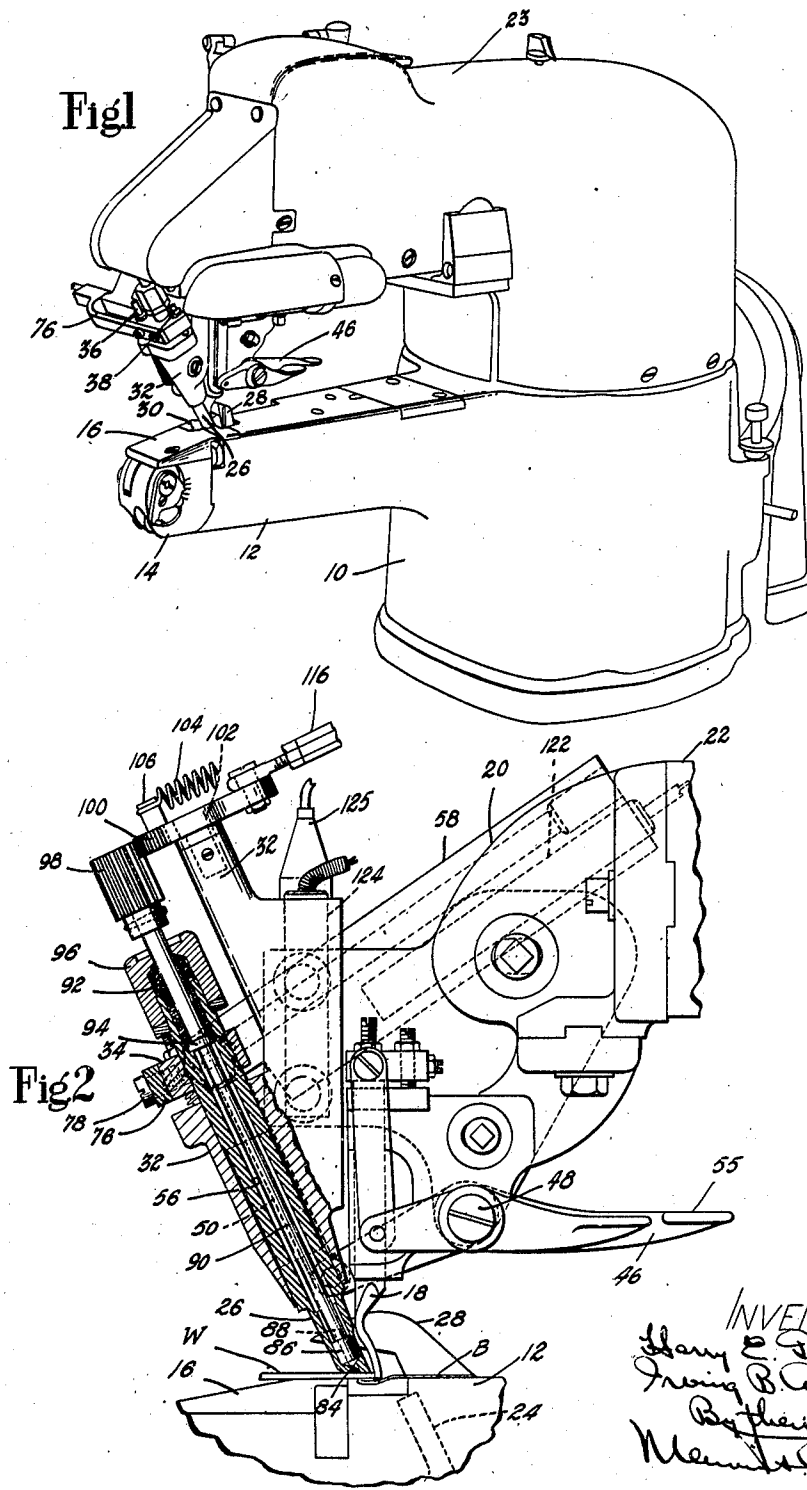


2,347,674

FOLDING MACHINE

Filed Aug. 11, 1942.

2 Sheets-Sheet 1



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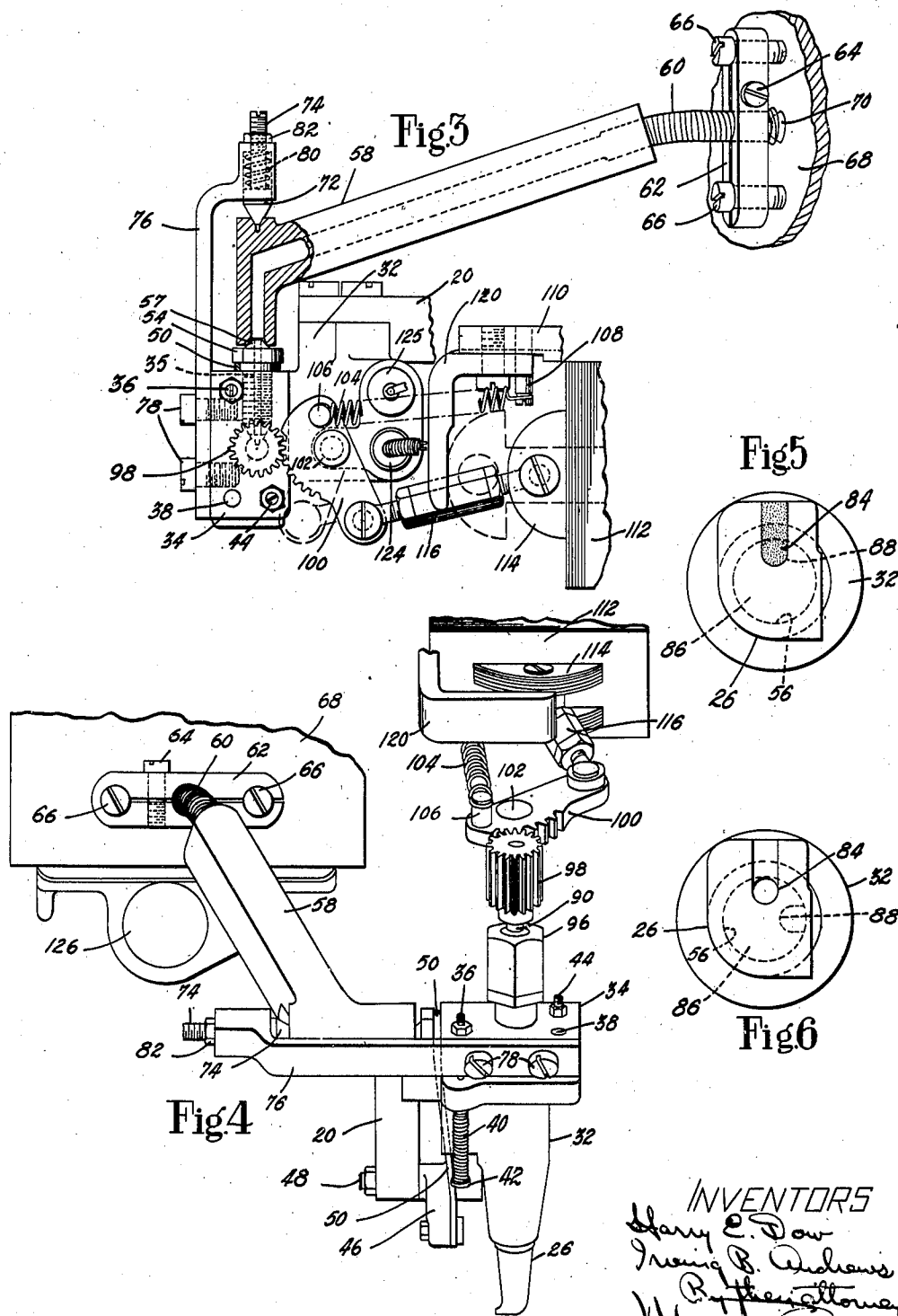
H. E. DOW ET AL

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,347,674

FOLDING MACHINE

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Application August 11, 1942, Serial No. 454,396

15 Claims. (Cl. 12—54)

This application relates to folding machines and is illustrated herein with reference to a folding machine of the type set forth in Letters Patent of the United States No. 2,301,202, granted November 10, 1943, upon an application of Paul H. Dixon. Machines of this type are adapted to fold the margins of flexible sheet material such as shoe uppers, and comprise mechanism for turning up the margin of the work to form a fold therein and then pressing the folded margin upon the body of the work. As illustrated in the Dixon patent, this mechanism includes a creaser foot against which the margin of the work is folded and through which adhesive is delivered onto the work immediately prior to the pressing of the folded margin. Preferably, a heated thermoplastic adhesive is employed to insure firm adhesion of the folded margin to the body of the work while requiring a very short time for the adhesive to set, during which pressure is applied to the folded portion. The adhesive is forced from a heated reservoir through a heated tube to the upper portion of the creaser foot, thence downwardly through a passageway therein, through an extrusion opening and onto the work. In the prior construction a valve was provided at the inlet of the pump to control the flow of adhesive from the reservoir through the creaser foot so that with no work passing through the machine and the valve closed, the flow of adhesive could be interrupted without stopping the machine. In order that such a valve may effectively control the flow of adhesive, the passageway through the creaser foot must be sufficiently small to hold the adhesive therein as by capillary action so that there will be no tendency for the adhesive to flow from the creaser foot by gravity when the valve is closed and the pump is thus rendered ineffective. While this arrangement has proved to be quite satisfactory, under certain conditions the character of the adhesive employed is such that it tends to ooze out of the creaser foot after the valve has been closed, and if the machine remains idle for a substantial period of time a considerable quantity of the adhesive may flow from the creaser foot onto the work support and must be removed by the operator in order that the next work piece will not be soiled thereby. In addition to this, if the creaser foot does not remain filled with adhesive there is a time lag between the opening of the valve and the extrusion of the adhesive from the creaser foot, so that when a new work piece is started through the machine the operator must allow for this time lag in opening the valve, since otherwise a portion of the folded margin would

not be provided with adhesive and would not be properly secured in place.

An object of the present invention is to provide improved mechanism for controlling the flow of adhesive from the creaser foot whereby the flow may be positively and rapidly started and stopped at will. To this end, the machine illustrated herein has a creaser foot through which adhesive passes onto the work during the folding operation, there being a valve in the creaser foot at the extrusion opening movable between open and closed positions for controlling the flow of adhesive therefrom, the valve effectively preventing oozing of adhesive from the creaser foot when the valve is closed. By so locating the valve, the creaser foot is maintained full of adhesive which will begin to flow therefrom immediately upon opening of the valve, thereby eliminating the time lag which would result if the passageway in the creaser foot were not maintained full of adhesive.

The creaser foot is mounted for movement heightwise of the work support to facilitate presentation of a work piece to the machine and to permit upward yielding movement in accordance with variations in thickness of the work being operated upon. To insure quick response of the valve the machine is provided with a solenoid which causes immediate and rapid movement of the valve in response to energization of the solenoid. The solenoid is so connected to the valve as not to interfere with the vertical movements of the creaser foot during the machine operation.

The above and other features of the invention will now be described in detail and illustrated in the drawings, in which,

Fig. 1 is a perspective view of one form of machine in which the invention may be embodied;

Fig. 2 is a front elevation, partly in section, of the work-engaging parts of the machine illustrating the construction of the creaser foot and the valve mechanism by which the flow of adhesive to the work is controlled;

Fig. 3 is a plan view, partly in section, illustrating the valve-operating mechanism;

Fig. 4 is an end elevation of the creaser foot and associated mechanism;

Fig. 5 is a bottom view of the creaser foot with the valve in open position; and

Fig. 6 is a view similar to Fig. 5 with the valve in closed position.

The illustrated machine comprises a base arranged to be mounted on a bench or other suitable support. The base is provided with an arm which overhangs the support and to the outer

end of which is secured a nose piece 14. A plate 16, carried by the upper surface of the nose piece, provides a support for a piece of work the margin of which is to be folded. The machine illustrated herein is equipped to fold a binding strip around the edge of a piece of leather to which it is secured and a gage finger 18 is provided for engaging the edge of the leather to guide the work through the machine. It should be understood that by the substitution of a different type of gaging means the margins of pieces of leather may be folded. The gage finger is carried by a bracket 20 as fully described in the Dixon patent. The bracket 20 is adjustably secured to the outer end of a neck 22 overhanging the arm 12 and secured to the base 10. The neck 22 and the bracket 20 are enclosed by a cover member 23.

The margin of the work, which in the illustrated embodiment of the invention is a flexible binding strip B, is turned upwardly by a folding finger 24 arranged to oscillate between the position shown in Fig. 2 and a position in which it projects above the upper surface of the arm 12. The margin of the work is folded thereby against the adjacent surface of a creaser foot 26, after which the upturned margin of the work is pressed against the body of the work W between a hammer 28 and an anvil 30. The hammer oscillates toward and away from the anvil and the hammer and anvil move in unison when the work is pressed therebetween to impart a feeding movement to the work. The folding finger 24 and the hammer and anvil may be operated by mechanism such as that illustrated in Letters Patent of the United States 2,270,891, granted January 27, 1942, upon an application filed in the name of C. A. Newhall.

The creaser foot 26 is mounted for upward movement in a support 32 secured to the bracket 20 so that the creaser foot may be moved upwardly away from the work support to facilitate the presentation of a piece of work to the machine and so that it may yield upwardly to accommodate varying thicknesses of work. A plate 34 is secured to the upper end of the creaser foot by a screw 35 (Fig. 3). Carried by the plate is a pair of pins 36 and 38 which extend downwardly through the enlarged upper end of the creaser-foot support 32 and prevent rotative movement between the creaser foot and the support. The pin 35 extends a substantial distance below the upper end of the support 32, and a spring 40 surrounding the pin acts between a head 42 at its lower end and the enlarged upper end of the support 32 to urge the pin and hence the creaser foot downwardly toward the work support. This downward movement of the creaser foot is limited by a stop screw 44 carried by the plate 34 and engaging the adjacent surface of the support 32. For moving the creaser foot upwardly, a lever 46 pivoted at 48 to the support 32 is provided. One end of this lever is connected by a link 50 to the screw 35 threaded into the plate 34. The link is held in place between a head 54 of the screw 35 and the adjacent surface of the plate 34. The lever 46 is provided with a finger piece 55 by which upward movement is imparted to the creaser foot.

The screw 35 (Fig. 3) by which the plate 34 is secured to the creaser foot has a central passageway therethrough which communicates with a passageway 56 in the creaser foot. The outer end of the screw 35 beyond the head 54 is provided with a conical nipple 57 to form a fluid-tight swivel connection with an angularly disposed end

of a rigid tube 58, the other end of which receives one end of a flexible tube 60. The other end of this flexible tube is held by a split U-shaped clamp 62 the legs of which are secured upon the tube by a clamping screw 64. Screws 66 pass through the clamp 62 and are threaded into a wall of an adhesive reservoir 68, the upper end of the tube 60 being held against a conical nipple 70 extending outwardly of the wall and through which adhesive is forced by a pump in the reservoir, as shown in the Dixon patent. The angularly disposed end of the rigid tube 58 is maintained in fluid-tight engagement with the nipple 57 by a plunger 72 having a shank portion 74 passing through a bracket 76 which is in turn secured by screws 78 to the plate 34 at the upper end of the creaser foot. The inner end of the plunger is conical and is arranged to seat within a correspondingly shaped recess in the tube 58. A spring 80, surrounding the shank portion 74 of the plunger, acts between the plunger and the bracket 76 to urge the plunger against the tube 58 thereby to maintain the end of the tube in engagement with the nipple 57. The outer end of the shank portion 74 of the plunger is threaded to receive a nut 82 which limits movement of the plunger by the spring 80, thereby maintaining the plunger and the bracket in assembled relation upon removal of the tube 58 by retraction of the plunger.

The adhesive is forced from the adhesive reservoir through the flexible tube 60, the rigid tube 58, the passageway through the screw 35 and downwardly through the passageway 56 in the creaser foot onto the work. The lower end of the passageway 56 in the creaser foot terminates in an extrusion opening 84 (Figs. 5 and 6) which is of small diameter as compared to the passageway 56 and is disposed eccentrically with respect thereto. For controlling the flow of adhesive through the opening 84, a rotatable valve 86 is seated on the shoulder formed between the passageway 56 and the extrusion opening. This valve comprises a rotatable plug, the diameter of which is substantially the same as the diameter of the passageway 56. In the surface of the valve is a groove 88 extending lengthwise thereof and arranged to provide communication between the passageway above the valve and the opening 84 when the valve is in the position of Fig. 5. Upon rotation of the valve out of this position into the position shown in Fig. 6 the valve effectively prevents communication between the passageway and the extrusion opening, thus interrupting the flow of adhesive to the work.

Extending upwardly from the valve 86 is a valve stem 90 which projects above the creaser foot. The valve stem is spaced from the walls of the passageway 56 to allow free flow of adhesive downwardly through the creaser foot to the valve. The upper end of the valve stem is sealed by packing 92 confined between the stem and the creaser foot, the valve stem having a flange 94 near its upper end seated on a shoulder at the upper end of the passageway 56. A packing nut 96 surrounds the upper end of the valve stem and is threaded onto the upper end of the creaser foot to maintain the packing under compression to form a fluid-tight assembly.

For rotating the valve, a pinion 98 is secured to the upper end of the valve stem and is in engagement with the teeth of a gear segment 100 journaled on a pin 102 in the creaser foot support 32. The gear segment 100 is urged in a direction to maintain the valve closed, as shown

in Fig. 6, by a tension spring 104 secured at one end to a pin 106 carried by the gear segment, the other end of the spring being secured to a pin 108 (Fig. 3) carried by a bracket 110 suitably secured to the neck 22. Carried by the bracket 110 is a solenoid 112 having an armature 114 connected by an adjustable link 116 to the gear segment 100 at a point diametrically opposite to the pin 106. When the solenoid is energized, the armature is moved from the broken line position of Fig. 3 into the full line position, thus turning the gear segment against the force of the spring 104 and moving the valve into a position in which the groove 88 is in line with the extrusion opening 84, as shown in Fig. 5. When the circuit to the solenoid is broken, the spring 104 turns the gear segment in the opposite direction to move the valve into the position shown in Fig. 6, in which the flow of adhesive to the work is interrupted at the extrusion opening. For limiting the amount of turning movement of the valve by the spring 104, a stop 120 is carried by the bracket 110 and has a portion arranged to be engaged by the armature 114 of the solenoid when the gear segment 100 has been turned a predetermined amount by the spring.

The teeth of the pinion 98 carried by the valve stem are considerably longer than those of the gear segment 100, as shown in Fig. 2, and permit upward movement of the creaser foot in the support 32 without interrupting the connections between the valve and the solenoid. The path of movement of the creaser foot in the support is parallel to the axis of the pin 102 upon which the gear segment is journaled, so that the gear segment and pinion 98 will always be in operative engagement.

For maintaining the adhesive heated during its passage to the work, the tube 58, through which the adhesive flows from the reservoir to the creaser foot, is provided with a cartridge-type heater 122 (Fig. 2) below its passageway. A similar heating unit 124 is inserted in the creaser foot support 32 and heats the creaser foot through conduction. The creaser foot may also be provided with a thermostat 125 connected in the circuit of the heater 124 so that the adhesive, as it flows onto the work, may be maintained at a predetermined temperature. A similar heating unit 126 (Fig. 4) is secured to the under side of the adhesive reservoir and the circuits for the various heating units may be separately controlled to facilitate the control of the heat in various parts of the machine. The flexible tube 60, between the adhesive reservoir and the tube 58 is short enough so that no special heating unit is required therefor.

In the operation of the machine, the creaser foot 26 may be raised by depressing the lever 46 to facilitate the insertion of a work piece into the machine. At this time, the solenoid 112 is preferably not energized and the valve 86 is in closed position but the passageway in the creaser foot above the valve is maintained filled with adhesive by the pump (not shown) in the adhesive reservoir 88. After the work is inserted in the machine, the creaser foot is then released to the action of the spring 40 and is moved into contact with the work and the circuit to the solenoid 112 is then closed. For this purpose a switch (not shown) arranged to be operated by the knee of the operator may be employed. The valve 86 is thus moved rapidly into open position so that adhesive immediately begins to flow onto the work. The margin of the work

is progressively folded upwardly by the folding finger 24 against the rearward surface of the creaser foot, after which the folded portion is pressed by the hammer 28 against the body of the work to which the cement has just been applied. The work is intermittently fed through the machine by the hammer and anvil and as soon as the folding operation on a piece of work is completed the operator opens the circuit to the solenoid, whereupon the valve 86 moves to closed position, thereby immediately stopping the flow of adhesive to the work. By locating the valve at the extrusion opening there is no danger of the adhesive in the passageway 56 of the creaser foot leaking out onto the work support thereby soiling it and wasting adhesive. In addition, since the adhesive cannot leak out of the creaser foot from the passageway, the creaser foot is always maintained full of adhesive so that immediately after the valve is opened, at the start of the subsequent folding operation, the adhesive will commence to flow onto the work.

Having thus described the invention, what we claim as new and desire to secure by Letters Patent of the United States is:

1. In a folding machine, means for folding the margin of a piece of work, means for pressing the folded margin of the work, a member for delivering adhesive to the body of the work just inwardly of the line of fold concomitantly with the folding of the margin, and a rotatable valve at the delivery end of said member for controlling the flow of adhesive to the work.

2. In a folding machine, means for folding the margin of a piece of work, a creaser foot against which the margin of the work is folded, said creaser foot having a passageway through which adhesive is delivered to the work concomitantly with the folding of the margin, and means at the delivery end of said passageway for controlling the flow of adhesive to the work.

3. In a folding machine, means for folding the margin of a piece of work, a creaser foot against which the margin of the work is folded, said creaser foot having a passageway through which adhesive is delivered to the work concomitantly with the folding of the margin, a rotatable valve at the outlet end of said passageway, and means for rotating said valve to control the flow of adhesive to the work.

4. In a folding machine, means for folding the margin of a piece of work, a creaser foot against which the margin of the work is folded, said creaser foot having a passageway through which adhesive is delivered to the work concomitantly with the folding of the margin, a valve at the outlet end of said passageway for controlling the flow of adhesive to the work, said valve having a stem passing upwardly through the creaser foot and terminating outwardly thereof, and means connected to the upper end of said valve stem for operating said valve.

5. In a folding machine, means for folding the margin of a piece of work, a creaser foot against which the margin of the work is folded, said creaser foot having a passageway through which adhesive is delivered to the work concomitantly with the folding of the margin, and a valve at the outlet end of said passageway for controlling the flow of adhesive to the work, said valve comprising a rotatable plug at the outlet end of and substantially filling said passageway, said plug having a groove extending lengthwise thereof to permit the flow of adhesive thereby, said creaser foot having an outlet opening below the

plug arranged to register with the groove when said valve is in one position, thereby to permit flow of adhesive to the work.

6. In a folding machine, means for folding the margin of a piece of work, a creaser foot against which the margin of the work is folded, said creaser foot having a passageway through which adhesive is delivered to the work, a valve at the lower end of said passageway, said valve comprising a rotatable plug substantially filling the lower end of the passageway, the surface of said plug having a groove extending lengthwise thereof to permit flow of adhesive past the plug, the creaser foot having an outlet opening below the plug arranged to communicate with the groove when the valve is in one position to permit flow of adhesive to the work, said valve having a stem extending upwardly through said passageway and spaced from the walls thereof, and means at the upper end of said creaser foot for turning the valve to control the flow of adhesive to the work.

7. In a folding machine, means for folding the margin of a piece of work, a creaser foot against which the margin of the work is folded, said creaser foot having a passageway through which adhesive may be delivered to the work, a rotatable valve at the outlet end of the passageway for controlling the flow of adhesive to the work, means urging said valve into closed position, a solenoid, and means connecting said solenoid and said valve operative to move said valve to open position in response to the energization of said solenoid.

8. In a folding machine, means for folding the margin of a piece of work, a creaser foot against which the margin of the work is folded, said creaser foot having a passageway through which adhesive may be delivered to the work, a valve in said passageway at the lower end of said creaser foot for controlling the flow of adhesive to the work, said valve having a stem passing upwardly and terminating outwardly of the creaser foot, means connected to the upper end of said valve stem for urging said valve to closed position, and means for moving said valve to open position.

9. In a folding machine, means for folding the margin of a piece of work, a creaser foot against which the margin of the work is folded, said creaser foot having a passageway through which adhesive may be delivered to the work, a rotatable valve in said passageway near the lower end of said creaser foot for controlling the flow of adhesive to the work, said valve having a valve stem extending upwardly and terminating outwardly of the creaser foot, a pinion on the upper end of said valve stem, a gear segment pivoted to the frame of the machine and having its teeth in engagement with the teeth on said pinion, a solenoid, means connecting said solenoid to one end of said gear segment arranged to move the valve to open position in response to energization of the solenoid, and a spring connected to the other end of said gear segment for moving the valve to closed position upon de-energization of the solenoid.

10. In a folding machine, a work support, means for folding the margin of a piece of work on said work support, a creaser foot against which the margin of the work is folded, means mounting said creaser foot for movement heightwise of the work support, said creaser foot having a passageway through which adhesive may be delivered to the work during the folding operation,

a rotatable valve in said passageway near the lower end of the creaser foot constructed and arranged to control the flow of adhesive from the creaser foot, said valve having a stem extending upwardly and terminating outwardly of the creaser foot, a pinion at the upper end of said valve stem, a gear segment meshing with said pinion, and means for rocking said gear segment to move the valve into or out of closing position, the teeth of said pinion being of sufficient length to permit substantial vertical movement of the creaser foot while the connection between the segment and the pinion is maintained.

11. In a folding machine, a work support, means for folding the margin of a piece of work on said work support, a creaser foot against which the margin of the work is folded, means mounting said creaser foot for movement heightwise of the work support, said creaser foot having a passageway through which adhesive may be delivered to the work during the folding operation, a rotatable valve in said passageway near the lower end of the creaser foot constructed and arranged to control the flow of adhesive from the creaser foot, said valve having a stem extending upwardly and terminating outwardly of the creaser foot, a pinion at the upper end of said valve stem, a gear segment meshing with said pinion, said pinion being sufficiently long to permit substantial heightwise movement of the creaser foot while maintaining engagement of the pinion with the gear segment, a spring connected to said gear segment and urging it in a direction to close said valve, a solenoid, and means connecting said solenoid and said gear segment arranged to move the valve to open position in response to the energization of the solenoid.

12. In a folding machine, a creaser foot, a passageway through said creaser foot, the lower end of said passageway terminating in a portion of reduced diameter forming a shoulder and providing an outlet port, said shoulder providing a valve seat, a valve at the lower end of said passageway cooperating with said valve seat to control the flow of adhesive through the outlet port, said valve having a stem extending upwardly through the creaser foot, means for conveying adhesive to the upper end of said passageway, and means for operating said valve.

13. In a folding machine, a creaser foot, a passageway through said creaser foot, the lower end of said passageway terminating in a portion of reduced diameter forming a shoulder and providing an outlet port disposed eccentrically with respect to said passageway, said shoulder providing a valve seat, a valve cooperating with said valve seat to control the flow of adhesive through the outlet port, said valve having a groove in its surface extending lengthwise of the valve and arranged to provide communication between the passageway above the valve and the outlet port when the valve is turned to a predetermined position, and means for operating said valve.

14. In a folding machine, a creaser foot, a passageway through said creaser foot, the lower end of said passageway terminating in a portion of reduced diameter, forming a shoulder and providing an outlet port, said shoulder providing a valve seat, a valve at the lower end of said passageway cooperating with said valve seat to control the flow of adhesive through the outlet port, said valve having a stem extending up-

wardly through the creaser foot, the stem being spaced from the walls of said passageway, thereby to form an annular passageway for the flow of adhesive to the valve, and means for conveying adhesive to the upper end of said passageway, said valve comprising a cylindrical plug arranged to fit tightly within said passageway, said valve having a groove extending lengthwise in its periphery, said outlet port being eccentrically disposed with respect to the passageway, thereby to register with the groove in said valve when said valve is rotated to one position.

15. In a folding machine, a creaser foot, a bore extending lengthwise through said creaser foot, the lower end of said bore being reduced in diameter to form a valve seat and an outlet port, a valve rotatably supported on said seat,

said valve having a stem extending upwardly through said bore and spaced from the walls of said bore, thereby to form an annular passageway through which adhesive may flow, means mounting said creaser foot for axial movement, a pinion on the upper end of said valve stem, a gear segment in mesh with said gear, said pinion being of sufficient length to permit the desired vertical movement of said creaser foot without causing the pinion to move out of engagement with the segment, a spring acting on said segment to cause the valve to move to closed position, and means connected to said segment for rocking it in the other direction to move the valve to open position.

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