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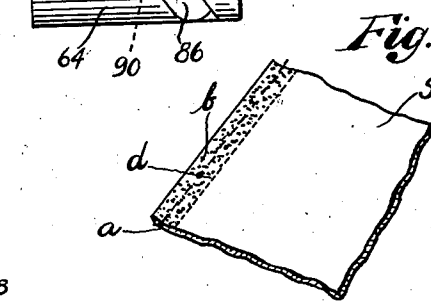
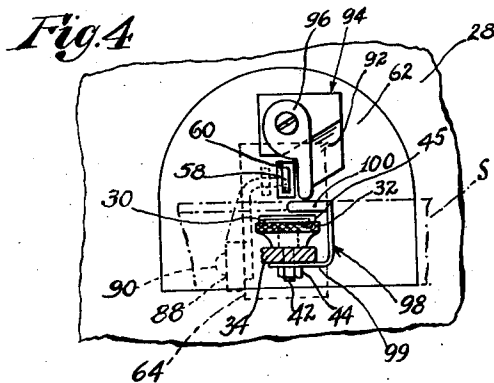
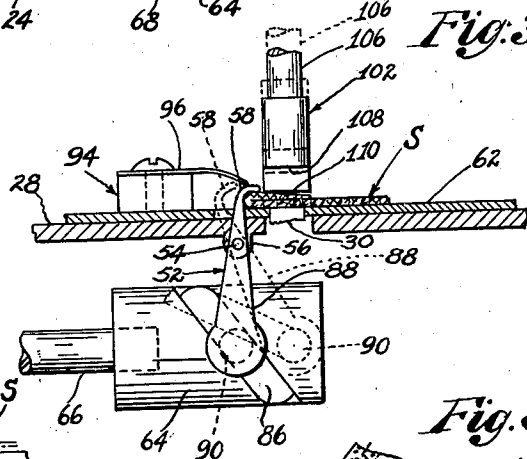
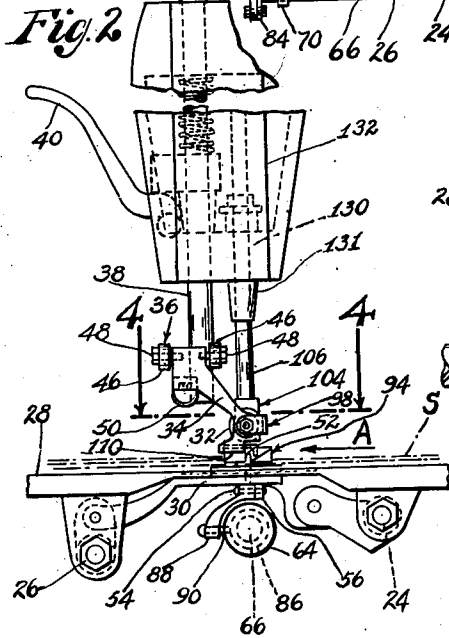
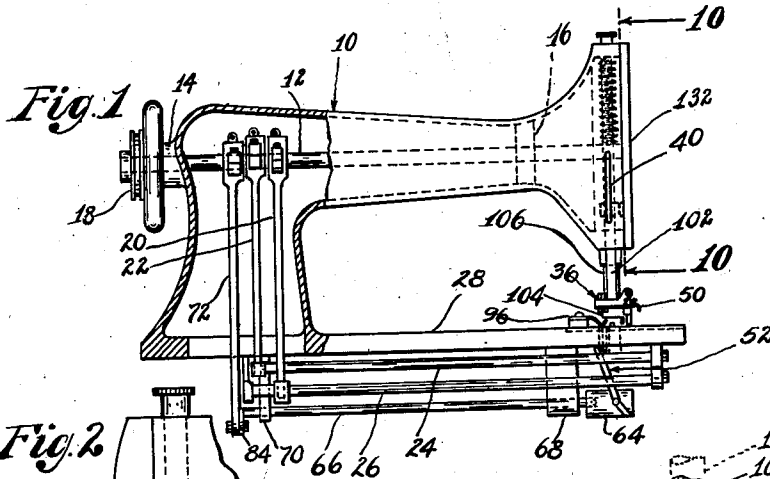
J. W. RUDOLPH

2,311,085

FOLDING MACHINE

Filed April 28, 1942

2 Sheets-Sheet 1



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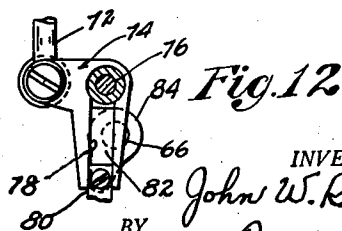
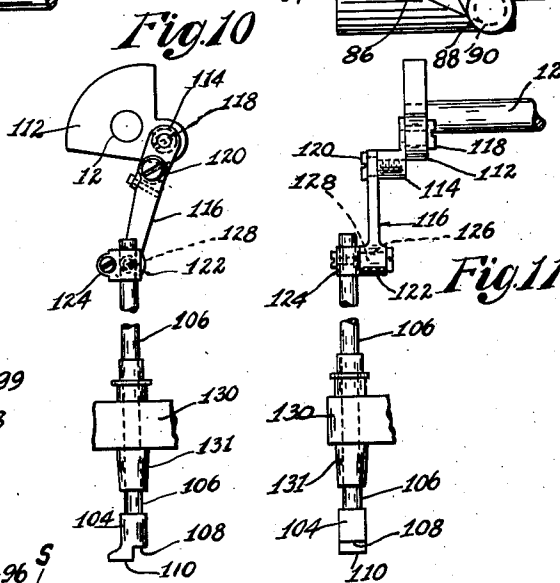
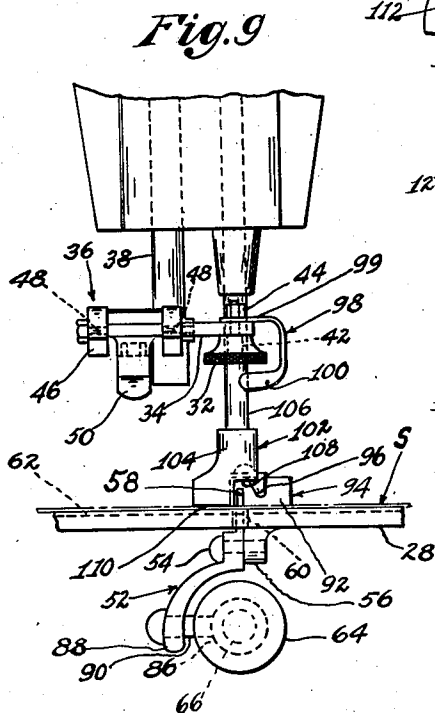
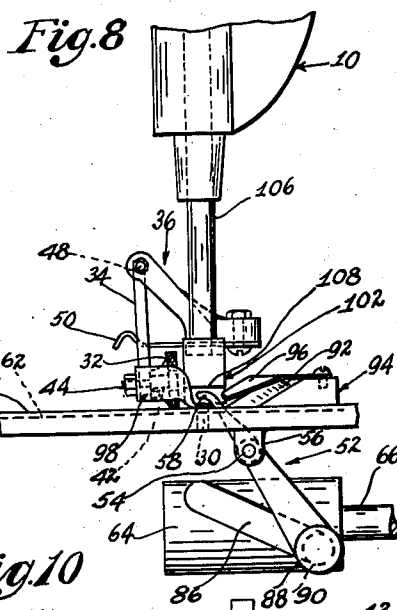
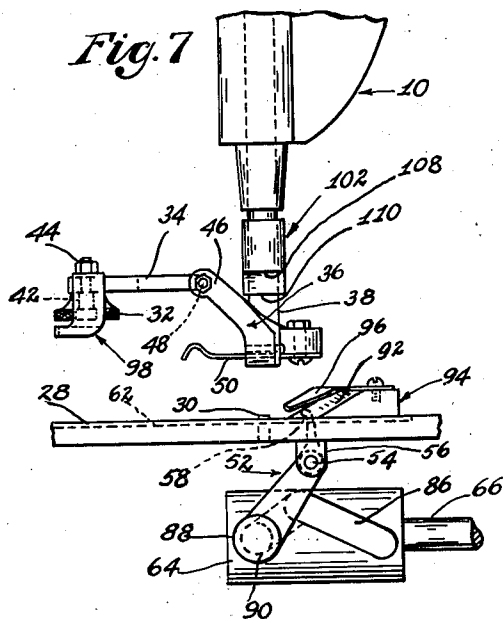
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FOLDING MACHINE

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2 Sheets-Sheet 2



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2,311,085

FOLDING MACHINE

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Application April 28, 1942, Serial No. 440,887

4 Claims. (Cl. 12—55)

This invention relates to folding machines and more particularly to machines for providing leather, fabric or other sheet material with a folded marginal edge.

In the manufacture of various articles, for example, shoe uppers, it is necessary to provide the sheet material of which the article is formed with a folded marginal edge, the inturned edge portion being adhesively secured to the underlying or adjacent portion of the material. The main object of the present invention is to provide a machine which is operable automatically during the feed of the material through the machine to fold the material and to secure the folded portion adhesively in position.

A further object of the invention is the provision of a machine which is operable for the above stated purpose and which is simple in construction and easy to operate.

The above and other objects and advantages of the invention will be fully understood from the following description, reference being had to the accompanying illustrative drawings.

In the drawings:

Fig. 1 is a rear view, in side elevation, and with parts broken away for the purpose of illustration, and also with certain parts displaced from their normal position in the machine to facilitate the illustration;

Fig. 2 is a fragmentary view of one end of the machine;

Fig. 3 is a view in side elevation, on a larger scale, of parts of the machine;

Fig. 4 is a plan view, with parts in section on the line 4—4 of Fig. 2;

Fig. 5 is a fragmentary perspective view of the sheet material before it is folded;

Fig. 6 is a fragmentary perspective view of the sheet material after it is folded;

Fig. 7 is a view in elevation of parts of the machine, as seen from the front of the machine, showing the folder member and the presser member in retracted position and showing also the retracted position of the part which cooperates with a part of the material feeding device;

Fig. 8 is a view similar to Fig. 7, but showing the folder and presser members in projected position and showing also the normal position of the part which cooperates with the feeder device;

Fig. 9 is a fragmentary end view similar to Fig. 2, with certain parts shown in Fig. 2 omitted and showing in retracted position the part which cooperates with the material feeding device;

Fig. 10 is a view of the mechanism for actuating the presser member, as seen on the line 10—10 of Fig. 1;

Fig. 11 is a view of the mechanism shown in Fig. 10, as seen at right angles to Fig. 10;

Fig. 12 is a detail view of parts which actuate the shaft which operates the folder member of the machine.

Referring now to the drawings in detail and first to Figs. 5 and 6, it will be understood that in accordance with the present invention the sheet material S, shown in Fig. 5, when passed through the machine is provided with a folded edge E, as illustrated in Fig. 6. Ordinarily, in folding material intended for use in manufacturing shoe uppers, said material S consists of shoe-upper leather, but of course it will be understood that the present machine can be used for folding other materials. As here shown, the material S has a skived longitudinally extending marginal edge portion *a*, the upper surface of said marginal edge portion having thereon a layer *b* of tacky and incompletely set adhesive cement by which the folded over portion is secured to the underlying portion of the material. In short, when the material is passed through the present machine, the material is folded longitudinally along a line *d*, shown as a dotted line in Fig. 5, and the folded over portion E is simultaneously pressed into engagement with the adjacent surface portion of the material. Subsequently, the adhesive *b* sets sufficiently to secure the folded over portion to the underlying or adjacent portion of material along the marginal edge thereof. The machine constructed in accordance with the present invention for accomplishing this result will now be described.

The folding machine of the present invention comprises a frame 10 which, as here shown, is constituted by the head of a sewing machine but which can be of any other suitable construction. Also, as here shown, certain of the mechanisms found in a sewing machine are made use of in providing a folding machine embodying the present invention but it will be understood that while an advantage is derived by reason of the fact that sewing machine heads not otherwise in use can be utilized, with certain changes and additions, for constructing folding machines of the present invention, the latter does not depend upon the use of sewing machine mechanisms but obviously can be constructed from parts and mechanisms designed for the broad purposes of the present invention.

The machine comprises a main shaft 12 journaled for rotating in bearings 14 and 16 carried by frame 10. A pulley 13 is secured to one end of the shaft and is adapted to be connected in any suitable way as by a belt (not shown) to an electric motor or to any other source of power whereby to rotate the shaft. Shaft 12 is connected by means of eccentric rods 20 and 22 to rock shafts 24 and 26 mounted for oscillation about their respective longitudinal axes. Said rock shafts 24 and 26 form part of a mechanism which is conventional in sewing machines for actuating a feed dog 30 by which materials placed upon the support 28 is fed through the sewing machine. As dog 30 and the mechanism for actuating the latter during the rotation of shaft 12 are well known parts of sewing machines, further description of these parts of the present machine are unnecessary. It will be understood, however, that as shaft 12 is rotated the feed dog mechanism operated by said shaft through eccentric rods 20 and 22 is operable to advance intermittently the sheet material S on support 28 in the direction indicated by the arrow A in Fig. 2, the feed dog 30 being moved by the mechanism including shafts 24 and 26 upwardly and downwardly as well as in the direction of arrow A and in a reverse direction.

In lieu of the usual pressure foot which is provided in the conventional sewing machine for cooperation with the feed dog, the present invention includes a knurled rotary wheel 32 which is carried by an arm 34 pivotally mounted in a bracket 36. Said bracket is fixed to the lower end of the spring-pressed rod 38 to which the conventional pressure foot is secured in the usual sewing machine, the lever 40 being provided for raising and lowering said rod 38 as in the usual sewing machine. Knurled wheel 32 is mounted for rotation on a shouldered screw 42 which is secured to arm 34 by a nut 44. It will be understood that when rod 38 is in its lower position, wheel 32 is positioned to engage the upper surface of the sheet material fed through the machine by feed dog 30 which engages the lower surface of said material through an opening 45 provided in support 28 (Fig. 4). As illustrated in Figs. 7 and 9, arm 34 and the parts carried thereby can be moved away from the upper surface of support 28, for which purpose said arm 34 is pivotally mounted between the spaced parts 46 of brackets 36 by means of adjustable pivot pins 48. A resilient spring 50 is carried by bracket 36 in position to engage arm 34 releasably, as shown in Fig. 8, for holding said arm in normal operative position whereby to dispose wheel 32 over feed dog 30.

As the sheet material S is fed through the machine in the direction of the arrow A by the feeding mechanism including the dog 30, the marginal edge portion of said material is subjected to the action of the folder mechanism which will now be described for providing said sheet material with the folded edge portion E described above with reference to Figs. 5 and 6. Said folding mechanism comprises a folder member 52 (Fig. 3) which is mounted for pivotal movement toward and away from the sheet material S transversely of the line of feed of said material. Said folder member 52 is mounted on a pivot pin 54 in a bracket 56 carried at the bottom of support 28. Said folder member has an upper curved end part 58 which is positioned above support 28, the upper part of said folder member projecting through an opening 60 pro-

vided in the metal plate 62 which is set into a recess in support 28, as in the conventional sewing machine. Folder member 52 is oscillated by a cylindrical cam 64 which is fixed to and oscillated by a rock shaft 66 mounted for oscillatory movement about its longitudinal axis in bearings 68 and 70. In the present disclosure wherein parts of a sewing machine are utilized, shaft 66 corresponds to the rock shaft which in the usual sewing machine operates the shuttle. In the present machine the shuttle has been removed and the cam 64 is secured to oscillatory shaft 66 and is oscillated thereby when shaft 12 is rotated. The eccentric or crank rod 72 is connected to rock shaft 66 through the conventional oscillating mechanism illustrated in Fig. 12, said mechanism including a bell crank lever 74 mounted for oscillatory movement on a bearing pin 76 fixed in frame 10. One end of belt crank 74 is pivotally connected to rod 72 and the other arm of said bell crank is provided with a slot 78 in which a block 80 reciprocates when said bell crank is oscillated, said block being connected to crank arm 82 of a collar 84 fixed to the adjacent end of shaft 66. It will be understood that cam 64 at the other end of rock shaft 66 is designed so that as said cam is oscillated about the longitudinal axis of rock shaft 66 folder member 52 is oscillated on pin 54 about an axis at right angles to the axis of oscillation of shaft 66. For this purpose cam 64 has a properly designed cam groove 86 to which the lower arm 88 of folder member 52 is connected by means of the cam follower pin 90 which is fixed to the end of said arm and projects into said cam groove.

As the sheet material S is fed through the machine, folder member 52 is oscillated in timed relation to the feed of the material and the upper curved end 58 of said folded member intermittently engages the edge of the sheet material and turns the latter inwardly over the adjacent edge portion of said sheet material. To facilitate this operation the material is fed through the machine with the marginal edge portion thereof raised out of the plane of the adjacent part of the sheet. This is accomplished by passing the marginal edge portion of the material between the upwardly inclined surface 92 of guide block 94 and the spring finger 96 which is secured to said block (Figs. 4, 7 and 8). Means is provided for holding down the portion of the sheet material at the point adjacent the portion which is engaged by the upper end 58 of the folder member. The means provided for this purpose comprises a member 98 formed of resilient sheet metal. Said member 98 is fixed to the arm 34 by means of the nut 44, said member 98 having a side portion 99 which is apertured for engaging over the shank of the shouldered screw 42 (Fig. 4). The other side 100 of member 98 is positioned to resiliently engage the sheet material as described above and as shown in Fig. 4.

In addition to the folder member 52, the folder mechanism includes means for pressing the in-turned portion of the sheet material against the adjacent portion thereof whereby to unite said portions to each other. The means provided for this purpose comprises a reciprocating presser member 102 which is positioned immediately in advance of folder member 92 in the direction of the line of feed of the material. Said presser member includes a presser foot 104 fixed to the lower end of a rod 106 which in the form of the invention here shown is constituted by the rod 75 which is the needle bar in the conventional sew-

ing machine. Said presser member has a lower recessed portion 108 to permit the forward movement of the upper end 58 of the folder member to a position close to the point where the lower surface 110 of the presser member engages the inturned portion of the sheet material, this relation of the parts being illustrated most clearly in Fig. 9. It will be understood that the presser member is actuated in timed relation to the oscillations of the folder member and that the presser member is in its lowermost position at the instant the upper inturned end 58 of the folder member completes its forward stroke for inturning the edge portion of the material. After the downward stroke of the presser member is completed, the latter moves upwardly, and, simultaneously, the folder member is moved to its retracted position illustrated in Fig. 7, and while this occurs the feeder mechanism operates to advance the sheet material a short distance for bringing an edge portion thereof into position for action thereon by the folder member.

The means for reciprocating the presser member in timed relation to the oscillations of the folder member and in timed relation to the operation of the feed mechanism is illustrated more clearly in Figs. 10 and 11. As here shown, said means for actuating the presser member comprises a mechanism actuated by the main shaft 12. Said mechanism comprises a crank member 112 fixed to and rotated by shaft 12 and pivotally connected to the upper end of rod 106 by means including links 114 and 116. Link 114 is pivotally secured to crank member 112 by a shouldered screw 118, and link member 116 is pivotally secured at its upper end to link 114 by a shouldered screw 120. The other end 122 of link 116 is pivotally connected to rod 106 and more particularly is pivotally secured to a bracket 124 clamped to the upper part of said rod 106. To provide the pivotal connection between the lower end of link 116 and bracket 124, the lower end 122 of link 116 is provided with a bore 126 having a bearing engagement with the shank 128 of a shouldered screw which passes through said bore and is fixed to bracket 124. Rod 106 is guided for rectilinear movement in the end part 130 of the frame adjacent the cover plate 132 and in the depending fixed guide 131, it being understood that rod 106 is movable only rectilinearly.

The operation of the machine has been explained above in the description of the construction and organization of the several mechanisms of the machine. However, by way of a brief summary of the operation of the machine, it may be stated that upon rotation of shaft 12 and upon feeding the sheet material to the machine disposed on support 28 so that the edge of the material which is to be folded moves along inclined surface 92 of block 94, the upper end 58 of folder member 52 intermittently engages the edge portion of the material immediately in advance of the free end of part 100 of member 98 and turns said edge portion of the material inwardly over the adjacent edge portion. Then the folder member is moved to its retracted position and the feeder mechanism operates to advance the sheet material a short distance, following which the presser member 104 is lowered and moves to its projected position in engagement with the inturned portion of the material just previously operated upon by the folder member and presses said inturned portions of the material against the adjacent or underlying

portions of the material whereby to firmly unite said portions of the material through the adhesive applied thereto as described above with reference to Fig. 5. During this action of the presser member the folder is actuated for inturning the edge portion of the material immediately adjacent and to the rear of the previously inturned edge portion, this action taking place while the presser member engages the immediately preceding inturned edge portion of the material. Thus, the machine operates progressively and automatically to form a folded edge on the sheet material as the latter is fed through the machine by the feed mechanism. It will be observed that the length of the edge of the sheet material which is inturned upon each forward movement of the upper end 58 of folder member 52 is very short and is approximately equal to the distance between the free end of part 100 of member 98 and the adjacent end of the lower surface 110 of presser member 104.

While I have shown and described the preferred embodiment of my invention it will be understood that the latter may be embodied otherwise than as herein shown or described and that in the illustrated embodiment certain changes in the details of construction and in the arrangement of parts may be made. Also, it will be understood that while, as indicated above, an advantage of the invention is derived by utilizing existing sewing machine heads and some of the sewing machine mechanisms, machines embodying the present invention can be constructed without regard to existing sewing machines, it being observed in this connection that for accomplishing the purposes of the invention the material is not stitched and need not be stitched in forming the folded edge portion. Accordingly, it is to be understood that the invention is not to be limited to the embodiment illustrated or described herein except to the extent which may be required by the scope of the appended claims.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. A machine for folding sheet material, comprising a frame, a shaft mounted on said frame for oscillation about its longitudinal axis, a folder member mounted on said frame for oscillatory movement about an axis at right angles to said shaft axis, means connecting said shaft to said folder member for oscillating the latter when the shaft is oscillated, a presser member mounted for movement on said frame, means for oscillating said shaft, and means for moving said presser member in timed relation to the oscillations of said folder member.

2. A machine for folding sheet material, comprising a support for the material, a movable folder member, means for intermittently feeding the sheet material on said support past said folder member, said folder member being mounted for movement in directions toward and away from an edge of said sheet material transversely of the line of feed thereof and engageable with a marginal edge portion of the material for progressively inturning said edge portion over the adjacent portion of the material, and means mounted on said support for raising the marginal edge portion of the material above an adjacent portion thereof at the points where said marginal edge portion is turned in by said folder member, said last mentioned means comprising a member having a surface inclined upwardly in a direction away from the adjacent edge of the material

and a member positioned over said inclined surface and forming a guide therewith for the passage of said marginal edge of said material.

3. A machine for folding sheet material, comprising a folder member, and means for feeding the sheet material past said folder member, said feeding means comprising a feeder member intermittently engageable with one side of said material for advancing the latter step by step with intermediate intervals of the rest of the material, a rotary member engageable with the other side of said material for pressing the latter against said feed member, and means for supporting said rotary member comprising a spring-pressed rod, a bracket carried by said rod, and an arm pivoted in said bracket and carrying said rotary member, said arm being movable on its pivot for moving said rotary member from a retracted position to a position in which it is operative to engage said material.

4. A machine for folding sheet material, comprising a folder member, and means for feeding

the sheet material past said folder member, said feeding means comprising a feeder member intermittently engageable with one side of said material for advancing the latter step by step with intermediate intervals of the rest of the material, a rotary member engageable with the other side of said material for pressing the latter against said feed member, and a spring-pressed rod to which said rotary member is connected, said rod being movable from a retracted position to a projected position for moving said rotary member into and out of engagement with said material, said connection comprising a bracket carried by said rod, and an arm pivoted in said bracket and carrying said rotary member, said arm being movable on its pivot for moving said rotary member from a retracted position to a position in which it is operative to engage said material when said rod is in said projected position.

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