To all whom it may concern:

Be it known that we, ROBERT L. FOLZ and PHILIP A. ZACE, citizens of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Automatic Stop Devices for Automatic Machines, of which the following is a specification.

Our invention relates to improvements in automatic stop devices for automatic machines, and in some of its features it refers more particularly to automatic stop mechanism for paper folding machines.

For purposes of full disclosure we will hereafter describe our invention as applied in combination with a paper folder, although it will become apparent to those skilled in the art that in some of its features it is available for other uses, in conjunction with other forms of automatic machinery.

In the drawings wherein we have illustrated the embodiment of our invention Figure 1 indicates schematically certain vital elements of a paper folding machine, such as for instance the well known "Dexter" folder, equipped with accessories for the embodiment of our invention. Figure 2 is a detail in longitudinal section of the contact parts. Figure 3 is a transverse section showing the contact parts. Figure 4 is a detail of a link medium.

In a paper folding machine the paper, usually delivered by an automatic feeder, is frictionally fed forward by rapidly moving tapes 12, past the transversely unobstructed space 13 into which the folder blade 14 works and passes between suitable upper and lower guide rods 15–16" (which are often supplemented by other moving tapes) until the paper strikes the gage points 16 of the front gage bar 17 which is adjustable to define the proper position for what may be termed the front edge of the paper. The side edge of the paper is then gripped by suitable gripper 18, operated, and timed in operation by a rock shaft or gripper rod 19, and the side edge of the paper is brought to proper position. Then the folder blade 54 makes the central fold in the sheet of paper and delivers it to the folding rollers below which pass the paper along for its further progress through the machine.

The details of folding machine construction vary widely, but in general every such machine involves a rapidly moving frictional paper feeding means, a front gage to which the front edge of the paper should be squarely presented, and a rock shaft or equivalent part, actuating a gripper or the like and timed in its operation to act immediately after the front edge of the paper has, or should have, reached its position of contact with the fingers or points 16 of the front gage 17.

In operation it is, of course, desirable that the folding machine should handle only perfect stock, and that mutilated sheets should be discarded, and likewise it is highly important that the machine should be permitted to operate only upon sheets which are properly presented squarely to the fingers or points of the front gage. Unless a paper sheet is of perfect character it is not apt to be squarely presented to the front gage, because if the sheet is torn or otherwise imperfect, it is not apt to travel uniformly under the influence of the frictional driving tapes, but on the contrary, owing to the uneven resistance of the imperfect sheet, it arrives at the front gage in a diagonal position. A sheet so improperly presented is apt to cause damage to the machine itself because, if the first fold made therein is not properly taken none of the further operations of the machine can be properly made, and the torn, rumpled or projecting parts of the sheet are apt to catch some of the tapes and draw them out of order.

Thus the need for an automatic stop device, particularly in machines in which the gages are located adjacent to the center of the sheet, is always present. Particularly is this true of the so-called "Dexter" or "Dexter" type folding machines, where the gage and the explorer are located adjacent to the center of the paper, and where the paper is driven to the gage from one end only, and where, as a result, there is apt to be a lack of uniformity in the operation of the machine, due to the variable condition of the paper and the type of folds which it is desirable to make. In such cases the stop device must be so located that it will operate to arrest the machine before the paper has passed the center of the gage, and then to drive the paper back to the gage and position it properly before it is folded. This is a difficult problem, particularly where the paper is driven to the gage from one end only, as is the case in the "Dexter" type folder, and where the paper itself is not subject to uniformity in quality, or where there is a tendency to unevenness in the paper itself.
the machine. Since the explorer is set at approximately the center of the gage to which the paper sheet is to be presented, if a paper sheet get shifted diagonally, even to a comparatively slight extent in the course of its frictionally impelled travel through the machine (as is almost invariably the case either if the feeding mechanism is out of order or if the paper sheet is mutilated) the central portion of the sheet will not lie in the path of movement of the explorer and so the explorer when actuated will make a full excursion, uninterrupted by the paper sheet, and will cause the operation of the automatic stop mechanism so that the improperly presented sheet may be removed before it has a chance to do any damage.

In the specific construction shown, insulating plates 20 and 21 are secured to the upper and lower surfaces of the gage bar 17 so as to lie respectively above and below the plane in which the paper is presented to the gage, these plates being held in position by bolts 22. To this insulating frame we secure an L-shaped strip 23 extending above the upper plate to form a bearing post upon which we mount the bell-crank lever 24, preferably of wood or other insulating material, having its horizontal arm bifurcated at its extremity to straddle a metallic contact stem 26 which constitutes a movable electric explorer. The stem 26 is made vertically adjustable in the bifurcated arm of the lever 24 by means of an adjusting nut 28, and at its lower end said stem extends through a guide sleeve 29 mounted in the plate 20. Below the level on which the paper travels the plate 21 is provided with a contact block 30 alining with the stem 26, the stem 26 and contact block 30 being connected in an electric circuit 31 which includes a source of current supply 32 and an electro-responsive device 33, the armature 34 whereof constitutes the trip latch for a switch 35 controlling the motor 36 which drives the folder. Such arrangement diagrammatically shown will be understood to be represented merely as typical of a suitable electric stop mechanism for the major machine.

The movements of the bell-crank lever 24 are timed by connection of said lever with any appropriately timed part of the major machine so that the said lever makes its excursions just after the paper is presented to the front guide. In the specific construction shown the gripper shaft 19 has adjustably mounted thereon a collar 37 carrying a stem 38 to which is vertically connected a block or link 39 through which passes a rod 40 secured in the block 39 by a set screw 41. The opposite end of the rod 40 makes pivotal connection with the vertical arm of the bell crank lever 24 so that as the shaft 19 rocks for the purpose of causing the functional action of the gripper 18, it also, through the connection 40 rocks bell crank lever 24, to depress the horizontal arm thereof to the position shown in dotted lines in Fig. 2. Such depression of the bell crank lever 24 releases the explorer stem 26 which drops by gravity for a short interval of time and then is lifted again by the bell crank lever as the rock shaft 19 resumes its normal position. If the paper sheet A has been properly fed and is presented squarely to the front gage parts 16, then the interposition of the paper sheet between the explorer 26 and the contact 30 acts to prevent the closing of the electrical circuit 31. If, however, from any of the causes mentioned, or other causes, the paper sheet fails to be presented squarely to the gage, then the explorer stem 26 makes electrical contact with contact 30 closing the circuit 31 and causing the stoppage of the machine.

While we have herein described in some detail a particular embodiment of our invention particularly combined with a paper folding machine, it will be apparent that the invention might be embodied with other forms of machines for automatic operation on separately presented articles and the details of construction may be varied to adapt the mechanism to specifically different conditions imposed by construction of the major machine, within the spirit of our invention and within the scope of the appended claims.

What we claim is:

1. The combination of an automatic machine for operating upon successively presented articles, comprising a gage to which each article should be presented and a timing part movable in definite time-relation to the presentation of said article, of an explorer mounted on said gage part, means timed by said timing part of the machine to occasion movement of said explorer to intersect a portion of the path of travel of said article and means responsive to uninterrupted movement of said explorer to stop the machine.

2. The combination of an automatic machine comprising a gage, means to move successive articles to said gage, and a working part timed intermittently to operate upon presentation of each article to said gage, of an explorer mounted on said gage movable to intersect the path of said article, operating connections between said explorer and said timed working part and means operable by uninterrupted excursion of the explorer to stop the machine.

3. The combination with a machine for handling separate paper sheets, comprising frictional paper feed mechanism, a gage to which each sheet of paper should be
squarely presented, and a part timed for operation while the paper sheet should be in contact with the gage, of an explorer part mounted on said gage approximately centrally of the gage, connections between said explorer and said timed part of the machine whereby the explorer moves through a path which may be interrupted by the central portion of the paper sheet if said sheet be squarely presented to the gage, and means responsive to uninterrupted movement of the explorer to stop the machine.

4. The combination with a machine for handling separate paper sheets, comprising frictional paper feeding mechanism, a gage to which each sheet of paper should be squarely presented, and a part timed for operation while the paper sheet should be in contact with the gage, of an insulating frame mounted on said gage, a movable explorer and a stationary contact supported by said frame respectively above and below a paper sheet, and connections between said explorer and timed part of the machine for intermittently moving said explorer toward the stationary contact.

5. The combination of an automatic machine comprising a gage, means to move successive articles to said gage, and a working part timed intermittently to operate upon presentation of each article to said gage, of means to stop the machine, an explorer movable across the path of said article for control of said stopping means, and means so to move said explorer comprising a pivoted lever associated with the gage having connections respectively with the explorer and with the timed means of the machine, said connections including parts connected for lost motion, said explorer mounted on the gage to tend to move across the path of said article under control of said lost-motion connections.

6. The combination of an automatic machine comprising a gage, means to move successive articles to said gage, and a working part timed intermittently to operate upon presentation of each article to said gage, of means to stop the machine, an explorer movable across the path of said article for control of said stopping means, and means so to move said explorer comprising a bell-crank lever pivotally mounted upon said gage, the horizontal arm of said lever having lost-motion connection with the gage and the vertical arm having connection with the timed means of the machine.

In testimony whereof we hereunto set our hands.

ROBERT L. FOLZ.
PHILIP A. ZACE.

In the presence of—
W. LINN ALLEN,
MARY F. ALLEN.