Sept. 7, 1954 H. BOBLIT, SR ET AL 2,688,482

BUCKLE-TYPE PAPER FOLDING MACHINE

Filed July 11, 1949 4 Sheets-Sheet 1

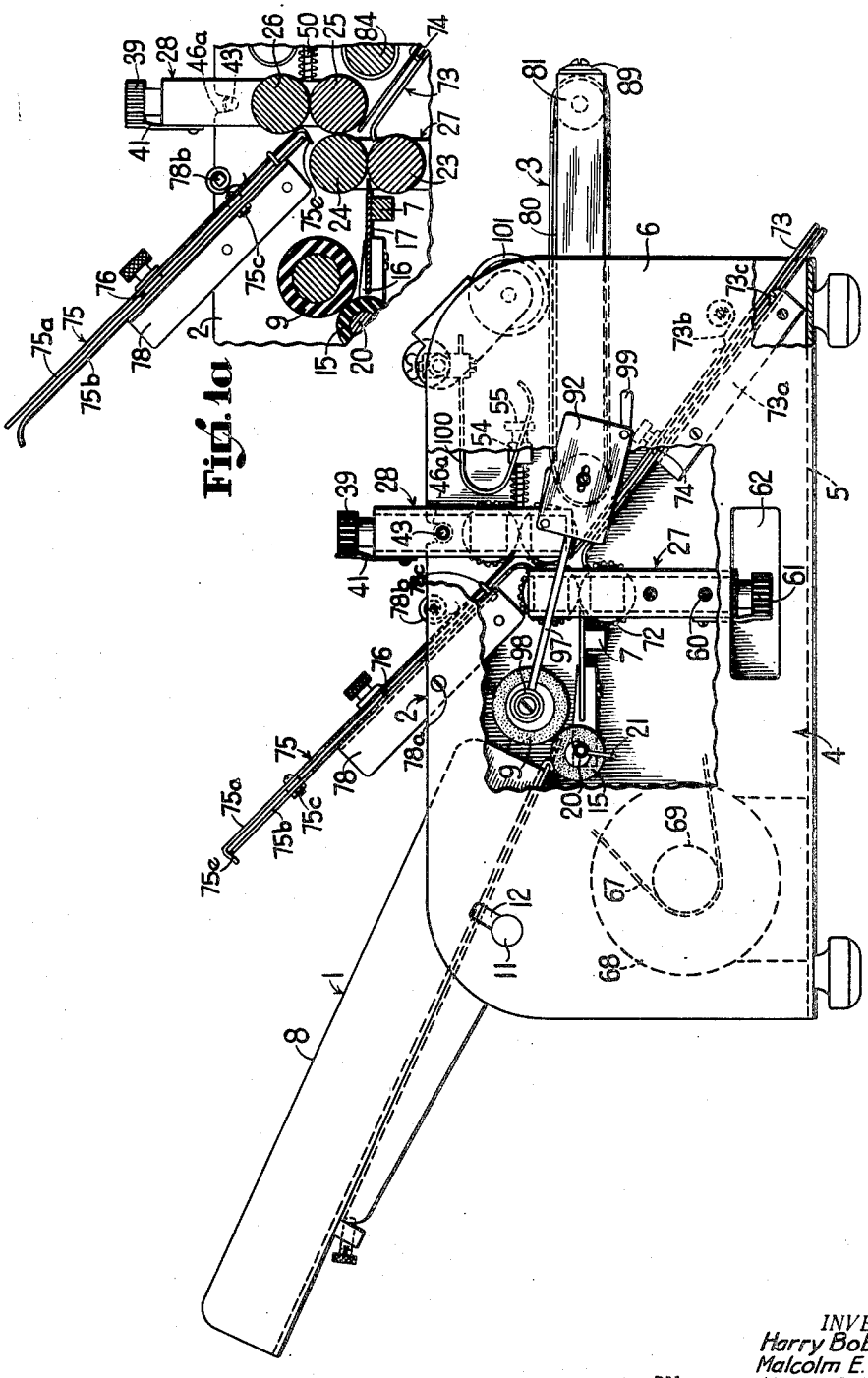


Fig. 1a

Fig. 1

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BUCKLE-TYPE PAPER FOLDING MACHINE

Filed July 11, 1949 4 Sheets-Sheet 2

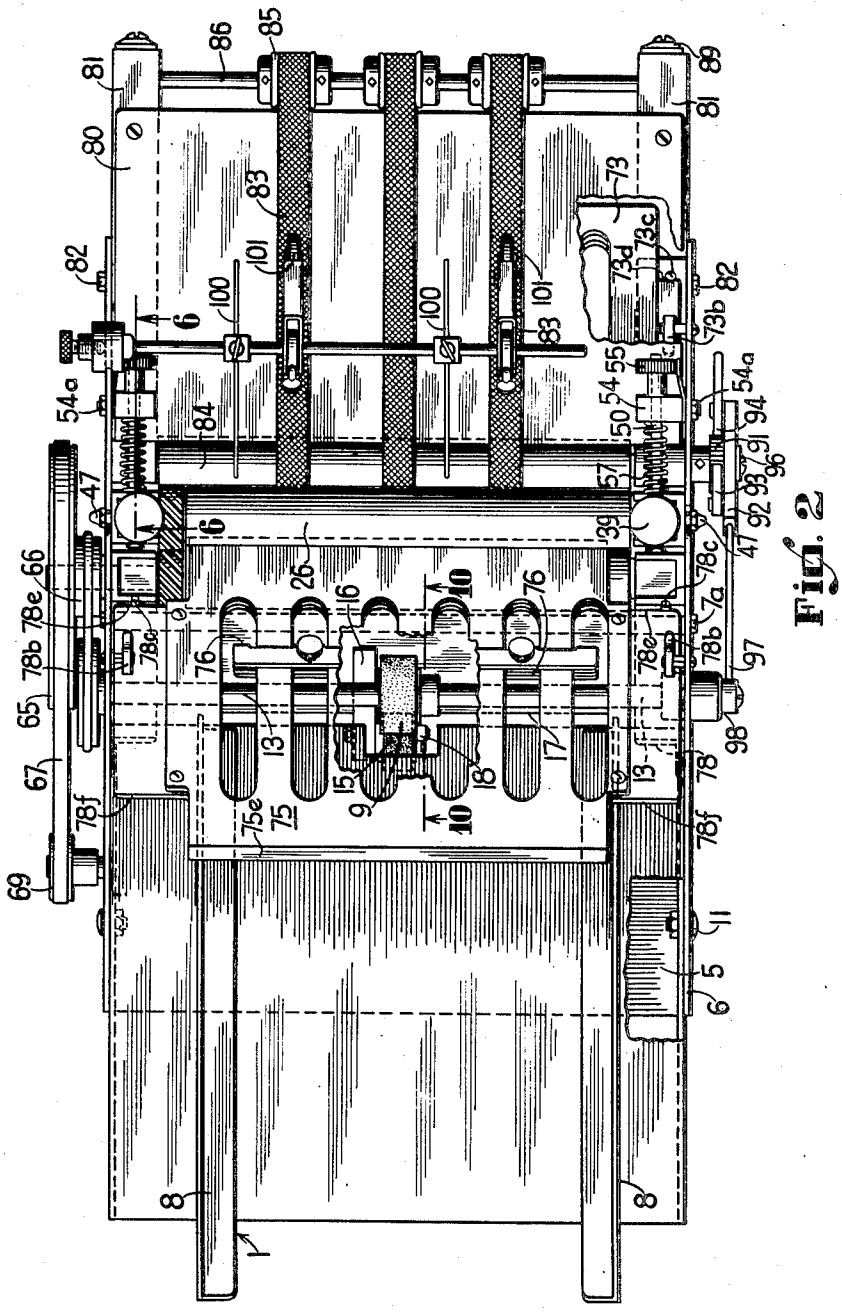


Fig. 2

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BUCKLE-TYPE PAPER FOLDING MACHINE

Filed July 11, 1949 4 Sheets-Sheet 3

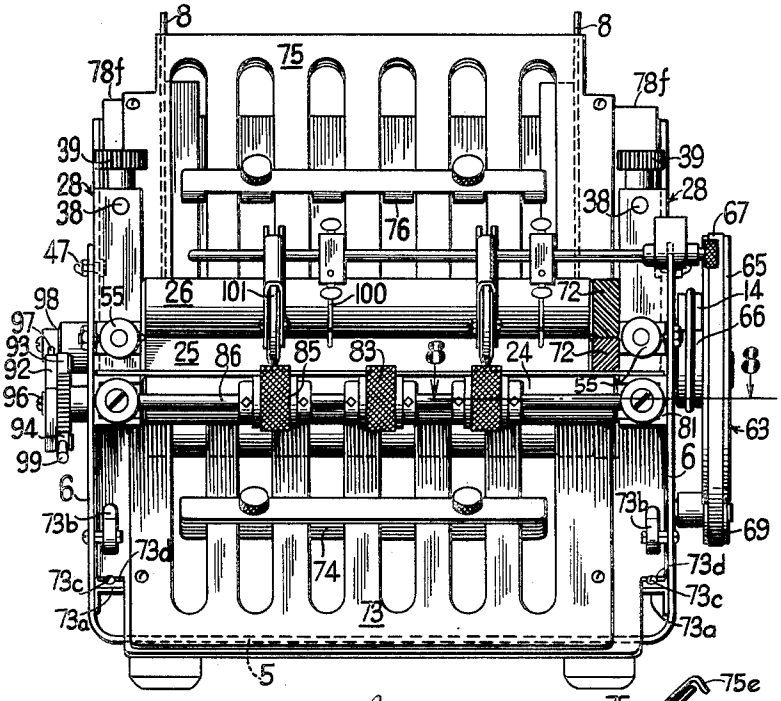


Fig. 3

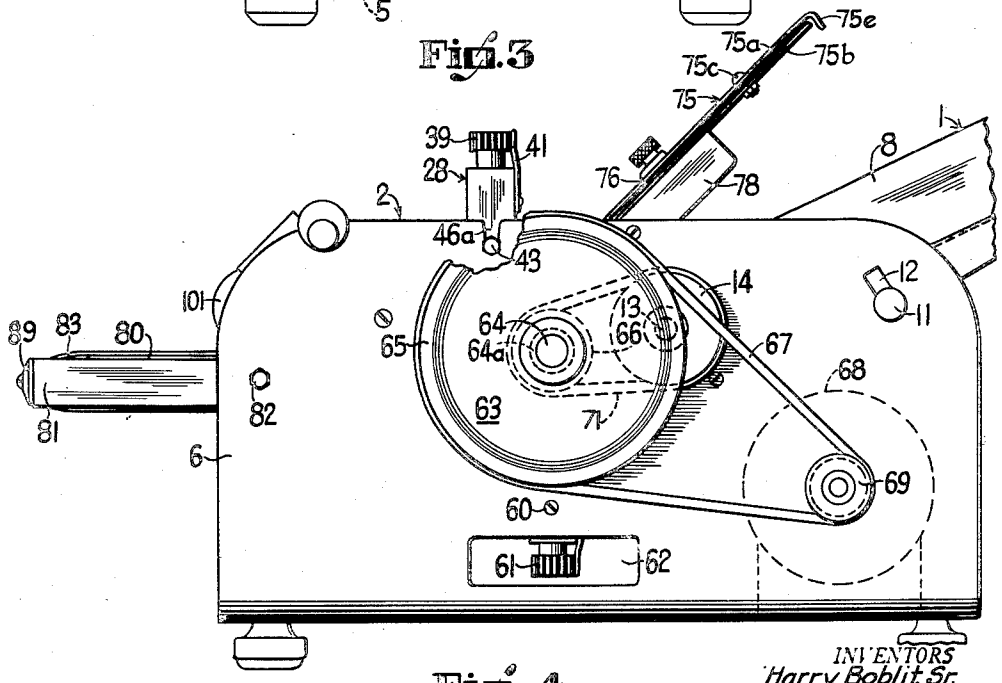


Fig. 4

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BUCKLE-TYPE PAPER FOLDING MACHINE

Filed July 11, 1949 4 Sheets-Sheet 4

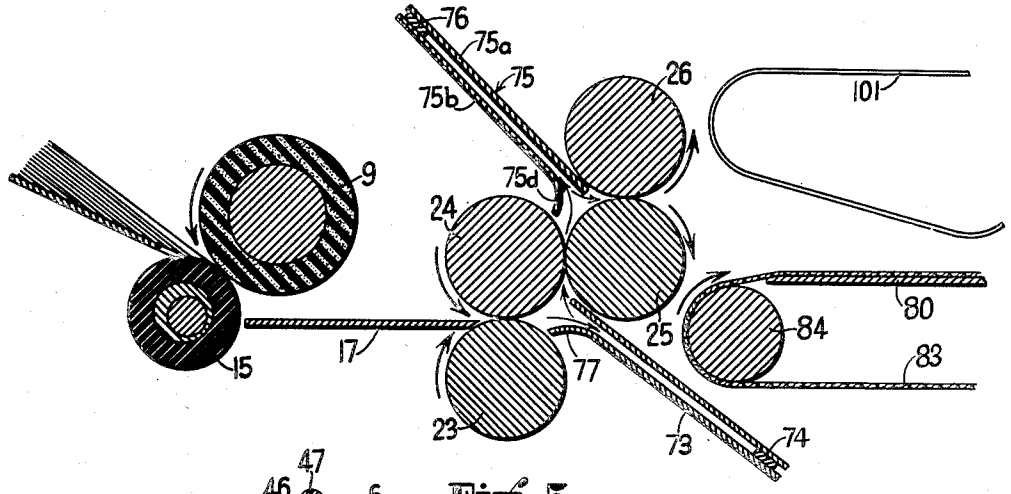


Fig. 5

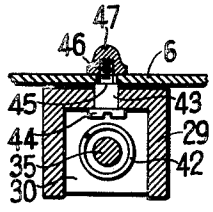


Fig. 7

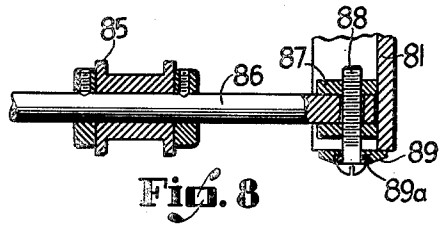


Fig. 8

Fig. 6

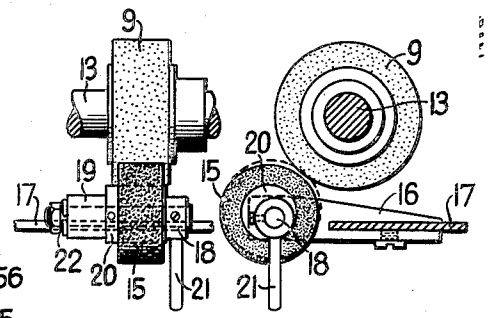


Fig. 9

Fig. 10

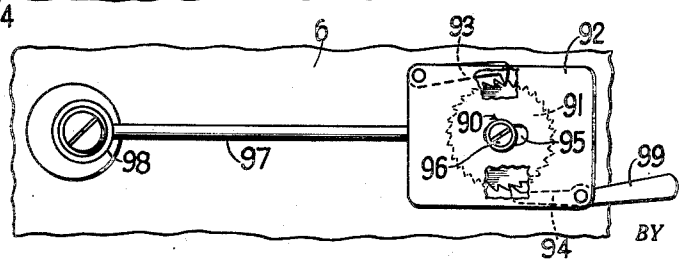


Fig. 11

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Patented Sept. 7, 1954

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UNITED STATES PATENT OFFICE

2,688,482

BUCKLE-TYPE PAPER FOLDING MACHINE

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Application July 11, 1949, Serial No. 104,082

17 Claims. (Cl. 270—68)

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Our invention relates to a paper folding machine. It has to do, more particularly, with a paper folding machine of that type known as the buckle-type paper folding machine. In general, this type of machine embodies means for producing a buckling action on the paper to form parallel folds therein.

More specifically, this type of paper folding machine includes a feeding unit, a folding unit, and a delivery unit. The feeding unit serves to feed sheets of paper successively into the folding unit. The folding unit receives such sheets successively and produces in each successive sheet the selected number of folds in parallel relationship. The folding unit consists of a plurality of feeding and folding rollers arranged in successive pairs, the rollers of each pair cooperating with each other to feed the sheets therebetween. Associated with each pair of rollers for receiving the sheet therefrom is a fold plate or pan having an adjustable stop bar thereon. As the sheet is fed between the pair of rollers, it enters into the fold plate or pan and its free end engages the stop bar thereon. Continued feeding of the sheet causes it to buckle and the next pair of rollers is so arranged that it receives the buckled portion and as it passes between such rollers forms a permanent crease or fold therein. From the second set of rollers the folded end of the sheet is fed into another fold plate or pan into arrangement with the stop bar thereof and another buckle is produced, the buckled portion being fed between the next two folding rollers. This operation is repeated over and over depending upon the number of sets of rollers and associated fold plates which are provided in the folding unit. The folded sheets are received from the folding unit by the delivery unit from which they may be removed.

One of the objects of our invention is to provide a folding machine of the type indicated wherein the supporting frame is of a one-piece unitary structure which can be fabricated at a low cost from a single piece of sheet metal and which will, due to its extreme rigidity, maintain all of the units of the machine in proper association with each other and all parts of each unit in proper association with each other.

Another object of our invention is to provide a novel support for the paper retarder which cooperates with the feed roller of the paper feeding unit, such support permitting simple and quick adjustment of the retarder of such unit relative to the feed roller to compensate for wear.

Another object of our invention is to provide

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a machine of the general type indicated wherein the feeding and folding rollers of the folding unit are arranged in a novel manner to facilitate the necessary adjustment of adjacent rollers.

Another object of our invention is to provide a machine of the type indicated in the preceding paragraph wherein the feeding and folding rollers are arranged in vertically disposed pairs with the lower roller of each succeeding pair opposite the upper roller of the preceding pair.

Another object of our invention is to provide a machine of this type wherein the bearings of each successive vertically disposed pair of rollers are carried by novel bearing supports which serve to force one of the rollers into contact with the other with a selected pressure, such pressure being variable and the bearing supports being adjustable to compensate for difference in thicknesses of sheets which the machine is adapted to fold.

Another object of our invention is to provide bearing supports of the type indicated which permit removal, in case of jamming of paper between rollers, and replacement of each pair of vertically disposed rollers.

Still another object of our invention is to provide bearing supports for pairs of vertically disposed rollers, the supports permitting the adjustment of one pair of rollers towards the other.

Another object of our invention is to provide simple means for supporting the fold plates or pans of the folding unit in such a manner that they may be easily removed and replaced.

Still another object of our invention is to provide a pan or fold plate of novel structure which has means forming a part thereof that can be selectively positioned either to block off such fold plate or to permit use of such fold plate.

Another object of our invention is to provide simple adjustable members for supporting one of the shafts or rollers which carries the belts of the delivery unit that receives the folded sheets from the folding unit, such adjustable members permitting proper tensioning of the belts.

A further object of our invention is to provide a novel type of double-acting ratchet drive which is associated with one of the shafts or rollers that support the delivery belts.

Various other objects of our invention will be apparent from the following description, the drawings and the claims.

The preferred embodiment of our invention is illustrated in the accompanying drawings wherein similar characters of reference designate corresponding parts and wherein:

Figure 1 is a side elevational view of a folding machine embodying our invention.

Figure 1a is a vertical sectional view showing the block-off means of the fold plate in position to prevent the paper entering such fold plate.

Figure 2 is a plan view of the machine of Figure 1.

Figure 3 is an elevational view of the delivery end of the machine.

Figure 4 is a side elevational view of the machine.

Figure 5 is a diagrammatic view illustrating the arrangement of the rollers and fold plates of the folding unit and showing the associated feeding and delivery units.

Figure 6 is a vertical sectional view taken along line 6—6 of Figure 2 and showing a bearing supporting unit of one pair of the folding rollers.

Figure 7 is a horizontal sectional view taken along line 7—7 of Figure 6.

Figure 8 is a horizontal sectional view taken substantially along line 8—8 of Figure 3 and showing the adjustable support at one end of one of the rods that aids in supporting the belts of the delivery unit.

Figure 9 is a detail in plan of the adjustable support for the paper retarder associated with the feed roller of the feeding unit.

Figure 10 is a side elevational view of the structure of Figure 9.

Figure 11 is a side elevational view of the ratchet mechanism which we provide for driving the delivery belts of the delivery unit.

With reference to the drawings, we have illustrated our machine as including mainly a feed unit 1, a folding unit 2 and a delivery unit 3. All of these units are supported in proper association with each other by the frame 4.

The frame 4 is preferably made of one piece of sheet metal which is properly folded to form a frame which is trough-shaped or U-shaped in cross-section as illustrated best in Figure 3. This frame includes the bottom wall 5 and the upstanding side walls 6. Before the sheet of metal is bent into trough-like form, all of the necessary openings are preferably punched therein. Thus, the frame can be economically formed. Furthermore, when all of the units 1, 2 and 3 are disposed between the side walls and are secured in position the frame will be extremely rigid. It is not necessary to provide a large number of special tie rods between the side walls 6 at the upper edges thereof since the parts of the various units 1, 2 and 3 will serve to rigidly tie the side walls to each other. However, as a supporting means for certain parts which will be referred to hereinafter a single tie rod 7 is provided and extends transversely between the side walls 6 of the frame. As shown best in Figure 1, this rod is disposed substantially halfway between the forward and rear ends of the frame and substantially midway of the height of the side walls 6. The ends of the rod are fastened to the side walls by means of bolts 7a as shown best in Figure 2.

The feeding unit 1 includes a chute 8 which is downwardly and rearwardly inclined and which serves to feed the sheets of paper successively into association with a feed roller 9, as shown best in Figures 5 and 10. The lower end of the chute is disposed between the side walls 6 of the frame at the rear and upper corner thereof. The chute 8 is of the usual type and is adjustably mounted on the frame 6. The lower end of the chute is adjustably connected to the side walls 6

of the frame for vertical adjustment by means including the lock bolts 11 (Figures 1 and 4) which pass through arcuate slots 12 in the side walls 6 of the frame. The bolts 11 can be loosened to permit adjustment of the chute 8 and can be tightened to hold the chute in adjusted position. Thus, the chute structure 8 also serves to aid in rigidly tying the side walls 6 of the frame to each other.

The chute 8, as indicated, feeds the sheets of paper successively into association with the feed roller 9. This feed roller 9 is positively driven and is carried by the transversely extending shaft 13 which is rotatably mounted in openings formed in the side walls 6 of the frame. One end of the shaft 13 (Figure 4) has a pulley 14 keyed thereon by means of which the roller 9 may be driven. The roller 9 is preferably covered with semi-soft rubber so that it will frictionally engage the paper.

Associated with the feed roller 9 is the paper retarder 15 of roller form but non-rotatable, as shown best in Figures 1, 2, 9 and 10. This retarder 15 is preferably of hard rubber and is adapted to contact or almost contact with the feed roller 9. It is adjustable towards the feed roller 9 by a simple mounting which we provide. The retarder 15 is carried by an arm 16 which is attached to and extends rearwardly from a horizontally disposed paper guiding plate 17. This plate 17 is carried by the tie rod 7 and extends rearwardly therefrom. The arm 16 is shown best in Figures 9 and 10. The arm carries a transversely extending pin 18 at its rear end upon which a sleeve 19 is rotatably mounted. The sleeve carries an eccentric member 20 which is a fixed part of member 15. The sleeve 19 can be rotated by means of a small handle 21 rigidly secured thereto. Rotation of the sleeve causes the eccentric 20 to move about the axis of the pin 18. This will adjust the member 15 towards the roller 9. A lock nut 22 is threaded on the end of pin 18 and exerts sufficient friction on the end of sleeve 19 to normally prevent rotation thereof. Thus, the retarder 15 may be adjusted into tight contact with feed roller 9 and will be held in adjusted position by friction. This provides a very simple means for adjusting the retarder 15 relative to the roller 9 to compensate for wear.

The paper guiding plate 17 is adapted to guide the sheets of paper into the folding unit 2. This unit is made up of a plurality of sets of feeding and folding rollers. These rollers are arranged in vertically disposed pairs and in the unit illustrated we have shown two pairs of such rollers although it is to be understood that any desired number of pairs may be provided. The first pair of rollers consists of the lower roller 23 and the upper roller 24, as shown best in Figure 1. These rollers extend transversely of the frame and are so located that the plate 17 will direct the sheets of paper therebetween. The next pair of rollers consists of the lower roller 25 and the upper roller 26. This pair of rollers is disposed just ahead of the rollers 23 and 24 and the lower roller 25 thereof is in contact with the upper roller 24 of the first pair. If it is desirable to provide another pair of rollers, such pair would be disposed ahead of the rollers 25 and 26 with the lower roller of the next pair in contact with the upper roller 26. Any desired number of pairs of rollers may be provided depending upon the number of folds to be produced in the paper.

The bearings for the shafts of the rollers 23 and 24 are carried by special bearing supporting units 27. Similarly, the shafts of the rollers 25

and 26 are carried by special bearing supporting units 28. The units 27 and 28 are practically identical, one of the units 28 being illustrated in detail in Figures 6 and 7.

The unit 28 comprises a bearing-receiving channel or guide 29. This member 29 may be produced simply by cutting from a standard piece of metal channel. Within this channel is disposed the bearing members 30 for the roller 26 and the bearing member 31 for the roller 25. The bearing member 30 is provided with an opening for receiving the end of the shaft 32 (Figure 2) of the roller 26. The bearing member 31 is provided with a similar opening for receiving the end of the shaft 33 of the roller 25. The bearing 31 is held in fixed position within the channel 29 by a screw 34. The bearing member 30, however, is movable vertically within the guide channel. Lateral movement out of the channel is prevented by the roller shaft 32.

For adjusting the bearing 30 vertically an upstanding pin 35 is provided which has its lower end anchored at 36 to the bearing. The upper end of the pin 35 slidably passes through an opening 37 formed in a transverse pin 38 positioned at the upper end of the channel 29. A knurled knob 39 is threaded on the threaded upper end 40 of pin 35 and engages the pin 38. A spring finger 41 engages the peripheral edge of knob 39 and normally prevents rotation thereof. A compression spring 42 is disposed between pin 38 and the upper surface of bearing 30 around the pin 35. It will be apparent that the spring 42 will always urge the bearing 30 towards the bearing 31. However, the lowermost position of the bearing 30 may be adjusted by rotating the knob 39.

It will be apparent that with this arrangement the roller 26 will always be urged towards the roller 25. These rollers are preferably formed of metal with roughened peripheries so that they will more effectively grip the paper. The knobs 39 can be used in adjusting the roller 26 relative to the roller 25 to adapt the machine to handling paper of various thicknesses. Obviously, the unit 28 at each side of the machine is of the same construction but is in a reverse position.

The channels 28 are mounted at each side of the machine directly within the side walls 6 of the frame and are carried thereby. They are so mounted that the roller 25 of the rear pair may be moved forwardly or rearwardly relative to the upper roller 24 of the forward pair. This is accomplished by having the channel 28 pivoted at 43 intermediate its upper and lower ends to the side walls 6. The pivot 43 is illustrated best in Figure 7 and comprises a pin which extends through an opening in the channel 29. The pin has a head 44 engaging the inner surface of the channel and a shoulder 45 engaging the inner surface of the side wall 6. It has a threaded reduced end 46 which extends through a slot 46*a* (Figure 4) in the wall 6 and which receives an acorn nut 47 that engages the outer surface of the wall 6. The slot 46*a* extends from the upper edge of wall 6, where it has an open end, downwardly a sufficient extent to locate channel 29 at the proper level. Thus, the channel 29 is swingably mounted on the pivot pin.

For swinging the lower end of the channel 29 about the pivot pin 43 and holding it in adjusted position, we provide the pin 50 which is anchored to the lower end of the channel and to the frame. This pin is substantially horizontally disposed and has its forward end passing loosely through an opening 51 in the rear flange of the channel 29. A transverse pin 52 in the forward end of pin 50 prevents the pin 50 from pulling rearwardly through the opening 51. The pin 50 passes rearwardly loosely through an opening 53 in a lug 54 which projects inwardly from the side wall 6 of the frame and is removably secured thereto by bolt 54*a* (Figure 2). A nut 55 is threaded on the threaded rear end 56 of pin 50 and engages lug 54. A compression spring 57 surrounds pin 50 and is disposed between lug 54 and channel 29.

It will be apparent that adjustment of the nut 55 will swing the bearing supporting unit 28 about the pivot 43. This will move the roller 25 relative to the roller 24. The proper adjustment of these rollers to compensate for different thicknesses in paper, which has its first fold when it passes therebetween, is thus possible.

It will be noted that the head 44 of the pivot pin 43 is flattened on one side, as indicated at 58 in Figure 6. With this arrangement the bearing member 30 may be moved up until it contacts with the flattened portion of the pin during the time the nut 47 is being tightened or loosened on the end 46 thereof, so as to prevent rotation of the pin. With this pivot structure, it is possible merely by loosening nuts 47 to lift the units 28 and the rollers 25 and 26 carried thereby completely from the frame as a single unit, the pins 43 being lifted out of slots 46*a*. Before this is done, however, each of the lugs 54 is disconnected from adjacent side wall 6 by removing the bolt 54*a*. Thus, it is possible to completely remove the pair of rollers 25 and 26 in case of jamming of the paper.

The rollers 23 and 24 are identical with the rollers 25 and 26 and are carried by the bearing-supporting units 27. These units 27 are exactly the same as the units 28. However, they are rigidly mounted on the frame by removable bolts or screws 60 since no pivotal movement is required. In this instance, the lower roller 23 is movable vertically by compression springs like the springs 42 and the adjustments for variation in thickness in paper is accomplished by means of the knobs 61 at the lower ends of the units 27. These knobs 61 are accessable through slots 62 formed in the side walls 6 adjacent the bottom of the frame. To remove units 27 it is merely necessary to remove screws 60.

The rollers 23, 24, 25 and 26 are driven by means including a large pulley 63 which directly drives the uppermost or fixed roller 24 of the first pair. This pulley is carried on one end of shaft 64 and, as shown best in Figure 4, this end of the shaft projects loosely through an opening 64*a* formed in the adjacent side wall 6. The outwardly projecting end of the shaft 64, which extends through large opening 64*a*, will not interfere with lifting of the rollers 23 and 24 from the frame with the units 27 when the screws 60 are removed. The opposite side will be lifted first and the end of the shaft 64 can gradually be pulled out of opening 64*a*.

The pulley 63 is a double pulley being provided with the large portion 65 and the smaller portion 66. The portion 65 receives a belt 67 driven by an electric motor 68 carried within the frame and having its drive shaft projecting laterally through the side walls 6 of the frame where it has a drive pulley 69 keyed thereon. The smaller portion 66 of the pulley drives a belt 71, which in turn, drives the pulley 14 keyed on the shaft 13 of the feed roller 9. The drive between the various rollers 23, 24, 25 and 26 is by means of the spiral gearing 72 associated with the roller shaft. The direction of drive of these rollers is illustrated in Figure 5.

Paper which passes between the rollers 23 and 24 enters into a fold plate or pan 73. This pan extends downwardly and rearwardly from the space between the rollers 23 and 24. The end of the paper passing between rollers 23 and 24 will feed into the pan and contact a stop bar 74. The sheet will then be caused to buckle and the buckle portion will pass upwardly between the rollers 24 and 25 producing a fold therein. The folded end then passes up into a fold plate or pan 75 extending forwardly and upwardly from the space between the rollers 24 and 25 which has the stop bar 76. The sheet will again be buckled and the buckle portion will pass rearwardly between the rollers 25 and 26. This action is the usual action for folding machines of this buckling type.

The plates or pans 73 and 75 are disposed between the side walls 6 of the frame and are mounted thereon in a novel manner, as shown best in Figures 1 and 3. The upper pan 75 is carried by angle members 78 which are bolted by means of bolts 78a to the side walls 6 and extend forwardly and upwardly thereof. The pan 75 is of novel construction and rests on the angles 78. Adjacent the lower ends of the angles 78, but spaced upwardly and forwardly from such ends, are the spring units 78b secured to each of the side walls 6. These units 78b bear against the upper surface of the pan and hold it against the angle members 78. Stop pins 78c are provided at the lower ends of the angles and engage the pan 75 to limit downward movement on the angles. Obviously, the pan 75 can be slid into position on the angles, passing beneath the springs 78b until it engages the stop pins 78c. The springs will hold the pan in firm position but will permit easy withdrawal thereof. It will be noted from Figure 2 that pan 75 is provided with shoulders 78e adjacent its lower end which engage stop pins 78c. Similar shoulders 78f are also provided adjacent its upper end.

The pan 75 includes the upper plate 75a and the lower plate 75b held in spaced relationship and clamped together by suitable clamp bolts 75c. As shown in Figure 1, the lower edge of plate 75b has a guide lip 75d formed thereon which will normally be disposed adjacent rollers 24 and 25 so as to guide paper up into pan 75. However, in case it is desired to eliminate the buckling action of pan 75 and the resulting fold, block-off means is provided on pan 75. This means comprises a lip 75e formed on the upper end of upper plate 75a and extending over the space between the ends of plates 75a and 75b. When the pan 75 is to be blocked-off, it is positioned as shown in Figure 1a. The block-off lip 75e will now prevent paper from entering into pan 75 and will serve to guide it between rollers 25 and 26. The block-off means is always on the pan since it is a part thereof and can be positioned as in Figure 1 or as in Figure 1a merely by swinging the pan 75 around to reverse the position of its side edges and its upper and lower edges. When in the position shown in Figure 1a, stop pins 78c engage shoulders 78f instead of shoulders 78e.

The pan 73 is carried by the frame somewhat similar to pan 75, being supported on the angle members 73a which are bolted to the side walls 6 of the frame and which extend downwardly and rearwardly thereof. Identical spring units 73b are associated with this pan 73 and are located towards the lower ends of the angles 73a. In this instance, the pan 73 is slid upwardly into position on the angles 73a and is retained in position by cooperation of the springs 73b with screwheads 73c of screws carried by the angles 73a at their lower ends. The springs 73b hold the pan down against the angles and the screwheads 73c, as shown in Figure 3, engage shoulders 73d on the pan 73 to keep the pan from sliding downwardly and rearwardly. Obviously, this pan can be removed easily by lifting shoulder 73d over the screwheads 73c against the force of springs 73b and sliding the pan downwardly along the angles 73a. This pan need not be provided with the block-off means although it could be the same structure as pan 75.

As the folded sheet leaves the rollers 25 and 26, it is discharged onto the delivery unit 3. This unit includes the plate or table 80 which is horizontally disposed and is carried by horizontal channel members 81 extending rearwardly from the frame, these members 81 being bolted to the sides 6 of the frame by means of bolts 82. A series of belts 83 pass over this plate 80 and around a driving roller 84 which is rotatably carried by bearings at the forward ends of the channels 81. The belts 83 at their rear ends pass around guide rolls 85 which are rotatable on a transverse rod 86. The ends of this rod are carried in supporting blocks which can be adjusted easily by simple means to properly tension the belts 83. As shown in Figure 8, this means comprises at each end of the shaft 86 a block 87 in which the rod 86 is mounted. This block 87 is mounted for sliding movement in the channel 81 which faces inwardly. This movement is accomplished by means of a screw 88 which is threaded into the block 87 and which has a washer 89 associated therewith that engages the end of the channel. Screw 88 also passes loosely through an opening in rod 86. Washer 89 and screw 88 also have a lock washer 89a associated therewith. Thus, by simply rotating bolt 88 at each side of the unit 3, the belts 83 can be properly tensioned. It will be noted that plate 80 and members 81 along with the rollers and associated parts of the folding unit also serve to connect side walls 6 together.

We also provide novel ratchet means for driving the belts 83. This means may be selectively actuated to practically continuously drive the belts or to intermittently drive them. As shown best in Figure 11, this drive comprises a double-acting ratchet mechanism.

The roller 84 for driving the belts is provided with a roughened surface so that it will frictionally engage such belts which are passed around it. One end of the shaft 90 of the roller 84 projects through the wall 6 of the frame, being rotatably mounted therein, and has the ratchet wheel 91 keyed thereon. Mounted outside of the ratchet wheel 91 is a pawl-carrying plate 92 which carries the pawls 93 and 94 pivotally at diagonally opposed corners. This plate 92 is provided with a slot 95 by means of which it is slidably mounted on the outer end of shaft 90 being prevented from moving laterally off the shaft by a washer and bolt 96 threaded into the shaft. The plate 92 is reciprocated longitudinally by means of an actuating rod 97. This rod 97 is driven by the eccentric 98 which is carried on the shaft 13 of the feed roller 9.

The pawl 93 engages the top of the ratchet wheel 91 while the pawl 94 engages the wheel at the bottom thereof. Therefore, a rear movement of rod 97 causes the pawl 93 to act to rotate the wheel while a forward movement of the rod 97 causes the pawl 94 to rotate the wheel. Thus, the rotation will be almost continuous. The pawl 94 has a counterweight 99 formed thereon which is

sufficiently heavy to normally hold the pawl 94 in engagement with the wheel. The pawl 93 may be swung to the one side out of engagement with wheel 91 and then the rotation will be intermittent since the rod 97 will only act to produce rotation during its forward movement. It will be apparent that this arrangement will serve to drive the belts 83 and carry the folded paper rearwardly.

Associated with the delivery unit 3 are the usual paper retarding and arranging springs 100 and rollers 101 which engage the paper as it is fed onto and carried by the belts 83 and keep it in order thereon until it is removed.

It will be apparent from the above description that we have provided a folding machine having many desirable improvements. The advantages of these improvements have been discussed in some detail but others will be apparent.

Having thus described our invention, what we claim is:

1. In a folding machine of the type described, a frame having two parallel sides, folding mechanism disposed within the sides of said frame and carried thereby, said folding mechanism including rollers arranged in vertical pairs, bearing units carrying each pair of rollers, said bearing units comprising vertically disposed channels having bearings disposed therein for movement towards and away from each other, and means for fastening said channels to the sides of the frame, said means permitting disconnection of the channels from the frame to permit lifting of the rollers supported thereby from the frame as a unit.

2. A folding machine according to claim 1 wherein one of the bearings in each channel is held in fixed position and the other bearing in each channel is movable relative thereto.

3. A structure according to claim 2 wherein a spring is disposed in said channel for urging one of the bearings towards the other.

4. A structure according to claim 3 wherein a screw member is provided for adjustably limiting the extent of movement of the one bearing in the channel towards the other bearing.

5. A folding machine according to claim 1 wherein the channel members which support one pair of said rollers are pivoted for swinging movement to the side walls of the frame to permit adjustment of one pair of rollers relative to the other.

6. A folding machine according to claim 5 wherein screw mechanism is provided for adjusting said channels about their pivots and holding them in adjusted position.

7. A folding machine according to claim 6 wherein said screw mechanism includes resilient means for forcing said channels to the position determined by adjustment of said screws.

8. A folding machine according to claim 7 wherein the pivots of said channels are removable to permit removal of the channels and the rollers carried thereby.

9. In a folding machine having a supporting frame, feeding and folding rollers arranged on said frame in vertically disposed pairs with the lower roller of each pair subsequent to the first being at substantially the same level as the upper roller of the preceding pair, stop plates disposed on the frame for cooperating with the rollers for buckling the sheets advanced thereto, a bearing support for supporting one pair of rollers on the frame for relative movement to an adjacent pair so that one roller thereof of adjacent pairs on the same level can be moved toward and away from a roller of the adjacent pair on the same level, and an adjusting unit for moving said support to adjust said rollers of adjacent pairs on the same level, toward and away from each other.

10. A structure according to claim 9, including a bearing support for the adjacent pair of rollers and wherein one of said supports is fixed to the frame and the other bearing support is mounted on the frame for relative movement, and said adjusting unit is connected to said frame and to said movable support.

11. A structure according to claim 10, wherein in each of said bearing supports carries the rollers of the pair for relative movement of their axes, and resilient means carried by said support for urging the rollers toward each other.

12. A structure according to claim 11, wherein said adjusting unit includes resilient means for urging the movable support toward said fixed support to urge the lower roller of each succeeding pair toward the upper roller of the preceding pair.

13. A structure according to claim 12, wherein the bearing supports comprise channel members, bearing blocks for the rollers carried therein for relative movement in the channel, said resilient means for urging the rollers toward each other moving one of said blocks relative to the other.

14. A structure according to claim 13, wherein the movable bearing support is pivoted at its upper end to the frame for swinging movement about a horizontal axis toward and away from said fixed support, said adjusting unit being connected to the lower end of said movable support and being anchored to the frame.

15. In a folding machine, feeding and folding rollers arranged in vertically disposed pairs, units of which are pivotally mounted on the frame with one roller of one pair at the same level as one roller of an adjacent pair, stop plates cooperating with the rollers for buckling sheets advanced therebetween, a housing mounting each pair of rollers for rotational movement and one of the housings being pivotally mounted for adjustment of the rollers on the same level in the housings in a direction toward and away from each other, and means for securing the pivotally mounted housing in adjusted position.

16. A folding machine as claimed in claim 15, which includes means constantly urging said pivotally mounted housing in the direction toward the other.

17. In a folding machine, folding mechanism including a frame, pairs of rollers, bearings supporting each roller at each end for rotational movement, housing members mounted in the frame supporting the bearings on the end of each pair of rollers; one of said housings being pivotally mounted for movement in a direction toward and away from the other, means for adjusting the bearings in the direction toward and away from each other within the housing, means for securing said bearings in their adjusted position within the housing, means for pivotally adjusting the housing on the frame in the direction toward and away from the adjacent housing, and means for securing said housings in adjusted position.

(References on following page)

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
893,629	Johnson	July 21, 1908
973,428	Henderson	Oct. 18, 1910
1,448,994	Danley et al.	Mar. 20, 1923
1,580,759	Olson	Apr. 13, 1926
1,803,370	Tufts	May 5, 1931
1,806,706	Rader	May 26, 1931
1,843,763	Davidson	Feb. 2, 1932
1,955,514	Quick et al.	Apr. 17, 1934
1,956,229	Sidebotham	Apr. 24, 1934

Number	Name	Date
2,058,876	Hitchcock	Oct. 27, 1936
2,186,901	Ewald et al.	Jan. 9, 1940
2,224,138	Trydal	Dec. 10, 1940
2,238,009	Breman	Apr. 8, 1941
2,414,386	Olson	Jan. 14, 1947
2,461,214	Holms	Feb. 8, 1949
2,503,858	Waterworth	Apr. 11, 1950
2,529,022	Heller	Nov. 7, 1950
2,539,839	Jagger	Jan. 30, 1951
2,589,790	Ford	Mar. 18, 1952