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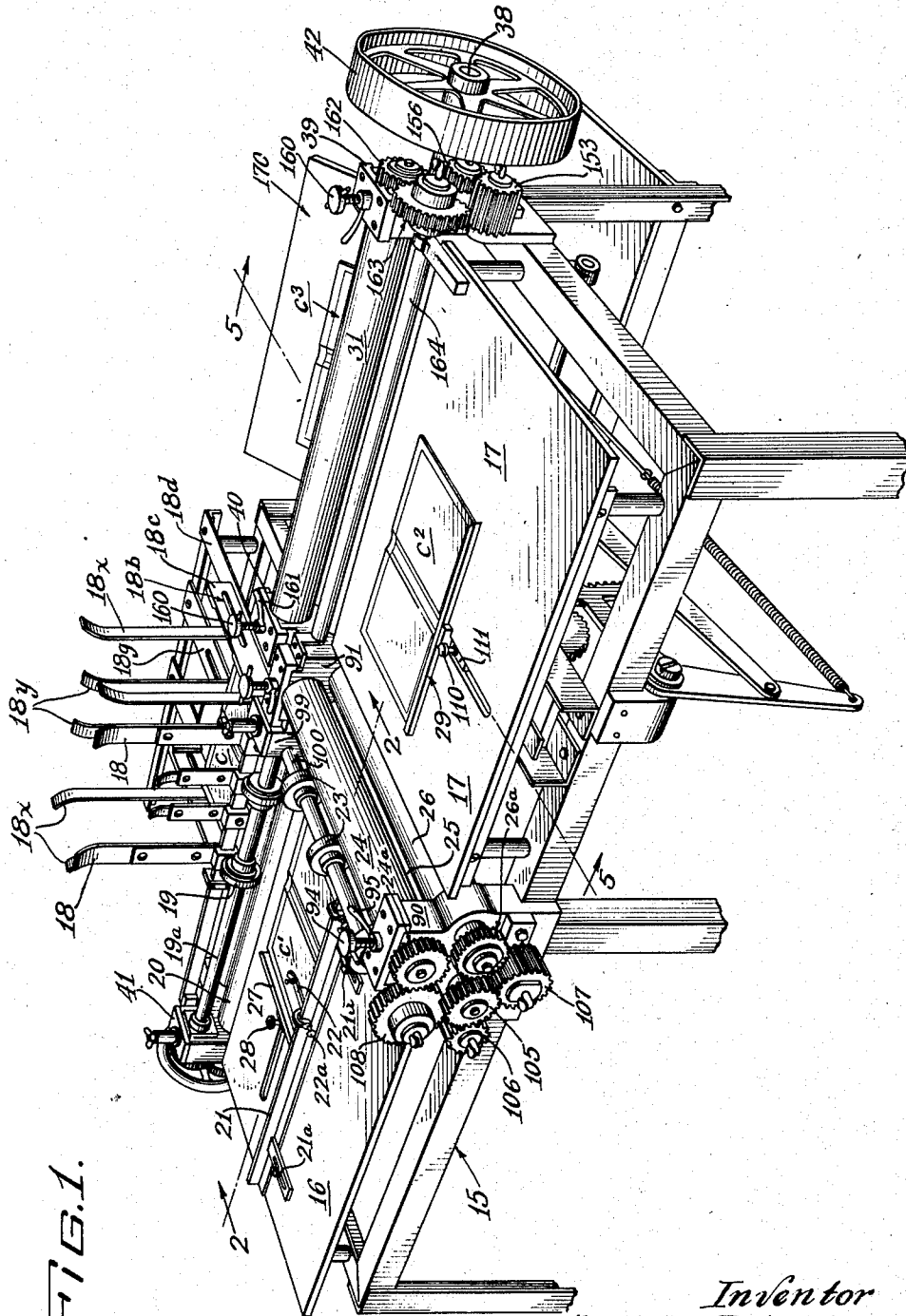
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2,364,142

BOOK COVER BENDING MACHINE

Filed Aug. 14, 1943

6 Sheets-Sheet 1



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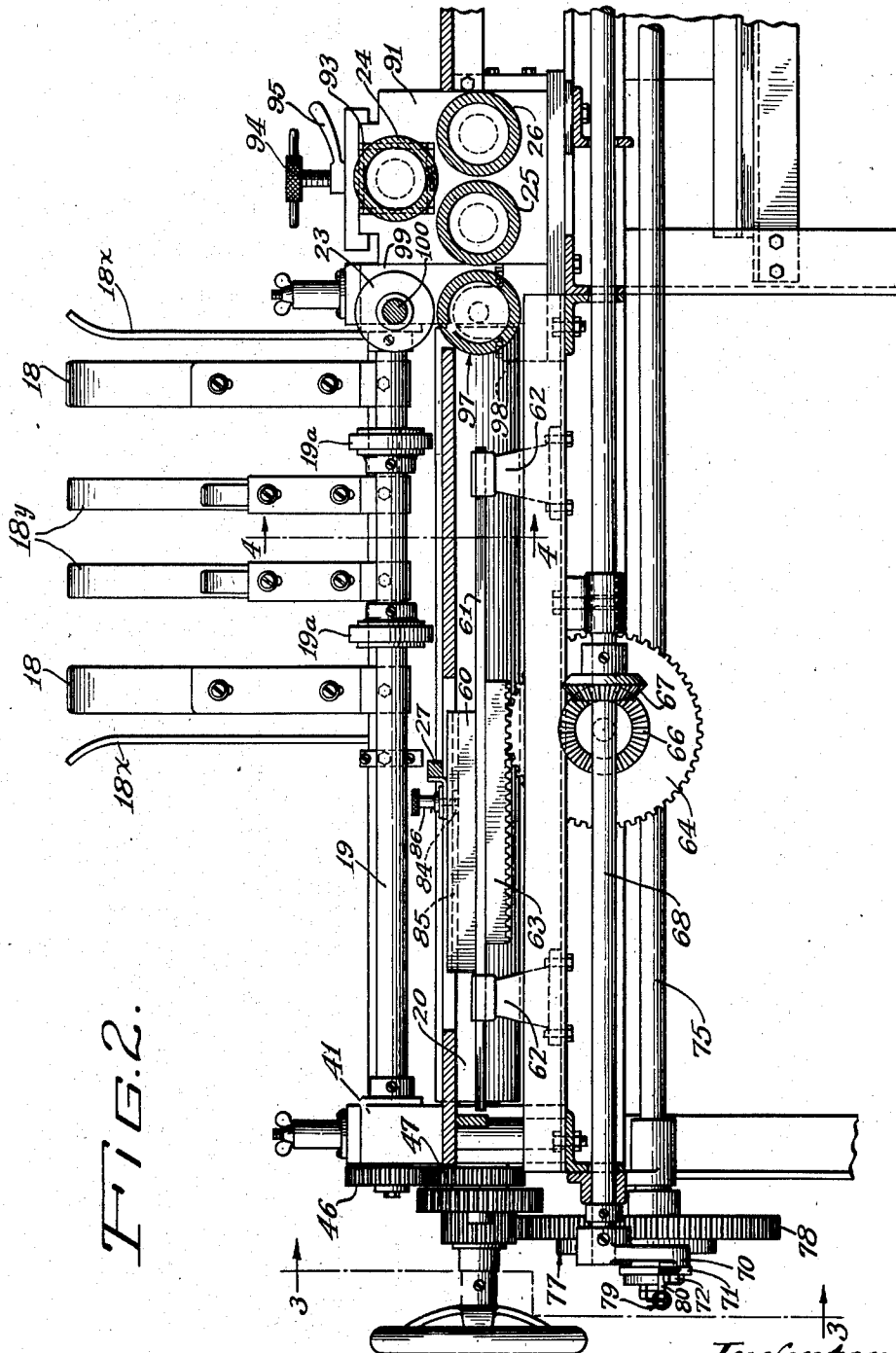
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BOOK COVER BENDING MACHINE

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6 Sheets-Sheet 2



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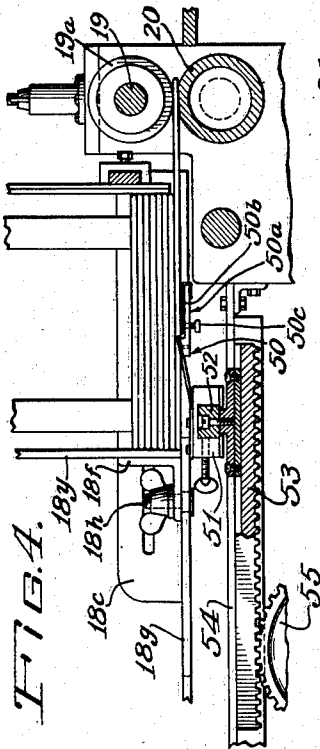
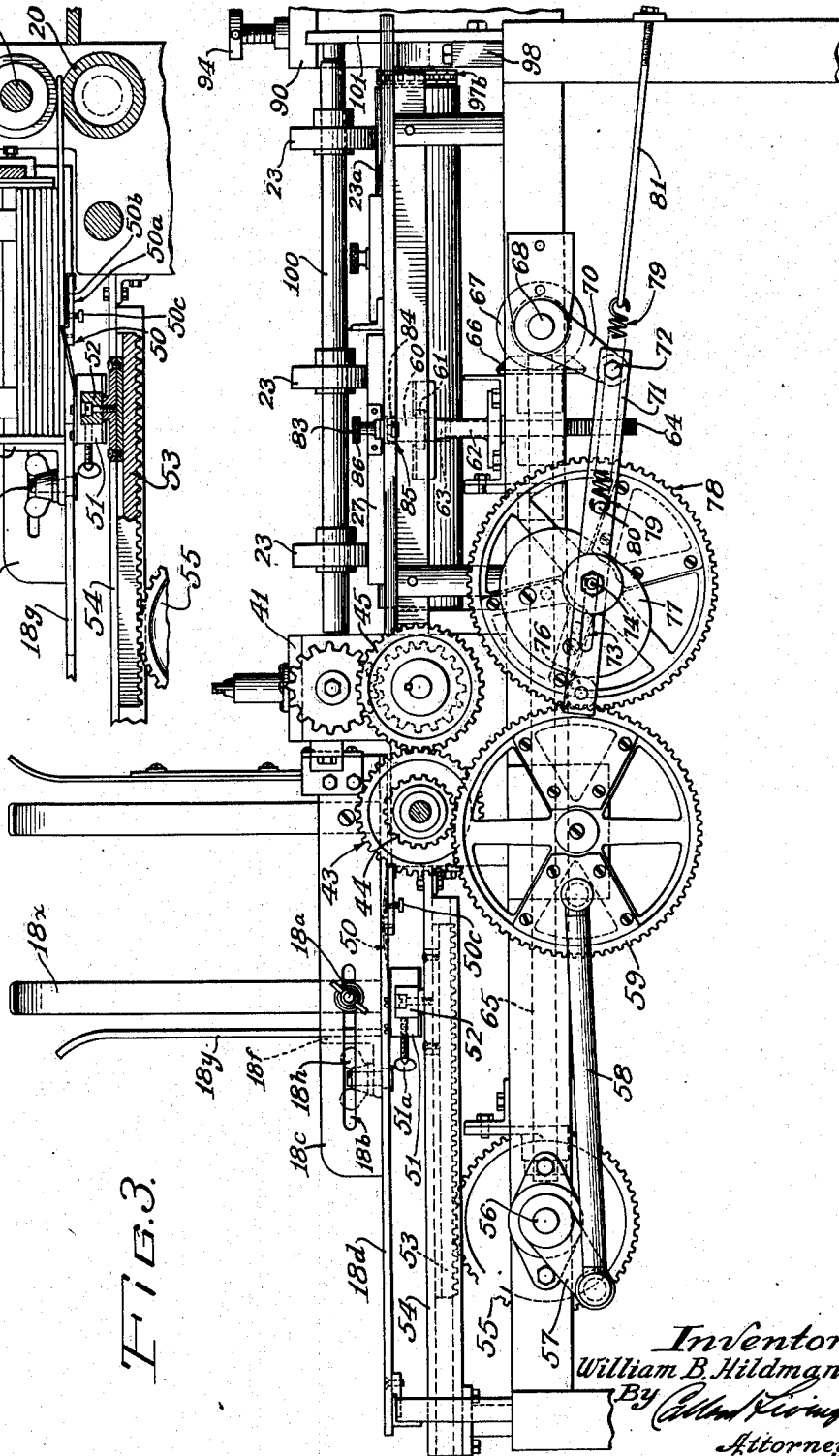
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BOOK COVER BENDING MACHINE

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6 Sheets-Sheet 3



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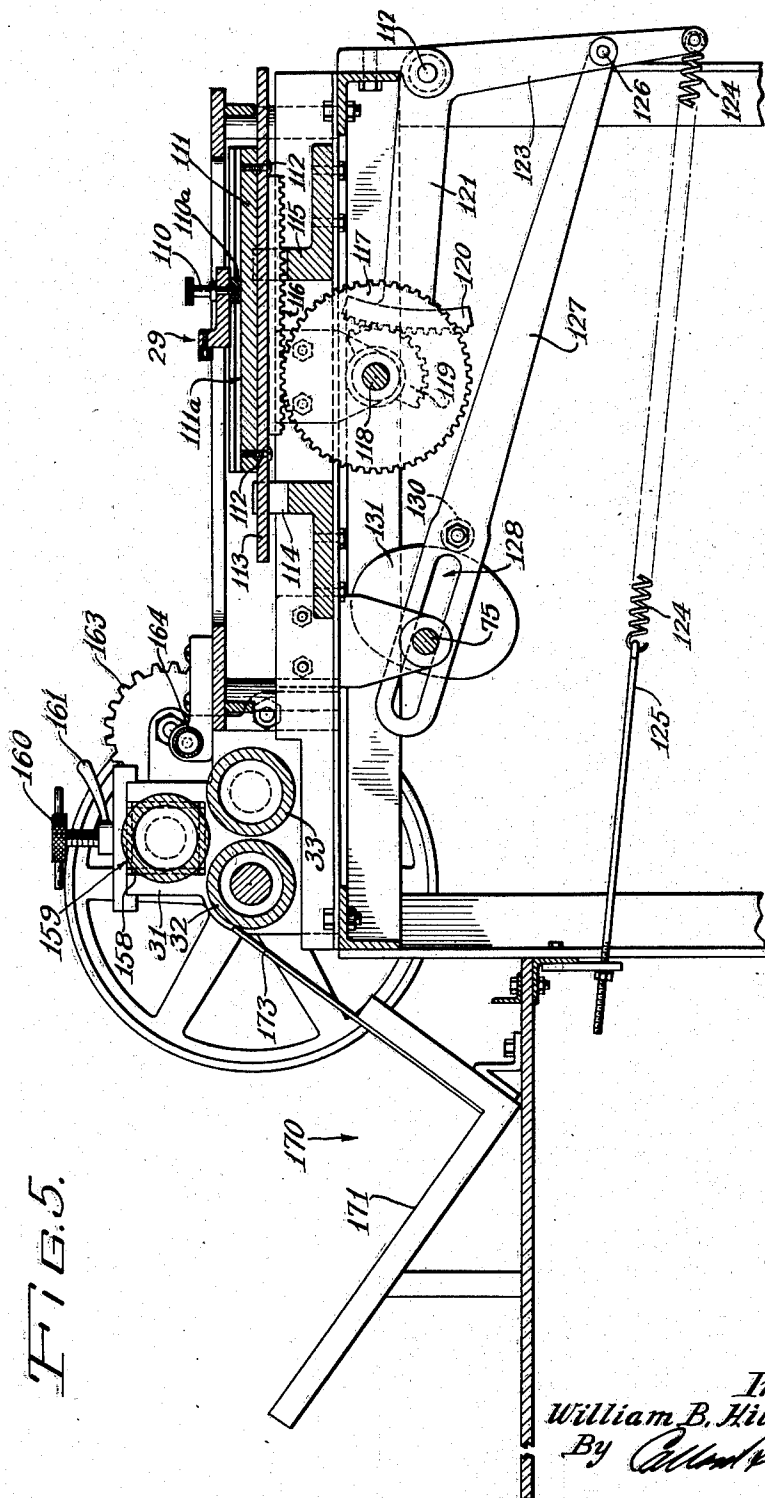
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BOOK COVER BENDING MACHINE

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6 Sheets-Sheet 4



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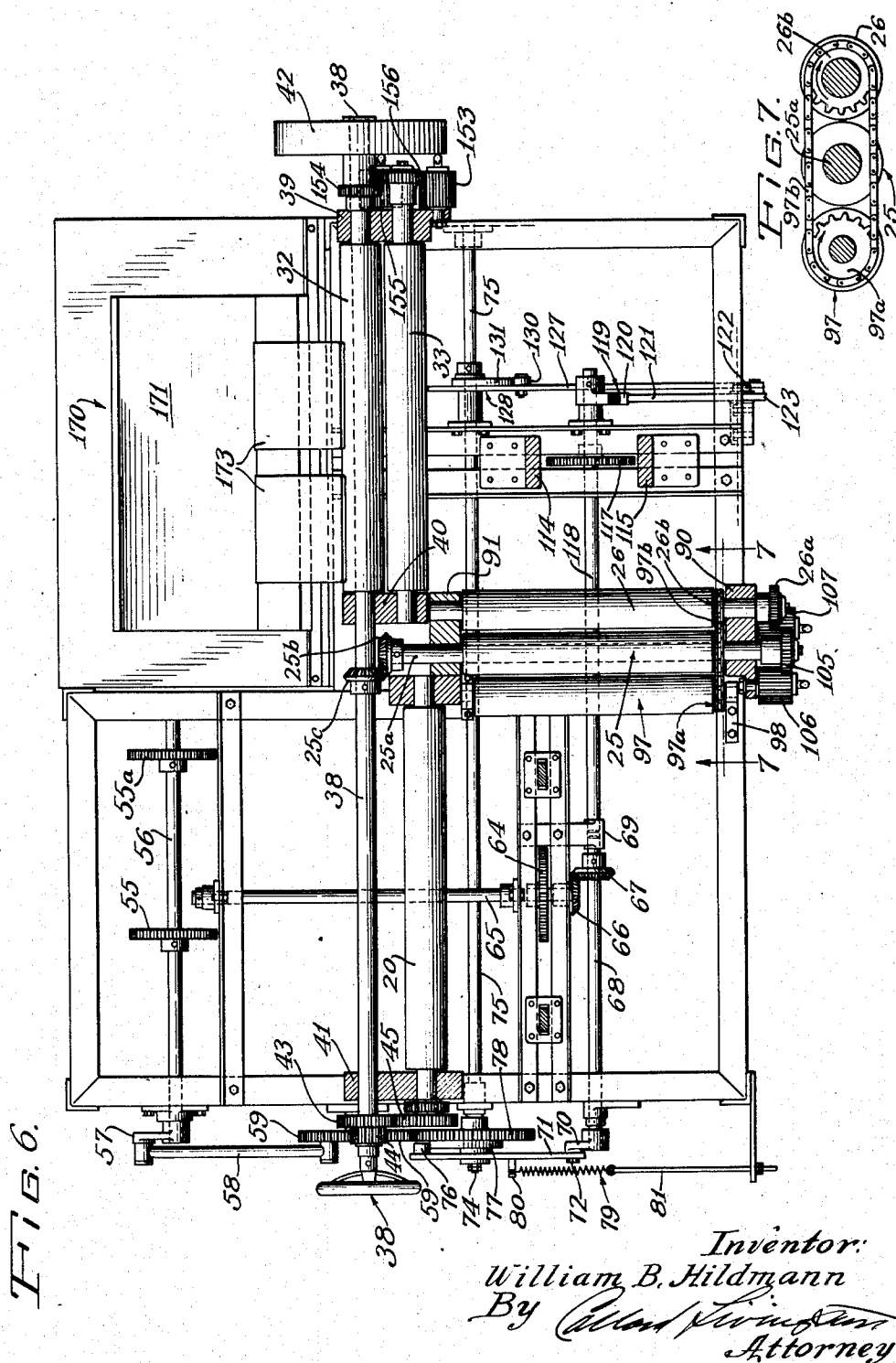
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BOOK COVER BENDING MACHINE

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6 Sheets-Sheet 5



Dec. 5, 1944.

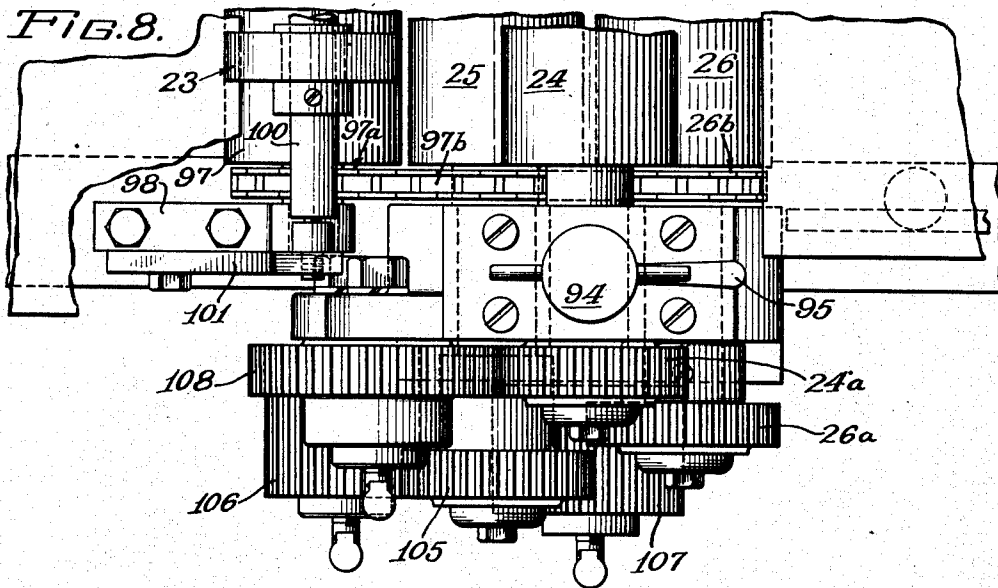
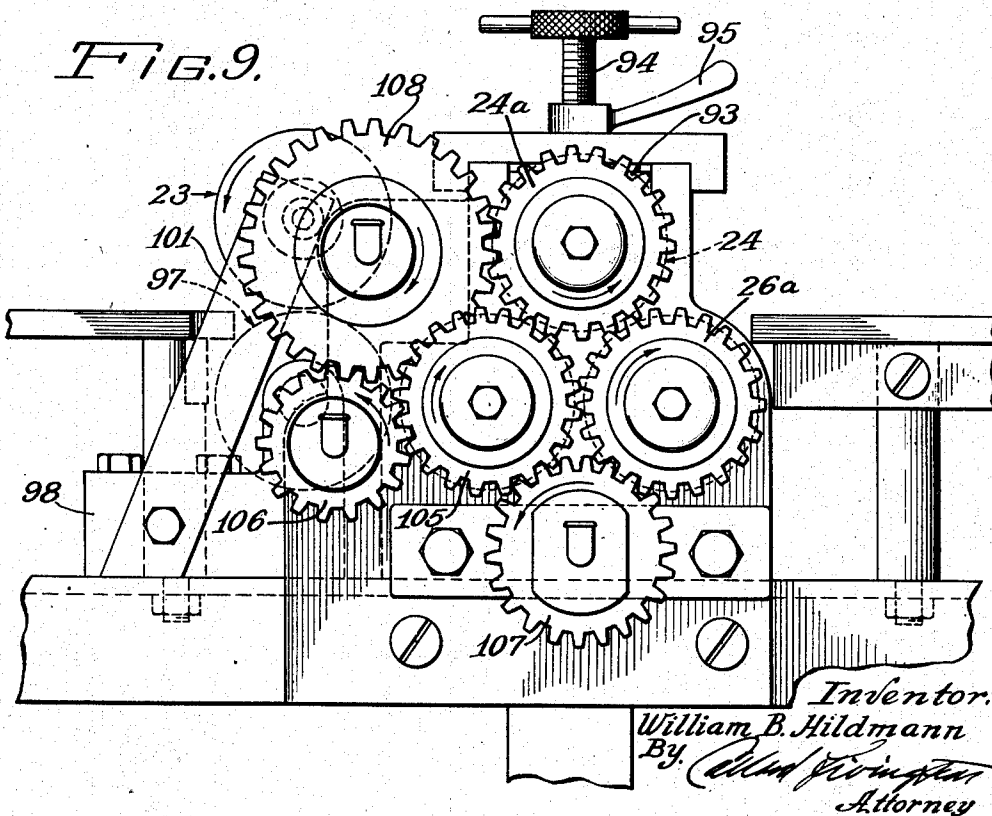
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BOOK COVER BENDING MACHINE

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6 Sheets-Sheet 6



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UNITED STATES PATENT OFFICE

2,364,142

BOOK-COVER BENDING MACHINE

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15 Claims. (Cl. 11—2)

This invention relates primarily to the book-binding arts, and secondarily to warping and bending mechanisms, and has as its principal object the provision of automatic means for imparting a complex curvature, amounting to an overall bowing, of book covers to condition them for reception of an imprint from embossing dies or the like.

It is a particular object of the invention to provide a machine acting automatically to bend book covers and the like at high speed in several directions with respect to the length and breadth thereof, such that when the covers leave the machine, they will be substantially bowed outwardly with a sort of overall convexity suitable for stamping or embossing; and further, to provide a machine of simple and rugged construction which will be of compact overall size with infeed and discharge positions closely adjacent at one side of the machine for convenient attendance by the operator.

Book covers of the kind here contemplated consist of some sort of stiffening member, such as cardboard, usually covered with a fabric, such as cloth, adhered thereto by glue; and such covers are generally embossed or imprinted with decorative or title matter applied by stamping dies pressed into the outer surface portions thereof, by reason of which it is necessary that such surfaces be bowed appreciably if the imprint is to be uniform and clear.

According to prior practices, bending of the covers was accomplished by crude manual expedients and by feeding the covers through rollers, first in one direction, and then in another, and such methods involve monotonous, slow, and tiring manual labor which is conducive to various irregularities and losses due to damage from improper handling resulting largely from the fatigue element when large quantities of covers must be conditioned in this manner.

The present invention overcomes such difficulties by affording a high speed bending machine characterized by the provision of means for feeding open covers, one at a time, into and through a plurality of sets of warping rollers, arranged with their rotational axes offset, and by the provision of means for changing the direction of travel of the covers with respect to the sets of rollers, so that the necessary curvature is imparted to the covers by the time they issue from the machine.

Further, and more detailed, objects, advantages, and features of novelty will appear as the

following description proceeds in view of the annexed drawings in which:

Fig. 1 is a perspective view of the entire machine with the supporting legs shown in fragment;

Fig. 2 is a vertical section looking in the direction of lines 2—2 of Fig. 1;

Fig. 3 is a side elevation looking in the direction of lines 3—3 of Fig. 2;

Fig. 4 is a vertical section in the direction of lines 4—4 on Fig. 2, showing details of the cover feeding mechanism;

Fig. 5 is a vertical section on the discharge side of the machine looking in the direction of lines 5—5 on Fig. 1;

Fig. 6 is a top plan view of the mechanism disposed beneath the table surfaces or top of the machine, said table surfaces being removed and the view looking downwardly;

Fig. 7 is a sectional detail of the roller drive seen in the direction of lines 7—7 of Fig. 6;

Fig. 8 is a fragmentary top plan view of the driving gear assembly for the first warping unit;

Fig. 9 is an elevational view of the assembly shown in Fig. 8, also looking in the direction of lines 7—7 of Fig. 6;

General description

In the perspective view of Fig. 1, there is shown a main frame 15 surmounted by a first feeding table 16, at the left, and a second feeding table section 17 at the right. Adjacent the first section 16 is a cover hopper in the form of a plurality of upright bars 18, 18x, 18y, mounted on the frame in square array, into the confines of which covers C are placed in open, stacked condition, outer sides lowermost, to be fed from the bottom of the stack (by means hereinafter described) into engagement with constantly rotating feed rollers 19 and 20 (see also Fig. 4) onto the first table portion 16 against an adjustable stop member 21, for subsequent movement into the rollers of a first warping unit.

The covers leave the feed rollers with sufficient velocity to lodge beneath hold-down fingers 22 on the stop member, so as to align themselves with respect to a second feed roller means, the cover C¹ being shown in such condition against the stop on section 16 in Fig. 1.

From the first table section, the cover (C¹ for example) is automatically moved into engagement with a second set of feed rollers 23 and 24 (Fig. 2 also) which serve to urge the covers into a first triad of warping rollers 24, 25 and 26 as a result of timed movement (toward the

right) of a cover driver or pusher 27 on table section 16, which causes the leading or right-hand edge of cover C¹ to engage beneath the friction feed wheels 23 and roller 27 for movement into the warping rollers, as aforesaid.

The cover is warped or bent in its direction of movement through rollers 24, 25 and 26, from which it is ejected with sufficient velocity to lodge before a second advancing means or pusher 29 on table section 17, into the position occupied by the cover C² in Fig. 1, and the movements of this second pusher, like the first, are timed accurately with respect to the general transit of the covers so that the cover C² will be engaged by the pusher 29 very shortly after the cover lands on the table section, and be transported into a second set or triad of warping rollers 31, 32 and 33 (see Fig. 5 also), which impart a further bend to the covers, but this time in a direction at right angles to the first bending thereof, because the orientation of the cover has been changed so that the long edge thereof will enter the second set of warping rollers.

Upon leaving the second set of warping rollers, the covers are discharged into an angular stacking bed 170 (see also Fig. 5) wherein the covers C³ are properly stacked for convenient removal by the attendant in a position which is adjacent the loading hopper 18, so that the attendant can load the machine in one movement, and by a continuing movement, remove the conditioned covers from the stacking bed.

Detailed construction

Considering now the plan view of Fig. 6 (with the two table sections 16 and 17 removed), there will be seen a main drive shaft 38 journaled in blocks 39, 40 and 41 on the main frame, a drive pulley 42 being fixed on the right-hand end of this shaft to be driven from a suitable power source (not shown), while at the left end of this shaft are fixed pinions 43 and 44.

Pinion 43 meshes with pinion 45 on feed roller 20. The shaft 19a for feed rollers 19 (see Fig. 2) is provided with a pinion 46 meshing with pinion 47 on the shaft of feed roller 20. In this manner feed rollers 19 and 20 are driven from the main shaft 38.

Means for feeding the covers from the hopper or stacker 18, includes a pair of yieldable feeding fingers 50 (Figs. 3 and 4) adjustably carried on a sliding block 51 mounted on a cross carrier 52, which in turn is carried on spaced-apart rack bars 53 slidably mounted between corresponding pairs of bearer bars 54 (only one of which appears in Figs. 3 and 4).

As seen in Fig. 3, the racks 53 each mesh with a corresponding pinion 55, 55a, carried on a cross shaft 56 journaled in the frame (see also Fig. 6). A bell crank 57 on shaft 56 is connected with crank rod 58, which in turn connects eccentrically to a pinion 59 meshing with pinion 44 on the main drive shaft 38. Thus, the feeding racks are reciprocated in a certain timed relation to the other moving parts of the machine, which are also driven by especially situated take-off mechanisms from this main shaft, as will hereinafter appear.

The feeding fingers 50 are disposed to lie beneath the cover hopper and to press upwardly against the lowermost cover so as to engage with the rearward edge thereof upon the back stroke thereof (toward the left, Figs. 3 and 4), so that upon forward movement thereof, the bottom

cover will be ejected into the feed rollers 19 and 20.

In Fig. 4 it will be observed that the fingers 50 are provided with brackets 50a at their outer ends, and there is further secured on these brackets an upwardly biased spring feeler 50b which may be adjusted as to depth of downward yield by positioning a corresponding stop screw 50c. This feeler means is adjusted according to the thickness of the covers to be fed so that the free end of the corresponding feeding finger portion 50 will always be guided against the rearward edge of the bottommost cover by the pilot or feeling action of the advance spring portions 50b. Each feeding finger unit is provided with a set screw 51a for securing the same in adjusted position on the bearer 52.

The stack hopper is adjustable to receive covers of different size, and to this end, the opposite uprights 18x (Fig. 3) are slidably mounted by means of wing-nut bolts 18a working in horizontal slots 18b in fixed plates 18c on the frame bearers 18d, while the rearmost upright 18y has an angled foot 18f (Figs. 1 and 4) slidably mounted on slotted bearer 18g with a wing-nut setting bolt 18h engaging in the slotted portion thereof.

As viewed in Fig. 2, the first cover advancing member or pusher 27 is carried on a bar 60 secured to a slide member 61 supported in slide stanchions 62. To the bottom of the slide member 61 is secured a rack 63 meshing with pinion 64 on a shaft 65 journaled in the frame. As seen best in Fig. 6, pinion 64 is oscillated by a miter gear 66 on shaft 65 (Fig. 2 also) meshing with another miter gear 67 on a crank shaft 68 journaled at one end in a bearing bracket 69, and at the opposite end in the frame (see also Fig. 2) there being a crank 70 at this latter end connecting with crank rod 71, as at 72 (Fig. 3) which has an elongated slot 73 engaged on the outer end 74 of a long transverse shaft 75 (see also Fig. 6).

The end of the crank rod 71 is provided with a roller 76 which rides a cam 77 (Figs. 3 and 6) fixed on the long shaft 75 and the large pinion 78 thereon, this pinion 78 meshing with the companion pinion 59 which serves to drive the cover feeding means. A spring 79 is attached at 80 to the crank rod, and at its opposite end to a tie rod 81 anchored in the frame for the purpose of holding cam roller 76 on cam 77.

The first pusher 27 is adjustably mounted on its carrying member 60 (Figs. 2 and 3) by a set bolt 83 having a head 84 free to work in slot 85 in the member 60 when the setting nut 86 is loosened.

The first warping unit includes three parallel steel rollers 24, 25 and 26 placed with their centers in triangular array as viewed best in Fig. 2, so that one roller 24 at the top of the triad is disposed above a depression or hollow formed between the other two rollers therebelow, with the object of pressing the covers sufficiently into said hollow to give them a permanent bend. These three warping rollers are journaled in opposite blocks 90 and 91 mounted on the frame (see Fig. 6 showing the two bottom rollers), the top roller 24 being adjustably mounted at opposite ends in vertically sliding journal blocks 93, only one of which is seen in Figs. 2 and 9; and these sliding journals may be moved up and down by turning screws 94, after loosening the respective lock-lever nuts 95 thereon, with the object of varying the pressure of the top roller

in accordance with the degree of bend or warp required.

Feed roller means for the first warping unit includes a lower steel roller 97 (Figs. 2, 6, 8) journaled in blocks 98 on the frame adjacent the lower warping roller; and friction wheels 23 (Figs. 1, 2 and 3) carried thereabove on shaft 100, journaled at its inner end in block 99, and at its outer end on an arm 101 secured to the outer block 98 on the frame.

The foregoing feed roller and warping roller assembly is driven from the main drive shaft 38 (Fig. 6) through the shaft portion 25a of the lower left warping roller, which shaft portion projects at its inner end through the block 91 to engage with a miter gear 25b, meshing with a companion miter gear 25c on said main shaft 38.

At its outer end, the roller shaft portion 25a carries a driving pinion 105 (Figs. 1, 6, 8 and 9) which meshes with two intermediate idling pinions 106 and 107. Intermediate pinion 106 also meshes with a third intermediate pinion 108, the function of which is to drive the top warping roller by meshing with its pinion 24a (Figs. 1 and 9 particularly).

The remaining warping roller 25 is driven from the intermediate pinion 107 through its pinion 25a meshing with the latter intermediate pinion 107. Thus, the lower warping roller 25 is driven directly from its pinion connection with the main drive shaft as previously described, while the top roller 24 and the remaining lower roller 26 are driven through intermediate pinion drives 108 and 107, respectively, to give the several rollers appropriate directional rotation to transport the covers from left to right (Fig. 1), lower rollers 25 and 26 rotating clockwise, and the top roller 24 rotating anti-clockwise, for this purpose.

The feed roller 97 for this first warping unit is especially driven in a clockwise direction by means of a chain drive including a sprocket gear 97a (Figs. 6, 7, 8) on the shaft of roller 97, and a sprocket gear 26b on the right-hand lower warping roller 26, a sprocket chain 97b drivingly interconnecting said sprocket gears. The friction wheels 23 rotate as a result of movement of the covers therebeneath.

Means for reciprocating the second cover driving or advancing means 29 is shown particularly in Figs. 5 and 6. As in the case of the first pusher, the second pusher 29 is mounted by means of a set screw 110 on a block 111 secured by screws 112 to a slide bar 113 supported in a pair of slide stanchions 114 and 115. On the underside of the slide bar is formed a gear rack 116 which meshes with a pinion 117 on shaft 118 (see also Fig. 6). Also fast on this shaft is a gear segment 119 meshing with a radius gear 120 on crank arm 121 pivoted on the frame at 122. Another arm 123 of the crank has its extremity connected with a spring 124, which in turn is attached at its opposite end to a tie rod 125 anchored on the frame.

Pivotaly connected to crank arm 123 as at 126 (Figs. 5 and 6) is a rock lever 127 having a long slot 128 at its opposite end engaged on the long shaft 75; and a cam roller 130 on this arm bears against the periphery of a cam 131 fast on shaft 75. Thus, rotation of shaft 75 (through the gear train 78, 59, 44; Fig. 3 also) rotates the cam 131, displacing lever 127, thus rocking crank 122-123, causing gear segments 120-119 to oscillate along with pinion 117, which reciprocates the rack 116 and hence the pusher 29. This pusher may also be adjusted in the direction of

its movement for various size covers by loosening the set screw 110, so that the head portion 110a thereof may slide freely in the longitudinally slotted portions 111a of the block 111.

The second or alternate warping unit is similar to the first one, differing from the latter mainly in the omission of friction wheels on the infeed side, and the far lower roller being driven from the power shaft, instead of the near roller, as in the case of the first unit.

As viewed in Fig. 6, there are two parallel, horizontally spaced bottom rollers 32 and 33 journaled in opposite blocks 39 and 40 on the main frame, it being observed that the bottom roller 32 is mounted on the main drive shaft 38, at the outer right-hand end of which there is a pinion 154 meshing with an intermediate idling pinion 155. Lower roller 33 is provided with a pinion 156 meshing with this idling pinion 155, so that the two bottom rollers 32, 33, as viewed in Fig. 5, will rotate in anti-clockwise direction, tending to drive the covers toward the left in that view.

The top roller 31 of this second unit is adjustably mounted in journal blocks 158 (Fig. 5) each vertically slidable in a corresponding slot 159 in one of the blocks 39 (or 40) as seen in Fig. 5, there being provided a pair of adjusting screws 160 (Fig. 1 also) each threaded into one of said blocks 39 or 40 and engaged with a corresponding sliding block 158 for manipulation to raise or lower the roller with respect to the hollow or trough portion between the two bottom rollers, as in the case of the first warping unit. Lock nuts 161 secure the adjusting screws 160 in adjusted position.

The top roller 31 is rotated in a direction opposite to that of the lower rollers by means of its pinion 162 (Fig. 1) which meshes with a large idling pinion 163 driven by another idling pinion 153, which is in turn driven by pinion 156 on roller 33.

A small steel roller 164 (Figs. 1 and 5) is employed to guide and hold down the covers as they pass through this second warping unit, pusher 29 having a longer stroke (approximately five inches) than the first pusher (about one inch), and serving to drive the covers farther into the second warping unit than would be possible with the first unit because in the first bending operation the covers are fed in the direction of their greatest dimension, and there is danger of buckling at the hinge or backbone. For this reason, the first pusher merely advances the covers far enough to be grasped between the feed rollers 23 and 97.

The second or alternate bending operation occurs laterally of the open covers, and since there is no danger of buckling in this direction, the pusher 29 can follow and drive the covers a substantial distance after they enter the second unit.

The covers are ejected from the second warping unit with considerable force, so that they will lodge in a stacking bed 170 (Fig. 5) disposed at an angle with a wide surface 171 upon which the underside of the discharged cover rests with succeeding covers stacked thereon at an angle which facilitates removal and renders the weight of the stack ineffectual to alter the degree of bend in the covers at the bottom. An apron structure 173 is disposed close to the lower roller 32 to assist in guiding the covers into the bed 170.

Summary of operation

A supply of open book covers C is stacked (in-

side uppermost) in the hopper 18, as indicated in Figs. 1, 3, and 4; and with the main drive shaft 38 constantly rotating through connection of a suitable driving motor to pulley 42, the cover feeding fingers 50 will be reciprocated to push covers, one at a time, from the underside of the stack in the hopper in between the feed rollers 19 and 20, which serve to eject the covers energetically onto the first table section 16 against stop 21 and beneath fingers 22, which assures a proper alignment of the covers with respect to the first advancing or pusher means 27 and the first warping unit.

Pusher 27, reciprocating in timed relation to the ejecting movement of the fingers 50 (through the rack and pinion means 63, 64, and driving link 68, 70, 71, 77, 78 with driving pinion 58 for the feeding fingers) will engage the cover C¹ in Fig. 1, and push it a short distance until the leading edge thereof engages between the feeding rollers 23 and 97, which drive the cover in between the first set of warping rollers 24, 25, 26 (Figs. 1 and 2). Feed roller 97 is driven by chain 97b from sprocket 26b on warping roller 26 (Figs. 6 and 7).

As a result of passage through the first set of warping rollers, as aforesaid, the cover will be ejected forcibly onto the second table section 17 in the path of the second advancing or pushing means 29, which is also timed in movement (owing to its rack and pinion drive 116, 117, 121, 127, 128 with shaft 75, which is driven commonly with the feed drive pinion 59 and first pusher crank pinion 78) so that this second pusher will be in retracted position (away from the second warping unit) at the time when the cover lands upon the second table section 17.

The second pusher 29 will advance to engage the edge of the cover C² and rectify any misalignment thereof as it is advanced beneath the hold-down roller 164 and driven by a following motion of the pusher well into the second set of warping rollers 31, 32, 33, whereupon the cover will be ejected into the stacking bed 170.

Pusher 29 is reciprocated at a predetermined rate with respect to the feeding action of fingers 50 and pusher 27 by a rack and pinion means similar to that which drives pusher 27, and like the latter, pusher 29 is driven from shaft 75 through the cam 131, cam lever 127, crank 121—123, gear segments 119, 120, pinion 117, and rack 116, (Fig. 5).

As a result of the complex warping thus imparted to the covers, the major, central portions of both cover sections are bowed or raised outwardly of the cover bodies, and the covers are therefore in a proper condition to receive the imprint of the usual stamping die which will be pressed against said raised or outwardly bowed portions.

The only adjustments required in operating the machine relate to the size of cover to be run and the degree of warp or bend desired. To this end, hopper 18 may be arranged to accommodate various sizes of cover by loosening the wing set screws 18a and 18b (Figs. 1, 3, 4) and moving uprights 18x and 18y as necessary.

The stop member 21 may be accordingly positioned by loosening its set screws 21a and sliding the member into the desired position to align the size of cover for which the hopper has been adjusted as aforesaid. Also, the hold-down fingers 22 can be slid along the stop member 21 by loosening their set screws 22a.

The cover advancing means or pushers 27 and 29 may be adjustably positioned in the direction of their motion by manipulating their respective set screws 86 and 110, respectively.

The degree of warp or bend is controlled, depending upon the thickness and kind of cover stock, by loosening the lock nuts 95 or 161, and the corresponding setting screws 94 or 160 for the top rollers 24 and 31, respectively, for each warping unit, so that these rollers are moved toward or away from their coacting lower roller sets.

The arrangement of the actuating mechanism is so calculated that proper timing of the several functional units is accomplished without resort to complicated or costly controls and adjustments or regulating means. The arrangement of the infeed or hopper in adjacency with respect to the outfeed or discharge side of the machine is such that one attendant may be positioned to handle the loading and removal of covers. The entire mechanism is relatively simple in construction, is inexpensive to build and maintain, and all of its parts are readily accessible. The device is capable of conditioning several thousands of covers per hour, without damaging any of the covers, and with a minimum of supervision.

By feeding covers one at a time and successively advancing them in different directions through a series of warping rollers, a complex bend, amounting to an overall bowing or convexity, of uniform character is quickly imparted to the covers during an interval which is too short for any considerable restorative or reflexive bending of the covers owing to their inherent bias or flexibility, so that the overall average bend will be the same for all covers of a given type or stock.

By changing the direction of advance of the covers from their starting position, and disposing the sets of warping rollers with their respective axes of rotation offset, the covers are made to issue at the same side of the machine at which they enter, thus conserving overall space required for the machine, and, moreover, making it possible for the attendant to remain in substantially one position while handling both the loading and unloading of the covers.

The results obtained by the novel machine are superior to those possible under previously known methods, both as to quantity handled and uniformity of bend imparted to the covers. In the present device, the several bending operations follow each other in very rapid succession, tending to produce an averaged, overall warp without a sufficient lapse of time between bends to permit any considerable restoration which might affect the extent or character of succeeding bends, such as would be the case by the old manual method, wherein all covers were run first in one direction, and then in another, with a lapse of time between alternate bends depending upon the speed of the operator and the numbers of covers run in a given group. These manual methods, moreover, entailed additional stacking operations between alternate bends.

The foregoing objects, advantages, and features of novelty may be realized by modifications in the precise construction described, and it is not intended that the invention shall be limited except as may be provided by the appended claims.

Having thus described my invention, what I claim and desire to protect by Letters Patent of the United States is:

1. Mechanism for bending bookcovers and the

like, comprising a first roller means, a first pusher means for advancing covers one at a time into engagement with said first roller means, a second roller means mounted to rotate about axes disposed out of parallelism with the rotational axes of said first roller means, a second pusher means for advancing covers discharged from the first roller means into operative engagement with said second roller means, means for feeding and aligning covers one at a time into position for operative engagement with said first pusher means, and driving mechanism actuating the foregoing means in timed cooperative relation to effect transit of covers one at a time successively through said roller means.

2. In a machine of the class described, a plurality of warping rollers arranged in sets with rollers of one set rotating about parallel axes disposed at an angle to the rotational axes of another set, and reciprocable pusher means for effecting transit of members to be warped into engagement with said sets of rollers and for changing the direction of bodily movement of said members with respect to one set of rollers after leaving another set of said rollers for the purpose of imparting a complex warp thereto together with drive means actuating said sets of rollers and said pusher means in a predetermined timed relationship such that said covers are moved one at a time in succession in transit as aforesaid.

3. Bending apparatus comprising, in combination: a plurality of warping mechanisms, means providing table surfaces adjoining said mechanisms, means providing an aligning stop on a first one of said surfaces, means for ejecting articles onto said first surface against said stop to align the same with respect to a first one of said warping mechanisms, pushing means for advancing articles from said stop into operative engagement with said first warping mechanism, the latter operating to eject articles therefrom onto a second of said table surfaces, pushing means operable to advance and align articles ejected upon said second surface as aforesaid with respect to a second one of said warping mechanisms and to further urge articles advanced thereby into operative engagement with said second warping mechanism, means for receiving articles from said second warping mechanism and stacking said articles in planes at an angle to the horizontal, and means for driving said warping mechanisms and said pushing means in timed relation.

4. The invention defined in claim 3 further characterized in that said first-mentioned pushing means functions to advance articles in a certain bodily orientation with respect to the first-mentioned warping mechanism, and said second mentioned pushing means alters said certain bodily orientation of the article before the latter is acted upon by said second mentioned warping mechanism.

5. Apparatus for bending book covers comprising: a first warping mechanism, pushing means for feeding and aligning covers in a certain direction of bodily orientation into warping engagement with said first warping mechanism; a second warping mechanism, pushing means for causing movement of articles from said first warping mechanism into warping engagement with said second warping mechanism, said last-mentioned pushing means further changing the bodily orientation of said covers moved thereby with respect to said second warping mechanism,

and means for feeding covers one at a time into operative relation with said first pushing means.

6. The invention defined in claim 5 further characterized by the provision of driving means correlating the operation of said pushing, and warping means and mechanisms respectively to cause covers to be moved one at a time in rapid succession automatically to said first pushing means and through said warping mechanisms.

7. A machine for bending bookcovers including a main drive shaft, feed roller means driven from said shaft about rotational axes in parallelism with said shaft, means driven from said shaft for feeding covers from a starting position at one side of said shaft in a direction transversely of said shaft into engagement with said feed roller means, means at the discharge side of said feed roller means for supporting covers at a first position said feed roller means acting to lodge covers at said first intermediate position, aligning means positioned adjacent said first intermediate position to be engaged by covers lodged thereat as aforesaid, advancing means driven from said shaft for moving covers from said first intermediate position in the direction of the length of said shaft, first warping roller means driven from said shaft about axes extending in a sense transverse of said shaft and receiving covers by action of said advancing means and further acting to lodge said covers in a second intermediate position, means at the discharge side of said first warping roller means for supporting covers at said second intermediate position a second warping means driven from said shaft and including roller means rotating about an axis coincident with that of said main drive shaft, a second advancing means driven from said shaft and acting to advance covers from said second intermediate position in a direction transverse of said shaft into operative engagement with said second warping means, said second warping means discharging covers advanced thereto as aforesaid in a direction transverse of said shaft and into a discharge position which is on the same side of said shaft as, and adjacent to, said starting position.

8. A bookcover bending machine including a stop, feed rollers acting to discharge covers against said stop, a pusher reciprocable at right angles to the direction of discharge of said covers against said stop, a first set of warping rollers rotatable about axes at right angles to the direction of movement of said pusher, said pusher urging covers into said first set of warping rollers, a second pusher reciprocable at right angles to the axes of said first warping rollers, a second set of warping rollers rotatable about axes at right angles to the axes of said first set of warping rollers, said second pusher urging covers discharged from said first set of rollers into the second set of warping rollers, and driving mechanism for said pushers and sets of warping rollers, timed to actuate the same in cooperative relationship to effect movement of covers in succession through said sets of warping rollers.

9. In a bookcover bending machine, substantially axially aligned infeed and outfeed roller means, intermediate roller means rotatable axially at right angles to the rotational axes of said infeed and outfeed roller means, and at a position approximately intermediate the remote ends of said last-mentioned roller means, means for supporting covers for movement relative to said roller means, means driving said roller means to effect movement of covers from between said in-

feed roller means to a position opposite the intermediate roller means on said supporting means, and from between the intermediate roller means to a position on said supporting means opposite the outfeed roller means, and from between said outfeed roller means in a direction opposite to the movement of covers by the infeed roller means, and operatively coordinated cover moving means operating intermittently for moving covers on said supporting means into engagement with said intermediate and outfeed roller means.

10. In a bookcover bending machine, infeed, outfeed, and intermediate roller means disposed substantially in a common plane, the axes of said intermediate roller means being angularly disposed relative to the axes of said infeed and outfeed roller means, and each said roller means having an axial end region disposed adjacent an axial end region of the others, means jointly driving said roller means, cover stacking means at a side of said infeed roller means away from said intermediate roller means, cover-receiving means opposite said outfeed roller means at a side thereof away from said intermediate roller means, cover-supporting means in said plane adjacently between said infeed and intermediate roller means and between said intermediate and outfeed roller means, and driven means moving in predetermined timed relation for engaging and advancing covers one at a time from said stacking means into said infeed roller means, and from positions on said cover-supporting means into engagement respectively with said intermediate roller means and said outfeed roller means.

11. In a bookcover bending machine, means providing a cover supporting table, means for stacking a supply of covers adjacent said table at an infeed side thereof, a feed roller means for ejecting covers forcibly into a first position on said table at said infeed side, an aligning stop on said table against which covers are forcibly ejected by said feed roller means, warping roller means rotatable about axes at right angles to said feed roller means and said stop and opposite the latter, a first pusher on said table reciprocable at right angles to the axes of said warping roller means and between said stop and feed roller means to push covers ejected as aforesaid into engagement with said warping roller means, the latter acting to eject covers into a second position on said table, a second warping roller means rotatable about axes extending in approximately the same direction as the axes of said feed roller means, and on the infeed side of said table, a second pusher opposite said second position and reciprocable relative to said second warping roller means to urge covers into the latter from said second position, and drive mechanism for said roller means and pushers and coordinating the reciprocation of the latter to move covers from said feed roller means in rapid succession through said warping roller means.

12. A bookcover bending machine according to claim 11 and further characterized by the provision therein of reciprocable cover advancing means cooperable with said cover stacking means and actuated by said drive mechanism in timed relationship with said pushers to advance covers from said stack one at a time into said feed roller means.

13. A bookcover bending machine according to claim 11 and further characterized in that said feed roller means and said second warping roller means are jointly driven by a common shaft means driven by said drive mechanism, and said first warping roller means is driven from said common shaft axially at right angles thereto.

14. A bookcover bending machine including in cooperative association, table means, feed roller means and warping roller means at a particular side of said table means, and including a common drive shaft and rotating to discharge covers in opposite directions, intermediate warping roller means driven from said common shaft but axially at right angles thereto and in a plane including the surface of said table means, said feed roller means acting to eject covers into a first position on said table means, a first advancing means for moving covers from said first position into said intermediate warping roller means, the latter acting to eject covers to a second position on said table means opposite said first-mentioned warping roller means, a second advancing means acting to move covers from said second position to said first-mentioned warping roller means, and drive mechanism actuating said feed roller means, said warping roller means, and said advancing means in coordinated relationship to effect successive movement of covers through the warping roller means.

15. In a cover bending machine, means providing adjoining table surfaces, intermediate roller means interposed between said surfaces and rotating to eject covers received from a first said surface onto a second said surface, infeed roller means at an infeed side of said first surface and rotatable to move covers onto the latter, outfeed roller means at an outfeed side of said second surface adjacent said infeed side and rotatable to move covers away from the latter surface in a direction opposite from the movement of covers by said infeed roller means, a first means for advancing covers on said first surface into engagement with said intermediate roller means, a second means for advancing covers on said second surface into engagement with said outfeed roller means, and mechanism driving said roller means and intermittently actuating said first and second advancing means in timed relation to effect transit of covers in succession from said infeed roller means through said intermediate and outfeed roller means, whereby covers can be fed into said machine and discharged therefrom on the same side thereof.

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