

UNITED STATES PATENT OFFICE

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FOLDING MACHINE

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According to a known method of folding sheets of paper and the like the sheet is fed with its front edge into a narrow guide, by means of rollers, and caused to strike a stop while still being pushed from behind, so that it buckles and is gripped by a pair of rollers and is folded. This method frequently gives rise to inaccurate folding especially in the case of thin and weak paper, because the sheet is liable to meet with resistance in the guide, for example owing to deflection, which leads to premature folding. Another cause of faulty folding is that when the sheet strikes the stop it is not always buckled in the right place.

For avoiding these defects I arrange that the portion of the sheet, which is to be buckled for producing the fold and hitherto is limited only on the front side by the pair of feed rollers pressing the sheet between themselves, is confined to smaller limits than heretofore. I arrange also a limiting element on the other end of the small sheet portion to be buckled, namely a clamping or gripping device which comes into operation when the sheet has reached the folding position. This method not only ensures greater accuracy in regard to the position of the fold, but also enables the guide to be so constructed that it opposes less resistance to the feed because it is no longer required directly to take part in the operation of buckling.

The clamping device may be a movable roller which cooperates with a folding roller rotating in the opposite direction to the direction of feed of the sheet.

According to the invention the feeding of the sheet and the action of the gripper or of the rollers which effect a backward feed of the forward part of the sheet are controlled in such dependence on each other that the forward part of the sheet is gripped or fed back directly from the feeder.

For this purpose a device regulating the sheet entry, and the gripper or reverse feed rollers may be actuated by the same mechanism in proper relation to each other. The sheet entry may be effected by rollers to which sheets are fed at predetermined intervals, and these rollers may be connected to

the gripper or the reverse feeder. The gripper or reverse feeder may consist of a roller or rollers eccentric in relation to a shaft and acting in the course of each revolution of the shaft to temporarily press the sheet against an abutment surface which may serve or not as a reverse-feed roller. The said eccentric roller may be circularly adjustable on a rotating disc. Instead of eccentric rollers I may use a shaft with sector-shaped projections for gripping or feeding back the forward part of the sheet. The approach of the sheets to the rollers effecting its entry may be controlled by travelling sheet registering devices against which the front edges of the sheets abut. The creasing of the sheet, for entrance between the folding rollers, may be effected by means of a stationary bar. A regulatable controlled blast of air delivered at the proper time or continuously may also be used for bending the sheet for the folding operation. Alternatively a moving bar actuated by a tappet may be used for the purpose. This tappet may be circularly adjustable on a disc, and may be connected with the roller which is pressed against the forward part of the sheet.

With the foregoing and other objects in view the invention consists in the combination and arrangement of parts to be hereinafter fully described, pointed out in the appended claims and illustrated in the accompanying drawing which forms a part of this application and in which all details of folding machines not necessary for the explanation of my invention are omitted.

Fig. 1 is partly a vertical sectional view, partly a side view in elevation, of a paper folding machine equipped with my improvement.

Fig. 2 is a similar view of a modification.

Figs. 3 and 4 are vertical sectional views of modifications of details.

In the drawings 1 is a frame, 2 a feed table, and 4 a registering ruler. 5 and 6 are folding rollers, 7 is a grid for holding down the sheets and there is another grid 7 for the front part of the sheet fed beyond the folding rollers. Shafts 33, 34 carry pulleys with belts 35, on which are registering devices 54

regulating the feed of the sheets. A feed roller 36 and one or more coacting pressing rollers 37 (one only being shown) feed the sheets in at a predetermined rate. Roller 36 is driven by shaft 38 and gears 39, 40, while roller 37, as shown, is journaled on an arm 37^a loosely mounted on the machine frame, whereby roller 37 is free to turn loosely in either direction and normally swings downward and presses by gravity against roller 36 or against the paper sheet contacting therewith. Shaft 38 drives by means of gears 39, 41 the rollers 5, 6, and by means of gears 39, 41, 43 the shaft 34. A chain 44, shaft 45 and gears 46, 47 drive a shaft 48 carrying a roller 50 on an eccentric pivot 49, this roller being at each revolution of the shaft pressed against an abutment in the form of a coacting gripping roll 51 which is mounted to revolve in either direction, and which is therefore free to revolve in the opposite direction to the normal direction of feed of the sheet. The rollers 50 and 51 therefore coact to grip the sheet at the moment of its reverse feed and the roller 51 is free to turn under the pressure of roller 50 to assist in starting the sheet on its reverse feed. The pivot 49 is adjustable in a circular slot 52, provided in a disc fixed to shaft 48.

To reduce the distance between the rollers 36, 51 the folding roller 5 may cooperate with rollers 53, to act as a feed roller. The roller 51 is preferably as close as possible to the roller 6, and the latter may be itself used as a gripping or reverse feeding roller instead of the roller 51.

According to Fig. 1 the sheet is buckled in the direction between the folding rollers 5, 6 by a bar 55, and according to Fig. 2 by a blower consisting of a pipe 56 with nozzles, connected by pipe 57 to a fan. The valve arm 58 is controlled by a cam 59 on shaft 45.

The blast delivered by the nozzles may be intermittent, i. e., delivered at proper periods for folding actions, during which the blast apparatus may be inactive, or the blast may be continuous, in which event it may be normally weak enough to prevent the feeding sheet from being forced thereby between the folding rolls, and increased to a proper intensity for a folding action at folding periods, or the blast may be continuous and of the same intensity, weak enough for preventing downward deflection of the sheet between the feed rolls as long as the sheet is traveling, but of sufficient intensity when the sheet is arrested by the clamping means to force it between the folding rolls for the folding action.

According to Fig. 3, the sheet buckle is led between the folding rollers by a bar 60 carried by arms 61 on a rock-shaft 62 having an arm 63 controlled by a spring 64 and cam 65. The latter is connected with the pivot 49 of

the roller 50, and together with the pivot adjustable.

According to Fig. 4 a segment bar 67 fixed on a shaft 66 corresponding to shaft 48 instead of the eccentric roller 50 is provided for clamping or feeding back the forward part of the sheet.

What I claim is:

1. A folding machine for folding sheets of paper or the like having in combination with folding rollers and means for feeding the forward part of the sheets past said rollers a sheet clamping device placed a short distance beyond said rollers in the direction of feed, said clamping device comprising an abutment member and a member moved alternately to and from said abutment member.

2. A folding machine according to claim 1, wherein the movable clamping member is a roller which cooperates with a roller free to rotate in the opposite direction to the direction of feed of the sheet.

3. In a folding machine according to claim 1, the combination of means for regulating the sheet entry to the folder, and of means for clamping the forward part of the sheet, said regulating means and said clamping means being controlled to operate in dependence on each other.

4. In a folding machine according to claim 1, the combination of means for regulating the sheet entry to the folder and of means for clamping the forward part of the sheet, said clamping means comprising a movable pressing roller cooperating with a roller free to rotate in opposite direction to the direction of feed of the sheet, and of means for controlling the movable pressing roller to operate in dependence on the sheet entry regulating means.

5. Folding machine according to claim 1 characterized in that the sheet entry is regulated by positively feeding rollers to which the sheets are fed at predetermined intervals, and that the device controlling the gripper or the reverse feed of the forward part of the sheet is actuated together with the feed rollers positively effecting the entrance of the sheet.

6. Folding machine according to claim 1, characterized in that the device for gripping or feeding back the forward part of the sheet consists of a roller rotating eccentrically about a shaft in interdependence with the positive feed rollers for the sheet entry, said roller at each revolution temporarily pressing the forward part of the sheet against a roller free to rotate in the opposite direction to the sheet entry.

7. Folding machine according to claim 1 characterized in that the sheet feeding means comprises feed rollers the delivery of the sheets to which is regulated by rotating gauges.

8. A folding machine according to claim 1 in which the member movable alternately to

and from the stationary abutment member comprises an eccentrically mounted roller circularly adjustable on a rotating disk.

5 9. A folding machine according to claim 1, characterized in that the device for gripping or feeding back the forward part of the sheet consists of a roller rotating eccentrically about a shaft, in cooperation with positive feed rollers for the sheet entry, said eccentrically rotating rollers being circularly ad-
10 justable on a rotary disk carried by said shaft and operating at each revolution to temporarily press the forward part of the sheet against a roller free to rotate in the opposite
15 direction to the sheet entry.

In testimony whereof I affix my signature.

GEORG SPIESS.

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