

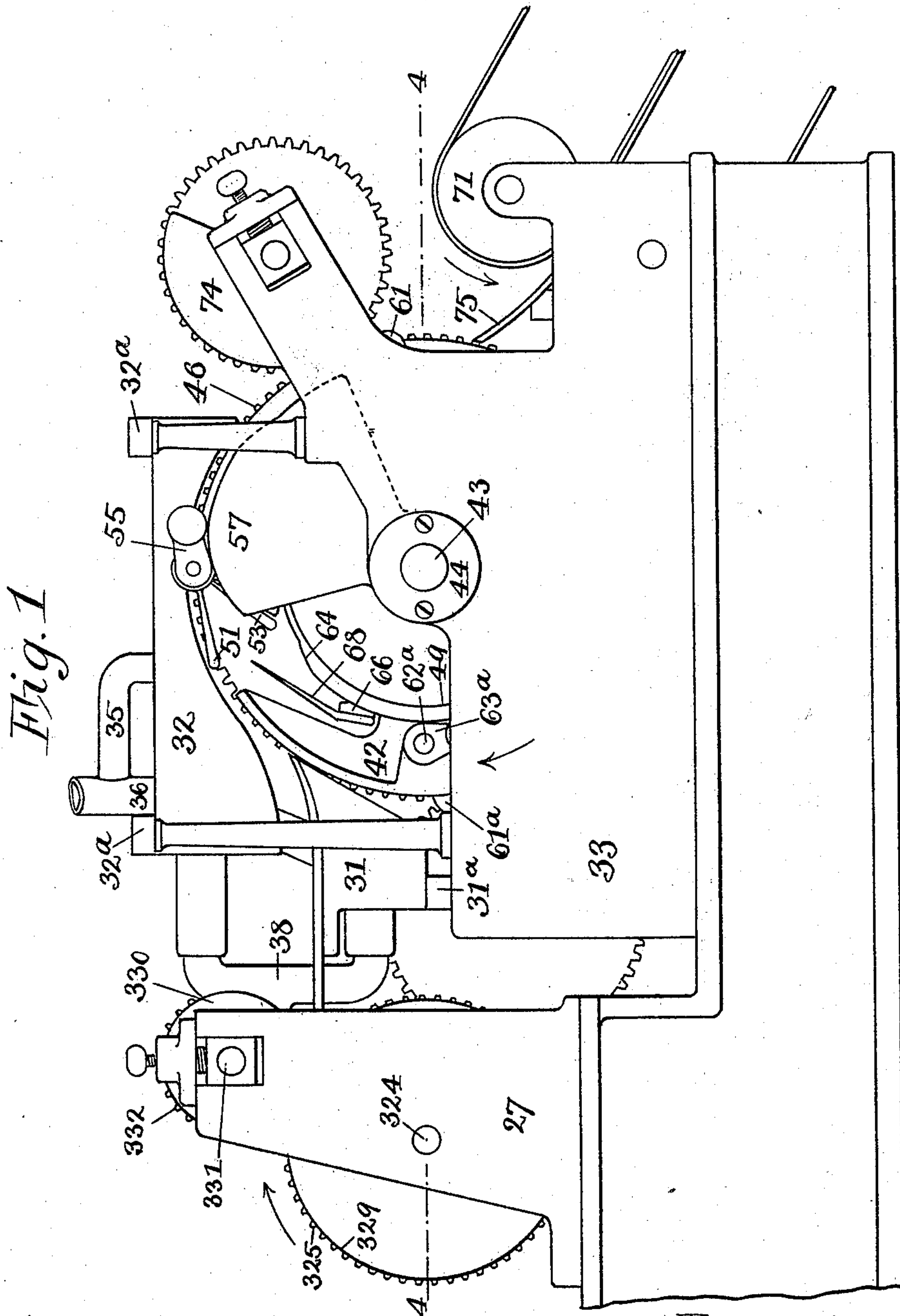
(No Model.)

6 Sheets—Sheet 1.

W. A. LORENZ.  
PAPER BAG MACHINE.

No. 591,175.

Patented Oct. 5, 1897.



Witnesses:  
*Jennie Nellis.*  
*A. Howe*

Inventor:  
*William A. Lorenz*  
By his Attorney *W. H. Thomas.*

(No Model.)

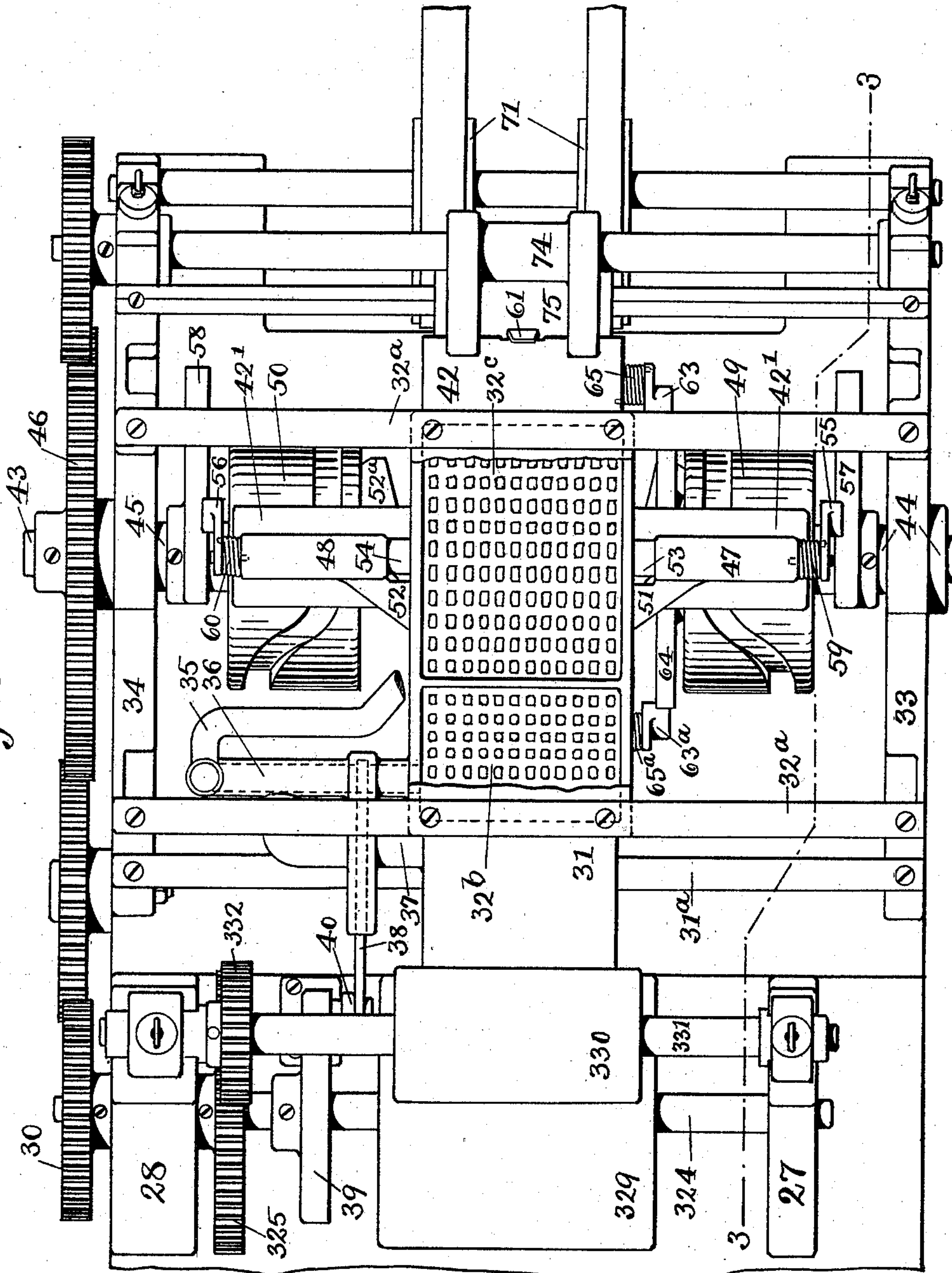
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Fig. 2



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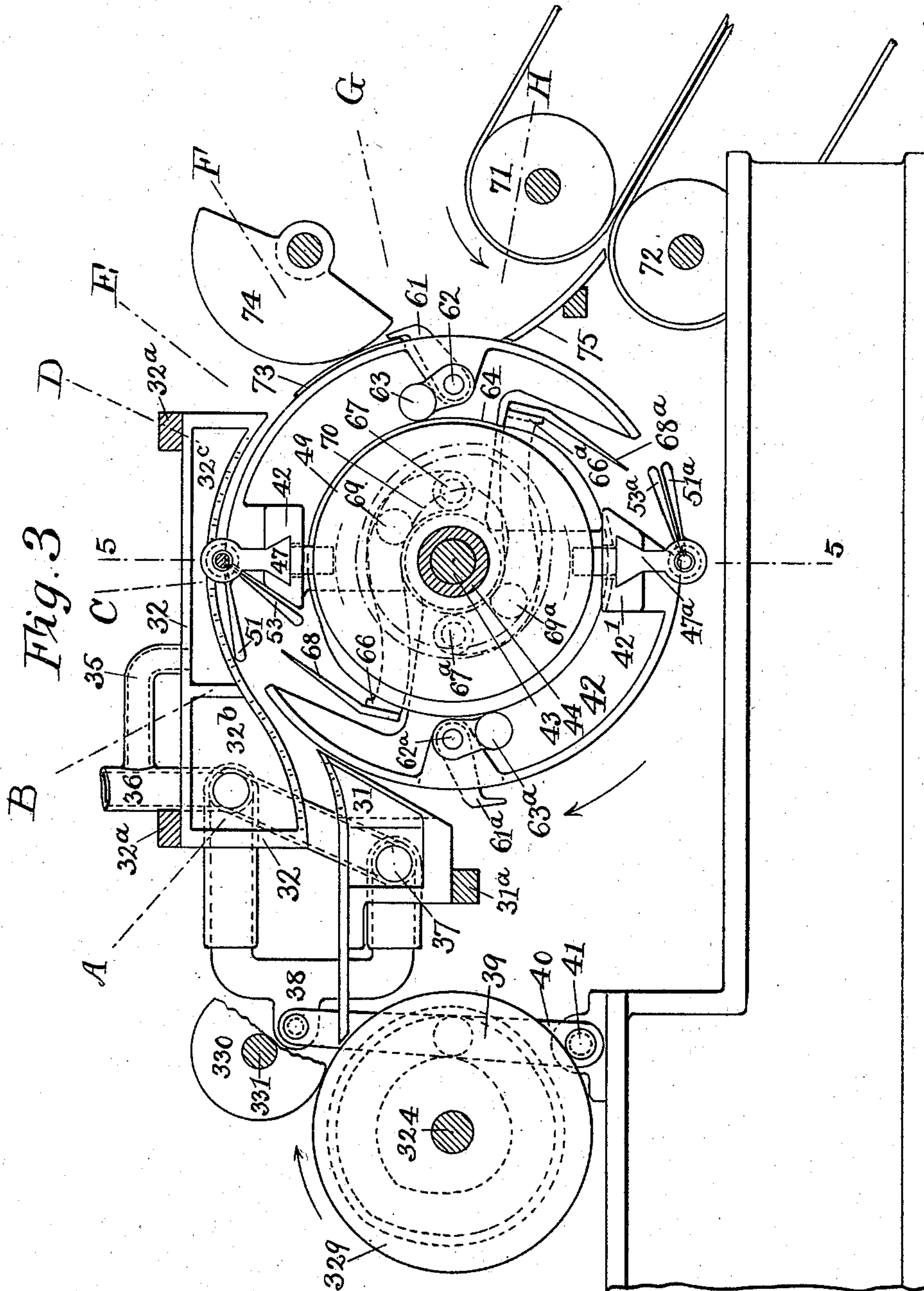
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(No Model.)

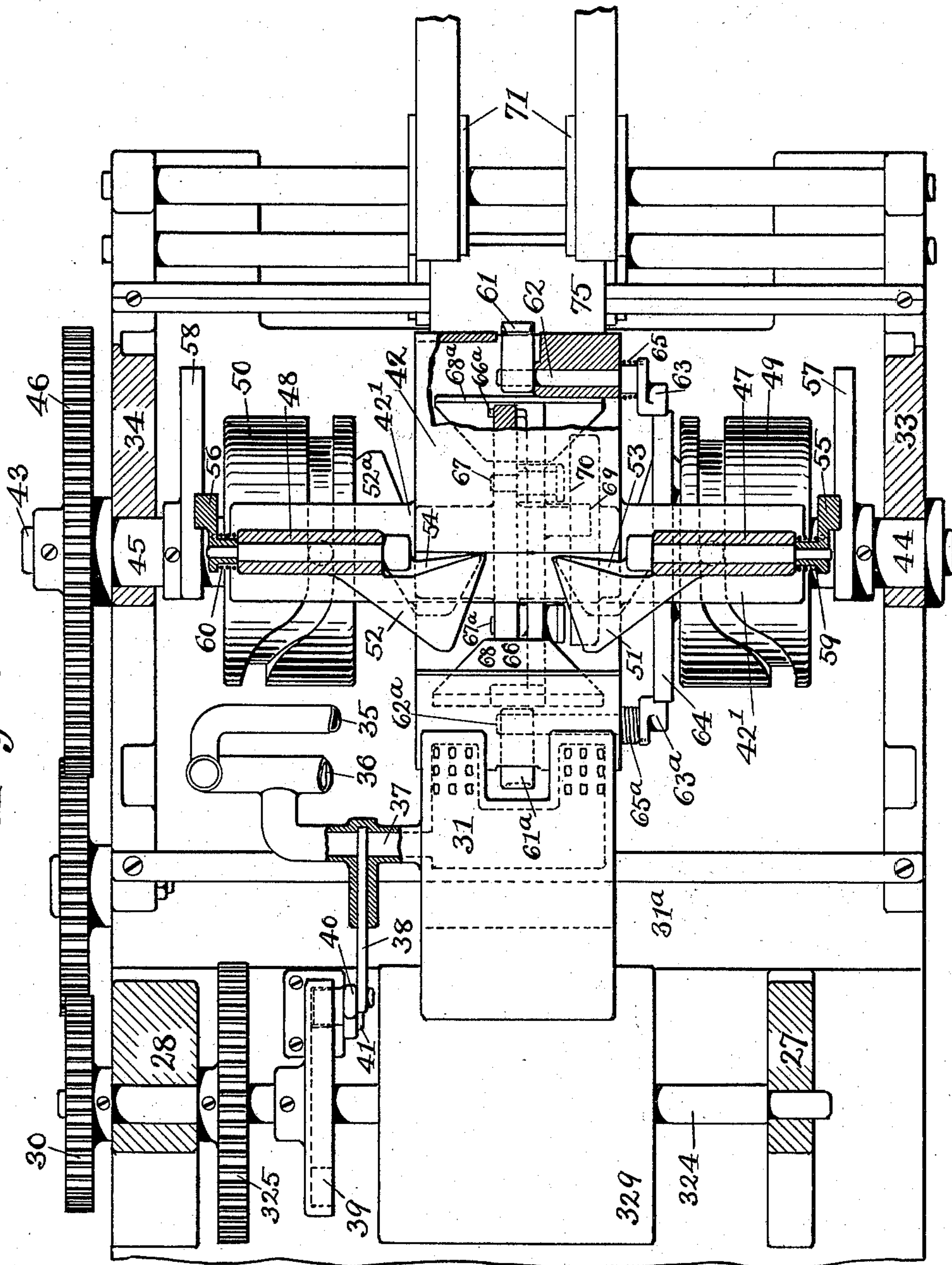
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Fig. 4



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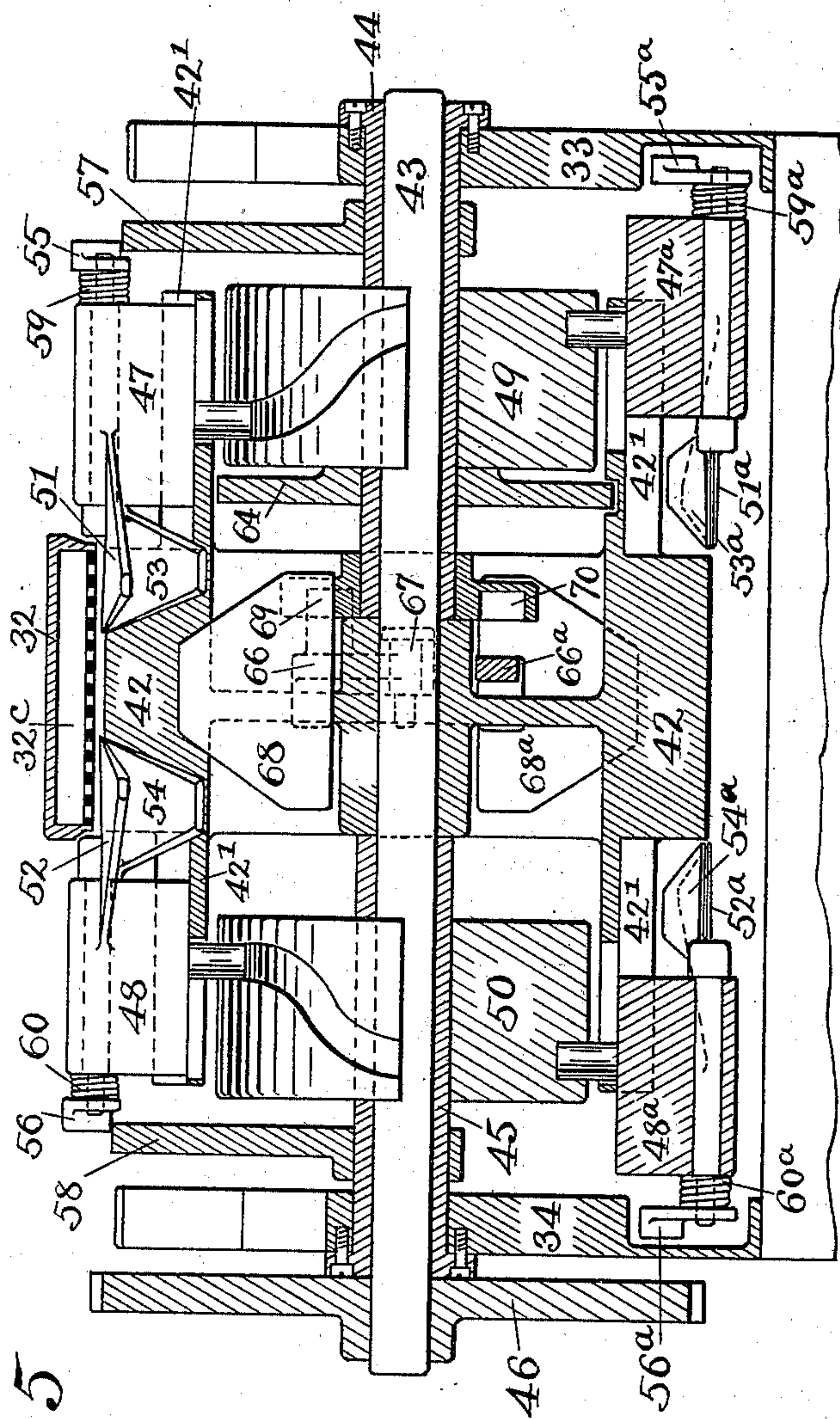


Fig. 5

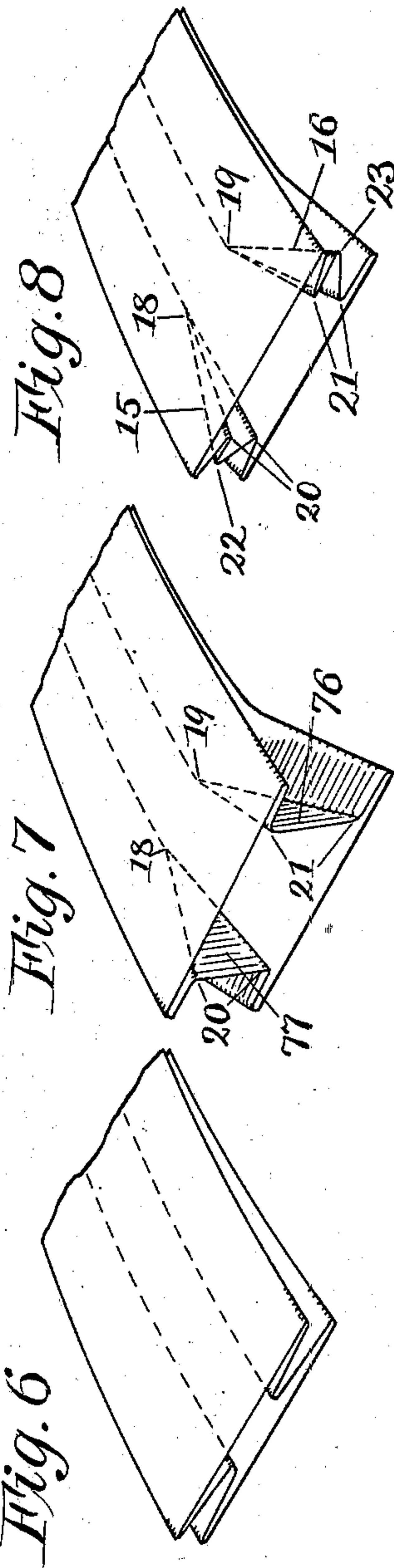


Fig. 6

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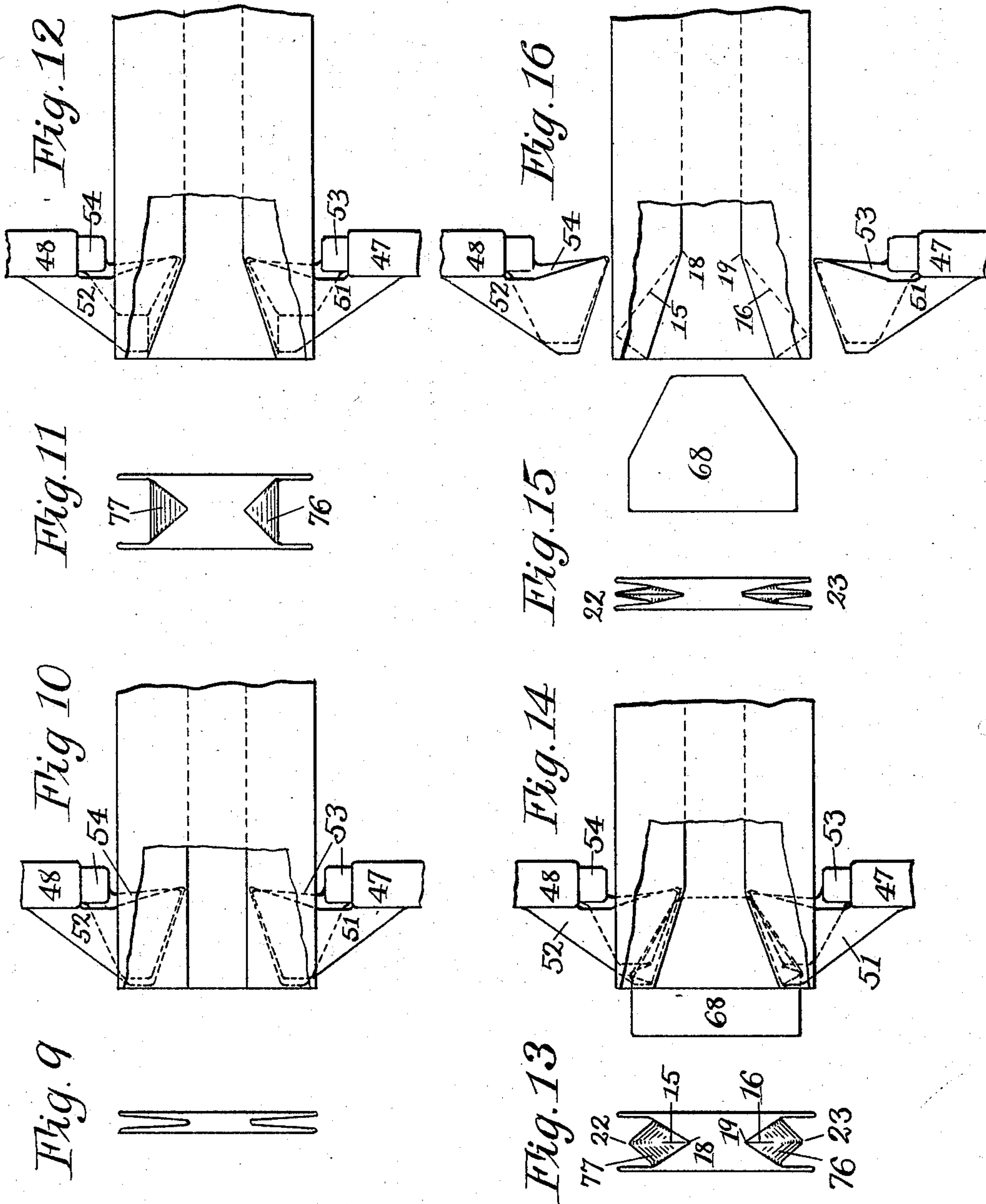
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6 Sheets—Sheet 6.

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# UNITED STATES PATENT OFFICE.

WILLIAM A. LORENZ, OF HARTFORD, CONNECTICUT, ASSIGNOR TO ALBERT H. WALKER, TRUSTEE, OF SAME PLACE.

## PAPER-BAG MACHINE.

SPECIFICATION forming part of Letters Patent No. 591,175, dated October 5, 1897.

Application filed January 6, 1897. Serial No. 618,203. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM A. LORENZ, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Paper-Bag Machines, of which the following is a full, clear, and exact specification.

The subject of this invention is a machine for performing a new function in connection with the manufacture of paper bags having inwardly-tucked bellows sides, that function being to reverse the upper ends of each of the bellows sides of the bag upon their central fold-lines for a distance from the mouth end of the bag substantially greater than the original depth of the tucked sides, thus producing an outer acute angled reëntrant tuck in each of the bellows sides. A bag thus folded will when opened naturally take an open funnel-shaped form, having a mouth-opening substantially coextensive with the entire area of its body, the inclined walls formed by my improved folds in the tucked sides tapering thence to the points where those improved folds terminate.

In a contemporaneously-pending application, Serial No. 596,190, filed June 19, 1896, I have shown, described, and claimed a paper bag having the above-described funnel-shaped form of mouth; and the object of my present invention is to provide a machine for automatically and rapidly performing the operation of converting the mouth end of any bellows-sided bag into the form shown in the above-mentioned application, and shown also in Fig. 8 of the accompanying drawings.

Figure 1 of the drawings is a side view of a machine embodying my present invention. Fig. 2 is a plan view of the machine of Fig. 1, the upper wall of the upper suction-boxes being removed in order to show the perforations in the bottom of those boxes. Fig. 3 is a side view in section taken on the line 3 3 of Fig. 2. Fig. 4 is a plan view of the machine with the upper suction-box removed, the framing being shown in section on the line 4 4 of Fig. 1. Fig. 5 is an end view, looking toward the right, in section taken on the line 5 5 of Fig. 3. Figs. 6, 7, and 8 are perspective views of the upper or mouth portion of

a bellows-sided paper bag, Fig. 6 representing that portion in the usual well-known form in which it is now delivered from a paper-bag-making machine. Fig. 7 represents the mouth end of the bag expanded by the operation of the machine of my present invention to the condition shown also in Figs. 11 and 12 of the drawings, the bag being folded to this form when its folding devices are at the position C in Fig. 3. Fig. 8 represents the bag completely folded, as shown in Figs. 15 and 16 and as it would appear when the folding mechanism is at the position H, shown in Fig. 3. Fig. 9 is an end view of the blank of Fig. 6, while Fig. 10 is a plan view of that blank, showing my improved folding devices after they have entered the tucks and while at the position B of Fig. 3. Fig. 11 is an end view of the bag, and Fig. 12 a plan view thereof with its folding devices in the position occupied by them when at C of Fig. 3. Fig. 13 is an end view of the bag, and Fig. 14 a plan view thereof and of the folding devices in the position occupied by them at E. Fig. 15 is an end view of the completed bag; and Fig. 16 a plan view thereof, the latter showing also the folding-blades withdrawn from the completed folds to the position occupied by them at H in Fig. 3.

The devices of my present invention may be employed as an independent machine by providing suitable means for driving it and with means for feeding the blanks thereto in proper time and register, but I prefer to combine these devices directly with other mechanism for forming the bottom folds of the bag, either operating upon the blanks in advance of that bottom-folding operation or operating upon the bags as they pass from the bottom-folding mechanism, as herein shown.

The organization of mechanism shown and described herein is adapted to form an auxiliary to the paper-bag-making machine shown and described in United States Letters Patent to W. A. Lorenz and W. H. Honiss, No. 361,951, of April 26, 1887, the feed-rolls 329 and 330 being considered as equivalents of or substitutes for the similarly-designated final rolls of the machine of the above-mentioned patent. The mechanism is herein shown to be driven by a train of gears receiving their motion from the gear 325 on the shaft 324,



corresponding to the similarly-designated shaft and gear of that patent. When the machine of my present invention is thus employed as an auxiliary to a machine making the well-known bellows-sided square-bottomed bags—such as that shown in the patent to M. L. Deering, No. 227,350, of May 11, 1880—the diameters of the blank-carrying rolls employed in the auxiliary folding devices may be less than those of the corresponding rolls employed in the principal machine, inasmuch as the original length of the blank is considerably shortened by the bottom-folding operations, and the bag therefore is considerably shorter when it passes the rolls 329 330 than when it was severed from the tube as a blank. On account of this shortening of the blank in its transformation into a bag the diameters, and hence the lineal speeds of the blank-carrying rolls of my improved devices, may be reduced, as herein shown by a comparison of the diameters of the gears 325 and 30, thus lessening the linear speed at which all the subsequent devices are driven.

The feeding-rolls 329 and 330 are mounted upon the shafts 324 and 331, journaled in the brackets 27 and 28, and are provided with the gears 325 and 332, respectively, by means of which they receive their motion from the train of gearing of the bag-making machine. The bags pass from the feed-rolls 329 and 330 between the suction-boxes 31 and 32. These suction-boxes are supported by the cross-braces 31<sup>a</sup> 32<sup>a</sup>, respectively, upon the side frames 33 and 34 of the machine. The suction-box 32 is divided into two compartments 32<sup>b</sup> and 32<sup>c</sup>, the latter of which is connected, by means of the air-pipe 35, with a suitable exhausting apparatus, (not shown herein,) whereby a partial vacuum is constantly maintained within that compartment. The compartment 32<sup>b</sup> and the suction-box 31 are also connected, by means of the air-pipes 36 and 37, with the exhausting apparatus, and these latter pipes are provided with a gate 38, by means of which the connection between the exhausting apparatus and the suction-boxes 32<sup>b</sup> and 31 may be interrupted, the time and durations of these interruptions being controlled by the cam 39, fixed upon the shaft 324. That cam engages with the lever 40, pivoted at 41 to the bed of the machine, the upper end of the lever being connected to the gate 38. As the cam 39 is upon the same shaft with the feed-roll 329, it repeats the operation of the gate for each bag fed into the machine. The suction-box 31 is placed below the path of travel of the bag, leading from the rolls 329 and 330 to the cylinder 42, while the suction-box 32 is located above that path, its lower or suction surface following the curvature of the cylinder, leaving an annular space between them sufficient for the passage of the bag, as best shown in Fig. 3.

The cylinder 42 is fixed upon the shaft 43, and that shaft is journaled in the bushings 44 45, fixed in the side frames 33 and 34, re-

spectively. The shaft 43 has fixed upon it the gear 46, by means of which it is connected with the train of gearing shown in Figs. 2 and 4. The cylinder 42 is so geared with relation to the feed-roll 329 that the latter makes two revolutions to each revolution of the cylinder, which is therefore provided, as shown, with two oppositely-disposed sets of folding devices. These two sets are exactly alike in construction and mode of operation, and a description of them will now be given.

The slides 47 and 48 are mounted upon oppositely-disposed extensions 42' of the cylinder 42 and are provided with lugs engaging with the cams 49 and 50, fixed upon the bushings 44 and 45, respectively. Upon each of these slides is mounted a pair of my improved tuck-spreading devices, each pair consisting of a fixed and a movable blade. The blank-engaging edges of the blades are inclined to coincide with the desired inclination of the lines 18 20 and 19 21 of the blank of Fig. 8, the lines of these inclined edges intersecting each other and the axis upon which the movable blade turns at the apices 18 19 of the folds. The fixed blades 51 and 52 are preferably integral with their respective slides and are disposed in substantially a tangential relation to the outer circumference of the cylinder 42, as best shown in Figs. 1, 3, and 5. The movable blades 53 and 54 are provided with stems or shafts journaled in the slides 47 and 48 upon the opposite sides of the cylinder, the axes of these shafts being located at the level of the periphery of the cylinder and substantially in line with each other. The outer ends of the oscillating blades have fixed thereon the cam-arms 55 and 56, which engage with the cams 57 and 58, respectively, also fixed upon the bushings 44 and 45, as best shown in Figs. 4 and 5. The arms 55 and 56 have coiled upon them the springs 59 and 60, one end of each spring being attached to its arm and the other to its slide, so that the arms are held in contact with their respective cams by the torsional action of the springs.

Upon the cylinder 42, diametrically opposite to the slides 47 and 48, are similarly mounted the slides 47<sup>a</sup> 48<sup>a</sup>, which are also operated by the cams 49 and 50. These slides are provided with the fixed blades 51<sup>a</sup> 52<sup>a</sup> and with the oscillating blades 53<sup>a</sup> 54<sup>a</sup>, the latter being provided with cam-arms 55<sup>a</sup> 56<sup>a</sup>, engaging also with the cams 57 and 58. The extent of movement imparted to the slides toward and from the cylinder may best be seen by a comparison of the position occupied by the slides 47 and 48 with that of the slides 47<sup>a</sup> 48<sup>a</sup> on Fig. 5, while the extent of movement imparted to the oscillating blades by their cams 57 and 58 may best be seen by a comparison of the position occupied by the blades 53 and 54 with that of the blades 53<sup>a</sup> and 54<sup>a</sup> in Fig. 3.

At diametrically opposite locations upon the cylinder are mounted the grippers 61 61<sup>a</sup>, the former being mounted at a distance in



advance of the slides 47 and 48 suitably proportioned to the length of the blanks to be operated upon, while the gripper 61<sup>a</sup> is located at a corresponding distance upon the cylinder in advance of the slides 47<sup>a</sup> 48<sup>a</sup>, as best shown in Fig. 3. These grippers are mounted, as shown in Fig. 4, in suitable recesses in the cylinder, being fixed upon the shafts 62 62<sup>a</sup>, the opposite ends of which have fixed upon them the cam-arms 63 63<sup>a</sup>, which engage with the cams 64, fixed upon the bushing 44. The springs 65 65<sup>a</sup>, attached between the cam-arms and the cylinder, operate to press their respective grippers toward its closed position upon the cylinder occupied by the gripper 61 in Fig. 3, the grippers being raised at suitable times by the cam 64 to the position occupied by the gripper 61<sup>a</sup> in Fig. 3.

The folder-arms 66 and 66<sup>a</sup> are pivotally mounted at the diametrically opposite positions 67 67<sup>a</sup> upon the cylinder 42, and these arms are provided with blades 68 68<sup>a</sup>, which are located in suitable relation to the folding-blades carried upon the slides 47 48 and 47<sup>a</sup> 48<sup>a</sup>, respectively, the arms being provided with lugs 69 69<sup>a</sup>, which engage in a groove in the side of the cam 70. The opposite side edges of these blades are inclined, as shown in Fig. 15, to agree with the inclination of the fold-lines 18 22 and 19 23 of the blank shown in Fig. 8, and the extent of movement imparted to them by their cam 70 is sufficient to move them from the position shown in Fig. 3 to that shown in Fig. 14, the inclined edges of the blade defining those fold-lines by reversing this portion of the side tucks upon their inner fold-lines and stretching the adjacent plies against the angular edges of the blades 51 52 53 54, those blades being at that time somewhat closed from the widest open position shown in Fig. 3 and the end of the blank being in the condition shown in Fig. 13.

The machine is provided with rotating delivery-rolls 71 and 72, which may be provided with belts, as shown, by means of which the completed bags are delivered from the machine to a drier or to any convenient receptacle. Upon reaching the position occupied by the bag 73 of Fig. 3 it may be released from its gripper 61, being then held by the gripper-roll 74, by means of which the bags are moved forward with the cylinder over the guide-plate 75 to and between the delivery-rolls 71 and 72.

The cylinder 42 is provided with diametrically opposite recesses for the two sets of folder-blades 68 68<sup>a</sup> and also to allow of the movement of the oscillating blades 53 53<sup>a</sup> and 54 54<sup>a</sup>.

A description will now be given of the mode of operation of this machine, reference being made chiefly to Fig. 3, in which, for convenience, the successive positions of the axes of the oscillating blades 53 and 54 are indicated by the radial lines A B C D E F G H.

The bags are fed at regular intervals between the feed-rolls 329 and 330 either from

the delivery-rolls of a paper-bag machine or in any preferred way. During the time that the leading end of the bag is passing between the suction-boxes 31 and 32<sup>b</sup> the air-valve 38 is closed, so that the suction does not operate upon the bag at this time. Upon reaching the cylinder the leading end of the bag is seized by the gripper 61, and thenceforth moves with the speed of the cylinder. As the latter or mouth end of the bag reaches the suction-boxes 31 32<sup>b</sup> the valve 38 is opened, allowing the suction to operate upon the side plies of the mouth of the bag, thus drawing them apart and opening the tucked sides for the entrance of the tuck-spreading blades 51, 52, 53, and 54, which between the locations A and B are moved to their inner position in the tucked sides of the blank, as shown in Fig. 10. The oscillating blades 53 and 54 are then moved downward or away from the blades 51 and 52. When the center of oscillation of the blades 53 and 54 reaches the position C of Fig. 3, they are in the open position shown in that figure and shown also in Fig. 12, opening the mouth of the bag or blank to the position shown in Figs. 7 and 11, thus distending that mouth and forming the flat acute-angled triangular plies 76 77. Then the blade 68 moves into the mouth of the bag until at the position D of Fig. 3 its beveled edges come into contact with the longitudinal centers of the triangular plies 76 77, thus reversing those plies substantially upon the lines 18 22 and 19 23 of Fig. 8, the oscillating blades 53 and 54 closing at the position E of Fig. 3, as shown also in Fig. 14, so as to enable the mouth of the bag to close again to the form shown in Fig. 13. Upon reaching the position E the folder-blade has been moved to its full depth and at position F is fully withdrawn, the blades 53 and 54 meanwhile closing upon the reversed folded plies 76 and 77 until at the position G they have fully closed against the blades 51 and 52, flattening the plies between them to the condition shown by the bag of Fig. 8. Upon reaching the position H of Fig. 3 the tuck-spreading blades are fully withdrawn by means of their slides 47 and 48, as shown in Fig. 16, the bag being now released from the cylinder and being delivered therefrom by means of the rolls 71 and 72 or by any other convenient means.

The suction-box 32<sup>a</sup> operates to hold open the upper or outer ply of the bag until the latter passes the position E, thus serving to hold that ply flat, so as to prevent its sides from being crowded together by the operation of the folding-blades, thereby preventing distortion of the folds formed therein by those blades. As above stated in connection with the description of this box, a constant vacuum is maintained therein, since there is no necessity for interrupting its action. The vacuum-box 32<sup>b</sup> is made independent in order to enable the suction therein to operate intermittently, like that of the suction-box 31,



being stopped while the bag is passing to the cylinder and until it is seized by the grip 61 or by the gripper 61<sup>a</sup>, as the case may be.

The cylindrical folding-bed 42 is herein shown to be of a diameter sufficiently large to accommodate two diametrically opposite sets of my improved folding devices. This arrangement, however, is not an essential feature of this invention, as a single set of those folding devices might obviously be similarly placed upon a cylindrical bed of about one-half the diameter of that herein shown. I prefer, however, to employ a folding-bed large enough to accommodate two or even three sets of these folding devices, as the curvature of the larger periphery approximates more nearly to the plane folds which are to be formed in the bag or blank, thereby rendering the formation and subsequent flattening of those folds more easy of accomplishment. By the use of the larger periphery I am also enabled to extend and separate the suction-boxes and the other devices external to the cylinder, thereby enabling them to be made of convenient size and affording them ample room to perform their respective functions.

I claim as my invention—

1. Means for spreading the mouth end of the tucked side of a paper-bag blank, and for defining the limits of the described mouth-folds therein, consisting of a pair of blades having inclined edges for defining the lines 20 of the described blank, means for moving the blade into the tuck, and means for oscillating one of the blades whereby they are separated to an angular extent substantially equal to the desired angle of the triangular ply 76.

2. Means for spreading the mouth end of the tucked side of a paper-bag blank, and for defining therein the lines 20 of the triangular ply 76, consisting of a pair of blades, one of which is arranged to oscillate upon an axis which intersects the bottom of the tucked side at the desired location of the apex 19 of the triangular ply, with means for moving the blades into the tucks, and for oscillating the movable blade to an extent substantially equaling the desired angle of the triangular ply 76, substantially as described.

3. Means for forming reëntrant plies in the mouth end of the tucked sides of a paper bag, consisting of angular blades for entering and spreading the side tucks, and of a folder-blade having beveled sides for reversing and doubling outwardly the plies thus opened, substantially as described.

4. Means for forming the described folds in a paper bag, consisting of two pairs of tuck-spreading blades, disposed on opposite sides of the bag-blank, means for carrying each pair of blades into its adjacent side tuck and for oscillating one of the blades of each pair so as to spread the side tucks, whereby an acute-angled triangular ply is formed in each of them, and a blade having inclined side edges for reversing the middle fold of each of the triangular plies by folding them between

the respective pairs of tuck-spreading blades, substantially as described.

5. Means for forming the described angular folds in the tucked side of a bag-blank, consisting of a pair of angular blades, one of which is movable upon an axis transverse to the bag-blank, at a point thereof at which the common apex of the triangular folds is to be located, and a folding-blade arranged to pass into the mouth of the bag between the angular blades when in their open position, reversing the middle fold of the tuck and doubling between the blades, substantially as described.

6. Means for forming the described fold in the tucked side of a paper-bag blank, consisting of blades having inclined edges for defining the lines 18 20, and a folder-blade having an inclined edge cooperating therewith to reverse the triangular ply 77 upon its middle fold by doubling it outwardly between and against the defining edges of the blades, substantially as described.

7. In combination with a blank-carrying folding-bed, two oppositely-disposed pairs of tuck-spreading blades carried thereon, having inclined edges for defining the outer limits of the desired folds, means for moving the blades into and out of the side tucks of the blank, and for moving one of each pair of the blades so as to spread the side tucks, and a folder-blade arranged to pass into the mouth end of the blank, having inclined edges for folding outwardly between each of the pairs of blades the triangular portions of the side tucks lying between and defined by them.

8. Means for forming the described mouth-folds in a paper-bag blank, consisting of a traveling folding-bed, means for gripping the forward end of the bag or blank upon the bed, suction devices for separating the two side plies adjacent to the mouth end of the bag-blank, oppositely-disposed tuck-spreading blades carried upon the traveling folding-bed, one of the blades being movable upon an axis coincident with the apex of the triangular mouth-folds to be made, and a folder for reversing the triangular plies formed by the tuck-spreading blades and doubling those plies between those blades, substantially as described.

9. The combination of a traveling blank-carrying folding-bed, a gripper mounted thereon arranged to grip the leading end of the bag or blank to the cylinder, a suction-box having its suction-surface arranged adjacent to and substantially parallel with the path of travel of the blank, whereby the outer ply of the blank is drawn away from the ply which is in contact with the folding-bed, and is held flatly in contact with the suction-box, thereby resisting the tendency of the folding devices to distort the blank by crowding it together laterally, substantially as described.

10. The combination of a traveling blank-carrying folding-bed, a gripper thereon for seizing the leading end of the blank and hold-



ing it to the folding-bed, stationary suction-boxes arranged on opposite sides of the path of the blank, with means for timing the operation of the suction in the boxes, whereby it operates only upon the rearward or mouth ends of the passing blanks, for the purpose specified.

11. The combination of a rotating cylindrical folding-bed, a gripper mounted thereon for seizing the front end of the bag or blank, suction-boxes arranged on opposite sides of the path of the blank, leading to the folding-bed, means for timing the operation of the suction therein, whereby it operates only upon the rearward or mouth ends of the passing blanks, the suction-boxes on the outer side of the blank being extended part way around the cylinder in substantial conformity therewith, with means carried upon the cylindrical folding-bed for spreading the side tucks of the blank at its mouth end, and for forming therein the described mouth-folds.

12. In combination with a rotating cylindrical blank-carrying folding-bed, a suction-box 32 mounted with its suction-surface substantially parallel with and adjacent to the path of the blank, to and part way around the cylindrical folding-bed, the suction-box being provided with two compartments, with means for causing the suction to operate intermittently in the first compartment, and to operate constantly in the second compartment, substantially as described and for the purpose specified.

13. The combination of a rotating cylindrical folding-bed, provided with means for gripping the leading end of the blank thereto, slides mounted upon opposite sides of the

folding-bed and moving toward and from the cylinder, each slide having fixed thereon a tuck-spreading blade, located substantially in a tangential relation to the periphery of the cylindrical folding-bed, a movable tuck-spreading blade journaled in each of the slides upon coincident axes located transversely to the cylinder, and substantially at the periphery thereof, means for moving the slides toward and from the cylinder, and with means for oscillating the movable blades away from the fixed blades, substantially as described.

14. The combination of a rotating cylindrical folding-bed, provided with means for gripping the leading end of the blank thereto, slides mounted upon opposite sides of the folding-bed and moving toward and from the cylinder, each slide having fixed thereon a tuck-spreading blade, located substantially in a tangential relation to the periphery of the cylindrical folding-bed, a movable tuck-spreading blade journaled in each of the slides upon coincident axes located transversely to the cylinder, and substantially at the periphery thereof, means for moving the slides toward and from the cylinder, means for oscillating the movable blades away from the fixed blades, and a folder journaled upon the traveling folding-bed, and oscillating in the plane of movement thereof, with means for moving the folder into the angular opening between the fixed and the movable tuck-spreading blades, substantially as described.

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