

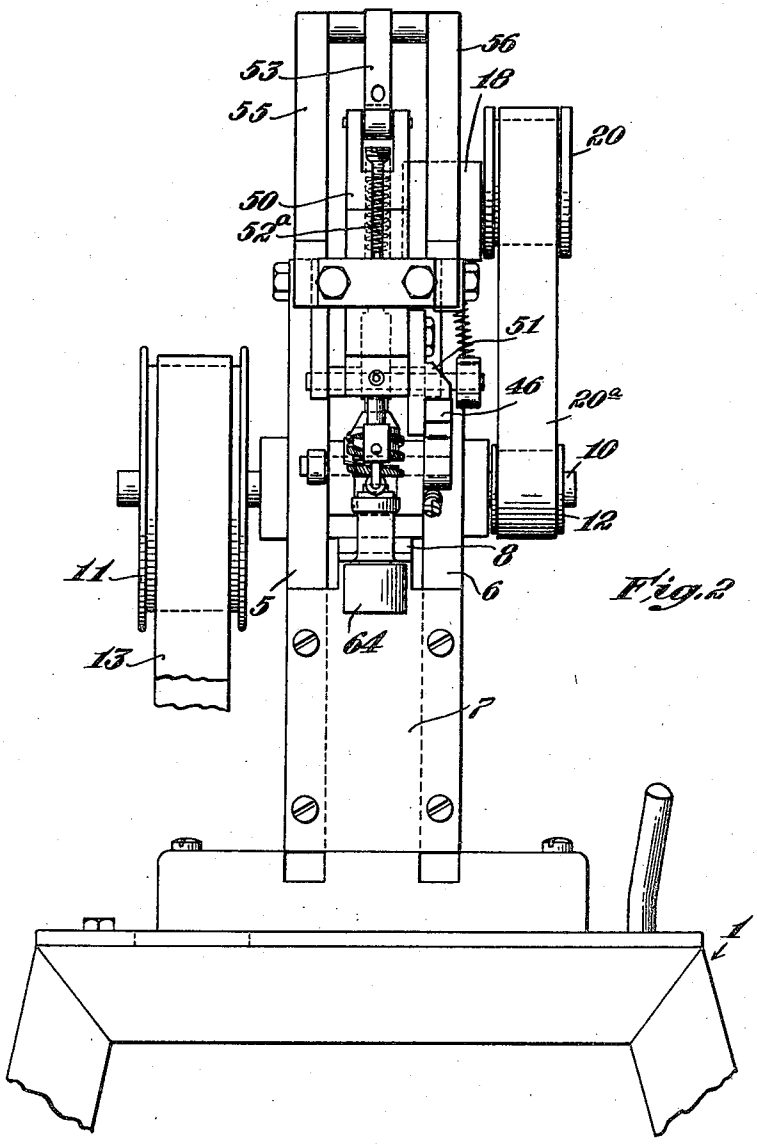


Fig. 2

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METHOD OF LASTING FOOTWEAR

Original Filed June 7, 1938 4 Sheets-Sheet 3

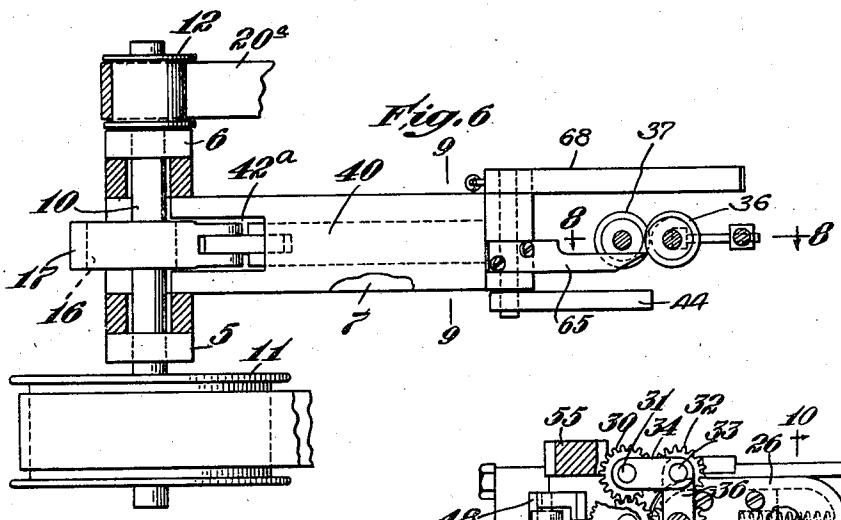


Fig. 6

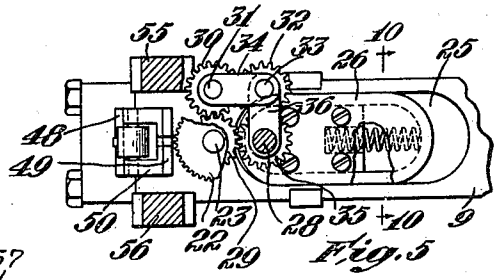


Fig. 5

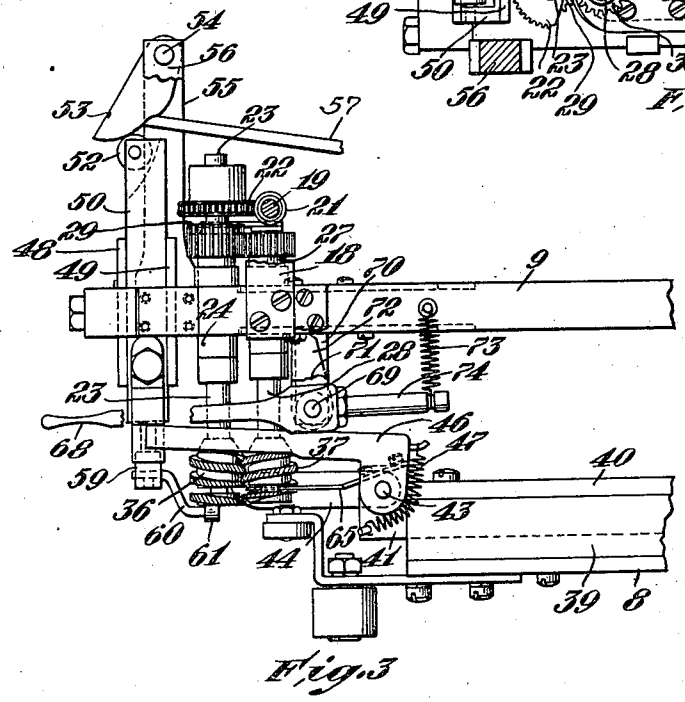


Fig. 3

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METHOD OF LASTING FOOTWEAR

Original Filed June 7, 1938 4 Sheets-Sheet 4

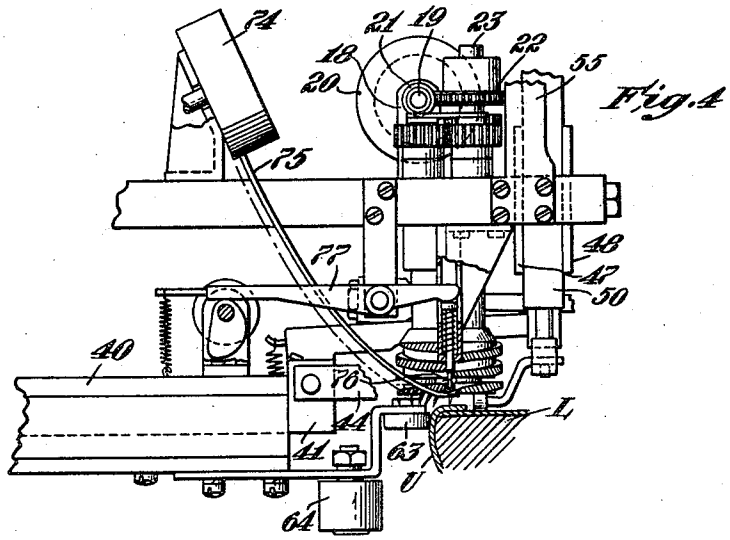


Fig. 4

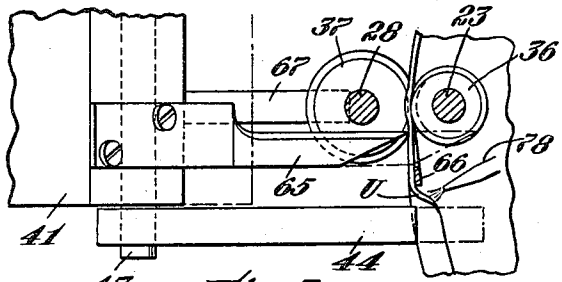


Fig. 7

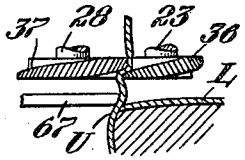


Fig. 8

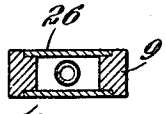


Fig. 10

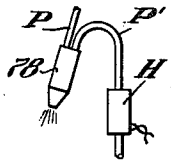


Fig. 12

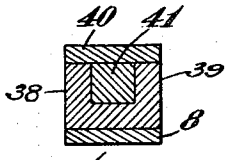


Fig. 9

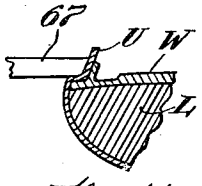


Fig. 11

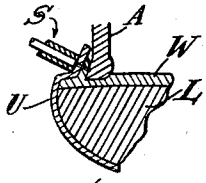


Fig. 11a

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Patented Sept. 2, 1941 2,254,224

UNITED STATES PATENT OFFICE

2,254,224

METHOD OF LASTING FOOTWEAR

Jacob S. Kamborian, West Newton, Mass., assignor to General Research, Inc., Boston, Mass., a corporation of Massachusetts

Original application June 7, 1938, Serial No. 212,236. Divided and this application October 24, 1939, Serial No. 300,929

24 Claims. (Cl. 12—145)

This invention pertains to the manufacture of footwear and relates more especially to a method of lasting shoes, being particularly useful in side and forepart lasting although useful, if desired, for lasting the entire shoe, the present application being a division of the application Serial No. 212,236, filed June 7, 1938, by Jacob S. Kamborian, for Lasting footwear.

While this improved method 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 improved method of stretching the upper snugly about the last and of lasting its margin smooth and level against the under surface of the insole; to provide a method 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; to provide a method of lasting 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; and to provide for applying fastener means, for example adhesive, metal fasteners or the like as a step in the lasting operation.

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 there is disclosed apparatus illustrating one practical method of practicing the invention and wherein:

Fig. 1 is a fragmentary elevation, to small scale, showing such 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 horizonal 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 the line 9—9 of Fig. 6;

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

Figs. 11 and 11ª 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.

Journaled in the posts 5 and 6, with its axis substantially in the horizontal plane of the arm 8, 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 lasting 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 20a 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 33, 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.

Spaced parallel plates 38 and 39 (Fig. 9) are arranged at opposite edges of the bracket arm 8 and a cover plate 40 is secured to the upper edges of the plates 38 and 39. These several plates with the bracket 8 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 42a (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. 9) having a smoothly curved or beveled foward 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 stuck down so as thereby to facilitate trimming, if for example the trimming devices hereinafter described are not used.

To the opposite or left-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 41 (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 (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 antifriction 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 upper 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.

The second 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 wiper 67 being disposed substantially in the vertical plane of the axes of the rolls 36 and 37. This wiper 67 acts to stress the stretched upper inwardly about the edge of the insole preliminary to its engagement by the trimmer 65 and the wiper 44 and just before the staple or other fastener is inserted, if such fasteners be used. If staples or like metallic fasteners are employed and the adhesive is omitted, the wiper 44 may be removed, since the operation of inserting the metallic fasteners lays the upper down in place against the bottom of the insole.

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.

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-lasted. Also to assist in getting the several elements of the upper, including the lining, in proper relative position, the operator may perform the usual pincering 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, constantly and uninterruptedly 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 progressive feeding action upon the work tending to move the last and upper in a direction longitudinal of the last, the point at which the stretching stress is exerted advancing by infinitesimal amounts longitudinally of the shoe.

In moving the hold-down device 61 downwardly the operator at the same time turns the shaft 43 and thus brings the free ends of the wiper members 67 and 44 into position to engage the marginal portion of the upper. As the gripper rolls feed the work along they stretch it upwardly away from the plane of the last bottom and then release it. While thus stressed, it is engaged by the inwardly moving wiper 67 which thrusts it inwardly over the edge of the insole. As it is released by the gripper rolls 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 gripper rolls act, so that the fasteners are introduced before the material 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 66 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 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.

A desirable apparatus has been described for use in the practice of the invention, but is to be regarded as merely illustrative of suitable means for the purpose, but the invention is not necessarily dependent upon the precise sequence of steps herein described, nor the use of such apparatus, and is inclusive of the substitution of equivalent method steps for those herein described.

I claim:

1. Method of lasting shoes which comprises as steps seizing a narrow area of the margin of the upper and positively stressing it in a direction substantially perpendicular to the bottom of the last thereby to stretch it snugly about the last, and wiping in the marginal material when it has been so stressed, the point at which such stress is applied advancing without interruption and by infinitesimal amounts along the periphery of the last bottom.

2. Method of lasting shoes which comprises as steps seizing a narrow area of the margin of the upper and stressing it in a direction substantially perpendicular to the bottom of the last thereby to stretch it snugly about the last, concomitantly wiping in a narrow area of the marginal material closely adjacent to but spaced from the point at which said stress is applied, trimming away the surplus at the edge of the marginal material at a point intermediate the points at which stressing and wiping are taking place, and causing said stressing, trimming and wiping action to progress in said respective order about the periphery of a last bottom.

3. Method of lasting shoes which comprises as steps seizing a narrow area of the margin of the upper and positively stressing it in a direction substantially perpendicular to the bottom of the last thereby to stretch it snugly about the last, urging the stressed upper material inwardly relatively to the edge of the last at a point substantially in the vertical plane of the point at which the stress of force is applied, concomitantly wiping in a narrow area of the marginal material adjacent to the point at which the stress is applied, and causing said stressing action to progress uninterruptedly and by infinitesimal amounts along the periphery of the last bottom.

4. That method of lasting shoes which comprises as steps gripping a narrow area of the margin of the upper and subjecting it to positive lasting pull in a direction substantially perpendicular to the bottom of the last thereby to stretch it snugly about the last, concomitantly wiping a narrow area of the marginal material inwardly relative to the edge of the last bottom at a point substantially in the vertical plane in which such lasting pull is applied, and causing said pulling action to progress uninterruptedly and by infinitesimal amounts along a substantial portion of the periphery of the shoe bottom.

5. That method of lasting shoes which comprises as steps causing the margin of the upper to pass progressively through stressing, trimming and wiping-in zones, and concomitantly, at said respective zones, stressing, trimming and wiping narrow areas of the margin of the upper inwardly over the bottom of the insole.

6. That method of lasting shoes which comprises as steps seizing a narrow area of the margin of the upper and applying positive lasting pull thereto such as to stretch the upper snugly about the last, progressively shifting the point of application of pull by infinitesimal amounts along the periphery of the last bottom in such a way as, while seizing fresh portions of the marginal material, concomitantly releasing the pull on the material previously stressed, and progressively wiping in the marginal material as the pull thereon is released.

7. That method of lasting shoes which comprises as steps seizing a narrow area of the margin of the upper and applying positive lasting pull thereto such as to stretch the upper snugly about the last, progressively shifting the point of application of pull by infinitesimal amounts along the periphery of the last bottom in such a way as, while seizing fresh portions of the marginal material, concomitantly releasing the pull on the material previousiy stressed, applying adhesive to the inner surface of the marginal material, and progressively wiping in each stressed area of the margin as such area is released from the gripping means thereby to dispose the adhesively coated marginal material in adhering contact with the bottom of the insole.

8. That method of lasting shoes which comprises as steps seizing a narrow area of the margin of the upper and applying positive lasting pull thereto such as to stretch the upper snugly about the last, progressively shifting the point of application of pull by infinitesimal amounts along the periphery of the last bottom in such a way as, while seizing fresh portions of the marginal material, concomitantly releasing the pull on the material previously stressed, progressively wiping in the marginal material as the pull thereon is released, and permanently uniting the wiped-in marginal material to the insole.

9. That method of lasting shoes which comprises as steps causing gripping means progressively to grip and thereafter to release narrow

areas of the margin of the upper from point to point along the edge of the insole while uninterruptedly advancing in the same direction relative to the shoe, and while so gripping the material exerting pull thereon in a direction away from the insole thereby to stretch the upper about the last, progressively wiping in successive stressed areas of the margin and applying a metallic fastener permanently to anchor each successively wiped-in area of the margin in place.

10. That method of lasting shoes which comprises as steps uninterruptedly progressing the margin of the upper through a stressing zone wherein narrow overlapping areas of the upper, one after another in succession, are positively stressed in a direction substantially perpendicular to the bottom of the last, and subjecting the marginal material, as it leaves the stressing zone to the action of rapidly reciprocating wiping means moving in a path substantially parallel to the last bottom and transversely of the bottom edge of the last.

11. That method of lasting shoes which comprises as steps progressing the margin of the upper through a stressing zone wherein narrow areas of the upper, one after another in succession, are stressed in a direction substantially perpendicular to the bottom of the last, and subjecting the marginal material, as it leaves the stressing zone, to the successive action of trimming means and rapidly reciprocating wiping means, said wiping means moving in a path substantially parallel to the last bottom and transversely across the bottom edge of the last.

12. That method of lasting shoes which comprises as steps uninterruptedly progressing the margin of the upper through a stressing zone wherein successive overlapping narrow areas of the upper are positively stressed in a direction substantially perpendicular to the bottom of the last, and subjecting the marginal material, as it leaves the stressing zone, to the action of a narrow heated wiping element vibrating rapidly in a path extending transversely of the edge of the insole, and concomitantly urging said wiping element toward the last bottom.

13. That method of lasting shoes which comprises as steps seizing a narrow area of the margin of the upper and applying positive lasting pull thereto in a direction substantially perpendicular to the last bottom, progressively and uninterruptedly shifting the point of application of such pull along the periphery of the shoe bottom, and wiping narrow areas of said margin inwardly over the insole successively from point to point longitudinally of the shoe.

14. That method of lasting shoes which comprises as steps seizing a narrow area of the margin of the upper and applying positive lasting pull thereto in a direction substantially perpendicular to the last bottom, progressively and uninterruptedly shifting the point of application of such pull along the periphery of the shoe bottom, and causing a horizontally narrow wiping element to act upon said margin progressively from point to point peripherally of the shoe.

15. That method of lasting shoes which comprises as steps seizing a narrow area of the margin of the upper and applying positive lasting stress thereto in a direction substantially perpendicular to the last bottom, progressively and uninterruptedly shifting the point of application of such stress along the periphery of the shoe bottom, and causing a horizontally narrow heated wiping element to reciprocate rapidly in a path substantially parallel to the bottom of the last and in a direction transverse to the edge of the insole thereby to wipe narrow areas of the margin inwardly onto the bottom of the insole successively from point to point peripherally of the shoe.

16. That method of lasting shoes which comprises as steps stressing the margin of the upper in a direction substantially perpendicular to the last bottom, and progressively trimming surplus from the edge of said marginal material while concomitantly wiping in narrow areas of said margin successively from point to point longitudinally of the shoe.

17. That method of lasting shoes which comprises as steps restraining the insole and last from movement in a direction perpendicular to the last bottom, gripping the margin of the upper at a selected point and applying positive pull tending to stretch the upper about the last and, without intermitting such stretching pull, causing the point of application of said pull to progress uninterrupted from point to point along said margin.

18. That method of lasting shoes which comprises as steps restraining the insole and last from movement in a direction perpendicular to the last bottom, gripping the margin of the upper at a selected point and applying positive lasting pull tending to stretch the upper about the last, and, without ceasing to apply such pull, causing the point of application of said pull to progress by infinitesimal amounts peripherally of the shoe.

19. That method of lasting shoes which comprises as steps causing gripping means to engage a narrow area of the margin of the shoe upper and to apply positive pull thereto in a direction such as to draw the upper snugly about the last, causing said gripping means to move uninterruptedly longitudinally of the margin and progressively to engage new portions of the margin while concomitantly releasing portions of the margin which it has previously gripped, but without at any time wholly releasing the margin, and progressively wiping in such portions of the margin as they are released from the gripping means.

20. That method of lasting shoes which comprises as steps exerting positive pull at a selected point in the margin of the shoe upper such as to draw the upper snugly about the last, progressively displacing the point of application of such pull along the margin by infinitesimal amounts, and as the point of application of pull advances, wiping in the marginal material just to the rear of the instant point of application of pull.

21. That method of lasting shoes which comprises as steps causing gripping means uninterruptedly and progressively to grip and thereafter to release narrow areas of the margin of the upper from point to point along the edge of the periphery of the shoe, and, while so gripping the marginal material, exerting positive pull thereon in a direction away from the last bottom thereby to stretch the upper about the last, progressively wiping in each such stressed area of the margin, inserting staples into the wiped-in areas and clenching the staples thereby permanently to anchor such wiped-in areas of the margin.

22. Method of lasting shoes which comprises as steps seizing a narrow area of the margin of the upper and positively stressing it in a direction substantially perpendicular to the bottom of

the last thereby to stretch it snugly about the last, concomitantly wiping a narrow area of the marginal material inwardly relatively to the edge of the last bottom at a point substantially in the vertical plane in which such stress is applied, and causing said stressing and wiping actions to progress uninterruptedly and by infinitesimal amounts about the periphery of the last bottom.

23. That method of lasting shoes which comprises as steps causing the margin of the upper to pass progressively through stressing, trimming and fastener-applying zones and concomitantly, in the several zones respectively, stressing, trimming and applying fasteners, respectively, to narrow areas of the margin of the upper.

24. That method of lasting shoes which comprises as steps exerting positive stress at a selected point in the margin of the shoe upper such as to draw the upper snugly about the last, progressively displacing the point of application of such stress along the margin by infinitesimal amounts and, as the point of application of stress advances, wiping the stressed marginal material inwardly with respect to the edge of the last bottom.

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