March 19, 1940. A. J. WIKANDER ET AL 2,194,344

SHEET FOLDING AND PLEATING MACHINE

Filed Nov. 10, 1938 7 Sheets-Sheet 1

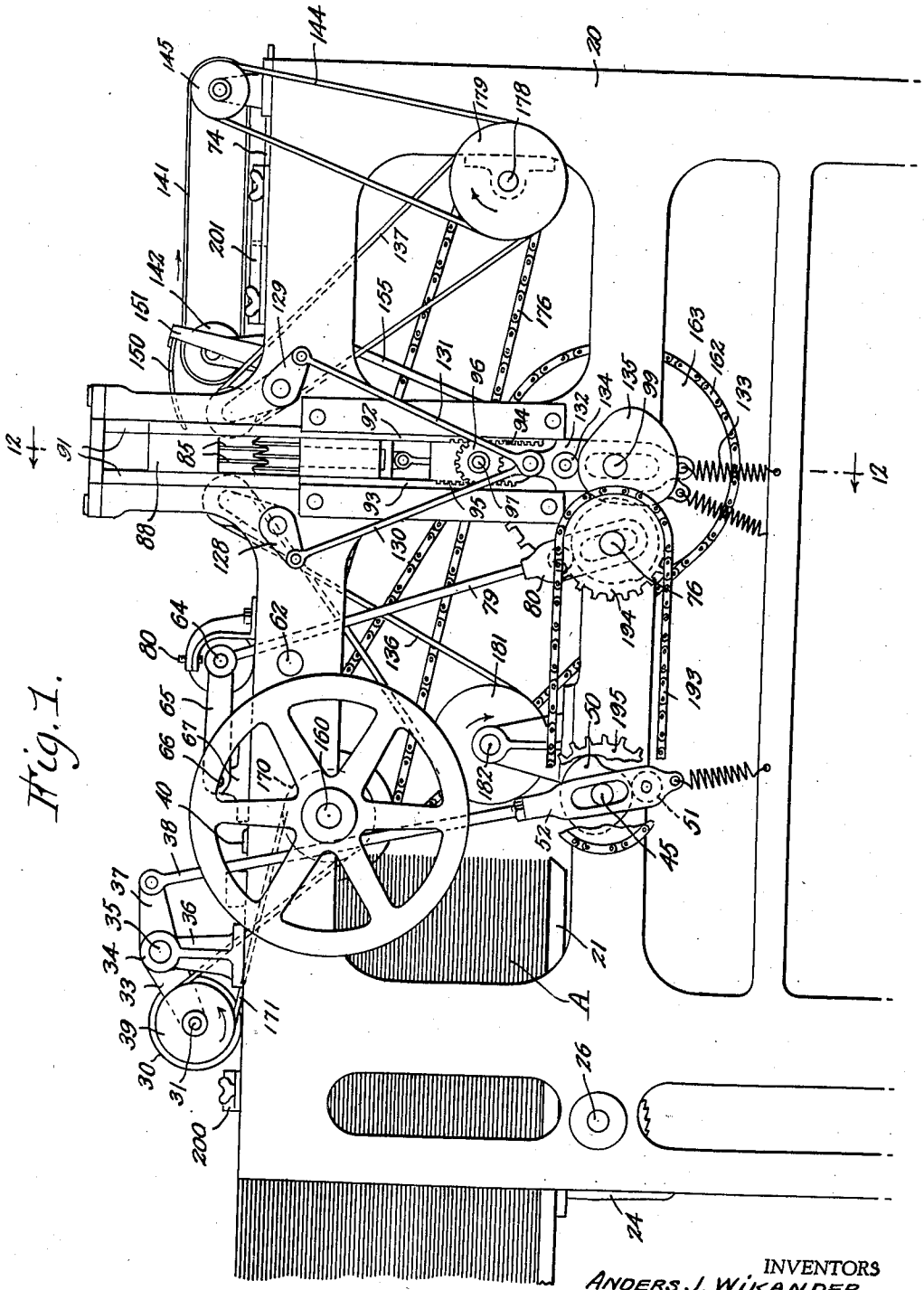


Fig. 1.

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SHEET FOLDING AND PLEATING MACHINE

Filed Nov. 10, 1938 7 Sheets-Sheet 2

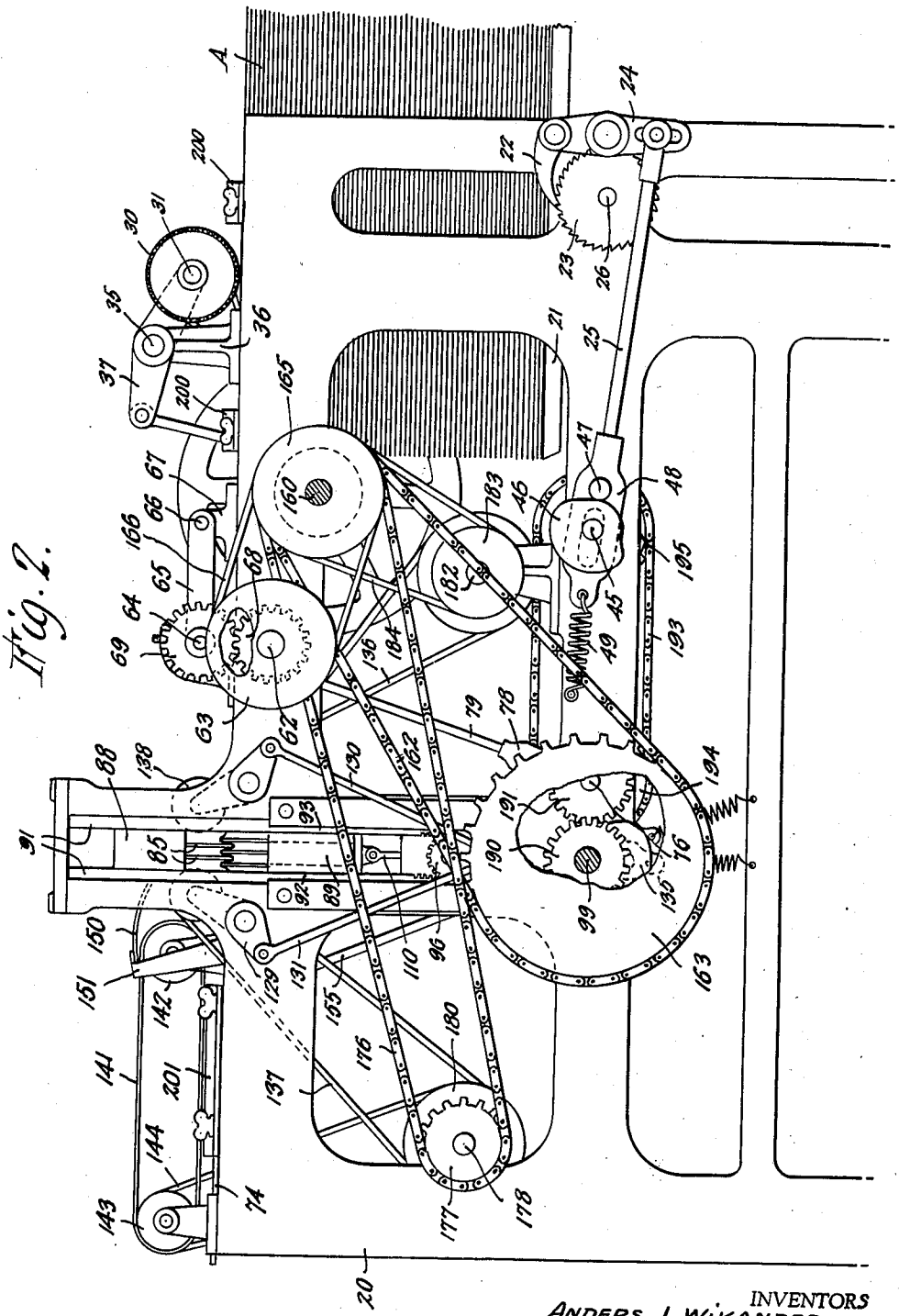


Fig. 2.

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SHEET FOLDING AND PLEATING MACHINE

Filed Nov. 10, 1938 7 Sheets-Sheet 3

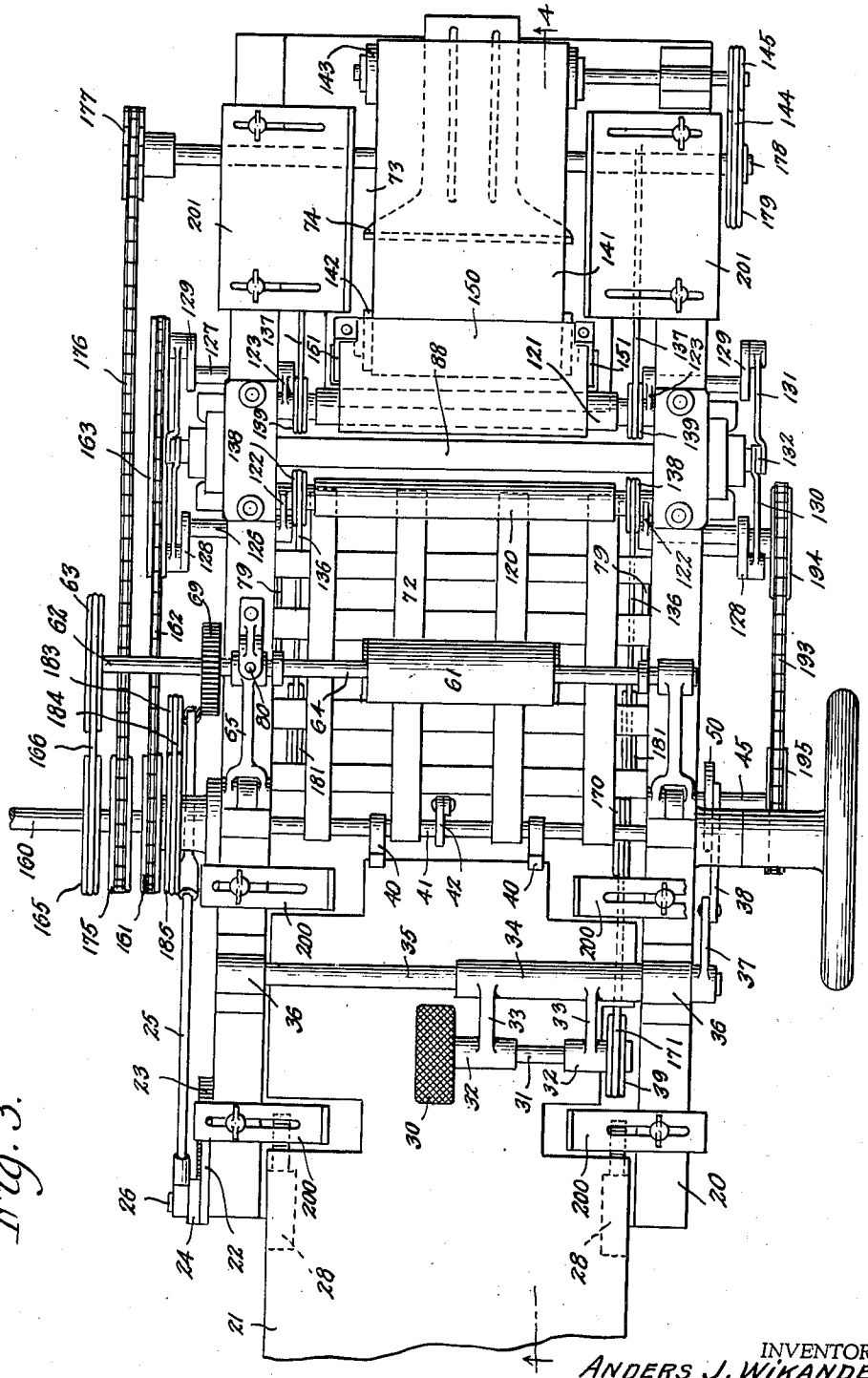


Fig. 3.

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SHEET FOLDING AND PLEATING MACHINE

Filed Nov. 10, 1938 7 Sheets-Sheet 4

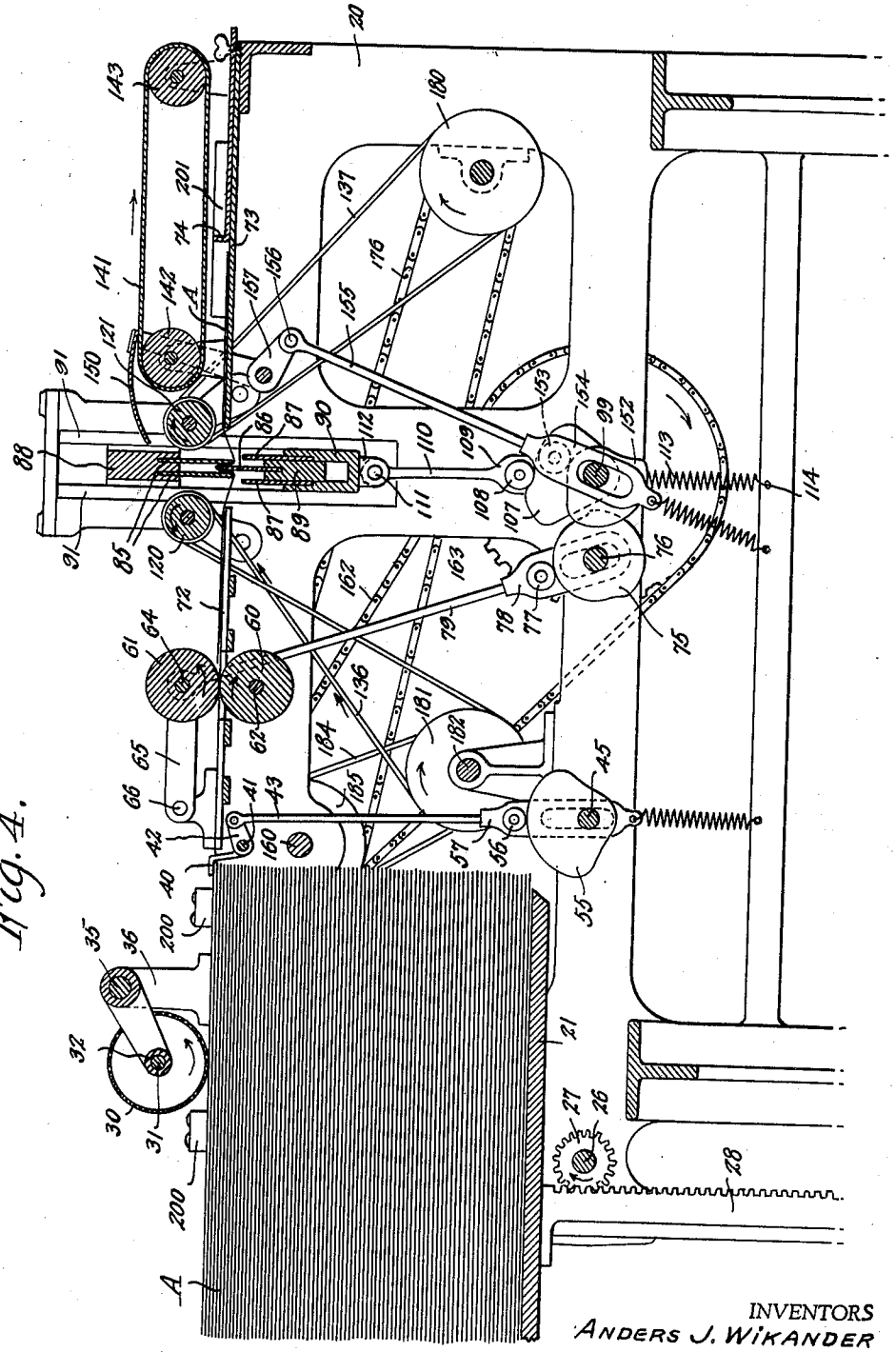


Fig. 4.

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March 19, 1940. A. J. WIKANDER ET AL 2,194,344

SHEET FOLDING AND PLEATING MACHINE

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Fig. 5.

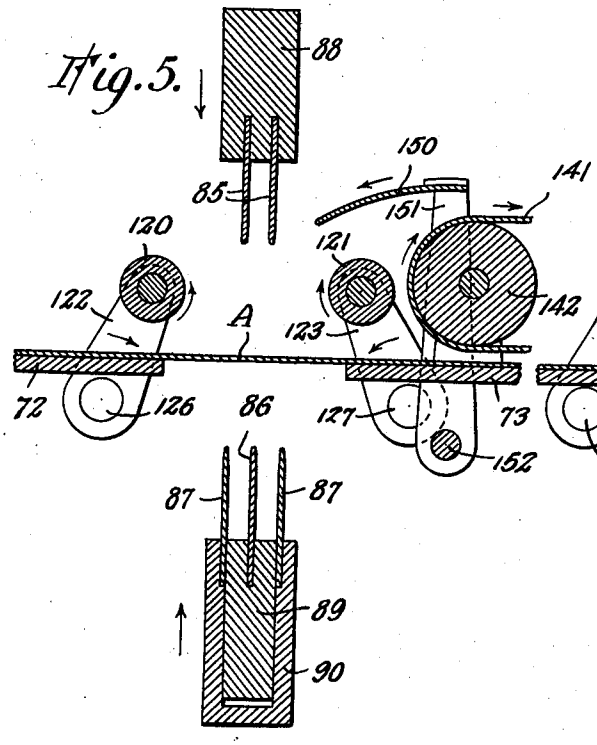


Fig. 6.

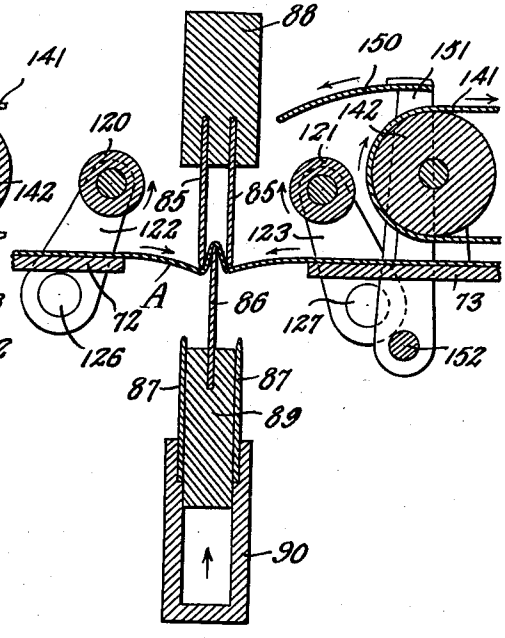


Fig. 7.

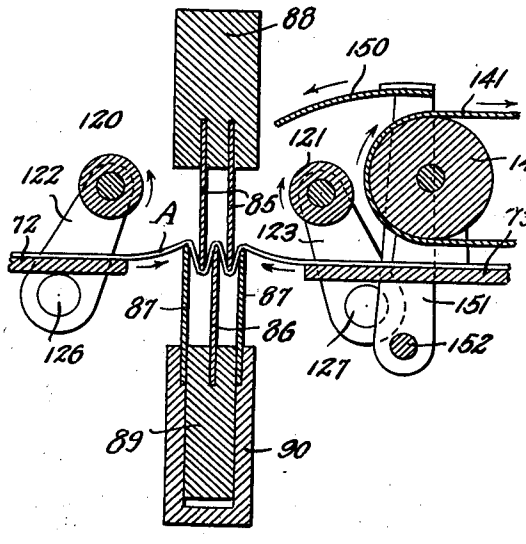
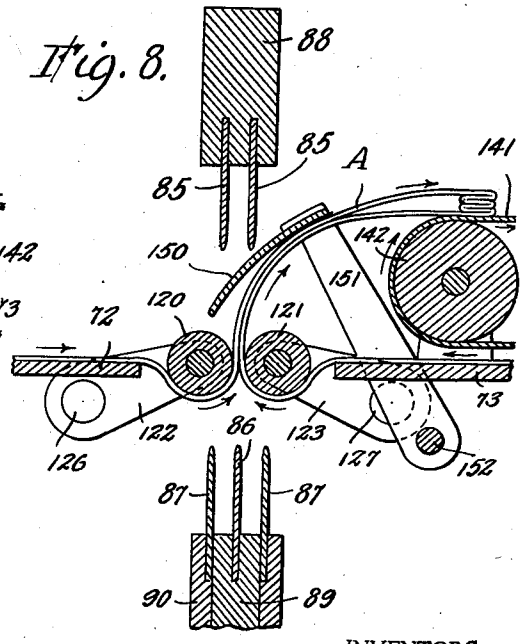


Fig. 8.



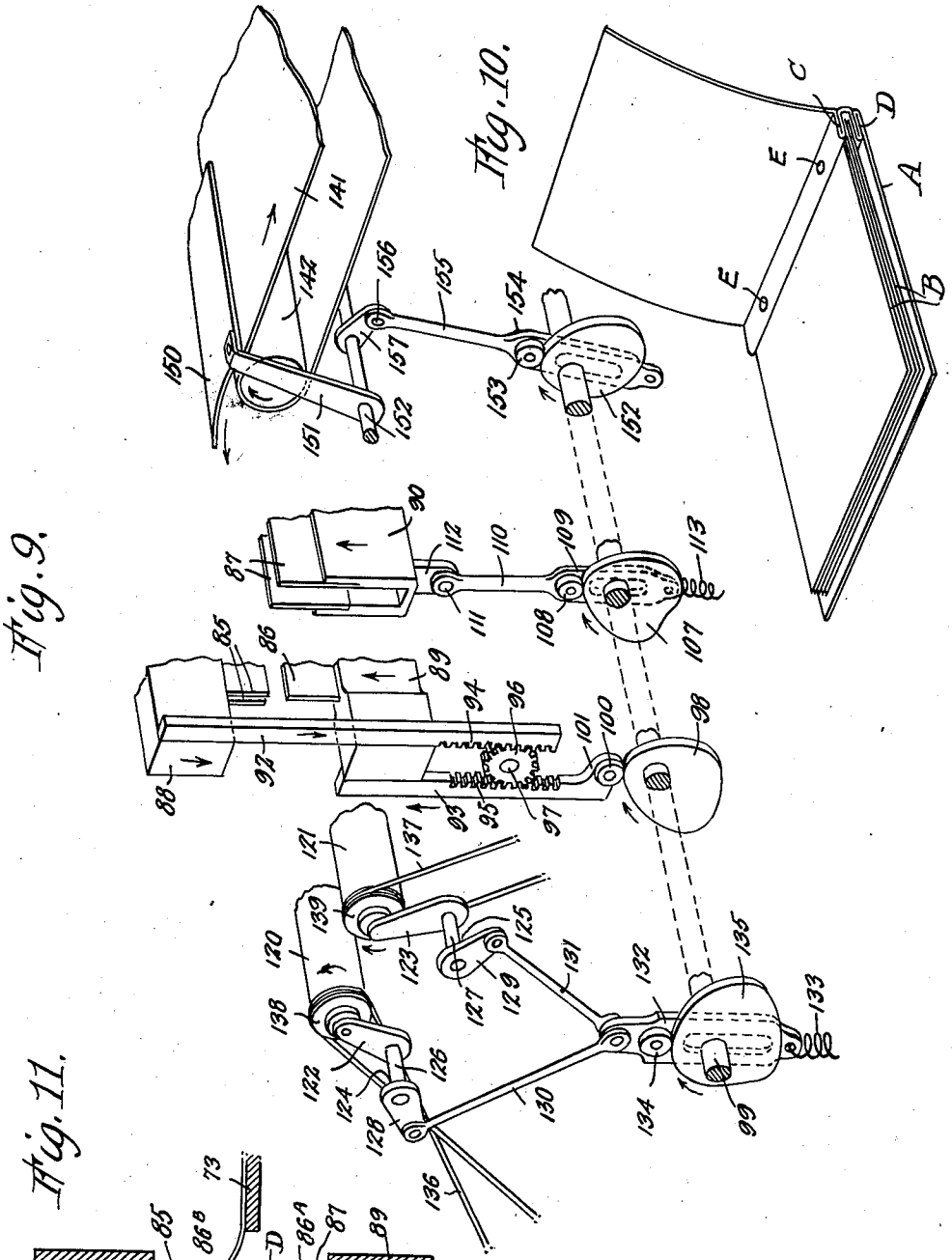
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SHEET FOLDING AND PLEATING MACHINE

Filed Nov. 10, 1938 7 Sheets-Sheet 6



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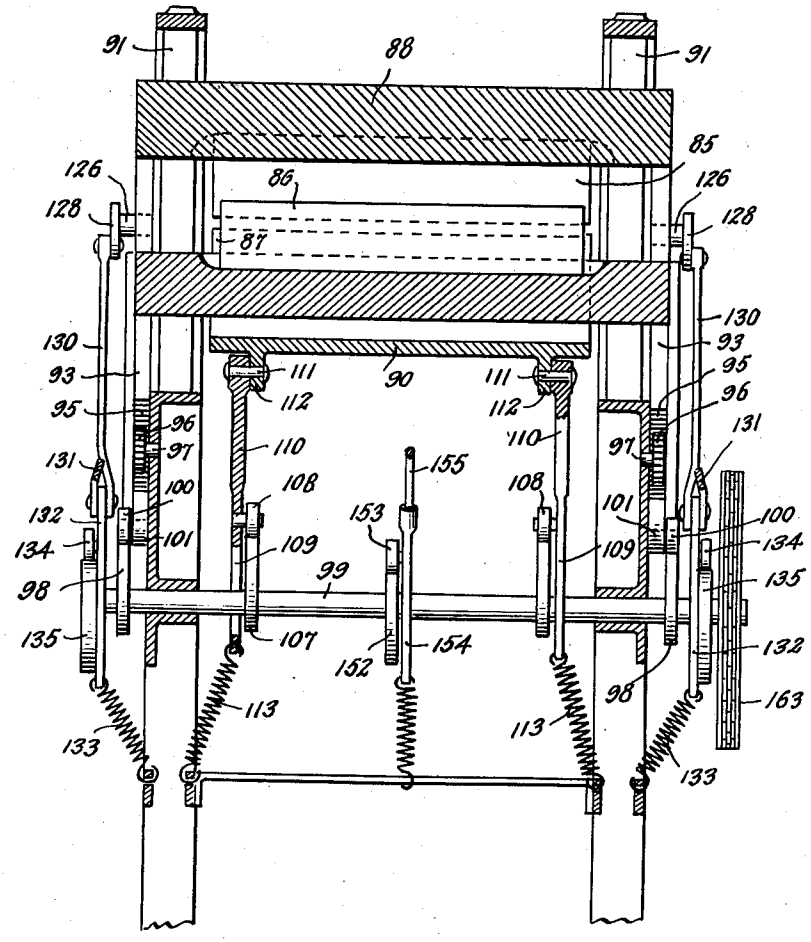
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SHEET FOLDING AND PLEATING MACHINE

Filed Nov. 10, 1938 7 Sheets-Sheet 7

Fig. 12.



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Patented Mar. 19, 1940 2,194,344

UNITED STATES PATENT OFFICE

2,194,344

SHEET FOLDING AND PLEATING MACHINE

Anders J. Wikander and Ivan Lind, Brooklyn, and Lacy L. Wisdom, New York, N. Y.

Application November 10, 1938, Serial No. 239,784

15 Claims. (Cl. 270—79)

This invention relates to sheet folding machines and has particular reference to a machine for folding and pleating sheets of paper intermediate the ends thereof so as to provide paper folders such as are used for brief backs, report binders and the like.

The invention broadly comprehends a machine which includes means for intermittently feeding sheets of paper to a mechanism for forming one or more pleats intermediate the ends of each sheet and for folding together the portions of each sheet lying on opposite sides of the pleats and conveying the pleated and folded sheets away from said mechanism.

More particularly the invention resides in a sheet pleating and folding mechanism which includes oppositely disposed creasing blades movable towards each other into spaced parallel nested relationship so as to effect the pleating between adjacent nested blades, in combination with rollers for pressing the creased stock together and for feeding the sheet away from the blades as the same are retracted to thereby fold together the portions of the sheet lying on opposite sides of the pleated portion thereof.

The invention further embodies in a machine of the indicated character a take off mechanism and means for deflecting onto the take off mechanism the pleated and folded sheets as they leave the pressing and feeding rollers, the deflector means being movable to active position overlying the pressing and feeding rollers in timed relation and immediately following the retraction of the creasing blades.

The invention is further directed to a machine of the indicated character in which means is provided for feeding and retaining each sheet in juxtaposition to the pleating and folding mechanisms and so supporting the sheet as to permit of the drawing of the opposite end portions thereof towards the intermediate portion as the pleating and folding operations are effected.

The invention furthermore aims to provide a machine as and for the purpose specified by means of which paper folders may be expeditiously and economically produced to avoid the expense incident to hand labor heretofore involved in the pleating and folding of the same.

With the above and other objects in view, the invention is set forth in greater detail in the following specification and illustrated in the accompanying drawings, wherein:

Fig. 1 is a side view of the machine constructed in accordance with the invention.

Fig. 2 is a similar view illustrating the opposite side of the machine.

Fig. 3 is a top plan view thereof.

Fig. 4 is a longitudinal sectional view taken approximately on the line indicated at 4—4 in Fig. 3.

Fig. 5 is an enlarged fragmentary diagrammatic sectional view illustrating parts of the creasing and pleating, pressing and folding, and deflecting and take off mechanisms showing the same in their initial positions when the sheet is delivered thereto.

Fig. 6 is a similar view showing the lower central creasing blade and the upper creasing blades in their active position effecting the initial creasing and pleating of the sheet.

Fig. 7 is a similar view showing the lower outer pair of creasing blades in active position effecting the additional creasing and pleating of the sheets.

Fig. 8 is a similar view showing the addition of parts subsequent to the creasing and pleating operations and illustrating the sheet as it is being folded, deflected and presented to the take off mechanism.

Fig. 9 is a diagrammatic expanded perspective view illustrating parts of one end of the creasing and pleating, the pressing and folding, and the deflecting and take off mechanisms together with cams for controlling the same.

Fig. 10 is a perspective view illustrating one of the completed paper folders and the manner in which it is utilized as a sheet binder.

Fig. 11 is a fragmentary view similar to Fig. 7 illustrating an attachment for the creasing and pleating mechanism to provide a modified form of pleating arrangement.

Fig. 12 is a transverse sectional view through the machine taken approximately on the line 12—12 of Fig. 1.

Referring to the drawings by characters of reference, the machine includes a frame 20 adjacent one end of which is provided a table 21 for supporting a stack of sheets A to be pleated and folded, which table is mounted for vertical step by step upward movement by means of a ratchet pawl 22 engaging a ratchet wheel 23, the pawl being actuated by a rock lever 24 which is in turn rocked through the medium of a reciprocatory rod 25. The ratchet wheel shaft 26 has keyed thereto pinions 27 which engage with rack bars 28 depending from the underside of the sheet supporting table 21. The uppermost sheet of the stack on the table 21 is engaged by a knurled feed roller 30 which is keyed to a

transverse shaft 31 journaled in aligned bearings 32 carried by the radial arms 33 of a rotatory sleeve 34 which is mounted to turn on a transverse shaft 35 secured in bearings 36 on the upper portion of the frame 20.

The sleeve 34 is provided with a radial arm 37 which extends substantially diametrically opposite the radial arms 33 and has connected therewith an actuating rod 38 for rocking the sleeve to raise and lower the knurled feed roller 30 for singly feeding the sheets from the stack on the supporting table 21. The shaft 31 has keyed thereto a drive pulley 39 for rotating the feed roller in the direction of the arrow and motion is imparted thereto by means which will be hereinafter set forth.

A sheet releasing means is provided which consists of a pair of transversely spaced fingers 40 connected to a transverse rock shaft 41 journaled in the frame 20, the rock shaft being provided with a radial arm 42 connected to a reciprocatory actuating rod 43. A transverse rotary cam shaft 45 is journaled in the frame and the said shaft has secured thereto a plurality of cams. The cam 46 engages a cam roller or follower 47 which is journaled on a slotted yoke 48 attached to the reciprocatory rod 25 for actuating the rock lever 24, the pawl 22 and the ratchet wheel 23 to effect the vertical step by step upward movement of the stack supporting table 21.

A spring 49 connected at one end to the frame 20 and at the opposite end to the yoke 48 functions to maintain the cam follower or roller 47 in contact with the periphery or face of the cam. A cam 50 keyed to the shaft 45 engages with the cam follower or roller 51 carried by the yoke 52 which is connected with the rod 38 for controlling the raising and lowering of the knurled feed roller 30. A cam 55 keyed to the shaft 45 engages with a cam follower or roller 56 on a yoke 57 carried by the rod 43 for controlling the swinging movement of the sheet release fingers 40. The cams 46, 50 and 55 are so disposed and contoured as to effect the feeding of the sheets A singly from the top of the stack and the release of the top sheet by the fingers 40 so that as the trailing edge of the uppermost sheet approaches the knurled feed roller 30, the cam 50 will effect the raising of the feed roller to a non-feeding position out of engagement with the next adjacent sheet on the stack.

The leading edge of the uppermost sheet is advanced by the knurled feed roller 30 and received between a pair of superimposed feeding rolls 60 and 61, the former being secured to a transverse shaft 62 which is driven through the medium of a pulley 63 to which motion is transmitted by means to be hereinafter set forth. The upper feed roll 61 is secured to a transverse shaft 64 which is journaled for rotation in pivoted arms 65 fulcrumed as at 66 to bearing brackets 67 on the top of the frame 20. Motion is transmitted to the upper feed roll 61 from the lower feed roll 60 by meshing gears 68 and 69 keyed respectively to the shafts 62 and 64.

The feed rolls 60 and 61 feed each sheet horizontally over longitudinally spaced supporting tables 72 and 73 until the leading edge thereof contacts with an adjustable stop gage 74 at which time the feeding is automatically discontinued by raising of the top roll 61 through the medium of a cam 75 keyed to a transverse cam shaft 76, the face of which cams coact with cam followers or rollers 77 carried by yokes 78 attached to rods 79 which are connected at their upper ends to the free ends of the arms 65. The upward movement of the feed roll 61 is, however, limited by an adjustable stop 80 engaging one of the arms 65, to prevent disengagement or unmeshing of the teeth of the gears 68 and 69, while permitting sufficient separation of the peripheries of the feed rolls to discontinue the feeding of the sheet.

A sheet pleating and folding mechanism is located on the frame between the sheet supporting tables 72 and 73 and includes upper and lower vertically disposed transversely extending creasing blades, two or more upper blades being employed and one or more lower blades being utilized depending upon the number of pleats to be formed, in the present instance two upper blades 85 being disclosed and three lower blades, namely, a central blade 86 and a pair of outer blades 87, the upper creasing blades are carried by a single vertically movable support or bar 88, the lower central blade 86 by a vertically movable blade supporting bar 89, and the lower outer blades 87 by a cross sectional U-shaped vertically movable blade support or bar 90. The blade supports or bars 88 and 89 are mounted for vertical sliding movement in guideways 91 provided by vertical slots formed in the opposite sides of the frame 20. The upper blade support or bar 88 has secured to the opposite ends thereof, depending bars 92, while the support or bar 89 for the central lower blade 86 is connected to depending bars 93.

The confronting edges of the bars 92 and 93 adjacent their lower ends are formed respectively with rack teeth 94 and 95 which mesh with the teeth of pinions 96 journaled on fixed bearing studs 97 secured to the frame, the arrangement being such that through the medium of the pinion and rack teeth the rods 92 and 93 are simultaneously moved in opposite directions to respectively effect the advancement of the creasing blades 85 and 86 towards and away from each other. The upper blades 85 and the lower central blade 86 are staggered with reference to each other so that when advanced towards each other, the lower central blade 86 is received between the pair of upper blades 85 whereby the intermediate portion of the sheet will be creased and disposed in pleated formation.

Motion is imparted to the creasing blades 85 and 86 by cams 98 which are secured to a rotary shaft 99 extending transversely of and journaled in the lower portion of the frame 20. The faces of the cams 98 engage cam rollers or followers 100 which are mounted for rotation on lugs 101 at the lower end of the rack bars 93. Motion is imparted to the U-shaped blade support or bar 90 for the lower outer blades 87 by means of cams 107 which are also secured to the shaft 99 to rotate therewith and the faces of which cams 107 engage the cam rollers or followers 108 mounted for rotation on slotted yokes 109 at the lower ends of links 110 fulcrumed at the upper ends as at 111 to lugs 112 carried by and depending from the U-shaped blade support 90. The link 110 is normally pulled downwardly by means of a contractile spring 113, one end of which is attached to the lower end of the yoke 109 and the lower end of which is anchored at 114.

The faces of the cams 107 are so contoured and arranged with reference to the cams 98 as to effect an advancement of the lower outer blades 87 towards the upper creasing blades 85 subsequent to and immediately following the creas-

ing and pleating of the stock by the movement of the central lower blade 86 and upper blades 85 to their nested relation so as to avoid strains or stresses on the stock which would tend to tear or mutilate the same. If additional creases and pleats are to be formed, it is obvious that additional pairs of creasing blades and supports therefor similar to the U-shaped support 90 would be added alternately to the upper and lower sets of blades with mechanism for successively moving said blades to creasing and pleating position. The cams 96 and 97 are so contoured that after the creasing operation all of the lower blades are simultaneously moved downwardly away from the upper blades coincident with the upward movement of the upper blades.

In order to provide means for pressing together the pleated intermediate portion of the sheet and to fold and convey the same away to a take off mechanism, a pair of pressing, folding and feeding rollers 120 and 121 are provided which are journaled for rotation in the arms 122 and 123 of bell cranks 124 and 125, the shafts 126 and 127 of which are fulcrumed in the frame 20 and the remaining arms 128 and 129 thereof are connected by links 130 and 131 to a slotted yoke 132 which is normally pulled downwardly by a spring 133. The yoke is provided with a cam follower or roller 134 which is urged into contact with the face of a cam 135 keyed to the shaft 99. The cam 135 is so contoured and disposed as to swing the rollers 120 and 121 downwardly and inwardly towards each other as the creasing blades 85, 86 and 87 are retracted, whereby the rollers 120 and 121 will press the pleated medial portion of the sheet together. The rollers 120 and 121 are driven to turn in the direction of the arrows by means of belts 136 and 137 which are trained around sheaves 138 and 139 on the shafts of the rollers 120 and 121. It, therefore, follows that coincident with the movement of the rollers 120 and 121 towards each other to press the pleated portion of the sheet, the rollers will effect upward feeding of the sheet and a folding together of the portions of the sheet lying on opposite sides of the intermediate pleated portion.

For the purpose of taking off the pleated and folded sheets, an endless conveyor belt 141 is trained around longitudinally spaced transversely disposed conveyor rolls 142 and 143, which are driven to move the conveyor belt 141 in the direction of the arrow by a belt 144 which is trained around a sheave 145 on the shaft of the roller 143.

In order to deflect the pleated and folded sheet onto the take off conveyor belt 141, a curved deflector element 150 is provided which is attached to rock arms 151 which are secured to a transverse rock shaft 152 journaled in the frame 20. Motion is imparted to the rock shaft by means of a cam 152 which is keyed to the shaft 99 and the face of which engages a cam follower or roller 153 carried on a slotted yoke 154 which is attached to an actuating rod 155, the upper end of which rod is pivotally connected as at 156 to a radial arm 157 secured to the rock shaft 152. The cam is so arranged and contoured as to time the swinging movement of the deflector element 150 from an out-of-the-way position to an active position in the path of movement of the folded and pleated sheet as the pressing, folding and feeding rolls 120 and 121 initiate their feeding movement of the sheet subsequent to the retraction of the creasing blades. It thus follows that the folded and pleated sheets are deflected onto the take off conveyor belt 141 from which they are discharged from the end of the machine.

Motor power to drive the machine is imparted to a drive shaft 160 which extends transversely through the machine and is journaled in bearings in the frame. The drive shaft has keyed thereto a sprocket 161 around which is trained a sprocket chain 162 which engages with and drives a sprocket 163 on the cam shaft 99 thereby transmitting motion to said cam shaft. The drive shaft 160 also has keyed thereto a pulley 165 around which is trained a belt 166 which is in turn trained around the pulley 62 keyed to the shaft 62 and by means of which motion is imparted to the superimposed feeding rolls 60 and 61.

The drive shaft 160 also has keyed thereto a pulley 170 around which is trained a crossed belt 171 which is also trained around the pulley 39 whereby motion is imparted to the knurled feed roller 30. The drive shaft 160 has keyed thereto a sprocket 175 around which is trained a sprocket chain 176 which is also trained around a sprocket 177 on a transverse shaft 178 which is journaled in bearings on the frame 20.

The shaft 178 has keyed thereto a pulley 179 around which the belt 144 is trained to impart motion to the take off conveyor belt 141. The shaft 178 also has keyed thereto pulleys 180 around which the belts 137 are respectively trained for imparting motion to the pressing, folding and feeding roller 121. The belts 136 of the other pressing, folding and feeding roller 120 are trained around pulleys 181 on a transverse shaft 182 journaled in bearings in the frame, the shaft 182 having keyed thereto a pulley 183 which is driven by a belt 184 trained around a pulley 185 keyed on the main drive shaft 160. It will be understood that the belts 136 are crossed so as to turn the pressing, folding and feeding rollers 120 in a counter-clockwise direction.

Motion is imparted to the cam shaft 76 by means of meshing pinions 190 and 191 which are keyed respectively to the shafts 99 and 76 and motion is transmitted to the cam shaft 45 from the cam shaft 76 by a sprocket chain 193 trained around sprockets 194 and 195 keyed respectively to the cam shafts 76 and 45.

In operation the stack of sheets A on the table 21 are fed upwardly in a step by step movement and the uppermost sheet of the stack is moved to the right in Fig. 4 by means of the knurled feed roller 30 after the fingers 40 have been swung to the right and downwardly to an out-of-the-way position by means of the cam 55. After the leading edge of the sheet has passed over the fingers, the cam 55 swings the fingers upwardly and to the left to retain the adjacent sheets underneath against movement, while the feed roller continues to feed the uppermost sheet until the leading edge is received between the superimposed feeding rollers 60 and 61. The sheet is then supported on the slatted table 72 and is located between adjustable pairs of side guides 200 on the sides of the frame. After the sheet has been fed between and gripped by the superimposed rollers 60 and 61, the cam 50 functions to raise the knurled feed roller 30 out of contact with the sheet so that the feeding of the same towards the right is continued by means of the feeding rolls 60 and 61 only. The feeding movement of the sheet is continued until its lead-

ing edge contacts with the adjustable stop gage 74 at which time the cams 75 function to lift the upper feed roll 61 to discontinue the feeding of the sheet. The forward portion of the sheet is then supported by the table 73 between the adjustable side guides 201, while the rear portion thereof is supported on the slatted table 72 with the intermediate portion of the sheet disposed between the separated upper creasing blades 85 and lower creasing blades 86 and 87. The cam 93 then actuates the rack bars 92 and 93 to simultaneously move the two upper creasing blades 85 and the central lower creasing blade 86 towards each other to crease and form a pleat, it being understood that the pleating operation effects a drawing of the opposite end portions of the sheet towards the intermediate portion to compensate for the offsetting of said intermediate portion by the pleating operation. Immediately following this the cam 107 effects the upward movement of the pair of outer blades 87 upwardly to form additional pleats.

It is, of course, obvious that additional pairs of blades similar to the pair of blades 87 may be alternately added to the upper and lower sets if additional pleats are desired. After the pleating operation is finished, the cam 135 functions to swing the pressing, folding and feeding rollers 120 and 121 downwardly and towards each other in timed relation to the movement of the upper and lower blades simultaneously away from each other so that the pleated intermediate portion of the sheet is pressed together and is fed upwardly by the rotary motion of the rollers 120 and 121. Immediately following the movement of the rollers 120 and 121 to their pressing and feeding position, the cam 152 effects the swinging movement of the deflector element 150 to its active position overlying the rollers 120 and 121 whereby the pleated intermediate portion is deflected to the right and onto the upper lead of the conveyor belt 141, the rotation of the rollers 120 and 121 serving to draw and fold together the portions of the sheets which lie on the opposite sides of the intermediate pleated portion. This delivers the sheet in its pleated, pressed and folded condition onto the conveyor belt for discharge from the end of the machine, after which the deflector element 150 is moved to its inactive position by the cam 152, while the cam 135 effects the movement of the rollers 120 and 121 upwardly and away from each other and out of the path of movement of the next succeeding sheet which is fed into position so that the operation is repeated.

As illustrated in Fig. 10 of the drawings, the creased, folded and pleated sheet A is illustrated in its completed form and the manner in which the same is used as a brief back or binder for the pages B, the edge portions of which are disposed between the pleats C and D with suitable fastening elements E extending therethrough. It has, however, been found in some instances that it is desirable to so pleat the sheet A as to increase the spacing between the pleats C and D and in order to accomplish this the lower central blade 86, as previously shown in the drawings, has substituted therefor a lower central creasing blade 86A as illustrated in Fig. 11 of the drawings. This creasing blade is formed with an enlarged upper edge portion 86B, while the upper pair of creasing blades 85 are necessarily spaced apart to correspond with the thickness of the substitute creasing blade 86A and the lower outer creasing blades 87 likewise spaced apart accordingly. It thus follows that in the finished brief back or binder, the pleats C and D will be spaced apart to accommodate a greater number of pages B than could be received between the pleats C and D under the arrangement of the creasing and pleating blades previously set forth.

What is claimed is:

1. In a machine of the character set forth, mechanism for transversely pleating a sheet intermediate the ends thereof including opposed pleating blades located on opposite sides of said sheet for creasing the same in opposite directions to form a pleated structure, means for moving the creasing blades on opposite sides of said sheet towards and away from each other, and mechanism for gripping said pleated portion of the sheet and for removing the pleated sheet so as to fold together the remaining portions thereof lying on opposite sides of the pleated portion as the sheet is removed.

2. In a machine of the character set forth, mechanism for transversely pleating a sheet intermediate the ends thereof including opposed pleating blades located on opposite sides of said sheet for simultaneously creasing the same in opposite directions to form a pleated structure, means for moving the blades on opposite sides of said sheet towards and away from each other, and mechanism for gripping said pleated portion of the sheet and for removing the pleated sheet so as to fold together the remaining portions thereof lying on opposite sides of the pleated portion as the sheet is removed.

3. In a machine of the character set forth, mechanism for transversely pleating a sheet intermediate the ends thereof including opposed pleating blades located on opposite sides of said sheet for creasing the same in opposite directions to form a pleated structure, means for effecting relative movement of the creasing blades on opposite sides of said sheet towards and away from each other, and mechanism for gripping said sheet and for folding together the portions thereof lying on opposite sides of the pleated portion and for feeding the pleated and folded sheet away from said creasing blades as the same are retracted from each other.

4. In a machine of the character set forth, mechanism for transversely pleating a sheet intermediate the ends thereof including opposed pleating blades located on opposite sides of said sheet for creasing the same in opposite directions to form a pleated structure, means for moving the creasing blades on opposite sides of said sheet towards and away from each other, mechanism for gripping said pleated portion of the sheet and for folding together the remaining portions thereof lying on opposite sides of the pleated portion and for feeding the pleated and folded sheet away from said creasing blades as the same are retracted from each other, said gripping and folding mechanism including elements mounted for movement towards and away from each other, and means for effecting the movement of said elements having timed relation with the means for effecting the movement of the creasing blades.

5. In a machine of the character set forth, mechanism for transversely pleating a sheet intermediate the ends thereof including opposed pleating blades located on opposite sides of said sheet for creasing the same in opposite directions to form a pleated structure, means for moving the creasing blades on opposite sides of said sheet towards and away from each other, mechanism for pressing said pleated portion of the sheet

and for folding together the remaining portions thereof lying on opposite sides of the pleated portion and for feeding the pleated and folded sheet away from said creasing blades as the same are retracted from each other, said pressing and folding mechanism including oppositely driven continuously rotating rollers mounted for movement towards and away from each other, means for effecting the movement of said rollers having timed relation with the means for effecting the movement of the creasing blades, and mechanism for deflecting the pleated and folded sheet laterally with reference to the plane of movement of the creasing blades.

6. In a machine of the character set forth, mechanism for transversely pleating a sheet intermediate the ends thereof including a pair of spaced parallel creasing blades extending transversely of and located on one side of the sheet to be pleated, a single creasing blade extending transversely of and arranged on the opposite side of the sheet, means for moving said blades towards each other to dispose the free edge portion of said single blade between the free edge portions of said pair of blades so as to pleat the sheet, and mechanism for pressing said pleated portion of the sheet and folding together the remaining portions of the sheet lying on opposite sides of the pleated portion.

7. In a machine of the character set forth, mechanism for transversely pleating a sheet intermediate the ends thereof including a pair of spaced parallel creasing blades extending transversely of and located on one side of the sheet to be pleated, a single creasing blade extending transversely of and arranged on the opposite side of the sheet, means for moving said blades towards each other to dispose the free edge portion of said single blade between the free edge portions of said pair of blades so as to pleat the sheet, and mechanism for gripping said pleated portion of the sheet and folding together the remaining portions of the sheet lying on opposite sides of the pleated portion, and for feeding the pleated and folded sheet from between the creasing blades subsequent to the retraction of the same from each other.

8. In a machine of the character set forth, mechanism for transversely pleating a sheet intermediate the ends thereof including a pair of spaced parallel creasing blades extending transversely of and located on one side of the sheet to be pleated, a single creasing blade extending transversely of and arranged on the opposite side of the sheet, means for moving said blades towards each other to dispose the free edge portion of said single blade between the free edge portions of said pair of blades so as to pleat the sheet, mechanism for pressing said pleated portion of the sheet and folding together the remaining portions of the sheet lying on opposite sides of the pleated portion and for feeding the pleated and folded sheet from between the creasing blades subsequent to the retraction of the same from each other, mechanism for taking off the pleated and folded sheets, and a deflector means movable between the retracted creasing blades for guiding the sheets onto said take off mechanism.

9. In a machine of the character set forth, mechanism for transversely pleating a sheet intermediate the ends thereof including a pair of spaced parallel creasing blades extending transversely of and located on one side of the sheet to be pleated, an intermediate creasing blade extending transversely of and located on the opposite side of said sheet, a pair of spaced parallel outer creasing blades extending transversely of and straddling said intermediate blade, means for simultaneously moving said intermediate blade and the first mentioned pair of blades towards each other to dispose the free edge portions of the intermediate blade between the free edge portions of the first mentioned pair of blades so as to crease and pleat the sheet, means for subsequently moving the free edge portions of said second pair of blades towards the first pair of blades to dispose the free edge portions of said first pair of blades between said second pair of blades for additionally pleating the sheet, said blade moving means functioning to simultaneously move all of said blades away from each other after the sheet pleating operation.

10. In a machine of the character set forth, mechanism for transversely pleating a sheet intermediate the ends thereof including a pair of spaced parallel creasing blades extending transversely of and located on one side of the sheet to be pleated, an intermediate creasing blade extending transversely of and located on the opposite side of said sheet, a pair of spaced parallel outer creasing blades extending transversely of and straddling said intermediate blade, means for simultaneously moving said intermediate blade and the first mentioned pair of blades towards each other to dispose the free edge portions of the intermediate blade between the free edge portions of the first mentioned pair of blades so as to crease and pleat the sheet, means for subsequently moving the free edge portions of said second pair of blades towards the first pair of blades to dispose the free edge portions of said first pair of blades between said second pair of blades for additionally pleating the sheet, said blade moving means functioning to simultaneously move all of said blades away from each other after the sheet pleating operation, and mechanism for gripping said pleated portion of the sheet and folding together the remaining portions thereof lying on opposite sides of the pleated portion and for feeding the pleated and folded sheet away from said creasing blades as the same are retracted from each other.

11. In a machine of the character set forth, mechanism for transversely pleating a sheet intermediate the ends thereof including opposite pleating blades located on opposite sides of said sheet for creasing the same in opposite directions to form a pleated structure, means for moving the creasing blades on opposite sides of said sheet towards and away from each other, and means independent of the pleating blades for supporting said sheet in juxtaposition to said pleating mechanism for free movement of the opposite end portions towards the intermediate portion during the pleating operation.

12. In a machine of the character set forth, mechanism for transversely pleating a sheet intermediate the ends thereof including opposed pleating blades located on opposite sides of said sheet for creasing the same in opposite directions to form a pleated structure, means for moving the creasing blades on opposite sides of said sheet towards and away from each other, mechanism for pressing said pleated portion of the sheet and for folding together the remaining portions thereof lying on opposite sides of the pleated portion, and means for supporting said sheet in juxtaposition to said mechanisms for free movement of the opposite end portions dur-

ing the pleating, pressing and folding operations.

13. In a machine of the character set forth, spaced horizontal sheet supporting tables, means for feeding a sheet to a predetermined position to be supported upon said tables with the intermediate portion of the sheet spanning the space therebetween and the opposite end portions mounted for free movement, mechanism for forming transverse pleats in said intermediate portion of the supported sheet including spaced parallel vertically disposed upper and lower sets of creasing blades respectively disposed above and below the sheets, and means for moving said sets of blades towards each other to a nested relation in the space between the supporting tables to effect the pleating of the sheet between said blades and the drawing of the opposite end portions thereof towards the intermediate portion during the pleating operation.

14. In a machine of the character set forth, spaced horizontal sheet supporting tables, means for singly feeding sheets over said tables, means engaging with the leading edge of the sheet to dispose the same in a predetermined position, supported upon said tables with the intermediate portion spanning the space therebetween and the opposite end portions free for movement towards the intermediate portion, mechanism for forming transverse pleats in the intermediate portion of the supported sheet including spaced parallel vertically disposed upper and lower sets of blades disposed respectively above and below the sheets, means for moving said sets of blades towards each other to a nested relation in the space between the supporting tables so as to effect the pleating of the sheet between said blades, said means being adapted to move said sets of blades to a relatively retracted position, and mechanism for pressing said pleated portion of the sheet and for folding together the remaining portions lying on opposite sides of the pleated portion subsequent to the retraction of said blades.

15. In a machine of the character set forth, mechanism for transversely pleating a sheet intermediate the ends thereof including a pair of spaced parallel creasing blades extending transversely of and located on one side of the sheet to be pleated, an intermediate creasing blade extending transversely of and located on the opposite side of said sheet, a pair of spaced parallel outer creasing blades extending transversely of and straddling said intermediate blade, means for simultaneously moving said intermediate blade and the first mentioned pair of blades towards each other to dispose the free edge portions of the intermediate blades between the free edge portions of the first mentioned pair of blades so as to crease and pleat the sheet, means for subsequently moving the free edge portions of said second pair of blades towards said first pair of blades to dispose the free edge portions of said first pair of blades between said second pair of blades for additionally pleating the sheet, means for feeding and supporting said sheet in juxtaposition to said blades with the end portions thereof free for movement towards the intermediate portion, and a common actuating means for said blade moving means.

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