April 30, 1968 L. A. PLATT 3,380,228

BOX LIDDER

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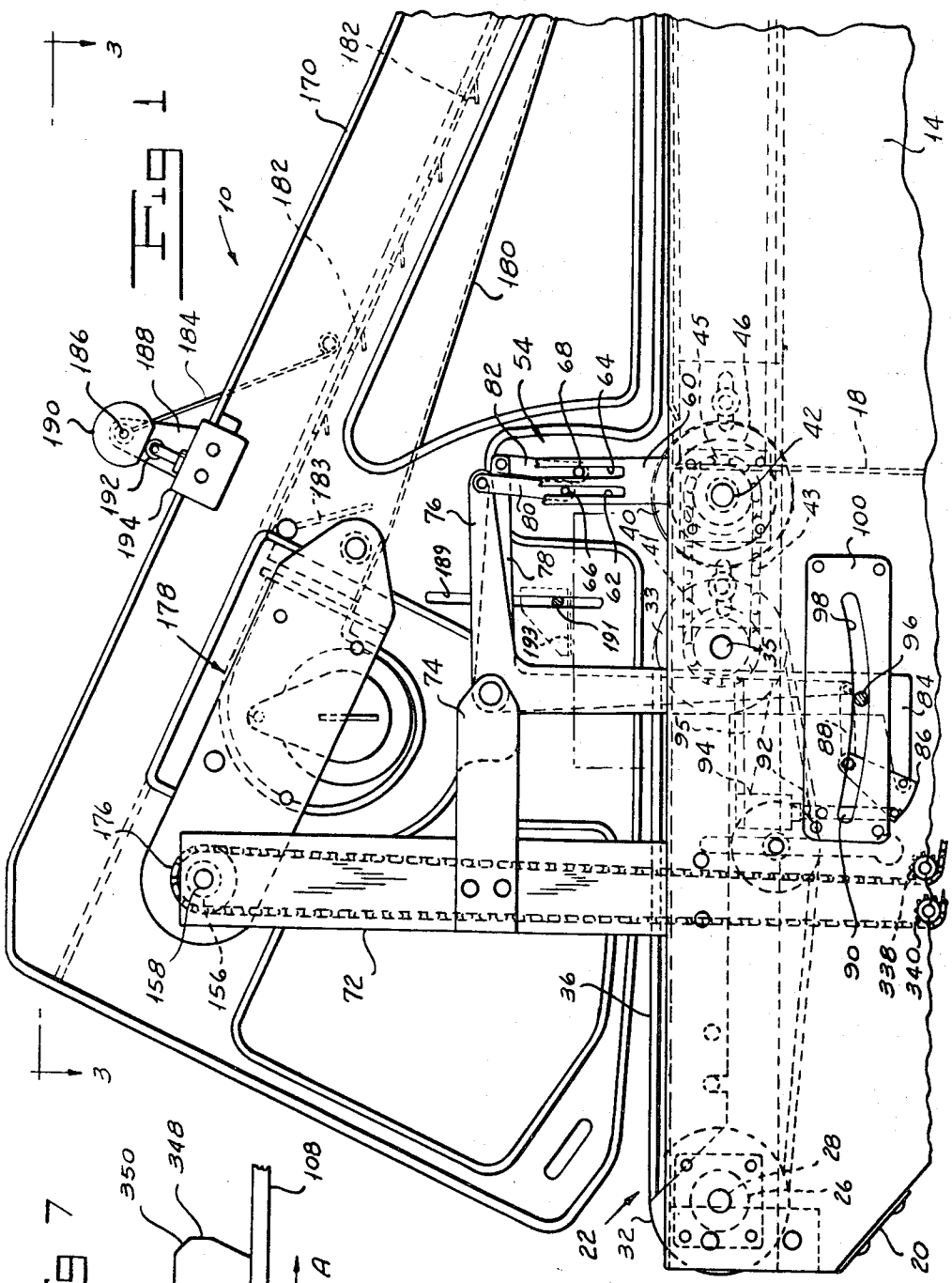

FIG. 1

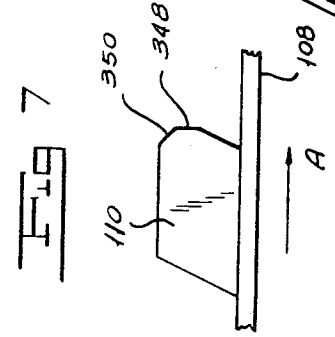

FIG. 7

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BOX LIDDER

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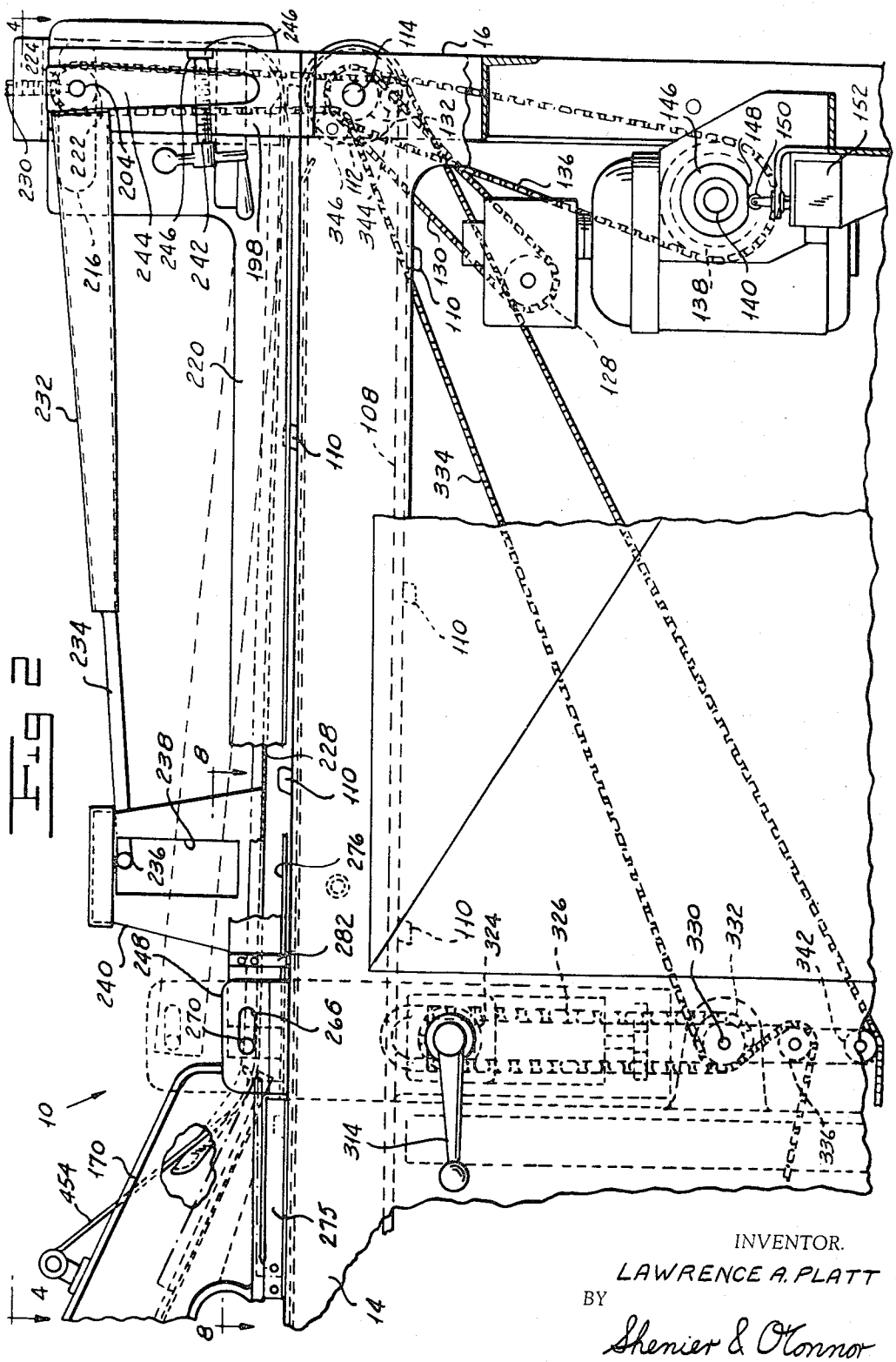

FIG 2

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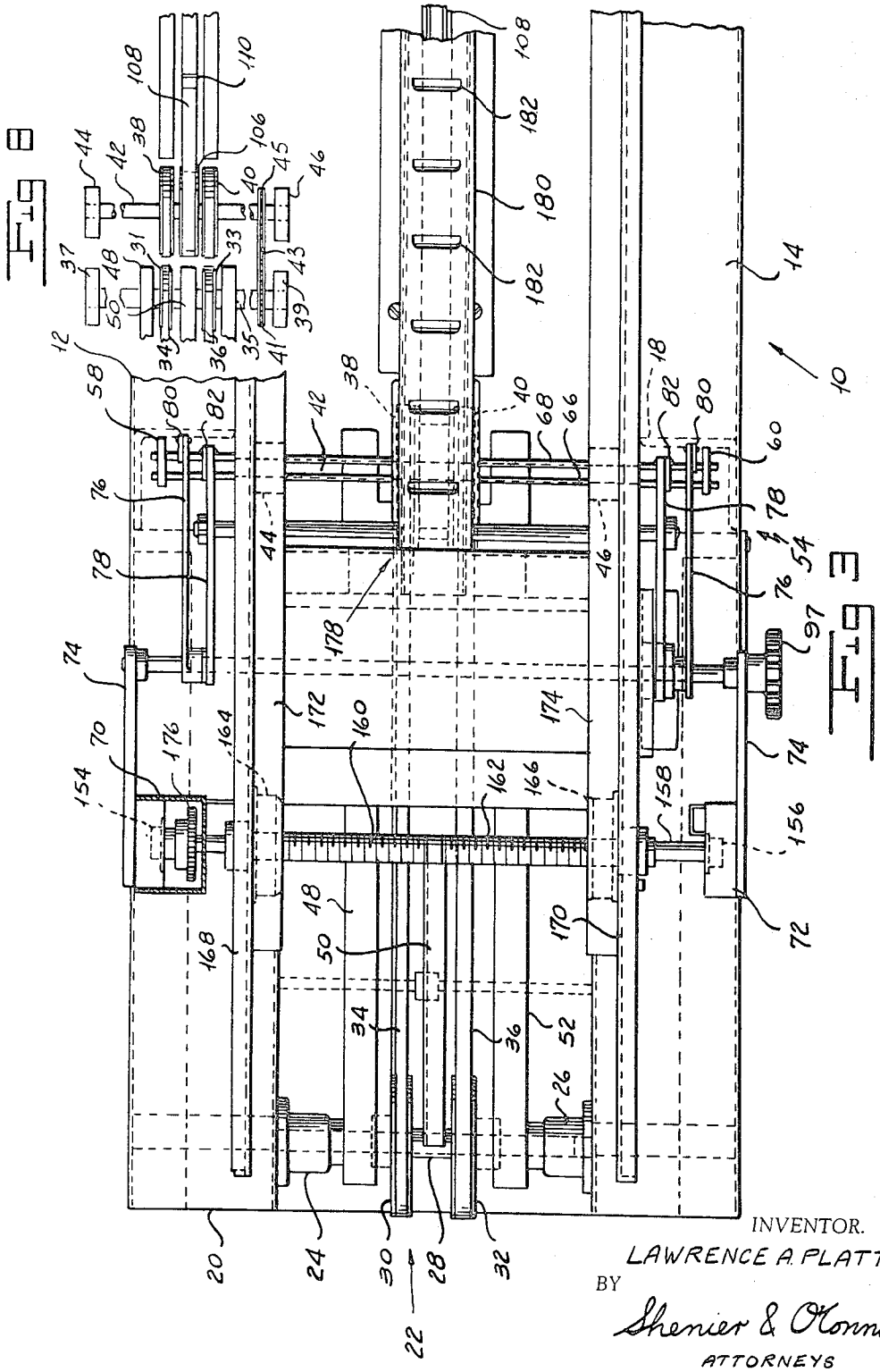

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BOX LIDDER

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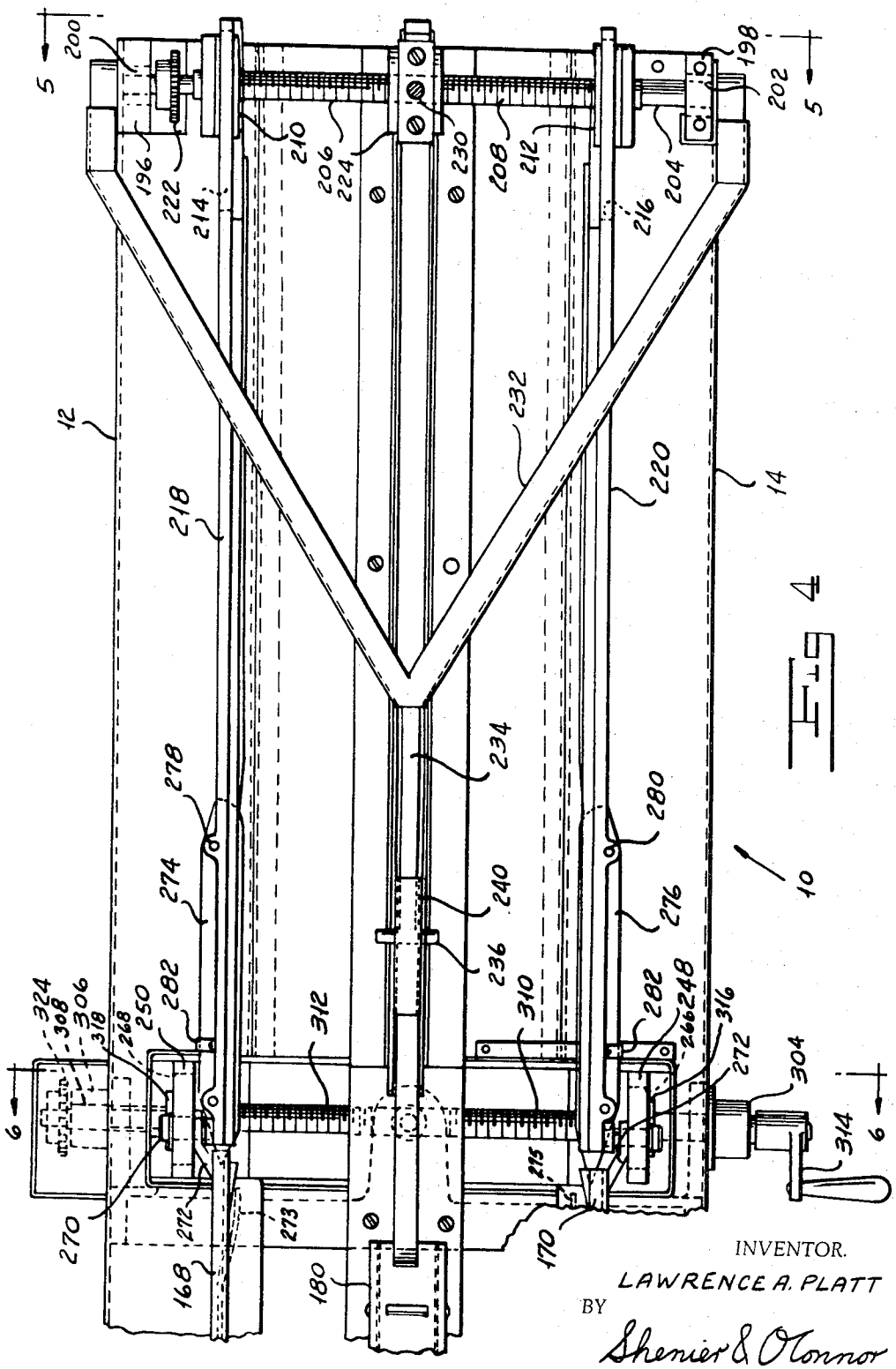

FIG 4

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BOX LIDDER

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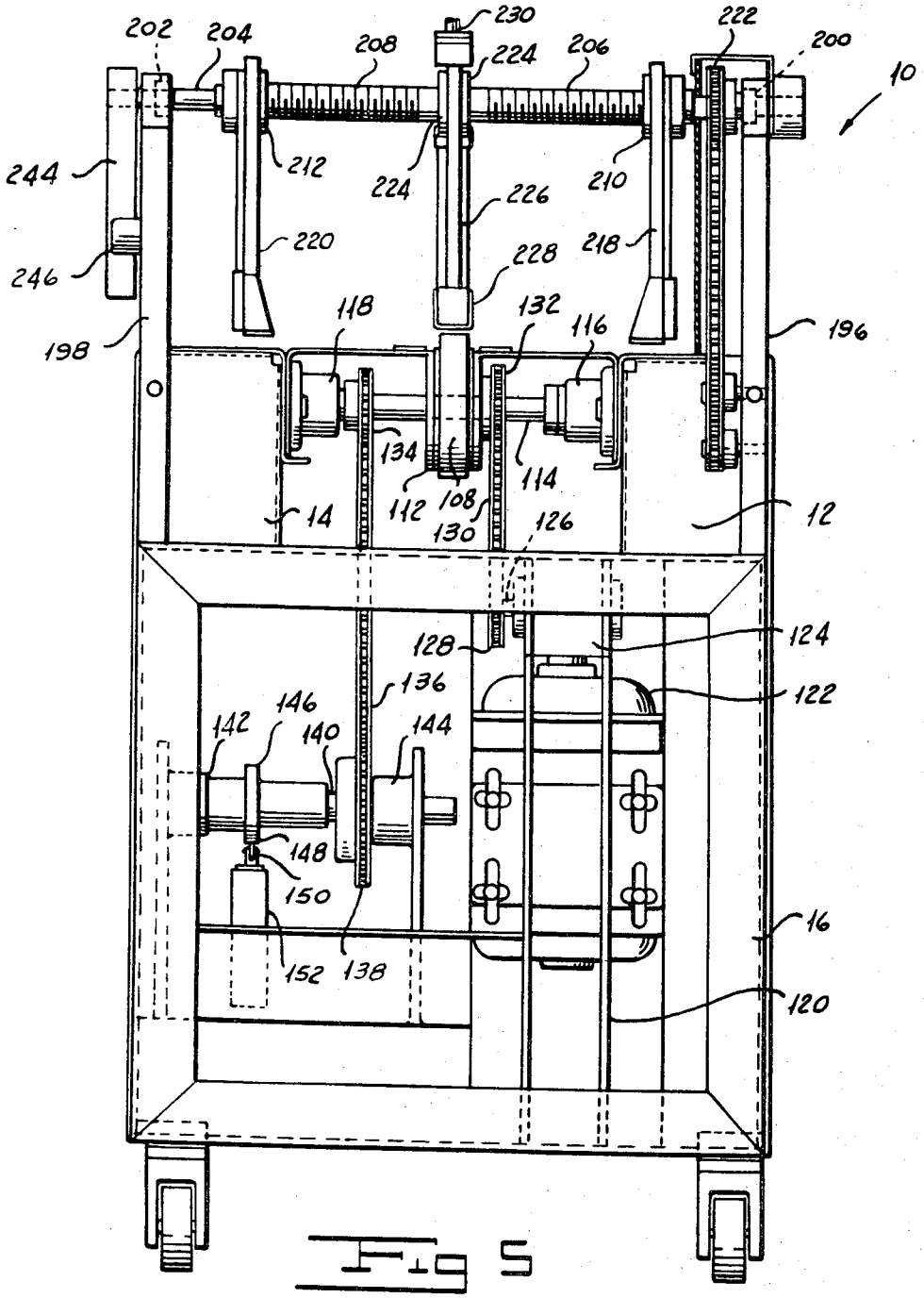

Fig 5

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BOX LIDDER

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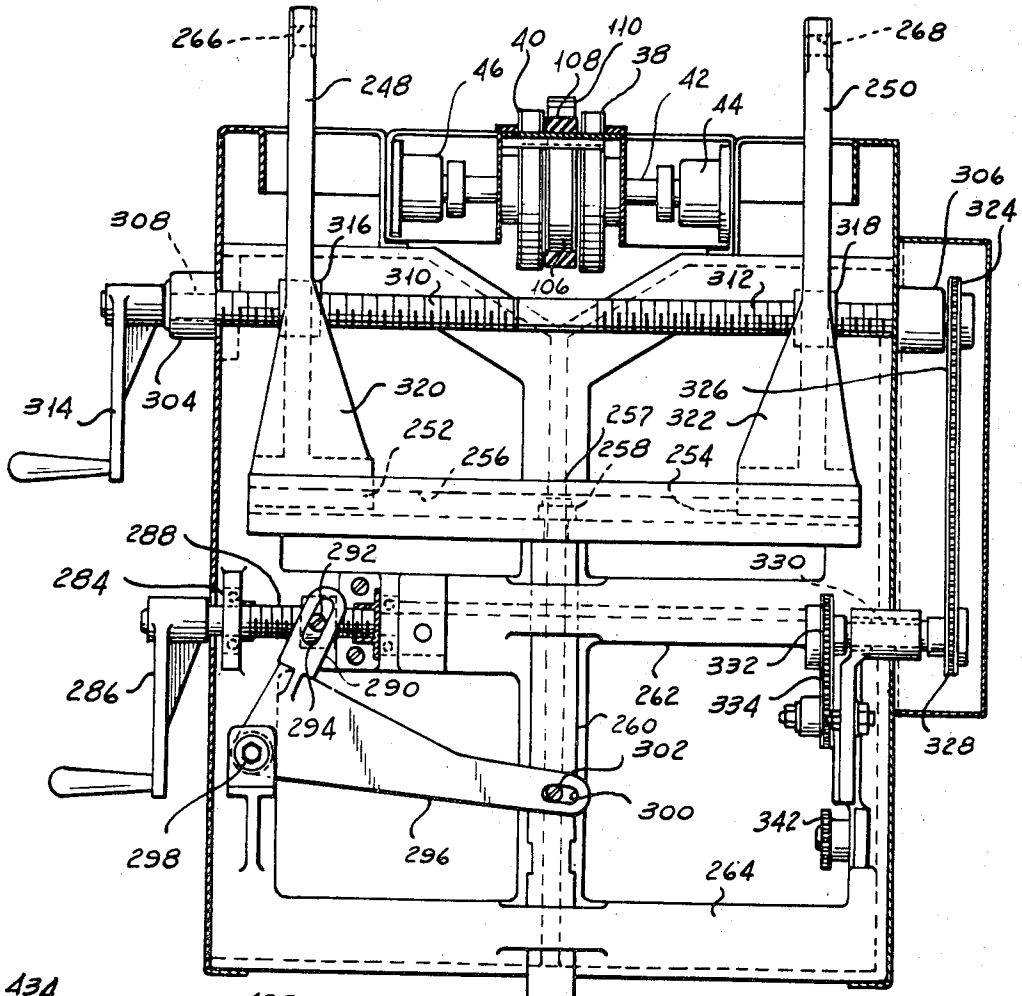
Fig 6



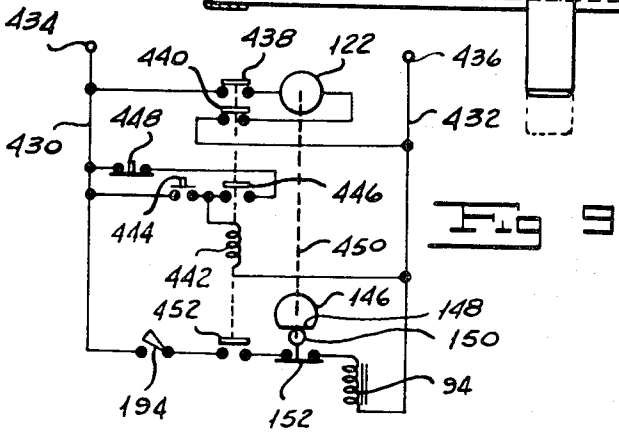


Fig 9

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United States Patent Office 3,380,228
Patented Apr. 30, 1968

3,380,228

BOX LIDDER

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Filed June 30, 1964, Ser. No. 379,233
6 Claims. (Cl. 53—315)

My invention relates to an improved box lidder and more particularly to box lidding apparatus which facilitates the assembly of lids on box bottoms and which is readily adjustable to accommodate a wide range of box sizes.

One of the most difficult problems facing many manufacturers is that of packaging manufactured articles which are to be placed in boxes for sale. In the prior art this is largely a manual operation wherein the packer takes a bottom from a supply of bottoms, places the article or articles in the bottom, takes a lid from a supply of lids and then places the lid on the bottom. It will readily be appreciated that this manual operation is relatively expensive.

It has been suggested in the prior art that automatic equipment be provided for assembling lids on bottoms to provide the packer with a supply of lidded boxes. The apparatus proposed in the prior art suffers from a number of defects and limitations. The equipment is relatively complicated for the result achieved. No provision is made for accommodating boxes of different size so that one machine can handle only one size box. Bottoms and lids having minor imperfections may prevent their assembly so as to disrupt the operation of the machine or at least destroy the box.

I have invented an improved box lidder which overcomes the disadvantages of box lidders which have been proposed in the prior art. My lidder accommodates minor imperfections in bottoms and lids so as effectively to assemble even lids and bottoms with such minor defects. My box lidder is readily adjustable to accommodate a wide range of box sizes. I so arrange my lidder as to permit the complete assembly of fully telescoping lids on bottoms.

One object of my invention is to provide an improved box lidder which will accommodate minor imperfections in lids and bottoms so as to assemble such lids on such bottoms.

Another object of my invention is to provide an improved box lidder which readily accommodates a wide range of box sizes.

A further object of my invention is to provide an improved box lidder which permits the assembly of fully telescoping lids on bottoms.

A still further object of my invention is to provide an improved box lidder for assembling lids on bottoms in a rapid and expeditious manner.

Other and further objects of my invention will appear from the following description.

In general my invention contemplates the provision of an improved box lidder in which an adjustable escapement mechanism releasably holds a box bottom in position to be engaged by a conveyor pusher adapted to engage the bottom to move it into engagement with a lid and through an assembly zone wherein the lid and bottom are assembled. My pusher bows the back wall of the bottom inwardly as it moves through the assembly zone so as to facilitate movement of the lid into assembled position on the bottom.

In the accompanying drawings which form part of the instant specification and which are to be read in conjunction therewith and in which like reference numerals are used to indicate like parts in the various views:

FIGURE 1 is a fragmentary side elevation of the end of my box lidding apparatus which receives bottoms and tops to be assembled.

FIGURE 2 is a fragmentary side elevation of my box lidding apparatus showing the portion of the apparatus wherein bottoms are assembled with tops.

FIGURE 3 is a fragmentary top plan view of my box lidding apparatus taken along the line 3—3 of FIGURE 1.

FIGURE 4 is a fragmentary top plan view of my box lidding apparatus taken along the line 4—4 of FIGURE 2.

FIGURE 5 is an end elevation of my box lidding apparatus illustrating the end at which lidded boxes are delivered.

FIGURE 6 is a sectional view of my box lidding apparatus taken along the line 6—6 of FIGURE 4.

FIGURE 7 is a fragmentary view of the driving conveyor of my lidding apparatus illustrating the configuration of one of the conveyor pushers.

FIGURE 8 is a fragmentary plan view of a portion of my box lidding apparatus illustrating the connection between the bottom feeding conveyor and the driving conveyor thereof.

FIGURE 9 is a schematic view illustrating one form of electrical control circuit which can be employed with my lidding apparatus.

Referring to FIGURES 1, 3, 5 and 8 of the drawings, the box lidding portion of my apparatus, indicated generally by the reference character 10, comprises respective side walls 12 and 14 held in asembled relationship by a front frame 16, a rear frame 18 and a cross brace 20 secured to the portions of the walls 12 and 14 extending beyond the rear frame as viewed in FIGURE 1.

I provide my machine with a first conveyor indicated generally by the reference character 22 which receives box bottoms. Respective bearings 24 and 26 carried by the walls 12 and 14 rotatably support a shaft 28 carrying a pair of pulleys 30 and 32. V-belts 34 and 36 carried by the pulleys 30 and 32 extend around pulleys 31 and 33 carried by a shaft 35 rotatably supported in bearings 37 and 39 on the sides 12 and 14. Box bottoms fed to the conveyor 22 including the belts 34 and 36 are carried over guides 48, 50 and 52 toward an escapement mechanism indicated generally by the reference character 54. A sprocket wheel 45 carried by a shaft 42 supported in bearings 44 and 46 on sides 12 and 14 drives a chain 43 which drives a wheel 41 on shaft 35.

Each of a pair of upright guides 58 and 60 on the sides 12 and 14 has respective slots 62 and 64 therein. The pair of slots 62 receive a stop bar 66 while the slots 64 receive an escapement bar 68. Respective uprights 70 and 72 on the sides 12 and 14 carry brackets 74, each of which brackets supports a stop bar adjusting arm 76 and an escapement actuating arm 78. Respective links 80 and 82 pivotally connect arms 76 and 78 to the ends of the bars 66 and 68. I provide the arm 76 adjacent side 14 with an extension 84 which pivotally supports a bell crank 86. A link 88 connects one arm of the bell crank 86 to the end of arm 78. A link 90 connects the other bell crank arm to the armature 92 of a solenoid 94. Arm 76 also carries a shaft 96 which rides in an arcuate slot 98 in a plate 100. A knob 97 threaded on the end of shaft 96 permits the position of the shaft in slot 98 to be adjusted to position the bars 66 and 68 to accommodate box bottoms of various heights. A bracket 95 supports the solenoid 94 on the arm 78 for movement therewith readily to permit adjustment of bar 68.

From the structure just described, it will be apparent that a box bottom fed to the conveyor 22 is carried by the conveyor to a point at which the front of the box is engaged by the escapement rod 68. Rod 66 is so positioned

with respect to the rod 68 that it overlies a box bottom in engagement with the escapement bar 68. As will be described hereinafter, when a box bottom is to be released for engagement with a lid, solenoid 94 is energized to rotate bell crank 86 in a clockwise direction as viewed in FIGURE 1 to pivot arm 78 slightly in a counterclockwise direction to lift the bar 68 a sufficient distance to free the box bottom. Shaft 42 carries accelerating rolls 38 and 40 which accelerate a bottom leaving the escapement mechanism 54.

Referring now to FIGURES 1 to 5 and 8, shaft 42 also carries for rotation therewith a pulley 106 carrying a timing belt 108 provided with a plurality of lugs 110 adapted to engage the rear of a box bottom to move the bottom to a position at which it can engage a lid. Belt 108 also extends around a timing belt pulley 112 carried by a shaft 114 supported in bearings 116 and 118 in the sides 12 and 14. A bracket 120 carried by the front frame 16 supports a drive motor 122 which when energized drives a speed reducer 124, the output shaft 126 of which carries a sprocket wheel 128 for driving a pitch chain 130 which drives a sprocket wheel 132 on shaft 114. Shaft 114 carries a second sprocket wheel 134 which drives a pitch chain 136 in engagement with a sprocket wheel 138 on a shaft 140 rotatably supported in bearings 142 and 144 carried by the machine frame. Shaft 140 carries a cam 146 having a flat 148 thereon which is engaged by a follower 150 to permit a microswitch 152 to close once during each revolution of shaft 140. As will be explained hereinafter, switch 152 permits the release of a box bottom by the escapement bar 68 in timed relation to the arrival of a lug 110 at a position at which it can engage the rear of a box bottom.

The uprights 70 and 72 carry bearings 154 and 156 which rotatably support a shaft 158. Shaft 158 has oppositely threaded portions 160 and 162 extending outwardly from the center of the shaft. The respective portions 160 and 162 receive threaded bosses 164 and 166 on lid guide side plates 168 and 170 provided with flanges 172 and 174 down which lids are guided in a manner to be described. It will readily be apparent that if shaft 158 is turned, the side plates 168 and 170 will move together either toward or away from each other. Shaft 158 carries a sprocket wheel 176 adapted to be driven to make this adjustment. Side plates 168 and 170 support a blower assembly indicated generally by the reference character 178 adapted to supply air to a duct 180. I form a plurality of spaced openings 182 along the top of the duct 180 to create a flow of air which assists in moving lids down along the guides 172 and 174. An adjustable damper 183 permits the air flow to be regulated. A feeler 184 on a shaft 186 carried by a bracket 188 on side wall 170 is adapted to sense the presence of at least two lids on the guides 172 and 174. When a second lid is present, it moves the arm 184 to rotate the cam 190 to a position at which it actuates a follower 192 to close a microswitch 194.

Vertically extending slots 189 in the respective plates 168 and 170 receive studs 191 on an anti-shingle bracket 193 extending across the width of the machine above the conveyor 22. Any suitable means such as knobs (not shown) on the studs permit the height of bracket 193 to be adjusted. As will be explained hereinafter, this bracket 193 prevents a bottom moving from conveyor 22 to the timing belt from tilting to permit a following bottom to move thereunder where relatively shallow bottoms are being handled.

I provide the side plates 168 and 170 with a pair of spring arms 454 which hold the lids down as they move along the flanges 172 and 174 on the side guides 168 and 170.

Referring now to FIGURES 2, 4 and 5, a pair of spaced uprights 196 and 198 carry bearings 200 and 202 which rotatably support a shaft 204. Shaft 204 has oppositely threaded portions 206 and 208 which receive threaded blocks or plates 210 and 212 riding in slots 214 and 216

in the right and left front lid guides 218 and 220 of my machine. In response to rotation of shaft 204, when a sprocket wheel 222 is driven in a manner to be described, guides 218 and 220 move toward or away from each other.

The central portion of shaft 204 between the threaded portions 206 and 208 passes through a vertically extending opening in a front guide adjusting plate 226 secured to a lid top guide member 228. Collars 224 on the shaft 204 position the plate 226. I thread a lead screw 230 into the top of the plate 226 and turn the screw down until it engages the shaft 204 thus to adjust the height of the front end of guide 228.

I pivotally support the ends of a V-frame 232 on the ends of shaft 204. Extension 234 at the apex of the V-frame carries a pin 236 which rides in an opening 238 in an adjusting frame 240 secured to the rear end of the guide 228. A lead screw 242 carried by an arm 244 on frame 232 is adapted to engage a lug 246 on the upright 198 to permit adjustment of the position of the frame 232 to limit the upward movement of the guide 228 against the influence of gravity as a lid is being applied to a box in a manner to be described.

Referring now to FIGURES 2, 4 and 6, my machine includes a pair of adjustable uprights 248 and 250 located intermediate the ends of the machine. T-heads 252 and 254 at the lower ends of the uprights are received in a T-slot 256 in a support 257 secured by any suitable means, such as a screw 258, to a lift rod 260 slidably supported in cross frame members 262 and 264. The adjustable uprights 248 and 250 have respective slots 266 and 268 adjacent their upper ends. Each of the slots 266 and 268 receives a pivot pin 270 which extends through the slot, through a bifurcated extension 272 on the front end of one of the guide plates 168 or 170 and into the rear end of one of the front lid guides 218 or 220. It will readily be apparent that when the uprights are raised, the members 168 and 170 will swing about the axis of shaft 158 while the members 218 and 220 swing about the axis of the shaft 204. The slide plates 210 and 212 permit this movement of the members 218 and 220 while the slots in extensions 272 of the members 168 and 170 permit that movement of those members.

A bottom being moved by a pusher 228 first engages fixed centering spring guides 273 and 275 carried by plates 168 and 170. These guides 273 and 275 center the box and impede its progress slightly so that a lid will be ready to receive it when it arrives at the assembling zone. The right and left front lid guides 218 and 220 carry respective centering rails 274 and 276 pivotally supported on pins 278 and 280 on the members 218 and 220. Springs 282 carried by the members 218 and 220 normally urge the centering rails 274 and 276 to move inwardly to positions at which a lid traveling down the guides 168 and 170 will rest upon these centering rails while a box bottom having been released by the escapement will be moved to a position at which it passes between the rails so that its sides are squeezed inwardly thereby.

A bearing 284 on the machine frame supports a screw 288 adapted to be rotated by a crank 286 to move a nut 290 inwardly and outwardly with respect to the side of the frame. Nut 290 carries a pin 292 which rides in a slot 294 in one arm of a bell crank 296 pivotally supported on a pin 298. The other arm of bell crank 296 has a slot 300 which receives a follower pin 302 secured to the bar 260.

From the structure just described, it will be apparent that when screw 288 is turned bell crank 296 is rotated in one direction or the other to raise or lower the adjustable uprights 248 and 250, thereby to raise or lower the centrally located ends of plates 168 and 170 and guides 218 and 222.

Respective bearings 304 and 306 on the machine frame rotatably support a shaft 308 having oppositely threaded portions 310 and 312 extending outwardly from the cen-

ter of the shaft. A crank **314** is adapted to be actuated manually to rotate shaft **308**. Threaded shaft portions **310** and **312** carry respective T-nuts **316** and **318** which ride in corresponding T-slots in the upper ends of the blocks **320** and **322** on the heads **252** and **254**. Now, when shaft **308** is rotated, the uprights **248** and **250** move toward or away from each other to accommodate boxes of different widths.

Referring now to FIGURES 1 to 6, I provide my machine with means for adjusting the spacing between plates **168** and **170** and between guides **218** and **220** concomitantly with the adjustment of the spacing between uprights **248** and **250**. The end of shaft **308** outboard of the bearing **306** carries a sprocket wheel **324** for driving a pitch chain **326** adapted to drive a sprocket wheel **328** on a shaft **330**. Shaft **330** carries another sprocket wheel **332** adapted to drive a pitch chain **334**. Chain **334** extends around an idler sprocket wheel **336** to an idler sprocket wheel **338** rotatably supported on the frame adjacent the rear thereof and up and around the sprocket wheel **176** on shaft **158**. Chain **334** then extends downwardly around an idler sprocket wheel **340** carried by the upright **70**, over into engagement with a chain adjusting sprocket wheel **342** and from the wheel **342** to an idler sprocket wheel **344** on the front frame and thence upwardly and around the sprocket wheel **222** on the shaft **206**. From sprocket wheel **222** and **334** extends around an idler sprocket wheel **246** on the front frame and back to the wheel **332**.

From the driving arrangement just described, it will readily be apparent that when the handle **314** is turned to drive shaft **308**, both shaft **158** and shaft **204** will be driven. Thus, all the side guide members, including the right- and left-hand side plates **168** and **170**, the right- and left-hand adjustable uprights **250** and **248**, as well as the right- and left-hand front guides **218** and **220** will be moved toward or away from each other to accommodate boxes of different widths.

Referring now to FIGURE 7, I have shown an enlarged view of one of the lugs **110** carried by the timing belt **108**. I so shape the lug as to provide a box-rear-engaging-surface **348** which extends forwardly of the base. Owing to this arrangement the box bottom will be engaged at a point above the base of the bottom so as to cause the rear wall of the box, if bowed, to straighten or bend slightly inwardly thus to provide more clearance for the lid as it moves into position over the bottom. I also provide the lug top with a bevel **350** to ensure that a fully telescoping lid will slide down across the face of the lug between the surface **348** and the rear wall of the box bottom and not come to rest on top of the lug.

Referring now to FIGURE 9, I have shown one particular form of electrical circuit which can be employed to control the operation of my apparatus. I connect respective conductors **430** and **432** to terminals **434** and **436** of a suitable source of power. Respective normally open switches **438** and **440** are adapted to be closed to connect motor **122** across the conductors **430** and **432**. A relay winding **442** is adapted to be energized in response to operation of a push button switch **444** to close switches **438** and **440** and to close a switch **446** to complete the holding circuit for winding **442** through a normally closed push button switch **448** which may be operated to stop the apparatus.

As has been pointed out hereinabove, motor **122** drives cam **146** as indicated schematically by the broken line **450** in FIGURE 9. Cam **146** has a flat **148** which is engaged by a follower **150** to permit a switch **152** to close once for each revolution of the cam. In a particular embodiment of my apparatus, switch **152** is permitted to close sixty times a minute. I connect the lid sensing switch **194**, a normally open switch **452** responsive to winding **442**, switch **152** and winding **94** in series between the conductors **430** and **432**. Thus, with at least two lids present, with winding **442** energized, solenoid **94** receives a pulse each time switch **152** closes.

In setting my apparatus up for operation, I first make the required adjustments for handling a box of the size to be lidded. I achieve this result by making five quick adjustments. First, considering the width of the box, I turn crank **314** to adjust all of the side guides including the right and left guide walls **168** and **170** and the right and left front lid guides **218** and **220**. At the same time, as has been explained hereinabove, the adjustable uprights **248** and **250** are moved to positions at which the distance separating them corresponds to the proper box width. I next set the top lid guide or closure bar **228** to the box height. This is readily achieved by turning the lead screw **230**. At the same time I can adjust the lead screw **242** for the limit position of the member **228**. In the position of the parts of the apparatus shown in the drawings, they are set to handle what would be a very shallow box. When an adjustment is made the parts move, for example, to the broken line position shown in FIGURE 2.

When the operations just described have been completed, I adjust the escapement mechanism **54** to position the bar **68** at the correct height to be engaged by a bottom advanced thereto by the conveyor **22**, with the stop bar **66** positioned just above the top of the bottom. This adjustment is achieved by moving the rod **96** in the slot **98** until the pairs of arms **76** and **78** have been pivoted through a sufficient distance properly to position the escapement bar **68** and the stop bar **66**. It is necessary, also, that the anti-shingle bracket properly be positioned.

After adjustment of the escapement mechanism, I then set the chute comprising the flanges **172** and **174** at such angle that the bottom will just clear the ends of the chute. I also adjust the fan air fed by blower **178** to duct **180** to give the correct air pressure properly to assist gravity in moving the lids down the chute.

When all of the adjustments described above have been accomplished, I operate push button **444** to energize winding **442** to close switches **438** and **440** to energize the motor **122**. The relay winding **442** also closes switch **446** to complete the relay holding circuit through switch **448**. Switch **452** closes to enable the escapement circuit. When these operations have been accomplished, lids are fed to the chute formed by flanges **172** and **174**. Under the influence of gravity, assisted by the flow of air from duct **180**, the lids move downwardly along the flanges until the lowermost of the lids rest on the upper edges of the two centering rails **274** and **276**. Boxes are fed from a suitable supply to the conveyor **22** to a position at which the leading box engages the escapement bar **68**. With the parts in this position, once in the course of each revolution of cam **146**, switch **152** closes. Owing to the fact that an adequate supply of lids is present, switch **194** is closed and when switch **152** closes, solenoid **94** receives a pulse.

As will be apparent from the explanation advanced hereinabove, switch **152** closes when a bottom is properly positioned with reference to one of the lugs **110** on the timing belt as to permit the surface **348** on the lug to engage the back of the bottom. Accelerating rolls **38** and **40** accelerate the released bottom toward the timing belt. The timing belt then carries the bottom forward until it engages the lid whose leading edge is resting on the rails **274** and **276**. As the bottom moves into the space between the rails **274** and **276**, its sides are squeezed together slightly and at the same time the lug **110** engages the back of the bottom to bow it inwardly slightly. These two operations greatly facilitate movement of the lid onto the bottom. Now the bottom and the lid move together along with the timing belt under the top lid guide or closure bar **228** which rests by gravity on the top of the lid. Ultimately, as the bottom and the lid move out of the front of the lidding apparatus **10**, the lid is closed firmly on the bottom.

In a practical embodiment of my apparatus, I operate the switch **152** sixty times a minute to cause my apparatus to accomplish 60 lidding operations a minute. If, after a particular run, a different size box is to be used, the apparatus is rapidly and expeditiously set up to handle this new size by making the adjustments outlined above. The bevel **350** ensures that a fully telescoping lid will not rest on top of a lug **110** but can be completely closed on a bottom.

It will be seen that I have accomplished the objects of my invention. I have provided an improved box lidder which accommodates minor imperfections in lids or bottoms in assembling such lids on such bottoms. My apparatus ensures that a fully telescoping lid moves to a fully closed position on a bottom. The escapement mechanism of my box lidder is readily adjustable to accommodate a wide range of box sizes.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations. This is contemplated by and is within the scope of my claims. It is further obvious that various changes may be made in details within the scope of my claims without departing from the spirit of my invention. It is therefore, to be understood that my invention is not to be limited to the specific details shown and described.

Having thus described my invention, what I claim is:

1. Box lidding apparatus for assembling lids on bottoms in an assembly zone including in combination means for releasably holding a lid in a position to be engaged by a bottom being advanced through said zone, means for advancing a bottom through said zone and means for bowing an end wall of said box bottom inwardly as it moves through said zone.

2. In a box binder having a conveyor adapted to carry bottoms through an assembly zone wherein the bottoms receive lids, a pusher on said conveyor, said pusher having a surface inclined in the direction of travel of said conveyor to engage a box bottom above the lower edge thereof, said pusher having a beveled upper forward edge to prevent a lid from resting on top of said pusher.

3. In a box lidder having a conveyor adapted to carry a box bottom through an assembly zone wherein the bottom receives a lid, a pusher on said conveyor for engaging a bottom to be carried through said zone, said pusher having a beveled upper forward edge to permit a fully telescoping lid to close completely on a bottom.

4. In a box lidder having a conveyor adapted to carry bottoms through an assembly zone a pusher on said conveyor, said pusher having a surface inclined in the direction of travel of said conveyor to cause said pusher to engage a box bottom above the lower edge thereof.

5. In a box lidder having a conveyor adapted to carry bottoms through an assembly zone a pusher having a forward rake to engage a box bottom above the base thereof.

6. In a box lidder for assembling lids on bottoms in an assembly zone a conveyor for carrying bottoms through said zone whereby a bottom carried through said zone has a trailing end wall and means on said conveyor for engaging a bottom trailing end wall over an area limited to a portion thereof spaced above the base of said bottom.

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