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A. EPPLER, JR
FOLDING MACHINE

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2 Sheets-Sheet 2

Fig. 2

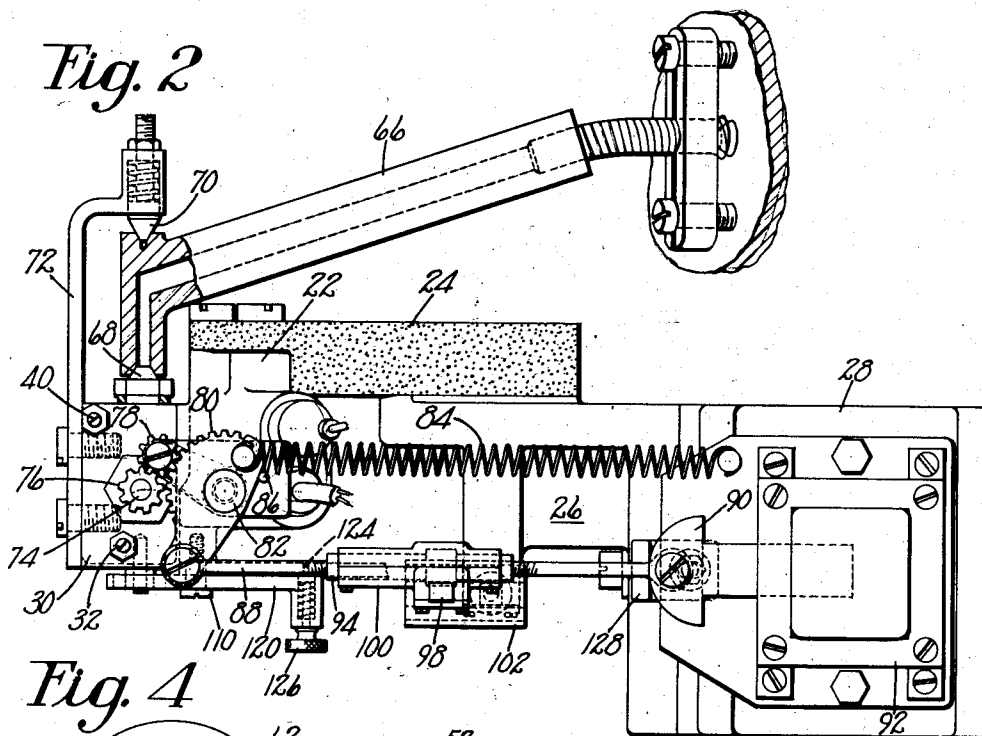


Fig. 4

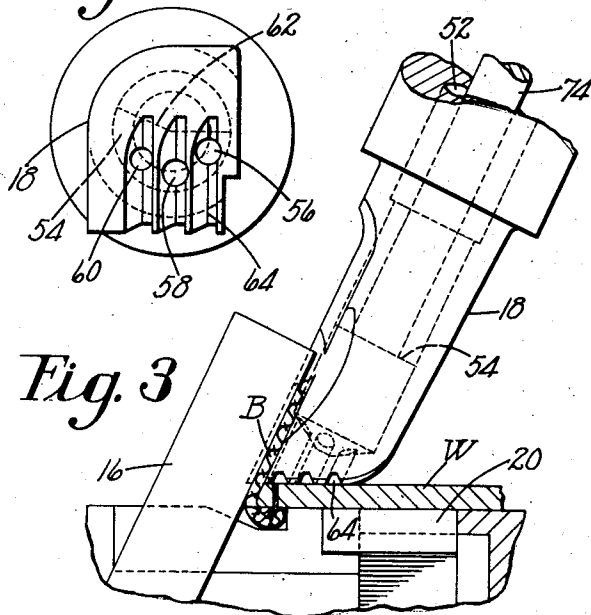


Fig. 3

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FOLDING MACHINE

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13 Claims. (Cl. 12—55)

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This invention relates to machines for folding the margins of flexible sheet material, and more particularly to machines for folding margins of shoe uppers. The invention is illustrated as embodied in a machine of the type shown in Letters Patent of the United States No. 2,301,202, granted November 10, 1942, on an application filed in the name of Paul H. Dixon, although it will be understood that the invention is not thus limited in its application.

Shoe uppers are frequently provided with a cloth binding strip which is stitched along the outer margin of the shoe upper and is folded inwardly and secured by adhesive to the inner margin of the shoe upper. As pointed out in the Dixon patent it is desirable to use uncoated bindings for this purpose and to apply adhesive to the work during the folding operation. In the machine of the Dixon patent, adhesive is applied to the work through the creaser foot of the folding machine immediately following the application of which the binding strip is pressed against the adhesively coated surface.

Binding strips are used in different widths and it is desirable that the amount of adhesive applied to the work be in proportion to the width of the binding so that the binding is secured throughout its width to the upper. Were an excessive amount of adhesive applied it would be squeezed out beyond the edge of the binding with a consequent soiling of the work. It is accordingly an object of the present invention to provide improved means by which the flow of adhesive from the creaser foot onto the work in readily controlled to accommodate binding strips of different widths. To this end and in accordance with a feature of the invention, the creaser foot is provided with a plurality of extrusion ports and with a valve which is turned to open position at the beginning of the folding operation, the extent of turning movement being readily controlled to uncover one or more of the ports according to the width of the binding strip.

Shoe uppers frequently have laps or seams where two pieces of leather are united to form the upper so that the thickness of the leather about which the strip is to be folded is variable. Consequently for a binding strip of any width, the extent to which the folded strip overlies the inner margin of the upper will depend upon the thickness of the work at any point along the margin. It is accordingly desirable that as the work increases in thickness the amount of adhesive applied thereto be reduced to eliminate undesirable soiling of the work. For the purpose

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in view, and in accordance with another feature of the invention, the means by which the extent of movement of the valve is controlled is connected to the creaser foot so that in response to upward movement of the creaser foot when a lap or seam passes thereunder, the valve will automatically be moved toward closed position to reduce the amount of adhesive applied to the margin of the work. The construction is therefore such that with the valve properly set for the particular width of binding strip to be folded, adhesive will be delivered to the margin of the work in the correct amount at all times regardless of variations in the thickness of the work being folded.

The above and other features of the invention, including various details of construction and novel combinations of parts will now be described by reference to the drawings and pointed out in the claims.

In the drawings,

Fig. 1 is a front elevation, partly in section, of a portion of a machine in which the invention is embodied;

Fig. 2 is a plan view, partly in section, of the portion of the machine shown in Fig. 1;

Fig. 3 is a rear elevation, partly in section, on a larger scale, of the creaser foot and associated parts, showing their relation to a work piece being folded; and

Fig. 4 is a bottom plan view on the same scale as Fig. 3 of the creaser foot looking in the direction of the axis of the foot in Fig. 1.

The machine includes a work support 10 over which a work piece W is fed by the cooperative action of a hammer 12 and an anvil, not shown. Work is guided over the work support by a gage finger 14, the margin of the work, which is illustrated as being in the form of a strip of French binding B, being turned upwardly by a folding finger 16 against a creaser foot 18. During the upward movement of the folding finger, the work is clamped against the bottom face of the creaser foot by a gripper member 20 which is moved downwardly during return movement of the folding finger from the position of Fig. 3 to that of Fig. 1 to permit feeding of the work by the hammer and anvil. The operation of these mechanisms will be clearly understood by reference to the Dixon patent.

The creaser foot 18 is mounted for upward movement in a support 22 carried by a plate 24 of insulating material which is in turn secured to a bracket 26 mounted on the head 28 of the machine. Secured to the upper end of the

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creaser foot is a plate 30 carrying an adjustable stop screw 32 engageable with the upper end of the support 22 to limit downward movement of the creaser foot. A screw 34 also carried by the plate 30 extends downwardly through a projection 36 of the creaser foot support 22 and a spring 38 surrounding the screw acts between the head 40 thereof and the projection 36 normally to maintain the creaser foot in its lowermost position. It is capable, however, of yielding upwardly against the action of the spring 38 to accommodate variations in the thickness of the work as the work is fed thereunder and to be moved upwardly by the operator to facilitate presentation of a new piece of work to the machine. For this purpose a lever 42 pivoted at 44 on a bracket 46 is connected to the creaser foot, as shown more clearly in Letters Patent of the United States 2,347,674, granted May 2, 1944, on an application filed in the names of Dow and Andrews. Upon depressing the right end of the lever 42 the creaser foot 18 is lifted against the action of the spring 38 so that a work piece may be placed on the work support between the creaser foot and the gripper member 20. The gage finger 14 is also connected by a link 48 to a lever 50 pivoted at 44 so that the gage finger may be lifted simultaneously with the creaser foot.

Besides functioning as a member against which the binding strip is turned by the folding finger 16, the creaser foot also serves to deliver adhesive to the surface of the work against which the binding is to be folded. Accordingly the creaser foot has a centrally disposed passageway 52 in the lower portion of which is a valve member 54 arranged for turning movement therein to control the flow of adhesive through one or more ports 56, 58, 60 (Fig. 4). The valve member 54 has a recessed portion 62 formed in its periphery so that, depending on the extent to which the valve member is turned in a clockwise direction from the position shown in Fig. 4, one or more of the ports are uncovered permitting flow of adhesive from the passageway 52 in the creaser foot into grooves 64 formed in the bottom surface of the creaser foot, and thence onto the work.

Adhesive is delivered into the passageway 52 in the creaser foot by way of a tube 66 (Fig. 2) which is connected to the upper end of the creaser foot by a nipple 68, the tube being held in place by a spring pressed plunger 70 carried by the outer end of a bracket 72 secured to the plate 30. The valve member 54 has an upwardly extending valve stem 74 which is axially disposed in the passageway 52 in the creaser foot so that adhesive flows downwardly around the valve stem. For turning the valve to control the flow of adhesive through the ports 56, 58, 60, the upper end of the valve stem 74 carries a pinion 76 which meshes with an idler gear 78 which is in driving engagement with a gear segment 80 journaled at 82 at the upper end of the creaser foot support 22. The gear segment is normally held by a spring 84 in contact with a stop pin 86 in the creaser foot support so that the ports in the lower end of the creaser foot are closed to the passageway 52. The gear segment is connected by a link 88 to the armature 90 of a solenoid 92 so that upon energization of the solenoid by the operator during the folding operation by a suitable switch as the knee operated switch of the Dixon patent, the armature 90 is moved to the right as viewed in Fig. 2 causing the valve

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stem 74 to be turned in a clockwise direction as viewed in Fig. 4 to open one or more of the ports 56, 58, 60 depending upon the extent of rotation which is imparted to the valve member.

It is desirable to control the amount of adhesive delivered to the work in accordance with the width of the binding to be folded and for this purpose the length of the link 88 is adjusted to determine the position to which the armature 90 of the solenoid is moved when there is no current flow through the solenoid and accordingly the extent of movement of the armature upon energization of the solenoid is readily varied to control the extent of turning movement imparted to the valve member. For this purpose the link 88 is in three parts, one of which includes a sleeve 94 the ends of which are in threaded engagement with the adjacent threaded ends of the other two parts of the link. By turning the sleeve 94 the outer ends of the link are drawn toward or moved away from each other so that the length of the link is readily varied, the sleeve 94 acting as a turn buckle. Formed on the sleeve 94 are gear teeth 96 which are engaged by the teeth on a rack 98 which is mounted for vertical movement in a housing 100 which surrounds both the sleeve and the rack whereby the rack and the teeth on the sleeve are maintained in engagement with each other. It will be understood that by moving the rack 98 vertically, the sleeve 94 is turned thus varying the length of the link 88 according to the direction and extent of movement of the rack 98.

Secured to the bottom of the rack 98 is a U-shaped channel member 102 in which is slidably received a circular head 104 on a rod 106 carried for vertical movement by a bearing 108 formed on the bracket 26. Pivotaly carried by the creaser foot support at 110 is an arm 112 the right end of which is received between a fixed collar 114 on the lower end of the rod 106 and a collar 116 backed up by a compression spring 118. Also pivoted at 110 is an arm 120 the left end of which is slotted to receive a block 122 pivoted on the plate 30 at the upper end of the creaser foot. The other end of the arm 120 carries a detent 124 (Fig. 2) provided at its outer end with a knob 126 by which it may be withdrawn from engagement with one of a plurality of apertures formed in the arm 112. As illustrated, the detent is received by the lowermost aperture in the arm 112 which therefore is in its uppermost position with the rack 98 likewise in its uppermost position so that the sleeve 94 is turned to a position in which the link 88 has its minimum length. The armature 90 in the solenoid 92 is therefore fully extended when the solenoid is de-energized, the armature at this time being in engagement with a stop 128 provided by a bracket secured to the machine. If now the solenoid is energized the link 88 moves to the right its maximum extent to turn the valve member through a sufficient angle to uncover all the ports in the creaser foot so that a band of adhesive of maximum width is applied to the work. It will be understood that in the embodiment illustrated the band will be in the form of three separate stripes. If now a piece of work with a narrow binding strip is to be folded the detent 124 is withdrawn by pulling on the knob 126 and the arm 120 moved upwardly with respect to the arm 112 to a position determined by the width of the binding strip to be folded. This has the effect of moving the right

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end of the arm 112 downwardly because with the creaser foot 18 in its lowermost position in which it is normally held by the spring 38, the position of the arm 120 is fixed so that the arm 112 is adjusted thus moving the rack 98 downwardly to turn the sleeve 94 in a direction to lengthen the link 88. Because the segment 80 is held by the spring 84 against the stop 86 the armature 90 is moved toward the right to reduce the stroke of the armature 90 when the solenoid is energized during the folding operation and accordingly the extent of rotation of the valve member 54 is correspondingly reduced with the result that one or more of the ports in the bottom of the creaser foot remain closed to the passageway 52 through which adhesive is being forced. In this way the width of the band of adhesive or the number of stripes is decreased to correspond to the width of the binding strip. Suitable indicia such as N, M and W to designate narrow, medium and wide binding strips may be applied to the arm 112 to facilitate the proper setting of the arm 120.

During the folding operation, thickened portions of the work are frequently encountered due to the presence of laps or seams in the work with the result that the width of the folded-over portion of the binding strip varies inversely in accordance with the thickness of the work. Consequently it is desirable to vary the width of the band of the adhesive inversely as the thickness of the work varies. This is readily accomplished with the structure disclosed herein by the lifting of the creaser foot 18 by the work as seams etc. pass beneath the creaser foot. Upon lifting of the creaser foot the left end of the arm 120 is lifted by reason of the engagement of the arm through the block 122 with the plate 30 secured to the upper end of the creaser foot. It will be understood that the right end of the arm 112 which is secured at this time by the detent 124 to the arm 120, will accordingly be moved downwardly in response to upward movement of the creaser foot. Accordingly the rack 98 is moved downwardly to turn the sleeve 94 in a direction to move the ends of the link 88 apart thereby lengthening the link and moving the segment 80 in a clockwise direction thereby moving the valve member toward closed position, the extent of this movement being dependent upon the extent to which the rack 98 has been lifted due to lifting of the creaser foot.

From the above it will be seen that the delivery of adhesive to the work responds immediately to variations in the thickness of the work which is therefore supplied at all times with the proper amount of adhesive to insure the binding being secured firmly in place throughout its width and without soiling the work by delivery of an excessive amount of adhesive thereto. Also for a binding of a given width the machine is readily adjusted prior to the start of the folding operation by adjusting the relative positions of the arms 112, 120. Thus the machine is readily adjusted to operate on work having binding strips of different widths regardless of variations in thickness of the work due to the presence of seams and the like.

Having thus described my invention what I 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, a work engaging member having a passageway through which adhesive is delivered to the work concomitantly with

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the folding of the margin, a valve in said passageway for regulating the flow of adhesive therethrough, operator controlled means for moving said valve from closed position, and means controlled by said work engaging member for varying the extent of opening movement of said valve.

2. In a folding machine, means for folding the margin of a piece of work, a work engaging member having a passageway through which adhesive is delivered to the work concomitantly with the folding of the margin, a valve in said passageway for regulating the flow of adhesive therethrough, means for opening said valve, and means for varying automatically the open position of said valve in accordance with variations in thickness of the work piece.

3. In a folding machine, means for folding the margin of a piece of work, a work engaging member having a passageway through which adhesive is delivered to the work concomitantly with the folding of the margin, a valve in said passageway for regulating the flow of adhesive therethrough, means for opening said valve including parts relatively adjustable to determine the extent of opening movement imparted to said valve, and means for relatively adjusting said parts automatically to vary the open position of the valve in accordance with variations in thickness of said work piece.

4. In a folding machine, means for folding the margin of a piece of work, a work engaging member having a passageway through which adhesive is delivered to the work concomitantly with the folding of the margin, a valve in said passageway for regulating the flow of adhesive therethrough, means for moving said valve from a closed position into any one of a number of predetermined open positions, and automatic means for varying the open position of the valve in accordance with variations in thickness of the work piece.

5. In a folding machine, means for folding the margin of a piece of work, a work engaging member having a passageway through which adhesive is delivered to the work concomitantly with the folding of the margin, said passageway terminating in a plurality of outlet ports in the bottom face of the work engaging member, a valve in said passageway controlling communication between the passageway and the outlet ports, said valve being movable from a closed position into any one of a plurality of open positions to permit flow of adhesive through one or more of said ports, means for predetermining the position to which the valve is to be moved from its closed position, and means for thus moving said valve.

6. In a folding machine, means for folding the margin of a piece of work, a work engaging member having a passageway through which adhesive is delivered to the work concomitantly with the folding of the margin, a plurality of outlet ports in the bottom face of the work engaging member and arranged for communication with said passageway, a rotatable valve in said passageway controlling communication between said passageway and said ports, said valve having a groove extending along one side thereof and arranged to provide communication between the passageway and one or more of said ports upon movement of the valve into one of a plurality of predetermined positions, means for predetermining the position to which the valve is turned from its closed position, and means for thus turning said valve.

7. In a folding machine, means for folding the

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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 in said passageway for controlling the flow of adhesive therethrough, said valve being movable between closed position and one or more open positions to permit flow of adhesive at different rates from said creaser foot onto the work, operator controlled means for moving the valve from said closed position to one of said open positions, and means for predetermining the position to which the valve is moved.

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 is delivered to the work concomitantly with the folding of the margin, said creaser foot having a plurality of outlet ports in its bottom face arranged for communication with said passageway, a valve in the lower portion of said creaser foot, said valve being arranged to uncover one or more of said ports in accordance with the position of the valve, and means for moving the valve into one of a plurality of different positions.

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 is delivered to the work concomitantly with the folding of the margin, said creaser foot having a plurality of outlet ports in its bottom face arranged for communication with said passageway, a rotatable valve in the lower portion of said creaser foot, said valve being arranged to permit communication between one or more of said ports and said passageway upon movement of the valve into one of a plurality of predetermined positions, and means for turning said valve into any one of said positions.

10. 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, said creaser foot having a plurality of outlet ports in its bottom face arranged for communication with said passageway, a valve in the lower portion of said creaser foot, means normally holding said valve in closed position in which flow of adhesive from said passageway through said ports is prevented, said valve being mounted for turning movement into one or more of a plurality of

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selected positions to uncover one or more of said ports, operator controlled means for turning said valve from said closed position, and means for predetermining the extent of movement of said valve by said operator controlled means.

11. 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, means mounting said creaser foot for vertical yielding movement to accommodate variations in the thickness of the work, means for controlling the rate of flow of cement through said creaser foot, and means operative in response to vertical movements of said creaser foot for adjusting said controlling means.

12. 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 terminating in a plurality of outlet ports in the bottom face thereof through which adhesive is delivered to the work concomitantly with the folding thereof, means mounting said creaser foot for vertical yielding movements to accommodate variations in the thickness of the work, a valve controlling the flow of adhesive through said ports, and means operated by vertical movements of said creaser foot for adjusting said valve to vary the number of ports open to said passageway.

13. 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 terminating in a plurality of outlet ports in the bottom face thereof through which adhesive is delivered to the work concomitantly with the folding thereof, means mounting said creaser foot for vertical yielding movements to accommodate variations in the thickness of the work, a valve controlling the flow of adhesive through said ports, means operated by vertical movements of said creaser foot for adjusting said valve to vary the number of ports open to said passageway, and means for adjusting the position of said valve for any position of said creaser foot.

ANDREW EPPLER, JR.

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UNITED STATES PATENTS

Number	Name	Date
2,347,674	Dow et al.	May 2, 1944