

Aug. 27, 1963

E. O. PETERSON
TOE LASTING OF SHOES

3,101,495

Filed Dec. 22, 1961

7 Sheets-Sheet 1

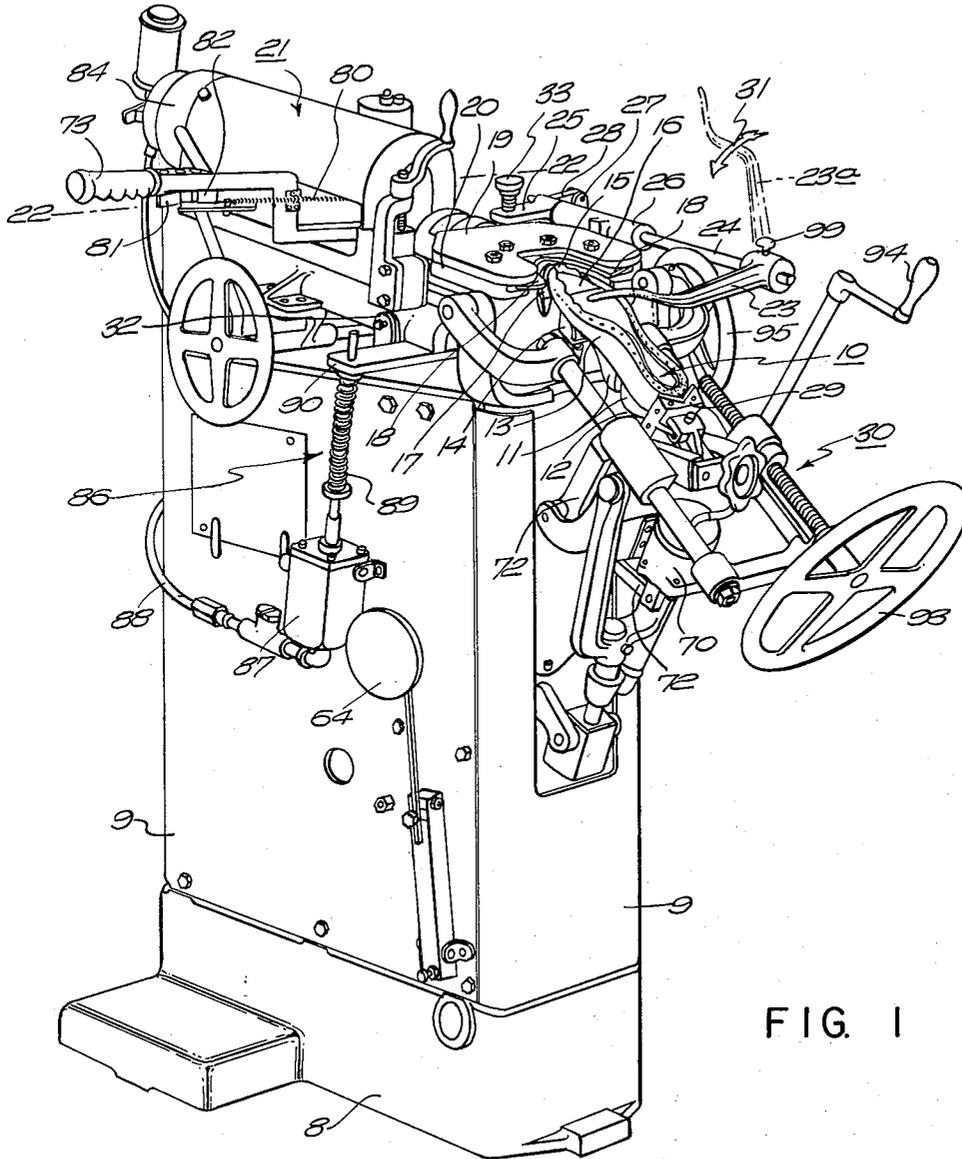


FIG. 1

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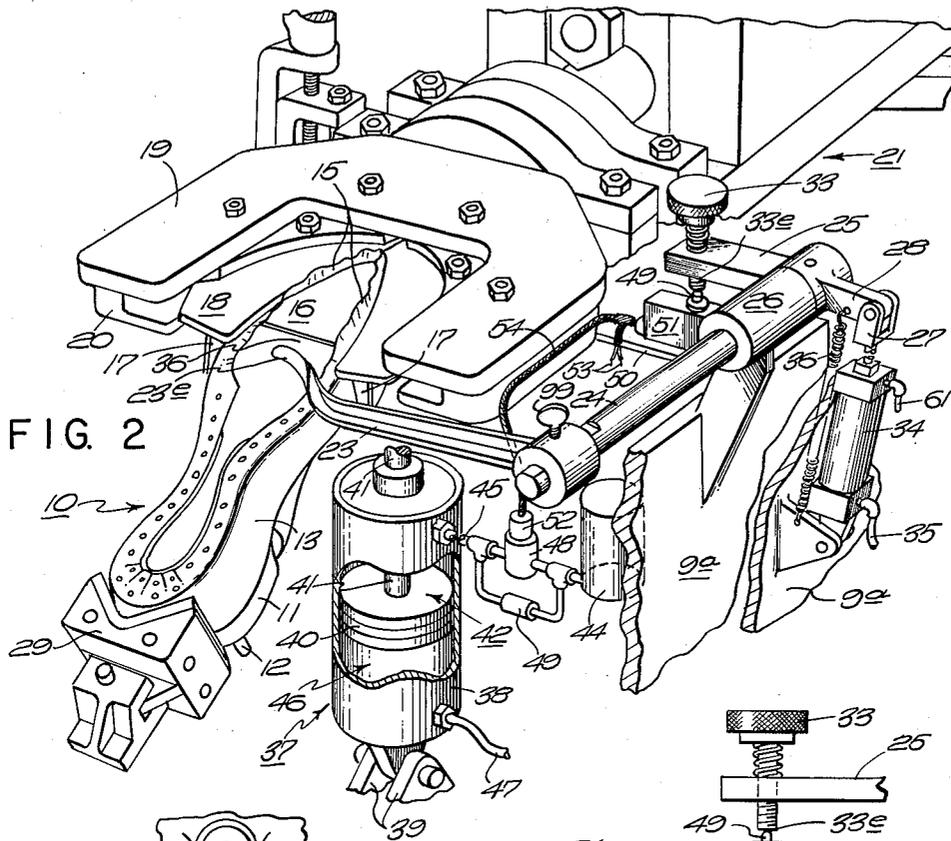


FIG. 2

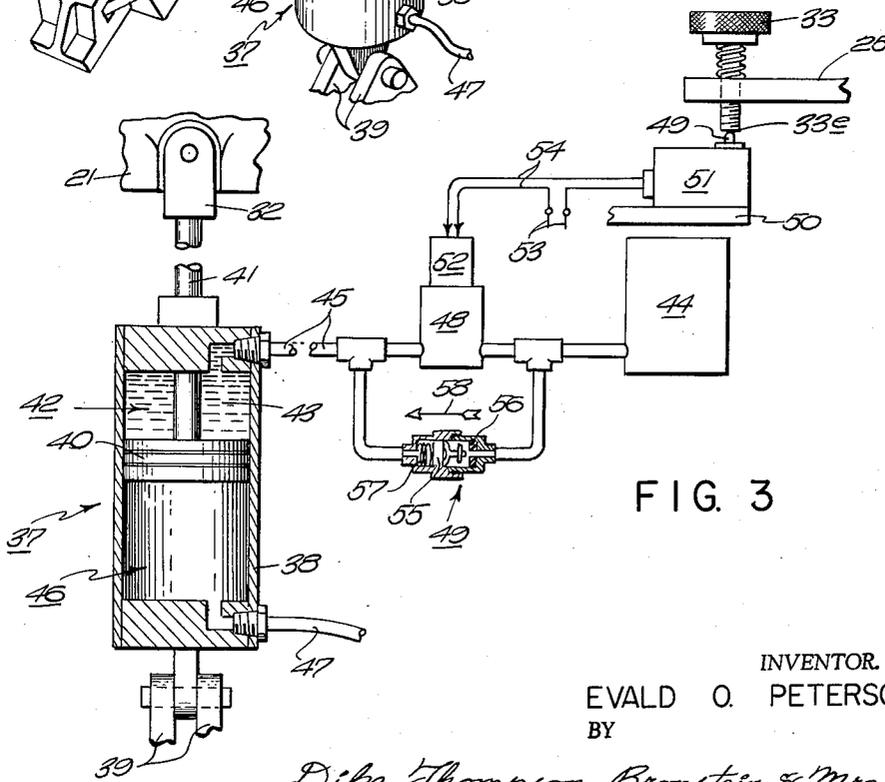


FIG. 3

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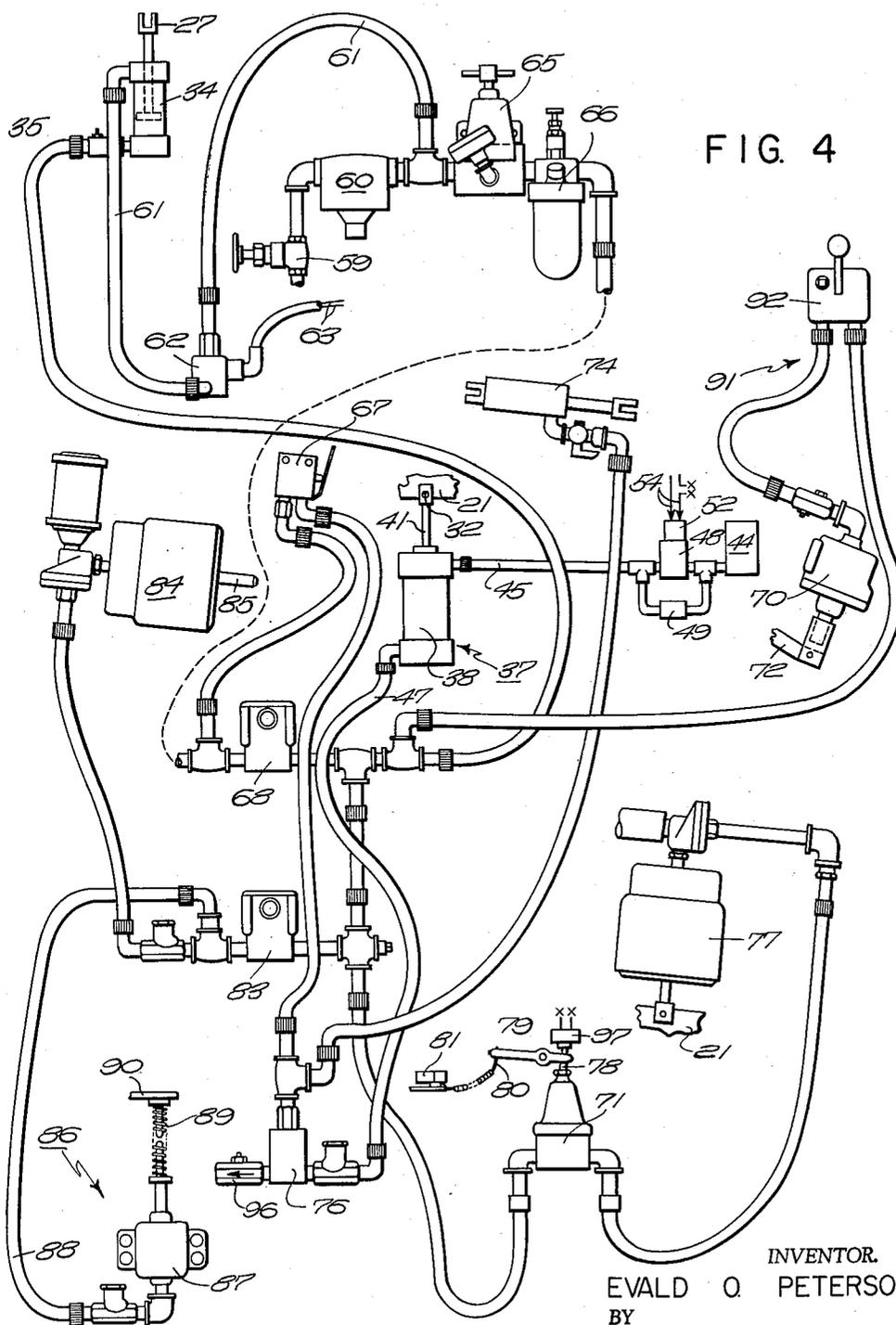


FIG. 4

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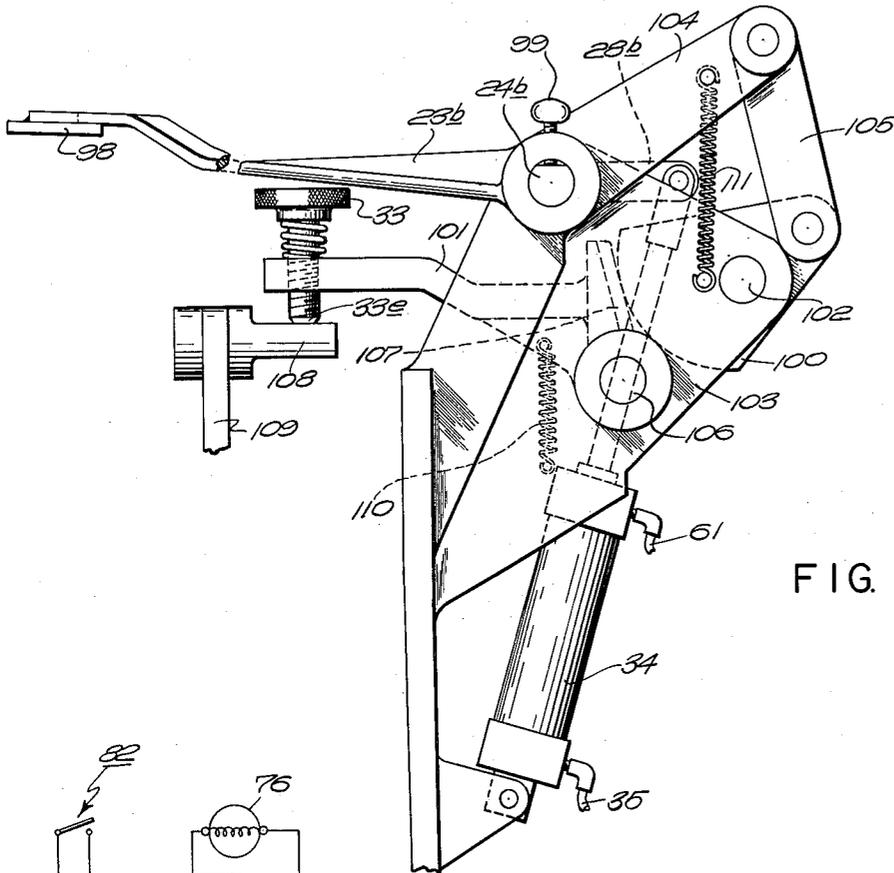


FIG. 7

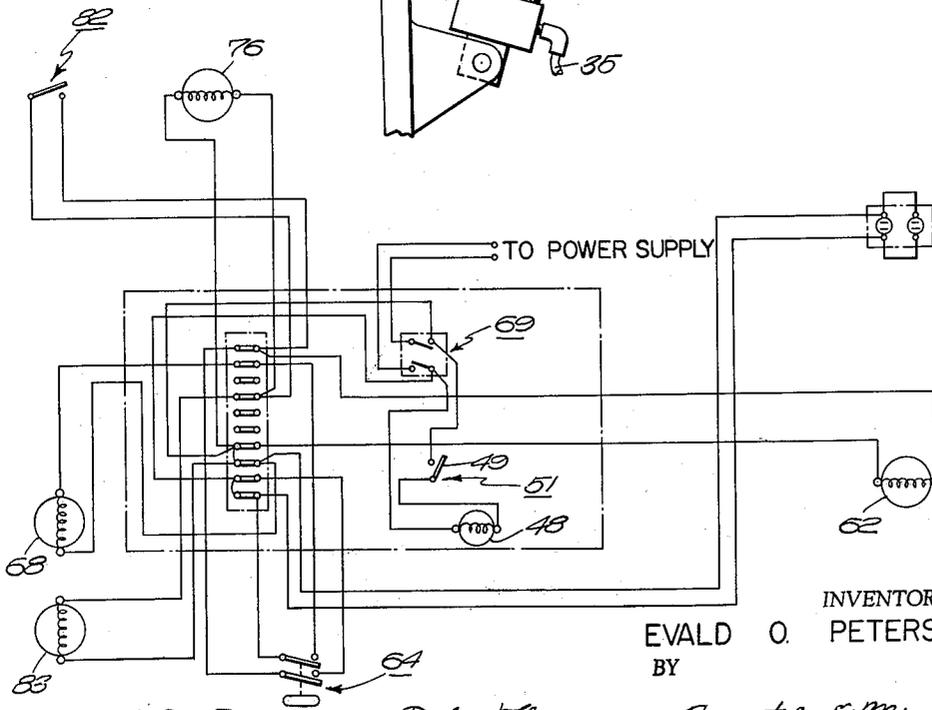


FIG. 5

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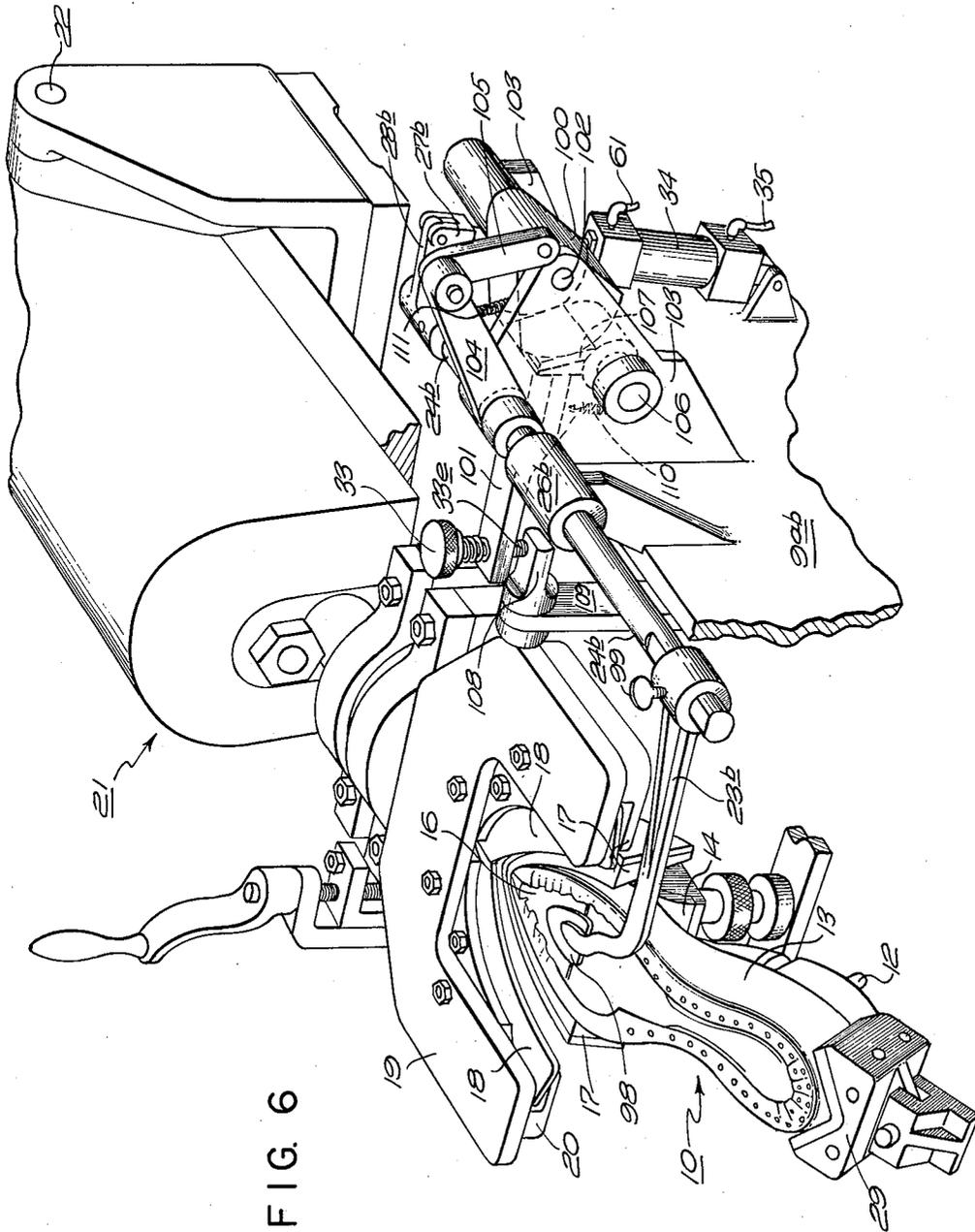


FIG. 6

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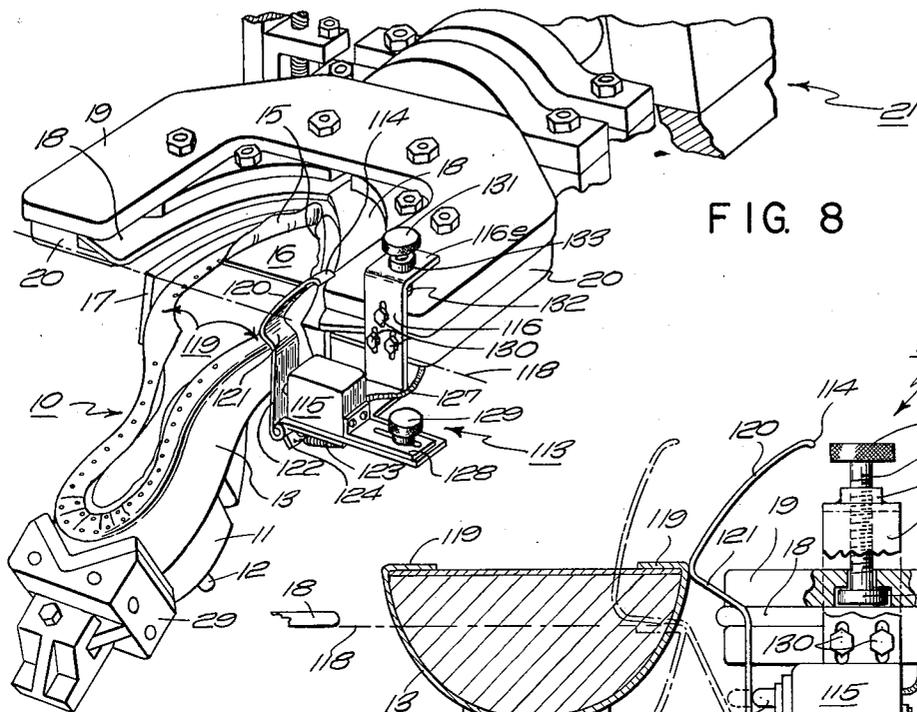


FIG. 8

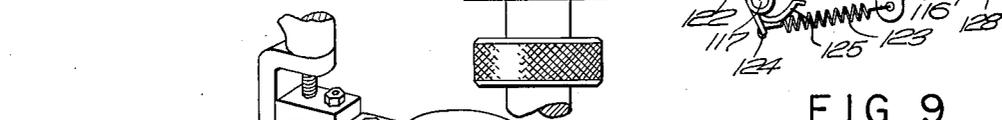


FIG. 9

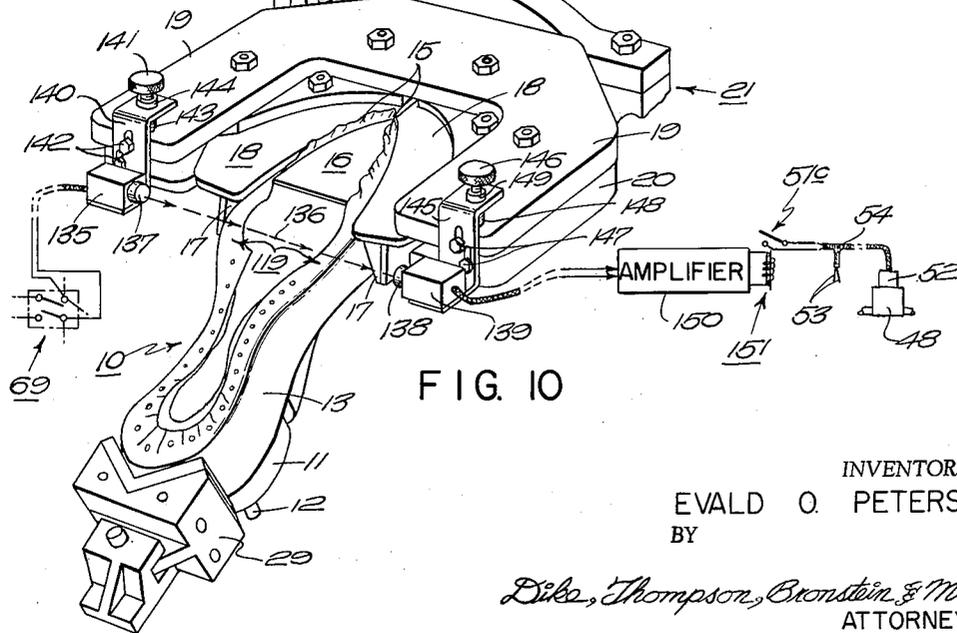


FIG. 10

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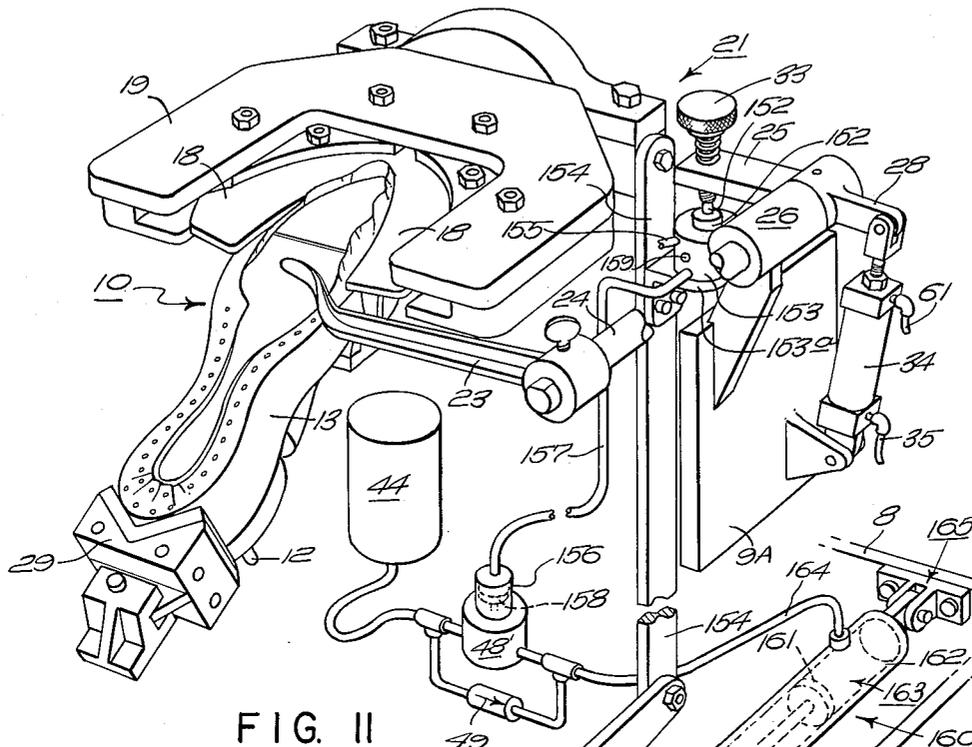


FIG. II

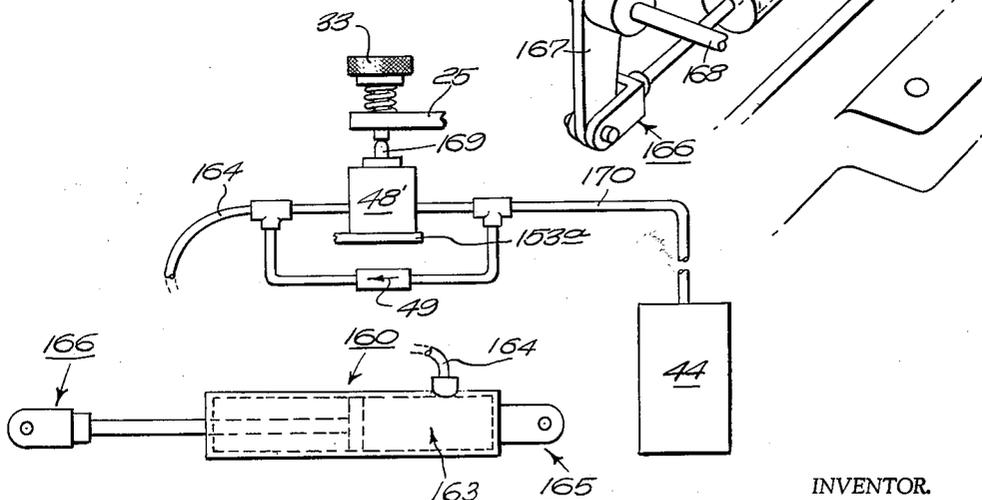


FIG. 12

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TOE LASTING OF SHOES

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Filed Dec. 22, 1961, Ser. No. 161,662

21 Claims. (Cl. 12—12.4)

The present invention relates to improvements in the lasting of toe ends of shoes and, in one particular aspect, to novel and improved toe lasting machinery which is automatically self-adjusting and accurately self-regulated to facilitate high-quality lasting of shoe toes at high production rates with minimum demands upon operator skill and effort.

Modern techniques for the economical fabrication of high-quality shoes at high production rates commonly involve the use of powered machinery which aids the operators in performing tasks which formerly involved strenuous labor and a very high degree of skill. One critical phase of shoe manufacture which has been partly automated, with like objectives, is the so-called "toe lasting," in which the outer leather or substitute material and its underlying liners on a partly-lasted shoe must be drawn taut and smooth across the toe portion of the last and then secured firmly and evenly by cementing near the edge of the bottom of the last. The appearance of the finished product hinges very largely upon the condition of the lasted toe portion, and yet it is unfortunately the case that manufacture of this particular portion of the shoe is beset by numerous possible difficulties. By way of example, the outer leather and linings must often first be drawn to define toe surfaces which are sharply curved, as in the case of pointed-toe shoes, without wrinkling or creasing, and the excess material which is to be cemented to the underside of an innersole member must be trimmed, fitted into place, cemented, and held or bedded under bonding pressure while the toe-covering portions are preserved taut and smooth without relaxation of needed tensions. One of the most satisfactory equipments for this processing involves a wiping operation wherein the loose toe-covering materials extending across the top of the toe of an inverted partly-lasted shoe are engaged by a generally U-shaped smooth-surfaced wiper mechanism which is raised under power to draw the covering materials taut across the shaped top of the toe of the last. This powered "upwiping" is in direction rendering it incapable of flattening the excess material across the bottom of the last, as is necessary for securing the material to the underside of the innersoling and for holding the material taut and smoothly shaped in the finished product, such that a further "overwiping" must be introduced in a transverse direction. The latter action is conveniently performed by a powered sliding and scissoring wiper mechanism which first draws and flattens the excess material about the edges of the bottom of the toe portion of the lasted shoe and then applies a bedding pressure which thrusts the material downwardly onto the last-supported innersoling to which it is being bonded by a quick-setting cement. Both the upwiping and overwiping must be very accurately related to the orientation of the lasted shoes, else the toe-covering material cannot be lasted properly and the shoes may be of reject quality. Accordingly, the regulation of these actions is left to the expertise of the operators, and the toe-lasting mechanisms are thus merely in the nature of power-assist or power-servo mechanisms which alleviate operator fatigue and strain but do alter the status of toe-lasting as an art demanding skill and judgment and close attentiveness on the part of the operator. The teachings of the present invention overcome such limitations and, while conveniently exploiting

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upwiping and overwiping mechanisms of existing forms, provide for simple yet highly effective and precise self-regulation and control of the toe lasting operations which assures high-quality production at high speeds largely independently of operator skills.

It is therefore one of the objects of this invention to provide improvements in the lasting of toes of shoes whereby the skills and labor required for high-quality, high-speed and economical manufacture of shoes are materially reduced.

A further object is to provide novel and improved shoe machinery having self-regulation and control of the settings of wiping mechanisms employed in toe lasting.

Another object is to provide improved toe lasting machinery having provisions for automatically gauging partly-lasted shoes and stopping and locking the positions of wipers in accordance therewith to promote optimum processing conditions during the lasting of toes of shoes.

By way of a summary account of practice of this invention in one of its aspects, a machine for the lasting of toes of shoes includes provisions for receiving and rigidly mounting in an inverted position a last about which the upper materials are partly lasted in place, except for the intended toe portion thereof. In such a machine, lasts of the different dimensions designed to accommodate shoes of vastly different sizes will present their toe and bottom surfaces at different sites relative to other parts of the toe-forming machinery, such as the overwipe and upwipe mechanisms. The latter include a smooth-surfaced upwipe band of generally U-shaped configuration which is designed to be raised pneumatically by a pivoted wiper head assembly from an initial position below the last into engagement with the material across the toe of the last and into a smoothing and drawing, or "wiping," action upon the material as the band is raised further in relation to the stationary last. At the outset, before the upwipe bands can be raised to the level of the bottom surface of the last, a gauging arm pivoted on the stationary frame for the machine is automatically moved into engagement with the bottom of the fore portion of the stationary last and is securely biased into a stopped relationship which depends upon the orientation of the bottom of the last relative to the frame. A stopping member carried by the gauging arm and disposed to interfere with a cooperating stopping member carried by the wiper head assembly pivoted on the same frame is in this manner caused to take up a position relative to the frame which characterizes the locus of the bottom of the last being held by the machine at that time. As the rising pivoted wiper head assembly reaches a critical level, at which the upwipe bands have just drawn the toe covering materials fully over the top of the toe of the last and at which the overwipe assembly fixed with the wiper head assembly is accurately aimed to draw the covering material over the edges of the bottom of the innersole-covered last, the two stopping members engage sufficiently to cause actuation of a microswitch associated with one of them. Instantly, upon actuation of this switch, an electrical circuit of which the switch is part actuates a solenoid check valve which then blocks flow of a liquid medium from one side of the pneumatic cylinder and piston assembly which, on the other side, is pneumatically excited to raise the wiper head assembly. This blockage of the liquid flow which otherwise would be dumped into a reservoir creates an obstacle to further pneumatically-powered upwipe motion, and the wiper head assembly is thus held rigidly in the intended position. Thereafter, the overwipe mechanism is operated and downward bedding force is imparted to the wiper head assembly by a further pneumatic motor, the liquid associated with the pneumatic upwipe motor being free to return from the

reservoir by way of another check valve to accommodate the desired downward bedding movements.

The subject matter regarded as my invention is particularly pointed out and distinctly claimed in the concluding portion of this specification. However, both as to preferred structure and practices, and further in relation to objects and advantages thereof, this invention may be best understood through reference to the following description taken in connection with the accompanying drawings, wherein:

FIGURE 1 provides a pictorial illustration of a toe lasting machine in which teachings of this invention are practiced;

FIGURE 2 depicts cooperating portions of preferred automatic gauging and stopping mechanisms, together with fragments of the machine of FIGURE 1 which aid in an understanding of machine operation;

FIGURE 3 is a partly schematic and partly cross-sectioned pictorial diagram of the gauging and stopping mechanisms shown in FIGURE 2;

FIGURE 4 comprises a pictorial diagram of the powered actuating devices and controls for the machinery of FIGURES 1 and 2;

FIGURE 5 is a wiring diagram for the electrical circuitry involved in the automatic equipment of FIGURES 1 and 4;

FIGURE 6 depicts cooperating parts of an alternative embodiment of automatic gauging and stopping mechanisms, together with fragments of a lasting machine such as that of FIGURE 1;

FIGURE 7 provides a pictorial illustration of the gauging and stopping mechanisms shown in FIGURE 6, in a view taken from the front of the machine;

FIGURE 8 is a perspective view of a portion of an automatic toe lasting machine provided with an automatic gauging mechanism carried wholly by the movable wiper head assembly of the machine;

FIGURE 9 provides an enlarged view of details of the gauging mechanism of the FIGURE 8 embodiment, taken from the front of the machine;

FIGURE 10 depicts a portion of a machine incorporating photoelectric gauging elements for automatic regulation of toe lasting;

FIGURE 11 illustrates a portion of a toe lasting machine having pressure-actuated valve control provisions in the gauging and stopping assembly; and

FIGURE 12 is a detail of a portion of a machine wherein the control valve for automatic stopping and regulation of toe lasting is actuated directly rather than remotely.

The toe lasting machine portrayed in FIGURE 1 is viewed obliquely from the left front corner near which the operator stands while setting up the work pieces and initiating the self-regulated wiping actions. Base 8 and the upstanding side frame members 9 support and enclose various mechanisms which contribute to operation of the machine and also provide a site for the work piece 10 which is at a convenient height for certain routine manipulations by the operator in setting up, trimming, cementing, and removing the work piece. The specific work piece which is to be processed by such a machine is a partly-lasted shoe, as is illustrated, the last 11 being inverted with the rear section mated about an upwardly-extending last pin 12 and the fore section, covered by the upper materials 13 already partly lasted in place, resting upon a swiveled toe post 14. At this stage of manufacture, the upper materials, linings, etc., are tacked or otherwise secured about all of the bottom edges of the shoe except those at the toe. The loose toe materials, such as an upper leather or equivalent, together with box toe and other liner materials, are intended to be drawn taut and smooth over the convex toe portion of the last, and at least the overhanging edges 15 of the upper material are then to be securely cemented to a cooperating insole

member, 16, while the toe materials are held taut and smooth, to complete the tip or toe of the shoe.

The desired tensioning and smoothing of the upper leather about the toe is achieved by two cooperating powered wiper mechanisms. One of these develops an "upwipe" action in the course of its upward motion from an initial position below the inverted toe to substantially the level of the bottom of the toe of the inverted last. The smoothing and tensioning forces of the upwipe mechanism are applied directly to the upper material by a known type of generally U-shaped toe band or wiper, 17, which is faced with a smooth-surfaced slippery material such as tetrafluoroethylene polymer, and which is yieldable to conform to the toe contour of the last while nevertheless applying needed pressures. The other of these mechanisms develops an "overwipe" action in the course of its generally horizontal motions as it advances forwardly from a position rearwardly of the last over the bottom of the toe portion of the last and as it simultaneously closes inwardly toward the centerline of the last in scissor-like movements. The overwipe forces are applied to the upstanding edges or margins 15 of the toe-covering materials by metal wiper blades 18 of a known construction carried between the plate 19 and a support 20. The wiper blades are brought into play only after the upwipe bands have first drawn the toe-covering materials snugly about the contoured toe of the last, whereupon the margins of material are then forced inwardly generally toward the centerline of the last while the wiper blades are so close to the bottom of the last that they exert a downward holding pressure on the material as well. Final overwiping is not performed until after a quick-setting cement such as a hot melt has been applied by the operator between the edges of the insole member 16 and the margin material 15, and the desired bonding is thereafter facilitated by application of further downward or "bedding" pressure through the wiper blades. Both the upwipe and overwipe mechanisms are carried by a head assembly, 21, which is in turn pivoted about a transverse rear axis 22-22 to promote the powered upward wiping and downward bedding actions by pneumatic motors.

The aforesaid general construction and operating characteristics of the machine of FIGURE 1 are in accord with prior practices. However, such prior practices have required that the operator be very attentive and exercise a high degree of skill and judgment in the matter of stopping the powdered upwipe movements at the desired critical level for each different size of last which is being processed. Should the upwipe be terminated prematurely, the attempted power-assisted overwipe at a low level may cause the overwipe blades and an associated automatic trimming knife to damage the upper materials, while a stopping of the upwipe beyond the critical level may result in the subsequent overwipe being insufficient to preserve the upper materials taut and smooth and may, in fact, induce intolerable looseness or wrinkling of the upper material on the toe of the shoe. Where the toe lasting proceeds at a high rate of speed, as usually it must for economical fabrication of shoes, it becomes exceedingly difficult for the operator to produce an optimum product each time and to avoid need for repairing imperfectly-lasted work pieces. However, the machine shown in FIGURE 1 also embodies automatic gauging and self-regulated stopping provisions which avoid these very difficulties. Principal features of these provisions which appear in FIGURE 1 include an angularly-movable gauging lever or arm 23 angularly fixed in relation to a shaft 24 and to a rearwardly-disposed lever 25, the shaft being journaled in a stationary bearing frame 26 which is secured to the frame of the machine and is therefore fixed in relation to the sides 9 and base 8. In the full-line illustration of gauging arm 23 its outer end is disposed to engage the bottom of the inverted partly-lasted shoe 10, substantially along the centerline and at the forepart por-

tion rearwardly toward the ball and inwardly of the margins 15 of the material being lasted at the toe site. This position of the gauging arm results from upward thrust of a frame-mounted pneumatic motor (piston-cylinder device) through a linkage 27 which turns the crank arm 28 on shaft 24 as far as the freedom of movement of the gauging arm 23 will permit (i.e., until the end of the gauging arm encounters the bottom of the partly-lasted shoe 10). In repose, when not so actuated for gauging purposes, the arm 23 is deflected angularly to a stopped orientation designated by dashed linework 23a where it is raised so that it will not interfere with the operator's manipulations of the workpiece. Once a partly-lasted shoe has been fixed in place upon the heel pin 12, backed up by the heel cup 29 of an adjustable frame-supported carriage assembly 30 and with the forward portion resting upon the toe post 14, the operator initiates powered upward actuation of the crank arm 28 and thereby causes the gauging arm 23 to turn counterclockwise, in the direction of arrow 31, until it engages the intended central part of the ball of the bottom of the partly-lasted shoe. The angular positions ultimately assumed by the gauging arm of course vary with the different shoe sizes involved. Rear lever 25 takes up corresponding positions relative to the stationary frame of the machine, and the bottom end (not visible in the drawing) of the manually adjustable stop member 33 on this lever is likewise correspondingly positioned relative to the frame. This automatic setting of the stop member precedes the elevation of the forward end of wiper head assembly 21 from its lowermost position, by a powered pivoting about the transverse axis 22—22. In one of several possible ways, two of which are described in detail hereinafter, the forward end of the wiper head assembly being raised by linkage 32 is abruptly halted in its motion, this being the consequence of engagement between the stopping member 33 and a cooperating stopping member (not visible in the FIGURE 1 drawing) carried by the wiper head assembly near its forward end and in position to make the desired engagement. A preferred arrangement for halting the upward motion of the wiper head assembly is one which effects a non-injurious jamming of the assembly while its pneumatic motor (piston-cylinder device) continues to be actuated to move upwardly, whereupon the head assembly is held positively at the precise position in which the upwiper by band 17 should terminate and in which the overwiper by blades 18 should commence.

Further details of a preferred form of the gauging and stopping mechanism are depicted in FIGURE 2, wherein it is seen that the shaft-journaling member 26 is bracketed to a structurally sound side plate 9a and is therefore held immovably in relation to the generally stationary machine. Unless the pneumatic actuating motor 34 is pressurized through its supply line 35, the gauging arm 23 normally takes up a raised position, clockwise of that illustrated, to which it is biased by a spring 36 acting between the crank arm 28 and side plate 9a. In that position (dashed linework 23a in FIGURE 1), the side occupied by the partly-lasted shoe 10 is substantially unobstructed and the operator has wanted freedom to insert and adjust the shoe and to remove the processed article. When pressurized, however, the pneumatic motor 34 deflects the gauging arm 23 counterclockwise to the illustrated position wherein its end 23e rests firmly upon the bottom of the fore part of the partly-lasted shoe (i.e., upon an insole member). Preferably, the gauging arm and its support elements are proportioned such that the end 23e engages the bottom of the partly-lasted shoe along the centerline 36 of the fore part, which avoids any resultant errors due to the "roll" or transverse sloping contours of the last. Shoe lasts are themselves "graded" items, that is, their parts are in predetermined proportion, such that lasts of different sizes introduced into the machine will be gauged properly and will serve as the basis for satisfactory self-control of the wiping operations. Upward movement of

the wiper head assembly 21 is induced by the pneumatic motor 37 the outer cylinder 38 of which is pivoted on the stationary framework of the machine by way of a bracketing 39 and the inner piston 40 of which drives a shaft 41 connected with the head assembly by way of the linkage 32 (FIGURES 1 and 3). Stopping member 33 orients its lower end 33e at vertical positions which are in a predetermined proportional relationship to those of the end 23e of the gauging arm. In a typical installation, this relationship is about 1 to 0.6, that is, the vertical travel of the end 33e of the stopping member is always about six-tenths of the corresponding vertical travel of the end 23e of the gauging arm, in the regions of travel which are of interest for present purposes. This ratio (1:0.6 in the example given) is substantially the same as the ratio of the distance between the point of engagement of end 23e with the lasted shoe and the pivot axis 22—22 of the head assembly to the distance between that axis and the end 33e of the stopping member. Because of these like relationships, each automatically-stopped position of the wiper head assembly always closely matches that dictated by the gauged locus of the bottom of each shoe being lasted. The jamming action which stops upward motion of the wiper head assembly at just the right place is preferably hydraulic in nature. For this purpose, the upper chamber 42 within the cylinder 38 is filled with a liquid 43, such as oil, which is in communication with an external container or reservoir 44 by way of a coupling 45. As the piston 40 is forcibly raised by increase of the air pressure in the lower chamber 46 through the supply by way of a coupling 47, the oil in upper chamber 42 is forced toward the external reservoir 44 to accommodate the needed reduction in volume. Under initial upwipe conditions, when the stopping member 33 has not yet been brought into play, the oil flow from chamber 42 to the reservoir 44 is through a normally-open solenoid-actuated valve 48, the check valve 49 in by-pass relationship to the valve 48 being normally closed to the flow in that direction. At the intended limit of permissible upwipe travel, as regulated by the gauging mechanisms, the end 33e of stop member 33 encounters the stopping member 49 carried by the upwardly-moving wiper head assembly 21 on a bracket 50. Stopping member 49 comprises a movable armature of a normally-open electrical switch 51, such as a conventional form of microswitch, and its actuation by the stopping member 33 instantly produces a switch closure which energizes the solenoid 52 of valve 48 from supply lines 53 via the electrical coupling 54. At that moment, the normally-open valve 48 is closed and flow of oil out of cylinder chamber 42 is thus abruptly halted. Inasmuch as the oil is a substantially incompressible liquid, the piston 40 is jammed against it and is unable to raise the wiper head assembly 21 any further. It is under these stopped or intentionally-jammed conditions that the wiping operations are initiated, it being known that the wiper head assembly is properly oriented for these purposes. At a subsequent stage in the processing, when it is intended that the wiper head assembly shall move downwardly, the unidirectional check valve 49, which is of a known common construction, readily permits flow of oil from the reservoir 44 back into the upper cylinder chamber 42 to accommodate the downward piston movements. As is represented in FIGURE 3, the check valve 49 may conveniently comprise a shaped valving member 55 normally biased into a sealed seating engagement with a resilient seat 56 by a spring 57, and, depending upon the selected biasing spring force, the check valve may open to permit oil flow in the direction of arrow 58 only after a predetermined selected minimum level of pressure is exceeded. When this spring force is high enough, the upwipe piston 40 will advantageously be prevented from permitting the wiper head assembly 21 to drop, as it may otherwise tend to (since the upwipe cylinder is no longer powered at this moment) until after the toe wiping operations are completed and the wiper head assembly is intentionally de-

pressed for bedding action. In some installations the check valve 49 may be dispensed with entirely, and opening of the solenoid-actuated valve may be relied upon to permit desired downward movement of the wiper head assembly at the proper time.

The pneumatic gauge arm actuating motor 34 and motor 37 for actuation of the wiper head assembly are shown in FIGURE 4 their relationships to the balance of the power circuitry for a complete toe-lasting machine such as that of FIGURE 1. Air under pressure is admitted as an input to the equipment from an outside source via the main valve 59 and, after passing through a filter 60, is tapped by a conduit 61 to apply pressure to the upper cylinder of the gauge arm actuating motor 34, as regulated by the settings of a normally-open solenoid-operated valve 62. The latter is electrically excited, or not, by way of leads 63 in accordance with switching conditions established by the operator, who actuates the normally-open self-holding knee switch 64 (FIGURES 1 and 5) to close valve 62, among other things. Input air leaving the filter is also passed through a known type of pressure regulator 65 and air lubricator 66 before being passed to a normally-closed valve 67 and to a normally-closed heel clamp solenoid valve 68. When the master control "on-off" switch 69 (FIGURE 5) for the machine is turned on, after a partly-lasted shoe has first been loosely placed upon the heel pin 12 and toe post 14 (FIGURE 1), and when the operator then deflects the knee switch 64, air passes to the heel clamp cylinder 70 and to the normally-closed bedding regulator 71, through valve 68. Pressurization of the heel clamp cylinder 70 immediately results in a forced tilting of a jack spindle 72 which locks the shoe in place against the heel abutment 29 (FIGURE 1). Thereafter, when the operator pulls the wiper lever 73 (FIGURE 1) forward, the valve 67 is opened by this movement and passes air to the toe band air cylinder 74, and to the upwipe cylinder 37 through the normally-open solenoid valve 76. Initially, the oil flow control solenoid 48 is open, inasmuch as the normally-open microswitch 51 has not then been closed by engagement with the stopping member 33, and the upwipe cylinder 37 may thus power the wiper head assembly 21 upwardly from a low position and into raised positions at which the desired toe wiping will be produced by the toe band assembly 17. For the latter purpose, the spaced arms of the U-shaped toe band 17 are automatically deflected toward one another by the output motion of the air cylinder 74, through mechanisms which are not illustrated in detail and which need not be further explained here insofar as an understanding of the present invention is concerned. Bedding regulator 71 is a form of mechanically-adjustable fluid valve which controls the supply of air to the bedding cylinder 77, the latter serving to drive the wiper head assembly 21 in a downward direction about its pivot axis 22—22 for the purpose of developing high downward pressures upon the overwiped toe margins of the lasted shoe, through the overwipe blades 18, after cement has been applied to the toe margins and the overwiping has finally drawn the toe covering material taut about the last. Movable plunger 78 atop the plunger controls the bedding pressure and it, in turn is depressed by desired amounts by a lever 79 articulated by a cable 80 fixed to a thumb-actuated lever 81 on the wiper lever 73 (FIGURE 1). A normally-open microswitch 82 (FIGURES 1 and 5) closes when the small thumb actuated lever 81 has been turned sufficiently about a vertical pivot, whereupon it closes a circuit through the normally-closed overwipe solenoid valve 83 and admits air to the power-assisting overwipe cylinder 84. The latter then thrusts its output shaft 85 forward and thereby forcefully drives the overwipe blades 18 across the shoe bottom to complete the wiping operation. Switch 82 also releases air to chamber 46 of the upwipe motor 37, by energizing normally-closed solenoid valve 76 (FIGURE 4).

In those instances when the tension of the biasing

spring 57 of the check valve 49 is not to be relied upon to prevent unwanted dropping of the wiper head assembly 21, or when the solenoid-actuated oil flow valve 48 is not itself to be relied upon for the same purpose, the auxiliary powered support or counterbalancing assembly 86 is of distinct advantage. This assembly includes a frame-mounted air cylinder 87 which is pressurized via coupling 88 at the same times that the power-assist overwipe motor 84 is pressurized and upwipe motor chamber 46 is exhausted. A normally-relaxed coupling spring 89 is thereby compressed against a bracket 90 fixed with the wiper head assembly 21, to counterbalance the downward forces due to the weight of the wiper head assembly and to keep it elevated at the desired precise level for overwiping. At other times, the spring 89 is either not under substantial compression and thus does not interfere with movements of the wiper head assembly or is in any event further compressible to accommodate intended downward thrusts of the wiper head assembly.

An additional feature of the pneumatic circuitry, designated by reference character 91, is of particular advantage when an operator wishes to employ a tool such as special form of pliers to pull the upper material about the toe of the last under manual control and thereby to reclaim what might otherwise be a reject shoe. This feature includes a separate manually-actuated valve 92 disposed on the machine frame within reach of the operator and serially in line with the heel clamp cylinder 70 and its air supply. By manually closing this valve, the operator may free the partly-lasted shoe from its clamped position against the heel abutment and toe post, and may therefore use hand tools and otherwise manipulate the upper materials over the bottom edge of the last for subsequent wiping, all without disturbing the other mechanisms of the machine and, particularly, without causing movement of arm 23 which would interfere with use of hand tools, such as hand pincers. Subsequent opening of this valve re-clamps the upper material against the toe post.

In fabricating a toe-lasted shoe with the machine which has been described, the operator first removes a partly-lasted shoe from a rack and sets it loosely in place inverted upon the heel pin 12 and toe post 14. If necessary, the center of the toe of the shoe is brought opposite the center of the wiper blades 18, by appropriate turning of the hand wheel 93 (FIGURE 1), a general parallelism between the bottom of the shoe and wiper blades is established by turning the crank 94 which raises and lowers the heel portion of the shoe, and the center line of the bottom of the shoe is brought generally into alignment with the wiper head assembly by adjustment of the hand wheel 95. Having the master switch 69 in the "on" condition, the operator next actuates the knee switch 64 momentarily, and this switch holds itself closed so that it may energize the solenoid valve 68 to deliver air to the heel clamping cylinder 70 and to force air into the gauging arm cylinder 38. Immediately, the shoe then becomes locked or "jacked" in place in the machine and the gauging arm 23 is turned counterclockwise with its shaft 24 until it is stopped by engagement with the bottom of the fore-part of the shoe. At that time, the stopping member 33 may be adjusted to set the height to which the powered upwiping by the toe band assembly should proceed for properly coordinated upwiping and overwiping for the particular style of shoes being lasted. All sizes and widths of this and similar styles of shoes may then be processed without further adjustment of adjusting knob 33 since the grade or change of last dimensions is sensed by the gauging member 23 and establishes, without skill or discrimination on the part of the operator, the optimum height to which the wipers and toe band rise in relation to the plane of the fore-part of the shoe. The operator, in placing different sizes of shoes in the machine, is required, as is normal, to adjust hand wheel 93 and crank 94 to place the shoe in the proper

fore-and-aft position in relation to the wiper travel and also in the proper angular position to align the plane of the forepart of the shoe with the plane of the action of the overwipe blades.

As the operator next brings the wiper lever 73 forward slightly, drawing the overwipe blades 18 forward, the valve 67 is closed and its closing initiates two actions: first, the toe band cylinder 74 is thereby pressurized to contact the U-shaped toe band and, second, the upwipe cylinder 37 is pressurized to elevate the wiper head assembly. The contracted toe band is thus drawn firmly about the toe upper materials, smoothing them and drawing them taut about the contoured toe of the last. As the upwipe proceeds, the stopping armature 49 of the microswitch carried by the rising wiper head assembly 21 ultimately engages the end 33e of the stopping member 33 and closes the microswitch, whereupon the solenoid 52 is energized to close the oil-flow control valve 48 and the uplift pneumatic motor 37 jams itself harmlessly against the entrapped oil 43 and stops further upward movement of the wiper head assembly and toe band assembly 17. The upwiping is thus completed and is terminated at precisely the proper level, the overwipe blades 18 then being automatically poised for optimum overwiping action. If necessary, or if desired for the purpose of further improving the quality of the upwiping, the wiper lever 73 may be pushed back to its rearmost position and then brought forward again, one or more times, to repeat the unwiping and automatic stopping actions. At this point, the operator may conveniently release the unwipe by pushing the lever 73 rearwardly and then may trim away the upstanding inner lining materials and/or box toe, down to approximately the level of the bottom of the shoe, using a knife. The shaped gauging arm 23 is shaped to lie essentially flat near the bottom of the shoe, and is disposed centrally, away from the margins where the trimming is being performed, such that the gauging equipment does not impair the operator's manipulations of the upper and lining materials or the trimming knife. Bringing the lever forward once again, the operator thereby repeats the automatically-stopped upwipe and applies a cement, such as a quick-setting hot-melt cement about the margins of the toe, between the margin 15 of the upper material and the insole piece 16. Thereafter, the operator presses the thumb lever 81 while pulling lever 73 forward, and the known form of overwipe mechanisms (not shown in full) which slide the blades 18 forward and scissor them together slightly then become powered by the pneumatic motor 84 in response to actuation of its solenoid valve 83 by the microswitch 82 actuated by the thumb lever. At the same time, microswitch 82, which is wired in series with the upwipe solenoid valve 76, automatically causes the normally-open upwipe valve to close and to exhaust the pressure in the lower cylinder 46 of the upwipe motor 37 through an outlet 96 (FIGURE 3). This prevents upwipe forces from opposing the desired downward bedding motions. However, the mass of the wiper head assembly is substantial and it tends to drop the head and overwipe blades below the desired and proper level for overwiping; were this depression permitted, the blades could improperly engage the toe upper materials of the shoe, damaging them. Therefore, the counterbalancing air cylinder mechanism 86 is relied upon to prevent such dropping motion and to keep the wiper head assembly at the stopped level. As has been said, this counterbalancing mechanism is pressurized into action by the same actuation of the overwipe solenoid valve 83 which brings the overwipe cylinder 84 into play, hence the counterbalancing is always effective when needed. Alternatively, or additionally, of course, the check valve spring 57 is made stiff enough to oppose the tendency of the wiper head assembly to drop, or, when no auxiliary check valve is used, the closed solenoid valve 48 of the gauging mechanism will have the same effect if it is opened. The latter mode of operation may be promoted simply by placing

in series with the solenoid 52 a normally-closed microswitch 97 (FIGURE 4) which is opened upon positive actuation of the bedding pressure regulator 71.

Downward bedding pressures on overwipe blades 18 are governed by the extents to which the operator presses the thumb lever 81, and these pressures are maintained while the wiper lever 73 is held briefly (as by a catch) in its foremost full-overwipe position, until the applied adhesive has had an opportunity to set firmly. The operator then strikes the knee switch 64 once again, opening it. Thereupon, the heel clamp solenoid valve 68 stands closed, such that there can be no bedding pressure, no heel-clamping pressure, no counterbalancing pressure, no gauging arm actuating pressure, and no powered overwipe pressure, until the machine is re-cycled in subsequent operation. In addition, the gauging arm solenoid 62 is de-energized and opens its valve to admit air pressure to the upper chamber of the gauging arm cylinder 34, whereupon the gauging arm 23 is powered clockwise out of engagement with the shoe. It will be understood that the powered clockwise movement may instead be developed entirely by the return spring 36. Release of the spring-biased wiper lever 73 trips the valve 67 closed, thereby removing pressure from the toe band cylinder 74, such that the machine sands in full readiness for another toe-lasting sequence once the freed shoe has been removed and another unfinished item is inserted in its place.

The apparatus of FIGURES 6 and 7 is of a construction which develops an automatic mechanical jamming action which regulates the limit of upwipe motion and level of overwipe action. For convenience in description, those elements which are the same as those illustrated and discussed earlier herein are identified by the same reference characters, while those which are similar in function but structurally distinctive in some respect are identified by the same reference characters together with the distinguishing subscript *b*. The gauging arm 23*b* is there shaped to have its outer end lie close to the bottom surfaces of the shoe, where it offers no obstruction to the operator's manipulations in trimming, supplemental corrective pulling of upper materials with pliers, and cementing. Moreover, a flat generally-triangular pressure plate or pad 98 is added to the end of the gauge arm for the purpose of putting the pressures exerted by that arm to a further use in holding the insole materials, particularly spongy materials, in a flat and fully-spread condition during the overwiping when inwardly-directed overwipe forces may tend to cause insole wrinkling. Gauging arm 23*b* is longitudinally adjustable along its actuating shaft 24*b* and is angularly fixed therewith, by an adjustable keying member 99. Its angular excursions are in accordance with the pressurizations of the cylinder 34 and the resulting deflections of the crank arm 28*b*. However, the stopping actions which halt upward movement of the wiper head assembly 21 do not involve electrical switching and are instead, the result of interference between a specially-shaped cam 100 and a cooperating Jam unit 101 in the general form of a lever, pivoted sector 100 is pivoted about an axis parallel with but displaced from gauge arm shaft 24*b*, on a shaft 102 carried by side frame brackets 103. The cam surface, from top to bottom, follows a diminishing radius from its axis of angular movement, the change in radius being essentially linearly related to the change in angle. Crank arm 104, fixed with shaft 24*b*, and a connecting link 105, develop angular orientations of the cam which are related to the angular orientations of the gauge arm and its shaft 24*b*. Jam unit 101 is in the general form of a lever, pivoted on one of the brackets 103 on a shaft 106, and carrying the stopping member 33 at one end and an inclined flat brake surface 107 nearer the pivot axis at a site where it may engage the cam 100 substantially tangentially. A second stopping member 108 fixed with the movable wiper head assembly 21 by a bracket 109 is disposed to encounter the stopping member 33 as it rises with the upwiping motion of the wiper head assembly, thereby

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pivoting lever 101 and brake surface 107 about shaft 106 until the brake surface engages the cam 100 at some position precisely regulated by the orientation of the gauging arm and hence, the bottom of the shoe, at that time. The non-galling surface 107 may conveniently be formed by a known brake lining material such as is used in the automotive industry and which can develop high levels of friction without excessive deformations. Surface 107 is inclined at such an angle in relation to its axis of rotation on the shaft 106 that it must engage the camming surface of cam 100 substantially tangentially. This produces the advantageous result that the jamming forces reflected back into the gauging mechanisms are thrust directly onto the rugged cam shaft 102 and bracket 103, rather than developing torques about shaft 102 which could tend to lift the gauging arm away from the shoe against the restraint of the motive forces of cylinder 34. The gauging mechanism is thus a unilaterally-transmitting device. Once the stopping member 108 is lowered by downward motion of the wiper head assembly to which it is affixed, the jamming action is relieved and the gauging arm can be tilted clockwise to its upwardly poised rest position out of the operator's way. Any tendencies of the brake surface and cam to stick are overcome by the reverse action of cylinder 34, by a feed of air through line 61 as solenoid valve 62 is opened by release of the knee switch. This action is aided by tendencies of lever 101 to drop of its own weight, although this may also be augmented by action of a biasing spring 110 between the jam arm and frame. The biasing spring 111 between cam 100 and crank arm 104 normally tends to eliminate backlash-induced inaccuracies. Operation in fabrication of toe-lasted shoes is generally as stated hereinbefore in connection with the switch-controlled stopping mechanism, except that the described stopping actions are wholly mechanical.

A highly simplified and economical embodiment of certain of the present teachings is represented in FIGURES 8 and 9, wherein, again, for convenience in description the basic machine elements are identified by the same reference characters employed in connection with the earlier figures to designate the same parts. While only a portion of the toe-lasting machine is depicted, it will be understood that the balance of the general construction is functionally the same as that for the machine described hereinbefore, with the exceptions now noted. All of the gauging mechanisms, 113 are mounted on and movable with the rearwardly-pivoted wiper head assembly 21. These include a gauging arm 114 and a microswitch 115 fixed with an adjustable bracket 116 carried at the front end of the plates 19 and 20 which carry the overwipe blades 18. Gauging arm 114 is pivoted on the bracket 116 on a shaft 117 which extends in the fore-and-aft direction below the level 118 of the overwiping action, such that it may engage the shoe and may be deflected angularly as a consequence of relative movements between the shoe and the wiper head assembly. For these purposes the gauging arm is also disposed forwardly of the plates 19 and 20 where it will engage the shoe at a lateral position rearwardly of the upstanding toe margins 15 and where the margins 119 of the upper material at about the ball portion of the shoe are already tacked or otherwise caused to lie substantially flat upon the bottom of the partly-lasted shoe as a consequence of prior lasting operations. At its upper end 120, the arm is curved progressively to the side, away from the intended site of the shoe, merging below with a relatively abrupt detent section 121 which extends toward the shoe from a lower end 122, removed laterally from the shoe site. Biasing spring 123 exerts a restraint between the lowermost tongue 124 of the arm and the supporting bracket 116, which normally deflects the gauging arm 114 toward the position to be occupied by the shoe, and one part 125 of the tongue 124 further serves as a stop which prevents excessive deflection of the arm by engaging the lower bracket part 116'. When the workpiece is

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not in place in the machine, arm 114 occupies a position near the center line of the intended shoe site, and the operator merely thrusts the inverted partly-lasted shoe downwardly against it to deflect it automatically to the illustrated position (FIGURE 9) while inserting the shoe into the machine in the usual way. The closed microswitch 115 thereby has its longitudinally-movable armature 126 moved fully to the right, where it causes the microswitch to be opened, electrically. Microswitch 115 corresponds in function to the normally-open microswitch 51 in FIGURES 2 and 5, and its circuit connections through its cable 127 are the same as those through the cable 54 associated with switch 51 and therefore will not be re-stated here. Accordingly, the upwipe actions of the machine may proceed freely until the overwipe level 118 of the wiper head assembly is raised to about the level of the bottom of the inverted shoe. At that moment, the detent section 121 of arm 114 is automatically sprung laterally over the flattened margin 119 of the shoe 10 and, in so deflecting, permits the spring biased armature 126 of microswitch 115 to slide outwardly sufficiently to close the microswitch contacts. This actuating condition is represented by the dashed linework outlining the obvious parts involved, in FIGURE 9, although it should of course be understood that it is the wiper head assembly 21 which has moved upwardly, rather than that the shoe would have moved downwardly, in relation to the stationary framework of the machine. Closure of the microswitch instantly actuates the solenoid 52 (FIGURE 4) of the oil-flow control valve connected with the upper cylinder 42 of the upwipe cylinder 37, thereby immediately stopping the wiper head assembly 21 at the prescribed level at which the upwipe should terminate and the overwipe should commence. Inasmuch as shoe lasts are "graded" items, having parts in predetermined proportions to one another, the gauging mechanism may be used with a variety of lasts. In practice, the operator may adjust the microswitch operations, as needed, by sliding it laterally relative to the bracket 116 and shoe 10, on a slotted sliding bracket 128, and may then clamp it in place by tightening the knurled knob 129 of a lock screw threaded into bracket 116. In addition the entire gauging assembly is movable vertically in relation to the supporting wiper head assembly, to enable further settings which will regulate the automatic stopping at desired levels for shoes of a variety of styles and sizes. The latter type of adjustment is facilitated by the illustrated vertical slotting of the bracket 116 to permit vertical sliding motion of the bracket in relation to three guide bolts 130 set into the wiper bend plates 19 and 20. Vertical settings of the bracket are established by rotation of the knurled adjusting knob 131 fixed with a threaded shaft 132 mated with the threads in a collar 133 atop the bracket portion 116e. The lower end 134 of shaft 132 is enlarged and somewhat loosely trapped within a recess between the plates 19 and 20, such that the shaft may be rotated without shifting its position, whereby the bracket 116 and the gauging mechanisms upon it are vertically adjustable through rotation of knob 131. The gauging may be performed properly on either right or left shoes. In alternative arrangements, the gauging mechanisms may be disposed at other locations such as forward of the left, rather than right, side of the front of the wiper head assembly, where measurement is responsive to a part of the shoe which is in a predetermined relationship to the level at which optimum overwiping action of the shoe is to be realized.

The embodiment of gauging mechanisms appearing in FIGURE 10 is one which also is carried upon the movable wiper head assembly, 21, forwardly of that assembly where it is responsive to the locus of the bottom of the partly-lasted shoe at about the ball portion thereof where the margins 119 of upper material have been flattened upon the bottom of the shoe in earlier stages of manufacture. Specifically, the gauging mechanism involves a housing 135 for a common form of light source

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at one side of the site of the shoe 10 and directing a narrow beam of light 136 substantially horizontally through its lens 137 transversely across the front of the wiper head assembly to a collecting lens assembly 138 of a second housing 139 for a known form of light-responsive cell beyond the opposite side of the shoe. A bracket 140 supports the light-source housing 135 for adjustable vertical settings on the wiper head plates 19 and 20 by way of manipulations of a knob 141. This bracket is vertically slotted so that it may slide on guide bolts 142, and the threaded trapped shaft 143 fixed with the knob 141 is mated with a threaded collar 144 atop the bracket to induce the desired vertical motions in a manner fully comparable to that which obtains with the similar vertically-adjustable bracket 116 shown in detail in FIGURE 9. Bracket 145, knob 146, guide bolts 147, shaft 148, and collar 149, associated with the light-responsive cell housing are similar in function and structure, permitting desired vertical adjustments and settings. The light-responsive cell may be of a known photoconductive or photovoltaic type, controlling the output of a conventional form of amplifier 150 to energize a relay 151 and close its normally-open switch contact assembly 51c only when the beam 136 impinges upon the cell. Switch contact assembly 51c is functionally the same as the microswitch 51 in FIGURES 2 and 5 and its closures actuate the solenoid 52 of oil-flow control valve 48 to control the stopping of the machine in the same manner as has been described in detail in connection with the like basic machine of FIGURES 1-5. When the pivoted wiper head assembly is in its lowermost position prior to commencement of an upwipe action, the light beam 136 is interrupted by the shoe 10 and the upwipe cylinder 37 is thus unstopped and may be raised to cause the desired upwiping by the toe band mechanism 17. As the wiper blades are raised in this manner to the proper level for overwiping, the light beam passes over the flattened margins at the ball portion and immediately excites the light-responsive cell within housing 139 to actuate the amplifier 150, energize the relay 151, close the contacts 51c, energize the solenoid 52, and close the normally-open oil-flow control valve 48. In a manner already described, the closure of valve 48 instantly halts the powered upward motion of the wiper head assembly at the intended level.

The desired stopping actions in a self-regulating toe laster may conveniently be controlled pneumatically, rather than electrically, and the hydraulic stopping means may conveniently comprise an independent unit, rather than a part of the upwipe motor construction. Both of these features are embodied advantageously in the toe laster machinery shown in part in FIGURE 11, wherein the machine elements which are the same as those illustrated and discussed earlier herein are identified by the same reference characters, and wherein the elements not differently shown or described are to be understood as conventional for such machinery. Gauging arm shaft 24 is oriented angularly in accordance with the orientations of the end of gauging arm 23 upon the bottom of the forepart of a last having an upper, 10, supported in the machine, and the associated lever 25 thus positions the adjustable stop member 33 in the intended manner. The cooperating stop member movable with the wiper head assembly 21 in this instance comprises the movable valving member 152 of a three-way pneumatic pilot valve 153 upon a bracket 153a fastened to a side link 154 which is connected to the wiper head assembly and which is actuated by the bedding motor (77, FIGURE 4) at a lower position to force the wiper head assembly downwardly in relation to the frame to develop the needed bedding forces which are to be applied through the overwipe blades 18. Pilot valve 153 is supplied with air under pressure via a flexible inlet tube 155, and controls the supply of this air to the air-powered actuator 156 of the hydraulic flow-control valve 48' via the flexible tubing 157. Actuator 156 is of a conventional piston-cylinder

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type, in which the piston 158 is powered by air pressure to close the normally-open valve 48', and which includes a return-spring automatically biasing the piston to a position at which it opens valve 48' at other times. In the latter connection, the actuator must be exhausted when not being powered, and this exhaust is achieved through the exhaust port 159 of the pilot valve while the air supply from inlet 155 is being cut off. Hydraulic flow-control valve 48', which corresponds functionally to the valve 48 referred to earlier herein, is coupled both with the liquid reservoir 44 and with the hydraulic stopping assembly 160, and is preferably by-passed by the check valve 49. The stopping assembly 160 includes a piston 161 within a cylinder 162 forming a chamber 163 filled with the substantially incompressible fluid and in communication with the reservoir 44 and valve 48' through the fluid coupling 164. Mechanical couplings 165 and 166 connect the stopping assembly between the base 8 of the machine frame and the bell crank arm 167 which is pivoted on the frame about a shaft 168 and is also connected with the link 154. The link, and hence the wiper head assembly, is free to move upwardly only so long as the liquid in the stopping assembly chamber 163 may flow to the reservoir 44. However, when the upwardly-moving wiper head assembly (powered by a pneumatic motor) forces the pilot valve armature 152 against the stop member 33, the pilot valve admits air under pressure to the actuator 156 and thereby causes closure of the valve 48'. At that time, the flow of liquid from chamber 163 is blocked, and the bell crank 167 is jammed and cannot deflect further against the assembly 160, whereby the upwipe movement is stalled with the overwipe blades 18 at the desired level.

In FIGURE 12, details are shown of an alternative arrangement of the normally-open valve 48' of the FIGURE 11 embodiment. This valve is itself shown to be mounted directly upon the bracket 153a fastened to the link 154, and the need for an auxiliary pilot valve and pneumatic valve actuator is thus avoided. Instead, the movable actuating shaft 169 of hydraulic flow-control valve 48' is disposed to engage and to be actuated by the cooperating stop member 33 to close this valve at the proper times. Hydraulic fluid is communicated between stopping assembly 160 and reservoir 44 via flexible tubes 164 and 170, which are capable of handling the liquid pressures involved.

While preferred practices have been described, and while specific embodiments have been illustrated and referred to in the descriptions, these are presented by way of disclosure rather than limitation, and it should be understood that various changes, modifications and substitutions may be effected without departure from these teachings and that it is aimed in the appended claims to embrace all such variations as fall within the true spirit and scope of this invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. Apparatus for lasting the toes of shoe uppers each mounted upon a graded last, comprising a machine frame carrying means for supporting a last, a wiper assembly carrying wiping means for drawing upper materials smoothly about the toes of lasts and movable on said frame heightwise in relation to the toe ends of lasts supported on said frame, motive means operated by fluid pressure and connected to power movement of said wiper assembly in relation to said frame, means for admitting pressurized gaseous fluid to said motive means to power upward movement of said wiper assembly in relation to said frame by said motive means, hydraulic stopping means including a cylinder and piston assembly filled with a substantially incompressible liquid, a reservoir for the liquid, normally-open valve means communicating the liquid in said stopping means with said reservoir, and means responsive to heightwise orientations of predetermined portions of lasts supported on said frame closing

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said valve means and thereby stopping upward movement of the wiper assembly when said wiper assembly is in predetermined relationship to the toe ends of the lasts for the lasting of the uppers about the toes.

2. Apparatus for lasting the toes of shoe uppers as set forth in claim 1, further comprising a check valve in by-pass relation to said valve means, said check valve being set to pass flow of the liquid in one direction from said reservoir to said hydraulic stopping means and to block the flow of liquid in the opposite direction, whereby said wiper assembly may be moved downwardly on said frame to develop bedding forces after said valve means has been closed.

3. Apparatus for lasting the toes of shoe uppers as set forth in claim 2, wherein said check valve includes a movable valve member yieldably biased against a seat with a predetermined force to block flow of the liquid in said one direction until said force is overcome, whereby said wiper assembly is held upwardly in said predetermined relationship until downward bedding forces overcoming said predetermined force are applied in said apparatus.

4. Apparatus for lasting the toes of shoe uppers as set forth in claim 1, wherein said means responsive to heightwise orientations of said predetermined portions of lasts includes a movable gauging arm, means mounting said gauging arm in said apparatus at a position from whence an end of said arm may move to engage the said predetermined portions of lasts, and means responsive to predetermined orientations of said gauging arm for closing said valve means.

5. Apparatus for lasting the toes of partly-lasted shoes as set forth in claim 1, wherein said normally-open valve means includes a remotely-actuated valve, wherein said means responsive to said heightwise orientations includes a remote valve actuating device normally holding said valve open and actuating said valve to closure when said wiper assembly reaches said predetermined relationship to the toe ends of the lasts, whereby occurrence of said predetermined relationship effects closure of said valve means and stopping of said upward movement.

6. Apparatus for lasting the toes of shoe uppers as set forth in claim 1, wherein said normally-open valve means includes a solenoid-actuated valve, wherein said means responsive to said heightwise orientations includes a normally-open electrical switch which is closed when said wiper assembly reaches said predetermined relationship to the toe ends of the lasts, and means for connecting said switch and solenoid-actuated valve in electric circuit relationship with an electrical power source, whereby closure of said switch effects closure of said valve means.

7. Apparatus for lasting the toes of shoe uppers each mounted upon a graded last, comprising a machine frame carrying means for supporting a last and upper, a wiper assembly carrying wiping means for drawing upper materials smoothly about the toes of lasts and movable on said frame heightwise in relation to the toe ends of lasts supported on said frame, motive means operated by fluid pressure including a cylinder and a piston separating said cylinder into two opposed chambers, means for admitting air under pressure into one of said chambers to power upward movement of said wiper assembly in relation to said frame by said motive means in response to actuations thereof, a substantially incompressible liquid filling the other of said chambers, a reservoir for the liquid, a normally-open solenoid-actuated valve communicating the liquid in said other of said chambers with said reservoir, a gauging arm, means pivotally mounting said gauging arm in said apparatus at a position from whence an end of said arm may pivot angularly about an axis to engage the forepart of the bottom of a partly-lasted shoe on said supporting means, means urging said gauging arm about said axis into engagement with the shoe, a normally-open electrical switch positioned for closure by said gaug-

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ing arm when said arm has predetermined angular orientations about said axis and when said wiper assembly has been moved into a predetermined relationship to the toe ends of the lasts on said supporting means, and means for connecting said switch and solenoid-actuated valve in electric circuit relationship with an electrical power source, whereby closure of said switch effects closure of said valve.

8. Apparatus for lasting the toes of shoe uppers each mounted upon a graded last, comprising a machine frame carrying means for supporting a last and upper, a wiper assembly carrying wiping means for drawing upper materials smoothly about the toes of lasts and movable on said frame heightwise in relation to the toe ends of lasts supported on said frame, motive means operated by fluid pressure for powering the movable wiper assembly upwardly on said frame in response to pressurization thereof, means for admitting air under pressure into said motive means, hydraulic stopping means including a cylinder and piston assembly filled with a substantially incompressible liquid and connected between said wiper assembly and frame, a reservoir for the liquid, normally-open valve means communicating the liquid in said stopping means with said reservoir, a movable gauging arm, means mounting said gauging arm in said apparatus at a position from whence an end of said arm may move to engage a last with a shoe upper on said supporting means, means urging the end of said gauging arm into engagement with a last with a shoe upper on said supporting means, means for actuating said normally-open valve means to closure and having a part positioned for actuation by said gauging arm to close said valve means when said arm has predetermined orientations responsive to movement of said wiper assembly into a predetermined relationship to the toe ends of the lasts on said supporting means.

9. Apparatus for lasting the toes of shoe uppers as set forth in claim 8, wherein said mounting means mounts said gauging arm on said machine frame pivotally about an axis, wherein said gauging arm is pivoted about said axis to have said end engage the forepart of the bottom of a last with a shoe upper substantially along the center line thereof and inwardly of the margins of the lasted upper thereon, where in said valve means comprises a normally-open solenoid-actuated valve, and wherein said means for actuating said valve means includes a normally-open electrical switch having a movable armature actuated to close said switch by relative movement between said wiper assembly and said gauging arm pivoted on said frame, and wherein said means urging said gauging arm into engagement with the last includes motive means exerting torque about said axis in direction to force said engagement when said means for admitting air pressurizes said motive means.

10. Apparatus for lasting the toes of shoe uppers as set forth in claim 8, wherein said wiper assembly is pivoted at the rear of said frame about an axis substantially transverse to the center line of lasts supported on said frame near the front thereof, wherein said means mounting said gauging arm includes means pivotally mounting said arm on said frame near the front thereof about an axis perpendicular to said transverse axis, and wherein the ratio of distance of said transverse axis from the position of engagement of said end of said arm with the lasts to the distance of said end of said arm from the pivot axis of said arm is substantially the same as the ratio of the latter distance to the distance of said part of said actuating means from said pivot axis of said arm.

11. Apparatus for lasting the toes of shoe uppers as set forth in claim 8, wherein said end of said gauging arm is enlarged and shaped to lie flat upon the bottom of the forepart of a last on said supporting means, whereby said enlarged end is forced upon insole material on the bottom of the last to hold said insole material substantially flat and unwrinkled during the toe lasting.

12. Apparatus for lasting the toes of shoe uppers each

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mounted upon a graded last, comprising a machine frame carrying means for supporting a last and upper, a wiper head assembly carrying wiping means for drawing upper materials smoothly about the toes of lasts and movable on said frame heightwise in relation to the toe ends of lasts supported on said frame, motive means operated by fluid pressure for powering the movable wiper head assembly upwardly on said frame in response to pressurization thereof, means for admitting air under pressure into said motive means to power upward movement of said wiper head assembly in relation to said frame, hydraulic stopping means including a cylinder and piston assembly filled with a substantially incompressible liquid and connected between said wiper head assembly and frame, a reservoir for the liquid, normally-open valve means communicating the liquid in said stopping means with said reservoir, a gauging arm, means mounting said gauging arm on said movable wiper head assembly for movements therewith and in relation thereto, means biasing said arm to a position of engagement with lasts having uppers supported by said supporting means rearwardly of the toe portions thereof, and means for actuating said valve means to closure responsive to movements of said gauging arm relative to said wiper head assembly, said gauging arm being disposed to actuate said actuating means to close said valve means when the wiper head assembly moves said gauging arm into a predetermined relationship to the last, whereby upward movements of said wiper head assembly are automatically stopped in position for overwiping of toes of lasts by said wiping means.

13. Apparatus for lasting the toes of shoe uppers each mounted upon a graded last, comprising a machine frame carrying means for supporting a last and upper, a wiper head assembly carrying wiping means for drawing upper materials smoothly about the toes of lasts and movable on said frame heightwise in relation to the toe ends of lasts supported on said frame, motive means operated by fluid pressure for powering the movable wiper head assembly on said frame in response to pressurization thereof, means for admitting air under pressure into said motive means to power upward movement of said wiper head assembly in relation to said frame, hydraulic stopping means including a cylinder and piston assembly filled with a substantially incompressible liquid and connected between said wiper head assembly and frame, a reservoir for the liquid, normally-open remotely-actuated valve means communicating the liquid in said stopping means with said reservoir, a gauging arm, means mounting said gauging arm on said movable wiper head assembly, means biasing said arm to a position of engagement with lasts having uppers supported by said supporting means rearwardly of the toe portions thereof, a valve-actuating device normally holding said valve means open and actuating said valve means to closure in response to actuations thereof, said gauging arm being disposed to actuate said valve-actuating device when the wiper head assembly carries said gauging arm into a predetermined relationship to the last, whereby upward movements of said wiper head assembly are automatically stopped in position for overwiping of toes of lasts by said wiping means.

14. Apparatus for lasting the toes of shoe uppers each mounted upon a graded last, comprising a machine frame carrying means for supporting a last and upper, a wiper head assembly carrying wiping means for drawing upper materials smoothly about the toes of lasts and movable on said frame heightwise in relation to the toe ends of lasts supported on said frame, motive means operated by fluid pressure for powering the movable wiper head assembly upwardly on said frame in response to pressurization thereof, means for admitting air under pressure into said motive means to power upward movement of said wiper head assembly in relation to said frame, hydraulic stopping means including a cylinder and piston assembly filled with a substantially incompressible liquid, and connected between said wiper head assembly and frame, a reservoir

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for the liquid, normally-open solenoid-actuated valve communicating the liquid in said stopping means with said reservoir, a gauging arm, means pivotally mounting said gauging arm on said movable wiper head assembly, means biasing said arm to a position of engagement with lasts having uppers supported by said supporting means rearwardly of the toe portions thereof, an electrical switch mounted on said movable wiper head assembly and actuated between open and closed conditions by pivotal movements of said gauging arm relative to said wiper head assembly, said gauging arm being disposed to close said switch when the wiper head assembly carries said gauging arm into a predetermined relationship to the last, and means connecting said switch and solenoid-actuated valve in electric circuit relationship with an electrical power source, whereby upward movements of said wiper head assembly are automatically stopped in position for overwiping of toes of lasts by said wiping means.

15. Apparatus for lasting the toes of shoe uppers as set forth in claim 14, wherein said biasing means comprises a spring yieldably urging said gauging arm into a position to be occupied by the ball portions of lasts with uppers on said supporting means, wherein the gauging arm extends substantially upright from its pivotal mounting and has an upper end curved to engage and to be deflected by lasts with uppers being placed upon said supporting means, and wherein said gauging arm has a detent portion disposed to slide over the lasted margins of the ball portions of lasts with uppers on said supporting means when the wiper head assembly carries said arm into said predetermined relationship and, thereby, to deflect sufficiently to effect closure of said switch.

16. Apparatus for lasting the toes of shoe uppers each mounted upon a graded last, comprising a machine frame carrying means for supporting a last and upper, a wiper head assembly carrying wiping means for drawing upper materials smoothly about the toes of lasts and movable on said frame heightwise in relation to the toe ends of lasts supported on said frame, motive means operated by fluid pressure, means for admitting air under pressure into said motive means to power upward movement of said wiper head assembly in relation to said frame by said motive means in response to actuations thereof, hydraulic stopping means including a cylinder and piston assembly connected between said frame and wiper head assembly and filled with a substantially incompressible liquid, a reservoir for the liquid, a normally-open solenoid-actuated valve communicating the liquid in said stopping means with said reservoir, a light source mounted on said movable wiper head assembly and directing a light beam across the site to be occupied by the ball portions of lasts supported on said supporting means, a light-responsive electrical cell mounted on said movable wiper head assembly in position to intercept said beam, a normally-open electrical switch actuated to closure by said cell when said cell intercepts said beam, and means connecting said switch and solenoid-actuated valve in electric circuit relationship with an electrical power source, whereby during upward movement of said wiper head assembly said light beam is interrupted by the ball portions of the lasts on said supporting means until the beam crosses the lasted margins on the bottom of the ball portions of the lasts and causes closure of said solenoid-actuated valve to stop upward movement of said wiper head assembly at a position for overwiping.

17. Apparatus for lasting the toes of shoe uppers each mounted upon a last, comprising a machine frame carrying means for supporting lasts and uppers in inverted positions, a wiper head assembly carrying wiping means for lasting upper materials about the toes of lasts and movable on said frame heightwise in relation to the toe ends of lasts supported on said frame, motive means for powering said wiper head assembly upwardly in response to actuations thereof, a gauging arm pivotally mounted on said machine frame and having an end disposed to engage

the bottoms of lasts with uppers on said supporting means substantially along the center-lines thereof and inwardly of the margins thereof when said arm is pivoted angularly in one direction, means normally urging said gauging arm angularly in the opposite direction away from engagement with the lasts, motive means for powering said gauging arm angularly in said one direction in response to actuations thereof, first mechanical stopping means fixed with said movable wiper head assembly, and second mechanical stopping means variably oriented in accordance with the angular positions of said gauging arm, said first and second stopping means being disposed for engagement and thereby to stall upward movement of said wiper head assembly when said wiper head assembly is in predetermined relationship to the toes of lasts as sensed by said gauging arm.

18. Apparatus for lasting the toes of shoe uppers as set forth in claim 17, wherein said second stopping means includes a cam pivoted on said frame and having a camming surface with varying radius from the pivotal axis thereof, means angularly positioning said cam in accordance with the angular positions of said gauging arm, and a lever pivoted on said frame and carrying a substantially flat braking surface positioned for substantially tangential engagement with said camming surface, said lever being disposed for engagement with said first stopping means and for attendant pivoting of said braking surface into engagement with said camming surface, whereby forces transmitted to the cam from the lever are ineffective to deflect said gauging arm.

19. Apparatus for lasting the toes of shoe uppers each mounted upon a graded last, comprising a machine frame carrying means for supporting a last and upper, a wiper assembly carrying wiping means for drawing upper materials smoothly about the toes of lasts and movable on said frame heightwise in relation to the toe ends of shoes supported on said frame, motive means operated by fluid pressure for powering upward movements of said wiper head assembly in response to pressurization thereof, means for admitting air under pressure into said motive means to power upward movement of said wiper assembly in relation to said frame, hydraulic stopping means including a cylinder and piston assembly connected between said frame and wiper head assembly and filled with a substantially incompressible liquid, a reservoir for the liquid, normally-open valve means operated by fluid pressure for communicating the liquid in said stopping means with said reservoir, a gauging arm, means pivotally mounting said gauging arm on said frame at a position from whence an end of said arm may pivot angularly about an axis to engage a predetermined portion of the bottom of a last on said supporting means, means urging said gauging arm about said axis into engagement with the last, a pilot valve actuated responsive to relative orientations of said wiper head assembly and gauging arm for pressurizing and de-pressurizing said valve means and operating said valve means to closure when said arm has predetermined angular orientations about said axis and when said wiper assembly has been moved into a predetermined relationship to the toe ends of the last on said supporting means, and means for admitting fluid under pressure to said valve means through and under control of said pilot valve.

20. Apparatus for lasting the toes of shoe uppers each mounted upon a graded last, comprising a machine frame carrying means for supporting a last and upper, a wiper assembly carrying wiping means for drawing upper materials smoothly about the toes of lasts and movable on said frame heightwise in relation to the toe ends of shoes supported on said frame, motive means operated by fluid pressure for powering upward movements of said wiper head assembly in response to pressurization thereof, means for admitting air under pressure into said motive means to power upward movement of said wiper as-

sembly in relation to said frame, hydraulic stopping means including a cylinder and piston assembly connected between said frame and wiper head assembly and filled with a substantially incompressible liquid, a reservoir for the liquid, a normally-open valve communicating the liquid in said other of said chambers with said reservoir and having an actuating member movable to close said valve, a gauging arm, means pivotally mounting said gauging arm on said frame at a position from whence an end of said arm may pivot angularly about an axis to engage a predetermined portion of the bottom of a last on said supporting means, means urging said gauging arm about said axis into engagement with the last, means mounting said valve in said apparatus at a position wherein said actuating member is disposed for movement by said gauging arm to close said valve when said arm has predetermined angular orientations about said axis and when said wiper assembly has been moved into a predetermined relationship to the toe ends of the lasts on said supporting means.

21. Apparatus for lasting the toes of partly-lasted shoes each including an upper mounted upon a last, comprising a machine frame for supporting partly-lasted shoes in inverted positions, a wiper head assembly pivoted on said machine frame about a transverse axis rearwardly of said supporting means, said wiper head assembly carrying movable overwipe blades at the forward end of said wiper head assembly in position to be moved inwardly across the margins of partly-lasted shoes along the bottoms thereof, and toe band means carried by said wiper head assembly and adapted to embrace and draw upper materials across the toes of lasts during upward movement of the forward end of said pivoted wiper head assembly, motive means operated by fluid pressure for pivoting said assembly upwardly on said frame, means for admitting air under pressure into said motive means to power upward movement of the forward end of said assembly, hydraulic stopping means including a cylinder and piston assembly connected between said frame and wiper head assembly and filled with oil, an oil reservoir, a normally-open solenoid-actuated valve communicating the oil in said hydraulic stopping means with said reservoir, a gauging arm, means pivotally mounting said gauging arm on a forward end of said machine frame about a fore-and-aft axis, said gauging arm having an end extending to engage the forepart of the bottom of a partly-lasted shoe on said supporting means, means actuated by fluid pressure to selectably pivot said gauging arm about said fore-and-aft axis into and out of engagement with the forepart of the partly-lasted shoe, a normally-open electrical switch mounted on said movable assembly and having a movable actuating armature, a stop member angularly positioned in accordance with the angular positions of said gauging arm and disposed to interfere with and actuate said switch armature to close said switch when said assembly moves upwardly to a predetermined relationship to the toe of the partly-lasted shoe on said supporting means, means for connecting said switch and solenoid-actuated valve in electric circuit relationship with an electrical power source, and a check valve in by-pass relation to said solenoid-actuated valve, said check valve having a movable valve member blocking flow of the oil from said other chamber to said reservoir and permitting flow of oil from said reservoir to said other chamber when at least a predetermined minimum oil pressure is experienced tending to cause oil flow in the latter direction.

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