Sept. 20, 1932. S. J. CAMPBELL 1,878,437

NAPKIN FOLDER

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Fig. 1.

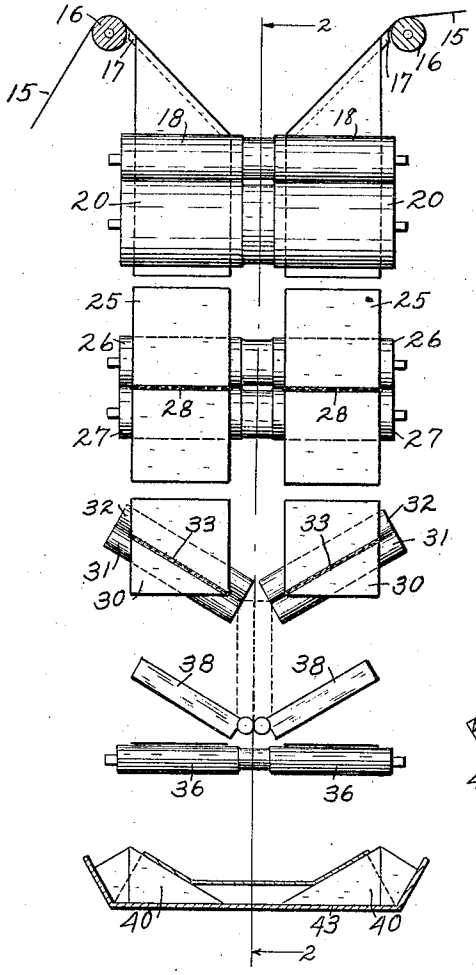


Fig. 3.

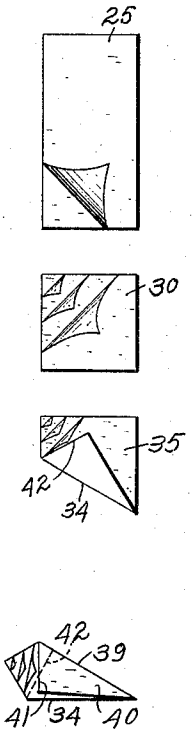
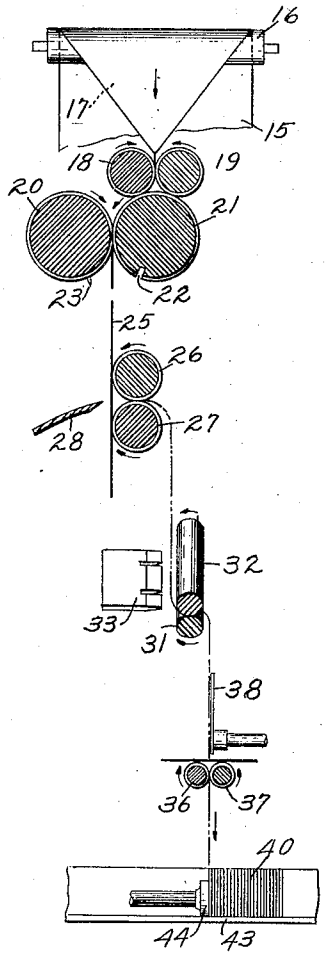


Fig. 2.



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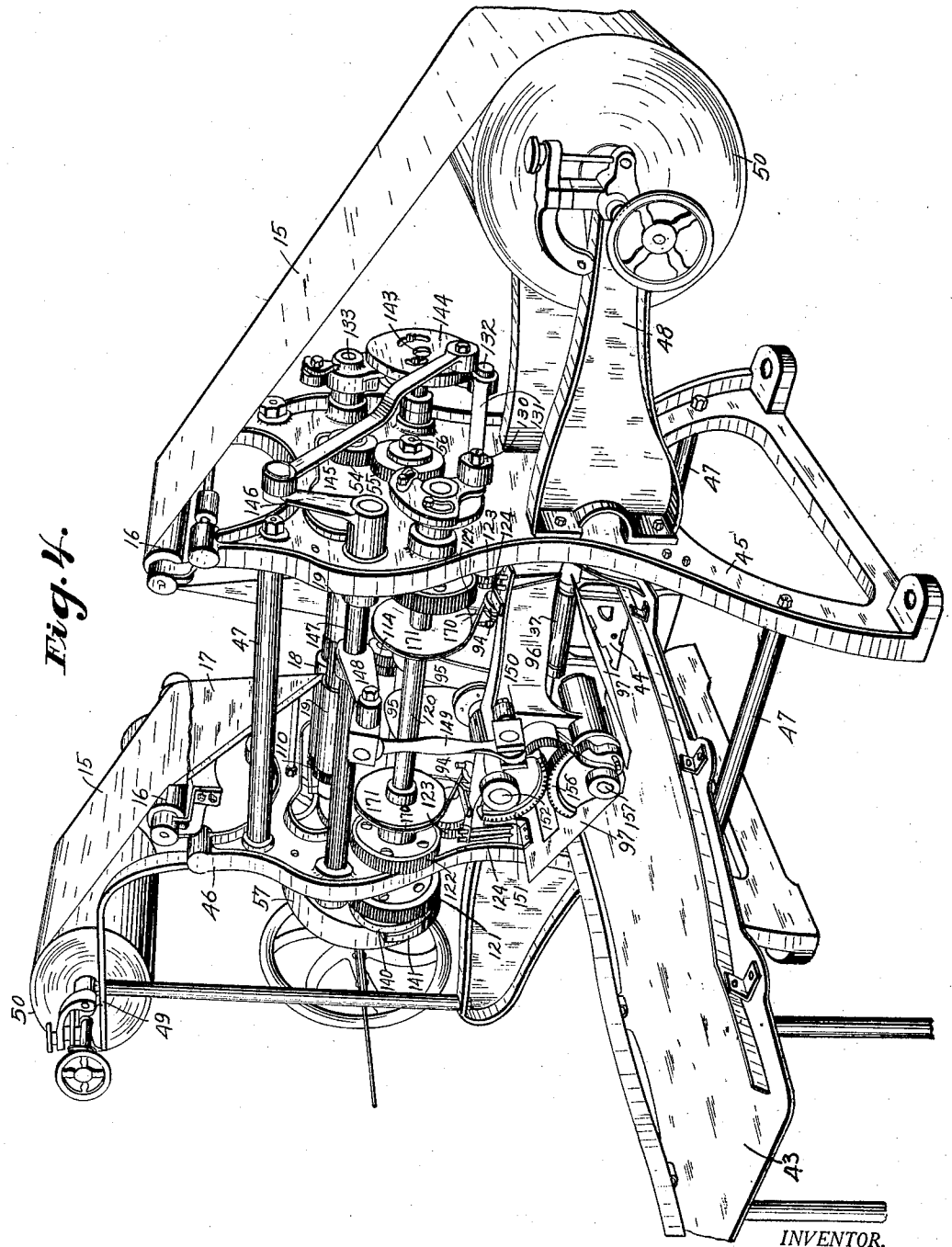


Fig. 4.

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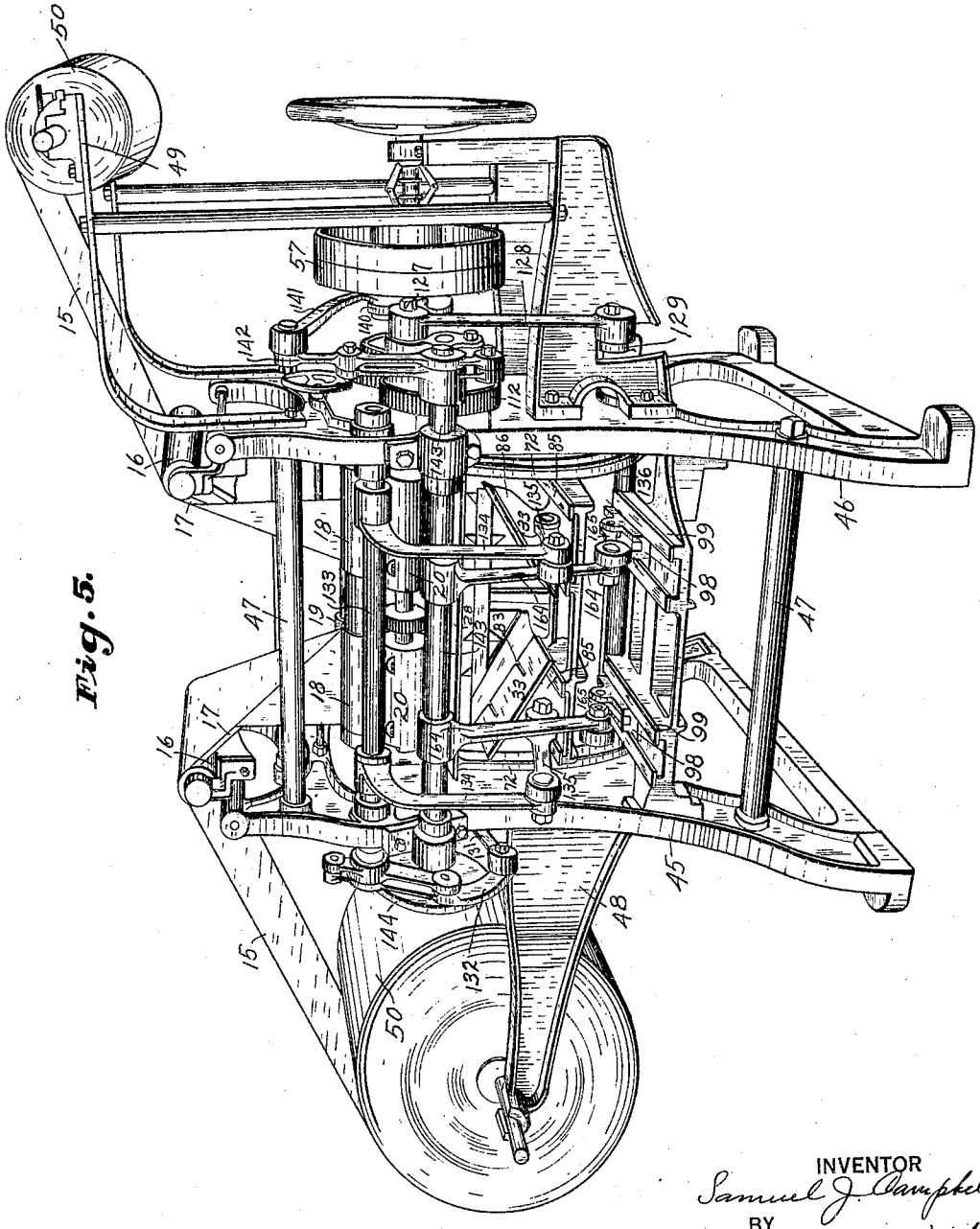


Fig. 5.

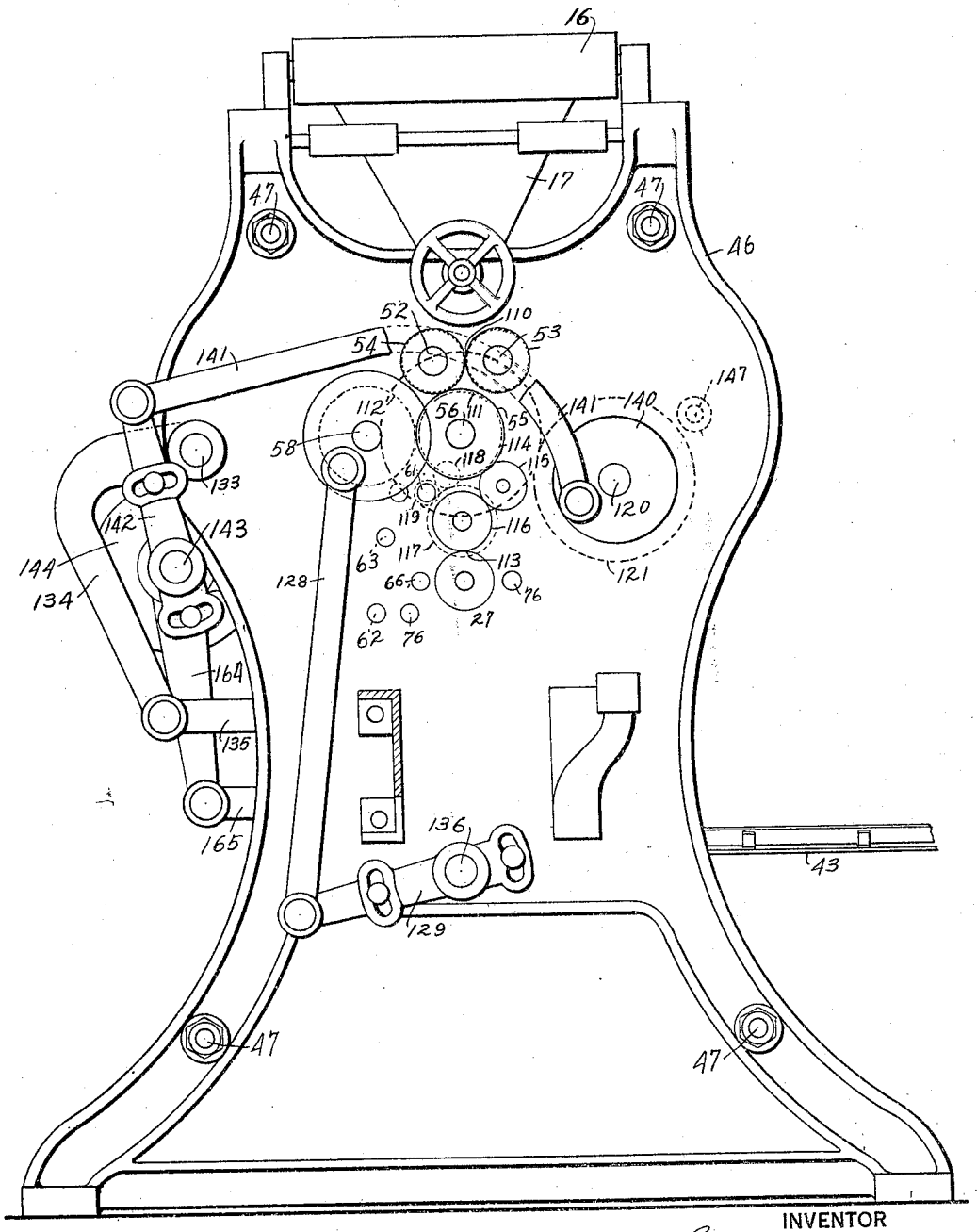
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Fig. 6.



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Fig. 7.

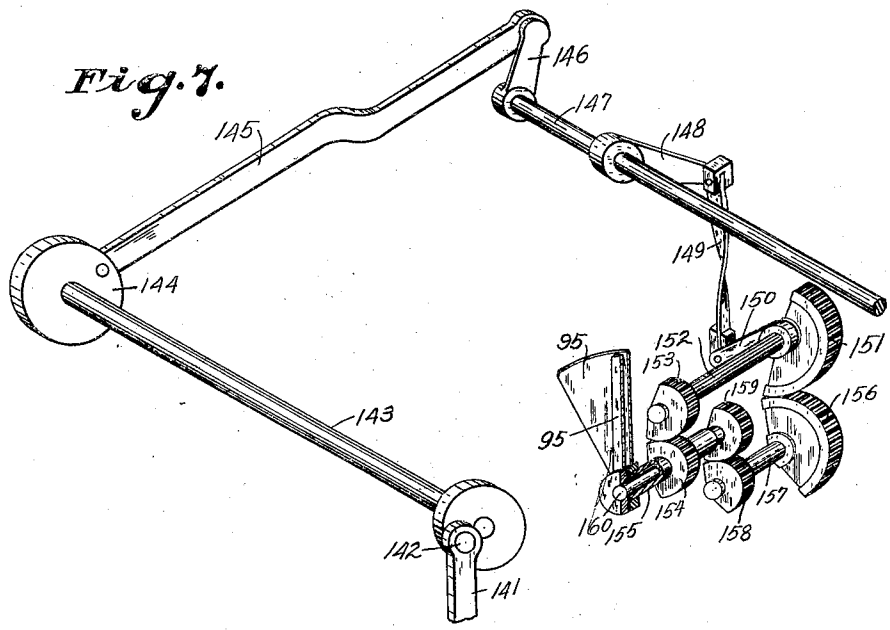
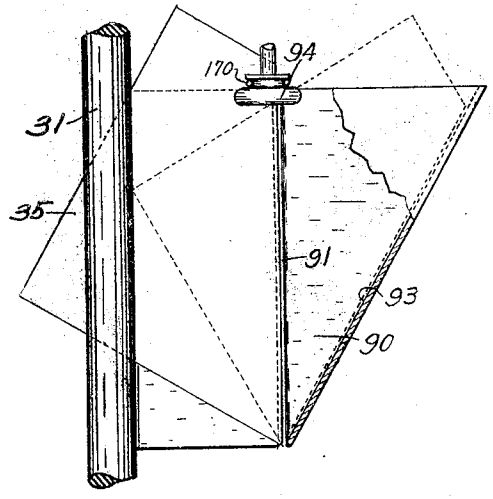


Fig. 16.



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Fig. 8.

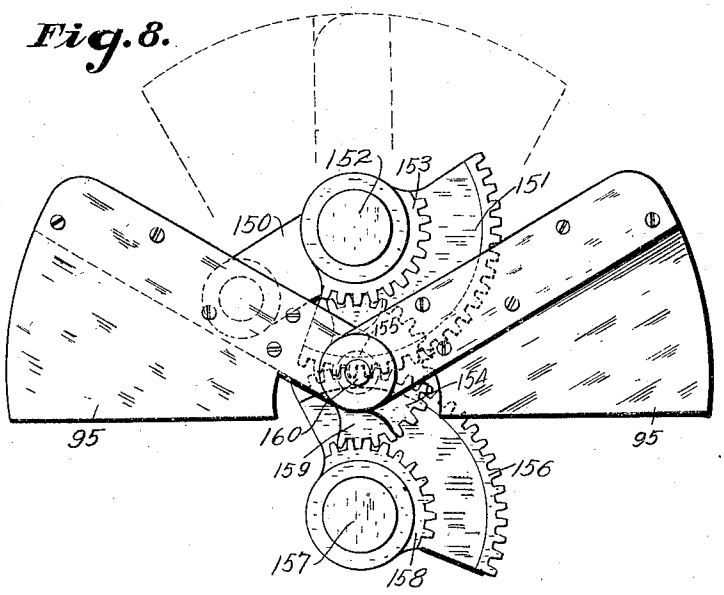
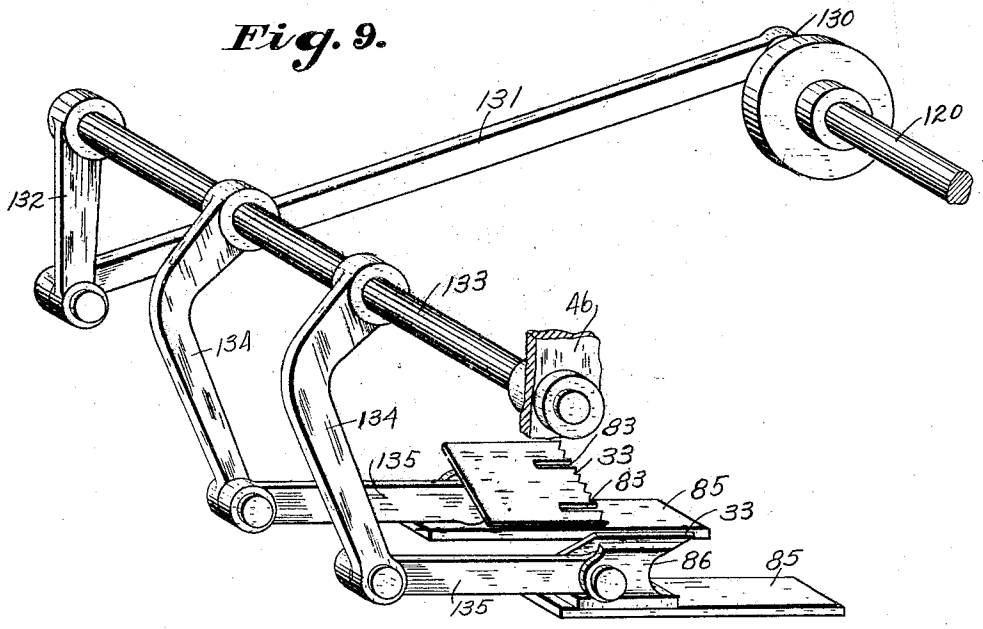


Fig. 9.



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Fig. 10.

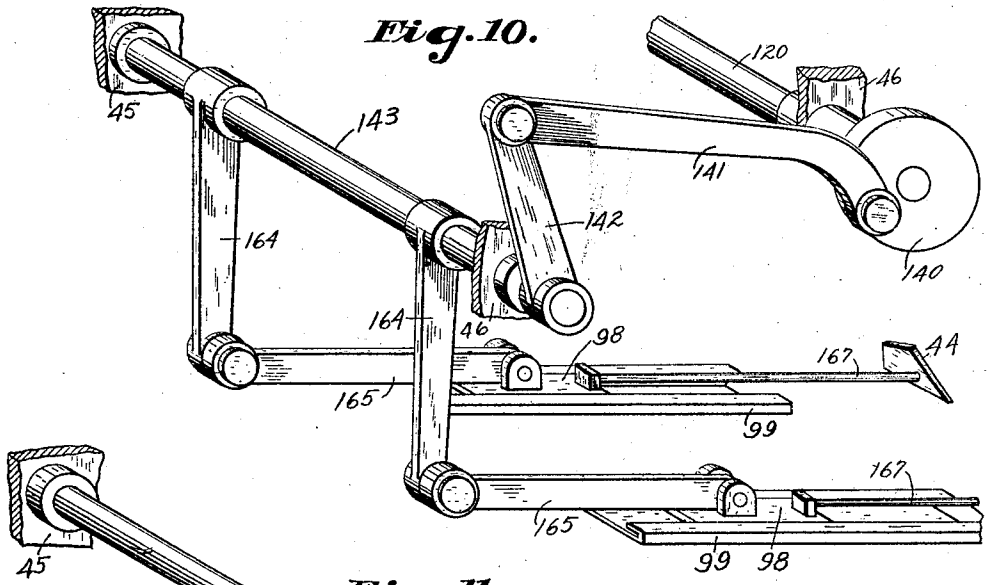
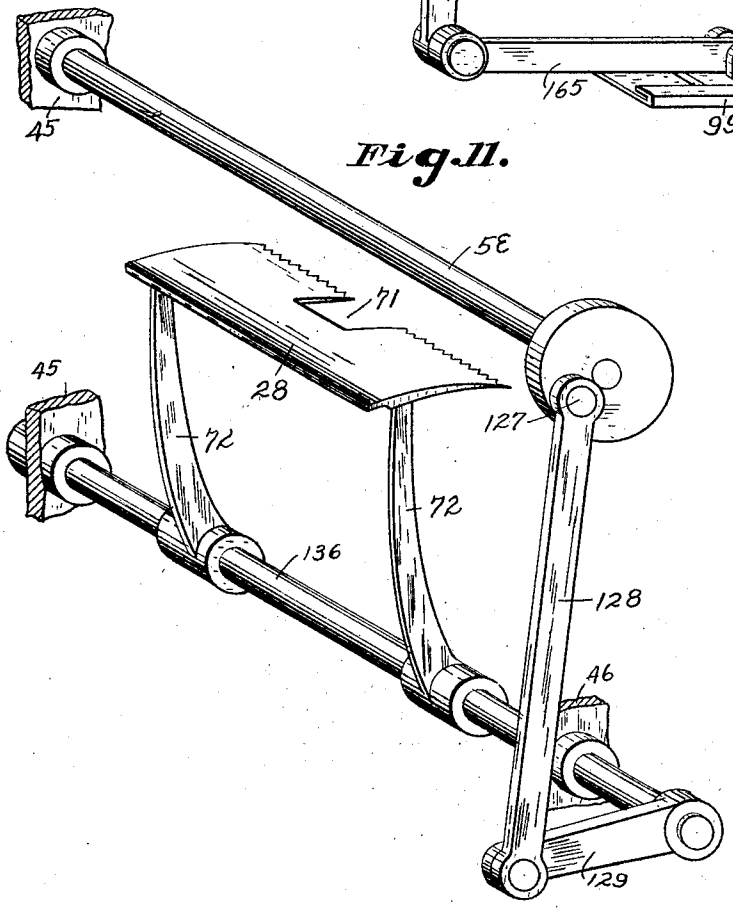


Fig. 11.



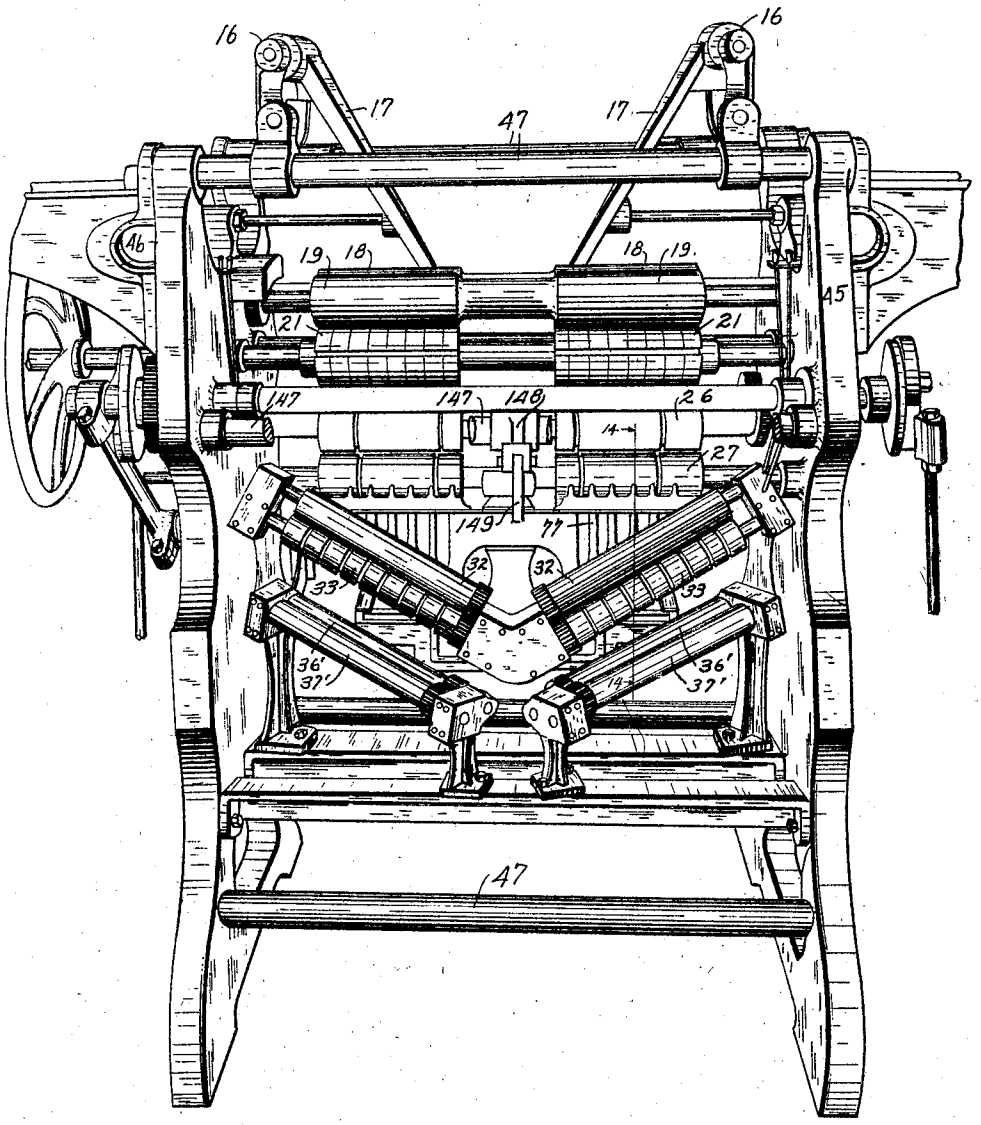
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Fig. 12.



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Fig. 13.

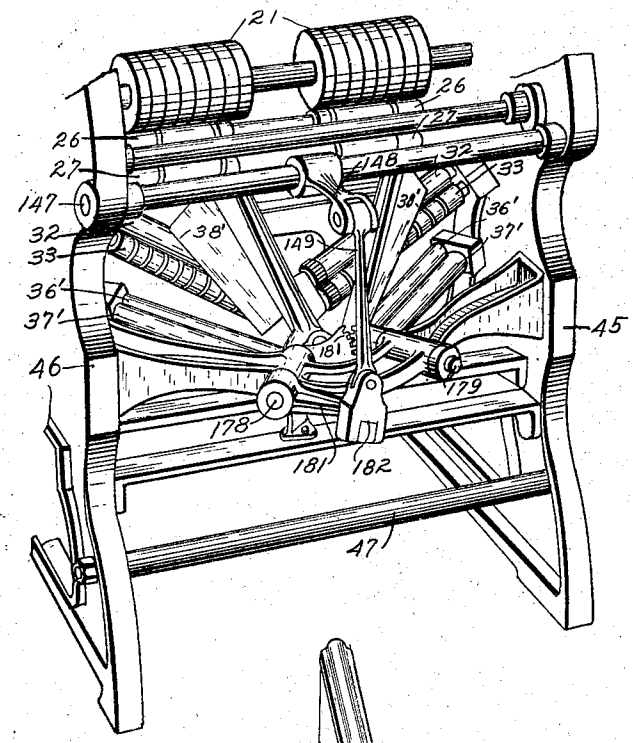
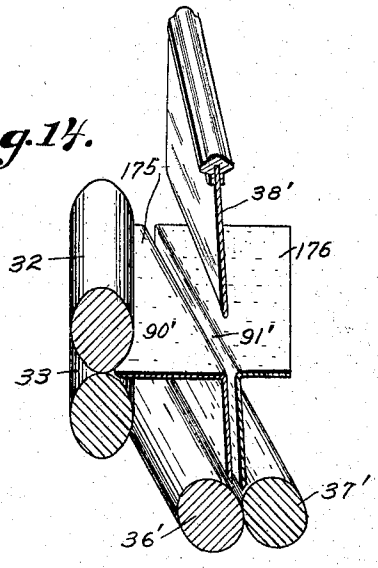


Fig. 14.



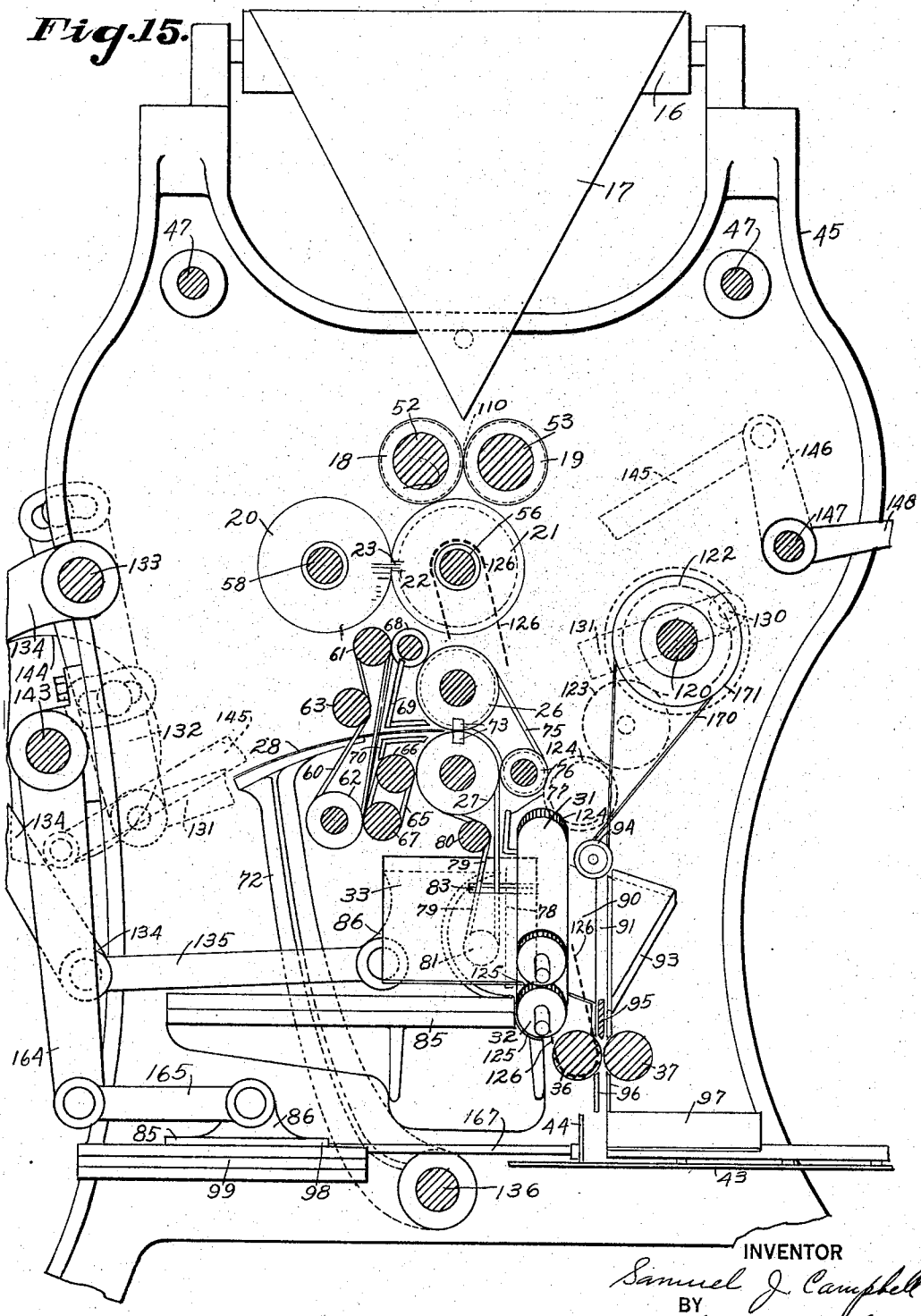
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Fig. 15.



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Patented Sept. 20, 1932 1,878,437

UNITED STATES PATENT OFFICE

SAMUEL J. CAMPBELL, OF GREEN BAY, WISCONSIN

NAPKIN FOLDER

Application filed March 24, 1928. Serial No. 264,410.

This invention relates to improvements in napkin folders.

Broadly speaking, it is the primary object of the invention to produce a novel and simplified machine for cutting and folding napkins to the so-called cornucopia form or outline, but with certain distinctive features whereby the finished napkin may have loose flap portions exposed at its opposite faces so that it may readily be grasped irrespective of which face may happen to be uppermost. The invention contemplates the automatic manipulation of the napkin in the process of folding so that the machine fed with webs of paper from large supply rolls will deliver completely and accurately folded napkins of the desired form and type with a minimum length of paper travel.

More specifically, it is my purpose to promote accuracy in the napkin folding operations: First, by providing a machine in which the paper is held at all times by the mechanism acting thereon or by suitable guides so that it can not become displaced; secondly, by providing a novel form of creasing roll whereby the fold is positively plucked from the tucker blade instead of being impositively drawn therefrom by friction; thirdly, by providing a machine in which the sequence of operations is so closely related that one set of converting mechanism may commence to operate on the paper while the paper is still positioned by a preceding mechanism prior to its release therefrom; fourthly, the provision of grooved rolls and guides closely confining the partially folded paper and interacting with the grooved rolls in such a way as to minimize the possibility of irregular action; and fifthly, by operating the cut off rolls at a higher peripheral speed than the rate of paper travel so that the paper will be cleanly cut regardless of how soft it may be.

It is my further purpose to promote the efficient folding of a "cornucopia" shaped napkin by providing one or more sets of folding rolls at an angle to the path of travel to the path of the paper.

It is my further purpose to provide means for positively adjusting the angular position of a partially folded napkin by twisting it in its plane of movement to bring its prospective fold line to the proper angle.

It is my further purpose to provide a single machine capable of handling numerous napkin sizes, both as to width and length of sheet, with only a minor adjustment.

Other objects of the invention relate to novel and improved motion transmitting connections for the actuation of the several parts in a manner best adapted to carry out the aforementioned objects.

In the drawings:

Figure 1 is a developed view in front elevation of the various component parts of the machine which act on the paper.

Figure 2 is a developed view taken on the section indicated at 2—2 in Figure 1.

Figure 3 is a view illustrating the appearance of the napkin at different points in the course of its manufacture, the various partially completed napkins being shown opposite the portions of the mechanism in Figures 1 and 2, whereby they are folded to the indicated form.

Figure 4 is a perspective view of the front or delivery side of the machine.

Figure 5 is a perspective view of the rear side of the machine.

Figure 6 is an end elevation on an enlarged scale of the machine frame, certain of the actuating connections being removed in order to show the location of the several shafts.

Figure 7 is a detail view of certain mechanism for actuating the tucker blades used in the final folding operation.

Figure 8 is a detail view in end elevation of the mechanism shown in Figure 7.

Figure 9 is a detail view in perspective showing a development of the actuating connections for the tucker blades in making the second last fold in the napkin.

Figure 10 is a developed view of the actuating connections for the packer.

Figure 11 is a developed view of the actuating connections for the quarter folding tucker blade.

Figure 12 is a rear elevation of a machine embodying a modified arrangement of the

final folding rolls, tucking blades and guide parts being removed to expose the rolls.

Figure 13 is a perspective detail showing the disposition of the tucking blades with reference to the rolls in the Figure 12 device.

Figure 14 is a diagrammatic detail in cross-section of the complete assembly of final folding rolls, guides and tucker blades as viewed in the plane indicated at 14—14 in Figure 12.

Figure 15 is a view in transverse section through the machine showing in end elevation the folding mechanism illustrated in Figures 1 to 11 inclusive.

Figure 16 is a fragmentary detail in plan of the napkin positioning device illustrated in Figure 15.

Like parts are identified by the same reference characters throughout the several views.

Principle of operation

I shall first describe the principle of operation of the machine with particular reference to the diagrammatic views, Figures 1, 2 and 3 and the sectional view Figure 15. Thereafter the specific mechanism which actuates these parts will more readily be understood.

As previously indicated, the machine is a duplex machine each side of which functions independently of the other side to produce cornucopia-folded napkins from the web of paper fed thereto.

The paper webs 15 pass over guide rolls 16 and the usual triangle plate 17, whereby the paper is longitudinally folded along its center line.

The feed rolls 18 and 19 draw the paper continuously across triangle plate 17 and feed the folded webs to the creasing and cutting rolls 20 and 21. Roll 21 has a longitudinal slot at 22 in its periphery and roll 20 has a knife 23 which registers with the slot to cut the once folded web into lengths as shown at 25 in Figure 3.

The several lengths of paper are then fed by means hereinafter to be described across the faces and transversely of the line of bite of the folding rolls 26 and 27. A tucker blade 28 is timed to strike each length of paper intermediate its ends to press its central portion between the folding rolls 26 and 27, whereby a transverse or quarter fold is made to leave the paper in the form of a square of four thicknesses as shown at 30 in Figure 3.

Another conveyor receives the quarter folded napkin and guides it across the face of rolls 31 and 32 which are upwardly inclined in a vertical plane in accordance with one of the novel features of this invention. Heretofore the side margins of the napkin have been vertical and the top and bottom margins horizontal. Tucker blades 33 interact with these rolls, being so synchronized with reference to the movement of the quarter folded napkin as to act on the napkin at the time the lower corner of each napkin intersects the tangential plane of the line of bite between the inclined rolls. Obviously the tucker blades 33 must be inclined to correspond with the inclinatiton of the line of bite between these rolls.

As a result of this operation the first cornucopia-fold is made in the napkin at 34, leaving it in the form shown at 35 in Figure 3. The line of fold is intermediate the margins of the napkin and is at a 30° angle.

The final set of folding rolls is shown at 36 and 37. Tucker blades 38 cooperate therewith to make a fold 39 at the opposite side of the napkin blank corresponding in location to fold 34, but bending the corner of the napkin onto the opposite face thereof from the face upon which the first corner was pressed by the first cornucopia-fold.

The second cornucopia-fold leaves the napkin completed in the form shown at 40 in Figure 3 with its opposite corners folded oppositely upon different faces thereof to provide the free flaps 41 and 42 which may be grasped alternatively according to the side of the napkin which is uppermost.

The completed napkins 40 are delivered on edge into the delivery troughs 43 in which packing members 44 are reciprocable to compress the napkins into suitable form for packaging as shown in Figure 2.

Mechanism

Having now described the principle of operation, I shall point out the disposition of the several parts in an actual machine.

The machine frame comprises end standards 45 and 46 joined at suitable points by tie bolts or spacers 47. Brackets at 48 and 49 support the rolls 50, from which webs of paper are fed to the two parts of the machine. Most of the shafting is journaled in both of the end frame members 45 and 46 and carries duplicate parts for the performance of like functions at either side of the machine.

The guide rolls extend transversely of the machine and each is carried by brackets at the top of one of the end members 45 or 46 as is clearly shown in Figures 4 and 5. These same brackets support the triangle plates which extend downwardly with their points projecting toward the center of the machine and toward the line of bite between the felt covered feed rolls 18 and 19. These feed rolls are mounted upon shafts 52 and 53 extending lengthwise of the machine and parallel to each other in substantially a horizontal plane. Shaft 52 carries a pinion 54 driven by a gear 55 on shaft 56 which carries the matrix roll 21 and constitutes the main drive shaft for the machine to which power is applied through pulley 57.

The creasing and cutting rolls 20 and 21 mounted on shafts 58 and 56, respectively, are likewise parallel in a horizontal plane, but are offset from the line of bite of the feed rolls 18 and 19 so that the folded web is held snugly about the peripheries of rolls 18 and 21. The peripheral speed of the cut off rolls 20 and 21 is somewhat higher than that of the feed rolls and I have found that thereby a clean cut is assured regardless of the character of the paper.

Immediately below the line of bite between rolls 20 and 21, is a conveyor system for receiving the blanks or lengths of once folded webs and supporting them in a position for the quarter fold. The conveyor includes a rear belt or tape 60 running over roll 61 and pulleys 62 and 63, and a front belt or tape 65 running over pulleys 66 and 67. The roll 68 interacts with roll 61 to feed the paper downwardly between tape 60 and guide plates 69 and 70 which have edges approximately upright for the guidance of the web. Plate 69 has its apex fitted into a groove in roll 68 and strips the paper therefrom while tape 60 strips the paper from roll 61. The arrangement whereby the paper is thus confined and supported at all times contributes to the accuracy desired in the use of this machine.

Guide plates 69 and 70 are spaced apart vertically, as is clearly shown in Figure 15, to permit the passage of the paper under the impulse of tucker blade 28 carried by an arm 72. The tucker blade is notched at 71, as is best illustrated in Figure 11, to pass tape 60 so that the tape may be extended past the range of movement of the tucker blade for adequate support of the advancing sheet.

Rolls 26 and 27 may be disposed immediately beneath the primary shaft 56 of the machine and have their axes disposed in a common vertical plane extending lengthwise of the machine. The rolls are preferably provided with yieldable inserts of rubber or the like as shown at 73, which are so synchronized as to bite the paper at the time a fold thereof is thrust between them by tucker blade 28. The yieldable inserts project normally beyond the peripheries of their respective rolls and hence contact initially somewhat to the left of a plane joining the axes of the rolls as viewed in Figure 15. Thereby the paper is positively plucked from the tucker blade and firmly creased at its fold line formed between guide plates 69 and 70.

As the quarter folded napkin leaves rolls 26 and 27, it is held to the periphery of roll 27 by means of a belt or tape 75 which runs about roll 26 and pulley roll 76. This belt delivers the napkin to another conveyor system which includes the upright guides 77 and 78, and a co-operating set of belting or tapes passing around roll 27 and pulleys 80 and 81. Each of the tucker blades 33 is notched, as shown at 83 in Figure 9, in order that the operating edges of these tucker blades may pass the conveyor belts or tapes 79.

Each of the two pair of folding rolls 31 and 32 is inclined downwardly in a vertical plane toward the center of the machine. The inclination of the rolls makes it inadvisable to mount tucker blades 33 upon swinging arms such as are used for the support of tucker blade 28. Accordingly, a guideway 85 is provided upon which cross heads 86 are reciprocable to carry the tucker blades 33.

After the napkin receives its first cornucopia-fold between rollers 31 and 32, it leaves such rollers on a table 90 which is inclined to correspond with the tangential plane which includes the line of bite between such rollers. The newly folded margins of the blank 35 delivered by these rolls will necessarily be in parallelism with the line of bite between the rolls at the time of delivery. Inasmuch as the line of bite between rolls 36 and 37 is likewise parallel to a vertical plane including the newly folded edge of the blank, and inasmuch as the final fold must be made at an angle to such plane, it becomes necessary to effect an adjustment of blank 35 angularly about the point of the blank as viewed in plan in Figure 16. Table 90 is slotted at 91 to provide a passage leading to the rolls 36 and 37 for the final fold and, to put the above requirements differently, it is necessary to adjust the napkin so that its new line of fold may be brought into registry with the slot at 91.

In order to accomplish this, a stop is provided at 93 upon the table 90, and a small wheel 94 rotates near the upper margin of the inclined table in the path of the blank as it issues from rolls 31 and 32. The rate of rotation of wheel 94 exceeds the normal rate of advance of the blank and consequently when the periphery of wheel 94 engages the blank near its wider end, it accelerates the motion of this end of the blank and throws the blank about an imaginary axis at its point into engagement with stop 93. In this position the prospective final fold line of the blank registers with the guide slot 91 in table 90, and the tucker blade 95 passes downwardly through said slot giving the blank its final cornucopia-fold and pressing such fold between rolls 36 and 37, to be creased thereby.

The napkin issuing from between rolls 36 and 37 passes downwardly through slots in the vertical guides 96 into contact with the delivery table 43 and beneath the confining plates 97. It is now in the path of one of the packing members 44 which are carried by cross heads 98 reciprocable in guideways 99.

Actuating connections

It will be noted that all of the parts which act directly upon the napkin to fold or crease it subsequently to the cutting operation performed by blade 23 must be synchronized with the movement of rolls 20 and 21 in order that the several folds may be formed properly with reference to the ends of the blank severed by blade 23. For this reason all of the moving parts derive their motion from or are connected mechanically with roll 21, through which power is supplied to the machine.

The gears 54 and 55, already mentioned, drive the feed rolls 18 and 19 which are geared together at 110 (Fig. 4) and determine the rate of paper travel. The ratio of these gears is such that the peripheral speed of the feed rolls will be considerably slower than that of the cut off rolls. This has two advantages. The cutting blade is found to operate smoothly on the softest napkin paper under such circumstances. Also it is possible to vary the length of the napkin by changing the relative rate of paper feed while always preserving the speed advantage of the cutting roll. For this purpose one or both of the gears 54 and 55 are interchangeable with other gears having a different number of teeth to vary the relative driving rate. Thereby the length of the napkin may be varied to satisfy commercial requirements of, for example, 12 to 14 inches and the wear in the felt covers of the feed rolls may also be compensated by proper change gears to make it possible to use the felted rolls over longer periods without replacement such as is ordinarily made necessary by changes in rate of paper feed resulting from wear of the felt.

Shaft 58 carrying roll 20 is driven from shaft 56 by means of gear 111 on shaft 56 and gear 112 on shaft 58.

The quarter fold creasing rolls 26 and 27 are geared together at 113 and driven from shaft 56 through a central gear 114 thereon and an intermediate pinion 115 which meshes with a gear 116 on the shaft which carries roll 26.

Pulley 61 for guide belts 60 is driven from roll 26 through intermediate gears at 117, 118 and 119. Pulleys 62 and 63 run idle. The latter pulley holds the two runs of belt 60 close together to reduce the depth of slot required at 71 in tucker blade 28.

Pulley 66, carrying the guide belt 65, is driven from roll 27 while pulley 67 runs idle.

Roll 76 is driven from roll 27 and is grooved to receive belt 75 which also runs in grooves in roll 26.

Belts 79 run directly upon grooves in roll 27 and pulleys 80 and 81 run idle. Pulley 80 holds the two runs of belts 79 close together to reduce the depth of slot required at 83 in tucker blade 33.

Shaft 120 carries the large gear 121 as shown in Figure 4 by which it is driven directly from the power shaft 56. Shaft 120 is an important shaft in the actuation of any of the oscillatory and reciprocable parts as will hereinafter be described. It also carries gears 122 which will be noted just inside of the frame members in Figure 4 and which drive intermediate gears 123 mounted on studs carried by said frame members. These intermediate gears have helical beveled teeth at 124 meshing with similar teeth out at the ends of the first cornucopia folding rolls 32. Rolls 31 are driven from rolls 32 by spur gearing at 125. Rolls 36 and 37 are driven by chain 126 from shaft 56. Shaft 58 actuates tucker blades 28 by means of crank 127, connecting rod 128, crank 129, and shaft 136, which carries arms 72.

Shaft 120 drives the tucker blades for the first and second cornucopia folds and also drives the packers as follows:

The reciprocable tucker blades 33 for the first set of cornucopia folding rolls are driven from shaft 120 by crank 130, connecting rod 131, crank 132 (Fig. 4) rock shaft 133 (Fig. 5), rocker arms 134, and links 135. (Figs. 9 and 15.)

The oscillatory tucker blades for the second set of cornucopia folding rolls are driven from shaft 120 by crank 140, connecting rod 141 (Figs. 4 and 5), crank 142 (Fig. 7), rock shaft 143, crank disk 144 (Fig. 4), connecting rod 145, crank 146, rock shaft 147, arm 148, flexible link mechanism 149, crank 150 and a set of gear sectors for rotating the tucker blades 95 oppositely on the same axis. The mechanism is shown in Figs. 4, 7, and 8 and includes gear sector 151 connected with crank 150 and mounted on rock shaft 152. Sector 153 meshes with sector 154 on sleeve 155 to which one of the tucking blades 95 is connected. Gear sector 156 meshes with sector 151 and oscillates shaft 157 on which sector 158 is mounted to oscillate sector 159 and shaft 160 which carries the other tucker 95. Thus the two tuckers are coaxial and are operated oppositely in synchronism.

The packers 44 are operated from shaft 120 (Fig. 10) by means of arms 164 mounted on rock shaft 143, the driving connections to such shaft having been described above. Arms 164 actuate links 165 connected to slides 98 upon which rods 167 are mounted to support the packing plates 44. (See also Figures 4, 5, and 15.)

The rollers 94 which adjust or position the partially completed napkins are driven by belts 170 from pulleys 171 on shaft 120.

The modified construction

The entire organization of the modified construction shown in Figures 12 to 14 inclusive is very similar to that already described, the chief differences being a slight rearrange-

ment of the parts for greater compactness and a different mechanism for producing the final cornucopia fold.

The rearrangement of the parts is of no particular consequence since the principle of operation and the sequence of steps remains the same. The provision for the final cornucopia fold, however, involves a certain amount of simplification and a more positive operation in accordance with the objects of this invention and hence will be described.

It will be remembered that in the mechanism above discussed for producing the final cornucopia fold the axes of both sets of cornucopia folding rolls were in parallel vertical planes, as shown in Figure 2. In order to produce the angularly disposed final fold in the napkin it was necessary to adjust the napkin with reference to the line of bite of the final rolls by means of the belt driven friction wheels 94. This necessity is eliminated in the modified construction by setting the rolls 36′ and 37′ at an upward and inward inclination as clearly appears in all of the views illustrating the modified construction. Figure 12 shows the machine partially disassembled in order to completely expose the inwardly and upwardly inclined final folding rolls 36′ and 37′ in their proper relation to the first cornucopia rolls 32 and 33 which latter rolls correspond in all particulars to those already described.

The disposition of the final folding rolls 36′ and 37′ in the modified device is such that their angle will correspond exactly with the required angle for the final fold. The table 90′ upon which the napkin is delivered from the first cornucopia fold rolls 32 and 33 is made up of first and second guide plates 175 and 176, the former of which strips the napkin from the first cornucopia fold roll. The guide plates are separated to provide an angularly disposed slot 91′ corresponding with the vertical plane which includes the line of bite of rolls 36′ and 37′ and hence corresponding with the desired angular disposition of the final fold. (See Fig. 14.)

Because of the fact that the final folding rolls 36′ and 37′ are angularly related in the modified construction it is no longer possible to use the same tucking blade arrangement which was utilized in the first described embodiment of the invention. Figure 13 clearly shows the modified arrangement of tucker blades 38′ whereby such blades are mounted upon angularly related shafts 178 and 179 intergeared by segments at 180 and operated by arm 181 which is linked flexibly at 182 to a connecting rod 149 for operation from rocker arm 148 in the same manner as the tucker blades first described.

It will be understood that this modified arrangement is simply an expedient for simplifying the machine by eliminating all necessity for adjusting the napkin with reference to the machine.

Summary

It will be noted that in both of these machines the napkin passes directly from one operation to another being engaged by the conveyor or folding mechanisms at all points in its path of travel. This not only makes for great compactness in the machine but eliminates much of the difficulty heretofore experienced in uneven folding. A feature of the machine by which this result is accomplished consists in the use of conveyor tape belts and tucker blades which are notched to pass such belts thereby enabling the paper to be tucked even while it is supported by the conveyor system.

Reference has already been made to the fact that the machine is adapted to produce varying lengths of napkins. It is an important fact that varying widths of napkins may also be produced without any change or adjustment of the mechanism by the simple expedient of feeding varying widths of paper to the machine. In previous types of napkin folders with which I have been familiar this has not been possible due to the use of guides and other structure in the path of the free edge of the moving blank. Inspection of the present machine will disclose that the blank is guided at all points by conveying and folding mechanism acting on the face of the blank. The position of the blank in the machine is determined entirely by its folded margin passing from the folding plate 17. In other words the apex of such plate determines the plane in which the folded margin of the sheet moves throughout the machine. It will be obvious that a mere increase in the width of the paper will have no effect other than to increase the extent to which the blank will project from this predetermined and fixed line of movement of its folded margin. There are no guides which require adjustment and consequently it is possible to produce any desired size of folded napkin within commercial requirements by changing the width of paper for the purpose of controlling the width of the completed napkin and changing the gearing which drives the feeding rolls for the purpose of altering the length of the completed napkin.

It will be found upon comparison of the machine with the statement of objects outlined above that the machine fully satisfies such objects and is capable of highly accurate napkin folding work to produce the style of napkin shown at 40 in Figure 3.

I claim:

1. In a device of the character described, the combination with a set of paper converting rolls and a tucker blade movable to and from said rolls and adapted to thrust paper

therebetween, of paper guiding and conveying means arranged to carry paper transversely of the path of movement of said tucker blade past said rolls and comprising a narrow belt, a pulley adapted to hold the return length of the belt adjacent the operative length thereof whereby to reduce the clearance required in the tucker blade for such belt, the tucker blade being notched to pass said belt.

2. In a device of the character described, the combination with a pair of folding rolls, of paper supporting and guiding means comprising a conveyor belt adapted to carry paper past said rolls, and co-operative guide plates opposing said belt and spaced from each other in the direction of paper advance at a point substantially in a plane tangent to the line of bite between said rolls, together with a tucker blade notched to receive said belt and mounted for movement between said guide plates to and from the line of bite between said rolls whereby to be adapted to thrust between said guide plates and into said rolls paper supported, guided and conveyed by said means.

3. In a device of the character described, the combination of a pair of creasing rolls, each provided with a longitudinally extending yieldable rib projecting somewhat from the adjacent peripheral portions of the respective roll and means for driving said rolls in synchronism, said ribs being disposed for registering engagement during the rotation of the rolls.

4. In a device of the character described, the combination of a pair of creasing rolls, each provided with a longitudinally extending yieldable rib projecting somewhat from the adjacent peripheral portions of the respective roll and means for driving said rolls in synchronism, said ribs being disposed for registering engagement during the rotation of the rolls, together with a tucking blade movable to and from said rolls and synchronized therewith to reach its maximum approach toward said rolls substantially co-incident with the engagement of said ribs, said ribs being adapted to pluck material from said blade.

5. In a device of the character described, the combination with a set of creasing rolls provided with registering longitudinally extending and radially projecting yieldable ribs adapted to come into engagement slightly before reaching the normal line of bite between said rolls, means for feeding material past said rolls and a tucking blade movable across the path of such material toward and from the line of bite between said rolls, said tucking blade being synchronized with said rolls whereby to reach its most advanced position substantially coincident with the time of engagement of said ribs, said position being such that said ribs are adapted to pluck material from said blade.

6. In a device of the character described, the combination with means for feeding material along a given path including spaced guide plates intermediate of said path, of a tucker blade movable transversely of said path into the space between said guide plates whereby to be adapted to fold therebetween an intermediate portion of material advancing along said path, and a set of creasing rolls disposed with their line of bite adjacent the most advanced position of said tucker blade and provided with radially projecting yieldable portions adapted for engagement before reaching the normal line of bite between said rolls, said rolls being synchronized with said blade whereby said portions are adapted to pluck folded material from the blade.

7. In a device of the character described, the combination of a pair of creasing rolls connected for synchronous rotation and provided with relatively non-yieldable portions in substantial engagement and radially projecting yieldable rib portions adapted for cooperation in the engagement of material to be fed between said rolls slightly before such material reaches the line of bite therebetween.

8. In a device of the character described, the combination with a paper converting machine including means for severing blanks of paper and means for acting upon said blanks to fold them, of a set of actuating connections synchronizing the movement of said severing means and said folding means, a set of rolls controlling web advance to said severing means and normally operated at a materially slower rate than said severing means, and actuating connections between one of said rolls and said first mentioned actuating connections provided with means for varying the relative rate of operation thereof whereby to feed differing lengths of material through said severing means.

9. In a device of the character described, the combination with a set of feed rolls of a set of cut off rolls, and actuating connections for said rolls so timed as to operate said cut off rolls at a higher peripheral speed than said feed rolls, said connections being adapted to vary the relative rate of operation of said feed rolls without exceeding the peripheral rate of said cut off rolls, together with folding rolls synchronized with said cut off rolls and provided with non-yieldable actuating connections therewith.

10. In a device of the character described, the combination with paper converting mechanism including feed rolls, cut off rolls, and folding rolls, of a triangle plate positioned above said feed rolls over which a web of material is delivered thereto longitudinally creased, and conveying and guiding means positioned along the path of material advance between the several rolls and adapted

to act with said rolls substantially continuously upon the face of the material only, whereby to maintain such material in a path determined by the point of its entry in the machine irrespective of the width of the material.

11. In a device of the character described, the combination of paper converting mechanism including feed rolls, cut off rolls, and folding rolls, conveying and guiding means interposed between certain of said rolls and adapted for contact with the face of the paper only, a triangle plate having its apex above said feeding rolls and adapted to crease paper entering said feed rolls, the apex of said plate being determinative of the line of travel of the folded margin of the paper through the converting mechanism, actuating connections between said rolls, and means for varying the relative rate of operation of said feed rolls with respect to said cut off rolls without exceeding the peripheral speed of the latter, whereby varying sizes of paper blanks may be handled by said converting mechanism.

12. In a device of the character described, a means for producing a cornucopia fold in a quarter folded napkin comprising means for advancing the napkin along a predetermined path, folding rolls disposed adjacent said path with their line of bite at an acute angle to one side of the quarter folded napkin as it advances upon said path, and a tucker blade adapted to thrust an intermediate portion of the moving napkin between said folding rolls when the line of bite thereof registers with the desired fold line in said napkin.

13. In a device of the character described, the combination with web feeding means of a set of blank severing and folding rolls having substantially horizontal axes, and a pair of cornucopia folding rolls having inclined axes adjacent the path of travel of an article delivered by said first mentioned folding rolls, and a tucking blade synchronized with napkin delivery from said first mentioned folding rolls and cooperative with said inclined folding rolls to press therebetween an intermediate portion of a moving napkin registering therewith, whereby to produce an inclined fold therein.

14. In a device of the character described the combination with means for advancing a quarter folded napkin along a given path, of a plurality of sets of cornucopia folding rolls disposed adjacent said path in successive predetermined inclined positions with reference to the side margins of napkins advancing thereon, and tucker blades cooperating with said inclined folding rolls and synchronized with napkin movement whereby to thrust into said sets of rolls successively the inclined napkin portions registering with the lines of bite thereof, whereby a napkin is folded to a cornucopia outline.

15. In a device of the character described, the combination with web feeding rolls of cut off rolls adapted to sever blanks from the web, and paper converting mechanism synchronized with said cut off rolls for the advance and folding of the blanks so severed, said mechanism comprising a conveyor adapted to receive blanks from said cut off rolls, a set of folding rolls adjacent the path of said conveyor, a tucker blade associated with said folding rolls and adapted to deliver thereto an intermediate portion of a blank supported by said conveyor, a second conveyor adapted to receive blanks from said folding rolls, and a second set of folding rolls having their axes inclined with reference to the margin of a blank supported by said second conveyor, together with a second tucking blade adapted to press an inclined fold line of a napkin blank so supported into the line of bite of said second folding rolls.

16. In a device of the character described, the combination with web feeding rolls of cut off rolls adapted to sever blanks from the web and paper converting mechanism synchronized with said cut off rolls for the advance and folding of the blanks so severed, said mechanism comprising a conveyor adapted to receive blanks from said cut off rolls, a set of folding rolls adjacent the path of said conveyor, a tucker blade associated with said folding rolls and adapted to deliver thereto an intermediate portion of a blank supported by said conveyor, a second conveyor adapted to receive blanks from said folding rolls, said second set of folding rolls having their axes inclined with reference to the margin of a blank supported by said second conveyor together with a second tucking blade adapted to press an inclined fold line of a napkin blank so supported into the line of bite of said second folding rolls, a slotted table adapted to receive folded napkins from said second folding rolls, a third set of folding rolls having their line of bite in registry with the slot in said table, and a tucker blade cooperative with said third set of folding rolls to thrust a fold line of said napkin through said slot and into the line of bite of said third set of folding rolls, the slot in said table being inclined with reference to the side of a napkin supported on said table at the time of engagement of the tucker blade therewith.

17. In a folding machine, the combination with means for feeding the material along the given path of a set of folding rolls having a line of bite inclined with respect to said path, a tucker co-acting with said rolls to feed therebetween material traversing said path, a receiving table at the delivery side of said rolls provided with a delivery slot inclined

with reference to the path of movement of material thereover, a tucker movable over a point above said table into said slot and adapted to fold therein the material traversing said table, and a creasing means positioned beneath said slot to receive the material from said tucker whereby to crease therein a second inclined fold.

18. In a folding machine, the combination with a pair of creasing rolls, of a receiving table associated therewith and provided with a slot inclined with reference to the path of delivery of material from said rolls on to said table, guide means associated with the margins of said table at either side of said slot and extending beyond said rolls, a tucker adapted to press material traversing said table through said slot, and a second set of folding rolls adapted to receive material from said guide means beyond said first mentioned rolls.

19. In a folding device, the combination with means for advancing material along a predetermined path, of guide means for material on said path comprising a pair of plates spaced at either side of a plane intersecting said path at an angle to the movement of material thereon, and divergent flanges carried by said plates and constituting a table adapted to support such material in traversing said path, a tucker receivable between said plates and synchronized with said advancing means for action upon an intermediate portion of material advanced by said means along said path, and creasing means adapted to receive such material from the tucker at a point remote from said path.

20. In a folding machine, the combination with means for feeding the material along a predetermined path, of a plurality of mutually independent sets of creasing rolls, tuckers associated with said rolls for pressing material between the lines of bite thereof, and guide means extending between said rolls, the second set of rolls having its line of bite substantially parallel to the plane in which material is delivered from the first set of rolls, but angularly inclined in such plane with respect to the path of delivery.

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