June 26, 1945. A. W. WERNER 2,379,127

BOX CREASING AND FOLDING MACHINE

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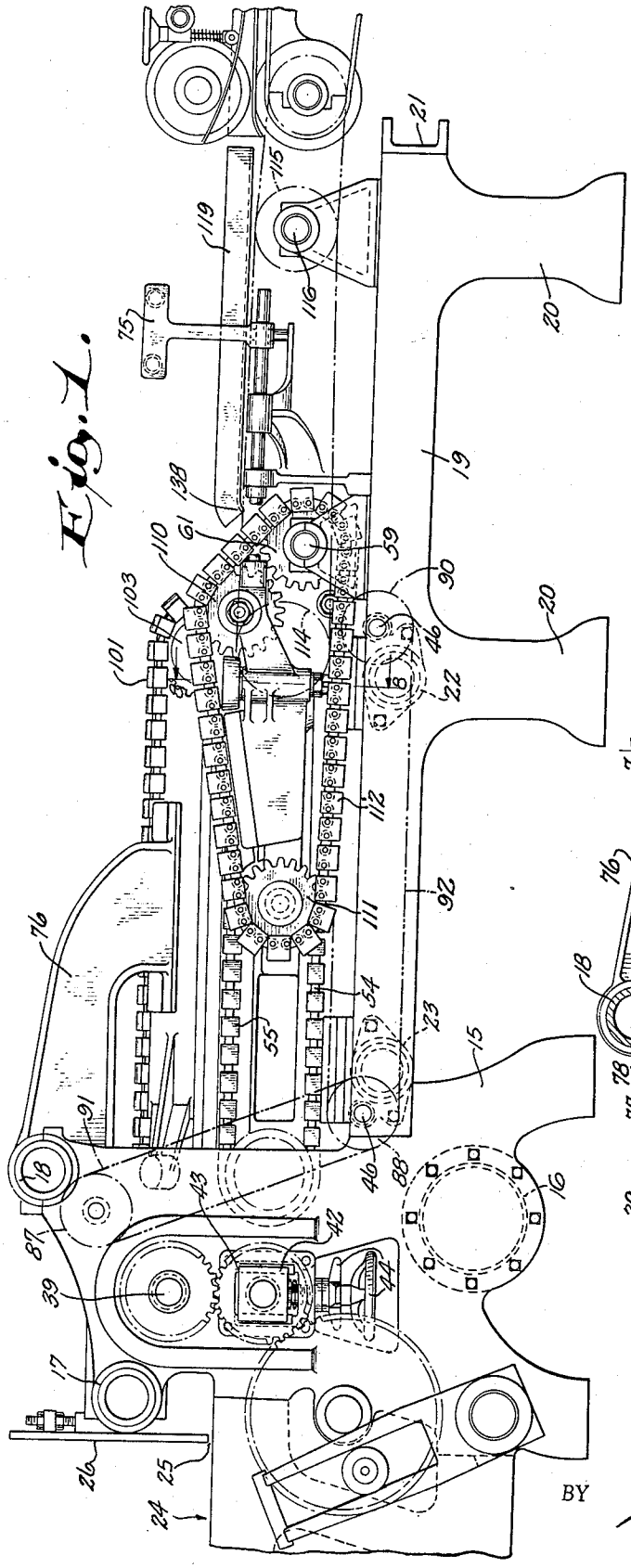


Fig. 1.

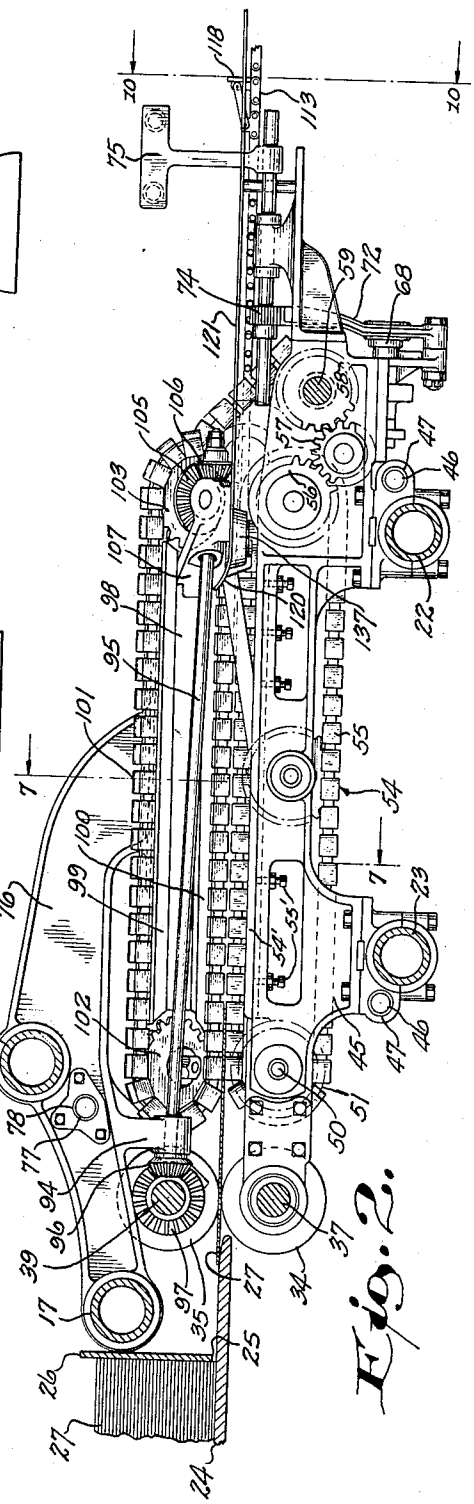


Fig. 2.

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BOX CREASING AND FOLDING MACHINE

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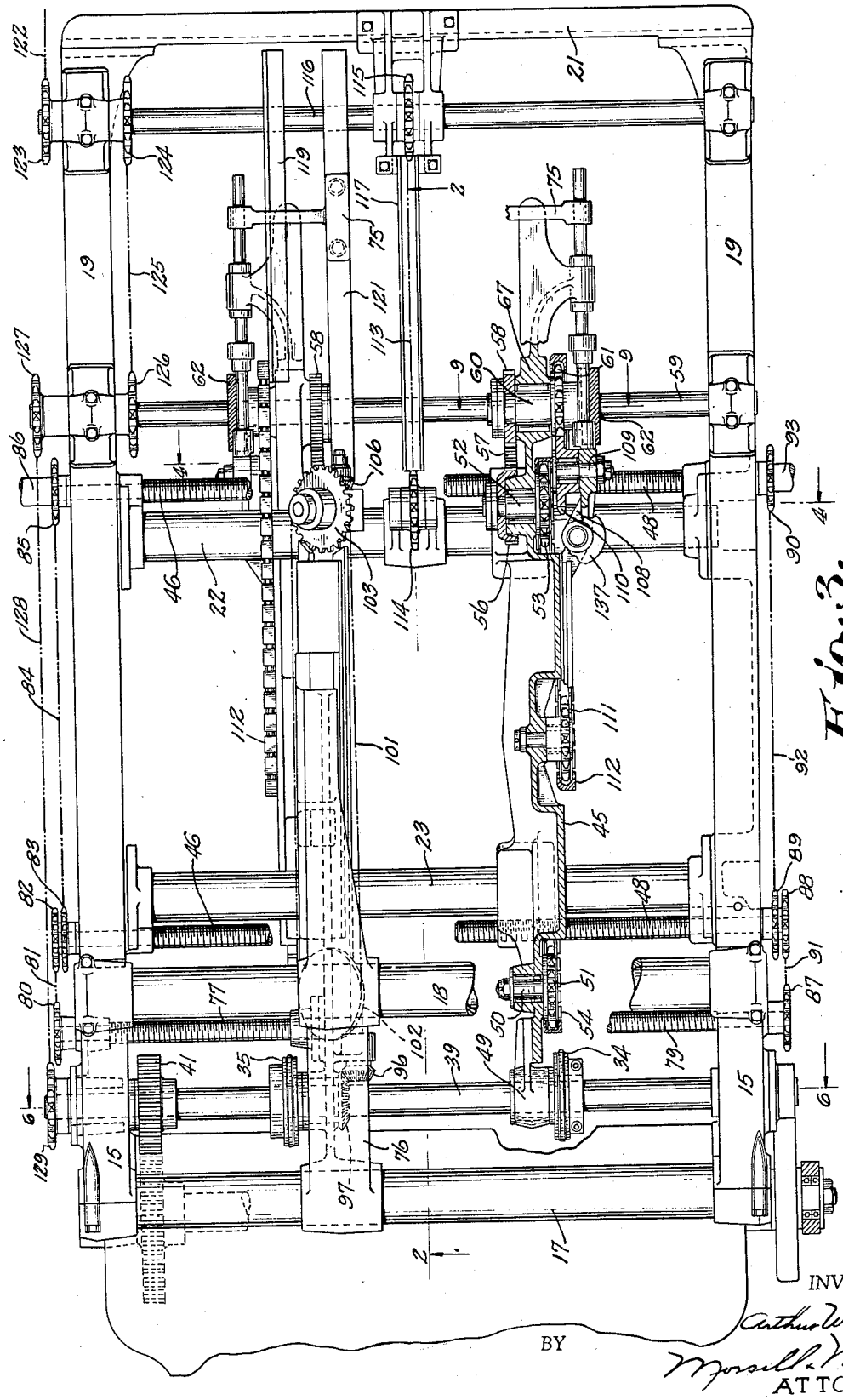


Fig. 3.

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BOX CREASING AND FOLDING MACHINE

Filed March 6, 1942 4 Sheets-Sheet 3

Fig. 4.

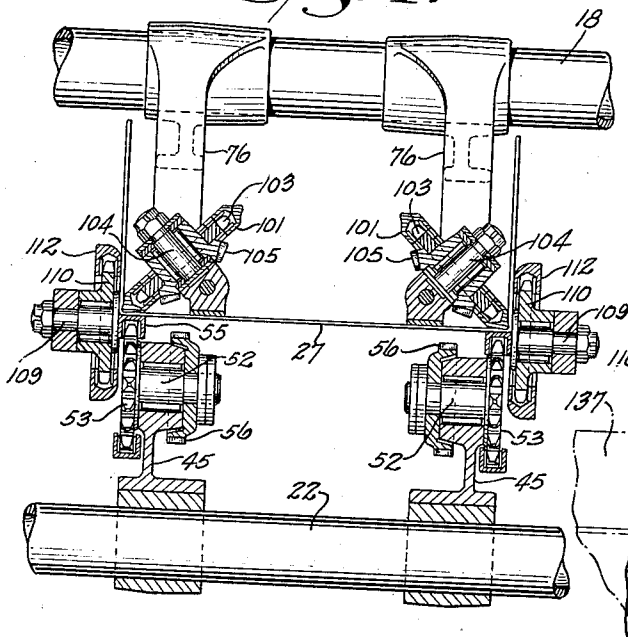
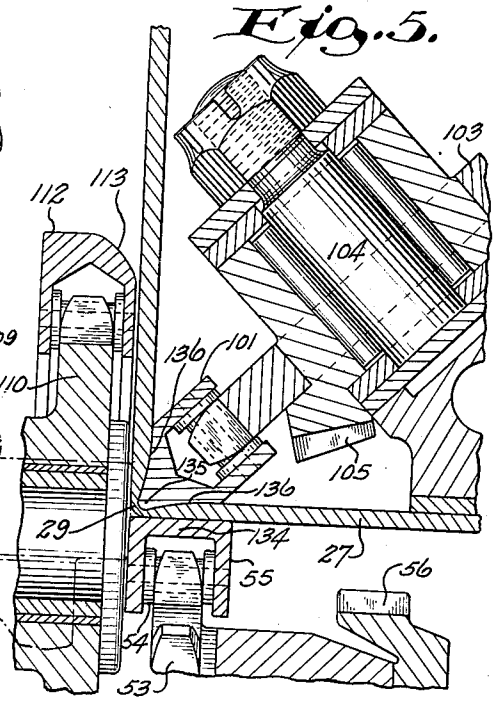


Fig. 5.



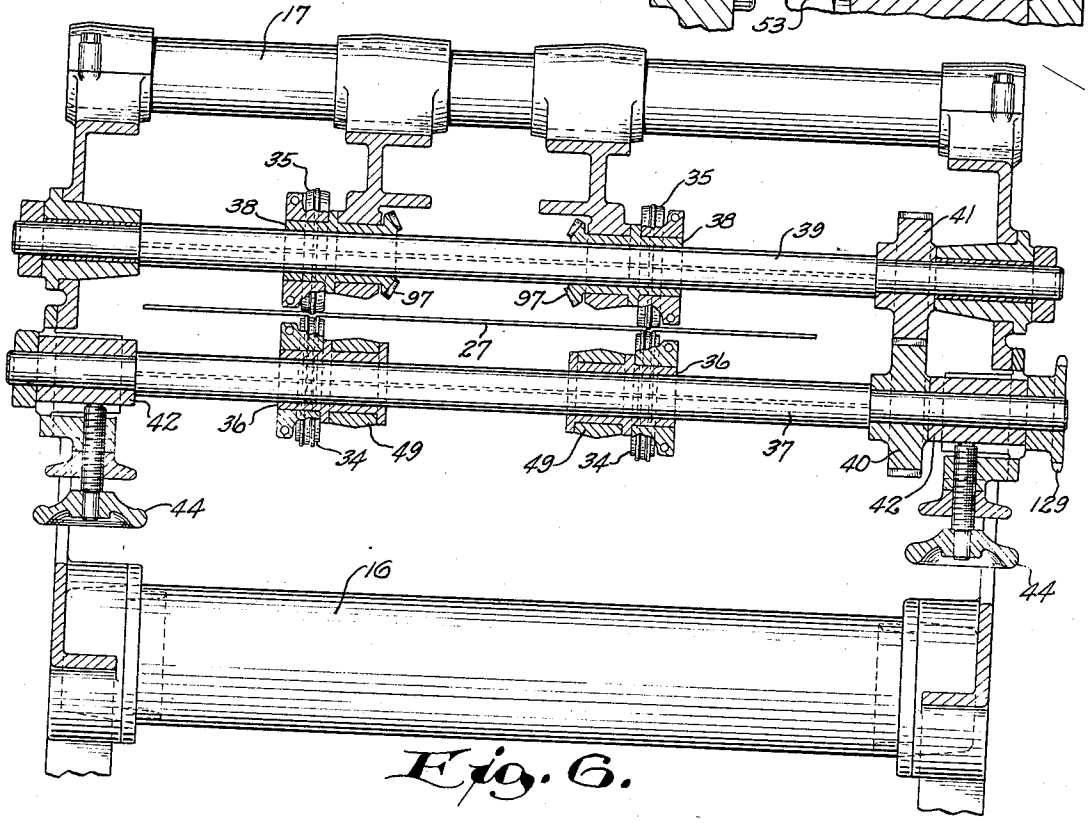


Fig. 6.

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June 26, 1945. A. W. WERNER 2,379,127

BOX CREASING AND FOLDING MACHINE

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Fig. 7.

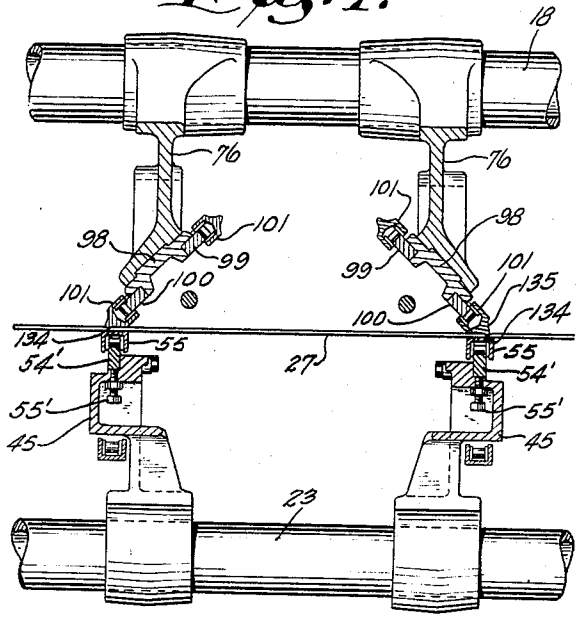
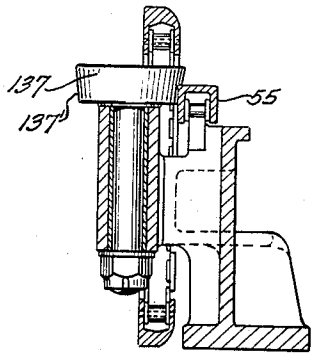


Fig. 8.



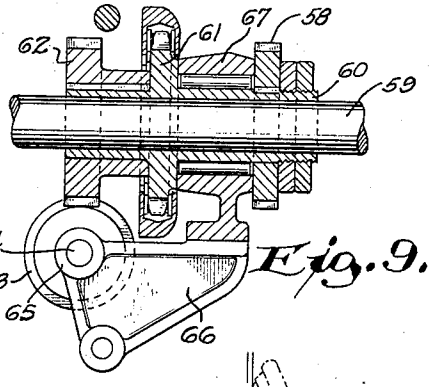


Fig. 9.

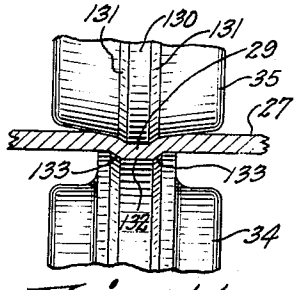


Fig. 11.

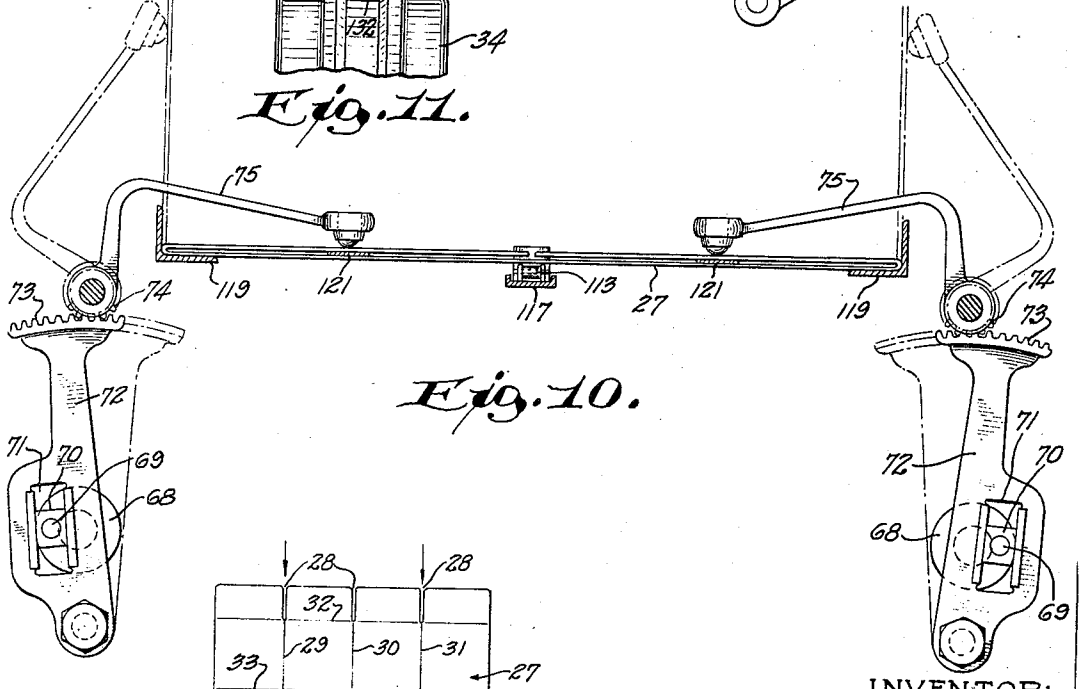


Fig. 10.

Fig. 12.

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Patented June 26, 1945

2,379,127

UNITED STATES PATENT OFFICE

2,379,127

BOX CREASING AND FOLDING MACHINE

Arthur W. Werner, Milwaukee, Wis.

Application March 6, 1942, Serial No. 433,549

15 Claims. (Cl. 93—49)

This invention relates to improvements in box creasing and folding machines, and more particularly to a machine adapted to operate upon blank sheets of fiberboard or corrugated board so as to fold opposite end portions of the sheets toward one another as a step in the manufacture of containers.

Heretofore, in attempts to provide mechanical folding devices, difficulties have been encountered because a straight fold could not be insured. As a result it was necessary to provide a squaring device for squaring the folded portions before stitching or otherwise securing the ends of the blank together. Even with such squaring devices a perfectly true, squared container did not always result. This was particularly noticeable when operating upon corrugated board, because the corrugations therein are not always exactly parallel to the desired line of fold, and in folding such corrugated board there is a tendency for the board to fold on a line coinciding with a corrugation rather than on the desired score line.

It is a general object of the present invention to provide in a device of the class described means whereby a positive and straight fold by a mechanical folder is assured, and wherein the necessity of further squaring the folded blank is eliminated.

A further object of the invention is to provide a device wherein a previously scored blank of corrugated board may be additionally creased on said score lines in such a manner as to provide for a perfectly straight and square fold regardless of the position of the corrugations with respect to the position of the crease on which the fold is to be made.

A further object of the invention is to perform said additional creasing by the use of creasing rolls having a novel form especially adapted for the described purpose.

A more specific object of the invention is to provide a creasing and folding machine which includes a set of specially constructed endless chains for each crease, one chain being an upper or anvil chain, another chain being a lower or carrier chain, and the third being a forming chain which is inclined upwardly and positioned at one side of the carrier chain. The forming chain travels with the blank and serves to preliminarily bend an end portion of the blank at right angles while the blank is being conveyed and while the crease line on which the fold is being made is positively engaged by the specially shaped and angularly disposed links of the anvil chain in a way to insure a perfectly straight and square fold.

A further object of the invention is to provide in a construction as above described a pressure wheel adapted to bear against the upwardly bent end portion of the blank immediately adjacent the line of fold so as to aid in providing a definite and permanent fold in the blank.

A further object of the invention is to provide a machine as above described including reciprocating folding arms for performing the final folding operation, such arms operating continuously through such an arc that no stop motion is necessary to insure positioning of the next incoming box blank, there being means for conveying the completely folded blank out of the folder.

A still further object of the invention is to provide means providing for quick adjustment of the various endless chains and mechanism associated therewith in order to adapt the position thereof to the particular blank to be folded.

With the above and other objects in view, the invention consists of the improved box creasing and folding machine, and all its parts and combinations as set forth in the claims, and all equivalents thereof.

In the accompanying drawings illustrating one complete embodiment of the preferred form of the invention,

Fig. 1 is a side elevational view of the improved device, showing a fragment of a feed hopper at one end and a fragment of an additional box making machine at the other end, the adjustment sprockets and some of the endless chains being indicated by dot-and-dash lines so as not to hide other portions of the machine;

Fig. 2 is a fragmentary longitudinal vertical sectional view taken on the line 2—2 of Fig. 3;

Fig. 3 is a top view of the improved machine with the box forming unit on one side shown partially in horizontal longitudinal section, and with parts broken away;

Fig. 4 is a fragmentary sectional view on an enlarged scale taken on the line 4—4 of Fig. 3;

Fig. 5 is a similar view of a smaller fragment on a still larger scale to show the cooperation of the various endless chains with the crease line of the box blank;

Fig. 6 is a sectional view on an enlarged scale taken on the line 6—6 of Fig. 3;

Fig. 7 is a fragmentary sectional view on an enlarged scale taken on the line 7—7 of Fig. 2;

Fig. 8 is a fragmentary sectional view on an enlarged scale taken on line 8—8 of Fig. 1;

Fig. 9 is a fragmentary sectional view taken on line 9—9 of Fig. 3;

Fig. 10 is a sectional view taken on line 10—10 of Fig. 2;

Fig. 11 is an enlarged fragmentary edge view of one set of creasing rollers; and

Fig. 12 is a plan view of a typical box blank.

Referring to the drawings, upright side frame members 15 adjacent the entrance end of the machine are secured in suitably spaced relation by a lower tubular cross member 16 and by upper tubular cross members 17 and 18. Elongated side frame members 19 have one end suitably secured to the upright frames 15 and are additionally supported by legs 20. The rear ends of the side frames 19 are secured in suitably spaced relation by a channel-type cross member 21, and there are additional tubular cross members 22 and 23 which connect the side frame members 19.

A hopper 24 for box blanks, of standard construction, is suitably connected to the entrance end of the improved machine, and this hopper has mechanism associated therewith for automatically feeding blanks, one at a time, from the bottom of a stack supported on the hopper table through a space 25 beneath the lower edge of a hopper front plate 26.

These blanks 27 (see Fig. 12), are formed of either solid fiberboard or corrugated board, and the machine is particularly adapted to operate on blanks which have already been slotted, as at 28, and scored, as at 29, 30, 31, 32 and 33. This type of blank is adapted to form either a square or rectangular shipping container having four side walls with bottom and top forming flaps connected to said walls by the lines of scoring 32 and 33. The blanks are adapted to be fed into the machine in the direction indicated by the arrows in Fig. 12, with the idea of folding the two end-most sections of the blank toward one another on the score line 29 and 31. After folding, the free edges of the blank are either taped together, or in the case of a blank having a stitching flap, are stitched together. The taping or stitching operation, however, forms no part of the present invention as the present invention is concerned with mechanical folding on the lines 29 and 31 in such a way as to insure a perfectly squared final box.

In view of the fact that the preliminary score lines 29 and 31, when on corrugated board, do not insure that later mechanical folding will follow said score lines rather than closely adjacent corrugations, which corrugations may be slightly out of line with the desired line of fold, the present invention provides means for additionally creasing on the score lines 29 and 31 of the blank.

This means consists of lower creasing rollers 34, and upper creasing rollers 35 (see Fig. 6). The lower creasing rollers 34 are rigidly mounted on hub portions 36, which hubs are splined to a lower creasing roller shaft 37 so that the creasing rollers may be driven by rotation of the shaft 37 but are nevertheless laterally adjustable on said shaft. The upper creasing rollers 35 are similarly mounted on hubs 38 which are splined to an upper creasing roller shaft 39. The lower shaft 37 is driven in a manner to be hereinafter explained and has a gear 40 thereon which engages a gear 41 on the upper shaft 39 to drive the latter.

Referring to Fig. 1, the ends of the lower shaft 37 are journalled in bearing blocks 42 which are vertically adjustable in guideways 43 in response to manipulation of adjustment members 44. Thus the lower shaft 37 may be adjusted up and down to accommodate various thicknesses of stock being creased.

Referring to Fig. 2, a pair of bottom longitudinally extending brackets 45 are slidably supported on the tubular cross members 22 and 23. The bracket 45 on one side may be adjusted in a transverse direction by means of threaded adjustment screws 46 which cooperate with threaded openings 47, and on the other side the corresponding bracket 45 is similarly adjustable by separate adjustment screws 48 (see Fig. 3). The forward end of each bracket 45 has a bearing extension 49 through which the hub 38 of the adjacent creasing roller 34 rotatably extends. Thus adjustment of the brackets 45 will cause corresponding movement of the creasing rollers 34.

Referring again to Fig. 3, each bracket 45 has a rotatably mounted stud 50 near one end carrying a sprocket wheel 51, and a rotatably mounted stud 52 near the other end carrying a sprocket 53. The sprockets 51 and 53 on each side of the machine are connected by endless carrier chains 54 having link elements 55 which are channel-shaped in cross section, as shown clearly in Fig. 5. These link elements have flat top surfaces and form a bottom carrying support for the blank 27. The link elements ride on elongated guides 54' which are adjustable to vary the pressure on the bottom of the blank through screws 55'.

The end of each stud 52, which is opposite to the sprocket 53, carries a rigidly mounted gear 56 (see Figs. 2 and 3), which is driven through an idler 57 by another gear 58, which latter gear is driven by a shaft 59.

Referring to Fig. 9, the gear 58 is mounted fast on a hub portion 60, which hub is splined on the shaft 59 so that the hub is driven by the shaft when the latter is rotated but is nevertheless adjustable along said shaft when the bracket 45 is adjusted in a transverse direction. The hub 60 also carries a sprocket wheel 61 and a spiral gear 62.

The spiral gear 62 drives a gear 63 mounted rigidly on a shaft 64 which extends at right angles to the shaft 59 and which is rotatable in a bearing 65 formed on a bracket 66. The bracket 66 has another upwardly extending bearing portion 67 within which the hub 60 is rotatable, as shown in Fig. 9. Referring to Fig. 10, the shaft 64 carries on its projecting end a disk 68 having an eccentric pin 69 thereon. This pin cooperates with a block 70 slidable in the slot 71 of the arm 72 of a gear segment 73. Through engagement of the gear segment 73 on both sides of the machine with the gears 74 connected to the folding arms 75, the folding arms are adapted to be oscillated from the dotted line positions of Fig. 10 to the full line positions therein.

The upper chain assemblies are supported by means of spaced arms 76 which are adjustably slidable on the tubular cross members 17 and 18. The adjustable sliding movement of the arm on one side is accomplished by a screw member 77 which cooperates with a threaded opening 78 in the arm, and the arm 76 on the other side is adjustable independently by rotation of a similar screw 79. The screw 77 has an unthreaded end portion extending rotatably through the frame member 15 and has a sprocket 80 on its outer end. The sprocket 80 is connected by an endless chain 81 with a sprocket wheel 82 mounted on an end of the lower screw 46. Another sprocket wheel 83 connected with the screw 46 is connected by an endless chain 84 with a sprocket wheel 85 attached to the other lower adjustment screw 46. One of the screws, such as the last screw 46, may be provided with an operating end 86 which may

be operated either by a hand crank or by power driven mechanism to cause adjustable rotation of the screws 46 and 77, one one side of the machine simultaneously. Thus both the upper and lower adjustable assemblies on one side of the machine may be moved simultaneously toward or away from the center of the machine to adapt the position of the creasing rollers and the upper and lower chains to the particular box blank. On the other side of the machine the screw 79 and the two screws 48 are similarly equipped with sprocket wheels 87, 88, 89, and 90 connected by endless chains 91 and 92. On this side of the machine also there may be a manually or power operated end 93 on one of the screws 48 to provide for rotation of the two screws 48 and the screw 79 simultaneously. Thus the upper and lower adjustable assemblies on this side of the machine may also be moved toward or away from the center line of the machine.

The upper arm 76 on each side has a depending bracket 94 carrying a bearing at its lower end though which a shaft 95 is journalled. The shaft 95 has a bevel gear 96 on its forward end which is driven by a cooperating bevel gear 97 formed on the hub 38 for the creasing roller 35.

Each arm 76 also supports a bracket assembly 98 including upper and lower guideways 99 and 100 for the endless anvil chain 101 (see Fig. 7). The anvil chain 101 travels around tilted sprocket wheels 102 and 103 (see Fig. 2), which are rotatably supported at opposite ends of the bracket 98. Rigidly mounted on the stud 104, of each sprocket wheel 103, is a bevel gear 105 which is driven by a bevel gear 106 mounted on the inner end of the shaft 95. Said end of the shaft is supported in a bearing bracket 107 carried by the upper chain supporting bracket assembly 98.

The lower slidable bracket 45 on each side of the machine supports a smaller bracket 108 (see Fig. 3), which latter supports a stud 109. The sprocket wheel 110 is rotatable on said stud. Another sprocket wheel 111 is also rotatably supported on an intermediate portion of each lower bracket 45. An endless forming chain 112, or folding member (see Fig. 1), extends around the sprocket wheels 110, 111, and 61 and is driven by the sprocket 61 which in turn is driven by the shaft 59.

After the blank leaves the carrier and anvil chains, it is adapted to be conveyed through the final folding portion of the machine and onto an attached box-making machine by an endless chain 113 rotatable around sprocket wheels 114 and 115 and driven by the sprocket 115 which is rigidly mounted on a driven shaft 116. The upper reach of the endless chain 113 is adapted to pass on top of a chain guide 117, and said chain may be provided with spaced upstanding flights 118 which are engageable with the rear edge of the blank to push the same along. As the blank is being conveyed by the chain 113, the edges of the blank are supported and guided in angles 119 (see Fig. 10), and the blank as it enters the angles passes beneath the upturned ends 120 of flat supporting strips 121. When the upstanding ends of the blank are moved by the folding arms 75 to the full line position of Fig. 10, the foldable portions fold on top of the strips 121, and said strips form a support beneath the folding arms to prevent downward bulging of the blank.

The drive for all of the parts may be traced as follows: An endless chain 122 from a suitable source of power drives a sprocket wheel 123 on the main drive shaft 116. This shaft which carries the sprocket 115 drives the final conveyor chain 113, as heretofore described. The main drive shaft 116 also carries a sprocket wheel 124 which is connected by an endless chain 125 with a sprocket wheel 126 on the shaft 59. The gears 58 on the shaft 59 through the idlers 57 and gears 56 drive the sprocket wheels 53 for the lower carrier chains 55. In addition the sprocket wheels 61, driven by the shaft 59, drive the side forming chains 112. Also the gears 62 (see Figs. 9 and 10) on the shaft 59 drive the oscillating arms 72 which operate the folders 75. One end of the shaft 59 also has a sprocket wheel 127 mounted rigidly thereon which is connected by an endless chain 128 with a sprocket wheel 129 rigidly mounted on the lower creasing roller shaft 37. Thus the creasing rollers are driven, and also through the bevel gears 97 and 96 adjacent the creasing rollers the drive shafts 95 for the anvil chains 101 are driven.

Operation

In operation, the screw operating members 93 and 86 on each side are operated to move the chain assemblies toward or away from the center line of the machine so that the creasing rollers line up perfectly with the score lines 29 and 31 of the blank 27 of Fig. 12, or with the corresponding score lines on any other size box which may be fed. The blanks are then fed automatically from the hopper 24 into the bite of the creasing rollers, as indicated in Fig. 6, with the creasing rollers coinciding exactly with the score lines 29 and 31 of the blank. The upper creasing rollers are formed with beads 130 (see Fig. 11), which have flat external peripheries and tapered sides 131. The lower creasing rollers are formed with a groove 132 having tapering sides 133, which groove cooperates with the shape of the rib 130. Thus when the blank passes through the creasing rollers a relatively wide crease line is made over the previous score lines 29 and 31 and in perfect alinement therewith. The structure of the creasing rollers is such as to break down the fluted layer of corrugated board so that there is no tendency for the blank to be later folded along the line of a corrugation rather than along the line of a score line. As the forward edge of the blank passes through the creasing rollers, it is supported on and conveyed by the flat upper sides 134 of the channel-shaped special links of the carrier chain 55, as shown in Fig. 7. At the same time the lower reach of the anvil chain 101 engages the top side of the blank, as shown in Fig. 7. The special links of the anvil chain have V-shaped portions which converge to a rounded point 135, and on each side of the rounded point the special links are concave as at 136 (see Fig. 5). The rounded points 135, which extend at an angle, engage in the crease lines 29 and 31 of the blank to maintain the blank in a perfectly squared condition. Inasmuch as both the carrier chains and the anvil chains are traveling with the blank, the blank is maintained in properly alined position all of the time it is traveling between the carrier and anvil chains because of the peculiar shape and angular disposition of the links of the anvil chains. Also, because of the angular position, the anvil chains tend to withdraw from the blank without injuring the latter. As the overhanging end portions of the blank approach the forward end of the forming chains 112, which chains extend at an incline upwardly, as shown in Fig. 1, the said chains cause forcible folding of the overhanging end portions of the blank from

the position of Fig. 7 to the position shown in Fig. 4. This folding of the end portions of the blank to the 90° position of Fig. 4 is bound to be directly on the desired score lines 29 and 31 because of the structure and cooperation of the links of the carrier chain, anvil chain, and forming chain, as shown in Figs. 4 and 5. The outer portions of the links of the forming chain 112 are rounded as at 113 to avoid damage to the blank during original engagement of the forming chains therewith. By referring to Fig. 5 it is apparent that the links of the anvil chain with the rounded point 135 and with the concavities 136 fit the score line and the portions of the board on each side thereof with perfection and form a die for the folding operation. On each side of the device there is also a rotatably mounted pressure wheel 137 (see Fig. 8), which has its periphery angled downwardly as at 137'. These pressure wheels rotate only by virtue of the pressure between the wheel and the moving box blank and serve to definitely and permanently set the fold so that the portions of the box blank which have been folded upwardly to the position of Fig. 4 will not tend to spring back after the blank passes out of the nip of the forming and anvil chains.

As the blank leaves the latter chains its forward edge is guided by the down-turned ends 138 (see Fig. 1) of the angle guides 119 so that the box blank with upwardly projecting ends enters between the angles 119, as shown by dotted lines in Fig. 10. Next the folding arms 75 operate to move the partially folded end portions of the blank to the full line position of Fig. 10. These folding arms of course operate in timed relationship with the movement of the blanks so that each downward stroke of the folding arms engages a new blank after the previously folded blank has been carried out of the machine by the flights 118 of the final conveyer chain 113.

It is of course understood that the laterally adjustable assemblies on the two sides of the machine correspond part for part with each other, and any description with respect to the assembly on one side of the machine applies to the corresponding assembly on the opposite side as well.

It is apparent from the above that no squaring of the folded portions of the blanks is required, and it is also apparent that the novel structure of the carrier, anvil, and forming chains is such as to insure a positive fold which is straight and true. It is further apparent that in the case of a corrugated box the special creasing rollers cooperate to prevent the fold lines from following the corrugations of the board. It is also to be noted that the forming chains angle downwardly at the point where the blank leaves the forming chains, so that there is a minimum of chafing of the blanks. The use of the pressure wheels, which are formed of rubber or other resilient material, tends to set the 90° fold so that the folded portions will not tend to spring back before being completely folded by the action of the folding arms 75.

Although only one form of the invention has been shown and described, it is obvious that various changes and modifications may be made without departing from the spirit of the invention, and all of such changes are contemplated as may come within the scope of the claims.

What I claim is:

1. In a box making machine, means for conveying box blanks through the machine, an endless folding chain having a portion movable upwardly at an incline from a position below the plane of the blank being conveyed to a position thereabove, said endless folding chain having links shaped and positioned to cause folding of a portion of the blank, each link having a first relatively broad portion initially engageable from below with the portion of the blank to be folded and having a second portion engageable from the side with the folded portion of the blank as the folding progresses, and means for holding other portions of the blank against upward movement while said folding is being performed.

2. In a box making machine, means for conveying box blanks through the machine, an endless folding chain having a portion movable upwardly at an incline from a position below the plane of the blank being conveyed to a position thereabove, said endless folding chain having links shaped and positioned to cause folding of a portion of the blank, each link having a first relatively broad portion initially engageable from below with the portion of the blank to be folded and having a second portion engageable from the side with the folded portion of the blank as the folding progresses, and a movable endless chain having links shaped to hold other portions of the blank against upward movement while said folding is being performed.

3. In a box making machine, an endless carrier chain having links provided with relatively flat top portions on which box blanks are supported for movement through the machine, an endless folding chain having a portion movable upwardly at an incline from a position below the carrier to a position thereabove, said folding chain having links shaped and positioned to cause folding of a portion of the blank which overhangs the carrier chain, each link having a first relatively broad portion initially engageable from below with the portion of the blank to be folded and having a second portion engageable from the side with the folded portion of the blank as the folding progresses, an endless chain engageable with a portion of the top of the blank to hold the latter down on the carrier while the over-hanging portion is being folded, and means for driving said endless chains.

4. In a box making machine, an endless carrier chain having links on which box blanks are supported for movement through the machine, an endless folding chain having a portion movable upwardly at an incline from a position below the carrier to a position thereabove, said folding chain having links shaped and positioned to cause folding of a portion of the blank which overhangs the carrier chain, each link having a first relatively broad portion initially engageable from below with the portion of the blank to be folded and having a second portion engageable from the side with the folded portion of the blank as the folding progresses, an endless chain engageable with a portion of the top of the blank to hold the latter down on the carrier while the overhanging portion is being folded, said last mentioned endless chain having links formed with a cross sectional shape to conform to the desired fold angle and thereby form a shaping die for the folding operation, and means for driving said endless chains.

5. In a box making machine, an endless carrier chain having links on which box blanks are supported for movement through the machine, an endless folding chain having a portion movable upwardly at an incline from a position below the carrier to a position thereabove, said folding chain having links shaped and positioned to

cause folding of a portion of the blank which overhangs the carrier chain, each link having a first relatively broad portion initially engageable from below with the portion of the blank to be folded and having a second portion engageable from the side with the folded portion of the blank as the folding progresses, an endless chain engageable with a portion of the top of the blank to hold the latter down on the carrier while the overhanging portion is being folded, said last mentioned endless chain having links which are V-shaped in cross section to form a shaping die for the folding operation, and means for driving said endless chains.

6. In a box making machine, a carrier member on which box blanks having score lines extending in the direction of movement of the blanks are supported for movement through the machine, an endless folding member having a portion movable upwardly at an incline from a position below the carrier to a position thereabove, said folding member being positioned to cause folding on a score line of a portion of the blank which overhangs the carrier, an endless member engageable in a score line to hold the blank down on the endless carrier and prevent lateral shifting of the blank while the overhanging portion is being folded, said member having a portion which is V-shaped in cross section with the apex of the V engaging in the score line of the blank sprocket wheels around which said endless member travels, at least one of said sprocket wheels being rotatable in a plane which forms an acute angle with the plane of the folded portion of the blank, and means for driving said carrier and endless members.

7. In a box making machine, a carrier member on which box blanks are supported for movement through the machine, an endless folding member having a portion movable upwardly at an incline from a position below the carrier to a position thereabove with the line of movement of the endless member continuing at an incline after it passes the plane of the carrier, said folding member being positioned to cause folding of a portion of the blank which overhangs the carrier member, an endless member engageable with a portion of the top of the blank to hold the latter down on the carrier while the overhanging portion is being folded, means for driving said carrier and endless member, and a resilient pressure roller positioned to be engageable peripherally with the folded portion of the blank after it has been folded at approximately right angles and while the blank is moving to set the fold, said resilient pressure roller being rotatable on a fixed axis.

8. In a box making machine, a pair of transverse rotatable shafts one above the other, two spaced sets of creasing rollers mounted on said shafts for lateral adjustable movement, means between said shafts and rollers for driving the latter, an endless conveyor forwardly of each set of creasing rollers for conveying box blanks which have been creased by said rollers, a movable endless anvil member above each endless conveyor engageable with the upper surface of the blank in the crease line formed by said creasing rollers, an endless folding member on each side of the machine having a portion movable upwardly at an incline from a position below the plane of the blank being conveyed to a position thereabove, said folding members being positioned to cause folding of portions of the blank on said crease lines, and means for laterally adjusting the set of creasing rollers, the endless conveyor, the endless anvil member, and the endless folding member on either side of the machine simultaneously.

9. In a box making machine, a pair of transverse rotatable shafts one above the other, two spaced sets of creasing rollers mounted on said shafts for lateral adjustable movement, means between said shafts and rollers for driving the latter, an endless conveyor forwardly of each set of creasing rollers for conveying box blanks which have been creased by said rollers, a movable endless anvil member above each endless conveyor engageable with the upper surface of the blank in the crease line formed by said creasing rollers, an endless folding member on each side of the machine having a portion movable upwardly at an incline from a position below the plane of the blank being conveyed to a position thereabove, said folding members being positioned to cause preliminary folding of portions of the blank on said crease lines, oscillating folders for subsequently moving said preliminarily folded portions of the blank to fully folded position while the blank is being conveyed, and means for laterally adjusting the set of creasing rollers, the endless conveyor, the endless anvil member, the endless folding member, and the oscillating folder on either side of the machine simultaneously.

10. In a box making machine, means for conveying box blanks through the machine, an endless folding chain having a portion movable upwardly at an incline from a position below the plane of the blank being conveyed to a position thereabove, an edge of the top of each link of the endless folding chain being rounded laterally into the blank engaging side of the link to provide for smooth progressive transfer of blank contact from the top of the link to the side as the folding progresses, and means for holding other portions of the blank against upward movement while said folding is being performed.

11. In a box making machine, a carrier member on which box blanks are supported for movement through the machine, means for folding a portion of the blank to a position at an angle with respect to the remainder of the blank, an endless member engageable with a portion of the blank to hold the latter down on the carrier while the first mentioned portion of the blank is being folded, said endless member forming a shaping die for the folding operation, and sprocket wheels around which said endless member travels, at least one of said sprocket wheels being rotatable in a plane which forms an acute angle with the plane of the folded portion of the blank so that the endless member may travel out of engagement of the blank without crushing.

12. In a box making machine, a carrier member on which box blanks are supported for movement through the machine, means for folding a portion of each blank to a position at an angle to the remainder of the blank, an endless chain engageable with a portion of the top of the blank to hold the latter down on the carrier while the blank is being folded, said endless chain having links which are V-shaped in cross-section to form a shaping die for the folding operation, sprocket wheels around which said endless chain travels, said sprocket wheels being rotatable in a plane which forms an acute angle with the plane of the folded portion of the blank so that the shaping links may travel out of engagement with the blank, after folding has been accomplished without causing crushing.

13. In a box making machine, a pair of transverse rotatable shafts one above the other, two spaced sets of creasing rollers mounted on said shafts for lateral adjustable movement, means between said shafts and rollers for driving the latter, a carrier forwardly of each set of creasing rollers for conveying box blanks which have been creased by said rollers, movable endless anvil members engageable with the upper surfaces of the blank in the crease lines formed by said creasing rollers, means on each side of the machine for folding portions of the blank on said crease lines, and means for laterally adjusting the sets of creasing rollers and the endless anvil members simultaneously.

14. In a box making machine, means for conveying box blanks through the machine, an endless folding chain having a portion movable upwardly at an incline from a position below the plane of the blank being conveyed to a position thereabove, each link having a portion shaped to provide for original engagement with the blank without mutilation and to provide for transfer of blank contact from the top of the link to the side as the folding progresses, and means for holding other portions of the blank against upward movement while said folding is being performed.

15. In a box making machine, a carrier member on which box blanks are supported for movement through the machine, means for folding a portion of the blank to a position at an angle with respect to the remainder of the blank, an endless member engageable with a portion of the blank to hold the latter down on the carrier while the first mentioned portion of the blank is being folded, said endless member forming a shaping die for the folding operation, and wheels around which said endless member travels, at least one of said wheels being rotatable in a plane which forms an acute angle with the plane of the folded portion of the blank so that the endless member may travel out of engagement of the blank without crushing.

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