

Dec. 29, 1959

R. F. KRUPP ET AL

2,918,773

CONTAINER CASE FEEDING AND OPENING MEANS

Filed May 29, 1958

6 Sheets-Sheet 1

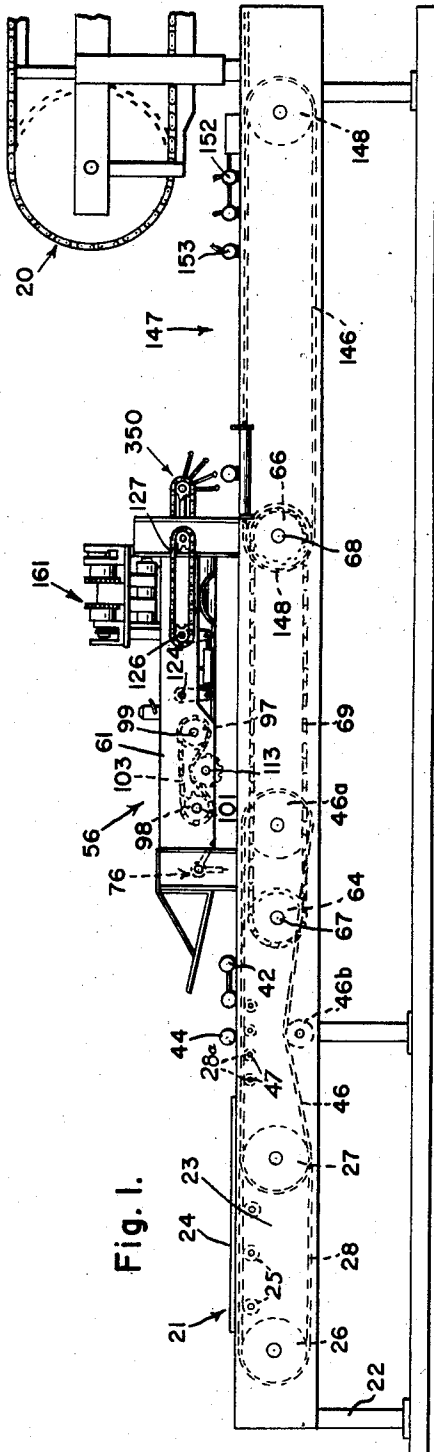


Fig. 1.

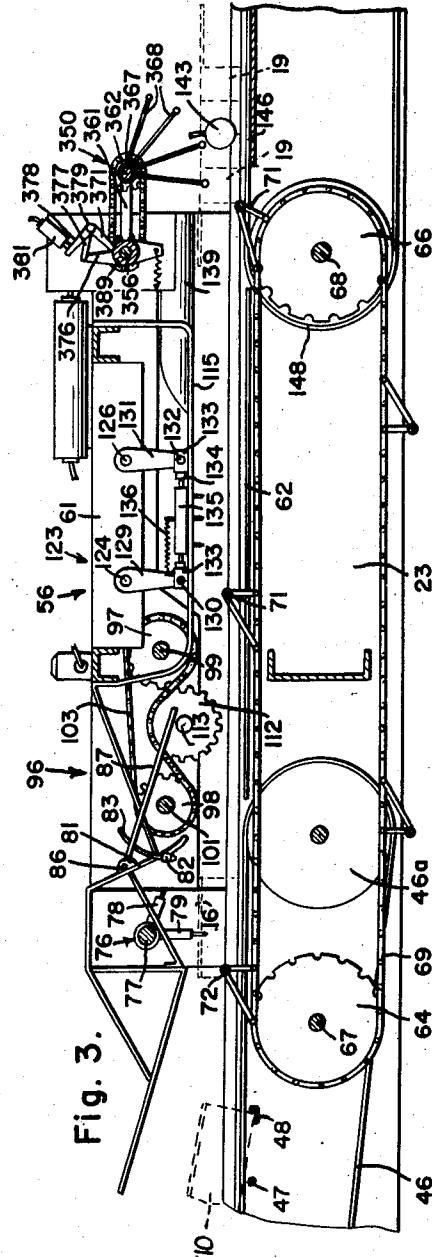


Fig. 3.

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6 Sheets-Sheet 2

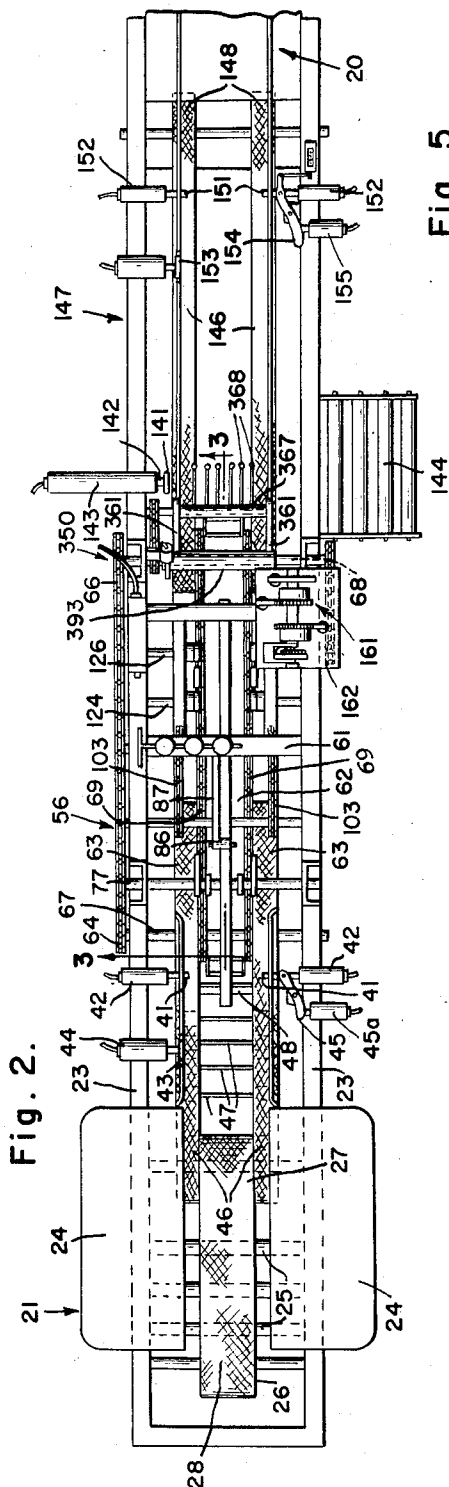


Fig. 2.

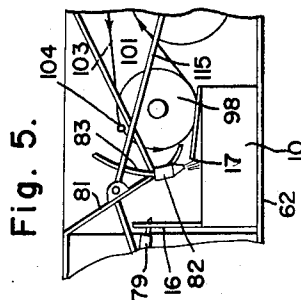


Fig. 5.

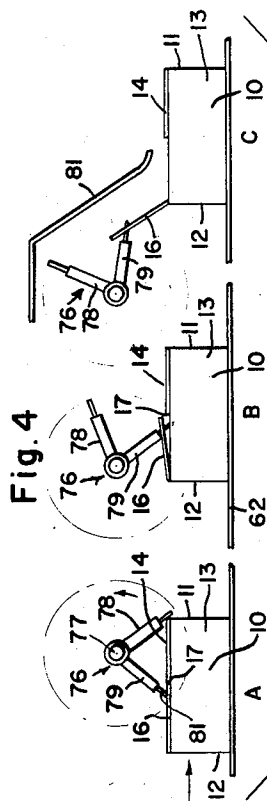


Fig. 4.

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Fig. 6.

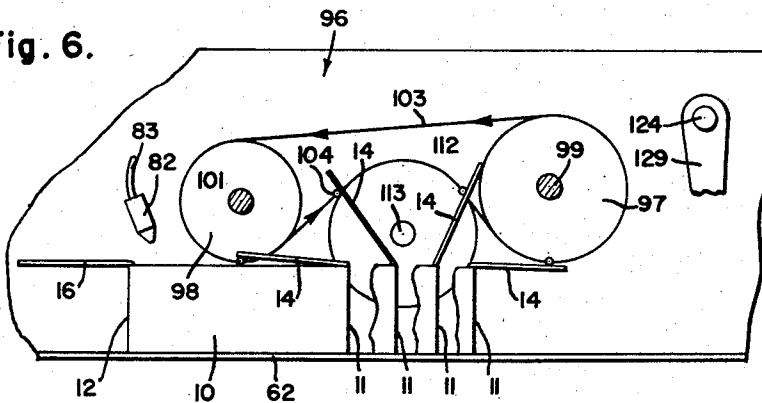


Fig. 7.

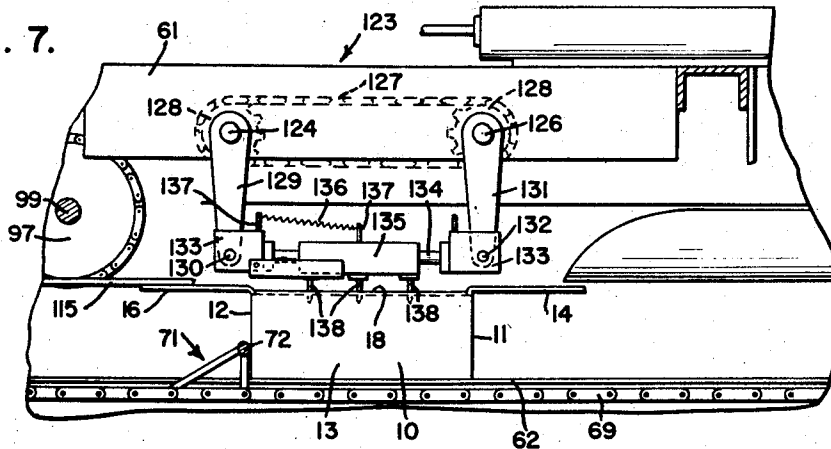


Fig. 8.

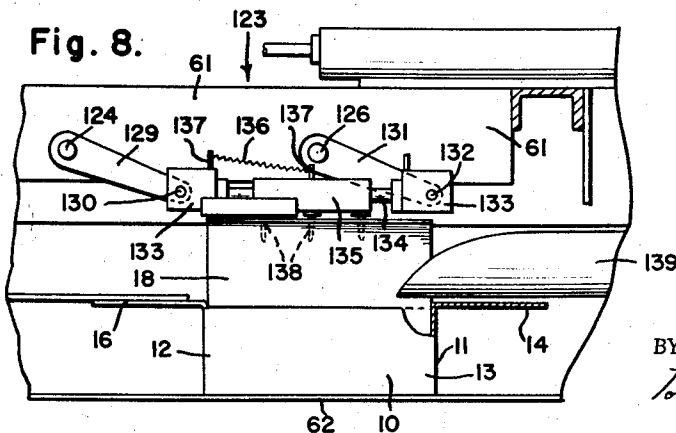
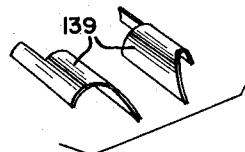


Fig. 9.



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Fig. 10.

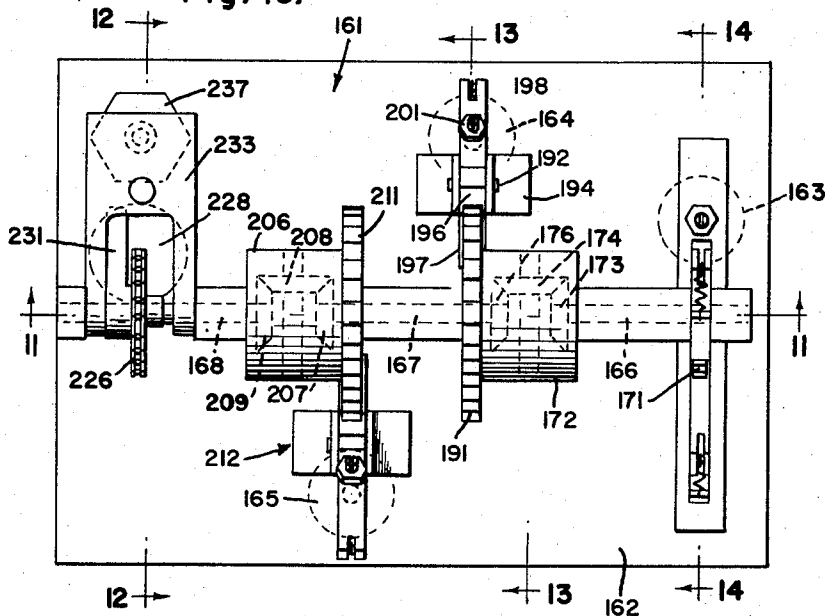
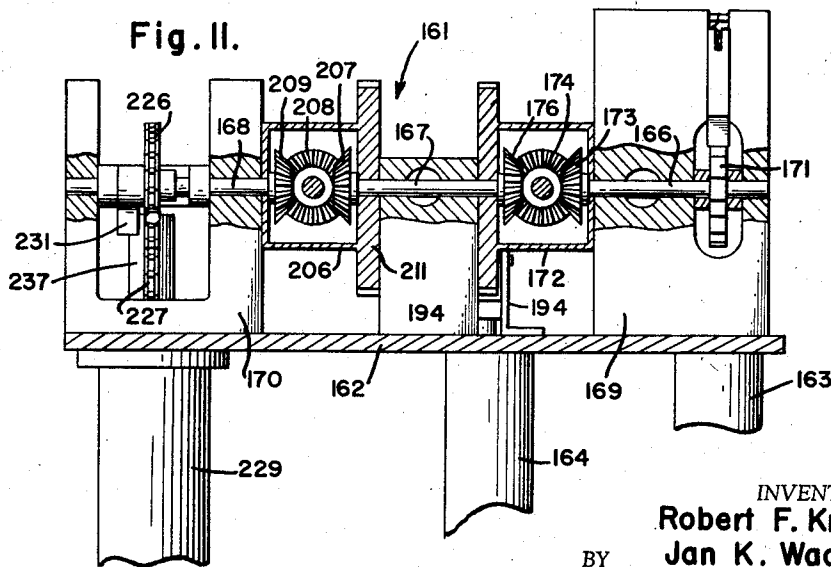


Fig. 11.



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Fig. 12.

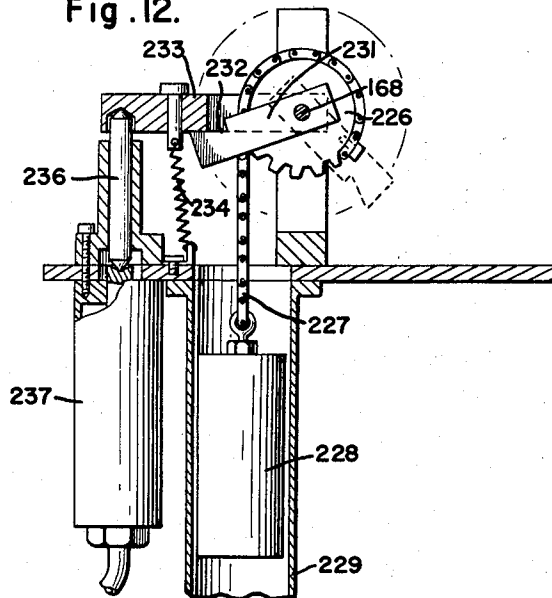
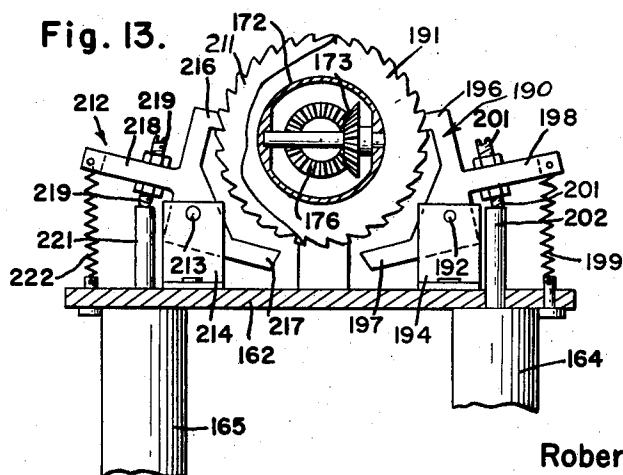


Fig. 13.



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Fig. 14.

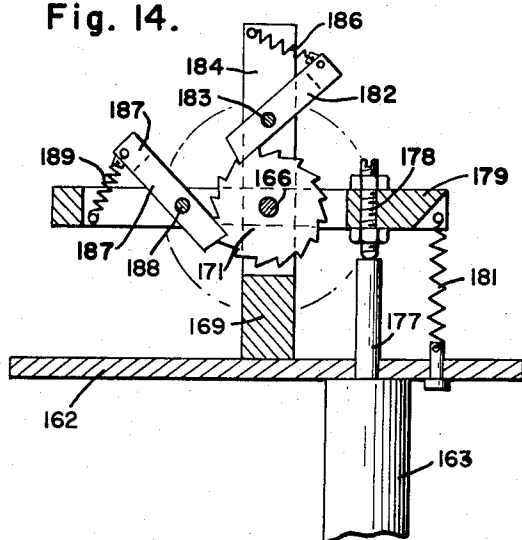
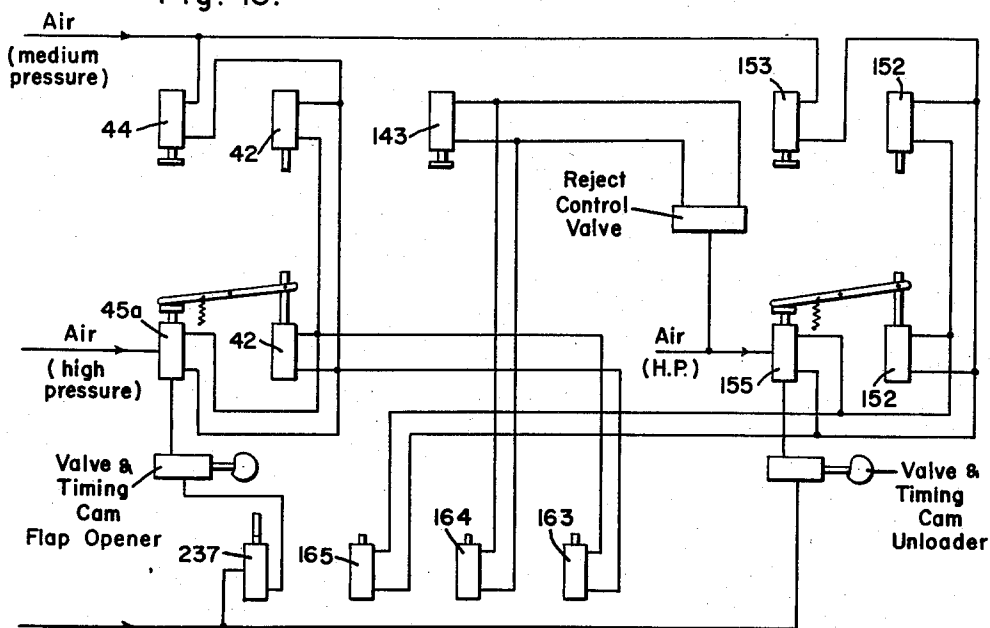


Fig. 15.



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CONTAINER CASE FEEDING AND OPENING MEANS

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Application May 29, 1958, Serial No. 738,762

14 Claims. (Cl. 53—382)

This invention relates to a new and improved container case feeding and opening means. Reference is made to co-pending patent application Ser. No. 672,618, of which this application is a continuation-in-part. In common practice, containers such as glass jars are shipped in cases or boxes from the container factory to the cannery or other location where they are to be filled. Commonly, the cases are used for shipping the filled containers and accordingly, when received at the cannery, the cases are closed and the bottom glued. The present invention relates to a machine to be used to prepare the cases for unloading.

The present invention relates to apparatus which feeds the cases one at a time in timed sequence and insures that not more than one case is fed into the machine at a time. Further, the machine insures that all cases are turned in the proper direction and that the cases are not tipped. The machine then opens all of the flaps of the case preparatory to unloading. Sequentially the rear outer flap, front outer flap and side flaps are opened and held in open position.

Reference is made to Patent No. 2,818,987, for "Jar Handling Machine," wherein is disclosed a machine for unloading glass jars from shipping cases. The present invention relates to a machine which may be installed immediately ahead of such a jar handling machine and prepares the case for handling by such machine.

A jar handling machine such as heretofore described in said Patent No. 2,818,987 requires that each of the flaps be laid open and that all of the containers in the case be positioned with their mouths uppermost. Unless these conditions prevail, serious damage may result. Accordingly, a further feature of the present invention is the provision of safety means which discards cases in the event that one or more of the flaps has failed to open.

Another feature of the invention is the provision of safety means which discards a case if one or more jars have been inverted.

Accordingly, the present invention provides means for rapidly and mechanically feeding, opening and testing cases of containers whereby the cases are prepared for unloading in timed sequence to the operation of the unloading machine.

Another feature of the present invention is the fact that there is provided a gate or stop located at the inner end of the magazine, which permits cases to enter the flap-unfolding portion of the machine in timed sequence to the operation of the flap opener portion of the machine. In addition, there is a second gate or stop located immediately in advance of the jar unloader portion of the machine, which is actuated in timed sequence to the operation of the unloader.

Another important feature of the machine is the provision of means of controlling retraction of the gate or stop on the magazine, which means is dependent upon the number of cases actually in the machine between the two gates or stops at any given period of time. Thus,

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it will be understood that from time to time one or more cases may be discarded by reason of errors in loading jars at the container factory or by reason of defective cases or improper operation of the flap opener. The mechanism for testing the presence of defective cases is described in co-pending patent application Ser. No. 700,200, filed December 2, 1957, for "Driving Mechanism for Driving a Plurality of Machines in Synchronism and in Phase." The present invention provides a mechanical means which accounts for the number of cases released by the magazine, the number of cases discarded as defective and the number of cases released into the unloader, and opens the magazine gate only when less than a specified number of cases is located between the two gates. By reason of the fact that the speed of discharge from the magazine is made greater than the rate of acceptance of cases by the unloader, in the event that one or more cases must be discarded as defective, there is a sufficient time interval for the deficiency to be made up.

One of the objects of the invention is to provide means for mechanically computing the necessity of releasing cases from the magazine into the flap opener. The mechanism automatically subtracts those cases which are fed into the unloader and those which are discarded as defective, and adds those cases released from the magazine. When the sum is below a specified total, additional cases are released by the magazine.

The foregoing means insures that there will be a smooth flow of cases into the unloader. The unloader, as is set forth in detail in Patent No. 2,818,987, consists of a series of pallets, and the computer mechanism herein described insures that there is a case for each pallet. Inasmuch as the present invention and the case unloader may comprise a line of machines, which prepares jars for filling in a container-filling machine, the foregoing features are of particular importance since, as is well known in the canning art, it is desirable for proper operation of a filling machine that there be a continuous flow of containers thereto.

A still further feature of the present invention is the fact that there is provided means for insuring that all cases released by the magazine are turned in the proper direction, i.e., with their long sides extending transverse to the direction of movement through the machine, and further that the cases be substantially horizontal rather than tipped or tilted.

Other objects of the present invention will become apparent upon reading the following specification and referring to the accompanying drawings in which similar characters of reference represent corresponding parts in each of the several views.

In the drawings:

Fig. 1 is a side elevation of the machine;

Fig. 2 is a top plan;

Fig. 3 is an enlarged vertical sectional view taken substantially along line 3—3 of Fig. 2;

Fig. 4 is a schematic view showing the opening of the rear flap at three different positions of its movement designated A, B and C;

Fig. 5 is a schematic view showing the use of an air blast to open the front flap;

Fig. 6 is a schematic view showing the completion of the opening of the front flap;

Fig. 7 is a side elevation of the inner flap-unfolding mechanism, as shown at the commencement of the cycle of operation thereof;

Fig. 8 is a view similar to Fig. 7, showing completion of the opening of the inner flap;

Fig. 9 is a fragmentary perspective view of means employed to hold the inner flaps open;

Fig. 10 is a top plan of the computer mechanism;
Fig. 11 is a sectional view taken substantially along line 11—11 of Fig. 10;

Fig. 12 is a sectional view taken substantially along line 12—12 of Fig. 10;

Fig. 13 is a sectional view taken substantially along line 13—13 of Fig. 10; and

Fig. 14 is a sectional view taken substantially along line 14—14 of Fig. 10.

Fig. 15 is a schematic view of the air control system. The shipping case 10 with which the instant machine is employed is generally rectangular in shape, having front and rear ends 11 and 12 and sides 13. In progressing through the machine, the ends 11 and 12 are placed transverse to the direction of movement and the sides 13 parallel to such direction. For the purpose of understanding the present invention, the bottom flaps of the box may be ignored. The outer top flaps, denominated the front and rear top flaps 14 and 16, are hingedly, integrally connected to the upper edges of the front and rear ends 11 and 12, respectively. The inner edges of the outer top flaps meet along a line 17 extending transversely of the path of progress of the case through the machine, which transverse line is centrally disposed. The inner flaps 18 are hingedly connected along the top edges of either side 13. A gap which extends parallel to the longitudinal movement of the case through the machine separates the inner edges of the inner flaps 18. Such a shipping case may be considered to contain glass jars 19 or the like, with their opened ends uppermost. After the flaps have been opened, the jars may be removed by a jar handling machine 20, such as is disclosed in Patent No. 2,818,987.

The cases 10 are deposited in a magazine 21, which comprises the left end of the machine hereinafter described. The function of the magazine 21 is to feed the cases 10 one at a time into the machine in timed relation to the cycle of operation thereof. The magazine employs a frame having vertical legs 22 supporting horizontal, longitudinally extending side frame members 23. Projecting laterally outwardly on the left end of either side of the frame are loading tables 24 upon which the workmen initially deposit the cases. Extending transversely between side frame members 23 are pulleys 26 and 27, the ends of which are journaled in the horizontal frame members 23. A centrally positioned canvas belt 28 passes over the pulleys 26 and 27 and is held level by rollers 25 and hence comprises in effect a flat table, moving to the right, as viewed in Fig. 1, which biases the shipping cases 10 toward the right, but can slip relative to the shipping cases when the latter are held stationary, as hereinafter appears. Pulley 27 is driven from pulley 46a by means of belts 46.

At the right end of the magazine 21, on either side of the machine, is a horizontally disposed stop 41 which projects into the path of travel of shipping cases 10 and prevents their forward movement. Stops 41 are retractable in timed sequence to the cycle of operations of the machine. Retraction and projection of the stops is accomplished by means of pneumatic cylinders 42, to the pistons of which stops 41 are connected. Spaced to the left from stops 41 a distance approximately equal to the length of one case 10 is a brake 43 which is actuated by a third pneumatic cylinder 44 and functions to bear against the second case in line to prevent its following the first case and when the stops are retracted. Adjacent one of the stops 41 is an inwardly biased arm 45 which allows cylinder 42 to be activated only when a case 10 is in position.

A valve (controlled by means hereinafter described) causes cylinders 42 to retract stops 41 to permit cases to be moved by belts 28 and 46 off the magazine in timed sequence to the operation of the flap opener. Simultaneously with retraction of stops 41, shoe 43 on cylinder

44 is projected, which interferes with movement of the second case.

Immediately beyond the end of the belt 28, on either side of the machine, are side belts 46 of limited width, the inner edges of which are spaced apart a predetermined distance which is greater than the length of one of the short sides 13 of a case, but less than the length of one of the long ends 11 or 12 of a case 10. Belts 46 pass over pulley 27 and pulleys 46a and are held taut by tightener pulleys 46b. Stub rollers 28a support the upper stretches of side belts 46. Thus, in order for a case 10 to rest upon the side belts 46, it must be turned in the proper direction, i.e., with the ends 11 and 12 transverse to the direction of movement; and, if it is improperly turned, then it drops down between the side belts 46 and is caught by transverse rods 47 below the level of belts 46 which support the case against breakage but do not permit it to advance into the machine. Further, if a case is turned at an angle to the direction of movement of the machine, one of its corners tends to tip or tilt by reason of the spacing between side belts 46 and, in such event, the depending forward corner of the case is caught by angle bar 48 disposed below the level of side belts 46 and stop the forward progress of the cases.

The flap opener portion 56 is likewise supported on longitudinally extending side frame members 23. A superstructure 61 consisting of various members extends above the level of side frame members 23.

At the level of the side frame members 23 is a longitudinally extending plate 62 which is disposed at the same inclination as the side frame members. The cases 10 move over the surface of plate 62. Longitudinally extending side guide members 63 engage the side edges of the cases 10 and confine them to the proper path of travel along plate 62. At either end and on each side of the machine is a large sprocket 64, 66 on shafts 67, 68, respectively, mounted on the frame, and shaft 68 is driven by a motor (not shown). Chains 69 on either side of the machine pass around sprockets 64, 66. The upper stretch of the chains 69 is elevated about at the surface of plate 62. At intervals along the chain 62 are angular members 71, the lower ends of which are attached to links of chain 69. At the upper corner of angular members 71 are transverse rods 72 which bear against the rear ends 12 of the cases and push them through the machine, sliding over the surface of plate 62 as the sprockets 64, 66 revolve. The actuation of magazine gate 41 is controlled in timed sequence to the movement of the push rods 72 so that a case 10 will be released to be deposited on plate 62 ahead of push rod 72.

On the left end of superstructure 61 is the rear outer flap opener mechanism 76. A transverse rod 77 elevated above the surface of cases 10 is journaled in superstructure 61. Depending from rod 77 is a feeler rod 78 and a spear 79 which are angularly spaced apart. Feeler rod 78 is contacted by the front end 11 of the case as the case is pushed along plate 62, and this causes shaft 77 to turn in counter-clockwise direction. Spear point 81 on the lower end of spear rod 79 impales the rear outer flap 16 and, as the case moves along, rear outer flap 16 is pulled backward by spear 79 until it is gradually opened to horizontal rearwardly extending position. Feeler shaft 78 and spear shaft 79 comprise two members telescopically arranged and so can be adjusted in length to accommodate shipping cases of different heights. In addition, the angular relationship of the two rods can be adjusted to accommodate different lengths of boxes, as by relative rotation of the collars on the upper ends of the rods which receive shaft 77. (See Fig. 4.)

Depending from the superstructure 61 is a downwardly inclined hold-down rod 81 which is disposed centrally with respect to side members 23, the lower end of rod 81 contacting the rear flap 16 and preventing it from

springing forward after it is released by impaling spear 79 (Fig. 4c).

Beyond rear flap unfolder 76 is front flap unfolder 96. A preliminary unfolding is imparted by an air blast from forwardly slanted nozzle 82 supplied with air through pipe 83 from a source (not shown). Nozzle 82 blows top flap 14 partially upwardly (Fig. 5).

Pivotaly mounted by means of hinge 86 is downwardly-forwardly slanted, centrally disposed rod 87. Rod 87 holds down the rear flap 16 after it is released by rod 81 but swings up to provide clearance when flap 14 is being folded open.

Immediately beyond nozzle 82 is located the front flap unfolder mechanism 96. A pair of large sprockets 97, 98 is mounted by means of transverse shafts 99 and 101 on either side of the machine. Shafts 99, 101 are journaled in superstructure 61. Reeved around sprockets 97, 98 are chains 103 and on opposite sides of the machine are inwardly projecting rollers 104 attached to links of chains 103. Chains 103 are driven at three times the speed of chains 69 by means not herein illustrated or described. Rollers 104 engage behind front flap 14 which has already been lifted by the air jet 82. By reason of the fact that rollers 104 are moving at thrice the speed of case 10, front flap 14 is unfolded and moved forwardly, projecting ahead of the case. To prevent bending of the front flap, chains 103 are raised by means of raising sprockets 112 mounted on shafts 113 journaled in superstructure 61 and engaging under chains 103. This insures the forward movement of front flap 14, as illustrated schematically in Fig. 6. Centrally disposed bar 115 holds flaps 14 and 16 extended.

Immediately to the right of the front flap unfolder 96 is the inner or side flap raising mechanism 123 suspended from superstructure 61. Shafts 124, 126 extend transversely of the machine. Shaft 126 is driven in timed sequence to the movement of cases through the machine. Shafts 124, 126 are drivingly connected by chains 127 and sprockets 128. Depending from shaft 124 on opposite sides of the machine are links 129, to the lower ends of which are fixed transverse rod 130. Similarly depending from shaft 126 is a pair of links 131, to the lower ends of which are fixed transverse rod 132. Fittings 133 on the ends of rods 130, 132 on opposite sides of the machine receive longitudinally extending slide rods 134. Each slide rod 134 is provided with a slide 135 which reciprocates on slide rod 134. Spring 136 interposed between pins 137 on rear fitting 133 and slide 135 biases slide 135 rearwardly (to the left as viewed in the drawings). Depending from slides 135 are a plurality of impaling pins 138. Thus, as is best shown in Figs. 7 and 8, as a case 10 advances under the inner flap-unfolding mechanism 123, the links 129—131 move into downward vertical position (Fig. 7) and impaling pins 138 impale the inner flaps 18. As the case 10 advances, spring 136 creates a drag on the impaling pins, and this tends to cause the inner flaps 18 to rise, as shown in Fig. 8. The partially raised inner flaps 18 are engaged by outwardly curved plows 139 stationarily mounted on superstructure 61 and are outwardly folded by plows 139 until they assume a horizontal outwardly diverging position.

At this stage, all four flaps 14, 16, 18, 18 of the case have been laid open to horizontal outwardly extending position and the case is now ready for unloading. However, it is desirable to test the case to make sure that all of the flaps have been unfolded and further to insure that the containers in the case are all positioned with their open ends uppermost. For such purpose, a tester station 350 is installed beyond the inner flap unfolder 123. The details of construction of this station are set forth in co-pending application Ser. No. 700,200 and similar reference numerals are employed for the various parts.

Those cases which are defective, as indicated by tester

station 350, are discarded when disk 141 on the end of piston rod 142 in cylinder 143 pushes the defective case to one side, where it is accepted by a conveyor 144 and the attendant remedies the defective condition.

Those cases 10 which are not defective are received on canvas belts 146 of limited width in secondary magazine 147 engaging their outer edges. Belts 146 are supported by pulleys 148 journaled in side members 23, and the cases are advanced to the right until they reach stops 151 on opposite sides of the machine, which project into the path of travel of the cases. Stops 151 are retracted by cylinders 152 in timed sequence to the operation of unloader 20 described in detail in Patent No. 2,818,987. A brake 153 similar in function to brake 43 is installed rearwardly of one of the stops 151 a distance substantially equal to the length of one case. Inwardly biased arm 154 and valve 155 function in a manner similar to arm 45 and valve 45a.

The computer or counter mechanism 161 is employed to insure a constant supply of cases 10 into the unloader 20. The speed of belts 28, 46 and 146 and chains 69 is substantially greater than the rate of acceptance of cases by unloader 20, so that, in the event that one or more cases is discarded by tester 350, the deficiency may be made up. Expressed in other terms, if no cases are discarded by cylinder 143, gates 41 and 151 are retracted an equal number of times established by the advance of cases through the unloader 20. However, when there is a deficiency to be made up by reason of discard of cases at tester 350, gate 41 is opened a greater number of times than gate 151 until the deficiency is made up. In a specific embodiment of this invention, gate 41 operates at the ratio of 27 to 22 with respect to gate 151. The computer mechanism 161 is mounted on plate 162 on superstructure 61 and contains three air cylinders 163, 164, 165. These cylinders are activated whenever cylinders 42, 143, and 152 are activated, respectively.

Three axially aligned shaft sections 166, 167, 168 are journaled in brackets 169, 194 and 170 projecting from plate 162. Shaft 166 carries a ratchet 171 at one end, and at its opposite end extends into housing 172 and is fastened to bevel gear 173 which meshes with idler bevel gear 174 carried by housing 172, and gear 174 in turn meshes with bevel gear 176 on shaft 167. As shown in Fig. 14, cylinder 163, when activated, raises piston rod 177 which contacts adjustment screw 178 on lever 179 pivotally mounted on shaft 166 and biased clockwise by spring 181. A first pawl 182 is pivoted by pin 183 on extension 184 on bracket 169 and biased into engagement with ratchet 171 by spring 186. Second pawl 187 is pivoted by pin 188 on lever 179 and biased into contact with ratchet 171 by spring 189. When the valve-controlling gate 41 causes rod 177 to raise, pawl 187 indexes ratchet 171 one notch, and at that time pawl 182 is retracted against the force of spring 186, but as soon as the ratchet 171 has indexed one notch pawl 182 prevents return of the ratchet in the opposite direction.

It will be noted that, for each revolution of ratchet 171 and shaft 166, if housing 172 is held from moving, then shaft 167 is turned one revolution in the opposite direction. It will also be noted that if shaft 166 is held from moving, then shaft 167 is turned two revolutions for each revolution of housing 172. Accordingly, a second ratchet 191 on shaft 167 having twice as many teeth as ratchet 171 is fixed to housing 172. In a specific embodiment of the invention ratchet 191 has thirty-two teeth and ratchet 171 sixteen teeth. Ratchet 191 is controlled by escapement 190 pivoted by pin 192 to extension 194 on plate 162, the escapement having the shape shown in Fig. 13, wherein pawls 196 and 197 index ratchet 191 one notch counterclockwise during a complete up and down cycle of rod 202 of cylinder 164. Escapement 190 has an arm 198 which is biased downwardly by spring 199, so that pawl 197 tends to engage ratchet 191. Arm 198 is raised by contact of adjustment screw 201 by piston

rod 202 of cylinder 164. Shaft 167 extends into housing 206 and carries on the inside of housing 206 bevel gear 207 which meshes with bevel gear 208 rotatable in housing 206, and the latter in turn meshes with bevel gear 209 on shaft 168. Third ratchet 211 is disposed on the side of bevel gear housing 206 opposite that on which ratchet 191 is related to housing 172, so that the turning of ratchet 211 is in the opposite direction to ratchet 191. An escapement 212 similar to escapement 192 but oppositely disposed relative to shaft 167 is pivoted by pin 213 to extensions 214 from plate 162. Escapement 212 carries pawls 216 and 217 and extension arm 218 carrying adjustment screw 219 and engaged by piston rod 221 on cylinder 165 against the force of spring 222, the parts being similar in function to parts 192 to 202, inclusive.

Shaft 168 carries sprocket 226 which carries chain 227. One end of chain 227 extends downwardly and is attached to weight 228 which hangs in tube 229 and biases shaft 168 in counterclockwise direction, as viewed in Fig. 12.

Mounted on shaft 168 is arm 231 which at its outer end is formed with a notch 232. In the path of travel of notch 232 is lever 233 pivotally mounted on shaft 168. Lever 233 is biased in counterclockwise direction, as viewed in Fig. 12, by spring 234. When shaft 168 is turned in clockwise direction, as viewed in Fig. 12, a sufficient distance so that lever 231 contacts lever 233, pin 236 of valve 237 is elevated and this closes valve 237 and prevents the cylinder 42 from releasing the magazine gate 41. When, however, lever 231 is out of contact with lever 232, pin 236 is depressed and valve 237 opened, thus permitting gate 41 to operate. Normally five cases 10 are disposed between gates 41 and 151 and, when less than that number is present, valve 237 is open.

Thus, in operation, each time the magazine gate 41 is opened, ratchet 171 is indexed in counterclockwise direction, as viewed in Fig. 14, one notch, and shafts 167 and 168 also rotate an amount equal to the rotation of shaft 166. Every time that a case 10 is released by unloader gate 151 from the secondary magazine 147, ratchet 211 is indexed one tooth in clockwise direction, as viewed in Fig. 13; and, since there are twice as many teeth on sprocket 191 as on sprocket 171, the resultant turning of shaft 168 is equal to, but in opposite direction to, its motion when shaft 166 is indexed by ratchet 171. Similarly, every time a bad case is ejected by cylinder 143, ratchet 191 is indexed in counterclockwise direction, as viewed in Fig. 13. So long as there are less than five cases in the line between the two gates 41 and 151, valve 237 is open, in that lever 231 does not contact lever 233. However, when there are five or more cases in the line, lever 231 contacts lever 233, and valve 237 is closed, preventing any further release of the magazine gate 41 until unloader gate 151 has been opened to discharge enough cases to reduce the total cases in the line to five or less.

Although the foregoing invention has been described in some detail by way of illustration and example for purposes of clarity of understanding, it is understood that certain changes and modifications may be practiced within the spirit of the invention and scope of the appended claims.

What is claimed is:

1. In a case opener machine, a frame, conveyor means for advancing a case longitudinally of said frame, means for opening the outer end flaps of said case, means for unfolding outwardly an inner side flap of said case, said last-named means comprising a pair of shafts above and transverse to the path of travel of said case, means for rotating said shafts together in timed relation to said conveyor means, links rotatable with said shafts, a longitudinally extending slide rod on the outer ends of said links and disposed on one side of said machine, a slide on said slide rod, and an impaling pin depending from said slide, said slide being lowered to impale said side

flap on said impaling pin during a portion of the cycle of rotation of said shafts.

2. A machine according to claim 1, which further comprises means for applying drag to said slide to retard said slide relative to the movement of said case to cause lifting of said side flap.

3. In a case opener machine, a frame, conveyor means for advancing a case longitudinally of said frame, means for opening the outer end flaps of said case, means for unfolding outwardly an inner side flap of said case, said last-named means comprising at least one impaling pin, a carrier for said pin, and means for imparting a cyclical movement to said carrier, said movement having a stretch above and parallel and in timed relation to said conveyor means, said carrier being lowered to cause said pin to impale said side flap.

4. A machine according to claim 3, which further comprises resilient means to retard said carrier relative to the movement of said case to cause lifting of said side flap.

5. In combination, a first magazine for a series of objects, operating means for performing desired operations on said objects and having conveyor means, means biasing said objects along said first magazine and into said operating means, a first stop on said first magazine movable between projected and retracted positions and when in projected position impeding discharge of objects from said first magazine, first magazine stop control means for moving said first stop, testing means testing successful performance of desired operations in said operating means, discharge means discharging objects rejected by said testing means, a second magazine beyond said testing means, means biasing objects along said second magazine, second stop means controlling discharge of objects from said second magazine, and counter means responsive to retraction of said first and second stops and of said discharge means to actuate said first stop control means to retract said first stop only when less than a predetermined number of objects is disposed between said first and second stops.

6. In combination, a flap opener for shipping cases having a plurality of flaps, a first magazine supplying cases to said flap opener, control means controlling discharge of cases from said first magazine into said flap opener, testing means testing successful opening of said flaps, discharge means rejecting cases detected by said testing means as improperly opened, and counter means controlling said control means to increase the frequency of discharge of cases from said magazine upon actuation of said discharge means.

7. In combination, a flap opener for shipping cases having a plurality of flaps, a first magazine supplying cases to said flap opener, control means controlling discharge of cases from said first magazine into said flap opener, testing means testing successful opening of said flaps, discharge means rejecting cases detected by said testing means as improperly opened, a second magazine receiving properly opened cases from said testing means, second control means controlling discharge of cases from said second magazine, said first-mentioned control means being capable of actuation with greater frequency than said second control means, and counter means responsive to actuation of said first-mentioned and said second control means and of said discharge means to actuate said first-mentioned control means to discharge a case from said first magazine only when less than a predetermined number of cases is disposed between said first and second magazines.

8. The combination of claim 7, in which said counter means comprises a valve connected to said first-mentioned control means, a lever movable to open said valve, means biasing said lever in a first direction to open said valve, means operable upon actuation of said first-mentioned control means to move said lever in a second direction opposite said first direction, means operable upon

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actuation of said second control means to move said lever in said first direction, and means operable upon actuation of discharge means to move said lever in said first direction.

9. The combination of claim 7, in which said counter means comprises a valve connected to said first-mentioned control means, a first shaft, a lever on said first shaft and operable when moved in a first direction to open said valve, a first differential gear housing, a first differential gear system in said first housing and connected to said first shaft, means rotating said first housing upon actuation of said second control means to rotate said first shaft in said first direction, a second shaft connected to said first differential gear system, a second differential gear housing, a second differential gear system in said second differential gear housing and connected to said second shaft, means for rotating said second housing upon actuation of said discharge means to rotate said first shaft in said first direction, a third shaft connected to said second differential gear system, and means for rotating said third shaft upon actuation of said first-mentioned control means to rotate said first shaft in a second direction opposite said first direction.

10. The combination of claim 9, which further comprises means biasing said first shaft in said first direction.

11. A counter comprising an actuating lever, a first shaft on which said lever is mounted, a first differential

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gear housing, a first differential gear system in said first housing and connected to said first shaft, first means rotating said first housing to rotate said first shaft in one direction, a second shaft connected to said first differential gear system, a second differential gear housing, a second differential gear system in said second differential gear housing and connected to said second shaft, second means for rotating said second housing in one direction, a third shaft connected to said second differential gear system, third means for rotating said third shaft in one direction, means rotatably mounting said shafts and housings, said first, second and third means being arranged so that one of said means is operable to rotate said first shaft in a direction opposite that in which said other two means rotate said first shaft.

12. A counter according to claim 11, in which at least one of said first, second and third means comprises a ratchet, a pawl engaging said ratchet, and means indexing said pawl.

13. A counter according to claim 11, which further comprises means biasing said first shaft in one direction.

14. A counter according to claim 11, which further comprises a valve, said valve being arranged to be moved by contact of said lever.

References Cited in the file of this patent

UNITED STATES PATENTS

2,761,263 Bruce ----- Sept. 4, 1956