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2 Sheets-Sheet 1

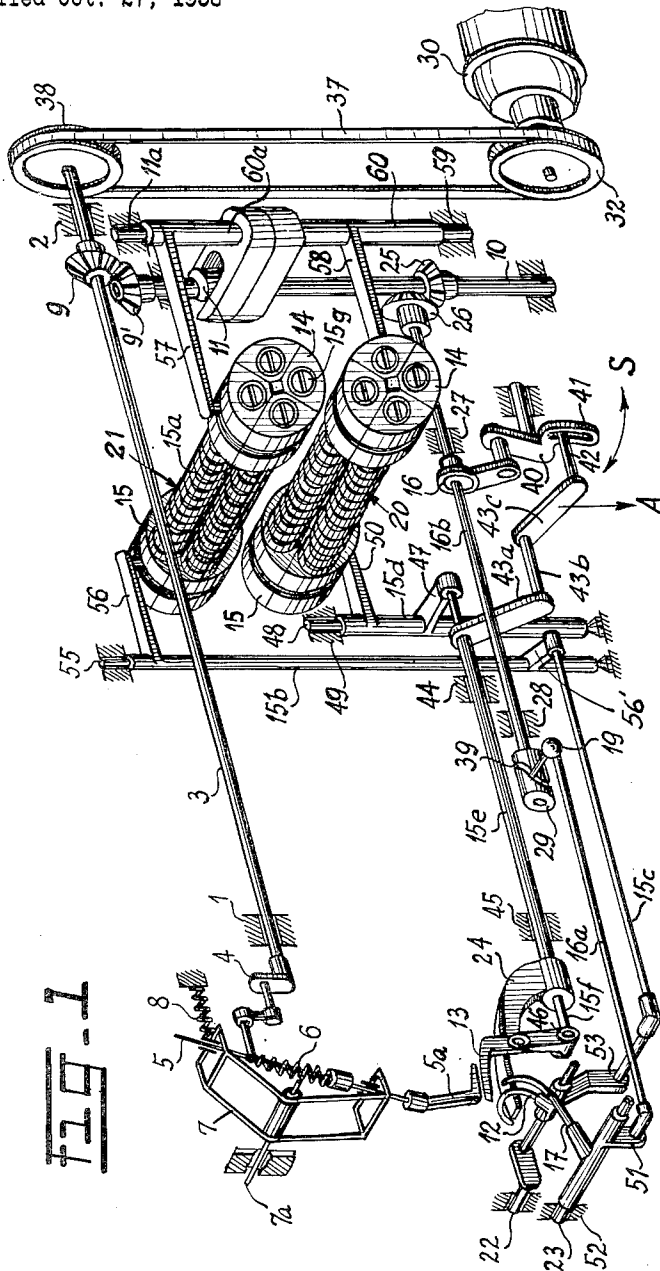


FIG. 1

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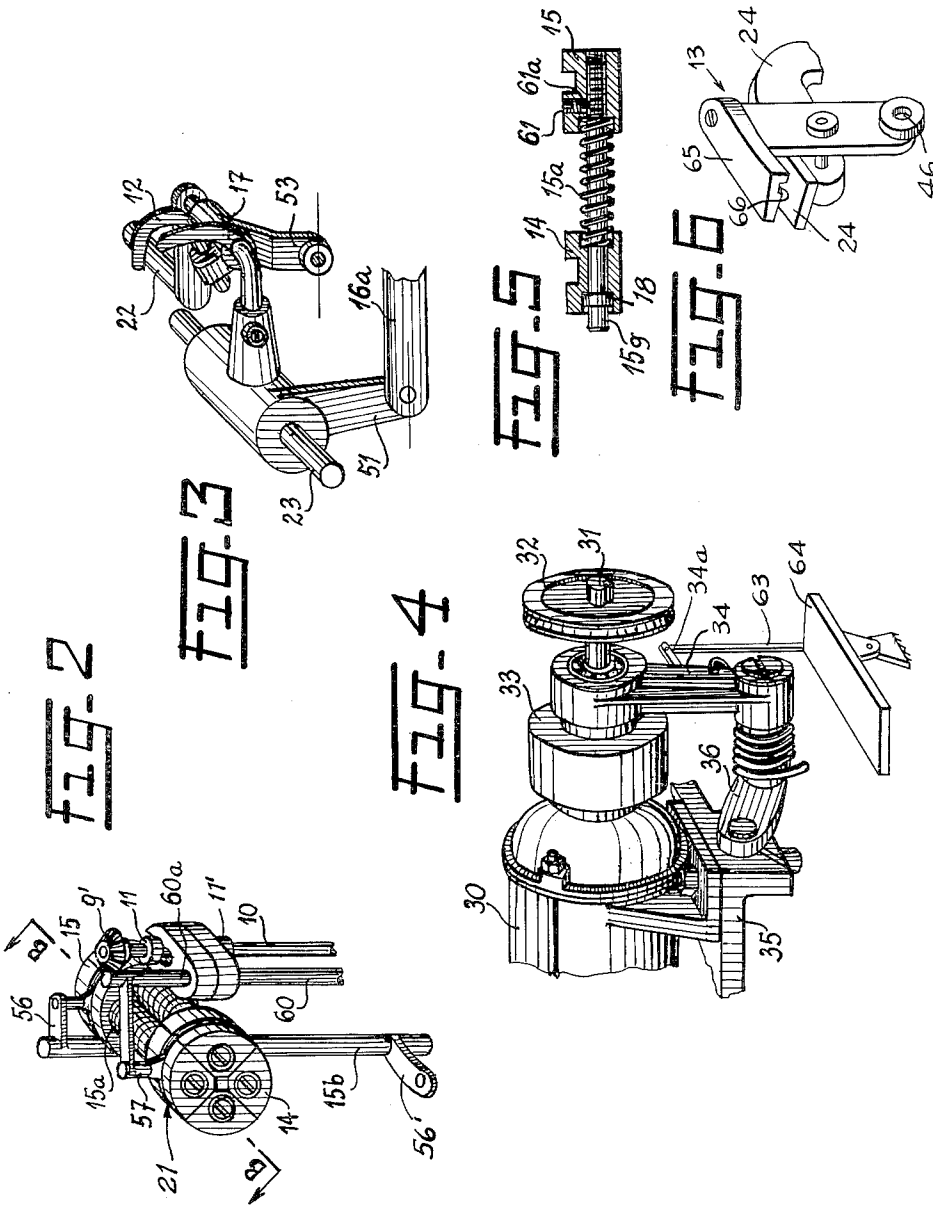
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MACHINE FOR FOLDING THE EDGES OF
SHOE UPPERS

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The invention refers to a machine for folding the edges of shoe uppers having inner or outer curvatures.

Machines for folding uppers which have inner and outer curvatures are known and are intended to eliminate manual work. The known machines do not always give satisfactory results since they fail to lay down the curved parts of the material in a regular manner. Even when radial incisions are made in the curved parts, the resulting shapes may mar the appearance of the finished shoe. Another disadvantage of the known devices resides in the difficulty of adjusting the movable parts, a fact which seriously reduces the productivity of the machine due to extended maintenance shut-down time.

These deficiencies of known devices are overcome by the invention, the basic features of which consists in the use of two folding tools parallel to one another and pivoted on pins arranged in tandem, these folding tools being operated by a special elastic device which consists of four integral elastic parts.

Other features of this invention and many of the attendant advantages will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

FIG. 1 is a perspective view showing the basic working elements of a preferred embodiment of the folding machine of the invention.

FIG. 2 shows a detail of the drive arrangement of the apparatus of FIG. 1 in perspective view.

FIG. 3 illustrates the folding devices of the apparatus of FIG. 1 on an enlarged scale.

FIG. 4 is a perspective view of the electric drive of the apparatus of FIG. 1 including a friction clutch.

FIG. 5 shows the device of FIG. 2 in fragmentary axial section on the line B—B.

FIG. 6 is a perspective detail view of the jaws for feeding material through the machine.

Referring now to the drawing in detail, there is seen an electric motor 30 fastened to the machine-frame 35 as best seen in FIG. 4. A pulley 32 is fastened to the end of a shaft 31 driven by the electric motor 30.

Between the pulley 32 and the casing of motor 30 there is a friction clutch 33. It is controlled by a lever 34 the end of which is suspended on an arm 36 fastened to the frame 35. Movement of the lever 34 is actuated by a pedal 64 to which it is connected by means of an arm 34a and a pull rod 63. The electric motor 30 drives the main drive shaft 3 by means of the pulley 32, a belt 37 and a pulley 38 fixed to a shaft 3 which is journaled in bearings 1 and 2 of the machine frame. A crank 4 driven by the shaft 3 actuates reciprocating movement of a rod 5 toward and away from the work area of the machine by means of a helical spring 6. The rod carries a hold-down foot 5a which serves for holding the folded material against a work table (not shown). The rod 5 is obliquely inclined relative to the shaft 3 and is supported in the machine frame by a yoke 7 which is pivotable against the force of a spring 8 about a shaft 7a, so that the rod 5 may move with the crank 4.

Shaft 3 actuates motion of an intermediate shaft 10 carrying two eccentrics 11, 11' by means of gears 9 and 91. The shaft 10 carries a bevel gear 25 which meshes

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with a bevel gear 26 and thereby transmits rotation to a counter shaft 16b. This shaft carries an eccentric disc 16 and a sleeve 29 which has a circumferential axially inclined guide groove 39. The eccentric disc 16 pivotally reciprocates a two-arm lever 40 one arm 41 of which has a longitudinal opening. A pin, adjustably secured in this opening, is fastened to a composite arm 43. The arm consists of an elongated flat link 43a which has one end fixedly mounted on a tubular shaft 15e and radially projects from the shaft 15e. The other end of the link 43a carries a pin 43b which is substantially parallel to the shaft 15e. One end of a second elongated flat link 43c is fastened to the pin 43b. The other end of the link 43c carries the pin 42. The angular position of the last mentioned link relative to the axis of the pin 43b is adjustable as indicated by the arrow A. Movement of the link 43c in the direction of the arrow causes adjustment of the position of the pin 42 in the opening of arm 41.

The shaft 15e is supported in the machine frame by bearings 44 and 45, and its front end carries a first jaw 24 which pivotally supports a second jaw 13. The jaw 13 constitutes a lever one arm of which is connected with one end of a rod 15f by a pivot 46. The rod 15f passes through the tubular shaft 15e. The other end of the rod 15f is connected to an arm 47 of a bell crank lever 15d which is pivoted on a vertical pin 48 journaled in bearings 49. The other arm 50 of the lever 15d engages one end of a resilient pressure device 20 which will be described in more detail hereinafter.

A pin 19 which engages the guide groove 39 of the sleeve 29 is mounted on one end of a rod 16a the longitudinal reciprocating movement of which operates the arm 51 of a hook shaped bending tool 17 best seen in FIG. 3. The tool is mounted on a pin 23 which is journaled in the machine frame by bearings 52. A U-shaped folding tool 12 is pivoted on a pin 22 parallel to pin 23, for movement in a radial plane axially spaced from and adjacent to the plane of movement of the bending tool 17. Pivoting movement of the folding tool 12 is actuated by an arm 53 connected to one end of a rod 15c the other end of which is pivoted to an arm 56' on a shaft 15b. This shaft is journaled in bearings 55 and carries an arm 56 which engages one end of a resilient pressure device 21. The other ends of the resilient pressure devices 21 and 20 are respectively acted upon by arms 57 and 58. These arms are parts of the two-armed levers 60a and 60 respectively which are independently pivoted on a vertical pin 11a supported by bearings 59. The levers 60 and 60a are acted upon respectively by two flanged eccentrics 11 and 11' best seen in FIG. 2, which cooperate with forked extension arms of the levers 60 and 60a respectively. Each of the pressure devices 20 and 21 consists of four connected identical portions, each including two terminal members 14 and 15 having the shape of sectors of a cylinder formed with a groove in the cylindrical surface thereof as seen in FIG. 5. The terminal members 14 and 15 are connected by means of a partly threaded bolt 15g threadedly engaging the terminal 15 so as to permit adjustment of the position of the member 15 on the bolt 15g. The adjusted position of the member 15 on the bolt 15g is secured by means of a set screw 61 acting on a pressure piece 61a which engages the threaded surface of the bolt 15g. A helical spring 15a which is slidable on the smooth shank portion of the bolt 15g abuts with one end against the terminal member 15 and urges the terminal member 14 which is slidably mounted on the smooth shank portion of the bolt 15g to move away from the member 15. Outward movement of the member 14 is limited by a collar 18 which is fixedly mounted on the bolt 15g. The terminal members 14 and 15 are formed with recesses which receive the ends of the spring 15a and the collar 18. The arm 57 engages the circular

groove formed in the four terminal members 14 of the pressure device 21, as best seen in FIG. 2, and the pressure exerted by the arm 57 is resiliently transmitted by the spring 15a to the arm 56 which engages the groove of the terminal members 15. The pressure device 20 transmits the pressure exerted or the motion transmitted by the arm 58 to the arm 50 in the same manner.

The afore-described machine operates as follows: Prior to insertion in the machine the curved parts of an upper are cut and provided with incisions according to its shape. The edges are chamfered and coated with adhesive. An edge portion of the upper is then placed under the hold down foot 5a, over the bending tool 17, the folding tool 12, and under the jaw 13 which is provided with a pressure shoe 65 having a groove 66, best seen in FIG. 6.

The motor 30 is then started. The speed of the machine is controlled by the clutch 31 according to the position of the pedal 64. The material to be folded is manually guided toward the work area along a guide rail on the work table (not shown) to maintain equal width of the folded over edge portion. During each rotation of the main drive shaft 3, the bending tool 17 performs one cycle of its reciprocating movement in which the free hook end of the tool moves upward to bend the edge portion of the upper through approximately a right angle. The free end of the folding tool 12 then completes the folding operation in the next cycle by the horizontal movement of its free end which moves approximately perpendicularly to the working stroke of the bending tool 17.

The pivoting movement of the folding tool 17 is derived from the motor 30 by a motion transmitting train which includes the clutch 33, the pulleys 32, 38 which are connected by the belt 37, the bevel gears 9 and 9', 25 and 26 which are connected by the intermediate shaft 10, the counter shaft 16b, and the sleeve 29 whose groove cooperates with the pin 19 to reciprocate the rod 16a which in turn pivots the arm 51.

The movement of the connecting shaft 10 is transmitted to the folding tool 12 by the eccentric 11, the lever 60a, the resilient pressure device 21, the shaft 15b, the rod 15c and the arm 53. Because of the interposition of the resilient pressure device 21, the folding tool acts on the previously bent edge of the material with considerable pressure.

When the bending and folding actions are completed, and the tools 12 and 17 start retracting, the hold-down foot 5a is raised to release the material, and pivoting movement of the jaws 24 and 13 about the axis of the tubular shaft 15e pulls the bent edge portion from the bending tools 17 to the folding tool 12, and brings a new edge portion into the range of the bending tool.

The rotating movement of the jaw 24 is derived from the countershaft 16b by means of the eccentric 16, the lever 40, arm 43, and tubular shaft 15e. The stroke of the feeding movement of the jaws 24 can be adjusted by distorting the composite arm 43 and thereby shifting the point of engagement of the pin 42 with the arm 41 toward and away from the pivot of the lever 40, thus changing the length of the arc S defined by the travel of the pin 42. When the pin is shifted in the direction of the arrow A, the stroke of the arm 43 and the feed stroke of the jaws 24 are lengthened.

The jaw 13 moves jointly with the jaw 24 about the axis of the tubular shaft 15e. The clamping movement of its free end toward and away from the free end of the jaw 24 is actuated by the intermediate shaft 10 by way of the lever 60, resilient pressure device 20, bell crank lever 15d and rod 15f. The clamping cooperation of the jaws 13 and 24 is resilient because of the interposition of the resilient pressure device 20 in the motion transmitting train between the motor 30 and the jaw 13. The folded over edge is clamped tightly between the jaws 13 and 24.

The material released from the jaws 13, 24 is finally compressed under the hold-down foot 5a whose main function though resides in holding the folded material in position during the return stroke of the open feeding jaws 13, 24 which is simultaneous with the bending and folding movements of the tools 17 and 12 respectively.

Shifting of the pin 42 in the slot of the lever arm 41 is possible even without interrupting operation of the machine. The control of the feed rate achieved thereby is inherently stepless. Higher feed rates will be preferred for substantially straight-edged portions of the upper, while reduced speeds are more advantageous for curved portions.

The force transmitted by the resilient pressure devices 20 and 21 may be adjusted by varying the tensions of their springs according to the material being worked.

While the operation of the machine of the invention has been described with specific reference to shoe uppers, it will be appreciated that this machine is used to advantage in the manufacture of leather bags and other objects made of leather and similar material.

It should be understood of course that the foregoing disclosure relates to only a preferred embodiment of the edge-folding apparatus of the invention and that it is intended to cover all changes and modifications of the example of the invention herein chosen for the purpose of the disclosure which do not constitute departures from the spirit and scope of the invention set forth in the appended claims.

What I claim is:

1. A machine for folding the edges of shoe uppers and like material, comprising, in combination, a support; a bending and a folding tool pivoted to said support for reciprocating movement in two adjacent parallel planes about two radially spaced parallel axes toward and away from a path of material through the machine; a pressure foot mounted on said support axially spaced from said tools relative to said axes for reciprocating movement toward and away from said path; feeding jaw means mounted on said support for reciprocating movement along said path substantially in a plane transverse of the planes of movement of said tools for sequentially feeding said material to said tools and to said pressure foot; drive means; and a plurality of motion transmitting means respectively interposed between said drive means and said bending and said folding tool, said pressure foot, and said jaw means for actuating movement of said tools, said foot, and said jaw means in a predetermined sequence.

2. A machine as set forth in claim 1, further comprising control means for varying the stroke of said reciprocating movement of said feeding jaw means along said path.

3. A machine as set forth in claim 1, the actuating means actuating movement of one of said tools and of said jaw means including respective resilient motion transmitting members.

4. A machine as set forth in claim 3, wherein each of said resilient motion transmitting members includes two terminal members respectively constituting a driving and a driven element of said motion transmitting member, a plurality of spring means interposed between said terminal members, and guide means for guiding reciprocating movement of said terminal members relative to each other under the urging and against the constraint of said spring means respectively.

5. A machine as set forth in claim 4, wherein each of said motion transmitting members further includes means for varying the spring force of said spring means.

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