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Braun

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[54] **METHOD AND APPARATUS FOR MANUFACTURING SHOES**

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Apr. 11, 1973 Germany............................ 2318206

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[51] **Int. Cl.**.. **A43d 21/00**
[58] **Field of Search**................................ 12/8.3, 145

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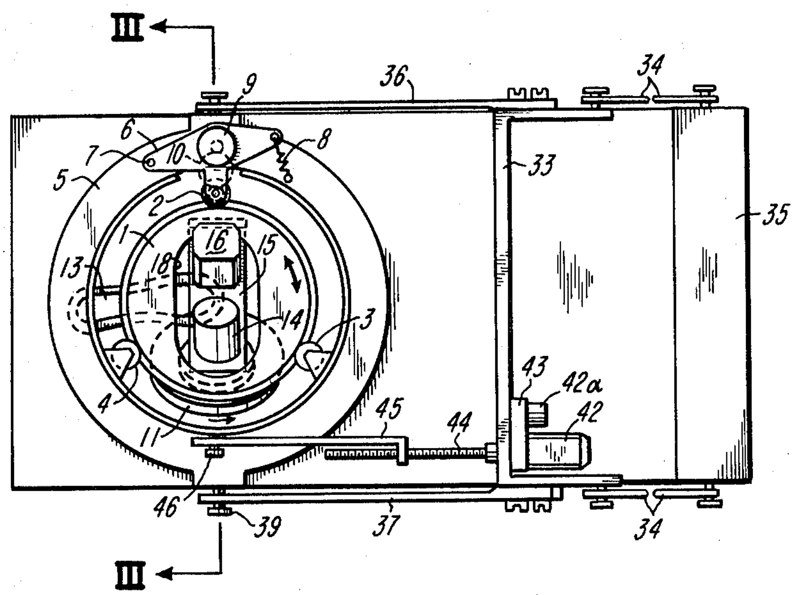
[57] **ABSTRACT**

A method and apparatus for manufacturing shoes, especially for working the lower edge of the upper over the periphery of the bottom of the shoe. A cup shaped rotary tool is mounted for rotation on an axis inclined to the shoe sole and with a region of the rim of the tool engaging the sole near the periphery. The tool follows a closed path about the shoe sole and wipes the edge of the upper toward the center of the sole. The tool is rotated on its axis. The tool is caused to traverse the sole longitudinally along each side of the sole and is rotated bodily at each end of the sole to cause the region of the rim of the tool engaging the sole to follow a closed path around the sole with the said region also moving substantially perpendicularly to said path toward the center of the sole due to the rotation of the tool on its axis.

21 Claims, 5 Drawing Figures



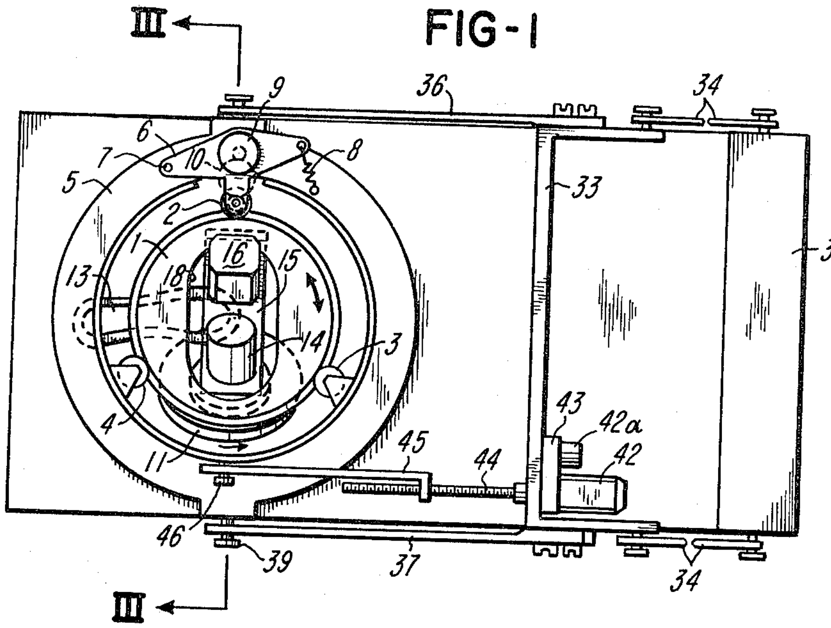

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FIG-1

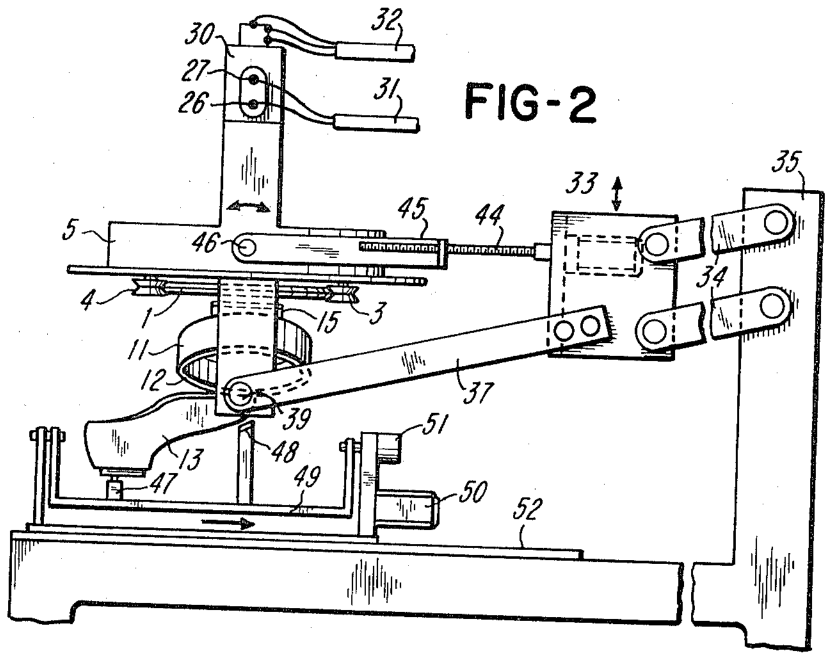
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FIG-2

FIG-3

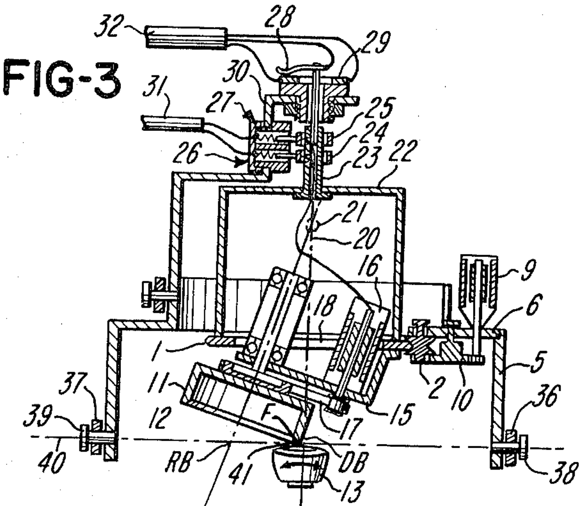
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FIG-5

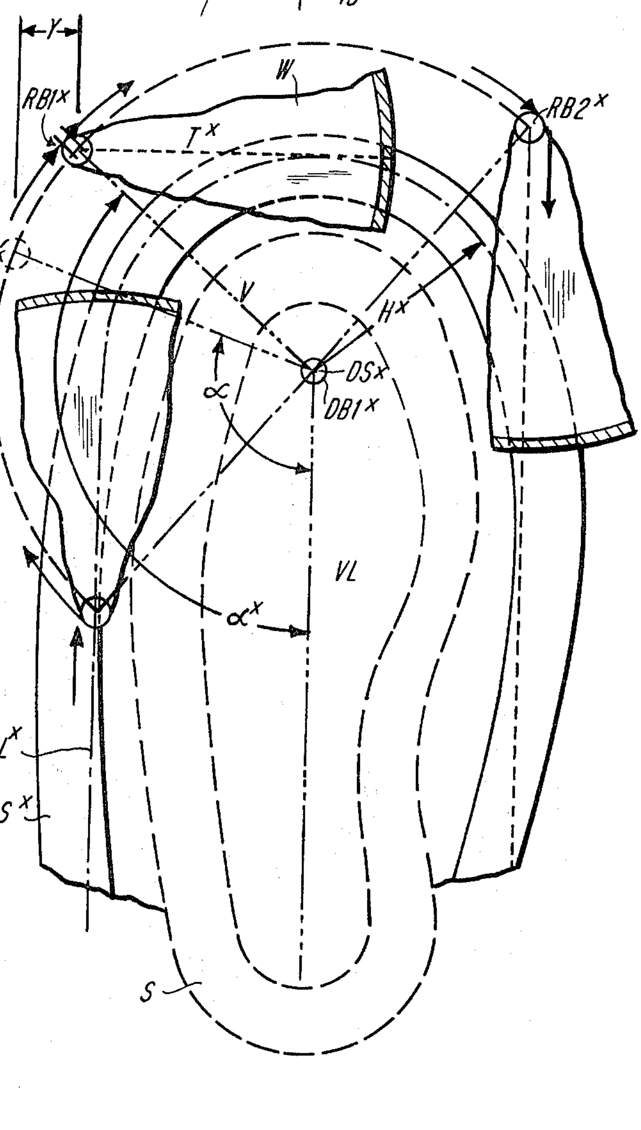
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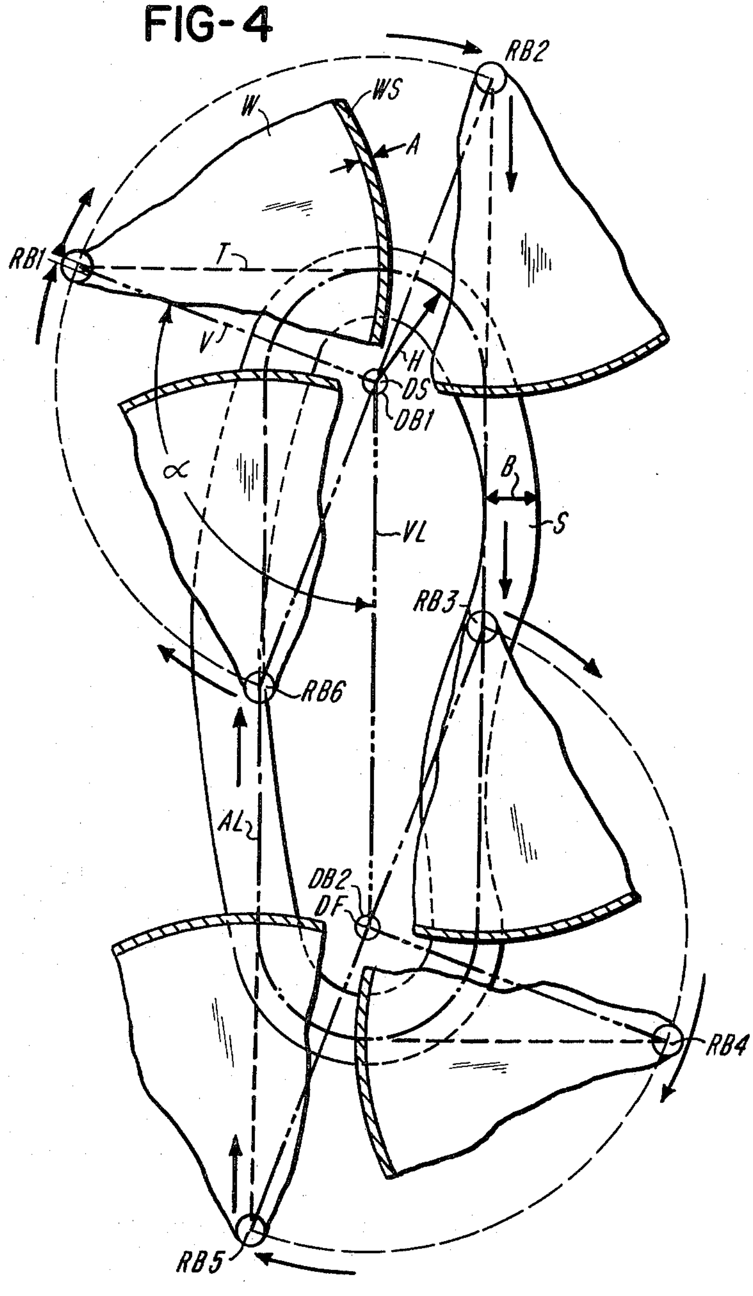
FIG-4



METHOD AND APPARATUS FOR MANUFACTURING SHOES

The present invention relates to a method for working the wedge fold (Zwickeinschlag) of a lasted shoe while employing a pot-shaped, cup-shaped, bell-shaped, or similar tool, the end face of which works the wedge fold during a relative movement between the tool and shoe all the way around. Always only one surface zone of the tool which so corresponds to the width of the wedge fold is engaging the shoe, and the axis of rotation of the tool intersects an imaginary base plane with adjustable angle of inclination in the so-called axis of rotation reference point, said base plane corresponding at least approximately to the shoe bottom.

The invention also concerns a device for holding and guiding a lasted shoe relative to a rotating knocking or roughing tool, for instance, a combined knocking and roughing tool for purposes of working the wedge fold.

Automatic working machines are known according to which a lasted shoe will, during a relative movement of the tool, be worked along the wedge fold. In order to assure that the tool will follow the contour of the shoe, the shoe is pivoted about a pivot axis extending in the longitudinal extension of the shoe. As a result thereof, during a pivot position, for instance, the left wedge fold is presented to the tool, and for working the right-hand wedge fold, the shoe is moved in the opposite pivoted position. In this connection, it is endeavored to work the wedge fold all the way around in a kind of wiping movement, always from the outside toward the inside, so that seams will be torn open. For instance, when employing a pot-shaped tool, the narrow edge on the end face serves for machining, the tool is pivoted about a pivot axis which is perpendicularly aligned with the axis of rotation of the tool and with the pivot axis of the shoe. By a fine corresponding pivoting of the shoe and of the tool, the above mentioned machining effect can be obtained.

The necessity of carrying out pivot movements carefully adjusted with regard to each other results either in templets to be produced by expensive and long procedures, or results in an electronic control which is inadmissibly expensive, thereby presenting a considerably drawback.

It is, therefore, an object of the present invention to provide a method for working or machining the wedge fold, which while resulting in a high quality machining permits a clear and extremely simple control possibility in order to be able to employ an electronic control with economically admissible costs.

These objects and other objects and advantages of the invention will appear more clearly from the following specification, in connection with the accompanying drawings, in which:

FIG. 1 is a top view of a device according to the invention.

FIG. 2 shows a side view of FIG. 1.

FIG. 3 represents a section through the device of FIG. 1, said section being taken along the line III—III of FIG. 1.

FIG. 4 is a diagrammatic view for explaining the machining method according to the method.

FIG. 5 illustrates a diagrammatic view similar to and supplementing that of FIG. 4.

The method according to the present invention is characterized primarily in that the tool is moved in a relative movement to and about the wedge fold in such a way that the connecting line between the reference point of the axis of rotation and a surface point of the surface zone of the tool respectively engaging the shoe will always at least approximately, be tangentially aligned with an imaginary working line which averages (ausmittalt) the wedge fold around the shoe along an arena-shaped contour while said working line describes a semicircle at the tip side and at the heel side, said semicircle being connected by substantially straight lines.

The main emphasis is on the arena-shape contoured working line which is composed of the semicircular arcs and straight lines. As a result thereof, an advantageous simplified control is obtained simultaneously with an improvement in the quality of the machining result.

The method according to the invention furthermore results in a control which can be effected in a particularly simple manner because merely a rectilinear reciprocatory movement of the reference point of the axis of rotation is to be combined with a simple rotary movement of the reference point of the axis of rotation.

According to a further development of the invention, the successive method steps during the complete machining of a shoe may be carried out in such a way that the rotary movement by an angle of 90° or 180° of the refernce point of rotation will furnish an advantageously clear and simple machining diagram. Due to the inclusion of an angle of attack, the possibility is realized to consider in a simple manner the size of the shoe without necessitating a change in the working program.

If according to an advantageous development of the invention the adjustment of the angle of pitch or attack is effected somewhat in the manner of a follow-up control system automatically in conformity with a control factor representing the shoe size, it will be assured that the wedge fold of a small shoe will precisely like that of a large shoe be worked in an optimum manner during a wiping movement from the outside toward the inside transverse over the wedge fold.

A further object of the invention consists in providing a device which, while consisting of a simple construction, will make possible a tool guidance which improves the machining or working operation. Above all, it is an object of the invention by a suitable structural design to bring about a simplification of the complicated pivoting movements between shoe and tool as they have been necessary heretofore with heretofore known machining automats.

It is still another object of this invention to provide a device for holding and guiding a shoe placed upon a last, relative to a rotating knocking or roughening tool, or a combined knocking or roughening tool for machining or working the wedge fold, which device will, in particular, be suitable for carrying out the machining operation according to the invention.

These last mentioned objects have been solved according to the invention by providing a supporting element for the rotating tool and by rotatably journaling the supporting element for rotation about an axis in a holding frame.

Referring now to the drawings in detail, the arrangement shown in FIG. 1 comprises a supporting element 1 in the form of a circular disc. The circular disc is held between three guiding rollers 2, 3 and 4, which are journaled in a holding frame **5**. The guiding roller **2** is mounted on a lever **6** which has one end thereof linked through a bolt **7** to a holding frame **5**, whereas its other end has suspended thereon a tension spring **8** which is connected to the holding frame **5**. The lever **6** furthermore supports an electric motor **9** which is adapted through a diagrammatically indicated transmission **10** to drive the guiding roller **2** and thereby to rotate the supporting element **1**. The transmission of the torque from the guiding roller **2** to the supporting element **1** may, in an advantageous manner, be effected by friction, inasmuch as between the small guiding roller **2** and the large supporting element **1** a high stepdown ratio is provided.

With reference to FIG. **3**, the device according to the present invention comprises a pot-shaped tool **11**, the end face **12** of which acts upon a shoe **13** to be worked, and is mounted on a plate **15** by means of a diagrammatically indicated spindle **14**. Likewise arranged on said plate **15** is an electric motor **16** which drives tool **11** through the intervention of a belt **17**. In order to assure that for purposes of increasing the stability, the mounting of the supporting element **1** can be placed as close to the point of action of tool **11** on shoe **13** as possible, the supporting element **1** is provided with a cutout **18** (FIGS. **1** and **3**) through which the spindle **14** and the electric motor **16** extend. Plate **15** is inclined relative to the supporting element **1** by an angle of from 5° to 60°, preferably from 15° to 20° and is connected to said supporting element **1** in such a way that the extensions of the axes, namely the axis of rotation **19** of the tool and the axis of rotation **20** of the supporting element **1** intersect in a point **21**.

In view of this fixedly mounted angular position, advantageously the required pivoting movements between the tool and the shoe are reduced, especially during the machining or working of the tip and heel regions. A tube **23** is connected to a yoke **22** which is mounted on the supporting element **1**. This tube **23** carries in an electrically insulating manner, two collector rings **24** and **25** through the intervention of which by means of two collector contacts **26** and **27** the electric connection with the electric motor **16** is established. As means for representing the momentary rotary position of the supporting element **1**, there is in FIG. **3**, for instance, a potentiometer diagrammatically indicated the movable collector contact of which is coupled to the tube **23** and the fixed resistor path **29** together with the collector contacts **26** and **27** is held fast on an angular extension **30** of the holding frame **5**. Electric cables are designated with the reference numerals **31** and **32**. The last mentioned details are not shown in FIG. **1** in order not unnecessarily to clog up the showing of FIG. **1**.

FIG. **2** in combination with FIG. **1** shows as an example the additional construction of a processing machine according to the invention. A frame **33** is, by means of the pivot arms **34**, vertically movably linked to a machine frame **35**. Supporting arms **36**, **37** are rigidly connected to both sides of frame **33**. At the end of the supporting arms **36** and **37**, the holding frame **5** is mounted for a limited movement. The pivot axis **40** which extends through the bearing bolts **38** and **39** is vertically aligned with the supporting axis **20** of the supporting element **1**, and the two axes **40** and **20** intersect at **41**, which point of intersection is located in a base plane which at least approximately corresponds to the shoe bottom.

A pivot drive consists, for instance, of an electric motor **42** which through a transmission **43** drives a threaded spindle **44**. An angle arm **45** is adapted on one hand to carry out a reciprocating movement on the threaded spindle **44** in conformity with the rotation of said spindle, and on the other hand is linked to a holding frame **5** by means of a bearing bolt **46**.

For purposes of representing the respective temporary pivot position of the holding frame **1**, for instance, a commercial potentiometer **42*a*** may be coupled to the transmission **43**. The shoe to be machined is, by means of a heel mandrel **47** and a tip support **48** held in a pivotal frame **49** which has a pivot drive **50**. The shoe **13** will thus be pivotable about a pivot axis which extends approximately in the longitudinal direction of the shoe. For illustrating this pivot movement, again a potentiometer **51** may be employed.

By moving shoe **13** along a sliding path **52**, by turning the supporting element **1**, and if necessary by pivoting the holding frame **5** and tilting the pivot frame **49**, any portion of the wedge fold may be machined in any desired alignment of the machining grooves caused by the tool. The described device is not limited to the employment of the machining mount according to the invention, even though it is particularly suitable for this method.

The essential geometric conditions for the machining method according to the invention are, for purposes of a better illustration and definition reduced mentally into a two-dimensional plane which at least approximately corresponds to the shoe bottom and henceforth is to be called the base plane. Thus, in FIGS. **4** and **5** all axes are illustrated at the respective portions as points where they penetrate the base plane. Thus, the point of intersection of the axis of rotation of the supporting element with the base plane will henceforth be called the reference point DB of the axes of rotation. This reference point DB is, during the relative DF. between shoe S and holding frame (for instance holding frame **5**, according to FIGS. **1–3**), placed along the distance designated as feed line VN and in the end positions will coincide with a so-called tip rotary point DS or with a heel rotary point DV. FIG. **4** shows the two positions of said reference point, while the timewise sequence in which these positions will be taken are indicated by indices corresponding to DB1 and DB2. Furthermore, different successive positions of a rotary reference point RB are indicated by indices. The rotary reference point RB is meant to indicate the point of intersection of the axis of rotation of a tool W (for instance tool **11** according to FIGS. **1–3**) with the base plane and is displaced by turning the supporting element about the reference point DB.

The tool W has been shown as segment only in the various positions. The shading indicates the end face WS acting upon the shoe. The width A of the end face WS and the width B of the wedge fold determine the emphasized surface zones which illustrate the contact surface of the tool W with the shoe S.

In conformity with the invention, the tool W is in a relative movement moved around the wedge fold in such a way that a connecting line T between the reference point RB of the axis of rotation and a surface point F of the respective surface zone of the tool in contact with the shoe S will always at least approximately be arranged tangentially to an imaginary working line AL which averages out arena like the wedge fold around the shoe. By "averaging out" is meant that the surface parts of the wedge fold which are confined by the working line amount to approximately from 30 to 50 percent of the surface parts remaining outside. The working line AL respectively describes a semicircle about the turning points DS of the tip and the turning point DF of the heel, and the semicircles are connected by straight lines.

For purposes of starting the machining operation, the reference point DB1 of the axis of rotation is by longitudinally moving the shoe S or the supporting element caused at least approximately to coincide with the point of rotation DS of the tip. Minor deviation may result by the lateral pivoting of the shoe S about a pivot axis extending in its longitudinal direction during the following machining operation, whereby alternately the left and the right part of the wedge fold is, in a suitable manner, exposed to the tool W. Depending on the distance at which said pivot axis is spaced from the base plane, the pivot movement of the shoe brings about a differently great lateral displacement of the contour of the wedge fold relative to the advancing line VL determined by the way in which the tool is guided. By structural steps, however, said pivot axis may be placed into the base plane or at least very close thereto so that this influence will be negligible. However, first the starting position of the reference point RB1 of the axis of rotation has to be set before the tool W will engage the shoe S. This position has to be so selected that the connecting line T of RB1 is directed tangentially with regard to the work line AL. This requirement would be met in each position of RB on the semicircle between RB6 and RB2.

According to a further development of the method according to the invention, the required rotary movements of the supporting element about its axis of rotation are to be simplified by employing only rotary movements precisely by angles of 90°. Thus, for the starting position, only the positions shown in FIG. **4** are to be employed. Tests have proved that the position RB1 brings about the best machining quality of the tip area. In this position the connecting line V from the reference point RB1 of the axis of rotation to the reference point DB1 of the axis of rotation defines with the advancing line VL an angle α which meets the relationship $\alpha = 90° + \sin (H/V)$. In this equation, H stands for half the diameter of the semicircle at the tip side of the working line AL, whereas V stands for the distance of the reference point RB of the axis of rotation from the reference point DB of the axis of rotation. In this position, the tool W is for the first time brought into contact with the shoe S. While the tool W which rotates, for instance, in clockwise direction acts upon the wedge fold, the reference point of the axis of rotation is turned by 90° in the direction of the arrow into the position **RB2.** Thereupon, for instance, by displacement of the shoe in feeding direction, the reference point DB of the axis of rotation is moved along the advancing line VL until in position **DB2** which coincides with the point of rotation DF of the heel. From the thus obtained position **RB3,** the reference point of the axis of rotation is moved into two successive 90° rotary movements through the position **RB4** into the position **RB5.** Subsequently, the shoe S is moved back whereby the reference point of the axis of rotation is again brought into its original position, namely, a position in which it coincides with the point of rotation DS of the tip. The reference point of the axis of rotation is thus displaced from **RB5** to **RB6** and from here is pivoted back in a final 90° rotary movement into the starting position. Here the tool W is lifted off the shoe S, and the next shoe may be inserted.

The maching of a shoe may, however, also be started from the position **RB4** because this position is equivalent to the position **RB1.** Also, the principle remains unchanged when the machining direction of the wedge fold is effected in counterclockwise direction. Expediently, programs which form an image to each other are employed for the two shoes of a pair of shoes.

With reference to FIG. **5,** it will now be shown how the adaptation of the method according to the invention can be applied to different sizes. To this end, FIG. **5** shows in dash lines a shoe S in conformity with the size shown in FIG. **4,** whereas the tip range of a larger shoe is shown in full lines. All reference numerals referring to the larger shoe differ from FIG. **4** nearly by an additional elevated cross. From the above mentioned relationship for the setting angle α it will be evident that the new setting angle α^x must be greater than the previous setting angle, in conformity with the likewise greater radius H^x of the semicircle located at the tip side and pertaining to the new working line AL^x.

The lateral displacement Y visible in FIG. **5** between RB1 and $RB1^x$ will be all the shorter the greater the distance V will be between the reference point RB of the axis of rotation and the reference point DB of the axis of rotation. With suitable dimensioning, this displacement will be negligible.

The setting of the setting angle α is expediently effected automatically in conformity, for instance, with the mutual position of a heel mandrel to the tip support.

As will be evident from the above the advantage of the device according to the present invention is seen, above all, in the fact that due to the additionally introduced rotary movement of the tool holding means, the interconnection of the pivot movements of the tool and the movements of the shoe is loosened. Thus, templets or simple adjustable electronic controls can be employed which make the arrangement easier to observe, and permit the machining operation to carry out in a more efficient and streamlined manner.

It is, of course, to be understood that the present invention is by no means limited to the specific showing in the drawings, but also comprises any modifications within the scope of the appended claims.

What is claimed is:

1. The method of folding the upper of a shoe over the sole which comprises; supporting the shoe with the sole exposed, supporting a cup shaped tool on a central axis of rotation which is inclined to said sole with the open side of the tool facing the sole and with a region of the rim of the tool engaging the sole near the periphery thereof, rotating the tool on its central axis to wipe the edge of the upper toward the center of the shoe sole, moving the tool and the shoe relatively to cause the region of the tool engaging the sole to follow a closed path about the sole to wipe the edge of the shoe upper over the entire periphery of the shoe sole, said closed path being formed by rotating said tool bodily about an axis perpendicular to the sole in about the center thereof at each end of the sole, and moving the tool bodily in a straight line along each side of the sole, a line drawn from the point of intersection of said axis with the plane of the sole to said region of the rim of the tool which engages the sole being substantially tangential to said path in each relative position of said tool and shoe.

2. The method according to claim 1 in which said point of intersection is spaced from each of said centers at the ends of the sole when the tool is in the semicircular portions of said path a distance about equal to the radius of the tool.

3. The method according to claim 1 in which an operation is initiated by positioning the axis about which the tool rotates bodily in about the center of the curved path at the front end of the sole, rotating the tool bodily until a line from said point to the said center forms an angle with the longitudinal axis of the sole which is about equal to 90° plus the angle whose sin is H/V where H is the radius of the curved path taken by the region of the tool rim engaging the sole and V is the distance from the said point to the said center, bringing the tool rim into engagement with the sole, rotating the tool bodily an angle of 90°, moving the tool bodily longitudinally to the rear end of the sole, moving the tool bodily 180°, moving the tool bodily longitudinally toward the front end of the sole, and then moving the tool bodily 90° back to the starting position thereof.

4. The method according to claim 3 which includes selecting the angle whose sin is H/V in conformity with the size of the shoe to be manufactured.

5. A device for use in shoe manufacture and comprising; means for supporting a shoe with the sole exposed, a cup shaped tool having the open side facing the shoe sole, a frame rotatably supporting said tool for rotation on the axis of the tool, said axis being inclined so as to converge with a perpendicular to the sole in a direction away from the sole, a region of the rim of the tool being adjacent the periphery of the sole, and means supporting said frame for rotation on an axis substantially perpendicular to and intersecting the longitudinal central axis of the sole.

6. A device according to claim 5 in which the axis of rotation of the tool and the axis of rotation of the frame diverge in the direction toward the sole and are substantially coplanar.

7. A device according to claim 6 in which the axis of rotation of the support passes by the tool near the rim thereof.

8. A device according to claim 6 in which the axis of rotation of the tool and axis of rotation of the support make an angle of from about 5° to about 60° with each other and are in intersecting relation.

9. A device according to claim 6 in which the axis of rotation of the tool and axis of rotation of the support make an angle of from about 15° to about 20° with each other and are in intersecting relation.

10. A device according to claim 5 which includes a drive motor connected to said frame for angularly adjusting said frame about the said axis of rotation thereof.

11. A device according to claim 10 which includes means actuated by said frame for developing an electric signal in conformity with the rotated position of the frame.

12. A device according to claim 5 which includes a support member for said frame in which said frame is rotatable on its said axis of rotation, and pivot means tiltably supporting said support member on an axis perpendicular to the axis of rotation of the frame and in intersecting relation therewith in about the plane of the shoe sole.

13. A device according to claim 12 which includes a motor connected to said support member for tilting the support member about said pivot means.

14. A device according to claim 13 which includes means for developing an electric signal in conformity with the tilted position of said support member about said pivot means.

15. A device according to claim 5 in which said means rotatably supporting said frame comprises a disc on said frame concentric with the axis of rotation thereof, a support member, and guide rollers rotatable on said support member and engaging the periphery of said disc.

16. A device according to claim 15 in which at least one of said rollers is resiliently biased radially toward said disc and is moveable radially of the disc.

17. A device according to claim 15 which includes means for driving at least one of said rollers to cause rotation of said frame.

18. A device according to claim 17 in which at least said one roller frictionally engages said disc.

19. A device according to claim 5 in which said means for supporting a shoe is tiltable about an axis extending in the longitudinal direction of the shoe.

20. A device according to claim 19 in which said means for supporting a shoe is bodily moveable in the longitudinal direction of the shoe.

21. A device according to claim 12 which includes a stationary main machine frame, and means supporting said support member in said main frame for body movement in parallelism with itself in a direction substantially perpendicular to the shoe sole.

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