A bottle packaging machine for loading bottles into cases in which bottles and cases are fed into the machine on separate feed conveyors, the bottles being conveyed horizontally above the case conveyor. The bottles are divided into lanes and grouped into patterns on a continuous basis and the bottle groups are fed into a bottle gripper section and under grippers on a gripper conveyor located above the path of bottle movement. The grippers gently and firmly grasp the necks of the bottles, avoiding any contact with crowns or twist-off caps, and have a spring loaded action to compensate for differences in bottle neck dimensions. The empty cases are fed to match the bottle groups and are conveyed to an escalator-like conveyor having carriages with a grasping device that firmly grasps each case and escalates it up and around the bottle group held by the grippers. The bottles and cases flow concurrently in converging paths. The cases are conveyed in registration with the bottles as they are being packed and the case is gently raised around the bottle group to envelop it. The case continues moving upwardly until it supports the bottles, whereupon the grippers release their hold on the bottles, the grasping device releases the case, and the tightly packed case is discharged from the machine. This manner of loading permits loading the bottles into a slightly undersized case to give a tight pack that prevents rattling of the bottles and allows for the elimination of separators between bottles. The gentle handling of the bottles drastically reduces bottle breakage during packing and thereafter. The tight pack also reduces bottle breakage. This bottle packer is much quieter than conventional drop packers, and lends itself to higher packing speeds because of its continuous motion principles.

16 Claims, 19 Drawing Figures
BOTTLE PACKAGING MACHINE AND METHOD

BACKGROUND OF THE INVENTION

The invention relates to the field of bottle packing machines.

Conventional prior art packing machines have had a number of disadvantages in the handling of bottles as they are moved through the machine, this handling generally involving stopping and starting, changes in direction of travel of the bottles, and a dropping of the bottles at some point in the packing operation. For example, conventional drop-packers for loading bottles into corrugated cardboard cases and the like, drop the bottles into separators in the case through guiding fingers that extend into the chambers of the separators. Also, the prior art packing machines are generally limited in speed of operation.

Other bottle packers of interest are disclosed in the following patents. Fairless U.S. Pat. No. 2,978,854 discloses bottle-crating machines wherein the bottles are suspended on rails and are moved along by yokes mounted on a conveyor. Seval U.S. Pat. No. 2,921,425 discloses a boxing machine having gripper-heads, box-conveyor, and box-selector of specific construction.

SUMMARY OF THE INVENTION

It is the object of the invention to provide an improved bottle packaging machine having a more gentle, higher speed, dependable and economical operation than prior art machines and having less noise and bottle breakage. This bottle packer is adapted to operate continuously, and without reversing direction of bottle or case travel. The gentle way in which the inventive machine handles the bottles results from a mode of operation in which the bottles are released gently into each case without the shock of a drop. The bottles are supported by the case before the bottles are released from the bottle gripping mechanism. This makes it feasible to package bottle-to-bottle without separators between the bottles into a tight case which gives firm glass-to-glass contact. The high speeds are achieved by reason of the unique way in which the cases and bottles flow together. Moreover, these high speeds are achieved with one-way glass bottles and with returnable glass bottles, and with various types of cases and trays, such as corrugated cases and trays, fibre cases, and plastic or wooden crates. If the machine should stop, such as when it runs out of bottles or cases, it stops smoothly and then starts up smoothly because of controlled acceleration and deceleration. Another factor contributing to the high speed of the machine is that the bottles move in a straight line direction, never changing their plane until they contact the case. This straight-line bottle movement eliminates bottle drop, and reduces noise and breakage.

Moreover, the machine produces a tight pack so that the use of partitions may be eliminated, thus reducing the cost of the package.

Further, the inventive machine, together with a case former, permits the bottler to purchase the bottles in bulk pallet loads instead of in a more expensive packed arrangement, such as with the empty bottles packed into open-top cases. Bulk pallet loads may comprise nested bottles arranged in layers separated by paperboard slip sheets on a pallet, and held together by hands and a clear synthetic plastic bag shrunk around them.

DEFINITIONS

The term "escalator" as used herein is defined as a moving staircase or conveyor wherein the stair treads or carriages have top surface which remain positioned substantially horizontally as they are moved upwardly along an inclined plane.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings, which are partly diagrammatic in order to better illustrate the invention,

FIG. 1 is an overall view in side elevation of the bottle packer machine constructed in accordance with this invention;

FIG. 2 is a view in side elevation, on an enlarged scale, of the bottle infeed conveyor system of the bottle packer machine, with the case infeed conveyor section being shown diagrammatically for clarity;

FIG. 3 is a view in top plan of the sections shown in FIG. 2;

FIG. 4 is a view in side elevation of portions of the grouper section and the bottle group infeed, showing more detail and showing the case release mechanism;

FIG. 5 is a view in side elevation of the bottle group infeed, bottle gripper conveyor, and the case escalator conveyor;

FIG. 6 is a diagrammatic view of part of the drive mechanism of the machine;

FIG. 7 is a view in section taken as indicated by the lines and arrows 7—7 which appear in FIG. 5;

FIG. 8 is a view in section taken as indicated by the lines and arrows 8—8 which appear in FIG. 5;

FIGS. 9 and 10 together disclose a view in side elevation of the bottle gripper conveyor;

FIG. 11 is an enlarged partial view in side elevation of the discharge end of the bottle gripper conveyor and illustrates the bottle release mechanism;

FIG. 12 is an end view partly in section of the escalator conveyor of the machine;

FIG. 13 is an enlarged partial view of the discharge end of the escalator conveyor;

FIG. 14 is a view in side elevation of the case carriage which forms a "step" or "tread" of the case escalator conveyor;

FIG. 15 is a partial end view of the case carriage taken as indicated by the lines and arrows 15—15 which appear in FIG. 14;

FIG. 16 is a partial view in top plan of the case carrier of FIGS. 14 and 15 showing the case grasping mechanism;

FIG. 17 is a view in side elevation of a two-bottle gripper forming a part of this invention;

FIG. 18 is a partial view in top plan looking down on FIG. 17; and

FIG. 19 an end view of FIG. 17 taken as indicated by the lines and arrows 19—19 which appear in FIG. 17.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Turning now to the specific embodiment of the invention selected for illustration in the drawings, there is shown in FIG. 1 an overall view of a bottle packaging machine 11 constructed in accordance with this invention for packing groups 13 of bottles 15 or the like into empty cases 17, trays or the like. Cases 17 include a leading endwall 19 and a trailing endwall 21 connected together by sidewalls 23 and bottom 25.
Bottle packaging machine 11 comprises a bottle infeed section 27 for feeding loose bottles into lanes, case infeed section 29 for feeding a line of empty cases 17 into the machine, a group 31 for grouping the loose bottles into groups 13, such as the illustrated group 13 of twelve bottles arranged in three lanes and four rows, a bottle gripper section 33 for gripping each bottle 15 of the group 13 around the upper portion of the bottle and conveying the group along a predetermined path to a bottle packer section 35 which includes a case escalator 37 that conveys empty cases 17 under the bottle groups 13 so that the case surrounds or envelopes the bottles, bottle and case release section 39, and discharge section 41.

Case escalator 37 includes a series of carriages 43 having means for grasping a supporting each case 17 and bringing them into enveloping contact with the bottle groups 13. Bottle and case release section 39 includes means for releasing the grippers from the bottles with the bottle group 13 is supported by its case 17 and also includes means for releasing the filled cases from the carriages 43 by placing them onto the discharge conveyor so that the discharge conveyor strips the filled case from the grasp of carriage 43 as the carriage sinks downwardly in its return travel.

The bottles 15 and bottle groups 13 are conveyed in a horizontal path through the bottle packer machine 11, and the cases 17 are conveyed in a concurrently flowing converging path beneath the bottle path, with the case path becoming upwardly inclined in bottle packer section 35 to converge with the bottle path so that the cases 17 meet the bottle groups 13.

Bottles 15 and cases 17 are fed into bottle packer machine 11 at bottle infeed section 27 and case infeed section 29. The bottles 15 are divided into three lanes, and are then grouped into patterns at grouper 31 on a continuous basis. The cases 17 are fed into the machine 11 to match the bottle groups 13.

After grouping, the bottle groups are fed in a timed sequence under grippers 45 in bottle gripper section 33 where the bottles are picked up by the grippers. Grippers 45 gently but firmly grasp the necks of the bottles 15 without damaging the bottles. The spring loaded action of the grippers 45 compensates for differences in bottle dimensions, and the grippers do not contact the crowns or twist-off caps of the bottles.

Cases 17 are conveyed to the bottle packer section and are metered on demand to case escalator 37 which firmly grasps the cases and escalates them up and around a bottle group 13.

One of the advantageous features of bottle packer machine 11 is the manner in which the cases 17 register with the bottle groups 13 as they are being inserted into the case. The leading endwall 19 of the case contacts the leading row of bottles and then the case is gently raised around the bottle group. The case 17 continues moving upwardly until it supports the bottle group 13, then the packed case is released from grouper 43, and the tightly packed case is discharged from the machine at discharge section 41.

The method of packing bottles 15 or the like into cases 17 or the like includes the steps of feeding groups 13 of bottles 15 through a bottle feeding zone 27 and a bottle gripping zone 33, suspending the bottle group 13 by gripping each bottle 15 around the neck of the bottle, moving the gripped bottles along a predetermined path into a packer zone 35, feeding empty cases 17 under the bottle groups 13 in successive relation to match said bottle groups 13, feeding the cases 17 in the same general direction as the bottles so that the bottles and cases flow concurrently, conveying the bottle groups 13 and cases 17 in converging paths so that they flow into contact with each other in packer zone 35, enveloping each bottle group 13 with a case 17, supporting each bottle group 13 with the case 17, and releasing the suspension from the bottle group by releasing the grip on the bottles 15 after the bottle group 13 is supported by the case 17.

Additional method steps include feeding the bottle groups 13 in a horizontal path, conveying the cases 17 in an upwardly inclined path to meet the bottle groups 13, grasping and supporting each case while feeding it to the packer zone, releasing the case after the case has been filled with bottles, and delivering the filled case from the machine.

Other method steps include tilting the case to drop the trailing case endwall 21 below the level of the leading case endwall 19, sliding the inside surface of the leading endwall upwardly around the leading bottles of the group 13, retilting the trailing endwall 21 upwardly, and sliding the inside surface of trailing endwall 21 upwardly around the trailing bottles of the group to envelop the bottle group 13 within the case 17. The bottle group 13 is loaded into case 17 with a sort of "shoehorning" motion. The cases 17 are moved at the same linear speed as bottle group 13, but at a slower horizontal speed because of the inclined path of the cases 17.

Accordingly, the leading bottles push against the inside surface of leading endwall tending to bow it forwardly. When loading into flexible corrugated paper cases or trays, the leading endwall actually bows to provide clearance between the trailing row of bottles and the trailing endwall, allowing the bottle group to be packed into a case which would normally be considered to be too small for the bottle group, to give an interference fit between the bottles and the case walls.

Of course, when loading into inflexible crates of wood or plastic, the leading bottles press against the inside surface of the leading endwall to provide clearance between the trailing bottles and trailing endwall, but do not bow the inflexible leading endwall. As the bottles are being enveloped by the case, the grips on the bottles, although firm, are elastic enough so that the bottles are self-guided into the case while still being held securely against dropping.

FIGS. 2 and 3 show views in side elevation and top view of bottle infeed section 27 which includes a crowding divider section 28 (FIG. 3) that divides the loose bottles into three lanes, and grouper section 31 which separates the bottles into groups of 12 arranged in 3 lanes and 4 rows. Case infeed conveyor section 29 is shown diagrammatically in FIG. 2 for clarity.

Frame 47 supports a pair of bottle infeed conveyors 49, of the flat-top chain type, which are driven by a motor 51. The incoming bottles 15 are guided into the three lanes by side guides 53, 55, 55a, and lane dividers 57, 59.

Limit switch 61 is mounted on side guide 55 to indicate that there is a supply of bottles being fed into the machine, three top positioned limit switches 63 are in series with limit switch 61 and are positioned over each of the three lanes to indicate when the bottle supply in a lane gets too low, and three top positioned switches 65 are positioned farther along bottle travel over each
At the end of conveyors 49, the bottles pass over a dead plate 67 and are carried away on the other side of the dead plate by three lane conveyors 71-73 in the grouper section 31 of the machine.

Grouper pins 75 are mounted on transverse bars 75a supported between grouper chains 76 which are trained around sprockets on shafts 77, 78. The pins 75 are positioned so as to ride alongside the lane conveyors 71, 72, and 73 above the bottom of the bottles. Pins 75 hold back the bottles because the grouper pin conveyor chains 76 are moving at a slower speed than the lane conveyors 71-73. This causes the bottle group 13 which precedes the leading grouper pins 75 to separate and detach itself from the following bottles as the group is conveyed forwardly by the greater speed of lane conveyors 71-73. A similar grouper is shown and described in my co-pending patent application Ser. No. 39,287, filed May 21, 1970 and now U.S. Pat. No. 3,832,826.

The transverse bars 75a are offset from the grouper chains 76, and this offset reduces the tendency to torque the connection between the transverse bars 75a and the grouper chains because the contact point between the bottles and the pins 75 are on the same line as the center line of the chain. The grouper chains are guided top and bottom by guides, and this keeps every thing firm so there is no tendency for the transverse bars 75a to twist.

A speed control conveyor 79, FIGS. 4-5, is provided for controlling the speed of the bottle group 13 and matching it with the speed of the grippers 45, and includes chains 79a trained around sprockets on shafts 80 and 81, and pins 82 that are mounted on cross bars 82a connected between chains 79a. Pins 82 contact the leading bottles of the group 13 to hold them back and control their speed so that they travel at the same speed as the grippers 45. The pins 82 overcome the faster speed of the lane conveyors 71-73.

FIG. 4 is a view in side elevation showing more detail of grouper section 31, of the speed control conveyor, and of the bottle group infeed. Case release hook 85 is pivotally mounted about a pivot pin 86 on the underside of the frame and is operated by an air cylinder 87 which has its piston rod connected to one end of a lever 89 having its other end connected to a shaft 91. Links 93 are pivotally connected between internal levers 89 on shaft 91 and case release hook 85 so that when the piston rod of air cylinder 87 advances it pushes case release hook 85 downwardly to catch and hold the case, and when the piston rod of air cylinder 87 is retracted it pulls case release hook 85 upwardly to release the case.

FIG. 5 shows the relationship among the bottle group infeed, the bottle gripper conveyor, and the case elevator. In the bottle gripper conveyor, grippers 45 are mounted on chains 95 which are trained around sprockets on shafts 84 and 103. In the case elevator, carriages 43 are connected at the front by pins to elevator conveyor chains 105 trained around sprockets on shafts 109 and 113. At the discharge end of the elevator conveyor, a skate-wheel discharge conveyor 115 is positioned and slants downwardly therefrom so that the filled case is moved by gravity therealong.

FIG. 7 is a view in section taken as indicated by the lines and arrows 7-7 which appear in FIG. 5 and shows a bottle group 13 being guided as it is being conveyed by lane conveyors 71-73 into bottle gripper section 33. A transverse arm 135 supports four bottle hold downs and close-lane dividers 137-140, which, with side guides 141 and 143, assist in properly positioning bottle group 13 for the grippers 45.

FIGS. 5 and 6 show the drive means and illustrate how the various conveyor chains are driven in timed relationship with each other. Main drive motor 117 (FIG. 1) drives elevator conveyor chains 105 which are trained around sprockets on shafts 109 and 113. Main drive motor 117 also drives bottle gripper shaft 103 (FIG. 5) by means of a chain, and so drives gripper conveyor chains 95 around sprockets on shafts 103 and 84. The lineal speed of the carriages 43 and grippers 45 is the same, so the horizontal speed of carriages 43 as they pass up the inclined path in bottle packer section 33 is slower than the horizontal speed of grippers 45 and bottles 15. This speed difference, combined with the manipulation of case and carriage by inclined cams produce the sheoehorning effect which allows insertion of the bottles into a tight case.

Shaft 84 in turn drives speed control jack shaft 83 by a chain 119, and shaft 83 drives speed control conveyor shaft 80 and shaft 123 by means of a chain 120. Shaft 123 drives shaft 77 by chain 122, and shaft 77 controls gripper pin shaft 75. Shaft 83 also drives shaft 121 by means of a chain, and shaft 121 drives the three lane conveyors 71-73.

The machine has two sets of control pins, grouper pins 75 which group the bottles 15 into bottle groups 13, and speed control pins 82 which time the advancing of the bottle group into the bottle gripper mechanism. The flat top chains 71-73 travel at a faster velocity than either set of pins 75, 82 and the pins bear against the lead bottles to hold them back at the proper speed to match the speed of the grippers 45.

Conveyors 71-73, since they travel faster than pins 75, 82, insure that the bottles 15 are crowded up against the restraining pins 75, 82. The speed control pins 82 are traveling at the speed as the grippers 45 so that the grippers 45 are in alignment with the tops of the bottles 15 as they come into the gripper section 33, and this is accomplished by taking the drive of the speed control pins 82 off gripper chain shaft 84.

The drive mechanism for case infeed section 29 is shown in FIGS. 2 and 5, and includes case conveyor drive motor 147 (FIG. 2) with shaft 148 connected to a jack shaft 149 by a belt 150. Shaft 149 is in turn connected to a drive shaft 151 by a belt, and case conveyor 153 is trained around shafts 151, 155, 156, 157 (FIG. 5), and 158. Primary case conveyor 159 is trained around shafts 161 and 163, and shaft 163 is driven from shaft 156 by belts which pass around a shaft 165.

Referring now more particularly to FIG. 8, grippers 45 comprise two gripper body members 171, 172 which are pivotally connected by pivot pins 173, 174 to a gripper pivot block 175. A spring 177 pushes the upper portions of body members 171, 172 apart to close the lower portions or jaws of the body members around the neck of the bottle.

The contours of the rubber gripper pads 195 are important. The top portion comprises a tapered socket which centers the bottle neck by urging the bottle neck toward the center of the gripper pad, and the bottom
portion comprises a gripper skirt which exerts additional guiding force on the bottle neck as it clamps onto it. The rubber of the gripper pad is deflected by the force exerted between gripper and bottles, and the deflected rubber holds the bottle securely.

A pair of rollers 179, 180 are mounted on the top of the upper portion of body members 171, 172 and they are controlled in transverse or lateral position against rocking by stabilizer rods 181a, 181b and 181c as shown in FIGS. 8-10. Grippers 45 are released by the action of gripper-release cam bars 183-186 which move rollers 179 and 180 toward each other to compress spring 77 and open the jaws of the gripper. Gripper-release cam bars 183-186 have cone-shaped gripper-opening ends like 186c in FIG. 10, and have cone-shaped gripper-closing ends like 186d in FIGS. 10 and 11 which gradually permit the grippers 45 to close after the bottles 15 have been released into the cases.

The grippers maintain a secure grip on the bottles, but are elastic and flexible enough to let the bottles self-guide themselves into the case while still being adequately supported by the grippers against dropping. The leading bottles of the group deform the leading endwall 19 of the case and the trailing endwall 21 is dipped downwardly in order to provide clearance between the trailing bottles of the group and the trailing endwall 21 of the case. This eliminates the extreme accuracy which would be necessary to pack a horizontally positioned case. The horizontal component of the escalator carriage speed is less than the speed of the bottle movement so as to naturally provide for the bottles pushing against and bowing out the interior surface of the leading endwall 19.

It is to be noted that the crown or cap of the bottles does not pass down through the rubber gripper pads. Accordingly, those pads do not touch and cannot damage the crown or cap. The bottom of the bottle kiss the bottom 25 of the case before the grippers release the bottles.

Pivot blocks 175 are mounted squarely on the bottom of cross bars 187 attached to conveyor chains 95 (FIG. 8).

As shown in FIG. 9, four gripper opening bars or cams 191 are positioned at the entrance of the bottle gripper section to open the grippers 45 to receive the bottles 15. Cams 191 comprise four curved opening bars having cone-shaped ends which bring together the rollers 179, 180 mounted on the top of gripper body members 171-172 so that the bottles 15 may be inserted easily into the grippers. Rollers 179, 180 are brought toward each other gradually by the cone-shaped gripper-opening ends 191a of bars 191, held in position by the main portion of bars 191, and then released gradually by cone-shaped gripper-closing ends 191b.

The lower portion of body members 171, 172 include stop members 193, 194 that limit elongation of spring 177 and the closing movement of resilient gripper pads 195, preferably of molded rubber, toward each other. Also, the friction between stop members 193, 194 keeps body members 171, 172 aligned so that they do not flop around. Accordingly, rollers 179, 180 are properly positioned so that the pointed opening ends 191a pass between the rollers to open them, and do not strike the rollers head-on.

Gripper pads 195 include a neck portion 197 and depending fan-like skirts 199 which are molded to conform somewhat to the shape of the bottles. Gripper pads 195 are designed to allow for manufacturing variations in size and contour of bottles and are designed to grip securely but gently around the neck of the bottle below the cap.

FIG. 11 shows bottle grippers 45 being released by cone-shaped gripper-closing ends 186b and travelling around sprocket shaft 103 of gripper chains 95.

FIG. 12 shows an end view in elevation of the discharge end of the case escalator with the filled case being shown still grasped and held in the carriage 43, and FIG. 13 shows escalator conveyor 105 trained around sprockets of shaft 109, and the position of skate discharge conveyor 115 relative thereto.

Turning now to FIGS. 12 and 14-16, there is shown a carriage 43 which comprises a pair of bottom case supports or runners 221 that support the bottom 25 of the case 17, angles 223, 224 (FIG. 12) which act as case side guides, and a case grasp 225 which grasps or clamps the case and locks it firmly in position on the carriage. Front stops 229 and 231 bear against the leading endwall of the case 17 to properly position the case longitudinally on the escalator carriage 43.

Case grasper 225 includes collars 235, 236 which are secured to a shaft 237 mounted in bearing blocks 239, 240 on angle 224. A torsion spring 241 is mounted between collars 235 and 236, and collar 236 is movable around shaft 237 to adjust the torque of the spring 241.

A front resilient pad 243, preferably made of a high friction material, extends from a mounting block 245 on shaft 237 and is rotatable therewith, and a rear resilient pad 247 extends from mounting block 249 which is also rotatable with shaft 237. Angle 224 is bolted to carriage plate 250 through slots 251, 252 so that case grasper 225 is laterally adjustable for various case widths by moving angle 224 laterally in slots 251, 252.

A roller 253 is mounted on and extends outwardly from mounting block 249 on shaft 237 and is adapted to open grasper 225 when the top of roller 253 is pressed downwardly by a cam. A pin 255 extends outwardly from both sides of the carriage 43 at the front and is connected to escalator drive chain 105 by an attachment 256. Pins 255 are driven by escalator chains 105 to pull the carriages along. A pair of outer rollers 257 extend outwardly from the sides of carriage 43 and are adapted to ride along outer cam tracks 261 (FIGS. 5, 13) to keep the carriage at the desired attitude.

A pair of inner rollers 263 extend forwardly from a cross bar 258 and are adapted to ride on inside cam tracks 267 during the upwardly inclined portion of the escalator travel in bottle packer section 35. Cross bar 258 connects the side plates 265 of carriages 43 together.

Escalator cam tracks 267 (FIG. 5) form a ramp and include a pair of primary cams 269 and secondary cams 271. Primary cams 269 remain the same for various size cases, whereas secondary cams 271 may be changed to accommodate cases of different size. Secondary cams 271 include a dip 273 in their cam track path which provides for the shoe-horning motion of the case 17 onto the bottle group 13.

After the bottles 15 are loaded into the case 17, the carriage 43 follows the path shown in FIG. 5, and in more detail in FIG. 13. Carriage 43 leaves the inner cams 267 and goes onto the outer cams 261 with its outside rollers 257. Outer cam tracks 261 include a dip 275 which is located just before discharge conveyor 115.
3,864,890

9

115. The bottle gripper assemblies 45 release the bottles 15 in sequence starting with the lead bottle row through to the trailing bottle row. After the bottles 15 have all been released from the grippers 45, the dip 275 lowers the bottles 15 out of the path of the now empty and open grippers 45.

A cam rod 277 (FIG. 5) bears down upon roller 253 to open the grappers 225 and allow insertion onto the carriage 43 of the empty case.

Entry shoe 278 (FIG. 13) helps guide the rollers 257 into a cam track around shaft 109 which is a closed portion of cam 261. The carriage 43 is manipulated by pins 255 and rollers 257 to descend from the bottle grippers, to deposit the filled case onto the discharge conveyor 115 smoothly and without shock, and to allow the carriage to descend farther and begin to tilt downward as it follows chain 105 and cam 261 until the carriage is fully inverted and is travelling rearwards on its return run.

Turning now to FIGS. 17-19, there is shown a number of two-bottle grippers 281 which are adapted to load 24 bottles arranged in 4 lanes and 6 rows. Grippers 281 include cross bars 283 supporting a series of main block 285. A pin 287 extends through mounting blocks 285, and a pair of cast aluminum grpper arms 289, 290 are mounted thereon. Two compression springs 291 push the upper portions of gripper arms 289, 290 apart to urge the lower portions of the gripper arms to a closed gripping position. Mounted on the bottom of gripper arms 289, 290 are a pair of springy steel gripper plates 293 with molded-on synthetic rubber gripper pads 295 which are adapted to grasp the necks of the bottles 15a below the bottle cap.

A pair of rollers 297, 298 are mounted on top of gripper arms 289, 290 and are in offset or staggered relationship so as not to block movement of the upper gripper arms toward each other. This permits a wider opening between rubber grippers 295 so as to accept the bottle necks more easily.

Opening cam bars 299 are positioned to move the rollers 297-298 toward each other to open the rubber grippers 295, pivoting around pin 287, to receive the bottles. Cam bars 299 are cone-shaped at their ends in order to give a proper lead-in for a gradual opening of the grippers.

Guide bars 301 and 302 in FIG. 19 are positioned to bring the bottles closer together after the grippers 281 have picked them up, and cross bars 283 are connected to gripper drive chain 95.

The linear speed of carriages 43 and grippers 45 is the same. When the carriages 43 are travelling up the slope or inclined path in bottle packer section 35, the horizontal component of carriage velocity is less than the horizontal velocity of the grippers 45. This difference in horizontal speed is helpful during the packing operation. The leading bottle of the group bear against the inside surface of the leading endwall 19 to actually deform and bow out the leading endwall 19. The case is at that time tilted rearwards at this point in its travel so as to provide a larger opening for insertion of the bottles into the case, and the bottles are actually shouldered into the case by sliding trailing case endwall 21 upwardly around the trailing bottles of the group. The bottom of the leading row of bottles contact the leading case endwall 19 somewhat below its top. If the case were square and in perfectly horizontal position, the match between the bottle group and the case would have to be nearly perfect in order to load the bottle group into the case.

In bottle packer section 35, the bottles enter the case with bottle bottoms at an angle to case bottom 25, with plenty of clearance between the bottles and the trailing wall 21 of the case. The tilting of the case rearwardly causes interference between the lead bottle and the inside surface of leading endwall 19 and provides clearance between the trailing bottles and the trailing endwall 21. This case tilt is caused by a dip 275 in secondary cams 271.

After bottles enter the case, the carriage passes the dip 273 and returns to its horizontal attitude until the grippers 45 are opened, whereupon the carriage 43 is moved downwardly by dip 275. Then the front of the carriage is cocked downwardly to deliver the filled case to the roller skate wheels of discharge conveyor 115 which leads to a take-away conveyor that transports the filled case to a gluer.

In operation, loose bottles 15 are fed by conveyors 49 through bottle infeed section 27 and divided into three lanes in crowd divider section 28 by side guides 53, 55, 55a and lane dividers 57, 59. The bottles 15 are pushed by succeeding bottles over dead plate 67 and are then transported by the three lane conveyors 71-73 which carry them to bottle gripper section 33 through gripper section 31 and speed control conveyor 79. In gripper section 31 and gripper section 33, gripper pins 75 separate the bottles 15 into groups, 13 by holding back the front row of bottles in each group, because the pins 75 move at a slower speed than the lane conveyors 71-73, and then release the group to the faster conveyors 71-73 which carries the group ahead of the following bottles. Speed control conveyor pins 82 then pick up the bottle group 15 and control its speed to match the speed of the grippers 45, holding back the bottles by overcoming the faster speed of lane conveyors 71-73.

Grippers 45, which have been opened by cam bars 191, close down over the bottle necks as gripper rollers 179, 180 pass cone-shaped gripper-closing ends 191b of cam bars 191. The gripped bottles are carried along a horizontal path by gripper conveyor chains 95.

In the meantime a series of empty cases 17 have been conveyed in a concurrent converging path by primary case conveyor 159, case conveyor 153, and the case escalator conveyor. Case conveyor 153 moves each case 17 onto a carriage 43 of the case escalator where it is received between side guides 223, 224 with leading case endwall 19 against front stops 229, 231, case gripper 225 having been opened by cam rod 277. As case escalator carriage 43 continues its travel, it passes the cone-shaped end of cam rod 277, releasing roller 253 so that spring 241 causes gripper pads 243, 247 to press the case sidewall against side guide 223 to firmly grasp the case and lock it in position.

The firmly held case 17 advances upwardly with carriage 43 along cam track 267 until it reaches dip 273 where it is tilted during the loading operation. Dip 273 and the upward movement of carriage 43 along cam track 267 causes the trailing case endwall 21 to tilt below the height of the leading case endwall 19, the inside surface of leading case endwall 19 to slide upwardly around the leading row of bottles of the bottle group, the trailing case endwall to retilt upwardly, and the inside surface of the leading case endwall 19 to slide upwardly around the trailing row of bottles to envelop the bottle group.
The horizontal speed of the cases 17 is slower than the bottles 15 so the leading row of bottles push against the inside surface of the leading case endwall 19 to bow it out. The tilting provides good clearance between the trailing bottle row and the trailing case endwall 21 for easy loading.

During the enveloping movement of the case 17 around the bottle group 13, the grippers 45, although firm, are elastic enough so that the bottles 15 are self-guided into the case 17 while still being firmly gripped against dropping.

After the bottles 15 are firmly supported by the case 17, the grippers 45 are released by cam rods 183-186 so that the grippers 45 are forced open against the urging of springs 177, then the filled case drops away from grippers 45 because of the action of dip 275 in cam 261 on escalator carriage 43. The downward cant and descending movement of the carriage deposits the case onto discharge conveyor 115.

An important feature of the invention is that the bottles are handled very gently. The packer does not drop the bottles, the bottles do not change plane or direction, they travel at a constant speed in the gripper conveyor, and they are subjected to a minimum of shock. This gentle handling of the bottles permits the packer to produce very tight packs because the bottles are forced into a small case.

Another feature of the grippers 45 is that they may be set at different positions along cross bars 187 so as to arrange the bottles for bottle-to-bottle contact, or to space the bottles for insertion into partitions.

Bottle packaging machine 11 is adapted to pack loose bottles into a case, as shown and described, and is also adapted to pack unit carriers, such as four six-packs, into a case, provided the necks of the bottles protrude from the unit carriers so that they may be gripped by the bottle grippers. For example, in the standard basket-type bottle unit carrier, either locked-bottom type or glue-bottom type, the necks of the bottles protrude from the unit carrier sufficiently so that they may be picked up by the grippers and packed into a tray.

1 claim:

1. In a continuous-flow bottle packer machine for loading bottles and the like into empty cases and the like, said cases including leading and trailing endwalls connected by sidewalls and a bottom, bottle suspension means for suspending groups of bottles, suspended-bottle conveyor means for conveying said bottle suspension means and suspended-bottle groups into a bottle packer section, and feeding and loading means for feeding empty cases in a concurrent-flow converging path under said suspended-bottle groups into the bottle packer section and for loading each bottle group into a moving case by moving the case to envelop and support said bottle group, wherein the improvement comprises in said bottle suspension means, bottle gripper means for positively gripping each bottle firmly around the neck, means for moving said bottle gripper means into open position around the neck of the bottle, means for closing the gripper means to close around the neck of the bottle while said gripper means and bottle are in motion, without the gripper means touching the cap of the bottle, and means for releasing the bottles from the bottle suspension means after the bottle group is supported by the case while both bottles and suspension means are in motion.

2. The bottle packer of claim 1, wherein the improvement comprises case grasping means for grasping the case sidewalls and supporting the empty cases as they are being conveyed into and through the bottle packer section.

3. The bottle packer machine of claim 2, said case grasping means including a resilient pad mounted on the carriage means at a position for grasping a case sidewall, means for urging said resilient pad into contact with a case sidewall to grasp and securely hold the case, and release means for moving said resilient pad away from the case sidewall to receive a case.

4. The bottle packer machine of claim 3, said pad being mounted on shaft, said urging means for urging said pad into contact with a case sidewall including a spring mounted on the shaft, and said means for moving said pad away from the case sidewall including a roller mounted on the shaft and adapted to contact a cam to rotate the shaft and thereby move the pad away from the case sidewall.

5. The bottle packer of claim 1, said feeding and loading means including carriage means with a series of carriages for supporting the cases, said carriage means including means for supporting the bottom of the case, means for guiding and positioning the case sidewalls, and means for positioning the leading case endwall.

6. The bottle packer of claim 1, said feeding and loading means including tilting means for tilting the trailing case endwall below the leading case endwall so that the leading bottles of the group contact and slide against the upwardly moving inside of the leading case endwall, and retilting means for retilting the trailing case endwall upwardly to slide the upwardly moving trailing case endwall on the trailing bottles of the bottle group.

7. The bottle packer of claim 6, including case speed control means for moving the cases at a slower horizontal speed than said bottles so that the leading case endwall is pushed forward by the leading bottles of the group.

8. The bottle packer of claim 7, said case speed control means including means for moving said cases and bottles along a horizontal path, and means for moving the cases on an inclined path so that the horizontal speed of the cases is less than said bottles.

9. The bottle packer of claim 1, including discharge means for discharging the packed case from the packer.

10. The bottle packer of claim 9, said discharge means including a skate-wheel discharge conveyor which slants downwardly away from the bottle packer section so that the filled cases are moved therealong by gravity.

11. In a bottle packer machine for loading bottles and the like into empty cases and the like, said cases including leading and trailing endwalls connected by sidewalls and a bottom, bottle suspension means for suspending groups of bottles, suspended-bottle conveyor means for conveying said bottle suspension means and suspended-bottle groups into a bottle packer section, feeding and loading means for feeding empty cases in a concurrent-flow converging path under said suspended-bottle groups into the bottle packer section and for loading each bottle group into a moving case by moving the case to envelop and support said bottle group, and means for releasing the bottles from the bottle suspen-
sion means after the bottle group is supported by the case, wherein the improvement comprises, in said suspension means, bottle gripper means for gripping each bottle of the group around the neck of the bottle, said bottle gripper means including a bottle gripper having a pair of pivotally mounted gripper body members, a pair of resilient pads mounted on the lower portions of the body members, spring means urging apart the upper portions of the body members to close said pads around the neck of the bottle, stop means for limiting the movement of said pads toward each other, roller means mounted on top of said body member upper portions, and cam means for contacting said roller means to move them toward each other to open said pads, said pads having upper contoured means for centering the neck of the bottle, and lower resilient skirt means which is deflected out of normal position by the bottle neck to form a resilient secure grip.

12. In a bottle packer machine for loading bottles and the like into empty cases and the like, said cases including leading and trailing endwalls connected by sidewalls and a bottom, bottle suspension means for suspending groups of bottles, suspended-bottle conveyor means for conveying said bottle suspension means and suspended-bottle groups into a bottle packer section, feeding and loading means for feeding empty cases in a concurrent-flow converging path under said suspended-bottle groups into the bottle packer section and for loading each bottle group into a moving case by moving the case to envelop and support said bottle group, and means for releasing the bottles from the bottle suspension means after the bottle group is supported by the case, wherein the improvement comprises, in said bottle suspension means, bottle gripper means for gripping each bottle of the group around the neck of the bottle, said bottle gripper means including a two-bottle gripper having a pair of pivotally mounted gripper arms, a springy gripper plate mounted on the bottom of each gripper arm, a pair of resilient pads mounted on said gripper plates, spring means urging apart the upper portions of the gripper arms to close said pads onto bottle necks, a pair of rollers mounted on top of said gripper arms in staggered relationship so as to not block movement of the upper portions of the gripper arms toward each other to permit a wider opening space between said pads so as to accept bottle necks more easily, and cam means for contacting said roller means to move them toward each other to open said pads, said pads having contour means for properly positioning the necks of two bottles therein.

13. A method of packing bottles and the like into cases and the like, said cases including leading and trailing endwalls connected by sidewalls and a bottom, comprising the steps of suspending groups of bottles, moving said suspended-bottle groups into a bottle packer zone, feeding empty cases in a concurrent-flow converging path under said suspended-bottle groups into the bottle packer zone, and moving each case to envelop and support a bottle group, wherein the improvement comprises positively gripping each bottle firmly around the neck without touching the cap of the bottle and gripping while the bottle is in motion, and releasing the suspension from the bottle group after it is supported by the case while the bottles are in motion.

14. The method of claim 13, wherein the improvement comprises grasping the case sidewalls and supporting the empty cases as they are being fed into and through the bottle packer section.

15. The method of claim 13, wherein the improvement comprises, in the bottle packer zone, tilting the trailing case endwall below the height of the leading case endwall, sliding the inside surface of the leading case endwall upwardly around the leading bottles of the bottle group, retilting the trailing case endwall upwardly, and sliding the inside surface of the trailing case endwall upwardly around the trailing bottles of the bottle group.

16. The method of claim 15, including moving the cases at a slower horizontal speed than said bottles, and pushing the leading bottles against the inside surface of the leading case endwall to bow it forwardly to gain clearance at the trailing endwall.