

March 7, 1967

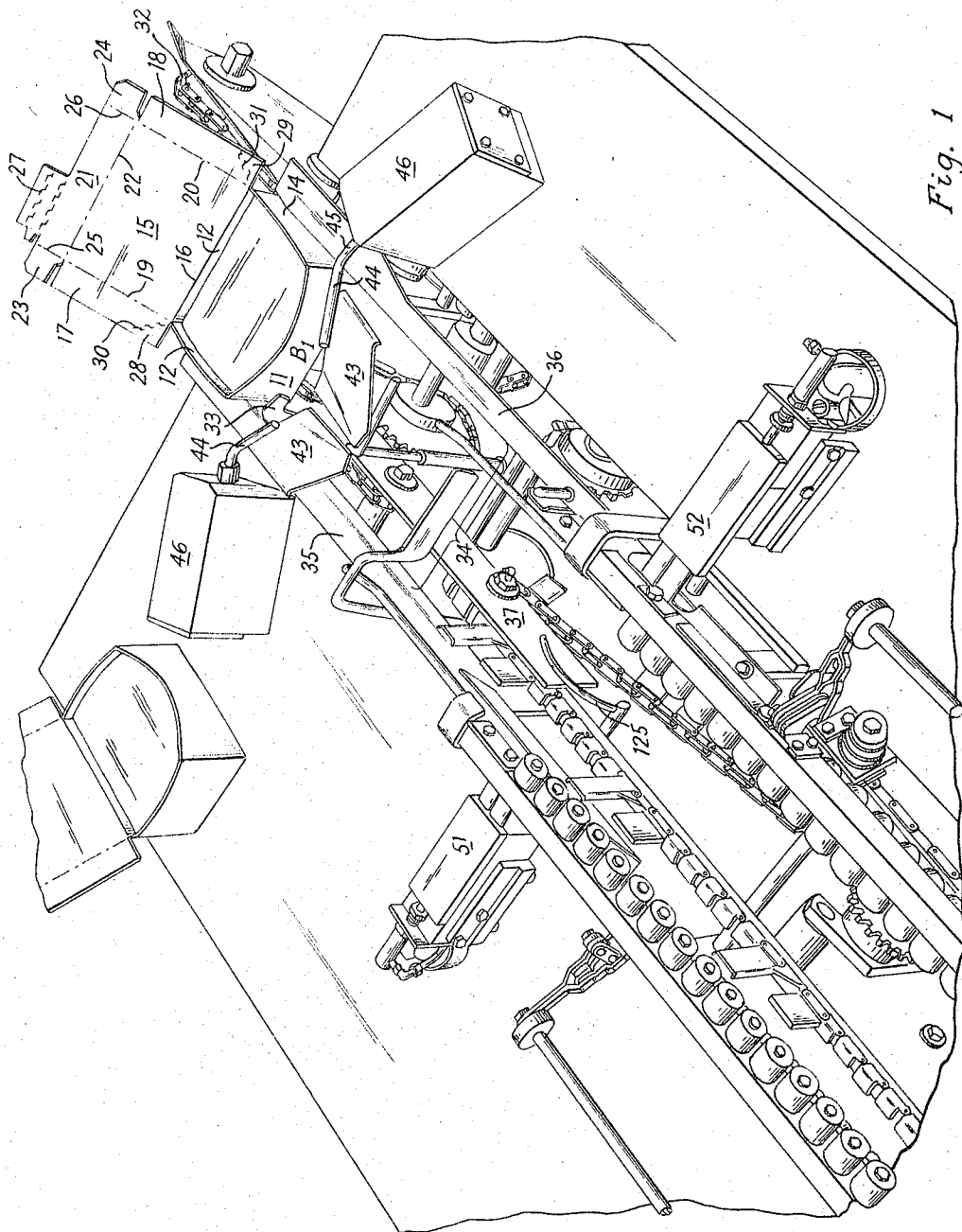
F. M. LEFIEF

3,307,329

CLOSING MACHINE FOR HINGE COVER FOLDING BOXES

Filed Dec. 8, 1964

14 Sheets-Sheet 1



INVENTOR

Frank M. Lefief

BY

Howard G. Russell

his ATTORNEY

March 7, 1967

F. M. LEFIEF

3,307,329

CLOSING MACHINE FOR HINGE COVER FOLDING BOXES

Filed Dec. 8, 1964

14 Sheets-Sheet 2

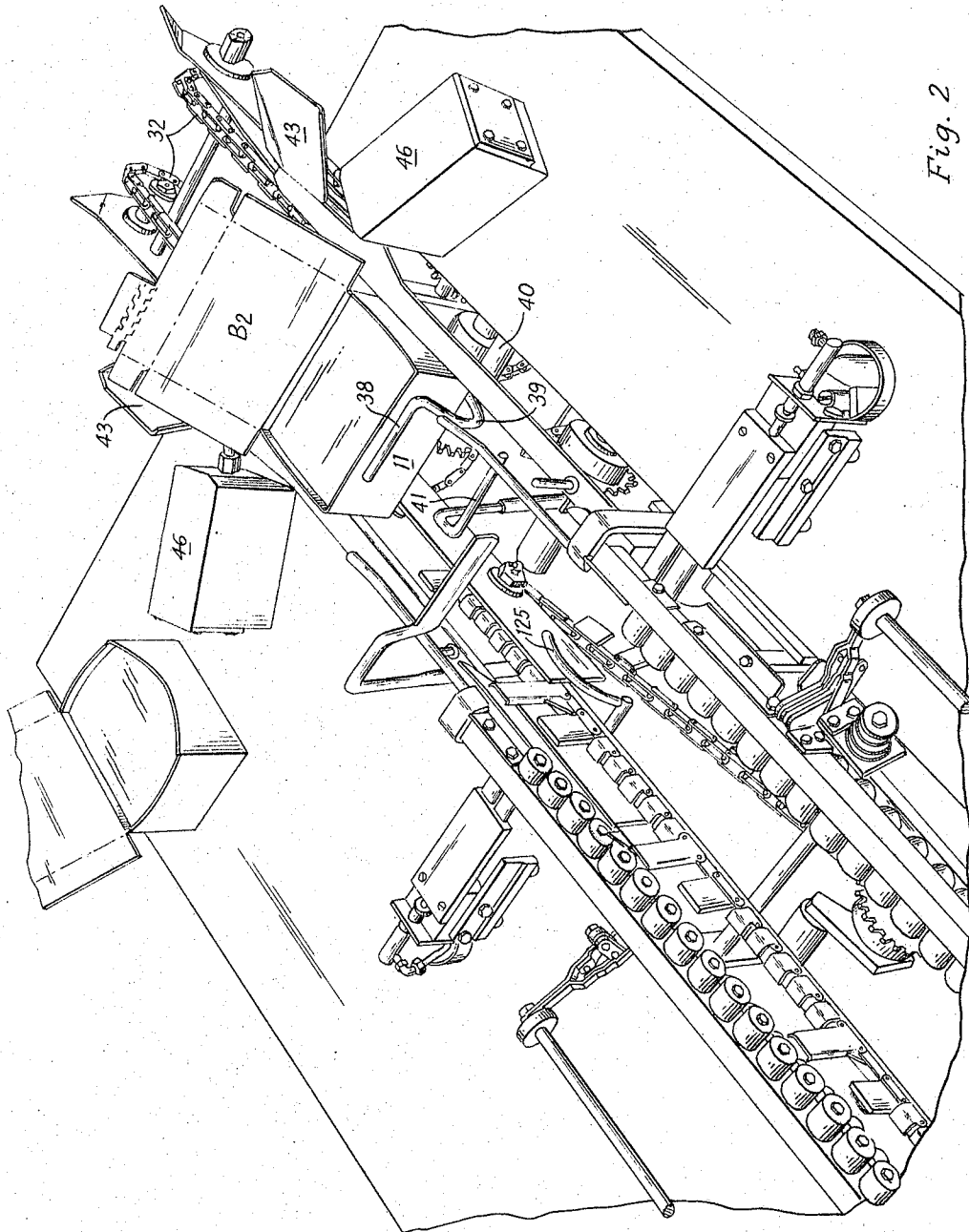


Fig. 2

INVENTOR

Frank M. Lefief

BY

Howard E. Russell

his ATTORNEY

March 7, 1967

F. M. LEFIEF

3,307,329

CLOSING MACHINE FOR HINGE COVER FOLDING BOXES

Filed Dec. 8, 1964

14 Sheets-Sheet 3

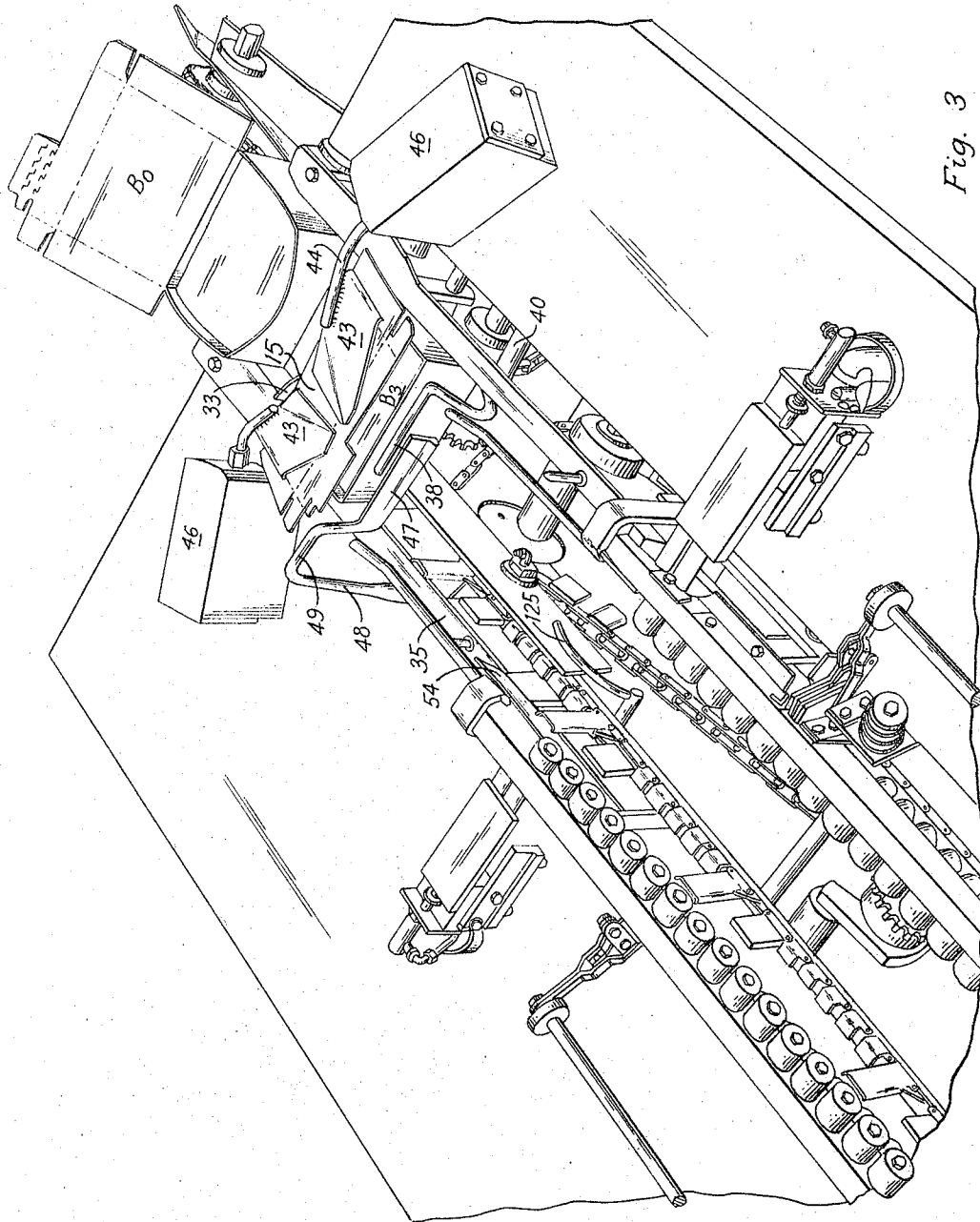


Fig. 3

INVENTOR

Frank M. Lefief

BY

Howard Russell

his ATTORNEY

March 7, 1967

F. M. LEFIEF

3,307,329

CLOSING MACHINE FOR HINGE COVER FOLDING BOXES

Filed Dec. 8, 1964

14 Sheets-Sheet 4

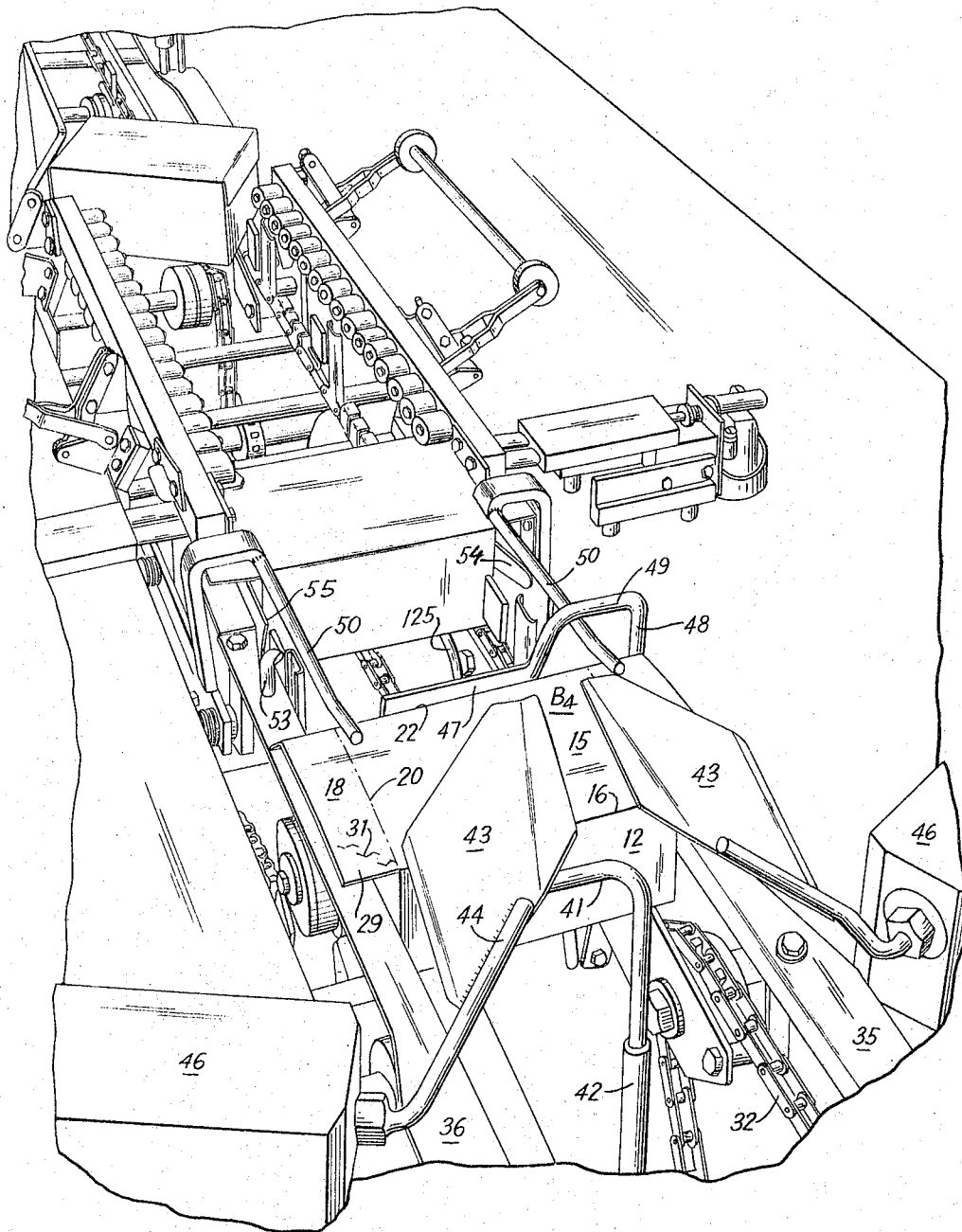


Fig. 4

INVENTOR

Frank M. Lefief

BY

Howard Russell
ATTORNEY

March 7, 1967

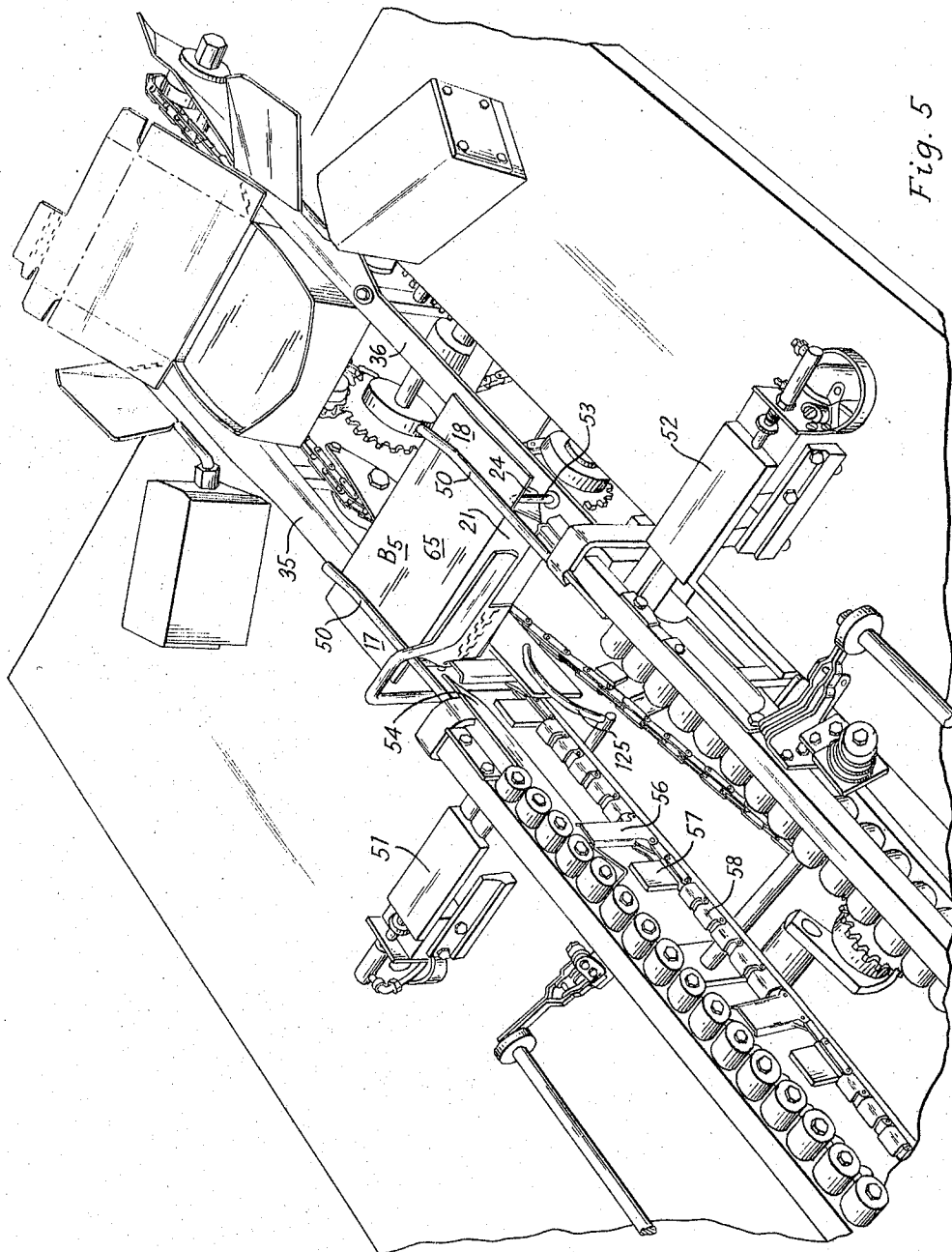
F. M. LEFIEF

3,307,329

CLOSING MACHINE FOR HINGE COVER FOLDING BOXES

Filed Dec. 8, 1964

14 Sheets-Sheet 5



INVENTOR

Frank M. Lefief

BY

Howard Russell
ATTORNEY

March 7, 1967

F. M. LEFIEF

3,307,329

CLOSING MACHINE FOR HINGE COVER FOLDING BOXES

Filed Dec. 8, 1964

14 Sheets-Sheet 6

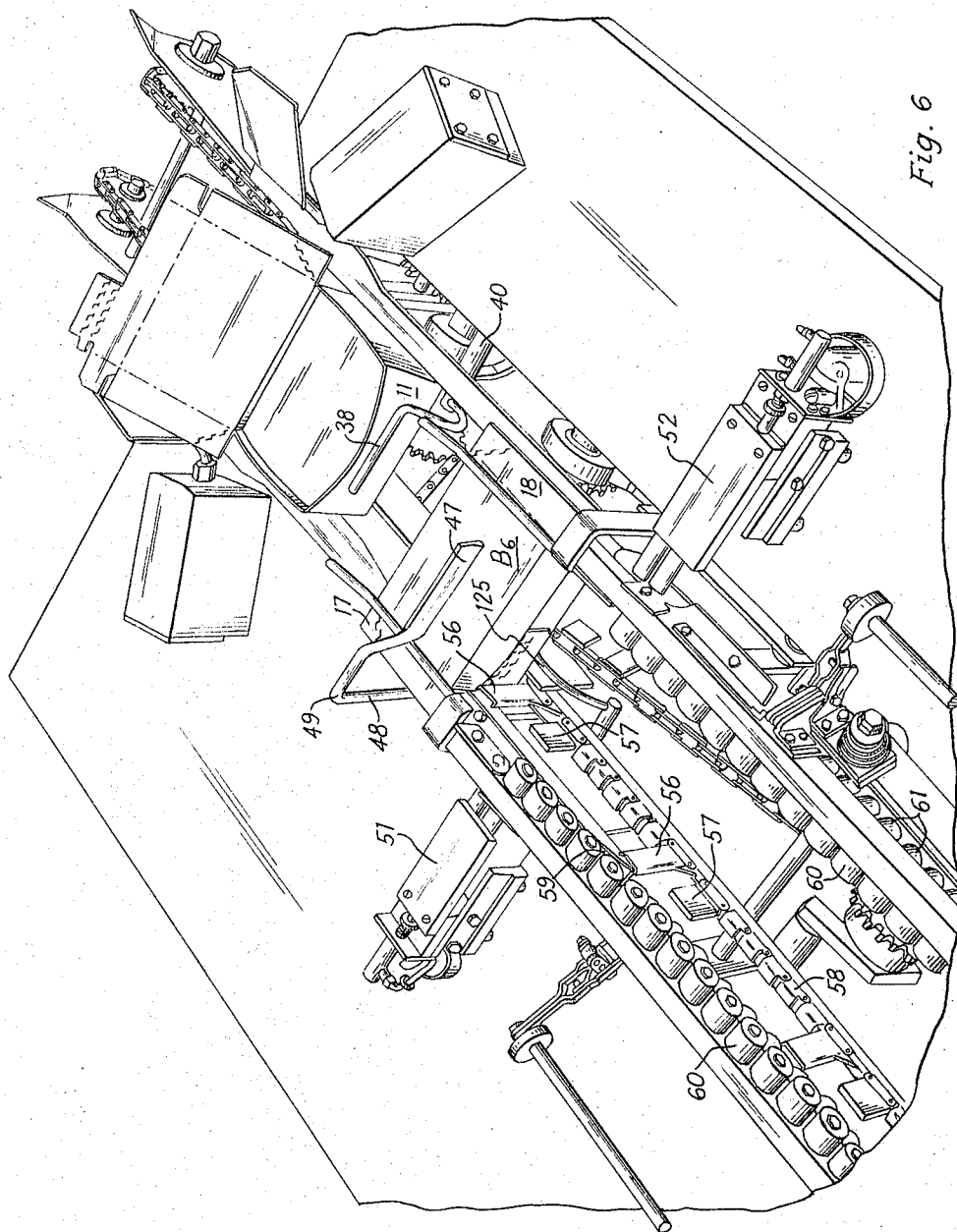


Fig. 6

INVENTOR

Frank M. Lefief

BY

Howard Russell

his

ATTORNEY

March 7, 1967

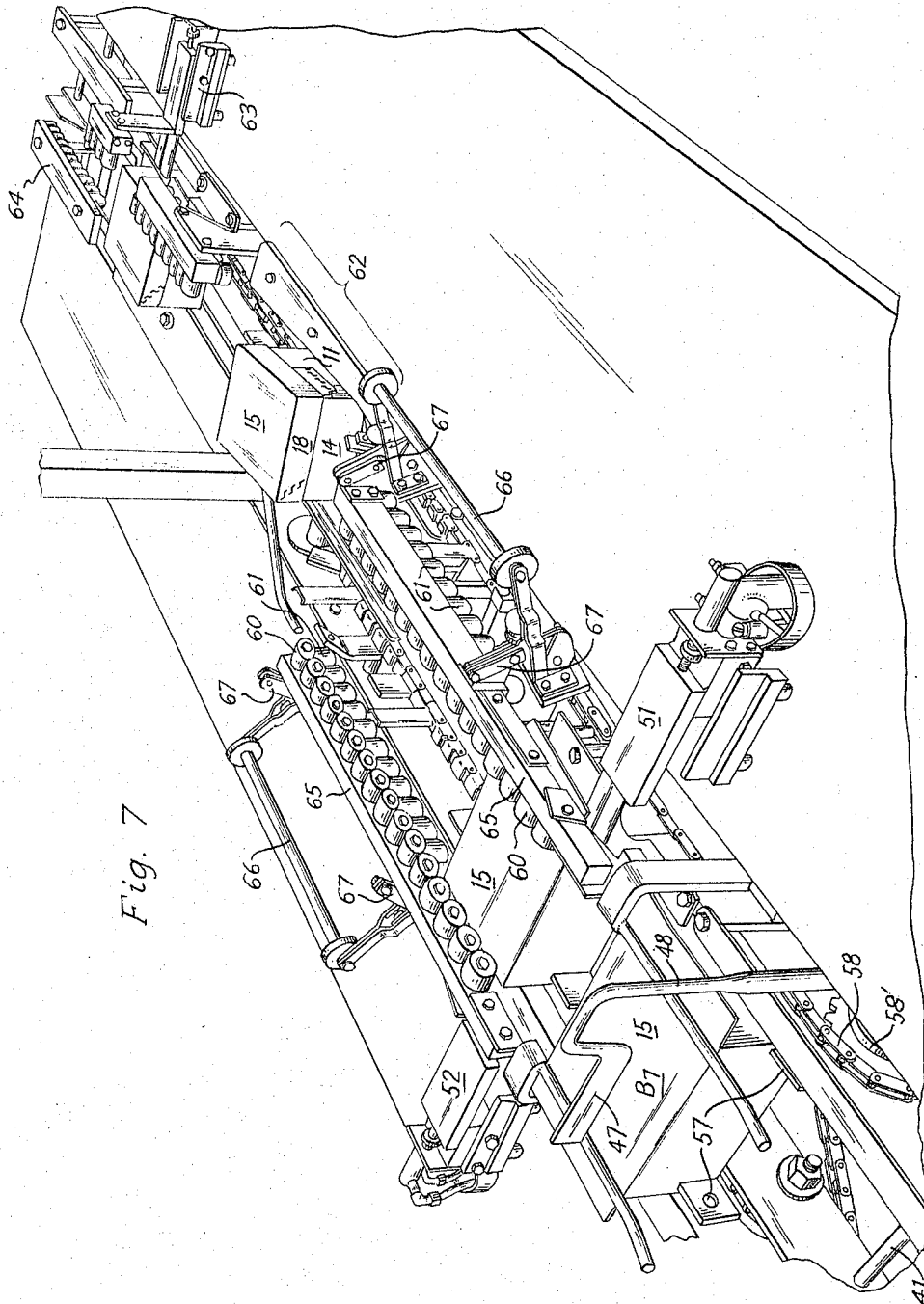
F. M. LEFIEF

3,307,329

CLOSING MACHINE FOR HINGE COVER FOLDING BOXES

Filed Dec. 8, 1964

14 Sheets-Sheet 7



INVENTOR.

Frank M. Lefief

BY

BY
Howard Russell
his ATTORNEY

be

ATTORNEY

March 7, 1967

F. M. LEFIEF

3,307,329

CLOSING MACHINE FOR HINGE COVER FOLDING BOXES

Filed Dec. 8, 1964

14 Sheets-Sheet 8

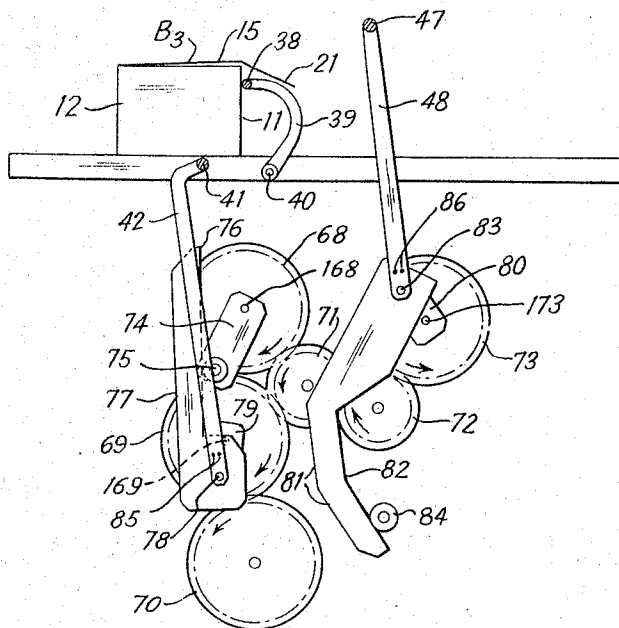


Fig. 8

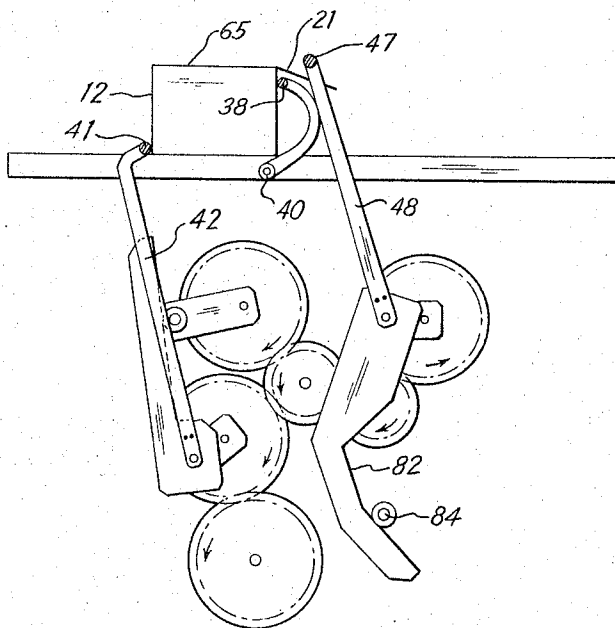


Fig. 9

INVENTOR.

Frank M. Lefief

BY

Howard Russell

his ATTORNEY

March 7, 1967

F. M. LEFIEF

3,307,329

CLOSING MACHINE FOR HINGE COVER FOLDING BOXES

Filed Dec. 8, 1964

14 Sheets-Sheet 9

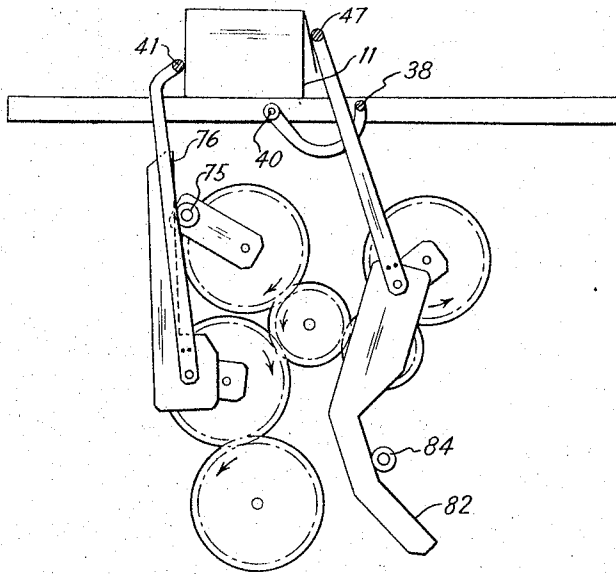


Fig. 10

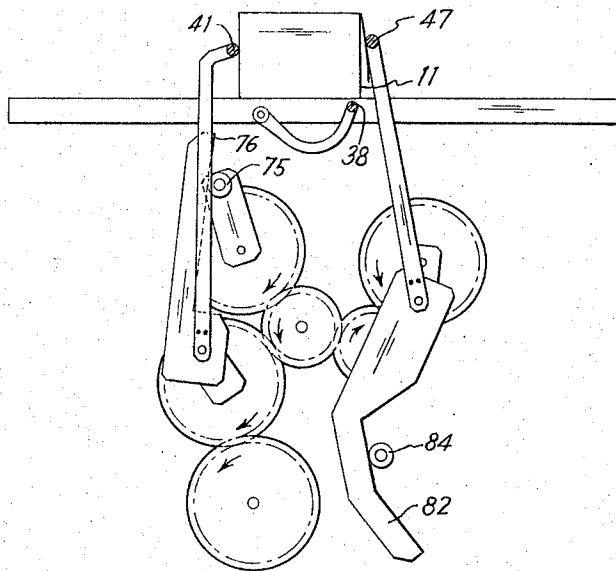


Fig. 11

INVENTOR.

Frank M. Lefief

BY

Howard Russell
his ATTORNEY

March 7, 1967

F. M. LEFIEF

3,307,329

CLOSING MACHINE FOR HINGE COVER FOLDING BOXES

Filed Dec. 8, 1964

14 Sheets-Sheet 10

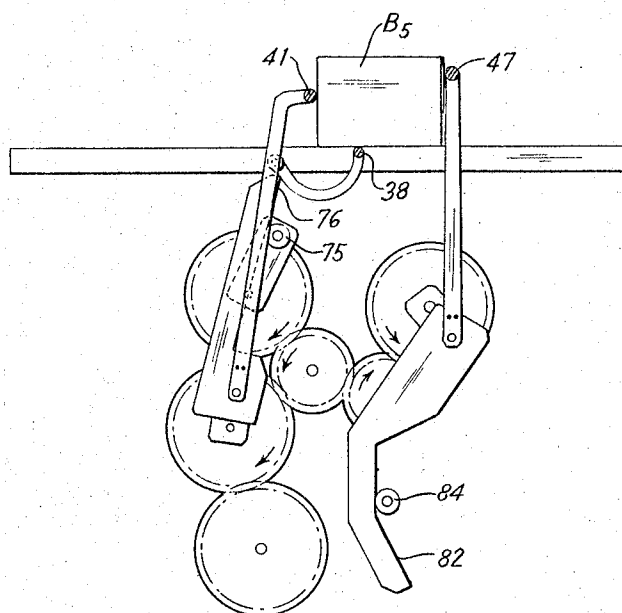


Fig. 12

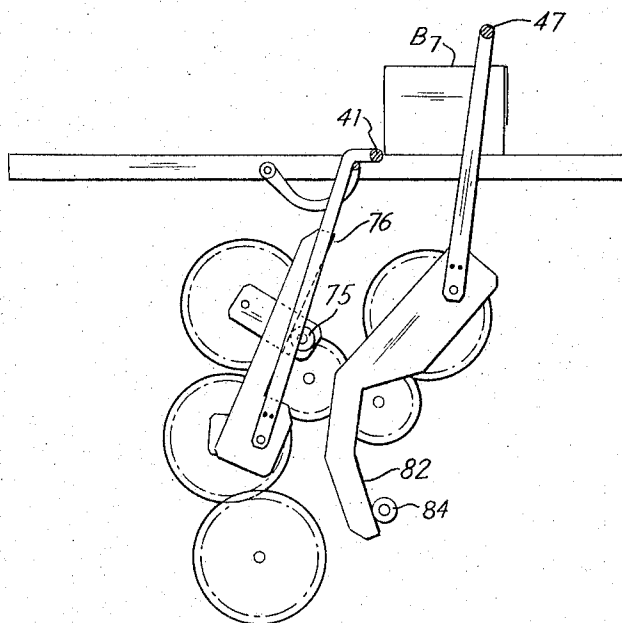


Fig. 13

INVENTOR.

Frank M. Lefief

BY

Howard Russell
his ATTORNEY

March 7, 1967

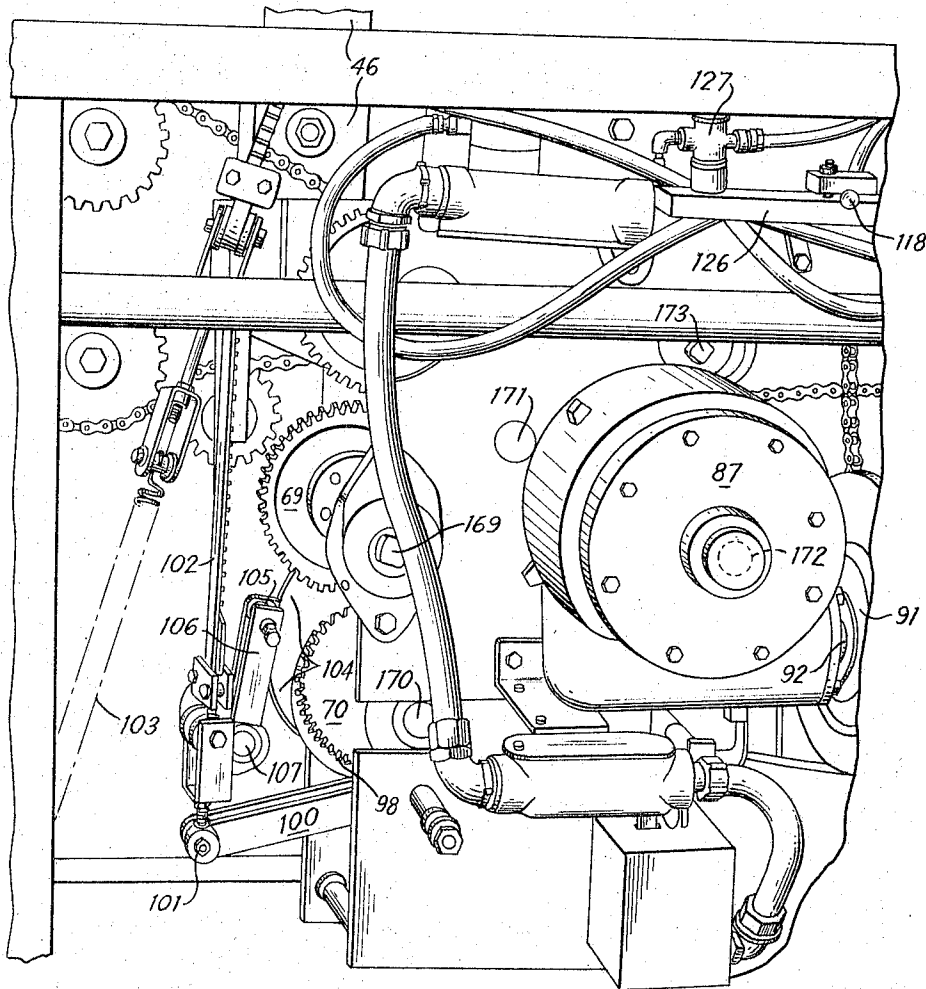
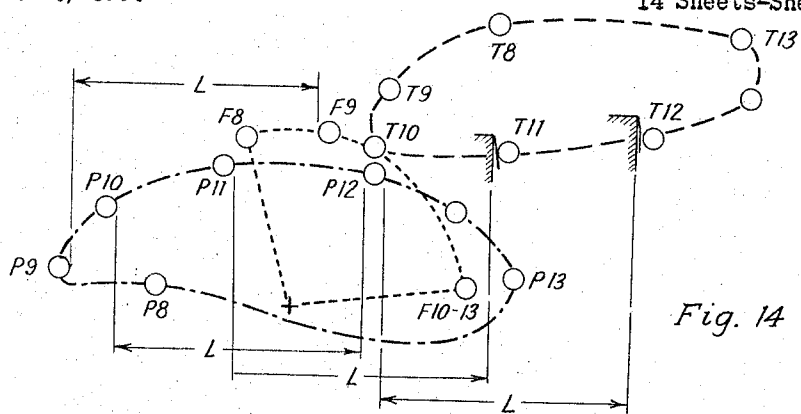
F. M. LEFIEF

3,307,329

CLOSING MACHINE FOR HINGE COVER FOLDING BOXES

Filed Dec. 8, 1964

14 Sheets-Sheet 11



INVENTOR.

Frank M. Lefief

BY

Howard Russell
ATTORNEY

March 7, 1967

F. M. LEFIEF

3,307,329

CLOSING MACHINE FOR HINGE COVER FOLDING BOXES

Filed Dec. 8, 1964

14 Sheets-Sheet 12

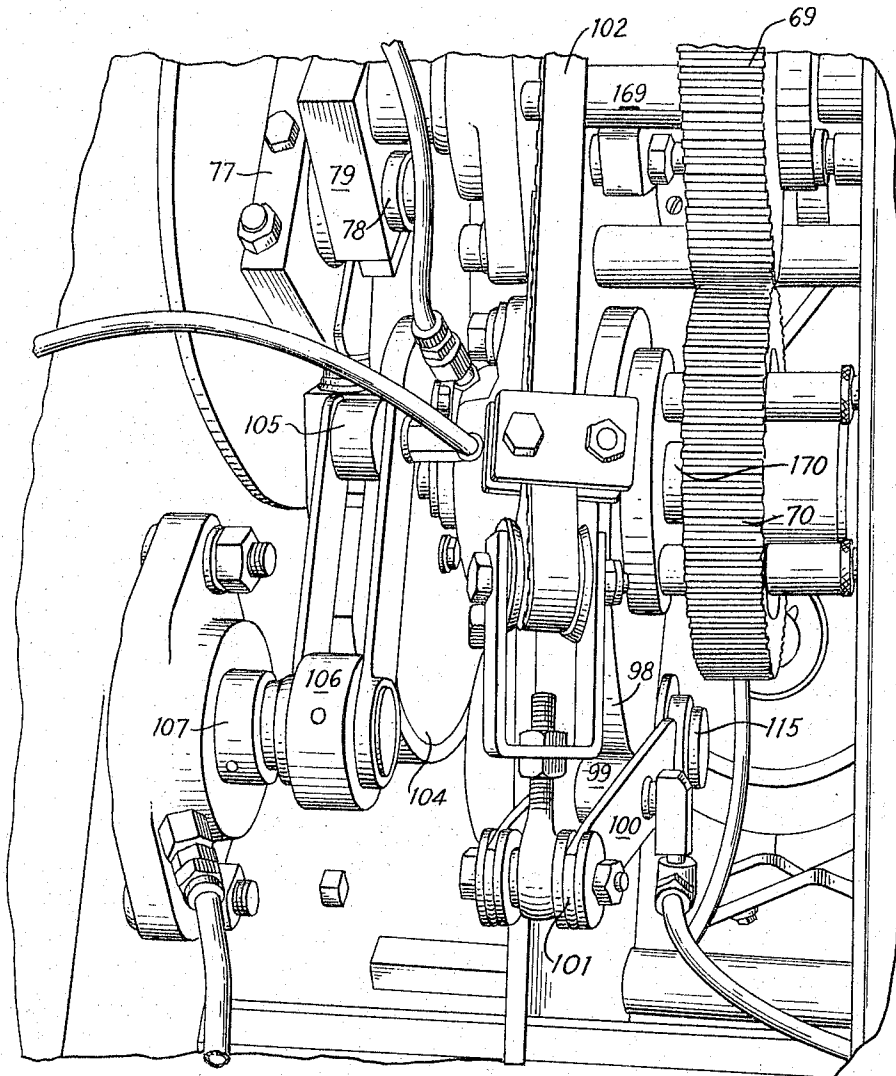


Fig. 16

INVENTOR.

Frank M. Lefief

BY

Howard Russell

his ATTORNEY

March 7, 1967

F. M. LEFIEF

3,307,329

CLOSING MACHINE FOR HINGE COVER FOLDING BOXES

Filed Dec. 8, 1964

14 Sheets-Sheet 13

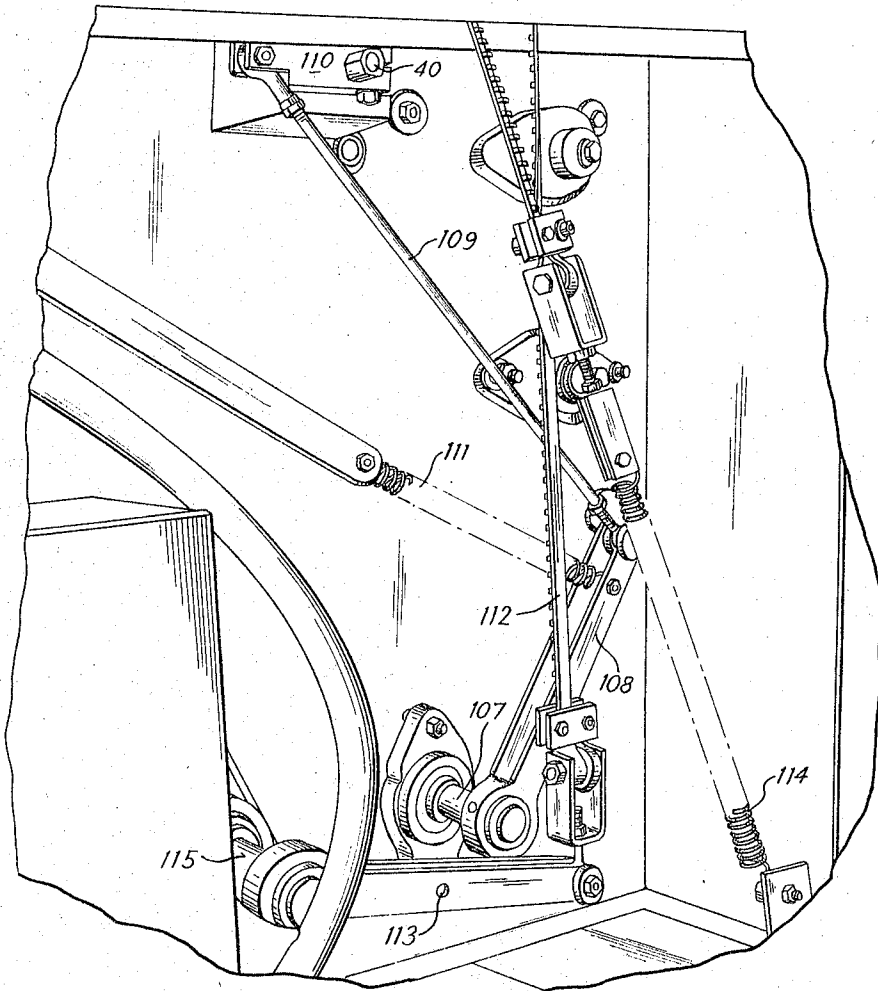


Fig. 17

INVENTOR.

Frank M. Lefief

BY

Howard Russell
his ATTORNEY

March 7, 1967

F. M. LEFIEF

3,307,329

CLOSING MACHINE FOR HINGE COVER FOLDING BOXES

Filed Dec. 8, 1964

14 Sheets-Sheet 14

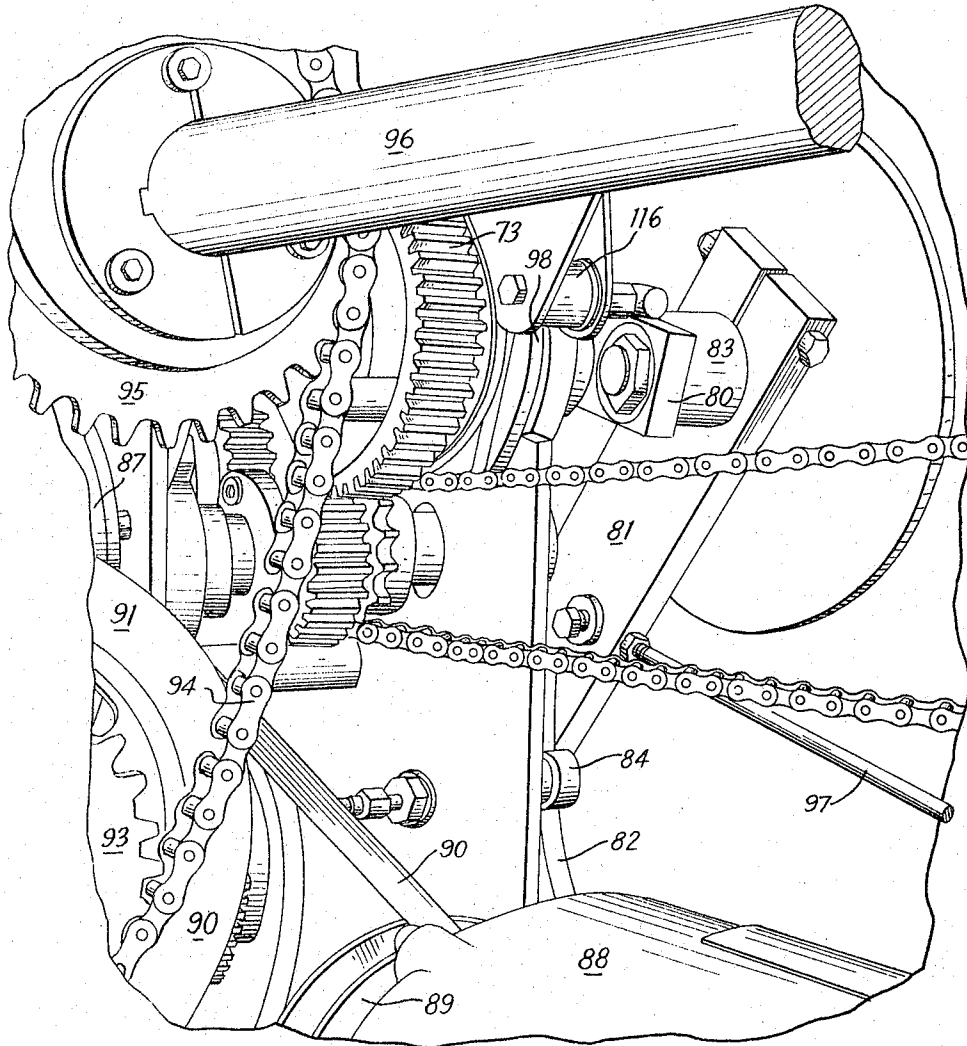


Fig. 18

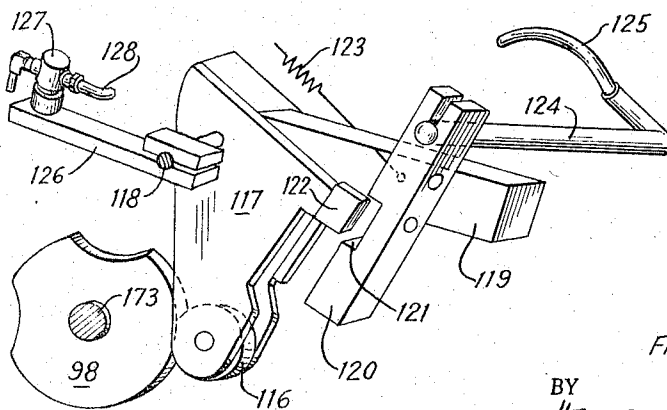


Fig. 19

INVENTOR
Frank M. Lefief

BY
Howard Russell
his ATTORNEY

1

3,307,329

CLOSING MACHINE FOR HINGE COVER FOLDING BOXES

Frank M. Lefief, Palo Alto, Calif., assignor, by mesne assignments, to Kliklok Corporation, New York, N.Y., a corporation of Delaware

Filed Dec. 8, 1964, Ser. No. 416,801

11 Claims. (Cl. 53-376)

This invention relates to closing machines for hinge cover folding boxes and provides, more particularly, a machine capable of closing, forming and sealing a hinge cover of the type provided with a cover front flap, cover side flaps and tabs for interconnecting the front and the side flaps at the corners.

Depending on the contents packaged in the box, and also depending on the filling or loading equipment employed, folding boxes arrive at the closing machine in different positions. Some boxes travel with one end wall leading and with the other end wall trailing. In this case the cover hinge line points in the direction of travel of the box.

Other boxes travel with the back wall and the cover leading. In that case the cover hinge line is transverse to the direction of travel and the closing of the cover involves little difficulty.

Still other boxes arrive at the closing machine with the cover trailing and the cover hinge line transverse to the direction of travel. In such a case the closing of the cover is less simple. Additional problems are provided by contents of a semi-liquid nature which makes turning of the open box inadvisable, even though turning by 90 degrees would lessen the mechanical problems of closing of the cover.

Still other problems are encountered where the nature and the weight of the box contents causes the box body to be deformed, for example one or several box body walls to be bulged out, as in such a case the edge of the box body wall moves out of line with the fold line of the respective cover flap which is to be folded over it. This makes it difficult to fold the cover flap.

The present invention provides a machine capable of closing hinge cover folding boxes arriving with the cover hinge trailing and transverse to the direction of travel, even boxes which may arrive with one or several box body walls badly bulged out and which, due to the nature of the box contents, cannot be suddenly accelerated, decelerated or turned.

In addition, machines incorporating the features of the present invention are capable of closing and sealing the box cover within an extremely short distance of travel of the order of three to four feet in the case of boxes requiring a seal along the cover side flaps only.

During all operations all boxes within the machine are readily accessible from above and are removable in case of any malfunction or failure or box defect.

The various objects, features and advantages of this invention will appear more fully from the detailed description which follows accompanied by drawings showing, for the purpose of illustration, a preferred embodiment of the invention. The invention also resides in certain new and original features of construction and combination of elements hereinafter set forth and claimed.

Although the characteristic features of this invention which are believed to be novel will be particularly pointed out in the claims appended hereto, the invention itself and the manner in which it may be carried out may be better understood by referring to the following description taken in connection with the accompanying drawings forming a part of it in which:

FIGS. 1 to 7 are perspective views showing the machine

2

in successive phases of operation, FIGS. 1 to 3 and 5 to 7 being views toward the receiving end, and FIG. 4 being a view toward the discharge end of the machine;

FIGS. 8 to 13 are diagrammatic figures illustrating successive steps in the action of the principal box handling elements and their operating mechanism;

FIG. 14 is a diagram illustrating the motion of certain box handling elements;

FIGS. 15 to 18 are perspective views of portions of the machine drive mechanism; and

FIG. 19 is a perspective and diagrammatic view of a portion of the adhesive applying mechanism.

In the following description and in the claims various details will be identified by specific names for convenience.

The names, however, are intended to be generic in their application. Corresponding reference characters refer to corresponding parts in the several figures of the drawings.

The drawings accompanying, and forming part of, this specification disclose certain specific details of construction for the purpose of explanation of broader aspects of the invention, but it should be understood that structural details may be modified in various respects without departure from the principles of the invention and that the invention may be incorporated in other structural forms than shown.

In view of the relative complexity of the machine incorporating the invention an understanding of the machine will be facilitated by an initial description of its operation, followed by an explanation of the operation of certain of its principal box handling elements by way of diagrams, to be concluded by a description of its operating mechanism.

The illustrated box B₁ is of one-half gallon capacity and is filled with ice cream in a semi-liquid state.

The box proper comprises a front wall 11, a rear wall 12, and side walls 13 and 14. A cover panel 15 is articulated to the rear wall 12 along a cover hinge line 16 and the cover panel 15 has cover side flaps 17 and 18 articulated to its sides along fold lines 19 and 20, and a cover front flap 21 articulated to its front boundary along a front flap fold line 22. Corner tabs 23 and 24 articulated to the lateral boundaries of the front flap 21 along tab fold lines 25 and 26 are to be adhered to the cover side flaps, and a glue tab 27 serves to seal the cover front flap 21 to the box body front wall 11.

The cover side flaps may be provided with severable substantially triangular rear corner tab portions 28 and 29 defined by lines of weakness 30 and 31 (see also FIG. 4). These tab portions are adhered to the side walls 13 and 14 during the sealing procedure and seal the cover shut. For the purpose of opening, these tab portions may be severed from the remainder of the cover side flaps by tearing along the lines of weakness 30 and 31, as is conventional practice.

The box is moved into the position B₁ by frictional engagement with a conveyor which, in the illustrated form of the machine, comprises a pair of link chains 32 best visible in FIG. 2.

In the position shown in FIG. 1 the box is arrested by a flag stop 33 which is periodically projected into the path of the boxes and retracted at the appropriate moment in order to release the box for advance into the grip of box handling elements about to be described.

The boxes move along a track 34 defined laterally by rails 35 and 36 and at the bottom initially by the chains 32, and beyond the chains by a supporting blade 37 disposed vertically, and beyond the blade 37 by other conveyor chains later to be described.

The lateral rails limit the bulging out of the side walls 13 and 14, but the front wall 11 may bulge out considerably under the pressure of the semi-liquid contents, as is seen in FIG. 1.

After release by the flag stop the box moves into engagement with a front bar 38 which, in the illustrated form, comprises a bowed central portion 39 and a pivot shaft portion 40, the latter being transverse to the box track 34.

At the illustrated moment the box is still being propelled by the conveyor. The front bar flattens out the box front wall 11, as is seen in FIG. 2 showing the box B₂ in the advanced position marked by the index 2.

In FIG. 2 a pusher element or transport bar 41 is seen in front of the box. This pusher element comprises a shaft portion 42 extending downwardly and performs a complex substantially vertical orbital motion in the course of which, at the illustrated moment, the bar is about to move under the box B₂ to engage its rear wall and advance the box farther along the track.

Returning for a moment to FIG. 1, cover folding means are visible in front of the box. These cover folding means may have the shape of arms, but are preferably fitted with blades for reasons which will presently become apparent. While one such cover folding arm and/or blade is sufficient to perform the intended folding operation, it is preferred to provide a pair of arms for the sake of symmetry. The blades 43 represent the ends of arms 44 which are bent at 45 and are pivotally mounted in trackside bearings inside the housings 46, the arrangement being such that the bearing axis about which each arm oscillates is at an angle to the center line of the track 34, as is clearly apparent from FIG. 1.

The arms are oscillated through approximately 180 degrees or somewhat less. FIG. 1 shows the extreme forward position of the blades 43 and FIG. 2 shows the extreme rearward position of the blades which, by reason of the bend 45 and of the angular disposition of the oscillation axes, move into and out of the space above the track.

Details of the actuating mechanism will be described later. At this point it will suffice to state that a gear belt, sometimes referred to as "timing belt" is employed which is trained around a toothed pulley resembling a gear inside each housing 46.

In the position shown in FIG. 2 the blades 43 are about to move forward to engage the cover panel 15 to fold it forward over the box body, as shown in FIG. 3 and marked by the index 3 (B₃). At this moment another box B₀ is about to arrive at the flag stop 33. It will further be noted that at this moment the pusher bar 41 has disappeared below the box and is about to engage the box from the rear.

FIG. 4 shows the box from the rear. The box has been moved beyond the end of the conveyor chain 32 by the pusher bar 41 which engaged it and advanced it a short distance beyond the position shown in FIG. 3.

At this moment a transverse folding element 47 has moved into engagement with the cover front flap 21 in order to fold it down into contact with the box front wall 11. The folding element 47 has the shape of a flat bar or blade and is mounted on the end of a downwardly extending operating shaft 48 comprising a gooseneck portion 49 in order to clear the track rail 35.

The motion imparted to the folding element 47 is complex and is essentially a vertical orbital motion so related to the orbital motion of the pusher or transport bar 41 that during transport of the box the horizontal distance between the bars 41 and 47 remains the same and equal to the length of the box, i.e., the distance between the front wall 11 and the rear wall 12. This will later be explained by reference to diagrams. The position of the bars in FIG. 4 corresponds about to the positions shown in diagrammatic FIG. 10.

The blades 43 are about to move back and behind the next box at the instant illustrated in FIG. 4.

In the position B₅ shown in FIG. 5 the blades have retracted and the box has advanced under top rails or bars 50 which hold the cover panel 15 down. The cover

side flaps 17, 18 extend horizontally over the lateral track rails 35, 36, as the box moves towards adhesive applicators 51 and 52 which apply adhesive to the underside of the cover side flaps.

Stationary plows or fingers 53 on the track rails 35, 36 engage the corner tabs 23, 24 and fold them against the box side walls 13 and 14, respectively. The tabs 23, 24 are held in infolded position by vertical rails 54, 55 between which the box enters (FIGS. 4 and 5).

At the instant shown in FIG. 5 the transverse folding element 47 is about to move upward out of engagement with the front flap 21 and is shown in fully disengaged position in FIG. 6.

In the position shown in FIG. 5 the front bar 38 has moved out of the way of the box into a position below the track, permitting the box B₅ to move over it. Immediately after passage of the box the bar 38 is raised to meet the next box and is seen in raised position in FIG. 6.

In FIG. 6 the second box in line has not quite arrived in the position of the box B₂ in FIG. 2 and a slight bow in the box front panel 11 is still noticeable. The first box in FIG. 6 has moved against tall vertical lugs 56 of a conveyor 58 whose shorter rear lugs 57 are raised behind the box to transport the box farther, and past the adhesive applicators 51 and 52.

The rising of the rear lugs 57 is well visible in FIG. 7 which also shows a portion of the disappearing pusher or transport bar 41. The conveyor 58 is trained around rear pulleys 58' causing the conveyor lugs 56, 57 to move into the path of the boxes.

Referring further to FIG. 7 the first box from the left approaches the adhesive applicators which, in the illustrated form of the machine, are pneumatically operated nozzle type applicators applying a measured quantity of adhesive to the underside of the cover side flaps passing thereover, first at the leading portion of the flaps, where the flap is to be adhered to the respective corner tab, and next to the trailing portion of the flap which is the triangular tear-off portion. Manifestly other forms of applicators, for example star-wheel applicators, may be employed in which tips of radial spokes of star wheels dip into a pool of adhesive and then apply spots of adhesive to a flap. Such applicators are conventional and well known.

The second box from the left in FIG. 7 has had adhesive applied to its cover side flaps which are about to be folded down by slanted plows 59 (visible in FIG. 6), whereafter the box moves into a compression unit comprising rows of horizontal rollers 60 and vertical rollers 61 pressing the cover panel 15 down and pressing the cover side flaps against the box body side walls.

The rollers 60 and 61 of the compression units are mounted on square bars 65. These bars may be swung out of the way of the box track by depressing unlocking bars 66 extending between knuckle-type supports 67. Boxes within the compression unit may then be lifted off the box track without difficulty. Lifting of the unlocking bars 66 restores the square bars 65 and rollers 60, 61 to their original position in which they are shown in FIG. 7.

Boxes leaving the compression unit move into a chain turner 62 which turns each box 90 degrees about its vertical axis, whereafter the box moves past a further adhesive applicator 63 and a further compression unit 64 for a further sealing operation to adhere the glue tab 27 to the cover front wall 11 in the same manner as the cover side flaps were adhered to the corner tabs 23, 24 lying underneath the side flaps and overlying the box side walls 13, 14.

The chain turner is of known construction and is described in detail in the patent to Chester J. Pierce, Jr., No. 2,984,332 dated May 16, 1961.

The sealed ice cream boxes are then discharged from the closing machine ready for full freezing, packaging and shipping.

The operating mechanism of the box handling elements 41 and 47 comprises cranks, cams and gears for producing the respective orbital motions and is most conveniently explained by reference to the diagrammatic FIGURES 8 to 14.

The illustrated gear train comprises an upper gear 68, a central gear 69, a lower gear 70, an intermediate gear 71, a drive gear 72, and a forward gear 73. The illustrated arrangement causes gears 68, 69 and 72 to rotate in a clockwise direction, and gears 70, 71 and 73 to turn counterclockwise.

The gear 68 is fixed on a shaft 168 to which a crank 74 is fastened carrying a roller 75. The roller bears against the cam surface 76 of a cam 77 pivotally mounted on the pin 78 of a further crank 79. The crank 79 is keyed to a shaft 169 to which the central gear 69 is secured.

The forward gear 73 is fixed on a shaft 173 to which a further crank 80 is secured. A cam 81 having a cam face 82 is pivotally mounted on a pin 83 of the crank 80. Its cam face engages a fixed roller 84.

It should be understood that in the machine spring means are provided for maintaining the respective cam faces 76 and 82 in engagement with their associated rollers 75 and 84. These means are not shown in the diagrams in order to keep the diagrams simple.

The shaft 42 of the pusher bar is secured to the cam 77 at 85 and the shaft 48 of the transverse folding element is secured to the cam 81 at 86.

The relative positions of the several elements as shown in FIG. 8 correspond approximately to the position of the box B_3 in FIG. 3. The front bar 38 is up and has flattened the front wall 11 of the box. The pusher bar 41 is below the box and is on its way to move behind the rear wall 12.

In the position shown in FIG. 9, which is slightly earlier than the condition illustrated in FIG. 4, the pusher or transport bar 41 moves up behind the box and engages the rear wall 12. The front bar 38 swings down about its axis 40 and the transverse folding element 47 approaches the cover front flap 21 of the box.

In the position shown in FIG. 10 the pusher or transport bar advances the box, as is readily seen by comparing the position of the roller 75 with respect to the cam face 76. The cam 77 moves to the right and so does the box. The transverse folding element 47 engages the front flap and has almost folded it flat against the box front wall 11. The front bar 38 has moved out of the path of the box. FIG. 10 approximately represents the position of the box B_4 in FIG. 4.

FIG. 11 shows the box farther advanced and above the front bar 40. This position represents approximately the condition of the box B_5 shown in FIG. 5. It will be observed that the bars 41 and 47 move to the right while maintaining the same distance between them, the distance being equal to the length of the box.

In the position shown in FIG. 12 the transverse folding element 47 moves upwardly to clear the box while the transport bar 41 moves down still pushing the box.

In FIG. 13 the transverse folding element 47 has moved upward far enough to clear the box, while the pusher bar 41 has moved downwardly out of engagement with the box which at this point is being grasped by the conveyor lugs 57 (FIG. 7). FIG. 13 therefore shows approximately the condition of the box B_7 in FIG. 7.

FIG. 14 is a diagrammatic representation of the path of the front bar 38 represented by the positions F, the path of the pusher bar 41 represented by the positions P, and the path of the transverse folding element 47 represented by the positions T. The indices 8 through 13 indicate the respective positions in which the elements appear in FIGS. 8 through 13.

It is seen that the path of the pusher element P is substantially an orbital clockwise motion, and that the path

of the transverse folding element is substantially an orbital counterclockwise path. The front bar F oscillates back and forth on an arc.

The length of the box, which is the distance from the box front wall 11 to the box rear wall 12, is indicated as L. This dimension appears as the horizontal distance between pairs of elements in their respective positions as follows: P_9-F_9 ; $P_{10}-T_{10}$; $P_{11}-T_{11}$; and $P_{12}-T_{12}$. This illustrates how the action of the several elements first results in de-bowing of the front panel, as the box is confined between P_9 and F_9 , and how the box is then advanced while being confined between the elements P and T until the position indicated by index 12 is reached.

In FIG. 14 one position is shown without an identifying index because the corresponding diagrammatic figure was omitted in order to reduce the total number of drawings.

With a knowledge of the operation of the various box handling elements described in the foregoing it will now be easy to follow the construction and arrangements of other parts of the operating mechanism.

FIG. 15 shows the assembly of the upper central and lower gears 68, 69 and 70, respectively. For the sake of convenience the gear shafts are given numbers differing from the gear number by one hundred. The intermediate gear 71 is not visible, but its location is indicated by its shaft 171. The shaft 172 of the drive gear extends into a worm-and-gear unit 87.

Turning to FIG. 18, it is seen that the unit 87 is driven by a motor 88 having a drive pulley 89 on its drive shaft from which a belt 90 extends over a driven pulley 91 on the input shaft 92 (FIG. 15) of the unit 87. There is further a chain drive 93, 94, 95 (FIG. 21) from the shaft 92 to a main shaft 96 which extends the length of the machine and operates the various conveyor chains in timed relationship including that of the chain turner 62.

FIG. 18 further shows the forward gear 73 and the crank 80 driven thereby which was previously shown diagrammatically in FIG. 8. The crank pin 83 drives the cam 81 whose face 82 engages the fixed roller 84. A pull rod 97 extends from the cam 81 to the right to a helical spring (beyond the illustration) which maintains the cam 81 in contact with the roller 84. The gear 73 further drives a cam 98 comprising two receding portions for operating the adhesive applicator 51, 52 by means of other mechanism described further below.

Returning to FIG. 15, a cam 98 on the shaft 170 engages a follower 99 on an arm 100, to the free end 101 of which a gear belt 102 is attached. This gear belt extends upwardly about a pinion in the housing 46 and thence downwardly to a helical spring which maintains the follower 99 in contact with the cam 98. This assembly is also shown in end view in FIG. 15.

A further cam 104 on the shaft 170 engages a follower 105 on an oscillating arm 106 which is fixed on a shaft 107. This shaft extends through the machine housing to the other side (FIG. 17), where a long arm 108 on the shaft operates the pivot shaft 40 of the front bar 38 (FIGS. 2, 3 and 6) by means of a push rod 109 and a lever 110 on the pivot shaft 40. A helical return spring 111 tends to pull the arm 108 into the illustrated position and also maintains the follower 105 (FIG. 16) in contact with the cam 104.

Returning to FIG. 17, a second gear belt 112 attached to an arm 113 extends upwardly about the pulley (not visible) of the other blade arm 44, the blade assembly being the one on the right in FIG. 1. The other end of the gear belt 112 is attached to a return spring 114. The shaft 115 on which the arm 113 is fixed also extends through the machine housing and the arm 100 (FIG. 16) is secured to it. At the upper left of FIG. 16 the crank 79 is visible which carries the cam 77 to which the arm 42 of the pusher bar 41 is secured, the latter details being shown in FIG. 8.

Turning to FIG. 18, the cam 98 on the shaft of the

gear 73 is engaged by a follower 116 on a lever assembly which is diagrammatically shown in FIG. 19.

An arm 117 having a pivot shaft 118 is biased in a clockwise sense by a mass 119. It therefore follows the contour of the cam 98 unless it is locked in a disengaged position by means of a catch 120 having a recess 121 into which a projection 122 on the arm 117 fits. The catch 120 is biased for clockwise displacement so as to engage the projection 122, a spring 123 being indicated for this purpose. The catch is clamped to a pivot shaft 124, the end 125 of which is shaped as a feeler extending into the path of boxes (FIGS. 1-6).

When a box depresses the feeler portion 125, the catch 120 disengages the arm which then is free to move into the depression in the cam periphery. In doing so an actuating arm 126 clamped to the shaft 118 actuates an air valve 127 which passes two bursts of compressed air into the line 128 leading to a piston type servo-motor in each adhesive applicator 51, 52 for each revolution of the cam 98. A portion of the mechanism of FIG. 19 is visible in FIG. 15 near the upper right corner.

After the box passes beyond the feeler 125, the feeler swings up slightly and the catch 120 engages the arm 117 in a position in which the follower 116 contacts the cylindrical periphery, but not the depression, of the cam so that the arm 126 does not actuate the air valve during the period the arm 117 is locked by the catch 120.

What is claimed is:

1. A device for folding the hinge cover of a folding box into box closing position, the device comprising, in combination, means forming a box track; transport means for advancing a box along said track in a direction in which the box cover hinge line is transverse to the center line of the track, with the hinge cover trailing; a pair of cover folding blades; trackside means for each of said blades for supporting the respective blade for oscillation back and forth about an oscillating axis angularly disposed with respect to the center line of the track, the axis of the supporting means of one blade being at an angle to the axis of the supporting means of the other blade; and means for oscillating both blades in timed relationship to said transport means.

2. A device for folding the hinge cover of a folding box into box closing position, the device comprising, in combination, means forming a box track; transport means for advancing a box along said track in a direction in which the box cover hinge line is transverse to the center line of the track, with the hinge cover trailing; a pair of cover folding blades; trackside means for each of said blades for supporting the respective blade for oscillation back and forth about an oscillating axis angularly disposed with respect to the center line of the track, the axis of the supporting means of one blade being at an angle to the axis of the supporting means of the other blade and the extent of sweep of motion being such that in one end position the blades are spaced apart wider than the width of the track and that in the other end position the blades lie substantially parallel above the track and spaced apart less than the width of the track; and means for oscillating both blades in timed relationship to said transport means.

3. A device for folding the hinge cover of a folding box into box closing position, the device comprising, in combination, means forming a box track; a first transport bar for advancing a box along said track by engaging the rear box wall to which the cover is hinged along a substantial width of the wall; a second bar for engaging the leading box wall; a pair of cover folding blades; trackside means for each of said blades for supporting the respective blade for oscillation back and forth about an oscillating axis angularly disposed with respect to the center line of the track, the axis of the supporting means of one blade being at an angle to the axis of the supporting means of the other blade; means for jointly oscillating both blades for simultaneous movement; means

timed with respect to said oscillating means for advancing said first bar to move a box along the box track; and means operative during at least a portion of the time said blades oscillate in the direction of box advance for moving said second bar such as to maintain a horizontal distance equal to a box length from said first bar.

4. A device for folding the hinge cover of a folding box into box closing position, the device comprising, in combination, means forming a box track; transport means for advancing a box along said track in a direction in which the box cover hinge line is transverse to the center line of the track, with the hinge cover trailing; a cover folding blade; trackside means for supporting said blade for oscillating movement back and forth about an oscillating axis angularly disposed with respect to the center line of the track; the oscillating axis being at an angle to the center line of the track; and means for oscillating said blade in timed relationship to said transport means and at a velocity sufficiently high that the horizontal component of the blade velocity in the direction of the track exceeds the velocity at which the box is advanced along said track.

5. A device for folding the hinge cover of a folding box into box closing position, the device comprising, in combination, means forming a box track; transport means for advancing a box along said track in a direction in which the box cover hinge line is transverse to the center line of the track, with the hinge cover trailing; a folding arm; means alongside said track for pivotally supporting said arm for movement into and out of the space above the track to engage the trailing cover and fold it over the box body; and operating means for moving said arm in timed relationship to said transport means.

6. A device for folding the hinge cover of a folding box into box closing position, the device comprising, in combination, means forming a box track; transport means for advancing a box along said track in a direction in which the box cover hinge line is transverse to the center line of the track, with the hinge cover trailing; a pair of folding arms, one arm being disposed on one side of the track, the other arm being disposed on the other side of the track and opposite said one arm; means alongside said track for pivotally supporting said arms for movement into and out of the space above the track to engage the trailing cover and fold it over the box body; and operating means for moving said arms in timed relationship to said transport means.

7. A device for folding into box closing position the hinge cover of a folding box provided with a front flap on the cover, the device comprising, in combination, means forming a box track; transport means for advancing a box along said track in a direction in which the cover front flap and the cover hinge line are transverse to the center line of the track with the hinge cover trailing; means operable in timed relationship with said transport means for folding said box cover forward over the box body; a transverse folding element adapted to engage and downfold the cover front flap; and means for imparting to said folding element a substantially orbital motion, the upper portion of which is in a direction opposite to said transport means and predominantly at a level above the said track higher than the height of the box, and the lower portion of which is in the direction of said transport means and predominantly at a level below the height of the box, said element moving during a portion of said lower motion at a substantially uniform horizontal distance from the point of engagement of said transport means with said box, said last named distance being substantially equal to the length of the box.

8. A device for folding into box closing position the hinge cover of a folding box provided with a front flap on the box cover, the device comprising, in combination, means forming a box track; a pusher element for engag-

ing the box at its rear wall to which the box cover is articulated and advancing the box along said track; first drive means for imparting to said pusher element a substantially orbital motion in a vertical plane; means operable in timed relationship with said first drive means for engaging and folding said box cover forward over the box body; a transverse folding element adapted to engage and downfold the cover front flap; second drive means for imparting to said folding element a substantially orbital motion in a vertical plane, the direction of the orbital motion of the first drive means being opposite to that of the second drive means.

9. A device for folding into box closing position the hinge cover of a folding box provided with a front flap on the box cover, the device comprising, in combination, means forming a box track; a pusher element adapted to engage the box at its rear wall to which the box cover is articulated and advance the box along said track; a first arm extending from said pusher element downwardly to a level below said track; a first drive crank below said track; a first cam element pivotally mounted on said first crank, said first arm being fixedly secured to said first cam element; a follower crank comprising a follower portion engaging said first cam element; means operable in timed relationship with said first drive crank for engaging and folding said box cover forward over the box body; a transverse folding element adapted to engage and downfold the cover front flap; a second arm extending from said transverse folding element downwardly to a level below said track; a second drive crank; a second cam element pivotally mounted on said second drive crank, said second arm being fixedly secured to said second cam element; a follower element engaging said second cam element; and means interconnecting said first drive crank, said follower crank and said second crank for rotation in timed relationship.

10. A device for closing and sealing the hinge cover of a folding box to which cover side flaps and a cover front flap are articulated, the device comprising, in combination, means forming a box track; an infeed conveyor for advancing a box along a first portion of the track by frictional engagement and in a direction in which the cover hinge line is transverse to the center line of the track; a flag stop for periodically blocking and releasing, respectively, boxes moving within said first portion; a

transport bar downstream with respect to said flag stop for advancing a box along a second track portion downstream with respect to said first portion by engaging the rear wall of the box; a second bar for engaging the leading box wall; a folding element for engaging and folding forward and downward into box closing position the hinge cover; means for operating said transport bar, said second bar, and said folding element in timed relationship with respect to said flag stop; an outfeed conveyor for grasping a box downstream of said first and second bar and advancing said box along a third track portion; a pair of track side adhesive applicators within said third track portion for applying adhesive to the cover side flaps; and means downstream of said applicators for downfolding, and applying sealing pressure to, said side flaps.

11. A device for closing and sealing the hinge cover of a folding box to which cover side flaps and a cover front flap are articulated, the device comprising, in combination, means forming a box track; an infeed conveyor for advancing a box along a first portion of the track by frictional engagement and in a direction in which the cover hinge line is transverse to the center line of the track; a flag stop for periodically blocking and releasing, respectively, boxes moving with said first portion; a transport bar downstream with respect to said flag stop for advancing a box along a second track portion downstream with respect to said first portion by engaging the rear wall of the box; a second bar for engaging the leading box wall; a pair of cover folding blades; trackside means for each of said blades for supporting the respective blade for oscillation back and forth about an oscillating axis angularly disposed with respect to the center line of the track; means for operating said transport bar, said second bar and said blades in timed relationship with respect to said flag stop; an outfeed conveyor for grasping a box downstream of said first and second bar and advancing said box along a third track portion; a pair of trackside adhesive applicators within said third track portion for applying adhesive to the cover side flaps; and means downstream of said applicators for downfolding, and applying sealing pressure to, said side flaps.

No references cited.

45 TRAVIS S. MCGEHEE, *Primary Examiner*.