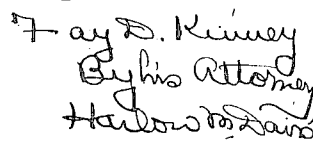


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METHOD OF AND APPARATUS FOR OPERATING ON THE SOLE EDGES OF RUBBER-SOLED SHOES

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This invention relates to methods of and apparatus for use in the manufacture of rubber-soled shoes and is herein exemplified with reference to operating on the edge portions of soles to effect their attachment to uppers.

In the manufacture of tennis shoes, for instance, an unvulcanized outsole is cemented to the lasted upper, the marginal portion of which adjacent to the sole usually carries a relatively narrow band of unvulcanized rubber, called the foxing, to which the sole edge is securely joined. The outsole is usually "laid" or pressed against the insole and the marginal edges of the upper or foxing by means of a press one element of which consists of a pneumatic, hydraulic, or other similar cushion abutment, which, together, with a co-operating pressing element, forces the outsole into intimate contact with the insole and bottom of the lasted upper over the entire attaching face of the outsole.

However, owing to the abruptly changing peripheral contour of the part of the shoe upper carrying the foxing and also its transverse convexity, it is impracticable by use of this means alone to join the extreme edge portion of the sole with the adjacent marginal portion of the upper or foxing around the entire edge of the sole. It is customary, therefore, to follow the sole laying operation by an operation which consists in pressing the marginal portion of the sole directly against the adjacent marginal portion of the upper or foxing in a direction substantially normal to its surface. This operation, commonly called "sole edge closing", is ordinarily carried out by hand by passing a knurled "stitch wheel" around the shoe both to imitate a stitched seam and to insure the tight attachment of the sole edge to the adjacent portion of the upper or foxing.

The success of this operation is dependent to a great extent upon the regularity of the edge of the outsole; that is, the "stitch wheel" must be pressed against the edge of the sole adjacent to the shoe and, if the sole edge is of different thickness in different places, the line of stitching at or near one margin of the edge will not appear to be parallel to the other margin of the edge. On the other hand, if a shoe having a slightly irregular sole is operated upon by means of the above-mentioned "stitch wheel" in such a way that the line of stitches is parallel to the lower margin of the sole edge, in places where the sole is relatively thin the stitch wheel will in all probability roll off the sole edge entirely; and in places where the sole is relatively thick the stitch wheel will pass so far from the edge of the sole as to be in-

effective for its principal purpose, namely, that of closing gaps between the sole edge and the adjacent portion of the upper which remain after the preliminary sole attaching operation.

It is, therefore, a general object of this invention to obviate the above difficulties and to provide improved methods of and apparatus for closing the sole edges of rubber-soled shoes. It is to be understood, however, that the invention is not limited in application only to the manufacture of rubber-soled shoes or to such shoes the soles of which are attached to the uppers by means of an adhesive substance; but the invention may have application in any aspect to the manufacture of shoes in which a gap between a rubber shoe-part and an adjacent attaching portion of a shoe is to be closed.

In view of the above it is one object of the present invention to provide an improved method by the use of which a gap between a sole and the attaching portion of the upper of a rubber-soled shoe may be closed. Thus the invention provides for pressing the sole edge against the adjacent portion of the upper or foxing by the progressive application of pressure to successive portions of the sole edge in a direction extending crosswise of the sole edge from the tread surface of the sole toward the upper. As herein disclosed, the above method is carried out by imparting a succession of wiping strokes against the edge of the sole.

Another important object of the invention is to provide an improved machine for performing operations such as that above referred to. To this end the machine in which the invention is illustrated as embodied is provided with means for closing the edge of the sole against the adjacent portion of the upper or foxing constructed and arranged to apply pressure to the sole edge in a direction extending crosswise of the sole edge from the tread surface of the sole toward the upper. The above means, as embodied in the illustrated machine, comprises a rotary tool having a peripheral rib which, when rotated in contact with the sole edge of a shoe, imparts wiping strokes to successive narrow sections extending across the edge of the sole as the sole edge is progressively presented to the tool. Preferably, and as herein illustrated, the rib is helical and hence, owing to its obliquity and the feed movement of the shoe, traverses the sole edge obliquely. The use of an operating tool of the above type results in excesses of material removed from the relatively "high" portions of the sole edge being carried along the sole edge some-

what ahead of the point of contact of the tool with the work. This material will therefore be carried into and fill the "low" spots in the sole edge, thereby effecting a continuous and regular attachment throughout its length between the sole edge and the adjacent portion of the upper or foxing.

In order further to insure a secure attachment between the sole edge and the upper and in accordance with another aspect of the method forming a part of this invention, the portion of the sole forming its attachment with the upper is beat against the adjacent portion of the upper simultaneously with the aforesaid crosswise pressing operation. This method is disclosed herein as being carried out by causing a rapid succession of blows to be imparted to the work in a direction substantially parallel to the tread face of the sole. Another important object of the invention is therefore to provide improved mechanism for carrying out this method, as well as for causing the above-described tool to impart a pressing action directed crosswise of the sole edge. To this end, the means for rotating the tool is also constructed and arranged to cause the tool as it is rotated to impinge upon the sole edge of a shoe held thereagainst. As herein illustrated, this tool rotating or operating means comprises an eccentric mounted on the shaft which supports the operating tool, which is arranged to rotate with the operating tool, and, bearing against a fixed abutment, vibrates the tool toward and from the sole edge with an amplitude corresponding to the throw of the eccentric.

In order to facilitate the positioning of the sole edge with respect to the tool, means constituting another feature of the invention is provided for controlling the shoe as its edge is progressively presented to the tool both radially and axially thereof. This means preferably comprises spaced guides arranged for contact with a portion of the shoe adjacent to the sole edge and a mounting for the tool arranged to allow the tool to move toward and from the guides in accordance with the change in position of the portion of the sole edge engaged by the tool with respect to the guides. The above-mentioned guides are constituted, as herein illustrated, by rolls disposed one at each side of the tool, the tool being yieldingly urged toward the rolls whereby it is caused to engage the sole edge of a shoe at all times when held in contact with the rolls.

Invention is also to be recognized in the provision, with guides of the type referred to above, of a rest associated with the tool adapted for engagement with the tread surface of the sole and constructed and arranged to position the sole edge in alinement with the work engaging face of the tool.

As the rubber in the sole of such a shoe as is operated upon by the machine disclosed herein is unvulcanized, it is relatively sticky; and it is desirable to reduce to a minimum the tendency of the rubber to stick to the operating tool. In view of the above, it is another object of the invention to provide means for lubricating the operating tool to prevent the adhesion of the unvulcanized rubber thereto. To this end the illustrated machine is provided with a lubricant reservoir in juxtaposition to the tool, the lubricant in which is transferred to the tool by means of an absorbent wiper arranged to engage the

rib of the tool and to impart a thin coating of lubricant thereto as the tool rotates.

Referring to the drawing,

Fig. 1 is a sectional elevation of an illustrative embodiment of the invention;

Fig. 2 is an oblique plan view of the mechanism shown in Fig. 1 as seen from a direction perpendicular to the tool shaft;

Fig. 3 is a view in perspective showing the operating tool and the work-guide means as seen from below and at the front of the machine;

Fig. 4 is a front view of the machine as illustrated in Fig. 2;

Fig. 5 is a view similar to Fig. 4 but showing the operating tool in one of the positions it occupies as the toe of a shoe is operated upon by it;

Fig. 6 is an elevational view of the operating tool and a work piece being operated on by the tool; and

Fig. 7 is an elevation of the parts as shown in Fig. 6, the operating tool being in a different position.

The supporting elements for the operating mechanism comprise a pedestal 10, a housing having parallel side plates 12 connected by a flange 14 which is secured to the top of the pedestal 10 by means of a bolt 16 and a frame 18 rotatably supporting a tool shaft 20. The frame 18 is mounted for pivotal movement with respect to the housing on trunnions 22 supported by the side plates 12 of the housing and engaging opposite sides of the frame 18. The frame 18 is thus arranged to swing in the housing in a vertical plane and its lowermost position is adjustably limited by means of a stop 24 having a head arranged to engage a brace 26 at the under side of the frame 18. The head of the stop 24 is eccentric with respect to the shank portion of the stop and can be secured in any position of adjustment in one of the side plates 12 of the housing by means of a clamp nut 28. The frame 18 is yieldingly urged toward its lowermost position by means of a spring 29 which connects a brace 30 extending between the side plates 12 of the frame 18 with the pedestal 10.

The tool shaft 20 is thus arranged not only to rotate about its own axis but also to pivot about the axes of the trunnions 22 which extend transversely of the axis of the tool shaft for a purpose to be hereinafter explained. Such pivotal movement of the shaft 20 is permitted on account of the mounting of a rear bearing element 32 for rotation on cone-pointed ends 34 of the trunnions 22. The tool shaft 20 is supported at its other end in a bearing 36 arranged to slide without any substantial turning movement between the side plates 12 of the frame 18. The bearing 36 is normally urged upwardly with respect to the frame 18 by a spring 38 the upper end of which is seated within a recess in the bottom side of the bearing 36 and the lower end of which is similarly seated in the brace 26 extending between the sides of the frame 18 at the front end thereof. The upward movement of the bearing 36 and hence the shaft 20 is limited by an eccentric 42 which is pinned to the shaft 20 adjacent to the bearing 36 and is arranged to engage a bearing plate 44 extending between the side plates 12 of the frame 18 at the upper front portion thereof. It will now appear that as the shaft 20 is rotated about its own axis it will also be rotated about the axes of the trunnions 22 by the eccentric 42 which

is constantly urged into contact with the bearing plate 44 by the spring 38. The tool shaft 20 is provided at its extreme right-hand end, as seen in Fig. 1, with a driving pulley 46 which may be driven by any suitable means such as a belt 48, as shown in the illustrated embodiment of the invention, which passes over idler pulleys 50 rotatably mounted on a shaft 51 supported by arms 52 extending downwardly from each side element of the frame 18.

The elements of the illustrated machine either directly effecting or assisting in the sole closing operation comprise a sole closing tool 54 fixed on the extreme left-hand end of the tool shaft 20 as seen in Fig. 1, a tread rest 56 arranged for contact with the tread face of the sole of the shoe when operated on in the machine, and a pair of guides 58 arranged to engage a shoe in the vicinity of the sole edge. The tool 54 comprises a hub 60 having a helical, peripheral rib 62 somewhat greater in length than 360 degrees and having a pitch of substantially the length of the heightwise dimension of the closed sole edge. As indicated in Figs. 6 and 7, the space between the successive portions of the rib where they overlap is about equal to the thickness of the rib, the work engaging surface of which is evenly rounded transversely.

The tread rest 56 comprises a frusto-conical roll rotatably mounted on a stud 64 which is threaded into the brace 26 in such a position that the edge of the sole of the shoe, when its tread face is held against the roll, is presented to the tool in alinement with the field of action of the tool in the manner indicated in Figs. 6 and 7, that is, so that the closed portion of the sole edge extends between the overlapping portions of the rib 62 when that portion of the tool is operating on the work. The guides 58 comprise rolls rotatably mounted on screws 66 secured at the lower ends of bars 68 which are adjustably fixed at the ends of a strut 70, extending between the side plates 12 of the housing, by means of screws 72 which pass through holes in the bars 68 and are threaded into the strut 70.

Secured to the forward end of the frame 18 and directly over the tool 54 is a reservoir 74 for holding a lubricant which, when applied to the rib 62 of the tool 54, prevents the material of the sole from adhering to the tool during the closing operation. The reservoir 74 is so disposed as to allow the rib 62 to extend into a hole in the bottom of the reservoir, the hole being covered by a wad of absorbent material 76 which acts as a wick to dispense lubricant continuously to the rib which rubs against the wad 76 constantly as the tool is rotated.

In the operation of the machine, a shoe sole the edge of which is to be closed, is presented to the machine the parts of which are disposed normally as indicated in Figs. 1 and 4; that is, the frame 18 is in its lowermost position, the brace 26 resting against the eccentric head of the stop 24. Two adjustments to be explained below first having been made, the shoe is held with the tread face of the sole against the tread rest 56 and the sole edge against the guides 58, and, keeping the above-mentioned parts of the shoe in contact with the corresponding guiding elements, the shoe is slowly turned in order to cause the point of operation of the tool on the sole edge to be transferred progressively about the sole edge. It will be apparent upon inspection of Fig. 5 that during the above operation the closing tool 54 will be bodily raised and lowered to some extent in

accordance with the relative elevation or depression of the part of the sole edge being operated on at any given instant with respect to the guide rolls 58; that is, when the toe of the shoe is being operated on, the closing tool 54 is in a relatively elevated position, as indicated in Fig. 5, and when the shank portions of the shoe are being treated the tool is in a relatively depressed position, the point of operation then being generally lower than the guide rolls 58. The above movement of the sole edge closing tool is allowed as previously described on account of the pivotal mounting of the frame 18 on the trunnions 22.

The above-mentioned adjustments are, first, the proper positioning of the bars 68 and hence the sole edge guides 58, so that when the toe of a shoe is operated on the sole edge closing tool will not be elevated unduly as a result of the tendency of the part of the toe being operated on to rise between the guides 58 in view of the relatively sharp curvature of this portion of the shoe. The guides 58 having thus been properly adjusted in view of the shape of the toe of the shoe to be operated on by the machine, the lowermost position of the frame 18 is next established by adjusting the stop 24 so that there is a slight amount of clearance between the brace 26 on the frame 18 and the adjacent portion of the stop 24 when that portion of the shoe is presented to the machine which allows the tool to occupy its lowermost position.

It will now appear that as the shoe is turned so that its entire sole edge is progressively operated on by the tool, the tool and the frame 18 will have been swung about the trunnions 22 in accordance with the changing shape of the sole edge. It is therefore apparent that the tool is in a relatively elevated position when operating on a convex portion of the sole edge and in a relatively depressed position when operating on a concave portion of the sole edge. It is assumed that the drive shaft 20 is being rotated rapidly in the direction indicated in Fig. 1 by means of the pulley 46 and the belt 48 which is connected to any suitable source of power. The rotation of the tool shaft 20 in this direction causes the point of operation of the rib 62 on the work to progress crosswise of the sole edge outwardly or in a direction extending from the tread face of the sole edge as ordinarily presented to the tool toward the attaching face thereof and the adjacent portion of the upper or foxing. Moreover, owing to the rapid rotation of the tool it is apparent that the pressure exerted by the rib 62 will result in wiping strokes being imparted against the sole edge in rapid succession in the above-indicated direction. Defined with respect to the tool, this direction is substantially parallel to that of the tool's axis of rotation, but owing both to the helix angle of the rib 62 of the illustrated tool and the normal speed with which the sole edge is progressively presented to the tool, the actual direction of the pressure exerted by the rib 62 with respect to the sole edge is oblique thereto and makes one side of an acute angle, the other of which is the direction of the sole edge at the point being operated upon or the direction of feed.

This operation of the tool results, in part, from the fact that the rib 62 of the tool does not engage the sole edge at only a point, but is embedded somewhat at that side to which the sole edge is first presented by material which has been removed from relatively "high" portions of the sole edge. This excess of sole material is

urged, with respect to the tool, in a direction substantially perpendicular to the helix angle at the lowermost point of engagement of the tool on the work; and this direction makes an acute angle with both the sole edge and the direction of feed. Moreover, owing to feeding movement of the sole edge, the actual direction of the force imparted to the sole edge through this excess material is at even a smaller acute angle than that referred to above.

As a result of the advance of the helix of the rib 62 crosswise of the sole edge, the excess material of the edge of the sole removed from a relatively high portion heightwise or crosswise thereof, the shoe being held as indicated in Fig. 6, is carried toward the adjacent portion of the upper or foxing, forming an attachment between the sole and the adjacent portion of the upper or foxing which is substantially continuous with the direction of the upper or foxing at the joint between them. Moreover, as the point of operation of the tool on the sole edge is transferred thereabout, the excess material of the sole edge which has been removed from a relatively high portion of the sole edge, considered peripherally, is pressed into the gap between the sole and the adjacent portion of the upper or foxing at such points along the periphery of the sole where it is relatively low.

In addition to the lateral pressure of the tool on the work owing to the obliquity of the rib 62, some force is also exerted directly toward the work in a direction normal to the region of the point of attachment between the sole edge and the adjacent upper or foxing by reason of the fact that the sole edge of the shoe must, of course, be held in contact with the operating tool by the operator. However, the portion of the sole edge which forms the attachment between the sole edge and the adjacent portion of the upper or foxing is also forced against the portion with which it is in engagement by a rapid succession of blows from the tool which is moved so as to impinge upon the sole edge in a direction normal to the sole edge at the point being operated on, on account of the provision of the eccentric 42 on the drive shaft 20. The tool 54 is thus rapidly oscillated bodily a certain amount in a plane including the axis of rotation of the tool and the work-engaging surface of the tool at the operating point, corresponding to the throw of the eccentric 42, about the cone-pointed ends 34 of the trunnions 22 which are seated in similarly shaped sockets in the bearing element 32. The sole edge of the shoe is therefore subjected to pressure crosswise thereof and also simultaneously therewith is beat against the adjacent portion of the shoe.

As mentioned above, as the rib 62 of the tool turns in engagement with the wad 76 of absorbent material, the latter supplies a thin coating of lubricant to the operating surface of the rib 62, thereby to assist in preventing the relatively sticky, unvulcanized material of the sole edge of the shoe being operated on from adhering to the rib 62.

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

1. That improvement in methods of closing the sole edge of a rubber-soled shoe by pressing the sole edge against the adjacent portion of the upper or foxing characterized by the progressive application of pressure to successive portions of the sole edge in a direction extending crosswise

of the sole edge from the tread surface toward the upper.

2. That improvement in methods of closing the sole edge of a rubber-shoe which consists in progressively applying pressure to successive portions of the edge of the sole in a direction which is oblique to the direction of the sole edge.

3. That method of closing the sole edge of a rubber-soled shoe which consists in imparting a succession of wiping strokes against the sole edge in a direction extending from the tread surface toward the attaching surface of the sole.

4. That improvement in methods of closing the sole edge of a rubber-soled shoe which consists in pressing the sole edge crosswise thereof against the adjacent portion of the upper or foxing, and simultaneously beating the sole edge against said adjacent portion of the shoe.

5. That improvement in methods of closing the sole edge of a rubber-soled shoe which consists in pressing the sole edge crosswise thereof against the adjacent portion of the upper or foxing, and simultaneously beating the sole edge against the adjacent portion of the shoe in a direction substantially parallel to the tread face of the sole.

6. That improvement in methods of closing the sole edge of a rubber-soled shoe which consists in applying pressure to the portion of the sole edge adjacent to the upper or foxing in a direction extending obliquely across the sole edge, and simultaneously beating the sole edge against the adjacent portion of the shoe, thereby to insure a secure connection therebetween.

7. That improvement in methods of closing the sole edge of a rubber-soled shoe which consists in imparting a succession of wiping strokes to the sole edge crosswise thereof, and simultaneously beating the sole edge against the adjacent portion of the shoe in a direction substantially parallel to the tread face of the sole.

8. That improvement in methods of closing the sole edge of a rubber-soled shoe which consists in applying pressure to the sole edge in a direction extending from the tread surface of the sole toward the adjacent portion of the shoe to form an attachment between the sole edge and the adjacent portion of the upper or foxing, and simultaneously beating the material forming said attachment against the portion of the upper engaging it thereby to insure a secure connection therebetween.

9. That improvement in methods of closing the sole edge of a rubber-soled shoe which consists in applying pressure progressively to successive portions of the sole edge in a direction extending from the tread face of the sole toward the adjacent portion of the shoe or foxing to form an attachment between the sole edge and the adjoining portion of the upper or foxing, and simultaneously beating the attaching portion of the sole edge against the engaging portion of the upper or foxing.

10. That improvement in methods of closing the sole edge of a rubber-soled shoe which consists in imparting wiping strokes against the sole edge in a direction extending from the tread face of the sole toward the adjacent portion of the upper to form an attachment between the sole edge and the adjoining portion of the upper or foxing, and simultaneously beating the attaching portion of the sole edge against the portion of the upper engaging it in a direction substantially parallel to the tread face of the sole.

11. In a machine for operating on rubber-

soled shoes, sole edge closing means adapted for engagement with the edge of the sole and mounted for continuous movement longitudinally of the sole at the operating point, means for moving
 5 said closing means, said closing means also being constructed and arranged to impart a succession of wiping strokes in a direction extending crosswise of the sole edge from the tread surface of the sole toward the upper in order to
 10 effect the attachment of the marginal portion of the sole to the adjacent portion of the upper.

12. In a machine for operating on rubber-soled shoes, rotary means for closing the edge portion of the sole against the adjacent portion of the
 15 upper or foxing, means for rotating said closing means, said closing means having a peripheral sole engaging portion constructed and arranged to apply pressure to the sole edge in a direction extending from the tread face of the sole toward the upper.
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13. In a machine for operating on rubber-soled shoes, a rotatable tool, and means for positioning a shoe with respect to the tool so that the plane of rotation of the tool parallels the plane of the
 25 sole, said tool being constructed and arranged to act upon the edge portion of the shoe sole in a direction extending crosswise thereof to close the gap between the sole edge and the upper.

14. In a machine for operating on rubber-soled shoes, sole edge closing means constructed and arranged to impart a wiping stroke across the
 30 edge portion of a shoe sole in a direction extending toward the adjacent portion of the upper or foxing, and means for operating said means constructed and arranged to cause the
 35 latter also to beat the edge portion of the sole against the adjacent portion of the shoe.

15. In a machine for operating on rubber-soled shoes, sole edge closing means constructed and
 40 arranged to exert a pressure against the sole edge crosswise thereof to urge the edge portion of the sole against the adjacent portion of the upper or foxing, and means for operating said sole edge closing means constructed and arranged to cause
 45 the latter to beat the edge portion of the sole against the adjacent portion of the shoe in a direction substantially parallel to that of the tread face of the sole.

16. In a machine for operating on rubber-soled shoes, sole edge closing means, and means for
 50 operating said closing means to close the gap between the sole edge and the upper, said closing means being constructed and arranged when operated both to exert a pressure on the sole
 55 edge crosswise thereof, and also to beat the sole edge with a succession of blows directed substantially parallel to the tread face.

17. In a machine for operating upon rubber-soled shoes, means adapted for engagement with
 60 the sole edge for pressing it against the adjacent portion of the upper or foxing mounted for movement in the direction of the sole edge at the point of pressure and arranged to exert pressure against the sole edge in a direction extending
 65 obliquely across it, and means responsive to the movement of the first mentioned means to cause it to beat the sole edge against the adjacent portion of the upper or foxing.

18. In a machine for operating upon rubber-soled shoes, a rotating tool for imparting a succession of applications of pressure across the sole
 70 edge to urge it against the adjacent portion of the upper or foxing, and means associated with said tool constructed and arranged to cause the
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tool to beat the sole edge against the upper or foxing when the tool is rotated.

19. In a machine for operating on rubber-soled shoes, a rotating sole edge treating tool, and
 5 means for rotating said tool, said tool being constructed and arranged simultaneously to impart a succession of wiping strokes in one direction with respect to the sole edge and a succession of blows against the sole edge in another direction, thereby to close the gap between the sole edge
 10 and the upper.

20. In a machine for closing the sole edge of a rubber-soled shoe, a rotating tool, means for rotating said tool, said tool being shaped and arranged progressively to exert pressure against
 15 successive narrow widths of the sole edge as it is progressively presented to the tool, and said rotating means being constructed and arranged to cause the tool to impinge upon the sole edge in a direction substantially parallel to that of the
 20 tread face of the sole.

21. In a machine for operating upon rubber-soled shoes, a rotating tool, and means for rotating the tool, the work engaging surface of said
 25 tool being constructed and arranged to exert a pressure against the sole edge of the shoe in a direction extending crosswise of the sole edge and the upper in order to close the sole edge against the upper.

22. In a machine for operating upon rubber-soled shoes, a rotating tool having a peripheral
 30 rib, said tool being constructed and arranged to engage the sole edge of a shoe held in engagement therewith and to urge it toward the adjacent portion of the upper or foxing, and means for
 35 positioning the shoe radially and axially of the tool.

23. In a machine for operating upon rubber-soled shoes, a rotating sole edge closing tool, means for rotating the tool, and means comprising
 40 sole edge and tread surface engaging members constructed and arranged respectively to position the shoe radially and axially of the tool.

24. In a machine for operating upon rubber-soled shoes, a rotary tool for closing the sole edge
 45 having a helical work engaging rib, the pitch of said rib being substantially equal to the width of the sole edge when closed against the upper, and means for positioning a shoe with respect to said tool so that the portion of the sole edge to be
 50 treated is aligned with the field of action of the rib.

25. In a machine for operating upon rubber-soled shoes, a rotating tool having a peripheral
 55 work engaging face, said tool being constructed and arranged to close the edge of the sole of a rubber shoe held thereagainst by forcing the material at the edge of the sole against the adjoining portion of the upper or foxing in substantially the direction of the axis of rotation of the
 60 tool.

26. In a machine for operating upon rubber-soled shoes, a rotary tool, means for controlling the position of a shoe to be operated upon with respect to the axis of the tool, and means associated with said tool for aligning the sole edge of the shoe with the operating face of the tool, said
 65 last-mentioned means being constructed and arranged to be displaced with respect to the controlling means according to the change in curvature of the sole edge as it is progressively fed past the tool.

27. In a machine for operating upon rubber-soled shoes, a sole edge closing tool, means for controlling the position of a shoe with respect to
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the tool comprising spaced guides arranged for contact with the portion of the shoe adjacent to the sole edge, and a mounting for the tool arranged to allow the tool to move toward and from said guides in accordance with the change in position of the portion of the sole edge engaged by the tool with respect to the said guides.

28. In a machine for operating upon rubber-soled shoes, a sole edge closing tool, means for positioning a shoe to be operated upon with respect to the tool comprising rolls disposed one at each side of the tool, said tool being yieldingly urged toward said rolls whereby it is caused to engage the sole edge of a shoe presented to the machine in contact with said rolls.

29. In a machine for operating upon rubber-soled shoes, a yielding sole edge closing tool, means for positioning a shoe as its sole edge is progressively presented to said tool comprising guides arranged for contact with the periphery of the shoe adjacent to the sole edge, and a rest associated with said tool adapted for engagement with the tread surface of the sole constructed and arranged to position the sole edge in alignment with the work engaging face of the tool.

30. In a machine for operating upon rubber-soled shoes, a sole edge closing tool, means for positioning a shoe with respect to the tool as its sole edge is progressively presented thereto comprising spaced guides adapted for engagement with the periphery of the shoe adjacent to the sole, a pivoted mounting for the tool arranged to allow the tool to swing away from said guides in contact with the shoe presented thereto, and a rest on said tool mounting adapted for engagement with the tread surface of the sole of the shoe in order to position its sole edge in alignment with the work engaging face of the tool.

31. In a machine for operating upon rubber-soled shoes, a tool for closing the sole edge against the adjacent portion of the upper or foxing, means for controlling the position of the shoe as it is rotated progressively to present its sole edge to the tool, said tool being arranged to move with respect to said controlling means in accordance with the change in contour of the sole edge being operated upon, and means for adjustably limiting the movement of the tool toward the controlling means to facilitate presentation of the work to the tool.

32. In a machine for operating upon rubber-soled shoes, a rotary tool having a helical work engaging rib, means for controlling the position of a shoe to be operated upon with respect to the axis of the tool, and means associated with said tool for aligning the sole edge of the shoe with the operating face of the tool, said last-mentioned means being constructed and arranged to be displaced with respect to the controlling means according to the change in curvature of the sole edge as it is progressively presented to the tool.

33. In a machine for operating upon rubber-soled shoes, a tool for closing the sole edge against the adjoining portion of the upper or foxing, relatively fixed means for controlling the work as it is moved progressively to present the sole edge to the tool, a pivotal mounting for the tool, and means connected therewith resiliently to urge the tool into contact with the sole edge as the shoe is moved against the controlling means.

34. In a machine for operating upon rubber-soled shoes, a housing, a rotatable shaft journaled in said housing and arranged to pivot at one end thereof about an axis perpendicular to its axis of rotation, a tool on the opposite end of said

shaft for closing the sole edge of a rubber shoe against the adjoining portion of the upper or foxing, and a cam on said shaft engaging said housing arranged to cause the tool to be moved transversely with respect to its axis of rotation as it is rotated.

35. In a machine for operating upon rubber-soled shoes, a housing, a rotatable shaft journaled in said housing and arranged to pivot at one end thereof about an axis perpendicular to its axis of rotation, a tool on the opposite end of said shaft for closing the sole edge of a rubber shoe against the adjoining portion of the upper or foxing, a cam on said shaft arranged to engage the housing, and connections between said shaft and said housing for resiliently holding said cam in engagement with said housing.

36. In a machine for operating upon rubber-soled shoes, a housing, a rotatable shaft journaled in said housing and arranged to pivot at one end thereof about an axis perpendicular to its axis of rotation, a tool on the opposite end of said shaft for closing the sole edge of a rubber shoe against the adjoining portion of the upper or foxing, a cam on said shaft arranged to engage the housing, connections between said shaft and said housing for resiliently holding said cam in engagement with said housing, and means attached to said housing for aligning the sole edge being operated upon with the operating face of the tool.

37. In a machine for operating upon rubber-soled shoes, a tool for closing the sole edge against the adjacent portion of the upper or foxing, means for rotating said tool, and means constructed and arranged to cause the tool to be oscillated toward and away from the sole edge as the tool is rotated.

38. In a machine for operating on rubber-soled shoes, a tool constructed and arranged to close the edge of a sole against the adjacent portion of the upper or foxing, means for rotating said tool, and means constructed and arranged rapidly to vibrate said tool as it rotates to beat the edge of the sole against the adjacent portion of the upper or foxing thereby to insure a secure attachment of the sole edge to the upper or foxing.

39. In a machine for operating on rubber-soled shoes, a rotatable tool constructed and arranged to close the edge of a sole against the adjacent portion of the upper or foxing and mounted to swing in a direction substantially parallel to the tread face of the sole, and means for causing said tool to swing as it is rotated thereby to force the closed edge of the sole against the adjacent portion of the upper or foxing in a direction substantially parallel to the tread face of the sole.

40. In a machine for operating upon the unvulcanized sole of a rubber-soled shoe, a tool for closing the edge of the sole against the adjacent portion of the upper or foxing, and means for lubricating said tool to prevent adhesion of the unvulcanized sole to the tool.

41. In a machine for operating upon an unvulcanized sole of a rubber-soled shoe, a tool for closing the edge of the sole against the adjacent portion of the upper or foxing, a lubricant reservoir in juxtaposition to said tool, and means for conducting lubricant from the reservoir to the tool whereby the tool is lubricated as it rotates to prevent the adhesion of the unvulcanized rubber of the sole being operated upon to the tool.

42. In a machine for operating upon the unvulcanized sole of a rubber-soled shoe, a tool for closing the edge of the sole against the adjacent portion of the upper or foxing, a lubricant reservoir in juxtaposition to said tool, and an absorbent

wiper in said reservoir in engagement with said tool arranged to impart a thin coating of lubricant on the work engaging face of said tool as it rotates.

43. In a machine for operating upon shoe soles, a rotatably mounted tool for operating upon a sole edge, means for rotating the tool, means for positioning the sole axially of the tool whereby the sole edge is alined with the operative surface of the tool, and means for causing the tool to be vibrated in a direction extending directly toward and away from the sole edge as the tool is rotated.

44. In a machine for operating upon shoe soles, a rotatably mounted tool, means for rotating the tool, said tool also being mounted for movement in a direction substantially normal to the work-engaging surface of the tool at the operating point, a guide for positioning the edge of a sole held thereagainst in alinement with the operative surface of the tool, and means for causing said tool rapidly to impinge upon the sole edge held thereagainst as the tool is rotated.

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