April 7, 1936. E. B. LUCKIE 2,036,421

METHOD AND APPARATUS FOR INSERTING BOTTLES IN BOXES

Filed Nov. 12, 1932 6 Sheets-Sheet 1

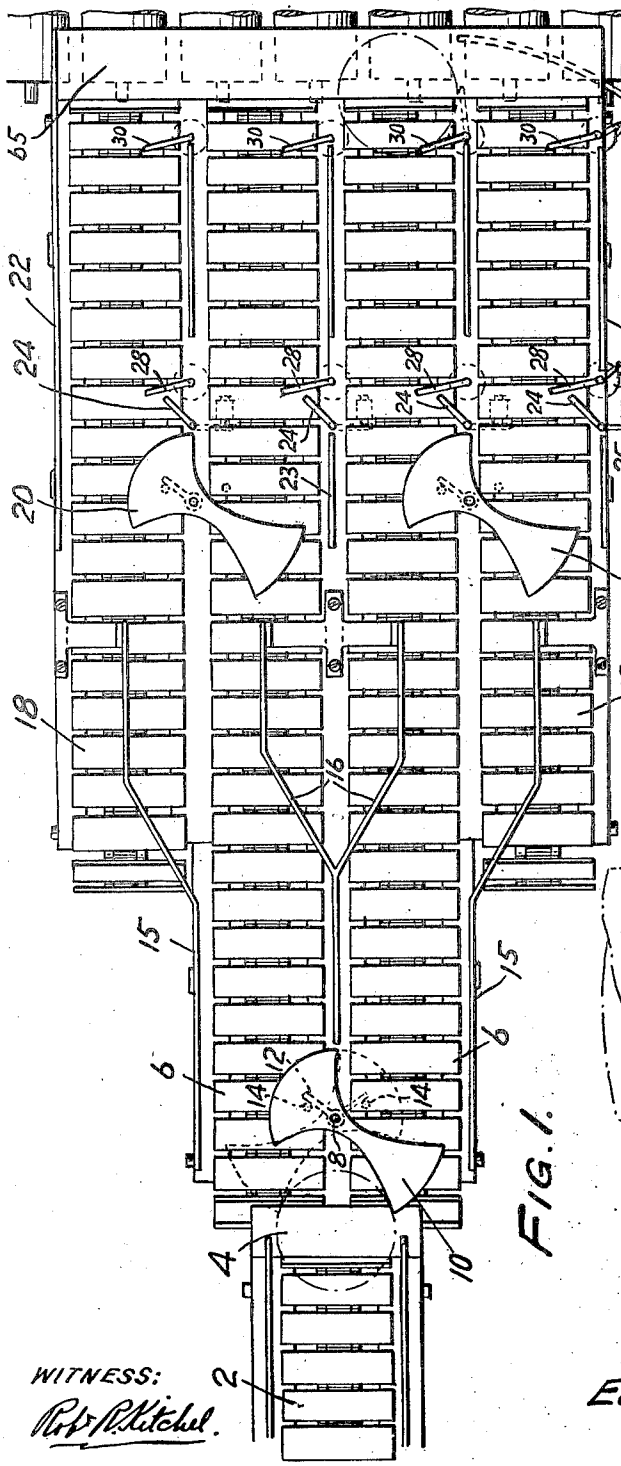

FIG. 1.

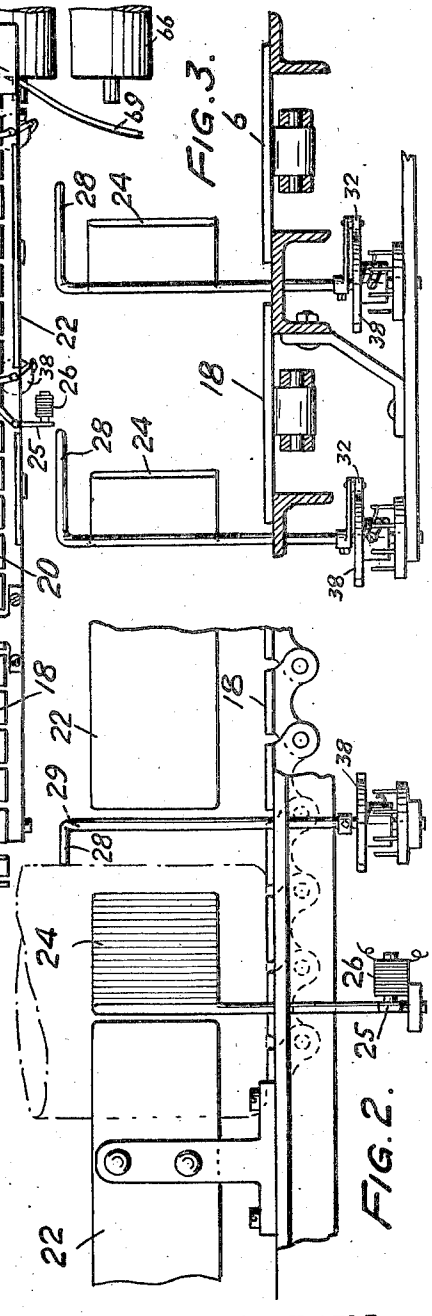

FIG. 3.

FIG. 2.

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METHOD AND APPARATUS FOR INSERTING BOTTLES IN BOXES

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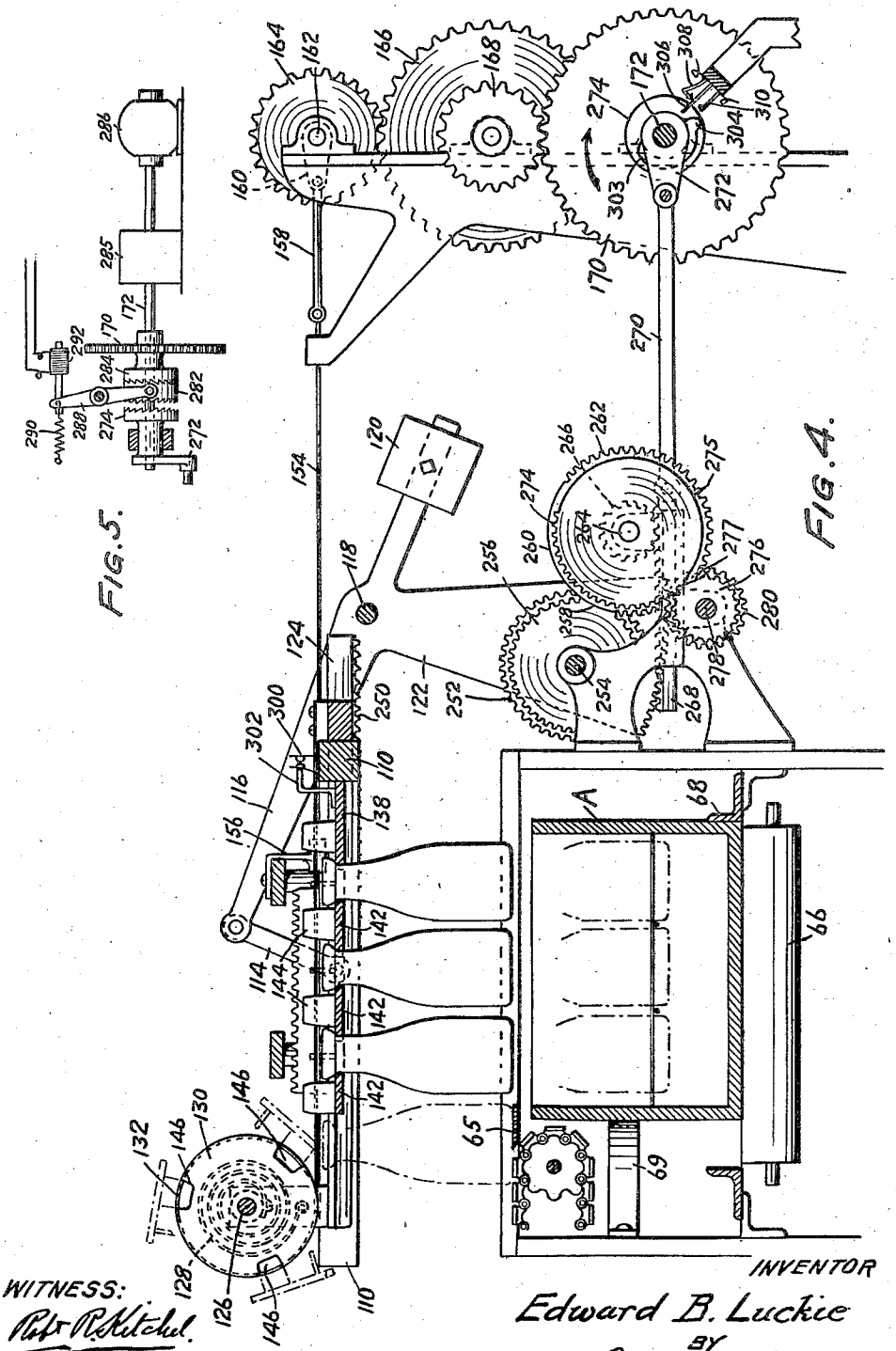

FIG. 4.

FIG. 5.

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METHOD AND APPARATUS FOR INSERTING BOTTLES IN BOXES

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FIG. 6.

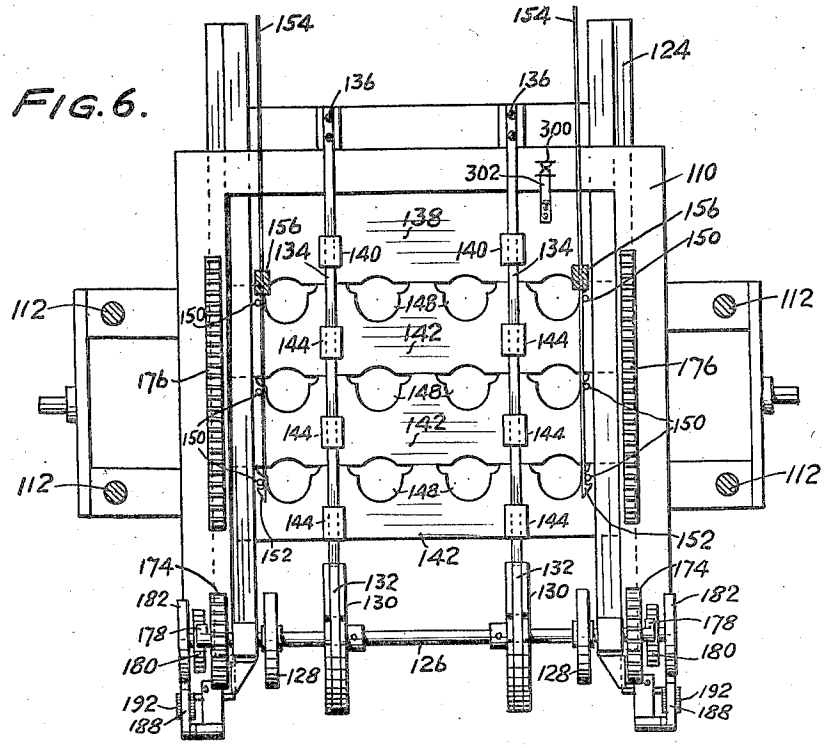
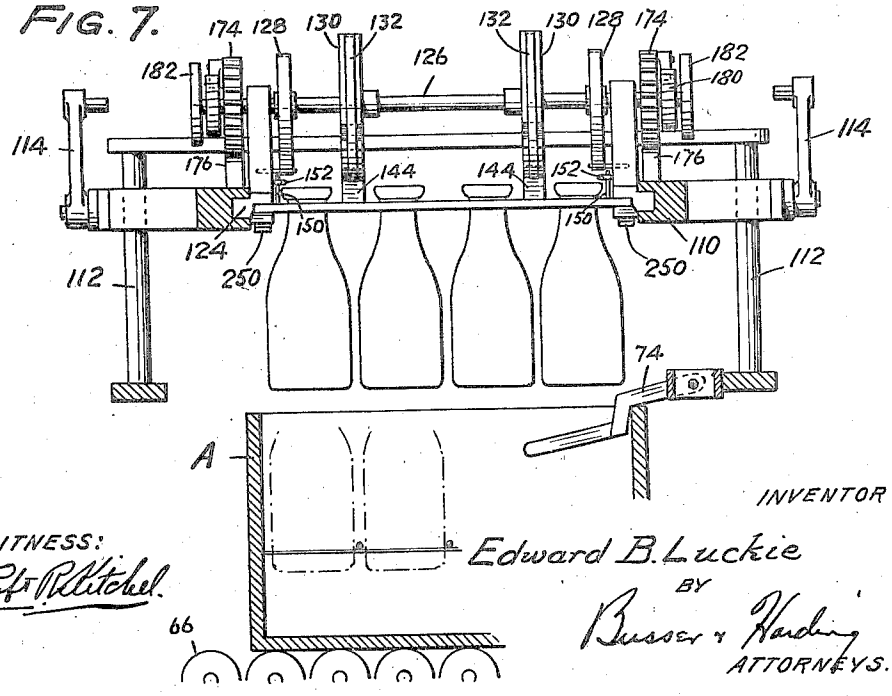


FIG. 7.



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METHOD AND APPARATUS FOR INSERTING BOTTLES IN BOXES

Filed Nov. 12, 1932 6 Sheets-Sheet 4

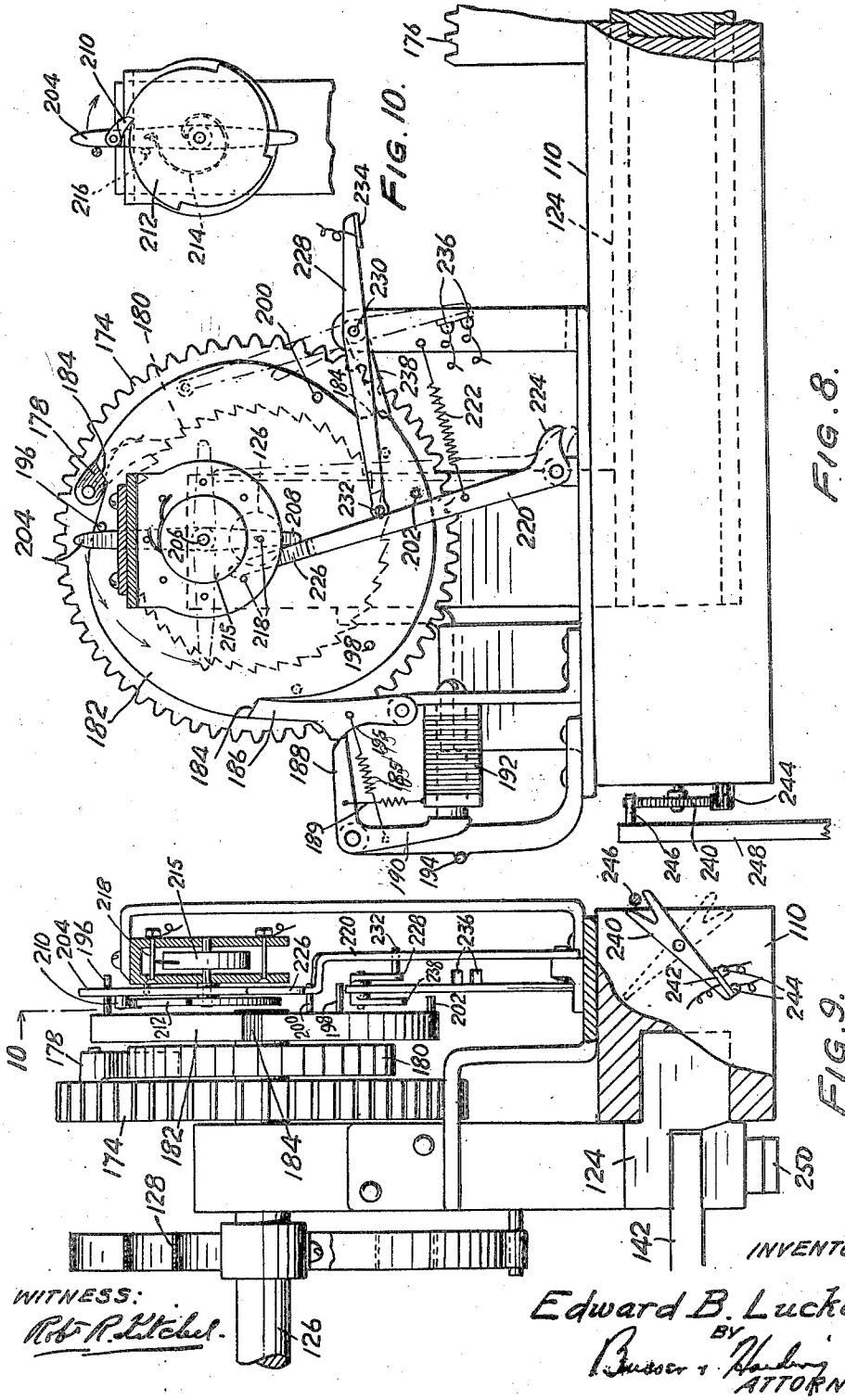

FIG. 8.

FIG. 9.

FIG. 10.

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METHOD AND APPARATUS FOR INSERTING BOTTLES IN BOXES

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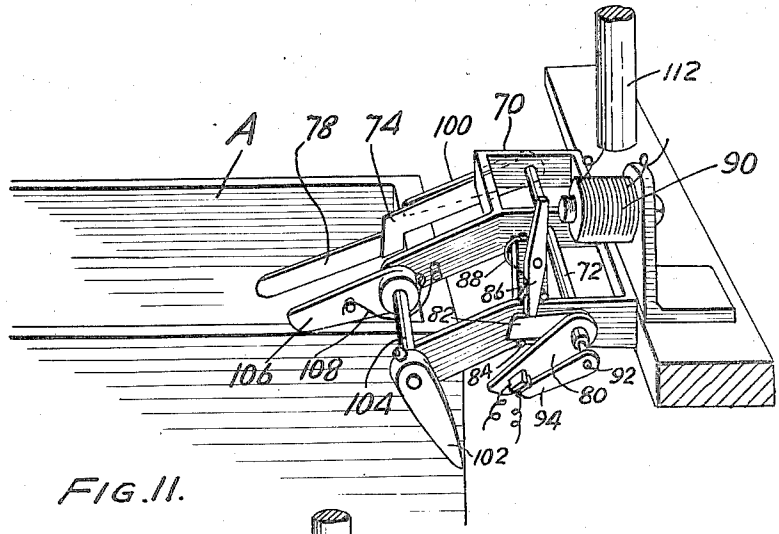

FIG. 11.

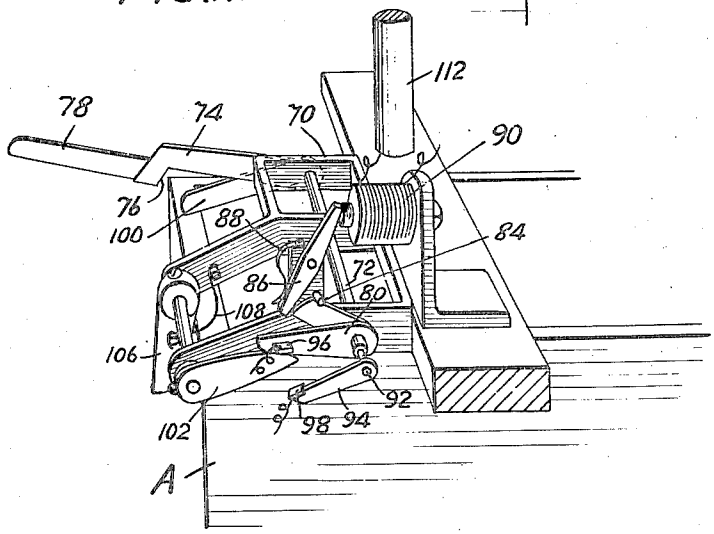

FIG. 12.

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METHOD AND APPARATUS FOR INSERTING BOTTLES IN BOXES

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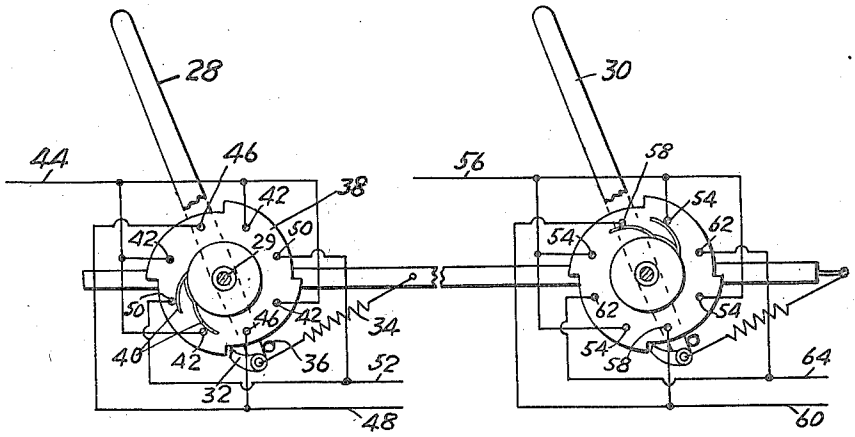

FIG. 13.

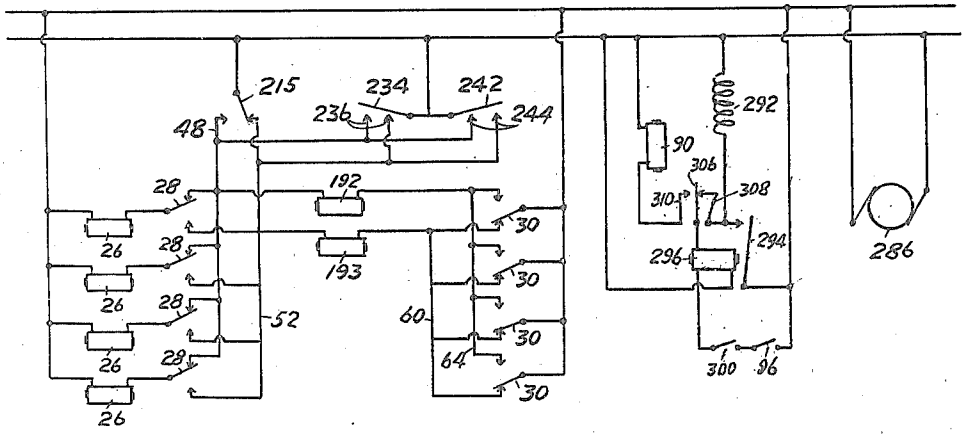

FIG. 14.

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UNITED STATES PATENT OFFICE

2,036,421

METHOD AND APPARATUS FOR INSERTING BOTTLES IN BOXES

Edward B. Luckie, Chester, Pa.

Application November 12, 1932, Serial No. 642,390

8 Claims. (Cl. 226—14)

This invention relates to a method and apparatus for inserting bottles or the like in boxes or cases and has particular reference to the placing of milk bottles in boxes therefor.

At the present time milk bottles are placed in position in boxes in which they are transported by a method involving moving the boxes along belts or suitable conveyors and locating the bottles therein by hand. Not only does this operation consume considerable time but it requires a large number of workmen to perform this box filling operation. The bottles in such boxes are maintained spaced apart by crosswires forming skeleton partitions. The presence of these wires reduces the ease of loading the boxes and from the standpoint of design of a mechanism to effect such loading creates further difficulties in view of the fact that the mechanism must be capable of acting with precision to properly locate the bottles in position without danger of breaking the same.

It is the broad object of the present invention to provide a method preferably carried out in its entirety by a machine by which the loading of boxes of conventional type is considerably facilitated with a resulting speeding up of the operation and elimination of labor. While the method is preferably carried out in its entirety by an automatic machine it will be obvious from the following description that it may be carried out in a semi-automatic manner, certain of the steps being carried out by mechanical elements, while others are carried out by hand.

A further object of the invention is to provide the fully automatic machine indicated above as capable of carrying out the method. In this machine individual bottles are received from a conveyor and are properly located relatively to each other in position to be inserted into a box which box is automatically positioned to receive them. Following the insertion the filled box is released and proceeds on its way on a suitable conveyor.

The more specific objects of the invention relating primarily to details of construction whereby the various functions of the machine are most effectively carried out will be apparent from the following description read in conjunction with the accompanying drawings in which:

Fig. 1 is a plan view of the bottle receiving and conveying portion of the machine;

Fig. 2 is a side elevation of certain of the elements associated with the mechanism of Fig. 1;

Fig. 3 is a transverse vertical section showing the mechanism of Fig. 2;

Fig. 4 is a sectional view, having certain parts omitted for clearness, illustrating the relationship of the bottle holding mechanism to the box or case and its supporting elements;

Fig. 5 is a diagrammatic elevation illustrating certain driving connections;

Fig. 6 is a plan view partly in section illustrating the bottle assembling and holding mechanism;

Fig. 7 is a vertical sectional view illustrating the same in its relationship to the box conveyor;

Fig. 8 is a fragmentary elevation partly in section illustrating certain controlling elements;

Fig. 9 is a vertical sectional view through the same mechanism;

Fig. 10 is a vertical section taken on the plane indicated by the line 10 in Fig. 9;

Figs. 11 and 12 are fragmentary perspective views illustrating the box positioning and controlling mechanism;

Fig. 13 is a diagrammatic view illustrating certain switches structurally shown in Fig. 1; and

Fig. 14 is a wiring diagram showing the electrical connections between the various controlling elements of the mechanism.

Referring first to Fig. 1 which illustrates the bottle conveying mechanism, there is illustrated therein a conveyor 2 which may be of any suitable driven type adapted to receive filled milk bottles or the like which are delivered thereto either by an operator or by the filling machine in any convenient manner. The bottles conveyed by the conveyor 2 are delivered to a table 4 which has a longitudinal extent considerably less than the diameter of the base of a bottle which is indicated in construction lines in Fig. 1. A pair of conveyors 6 are designed to receive the bottle from the table 4 and continue its movement in the same direction as the movement previously imparted by the conveyor 2. Located upon an upright shaft 8 between the conveyors 6 is a switch member 10 in the form of a plate provided with concavities of the form illustrated. An arm 12 carried by the shaft 8 is adapted to engage suitable fixed stops 14 so as to limit the movement of the member 10 to somewhat over 90° as will be evident from the drawing. If the switch member 10 is in the position illustrated when a bottle approaches the same, the bottle will first engage the lowermost portion of the switch member illustrated in Fig. 1. The switch member, however, is incapable of further rotation in a counterclockwise direction and accordingly the

bottle will be cammed transversely towards the belt 6 which is uppermost as viewed in that figure. As the bottle approaches the other end of the switch member 10 it will act upon the end turning it together with the shaft 8 to its opposite position so that the next bottle engaging the same will be moved to a position on the lowermost belt 6. Accordingly the bottles delivered by the conveyor 2 will be alternately directed upon the two conveyors 6. Suitable lateral guides 15 maintain the bottles in position on the respective conveyors. A central partition diverges as indicated at 16 so as to move the bottles from the belts 6 upon similar belts 18 which are moving with the same speed. The guides cause the bottles to be then delivered to switch members 20 similar to the switch member 10 which determine whether the bottles shall move upon the outer belts 18 or the inner belts 6. It will be obvious that the arrangement is such that four consecutive bottles will be distributed upon the different belts so that they advance in groups of four.

Side guides 22 maintain the bottles in position on the outermost belts. Likewise a central guide 23 maintains the bottles on the inner belts.

Located immediately beyond the switch members 20 are movable retaining elements 24 in the form of plates carried by upright shafts to which are secured armatures 25 adapted to be held by electromagnets 26. When the armatures 25 are released by the electromagnets, as will be pointed out hereafter, the bottles may proceed on their way on the various belts.

Beyond the retaining elements are switch devices comprising upright arms 28, secured to vertical shafts 29, arranged to be engaged by the bottles as they pass. Beyond these there are similar switch devices indicated at 30 which are of similar construction to the switch devices 28 and are adapted to be similarly engaged by the bottles as they move under the action of the conveyor belts. Since the two switches are of similar construction only the first will be described in detail, the two switches being shown in Fig. 13.

The arm 28 is carried by the shaft 29 which has secured to the lower end thereof an arm carrying a pawl 32 normally held against a stop 36 by the action of a spring 34. The pawl 32 acts upon a ratchet disc 38 provided with four teeth. This disc has secured thereto spring members 40 electrically connected together which are arranged to engage conducting posts 42, 46 and 50 disposed about the axis of rotation as indicated. Four of these posts designated 42 are electrically connected to a line 44. The two posts designated 46 are electrically connected to a line 48 while the two posts 50 are electrically connected to a line 52. The switch just described when given quarter turns by the action of the ratchet mechanism acts, in effect, as a double-throw switch alternately connecting the line 44 with either line 48 or line 52. In view of this function it is illustrated in a simple conventional manner as a single-pole double-throw switch in the wiring diagram of Fig. 14. In the case of the switch 30 four posts 54 are connected to a line 56. Two posts 58 are connected to a line 60 while the other two posts 62 are connected to a line 64. This switch also serves as a single-pole double-throw switch between the line 56 and the lines 60 and 64. The throws of the arms 28 and 30 are such that the passage of a bottle by either of the switches will cause the movement of the contact elements through 90°.

The bottles from the belts 6 and 18 are delivered upon a table 65. As will be obvious, hereafter, the operation of the machine is such that four bottles are lined up on the table 65 prior to successive operations of the machine, the four bottles located thereon being handled as a unit.

Related to the table 65 as indicated in Fig. 4 is a box conveyor 66 which may be either of a positively driven or roller gravity type adapted to convey the boxes A in a direction at right angles to the direction of movement of the bottles by the belts 6 and 18. A guide 68 against which the boxes are yieldingly pressed by a spring member 69 serves to properly align the boxes for the reception of the bottles.

In order to hold the boxes in position for the reception of the bottles, there is provided the mechanism illustrated in Figs. 11 and 12 carried by a fixed portion of the frame of the machine.

In view of the fact that the boxes are held by this mechanism, it is preferable to use gravity feed or a roller conveyor of the type illustrated at 66. The box holding mechanism comprises a frame member 70 in which is journalled a sleeve 72 carrying at one end an arm 74 which is provided with a sloping shoulder as illustrated at 76 and an extension 78. The other end of the sleeve 72 carries an arm 80 and also an arm 82, the counterclockwise movement of which as viewed in Fig. 1 is limited by a stop pin 84. A latch 86 in the form of a supplementary pivoted lever urged in a counterclockwise direction by spring 88 is adapted to engage the top of the arm 82 to hold it as illustrated in Fig. 11. The lever 86, the movement of which is limited by a stop pin, acts as the armature for an electromagnet 90 which by attracting the upper end thereof serves to liberate the arm 82 and thereby permit the sleeve 72 to rotate clockwise.

Extending through the sleeve 72 and journalled therein is a shaft 92 which carries at one end an arm 94 supporting a contact member 98 designed to engage a contact member 96 carried by the arm 80. The other end of the shaft 92 carries a finger 100 which extends to a position approximating the sloping shoulder 76 on the arm 74.

An arm 102 is carried by a shaft 104 journalled in the frame, this shaft also carrying an arm 106 and being urged in a counterclockwise direction as viewed in the figures by a spring 108. The arm 102 is in the same plane as the arm 80 so that it will engage and lift the same under the action of the spring 108.

The action of the mechanism just described in arresting a box will now be briefly described. As the box approaches the retaining devices the electromagnet 90 will ordinarily have been deenergized following an energization thereof so that the member 86 will not engage the top of arm 82 to hold the same downwardly but will rest against the outer end thereof substantially as illustrated in Fig. 12 in which figure, however, the electromagnet is illustrated as energized. In view of this the arm 106 will hang downwardly and arm 102 will by its action upon the lever 80 cause the arm 74 to be in raised position. As the box approaches it will initially engage the arm 100 swinging the same idly. It will then engage the arm 106 which is positioned so as to slide along the upper edge of a side of the box. As the arm 106 is raised arm 102 moves downwardly releasing the lever 80 and accordingly the arm 74 will drop by its weight rotating the shaft 72.

The parts are positioned, however, as illustrated so that the dropping of the arm 74 lags to some extent the upward movement of the arm 106 and accordingly the hook or shoulder 76 will not engage the leading edge of the box but, instead, this leading upper edge will be engaged by the extension 78. As the forward portion of the box passes, the arm 74 will drop to its lowermost position without, however, causing an engagement of the contacts 96 and 98 since, at this time, the lever 100 will be unsupported. As the box now moves further and its rear wall approaches the mechanism, it will be arrested by engagement with the shoulder 76 inasmuch as the arm 106 will still ride along the side upper edge. The slope of the shoulder 76 together with the off-center engagement is such that the tendency of the box to move on or by the conveyor will ordinarily swing the arm 74 upwardly. This, however, is now prevented inasmuch as when the arm 74 moves to its lowest position the latch 86 will move above the arm 82 holding the arm 74 downwardly. The arm 100 at the time the box is held is swung clockwise so that engagement of the contacts 96 and 98 occurs. Finally the box is retained with all of the parts in the positions illustrated in Fig. 11.

Release of the box is effected by the attraction of the lever 86 by the electromagnet 90. This action releases the shaft 72 for clockwise movement and the arm 74 is swung upwardly by the action of the box which will now have been filled with bottles. The extension 78 is provided so that the lever 74 will be held upwardly until the box clears the arm 106 so as to prevent the shoulder 76 from engaging the leading edge of a subsequent box which will, of course, be engaged when its rear wall approaches the position of retaining mechanism. The extension 78 is located so as to be between bottles which enter the box.

It has now been seen that the mechanism is such as to hold a box in position to be filled and also line up four bottles on the table 65. The electrical connections which insure a proper timing will be later described in conjunction with the mechanism as a whole.

As illustrated in Figs. 4 and 7, a frame 110 is vertically slidable on fixed upright guide rods 112. Vertical movements are imparted thereto through the medium of links 114 connected to levers 116 carried by a shaft 118, one of these levers being provided with a counterweight 120 and having an extension in the form of a gear segment 122 which will be actuated as hereafter described. Slidable within the frame 110 is a sliding frame 124 capable of movement in the direction of feed of the bottle conveyors. Journalled in this frame 124 is a shaft 126 which is urged in a counterclockwise direction as viewed in Figs. 4 and 8 by spiral springs 128. The shaft carries discs 130 about which are concentrically curved metallic rails 132 preferably extending within peripheral grooves as indicated. These rails 132 have tangential extensions 134 which are secured at 136 to the sliding frame 124. A plate 138 is provided with upwardly extending lugs 140 which have openings embracing the rails 134 so that the plate is guided therealong. Additionally the plate may be guided within suitable longitudinally extending grooves in the frame 124.

Besides the plate 138 there are three plates 142 of similar form also provided with upwardly extending lugs 144 riding on the rails 134 and adapted not only to engage the straight portions thereof but also the portions extending about the discs 130. The lugs of these plates 142 may engage within openings 146 in the discs so that as they move about the curved portions of the rails they will be held properly spaced by the discs and will by the rotation of the discs be moved about the curved portions of the rails.

The various plates form between them openings 148 designed to receive the necks of milk bottles, or other similar bottles, to support the same, these openings being smaller in size than the beads at the mouths of the bottles. The peculiar shapes of the openings illustrated, that is, the deviations from circular form, are provided for clearance purposes.

Extending upwardly from the plates 142 are pins 150 which may be engaged by the hooked ends 152 of rods 154 guided for longitudinal sliding movement in fixed elements 156 supported by the frame. The rods 154 are connected at their outer ends by links 158 to cranks 160 carried by a shaft 162 on which is secured a pinion 164 arranged to be driven through gearing 166, 168 and 170 in a manner which will be hereafter described, the gear 170 being journalled upon a shaft 172.

Pinions 174 are journalled on the shaft 126 being engageable with racks 176 carried by the fixed frame 110 during the relative movements between this frame and the movable frame 124. Spring pressed pawls 178 carried by the pinions 174 engage ratchets 180, 180 secured to the shaft 126 at opposite ends thereof.

Carried also by the shaft 126 at opposite ends thereof are detent plates 182 each of which is provided with three shoulders as illustrated at 184. Inasmuch as the elements associated with these plates are duplicated only one assembly will be described in detail, this being shown most clearly in Figs. 8 and 9. Escapement pawls 186 are designed to engage the shoulders 184 to prevent rotation of the plates 182 under the action of the spiral springs 128. Each pawl 186 has associated therewith a bell crank 188 provided with an arm 190 forming the armature of an electromagnet. One of these electromagnets is designated 192 while the other is designated 193. A spring 189 serves to urge each bell crank away from its electromagnet into engagement with a stop 194. The horizontal arm of the bell crank is adapted to act upon the cam surface 195 of the pawl 186 to move the same inwardly as it rises under the action of its electromagnet.

A light spring 185 tends to retract the pawl 184 when the bell crank is released by the electromagnet. It may be pointed out that the cam surface 195 may swing the bell crank away from the electromagnet if pawl 186 is pressed outwardly with sufficient force, for example, by the cam action occurring as the disc 182 rotates clockwise.

Extending from the surface of the disc 182 are pins 196, 198 and 200, the first of these pins being of greater length than the other two. A fourth pin 202 which is shorter than the pins 198 and 200 is also provided. Pins 196, 198 and 200 act similarly so far as an arm 204 is concerned which is journalled upon a shaft 206 mounted in a bracket carried by the sliding frame 124. The arm 204 has a lower extension 208 the purpose of which will be hereafter made clear. Pivoted on the arm 204 is a spring pressed pawl 210 arranged to engage the four teeth formed on a ratchet disc 212. This ratchet disc corresponds to the ratchet disc 38 illustrated in Fig. 13 carrying contact members which cooperate

with eight conducting posts 218 connected to provide in effect a single-pole double-throw switch 215 illustrated in the wiring diagram of Fig. 14. The arm 204 is normally urged into engagement with a fixed stop 216 by a spring 214. By reason of the fact that the shaft 206 is eccentric to the shaft 126 the movement of any one of the pins 196, 198 or 200 through a third of a revolution of shaft 126 will move the arm 204 through somewhat more than 90° with the result that stepping of the switch will take place to alternately connect two circuits as will be more fully brought out hereafter. The pin 202 is too short to engage the arm 204.

An arm 220 urged in a clockwise direction as viewed in Fig. 8 by a spring 222 to a limiting position determined by an extension 224 has a portion 226 lying in the same plane as the depending portion 208 of the lever 204. Normally, 220 is held inoperative by a pin 232 carried at the end of an arm 228 secured to a shaft 230 mounted in the frame. The pins 198 and 200 are too short to engage the arm 228. Pin 196 however is sufficiently long to engage this arm so that during counterclockwise rotation of the pin 196 it will engage the arm 228 rocking it clockwise and disengaging the arm 220. At such time the arm 220 will be moved by the spring 222 causing the lever 204 to assume for a time a horizontal position as illustrated in construction lines. The pin 202 serves during clockwise rotation of the shaft 126 to engage an arm 238 carried by the shaft 230 and restore the parts to the position illustrated in Fig. 8. A contact element 234 carried by the arm 226 is designed to bridge contacts 236 when this arm is moved clockwise by the pin 196. The contact element 234 is connected to a line and serves to simultaneously connect both of the contacts 236 to this line.

The vertically slidable carrying frame 110 has pivoted thereon a lever 240 provided with a bifurcated end engageable with a pin 246 carried by an upright fixed member 248. A contact 242 carried by 240 serves to bridge the two contacts 244 during a portion of the operation of the machine. It may be stated in passing that 242 is connected to the same line as 234 while the contacts 236 are connected in pairs with the contacts 244. Accordingly these two switches are in parallel as will be obvious from the wiring diagram.

The sliding frame 124 carries on its lower side racks 250 engageable with pinions 252 secured to a shaft 254. This shaft also carries a mutilated gear 256 forming the driven member of a pair, the gear being provided with a concavity 258 engageable with the smooth portion 260 of the periphery of a mutilated driving member 262 carried by a shaft 264 which also carries a pinion 266 engageable by a sliding rack 268 connected through a link 270 with a crank 272 journalled upon the shaft 172 already referred to. A mutilated gear 274 provided with a smooth portion 275 is also carried by the shaft 264 and engages a pinion 276 having a concavity 277 secured to a shaft 278 to which is also secured a pinion 280 engageable with the gear segment 122 mentioned above. The various portions of the mutilated gears are related in a manner which will be obvious from the description of the operation.

The crank 272 has secured thereto a clutch member 274. A movable clutch member 282 splined to the shaft 172 selectively engages either the clutch member 274 or a second clutch member 284 carried by the gear 170. The movements of the movable clutch member 282 are effected by a forked lever 288 to which motions in one direction are imparted by a spring 290 and in the other direction by the plunger of a solenoid 292, the circuit connections of which are shown in Fig. 14 and involve a relay 296 closing a circuit at 294. The shaft 172 is driven through reduction gearing 285 by a continuously running motor 286.

Contact members 300 carried by the frame member 110 are designed to be engaged with each other by the action of a member 302 carried by the plate 138. The member 302 causes a closure of the circuit through the contacts 300 when the plate reaches its extreme position relative to the frame 124. It may be pointed out that the arrangement is such that the plate 138 abuts a portion of the fixed frame 110 as illustrated most clearly in Fig. 4.

Two cams 303 and 304 are carried by the crank 272 and are adapted to wipe a flexible spring contact element 306 to cause it to first engage a yielding contact 310 and then disengage a flexible contact 308 which is carried by a spring causing it to follow contact 306 to the left as viewed in Fig. 4 so that 306 does not disengage 308 before engaging 310 but does later disengage 308 by further movement, under the action of the high cam 304, 310 yielding to permit this last movement. The simultaneous engagement of 308 and 310 energizes electromagnet 90 to effect release of the box.

In Fig. 14 there is illustrated the wiring diagram of the machine. The various switches 28, 30 and 215 are for greater clarity illustrated as equivalent single-pole double-throw switches. It will be noted that the various switches 28 are in series with the corresponding electromagnets 26 the combinations being in parallel. The switches 30 are also in corresponding positions, each being alternately capable of closing a circuit through either of the electromagnets 192 and 193. Switches 234 and 242 are in parallel. Switches 96 and 300 are in series with the relay electromagnet 296 which is arranged to close the circuit through the switch actuating solenoid 292.

With the above brief résumé of the wiring diagram the operation of the machine will be readily understood. Let it be assumed that the machine is in stationary position without any bottles upon the various conveyor belts and without any box in position to receive the bottles. Upon starting the main driving motor 286, or motors, if more than one is used, inasmuch as the conveyor belts may be operated independently, bottles will be placed upon the conveyor 2 and boxes will be placed upon the conveyor 66 to run in the present instance by gravity to the loading position. The operations involved in arresting a box in position to receive the bottles has already been described. As is indicated in Fig. 11 the presence of a box in proper position results in the closure of the switch 96.

Prior to the time of passage of any bottles past the switch members 20 the circuit arrangement will be as indicated in Fig. 14 or the alternate corresponding position. In the case illustrated, since the switch 215 engages the righthand contact the electromagnets 26 will be deenergized and consequently the retaining arms 24 will be freely movable to permit bottles to pass. The various switches 28 will occupy the upper positions illustrated. At the same time the switches 30 will occupy the lower positions, it being understood that the terms "upper" and "lower" and the like

are used not to describe actual conditions of physical switches but the positions of the equivalent switches in the wiring diagram. The electromagnet 193 is energized while electromagnet 192 is deenergized. As a result the disc 182 and consequently the shaft 126 are held against the tension of springs 128, the plates 142 occupying positions about the discs 130 with their lugs 144 engaged within the openings 146.

The first bottle entering the apparatus will pass above the uppermost switch 20 as viewed in Fig. 1. It will pass freely the retaining arm 24 and will immediately thereafter actuate the corresponding switch 28 moving it down as viewed in the wiring diagram and thus energizing the electromagnet 26. As a result, no subsequent bottle can pass the position of the arm 24 since the electromagnet will hold this arm in its retaining position. The bottle will further proceed and energize switch 30 moving it upwardly and thereby opening one of the four parallel contacts maintaining the electromagnet 193 energized.

The second bottle will pass above the lower of the switch plates 20 and will effect a similar action of the switches 28 and 30 corresponding thereto. The third and fourth bottles will effect similar operations. When the fourth bottle passes, however, the circuit through the electromagnet 193 will be broken and consequently the pawl 186 held thereby will be released. Four bottles are now in position upon the platform 65. As release of the pawl 186 corresponding to the electromagnet 193 occurs the shaft 126 will be rotated by the springs 128. This rotation will cause the first of the plates 142 to be moved to the straight portion of the tracks 134 to engage the necks of the four bottles and move them off the table 65. At this time, as will be evident from the description of the termination of the operation, the plate 138 will be in a position just forwardly of the table 65 so that it will be engaged by the plate 142 and the openings 148 will be formed so as to suspend the first four bottles. The movement of the shaft 126 is not alone depended upon to move the plate 142. In addition the hook members 152 engage the pins 150 of the first of the plates 142 to move the same into position, these hooks being continuously reciprocated by reason of the fact that the spring 290 maintains the movable clutch member 282 engaged with the clutch member 284 to drive the train of gearing 170—164.

As the shaft 126 revolves, the pin 196 moves the arm 204 changing the position of the switch 215 to the left as viewed in Fig. 14. As a result, the electromagnet 192 is immediately energized inasmuch as the switches 30 are now in their upper positions. Accordingly the pawl 186 corresponding to the electromagnet 192 is moved inwardly in position to engage and stop the shaft by engagement with the next shoulder 184. The shaft 126 accordingly makes a part of a revolution and comes to rest. The pin 196 rides off the end of the lever 204 and consequently the lever returns to its vertical position adjacent the next pin 200 which will be now uppermost.

The closure of the lefthand contact by the switch 215 immediately deenergizes the electromagnets 26 thereby permitting the feed to the table 65 of four more bottles as the same arrive in position on the conveyor. It will be noted that prior to the passage of the last four bottles the various switches 28, 30 and 215 will be in positions corresponding to but opposite those initially assumed, the electromagnet 192 rather than 193 being now energized. It is obvious, therefore, that the passage of the next four bottles will effect corresponding operations with the result that at the end of the shaft 126 will have imparted thereto another third revolution and the second series of bottles will be held between the first and second plates 142, the plate 138 being correspondingly advanced so that the first series of bottles are still held. After the second group of four bottles takes its position, the switches will occupy the first positions and the last group of four bottles will effect the same results as the first group.

As the shaft 126 has imparted thereto its last third of a revolution the third plate 142 engages the last group of four bottles with the result that after the hooks 152 act, all of the bottles will be held over the case, which is in receiving position, vertically above their final positions.

In the last part of a revolution of the shaft 126 the long pin 196 will be moving through the lower portion of its arc. It will accordingly engage the arm 226 closing the switch 234 which, in effect, results in a short circuiting of the switch 215 and causes the electromagnets 26 to be energized irrespective of the positions of the switches 28. The switch 215, it may be pointed out, would be at this time in position to open the circuits of these electromagnets. As a result new bottles are prevented from entering upon the table 65 during the period when the bottles already in loading position are being placed in the case. The parallel switch 242 is at this time open because the lever 240 will occupy its extreme clockwise position inasmuch as the frame 110 is raised.

When the hook members 152 finally act upon the pins 150 of the last plate 142 the member 302 will close the contacts 300. Inasmuch as switch 96 is already closed the circuit through the relay 296 is closed and the solenoid 292 is energized to shift the clutch member 282 to the left as viewed in Fig. 5 so that rotation of the crank 272 begins. The crank 272 rotates clockwise as viewed in Fig. 4. It is to be noted that the series arrangement of the switches 96 and 300 insures that the crank will not be brought into operation until both the bottles and the cases are in proper position for the loading operation.

Since contacts 306 and 308 are engaged, the coincident closure of switches 96 and 300 results in energization of solenoid 292 without the need for relay 296. The relay is provided, however, to maintain the solenoid energized during a subsequent period when 300 is open as will be indicated below. By closing the circuit at 294 both 292 and 296 are energized irrespective of switches 300 and 96 so long as contact is made between 306 and 308. As has already been noted 306 engages 310 before disengaging 308 so that the electromagnet 90 is energized momentarily receiving current through 294, 308, 306 and 310.

It may be pointed out at this time that the lever 220 swings to the right under the action of spring 222 holding the pawl carrying arm 204 in a horizontal position so that during subsequent operations the pins 196, 198 and 200 may freely pass it without engagement therewith.

Referring now more particularly to Fig. 4 the smooth portion 260 is now in engagement with the concavity 258 so that a considerable counterclockwise movement of the shaft 264 will take place prior to the movement of the shaft 254. Immediately upon initiation of movement of the rack 268 however the segment 122 is swung counterclockwise by the pinion 280 and consequently

the frame 110 is lowered bringing the bottles into position in the openings formed by the spacing wires in the case the position being however somewhat short of the bottom of the case so that eventually they will drop through a short distance into position. The lower position corresponds to the engagement of smooth portion 275 of gear 274 with concavity 277 of gear 276 whereby the segment 122 remains stationary. When the frame 110 reaches its lowermost position the racks 250 will engage the pinions 252 which up to the time of engagement are stationary. Immediately following engagement the teeth on 262 will engage the teeth on 256 and consequently the shaft 254 will be given a clockwise rotation. The sliding frame 124 will thus be moved to the right as viewed in Fig. 4. As this movement takes place the plates 138 and 142 are prevented from movement therewith by engagement of the plate 138 with a transverse member of the frame 110. The shaft 126, however, moves forwardly with the frame 124 and gears 174 are engaged with the racks 176 carried by the frame 110. Accordingly as the shaft 126 moves to the right it rotates clockwise due to the action of the pawls 178 upon the ratchets 180. The springs 128 are thus wound up while the pins 196, 198 and 200 pass the arm 204. The action of pin 202 on arm 238 breaks the contacts at 236 but previously the contacts at 244 were engaged by 242 during the downward movement of the frame 110 so that the other circuit conditions remain unchanged. Inasmuch as if any reverse movement of the gear 174 occurs the shaft 126 will be arrested by one of the pawls 186, the spring will be maintained under tension. During the winding operation the pawls were of course forced outwardly by the camming action of the peripheries of the discs 182.

As the discs 130 are rotated during this movement of the frame 124 to the right the plates 142 are successively picked up, lugs 144 entering the openings 146 so that they are moved about the curved portions of the tracks. As a result of this action the groups of bottles are successively dropped into the case.

Following the extreme righthand movement of the frame 124, as the crank 272 passes its dead center position, reversal of the movement takes place. In this reversal the slide 124 moves to the left carrying with it the plate 138 so that the switch 300 is opened. The circuit through 294 however remains closed as pointed out above.

At some time following release of the bottles, cam 303 causes contact 306 to engage 310 effecting release of the box.

Following completion of the reversal movement of the frame 124 the segment 122 is swung clockwise and the frame is raised. As the frame nears the end of its upward movement the pin 246 is engaged by the bifurcated lever 240 with the result that contact between 242 and the elements 244 is interrupted. As a result the switch 215 is the only connection between its side of the line and the various elements of the electric circuit involving the magnets 26. As noted above, the position of the switch at this time is such that the electromagnets 26 will be deenergized and accordingly new bottles may proceed past the position of the retaining arms 24 on their way to the table 65. As the dead center position of the crank 272 is approached the cam 304 engages the contact 306 to break its engagement with 308 so that the electromagnet 296 is deenergized and its armature 294 dropped breaking the circuit through the solenoid 292. When this takes place the clutch 282 is moved by the spring 290 with the result that the crank 272 is disconnected from the driving motor and the gear train 170—164 is again connected thereto. The overrun of the crank 272 serves to disengage the cam 304 from the contact 306 which springs back to its original position engaging contact 308. At the time the box is released contact at 96 is broken and accordingly all of the parts are in their original positions for a repetition of the operation.

It is obvious that numerous changes may be made in the details of construction without departing from the invention as defined in the following claims.

What I claim and desire to protect by Letters Patent is:

1. A machine for placing bottles or the like in boxes including means for supporting successive groups of bottles, means for successively engaging the necks of groups of bottles on said supporting means to support in association, a plurality of groups and means for lowering the bottles so associated into a box.

2. A machine for placing bottles or the like in boxes including a plurality of devices for holding groups of bottles in associated relationship by the necks thereof, means for actuating said devices to cause them to carry the bottles to positions for entry in a box, and means for successively disengaging said devices from the bottles to successively release groups of the latter.

3. A machine for placing bottles or the like in boxes including means for supporting successive groups of bottles, means for successively engaging the necks of groups of bottles on said supporting means to support in association a plurality of groups, means for lowering the bottles so associated into a box, and means for successively releasing the groups of bottles into positions in the box.

4. A machine for placing bottles or the like in boxes including means for supporting successive groups of bottles, a plurality of devices movable to engage successive groups of bottles at the necks thereof to support in association a plurality of such groups, means for lowering said devices to locate the bottles so associated within a box, and means for successively releasing said devices from the bottles.

5. A machine for placing bottles or the like in boxes including means for advancing bottles in random succession, means for guiding successive bottles so advanced in different paths to form linear groups extending transversely of the paths, means detaining subsequent bottles during the formation of groups to space such subsequent bottles from the bottles of a group, said detaining means being rendered inoperative after the completion of the formation of a group, means for moving a formed group as a unit, means for successively associating subsequent groups with said group laterally of it extent, and means for locating the associated groups in a box.

6. A machine for placing bottles or the like in boxes including a plurality of devices for holding the bottles in associated relationship by the necks thereof, said bottles when so associated being arranged in linear groups with said devices extending between said groups and each engaging the bottles of two groups, means for actuating said devices to cause them to carry the bottles to positions for entry in a box, and means for successively disengaging said devices from the groups of bottles to release said bottles.

7. A machine for placing bottles or the like in boxes including means for supporting successive linear groups of bottles, means for successively engaging the necks of such groups of bottles on said supporting means to support in association a plurality of groups in predetermined spacing from each other, means for lowering the bottles so associated into a box, and means for successively releasing the groups of bottles into positions in the box.

8. A machine for placing bottles or the like in boxes including means for supporting successive linear groups of bottles, a plurality of devices movable transversely to said groups to engage successive groups of bottles at the necks thereof to support in association a plurality of such groups with the devices located between them, means for lowering said devices to locate the bottles so associated within a box, and means for successively releasing said devices from the bottles after such location.

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