

Jan. 24, 1967

T. B. BRICKSON

3,299,614

FOLDING BOX MACHINES

Filed Nov. 3, 1964

10 Sheets-Sheet 1

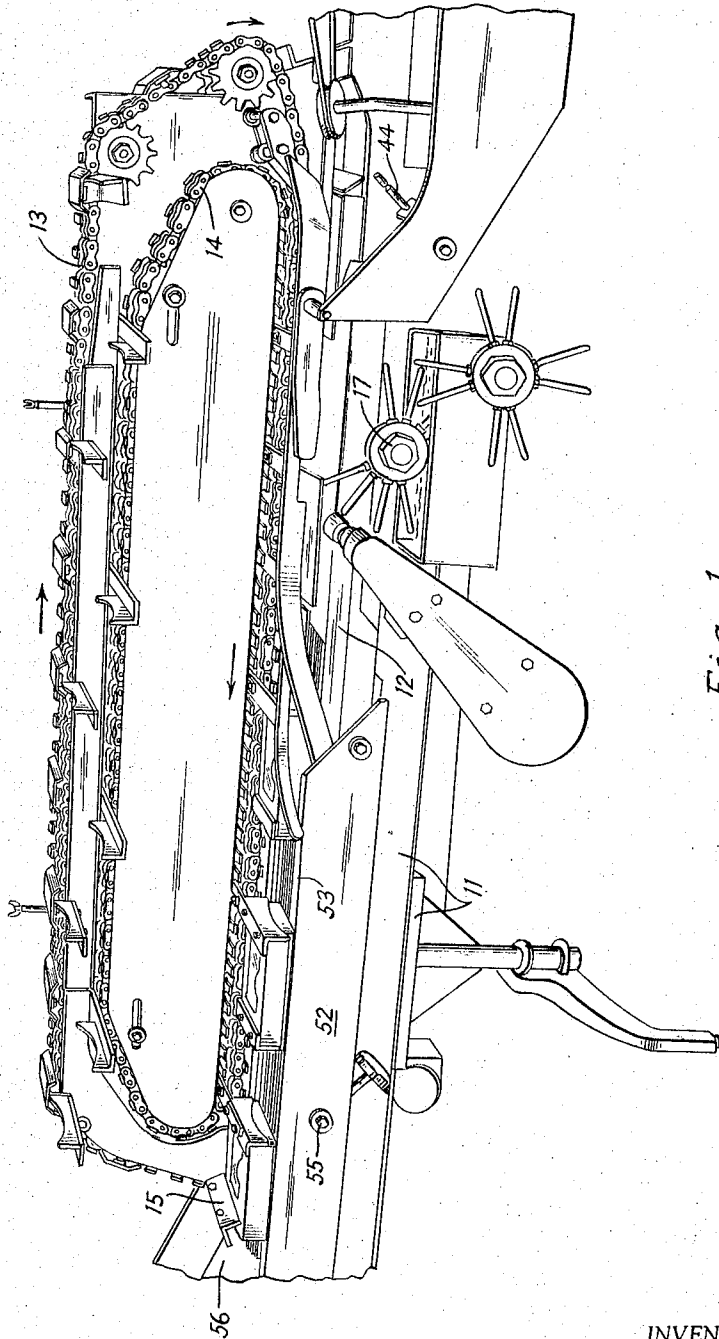


Fig. 1

INVENTOR.

Thomas B. Brickson

BY  
Howard Russell  
his ATTORNEY

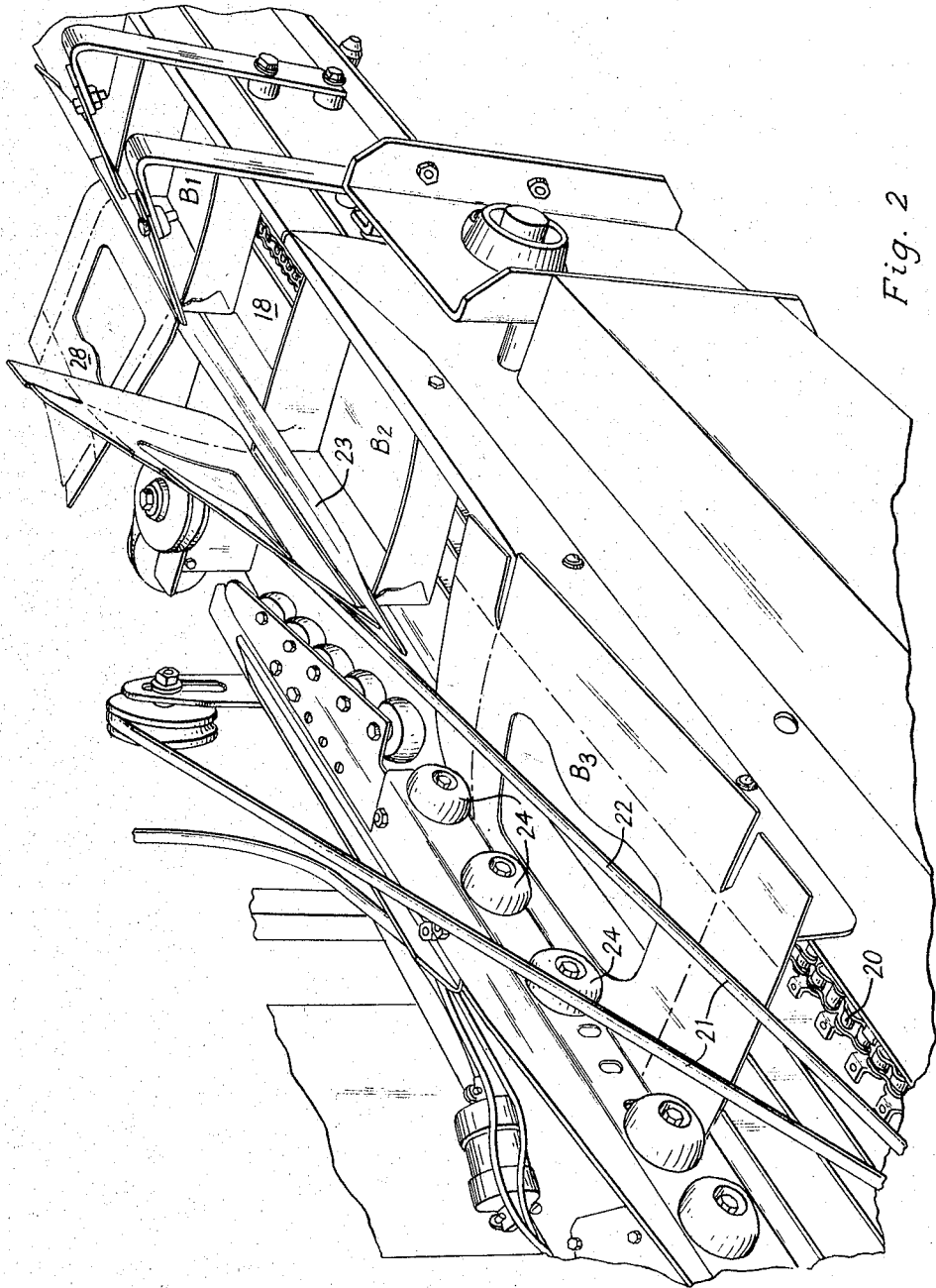
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10 Sheets-Sheet 2



INVENTOR.

*Thomas B. Brickson*

BY

*Howard Russell*  
his ATTORNEY

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10 Sheets-Sheet 3

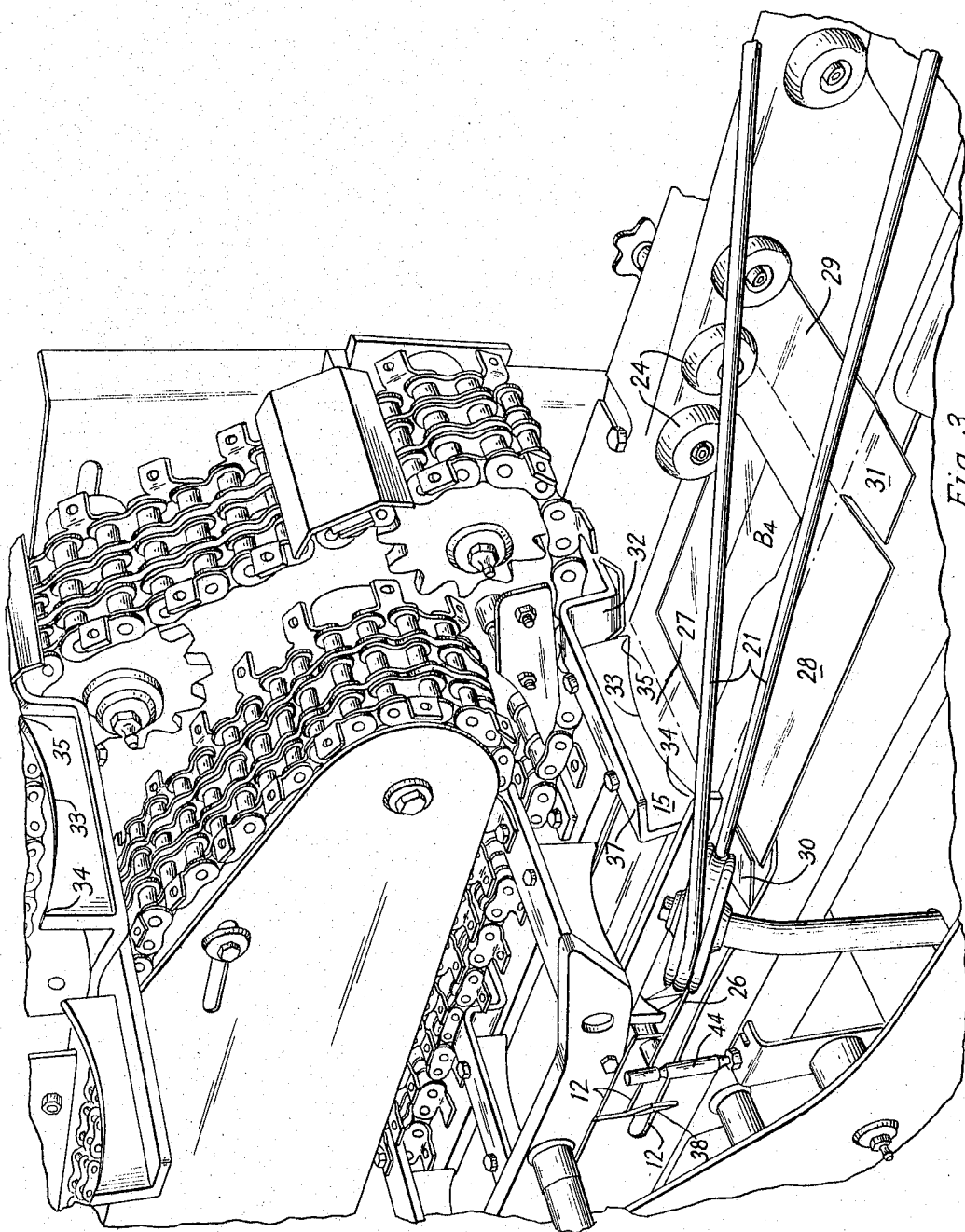


Fig. 3

INVENTOR  
Thomas B. Brickson  
BY  
*Howard Russell*  
ATTORNEY

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10 Sheets-Sheet 4

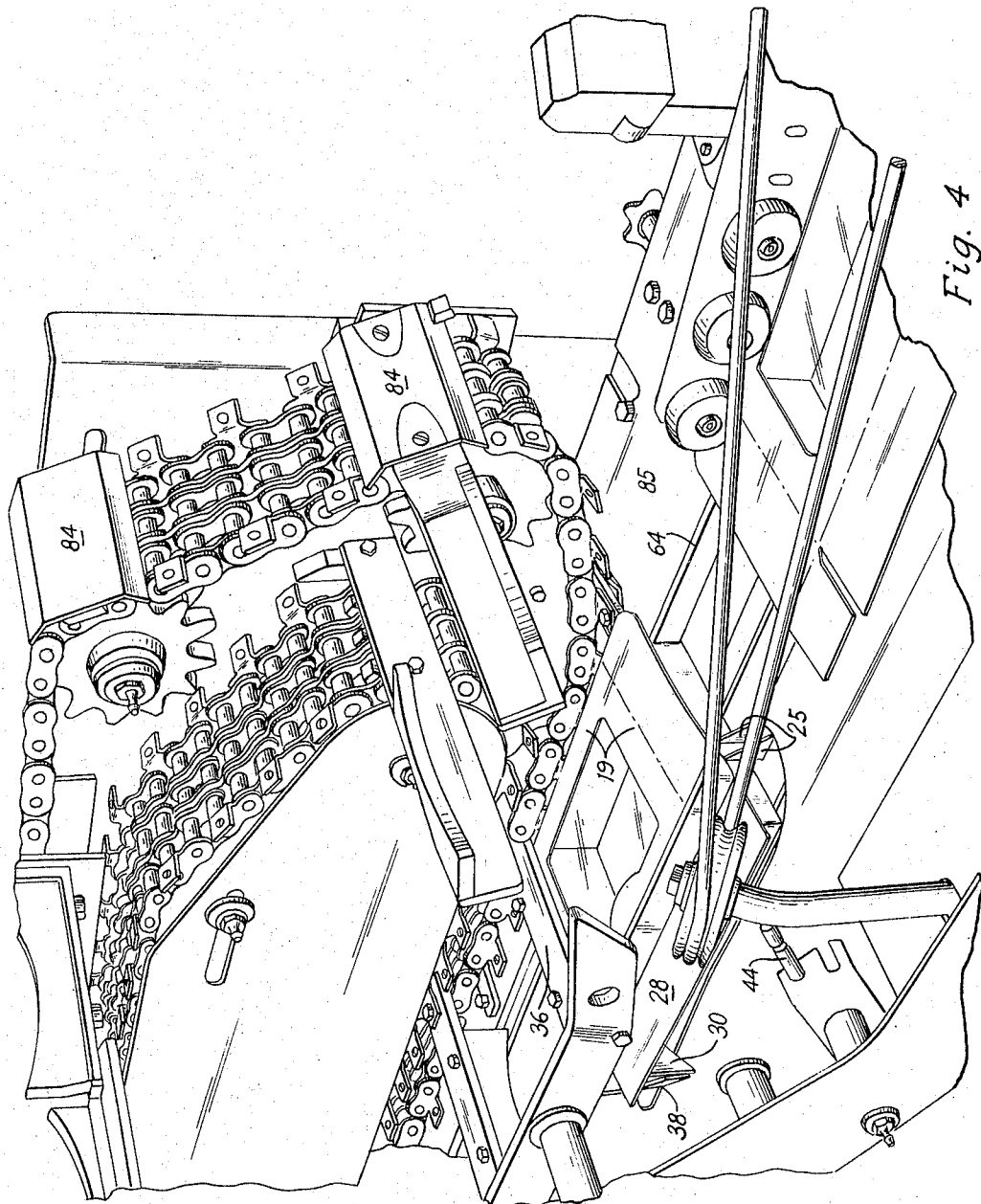


Fig. 4

INVENTOR  
Thomas B. Brickson  
BY  
Howard Russell  
ATTORNEY

Jan. 24, 1967

T. B. BRICKSON  
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10 Sheets-Sheet 5

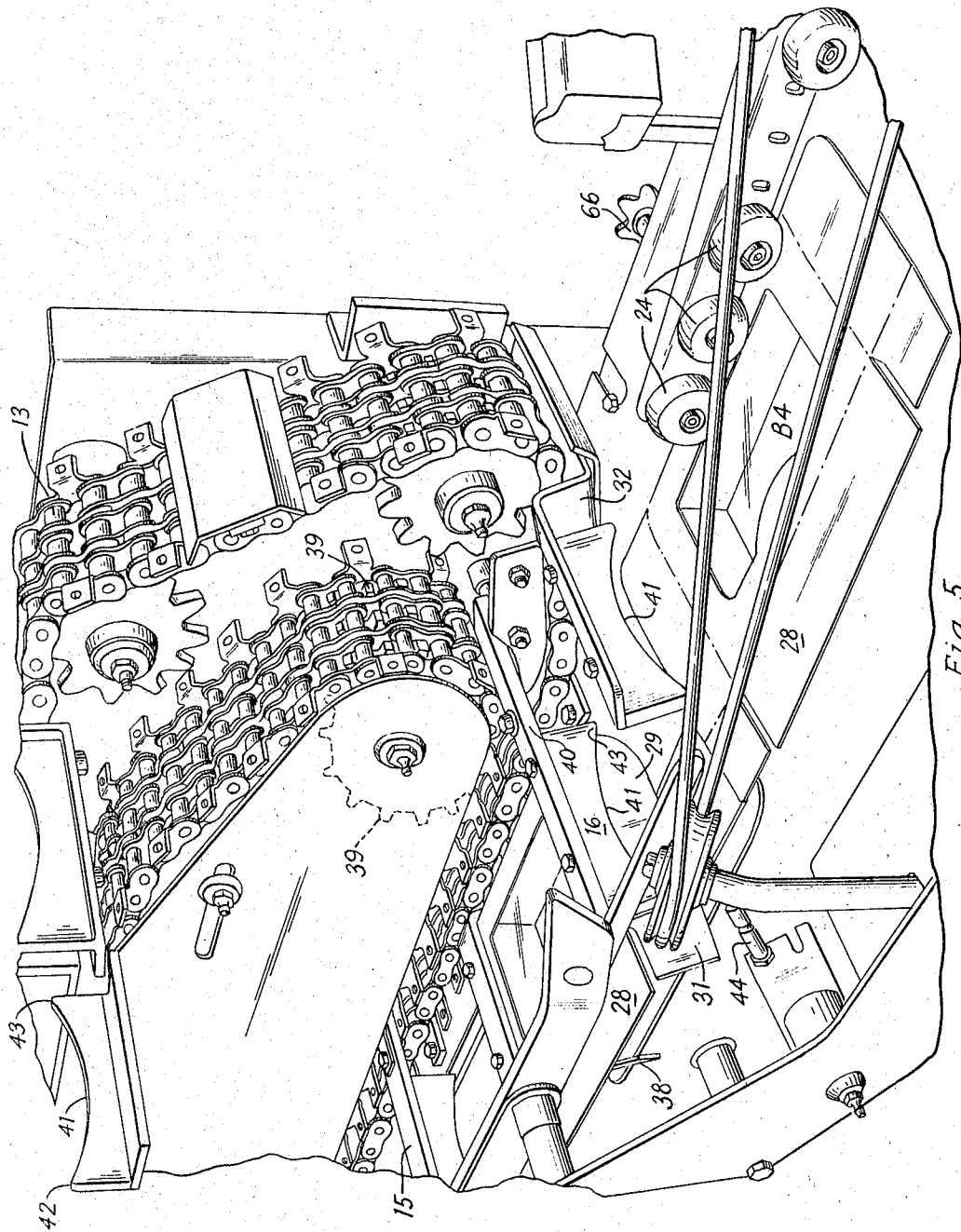


Fig. 5

INVENTOR  
Thomas B. Brickson  
BY  
Howard Russell  
his ATTORNEY

Jan. 24, 1967

T. B. BRICKSON  
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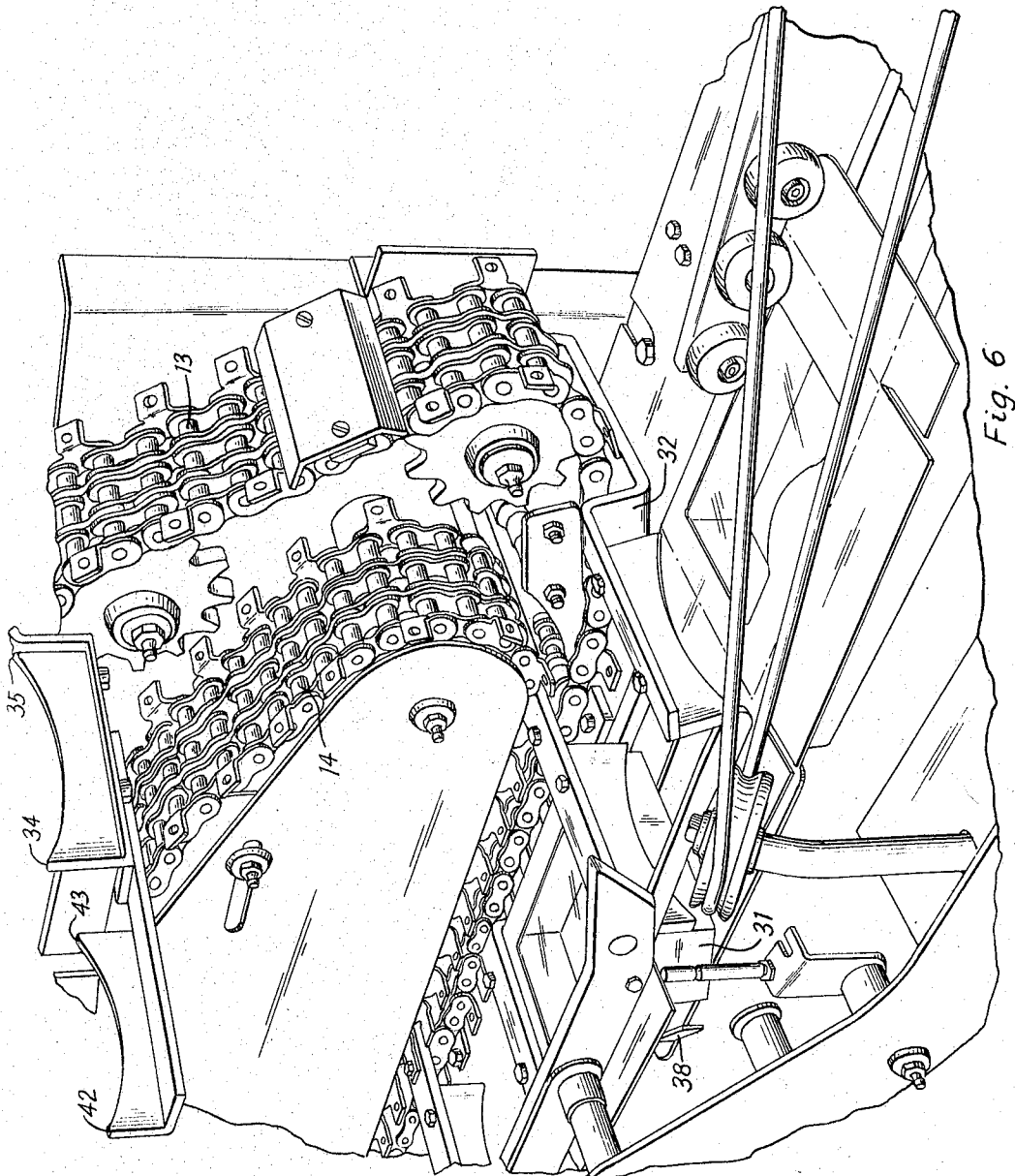


Fig. 6

INVENTOR.  
Thomas B. Brickson  
BY  
*Howard Russell*  
his ATTORNEY

Jan. 24, 1967

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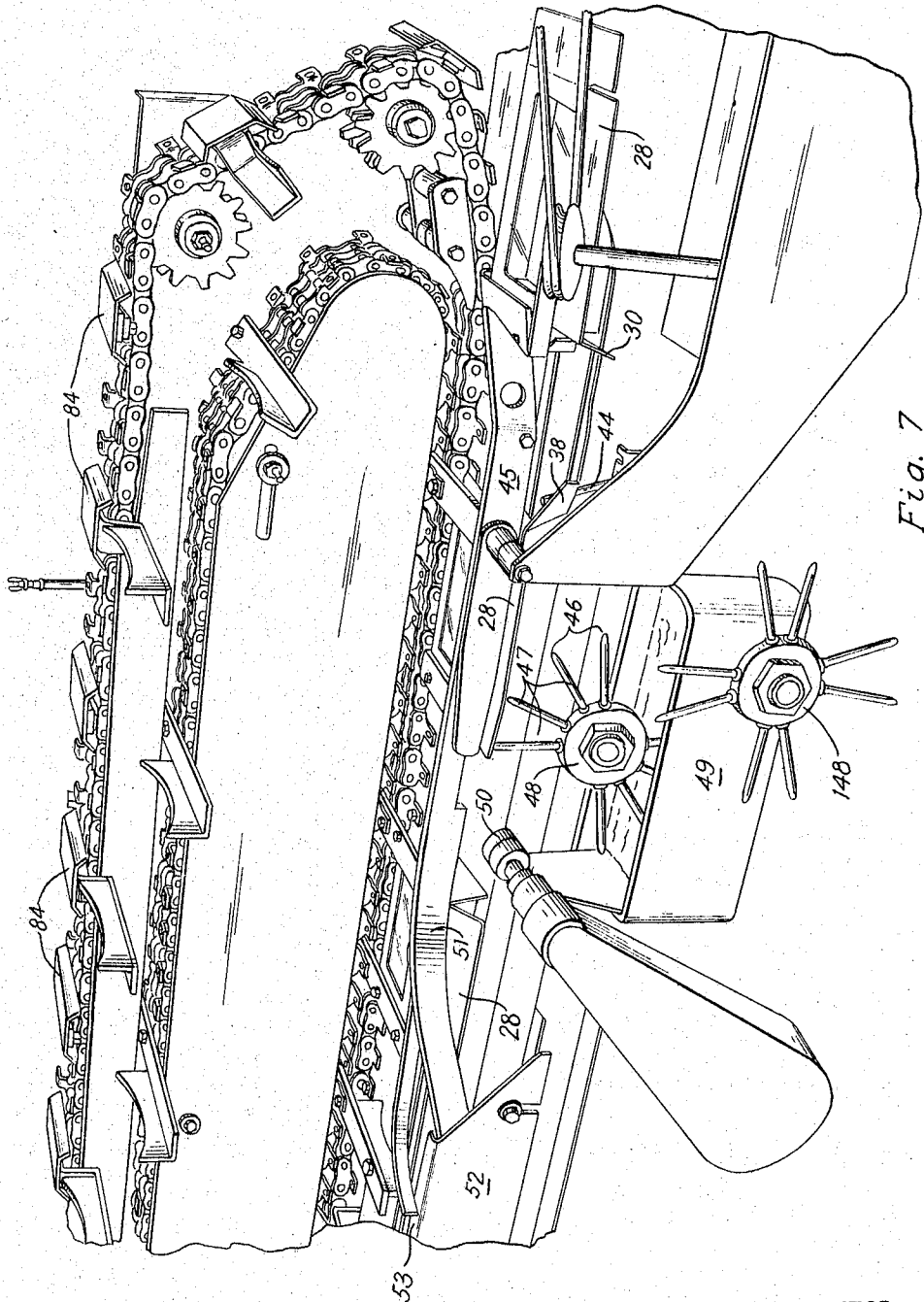


Fig. 7

INVENTOR.  
*Thomas B. Brickson*  
BY  
*Howard Russell*  
ATTORNEY

Jan. 24, 1967

T. B. BRICKSON

3,299,614

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10 Sheets-Sheet 8

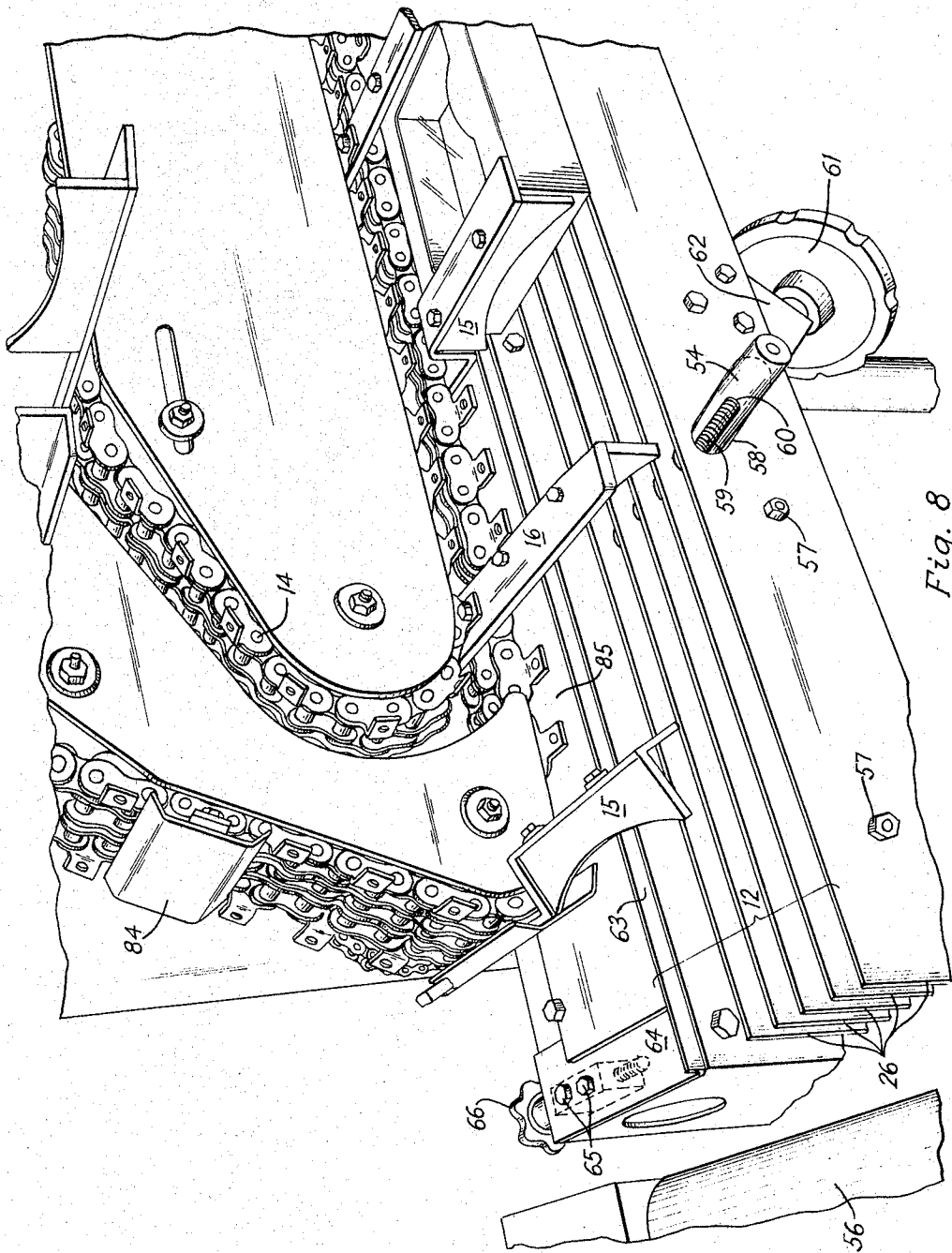


Fig. 8

INVENTOR  
Thomas B. Brickson  
BY  
*Howard Russell*  
his ATTORNEY



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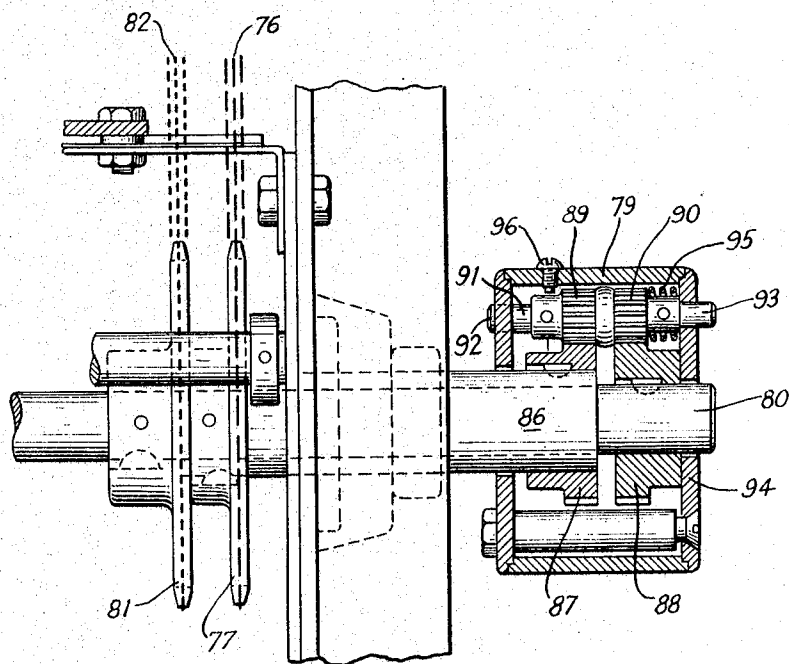


Fig. 10

INVENTOR  
Thomas B. Brickson  
BY  
*Howard Russell*  
ATTORNEY

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3,299,614

## FOLDING BOX MACHINES

Thomas B. Brickson, Palo Alto, Calif., assignor, by mesne assignments, to Kliklok Corporation, New York, N.Y., a corporation of Delaware

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13 Claims. (Cl. 53-376)

This invention relates to improvements in folding box handling machines, particularly to machines for handling hinge cover boxes during forming and closing of the hinge cover.

An inherent limitation in conventional hinge cover forming and closing machines is the difficulty, if not impossibility, of adjusting the machine for the handling of boxes of different sizes.

The packaging line of a wholesale bakery, for example, may package cupcakes during one day, doughnuts during the next day, and loaves of pound cake during the following day. Thus boxes of different height are required for each day. The width of the boxes also varies. It may even be desired to package a particular product, for example cupcakes, in units of 4, 6 and 8 all during the same day, thus requiring three boxes of different length.

The present invention provides a basic box handling mechanism which can within minutes be adjusted from one box size to another. The improved mechanism is particularly well suited for forming, gluing and, if required, sealing of hinge covers comprising a front flap and two side flaps. The cover may even be constructed as a hood type cover which, after its initial opening, may be reclosed and then remains closed by frictional engagement with the box body to which it was originally spot glued at the bakery.

The example of bakery boxes finds its parallel in other fields of merchandise.

The various aims, objects and advantages of the 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 the invention which are believed to be novel will be particularly pointed out in the claims appended hereto, the invention itself, its objects and advantages, 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:

FIG. 1 is a perspective overall view of a representative box handling machine incorporating the present invention, certain safety guards and covers being removed in this and the subsequent figures for better visibility;

FIG. 2 is a perspective view of the end of the filling or loading line in which the folding boxes are normally filled. For better clarity the boxes in this and subsequent figures are shown empty;

FIGS. 3 to 6 show, in perspective, and on an enlarged scale, the intake portion of the box handling mechanism set up to downfold the cover side flaps and fold glue tabs on the cover side flaps, the figures showing successive stages of operation;

FIG. 7 is a perspective view of the central portion of the mechanism comprising an adhesive-spot-applicator and means for folding the cover front flap into sealing position;

FIG. 8 is a perspective view of the terminal portion of the mechanism from which closed and sealed boxes are discharged;

FIG. 9 is a perspective view of a portion of the drive

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mechanism including a differential device which permits adjustment for box length; and

FIG. 10 is a section through a differential gear assembly of the machine, the section being taken on line 10-10 in FIG. 9.

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.

The machine shown in FIG. 1 comprises basically a main support or frame 11 on which a substantially horizontal box track 12 is adjustably mounted.

A pair of endless vertically disposed conveyors are mounted on the far side of the track 12 and comprise an outer conveyor 13 and an inner conveyor 14. Each conveyor is fitted with laterally extending outrigger type box handling elements. More particularly, the elements 15 of the outer conveyor are arranged to engage the leading portion of boxes supported on the box track and the elements 16 of the inner conveyor are arranged to engage the trailing portion of the boxes. When engaging the boxes, the said elements perform certain folding operations as will later be seen.

The arrangement of the conveyors is such that the respective upper rims are separate. Accordingly the elements 15 and 16 move at different levels within the upper runs.

Within the lower runs of the conveyors the elements 15, 16 move at the same level and in order to accomplish this more conveniently, the lower run of the inner conveyor 14 rests directly on the lower run of the outer conveyor 13.

The elements 15, 16 alternate in sequence and grasp boxes entering from the right between them. During passage of the boxes through the machine the cover side flaps are first folded, then adhesive is applied to the cover front flap by a star wheel applicator 17, and finally the cover front flap is folded down and the sealed box leaves the machine at the left.

Turning now to details, FIG. 2 shows the end of a packaging or filling line 18 along which boxes B travel. The box covers 19 are open, i.e., folded back as seen at B<sub>1</sub>, to permit the boxes to be loaded conveniently. In the present illustrations, however, the boxes are shown empty for greater clarity.

The boxes are advanced by a conveyor 20 fitted with upwardly extending lugs 25 (visible in FIG. 4 only) which engage the trailing wall of the box body, thus pushing the boxes forward. At the end of the filling line the boxes move into the grasp of a belt type cover closer. The closer comprises essentially an endless belt 21 whose lower run 22 moves at about the same velocity as the boxes and extends at a slant with respect to the path of the boxes. The lower belt run 22 engages the backfolded cover 19 at about the position B<sub>1</sub> and folds it gradually into closed position, as shown at B<sub>2</sub> and B<sub>3</sub>.

In order to assist in the folding operation, a sword 23 is provided which engages the boxes at the cover hinge line. Rollers 24 bearing down on the cover adjacent the cover hinge complete the folding of the cover.

In position B<sub>4</sub> the box enters the box handling machine

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proper (FIG. 3) and moves onto the box track 12 which is preferably composed of a plurality of vertical plates 26, as best seen in FIG. 8.

The specific functional purpose of the illustrated machine is to perform folding operations on the various elements of the cover, more particularly on the leading side flap 27, the front flap 28, the trailing side flap 29 and glue tabs 30 and 31 hingedly extending from the leading and trailing side flaps, respectively.

At the instant shown in FIG. 3 the element 15 has just engaged the leading side flap 27. The element is essentially a piece of angle iron attached laterally to the outer conveyor 13 by an offset bracket portion 32.

The substantially vertical forward portion of the angle iron or L is arched along its lower edge at 33 to form two points 34 and 35 which first engage the flap 27 adjacent the ends of the flap hinge line. At these points the flap folds readily, even if the end wall of the box body is bowed out by the pressure of the box contents. Bowing out of the box end wall may lead to crushing of the wall, if the cover end flap were folded down upon the bulge by a force applied to the flap centrally.

The illustrated contour results in application of folding force gradually from the ends towards the center as a result of which the bulge is gradually eliminated, as the flap 27 swings down.

The substantially horizontal upper portion 36 of the angle iron or L shaped element 15 comes to rest on the forward portion of the cover upon completion of the folding operation on the leading cover side flap 27, as shown in FIG. 4.

At about this instant the glue flap 30 on the leading cover side flap 27 moves against a trackside plow 38 and is plowed back against the front wall of the box body, underneath the outwardly extended cover front flap 28.

Up to the position shown in FIG. 4 the box is still being advanced by the lugs 25 of the conveyor 20 of the filling line. This conveyor is near the end of its run at this point and the lugs 25 are being withdrawn downwardly out of the path of the boxes within a short distance from the position shown in FIG. 4.

At this moment (FIG. 5) the box handling element 16 of the inner conveyor 14 moves into box engaging position as the conveyor links to which the element 16 is attached move around the terminal sprocket gear 39 around which the conveyor is trained. This gear is a triple sprocket gear and its teeth are visible between the links of the conveyor. The element 16 is laterally secured to the conveyor 14 by a straight bracket 40, the arrangement being that in their path over the box track the trailing element 16 moves at the same level as the leading element 15.

As seen in FIG. 5, the element 16 is of L-shaped cross section and the bottom edge of its rear portion is arched at 41 producing engagement points 42 and 43 which function in the same manner as points 34 and 35 of element 13 in flattening out the rear flap 29.

In the position shown in FIG. 5 the lugs 25 of the conveyor 20 are withdrawn and the box continues to be moved by the element 16.

As the element 16 moves on its arcuate path around the sprocket gear 39 its angular velocity is somewhat higher, temporarily, than the linear velocity of the element 15 moving on a straightaway path. The trailing element 16 therefore catches up to some degree with the leading element 15 with which it defines a box compartment, and as the distance between the two elements decreases the trailing cover side flap 29 is folded down.

When the downfolding is completed the depending or vertical portions of the elements 15 and 16 are spaced from each other by a distance which is equal to the length of the box between the elements. The box then continues to travel along the box track 12 confined between the elements, as is best seen in FIG. 1.

Returning to FIG. 5, it is seen that the glue tab 31 of the trailing cover side flaps 29 is still extended. A track-

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side kicker or finger 44 is provided for moving up behind the glue tab and folding it flat against the box front wall under the extended cover front flap 28. The forward and rearward limits of the sweep of the finger are shown in FIGS. 3 and 5, respectively. FIGURE 6 shows the finger 44 near the end of its forward sweep at which moment the tab is folded sufficiently far to be caught by the plows 38 which then complete the folding operation.

In the vicinity of the kicker finger 44 (FIG. 7) the cover front flap 28 moves under an overhead rail 45 which stabilizes the front flap at the proper height for contact with the tips 46 of the rods 47 of a star-wheel-type adhesive applicator 48 above a glue pot 49 into which the rods 47 dip. The glue pot 49 is electrically heated and contains a relatively quick setting thermoplastic adhesive.

A second star wheel applicator 148 is secured to the outside of the glue pot 49. The second wheel 148 is an exchange wheel used for applying adhesive to boxes of a greater length, as is apparent from the larger peripheral spread of the tips of the rods as compared to those of wheel 48.

The applicator applies four spots of adhesive to the underside of the front flap 28, the first spot in a position to bond the leading glue tab 30, the next two spots in a position to bond the front flap 28 to the box body wall, and the fourth spot in a position to adhere the front flap to the trailing glue tab 31.

The adhesive applicator is followed by a driven de-stringer roller 50 whose purpose is to catch and wind up strings or threads of adhesive which may be drawn out from the applicator wheel 48.

At about the position above the roller 48 a further overhead rail 51 begins to curve downwardly, thus gradually swinging the front flap 28 into sealing engagement with the box body wall.

The rail 51 then disappears behind a plate 52 of angular cross section. The plate (FIG. 1) has a top flange 53 formed on it and the edge of the flange bears against the folded front flap 28 and maintains it in sealing engagement with the box body.

For the purpose of taking the photograph from which FIG. 8 is traced, the plate 52 was removed so that other details would be visible. The plate 52 was attached to the lateral stud 54 (FIG. 8) by a bolt 55 (FIG. 1).

The plate 52 extends to the end of the machine at which the box enclosing compartments open by withdrawal of the respective leading box engaging element 15 while the trailing element 16 still advances the box until it is transferred to the carry-out conveyor belt 56 (FIGS. 1 and 8).

FIGURE 8 shows the construction of the box track particularly clearly. A set of vertical track plates 26 is bolted together at 57 and rests on the stud 54 in diagonal guideways 58 cut into the plate.

The stud 54 has a tapped hole extending through it at a slant and a spindle 59 extends through the hole at 60. A hand wheel 61 on the spindle bears against a slanted block 62 on the plates 26. When turned in one direction the spindle lifts the blocks 62 and the plates 26 relatively to the stud, thus raising the surface of the box track in relation to the conveyors 13, 14 and to the lateral box handling elements 15, 16 thereon.

The other end of the track rests on a similar stud by means of a slanted guideway which is not equipped with a spindle. The hand wheel 61 therefore constitutes the only control to be operated for a height adjustment of the track, i.e., the adjustment to set the machine for taller or lower boxes.

The width of the track is variable by moving an adjustable flange or rail 63 which is attached to horizontal mounting plates 64, one such plate being visible in FIG. 8. The rail is also well visible in FIG. 4. A spindle on a hand wheel or knob 66 (FIG. 8) extends through the tapped hole of a block attached to the underside of the plate 64 by bolts 65. Spindle and block are obscured by the plate 64, but it is evident that turning of the knob

66 moves the rail 63 towards, or away from, the observer, thus changing the width of the box track 12. There is one such width adjustment at each end of the machine. The hand wheel is also shown in FIG. 9.

The driving mechanism, certain details of construction, and the adjustment of the box compartment for different lengths are shown in FIG. 9.

The machine is operated in timed relationship with the filling or loading conveyor line on which the boxes arrive. It is therefore convenient to drive the machine from the power unit of that line.

A power input shaft 67 from the power unit of the loading line leads to a right angle drive 68. A drive chain 69 extends from the angle drive 68 to a sprocket 70 on a main drive shaft 71.

As most elements of the drive mechanism are hidden between the heavy sheet metal side plate 72, the various gears and chains are diagrammatically indicated on the plate.

Two separate yet interconnected drive circuits are provided, a first circuit for driving a drive gear 73 of the inner conveyor and a second circuit for driving a drive gear 74 of the outer conveyor 13.

The first circuit comprises a gear 75 which is fixed on the shaft 71 (but only diagrammatically shown). A chain 76 extends from the gear 75 around a differential input gear 77 and leads thence at an upward slant to the drive gear 73 and thence downward around an idler gear 78 back to the gear 75.

A hollow outer shaft 86 (FIG. 10) extends from the differential input gear 77 to a differential gear train enclosed in a housing 79 which rotates with the gear 77. The output shaft 80 of the differential has an output gear 81 on it which is an element of the second circuit. A drive chain 82 extends from gear 81 up to the drive gear 74 of the outer conveyor and thence down around a further idler 83 back to the differential output gear.

When the shaft 67 is driven the inner conveyor 14 is driven directly from the shaft 71 by the chain 76 which also drives the differential input gear 77. The outer conveyor is driven by the differential by the chain 82.

The differential gear assembly shown in FIG. 10 comprises, more particularly, a first spur gear 87 keyed to the hollow outer shaft 86. The solid output shaft 80 has a further spur gear 88 keyed to it. A pair of pinions 89 and 90 are fixed on a common pinion shaft 91 pivotally supported in the housing 79 at 92 and 93.

The pinions 89 and 90 have an unequal number of teeth, for example pinion 89 may have 11 teeth and pinion 90 may have 12 teeth, so that one revolution of the pinion assembly, produced by rotation of the housing 79, advances one spur gear with respect to the other by one tooth.

The pinions 89, 90 remain in mesh with the spur gears 87, 88 at all times, but the housing 79 is axially movable against the action of a spring 95 from a position in which its face 94 is flush with the end of the shaft 80 (FIG. 9) into a depressed position as shown in FIG. 10.

A hardened lock pin or screw 96 extends through the peripheral wall of the housing in a position in which it engages the teeth of pinion 89 when the housing is in extended position, flush with the end of the shaft 80, thus locking the entire differential gear train.

In the depressed position shown in FIG. 10, the pin 96 clears the pinion 89 thus permitting one spur gear to be advanced with respect to the other by rotation of the housing 79.

If now one conveyor is to be advanced relatively to the other in order to change the spacing of the elements 15 and 16 which define the box compartments, the housing 79 of the differential drive is turned by hand while the machine is at rest. For the purpose of the adjustment the inner conveyor 14 may be considered as stationary because it is blocked by the drive 67, 68 which is at rest. Turning of the differential housing therefore causes the

shaft 80 to turn, whereby the proper distance between the elements 15 and 16 may be set.

As best seen in FIGS. 7 and 8, the outer conveyor 13 is fitted with glide pads or skids 84 which glide on a track plate 85 (see also FIG. 9) extending the length of the machine. The glide pads stabilize the lower run of the conveyor and steady the laterally extending elements 15.

The lower run of the inner conveyor 14 rests directly on the lower run of the outer conveyor and its arms 40 are steadied by this engagement and by the very considerable weight of the chain structure 14.

It is obvious to persons skilled in the art that the box handling elements 15 and 16 may assume other forms than shown and that they may be used for the performance of other operations on boxes moving along the box track 12.

What is claimed is:

1. A folding box handling machine comprising, in combination, means forming a substantially horizontal track for boxes to be moved along said track; a pair of endless conveyors, said conveyors being disposed upright and one inside the other alongside said track; a first set of forward box engaging elements; a second set of rearward box engaging elements, said two sets of elements forming compartments above said track for enclosure of boxes within said compartments as they move along said track, the forward elements being adapted to engage the leading wall of boxes, the rearward elements being adapted to engage the trailing wall of boxes, an element of the first set being paired with an element of the second set to form a particular compartment, the first set of forward elements being laterally attached to one of said pair of conveyors so as to move above said track, the second set of rearward elements being laterally attached to the other of said pair of conveyors so as to move above said track; and drive means for moving both conveyors in the same direction and at the same linear velocity.

2. A folding box handling machine comprising, in combination, means forming a substantially horizontal track for boxes to be moved along said track; a pair of endless conveyors, said conveyors being disposed upright and one inside the other alongside said track; a first set of forward box engaging elements; a second set of rearward box engaging elements, said two sets of elements forming compartments above said track for enclosure of boxes within said compartments as they move along said track, the forward elements being adapted to engage the leading wall of boxes, the rearward elements being adapted to engage the trailing wall of boxes, an element of the first set being paired with an element of the second set to form a particular compartment, the first set of forward elements being laterally attached to the outer conveyor in a position above said track, considering the lower run of the outer conveyor, the second set of rearward elements being laterally attached to the inner conveyor in a position above said track, considering the lower run of the inner conveyor; and drive means for moving both conveyors in the same direction and at the same linear velocity.

3. A folding box handling machine comprising, in combination, means forming a substantially horizontal track for boxes to be moved along said track; a pair of endless conveyors, said conveyors being disposed upright and one inside the other alongside said track; a first set of forward box engaging elements; a second set of rearward box engaging elements, said two sets of elements forming compartments above said track for enclosure of boxes within said compartments as they move along said track, the forward elements being adapted to engage the leading wall of boxes, the rearward elements being adapted to engage the trailing wall of boxes, an element of the first set being paired with an element of the second set to form a particular compartment, the first set of forward elements being laterally attached

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to one of said pair of conveyors so as to move above said track, the second set of rearward elements being laterally attached to the other of said pair of conveyors so as to move above said track; drive means for moving both conveyors in the same direction and at the same linear velocity; and means for advancing one conveyor relatively to the other, independent of said drive means, whereby the length of the compartments may be varied.

4. A folding box handling machine comprising, in combination, means forming a substantially horizontal track for boxes to be moved along said track; a pair of endless conveyors, said conveyors being disposed upright and one inside the other alongside said track; a first set of forward box engaging elements; a second set of rearward box engaging elements, said two sets of elements forming compartments above said track for enclosure of boxes within said compartments as they move along said track, the forward elements being adapted to engage the leading wall of boxes, the rearward elements being adapted to engage the trailing wall of boxes, an element of the first set being paired with an element of the second set to form a particular compartment, the first set of forward elements being laterally attached to the outer conveyor in a position above said track, considering the lower run of the outer conveyor, the second set of rearward elements being laterally attached to the inner conveyor in a position above said track, considering the lower run of the inner conveyor; drive means for moving both conveyors in the same direction and at the same linear velocity; and means for changing the length of said compartments by advancing one conveyor relatively to the other.

5. A folding box handling machine comprising, in combination, means forming a substantially horizontal track for boxes to be moved along said track; a pair of endless conveyors, said conveyors being disposed upright and one inside the other alongside said track; a first set of forward box engaging elements, said elements being substantially of inverted L-shape in cross section, the vertical portion of the element being adapted to engage the leading wall of a box moving on said track, the horizontal portion of the L being adapted to overlie the leading portion of the top of the box; a second set of rearward box engaging elements, said last named elements being substantially of inverted and reversed L-shape in cross section, the vertical portion of the latter elements being adapted to engage the trailing wall of a box moving on said track, the horizontal portion of the latter elements being adapted to overlie the trailing portion of the top of the box, an element of the first set being paired with an element of the second set to form a particular compartment, the first set of forward elements being laterally attached to the outer conveyor, the second set of rearward elements being laterally attached to the inner conveyor; drive means for moving both conveyors in the same direction and at the same linear velocity; means for raising and lowering said track-forming means relatively to said conveyors for adjustment of said compartments for height; and means for advancing one conveyor relatively to the other for adjustment of said compartments for length.

6. A folding box handling machine comprising, in combination, means forming a substantially horizontal track for boxes to be moved along said track; a pair of endless conveyors, said conveyors being disposed upright and one inside the other alongside said track; a first set of forward box engaging elements, said elements being substantially of inverted L-shape in cross section, the vertical portion of the element being adapted to engage the leading wall of a box moving on said track, the horizontal portion of the L being adapted to overlie the leading portion of the top of the box; a second set of rearward box engaging elements, said last named elements being substantially of inverted and reversed L-shape in cross section, the vertical

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portion of the latter elements being adapted to engage the trailing wall of a box moving on said track, the horizontal portion of the latter elements being adapted to overlie the trailing portion of the top of the box, an element of the first set being paired with an element of the second set to form a particular compartment, the first set of forward elements being laterally attached to the outer conveyor, the second set of rearward elements being laterally attached to the inner conveyor; drive means for moving both conveyors in the same direction and at the same linear velocity; means for raising and lowering said track-forming means relatively to said conveyors for adjustment of said compartments for height; a first lateral rail alongside one side of said track; a second lateral rail alongside the other side of the track; means for adjusting the horizontal distance of one of said rails relatively to the other for adjustment of the width of the compartments; and means for advancing one conveyor relatively to the other for adjustment of said compartments for length.

7. A folding box handling machine comprising, in combination, means forming a substantially horizontal track for boxes to be moved along said track; a pair of endless conveyors, said conveyors being disposed upright and one inside the other alongside said track; a first set of forward box engaging elements, said elements being substantially of inverted L-shape in cross section, the vertical portion of the element being adapted to engage the leading wall of a box moving on said track, the horizontal portion of the L being adapted to overlie the leading portion of the top of the box; a second set of rearward box engaging elements, said last named elements being substantially of inverted and reversed L-shape in cross section, the vertical portion of the latter elements being adapted to engage the trailing wall of a box moving on said track, the horizontal portion of the latter elements being adapted to overlie the trailing portion of the top of the box, an element of the first set being paired with an element of the second set to form a particular compartment, the first set of forward elements being laterally attached to the outer conveyor, the second set of rearward elements being laterally attached to the inner conveyor; drive means for moving both conveyors in the same direction and at the same linear velocity; means for raising and lowering said track-forming means relatively to said conveyors for adjustment of said compartments for height; a front rail alongside that side of the track which lies adjacent to the free ends of said L-shaped elements; a rear rail alongside the other side of the track which lies adjacent said conveyors; means for moving said rear rail parallel to itself, towards and away from said front rail, respectively, for adjustment of the width of the compartments; and means for advancing one conveyor relatively to the other for adjustment of said compartments for length.

8. A folding box handling machine comprising, in combination, means forming a substantially horizontal track for boxes to be moved along said track; an outer endless substantially vertically disposed conveyor; upper supporting means for supporting the upper run of said conveyor; lower supporting means for supporting the lower run of said conveyor at a vertical distance below said upper run and adjacent said box track; an inner endless conveyor of a shorter overall length than said outer conveyor, the inner conveyor being vertically disposed inside said outer conveyor; intermediate supporting means for supporting the upper run of said inner conveyor below said upper supporting means; terminal guide means for the ends of said inner conveyor, said terminal guide means being so disposed as to cause the lower run of said inner conveyor to rest on top of the lower run of said outer conveyor to be supported thereby; a first set of forward box engaging elements laterally secured to said outer conveyor in a position to move above said track; a second set of rearward box engaging elements laterally secured to

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said inner conveyor in a position to move above said track and in staggered sequence with the first elements, considering the respective lower runs of the conveyors; and drive means for moving both conveyors in the same direction at the same linear velocity.

9. A folding box handling machine comprising, in combination, means forming a substantially horizontal track for boxes to be moved along said track; an outer endless substantially vertically disposed conveyor; upper supporting means for supporting the upper run of said conveyor; a lower plate for supporting the lower run of said conveyor at a vertical distance below said upper run and adjacent said track; glide pads on the periphery of said conveyor for slidably resting the lower run of said conveyor on, and stabilizing the lower run relatively to, said lower plate; an inner endless conveyor of a shorter overall length than said outer conveyor, the inner conveyor being vertically disposed inside said outer conveyor; intermediate supporting means for supporting the upper run of said inner conveyor below said upper supporting means; terminal guide means for the ends of said inner conveyor, said terminal guide means being so disposed as to cause the lower run of said inner conveyor to rest on top of the lower run of said outer conveyor to be supported thereby; a first set of forward box engaging elements laterally secured to said outer conveyor in a position to move above said track; a second set of rearward box engaging elements laterally secured to said inner conveyor in a position to move above said track and in staggered sequence with the first elements, considering the respective lower runs of the conveyors; drive means for moving both conveyors in the same direction at the same linear velocity; and means for differentially advancing one conveyor relatively to the other so as to vary the spacing between said two sets of box engaging elements.

10. A folding box handling machine comprising, in combination, means forming a substantially horizontal track for boxes to be moved along said track; an outer endless substantially vertically disposed conveyor; upper supporting means for supporting the upper run of said conveyor; lower supporting means for supporting the lower run of said conveyor at a vertical distance below said upper run and adjacent said box track; an inner endless conveyor of a shorter overall length than said outer conveyor, the inner conveyor being vertically disposed inside said outer conveyor; intermediate supporting means for supporting the upper run of said inner conveyor below said upper supporting means; terminal guide means for the ends of said inner conveyor, said terminal guide means being so disposed as to cause the lower run of said inner conveyor to rest on top of the lower run of said outer conveyor to be supported thereby; a first set of angular forward elements for engaging the leading wall and the top wall of boxes moving on said track, said first set of elements being laterally secured to said outer conveyor; a second set of angular rearward elements for engaging the trailing wall and the top wall of boxes

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moving on said track, said second elements being laterally secured to said inner conveyor in staggered sequence with the elements for said outer conveyor; means for adjusting the said track vertically in relation to the path of those of said elements which extend from the lower runs of the respective conveyors; a lateral rail along said track adjacent the lower runs of said conveyors; means for adjusting the said rail towards, and away from the free ends of said elements, respectively; an adhesive applicator on the side of the track opposite said rail in a position to apply adhesive to the underside of the cover front flaps of boxes moving on said track; means alongside said track for downfolding said cover front flap downstream of said applicator; means for urging the downfolded front flap into engagement with the box body, said last named means being located downstream with respect to said downfolding means; drive means for moving both conveyors in the same direction at the same linear velocity; and means for differentially advancing one conveyor relatively to the other so as to vary the spacing between said two sets of box engaging elements.

11. A machine as defined in the preceding claim 10 in which said elements are substantially of inverted L-shape, the vertical portion of the L which extends transverse to said track having an arched lower edge to provide greater clearance of the arch at its central portion than at its ends, considering the said elements on the lower run of said conveyors.

12. A folding box handling machine comprising, in combination, means forming a substantially horizontal track for boxes to be moved along said track; a pair of endless conveyors disposed vertically alongside said track, one conveyor being arranged inside the other; one set of box engaging elements; another set of box engaging elements, said two sets of elements forming compartments above said track for boxes to be moved along said track, one set of elements being adapted to engage the leading wall of boxes, the other set of elements being adapted to engage the trailing wall of boxes, an element of the one set being paired with an element of the other set to form a particular compartment, the one set of elements being laterally attached to one of said pair of conveyors so as to move above said track, the other set of elements being laterally attached to the other of said pair of conveyors so as to move above said track; common drive means for moving both conveyors in the same direction and at the same linear velocity; and means for moving one conveyor relatively to the other so as to change the distance between paired elements.

13. A folding box handling machine as claimed in the preceding claim 12 in which said means for moving one conveyor relatively to the other is a differential gear train.

No references cited.

WILLIAM W. DYER, JR., *Primary Examiner*.  
J. M. MEISTER, *Assistant Examiner*.