

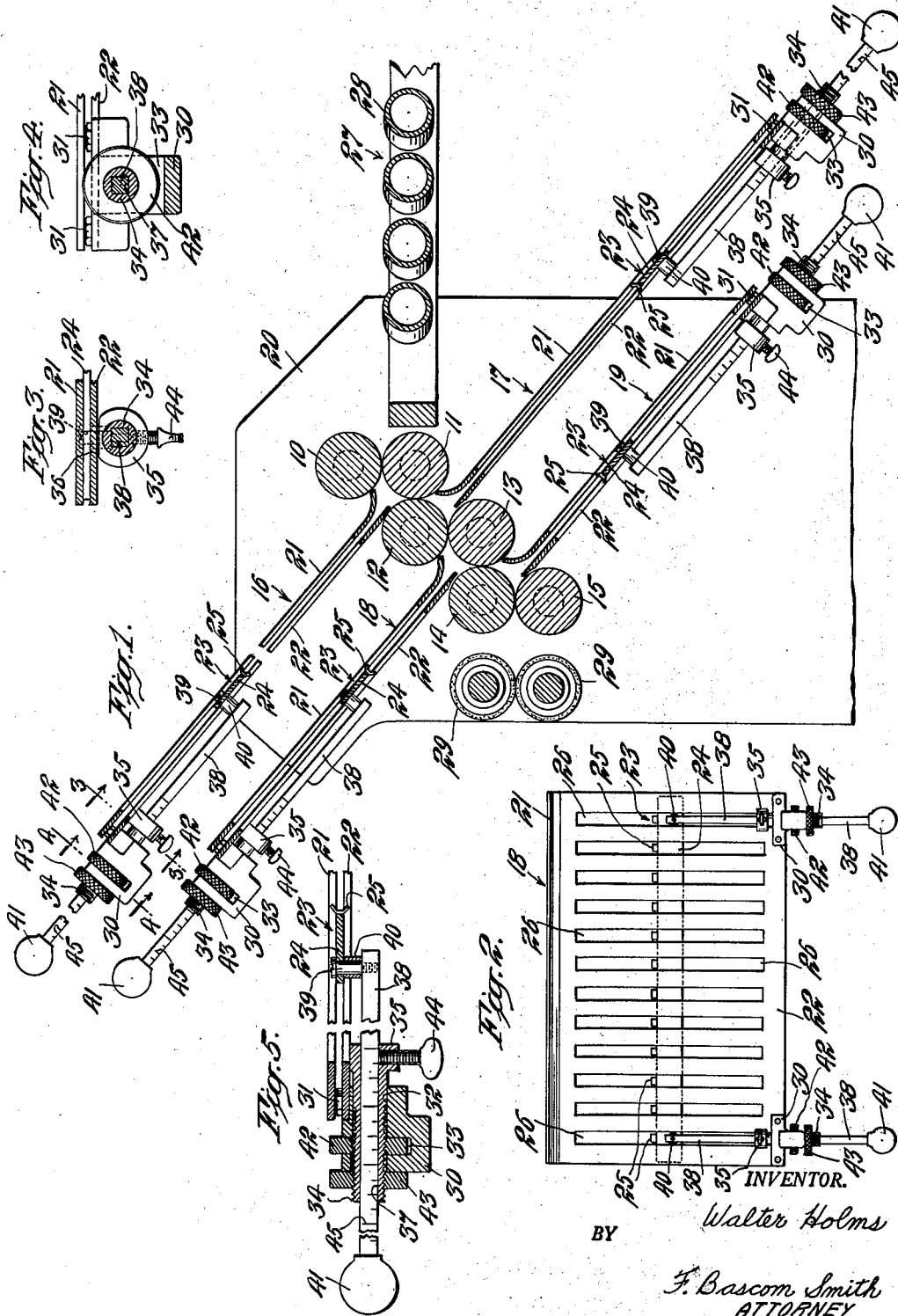
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FOLDING MACHINE

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FOLDING MACHINE

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This invention relates to folding machines, and more particularly to folding machines of the well known buckle type embodying fold plates and feeding and folding rollers acting in conjunction therewith to feed sheets of paper therethrough and fold said sheets by buckling and feeding actions produced thereon.

One of the objects of the present invention is to provide, in a buckle type folding machine, novel means for positioning the fold plate sheet stops.

Another object of the invention is to provide a buckle type folding machine having novel means for accurately and quickly positioning the fold plate sheet stops, said means being so mounted and arranged that the fold plates do not interfere with the sheet stop positioning operation.

Another object is to provide a novel mechanism whereby the fold plate sheet stops may be quickly positioned in a preliminary setting and then moved with extreme accuracy to a final setting, both operations being performed from the free ends of the fold plates.

The above and further objects and novel features of the present invention will more fully appear from the following detail description when the same is read in connection with the accompanying drawings. It is to be expressly understood, however, that the drawings are for the purpose of illustration only, and are not intended as a definition of the limits of the invention, reference for this latter purpose being had primarily to the appended claims.

In the drawings, wherein like reference characters refer to like parts throughout the several views,

Fig. 1 is a fragmentary vertical longitudinal section of a buckle type folding machine embodying the present invention;

Fig. 2 is a bottom plan view, on a reduced scale, of one of the fold plates shown in Fig. 1;

Fig. 3 is an enlarged fragmentary transverse section on the line 3-3 of Fig. 1;

Fig. 4 is an enlarged fragmentary transverse section on the line 4-4 of Fig. 1; and

Fig. 5 is a broken vertical longitudinal section, on a larger scale, of one of the sheet-stop adjusting units shown in Figs. 1 and 2.

Referring to the drawings, the present invention is herein shown, by way of example, as embodied in the first or parallel fold section or unit of a well known buckle type folding machine. This fold section or unit generally comprises a

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vertical bank or series of horizontal parallel feeding and folding rollers 10, 11, 12, 13, 14 and 15, and a plurality of parallel angularly disposed fold plates 16, 17, 18 and 19 associated with said rollers for making a maximum of four parallel folds in a sheet fed therethrough. It will be understood that, in accordance with the usual practice, any one or more of the fold plates may, through provision of deflectors (not shown), be rendered inoperative at will and in accordance with the requirement as to the number and character of the folds that are to be made in the sheets.

Rollers 10 to 15 are journaled at their opposite ends in suitable bearings carried by a frame 20, and are intergeared and driven by any suitable means for this purpose. Fold plates 16 to 19 are of well known construction, each comprising grid-like upper and lower plates 21 and 22, respectively, secured together in spaced relation and supported in a suitable manner on frame 20. Each fold plate is provided with a sheet stop 23 of well known construction, comprising a thin metal bar 24 slidably mounted between plates 21, 22, and having secured to one edge thereof a plurality of V-shaped stops 25 that extend upwardly and downwardly into the slots 26 in said plates.

The sheets to be folded are fed from a supply thereof over and along a horizontal initial feed table 27 having feed rollers 28 journaled thereon and extending diagonally thereof. Table 27 is of well known construction, and is supported in any suitable manner on frame 20, and rollers 23 are driven by any suitable means.

In the operation of the machine, and assuming four folds are to be made in the sheets, each sheet is delivered by feed table 27 into the bite of rollers 10, 11, which further advance said sheet into and along fold plate 16 until the leading edge of the sheet strikes the stop 23 in said plate. Upon engagement of the sheet with stop 23 in fold plate 16, and due to continued feeding action of rollers 10, 11 on the trailing portion of said sheet, the latter is caused to buckle towards rollers 11, 12, and enters between said rollers, thereby forming the first fold in the sheet. The once folded sheet is then advanced by rollers 11, 12 into and along fold plate 17 until the folded edge of said sheet strikes the stop 23 in said plate. Thereupon the sheet is again caused to buckle, this time toward rollers 12, 13, and enters between said rollers, thereby forming the second fold in the sheet. The twice folded sheet is then advanced by rollers 12, 13 into and along fold plate 18 until the lead-

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ing edge thereof strikes the stop 23 in said plate, whereupon the sheet is caused to buckle towards rollers 13, 14, and enters between said rollers, thus forming the third fold in said sheet. From rollers 13, 14 the folded sheet passes into and along the fold plate 19, and upon engagement with the stop 23 in said plate, said sheet is caused to buckle towards roller 14, 15, and enters between said rollers, thereby forming the fourth fold in the sheet.

The folded sheets are delivered by rollers 14 and 15 between pairs of feed rollers 29 for delivery thereby onto a stacking apron, or onto a cross carrier adapted to advance the folded sheets to a second or cross fold section or unit similar to the first fold section, but disposed at right angles to the latter, for imparting additional fold or folds in the sheets at right angles to the fold or folds previously made therein by the first fold section, as well understood in the art.

Novel means are provided for moving the sheet stops 23 of the fold plates 16, 17, 18 and 19 longitudinally of said plates to various positions for the making of various types and sizes of folds in the sheets. Said sheet stop moving means being capable of effecting coarse and fine settings of the sheet stops, and operable from the free or remote ends of the fold plates, whereby accurate positioning of the sheet stops may be conveniently and quickly effected. The sheet stop moving means are identical in construction and operation for each fold plate; therefore, a description of said moving means with respect to one of the fold plates will suffice for all of the fold plates.

As herein shown, each fold plate is provided at the end opposite to the mouth thereof with two brackets 30 which are preferably secured, as by bolts 31, to the bottom and adjacent opposite sides of the plate 22 of said fold plate. Brackets 30 project beyond the end of the fold plate, and each is formed with a circular opening 32 (Fig. 5) extending longitudinally there-through, and with a slot or groove 33 perpendicular to the axis of opening 32 and passing through the latter and open at the top of said bracket. Brackets 30 are disposed centrally with respect to two of the slots 26, preferably the end-most slots, in plate 22.

Fitted for sliding movement in the openings 32 of brackets 30 are sleeves 34 externally threaded and formed at their inner ends with enlarged circular heads 35 disposed beneath plate 22. Heads 35 are provided with flat portions 36 (Fig. 3) adjacent plate 22 in order to provide clearance for sleeves 34. Sleeves 34 are formed with broached openings 37 (Figs. 4 and 5) extending therethrough to receive and guide square bars 38 for movement longitudinally of the fold plate toward and away from the mouth of said plate. The forward ends of bars 38 are connected with the sheet stop bar 24 adjacent opposite ends thereof by shouldered studs 39 which extend loosely through said sheet stop bar and through the endmost slots 26 in plate 22, and are threaded in said square bars. Spacers 40 surrounding studs 39 and disposed between sheet stop 23 and bars 38 hold said stop and bars in proper spaced relation. The outwardly projecting ends of bars 38 have secured thereto manipulating knobs or handles 41. Disposed within grooves 33 in brackets 30 and threadedly engaged with sleeves 34 are knurled adjusting nuts 42, and threaded on the outwardly projecting ends of said sleeves are knurled lock nuts 43. Heads 35 of sleeves 34 have threaded therein thumb screws 44 adapted

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to be engaged with bars 38 for releasably connecting said bars with said sleeves.

It will thus appear that when it is desired to effect any considerable movement of sheet stop 23 in any one of the fold plates, this can be conveniently and quickly accomplished from the free or remote end of the fold plate, by first loosening thumb screws 44, then grasping knobs 41 and sliding bars 38 and therewith the sheet stop 23 manually toward or away from the mouth of the fold plate until said stop is in a position corresponding approximately to the position desired for making a particular type or size of fold in the sheet. This coarse or preliminary setting of the sheet stop 23 is facilitated by graduations 45 on the inner sides of bars 38, which are easily visible and read at the outer ends of the sleeves 34. After sheet stop 23 has been moved to an approximate position as described, the thumb screws 44 are again tightened to connect bars 38 with sleeves 34, whereupon the sheet stop is given a fine, final setting which is also quickly and conveniently accomplished from the free or remote end of the fold plate, by first loosening lock nuts 43, and then rotating the adjusting nuts 42 in the proper direction, resulting in minute axial movements of sleeves 34 and therewith the sheet stop 23 through bars 38, and location of said sheet stop in accurate fold effecting position. Lock nuts 43 are then again tightened to lock the sheet stop 23 in adjusted position. It will be understood that the final fine adjustment of sheet stop 23 is made after the folding machine has been started and after one or more test sheets have been run through said machine.

It will also appear that due to the pivotal connections 39 for the sheet stop 23 with the bars 38, the latter may be moved within limits independently of each other whereby opposite ends of the sheet stop may be adjusted to square-up the same with respect to the fold plate or with respect to the edge of the sheet moved into contact therewith.

There is thus provided novel means for accurately and quickly positioning the sheet stops in fold plates of buckle type folding machines, without the use of tools, and without injury to the operator in not requiring the operator to reach in over or under the fold plates, or between two closely spaced fold plates. Additionally, preliminary coarse and final fine adjustments of the sheet stops may both be effected from the remote ends of the fold plates, and in this manner accurate positioning of the sheet stops may be accomplished more quickly and more conveniently, resulting in a decrease in folder set-up time, and in an increase in output of folded sheets.

Although one embodiment of the present invention has been illustrated and described in the foregoing specification, and in connection with the first fold section or unit of a buckle type folding machine, it is to be expressly understood that said invention may be embodied in any or all of the multi-fold sections or units of such a machine, and that changes may be made therein, particularly in the design and arrangement of the parts without departing from the spirit or scope of the invention, as will now be clear to those skilled in the art. For example, the brackets 30 and all parts associated therewith may be mounted on the upper plate 21 instead of on the lower plate 22 of the fold plate, and round rods may be substituted for the square bars 38.

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Further, in the case of small fold plates only one sheet stop moving unit mounted centrally of the fold plate may be employed. For a definition of the limits of the invention, reference is had primarily to the appended claims.

What is claimed is:

1. In a fold plate for buckle type folding machines having a sheet stop associated therewith, means for moving said sheet stop along the fold plate to various positions, comprising a longitudinally movable elongated member connected with said sheet stop and extending therefrom beyond the end of the fold plate opposite to the mouth thereof for rapidly moving said member and the sheet stop therewith longitudinally of said fold plate, a bracket carried by said fold plate at said end, an externally threaded member slidably carried by said bracket and guiding said elongated member for movement toward and away from the mouth of the fold plate, a nut threaded on said threaded member and held by said bracket against axial movement relative to said threaded member for slowly moving the latter longitudinally of said fold plate and said elongated member, and means for releasably connecting said elongated member with said threaded member for movement with the latter upon rotation of said nut.

2. In a fold plate for buckle type folding machines having a sheet stop associated therewith, means for moving said sheet stop along the fold plate to various positions, comprising a longitudinally movable elongated member connected with said sheet stop and extending therefrom beyond the end of the fold plate opposite to the mouth thereof for rapidly moving said member and the sheet stop therewith longitudinally of said fold plate, a bracket carried by said fold plate at said end, an externally threaded member slidably carried by said bracket and guiding said elongated member for movement toward and away from the mouth of the fold plate, a nut threaded on said threaded member and held by said bracket against axial movement relative to said threaded member for slowly moving the latter longitudinally of said fold plate and said elongated member, means for releasably connecting said elongated member with said threaded member for movement with the latter upon rotation of said nut, and a lock nut threaded on said threaded member.

3. In a fold plate for buckle type folding machines having a sheet stop associated therewith, means for moving said sheet stop along the fold plate to various positions, comprising a longitudinally movable bar square in cross section connected with said sheet stop and extending therefrom beyond the end of the fold plate opposite to the mouth thereof for rapidly moving said bar and the sheet stop therewith longitudinally of said fold plate, said bar having graduations thereon, a bracket secured to the fold plate at said end, an externally threaded sleeve slidably carried by said bracket and guiding said bar for movement toward and away from the mouth of the fold plate, one end of said sleeve cooperating with said graduations to determine the location of said sheet stop with respect to said fold plate, a nut threaded on the sleeve and held by said

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bracket against axial movement relative to said sleeve for slowly moving the latter longitudinally of said fold plate and said bar, and screw means for releasably connecting said bar with said sleeve for movement with the latter upon rotation of said nut.

4. In a fold plate for buckle type folding machines having a sheet-stop bar slidably mounted thereon, means for moving said sheet-stop bar along the fold plate, comprising a pair of longitudinally movable elongated members, means for pivotally connecting corresponding ends of said members with said sheet-stop bar adjacent opposite ends thereof, said members extending from the sheet stop bar beyond the end of the fold plate opposite to the mouth thereof for rapidly moving the same and the sheet stop bar therewith longitudinally of the fold plate, a pair of brackets secured to the fold plate at said end, externally threaded sleeves slidably carried by said brackets and guiding said members for movement toward and away from the mouth of the fold plate, nuts threaded on the sleeves and held by said brackets against axial movement relative to said sleeves for slowly moving the latter longitudinally of said fold plate and said members, and means for releasably connecting said members with said sleeves for movement therewith upon rotation of said nuts.

5. In a buckle type folding machine having a fold plate and a movable sheet stop associated therewith, of mechanism for manually moving said sheet stop to various positions lengthwise of said fold plate, comprising an elongated member movable axially lengthwise of said fold plate and extending from said sheet stop in all positions thereof beyond the end opposite to the mouth of said fold plate, said member being adapted to move said sheet stop through large increments in opposite directions along said fold plate, means for connecting said member and said sheet stop and for holding the same against relative axial movement, supporting and guiding means surrounding said member and carried by said fold plate at said end for axial movement relative to said member and fold plate, means for moving said supporting and guiding means in opposite directions axially of said member through small increments, and means for releasably connecting said supporting and guiding means with said member in all relative positions of the latter, whereby said small increment movements will be imparted to said sheet stop.

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