

June 29, 1926.

1,590,652

G. A. SHAFFER ET AL

CORNUCOPIA FOLDING MACHINE

Filed Dec. 31, 1924

7 Sheets-Sheet 1

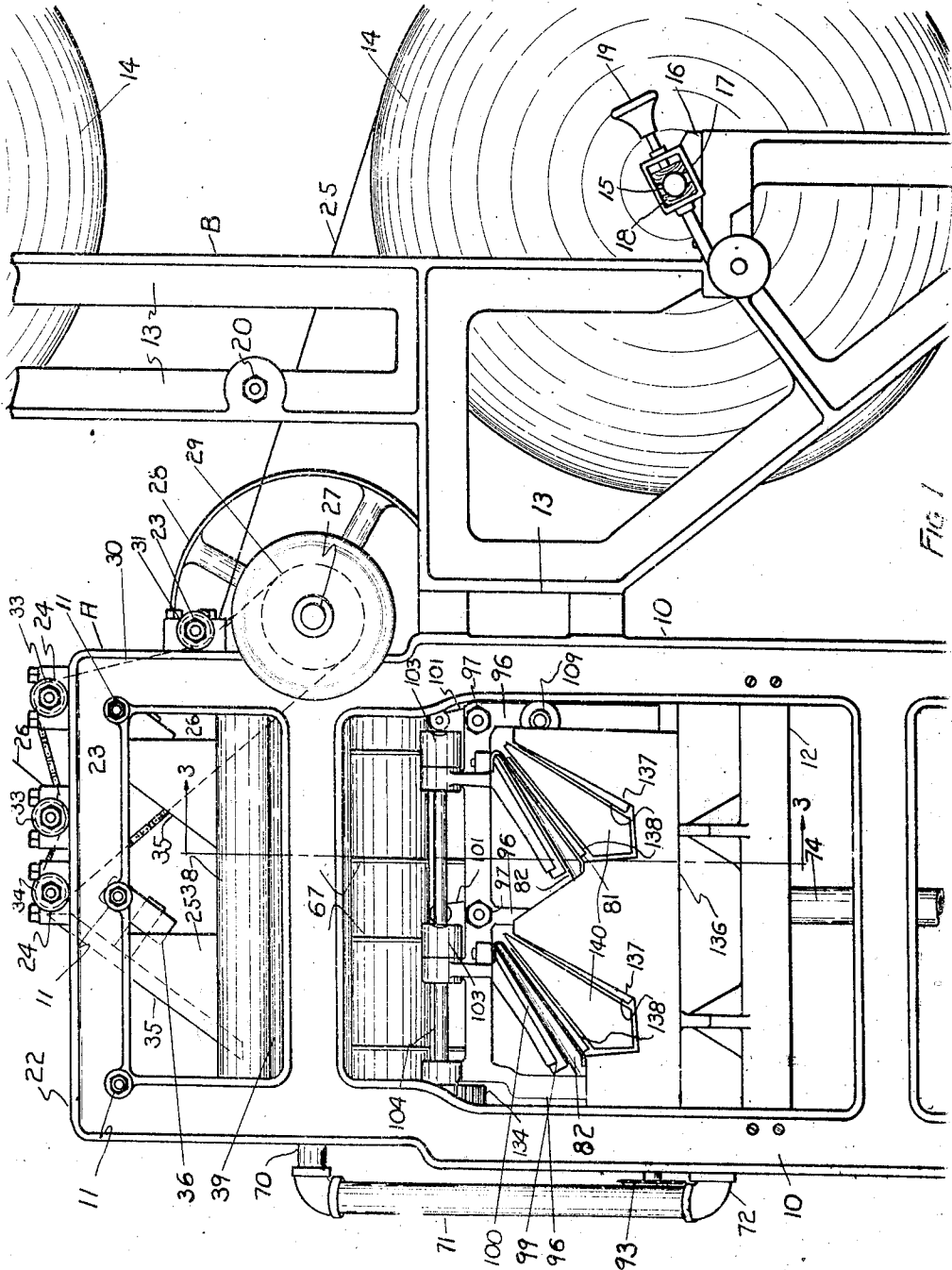


FIG. 1

GLENN A SHAFFER INVENTORS
FRANKLIN H. WIRTZ
BY
Paul V. Harker
ATTORNEYS

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7 Sheets-Sheet 2

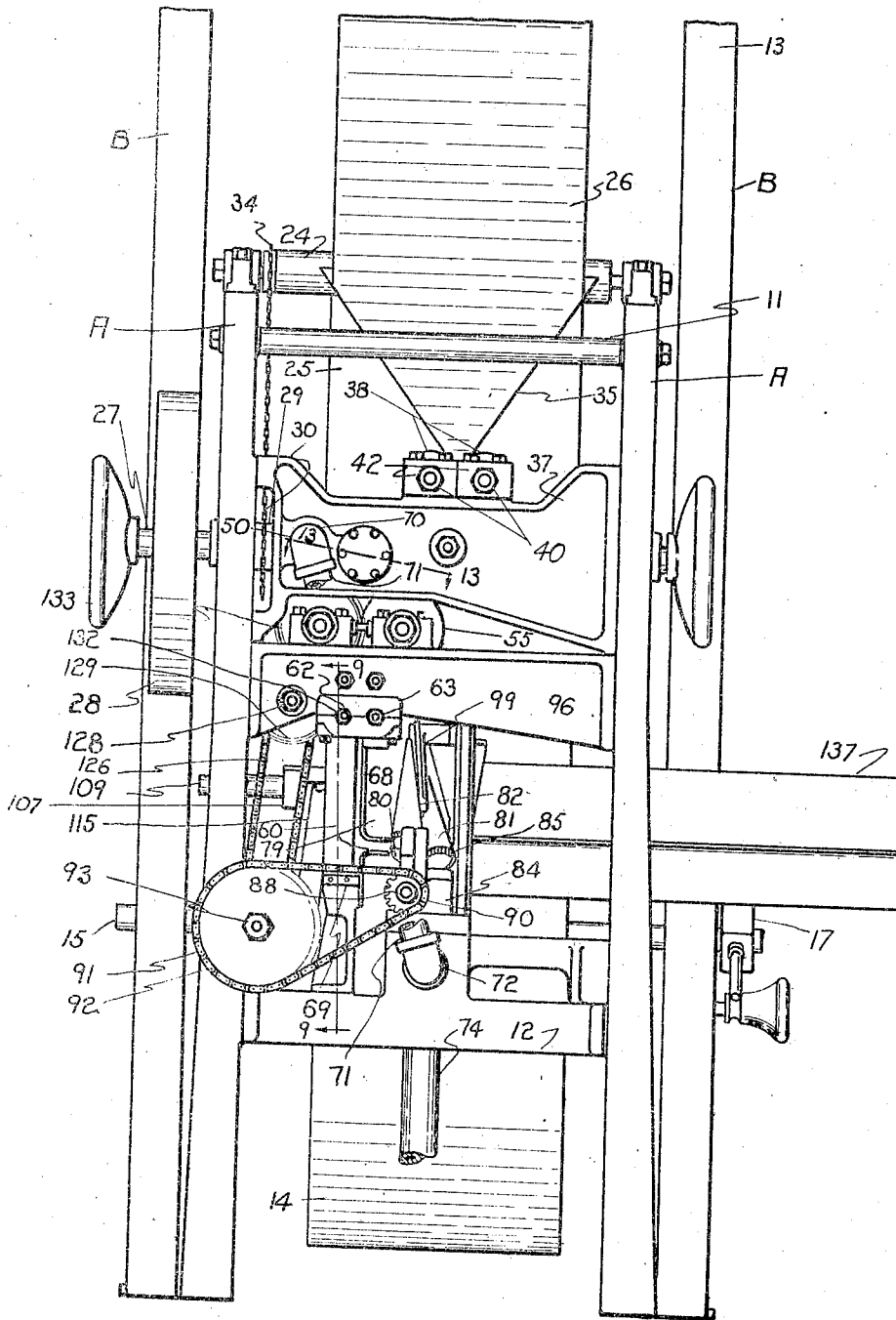


FIG 2

GLENN A. SHAFFER INVENTORS
FRANKLIN H. VIRTZ

Glenn A. Shaffer
ATTORNEYS.

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G. A. SHAFFER ET AL

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7 Sheets-Sheet 3

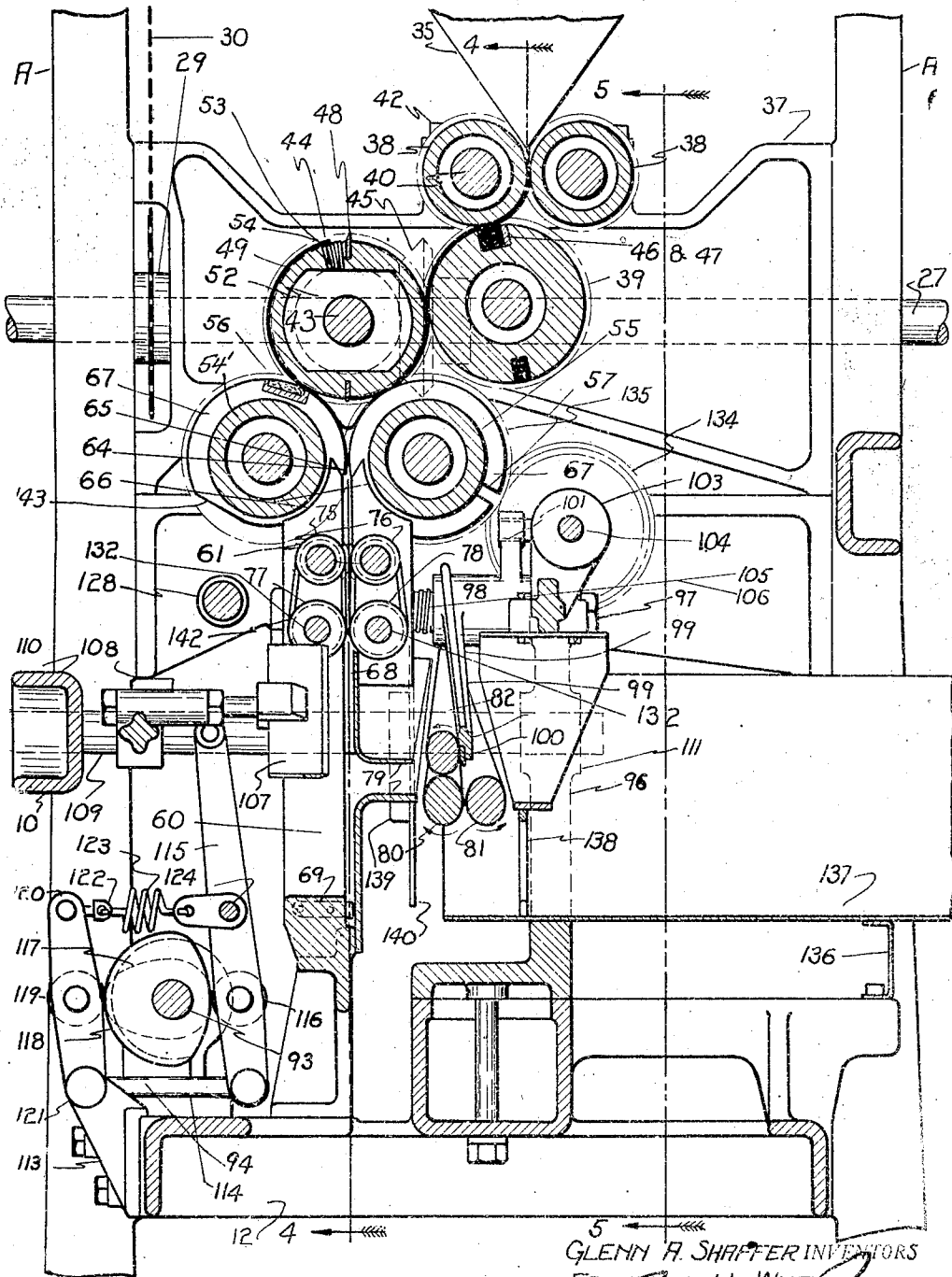


FIG 3

GLENN A. SHAFFER INVENTORS
FRANKLIN H. WIRTZ
BY
Paul H. Parker
ATTORNEYS.

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7 Sheets-Sheet 5

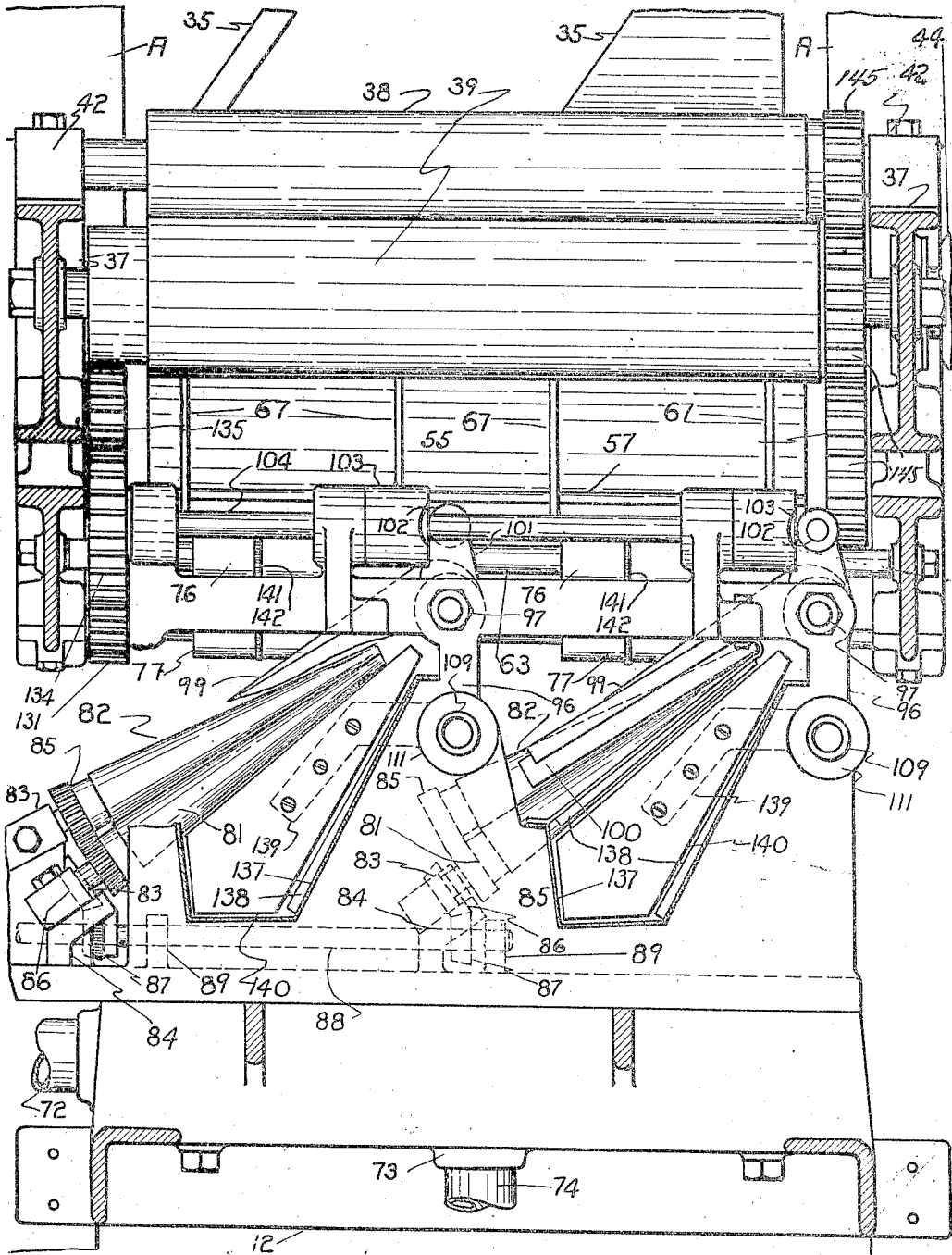


FIG 5

GLENN A. SHAFFER INVENTOR.
FRANKLIN H. WIRTZ
BY *Franklin H. Wirtz*
ATTORNEYS.

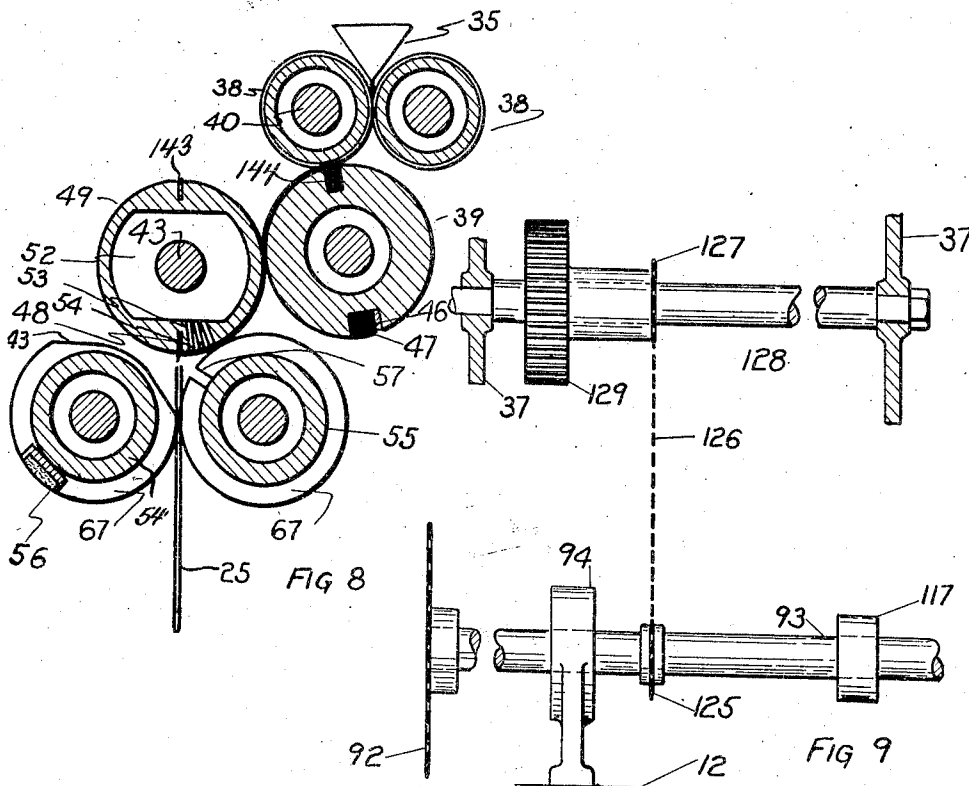
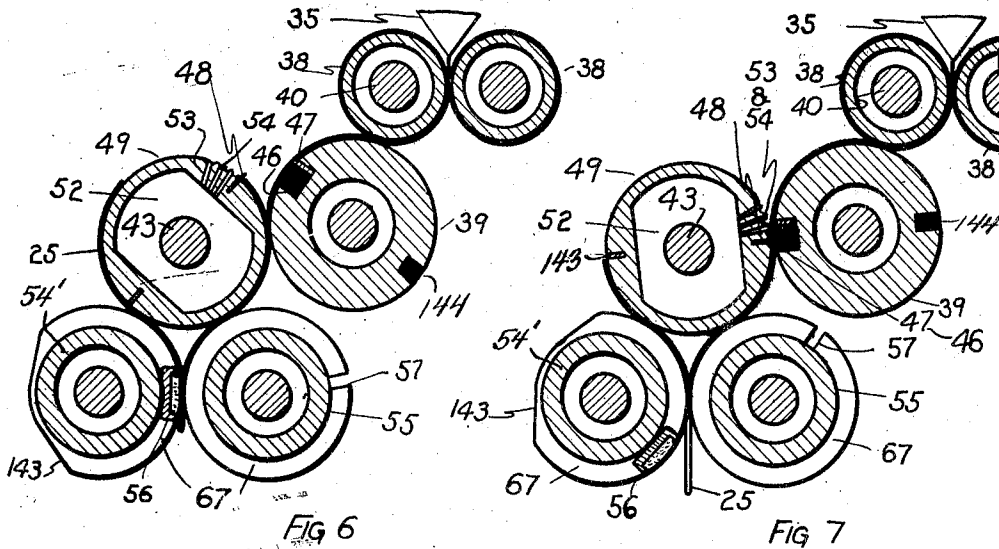
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G. A. SHAFFER ET AL.
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GLENN A. SHAFFER INVENTORS
FRANKLIN H. WIRTZ
BY
Paul J. Parker
ATTORNEYS.

June 29, 1926.

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7 Sheets-Sheet 7

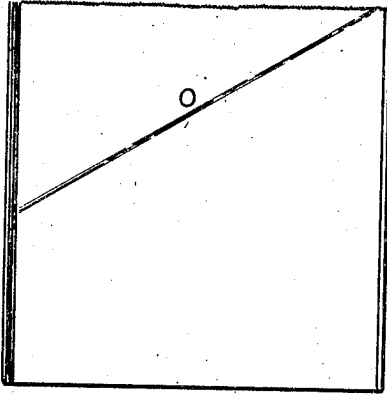


FIGURE 11

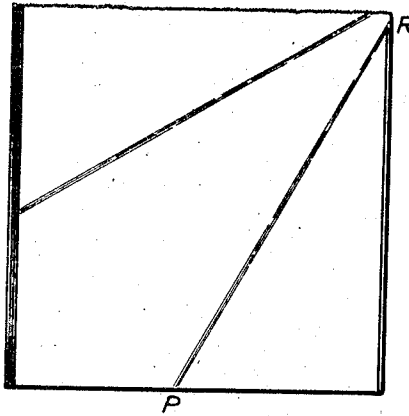


FIGURE 12

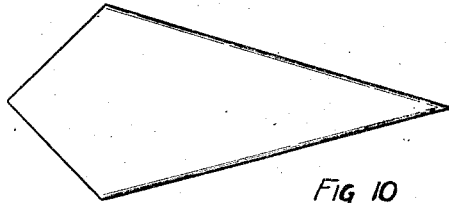


FIG 10

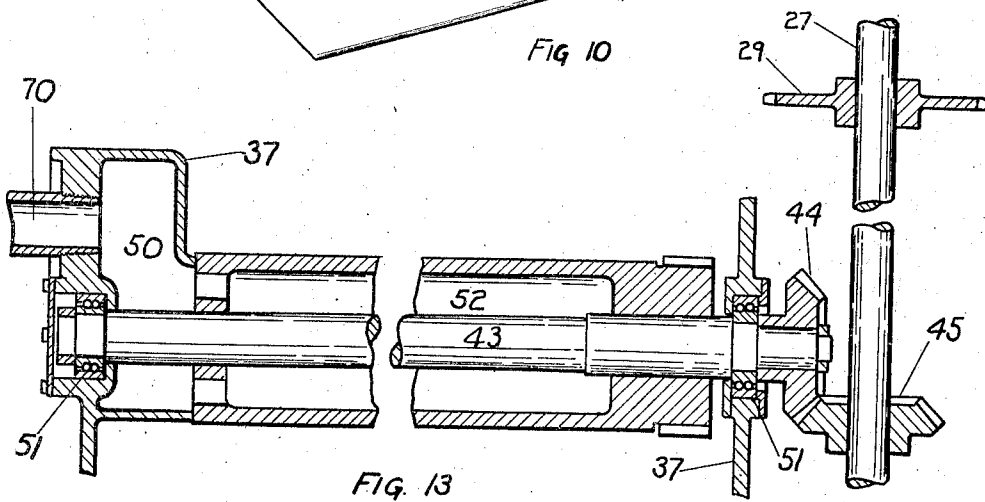


FIG. 13

GLENN A SHAFFER INVENTORS
FRANKLIN H. WIRTZ

BY
Frank W. Parker
ATTORNEYS.

UNITED STATES PATENT OFFICE.

GLENN A. SHAFFER AND FRANKLIN H. WIRTZ, OF GREEN BAY, WISCONSIN.

CORNUCOPIA-FOLDING MACHINE.

Application filed December 31, 1924. Serial No. 759,060.

The invention relates to folding machines, and more especially to paper folding machines.

The primary object of the invention is the provision of a machine of the above-named character, wherein one or more strips of paper introduced into the same will be folded in a unique manner and cut in the desired size, so that units in cornucopia form will be delivered from the said machine, the mechanism for cutting and folding the paper being of novel form and the parts thereof operating in a novel manner.

Another object of the invention is the provision of a machine of this character, wherein strips of paper are fed into the same and primarily folded and cut into napkin size, and thereafter finally further folded into cornucopia form, the folding and cutting of the strips being automatically effected, so that the machine performs in an efficient manner and the operation is continuous.

A further object of the invention is the provision of a machine of this character, wherein the folded napkins are automatically stacked in a receiver or container for the subsequent packaging thereof in any desirable manner.

A still further object of the invention is the provision of a machine of this character, in which the cornucopia folding rolls are novel in form, arrangement, and operation, as well as the tucking elements cooperating therewith, for the complete and accurate folding of the napkin units.

A still further object of the invention is the provision of a machine of this character, which is comparatively simple in construction, thoroughly reliable and efficient in its purpose, maintaining accuracy in the automatic operation thereof, strong, durable, requiring little or no attention in the working of the same, and comparatively inexpensive in the manufacture and installation.

With these and other objects in view the invention consists in the features of construction, combination and arrangement of parts, as will be hereinafter more fully described, illustrated in the accompanying drawings, wherein the preferred embodiment of said invention is disclosed, and as will be pointed out in the claims hereunto appended.

In the accompanying drawings:

Figure 1, is a front elevation of the machine constructed in accordance with the invention, looking from the discharge or trough side thereof.

Figure 2, is a side elevation thereof.

Figure 3, is an enlarged sectional elevation taken through the primary folding and cutting rolls, the feed rolls, the conical rolls, and the trough in their assembled relation to each other.

Figure 4, is an enlarged sectional view taken on the line 4—4 of Figure 3.

Figure 5, is a sectional view taken on the line 5—5 of Figure 3, the left hand tucker being broken away to show the conical rolls in full view, and the paper is shown on the right hand triangle.

Figure 6, is a fragmentary detail sectional view showing one of the positions of the folding and cutting mechanisms and the strip of paper.

Figure 7, is a similar view to Figure 6, showing another position of the primary folding and cutting mechanism.

Figure 8, shows a further position of the same.

Figure 9, is a fragmentary sectional view taken on the line 9—9 of Figure 2.

Figure 10, is a plan view showing the completed folded napkin.

Figure 11, is a plan view showing the initial fold line for the cornucopia folding of the napkin.

Figure 12, is a similar view showing the initial, second and final fold lines for the complete cornucopia folding of the napkin.

Figure 13, is a fragmentary horizontal sectional view taken through the vacuum roll and the driving connections therefor.

Similar reference characters indicate corresponding parts throughout the several views in the drawings.

Referring to the drawings, in detail, A, designates generally a main frame structure of the desired type for the machine, having spaced apart side sections 10, which are connected at their upper ends by transverse tie rods 11, while bolted or otherwise fastened to said side sections at their lower portions is a vacuum box or tank 12, the same being located between the side sections of the main frame.

Secured to the rear edges of the side sec-

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60

65

70

75

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95

100

105

tions 10, of the frame A, are uprights 13, of a stand B, for removably supporting paper rolls 14, preferably in superposed relation to each other, and each is carried upon a

cross arbor 15, mounted in suitable releasable bearings 16, on the uprights 13. On each arbor 15, is a brake drum 17, about which engages a releasable and adjustable brake band 18, the latter being adjustable by the adjusting device 19, so that the band 18, can be tightened or slackened about said drum, as the occasion may require. The uprights 13, are joined through the medium of a cross rod 20, to prevent spreading thereof and to add rigidity to the stand B.

Journalled in the side sections 10, of the main frame A, in the top beams 22, thereof are transversely arranged lower and upper guide rollers 23 and 24, respectively, over which are trained the paper strips 25 and 26, respectively, of the paper rolls 14, while suitably journalled in the frames 10, is a driving shaft 27, carrying a belt wheel 28, for connection with any suitable power plant, the shaft 27, also being fitted with a sprocket wheel 29, over which is trained an endless sprocket chain 30, the same being also trained over a sprocket wheel 31, fast upon the journal of the lower guide roller 23, so that motion will be transmitted thereto. This sprocket chain 30, is trained over sprocket wheels 33, and 34, on the journals of the respective upper rollers 24, so that the same will rotate in unison.

Suspended from the upper tie rods 11, are forwardly inclined folders 35, over which pass the strips 25 and 26, for the initial folding of the same, after being unwound from the rolls 14, which folders are supported by braces 36, suitably mounted in the main frame A, as shown in Figure 1, of the drawings.

In the side sections 10, of the main frame A, below the folders are opposed face plates or cheeks 37, the same being fastened in place in any suitable manner, and in these plates are journalled the primary folding and cutting mechanism, comprising upper presser rolls and feed roll 28 and 29, respectively, the presser rolls 38, each being carried upon a shaft 40, one of which is journalled in fixed boxings 41, and the other in adjustable boxings 42, so that one roll can be adjusted relative to the other to properly pinch the paper passing therebetween.

The feed roll 39, has formed therein longitudinally of the same a groove 46, in which is held a rubber cutting strip 47, to cooperate with a knife hereinafter described.

The rubber strip 47, cooperates with a saw knife 48, mounted in a suction or partial vacuum roll 49, which is located forwardly and slightly below the feed roll 39, and this roll 49, is journalled in a gland 50,

and bearing 51, respectively, formed on the plates 37, while the shaft 48, of the roll 49, has mounted thereon at its inner end a beveled gear 44, meshing with a companion beveled gear 45, mounted on shaft 27, so that motion will be imparted from one gear to the other.

The roll 49, is of hollow formation to provide a suction chamber 52, therein and in its peripheral portion adjacent to the knife 48, are rows of perforations 53, while the outer surface of said roll at this locality is provided with serrations 54, whereby the paper can be held more firmly on the roll, when taken from the feed roll 39, under the action of the suction through the perforations 53, so that said paper will be trained about the roll 49.

Below the rolls 39 and 49, are take-off and folding rolls 54' and 55, respectively, the roll 54' being journalled in the plates or cheeks 37, while the roll 55, is journalled in a manner similar to the feed roll 39, to obtain a fixed distance between said rolls. The take-off roll 54' is fitted with an adjustable and flexible wiper member 56, while the roll 55, is formed with a clearance channel 57, for the knife 48, during the rotation of the rolls, in the primary folding and cutting operations of the machine.

Located beneath the rolls 54' and 55, are strippers 60, and 61, respectively, which are hung in spaced vertical relation to each other upon cross rods 62, and 63, and have their upper ends at the inner edges reversely beveled at 64, to provide a mouth entrance 65, for the free passage of the folded paper between the strippers in its downward movement, while the outer edges at the upper ends of said strippers are concaved at 66, correspondingly to the grooves 67, in the rolls 54' and 55, so as to protrude slightly into the said grooves, as will be apparent in Figure 3, of the drawings, whereby the folded paper will be stripped from said folding rolls 54' and 55, when the machine is operating.

The space between the strippers 60, and 61, provides a way 68, for the passing of the primarily folded napkins downwardly therethrough, while each stripper 60, at or near its lower end is fitted with an adjustable stop 69, to bring the napkins to rest at this point, for a purpose presently described.

Coupled at 70, with the packing gland 50, is a suction pipe 71, which leads downwardly exteriorly of the main frame A, and is connected as at 72, with the vacuum box or tank 12, the latter being in communication at its bottom at 73, with a suction tube 74, leading from a suction fan (not shown), so that suction will be maintained in the box or tank 12, during the operation of said fan.

Journalled on the rods 62, and 63, between the strippers 60, and 61, are guide rollers 75, and 76, respectively, for the primarily folded napkins when the same have entered the way 68, while beneath these rollers 75, and 76, are opposed pinch rolls 77, and 78, respectively, which are adapted to feed the said folded napkins downwardly in the way 68, onto the stop 69, the strippers 61, being of considerably less length than the strippers 60, to accommodate beneath the same, guide cheeks or plates 79, which are disposed diagonally with respect to the strippers 60, to direct the primarily folded napkins toward the final cornucopia folding mechanism hereinafter fully described.

The cornucopia folding mechanism comprises groups of three conical rolls 80, 81, and 82, respectively, each, which are arranged in close relation to one another in pyramid fashion diagonally with respect to the strippers 60, and 61, the upper ends of these rolls being free, while the lower ends thereof are formed with journal stubs 83, supported on brackets 84, on and rising from the vacuum box or tank 12, as shown in Figure 5, of the drawings.

Fixed on the ends 83, of the rolls 80, 81, and 82, are beveled gears 85, arranged in selected meshing engagement one with the other, so that said rolls will rotate in the directions indicated by the arrows in Figure 3, of the drawings. The roll 80, has fitted thereon a second beveled gear 86, meshing with a companion beveled gear 87, on a driven shaft 88, suitably journaled in bearings 89, on the box or tank 12, and this shaft 88, at one end extends outside of the main frame A, which end carries a sprocket wheel 90, over which is trained a sprocket chain 91, the same being also trained over a sprocket wheel 92, on the outer end of a driven cam shaft 93, journaled in supporting bearings 94, suitably mounted on the vacuum tank 12, fastened in the main frame A, of the machine.

Rising vertically from the box or tank 12, midway between the side sections 10, of the main frame A, are uprights 96, in each of which is mounted slightly beyond the free end of the group of conical rolls 80, 81 and 82, adjacent thereto is a journal stud 97, on which is journaled the hub 98, of a swinging tucker arm 99, having the tucker blade 100, the hub 98, being formed with an extension 101, carrying a roller 102, for engagement with a cam 103, mounted on a driven shaft 104, suitably journaled transversely in the uprights 96. The stud 97, is fitted with an adjustable tensioning spool 105, surrounded by a coiled tension spring 106, which acts directly upon the tucker arm 99, and in this manner the roller 102, is constantly held in contact with the cam 103, for the positive operation of the tucker

blade 100, which latter is adapted to operate in a path crosswise to the path of movement of a primary tucker 107, mounted upon a supporting arm 108, projecting from and carried by a reciprocating plunger shaft 109, movable in guide housings 110, and 111, respectively in the cross-web of one side 10, and the upright 96, respectively.

On the vacuum tank 12, are hangers 112, and 113, and pivoted in the hangers 112, each is a link 114, the same being also pivoted to a throw lever 115, pivotally connected with the plunger shaft 109, to move the same. The lever 115, is fitted with rollers 116, working against a cam 117, on the shaft 93, which is also fitted with a further cam 118, against which works rollers 119, carried by a rocker 120, pivoted at 121, in the hanger 113, at the lower end, while the upper end of the rockers 120, is provided with an adjustable eye 122, with which is engaged one end of a coiled retractile spring 123, the latter being connected with the pivot rod 124, for the throw levers 115, and in this manner the latter is maintained engaged with and operated by the cam 117, which serves to throw said lever 115, while the cam acting on the rocker 120, retracts said throw lever, as will be apparent.

On shaft 93, is a sprocket wheel 125, over which is trained a sprocket chain 126, the same being trained over a sprocket wheel 127, on a driven shaft 128, which is fitted with a suitable gear 129, meshing with a gear 131, on the shaft 132, carrying the pinch rolls 77, and 78, while the gear 129, meshes with a companion gear 133, on the take-off roll 54, so that motion from the latter will be transmitted to the final cornucopia folding mechanism as will be clearly apparent.

The cam shaft 104, is fitted with a gear 134, meshing with a companion gear 135, on the folding roll 55, so that motion from the latter will be transmitted to the said cam shaft to operate the tucker arm 99, hereinbefore described.

Arranged immediately beneath the grouped rolls 80, 81, and 82, and angularly supported by brackets 136, correspondingly to the said rolls, is a cornucopia folded napkin receiving trough 137, the inner entrance ends of the latter being fitted with opposed marginal stops 138, adapted to hold the napkins injected into the said trough.

On each plunger shaft 109, is an arm 139, carrying at its angular free end a cornucopia shaped paddle 140, which serves to push the finally folded napkins into the trough 137, when said napkins pass out from between the rolls 80, and 81, of the group of cornucopia folding rolls hereinbefore described.

Formed in the rolls 75, and 77, are vertically aligned grooves 141, in which are re-

received endless spring belts 142, and likewise the rolls 76, and 78, are formed with these grooves 141, fitted with the spring belts 142, which belts serve to prevent the paper from getting out of its proper path in the way 68, during the downward travel of said paper to the final folding mechanism.

The roll 54', is incut at 143, for a portion of its periphery to allow for the clearance of the knife 48, while passing this roll, and free said napkins subsequently to the final folding thereof into square quarter form, and into the way 68, through the entrance 65, between the strippers 60, and 61, to be taken up by the guide rolls 75, and 76, and the pinch rolls 77, and 78, for the final cornucopia folding operation.

It will be apparent that the strips of paper from the rolls 14, in the stand 13, are first folded by the folders 35, and rolls 38, and thereafter are acted upon by the suction roll 49, coacting with the roll 39, the once folded paper being trained about the roll 49, until wiped therefrom at the proper interval by the roll 54', which with the roll 55, folds the paper again, as the latter is cut off of the strip by the rubber strip 47, and knife 48, the required size, and thence the twice folded paper napkins are advanced into the way 68, between the strippers 60 and 61, the twice folded paper being in square quarter folded form when entering said way, and is fed downwardly therein by the rolls 75, and 76, and rolls 77, and 78, until the paper comes to rest upon the stop 69, where said paper is acted upon by a tucker 107, the latter serving to first fold said paper on the line O, indicated in Figure 11, of the drawings, and tucked in between the rolls 80, and 82, which folds the paper on said indicated line.

As the paper is forced through between the rolls 80, and 82, the tucker blade 100, becomes active to crease the paper on the line P, and R, indicated in Figure 12, of the drawings, and force said paper between the rolls 80, and 81, thus completing the final cornucopia folding of the napkin into cornucopia form.

When the finally folded paper is delivered from between the rolls 80, and 81, the paddle 140, advances to push the folded napkin into the trough 137, through the inner open mouth end thereof, and on retrieving of the paddle 140, the napkin is prevented from working back by the stops 138, at opposite edges of the mouth of said trough, and in this manner the finally folded napkins are massed in the latter during the continued operation of the machine.

On the vacuum roll 49, is mounted a creaser 143', as shown in Figures 6, 7, and 8, of the drawings, which creaser tends to put a crease in the napkin for the second fold of the quarter fold so that the napkin is sure

to break in a straight line, while the roll 39, is provided with a rubber strip 144, to coact with said creaser 143', when the paper passes between the said rolls 39, and 49, to assure the perfect creasing of the napkin.

The rolls 38, 39, and 49, are fitted with gears 145, meshing with each other for the operation of the same.

The cheek plates 37, are divided into two parts to facilitate the removal of the rolls without disturbing the whole machine, that is to say, rolls 38, 39, 49 and 55, as will be clearly apparent in Figure 2, of the drawings.

What is claimed is:

1. A machine of the character described, comprising a primary folding mechanism adapted to cut and fold a sheet of paper into quarter size and square shape, and mechanism including a series of grouped conical rolls for finally folding the primary folded sheet into cornucopia shape.
2. A machine of the character described, comprising a primary folding mechanism adapted to cut and fold a sheet into quarter size and square shape, mechanism including a series of grouped conical rolls for finally folding the primary folded sheet into cornucopia shape, and mechanism for projecting the finally folded product into a container.
3. A machine of the character described, comprising a primary folding mechanism adapted to cut and fold a sheet of paper into quarter size and square shape, conical roll mechanism for finally folding the latter into cornucopia shape, mechanism for projecting the finally folded product into a container, and a cornucopia shaped container for receiving and massing the finally folded product.
4. A machine of the character described, comprising a primary folding mechanism adapted to cut and twice fold a sheet, conical roll mechanism for finally folding the latter into cornucopia shape, mechanism for projecting the finally folded product into a container, a cornucopia shaped container for receiving and massing the finally folded product, and means at the mouth of the container to prevent receding of the product when the projecting mechanism recedes from the container.
5. A machine of the character described, comprising a primary folding mechanism adapted to cut and twice fold a sheet, conical roll mechanism for finally folding the latter into cornucopia shape, mechanism for projecting the finally folded product into a container, a cornucopia shaped container for receiving and massing the finally folded product, means at the mouth of the container to prevent receding of the product when the projecting mechanism recedes from the container, and suction means cooperating with the primary folding mechanism,

6. A machine of the character described, comprising a primary folding mechanism adapted to cut and twice fold a sheet, grouped conical roll mechanism for finally folding the latter into cornucopia shape, mechanism for projecting the finally folded product into a container, a cornucopia shaped container for receiving and massing the finally folded product, means at the mouth of the container to prevent receding of the product when the projecting mechanism recedes from the container, suction means cooperating with the primary folding mechanism, and means for actuating the folding mechanisms and projecting mechanism in timed relations to one another.

7. A machine of the character described, comprising a frame structure, an inclined folder in the upper portion thereof, and adapted to longitudinally fold a sheet of paper passing thereover, rolls below the folder to guide the folded sheet, coating folding and cutting mechanism in the path of said sheet when passed between the first named rolls, to transversely fold and cut the sheet, whereby the latter will assume substantially quarter size, means for feeding the latter downwardly, a stop for limiting the downward movement of the quarter sized product, and mechanism for finally folding said last named product into cornucopia shape and including a group of conical shaped rolls, and tuckers coating therewith.

8. A machine of the character described, comprising a frame structure, an inclined folder in the upper portion thereof, and adapted to longitudinally fold a sheet of paper passing thereover, rolls immediately below the folder to guide the folded sheet, coating folding and cutting mechanism in the path of said sheet when between said first named rolls, to transversely fold and cut the sheet, whereby the latter will assume substantially quarter size, means for feeding the latter downwardly, a stop for limiting the downward movement of the quarter sized product, mechanism for finally folding said product into cornucopia shape and including a group of conical shaped rolls and tuckers coating therewith, and a receiver for the finally folded product.

9. A machine of the character described comprising a frame structure, an inclined folder in said frame and adapted to longitudinally fold a sheet of paper passing thereover, rolls immediately below the folder to guide the folded sheet, coating folding and cutting mechanism in the path of said sheet to transversely fold and cut the sheet, whereby the latter will assume substantially quarter size, means for feeding the latter downwardly, a stop for limiting the downward movement of said product, mechanism for finally folding said product into cornucopia shape and including a

group of conical shaped rolls and tuckers coating therewith, a receiver for the finally folded product, and means for pushing the product into the receiver when leaving the last named mechanism.

10. A machine of the character described, comprising a frame structure, a folder in said frame and adapted to longitudinally fold a sheet of material passing thereover, rolls below said folder to guide the folded sheet, coating folding and cutting mechanism in the path of said sheet to transversely fold and cut the sheet, whereby the latter will assume substantially square quarter size, means for feeding the latter downwardly, a stop for limiting the downward movement of the product, conical roll mechanism for finally folding said product into cornucopia shape, a receiver for the finally folded product, means for pushing the product into the receiver when leaving the last named mechanism, and means for feeding the sheet to the folder.

11. A machine of the character described, comprising a frame, a folder in said frame and adapted to longitudinally fold a sheet of material passing thereover, rolls below said folder to guide the folded sheet, coating folding and cutting mechanism in the path of said sheet to transversely fold and cut the sheet, whereby the latter will assume substantially square quarter size, means for feeding the latter downwardly, a stop for limiting the downward movement of the product, conical roll mechanism for finally folding said product into cornucopia shape, a receiver for the finally folded product, means for pushing the product into the receiver when leaving the last named mechanism, means for feeding the sheet to the folder, and mechanism for timing and driving the cutting and folding mechanism and rolls.

12. A machine of the character described, comprising a frame, a folder in said frame and adapted to longitudinally fold a sheet of material passing thereover, rolls below said folder to guide the folded sheet, coating folding and cutting mechanism in the path of said sheet to transversely fold and cut the sheet, whereby the latter will assume substantially square quarter size, means for feeding the latter downwardly, a stop for limiting the downward movement of the product, conical roll mechanism for finally folding said product into cornucopia shape, a receiver for the finally folded product, means for pushing the folded product into the receiver when leaving the last named mechanism, means for feeding the sheet to the folder, mechanism for timing and driving the cutting and folding mechanism, and rolls, and means retaining the product initially introduced in the receiver.

13. A machine of the character described,

comprising a primary folding mechanism adapted to cut and fold a sheet of paper into quarter size and square shape, and conical roll mechanism for finally folding the latter into cornucopia shape. 20

6 the latter into cornucopia shape.
14. A machine of the character described, comprising a primary folding mechanism adapted to cut and twice fold a sheet, conical

roll mechanism for finally folding the latter into substantially cornucopia shape, and mechanism for projecting the finally folded product into a container.

In testimony whereof we affix our signatures.

GLENN A. SHAFFER.
FRANKLIN H. WIRTZ.