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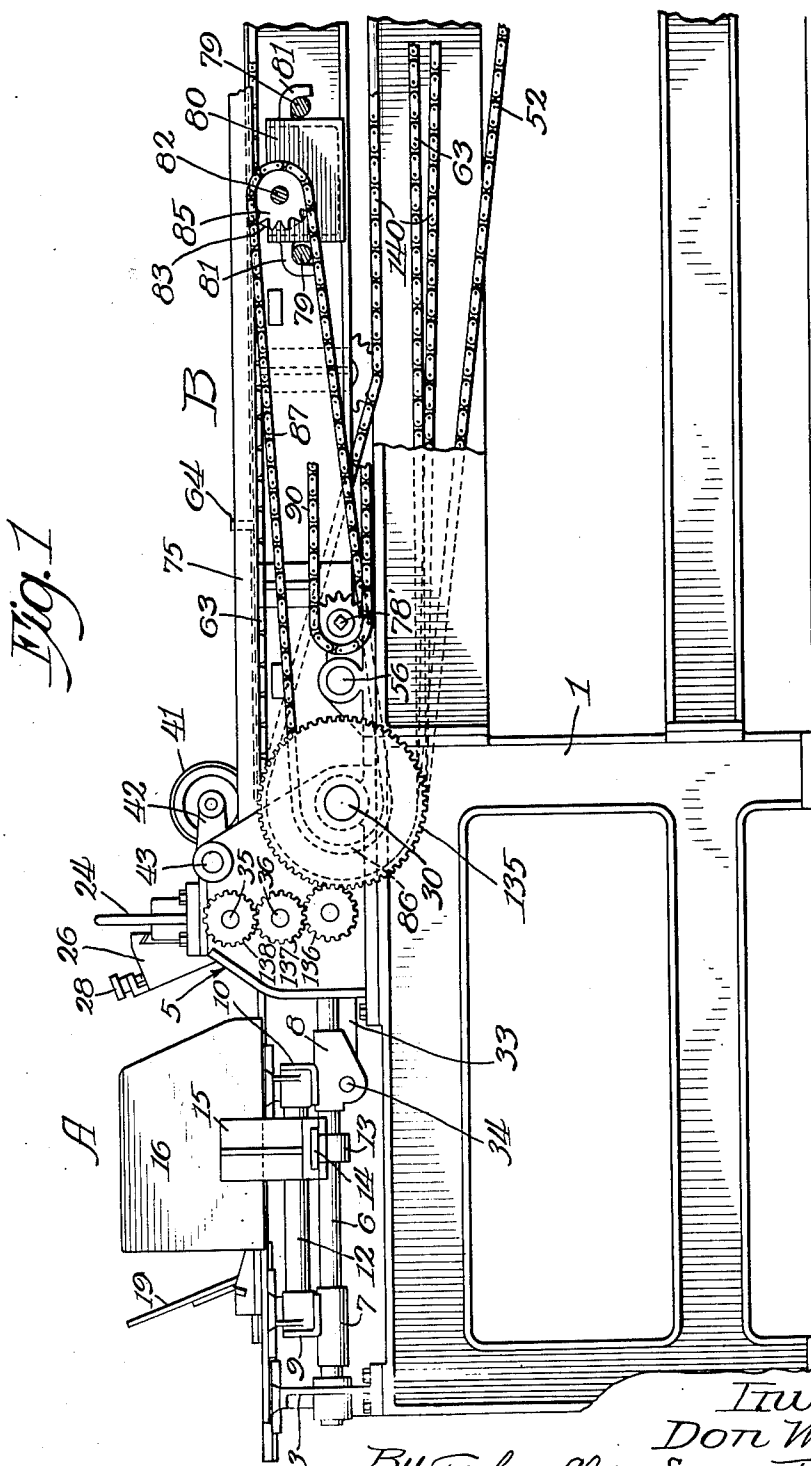
D. W. COY

1,979,253

CARTON BLANK FOLDING AND STAPLING MACHINE

Filed Feb. 21, 1931

9 Sheets-Sheet 1




 Inventor.
 DON W. COY,
 BY Fisher, Clapp, Soans & Pond Attys.

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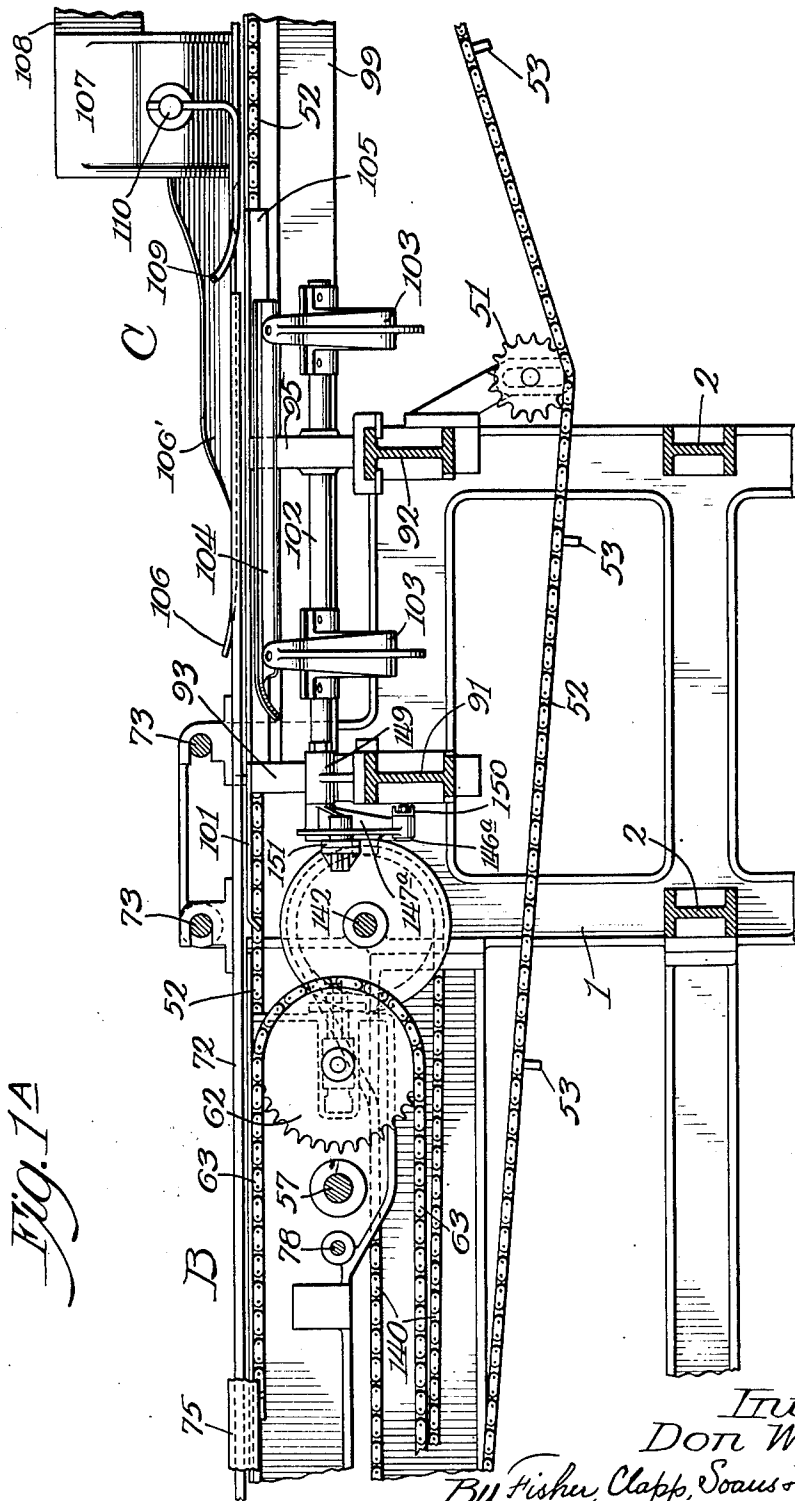
D. W. COY

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9 Sheets-Sheet 2



Inventor:
Don W. Coy,
By Fisher, Clapp, Soars & Pond, Attys

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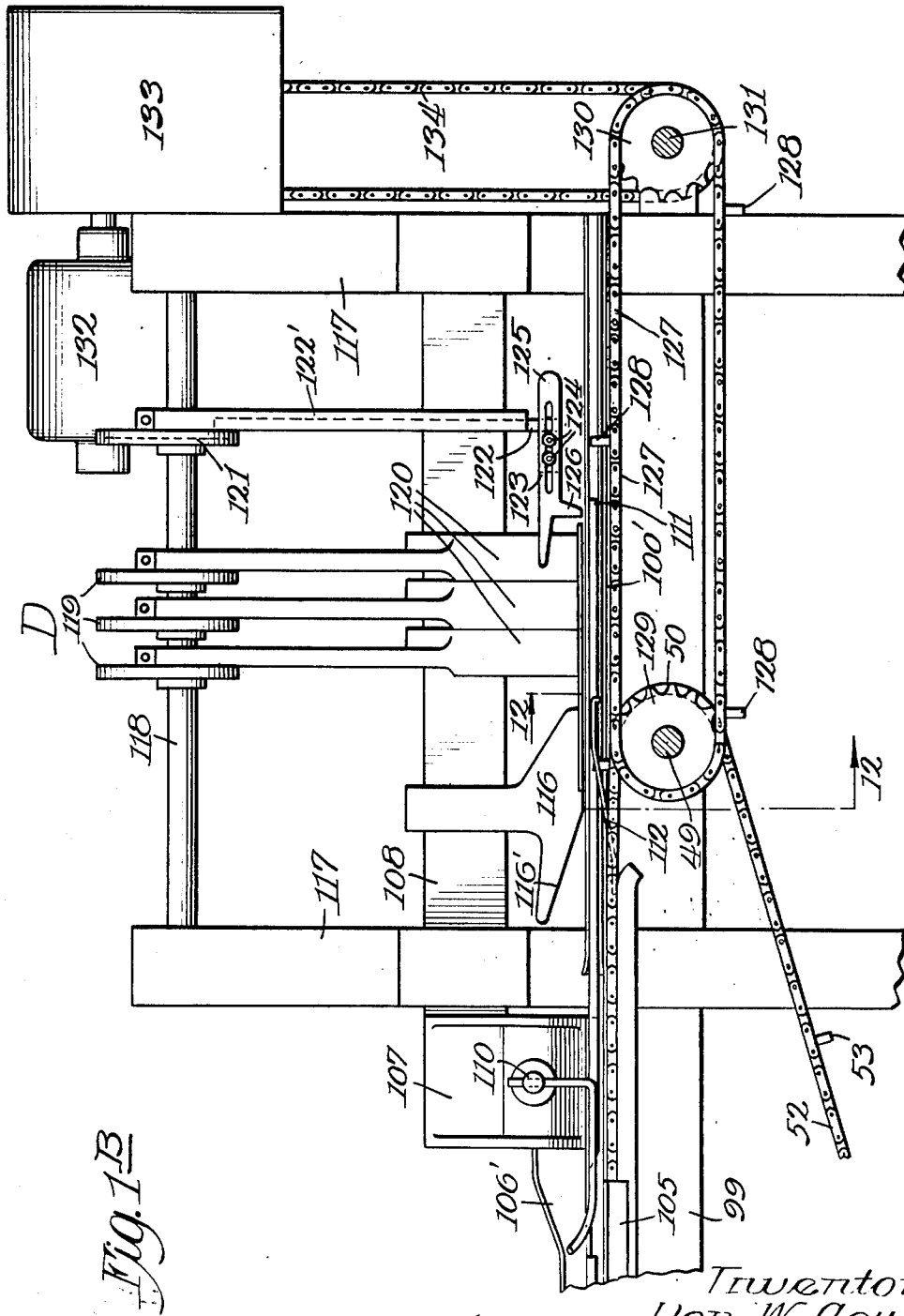
D. W. COY

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Twentor:
Don. W. Coy,
By Fisher, Clapp, Soans & Bond, Attys.

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D. W. COY

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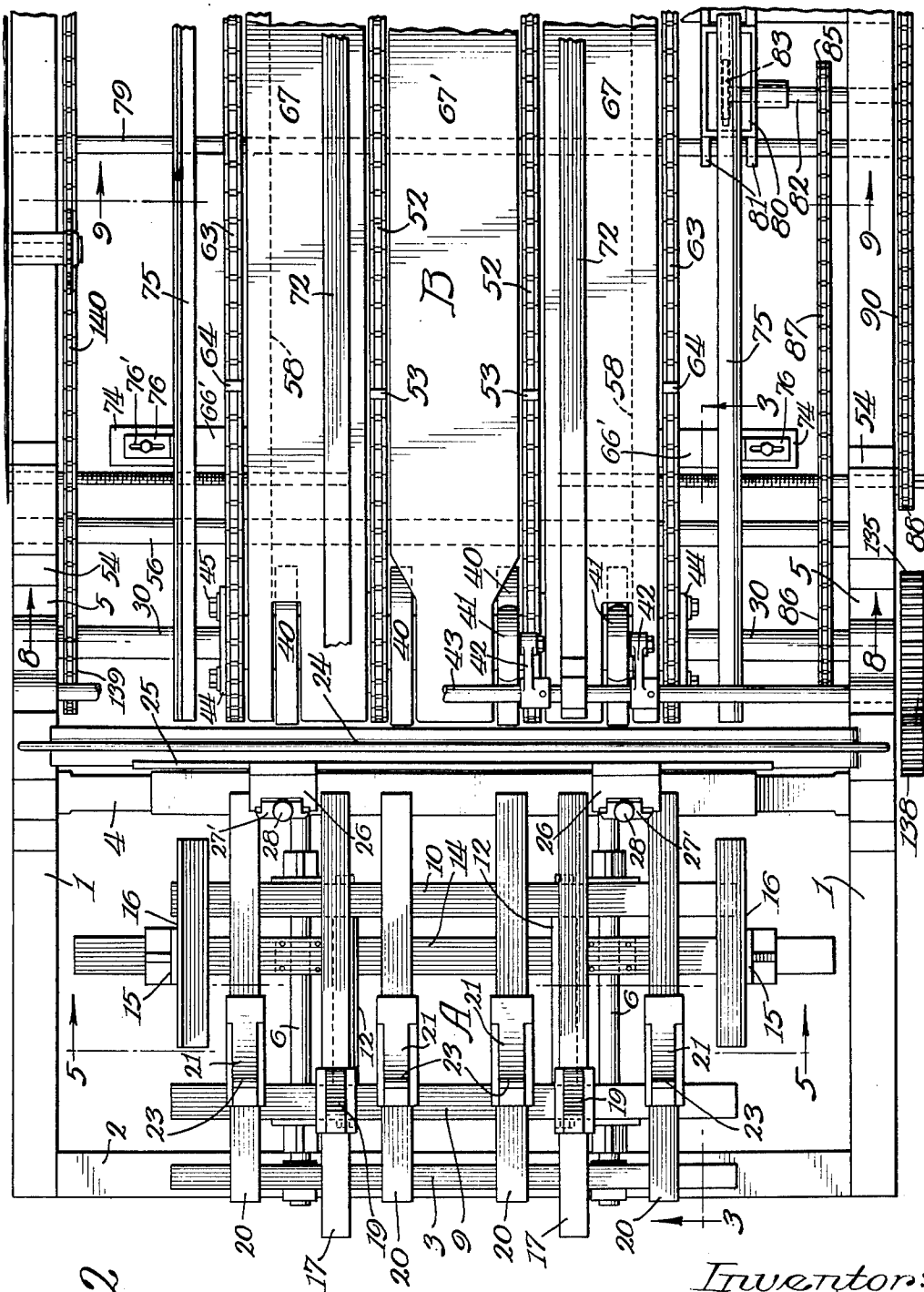


Fig. 2

Inventor:
D. W. Coy,
By Fisher, Clapp, Soans & Pond Attys.

Nov. 6, 1934.

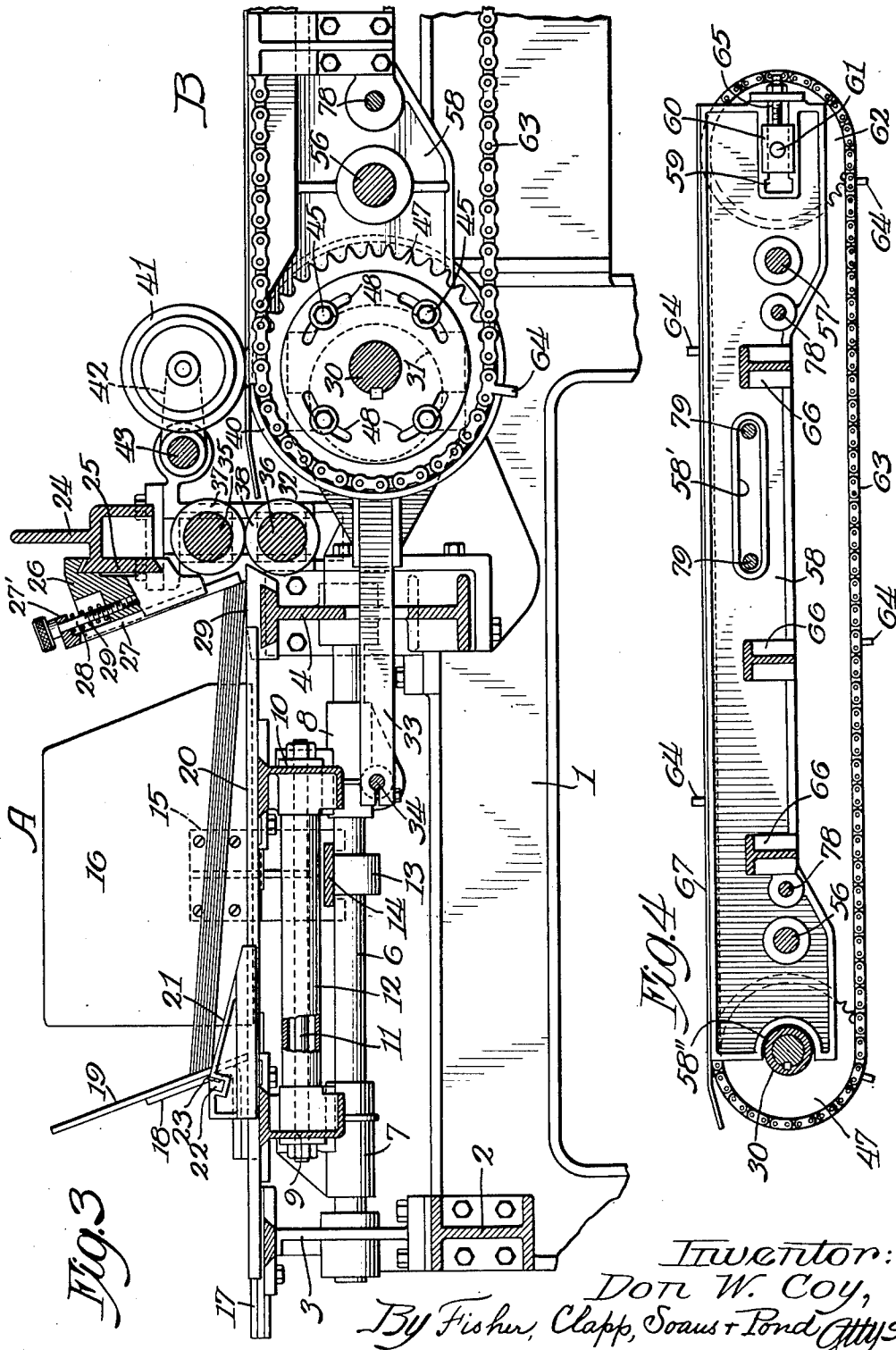
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CARTON BLANK FOLDING AND STAPLING MACHINE

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9 Sheets-Sheet 7

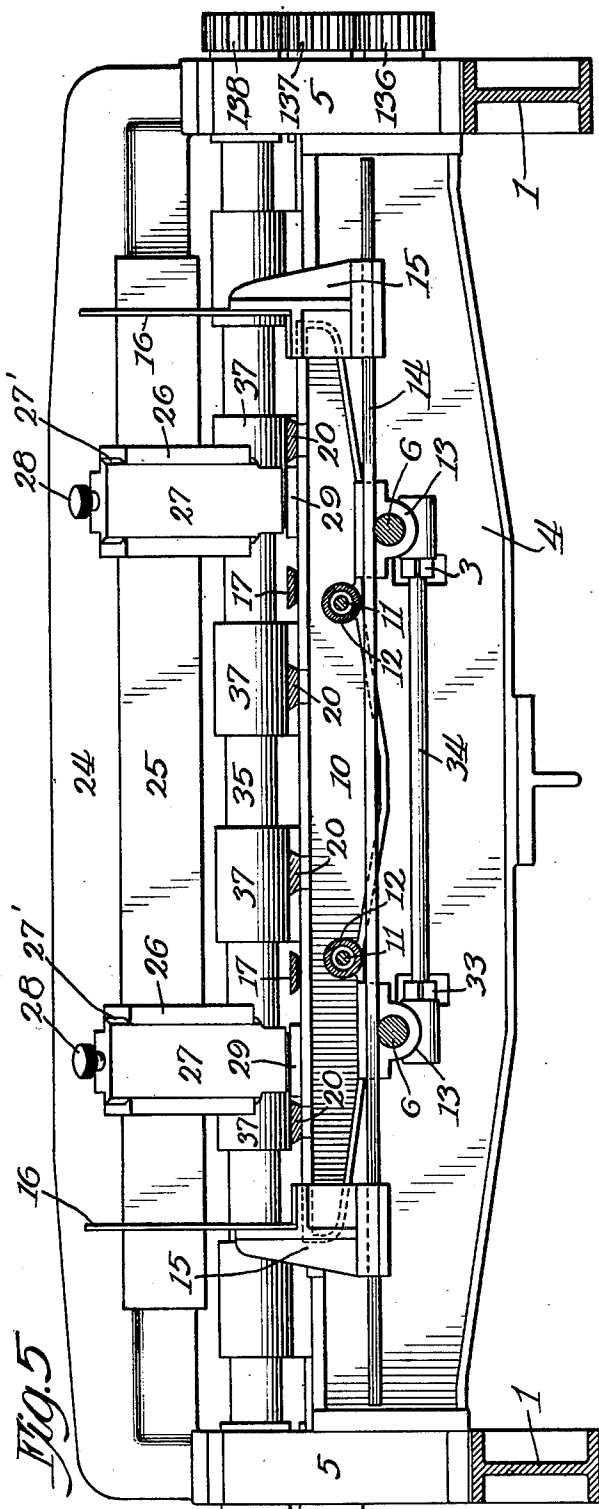


Fig. 7

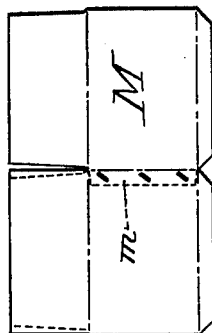
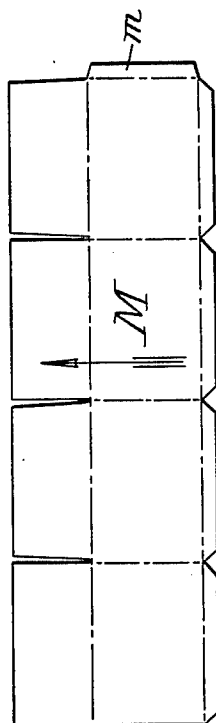


Fig. 6



Inventor:
Dor W. Coy,
By Fisher, Clapp,
Souss & Pond Attys.

Nov. 6, 1934.

D. W. COY

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Fig. 10

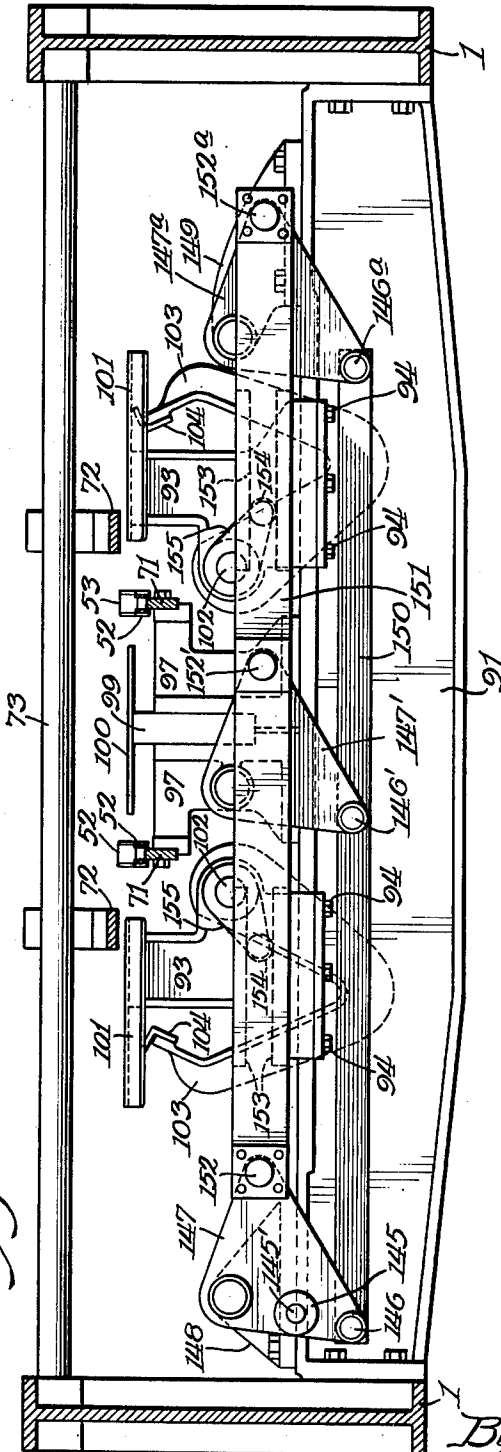
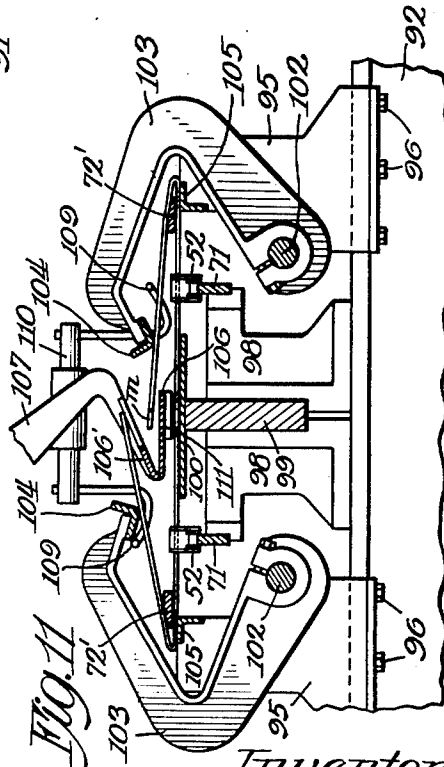
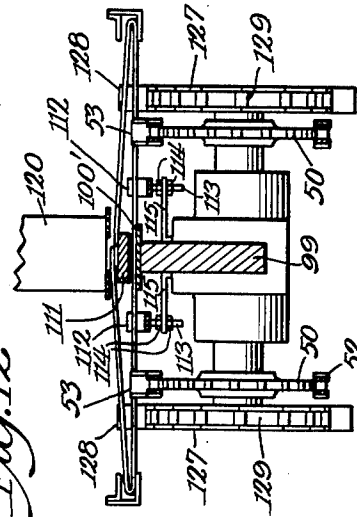


Fig. 12



UNITED STATES PATENT OFFICE

1,979,253

CARTON BLANK FOLDING AND STAPLING MACHINE

Don W. Coy, Chicago, Ill., assignor to Chicago Carton Company, Chicago, Ill., a corporation of Illinois

Application February 21, 1931, Serial No. 517,443

27 Claims. (Cl. 93—49)

This invention relates to machines for folding and connecting the ends of carton blanks. One object of the invention is to provide an improved machine for automatically feeding, gluing, folding and stapling a carton blank, and particularly one adapted to operate at high speed. Further objects are, to provide a machine in which the blanks are advanced through the different mechanisms of the machine by continuously operating conveyor chains; to provide an improved blank conveyor mechanism by which the blanks are first accurately squared relatively to the direction of travel and are then advanced into and through the zones of the gluing, folding and stapling mechanisms, and which is so organized as to permit the continuous operation of the stapling mechanism; to provide improved blank conveyor mechanism, including improved devices by which the blank is controlled during the folding operation; and to provide a machine of the type specified so constructed as to be readily and easily adjustable to handle blanks of varying sizes.

Still other objects and attendant advantages of the invention will become apparent to persons familiar with the art to which the invention relates from the following description, taken in connection with the accompanying drawings in which I have illustrated one embodiment of the invention which, in practice, has been found to satisfactorily effectuate the stated purposes and objects thereof, and in which—

Figs. 1, 1A and 1B, placed end to end in the order recited, constitute a side elevation of the complete machine, the intermediate portion of the machine, including the conveyor mechanism and the blank folding mechanism, being shown partly in vertical longitudinal section.

Figs. 2 and 2A, placed end to end, constitute a plan view of the machine, excepting the stapling mechanism which appears in side elevation in Fig. 1B.

Fig. 3 is an enlarged vertical longitudinal section through the blank feeding mechanism, the feed rolls, and the receiving end of the conveyor mechanism, taken on the line 3—3 of Fig. 2.

Fig. 4 is a vertical longitudinal section, taken on the line 4—4 of Fig. 9.

Fig. 5 is an enlarged vertical transverse section, taken on the line 5—5 of Fig. 2.

Fig. 6 is a plan view of the cardboard blank handled by the machine.

Fig. 7 is a plan view of the same blank after having been folded and stapled by the machine.

Fig. 8 is an enlarged vertical transverse section taken on the line 8—8 of Fig. 2.

Fig. 9 is an enlarged vertical transverse section taken on the line 9—9 of Fig. 2.

Fig. 10 is an enlarged vertical transverse section taken on the line 10—10 of Fig. 2A.

Fig. 11 is a vertical transverse section taken on the line 11—11 of Fig. 2A, but showing the folders in blank-folding position.

Fig. 12 is an enlarged vertical transverse section taken on the line 12—12 of Fig. 1B.

General organization

First briefly describing the general organization of the machine, 1 designates as an entirety, each of a pair of long skeleton side frames which are rigidly connected and spaced as by cross beams 2. Mounted on this supporting frame structure at one end thereof is a blank hopper and associated feed mechanism designated as an entirety in Figs. 1, 2 and 3 by A. Immediately beyond the hopper and associated feed mechanism is a blank conveyor and gluing mechanism designated as an entirety in Figs. 1, 1A, 2, 2A and 3 by B. Next beyond gluing devices is a blank folding mechanism designated as an entirety in Figs. 1A and 2A by C. And next beyond the folding mechanism C is a standard multiple head stapling machine designated as an entirety in Fig. 1B by D.

Blank hopper and associated feed mechanism

Referring more particularly to Figs. 1, 2, 3 and 5, 3 designates a cross girder mounted on one of the cross beams 2 at the front end of the machine, and 4 designates a similar cross girder secured at its ends to the side frames and to a pair of bearing brackets 5 mounted on the side frames 1. Mounted in and extending between the girders 3 and 4 are a pair of rods 6, and slidable on these rods are front and rear pairs of sleeves 7 and 8 forming parts of a cross head structure. Extending between and connecting the sleeves 7 is a cross bar 9, and similarly extending between and connecting the sleeves 8 is a cross bar 10. The cross bars 9 and 10 are rigidly connected by a pair of tie bolts 11 that extend through spacing sleeves 12. Fixedly mounted on the slide rods 6 are a pair of brackets 13 mounted on the upper flat sides of which is a cross strip 14. Mounted on and adjustable lengthwise of the strip 14, on opposite sides of the machine, are a pair of up-standing brackets 15 that are formed on their inner sides with rectangular seats (Fig. 5) for a pair of hopper side plates 16.

Referring to Fig. 2, mounted on the upper sides of the girders 3 and 4 and overlying the upper sides of the cross beams 9 and 10 are a pair of laterally adjustable stationary slats 17, on the upper side of which slats are mounted angle brackets 18, the upwardly and rearwardly inclined limbs of which support a pair of similarly inclined bars or strips 19, which latter form in effect the rear wall of the blank hopper, as clearly shown in Fig. 3. Mounted on and between the upper sides of the cross bars 9 and 10 are a group of slats 20 (herein shown as four in number), and adjustably mounted on each of said slats is a shoe 21, which is formed with a socket 22 in and crosswise of its upper face to receive a narrow blank push strip 23.

Mounted on and extending between the bearing brackets 5 just beyond the girder 4, is a cross beam or yoke 24, on the front face of which is formed a longitudinal dove-tailed rib 25, on which are adjustably mounted a pair of downwardly hanging blocks 26, each of said blocks being formed with a slideway for a downwardly and forwardly inclined gate 27. Each gate is formed on its upper end with a transverse flange 27', through which extends a screw 28 screwing into the block 26, and encircling the screw 28 is a spring 29 footed at one end on a shoulder on the block 26 and at its other end on the flange 27'; and thus normally urging the gate 27 upwardly, the said gate being adjusted downwardly by the screw 28. The lower edge of the gate 27 cooperates with blocks 29 slidably mounted on the top of the girder 4, to form a hopper throat of a width just sufficient to pass the lowermost blank of a stack, such as is indicated in Fig. 3, the width of the passage being, of course, easily adjustable by the screws 28, to suit blanks of varying thicknesses. The blank ejecting cross head above described, is reciprocated from a front sprocket shaft 30, more particularly hereinafter described, by a pair of eccentrics 31 (Fig. 8) keyed on said shaft, eccentric straps 32, and pitmen 33 coupled at their forward ends to a cross rod 34 extending between and connecting the rear sleeves 8 of the cross head.

Journalled in and between the bearing brackets 5 are upper and lower feed roll shafts 35 and 36 respectively (Fig. 3), the former equipped with friction rolls 37 and the latter with cooperating friction rolls 38. Incidentally it will be observed, by reference to Fig. 3, that the forward ends of the feed slats 20 form a traveling support for the forward portion of the lowermost blank. From the feed rolls 37, 38, the blanks are successively delivered onto a group of conveyor chains by which they are accurately squared with reference to the line of travel, and advanced successively and continuously through the field of action of the folding mechanism and into the field of operation of the stapling mechanism.

Blank conveyor mechanism

The mechanism which conveys the blanks from the feed rolls to the folding devices comprises, generally described, a group of blank advancing rolls located slightly beyond the feed rolls, and a pair of endless chains equipped with spaced lugs that engage with the rear edge of each blank after the latter has passed from between the advancing rolls and carries the blank forwardly into and through the field of action of the folding devices. Since these chains are necessarily spaced quite closely together in order to be out of the way of the folding devices, I also employ

a pair of endless chains located on the outer sides of the main conveyor chains and spaced slightly less than the full width of the blank for the purpose of accurately squaring the blank relatively to its direction of travel. These latter chains carry lugs which likewise engage the rear edge of each blank as the latter emerges from between the advancing rolls. These latter blank squaring chains are so mounted that they can be bodily adjusted widthwise of the machine bed so as to handle blanks of varying widths within the limits of the machine.

Referring to Fig. 8, mounted on the shaft 30 are a group, herein shown as four, of friction wheels 40, overlying and cooperating with which are gravity friction wheels 41, each of the latter being journaled on the free end of an arm 42 pivoted on a transverse pivot rod 43 (Fig. 2) and adjustable laterally on said rod. The lower friction wheels 40 are positively driven, as hereinafter described, so that, as the trailing edge of the blank emerges from between the feed rolls 37 and 38, the blank continues to be fed by and between the rolls 40 and 41.

Keyed on the intermediate portion of the shaft 30 are a group of four spiders 44, (Fig. 8) to which are adjustably secured, as by screws 45, sprocket wheels, the two intermediate sprocket wheels being designated by 46, and the two outer sprocket wheels by 47. As clearly shown in Fig. 3, the screws 45 extend through arcuate slots 48 in the sprocket wheels, whereby the sprocket wheels may be adjusted around the axis of the shaft 30 within the limits of the slots 48, in order to accurately position the blank engaging lugs on the two sets of chains relatively to each other. Referring to Fig. 1B, journaled in and extending transversely of the frame work of the stapling machine D is a rear sprocket shaft 49, fast on which are a pair of sprocket wheels 50 that are located in the vertical planes of the intermediate sprocket wheels 46 on shaft 30. Trained over the sprockets 46 and 50, and under idler sprockets 51 (Fig. 1A) are a pair of sprocket chains 52, on which, at uniform intervals, are located blank engaging lugs 53. The lugs on the two chains are, of course, located in the same transverse planes, which may be accomplished by angular adjustment of the front sprocket wheels 46, so that mating lugs on the two chains 52 will engage simultaneously with the trailing edge of the blank. By reference to Fig. 8 it will be observed that the two outer spiders 44 carrying the sprocket wheels 47 are splined on the shaft 30 so as to be adjustable lengthwise of the latter; and it will also be noted that the two outer friction wheels 40 are not mounted directly on shaft 30 but are keyed on inwardly extending hubs of the spiders 44.

Referring to Figs. 2 and 2A, mounted in and between suitable supporting brackets 54 and 55 on the side frames 1 are front and rear transverse rods 56 and 57. Supported on these rods on opposite sides of the machine respectively, are a pair of beams 58, one of which is shown in isolated detail in Fig. 4, these beams also appearing in front end elevation in Fig. 8 and in vertical cross section in Fig. 9. Each beam 58 is horizontally slotted at its rear end, as shown at 59 in Fig. 4, to form a slideway for a bearing block 60, this latter carrying a stub shaft 61, on which is mounted a rear sprocket wheel 62, the two sprocket wheels 62 being in the vertical planes of the two outer sprocket wheels 47 (Fig. 8); and trained over the aligned sprocket wheels

47 and 62 are the outer chains 63 that are equipped with uniformly spaced blank engaging lugs 64. By means of screws 65 (Fig. 4) engaged with the bearing blocks 60, the latter may be shifted in the slots 59 so as to properly tension the chains 63. As shown in Fig. 9, the beams 58 are provided at spaced intervals with lateral brackets 66 that form supports for flat metal strips 67 that extend lengthwise of and between adjacent chains and, together with an intermediate strip 67', serve as a supporting table or platform for the blanks during the travel of the latter. Also, on the outer sides of the beams 58 are lateral bracket arms 68 (Fig. 9) supporting rails 69 that form trackways for the upper laps of the outer chains 63.

Mounted on the intermediate portions of the front and rear rods 56 and 57 are brackets 70 (Fig. 9) that constitute supports for the intermediate blank supporting strip 67' and also for rails 71 that form trackways for the intermediate sprocket chains 52. By reference to Figs. 4 and 8 it will be seen that the forward ends of the beams 58 are formed with semi-circular seats 58'' that embrace the hubs of the outer spiders 44 between the sprocket wheels 47 and the friction wheels 40, so that, when the beams 58 are shifted laterally by means hereinafter described, the outer sprocket wheels 47 and friction wheels 40 are simultaneously shifted therewith.

The intermediate sprocket wheels 46 which actuate the chains 52 are so designed as to propel the chains 52 at a slightly greater speed than the outer chains 63 are propelled by their driving sprockets 47, so that the lugs 53 of the inner chains gradually gain upon and pass the blank squaring lugs 64 of the outer chains. This differential travel is easily and simply effected, according to the present invention, by providing the sprockets 46 with one more tooth than the sprockets 47. For example, the sprockets 46 may carry thirty-six teeth and the sprockets 47, thirty-five teeth; and assuming that the links of the chains 52 and 63 are the same length and that the lugs on the sprocket chains 63 are located thirty-five links apart and those on the sprocket chains 52 are located thirty-six links apart, it is apparent that the chains 52 will travel at a slightly greater speed than the chains 63, and consequently the lugs 53 will gradually overtake and pass the lugs 64. Since the spacing of the inner and outer lugs 53 and 64 corresponds with the number of teeth on their respective sprockets, the chains can be so operated that, as each blank emerges from between the advancing rolls 40, 41, its rear edge will first be engaged by the lugs 64 on the widely spaced outer chains and the blank will thus be accurately squared at right angles to its direction of travel; and, shortly after this has occurred, the faster traveling lugs 53 on the inner chains will engage with the rear edge of the blank and continue to advance the latter into and through the field of action of the folders and into stapling position. Also the faster traveling lugs 53 move the blanks out of contact with the lugs 64, so that the latter clear the rear edge of the blanks as they pass downwardly over the sprocket wheels 62. 72 designates each of a pair of flat strips that overlie the blank supporting plates 67 and serve to prevent any buckling up of the blanks during their travel, and also to insure contact of the blanks by the lugs through frictional resistance. These strips are conveniently mounted at one end on the rod 43 (Fig. 2) and at inter-

mediate points on a pair of cross rods 73 (Figs. 2A and 10).

It is noted that the hopper feed mechanism and the friction rolls 40 and 41 place the blanks one at a time in position to be properly engaged by the lugs 64 on the outer chains. Preferably also the gluing device, hereinafter described, is so arranged that it is engaged by the blanks when the lugs 53 overtake the lugs 64, and so aid the lugs 64 in overcoming any resistance to the passage of the blanks past the gluing device.

Referring to Figs. 2, 2A and 9, attached to the outer sides of the beams 58 are brackets 66' each supporting on its upper end a laterally projecting strip 74, which latter serves to support a longitudinal channel guide 75 that is attached to the strip 74 by an angle bracket 76 and a clamp screw 77 extending through a longitudinal slot 76' in the base limb of the bracket, whereby the channel guides 75 are adjustable sidewise of the machine to accommodate blanks of varying widths. The other ends of the channel guides 75 are suspended from one of the crossrods 73 in the same manner as the strips 72. The purpose of these channel guides is mainly to prevent any sidewise shift of the blanks; and the bottom limb of one of these guides is slotted, as shown in Fig. 9, to permit the passage of the gluing wheel later described.

The two beams 58 and the parts carried thereby, together with the outer friction wheels 40 and the outer sprocket chains and their supports, are bodily adjustable laterally by the means best shown in Figs. 2, 2A, 4 and 9. Each beam 58 has threaded holes located adjacent to the beam supporting rods 56 and 57, through which pass long screws 78, these screws being journaled at their outer ends in suitable bearings on the side frames 1, the outer end of each screw having a squared head 78' by which it may be turned by the application of a wrench. In this way, the two beams 58 and the blank and chain supporting members carried thereby can be adjusted bodily inwardly or outwardly to suit blanks of different widths.

By reference to Figs. 6 and 7 it will be observed that the blank M therein shown is formed on one side edge of its body portion with a flap *m* that, when the blank is folded, underlaps the opposite side edge of the blank and is stapled to the latter. To secure a closed joint at the overlap, the flap *m* is also preferably glued to the opposite edge of the blank, and the present machine is equipped with a device for automatically applying a layer of glue to the under side of the flap as the blank is advanced by the chains 52 and 63. Describing this automatic glue-applying means, 79 designates each of a pair of transverse rods connecting the bearings in which the screws 78 are mounted, said rods extending through a slot 58' in each of the beams 58 (Fig. 4). Referring to Figs. 1 and 9, mounted on and supported by the rods 79 is a glue box 80, the latter being equipped with hooks 81 on its opposite ends that overlie the rods 79. Journaled in and between the opposite side walls of the glue box 80 is a shaft 82 fast on which is a wheel 83 (Figs. 2 and 9) that dips into the body of glue in the box and has its upper peripheral portion extending through a slot in the bottom limb of the flap-supporting channel guide 75. The wheel 83 is preferably positively rotated at a peripheral speed equal to the speed of travel of the blank (so as to avoid any drag on the latter) by sprocket wheels 85 and 86 on the shafts 82 and 30, respectively, and a connecting chain 87. The two screws 78 on each side of the machine are 150

equipped with sprocket wheels 88 and 89, connected by a chain 90 (see Figs. 2 and 2A) so that a wrench applied to either screw simultaneously and equally actuates the other screw. When the beams 58 have been adjusted inwardly or outwardly by the screws 78, the glue box 80 is adjusted laterally to the same extent.

Blank folding mechanism

Referring to Figs. 2A, 10 and 11, 91 and 92 designate a pair of parallel transverse beams extending between and connecting the side frames 1 of the machine. Mounted on the top of beam 91 are a pair of brackets 93 that are slidable on the top flange of the beam and may be secured in adjusted position by clamp screws 94. Similarly mounted on the beam 92 are brackets 95 secured in adjusted position by clamp screws 96. Fixedly mounted on the beam 91 between the brackets 93 are a pair of brackets 97, and similarly mounted on the beam 92 between the brackets 95 are a pair of brackets 98. The brackets 97 and 98 form supports for the rails 71 which support the inner pair of conveyor chains 52, and the inner adjacent faces of the brackets 97 and of the brackets 98 are recessed to form seats for a longitudinal bar 99 that extends beyond the brackets 98 and into the frame of the stapling mechanism that is located just beyond the folding mechanism. Supported on the bar 99 is a blank supporting plate 100. Mounted on the upper ends of the brackets 93 are bridging plates 101 disposed just beyond the rear ends of the supporting plates 67 and serving to support the blanks as they are moved by the conveyor chains 52 onto the supporting plate 100 and through the field of the folding devices. The bridging plates 101 are located on the same level with the central plate 100, and are slightly downwardly inclined at their rear ends, as clearly shown in Figs. 1A and 10 to guide the advancing edge of the blank onto the supporting plate 100.

Journalled in bearings in the brackets 93 and 95 are a pair of parallel rock shafts 102 (Fig. 1A) keyed on each of which is a pair of elbow- or V-shaped folder arms 103, the free ends of the arms of each pair being connected by a longitudinally extending folder bar in the form of an angle bar 104. To effect the folding over of the end sections of the blank, these arms 103 swing from the position shown in Fig. 10 to that shown in Fig. 11. As best shown in Fig. 11, the strips 72 are continued as beveled extensions 72' to hold down the central section of the blank adjacent to the folding lines as the end sections are folded over by the arms 103; the edges of the central section being supported by angle strips 105 attached to and extending between the brackets 93 and 95. It is noted that the pivotal supports 102 for the folders are arranged below and inside of the outer edges of the bars 72' over which the end sections of the blanks are folded. With this arrangement, the bars 104 which contact with the end sections of the blanks move upwardly and inwardly over and in contact with the end sections as the latter are moved past the folders and in the extreme inward position of the folders shown in Fig. 11, the elbow- or V-shaped arms 103 extend both above and below the bars 72' and 105 adjacent the fold lines. It is also noted that with this arrangement the folders need only move through an arc of substantially 90 degrees and the folder bars 104 have a line contact with the end sections. Hence, there is little friction developed in the folding operation and the blanks

can be continuously advanced past the folders.

The end section of the blank which carries the flap *m* is folded slightly in advance of the opposite end section, as shown in Figs. 11 and 12, and comes to rest on a horizontal spacing plate or mandrel 106 that maintains it separated from the underlying central portion of the blank which rests on the plate 100. The spacing plate 106 is suspended from above by an arm 107 from an extension of a frame bar 108 (Fig. 1B) of the stapling mechanism, and integral with and supporting the spacing plate 106 at one edge of the latter is a transversely inclined over-hanging section 106' (Fig. 11), onto which the other end section of the blank is folded and by which it is guided and held temporarily out of contact with the flap *m* during the travel of the blank through the folding mechanism. As the blank, after being folded to the position shown in Fig. 11, advances the folded sections pass beneath a pair of stationary cams in the form of inclined wires 109 by which the folding operation is completed; the cams 109 being supported in the ends of a pin 110 mounted in the arm 107. Referring to Figs. 1B and 12, the bar 99, supporting an anvil bar 100' formed as an extension of the plate 100, extends into the frame of the stapling mechanism, and attached to the under side of, and supported by, the separating strip 106 is a clincher bar 111 overlying and spaced from the anvil bar 100'. The central section of the blank, after having passed the folding mechanism, is lifted out of engagement with the push pins 53 of the propelling chains 52 by a pair of inclined guides 112 that, as shown in Fig. 12, are mounted on a pair of pins 113 in turn adjustably supported by nuts 114 in brackets 115 projecting laterally from the bar 99. The blank is thus deposited at a point beneath the staple-applying plungers of the stapling mechanism. The overlying folded end section of the blank, as it passes off the inclined support 106' of the spacing plate is guided down onto the underlying folded section above the clincher bar 111 by a shoe 116 (Fig. 1B) mounted on the bar 108 and formed with a downwardly inclined cam face 116'.

Staple-applying mechanism

The staple-applying mechanism consists of a standard multiple head stapling machine such as is outlined in elevation in Fig. 1B, to which machine are added an adjustable stop device for the blanks to momentarily arrest the latter at the proper point for the application of the staples, and also an auxiliary conveyor for discharging the stapled blanks, and a part of the power transmission to the several mechanisms previously described. Referring to Fig. 1B, 117 designates as an entirety the skeleton frame work of the stapler, in the upper portion of which is journaled a shaft 118 equipped with cams 119 for operating the reciprocating staple-applying plungers 120. Also fast on shaft 118 is a cam 121 that effects vertical reciprocations of a rod 122 slidable in a guide 122', which rod terminates at its lower end in a foot 123 to which is adjustably secured, as by clamp screws 124, a longitudinally slotted bar 125 formed with a depending stop lug 126 that, in the lowest position of the rod 122, lies opposite the advance edge of each blank and arrests it momentarily, as it is disengaged from the lugs of the conveyor chains 52 and at a proper point to receive the staples. The parts are so timed that the conveyor chains 52 propel each blank into engagement with the stop 126 and, as soon as

the staples are driven, the stop bar 125 rises out of the way, and the blank is discharged by a pair of auxiliary conveyor chains 127 having pins 128 of proper length for engaging the rear edge of each blank immediately after the stapling operation has been completed and the stop lug 126 withdrawn. The conveyor chains 127 are trained over sprockets 129 on the shaft 49 and corresponding sprockets 130 fast on a cross shaft 131 journaled on and across the rear end of the frame of the stapling machine.

Power transmission devices

The means for operating the movable parts of the machine have, to some extent, already been indicated; and such parts of the power transmission as have not been described will now be set forth.

The moving parts of the machine are all operated from and by an electric motor 132 (Fig. 1B) mounted on the frame of the stapling machine. The armature shaft of the motor, through a speed reducer conventionally indicated at 133, drives the cam shaft 118 and, through a sprocket and chain connection 134 on one side of the machine, drives the shaft 131. Shaft 49 is driven from shaft 131 by the sprocket wheels 130 and 129 and chains 127. The inner pair of conveyor chains 52 transmit motion from shaft 49 to shaft 30. On one end of shaft 30 is a gear wheel 135 (Fig. 1) which, through an idler gear 136, drives a gear 137 on the spindle of the lower feed roll, and gear 137 drives a gear 138 fast on the spindle of the upper feed roll. On the other end of shaft 30 is a sprocket wheel 139 (Fig. 8) which, through a sprocket chain 140, drives a sprocket wheel 141 fast on a transverse shaft 142 (Fig. 2A). Fast on shaft 142 is a drum 143 formed with a peripheral cam groove 144. The cam groove 144 is occupied by a roller or cam follower 145 that, as best shown in Fig. 10, is mounted on a stud 145' on the face of a triangular rocker plate 147. This rocker plate is pivotally mounted at its upper end on a bracket 148 mounted on one end of the cross beam 91. Similarly mounted on one of the brackets 97 and on a bracket 149 on the other end of the cross beam 91 are similar triangular rocker plates 147' and 147^a. On the lower corners of the three rocker plates are studs 146, 146' and 146^a connected for simultaneous movement by a bar 150, whereby the cam 144 simultaneously swings the rocker plates 147, 147' and 147^a. These rocker plates are connected at corresponding corners by a bar 151, said bar being mounted on lateral studs 152, 152' and 152^a on the several rocker plates. On the rear side of the bar 151 are horizontal grooves or channels 153 that are engaged by rollers 154 on the free ends of arms 155 fast on the rocker shafts 102. From the foregoing it will be seen that through the cam 144 and its follower 145 an endwise reciprocating motion is imparted to the rod 150. By the latter the rocker plates 147, 147' and 147^a are oscillated up and down, thus rocking the shafts 102 and thus oscillating the folder arms 103 positively in both directions. The engagement of the rollers 154 with longitudinal channels 153 in the bar 151 enables the brackets 93 and 95 to be adjusted inwardly and outwardly without disconnecting the drive from the cam to the rocker arms. The folder arms are so positioned on their rock shafts that, as stated, the glued end of the carton is folded in advance of its opposite ends.

From the foregoing it will be seen that the blank hopper, the advancing rolls, the blank squaring devices and the blank folding mecha-

nism are all capable of adjustment widthwise of the machine so as to handle blanks of considerably varying widths, and that these adjustments are very easily and quickly effected. It is particularly noted that the carton blanks are conveyed through the fields of the gluing device and the folders and are delivered from the stapling mechanism by continuously operated conveyor chains, and that the blanks are continuously advanced except for a brief dwell in the field of operation of the stapler. Also the conveyor chains are so operated and timed that the operating shaft of the stapler is continuously rotated. For these reasons the speed of operation of the machine is very high and the output is much larger than is the case with machines employing intermittently operating parts. While the foregoing specification and drawings set forth an embodiment of the invention which, in practice, has been found to satisfactorily effectuate the stated purposes and objects thereof, the invention is not limited to the structural details shown and described, but includes all such variations, modifications and mechanical equivalents as fall within the spirit and purview of the appended claims.

I claim:

1. In a blank folding machine, the combination of a hopper, a feeder for successively moving blanks from said hopper, a traveling conveyor receiving and advancing the blanks, pivoted folders on opposite sides of said conveyor operative to fold end sections of the blank inwardly over the intermediate portions thereof, and means guiding the meeting edges of the end sections into overlapped relation as they are folded inwardly.

2. In a blank folding machine, the combination of a hopper, a feeder for successively moving blanks from said hopper, a traveling conveyor receiving and advancing the blanks, flap-folders on opposite sides of said conveyor operative to fold end sections of the blanks over the intermediate portions thereof, means guiding the meeting edges of the end sections into overlapped relation as they are folded inwardly, and mechanism beyond said folders and guiding means for stapling the overlapped portions of the end sections.

3. In a blank folding machine, the combination of a traveling conveyor for advancing the blanks one at a time, folders on opposite sides of said conveyor operative to fold the end sections of the blanks inwardly over the intermediate portions thereof, means guiding the meeting edges of the end sections into overlapped relation as they are folded inwardly, a stapling mechanism for uniting said overlapped edges, a shiftable stop member serving to arrest the travel of each blank at a point to be operated on by said stapling mechanism, and a discharge conveyor functioning to discharge the finished blank from the machine when said blank is released by said stop member.

4. In a blank folding machine, the combination with blank-folding devices, of means for supporting and moving a blank into and through the field of action of said folding devices, and means associated with said supporting and moving means for squaring the blank on the latter in advance of the operation of said folding devices.

5. In a blank folding machine, the combination with blank-folding devices, of means for supporting and moving a blank into and through the field of action of said folding devices, means associated with said supporting and moving means for squaring the blank on the latter in advance

of the operation of said folding devices, said blank squaring mechanism being adjustable widthwise of the machine to handle blanks of varying widths.

5 6. In a blank folding machine, the combination of blank-folding devices, a blank support, means for pushing a blank over said support into and through the field of action of said folding devices, and means movable in the direction of travel
10 of the blanks and associated with said blank pushing means for preliminary squaring the blank on said support in advance of the operation of said folding devices; said blank pushing means traveling at a greater speed than said blank
15 squaring means.

7. In a blank folding machine, the combination of a feed hopper, blank-folding devices and means for conveying blanks from said feed hopper to said folding devices, said means comprising
20 laterally spaced endless belts carrying blank-squaring pins, and an endless belt between said first-named belts carrying blank pushing pins, said last-named belt traveling at a greater speed than said first-named belts.

25 8. In a blank folding machine, the combination of a feed hopper, blank-folding devices and means for conveying blanks from said feed hopper to said folding devices, said means comprising a pair of laterally spaced endless belts carrying
30 laterally aligned blank-squaring pins, and a pair of laterally spaced endless belts between and longer than said first-named belts and carrying laterally aligned blank pushing pins, said last-named belts traveling at a greater speed than said
35 first-named belts and arranged to move the blanks through the field of operation of said folding devices.

9. In a blank folding machine, the combination with blank supporting and conveying means,
40 of folding mechanism comprising vertically swinging folder arms on opposite sides respectively of said blank supporting and conveying means adapted to raise and fold inwardly outer sections of the blanks as the latter are moved past said
45 folder arms by the conveying means, and a spacing plate suspended above the central portion of the blank onto which the free ends of the outer sections are folded in overlapped relation.

10. In a blank folding machine, the combination with blank supporting and conveying means,
50 of folding mechanism comprising opposed vertically swinging folder arms on opposite sides respectively of said blank supporting and conveying means adapted to raise and fold inwardly outer sections of the blanks, a spacing plate disposed
55 above the intermediate portion of the blank, and an inclined spacing plate suspension member continuous with one edge of said spacing plate, said suspension member serving as a guide for the free edge of one of the folded outer sections of the blank as the latter passes through
60 said folding mechanism.

11. In a blank folding machine, the combination with blank supporting and conveying means,
65 of swinging folders on opposite sides respectively of said blank supporting and conveying means adapted to raise and fold inwardly outer sections of the blanks as the latter are moved past said folder arms by the conveying means, and stationary strips overlying and holding down the intermediate portion of the blank adjacent to the lines of fold, said folders being pivotally supported below and inside of said strips and comprising
70 elbow-shaped arms and longitudinally

extending bars on said arms for contacting with the end sections of the blanks.

12. In a blank folding machine, the combination with blank supporting and conveying means,
80 of folding mechanism comprising opposed vertically swinging folder arms on opposite sides respectively of said blank supporting and conveying means adapted to raise and fold inwardly outer sections of the blanks, stationary strips
85 overlying and holding down the intermediate portion of the blank adjacent to the lines of fold, a spacing plate disposed above the intermediate portion of the blank onto which the free ends of said outer sections are folded in overlapped relation, and an inclined spacing plate suspension
90 member continuous with one edge of said spacing plate, said suspension member serving as a guide for the free edge of one of the folded outer sections of the blank as the latter passes through said folding mechanism.

13. In a blank folding machine, the combination with blank supporting and conveying means,
95 of folding mechanism comprising opposed vertically swinging folder arms on opposite sides respectively of said blank supporting and conveying means adapted to raise and fold inwardly outer sections of the blanks, stationary strips
100 overlying and holding down the intermediate portion of the blank adjacent to the lines of fold, a spacing plate disposed above the intermediate portion of the blank onto which the free ends of said outer sections are folded in overlapped relation, an inclined spacing plate suspension member continuous with one edge of said spacing
105 plate, said suspension member serving as a guide for the free edge of one of the folded outer sections of the blank, and a pair of stationary cams on opposite sides respectively of said spacing plate serving to complete the folding of said outer sections as the blank passes through said
110 folding mechanism.

14. In a blank folding and stapling machine, the combination of blank supporting and conveying means, means located on opposite sides
120 of said supporting and conveying means for raising and folding inwardly outer sections of the blanks, a spacing plate disposed above the intermediate portion of the blank onto which the free ends of said outer sections are folded in overlapped relation, a stapling mechanism located
125 beyond said blank folding means, and means for guiding the folded blank into the field of operation of said stapling mechanism, said conveying means being arranged to continuously and positively advance the blanks one at a time
130 past said folding means and into the field of said stapling mechanism.

15. In a blank folding and stapling machine, the combination of blank supporting and conveying means, means located on opposite sides
135 of said supporting and conveying means for raising and folding inwardly outer sections of the blanks, a spacing plate disposed above the intermediate portion of the blank onto which the free ends of said outer sections are folded in overlapped relation, a stapling mechanism located
140 beyond said blank folding means and including a vertically reciprocating staple driving plunger, means for guiding the folded blank beneath said plunger, and a clincher bar attached to and extending beyond said spacing plate between the intermediate portion of the blank and the overlapped ends of the outer sections.

16. In a blank folding and stapling machine, the combination of blank supporting and conveying
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veying means, means located on opposite sides of said supporting and conveying means for raising and folding inwardly outer sections of the blanks, a spacing plate disposed above the intermediate portion of the blank onto which the free ends of said outer sections are folded in overlapped relation, a stapling mechanism located beyond said blank folding means and including a vertically reciprocating staple driving plunger, means for guiding the folded blank beneath said plunger, a clincher bar attached to and extending beyond said spacing plate between the intermediate portion of the blank and the overlapped ends of the outer sections, and means for disengaging the blank from said blank conveying means when the blank has been carried beneath said plunger.

17. In a blank folding and stapling machine, the combination of blank supporting and conveying means, means located on opposite sides of said supporting and conveying means for raising and folding inwardly outer sections of the blanks, a spacing plate disposed above the intermediate portion of the blank onto which the free ends of said outer sections are folded in overlapped relation, a stapling mechanism located beyond said blank folding means and including a vertically reciprocating staple driving plunger, means for guiding the folded blank beneath said plunger, a clincher bar attached to and extending beyond said spacing plate between the intermediate portion of the blank and the overlapped ends of the outer sections, means for disengaging the blank from said blank conveying means when the blank has been carried beneath said plunger, and a retractable stop located beyond said plunger for arresting the movement of the blank in correct position to be stapled.

18. In a blank folding and stapling machine, the combination of blank supporting and conveying means, means located on opposite sides of said supporting and conveying means for raising and folding inwardly outer sections of the blanks, a spacing plate disposed above the intermediate portion of the blank onto which the free ends of said outer sections are folded in overlapped relation, a stapling mechanism located beyond said blank folding means and including a vertically reciprocating staple driving plunger, means for guiding the folded blank beneath said plunger, a clincher bar attached to and extending beyond said spacing plate between the intermediate portion of the blank and the overlapped ends of the outer sections, means for disengaging the blank from said blank conveying means when the blank has been carried beneath said plunger, a retractable stop located beyond said plunger, a blank discharging means adapted to push the stapled blank out of the stapling machine, and mechanism for retracting said stop in suitably timed relation to the operation of said blank discharging means.

19. Means for folding carton blanks and connecting the ends thereof, comprising mechanism for feeding the blanks, one at a time, gluing mechanism, folding mechanism, and stapling mechanism, and conveyor means for continuously advancing blanks, one at a time, past said gluing and folding mechanisms and into the field of operation of said stapling mechanism.

20. Means for folding carton blanks and connecting the ends thereof, comprising an automatic mechanism for feeding the blanks, one at a time, gluing mechanism located beyond said feed mechanism, folding mechanism located be-

yond said gluing mechanism, and stapling mechanism located beyond said folding mechanism, and continuously operating conveyor means located in advance of said stapling mechanism for continuously advancing the blanks past said gluing and folding mechanisms and into the field of operation of said stapling mechanism.

21. Means for folding carton blanks and connecting the ends thereof, comprising feed mechanism, gluing mechanism, folding mechanism and stapling mechanism arranged in succession one beyond the other and in the order named, continuously operating conveyor chains having blank-engaging lugs by which the blanks are continuously and positively moved past said gluing and folding mechanisms and into the field of operation of said stapling mechanism, and means for operating the conveyor chains and the folding and stapling mechanisms in proper timed relation.

22. Means for folding carton blanks and connecting the ends thereof, comprising folding mechanism and continuously operating stapling mechanism, continuously operating conveyors having blank-engaging lugs, one conveyor for continuously advancing the blanks past said folding mechanism and into the field of said stapling mechanism, and the other for removing the blanks from the stapling field, and automatic mechanism for feeding the blanks, one at a time, to said first mentioned conveyor.

23. Means for folding carton blanks and connecting the ends thereof, comprising feed mechanism, gluing mechanism, folding mechanism and continuously operating stapling mechanism, continuously operating conveyor chains having blank-engaging lugs by which the blanks are continuously and positively moved through the operating fields of said gluing and folding mechanisms and into the field of operation of said stapling mechanism, means for effecting a short dwell in the travel of each blank as it passes through the operating field of said stapling mechanism, and a second continuously operating conveyor for removing the blanks from stapling position.

24. In a machine for folding carton blanks and connecting the ends thereof, the combination of devices for folding the outer sections of the blanks onto the intermediate sections thereof, a continuously operating stapling mechanism for connecting the overlapped ends of the blanks, a continuously operating conveyor for advancing the blanks into and through the field of operation of said folding devices and into the field of operation of said stapling mechanism, a second continuously operating conveyor for advancing the blanks from said stapling mechanism and means for automatically feeding the blanks, one at a time, to said first mentioned conveyor.

25. In a machine for folding and connecting the ends of carton blanks, the combination of folding mechanism for folding the outer sections of the blanks on to the intermediate portions thereof with the edges of the end sections in overlapped relation, a continuously operating stapling mechanism, and a conveyor having lugs for engaging and continuously advancing the blanks past the folding mechanism and into the field of operation of the stapling mechanism.

26. In a machine for folding and connecting the ends of carton blanks, the combination of folding mechanism for folding the outer sections of the blanks on to the intermediate portions thereof with the edges of the end sections

in overlapped relation, a continuously operating stapling mechanism, a continuously operating conveyor having lugs for engaging the blanks and advancing the same through the field of operation of the folding mechanism and into the field of said stapling mechanism, automatic mechanism for feeding the blanks, one at a time, to said conveyor, and a second conveyor for removing the blanks from the stapling field.	on opposite sides of the conveyor for folding the end sections of each blank over the intermediate portions thereof, means for guiding the edges of the end sections into overlapped relation as they are folded inwardly and for maintaining the same spaced above the intermediate portion of the blank, and mechanism for stapling the overlapped portions of the end sections, said conveyor being arranged to advance the blanks, one at a time, through the field of operation of the folders and into the field of operation of the stapling mechanism.
27. In a machine for folding and connecting the ends of carton blanks, the combination of a hopper, a feeder for successively moving the blanks one at a time from said hopper, a conveyor for receiving and advancing the blanks, folders	DON W. COY.
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