May 6, 1941. G. A. SHAFFER 2,241,329

PAPER FOLDING MACHINE

Filed Feb. 7, 1939 10 Sheets-Sheet 1

Fig. 1.

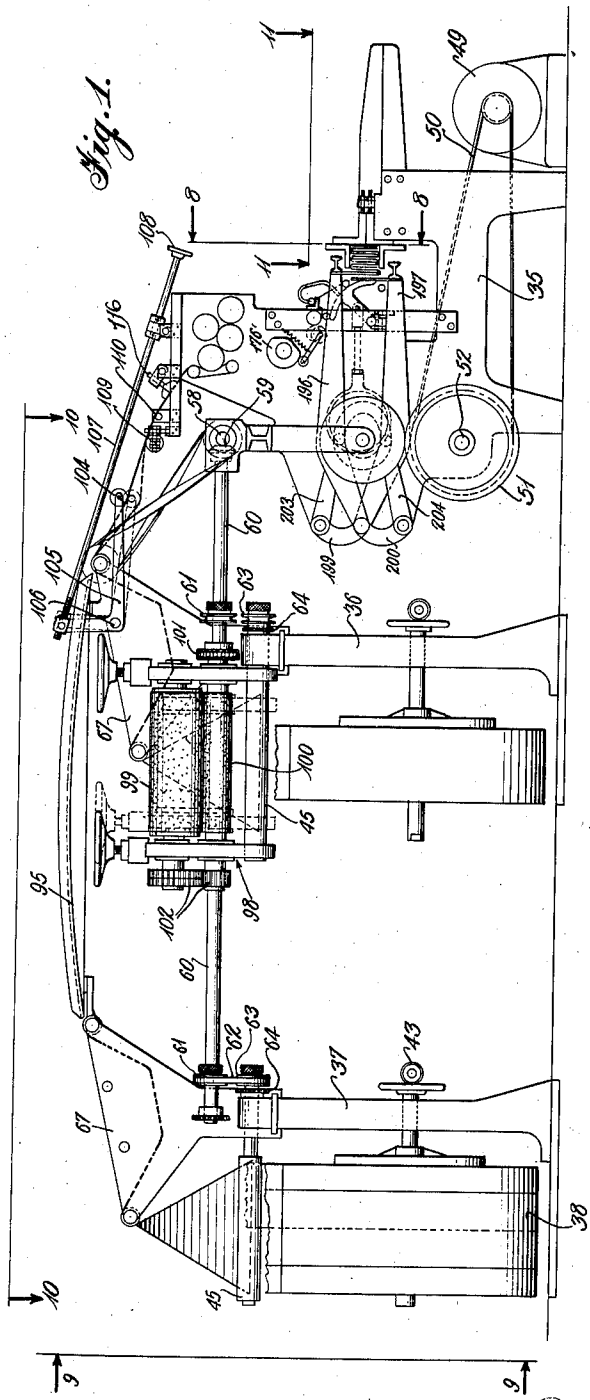
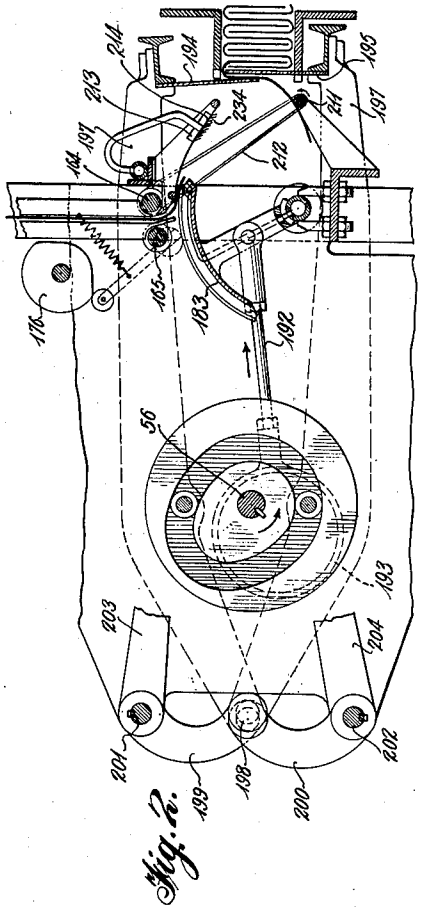


Fig. 2.



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May 6, 1941. G. A. SHAFFER 2,241,329

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Filed Feb. 7, 1939 10 Sheets-Sheet 2

Fig. 4.

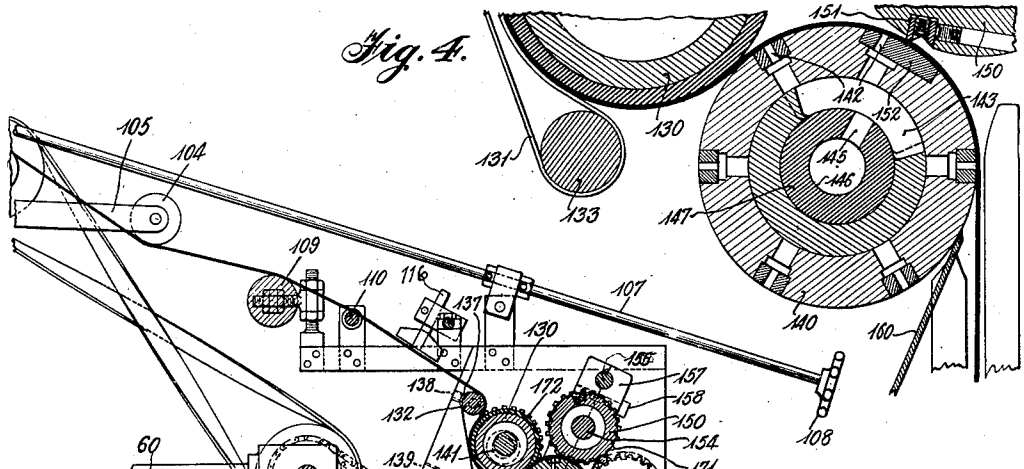


Fig. 3.

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May 6, 1941. G. A. SHAFFER 2,241,329

PAPER FOLDING MACHINE

Filed Feb. 7, 1939 10 Sheets-Sheet 3

Fig. 5.

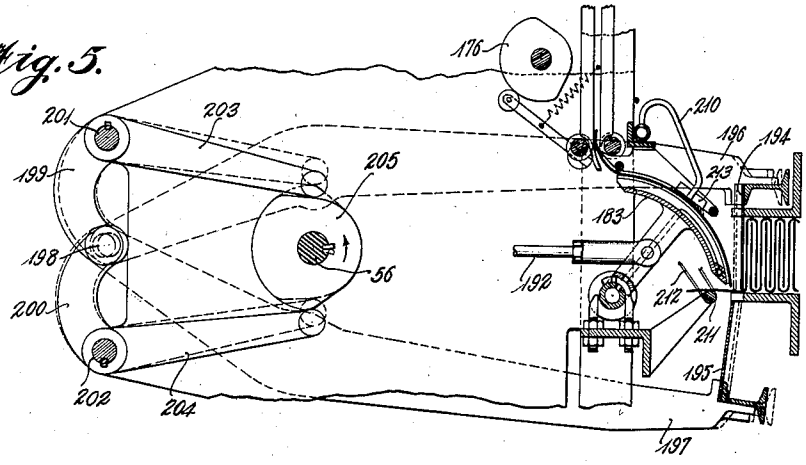


Fig. 6.

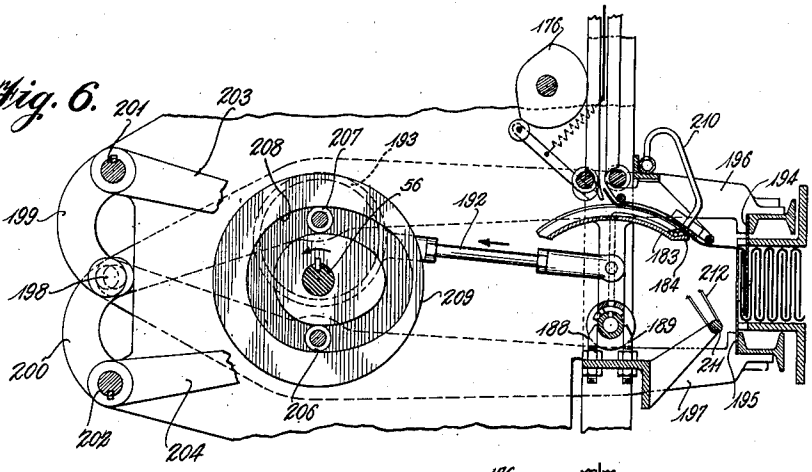
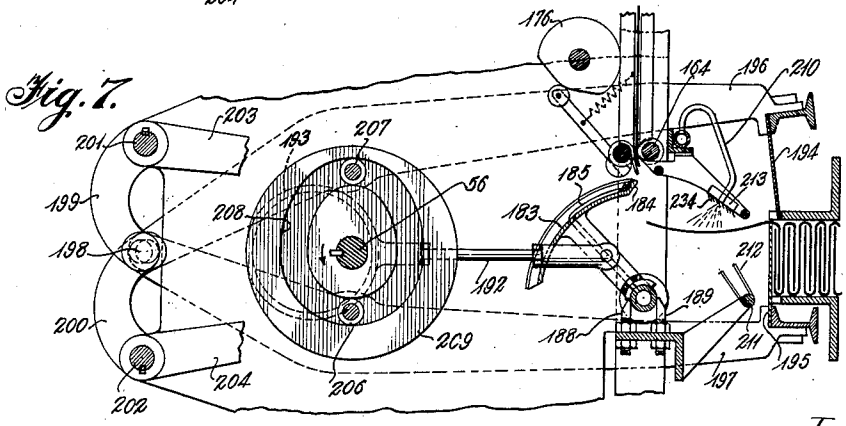


Fig. 7.



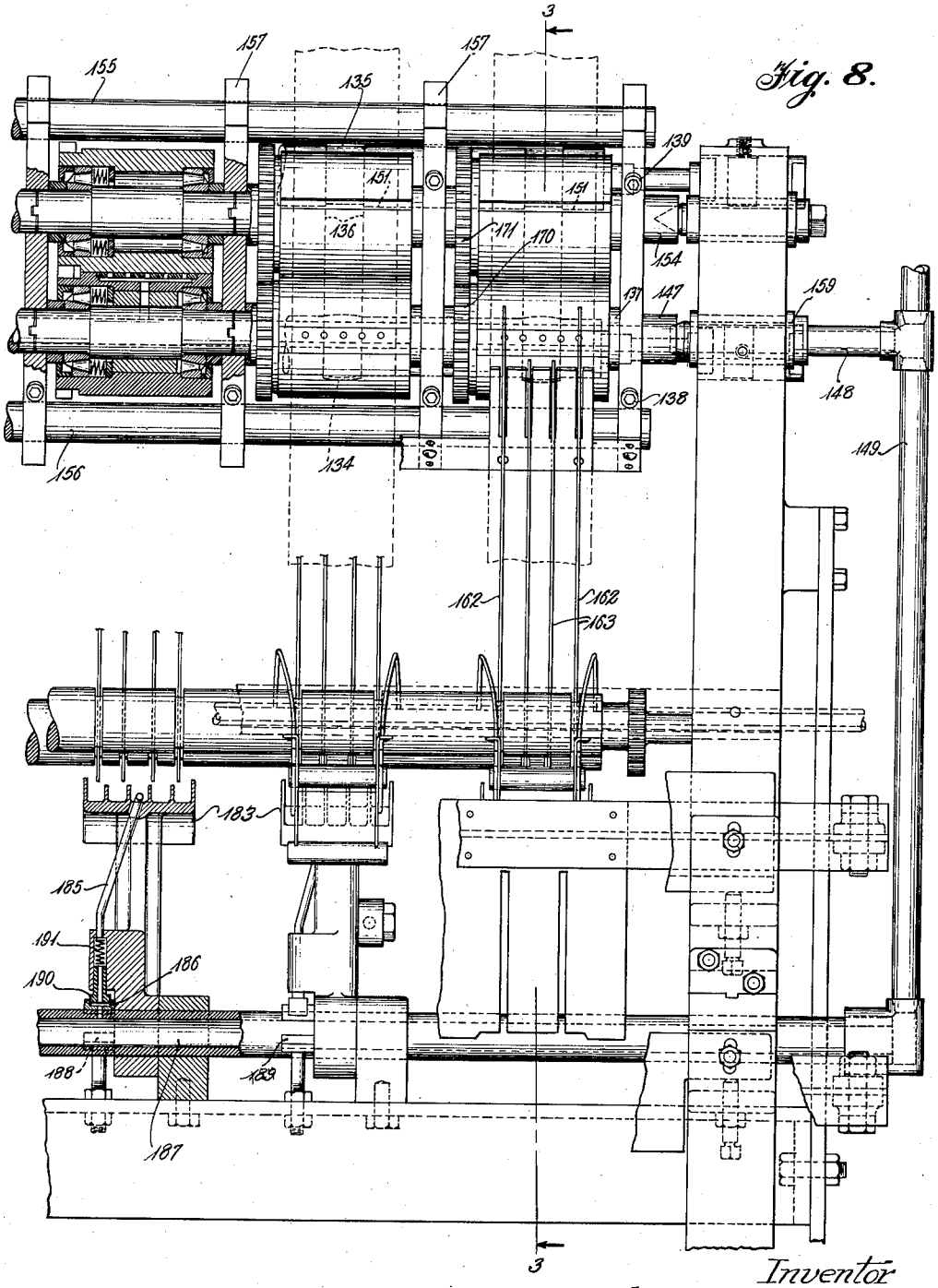
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May 6, 1941. G. A. SHAFFER 2,241,329

PAPER FOLDING MACHINE

Filed Feb. 7, 1939 10 Sheets-Sheet 4

Fig. 8.



Inventor
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May 6, 1941. G. A. SHAFFER 2,241,329

PAPER FOLDING MACHINE

Filed Feb. 7, 1939 10 Sheets-Sheet 5

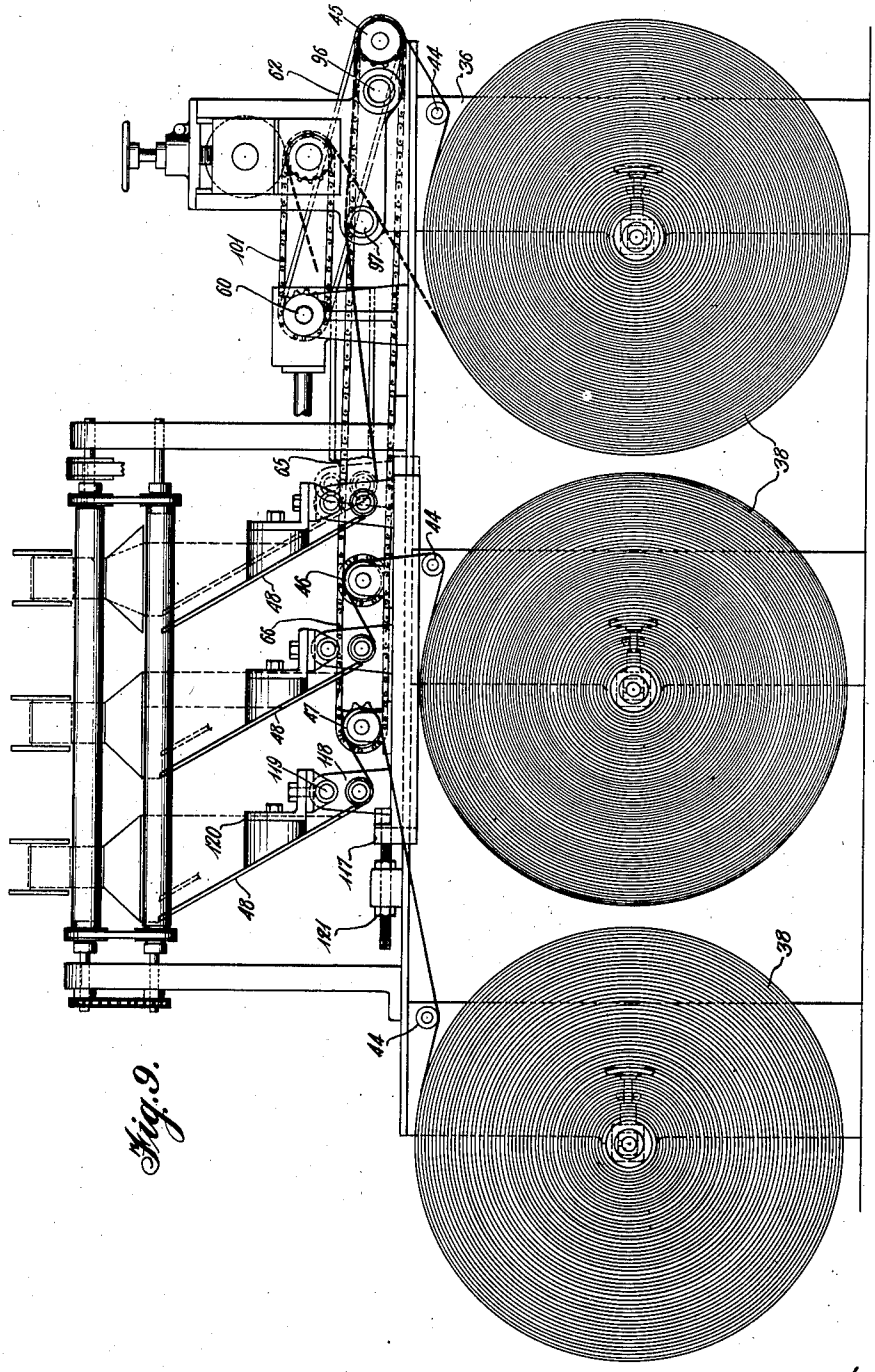


Fig. 9.

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May 6, 1941. G. A. SHAFFER 2,241,329

PAPER FOLDING MACHINE

Filed Feb. 7, 1939 10 Sheets-Sheet 6

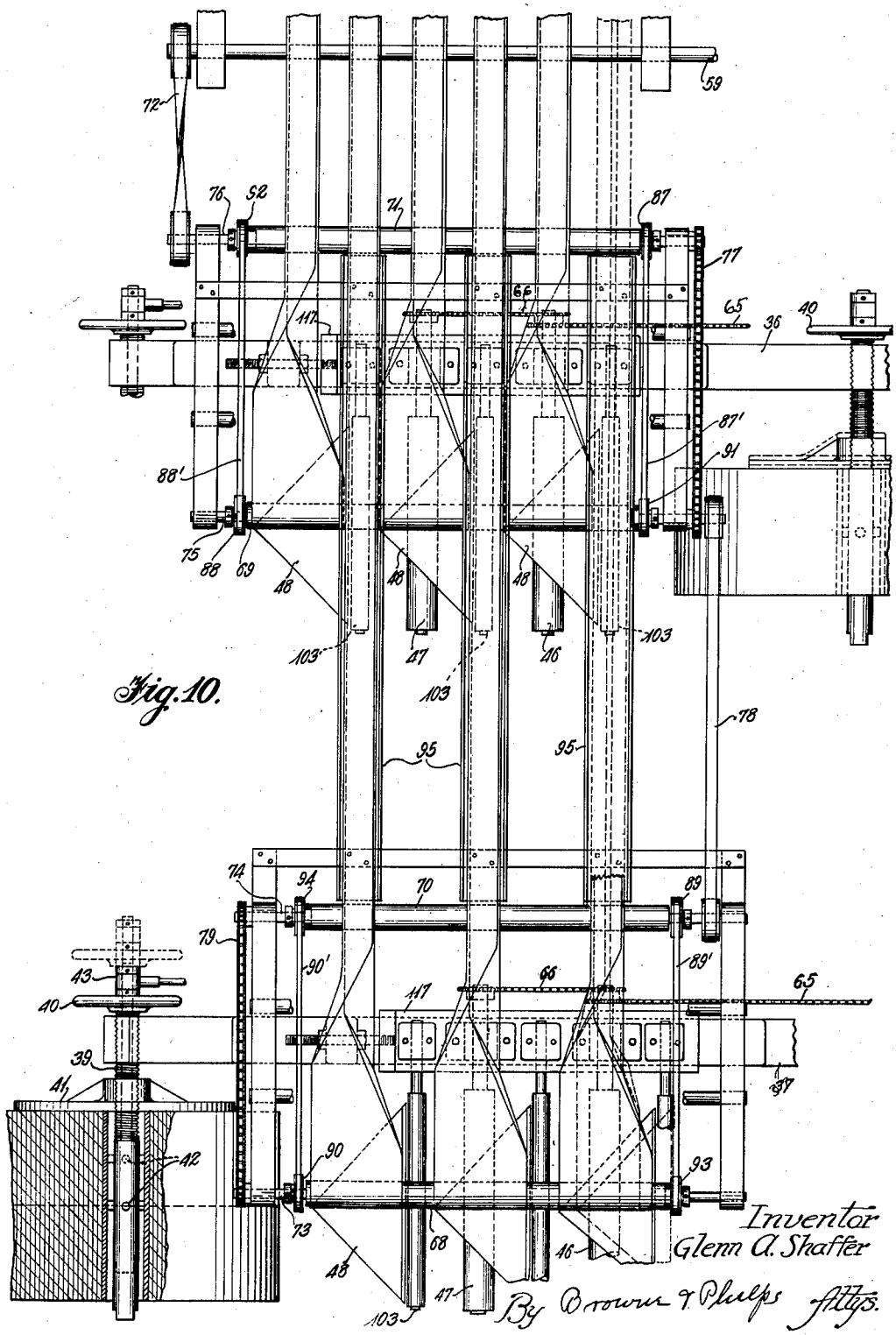


Fig. 10.

May 6, 1941. G. A. SHAFFER 2,241,329

PAPER FOLDING MACHINE

Filed Feb. 7, 1939 10 Sheets-Sheet 7

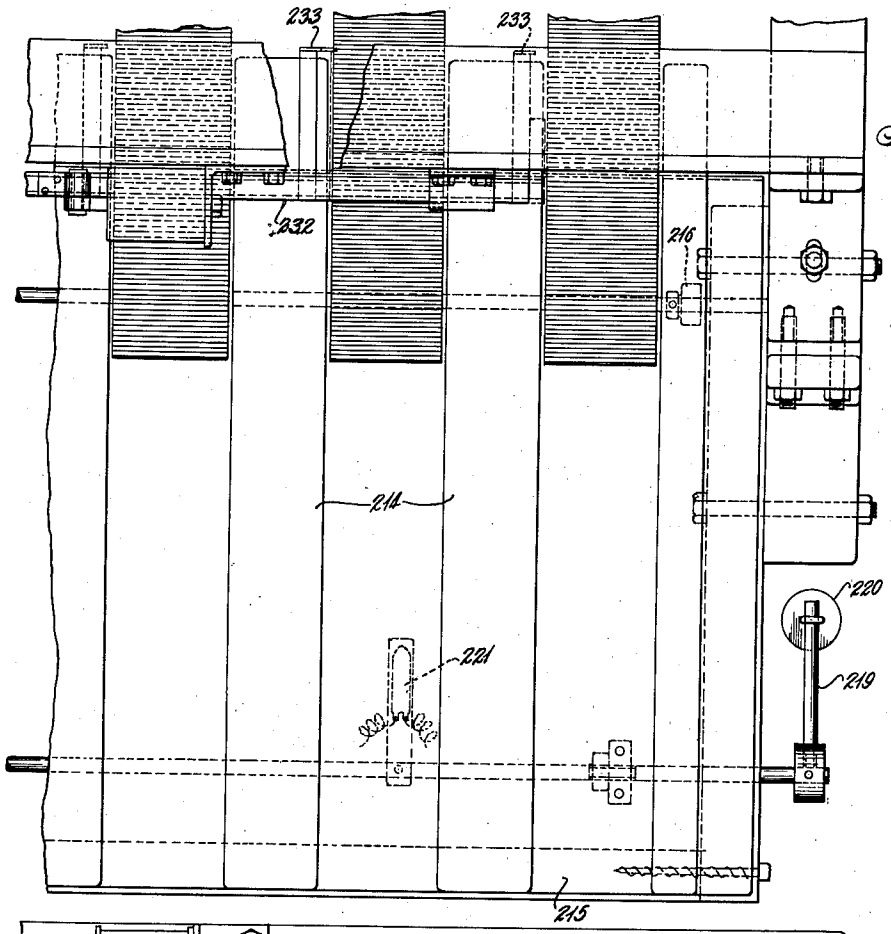


Fig. 11.

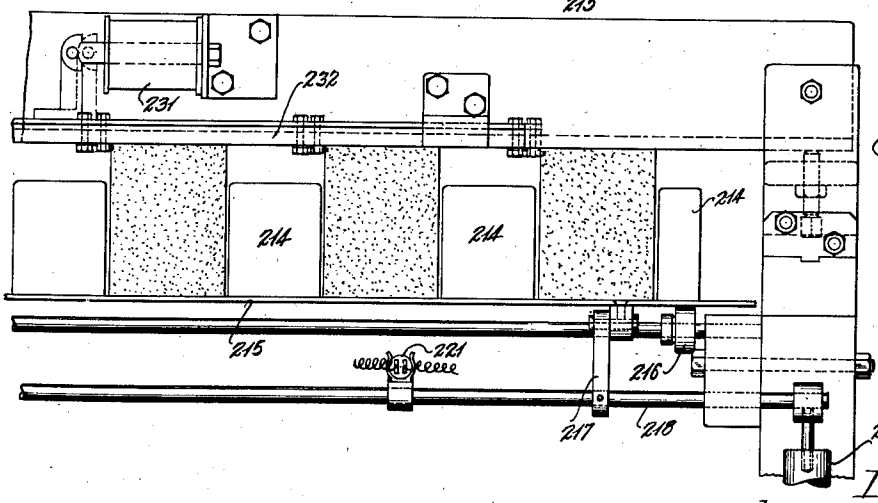


Fig. 12.

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May 6, 1941. G. A. SHAFFER 2,241,329

PAPER FOLDING MACHINE

Filed Feb. 7, 1939 10 Sheets-Sheet 8

Fig. 13.

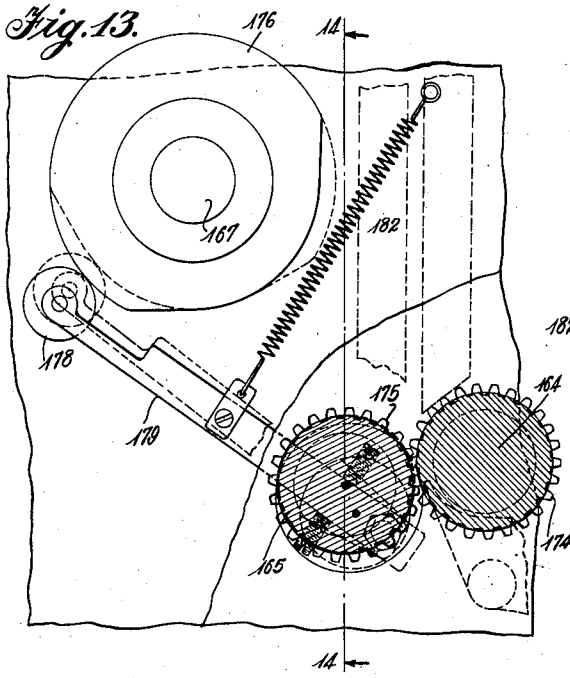


Fig. 14.

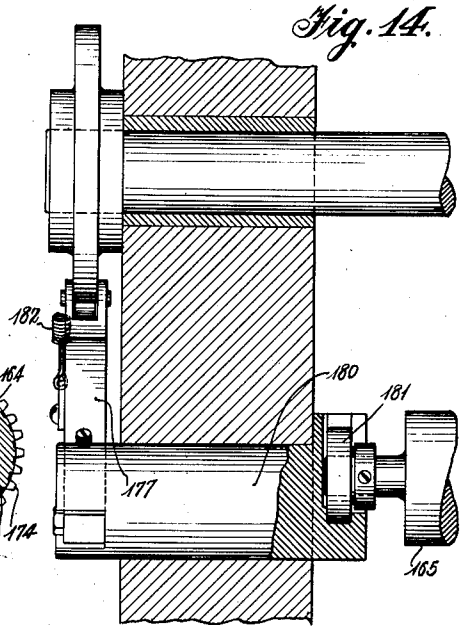


Fig. 15.

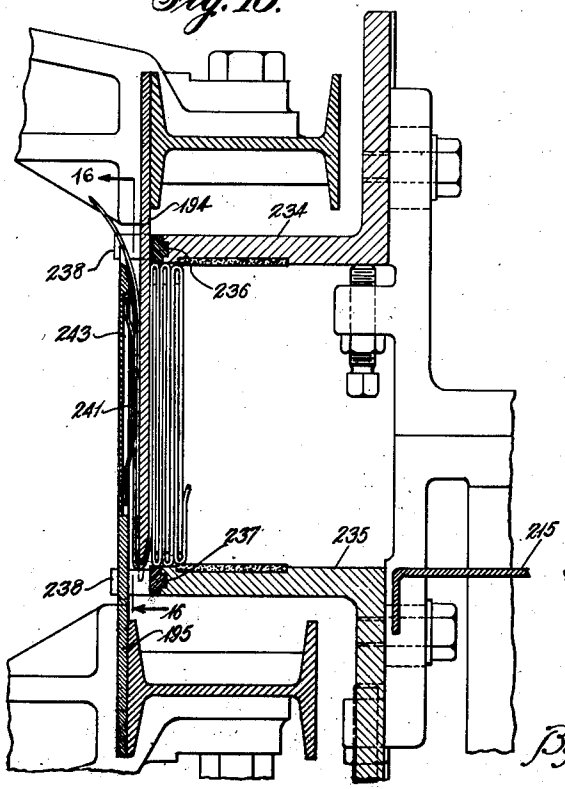
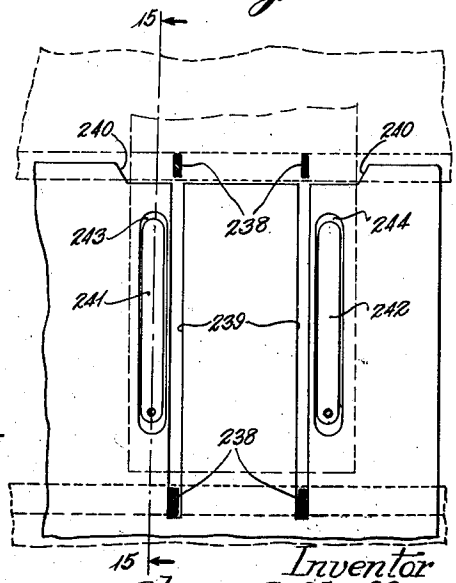


Fig. 16.



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May 6, 1941. G. A. SHAFFER 2,241,329

PAPER FOLDING MACHINE

Filed Feb. 7, 1939 10 Sheets-Sheet 9

Fig. 17.



Fig. 18.



Fig. 19.

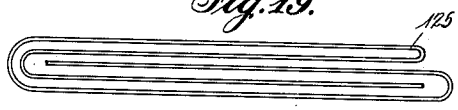


Fig. 20.

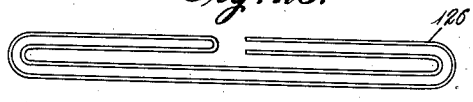


Fig. 21.

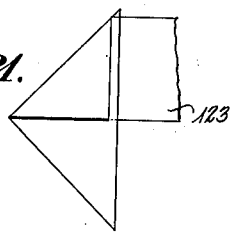


Fig. 22.

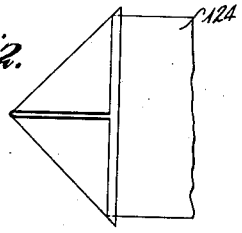


Fig. 23.

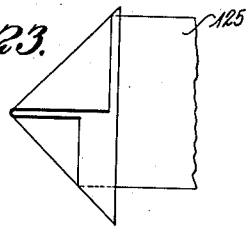


Fig. 24.

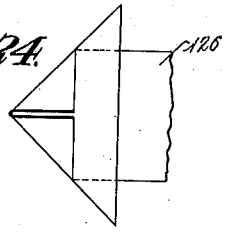
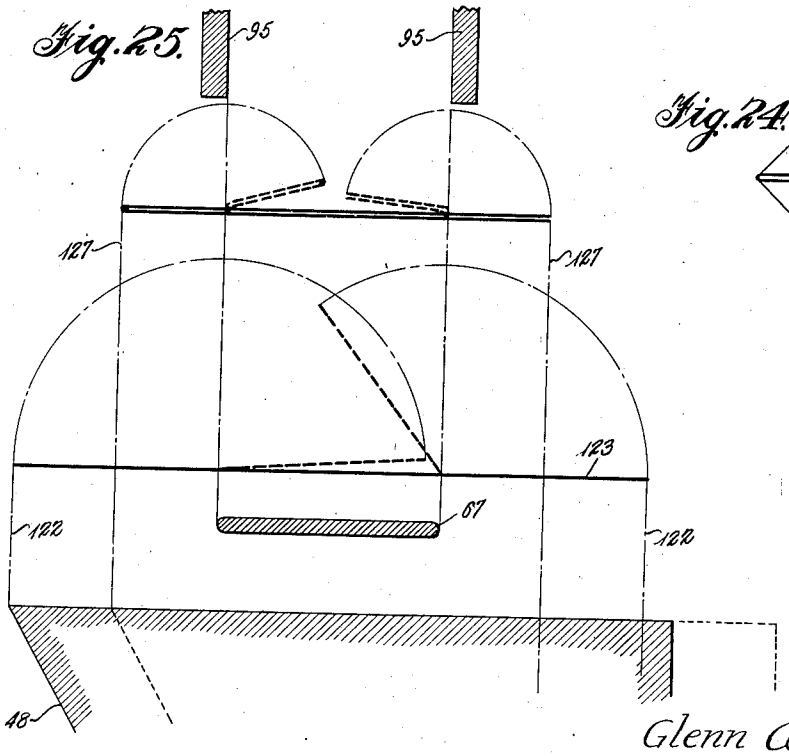


Fig. 25.



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May 6, 1941. G. A. SHAFFER 2,241,329

PAPER FOLDING MACHINE

Filed Feb. 7, 1939 10 Sheets-Sheet 10

Fig. 26.

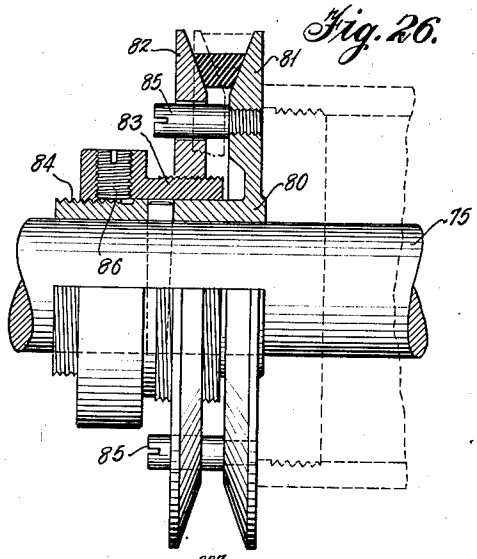


Fig. 27.

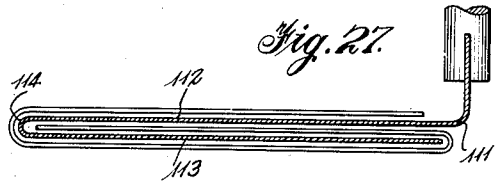


Fig. 28.

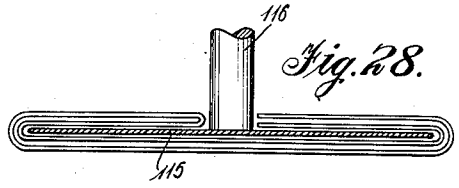


Fig. 29.

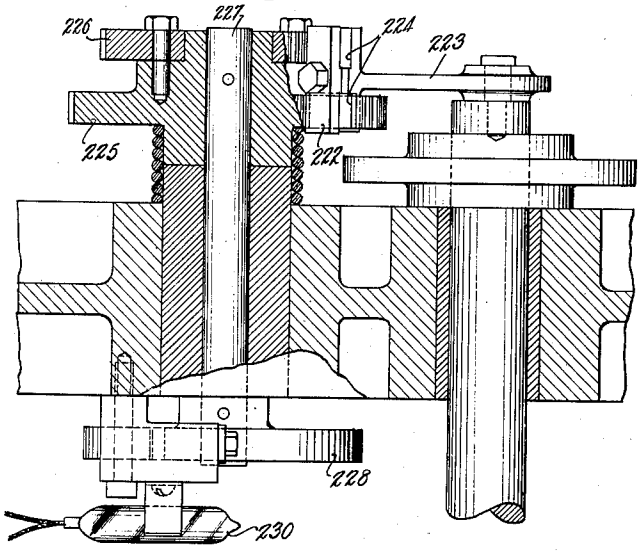
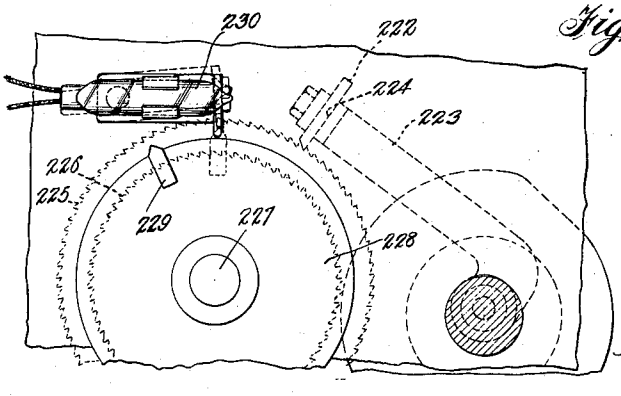


Fig. 30.



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Patented May 6, 1941 2,241,329

UNITED STATES PATENT OFFICE

2,241,329

PAPER FOLDING MACHINE

Glenn A. Shaffer, De Pere, Wis., assignor to Fort Howard Paper Company, Green Bay, Wis., a corporation of Wisconsin

Application February 7, 1939, Serial No. 255,144

23 Claims. (Cl. 270—66)

The invention relates to paper folding and interfolding machines and has as an object the provision of means for simultaneously operating upon a plurality of strips of paper.

It is a further object of the invention to provide a machine that will fold strips of paper, cut to napkin width into bands, cutting the folded bands into napkin lengths and interfolding the individual folded napkins into package form.

It is a further object of the invention to provide a machine that will fold any one of a plurality of widths of strips to form napkins of different sizes, each size being folded into a band of the same width irrespective of the width of the napkin, and interfold individual napkins cut from such bands so that the final napkin fold will be of the same dimensions irrespective of the size of the napkin.

It is a further object of the invention to provide a machine readily adjustable for the said different sizes of napkins.

It is a further object of the invention to provide a machine of the character described having means to emboss napkins to be folded, which embossing means may be readily thrown out of use for the purpose of folding the napkins without embossing.

It is a further object of the invention to provide means for reducing the tension upon the strips as they are drawn through the folding apparatus.

It is a further object of the invention to improve upon the mechanisms for folding and interfolding napkins.

It is a further object of the invention to provide a machine of the character described which will avoid defacement of the embossing of the napkins in the subsequent folding thereof.

It is a further object of the invention to provide means for adjusting the cutting lengths of the napkins to fall accurately between the successive embossed portions thereof.

Further objects of the invention will appear from the following description when read in connection with the accompanying drawings showing an illustrative embodiment of the invention, and wherein:

Figure 1 is a side elevation;

Fig. 2 is a detail vertical section through one of the feeding and interfolding mechanisms taken on a plane corresponding to line 3—3 of Figure 8.

Fig. 3 is a detail side elevation partly in section on a line corresponding to the plane of Figure 2;

Fig. 4 is a detail vertical section through a portion of the mechanism shown in Figure 3 drawn to an enlarged scale;

Figs. 5, 6, and 7 are detail vertical sections showing the interfolding mechanism in different positions of operation;

Fig. 8 is a detailed end elevation corresponding to the portion included in line 8—8 of Figure 1 partly in section to disclose the construction;

Fig. 9 is an end view from the left of Figure 1 but showing an embossing attachment on the rear backstand;

Fig. 10 is a detailed plan view of the portion embraced by line 10—10 of Figure 1;

Fig. 11 is a detail plan view of the portion embraced by line 11—11 of Figure 1;

Fig. 12 is a detail end view of the receiving chutes with parts omitted to show the package marking device;

Fig. 13 is a detail side elevation partly in section showing the means for feeding the paper cut to napkin length to the interfolding mechanism.

Fig. 14 is a section on line 14—14 of Fig. 13 with parts shown in elevation;

Fig. 15 is a detail vertical section on an enlarged scale showing the action of the tucker blades;

Fig. 16 is a section on line 16—16 of Figure 15;

Figs. 17, 18, 19, and 20 are end views showing forms of fold that may be provided by the apparatus of napkins to be interfolded;

Figs. 21, 22, 23, and 24 are plan views of the coaction of the folding triangles with different widths of paper strips;

Fig. 25 is a diagrammatic showing of the relation between the triangle and the paper formers showing the action of the latter with various widths of strips received from the triangle;

Fig. 26 is a detail elevation partly in section of an adjustable sheave for driving the booster rolls;

Figs. 27 and 28 are detail vertical sections showing paper guiding blades for coacting with different forms of fold;

Fig. 29 is a detail plan view partly in section of means for actuating a switch to control the package marking mechanism; and

Fig. 30 is an end view of the structure of Figure 29.

As shown, the mechanism is supported on a frontstand 35, an intermediate backstand 36, and a rear backstand 37. The strips of paper to

be folded are supplied in parent rolls 38, the machine being shown as arranged to support three rolls 38 upon each backstand.

To feed the paper to the initial folding triangles in proper relation thereto, the parent rolls are provided with adjusting means, best shown in Figure 10, wherein the roll is supported upon a screwthreaded arbor 39 and its screwthreads may be moved in the backstand to adjusted position by operation of the hand wheels 40, and the parent roll is placed upon the arbor against a disk 41 to properly locate the same and is retained in such position by means of expander pins 42 carried by the arbor. To steady the rolls and provide a slight resistance to the run-off of the paper, brakes 43 of known type are shown.

The paper leaving the parent rolls, as shown in Figure 9 illustrating the rolls upon the intermediate backstand 36, passes under idle rolls 44, and around booster rolls 45, 46, 47 to the triangles 48, which triangles operate in a known manner.

The main drive of the device is shown as from a motor 49 by means of a belt 50 to a pulley 51 on shaft 52, which shaft through sprocket 53 and chain 54 drives sprocket 55 on shaft 56, which shaft through sprocket and chain 57 drives shaft 58 and through bevel gears 59 drives shaft 60, see Figure 3.

Shaft 60 has mounted thereon belt sheave 61 which through belt 62 drives sheave 63 on the shaft of booster roll 45 upon which shaft is mounted sprocket 64 which through chain 65 drives booster roll 46 upon the shaft of which is a sprocket driving chain 66 which drives booster roll 47.

By means of adjustable sheaves 61, 63, the speed of the booster rolls may be adjusted to run so as to feed the strips to the triangles and relieve the strips as fed to the triangles from any tension resulting from the brakes. After passing the triangles the paper is fed to formers 67 the coaction of which with the triangles, to be described, is illustrated in Figures 17 to 25 inclusive.

The mechanisms for supporting and adjusting the rolls upon the backstands 36 and 37 are the same. To operate upon six strips of paper rolls abreast, the strips would have to be spaced a minimum distance depending upon the extent of the triangles. By placing one set of rolls upon the backstand 36 with the triangles therefor in staggered relation to the triangles upon the intermediate backstand 36, the six strips illustrated are accommodated by a machine of considerably less width than six times the width of any one of the triangles, as is plainly apparent from the plan view of Figure 10.

The paper passing the triangles is led about booster rolls 68, 69 to the formers 67 and after passing the formers about booster rolls 70, 71, each booster roll providing that the strip therebeyond shall be without tension.

To drive the booster rolls the shaft is provided with a pulley driving a belt 72. The booster rolls 68—71 are mounted loosely upon shafts 73, 74, 75, 76, respectively. The shaft 76 is driven by belt 72 and in turn through chain 77 drives shaft 75 which by means of belt 78 drives shaft 74 and the latter through chain 79 drives shaft 73. The said booster roll shafts are therefore each driven at a uniform and the same speed.

The booster rolls are driven from their shafts by adjustable sheaves shown in detail in Figure 26 and comprise a hub 80 carrying one side of the sheave 81, the remaining side 82 of the sheave being screwthreaded upon a sleeve 83 which in turn is screwthreaded upon a sleeve 84 integral with the hub 80 which is keyed to shaft 75 in the case of sheaves 87, 88, 89, 90 and is rigidly secured to the roll in the case of sheaves 91, 92, 93, 94. The two sides 81 and 82 of the sheave are compelled to revolve together by means of pins 85 fixed in one thereof and projecting through openings in the other thereof. The screwthreads upon the sleeves 83, and 84 differ in pitch in such manner that when sleeve 83 is turned it will feed toward the sheave member 81 at a faster rate than will the sheave member 82. The net result of revolution of sleeve 83 will be that the sheave member 82 will be moved toward or from the sheave member 81 by an amount equal to the difference in the pitches of the screws thereby causing the V-belt to move either outwardly or inwardly within the sheave to give a different speed of drive of the rolls. The sheaves are locked in adjustment by means of set screws 86.

The sheaves 87, 88, 89, and 90 are fixed upon the shafts respectively while the sheaves 91, 92, 93, 94 are loose on the shafts and have their sheave members corresponding to sheave 81, Figure 26, fixed to the respective booster rolls. By this means the speed of each of the booster rolls may be adjusted independently of the others driven from the constant speed shafts, roll 69 being driven from sheave 87 by belt 87' and roll 71 being driven from sheave 88 by means of belt 88'. In like manner roll 68 is driven by sheave 89 by means of belt 89' and roll 70 is driven from sheave 90 by means of belt 90'.

The folded bands from the backstand 37 are carried by bridges 95 over the mechanism upon the backstand 36.

If it be desired to emboss the strips of paper the device shown in Figures 1 and 9 may be applied, one embossing mechanism only being shown as applied to backstand 36, it being understood that a like embossing mechanism may be applied to backstand 37.

As shown the embossing mechanism is supported upon cantilever supports 96, 97 and comprise a frame 98 in which are journalled the shafts for embossing rolls 99, 100. Roll 100 is driven by chain 101 from shaft 60 and in turn drives the shaft of roll 99 by means of gears 102, Figure 1.

For embossing different widths of paper different embossing rolls must be provided in the frame member 98 for which purpose the frame members are shown in dotted lines in Figure 1 to be adjustable for spacing.

When embossing three strips of paper upon either backstand the strips are led directly from the parent rolls to the embossing rolls, being embossed in superposition between the rolls and the embossing rolls take the place of booster rolls 45, 46, and 47, paper passing directly from the embossing rolls to the idle rolls 103 at the bases of the triangles. The booster rolls 46, 47 may be taken out of the way for this purpose if desired. The path of the strip from one of the parent rolls in Figure 9 to the embossing roll is shown in dash lines. When the embossing rolls are not in use, chain 101 will be removed and when they are in use belts 62 will be removed.

The strips passing from the formers 67 pass under individual rolls 104 one of which is shown

in Figures 1 and 3, which rolls are carried upon bell cranks 105 pivoted at 106, the remaining arm of the bell crank having screw-threaded connection with shafts 107 reaching to hand wheels 108 within the reach of the operator. This adjustment of the rolls 104 is for the purpose of determining the correct arrival to the measuring and cutting device when the strips are embossed in order that the finished napkin may have the embossing properly formed thereon. The strips are then led across a common spreader roll 109 and over a spreader bar 110 for the purpose of flattening the folded bands. The strips are then led past spreader shoes, two forms of which are shown in Figures 27 and 28, the plate 111 in Figure 27 which is utilized with the forms of fold shown in Figures 17, 18, and 19 comprising two portions 112, 113 joined at 114 to coact with the strip as shown in Figure 27.

The single plate 115, Figure 28, supported upon a central standard 116, is used with the edge-to-center fold of Figure 20.

The relation of the folds of Figures 17, 18, 19, and 20 respectively to the triangles is shown in Figures 21, 22, 23, and 24 respectively. In Figure 25 the former 67 is shown in its fixed relation to the path of the band indicated in this figure as the bridge 95, the relation of the former and the bridge being fixed and the triangle being adjustable with respect thereto.

Since it is usually preferred to operate upon three or six strips of the same width at a given time, the triangles are shown in Figure 9 as supported upon a common base 117, being mounted thereon by means of standards 118 through swivel mounting 119 swivelling in one plane and a second swivel mounting 120 movable in the second plane, whereby to provide a universal movement of the triangles to provide a smooth fold.

By means of the adjustment screw 121 all of the triangles may be adjusted in their relation to the former 67. The former 67 is of a known type which will fold the margins of the strip delivered by the triangle upon a central portion thereof. The narrowest strip illustrated in Figures 17 and 21 is so delivered to the triangle as not to be folded at all but to be merely given a 90° turn, and its relation to the triangle is indicated by dot and dash lines 122 in Figure 25, the sheet 123 there illustrated being the narrowest sheet of Figures 17 and 21.

The adjustment of the triangle to the former for the narrowest sheet 123, the maximum width sheet 124 of Figures 18 and 22, and the intermediate width sheet 125 of Figures 19 and 23 will be the same.

As indicated in Figure 22, in comparison with Figure 21, it will be seen that the widest sheet is twice the width of the narrow and therefore the fold indicated as of sheet 124, Figures 18 and 22, will be exactly the same as that indicated for sheet 123 but will be of two thicknesses resulting in the fold of Figure 18.

When the intermediate width sheet 125 is delivered to the former there will be a wider portion come from the triangle at one side of its apex than from the other side of its apex, as indicated in Figure 23, whereby the edge-to-edge fold of Figure 19 will result wherein the uppermost fold will be a double fold and that shown in the center of the fold will be of a single thickness, the former 67 acting exactly as in producing the fold of Figures 17 and 18.

For the fold of Figure 20, which is a strip 126 wider than strip 123 but narrower than 125, the relation of the triangle to the former is as shown in dot and dash lines 127, Figure 25, resulting in the edge to center fold of Figure 20.

After passing the plate 111 or 115 of Figures 27 and 28, supported as shown in Figure 3, the bands pass to the measuring rolls 130 which are preferably faced with a friction material as rubber. The diameter of these rolls is very carefully adjusted to feed the napkins at a determined speed, the napkins being led around the surfaces of the rolls by means of lacing belts 131 passing about rollers 132, 133 driven by the contact of the belts with the napkin bands upon the measuring rolls 130. One of the lacing rolls 132 is preferably made with a convex surface as indicated at 134, Figure 8, and the other thereof with a concave surface as indicated at 135. The width of the lacing belts is preferably less than that of the bands, as indicated by dotted lines 136 in Figure 8.

To adjust the pinch of the lacing belts, the rolls 132, 133, are mounted in eccentric bearings as indicated at 137, Figure 3, and the rolls retained in adjusted position as by set screws 138, 139. The paper passes between the measuring rolls 130 and the anvil rolls 140 and the pinch between these rolls is adjusted by the mounting of the shaft upon which the measuring rolls 130 revolve in eccentric bearings, as indicated at 141, Figure 3.

The anvil rolls 140 are provided with vacuum ducts 142 communicating at appropriate times with a vacuum chamber 143, Figure 4, communicating by means of passages 145 with the hollow 146 in the shaft 147 in communication with conduits 148, 149, Figure 8, in communication with a suitable air pump.

To avoid destroying or lessening the embossing when embossed napkins are operated upon, the anvil rolls and the knife rolls 150 are desirably spaced as indicated in Figure 4 although shown in contact in the smaller sized view of Figure 8.

The knife rolls 150 carry knives 151 adjustably mounted in their periphery, coacting with anvils 152 upon the anvil rolls.

Since the napkins are cut through the plurality of thicknesses of each band by a direct pinch cut, there is a very considerable pressure required to cut the napkins. To resist this cutting action the shafts 147 and 154 are mounted in a frame comprising bars 155, 156 and beams 157, said beams being made in two parts as shown in Figure 3 clamped upon the bars 155, 156 by bolts 158. The shafts 147 and 154 do not revolve and the anvil and knife rolls are mounted thereon by means of anti-friction bearings as indicated in Figure 8. The shafts 147 and 154 are desirably made sectional as clearly indicated in Figure 8.

It will be seen from an inspection of Figure 4 that the vacuum of the anvil rolls will take the napkins immediately after passing the measuring rolls and continue to hold them after they are cut and until the cut lengths are delivered.

After a period of use the knife 151 will tend to produce a groove in the anvil to which the severed end of the napkins may adhere and to ensure the stripping of the napkins from these rolls doctors 160 are shown in Figures 3 and 4, the doctors for the several rolls being mounted upon a flexible strip 161 mounted upon the beam members 157.

The anvil, knife, and measuring rolls are driven by a chain 166 from shaft 53 driving a shaft 167 which by sprocket and chain 168 drives shaft 169 which in turn is geared to the

anvil rolls, which anvil rolls drive the knife rolls by means of gears 170, 171, and also drive the measuring rolls by gears 172, Figure 3.

The severed napkins leaving the anvil rolls pass between strippers 162, 163 to be delivered to the interfolding mechanism. The motion of the napkins up to this point is steady and continuous but the motion of the napkin through the interfolding mechanism is a step by step motion. To change the motion of the napkins and deliver the same to the interfolding mechanism, the napkins are seized at the end of the strippers 162, 163 by speed-up rolls 164, 165 which may be continuous across the machine. The distance from the point of cutting of the napkins by the knives to the speed up rolls 164, 165 is very little greater than the length of band cut off to form the napkins.

The structure of the speed up rolls and their drive is indicated in Figure 13. As there shown the roll 164 driven by chain 173 from shaft 156, Figure 3, drives roll 165 by means of gearing 174 and 175. The speed-up rolls are revolved so as to substantially double the speed of the napkins for an instant and to immediately release them, and are moved into and out of frictional engagement with the napkins by a cam 176 on shaft 167 acting upon a roller 178 carried upon an arm 179 connected to a stub shaft 180, Figure 14, which carries the bearing 181 for the shaft of roll 165 eccentrically, as shown in Figures 13 and 14. Therefore slight revolution of shaft 180 will move the roll 165 toward and away from roll 164 a distance less than the intermesh of gears 174, 175. The spring 182 is shown in Figures 13 and 14 to hold the roller 178 to the cam 176.

The strippers 162 are as shown in Figure 8 spaced apart, there being two of these strippers facing the operator, whereas the strippers 163 are spaced more nearly together. The spacing of the strippers 162 is for the purpose of enabling the operator to reach between them to pull out any napkin which may become jammed upon leaving the anvil roll.

From the speed-up rolls napkins are taken by means of quadrants 183 shown as provided at their leading edges 184 with vacuum nozzles communicating by conduits 185, Figure 8, with cut-off valves 186 making and breaking communication with the interior of hollow shaft 187 which is shown in communication with the conduit 149 of Figure 8.

The valves 186 have a limited motion about the shaft 187 between stops 188 and 189 mounted upon the frame as shown in Figure 3. The valves are moved by friction between the shoes 190 and the shaft, produced by spring 191 shown in Figure 8. It will be seen that in the position of Figure 7 the valve has just been opened by contact of the valve with stop 188, and that in the position of Figure 5 the vacuum has just been cut off to release the leading end of the napkin.

The sequence of operation follows through the positions of quadrants and tucker blades as shown in Figures 2, 3, 5, 6, and 7.

The quadrants 183 are driven by arms 192 driven by eccentrics 193 mounted upon shaft 56. The tucker blades 194, 195 are continuous across the machine for all six sheets and are carried by beams 196, 197 mounted upon movable pivots 198 carried by the arms 199, 200, of bell cranks pivoted at 201, 202 respectively. The remaining arms of the bell cranks 203, 204 are driven by cam 205, Figure 5, mounted upon the shaft 56. The beams 196 and 197 carry the rollers 206, 207 travelling in a cam groove 208 formed in disk 209 also mounted upon shaft 56, to produce the vertical movements of the tucker blades.

The principle of the operation of the tucker blades is precisely the same as that shown in prior patents granted to me, Nos. 1,572,817, February 9, 1926, and 1,707,580, April 2, 1929, differing therefrom in details only, one point of difference being that in the former structure the beams are urged inwardly by means of springs.

When the quadrants 183 release the trailing ends of the napkins, the said ends are given an impulse downwardly by means of a blast from a conduit 210 as indicated in Figure 7. To hold the trailing ends under slight tension against the subsequent motion of the tucker blade 194, in the position of Figure 2, the said ends rest upon a comber which is a rapidly revolving shaft 211 driven by a belt 212 from the shaft of speed up roll 164.

As shown in Figures 15 and 16, the angles 234, 235 forming the mouths of the chutes have bars 236, 237 respectively secured to their forward edges carrying projecting lugs 238 to receive the napkins from the tucker blades. The tucker blades are shown as slotted at 239 to pass said lugs. To prevent lateral misplacement of the napkins during interfolding, the tucker blades are shown as notched at 240, Figure 16.

Withdrawal of tucker blade 194 from the position of Figure 15 has a tendency to drag out the leading edge of the napkin. To prevent such action bowed spring fingers 241, 242 are shown secured at one end of each in recesses 243, 244 formed in the face of blade 195. These springs produce friction between said leading edge and the trailing edge of the preceding napkin which is greater than the friction of the smooth surface of blade 194 upon the leading edge in contact therewith.

To prevent the napkin from retrograde movement by friction with the quadrant 183 from the position of Figure 5, there is shown a shoe 213 carrying bristles 234 appropriately directed to resist said retrograde movement of the napkin. By action of the tucker bars, the interfolded napkins are fed into chutes shown in plan and end views in Figures 11 and 12, separated by means of chute bars 214, the ends of which bars approach very closely to the inward movement of the tucker bars.

The napkins at times may become jammed between the ends of the chute bars 214 and the tucker bars producing a resistance which might deform the tucker bars. To stop the machine in case of such jamming, the chute plate 215 is shown in Figures 11 and 12 as mounted at the forward end upon rolls 216 and at the rear end upon the upper ends of the arms 217 rigidly mounted upon shaft 218 having a crank arm 219 secured at each end thereof equipped with a weight 220 to urge the plate toward the forward position. A mercury switch 221 is shown mounted on the shaft 218, which will be actuated by slight revolution of the shaft 218 upon such rearward movement of the plate, which switch is connected to operate a circuit to stop the machine by means not shown.

The napkins are forced into the chutes in endless series and an attendant must remove the napkins in quantities to make up a package each. In order to mark the napkins at the point which should separate the packages, a counter is shown in detail in Figures 29 and 30 and in end view in

Figure 3. Said counter comprises a pawl member 222 carried by an arm 223 being mounted in an interchangeable position in a double ended socket 224.

As shown in Figures 29 and 30, the pawl is so mounted in the socket as to coact with a larger ratchet wheel 225 and may be reversed to coact with a smaller ratchet 226, the said ratchets being secured upon a shaft 227 carrying a disk 228 provided with a pin 229 which at each revolution of the shaft 227 will actuate a mercury switch 230 to close a circuit through a solenoid 231, Figure 12, to cause movement of a bar 232 carrying blades 233, Figure 11, one for each chute to slightly scarify the edges of one of the napkins to mark the division between the packages.

Minor changes may be made in the physical embodiment of the invention within the scope of the appended claims without departing from the spirit thereof.

I claim:

1. A paper folding and interfolding machine comprising, in combination: means to support a plurality of parent rolls of strips of paper to be folded; means to fold the respective strips into bands; means individual to each strip to cut the respective bands into lengths to be interfolded; individual means respectively to feed the lengths to interfolding means; common means to interfold the lengths cut from each band into individual package columns; and common drive means for the individual cutting and interfolding means.

2. The combination of claim 1 with means to so adjust the band folding means as to fold different widths of strips to a common standard width of band.

3. The combination of claim 1 with means to reduce the tension of the bands as delivered to the cutting means.

4. The combination of claim 1 with brakes upon the parent roll supporting means; power driven means to draw said strips from said parent rolls and power driven means to draw the bands from the band folding means; whereby to deliver the running paper from each means to the next with substantially no tension thereon.

5. The combination of claim 1 with a power driven booster roll between each parent roll and the band folding means receiving therefrom; a power driven booster roll between each band folding means and the cutting means receiving therefrom and means to adjust the speed of said booster rolls relative to the speed of said cutting means.

6. A paper folding and interfolding machine comprising, in combination: a revoluble support for a parent roll of paper; means to cut said paper into lengths and to interfold said lengths, booster means between said roll support and said cutting means to reduce tension of the paper as delivered to said cutting means.

7. A paper folding and interfolding machine comprising, in combination: a revoluble support for a parent roll of strip paper; a brake to control delivery from said roll; means to fold the running strip from said roll into a continuous band; means to cut said band into lengths; means to interfold said lengths; power driven booster means between said roll support and said band folding means; power driven booster means between said band folding means and said cutting means; and means to adjust the speed of the respective boosting means relative to each other and to said cutting means.

8. A paper folding and interfolding machine comprising, in combination: means to longitudinally fold a running strip of paper into a band; brake means to control the run of said paper to said folding means; means to cut said band into lengths and means to interfold said lengths; booster means to supply the paper to said folding means and to said cutting means substantially without tension comprising a pair of parallel shafts, a booster roll mounted upon each of said shafts; means to drive said shafts at a speed uniform with the speed of said cutting means; a sheave fixed to one of said shafts; a sheave fixed to the roll upon the remaining shaft; a belt to drive said roll; a sheave fixed upon said second named shaft; a sheave fixed to the roll upon the first named shaft; and a belt to drive the roll upon the first named shaft from said second named shaft.

9. The combination of claim 8 with means to adjust the effective diameters of said sheaves whereby to individually vary the speed of the respective rolls relative to the speed of the shafts.

10. A paper folding and interfolding machine comprising, in combination: means to fold paper into bands; means to cut said bands into lengths; speed-up means to receive said lengths from the cutting means acting to momentarily increase the speed of travel thereof and means to receive the lengths from the speed up means and to interfold the same.

11. A paper folding and interfolding machine comprising, in combination: means to fold a strip of paper into a longitudinally folded band; means to cut said bands into lengths; an oscillating member to feed said lengths to interfolding blades; vacuum means to provide a grip of said member upon said lengths; and means to prevent retraction of said lengths during return movement of oscillation of said feed means.

12. The combination of claim 11 wherein said retraction preventing means comprises a plurality of bristles engaging the paper at an acute angle to engage the paper upon attempted retraction thereof.

13. Paper interfolding means comprising oscillating means to advance successive sheets of paper to be interfolded; interfolding plates and blast means to depress the terminal edge of each sheet during the interfolding operation.

14. Paper interfolding means comprising: oscillating means to feed sheets to be interfolded; interfolding plates acting to interfold said sheets and revolving means to be engaged by the trailing edge of each sheet during the action of the plates upon the leading edge thereof to produce a slight tension in a direction away from the interfolding means.

15. A paper folding and interfolding machine comprising, in combination: paper cutting and interfolding mechanism; means to supply continuously running bands of longitudinally folded strips to said mechanism comprising a plurality of backstands; a plurality of parent rolls mounted upon each stand; and paper guiding means for each of said bands; the bands delivered from each backstand being interpolated between the bands from the remaining backstands.

16. A paper folding and interfolding machine comprising, in combination: means to longitudinally fold a plurality of strips of paper into running bands; means to cut said bands into lengths and to interfold said lengths, comprising a plurality of cutting rolls one for each band mounted

upon a common shaft; an anvil roll coacting with each cutting roll, said anvil rolls mounted upon a common shaft parallel to the first named shaft; and means connecting said shafts between said rolls to prevent spreading thereof under strain of the cutting operation.

17. A paper folding and interfolding machine comprising, in combination: means to supply strips of paper to be cut and interfolded; means to cut said running strips into sheets; means to receive said sheets from said cutting means comprising a pair of speed-up rolls driven at a speed in excess of that of said cutting means; interfolding feed means to receive the sheets from said speed-up rolls; means to move said speed-up rolls relative to each other to and from gripping relation to the sheets; said last named means acting to cause said rolls to grip the paper only momentarily slightly in advance of the action of said feed means.

18. A paper interfolding machine comprising, in combination: means to cut a plurality of strips of paper into sheets to be interfolded; means to interfold said sheets from the respective strips acting to deliver the interfolded sheets into chutes in continuous columns; common means comprising a revoluble member driven in synchronism with said cutting means; a pawl arm reciprocated by each revolution of said member; a plurality of ratchet wheels of differing diameters and formed with teeth of the same spacing, rigid on a common shaft, a pawl carried by said arm shiftable to coact with any chosen ratchet wheel; means actuated at each revolution of the ratchet wheel shaft to score an edge of an interfolded sheet in each chute to indicate a division thereof into packages; whereby shifting of the pawl may cause a variation of indicated size of package.

19. A paper folding and interfolding machine comprising, in combination: means for holding a parent roll of paper strip to be operated upon; a triangle to receive from said parent roll; folding means to fold said strip into a band; means to adjust said holding means to take rolls of different width strips; and means to adjust the location of the roll upon the holding means to deliver the same to the triangle to vary the fold produced by the latter.

20. The combination of claim 19 with means to adjust the relation of the triangle to said band folding means to vary the fold produced by the latter.

21. A paper folding and interfolding machine comprising, in combination: means to support a plurality of groups of parent rolls of strip paper to be folded; means to fold the respective strips into bands; means to feed the bands from each group in interpolated relation with the bands from another group; means individual to each band to cut respective bands into lengths; means individual to each band to feed the respective cut lengths to interfolding means; common interfolding means for said lengths; and common drive means for the individual cutting and feeding means.

22. Paper interfolding means comprising interfolding blades reciprocated in their own planes to overlapping position; means to move each blade to the rear of the other upon inward movement thereof; oscillating means to move the leading edge of each length to be acted upon by said blade into the fold to be enclosed by the trailing edge of the preceding sheet; and vacuum means to cause said oscillating means to grip said leading edge.

23. The combination of claim 22 with means to break the vacuum upon start of retrograde movement of the oscillating means.

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