

Sept. 21, 1948.

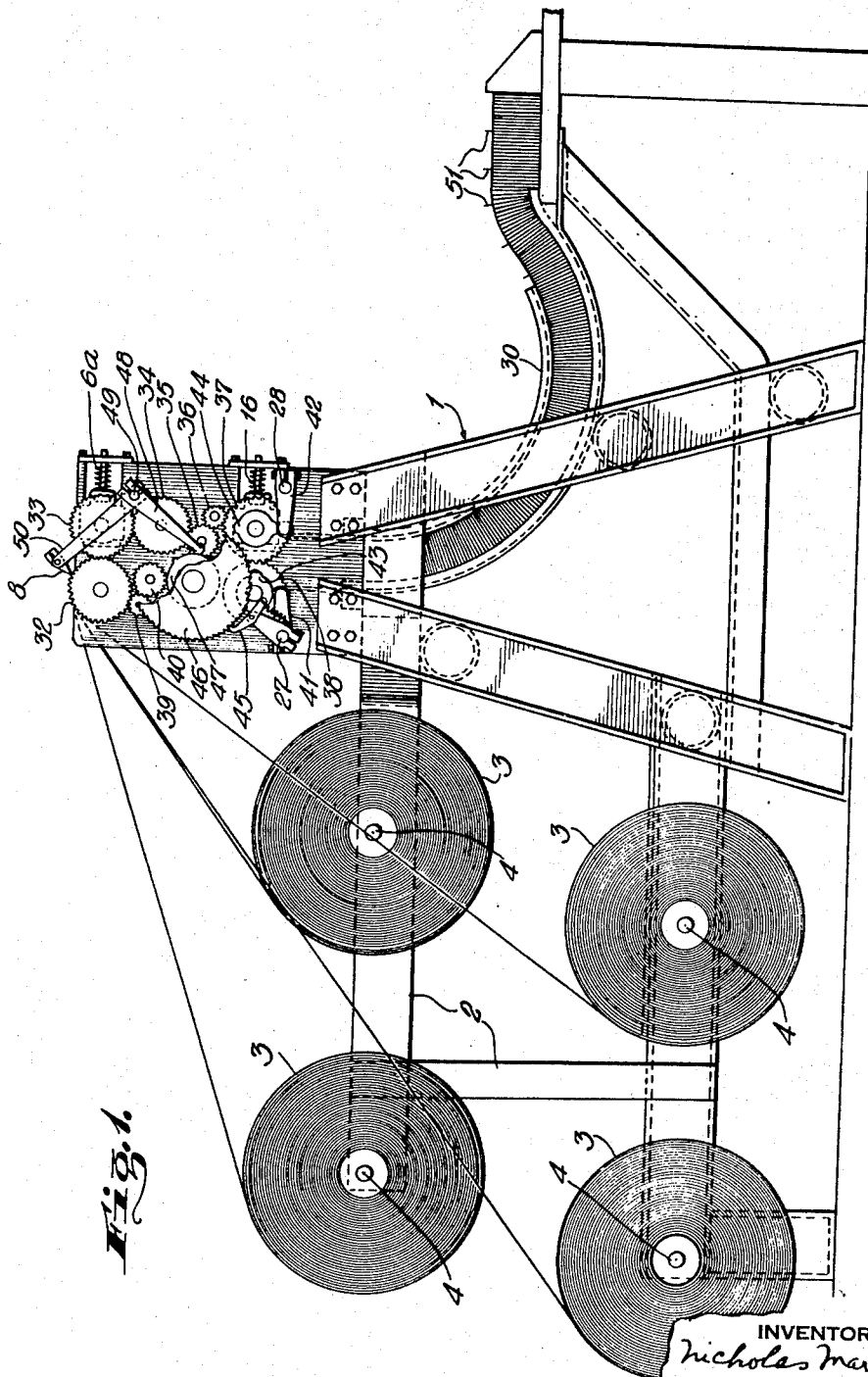
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2,449,663

INTERFOLDING

Original Filed Dec. 17, 1941

4 Sheets-Sheet 1



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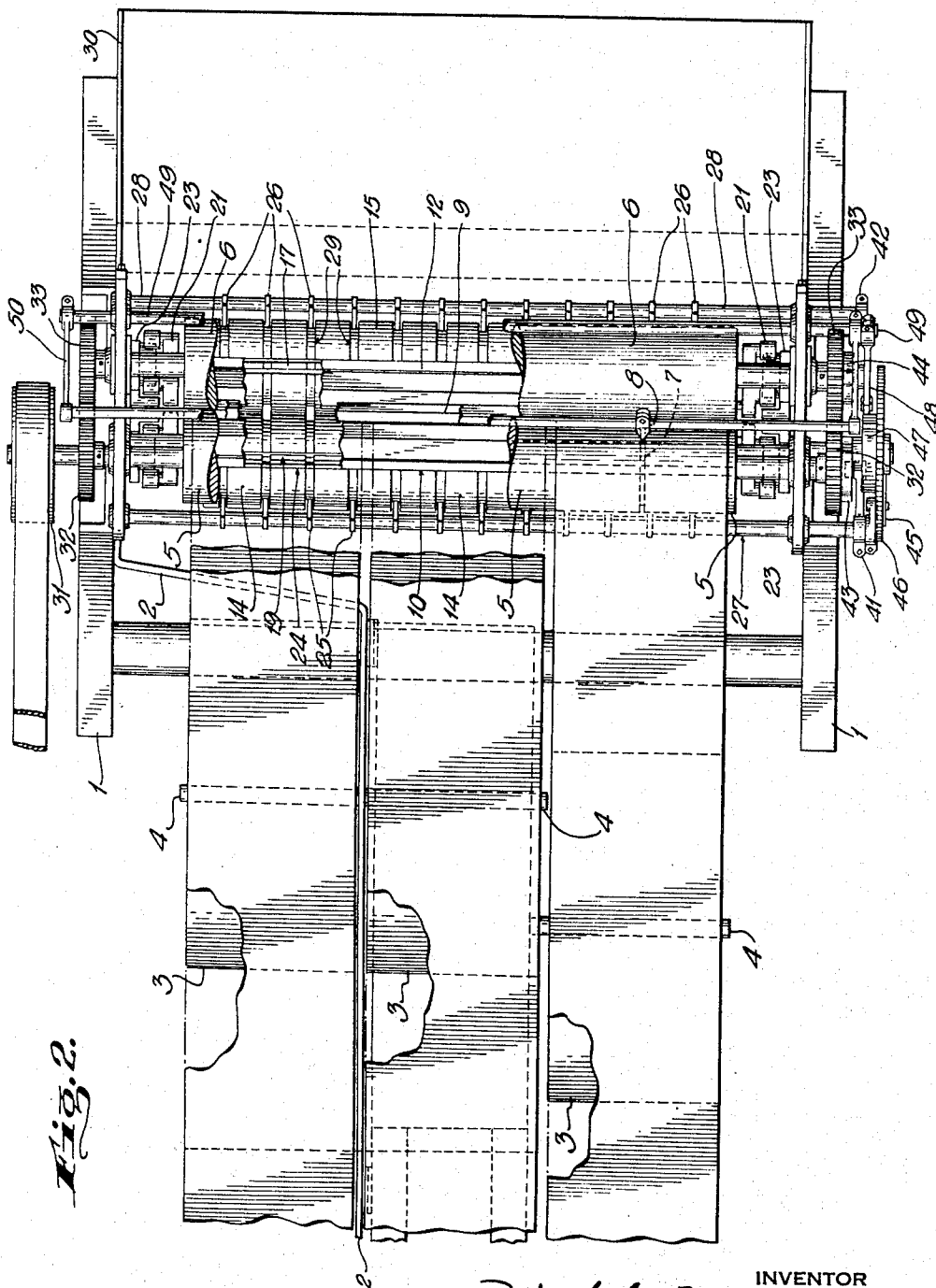


Fig. 2.

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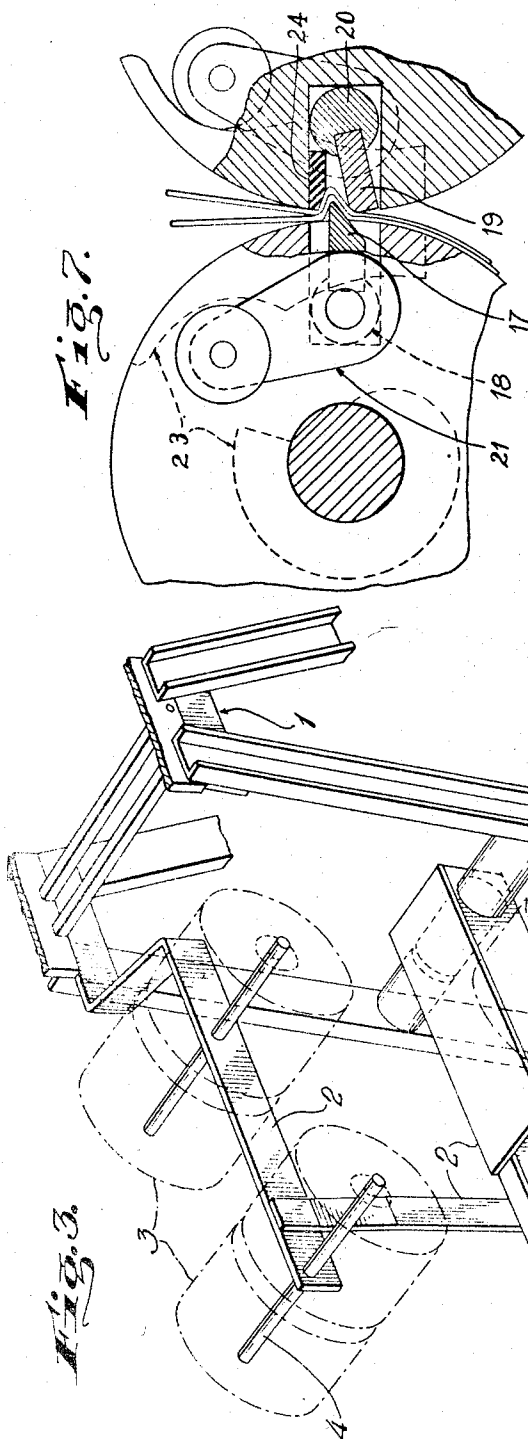


Fig. 7.

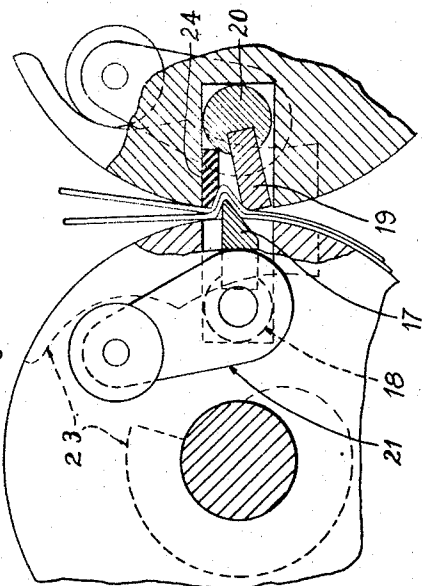
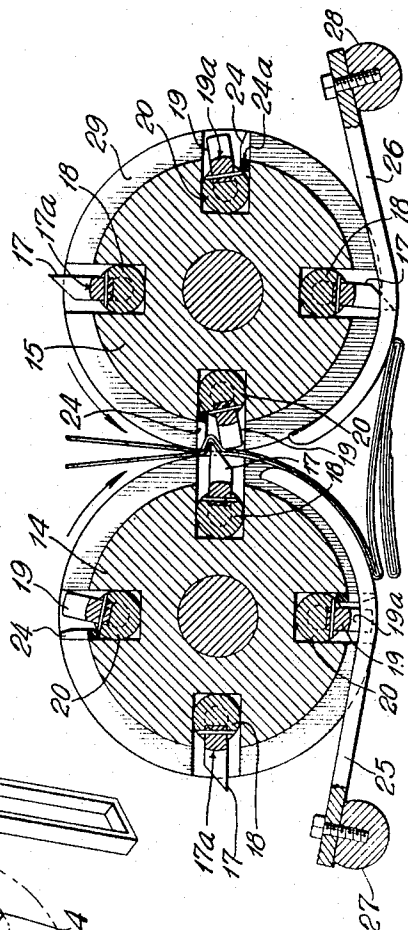


Fig. 6.



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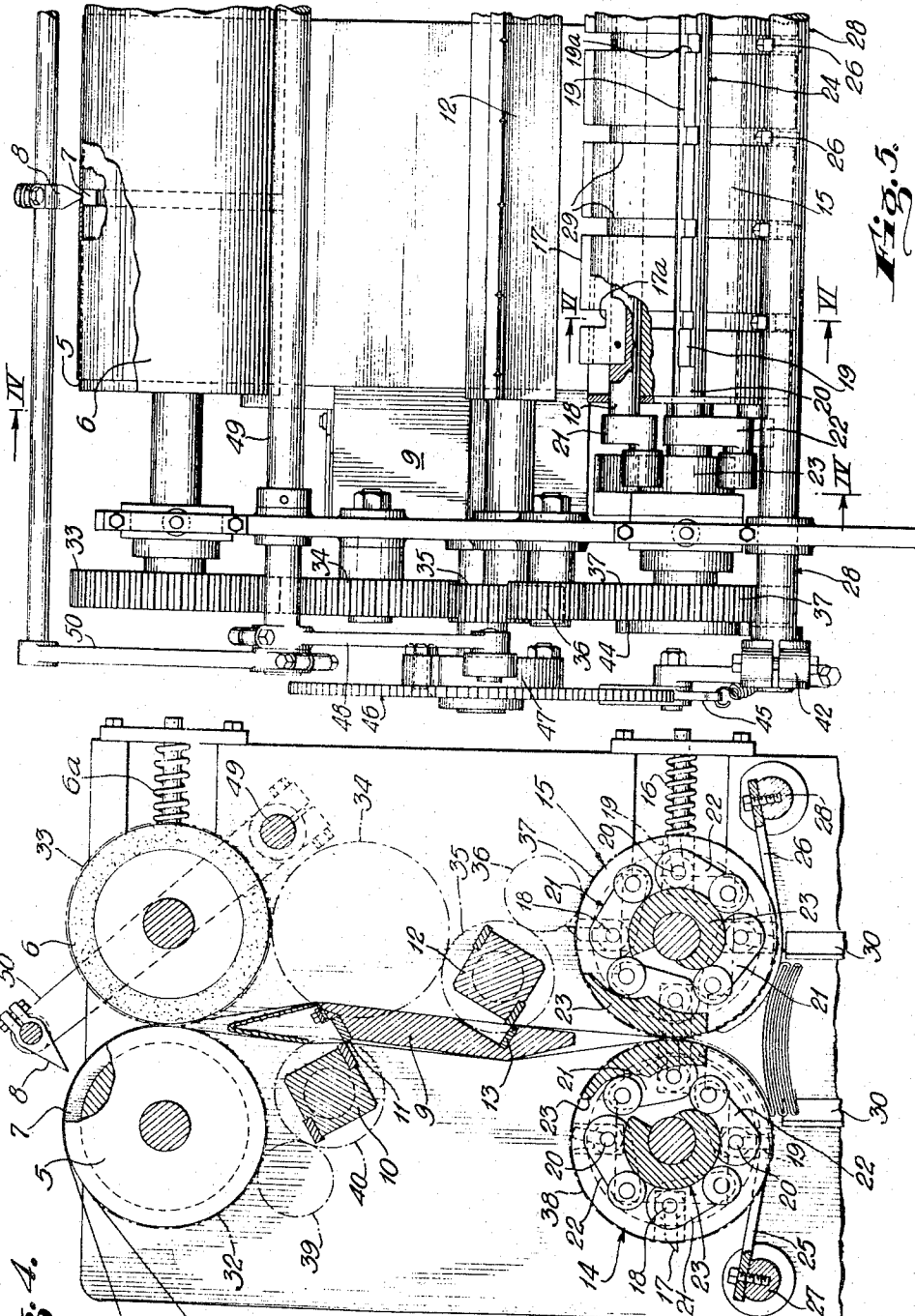
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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

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INTERFOLDING

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Continuation of application Serial No. 423,291
 December 17, 1941. This application September 28, 1946, Serial No. 700,129

14 Claims. (Cl. 270—39)

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My invention relates to interfolding and more particularly to interfolding machines for fabricating facial cleansing tissues and the like from extremely limp or filmy paper tissue stock, this application being a continuation of my prior application Serial No. 423,291, filed December 17, 1941, which has been abandoned.

Heretofore, one of the many difficulties and disadvantages encountered in fabricating facial cleansing tissue from an easily rupturable and extremely soft, pliant, limp and filmy paper tissue stock was occasioned by the utilization of machines equipped with folding mechanism originally designed and employed in treating or interfolding relatively stiff, hard, heavy and inherent crease retaining stock with the result that when the limp tissue stock was acted upon by the mechanism, the limp tissue stock was frequently displaced from or ruptured by the folding mechanism thus causing innumerable interruptions in production and high percentages of stock waste.

My invention overcomes the foregoing difficulties and disadvantages and effectively eliminates other handicaps contributing to low production and waste and while it is especially adapted for utilization in connection with the aforementioned tissue stock, it may be advantageously employed in the treating of other types of stock with resultant higher production and low waste.

One of the objects of my invention is to provide a machine for interfolding paper stock and which is so constructed and arranged as to more efficiently handle and at higher speed easily rupturable and extremely soft, pliant, limp and filmy paper stock from which facial cleansing tissue is fabricated than machines heretofore ordinarily employed and primarily designed for the treatment of dissimilarly characterized stock.

Another object of my invention is to provide a machine of the foregoing described character capable of being constructed and operated as a multi-head machine for simultaneously folding a plurality of parallel lines of stock web, in side by side relation, without pneumatic assistance and with resultant economy with respect to machine construction, power, labor and space.

A further object of my invention is to provide a machine of the foregoing described character equipped with folding mechanism so constructed and arranged as to effect retention of the web

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tuck within the nipping means during operation of the tucking means in conjunction with the nipping means and without rupture of the web.

An important object of my invention is to provide a machine of the foregoing described character which is simple in construction, durable in use, efficient in operation and economical in manufacture.

With the above and other objects in view, as will hereinafter appear, my invention consists in the combination and arrangement of parts hereinafter set forth and illustrated in the accompanying drawings, from which the several features of the invention and the advantages attained thereby will be readily understood by those skilled in the art.

Referring to the drawings wherein like reference characters designate like parts throughout the several views:

Figure 1 is a side elevation of a machine constructed in accordance with my invention.

Figure 2 is a top plan thereof with parts broken out.

Figure 3 is a perspective view of the creel.

Figure 4 is a sectional view taken on the line 4—4 of Figure 5.

Figure 5 is a front elevation of one side of the machine.

Figure 6 is an enlarged sectional view of the interfolding mechanism.

Figure 7 is a detail view of components for effecting the folding action.

In practicing my invention, as illustrated in the drawings, I provide a machine frame having a front section 1 mounting the mechanisms for severing and folding the webs, and a rear section or extension 2 constituting the creel on which all of the supply rolls 3 for the entire machine are carried or mounted through the medium of spindles 4. In contrast to the prior art, my machine is serviced with fresh stock solely from the rear whereby the front of the machine is left clear for the use of the attendants or packers. The machine illustrated is organized to operate from a supply of six rolls of stock, or three pairs, and delivers simultaneously three continuous columns or lines of interfolded web, each line representing the delivery from one pair of supply rolls 3. The two webs from each such pair of rolls 3 are advanced forwardly in superposition and constitute what may for convenience be termed

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a twin web leading to the feed rollers 5 and 6 which are long enough, in this case, to take three such twin webs side by side.

While the supply rolls 3 may be mounted in various positions, all in the rear section 2 or creel of the frame, they are preferably set on the horizontal spindles 4 fixed in the creel in such arrangement that the two rolls, which make each twin web, occupy parallel vertical planes. Those at the sides of the machine have the free or roll-receiving ends of their spindles projecting outwardly and at different levels and the spindles for the middle supply rolls are located in the higher level projecting oppositely to the other spindles at that level.

By the foregoing disclosed creel arrangement, it will be apparent that each pair of the rolls 3 is well adapted to deliver the webs under equal conditions of delivery tension and that the free ends of all of the spindles are readily accessible to facilitate fresh rolls being placed on the spindles without disturbing the other webs and therefore with the least effort and delay. The detail of the spindle construction has been omitted in the drawings because only the general arrangement is important to the invention.

In the present embodiment of the invention, the tissues produced by the machine are single-ply, that is to say, constituted by a single web from one spool or roll. However, the tissues may be multiple or double-ply if desired by either winding double-ply on the spools or by using two single-ply rolls in place of one, in the latter instance, the creel requiring double the number of spindles.

The two webs from each pair of supply rolls, that is to say, the twin webs, whether or not single or double-ply, are drawn forwardly and over the roller 5 and thence directly into the bite of the two feed rollers 5 and 6. The rollers 5 and 6 are pressed together by springs, one of which is indicated at 6a, the rollers being driven by gearing hereinafter referred to. The rollers 5 and 6 are rubber-covered while the roller 5 is provided with a circumferential groove 7 disposed within about the center of the path of each twin web trained thereover. The grooves 7 each provide a clearance for a marking dagger 8 which forms part of a counting mechanism, the daggers operating to pull up tabs, out of the webs, for discernment in the delivered stacks, as will be understood by those skilled in the art.

From the feed rollers 5 and 6 the twin webs are led downwardly and separated so that their component webs pass respectively on opposite sides of a divider 9, and in their passage over this member they are perforated or partially severed at equal intervals into facial tissue size, usually about ten inches square, or otherwise. The left-hand webs are cut by a rotary knife 10 cooperating with a ledger knife 11 fixed on the divider, and the right-hand webs are cut by a rotary knife 10 cooperating with a ledger knife 13 fixed on the opposite side. The relative positions of the two knives are so established that the lines of perforations or partial severance of the web on one side occur midway between the lines of perforations of partial severance in the web on the opposite side. By perforation or partial severance is meant that the successive sections are left united at intervals by small bonds or uncut portions. These connections are strong enough to maintain longitudinal continuity of the webs for machine purposes but are yet quite tearable so that the successive sections, or facial tissues, can

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be easily separated when they are withdrawn from the dispensing box or package in which they are sold.

From the divider, the separated webs are brought together again as they leave the lower end of the divider and advance into the bite of the interfolding rollers 14 and 15 of the folding mechanism, the rollers, generally speaking, functioning in the known manner. The rollers 14 and 15 are provided with coating nipper and tucker means for folding the twin web in the usual zig-zag formation with the lines of perforation or partial severance coinciding with and disposed within the fold creases. As in the instance of the feed rollers 5 and 6, the rollers 14 and 15 are pressed together by springs, one of which is indicated at 16. The rollers 14 and 15 are geared together and rotate at surface speeds coincident with that of the feed rollers 5 and 6 in order to impart no strain to the stock which is gravity fed to the rollers 14 and 15. Inasmuch as the ledger knives 11 and 13 are located respectively at the upper and lower sections of the divider 9—and not opposite each other—not only is adjustment of the shearing action of each ledger knife easily and accurately effected without affecting the adjustment of the other, but disposition of the lines of perforations within the fold creases is assured.

In the form of the invention herein disclosed, each of the rollers 14 and 15 is provided with a pair of tucker means and a pair of nipper means with one of each pair being arranged in circumjacent relation whereby the respective tucker and nipper means of one roller coast with the nipper and tucker means of the other roller in alternation upon coincident rotation of the rollers as will be apparent from an inspection of Figure 6 of the drawings. Each tucker means comprises a tucker blade 17 fixed on a rock-shaft 18 appropriately journaled in its roller and which coacts with fixed and movable nipper jaws 24 and 19 respectively, the latter jaw 19 being fixed on a rock-shaft 20 similarly journaled in its respective roller. Operation of the blades 17 and jaws 19 is controlled, with respect to rocking movement or oscillation, by crank arms 21 and 22, respectively, and which arms engage fixed cam structures 23 carried by the frame and disposed in proximity to the ends of the rollers. The movable nipper jaws 19 are rocked toward and from their companion jaws 24 each of which constitute a jaw surface defining a slot formed in the roller in which the respective jaw 19 is mounted, the tucker blades 17 being similarly disposed in slots and having their outer ends extending beyond the peripheries of the rollers. Each pair of the nipper jaws 19 and 24 are spaced or open as they approach the line of tangency between the rollers and the coating tucker blade 17 of the opposite roller assumes the angle best adapting it to enter edgewise into the opening between the nipper jaws and push or tuck the stock into the opening under continued rotation of the rollers, it being understood that this control of the tucker blade for this purpose is effected by its respective cam track of the cam structure and that the blade normally projects from the roller with only its angle changing as the nipper jaw 19 closes or moves toward the jaw 24 as the tucker blade 17 withdraws, leaving the tuck within the jaws to be fully creased and folded thereby, whereupon the jaw 19 immediately opens or moves away from the jaw 24 and thus releases the folded web as it carries it downwards toward previously folded tissues. During the foregoing operation and when

the tucker blade 17 has performed its tucking function it is momentarily released from the control of its cam track for free rocking movement thus permitting it to be shifted by the action of the jaw 19 as it closes toward the jaw 24.

The foregoing described operation occurs in alternation, the tucking and nipping occurring first on one roller and then on the other, thereby producing the zigzag folds, which are deposited under the presser fingers 25 and 26 and by them pressed into the delivery chute 30 and then moved through the latter to the delivery table at the front of the machine. Heretofore, with tissue stock of the kind referred to, difficulty and irregular action frequently occurred at the point of nipping because it was difficult to keep the delicate web from following the tucker blade back from between the nipper jaws as it withdrew from within the nipper means, instead of remaining held therein to be fully folded and creased by the jaws, it being believed that the tucker mechanism effected a somewhat precreasing or prefolding of the stock due to its relative stiffness during the tucking operation and which precreasing or prefolding formed relative stiff tucks normally retained in the nipping means until fully acted upon by the latter as distinguished from relatively soft tucks which unfold themselves or become deformed as the tucker blades withdraw, and before the nipper mechanism is rendered fully effective.

So far as I am aware, the more careful designing of the cam track contours have not resulted in regularity of nipping over the full width of relatively thin tissue webs, eliminating frequent rupturing of the webs at their tucking zones, nor has regularity been achieved by the expedient of making one or both of the nipper jaws yielding as by supporting them on backing springs or rubber cushions. Highly satisfactory results are attained however, according to this invention, by employing for one or both surfaces of the nipper jaws a soft compressible material. It is sufficient for either jaw surface to be so surfaced but as shown only the fixed jaw surface is so made. For this purpose the roller body or fixed jaw is channelled and a strip of compressible material, for instance, soft rubber is set in the channel, the outer margin of the clamping face of the strip being beveled as depicted in the drawings. The outer end section of the tucker blade is of a cuneiform configuration to provide a bevel face angularly related to and proximus to the clamping face of the jaw 19 for coaction therewith as illustrated in Figure 6.

Passing the point of roll tangency, the nipper means carry the web immediately under and into the control of one of the presser fingers 25 or 26, which presses the fold downwardly onto the previously formed stock. The outer ends of the fingers 25 and 26 are carried by rock shafts 27 and 28, respectively, and are oscillated up and down in alternation into and out of circumferential grooves 29 formed in the roller. The inner ends of the fingers are curved concentrically to their respective roller axes and in their upper positions these curved ends are wholly within the grooves 29 and the cylindrical confines of the rollers. The tucker blades 17 and the nipper jaws 19 and 24 are formed with notches 17a and 19a and 24a disposed in registry with grooves 29 to enable the fingers to remain in their upper positions to take the fold or tissue immediately upon its release by the nipper means, without risk of contact therewith, and to press such fold downwardly into the chute 30 therebelow and thereby push the column of folded web or tissues gradually through the chute to the

receiving table, indicated in Figure 1, where the column can be divided into separate stacks and packaged.

Power for driving the above described parts is applied through a drive pulley 31 fixed to the axle of one of the feed rollers 5 which is geared to the other feed roller by mating spur gears 32 and 33 at each end. As shown in Figure 1, one of the spur gears 33 drives, through an idler 34, the gear 35 on the shaft of the lower rotary cutter reel 12, and this gear through an idler 36 in turn drives the mating gears 37 and 38 of the interfolding rollers. The upper rotary cutter 10 is driven from the feed roller gear 32 by the idler 39 and spur gear 40 on the cutter shaft.

The presser finger rock-shafts 27 and 28 are oscillated by crank arms 41 and 42 thereon by the cams 43 and 44 fixed to the axles of the interfolding rollers 14 and 15 respectively. The oscillation of the rock-shaft 27 is transmitted through a crank and pawl 45 to drive a ratchet-wheel 46 carrying a cam 47 which periodically operates the crank arm 48 of a rock-shaft 49 provided with a marker frame 50 on which the marking daggers 8 above referred to are mounted. The cam 47 is advanced one tooth for every fold pressed down into the chute by the left-hand presser finger 25, as viewed in Figure 6, and after the passage of a predetermined number of teeth or once every complete revolution the cam 47 operates the daggers causing them to mark or form tabs projecting from the webs to indicate the number of folds made, the tabs being indicated at 51 in Figure 1 of the drawings.

Without further elaboration the foregoing will so fully explain the invention that others may, by applying current knowledge, readily adapt the same for use under various conditions of service. Moreover, it is not indispensable that all the features of the invention be used conjointly since they may be employed advantageously in various combinations and sub-combinations.

It is obvious that the invention is not confined to the herein described use therefore as it may be utilized for any purpose to which it is adaptable. It is therefore to be understood that the invention is not limited to the specific construction as illustrated and described as the same is only illustrative of the principles of operation, which are capable of extended application in various forms and the invention comprehends all construction within the scope of the appended claims.

What I claim is:

1. An interfolding machine comprising rollers adapted to advance a twin web, feed means for separately partially severing each web, a pair of interfolding rollers receiving such partially severed twin web both provided with nipper jaws and movably mounted tucker blades, and with rock-shafts to effect the rocking motion of the movable jaws and the blades respectively, said rollers being circumferentially grooved, and said blades and nipper jaws being both notched in registry with such grooves, and oscillating presser fingers adapted to enter the annular space provided by said registering grooves and notches for removing the webs from said nipper jaws.

2. An interfolding machine comprising feed rollers for advancing a twin web, a pair of interfolding rollers receiving such web both provided with rockable nipper jaws and rockable tucker blades, said rollers being circumferentially grooved, and said blades and nipper jaws being respectively notched in registry with such grooves, a delivery chute below such rollers, presser fingers

for transferring folded web from the rollers to such chute and means for oscillating said fingers from upper positions within the annular spaces provided by said registering grooves and notches to lower positions within said chute for advancing the folded web through such chute.

3. In an interfolding machine a frame structure having mounted thereon a pair of feed rollers delivering a twin web, a divider for such twin web and means for partially severing each web as it traverses the divider comprising cutting means for one such web located near one end of the divider and cutting means for the other web located near the other end of the divider, and a pair of interfolding rollers receiving and folding the partially severed webs leaving the divider.

4. In an interfolding machine a frame structure having mounted therein a pair of feed rollers delivering a twin web, a divider therefor, a ledger knife for one of such webs mounted on the upper part of the divider, a ledger knife for the opposite web mounted on the lower end of the divider, rotary knives respectively coacting with said ledger knives for partially severing the webs, and interfolding rollers receiving the partially severed webs from the divider.

5. In a machine for interfolding soft tissue paper towels, interfolding rollers containing tucker blades and nippers and having cam structures for respectively controlling their movements, said nippers each including a jaw member of compressible rubber-like material adapted to close on the tucker blade and the web thereon, and each tucker blade being adapted to rock on its roller when so engaged by the nippers.

6. In a machine for interfolding soft tissue paper towels, interfolding rollers containing tucker blades and nippers and means for partially cutting and feeding twin webs downwardly between said rollers, said nippers each including a jaw of compressible material, this jaw being the upper jaw when the nippers are engaged with the web and this upper jaw being beveled at its free web-engaging edge.

7. In a machine for interfolding soft tissue paper towels and the like, a pair of interfolding rollers containing tucker blades and nippers, said nippers each having at least one jaw member formed of rubber-like compressible material for contact with the tissue and said tucker blades being in constantly projecting relation from their respective rollers and free to rock thereon while engaged with said nippers.

8. In an interfolding machine comprising means for supporting the web rolls, means for feeding, partially cutting and interfolding the webs and for delivering the folded product, the improvement which consists in said feeding means comprising a pair of rollers organized to feed two webs in super-position, to the cutting means and said cutting means including a divider for separating said two webs provided with ledger knives at different distances from said rollers and having cooperating knife members for partially severing said webs in alternation against said ledger knives.

9. In an interfolding machine comprising means for supporting the web rolls, means for feeding, cutting and interfolding the webs and for delivering the folded product, the improvement which consists in said roll supporting means being organized to deliver lines of towel-width webs in edge-to-edge relation, and said cutting and interfolding means comprising a pair of interfolding rollers simultaneously receiving such lines of

webs, said rollers having nipper jaws long enough to grip all of said lines of web and made of soft rubber-like compressible material from end to end and also having tucker blades of corresponding length adapted to coact with said soft jaws to crease the webs.

10. In an interfolding machine comprising feed rollers for advancing webs to be partially severed and interfolding, and a pair of interfolding rollers receiving such web provided with rockable nipper jaws and rockable tucker blades, the improvement which consists in said rollers being circumferentially grooved and both said blades and nipper jaws being respectively notched in registry with such grooves, a delivery chute below such rollers, pressure fingers for transferring folded web from the rollers toward such chute, said fingers occupying the annular spaces formed by such registering grooves and notches and curved to extend upwardly therein close to the tucking point between said interfolding rollers, and means for oscillating said fingers from upper positions within said annular spaces to lower positions for advancing the folded web through such chutes.

11. In a tucking mechanism, coacting tucker and nipper means for folding relatively soft and limp tissue paper, said tucker means including a member for engaging and tucking the paper into said nipper means when said member is withdrawn from the tuck and said nipper means is rendered effective, said nipper means including a pair of jaws for receiving the tuck contactually therebetween to effect said folding and with at least one of said jaws having a tuck engaging surface constructed of a compressible resilient material effective for prohibiting withdrawal of the tuck from between said jaws during withdrawal of said member.

12. In a tucking mechanism, coacting tucker and nipper means for folding relatively soft and limp tissue paper, said tucker means including a member for engaging and tucking the paper into said nipper means to form a tuck for subsequent folding by said nipper means when said member is withdrawn from the tuck and said nipper means is rendered effective, said nipper means including a pair of jaws for receiving the tuck contactually therebetween to effect said folding and with at least one of said jaws being constructed of a compressible resilient material effective for prohibiting withdrawal of the tuck from between said jaws during withdrawal of said member.

13. In a tucking mechanism, coacting tucker and nipper means for folding relatively soft and limp tissue paper, said tucker means including a member for engaging and tucking the paper into said nipper means to form a tuck for subsequent folding by said nipper means when said member is withdrawn from the tuck and said nipper means is rendered effective, said nipper means including a pair of jaws for receiving the tuck contactually therebetween to effect said folding and with at least one of said jaws having a tuck engaging surface disposed in confronting relation with the other jaw and constructed of a compressible elastic material effective for fully retaining the tuck between said jaws during withdrawal of said member.

14. In a tucking mechanism, coacting tucker and nipper means for folding relatively soft and limp tissue paper, said tucker means including a member for engaging and tucking the paper into said nipper means to form a tuck for subsequent folding by said nipper means when said member is withdrawn from the tuck and said nipper means

is rendered effective, said nipper means including a pair of jaws for receiving the tuck contactually therebetween to effect said folding and with at least one of said jaws being constructed of soft rubber and effective for precluding withdrawal movement of the tuck from between said jaws during withdrawal of said member.

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