PATENT SPECIFICATION

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COMPLETE SPECIFICATION.

An improved Automatic Machine for Fitting and simultaneously Vulcanising Rubber Soles on Boots or Shoes.

I, ~~Gonzalo~~ GONZALO MEDIANO CAPDEVILA of No. 12 Pasaje Gayola, Barcelona, Spain, of Spanish Nationality, do hereby declare the nature of this invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The present invention relates to a machine for use in uniting by vulcanisation a rubber sole (which term may be read as including a heel) to the upper of a boot or shoe, the machine being of the kind comprising a last and a mould consisting of three parts movable relatively to the last and constituted by a sole platform and a pair of jaws adapted respectively to shape the under surface and the two side edges of the sole, at least the sole platform being provided with heating means.

An object of this invention is to provide an improved machine of this kind which operates automatically or largely automatically and which is especially suitable for use in uniting a rubber sole to a boot or shoe upper of material such as leather, liable to be damaged by exposure to high temperature.

More specifically, an object of this invention is to provide a machine comprising a combination of elements adapted to co-operate with an upper on a last placed in an upright position to effect the following operations:

a) Closure of the two jaws onto the bottom edges of the boot or shoe upper against which they exert lateral compression.

b) Lifting of the sole platform carrying unvulcanised rubber until it comes in contact with the boot or shoe upper.

The machine preferably effects, in addition, the following operations:

c) A period of immobility of the movable parts of the machine while the mould parts are exerting pressure, during which period the vulcanisation is completed.

d) Opening movement of the jaws to release the boot or shoe after vulcanisation has been completed.

e) Descent of the platform after vulcanisation has been completed.

The above-mentioned sequence of operations can be performed automatically, and the operator is required to attend to the machine only at the stages corresponding to the insertion into the machine of the parts of the boot or shoe preparatory to its vulcanisation and the extraction of the vulcanised boot or shoe from the machine. Consequently one operator can attend to several machines, since they effect all the operations necessary for uniting the sole to the upper by vulcanisation in a predetermined interval of time.

According to this invention a machine of the kind hereinbefore referred to is characterised in that it includes a rigid frame, a rockable bridge comprising a head having on its under side means for the attachment of a last in an upright position, the bridge also comprising two depending arms pivotally connected at their lower ends to said frame, guides rigidly mounted on said bridge and supporting a pair of jaws which are adapted to shape the two side edges of the sole and which are slidable towards and away from each other in a direction perpendicular to the direction of rocking movement of the bridge, means co-operating with the jaws and the frame to urge the jaws together in response to rocking movement of the bridge, a platform which is adapted to shape the under side of the sole, the platform being provided with heating means and connected to an elevating device mounted in the frame, and actuating means serving firstly to displace the bridge so as to close the jaws and thereafter to operate the elevating device so as to raise the platform into position to compress the sole against

the last. The said means for urging the jaws together may be constituted by struts each pivotally connected to one of the jaws and to the frame.

In a preferred arrangement the said actuating means include a screw-threaded shaft engaged in an internal screw thread in a hollow hub of a gear member rotatable but not axially displaceable in a gear box mounted on the said frame, and means for rotating the gear member in either direction, the shaft being pivotally connected to the bridge, and the arrangement being such that rotation of the gear member can cause axial displacement of the shaft without its rotation, whereby the bridge is rocked. This shaft may be provided with two clutch members disposed respectively on opposite sides of the hub of the gear member and adapted to engage complementary clutch members on this hub when the shaft reaches the respective limits of its range of axial displacement, whereby rotations in the two directions is imparted to the shaft on completion of its axial displacements. The actuating means may also include a shaft coupled by a universal joint to the said screw-threaded shaft and drivably connected to the elevating device.

The axial displacements of the shaft in the two directions correspond respectively to the stages of opening and closing of the jaws, and the rotary movement of the shaft, at the end of the axial displacement effecting the closing of the jaws, corresponds to the period in which the platform ascends and presses the rubber sole against the upper on the last.

The actuating means preferably are adapted also to open the jaws and to lower the platform and co-operate with a timing device which introduces a predetermined delay between on the one hand the closing of the jaws and the raising of the platform and on the other hand the opening of the jaws and the lowering of the platform. Thus, where the actuating means include the axially displaceable and rotatable shaft hereinbefore referred to, the platform is maintained automatically in its moulding position by the action of the timing device for as long as is required to ensure complete vulcanisation of the rubber sole. As soon as vulcanisation is complete, the gear member is set in rotation in the reverse direction with the result that firstly the shaft is displaced axially to cause the opening of the jaws and thereafter it is set in rotation to cause the descent of the platform. The operating mechanism of the platform may be operated by hydraulic or mechanical or electrical means.

The accompanying diagrammatic drawings show an embodiment of the invention, which is given by way of example. In the drawings:—

Fig. 1 is a side elevation of the machine, in section on the lines B—B¹ in Figs. 2 and 3.

Fig. 2 is a front elevation of part of the machine sectioned on the line C—C¹ in Fig. 1.

Fig. 3 is a plan of part of the machine taken in section on line D—D¹ of Fig. 2, showing the jaws open.

The machine is adapted to vulcanise two shoes simultaneously. Only one side and the middle part of the machine appear in Figs. 2 and 3, the line A—A¹ denoting the vertical plane of symmetry of the machine. A fixed horizontal frame 1 is rigid with a stand portion 2. At each side of the machine the ends of a pair of jaws 3 are slidable in guide members consisting of a casting 4 and two head plates 4¹ fixed to the part 4 by screws. The jaws 3 are connected to the sides of the frame 1 by means of struts 5 the ends of which are pivotally connected by means of ball joints 6 and 7 to the sides of the frame and of said jaws respectively; the jaws having their borders 8 so contoured as both to embrace the lower part of a shoe upper required to be united by vulcanisation to a rubber sole and also to mould the edge of the sole.

The guide members 4 are fixed by screws to a rocking bridge comprising a head 9 and two depending arms 11. In the head 9 is provided a space 10 for the last. The two arms 11 are pivoted on pins 12 rigid with a base portion 13 of the frame.

At one side of the frame 1 is an actuating screw shaft 14 passing through a gear box 15 in which is mounted on journal and thrust bearings a worm wheel 16. A hub 17 of the wheel 16 is internally screw threaded and engages the shaft. A worm 18 co-operates with the worm wheel 16 and is connected by a shaft 20 to a reversible motor 19 attached to the frame of the machine (Fig. 3).

Bearings 21 supporting the worm shaft 20 are fixed to the side of the frame through which the shaft 14 passes. This shaft has near its inner end a ball 22 (Figs. 1 and 3) connected by a universal housing to a beam 23 rigid with the guides 4. An extension 24 of the shaft 14 beyond the ball 22 ends in a universal joint 25 to which one end of a shaft 26 is connected. An intermediate sleeve 27 connects the shaft 26 to a shaft 28 constituting an extensible prolongation of the shaft 26, so that the length of the composite shaft 26, 27, 28 can be adjusted to suit the normal operation of the machine. The lower end of the shaft 28 is connected by a universal joint 29 to a projecting end 30 of a shaft in a gear box 31, in which a gear-wheel system is adapted to impart axial displacements in both directions to a

screw 32 guided in a cylinder 33. A piston 34 operates in the cylinder 33 to cause the transfer of liquid between the cylinder 33 and two ram chambers, one at each side of the machine, formed in cylindrical bodies 38, only one of which appears in Fig 2. A port 36 of the cylinder 33 is connected by a pipe with an admission and discharge port 37 in the bottom of each ram chamber 35. A piston 39 is slidable in the chamber 35 and provided with an elastic packing 40 sealing the piston with respect to the wall of the chamber 35. The piston 39 constitutes an actuating member for a platform 41 slidable in a direction parallel to the arms 11 in the guides 4. A strut 42 is connected by a gudgeon pin 43 with the piston 39 and by a gudgeon pin 44 with the base of the platform 41. Downward movement of the platform is assisted by helical tension springs 45 connected between brackets 46 extending from the body 38 and brackets 47 extending from the piston strut 42. The springs are anchored by hook bolts 48 and 49 which are held in the brackets by means of nuts 50 and 51 serving as tension adjusters.

The lower face of the bridge head 9 is provided with two ~~plugs~~ lugs 52. To one of these lugs is hinged a pressure plate 53 under which the last 54 is placed during the pressing operation. The last is fitted with the shoe upper 55, the base of which is opposed to an upper face 56 of the platform 41, which face has a contour complementary to that of the lower face of the sole to be vulcanised and united to the shoe upper 55. The face 56 is provided with flutings in accordance with the pattern required to be moulded on the lower face of the rubber sole.

The shaft 14 is provided, at its end projecting outwards from the gear box 15 with a hand wheel 57 for manual operation in emergency.

Further, the parts of the shaft 14 projecting from the two sides of the gear box 15 are fitted with nuts 58 and 59 which can be adjustably fixed by means of lock-nuts 60 and 61. The nuts 58 and 59 are provided at their faces directed towards the front and back ends 62 and 63 of the hub 17 of the worm wheel 16 (Fig. 1) with abutments 64 and 65 respectively. These abutments are adapted to engage respectively abutments 66 and 67 on the hub 17 of the wheel 16 and thereby to initiate rotation of the shaft 14 at the limits of its alternative axial movements.

A source of heat 68 (Fig. 1) which is preferably electrical, is accommodated within the upper part of the platform close under the upper face 56, in order to provide the heat necessary for vulcanisation.

The machine operates as follows. It will be assumed that the jaws 3 are open, i.e. in the position shown in Fig. 3. The last 54 fitted with the shoe upper 55 is placed between the jaws and the motor 19 is started; the worm 18 rotates the worm wheel 16.

Owing to the resistance imposed by the platform elevating mechanism to rotation of the screw shaft 14, the hub 17 of the wheel 16, acting as a nut, displaces the shaft 14 axially to the left as viewed in Figs. 1 and 3. This displacement causes a like displacement to the left of the beam 23 and of the two sets of guides 4, jaws 3 and platform 41. Since the guides are fixed to the arms 11, the bridges are rocked to the left. The struts 5 accordingly approach positions perpendicular to the plane A—A^1 and cause jaws 3 to close gradually against the sides of the lower part of the shoe uppers.

When the jaws are completely closed, the shaft 14 reaches the outer limit of its range of axial displacement and engages the abutment 65 on the nut 59 with the abutment 67 on the hub 17 of the worm wheel. The shaft 14 is thereby caused to rotate without axial displacement, and this rotation is transmitted by the shafts 26 and 28 to the gearing in the box 31 producing an advance of the piston 34 and a delivery of liquid into the ram chambers 35. Each piston 39 thereupon rises and urges the associated platform 41, on the face of which has been previously placed an unvulcanised rubber sole, towards the shoe upper 55 placed on the last 54, which supports the moulding pressure by bearing against the plate 53.

When this stage is reached, a timing device (not shown) automatically keeps the platforms stationary for the time necessary to effect the vulcanisation of the rubber, after which the motor 19 is automatically started in the reverse direction. The above-described sequence of operations now takes place in reversed order. Thus the shaft 14 is axially displaced to the right, the bridges tilt and the jaws 3 open until the abutment 64 on the nut 58 engages the ~~the shaft 14 begins to rotate without axial~~ abutment 66 on the hub 17. Thereupon the shaft 14 begins to rotate without axial displacement and causes the piston 34 to be withdrawn. In this way the platforms 41 are caused to descend until they are stopped by the action of a limit switch (not shown). When the parts of another pair of shoes have been placed in the machine, it is switched on in order to start a new cycle of operation.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

screw 32 guided in a cylinder 33. A piston 34 operates in the cylinder 33 to cause the transfer of liquid between the cylinder 33 and two ram chambers, one at each side of the machine, formed in cylindrical bodies 38, only one of which appears in Fig 2. A port 36 of the cylinder 33 is connected by a pipe with an admission and discharge port 37 in the bottom of each ram chamber 35. A piston 39 is slidable in the chamber 35 and provided with an elastic packing 40 sealing the piston with respect to the wall of the chamber 35. The piston 39 constitutes an actuating member for a platform 41 slidable in a direction parallel to the arms 11 in the guides 4. A strut 42 is connected by a gudgeon pin 43 with the piston 39 and by a gudgeon pin 44 with the base of the platform 41. Downward movement of the platform is assisted by helical tension springs 45 connected between brackets 46 extending from the body 38 and brackets 47 extending from the piston strut 42. The springs are anchored by hook bolts 48 and 49 which are held in the brackets by means of nuts 50 and 51 serving as tension adjusters.

The lower face of the bridge head 9 is provided with two ~~plates~~ lugs 52. To one of these lugs is hinged a pressure plate 53 under which the last 54 is placed during the pressing operation. The last is fitted with the shoe upper 55, the base of which is opposed to an upper face 56 of the platform 41, which face has a contour complementary to that of the lower face of the sole to be vulcanised and united to the shoe upper 55. The face 56 is provided with flutings in accordance with the pattern required to be moulded on the lower face of the rubber sole.

The shaft 14 is provided, at its end projecting outwards from the gear box 15 with a hand wheel 57 for manual operation in emergency.

Further, the parts of the shaft 14 projecting from the two sides of the gear box 15 are fitted with nuts 58 and 59 which can be adjustably fixed by means of lock-nuts 60 and 61. The nuts 58 and 59 are provided at their faces directed towards the front and back ends 62 and 63 of the hub 17 of the worm wheel 16 (Fig. 1) with abutments 64 and 65 respectively. These abutments are adapted to engage respectively abutments 66 and 67 on the hub 17 of the wheel 16 and thereby to initiate rotation of the shaft 14 at the limits of its alternative axial movements.

A source of heat 68 (Fig. 1) which is preferably electrical, is accommodated within the upper part of the platform close under the upper face 56, in order to provide the heat necessary for vulcanisation.

The machine operates as follows. It will be assumed that the jaws 3 are open, i.e. in the position shown in Fig. 3. The last 54 fitted with the shoe upper 55 is placed between the jaws and the motor 19 is started; the worm 18 rotates the worm wheel 16.

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When this stage is reached, a timing device (not shown) automatically keeps the platforms stationary for the time necessary to effect the vulcanisation of the rubber, after which the motor 19 is automatically started in the reverse direction. The above-described sequence of operations now takes place in reversed order. Thus the shaft 14 is axially displaced to the right, the bridges tilt and the jaws 3 open until the abutment 64 on the nut 58 engages the ~~the shaft 14 begins to rotate without axial~~ abutment 66 on the hub 17. Thereupon the shaft 14 begins to rotate without axial displacement and causes the piston 34 to be withdrawn. In this way the platforms 41 are caused to descend until they are stopped by the action of a limit switch (not shown). When the parts of another pair of shoes have been placed in the machine, it is switched on in order to start a new cycle of operation.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

* C L M S *

1. A machine of the kind hereinbefore referred to for uniting by vulcanisation a rubber sole to an upper of a boot or shoe, characterised in that the machine includes a rigid frame, a rockable bridge comprising a head having on its under side means for the attachment of a last in an upright position, the bridge also comprising two depending arms pivotally connected at their lower ends to said frame, guides rigidly mounted on said bridge and supporting a pair of jaws which are adapted to shape the two side edges of the sole and which are slidable towards and away from each other in a direction perpendicular to the direction of rocking movement of the bridge, means co-operating with the jaws and the frame to urge the jaws together in response to rocking movement of the bridge, a platform which is adapted to shape the underside of the sole, the platform being provided with heating means and connected to an elevating device mounted in the frame, and actuating means serving firstly to displace the bridge so as to close the jaws and thereafter to operate the elevating device so as to raise the platform into position to compress the sole against the last.

2. A machine as claimed in Claim 1, characterised in that the said means for urging the jaws together are constituted by struts each pivotally connected to one of the jaws and to the frame.

3. A machine as claimed in Claim 1 or 2, characterised in that the said actuating means include a screw-threaded shaft engaged in an internal screw thread in a hollow hub of a gear member rotatable but not axially displaceable in a gear box mounted on the said frame, and means for rotating the gear member in either direction, the shaft being pivotally connected to the bridge, and the arrangement being such that rotation of the gear member can cause axial displacement of the shaft without its rotation, whereby the bridge is rocked.

4. A machine as claimed in Claim 3, characterised in that the said shaft is provided with two clutch members disposed respectively on opposite sides of the hub of the gear member and adapted to engage complementary clutch members on this hub when the shaft reaches the respective limits of its range of axial displacement, whereby rotations in the two directions is imparted to the shaft on completion of its axial displacements.

5. A machine as claimed in Claim 4, characterised in that the said actuating means include a shaft coupled by a universal joint to the said screw-threaded shaft and drivably connected to the elevating device.

6. A machine as claimed in any of Claims 1 to 5, characterised in that the actuating means are adapted also to open the jaws and to lower the platform and cooperate with a timing device which introduces a predetermined delay between on the one hand the closing of the jaws and the raising of the platform and on the other hand the opening of the jaws and the lowering of the platform.

7. A machine as claimed in any of Claims 1 to 6, characterised in that the platform is guided by means attached to the bridge and is connected by a pivoted strut to the elevating device.

Dated this 2nd day of August, 1946.

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