

FIG. 1

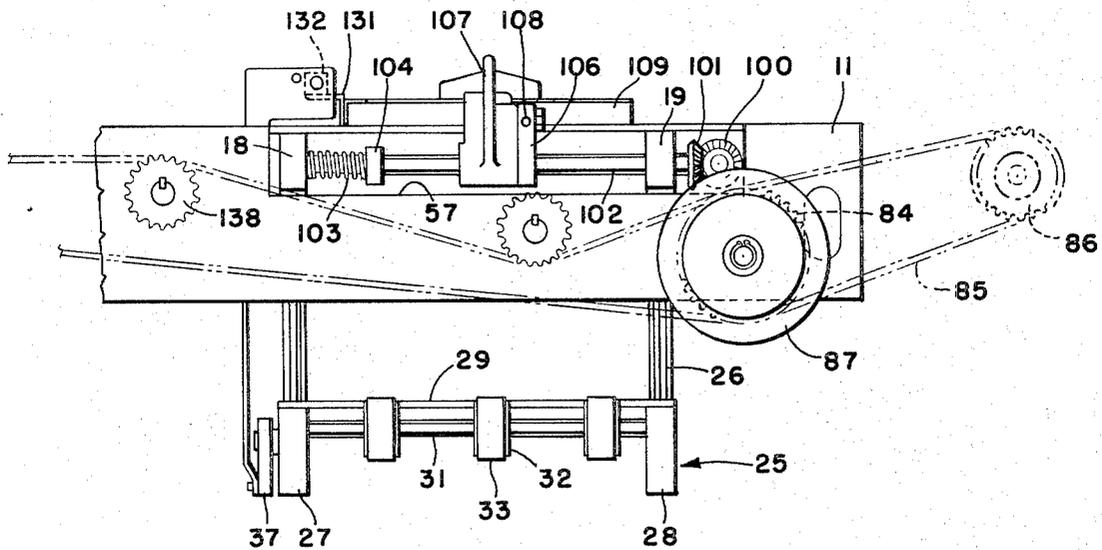
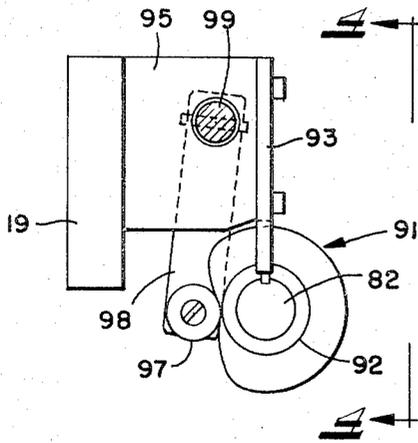


FIG. 2

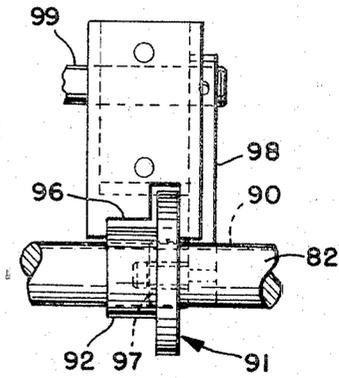
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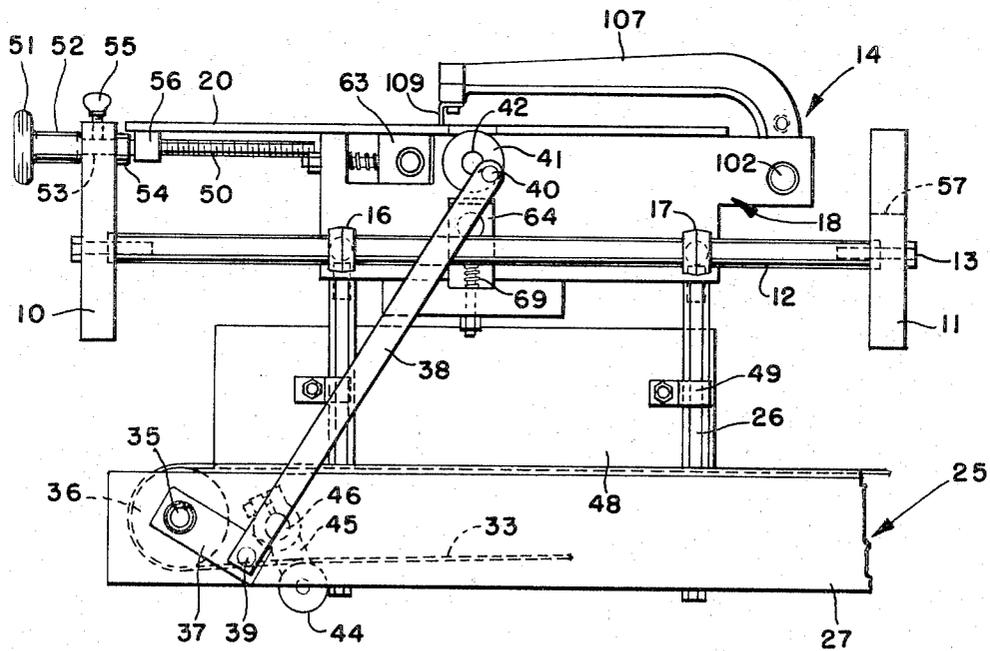
*Oberlin, Maky, Donnelly & Renner*  
ATTORNEYS



**FIG. 3**



**FIG. 4**

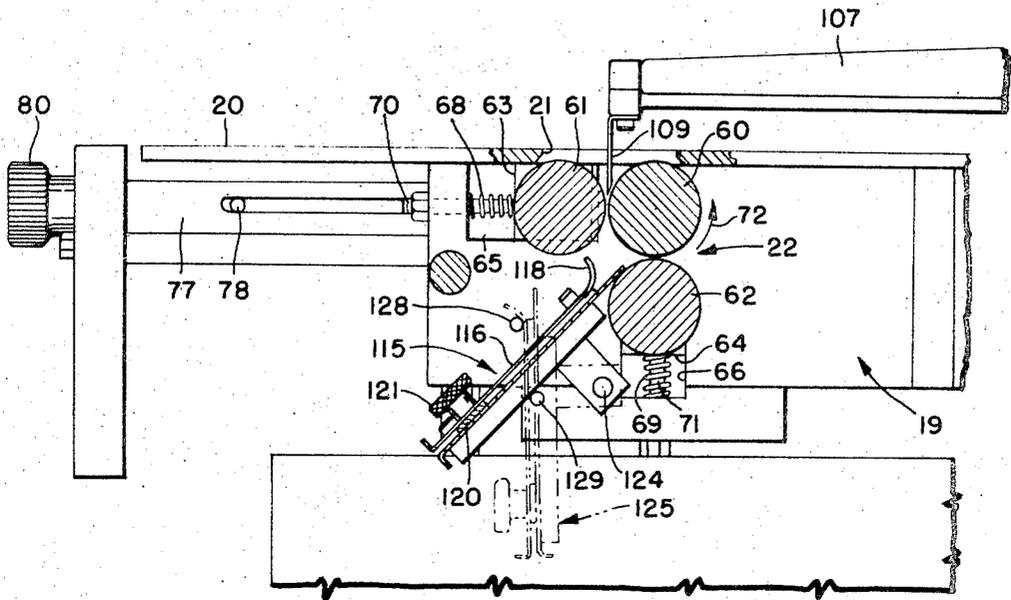


**FIG. 5**

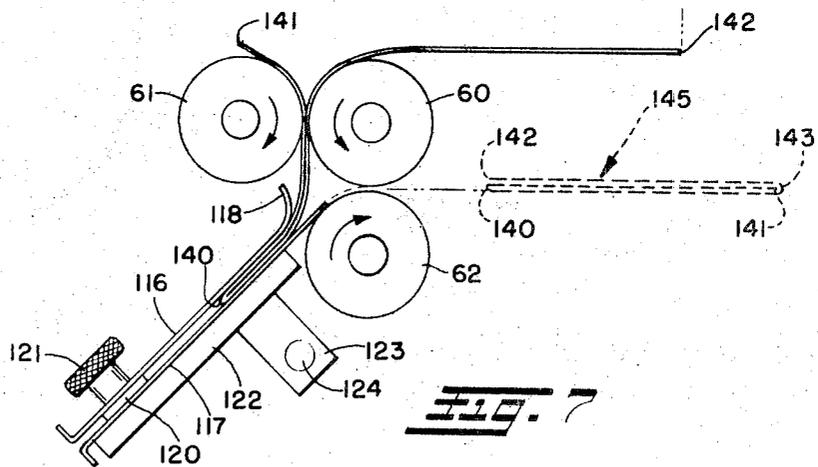
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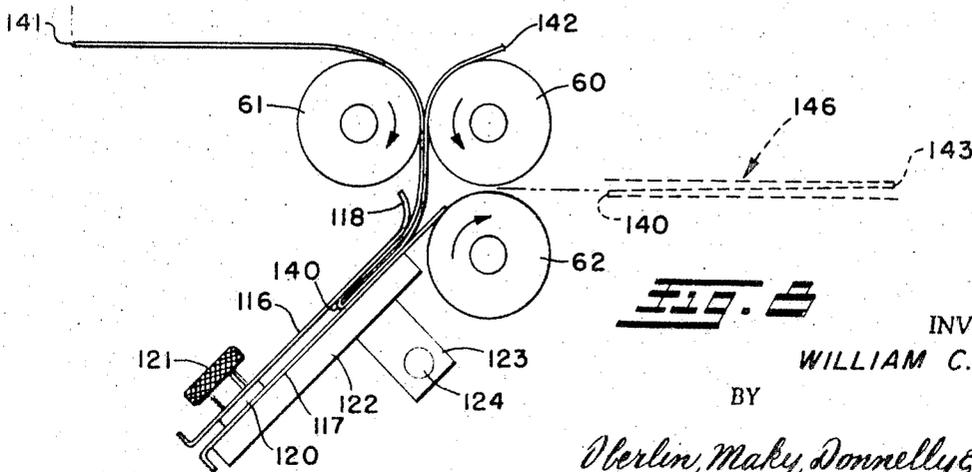
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**FIG. 1**



**FIG. 2**



**FIG. 3**

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## AUXILIARY FOLDER

This invention relates generally as indicated to an auxiliary folder and more particularly to an auxiliary folder for a web press which can produce a wide variety of products with relatively minor and easy to perform adjustments.

A web from a printing press generally passes through a web cutter and folder such as seen in Thatcher U.S. Pat. No. 3,524,638. The cutter and folder illustrated in such patent is capable of producing either a quarter fold or a tabloid fold. In a quarter fold, 24 inch web is folded longitudinally and then transversely to obtain what may be termed a  $9 \times 12$  fold. To obtain from such fold a  $6 \times 9$  fold, an accordian fold, letter fold, or to fold for collating providing a lip on either side, the folded and severed paper must be run through an auxiliary folder. Heretofore the auxiliary folder has required to be positioned properly with respect to the delivery table of the cutter and folder. This has often been accomplished by shifting the entire auxiliary folder to the desired position. This has required burdensome and complex movements of the various pieces of machinery involved.

With the present invention, it is a principal object to provide an auxiliary folder which may be used in conjunction with the delivery table of a cutter and folder to produce a wide variety of paper products from such cutter and folder with relatively simply minor adjustments.

Another principal object is the provision of an auxiliary folder incorporated in the delivery table of a cutter and folder, the principal parts of which are mounted on a carriage for adjustment transversely of the path of paper.

Another principal object is the provision of an auxiliary folder which with quickly and simply made adjustments can place an auxiliary folder at substantially any desired position of the paper on the delivery table.

Another object is the provision of such auxiliary folder utilizing an optionally employable buckle chute to produce letter or accordian folds.

A further important object is the provision of an auxiliary folder utilizing an oscillating folding blade driven by a cam and follower, the blade, cam and follower being adjustable transversely of the path of paper.

Other objects and advantages of the present invention will become apparent as the following description proceeds.

To the accomplishment of the foregoing and related ends, the invention, then, comprises the features hereinafter fully described, the following description and the annexed drawings setting forth in detail a certain illustrative embodiment of the invention, this being indicative, however, of but one of the various ways in which the principles of the invention may be employed.

In said annexed drawings:

FIG. 1 is a fragmentary top plan view, partially broken away, of an auxiliary folder in accordance with the present invention;

FIG. 2 is a fragmentary side elevation taken substantially from the line 2—2 of FIG. 1;

FIG. 3 is an enlarged vertical section of the cam and follower drive for the folding blade taken substantially on the line 3—3 of FIG. 1;

FIG. 4 is an end elevation of such cam and follower drive as seen from the line 4—4 of FIG. 3;

FIG. 5 is a fragmentary vertical section taken substantially on the line 5—5 of FIG. 1;

FIG. 6 is an enlarged fragmentary vertical section taken substantially on the line 6—6 of FIG. 1 showing the buckle chute in its alternative position in phantom lines;

FIG. 7 is an enlarged schematic of the roll assembly and the buckle chute illustrating the manner in which a letter fold is produced; and

FIG. 8 is a view similar to FIG. 7 illustrating the manner in which an accordian fold may be produced.

Referring first to FIGS. 1, 2 and 5, it will be seen that the auxiliary folder is incorporated in the delivery table of the cutter and folder of the type seen in the aforementioned Thatcher patent. Such delivery table comprises a stand having two side frame plates 10 and 11. Such side plates are interconnected by support rods 12 secured to the frames by the fasteners 13, one such support rod being positioned on each side of carriage 14. The carriage 14 is supported on the transversely extending rods 12 by means of laterally projecting eye lugs as indicated at 16 and 17 in FIG. 5. Such eye lugs extend laterally outwardly from carriage side plates 18 and 19, the profile configuration of which is seen more clearly in FIGS. 5 and 6, respectively. Supported between and on top of the carriage side plates 18 and 19 is a top plate 20 which has a rectangular aperture therein as seen at 21. The aperture is elongated in the direction of paper travel over the top of the plate 20 and is immediately superjacent the three roll knurled pinch roll assembly seen generally at 22 in FIG. 6.

Pendently supported from the side plates of the carriage is an auxiliary folder discharge conveyor 25 seen more clearly in FIGS. 2 and 5. Such auxiliary folder discharge conveyor extends transversely of and beneath the delivery table. The conveyor 25 is supported by hex rods 26 two each being connected to the underside of the carriage side plates 18 and 19. The conveyor 25 includes side plates 27 and 28 with a conveyor top plate 29 extending therebetween. At the discharge end of the auxiliary conveyor, there is provided a transverse rod or shaft 31 on which are journaled three idler sheaves 32 for respective belts 33. Such belts extend over the top surface of the plate 29 and support paper products dropping onto the conveyor 25 for transverse movement and discharge.

As seen more clearly in FIG. 5, the opposite end of the conveyor is provided with a transverse shaft 35 journaled in the side frames 27 and 28. Belt sheaves 36 are secured to such shaft for rotation therewith. The sheaves 36 and thus the belts 33 trained thereabout are driven for unidirectional intermittent rotation by means of arm 37 through a suitable overrunning or one way clutch mechanism. The arm 37 is oscillated by means of elongated link 38 pivotally connected at 39 to the end of the arm and at 40 to drive wheel 41 mounted on roll stub shaft 42.

Tensioning rollers 44 for the belts 33 are mounted on arms 45 adjustably secured to transverse rod 46 extending between the conveyor side frames 27 and 28, as seen more clearly in FIG. 5. Side plates 48 may be provided for the discharge conveyor 25 and these may be removably secured to the vertically extending support bars 26 by spring clamps 49. The discharge conveyor 25 for the auxiliary folder is thus secured to the

carriage 14 and is movable therewith laterally of the delivery table.

Lateral adjustment of the carriage is obtained by adjusting screw 50 which includes a hand knob 51 having an axial extension 52 with a necked portion 53 between the extension and collar 54. The necked portion is mounted for rotation in the delivery table side plate 10 and the thumb type lock screw 55 is provided to secure the adjusting screw in its selected position of adjustment. A nut 56 is secured to the underside of the carriage top plate 20 so that rotation of the adjustment screw will move the carriage to the right or left as seen in FIGS. 1 or 5 or normal to the plane of FIG. 2. A window or recess 57 is provided in the delivery table side plate 11 to accommodate the movement of the carriage. The conveyor 25, of course, moves with the carriage.

The roll assembly 22, as seen more clearly in FIG. 6, includes three rolls 60, 61 and 62. The roll 61 is directly horizontally opposite the roll 60 while the roll 62 is directly vertically beneath the roll 60. The rolls 61 and 62 are provided with stub shafts journaled in blocks 63 and 64 at each end, such blocks being mounted in horizontally and vertically elongated windows 65 and 66, respectively, in the carriage end plates 18 and 19. Compression springs as seen at 68 and 69 urge the rolls 61 and 62 toward the roll 60 to form the vertically and horizontally directed nips or passes therebetween. The compression springs 68 and 69 surround pinch roll adjusting screws 70 and 71 whereby the nip between the rolls may be controlled. If paper passing between the rolls gets jammed or caught, the springs will permit the rolls 61 and 62 to yield.

The rolls at their ends nearest the viewer in FIG. 6 are drivingly interconnected by pinions so that rotation of the fixed roll 60 in the direction of the arrow 72 will cause the other rolls to rotate in the opposite direction. Such rolls are driven by means of bevel gear 73 seen in FIG. 1 keyed to an extension of the stub shaft of the fixed roll 60 projecting beyond the carriage side plate 19. The bevel gear 73 is in mesh with bevel gear 74 keyed to shaft 75 journaled in plate 76 projecting from the side plate 19 of the carriage. The shaft 75 telescopes into tubular shaft 77 journaled in the side plate 10 of the delivery table, such shaft being provided with diametrically opposed elongated slots receiving transverse pin 78 in the shaft 75. The shaft 77 is provided with a pinion 80 in mesh with gear 81 secured to the projecting end of drive shaft 82 journaled between the side plates 10 and 11 of the delivery table.

The drive shaft 82 is driven selectively from sprocket 84 which is in turn driven by chain 85, the latter being driven by drive sprocket 86 on the cutter and folder as seen in FIG. 2. The selectivity of the drive is obtained by the hand wheel clutch 87 which when pushed axially inwardly drivingly connects the shaft 82 to the sprocket 84 by the drive slot and key illustrated. In this manner, the roll 60 is driven regardless of the position of the carriage. The roll 60 drives the other rolls through the noted intermeshing gears on such rolls, and also drives the conveyor 25 through the link and arm connection seen in FIG. 5, the drive wheel 41 being keyed to the opposite projecting stub shaft 42 of the roll 60.

Referring now additionally to FIGS. 3 and 4, it will be seen that the drive shaft is provided with an elongated keyway 90 and a knife operating cam 91 is keyed to such drive shaft. The cam is provided with an axial

sleeve extension 92 and is axially slidably mounted with respect to such drive shaft. A cam guide 93 in the form of a plate is secured to block 95 mounted on the outer side of the carriage side plate 19. The cam guide projects downwardly from the block and is provided with a recess 96 having the general profile configuration of the cam. Thus when the carriage is shifted, the cam 91 will likewise be shifted along the drive shaft 82.

A cam follower 97 is mounted on arm 98, the proximal end of the arm being secured to shaft 99 mounted in the block 95. As seen more clearly in FIG. 1, the shaft 99 is provided with a bevel gear 100 on the opposite side of the block in mesh with bevel gear 101. The bevel gear 101 is on the projecting end of knife shaft 102 extending between the side plates 18 and 19 of the carriage. A torsion spring 103 extends between the side plate 18 and collar 104 secured to the knife shaft. Secured to the knife shaft is knife adjusting lever 106 adjacent the proximal end of knife arm 107. By adjusting set screws 108, the position of the knife arm 107 may be adjusted with respect to the knife shaft 102. The arm includes at its distal end an elongated portion to which knife 109 is secured. The torsion spring will maintain the cam follower 97 in engagement with the periphery of the cam 91 and as the drive shaft 82 rotates, the shaft 102 will be caused to oscillate with the knife 109 moving to and from the position seen more clearly in FIG. 6.

Referring now more particularly to FIGS. 6 through 8, it will be seen that there is provided a buckle chute shown generally at 115. The buckle chute comprises two relatively closely positioned side walls 116 and 117, the former having an upper curved end as indicated at 118. The other wall 117 is straight and the configuration of the walls at their upper end permits the provision of an opening of the flared construction noted to be positioned adjacent the rolls as indicated in FIG. 6. The bottom of the buckle chute is closed by a stop bar 120. The stop bar is provided with threaded studs projecting through elongated slots and thumb screws 121 are employed to adjust the stop bar to control the depth of the buckle chute.

Brackets 122 at each side of the buckle chute include arms 123 which are pivoted to the side plates 18 and 19 of the carriage as indicated at 124. In the phantom line position seen at 125, folded paper passing between the nip of the rolls 61 and 60 will simply drop directly through and onto the discharge conveyor 25. However, in the full line position, the paper will be forced by the rolls 60 and 61 into the buckle chute to produce a buckle fold and then passing from the buckle chute outwardly between the nip of the rolls 60 and 62. Suitable removable stop pins 128 and 129 may be provided to hold the buckle chute in either the full or phantom line position 125.

Referring to FIGS. 1 and 2, an end stop 131 is provided mounted on stop bar 132 which is pivotally supported between right and left hand supports 133 and 134 secured to the delivery table side plates 11 and 10, respectively. The stop 131 is in the form of an angle as seen in FIG. 2 and its lower edge may be provided with suitable notches accommodating the conveyor belts 136 which extend over the top of the delivery table and accordingly over the top of the top plate 20 of the carriage 14. When the auxiliary folder is not in use, the stop 131 will be pivoted counterclockwise as seen in

FIG. 2 to an out of the way position so that paper from the cutter and folder to the right in FIG. 2 may simply move across the top of the delivery table. The conveyor belts 136 are driven from the chain 85 through sprocket 138 driving the shaft 139 on which the belt drive sheaves 140 are mounted.

#### OPERATION

With the cutter and folder producing a  $12 \times 9$ , for example, paper product, the delivery table will receive the products which have already been severed on the belts 136. If the auxiliary folder is not in operation, the hand wheel clutch 87 will be disengaged and the stop 131 will be up. This permits the paper products to move across the carriage in normal fashion for delivery. If it is desired to produce a  $6 \times 9$  fold from the  $12 \times 9$ , the carriage will be positioned so that the blade and the nip of the rolls 60 and 61 are in the center of the paper path. The stop 131 will be positioned and the hand wheel 87 pushed into engagement to connect the sprocket 84 to the drive shaft 82. This causes the roll assembly 22 to be driven and also now causes the folding blade arm 107 to begin oscillation. When the  $12 \times 9$  paper product strikes the stop 131, the arm will descend moving the blade 109 to the position seen in FIG. 6. With the buckle chute in the phantom line position, the now  $6 \times 9$  fold will be delivered to the conveyor 25. The drive connection between the roll 60 and the conveyor 25 will cause the  $6 \times 9$  fold to move off the end of the auxiliary delivery conveyor 25. For collating, the carriage may be adjusted slightly in either direction. For example, the carriage can be shifted approximately  $\frac{1}{8}$  of an inch and this will provide a  $\frac{1}{4}$  inch lip on either side, depending upon the direction of shift of the carriage. A suitable scale, of course, may be provided for the operator to obtain precise carriage adjustment side guides to insure proper position of the paper product against the stop and over the nip of the rolls 60 and 61.

Now to produce a letter fold or an accordion fold, reference may be had to FIGS. 7 and 8, respectively. For a letter fold which will convert the  $9 \times 12$  to a  $4 \times 9$ , the knife fold shown at 140 will be obtained by adjustment of the carriage to obtain the knife fold four inches from the edge 141. The knife fold will, of course, be 8 inches from the opposite edge 142. The knife fold 140 enters the buckle chute until it contacts the stop bar 120 and continued rotation of the rolls will cause the buckle fold indicated at 143 as the longer side of the paper product is caused to buckle between the nip of the rolls 60 and 62. The distance from such nip to the stop bar 120 is approximately the 4 inch distance from the knife fold 140 to the edge 141 so that the buckle fold will extend about such edge. The letter folded product indicated at 145 then drops on to the auxiliary delivery conveyor 25.

To produce the accordion fold 146 as seen in FIG. 8, the carriage is adjusted so that the knife fold 140 is approximately 8 inches from the edge 141 and only 4 inches from the edge 142. Again the stop bar 120 will be approximately four inches from the nip of the rolls 60 and 62 to produce the buckle fold 143 and the accordion folded product 146.

It will, of course, be appreciated that a much wider variety of products can be produced depending upon the setting of the carriage.

It can now be seen that there is provided an auxiliary folder which with relatively simple and easily made adjustments can produce a wide variety of products.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. An auxiliary paper folder comprising a delivery table for supporting paper moving in a substantially linear horizontal path, a carriage mounted on said table for movement transversely of the paper path, a folding device on said carriage operative to fold such paper longitudinally of such path, means operative to adjust the position of said carriage on said table to shift said folding device to a variety of positions transversely of the paper path, said folding device including a folding roll assembly and an oscillating blade for folding paper into said roll assembly, and drive means selectively operatively connected to said folding device, said drive means including an elongated drive shaft journaled for rotation on said table extending parallel to the path of movement of said carriage; a cam slidably mounted on said shaft for adjustment therealong coincident to carriage adjustment; and a means operative to move said cam along said shaft with said carriage, said cam cooperating with a follower on said carriage to oscillate said blade.

2. An auxiliary folder as set forth in claim 1 wherein said drive means includes a power source and a clutch selectively operative to connect the power source to the drive shaft.

3. An auxiliary folder as set forth in claim 1 including an extensible power shaft driven from said drive shaft operative to drive said roll assembly.

4. An auxiliary folder as set forth in claim 1 including a guide on said carriage operative to move said cam along said shaft with said carriage which is said means.

5. An auxiliary folder as set forth in claim 1 including a stop, and means selectively to position said stop with respect to said folding device to position the paper to be folded thereby.

6. An auxiliary folder as set forth in claim 1 wherein said roll assembly includes three rolls, two of said rolls being horizontally aligned and two being vertically aligned, and a buckle chute mounted on said carriage, and means operative selectively to position said buckle chute with respect to said roll assembly to produce a letter or an accordion fold depending upon the position of said carriage with respect to the paper.

7. An auxiliary folder as set forth in claim 6 wherein said buckle chute is pivotally mounted for movement to and from an operative position beneath the horizontally aligned rolls.

8. An auxiliary folder as set forth in claim 7 wherein said buckle chute includes a front and back wall, the front wall having a curved edge adjacent said horizontally aligned rolls to facilitate receipt of the folded paper in operative position.

9. An auxiliary folder as set forth in claim 1, wherein said carriage includes a discharge conveyor extending transversely of said delivery table.

10. An auxiliary folder as set forth in claim 9 including means operative unidirectionally to drive said discharge conveyor from said folding roll assembly.

11. An auxiliary folder as set forth in claim 10 wherein said means unidirectionally to drive said discharge conveyor comprises a wheel on an end of one of said rolls, a link pivoted to said wheel, and an arm pivoted to said link, said arm being connected to said discharge conveyor by an overrunning clutch.