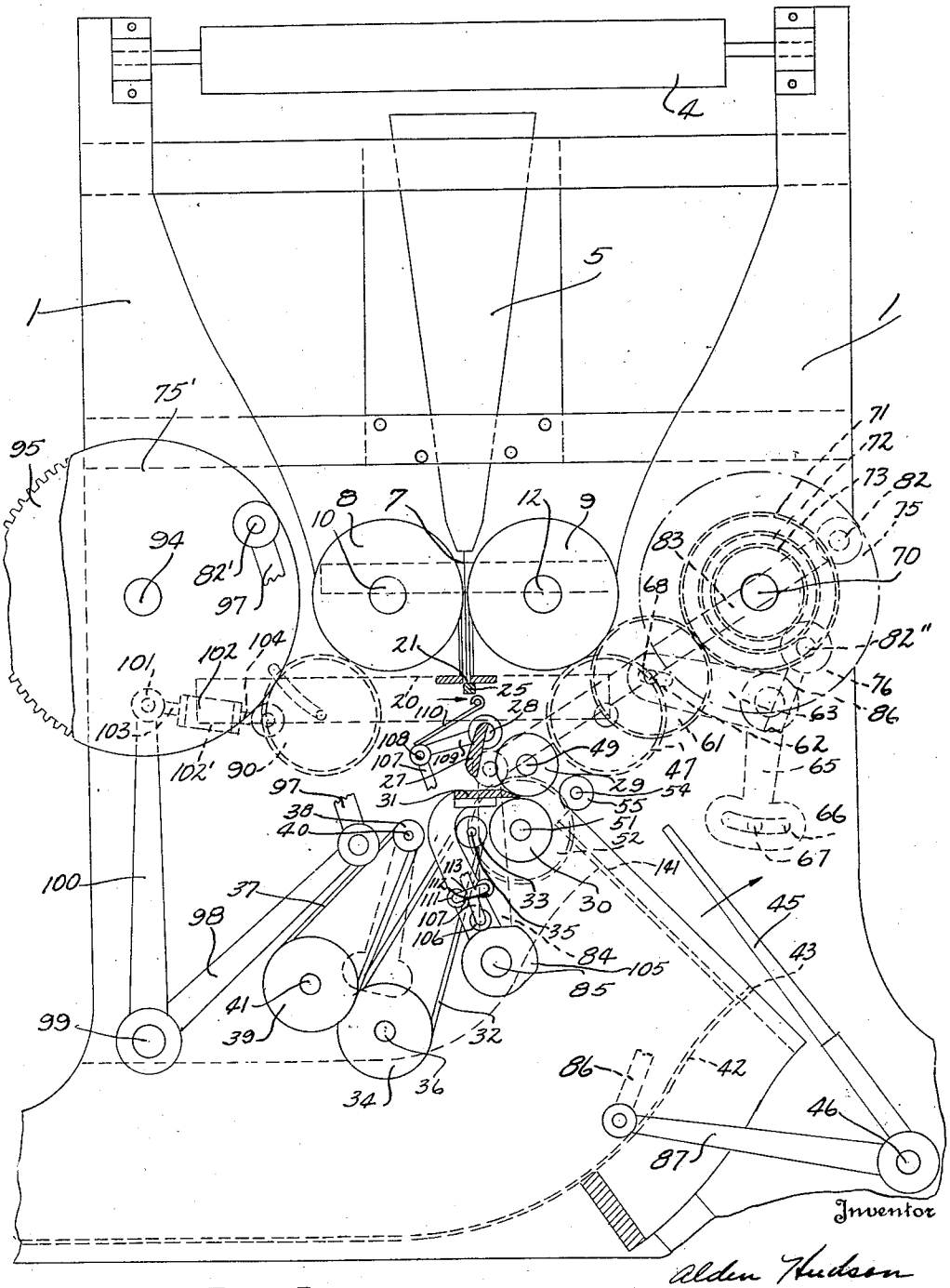
April 5, 1932. A. HUDSON 1,852,576

MACHINE FOR THE MANUFACTURE OF PAPER ARTICLES

Original Filed Jan. 14, 1924 6 Sheets-Sheet 1



Inventor

Alden Hudson

FIG. 1.

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MACHINE FOR THE MANUFACTURE OF PAPER ARTICLES

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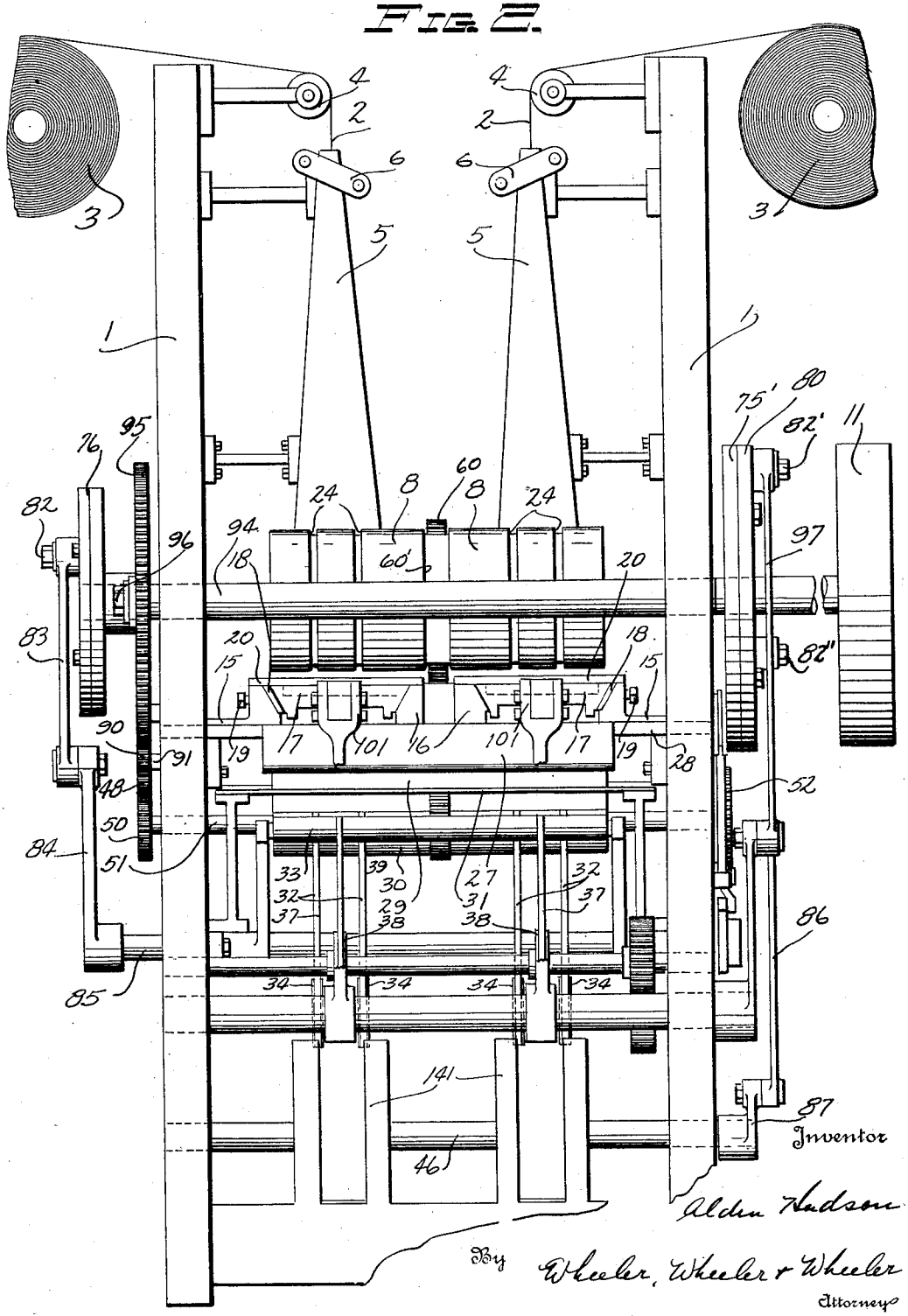
FIG. 2.



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MACHINE FOR THE MANUFACTURE OF PAPER ARTICLES

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FIG. 3.

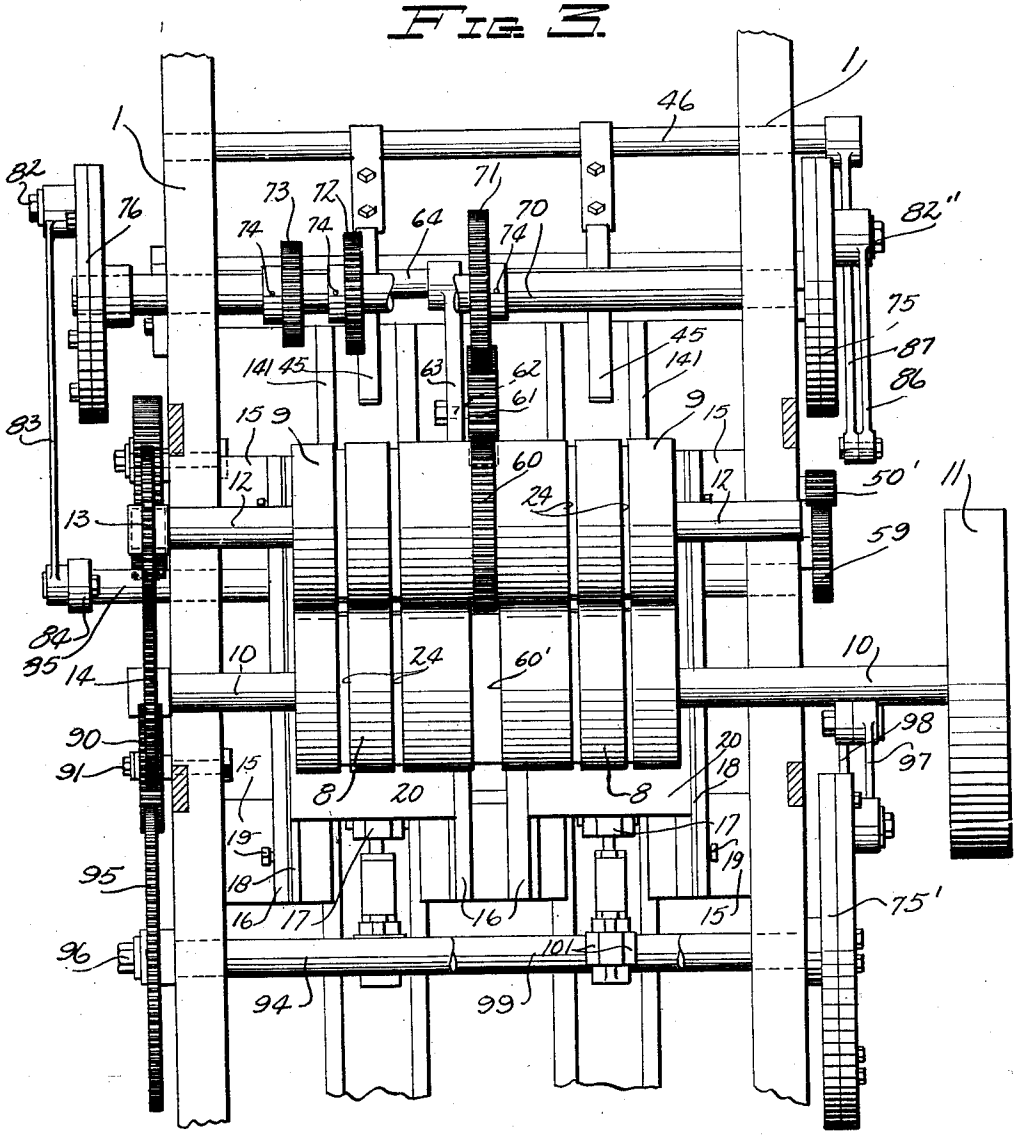

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FIG. 5.

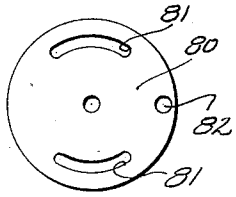


FIG. 6.

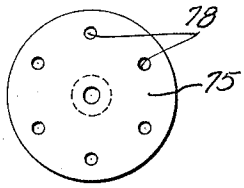


FIG. 7.

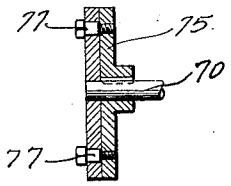
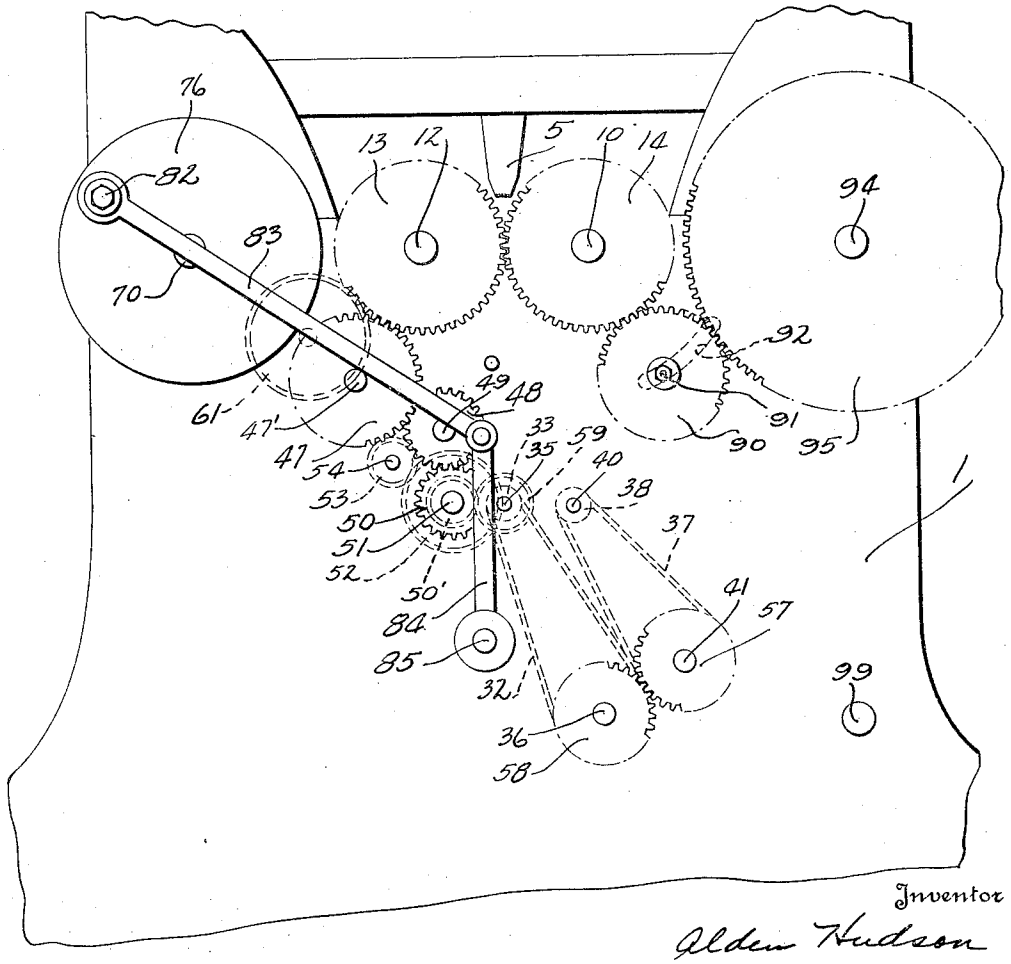


FIG. 4.



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MACHINE FOR THE MANUFACTURE OF PAPER ARTICLES

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Fig.10.

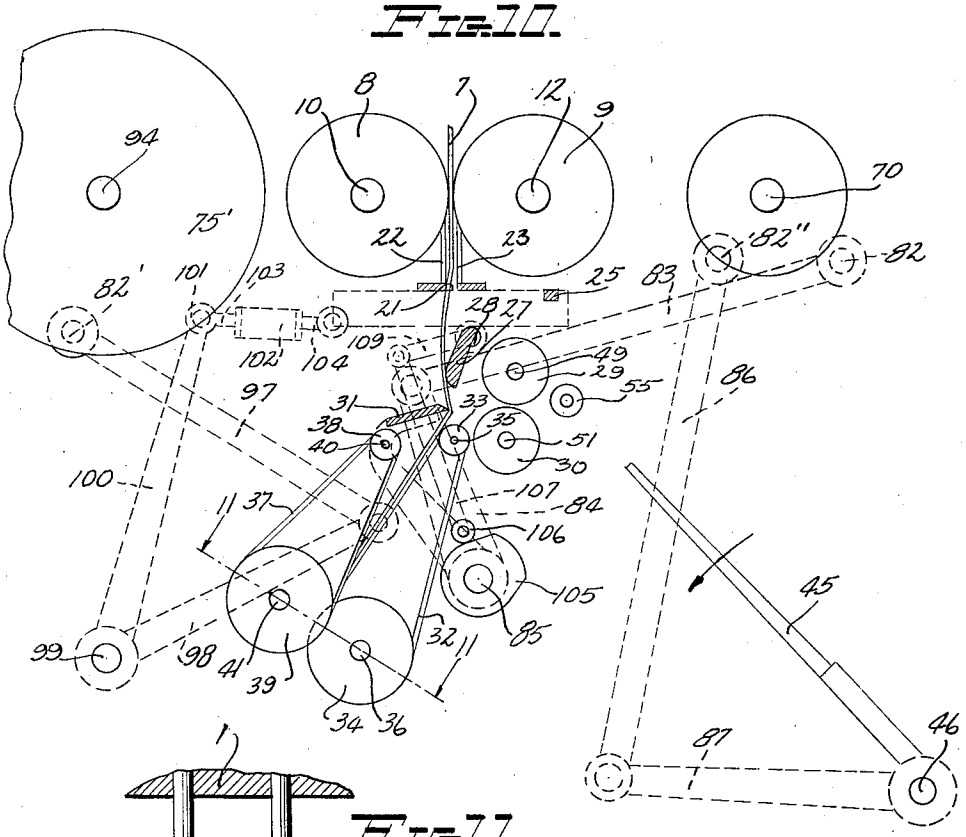

Fig.11.

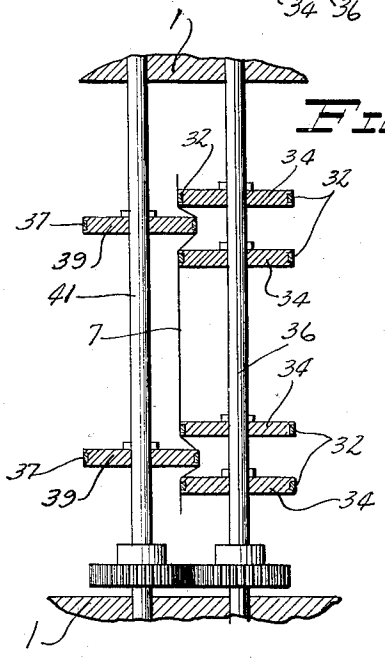

Fig.12.

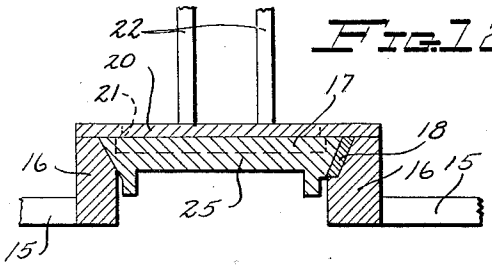

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FIG. 8.

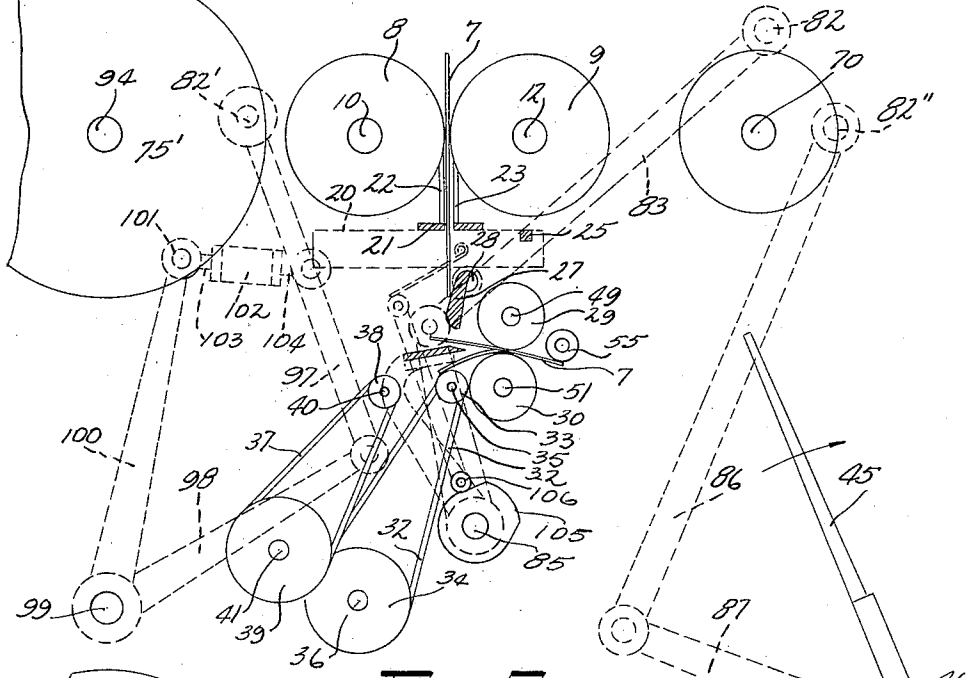
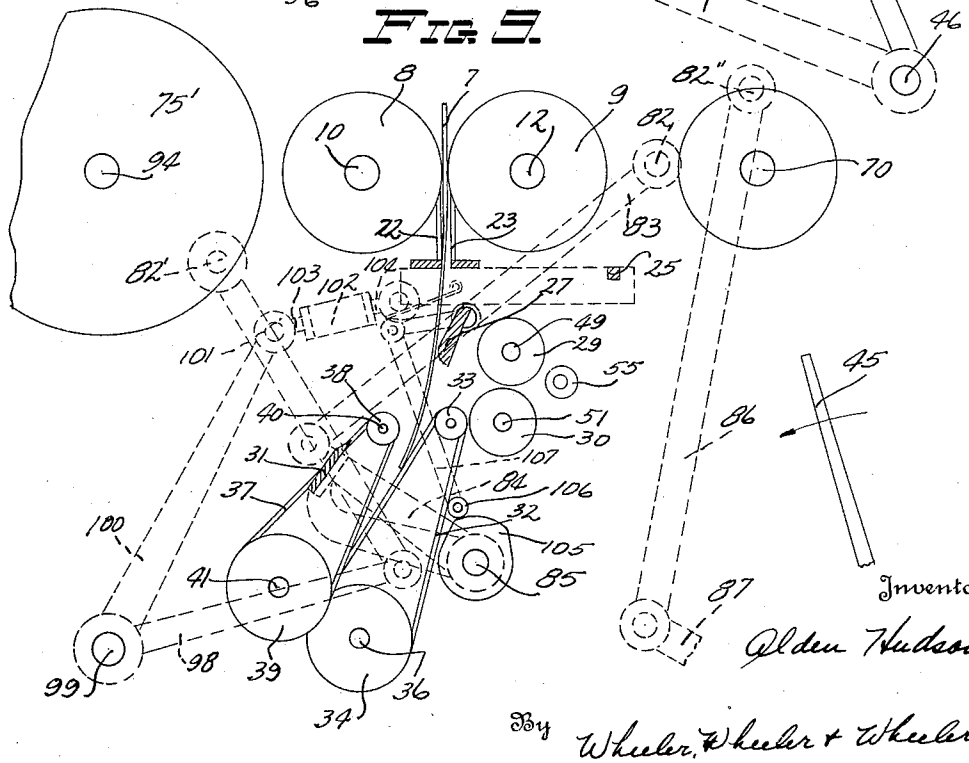


FIG. 9.



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Patented Apr. 5, 1932 1,852,576

UNITED STATES PATENT OFFICE

ALDEN HUDSON, OF GREEN BAY, WISCONSIN, ASSIGNOR TO DAVID WILLIAM HUDSON, OF GREEN BAY, WISCONSIN

MACHINE FOR THE MANUFACTURE OF PAPER ARTICLES

Original application filed January 14, 1924, Serial No. 685,987. Divided and this application filed April 15, 1929. Serial No. 355,158.

This invention relates to improvements in machines for the manufacture of paper articles. More particularly, this invention relates to a machine which is peculiarly adapted for making napkins, toilet paper and the like, but which may be used for the purpose of making other articles embodying sheets of paper or other flexible substances.

It is the primary object of this invention to provide a novel and simple machine which will be susceptible of adjustment to cut and fold sheets of varying sizes. It has heretofore been the practice to provide a separate machine for each size of folded article to be produced. This practice has necessitated large investments in machinery of this character as well as large areas of floor space to accommodate such machines. The disadvantages of the fixed type of machine are obvious and, in the case of a small industry, are serious. The present invention contemplates the provision of a machine which can be adjusted to produce, within certain limits, any desired size or shape of folded paper article, and therefore it is adapted to overcome the objections noted above.

A further very important object of this invention consists in the arrangement by which adjustments are made for the manufacture of different sizes of folded paper articles. It will be understood that a machine of this type involves a considerable number of parts to act on the paper, and it is necessary that such parts be actuated in synchronism. Therefore, a change of adjustment as to the operation of one of such parts will usually require a corresponding change in adjstment to control others of said parts, and it is one of the objects of this invention to provide means for controlling simultaneously adjustments of a plurality of synchronously operated parts so that the independent adjustment of each of such parts will be unnecessary.

It is also an important object of this invention to provide means for producing in an article, such as a napkin or the like, a fold at a point which is not fixed intermediate the ends of a napkin but may be adjusted within limits to the end that the napkin fold may be disposed exactly between the ends of the napkin or may be disposed at points offset from the center line thereof.

Other objects of this invention are to provide a simple, compact construction for the purposes aforesaid; to provide a machine easily susceptible of adjustment and easily operated; to provide a machine having a novel type of paper shearing mechanism which is particularly adapted for association with the folding mechanism of an adjustable machine; to provide a type of machine which consists of a plurality of units adapted to act simultaneously upon a corresponding number of webs of paper and all controlled by the same driving and adjusting mechanism to produce simultaneously napkins of a given size and having a given location of fold.

The drawings are largely diagrammatic but are intended to show in general the relative sizes of the parts as well as their respective location.

In the drawings:

Figure 1 is a diagrammatic side elevation of a device embodying the invention to which this application is directed.

Figure 2 is an end elevation of the device shown in Figure 1.

Figure 3 is a plan view of the majority of the working parts of the device, the superstructure being cut away substantially to the horizontal plane of rolls 8 and 9.

Figure 4 is a view of the driving and interconnecting gear as it appears from the rear of the machine.

Figure 5 is a detail view in front elevation of a crank disk.

Figure 6 is a view similar to Figure 5, of a disk with which disk the disk shown in Figure 5 cooperates.

Figure 7 is a vertical axial section through the assembled disks shown in Figures 5 and 6.

Figure 8 is a view similar to Figure 1, showing one sheet passing through the folding rolls and a new length of web being fed into the machine.

Figure 9 is a view similar to Figure 8, showing a deflector acting on the infed portion of the web, and showing the tucking blade fully retracted.

Figure 10 shows the tucking blade commencing to act upon the web.

Figure 11 is a detail view taken on the section indicated at 11—11 in Figure 10.

Figure 12 is a sectional view on an enlarged scale of the paper severing mechanism taken on the line 12—12 of Figure 3.

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

The framework of the machine is indicated in its entirety by the reference character 1. Paper webs 2 are fed into the machine from supply rolls 3 and pass about the guide rolls 4 from which they extend downwardly through the folding devices 5. Such devices are well known in the art and are adapted to put any desired number of longitudinal accordion folds in a moving web of paper or other flexible material. These devices are retained in place through the medium of gravity actuated links 6, whereby they may readily be removed for the substitution of other similar devices adapted to produce a different number of folds.

The longitudinally folded webs, one of which appears at 7 in Figure 1, are led downwardly between feed rollers 8 and 9. As is clearly shown in Figure 2, there are two of such rollers in axial alignment for the two parts of the machine. Each of the rolls 8 is mounted on a shaft 10 which comprises the primary drive shaft of the machine and, for power receiving purposes, carries a pulley 11. Similarly, each of the rollers 9 is mounted on a shaft 12 which is parallel to shaft 10 and is connected thereto through the medium of gears 13 and 14, respectively (see Figure 3).

Extending between the uprights of frame 1 are the bridge members 15 which may be intergrally connected by means of bearing members 16 providing a pair of parallel dove-tailed channels within which the slides 17 are operable. These slides are preferably accurately fitted to their respective bearing members inasmuch as each slide carries a shearing knife. In order to maintain the slides operative despite any wear which may occur in the use of the machine, each slide may rest on one side upon a take-up member 18 which is adjustable centrally of its slide by means of a set screw 19. The take-up member 18 will conform in angularity to the dove-tailed portion of the slide, and consequently, will act like a wedge to keep the slide pressed against the retaining or cover plate 20.

To facilitate an understanding of the operation of the device, a portion of the cover plate 20 is shown in broken lines in Figure 1. Immediately beneath each pair of feed rolls 8 and 9 the cover plate is provided with an aperture or transverse slot 21 which will preferably have square cut margins between which the longitudinally folded web 7 will be fed. To ensure that the web will be guided through slot 21, I preferably provide the upstanding fingers 22 and 23 which are spaced apart at substantially the width of the slot and are received into suitable peripheral grooves 24 in the feed rolls. This arrangement makes it impossible for the web to follow the rolls through adherence.

The slide 17 carries a transverse shearing bar 25 which, for clearness, is shown in section in Figure 1, although Figure 1 is primarily a side elevation. Due to the angular position of the take-up gibs 18, the slide will be maintained with shear bar 25 in a position to co-operate with the square cut margins of slot 21. The slide 17 and shear bar 25 are reciprocable through means hereinafter to be described and, in each direction of reciprocation of the shear bar 25, it will co-operate with one margin of slot 21 to sever the web portion projecting therethrough. In the position of the parts illustrated in Figure 1, this severing operation is just occurring and, for purposes of illustration, the shear bar 25 may be considered to be moving in the direction indicated by the arrow immediately beneath it.

Disregarding for the moment the portion of the web which has just been severed by the shear bar, the newly infed web portion will be considered from the time of its arrival through slot 21 until it is discharged from the machine. Thus a complete cycle of operation will be described.

After severing the web, shear bar 25 will move to the position in which it is indicated in Figure 8, and simultaneously the rotation of rolls 8 and 9 will advance web 7 until its end contacts with the deflector 27. This deflector may be stationary but will preferably be mounted for oscillation upon a cross shaft 28 and will, through actuating mechanism hereinafter to be described, be oscillating at this point of the cycle in a clockwise direction. It is the function of the deflector 27 to prevent the advancing end of the web from adhering to the extremity of the preceding napkin, or may otherwise be caught between the folding rollers 29 and 30.

The tucking blade 31 which, in the positions of the parts shown in Figures 1 and 8 is in the path of the advancing web, is being retracted at this time in the direction indicated by the arrow in Figure 8 and eventually reaches the position in which it appears in Figure 9. At this point the shear knife 25 is practically at the end of its stroke, and the tucking blade 31 is also almost fully retracted. The end of the longitudinally folded web portion 7 has now been fed by feed rolls 8 and 9 onto a transverse series of belts 32. These belts pass over spaced pulleys 33 and 34 upon shafts 35 and 36, respectively. A sufficient number of belts is employed to provide adequate support for the end of the advancing web. These belts advance in the di-

rection indicated by the arrows, either at the speed of web advance or at a slightly greater speed, so that they assist in maintaining the web in position and under that slight degree of tension which is desirable for the most perfect operation of the machine.

Co-operating with belts 32 are belts 37 which are disposed above the path of the advancing web and are carried by upper and lower pulleys 38 and 39 mounted respectively on shafts 40 and 41. The size and location of pulleys 39 is such that these pulleys will be disposed in staggered relation with pulleys 34, and a belt 37 will lie between each pair of belts 32. This arrangement is such as to ensure frictional contact of both belts with the web so that by the time the web reaches the position in which it appears in Figure 10 the extremity of the web will be corrugated to lie between belts 32 and 37 and pulley 34 and 39.

When the web reaches the point in its advance in which it is shown in Figure 10, the tucking blade will be well advanced on its operating stroke and will be engaged with the paper, as indicated in Figure 10, while moving in the direction of the arrow in said figure. The engagement of the belts 32 and 37 with the paper will hold it under tension at the time of contact of the tucking blade therewith, and will thereby ensure a perfect fold on a line normal to the margins of the web. If the sheet is not so held the fold will not always be straight. The upper belt 37 also serves to prevent the sheet or web from snapping backward. The shearing knife 25 will also be on its return stroke and will be approaching rapidly to the point where it will again sever that portion of the web with which the tucking blade 31 is engaged. The fact that the web is unsevered at this time ensures that it will be under tension, due to the pull of the belts thereon.

As the parts continue to move they will complete the cycle by reaching the positions in which they appear in Figure 1. The tucking blade 31 will force an intermediate portion of the web between the folding rolls 29 and 30 which will act upon the web in the usual manner, first to crease the fold made by the tucking blade and then to draw the severed portion of the web between themselves in the form of a completed paper article. The shearing knife 25 will be so synchronized with the movements of the tucking blade that the shear knife will sever the web substantially exactly at the time when the portion to be severed is forced by the tucking blade into the operative grip of folding rolls or vise rolls 29 and 30.

As the cycle just described recommences, the severed napkin is directed by roller 55 into a trough 141 down which it slides until it reaches a point of registry with chute 42. At this point it is brought to rest by means of a suitable stop 43. At this point the packer 45, which is mounted on rock shaft 46 and is in course of retraction in Figures 1 and 8, moves downwardly as indicated by the arrows in Figures 9 and 10 until it contacts with the newly formed folded article and compresses it above previously formed articles in the chute 42. Thus, upon each of the active strokes of the packer the articles in the chute will be advanced for a distance equivalent to the thickness of the newly added article.

The operation of the machine in general has been described before its specific mechanical connections were set forth in order that the adjustable features of the machine might be the more fully appreciated. It will be understood from the foregoing that it is necessary that the shear knife 25, tucking blade 31, the oscillatory deflector 27, and the packer 45 must all operate upon the work with synchronized action, and their operation must also be synchronized with the rate of advance of the web by the feed rolls 8 and 9. Furthermore, it will also be appreciated that for special work it is desirable to provide for the independent adjustment of several of these mechanical elements to change their time of action with respect to the action of others of the elements. It is also desirable, however, to provide for the simultaneous adjustment of the relative time of action of a plurality of elements when simultaneous adjustment is possible consistent with the desired operation of the machine.

One set of mechanical connections for accomplishing the results expressed immediately above will now be described, but inasmuch as it is obviously a simple matter to design equivalent means for obtaining this result I do not desire to limit myself to the specific construction herein disclosed, except as specifically pointed out hereinafter in the claims.

As has already been stated, power is applied to the machine through pulley 11 which is mounted on shaft 10. Gears 14 and 13 on shafts 10 and 12, respectively, connect such shafts for simultaneous rotation. From gear 13 power is transmitted not only to shaft 12 but also to a transmission gear 47 which may be mounted on a stud shaft 47′ carried by the frame 1. Gear 47 meshes at the back of the machine with a gear 48 on the shaft 49 which carries one of the folding or vise rolls 29. This gear 48 meshes in turn with a gear 50 on shaft 51 which carries the other folding or vise roll 30. Thus, the rotation of both of the vise rolls is provided for, and it will be noticed that no adjustment is necessary to control the relative rates of rotation on such rolls. Due to the reduction gearing employed between drive shaft 10 and the shafts 49 and 51, these shafts and the vise rolls 29 and 30 carried thereby will always rotate at relatively high speeds, and will thereby be adapt-

ed to handle any length of napkin which can be fed to them by the feed rolls 8 and 9. With respect to the feeding rolls 8 and 9, the speed of the clamping rolls 29 and 30 is constant.

The shaft 51 which carries the vise roll 30 is driven by gear 50 at its rear end and at its forward end it carries a gear 52, which is shown in dotted lines in Figure 4, by reason of the fact that it is at the front of the machine. Gear 52 meshes with a gear 53 which is likewise at the front of the machine and is carried by a shaft 54 upon which the rotary deflecting roller 55 is mounted.

The shafts 35 and 40, carrying respectively pulleys 33 and 38, are interconnected by means of intermeshing gears 57 and 58 on shafts 41 and 36, and by the belts 32 and 37 already described. These shafts are both driven through a gear 59 disposed centrally on shaft 35 which meshes with ring gear 50′ on the vise roll 30. Thus, the belts 32 and 37 and the rotary deflector 55, as well as the vise rolls 29 and 30, are all driven at constant speed with reference to the feed rolls 8 and 9, inasmuch as it is unnecessary to change the relative speed of movement.

As best shown in Figure 3, the two driving rolls 9 on shaft 12 are axially spaced apart to receive between them a gear 60 which, if the rolls 9 are integrally connected, may comprise a ring gear. The rolls 8 which are illustrated in Figure 3 as being integrally constructed are grooved at 60′ to provide clearance for gear 60. The groove 60′ lies between and defines the independent rolls 8 which act upon different webs of paper. Meshing with gear 60 is an intermediate gear 61 adjustably supported on a stud 62 in the end of an arm 63 on a rock shaft 64. The rock shaft may be constructed in any desired manner to be supported in any adjustment with reference to the frame. For example, it may, as indicated in dotted lines in Figure 1, be provided with an arm 65 substantially at right angles to arm 63 and provided with a slotted head 66 which may be secured in any position of oscillatory adjustment by means of a set screw 67 in threaded engagement with the frame. There is also a slot in arm 63 at 68 to permit the adjustment of stud shaft 62 radially of arm 63, whereby to maintain gear 61 in mesh despite the oscillatory adjustment of rock shaft 64 and arms 63 and 65.

Journaled in the frame 1 is a cross shaft 70 upon which are slidably mounted a series of gears 71, 72, and 73 which may either be splined to the shaft or may be provided with set screws 74 for securing them in any desired position of adjustment thereon. The arrangement is such that any of the gears just described can be positioned selectively upon the shaft in the plane of intermediate gear 61 to receive motion therefrom. The adjustment of rock shaft 64 and arm 63 which carry gear 61 are intended and adapted to permit gear 61 to be moved into mesh simultaneously with its driving gear 60 and its driven gear 71, 72, or 73. While only three gears have been illustrated on shaft 70, it will be obvious that the number of gears on said shaft could be multiplied indefinitely to produce any desired relative speed between said shaft and the driving gear 60 on shaft 12.

Keyed to shaft 70 at its ends are the disks 75 and 76 located respectively at the front and back of the machine. One of these disks is illustrated in elevation in Figure 6 and in section in Figure 7. The disks are each apertured at 78 to receive threadedly bolts 77. Co-operating with disks 75, 76 are disks 80 having arcuate slots 81 to receive bolts 77 and carrying crank pins 82 and 82″, respectively. Thus, the arrangement is such that each crank pin is rotatably adjustable with reference to the shaft 70 with which it is connected for operation. The adjustment of the crank pins provides for the independent timing of the members driven through shaft 70, whereas the several gears 71, etc., on shaft 70 permit of the simultaneous adjustment for timing purposes of all elements driven through said shaft.

The crank pin 82 connected with shaft 70 at the rear of the machine receives a connecting rod 83, whereby it is joined to a rocker arm 84 on the rock shaft 85 which carries the tucker 31. The rotative movement of shaft 70 is thus transmitted to rock shaft 85 to produce oscillation of said shaft and the corresponding movement of the tucker as previously described.

At the front of the machine, and preferably exterior to the frame thereof, shaft 85 carries a cam 105 which actuates a roller cam follower 106 on the reciprocable link 107. This link is connected at 108 with an arm 109 on rock shaft 28 which carries the deflector 27. A spring 110 presses link 107 downwardly to maintain cam follower 106 in operative contact with cam 105. The link 107 may be guided in any suitable means, such as the spaced rollers 111 and 112 connected with the frame of the machine. A retaining member 113 mounted on the axle studs of rollers 111 and 112 maintains the link in operative position between the rollers.

The crank pin 82″ at the front of the machine actuates a connecting rod 86 which is engaged with arm 87 on the rock shaft 46 which supports the packer 45. Therefore, the rotative movement of shaft 70 produces the above described oscillations of the packer and such oscillations are not only adjustable simultaneously with the adjustment of the tucking blade but are also adjustable independently thereof through the medium of the adjustable crank pin support through which each of the connecting rods 83 and 86 is independently operated.

Reference has already been made to the gear 14 on driving shaft 10 through which all of the above described gearing and motion transmitting connections are operated. This gear also actuates a further line of power transmitting mechanism, including a gear 90 adjustably mounted on a stud shaft 91 which is carried in an arcuate slot 92 in the frame, the slot being concentric with the axis of shaft 10. Thus, while the shaft 91 is adjustable, the gear 90 carried thereby will always mesh with gear 14 to be driven therefrom.

A cross shaft 94 in the frame is adapted to carry interchangeably at its rear end any one of a series of any desired number of gears, of which the gear 95 is one. This gear is held in place by means of a nut 96 on the end of shaft 94 or by any other equivalent means adapted to permit of the ready removal of the gear 95 for the substitution of another gear of different size. This arrangement constitutes a well known type of change speed mechanism embodying change speed gearing of the so called "take-off" variety. Other change speed mechanism might be employed, but inasmuch as there are ordinarily few changes or adjustments in a machine of this character no complicated change speed gearing would be warranted, and that illustrated has the advantage of being extremely simple and easy to operate.

Opposite to the end of shaft 94 which carries gear 95 is a disk 75′ and a complementary disk 80′ corresponding to disks 75 and 80 previously described. Disk 80′ carries a crank pin 82′ which is connected by pitman 97 with the rocker arm 98 on rock shaft 99. This rock shaft also carries arms 100, which are illustrated in Figure 1, in any intermediate position from which they oscillate in both directions during the operation of the device. These arms 100 will correspond in number to the number of cutters to be actuated. For while I have illustrated and described only two cutters side by side, it will be obvious that a machine of this character can be extended from front to rear to operate simultaneously upon as many webs as may be desired. The showing of means for operating on two webs will be understood to exemplify the fact that a plurality of webs may be treated with a machine of this type as readily as a single web may be acted upon.

The arms 100 on rock shaft 99 are provided at their upper extremities with clevises 101, whereby the adjustable links 102 are pivotally connected thereto. Each of the links includes a barrel 102′ interiorly threaded to receive right and left hand threaded members 103 and 104 (see Fig. 10). This arrangement permits of the ready adjustment of the length of the links. The end of each link remote from its pivotal connection with the clevises of arms 100 is connected pivotally with one of the slides 17 which carry the shear bars 25. The arrangement is such that the rotation of shaft 94 causes the oscillation of shaft 99 and the corresponding reciprocation of the slides carrying the shear bar. By means of disks 75′ and 80′ the relative timing between the shear bars and the remainder of the machine may be varied without altering the synchronization of the parts. By interchanging gear 95 with other gears of different ratios relative to gear 14, and by adjusting the intermediate gear 90 accordingly, the synchronization of shaft 94 with the remainder of the machine may be altered to vary the length of sheet which will be severed during the forward and rear strokes of the shear bar. Independent adjustments of the shear bars may be made when necessary by means of the adjustable lengths 102.

The operation of the machine has already been fully described, and I have also described means for making adjustments in the driving connections to vary the relative positions of different elements acting upon the paper, and also to vary the timing or synchronization of such elements. As illustrated in the accompanying drawings, gear 95 has a ratio of two to one as compared with the gear 14 from which it is driven. In other words, gear 95 will make one rotation for each two rotations of rolls 8 and 9. As a result of this proportion, and as a further result of the fact that the shear bar 25 severs a blank from the web twice during each complete cycle, it will be obvious that with the gear 95 as illustrated each blank will have a length equal to the circumference of rolls 8 or 9. By substituting for gear 95 a gear of a different ratio with respect to gear 14, it is possible to cut from the longitudinally folded web portion 7 a blank having a length lesser or greater than the circumference of roll 8. The length of the blank will always be one-half of the circumference of gear 95, due to the fact that the shear bar 25 makes two cutting strokes for each rotation of said gear. Consequently, the operator can conveniently determine the size of gear 95 by selecting a gear which has a circumference equal to twice the length of the desired blank. If such a substitution be made, it is obvious that a corresponding substitution will have to be made in the gears through which the tucking blade is operated. Otherwise, the shortened blank would pass the tucking blade to a greater proportionate extent with each successive cycle of operation.

In order to ensure that the tucking blade will strike the same relative portion of each successive blank, acted upon by it, the several gears 71, 72, and 73 are provided to correspond in their ratios with gear 60 to the ratio adopted between gear 95 and gear 14. Note that a corresponding rather than an identical

ratio is used. The tucking blade completes but one operation in its cycle of movement, whereas the shear bar completes two operations in its cycle of movement. Thus, the circumference of that gear 71, 72, or 73 which is selected on driven shaft 70 will always be equal to the length of the desired sheet in order that the tucker may operate once during each rotation of the chosen gear.

The adjustment made possible by the use of disks 76 and 80 provides for a change in the relative position of the tucker so that a greater or lesser length of the blank may be allowed to pass the blade before being acted upon thereby. Thus, the blank may either be folded in its exact center or to one side of the center as may be desired, and consequently, it is possible to secure a wide variety of folds on a machine of this character. Note particularly that a change in the relative position of the tucker blade, such as may be accomplished by adjustment of plate or disk 80, has no effect upon the synchronization of the parts and permits them to continue to operate with the same timing as that previously employed. In other words, the number of operations performed in a complete rotation of the driving gear will be constant, although the point of the cycle at which each operation is performed may be adjusted.

The specific web feeding and cutting mechanism herein disclosed is not separately claimed herein since such mechanism comprises the subject matter of my application No. 685,987, filed January 14, 1924, of which the present case is a division.

I claim:

1. In a device of the character described, the combination with a web feeder, a web cutter associated with the feeder to act upon material advanced therethrough and to sever therefrom blanks of determinable length, of a web folder comprising a tucking blade disposed in the path of web movement beyond said cutter and a web creaser adapted to receive portions of the web folded by said blade, and driving connections adapted to actuate said feeder, cutter, and folder in synchronism, said connections being adjustable to vary the rate of actuation of said cutter and folder with respect to the rate of actuation of said feeder.

2. In a device of the character described, the combination with a web feeder and a web folder, of driving connections for the simultaneous actuation of said feeder and folder, and including rate changing mechanism controlling the relative rate of operation of said feeder and folder.

3. In a device of the character described, the combination with a web feeder, of a web cutting member associated with the feeder and adapted to act upon a web fed thereby, a web folding member disposed in the path of web movement beyond the path of movement of said cutting member, driving connections adapted for the synchronous operation of said cutting member, feeder, and folding member, said connections including rate changing means for varying the rate of operation of said cutting member and folding member with reference to said feeder, and also including means for adjusting the relative time of operation of one of said members in the cycle of operation of the other without affecting their relative rate of operation.

4. In a device of the character described, the combination with a pair of feeding rolls, of spaced stationary shear bars providing between them a slot adapted to receive a web advanced by said rolls, a reciprocable shear bar associated with the stationary member and adapted to interact with each stationary shear bar during each complete reciprocation to sever the web portion advanced through said slot, a tucking blade mounted for to-and-fro movement across the path of web movement beyond said slot, creasing rollers adapted to receive the web from said tucking blade, and driving connections for said reciprocable shear bar, feeding rolls, tucking blade, and creasing rolls, said driving connections including rate changing means for controlling the relative rates of operation of said reciprocable shear bar and said tucking blade.

5. In a device of the character described, the combination with a pair of feed rolls adapted to advance continuously a web of flexible material, of stationary shear bars disposed upon either side of the path of advance of said web beyond said rolls, a reciprocable shear bar adapted to interact with each of said stationary shear bars during each complete reciprocation thereof, a set of staggered belts operable upon opposite sides of the web and in the direction of movement thereof, said belts being disposed to engage said web frictionally, a tucking blade movable transversely across the path of movement of said web intermediate said shear bars and said belts, creasing means adapted to receive an intermediate portion of said web from said tucking blade, and driving connections for the operation of said feed rolls, reciprocable shear bar, belts, tucking blade, and creasing means.

6. In a device of the character described, the combination with a pair of feed rolls adapted to advance continuously a web of flexible material, of stationary shear bars disposed upon either side of the path of advance of said web beyond said rolls, a reciprocable shear bar adapted to interact with each of said stationary shear bars during each complete reciprocation thereof, a set of staggered belts operable upon opposite sides of the web and in the direction of movement thereof, said belts being disposed to engage said web frictionally, a tucking blade movable

transversely across the path of movement of said web intermediate said shear bars and said belts, creasing means adapted to receive an intermediate portion of said web from said tucking blade, and driving connections for the operation of said feed rolls, reciprocable shear bar, belts, tucking blade, and creasing means, said connections being adapted to operate the above named parts in synchronism and including rate changing means for the control of operation of certain of said parts with respect to others of said parts, whereby the device is adapted to deliver a plurality of different articles.

7. In a device of the character described, the combination with a web feeder and creasing rolls at one side of the path of web movement beyond said feeder, of a tucking blade reciprocable across the path of movement and adapted to deliver an intermediate portion of said web to said creasing rolls, a web cutter associated with said feeder and adapted to sever from said web a portion engaged between said rolls, and a deflector positioned between said cutter and said roll and adapted to deflect a new length of said web from said roll.

8. In a device of the character described, the combination with a web feeder and creasing rolls at one side of the path of web movement beyond said feeder, of a tucking blade reciprocable across the path of movement and adapted to deliver an intermediate portion of said web to said creasing rolls, a web cutter associated with said feeder and adapted to sever from said web a portion engaged between said rolls, and a deflector positioned between said cutter and said roll and adapted to deflect a new length of said web from said roll, said deflector including a portion operable in a path of movement leading away from said rolls, and said portion being synchronized for operation from said rolls substantially at the time of advance of the end of a new length of said web.

9. In a device of the character described and adjustable to produce a plurality of different folded articles, the combination with means for acting successively upon portions of a web fed into said device, of driving connections for the synchronous operation of said several means, and including a rate changer so disposed as to be operable to control simultaneously the rates of operation of a certain plurality of said means with respect to another of said means.

10. In a device of the character described including a paper feeder, a paper cutting member, a paper folding member and a paper packing member, the combination with the feeder and said members of driving connections for the synchronous operation of said feeder and said members, and including rate changing means operable to control simultaneously the rate of operation of a plurality of said members, whereby to vary such rate with respect to the rate of operation of said feeder.

11. In a device of the character described, the combination with a feed roll and a gear connected therewith, of a reciprocable web cutter disposed adjacent said roll and provided with driving connections from said gear and including rate changing mechanism, whereby said cutter will operate to sever portions of varying length from a web advancing from said feed roll, a reciprocable tucking blade, a reciprocable packing member, and driving connections for the operation of said blade and member from said gear, said connections including rate changing mechanism providing for the operation of said blade and member at a plurality of relative speeds with respect to the rate of operation of said roll, the available speeds corresponding to the possible relative variations of speed between said cutter and said roll, whereby said blade and member may be adjusted simultaneously to operate synchronously with said cutter to act upon sheets of varying dimensions.

12. In a device of the character described, the combination with means for feeding continuously a web of flexible material, of means for periodically severing a portion of the advancing web, means for withdrawing laterally the severed portion of the web, and an oscillatory deflector interposed between said severing means and said withdrawing means and adapted to prevent the extremity of the web from being caught in said withdrawing means.

13. In a device of the character described, the combination with means for feeding continuously a web of flexible material, a means for periodically severing a portion of the advancing web, means for withdrawing laterally the severed portion of the web, and an oscillatory deflector interposed between said severing means and said withdrawing means and adapted to prevent the extremity of the web from being caught in said withdrawing means, together with a tucking blade co-operating with said withdrawing means and provided with motion transmitting mechanism operatively connected for the actuation of said deflector periodically in a cycle of movement of said tucking blade.

14. In a device of the character described, the combination with a feed roll, a cutting member, a folding member, and a creasing member; of variable-rate driving connections between said feed roll and said cutting member, whereby to cut blanks of varying length at varying time intervals from a web advanced by said feed roll; relatively fixed driving connections between said roll and another of said members; and variable-rate driving connections between said feed roll and a further one of said members.

15. In a device of the character described, the combination with a feed roll, a cutting member, a folding member, and a creasing member; of variable-rate driving connections between said feed roll and said cutting member, whereby to cut blanks of varying length at varying time intervals from a web advanced by said feed roll; relatively fixed driving connections between said roll and another of said members; and variable-rate driving connections between said feed roll and a further one of said members, said last mentioned driving connections being adjustable to synchronism with said first mentioned driving connections.

16. In a device of the character described, the combination with a pair of feed rollers, one of them being provided with a gear; of a web shearing device adapted to act upon a web advanced by said rollers and being provided with driving connections operative from said gear; a tucking blade movable to and fro across the path of web advance from said rollers and provided with driving connections for its operation from said gear; and a pair of creasing members disposed adjacent the path of advance of said web and adapted to receive material from said tucking blade, said creasing members being provided with driving connections operative from said gear, one of said driving connections being adjustable as to its rate of operation.

17. In a device of the character described, the combination with a pair of feed rollers, one of them being provided with a gear; of a web shearing device adapted to act upon a web advanced by said rollers and being provided with driving connections operative from said gear; a tucking blade movable to and fro across the path of web advance from said rollers and provided with driving connections for its operation from said gear; and a pair of creasing members disposed adjacent the path of advance of said web and adapted to receive material from said tucking blade, said creasing members being provided with driving connections operative from said gear, one of said driving connections being non-adjustable and adapted to operate at a fixed rate with reference to said gear, and the others of said driving connections being adjustable as to their rate of operation with respect to said gear.

18. In a device of the character described, the combination with a pair of feed rolls and a gear connected with one of them, of a guide member associated with said rolls and providing a slot adapted to receive a web delivered from said rolls, a shear bar reciprocable with respect to said guide member and adapted to sever a portion of the web projecting through said slot, driving connections of adjustable rate from said gear to said shear bar, and a pair of creasing members disposed adjacent the path of web advance beyond said slot and provided with driving connections from said gear adapted to operate said creasing members at a speed such as to enable said members to act upon portions successively cut from said web irrespective of changes in the rate at which such portions are cut.

19. In a device of the character described, the combination with a feeding roll, of a severing mechanism adapted to operate on a web advanced by said roll, motion transmitting connections for said mechanism adjustable to control the rate of operation of said mechanism with respect to the rate of operation of the roll, a pair of creasing members disposed adjacent the path of advance of a web beyond said severing mechanism, and means adapted for the continuous actuation of said members at a constant rate.

20. In a device of the character described, the combination with a feeding roll, of a severing mechanism adapted to operate on a web advanced by said roll, motion transmitting connections for said mechanism adjustable to control the rate of operation of said mechanism with respect to the rate of operation of the roll, a pair of creasing members disposed adjacent the path of advance of a web beyond said severing mechanism, means adapted for the continuous actuation of said members at a constant rate, and a tucking device mounted for co-operation with said creasing members and adapted to deliver intermediate portions of said web therebetween, said tucking device being provided with driving connections adjustable as to their rate of operation to synchronize with the driving connections for said severing mechanism.

21. In a device of the character described, the combination with a feeding roll, of a severing mechanism adapted to operate on a web advanced by said roll, motion transmitting connections for said mechanism adjustable to control the rate of operation of said mechanism with respect to the rate of operation of the roll, a pair of creasing members disposed adjacent the path of advance of a web beyond said severing mechanism, means adapted for the continuous actuation of said members at a constant rate, a tucking device mounted for co-operation with said creasing members and adapted to deliver intermediate portions of said web therebetween, said tucking device being provided with driving connections adjustable as to their rate of operation to synchronize with the driving connections for said severing mechanism, and an oscillatory deflector operatively connected with said tucking device for actuation therefrom, whereby changes in the relative rate of movement of said tucking device will change the relative rate of movement of said deflector, said deflector being operative periodically to engage the portion of an advancing web

from which a part has been severed and to press such portion from said creasing members.

22. In a device of the character described, the combination with a feeding roll, of a severing mechanism adapted to operate on a web advanced by said roll, motion transmitting connections for said mechanism adjustable to control the rate of operation of said mechanism with respect to the rate of operation of the roll, a pair of creasing members disposed adjacent the path of advance of a web beyond said severing mechanism, means adapted for the continuous actuation of said members at a constant rate, a tucking device mounted for co-operation with said creasing members and adapted to deliver intermediate portions of said web therebetween, said tucking device being provided with driving connections adjustable as to their rate of operation to synchronize with the driving connections for said severing mechanism, and packing mechanism operative to receive creased material from said creasing members, said packing mechanism including an oscillatory member actuated synchronously with said tucking device from the driving connections therefor, whereby the rate of movement of said oscillatory member will be varied simultaneously with variations in the rate of movement of said tucking device.

23. In a device of the character described, the combination with a feeding roll, of a severing mechanism adapted to operate on a web advanced by said roll, motion transmitting connections for said mechanism adjustable to control the rate of operation of said mechanism with respect to the rate of operation of the roll, a pair of creasing members disposed adjacent the path of advance of a web beyond said severing mechanism, means adapted for the continuous actuation of said members at a constant rate, a tucking device mounted for co-operation with said creasing members and adapted to deliver intermediate portions of said web therebetween, said tucking device being provided with driving connections adjustable as to their rate of operation to synchronize with the driving connections for said severing mechanism, packing mechanism operative to receive creased material from said creasing members, said packing mechanism including an oscillatory member actuated synchronously with said tucking device from the driving connections therefor, whereby the rate of movement of said oscillatory member will be varied simultaneously with variations in the rate of movement of said tucking device, and means in said last mentioned driving connections for the independent adjustment of the relative positions of said oscillatory member and tucking device.

24. In a device of the character described, the combination with a machine frame of a plurality of sources of web supply, of a plurality of web feeding mechanisms supported from said frame, a corresponding number of web severing mechanisms adapted to co-operate respectively with the several feeding mechanisms, a plurality of web creasing mechanisms, and a single set of driving connections for each plurality of mechanisms, certain of said driving connections including rate changing means, whereby to control the relative rate of operation of the mechanisms actuated therefrom.

ALDEN HUDSON.