June 5, 1934. H. EHLIG 1,961,633

SHEET FEEDER AND FOLDER

Filed Nov. 29, 1930 3 Sheets-Sheet 1

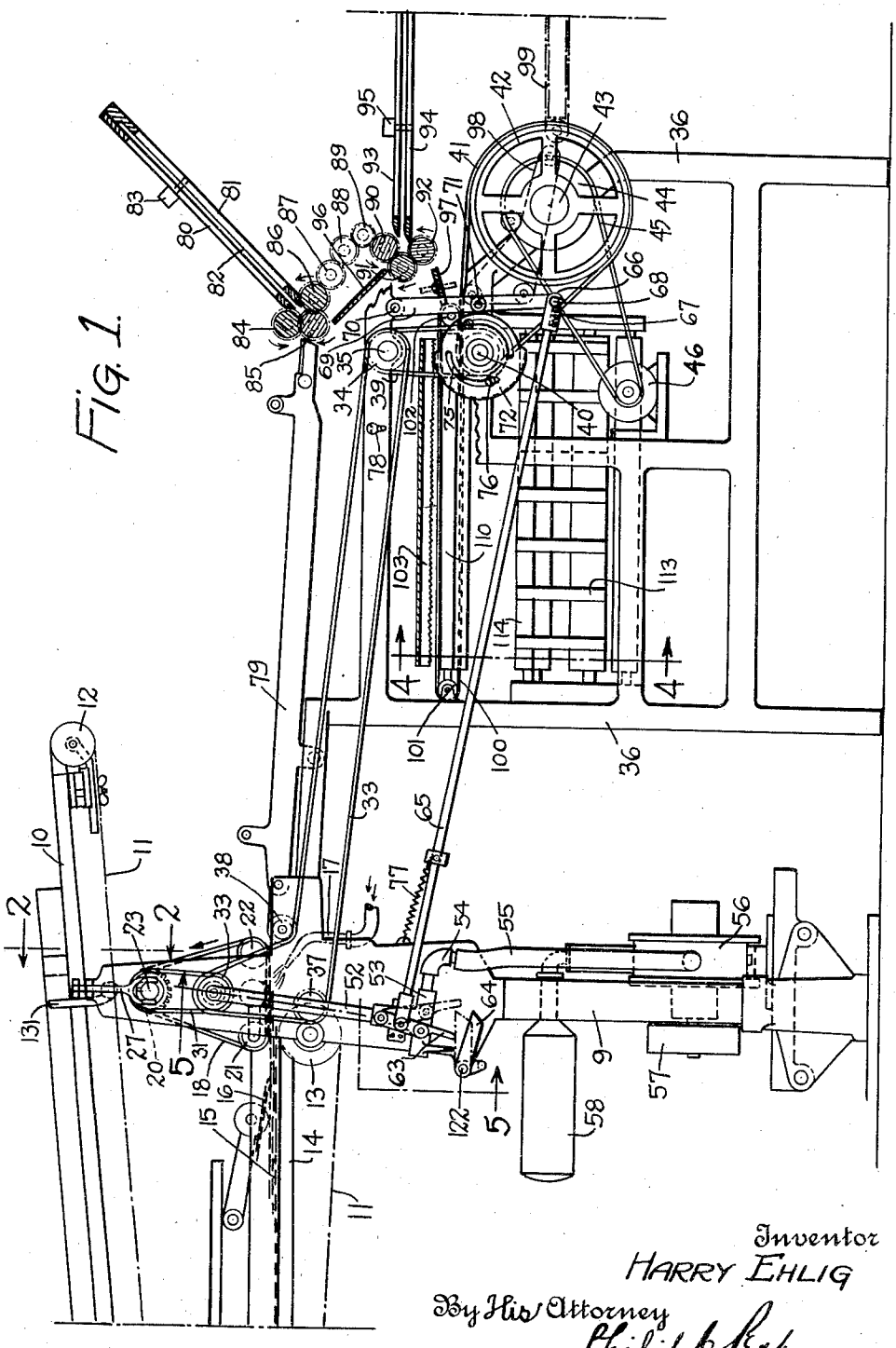


FIG. 1.

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SHEET FEEDER AND FOLDER

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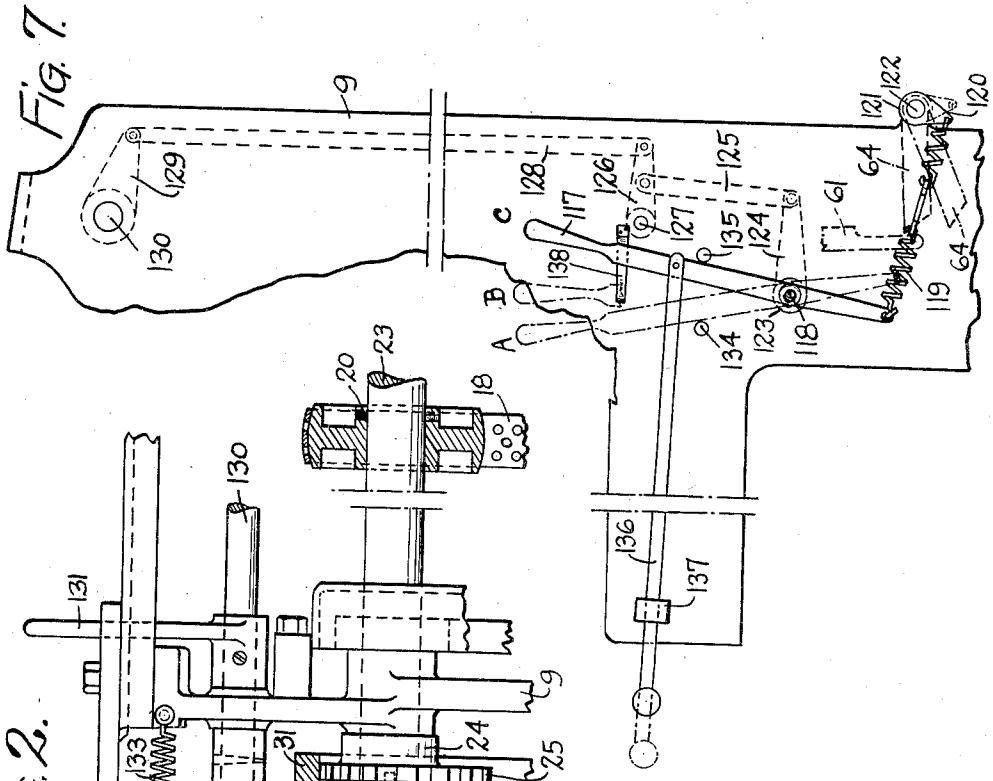


Fig. 7.

Fig. 2.

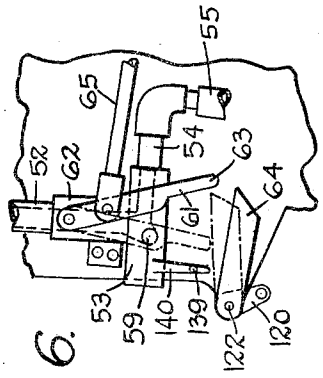


Fig. 6.

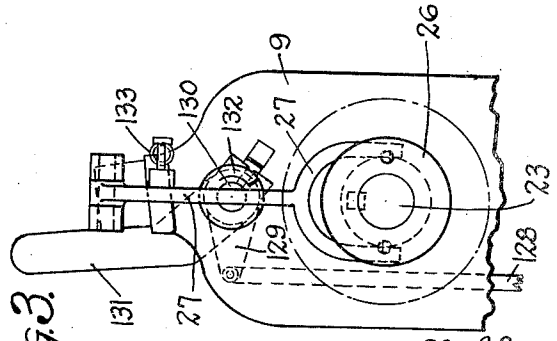


Fig. 3.

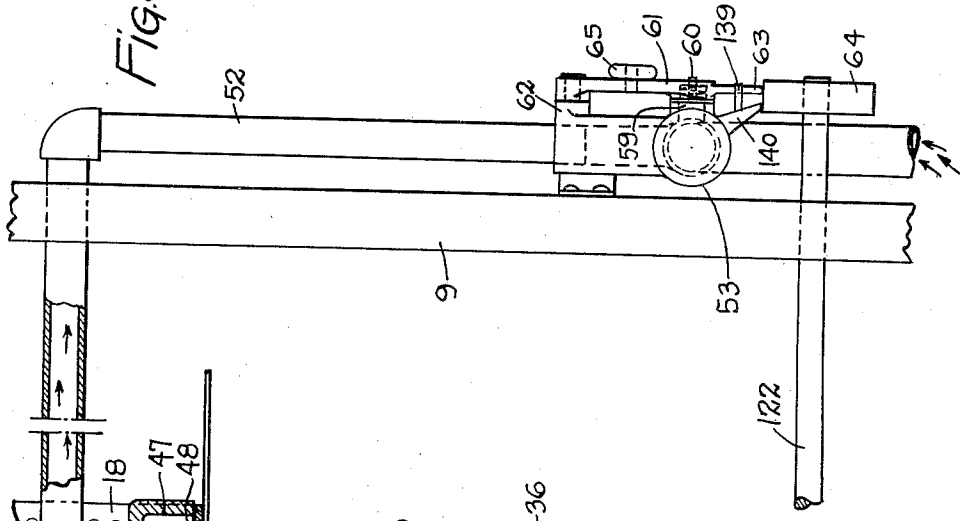
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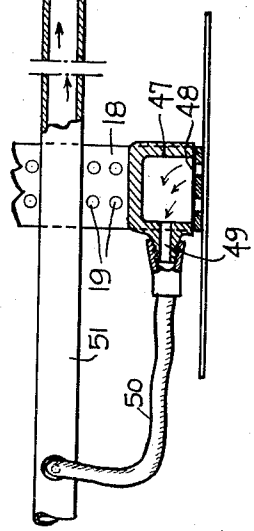
June 5, 1934. H. EHLIG 1,961,633

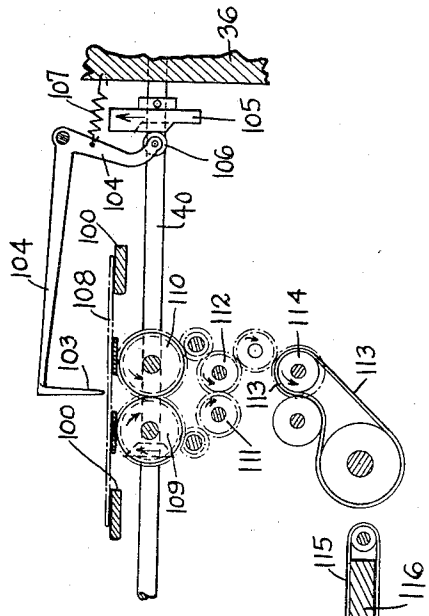
SHEET FEEDER AND FOLDER

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Fig. 5.







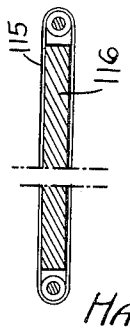


Fig. 4.

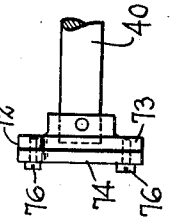


Fig. 8.

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UNITED STATES PATENT OFFICE

1,961,633

SHEET-FEEDER AND FOLDER

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Application November 29, 1930, Serial No. 498,950

30 Claims. (Cl. 270—62)

My invention relates to an improved sheet-feeder for automatically separating and advancing successive sheets of paper or other impression-receiving material to a folding machine for further operations on such sheets so advanced by the feeder, the entire machine to be operated as a combined sheet-feeder and folder unit.

The objects of my invention are, among other things, to provide a novel combined suction sheet-feeder and folder unit to be operated in unison with improved mechanisms jointly actuated in both feeder and folder so that the feeder may be interchangeably operated both as an untimed feeder forwarding the sheets in a continuous flow with the sheets fed forwardly substantially edge to edge, and also as a timed feeder with the suction intermitted at each cycle of the folder that embodies mechanisms for making both buckle and knife folds in their proper sequence.

In such type of folder the primary folding mechanisms that produce the buckle folds do not require any particular sequence in feeding the sheets which may be advanced in a more or less continuous stream by the untimed feeder, but the knife fold mechanism must operate at proper timed intervals and hence the feeder must likewise be transformed from an untimed to a timed feeder with the suction intermitted in proper relation to the folding knives comprising the secondary folding mechanisms.

According to my improved feeder and folder unit, the buckle fold devices continue to operate in conjunction with the knife fold devices when the feeder is timed to synchronize with the latter through the proper intermitting of the suction applied to the feeder, and the feeder may also be interchangeably operated as an untimed feeder for the buckle folds only.

My improvements embody a novel form of suction feeder and folder unit that ensures maximum production for both the parallel folding devices and also the right angle folder mechanism, the novel feeding and control mechanisms in the feeder proper, permitting a continuous stream of paper to pass to the parallel folding rollers when performing all parallel work and by an interchangeable connection allowing the feeder to feed the successive sheets in timed relation with the right angle fold in each cycle of the folder.

Another object of my invention is to provide a manually operated control device which will cut off the suction to stop the feeding of sheets, and also by a further movement the sheet-advancing means will be made inoperative. This mechanism is so arranged that it may be operated at any time to stop the forwarding of sheets during the cycle of a machine, when running in timed relation, and it also may be moved to start the feeding mechanism at any time during the cycle thereafter automatically picking up in proper timed relation.

Furthermore I have devised a mechanism for controlling the feeder which is manually operated and controlled, so that when running as a timed machine the suction may be so controlled that the sheet under suction control may be fed forwardly before the sheet-advancing mechanism is actually stopped.

I also provide a starting and stopping device that upon starting, the feeder will make the suction operative in timed relation with the machine cycle after actuating the advancing mechanism.

My invention also provides a novel mechanism for controlling the starting and advancing devices so as to render same inoperative while the suction is on thereby holding back the feeding of a sheet although such sheet is already under suction control and partly advanced by the sheet forwarding means.

My improved sheet-feeder and folder unit also embodies other advantageous features of novelty and improvement in which the different operating parts are simplified in structure and action, and are made more effective for use, all of which will be hereinafter described and then particularly set forth in the appended claims.

The drawings show my improvements in their preferred embodiment in a continuous feeder, but such improvements may be embodied in various forms of feeders with like advantages and results.

Of the drawings, Fig. 1 is a side elevation of the combined feeder and folder unit, some parts of the latter being shown in section, the outer ends of the folder and feeder being omitted at the right and left ends of this figure respectively.

Fig. 2 is an enlarged view on the line 2—2 of Fig. 1;

Fig. 3 is an end view of Fig. 2 looking from the left;

Fig. 4 is a view on the line 4—4 of Fig. 1;

Fig. 5 is an enlarged view on the line 5—5 of Fig. 1;

Fig. 6 is a detail view of the suction cut-off devices shown in Fig. 1;

Fig. 7 is a side elevation of the compound throw-off and throw-on devices; and

Fig. 8 is a detail view showing cam-adjustment means on the folder for feeding sheets of different lengths.

Similar numerals refer to similar parts throughout the several figures.

Referring to the drawings and more particularly to Fig. 1, the side-frames 9 (only one being shown) support the upper supply table 10 of the usual form in a continuous feeder, which table 10 carries the feed-belts 11 passing around the pulleys 12 and 13 respectively journalled in the supply table 10 and lower feed-board 14 which is also mounted in the side-frames 9. The bank of fanned-out sheets 15 is advanced to the sheet separating and feeding devices by the feed-belts 11. Above the sheets 15 is the customary pile-drag 16, and the front edges of the sheets are separated by the usual air blast from the nozzle 17 as shown in Fig. 1.

In the present embodiment, the sheet separating and advancing devices comprise the endless loop belt 18 having spaced-apart perforations 19 (Fig. 5), which belt passes around three pulleys 20, 21 and 22 arranged in vertical triangular formation (Fig. 1), so that the lower run of the belt 18 will lie over the front margin of the bank of sheets 15 and in close proximity thereto. The belt 18 is driven by the pulley 20 secured to the cross-shaft 23 journalled in the side-frames 9 (Fig. 2). Rotatably mounted on the end of the shaft 23 is the collar 24 carrying the sprocket gear 25, and adjacent the collar 24 is the sliding clutch collar 26 keyed to the shaft 23 and actuated by the forked lever 27 which rides in the groove 28 cut in the collar 26 (Fig. 3). The collar 24 carries the pins 29 which engage the holes 30 formed in the collar 26 when the clutch parts are in their Fig. 2 operative position.

The sprocket gear 25 is operated by the sprocket chain 31 driven by the gear 32 from the chain 33 which is actuated from a gear 34 on the shaft 35 journalled in the side frames 36 (only one being shown) of the folder. The chain 33 passes around the idler gears 37 and 38 carried by the side-frames 9. The shaft 35 is driven by the short loop chain 39 which is actuated by a gear on the cam-shaft 40 journalled in the side-frames 36. The shaft 40 is driven by the belt 41 passing around the pulley 42 mounted on the stub shaft 43 which also carries the pulley 44 driven by the belt 45 which is actuated by the motor 46, all as shown in Fig. 1.

Resting on the lower run of the perforated belt 18 is the suction nozzle 47 (Figs. 1 and 5) having an open lower face 48 against which the inner surface of the loop belt 18 is pressed along its lower run. The inner chamber of the nozzle 47 is connected by the port 49 and hose 50 with the cross-pipe 51 and vertical pipe 52 to the mechanism employed both for intermitting the suction in the nozzle 47 and also for providing a continuous suction from the vacuum pump in such nozzle 47.

Such means for controlling the suction in the nozzle 47 is best shown in Figs. 1, 5 and 6, and comprises the following devices: The lower end of the pipe 52 terminates in the cross pipe section 53 closed at one end and having its other end connected by the pipe 54 and hose 55 with the vacuum or air-exhaust pump 56 driven from the pulley 57 by any suitable source of power (not shown). Attached to the pump 56 is the usual reservoir 58 to equalize the air-blast to be applied to the nozzle 17.

Midway on the outer surface of the cross-section 53 is the port 59 to open the interior of the section 53 to atmosphere, but adapted to be closed by the spring-pressed valve 60 (Figs. 1 and 5) carried by the oscillatable rock-arm 61 pivoted to the bracket 62 mounted on the side-frame 9. The outer end 63 of the arm 61 is adapted to be releasably engaged by the rocking latch-arm 64 pivoted in the frame 9 (Fig. 6). The arm 61 is oscillated in the bracket 62 by the rod 65 pinned to the arm 61 and having its forward end 66 removably affixed by the ball detent 67 to the pin 68 on the cam-lever 69 pivoted at 70 to the side-frame 36. The cam-lever 69 carries the cam-roller 71 which engages the cam 72 mounted on the cam-shaft 40. The cam 72 comprises the inner member 73 and outer member 74 which is rotatably adjustable on the inner member 73 to vary the cam dwell by curved slots 75 and bolts 76 (Figs. 1 and 8) to accommodate for sheets of different lengths and thereby the timing of the suction intermission through the oscillating valve 60 opening and closing port 59. The spring 77 affixed to the rod 65 and side-frame 9 keeps the roller 71 in engagement with the cam 72. When the rod 65 is disengaged from the cam-lever 69 and the valve-arm 61 is pulled to the full-line position (Fig. 1), the port 59 is closed by the valve 60, and the suction nozzle 47 is under continuous suction derived from the pump 56. When so disengaged the rod 65 may rest on the hook 78 fastened to the side-frame 36, the spring 77 holding the arm 61 over the port 59.

Mounted pivotally to the side-frames 9 is the feeder delivery frame 79 extending forwardly over the folder frame 36 by which frame 79 the sheets are advanced from the feed-belt 18 to the primary folding mechanism that makes the buckle folds in the successive sheets.

This mechanism comprises the first set of spaced-apart plates or grids 80 and 81 secured together to form the space 82 with the usual adjustable stop 83 fastened to the grids. At the mouth of the grids 80 and 81 are rotatably mounted the parallel rolls 84, 85 and 86 which are geared to rotate in unison in the directions indicated by the arrows (Fig. 1) through the train of idler gears 87, 88 and 89 driven by the set of parallel rollers 90, 91 and 92 mounted to rotate in the directions indicated by arrows at the mouth of the secondary plates or grids 93 and 94 arranged in spaced-apart relation and provided with the adjustable stop 95. The deflector plate 96 carries the sheets folded in the first grids 80 and 81 to the second grids 93 and 94 in the usual way.

Below the bite of the rollers 91 and 92 the deflector 97 is rotatably arranged to carry the folded sheets to the secondary folding mechanism for the knife fold whenever the deflector 97 is in its full line position (Fig. 1) but when turned to its dotted line position the deflector 97 guides the buckle folded sheets to the delivery tapes 98 and 99 to emerge from the folder.

This secondary folding mechanism to produce the right angle or knife fold in the folded sheets delivered by the deflector 97 (in full line position) is shown in Figs. 1 and 4: The pair of endless spaced apart feed-belts 100 pass around pulleys 101 and 102 mounted on shafts journalled in the side frames 36 of the folder proper. These pulleys 101 and 102 are driven by any suitable means (not shown). The knife 103 is carried on the rocker arm 104 and is intermittently rocked downwardly by the cam 105 pinned on the cam-shaft 40, the cam-roller 106 on the rocker arm 104 riding on the cam 105 by the force of the pull-spring 107, all as shown in Fig. 4.

The knife 103 tucks the folded sheet 108 carried by the belts 100 between the bite of the folding rollers 109 and 110 which are revolved in the directions indicated by the arrows (Fig. 4) by any suitable means (not shown). The folded sheet 108 then passes downwardly through the bite of the rollers 111 and 112 onto the delivery belt 113 actuated by the drive pulley 114 in the direction shown, and is then delivered to the endless tapes 115 on the delivery board 116 to pass out of the folder in the usual way.

The manually operated control device for the suction and also for operating the clutch that regulates the drive of the suction feed-belt 18 is best shown in Figs. 1–3 and 5–7: The hand-lever 117 is pinned at 118 to the side-frame 9 with its lower end resiliently connected by the spring 119 to the rock arm 120 fastened to the collar 121 journalled on the cross-shaft 122 which collar 121 also carries the latch-arm 64. Secured to the lever 117 on the boss 123 on the pin 118 is the rock-arm 124 connected by the link 125 to the rock arm 126 pinned at 127 to the side-frame 9. The rock-arm 126 is connected by the link 128 to the rock-arm 129 fastened to the rock-shaft 130 journalled in the side-frame 9 (Figs. 2, 3 and 7). The handle 131 for manual operation is pinned to the shaft 130, and the outer end of the shaft 130 carries the cam 132 to bear on the inner surface of the forked lever 27 which is held against the cam 132 by the pull-spring 133. The pins 134 and 135 set in the side-frame 9 limit the positions of the hand-lever 117 for throw-off and throw-on movements, and the hand lever 117 has pinned thereto the hand-rod 136 sleeved in the boss 137 on the side-frame 9 (Fig. 7). The spring leaf 138 fastened to the side-frame 9 bears against the side of the lever 117 to frictionally engage same when the lever 117 is passing to and from its full-line position to its intermediate position (Fig. 7).

I have indicated on Fig. 7 the several positions of the hand lever 117: A shows the operating position with the suction on the nozzle 47 and the clutch in its Fig. 2 position to actuate the feed-belt 18; B shows the lever position to cut-off the suction by allowing the valve-arm 61 to swing forwardly through the force of the spring 77 when the latch-arm 64 is raised from its full-line position (Figs. 1 and 6) to engage the end 63 of the arm 61; and C shows the clutch thrown-off to stop the belt 18 when the forked-lever 27 is swung outwardly by the anti-clockwise movement of the cam 132 (Fig. 3) to move the collar 26 out of engagement with the pins 29. The pin 139 on the bracket 140 (Figs. 5 and 6) limits the throw of the valve-arm 61 when oscillated by rod 65 actuated by the cam 72 when the feeder is operating as a timed machine.

The operation of my feeder and folder unit interchangeably built as an untimed and timed feeder for feeding sheets to the folder provided with mechanisms for both buckle folds and knife folds is substantially as follows: When operating as an untimed feeder, the rod 65 is disconnected from the pin 68 on the cam-lever 69 and the valve 60 automatically closes the port 59 by the spring 77 because the lever 117 is in its "A" position with the latch-arm 64 depressed. Suction is directly and continuously applied to the nozzle 47 bearing on the perforated belt 18 which is revolving in the direction of the arrow in Fig. 1 to advance the sheets from the bank 15 in a continuous stream of paper carried down delivery frame 79 to the first pair of grids 80 and 81 and parallel folding rollers 84, 85 and 86 to make the buckle fold as hereinbefore described; then the folded sheets are carried to the second pair of grids 93 and 94 and parallel folding rollers 90, 91 and 92 for further buckle folds after which the folded sheets pass out of the folder on the delivery tapes 98 and 99.

When operating as a timed feeder, the rod 65 is fastened to the cam-lever 69 and the throw of the cam 72 is adjusted to properly accommodate the length of the sheets on the bank 15. In this position the oscillating valve-arm 61 is actuated to and fro by the rod 65 to open or close the port 59 to atmosphere whereby the suction in the nozzle 47 is intermitted to cause the endless belt 18 to advance the successive sheets in predetermined relation with the operation of the secondary folding mechanism producing the knife or right angle folds in the sheets which have already received their first buckle folds as heretofore described when the deflector 97 is fixed in its full-line position to convey the folded sheets onto the belts 100 for knife-folding by the lowering of the knife 103 to tuck the sheets into the bite of the folding rollers 109 and 110. Thereafter the sheets are carried onto the delivery board 116 as hereinbefore described. The cams 72 and 105 are so set on the cam-shaft 40 that the intermitting of the suction in the nozzle 47 is timed in proper relation with the descent of the knife 103 to make the knife fold in the previously buckle-folded sheets.

The operation of the throw-off and throw-on lever 117 has been set forth whereby in the throw-off movement the suction is first cut off to stop the feeding of the sheets followed by disengagement of the clutch to stop the revolutions of the belt. The spring 119 connection provides means for yieldingly bringing the latch-arm 64 to its dotted-line position (Fig. 6) whereby the lever end 63 may swing to the right with a clearance space to permit the latch-arm 64 to be depressed. On the reverse movement of the lever 117, the clutch is brought into operating engagement before the spring 119 lowers the latch-arm 64 to close the suction port 59 immediately when the feeder is set for untimed operation, but according to the timing of the cam 72 when the rod 65 is connected with the cam-lever 69.

Such compound throw-off and throw-on mechanism herein shown and described is peculiarly adapted for providing an effective control device for my combined feeder and folder unit in its complementary operations as a timed and untimed feeder in conjunction with separate or conjoint operations of the folder to produce knife folds and buckle folds or simply the buckle folds respectively as I have hereinbefore stated in setting forth the advantages of this double control mechanism. By my control methods the sheet which has been partly advanced by the belt 18 may be held by stopping the belt though the latter still holds the sheet under suction control, thereby preventing the feeding of one or more sheets before the feeder can be brought to a standstill when running at a high rate of speed.

The foregoing constructions embody the principles of my invention, but various changes may be made in the structural details without departing from the scope of my improvements as set forth in the appended claims.

I claim as my invention:—

1. A sheet-feeder and folder unit comprising, in combination, a suction feeding-device to advance the successive sheets, a primary sheet-fold-

ing mechanism acting on the advanced sheets, a secondary sheet-folding mechanism acting on the sheets folded by the primary sheet-folding mechanism, and interchangeable means governing the suction applied to said feeding-device, in one position intermitting the suction in timed relation with said secondary sheet-folding mechanism, and in another position applying a continuous suction to said feeding-device to advance sheets only to said primary sheet-folding mechanism.

2. A sheet-feeder and folder unit comprising, in combination, a suction feeding-device to advance the successive sheets, a primary sheet-folding mechanism acting on the advanced sheets, a secondary sheet-folding mechanism acting on the sheets folded by the primary sheet-folding mechanism, and interchangeable means governing the suction applied to said feeding-device, including an adjustable cam to vary the duration of said suction on said feeding-device, in one position intermitting the suction in timed relation with said secondary sheet-folding mechanism, and in another position applying a continuous suction to said feeding-device to advance sheets only to said primary sheet-folding mechanism.

3. In a sheet-feeder and folder unit comprising, in combination, a suction feeding-device to advance the successive sheets, a sheet-folding mechanism acting on the advanced sheets, means actuated and controlled by said folding mechanism to intermit the suction applied to said feeding-device, and means to separate said last-mentioned means from operative relation with said folding mechanism.

4. In a sheet-feeder and folder unit comprising, in combination, a suction feeding-device to advance the successive sheets, a sheet-folding mechanism acting on the advanced sheets, means actuated and controlled by said folding mechanism to intermit the suction applied to said feeding-device in each cycle of said folding mechanism, and means to separate said last-mentioned means from operative relation with said folding mechanism.

5. In a sheet-feeder and folder unit comprising, in combination, a suction feeding-device to advance the successive sheets, a sheet-folding mechanism acting on the advanced sheet, means actuated and controlled by said folding mechaanism to intermit the suction applied to said feeding-device in each cycle of said folding mechanism, means to separate said last-mentioned means from operative relation with said folding mechanism, and means to hold said suction-intermitting means in inoperative position.

6. A sheet-feeder and folder unit comprising, in combination, a suction feeding device to advance the successive sheets, a primary sheet-folding mechanism acting on the advanced sheets, a secondary sheet-folding mechanism acting on the sheets folded by the primary sheet-folding mechanism, means to intermit the suction applied to said feeding device in timed relation with said secondary sheet-folding mechanism, and a separable connection for said suction-intermitting means to allow suction to be applied continuously to the feeding device to advance the sheets only to said primary sheet-folding mechanism.

7. A sheet-feeder and folder unit comprising, in combination, a suction feeding device to advance the successive sheets, a primary sheet-folding mechanism acting on the advanced sheets, a secondary sheet-folding mechanism acting on the sheets folded by the primary sheet-folding mechanism, means to intermit the suction applied to said feeding device in timed relation with said secondary sheet-folding mechanism, and means for operating said suction-intermitting means controlled by said sheet-folding mechanisms.

8. A sheet-feeder and folder unit comprising, in combination, a suction feeding device to advance the successive sheets, a primary sheet-folding mechanism acting on the advanced sheets, a secondary sheet-folding mechanism acting on the sheets folded by the primary sheet-folding mechanism, means to intermit the suction applied to said feeding device in timed relation with said secondary sheet-folding mechanism, and means connected with said sheet-folding mechanisms to vary the timing of said suction-intermitting means for sheets of different lengths.

9. A sheet-feeder and folder unit comprising, in combination, a suction feeding device to advance the successive sheets, a primary sheet-folding mechanism acting on the advanced sheets, a secondary sheet-folding mechanism acting on the sheets folded by the primary sheet-folding mechanism, means including an adjustable cam to intermit the suction applied to said feeding device in timed relation with said secondary sheet-folding mechanism, and a separable connection for said suction-intermitting means to allow suction to be applied continuously to the feeding device to advance the sheets only to said primary sheet-folding mechanism.

10. A sheet-feeder and folder unit comprising, in combination, a suction feeding device to advance the successive sheets, a primary sheet-folding mechanism acting on the advanced sheets, a secondary sheet-folding mechanism acting on the sheets folded by the primary sheet-folding mechanism, means to intermit the suction applied to said feeding-device in each cycle in timed relation with said secondary sheet-folding mechanism, and a separable connection for said suction-intermitting means to allow suction to be applied continuously to the feeding device to advance the sheets only to said primary sheet-folding mechanism.

11. In combination, suction sheet-feeding means, sheet-folding means comprising a continuously operating buckle-fold device and an intermittently-operating knife fold device, and means for interchangeably actuating said feeding means to advance sheets to said buckle device in a substantially continuous stream and also for actuating said feeding means to advance the sheets to the knife-fold device in timed relation therewith.

12. In apparatus of the character described, a plurality of mechanisms for acting on sheets, means for feeding the sheets thereto, and feed control means adjustable for placing said sheet-feeding means in different operative relations with one mechanism to automatically control the feed of sheets to one or more of the plurality of mechanisms.

13. In apparatus of the character described, a plurality of mechanisms for acting on sheets, means for feeding the sheets thereto, and a feed control member adjustable for placing said sheet-feeding means in different operative relations with one mechanism predetermined by the use of one or more of said mechanisms.

14. In apparatus of the character described, a plurality of mechanisms for acting on sheets, means for feeding the sheets thereto and nor-

mally operated continuously, and a feed control member adjustable for placing said sheet-feeding means in operative relation to time and control the travel of each sheet to one or more preselected mechanisms of said plurality.

15. In apparatus of the character described, a knife fold mechanism, a buckle fold mechanism for use with or independently of the knife fold mechanism, means for feeding sheets to the buckle fold mechanism and the knife fold mechanism in timed relation with the latter, and means for varying the action of said sheet-feeding means to deliver sheets continuously to the buckle fold mechanism.

16. In apparatus of the class described, two mechanisms for acting on sheets, one requiring a type of sheet-feed different from that required for the other, and means for feeding the sheets to one or both of said mechanisms according to the type of sheet-feed required therefor respectively.

17. In apparatus of the class described, a mechanism for acting on sheets, a separate device for also acting on sheets and requiring a type of sheet-feed different from that employed for said mechanism, means for feeding the sheets thereto, and means for varying the type of feed of the sheets by said sheet-feeding means according to the type of feed employed for said mechanism and required by said device.

18. In apparatus of the class described, a plurality of mechanisms for acting on sheets, a separate device also acting on sheets and requiring a type of feed different from that normally employed for said mechanisms, means for feeding the sheets thereto, and means for regulating the type of feed of the sheets by said sheet-feeding means to said mechanisms and said device according to the type of feed required by the latter.

19. In apparatus of the class described, a mechanism for acting on sheets, a separate device for also acting on sheets and requiring a type of sheet-feed different from that normally employed for said mechanism, means enabling use of the mechanism alone or with said device as desired, a feeder for the sheets normally operated according to the type of feed normally employed for said mechanism, and means for regulating the feed of sheets by said feeder to said mechanism and said device according to the type of feed required by the latter.

20. In apparatus of the class described, mechanism for acting on sheets, a separate device for also acting on sheets and requiring a type of feed different from that normally employed for said mechanism, means enabling use of the mechanism alone or with said device as desired, means for feeding the sheets thereto, and means for varying the type of feed of the sheets by said first named means according to the use of said mechanism with or without said device.

21. In apparatus of the character described, a buckle fold mechanism, a knife fold mechanism, suction sheet-feeding means for said mechanisms, and means for interchangeably actuating said sheet-feeding means to advance sheets continuously to the buckle fold mechanism or to said buckle fold mechanism and said knife fold mechanism in timed relation with the latter.

22. In apparatus of the character described, a buckle fold mechanism, a knife fold mechanism, sheet-feeding means for delivering sheets in an uninterrupted stream to said buckle fold mechanism, and means for varying the action of said sheet-feeding means to deliver sheets in timed relation with said knife fold mechanism.

23. In combination, a plurality of folding mechanisms, and means for feeding sheets to one of said folding mechanisms in untimed relation therewith or for feeding sheets to all of said folding mechanisms in timed relation with another of the same.

24. In combination, two folding mechanisms and means for feeding sheets to one of said folding mechanisms in untimed relation therewith or through said folding mechanism to the other folding mechanism in timed relation therewith.

25. In combination, untimed folding mechanism, timed folding mechanism, and means for feeding sheets to the untimed folding mechanism in untimed relation therewith or for feeding sheets to said untimed folding mechanism and the timed folding mechanism in timed relation with the latter.

26. In combination, a buckle folder, a knife folder, and means for feeding sheets to the buckle folder in untimed relation therewith or for feeding sheets through said buckle folder to the knife folder in timed relation therewith.

27. In combination, timed folding mechanism, untimed folding mechanism from which the sheets may be fed to the timed folding mechanism for folding thereby, suction means for feeding sheets to the untimed folding mechanism, means for delivering the sheets with or without folding by the timed folding mechanism, and means for producing intermittent or continuous suction in said feeding means according to use of the untimed folding mechanism with or without said timed folding mechanism.

28. In combination, a knife folder, a buckle folder from which sheets may be delivered to the knife folder, means for deflecting the sheets from the buckle folder without folding by the knife folder, suction means arranged to feed the sheets to the buckle folder, and means for producing intermittent or continuous suction in said feeding means according to the use of the buckle folder with or without said knife folder.

29. In combination, timed folding means, untimed folding means from which sheets may be delivered to the timed folding means or directly from the untimed folding means without folding by said timed folding means, suction sheet feeding means for said folding means, the feeding means being adapted to have suction maintained continuously therein when sheets are to be folded only by the untimed folding means and said feeding means being adapted to have suction intermittently produced therein when the sheets are to be folded by both of said folding means, and means for producing continuous or intermittent suction in said suction sheet feeding means as desired.

30. In combination, a knife folder, a buckle folder from which sheets may be delivered to the knife folder or directly from the buckle folder without folding by said knife folder, means for deflecting the sheets from the buckle folder to the knife folder or directly from said buckle folder without folding by the knife folder, suction means arranged to feed the sheets to the buckle folder, a valve closed to maintain suction continuously in the feeding means when sheets are delivered from the buckle folder without folding by the knife folder, and means for actuating said valve and intermitting the suction in said feeding means in timed relation with the knife folder when sheets are to be folded thereby.

HARRY EHLIG.