

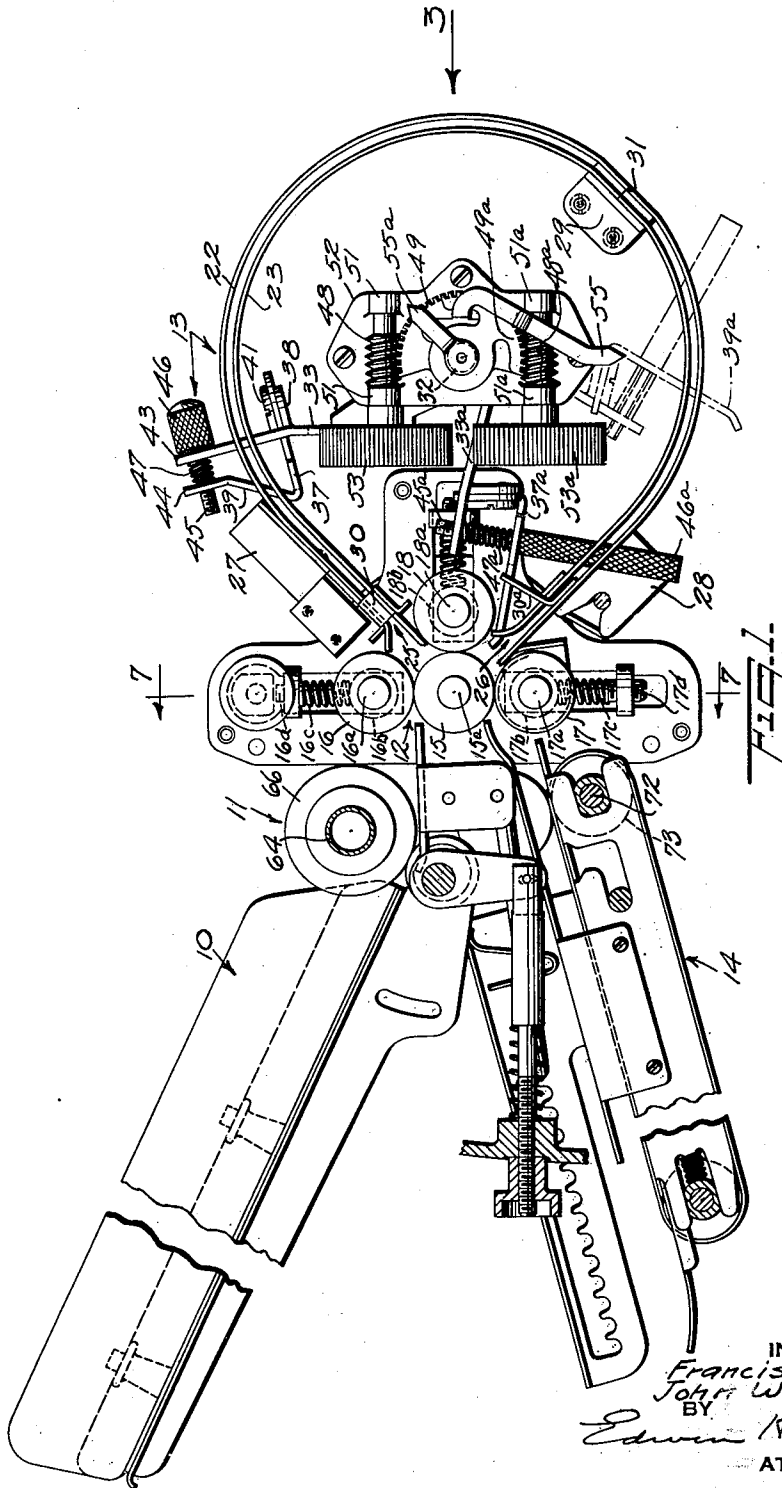
March 18, 1952

F. J. ROUAN ET AL
BUCKLING FOLDING MACHINE

2,589,436

Filed Oct. 13, 1948

5 Sheets-Sheet 1



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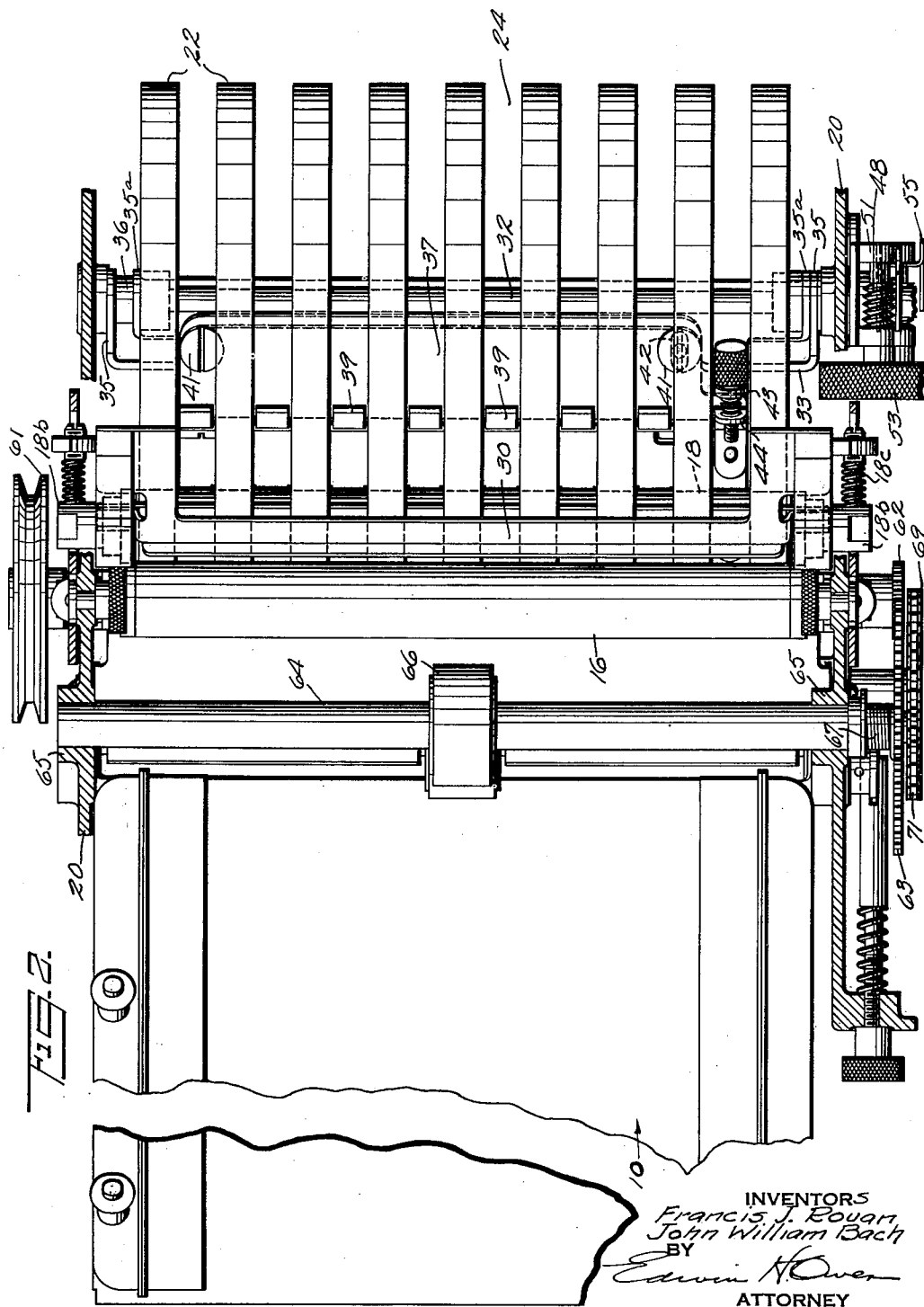
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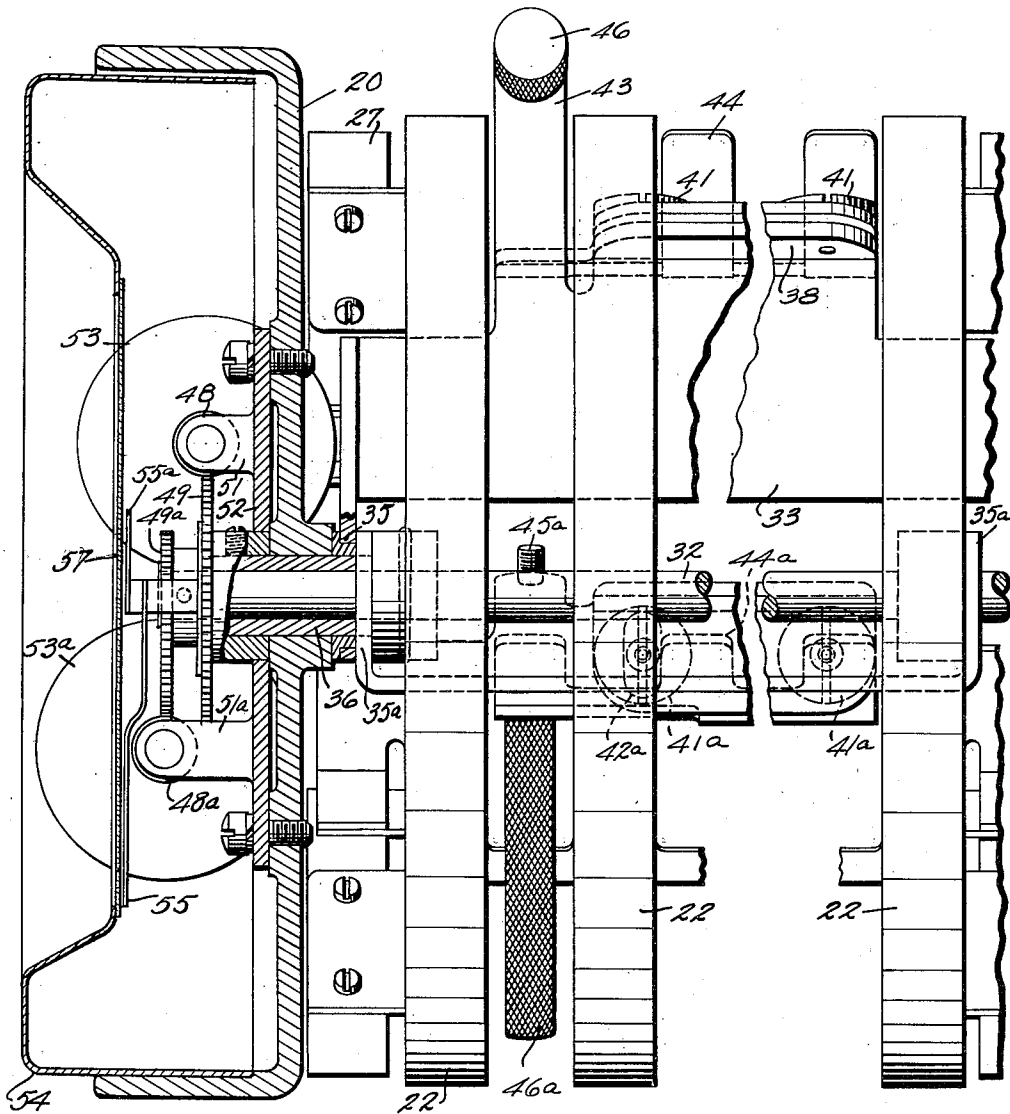


FIG. 3.

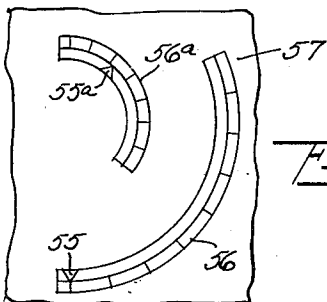
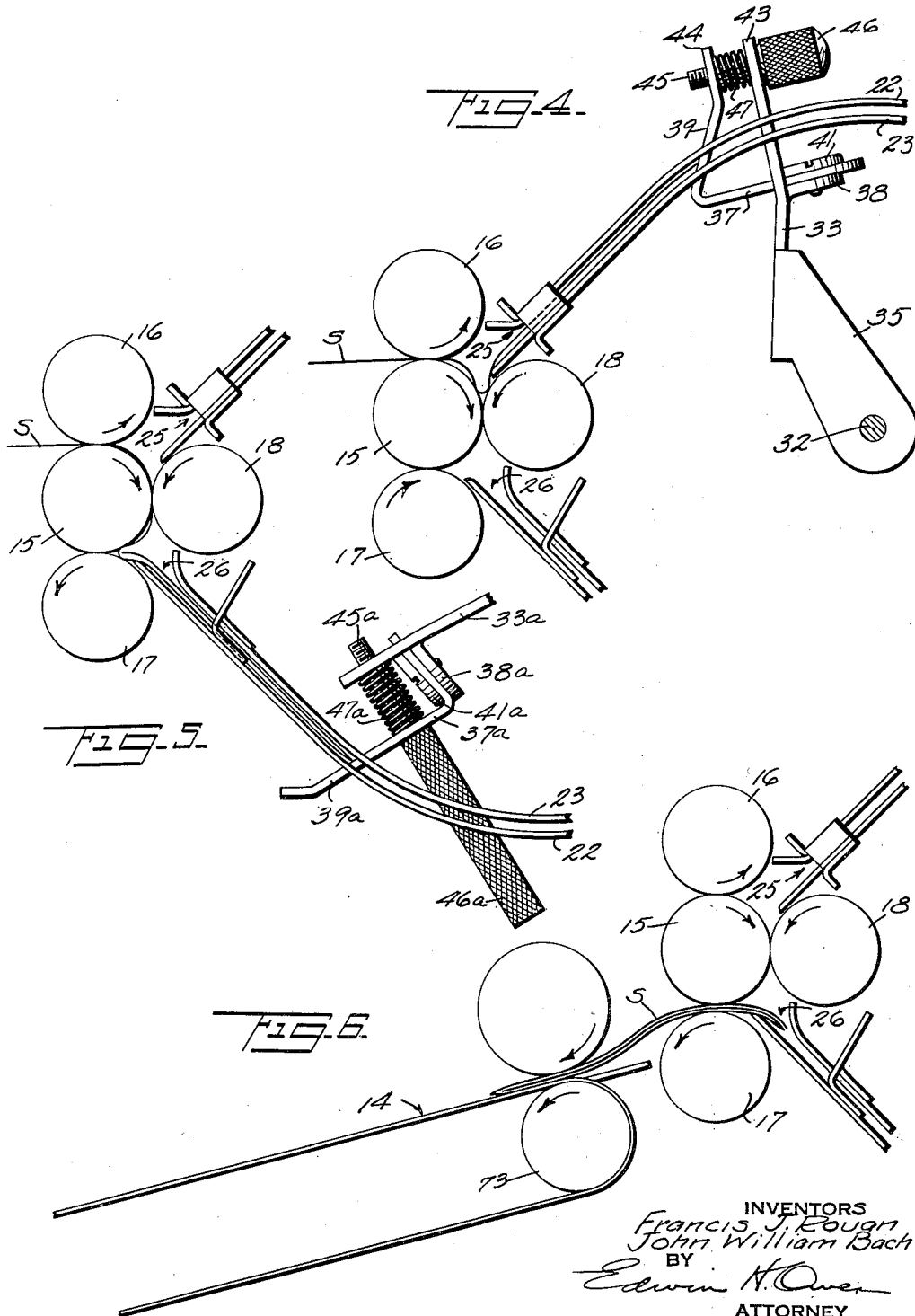


FIG. 11.

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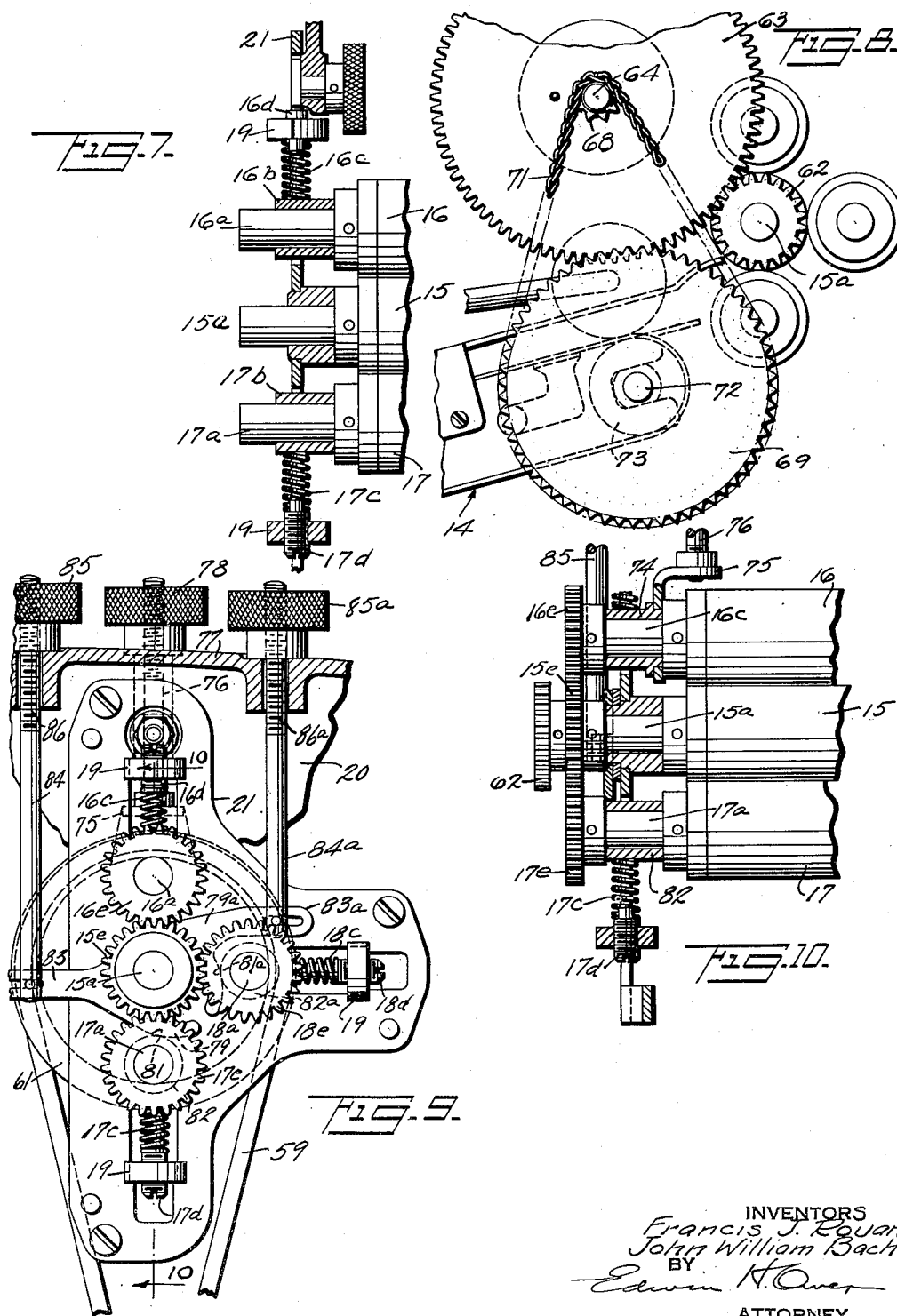
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BUCKLING FOLDING MACHINE

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5 Claims. (Cl. 270—68)

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This invention relates to a sheet folding machine of the buckle chute type.

The machine disclosed is in a class generally considered as a portable folding machine in that it can be easily moved from one location to another or stored away after use. The portable type of machine is usually operated by general office or mail room employees, who are unskilled in making careful machine adjustments, which are normally required, when setting up folding machines now in use. When an operator fails to carefully set up a folding machine, the resulting work is usually unsatisfactory.

The setting-up mechanism of the present invention has been arranged so that unskilled operators may quickly become familiar with the required setting adjustments, the elements of which are accessible at positions within convenient reach of the operator from the outside of the machine. A simple manual adjustment is provided for the setting of sheet end stops which an operator can manipulate with the same ease as the adjustment of the dial of a home radio set.

The initial consideration therefore, in the development of the device of this invention, was to simplify the setting-up adjustments with particular emphasis placed on the mechanism associated with the setting of the sheet end stops. Also included with the above stop setting, is a secondary stop setting for the control of the sheet in maintaining alignment of the folded side edges of the sheet.

One object of the invention therefore, is to provide for a simplified adjustment of a sheet end stop through manipulative means from a single point of control.

It is also an object to provide for the adjustment of a sheet end stop by pivotal or rotary manipulative means.

It is another object to include a graduated scale and movable pointer in combination with the sheet end stop adjustment elements, to measure the adjustment.

It is another object to provide worm and gear control mechanism for the adjustment of the sheet end stops to thereby obtain the desired stop adjustment through rotary means, and to maintain the adjustment without additional locking means.

It is a further object to provide means for the adjustment of a sheet end stop out of parallelism with the folding rollers for obtaining accurate alignment of the side edges of the folded sheet when the sheets are not cut accurately square.

With the above and other objects in view, which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it

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being understood that various changes in the precise embodiment of the invention herein disclosed may be made within the scope of what is claimed without departing from the spirit of the invention.

A preferred embodiment of the invention is illustrated in the accompanying drawings, wherein;

Fig. 1 is a side view of the folding machine with the frame structure and one side roller supporting plate removed, and generally shows the sheet feeding, folding, sheet end stop, buckle chute and stacking mechanism;

Fig. 2 is a plan view generally showing the mechanism of Fig. 1;

Figure 3 is an enlarged end view with parts broken away, and taken in the direction of the arrow 3 of Fig. 1;

Figs. 4, 5 and 6 are operational views showing respectively, the beginning of a first folding operation; the beginning of a second folding operation; and the combined second folding and stacker feed operation;

Fig. 7 is a vertical sectional view taken along the lines 7—7 of Fig. 1 and showing one form of bearing structure for the support of three of the sheet folding rollers;

Fig. 8 is a detail view showing a drive from a driven folding roller to a sheet feed and stacker feed mechanism;

Fig. 9 is a side elevational view showing an arrangement of gear driven folding rollers, and includes a manual means of adjustment for each of the folding rollers which surround a power driven roller;

Fig. 10 is a vertical sectional view taken along the line 10—10 of Fig. 9; and

Fig. 11 is a fragmentary detail view showing a portion of a graduated scale plate and includes the tips of the pointers as seen through a transparent portion thereof.

Referring to the drawings in detail, and particularly Fig. 1, the device generally comprises a sheet feeding hopper 10, sheet separator mechanism 11, folding rollers 12, buckle chute and stop mechanism 13, and folded sheet conveyor and stacker mechanism 14.

With regard to the present invention, the description will be directed principally to the mechanism involving sheet folding and the adjustment of the mechanism related thereto.

The folding roller mechanism 12 preferably comprises a power driven roller 15, an upper roller 16, a lower roller 17 and a side roller 18. Each of said rollers 16, 17 and 18 have shafts 16a, 17a and 18a respectively, which are yieldably supported in suitable bearings 16b, 17b and 18b respectively. The yieldability of the bearings is provided by means of springs 16c, 17c and 18c mounted between the bearing portions 16b, 17b and 18b and adjustable elements 16d, 17d

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and 18*d* respectively. The elements 16*d*, 17*d* and 18*d* are suitably supported in lugs 19 which form a part of a folding roller support bracket 21, the bracket being supported by the main frame structure 20 of the machine, as best shown in Fig. 9.

The buckle chute structure 13 comprises outer and inner guide members 22 and 23 respectively, (Fig. 1) which are spaced apart to permit the sheet or folds of the sheet to pass therebetween. Each guide member comprises a plurality of strap elements which are horizontally spaced apart, as indicated at 24, Fig. 2, and are suitably joined together at their sheet receiving ends as indicated at 30 and 30*a*, Figs. 1 and 2. The said guide members 22 and 23 are arranged in an upper and lower parti-cylindrical formation, with two straight sheet receiving ends converging tangentially from the parti-cylindrical portions thereof, and forming a sheet receiving mouth 25 positioned in the path of one pair of folding rollers 15 and 16, and a sheet receiving mouth 26 positioned in the path of rollers 15 and 18. Said guide members 22 and 23 may be mounted in any convenient manner, such as indicated at three supporting points 27, 28 and 29, Fig. 1. The outer and inner guide members 22 and 23 are split as indicated at 31, to facilitate removal.

A shaft 32, having its axis located at the axis of the parti-cylindrical portion of the guide members 22 and 23, is suitably supported by the frame structure of the machine, and provides a supporting and pivotal mounting for two sheet end stop units. One sheet end stop unit, which will be referred to as the first fold stop unit, comprises a supporting member 33, having side wing portions 35—35. Said wing portions are mounted on sleeve bearings 36—36, which bearings are supported by the shaft 32, as best shown in Fig. 3.

A stop element 37 for the first fold stop unit is mounted upon a shelf 38, projecting sidewardly from the supporting member 33, and has upwardly extending fingers 39, which pass outwardly through the spaces 24, provided between the strap portions of the sheet guide members 22 and 23, as best shown in Fig. 2. Said stop element 37 is secured to the shelf 38 at its extreme ends by means of screws 41—41, and is adapted to be pivoted about one screw. An elongated slot 42 is provided in the stop element 37 for the shank of the other screw 41 to pass through. A finger 43 extends upwardly from the support 33 at one end thereof, and a finger 44 extends upwardly from the stop element 37. A screw 45, having a knurled head 46, passes through a clearance opening in the finger 43 and engages a threaded opening in the finger 44. A spring 47 is also positioned over the screw 45 and is compressed between the fingers 43 and 44. If the side edges of the first few folded sheets passing through the machine are not aligned, due to the sheets being cut slightly off square, adjustment of the screw 45 will effect slight skewing of the sheet stop fingers 39 and provide for the desired fold edge alignment.

A second fold stop unit is provided, which is the same in every respect as the first fold stop unit, except that the second unit is directly secured to the shaft 32. In order to simplify the description, all parts of the second fold stop unit which are the same as those of the first stop unit will be numbered the same as the first fold stop unit, but will include the exponent "a" to distinguish same.

Adjustment of the first fold stop unit is provided by means of a worm 48 and worm gear 49.

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The worm gear 49 has a hub portion fixed to the sleeve 36, as best shown in Fig. 3, and the worm 48, which is in driving engagement therewith, is supported within bearings 51—51 of a bearing block 52. By means of a knurled knob 53, which is fixed to a shaft extension of the worm 48, the said worm is adapted to be rotated, to thereby effect rotation of the worm gear 49 and adjustment of the first fold unit supporting member 33.

Adjustment of the second fold stop unit is provided by means of elements which are similar to those of the first stop unit, except that the worm gear is fixed directly to the shaft 32. Therefore, each of the parts used in the adjustment of the second fold stop will carry the same reference characters as those used in connection with the first fold stop but will have the exponent "a" added thereto to distinguish same.

Through either of said adjustments, the first and second fold stop units are adapted to be rocked about the axis of the shaft 32 to move their respective stop fingers 39 or 39*a* toward or away from the sheet feeding rollers to any desired stop position, and the worm gear structure will maintain such setting without the use of locking means. The knurled knob portions 53—53*a* are adapted to extend sidewardly beyond the surface of a cover plate 54, as best indicated in Fig. 3, thus leaving a sufficient portion of each knob exposed beyond the plate to provide easy access for the operator in making the desired setting of either stop unit.

Pointers are also provided as indicated at 55 and 55*a*, Fig. 1. The pointer 55, which is associated with the first fold adjustment mechanism, is secured to the worm gear 49. The pointer 55*a*, which is associated with the second fold adjustment mechanism, is secured to the worm gear 49*a*. As best indicated in Fig. 11, a graduated scale 56 is also provided on a plate 57 in the path of the pointer 55 and a scale 56*a* is provided thereon in the path of the pointer 55*a*. Each scale portion 56—56*a* is transparent, while the remainder of the plate 57 is opaque. In this way the pointed ends of the pointers 55 and 55*a* are visible to the operator.

Referring to Figs. 4, 5 and 6, where the operations are shown for performing a double fold in a sheet S, the first fold stop unit is shown in Fig. 4, and the second fold unit in Fig. 5. In the first folding operation, the forward edge of the sheet S is shown as having engaged the fingers 39 of the first stop unit in Fig. 4, thus causing a buckle to be effected in the sheet in the direction of the folding rollers 15 and 18. From here the sheet is directed downwardly and through the lower buckle chute until the end of the first fold end engages the second fold stop fingers 39*a*. Again a buckle occurs, this time at the point of entry between the rollers 15 and 17, which provide the final fold as the folded sheet is carried therethrough in the direction of the conveyor and stacker mechanism 14.

From suitable power drive means, the folding roller 15 is directly driven through a belt and pulley connection 59 and 61 respectively, as indicated in Fig. 9. The driven roller 15 then forms the principal source of drive for the remaining driven elements of the machine, as best indicated in Fig. 8. Said drive comprises a pinion 62 on a shaft 15*a*, which also carries the driven roller 15, and said pinion meshes with a gear 63 on a shaft 64. The shaft 64 is suitably mounted in bearings 65—65, as best shown in Fig. 2, and further supports a separator feed roller 66. A slip

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clutch is also provided between the shaft 64 and gear 63, which clutch comprises a coil spring 67 having one end engaging the gear 63 and the coils gripping the shaft 64. The sheet is thereby adapted to be drawn through the folding rollers faster than it is fed by the separator feed roller 66. At the same end of the shaft 64 that supports the gear 63, a sprocket pinion 68 is secured, which pinion is joined with a sprocket gear 69 by means of a sprocket chain 71. The sprocket gear 69 is fixed to a shaft 72 which carries one end roller 73 of the stacker conveyor mechanism, generally indicated at 14, Fig. 1.

Referring to Fig. 9, adjustment mechanism is shown as associated with each of the sheet folding roller shafts 16a, 17a and 18a for use when said shafts are provided with drive gears 16e, 17e and 18e respectively, which gears mesh with a similar gear 15e on the driven shaft 15a. Adjustment of the roller shaft 16a is provided through a direct connection with a bearing portion 74 by means of a bracket 75, as best shown in Fig. 10. A screw rod 76 has a screw portion engaged with a threaded opening in said bracket 75 and extends vertically upward through the upper portion 77 of the machine frame 20. A knob 78 secured to the upper end of said screw rod provides a convenient means for effecting rotation of said rod and adjustment of the bearing 74.

A cam element 79, Fig. 9, is mounted so as to pivotally move around the shaft 15a, and has a cam surface 81, which bears against a bearing 82 on the end of shaft 17a. An arm 83, extending sidewardly from the cam element, has a screw rod 84 joined thereto, which rod extends vertically upward through the casing wall 77 and has a knob 85 screwed on a screw threaded portion 86. Adjustment of the knob 85 will thus effect movement of the cam element 79, and consequently adjust the position of the roller 17, relative to the roller 15, to the most suitable position for folding various weights of paper.

Another cam element similar to the one just described is associated with the roller shaft 18a, and inasmuch as it is similar in every respect to that of the cam element just described, the same reference characters will be used with the exponent "a" added thereto to distinguish same.

While the latter description of the adjustments of the folding roller shafts 16, 17 and 18 is related to the view shown in Fig. 9, which illustrates the members at one end of the machine, it is to be understood that similar adjustments are provided at the opposite end of the machine.

Having described the invention what is claimed is:

1. In a sheet folding machine, the combination with a plurality of sheet folding rollers, of a buckle chute comprising upper and lower parti-cylindrical chute portions having a common axis, a straight chute portion extending from and tangential to each of said parti-cylindrical portions, said straight chute portions converging toward the discharge paths of predetermined pairs of folding rollers, and a sheet end stop element associated with each of said upper and lower chute portions, said stop elements being pivotally mounted for adjustment about the common axis.

2. In a sheet folding machine, the combination with a plurality of sheet folding rollers, of a buckle chute comprising upper and lower parti-cylindrical chute portions having a common axis, a straight chute portion extending from and tangential to each of said parti-cylindrical portions, 75

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said straight chute portions converging toward the discharge paths of predetermined pairs of folding rollers, a sheet end stop element associated with each of said upper and lower chute portions, said stop elements being pivotally mounted for adjustment about the common axis, and a manually controlled drive connected with each sheet end stop element.

3. In a sheet folding machine, the combination with a plurality of sheet folding rollers, of a buckle chute comprising upper and lower parti-cylindrical chute portions having a common axis, a straight chute portion extending from and tangential to each of said parti-cylindrical portions, said straight chute portions converging toward the discharge paths of predetermined pairs of folding rollers, a sheet end stop element associated with each of said upper and lower chute portions, said stop elements being pivotally mounted for adjustment about the common axis, and a drive including a manually controlled worm driven gear connected with each sheet end stop element.

4. In a sheet folding machine, the combination with a plurality of sheet folding rollers, of a buckle chute comprising upper and lower parti-cylindrical chute portions having a common axis, each chute including outer and inner sheet guide members, a straight chute portion including outer and inner sheet guide members extending from and tangential to each of said outer and inner guide members of the parti-cylindrical portions, said straight chute portions converging toward the discharge paths of predetermined pairs of folding rollers, and a sheet end stop element associated with each of said upper and lower chute portions, said stop elements being pivotally mounted for adjustment about the common axis.

5. In a sheet folding machine including a supporting frame therefor, the combination with a plurality of sheet folding rollers, of a buckle chute comprising upper and lower parti-cylindrical chute portions having a common axis, a shaft supported by the frame with the axis thereof along the common axis of the chute portions, a straight chute portion extending from and tangential to each of said parti-cylindrical portions, said straight chute portions converging toward the discharge paths of predetermined pairs of folding rollers, a sheet end stop element associated with each of said upper and lower chute portions and carried by the shaft, each stop element having a gear associated therewith, one gear being rotatable around the shaft and the other gear being rotatable with the shaft, and a manipulative worm drive for each gear, whereby the sheet end stops may be pivotally adjusted about the common axis relative to the folding rollers and are maintained in any adjusted position.

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