Sept. 2, 1941.

C. HABER ET AL

PRODUCTION OF BOOTS AND SHOES

Original Filed April 23, 1936

4 Sheets-Sheet 1

Inventors,

C. Haber and E. Haumann

Sworn to and subscribed to before me

[Signature]

Agent
Sept. 2, 1941.

C. HABER ET AL

PRODUCTION OF BOOTS AND SHOES

Original Filed April 23, 1936

4 Sheets-Sheet 2

Fig. 7.

Fig. 2.

Inventors,

C. Haber and E. Haumann

By: Hassef, Downing, Beale

Attns.
UNITED STATES PATENT OFFICE

2,255,000

PRODUCTION OF BOOTS AND SHOES

Christian Haber, Hechingen, and Ernst Hau mann, Stetten, near Hechingen, Germany

Original application April 23, 1936, Serial No. 76,052. Divided and this application October 6, 1939, Serial No. 298,922. In Germany May 5, 1935

11 Claims. (Cl. 12—14)

This invention relates to a device for producing boots and shoes, particularly the uppers thereof, and has for its object to simplify existing working methods and, simultaneously, to increase output and to improve the quality of the products.

This application is a divisional of our co-pending application Ser. No. 76,052 filed April 23, 1936, which resulted in our U. S. Patent No. 2,190,294.

According to the methods hitherto in use, the uppers are fitted with counters and toe puffs, then tightly drawn over the last, either by hand or by means of a pulling over machine, and secured in front by a few tacks. The next steps comprise in any desired order the working of the side, toe and heel by a lasting machine, a toe wiping machine and a counter lasting machine, the wiping and nailing of the heel or toe being carried out in one operation. When the sides have been lasted and the toe and heel worked, pounding up takes place to level unevennesses at the toe and heel. This is usually done by hand, though automatic pounding-up machines may be employed also.

The upper is thus moulded with respect to its stiffened portion comprising the front and rear parts on the last, and the various steps of this process require the employment of different working machines and of auxiliary measures, such as the use of tacks, which complicates production and takes up much time.

In contradistinction to prevailing working methods the invention proposes to finish the stiffened portions of the upper by means of a single ingeniously combined device without the help of tacks before the upper is placed on the last on which it is arranged later on to have the soles attached thereto.

For this purpose stiffening insertions are first pasted into the unmolded upper fitted with the usual toe puff and counter. For pasting, a rapidly drying adhesive like latex is preferably employed, in which the insertions requiring no working under the new process are simply immersed. Then the rear portion and the toe portion of the upper are either successively or simultaneously worked, according to the type of device employed. The following description of the invention assumes that first the heel and then the toe of the upper is being molded.

The rear portion of the upper prepared in the manner indicated is placed over a preferably heated mold made of metal or other suitable material and corresponding to the desired inner outline of the upper, so that heat is supplied from the inside to the portions of the upper adjacent to the mold, whereupon the rear portion is brought into proper position and lightly drawn by the operator towards himself. The mold carrying the upper is then introduced into the actual working device, in which all parts of the upper, preferably by hydraulic means, are subjected to relatively high uniform pressure by means of a collar of leather, rubber, etc., which may also be provided with a heating device so as to press the upper upon the mold and adapt it thereto. Immediately afterwards, while the upper remains on the mold, a preferably heated wiping device begins to act for working in the portion of the upper projecting beyond the edge of the mold. During wiping, the pressure upon the upper is continued. In contrast with the working method of known wiping devices which carry out several reciprocatory motions, wiping is effected by a single motion of this kind over the width of the projecting portion while the wipers rapidly vibrate at the rate of several thousand motions per minute. This new wiping method effectively prevents the production of superposed folds in the leather, as frequently happens at present, it being merely upset and arranged practically without creases.

After completion of the wiping operation the projecting portion previously supplied with an adhesive is compressed between the mold and the wiping means by the application of pressure vertically to the direction of operation of the wiping means and by applying additional deforming pressure, and is fully levelled by the action of pressure and increased temperature, i.e., the heel portion of the upper is brought into the proper shape which it retains. The application of additional pressure in the original shaping direction after the wiping of the projecting part is of importance for the reason that owing to the application of vertical pressure for levelling purposes a displacement between the mold and the work occurs, which must be compensated for.

It is of special importance in this respect that the molding action of the relatively high pressure required both for causing the upper to cling to the outlines of the mold and for levelling the projecting portion is uniform, free from jerks and regulatable and that continuous pressure independent of the thickness of the material can be applied and maintained, even if for instance portions of the material are reinforced by ornaments, etc. These requirements are fully met in most advantageous manner by the hydraulic
pressure device employed according to the invention.

To attain a uniform molding action it is of course necessary that the pressure applying leather collar, etc. of the mold carrying the work possesses corresponding outlines. According to the invention, this is insured by a novel construction of the pressing member carrying the leather collar, which consists in subdividing the surface applying the pressure into a large number of small, preferably prismatic, elements which are displaceable in their longitudinal direction independently of one another. Owing to the pressure transmitted to them by freely displaceable steel balls which make possible their relative displacement in longitudinal direction, these elements, according to the contours of the mold, are more or less displaced, i.e., to such an extent that their head portions in their entirety automatically yield an absolutely true reproduction of the outlines of the mold carrying the work.

The final product of the operations carried out by a single device is an upper whose stiffened portions comprising the front and rear parts thereof have been fully worked merely by the exertion of pressure. Further finishing by pounding, turning, etc. or the use of tools, and the like can be dispensed with, and the upper thus produced absolutely retains its shape.

The upper made according to the new method are preferably so dimensioned that they are somewhat shorter than the interrupted lasts.

The finished upper is finally placed over a last which is adjustable as to length and first shortened to an extent, say, 3 cm. that the upper can be put on.

The last is then given the proper length to stretch the upper between the firm front and rear portions. As the outlines of these portions subjected to elongation stresses are fixed and these portions cover a large part of the last, an extension of the latter causes an elongation of the lateral portions of the upper between the toe and counter without the rise of the various driving devices are actuated including the vertical pressure cylinder 2 on the base plate 1, in which the piston 9, the piston rod 9 of which is articulated to the mold carrier 11, can be moved to and fro. The carrier 11 supports the presser mold base.

In the construction according to Fig. 1, the horizontally acting cylinder 31 with the piston 33 is arranged above the motor 4 or the pressure cylinder 2 on a bearing member 28 fixed to the column 9. By means of the piston rod 37 and the cross bar 39 the piston 33 actuates the draw bars 30 which displace a connecting member 15 parallel to itself in the direction of the motion of the piston. The connecting member 12, by means of the link member 12 articulated to the mold carrier 11 by the pin 14 and to the connecting member 13 by the pin 14a, is connected with the carrier 11. In Fig. 1 the piston 33 in the cylinder 30 is shown in its extreme operating position. It is actuated like the piston 9 in the usual manner, i.e., on completion of its working travel the return spring 35 is opened and reversal effected by the action of subatmospheric pressure. The piston 33 serves to draw the mold with the work against the pressing device if, according to Fig. 2, the pressing device operates with a cylinder having a drawing effect. On the other hand, if a pressure exerting cylinder, as shown in Figs. 3 to 5, is employed instead, the cylinder 31 and the parts cooperating therewith can be dispensed with or replaced by a stopping means for holding the carrier 11 moved into the pressing position this position.

Fig. 2 shows a construction of the actual pressing device not shown in Fig. 1. It is actuated by means of the piston 33 and having a transverse member 44 firmly connected with the extension of the piston by the nut 45, and of the draw bars 81 provided with bell cranks 80 arranged on both sides of the mold, a later part 17a of the three-part actual pressing member comprising the two side parts 17a and a central part 17 being securely engaged to each bell crank. The boxlike parts 17 and 17a contain the largest possible number of elongated prism-shaped bodies 18 which completely fill out the openings of the boxlike parts facing the mold and the heads of which cling to the outside of the leather collar 48. Behind the prisms 18 steel balls 16 of preferably about 2 mm. diameter move in the prism space of the boxlike parts. The steel balls 16 are freely displaceable relative to one another and during the relative approach of the two halves of the casing transmit the pressure of the bell cranks 80 by means of the prisms 18 to the leather collar 48 and thus to the work. Although the parts 17a, 17 are shown in section in Fig. 2, it will be understood that these box-like parts completely enclose the steel balls 16 and that the elongated prism shaped bodies 18 project outwardly from said box-like parts through the single openings in said parts.

It is apparent that in this manner, independently of the thickness of the work and of its outlines, the pressing member is always uniformly adapted to the outlines and therefore must show outlines which exert uniform pressure. In the drawings the piston is shown at 50 pressing the pressing point which corresponds to the pressing position of the pressing member. Reversal of the piston is effected in the usual manner, as indicated above.

To improve still more the adaptation of the pressing device to the contours of the work, it is advisable to provide the heads of the prisms in the top rows with small plates 80 flexibly disposed
on the prismatic bodies and automatically adjusting themselves to the curvatures of the mold, as shown in Fig. 6.

In the modification of the pressing device shown in Fig. 3 a single pressing member having the prismatic bodies and automatically adjusting themselves to the curvatures of the mold, as shown in Fig. 6.

The pressure piece 74 is displaced towards the work by means of the connecting rod 72 and the cylinder 52 operating in this instance in reversed direction compared with Fig. 2, the balls 71 are moved into the space behind the prisms 78 and, preferably by the interposition of the compensating springs 75, and pressed thereupon. During farther advance of the connecting rod 72 the action of the springs 75 is overcome, whereupon the steel wedges 76 connected by a bridge 77 are pressed into the ball space and the prismatic bodies are simultaneously moved in closing direction and pushed forward, and this motion is influenced by the course of the pressure members 47 are simultaneously vibrated. In the figure the piston 26 is shown in its end position corresponding to the full opening of the pressure members 47.

Figs. 8 and 9 show in detail a modification of the construction of the drive for the pressing members shown in Figs. 3, 4 and 5, and the wiping device shown in Fig. 7 with a pressure balancing device. In this embodiment, only one piston member 53' is employed for simultaneously actuating the wiping device and the pressing members of the type shown in Figs. 3, 4 or 5.

This compensation of pressure is required for insuring the exertion of equal pressure upon both sides of the work and is effected by connecting the two connecting rods 72 with the pressure piston 53 by means of the movable ring 60 arranged on the piston, the ring taking up any inequalities in pressure by moving in one or the other direction. The piston is preferably provided with an overflow valve 85 combined with a check valve.

During working of the heel the machine functions as follows:

The upper fitted with the counter and stiffening insertion requiring no shaping is placed over the mold 10, and the mold carrier 11 is then swung into the open pressing member and pressed against the leather collar 49, either by actuating the piston 33 by means of the piston rod 34, the connecting member 32, the draw rod 30, the connecting member 13, the hinge member 12 and the link pins 14 and 15, in the construction shown in Figs. 1 and 2, or by simple lever transmission from a foot lever when the piston 53 is constructed as pressure piston. The outlines of the collar 49 automatically adapt themselves to those of the mold 10 when the pressure sets in, owing to the prisms 20 contained in the casing 11 and clinging to the collar 49 and to the rearwardly disposed steel balls 16, so that the upper and the stiffening insertion contained therein is compressed between the mold 10 and the stationary casing 11. When the piston 53 is actuated, it exerts pressure during its advance by means of the cross member 54, the draw rods 51, the bell cranks 80 upon the casing members 17a and thus, through the medium of the steel balls 16 and the prisms 15, upon the leather collar 49. In this way the circumferential portions of the upper are pressed between the collar 49 and the mold 10, and the upper is thus to the extent of the stiffening insertion firmly pressed around the mold 10, as indicated in Fig. 2.

By the opening of the valve for the cylinder 27 the piston 26 is then actuated and during its advance, by means of the piston rod 28 and the eccentric pins 24 and the linkages connections 43, exerts pressure upon the members 47 acting upon the projecting portion of the upper, so that the cam rollers 44 are forced to travel over the curved
As the members 47 are rotatably secured at 46a to the freely movable guide member 45, the latter also moved forward while the cam rollers 44 describe the curves 46, the path traced by the cam rollers 44 being brought into the desired proportion to the travel of the guide member 45 by a corresponding choice of the radius of the curves 46. During its rotation, the eccentric pin 24 imparts to the members 47 and thus to the material to be worked several thousands of vibrations per minute, whereby the material is wiped and during wiping lasted. When the piston 28 has reached the end of its travel, 5 the members 47 are fully closed and the material projecting on top beyond the mold 18 is wiped. At this position of the piston the eccentric pin 24 is stopped and thereby the wipers 47 are stopped also. Then additional pressure is exerted by means of the piston 50 to equalize unevennesses possibly caused by the various operations, and finally the piston 1 is actuated in the cylinder and pressed up to press the wiped and lastly the material between the members 47 and thereby to smooth it. The pressure of the piston 1 is taken up by the counter pressure plate 21. The operation is now completed, and the pistons 1, 28, 51 and 52 are retracted. If the mold is preferably of the twin type, one mold is alternately under pressure until the other is filled.

The wipers as well as the mold and the pressure devices are preferably heated by electric heating means, as indicated at 13, to improve still more the effect of the ironing effect upon the material of the upper during working.

The finished upper is then taken from the mold, placed on the first shortened last, stretched in the manner described by extending the last and finally connected with the sole.

The invention is not limited to the embodiments shown and described, but may be varied in many ways without departing from its fundamental idea. In particular, the steel balls employed for transmitting pressure to the prismatic bodies of the pressing member may be replaced for instance by solid, liquid or gaseous means permitting free movability of the prismatic bodies, such as a container filled with liquid and having elastic walls, which fills the pressure casing behind the prismatic bodies.

Having thus fully described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. A device for finishing the uppers of shoes having stiffening insertions and a lining adhesively connected to the upper before the application of the upper to a last, comprising a mold resembling the last and adapted to receive the upper, a counter mold, a hydraulic pressure device for pressing said counter mold against the mold, a set of end-lasting wipers disposed above said molds for closing the portion of the upper projecting above the mold and for vibrating said wipers during said closing movement, a counter plate arranged above said wipers, and a device for pressing the mold with the upper positioned thereon in a vertical direction toward said counter plate to level the last projecting portion.

2. Device according to claim 1, wherein the mold is disposed on a movable carrier engaged by a hydraulically actuated drawing device for bringing the mold into the counter mold and pressing it against the latter.

3. Device according to claim 1, wherein the counter mold comprises a leather collar and a plurality of elongated pressure bodies longitudinally displaceable independently of one another and adapted to press against said collar, the pressure exerted by the hydraulic pressure device being transmitted to said bodies by a medium permitting displacement of the bodies for adaptation to the outlines of the mold and thereby the production of a counter pressure surface corresponding to the outline of said mold.

4. Device according to claim 1, wherein the counter mold comprises a leather collar, a plurality of elongated pressure bodies longitudinally displaceable independently of one another and adapted to press against said collar, the pressure exerted by the hydraulic pressure device being transmitted to said bodies by means of steel balls of approximately 2 mm. diameter arranged in a boxlike container whose openings facing the mold are filled by said longitudinally displaceable pressure bodies.

5. Device according to claim 1, wherein the counter mold comprises a leather collar and a plurality of elongated pressure bodies longitudinally displaceable independently of one another and adapted to press against said collar, the pressure exerted by the hydraulic pressure device being transmitted to said bodies by steel balls arranged in a boxlike container whose openings facing the mold are filled by said pressure bodies, said boxlike container comprising three parts, a central, and two lateral parts independently displaceable from one another, the space remaining in the lateral containers behind the elongated pressure bodies being completely filled with said steel balls.

6. Device according to claim 1, wherein the counter mold comprises a leather collar on the side of which averted from the mold a plurality of elongated pressure bodies longitudinally displaceable independently of one another, the pressure exerted by the hydraulic pressure device being transmitted to said bodies by steel balls arranged in a boxlike container whose openings facing the mold are filled by said longitudinally displaceable pressure bodies, said boxlike container comprising two parts movable relative to one another and thus also movable in the direction of the work.

7. Device according to claim 1, wherein the set of end-lasting wipers comprises two wipers articulated to a rapidly vibrated operating member, the closing motion of said wipers being controlled in dependence upon the extent of their advance in the direction of the mold by curved surfaces along which said wipers move during their advance.

8. Device according to claim 1, wherein the set of end-lasting wipers comprises two wipers articulated to a rapidly vibrated operating member, the closing motion of said wipers being controlled in dependence upon the extent of their advance in the direction of the mold by curved surfaces along which said wipers move during their advance, said member actuating said wipers being flexibly connected with the piston of an oil pressure pump by an eccentric pin rapidly rotated by being driven from the main driving member of the combined device and thereby imparting correspondingly rapid vibration to said wipers.

9. Device according to claim 1, comprising a device for equalizing the pressures exerted upon both sides of the work by the pressure transmitting device connected with the working piston of the pressing device, said equalizing device
consisting of a ring flexibly arranged on the extension of the pressure piston, the two outer parts of said ring being each engaged by one of the two connecting rods pressing the counter mold upon the work.

10. Device according to claim 1, wherein the counter mold comprises a leather collar on the side of which averted from the mold a plurality of elongated pressure bodies longitudinally displaceable independently of one another act, the pressure exerted by the hydraulic pressure device being transmitted to said bodies by a medium permitting displacement of said pressure bodies for adaptation to the outlines of the mold and thus the production of a counter pressure surface corresponding to the outlines of said mold, said elongated pressure bodies being arranged in rows.

11. Device according to claim 1, wherein the counter mold comprises a leather collar on the side of which averted from the mold a plurality of elongated pressure bodies longitudinally displaceable independently of one another act, the pressure exerted by the hydraulic pressure device being transmitted to said bodies by a medium permitting displacement of said pressure bodies for adaptation to the outlines of the mold and thus the production of a counter pressure surface corresponding to the outlines of said mold, said elongated pressure bodies being arranged in rows and, at least in the top row, provided with flexible, preferably curved head plates clinging to said collar during the exertion of pressure.

CHRISTIAN HABER.
ERNST HAUMANN.