Aug. 26, 1952 F. E. TAYLOR 2,608,308

TRANSFERRING MACHINE FOR OBJECTS LIKE BOTTLES

Filed March 26, 1948 3 Sheets-Sheet 1

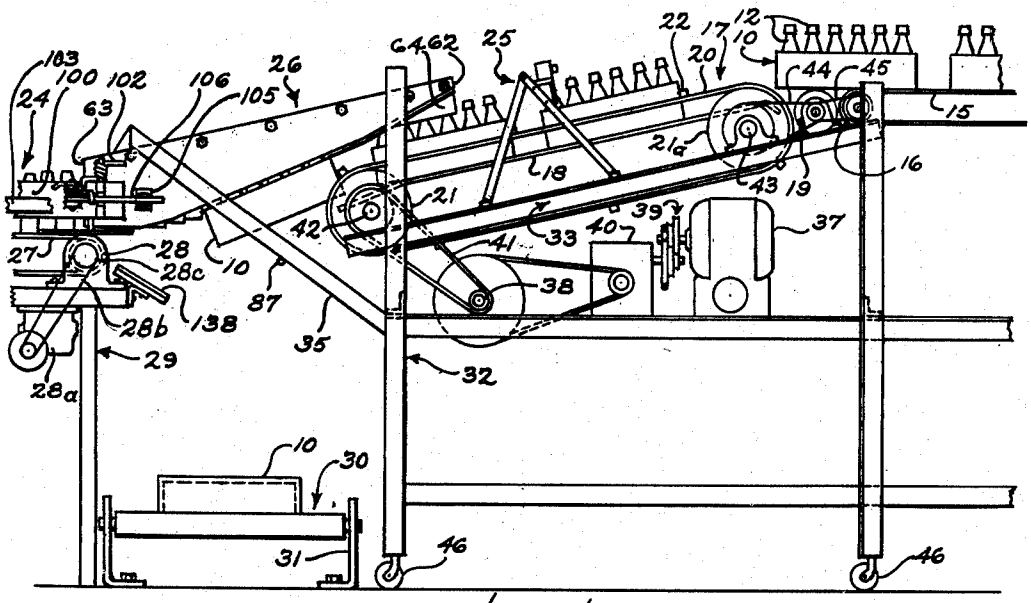


Fig. 1.

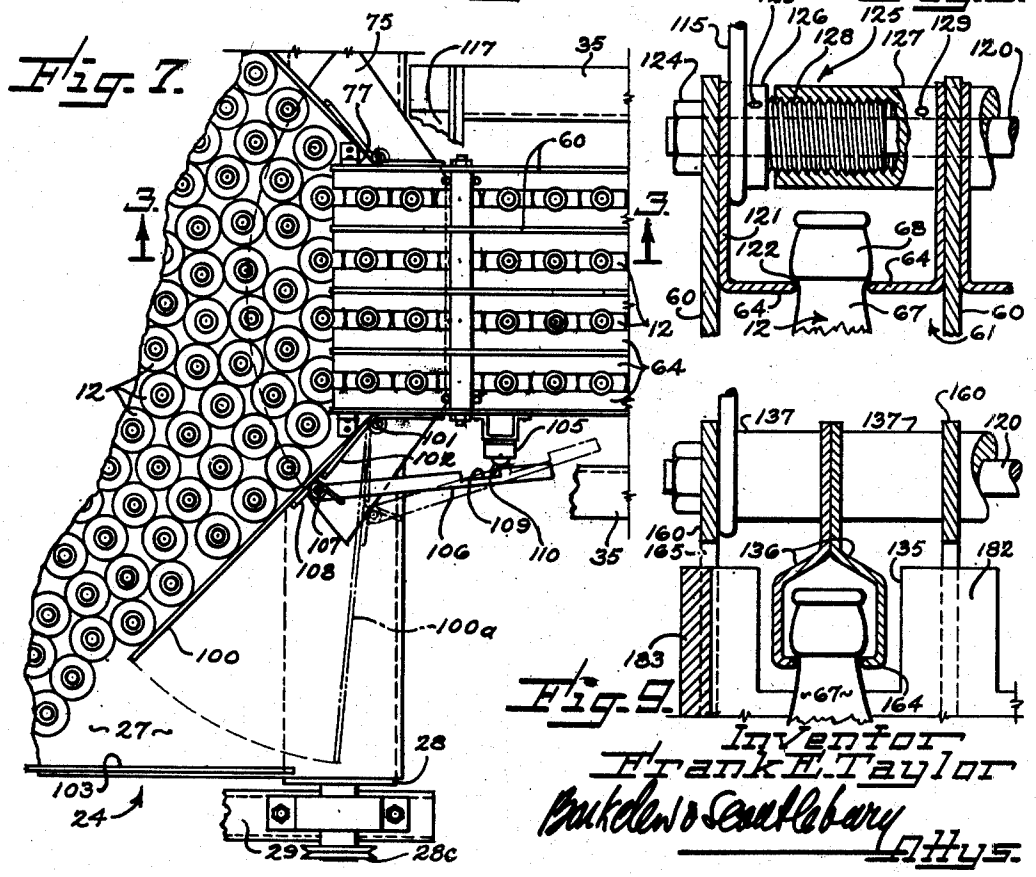


Fig. 7.

Fig. 8.

Fig. 9.

Inventor
Frank E. Taylor
Burkeley & Scudder
Attys.

Aug. 26, 1952 F. E. TAYLOR 2,608,308

TRANSFERRING MACHINE FOR OBJECTS LIKE BOTTLES

Filed March 26, 1948 3 Sheets-Sheet 2

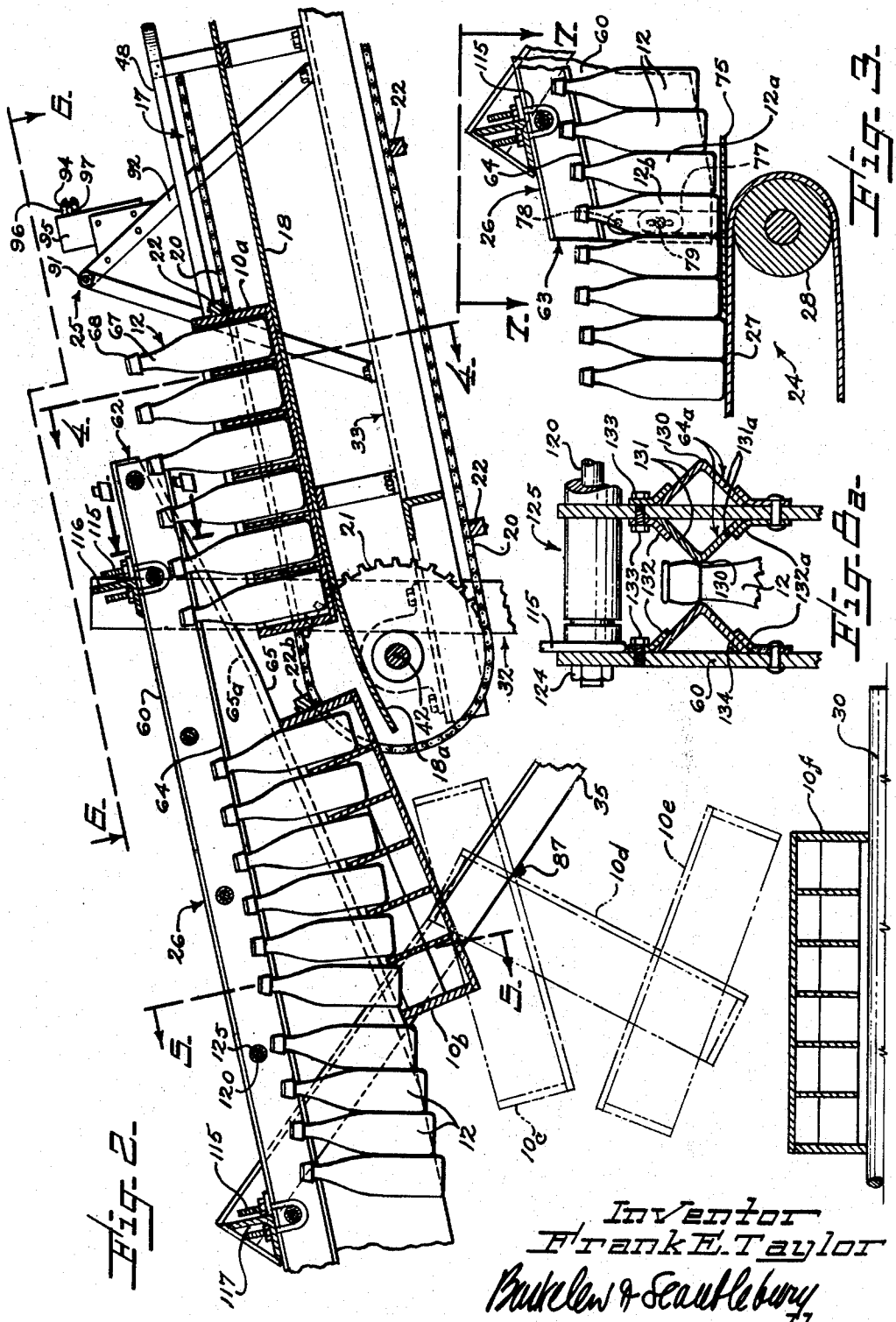


Fig. 2.

Fig. 3.

Fig. 3a.

Inventor
Frank E. Taylor
Buckles & Scarbrough
Attys.

Aug. 26, 1952 F. E. TAYLOR 2,608,308

TRANSFERRING MACHINE FOR OBJECTS LIKE BOTTLES

Filed March 26, 1948 3 Sheets-Sheet 3

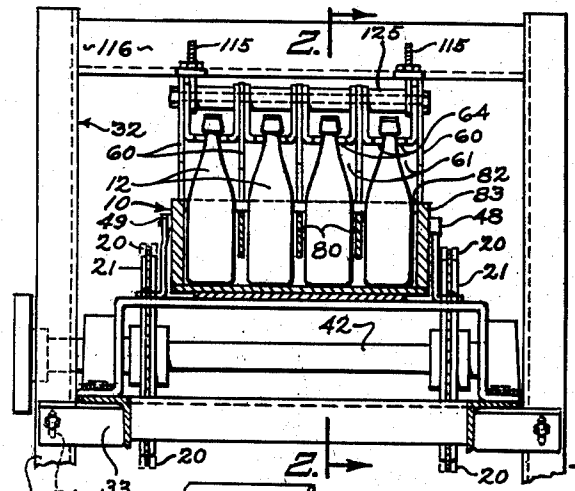


Fig. 4.

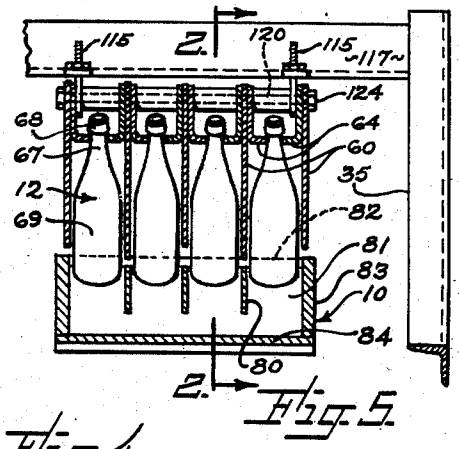


Fig. 5.

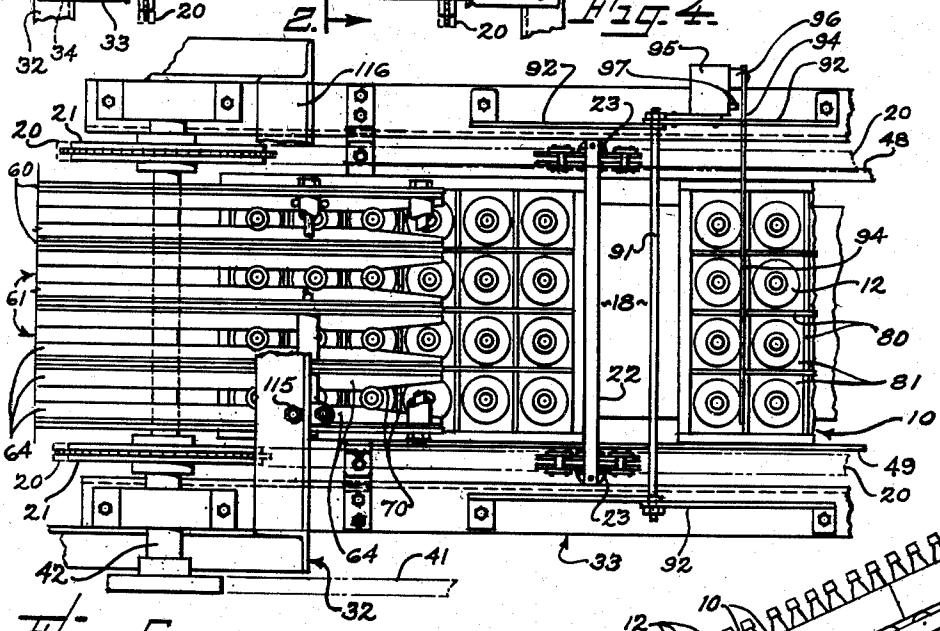


Fig. 6.

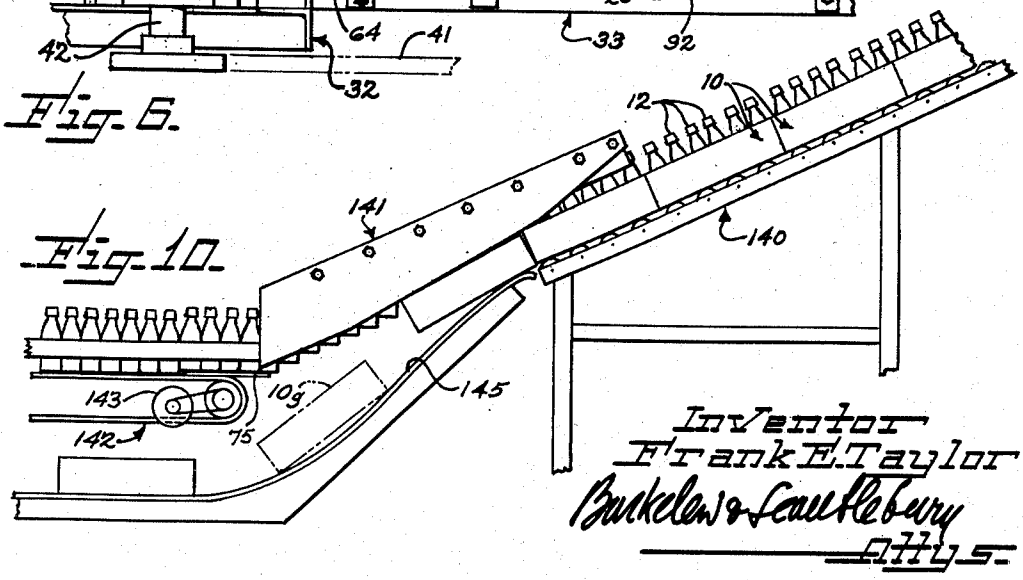


Fig. 10.

Inventor
Frank E. Taylor
Buckelew & Lauterbury
Attys.

Patented Aug. 26, 1952

2,608,308

UNITED STATES PATENT OFFICE

2,608,308

TRANSFERRING MACHINE FOR OBJECTS LIKE BOTTLES

Frank E. Taylor, Fresno, Calif., assignor, by direct and mesne assignments, to De-Caser Company, Fresno, Calif., a corporation of California

Application March 26, 1948, Serial No. 17,257

9 Claims. (Cl. 214—1.1)

1

This invention is concerned generally with means for handling larger numbers of objects the external form of which includes a head portion which surmounts a smaller neck portion. Objects having that characteristic form include, for example, most types of bottles, and the invention will be illustratively described as it relates to the handling of ordinary glass bottles of the type used for soft drinks, beer and the like.

The invention relates more particularly to means for transferring such objects from one supporting surface to another, for example from one conveyor belt to another, when those surfaces are spaced from one another. The invention is especially useful for transferring such objects between a flat supporting surface and a container such as a wooden case or fiber carton in which they are to be, or have been, transported. For illustrative purposes, the invention is here described primarily in terms of a mechanism particularly adapted for removing bottles from wooden cases of the type known as half-cases, characterized by the fact that at least two opposite side walls are distinctly lower than the tops of bottles standing in the cases.

An important object of the invention, as used for unloading bottles from cases, is to accommodate steady as well as intermittent flow of cases, and to deliver the bottles, after they have been removed from the cases, also in a substantially steady flow.

The invention further permits convenient inspection of the bottoms of the bottles as they are transferred from the cases. This is particularly useful when cases of empty bottles are being received and unloaded at a bottling plant, so that bottles needing it can be given special treatment. The invention includes also the incorporation, in a decasing machine, of the operation of clearing from the cases any waste material that may remain after the bottles have been removed.

A further object of the invention is the provision of automatic controls of various types to be described, which tend to avoid damage of the machine or to the objects being operated on.

Important advantages of a decasing machine in accordance with the invention are its relative simplicity of construction and freedom from complex or special moving parts. Furthermore, it can be made readily adjustable in accordance with the dimensions of bottles to be handled.

The invention and its further objects and advantages will be best understood from the following detailed description of a typical illustrative embodiment, which description is to be read in

2

conjunction with the accompanying drawings, of which:

Fig. 1 is a side elevation of a preferred embodiment of the invention;

Fig. 2 is a fragmentary vertical longitudinal section at enlarged scale, taken in the same aspect as Fig. 1 and as indicated by the lines 2—2 in Figs. 4 and 5;

Fig. 3 is a fragmentary section taken in the same plane and aspect as Fig. 2, but showing another portion of the device as indicated by the line 3—3 in Fig. 7;

Figs. 4 and 5 are fragmentary transverse sections taken as indicated by the lines 4—4 and 5—5 respectively in Fig. 2;

Figs. 6 and 7 are fragmentary plans, showing portions of the device as indicated respectively by the lines 6—6 in Fig. 2 and 7—7 in Fig. 3;

Fig. 8 is a fragmentary section at greatly enlarged scale, taken as indicated by the line 8—8 in Fig. 2;

Fig. 8*a* is a section like Fig. 8, showing a modification at reduced scale;

Fig. 9 is a section similar to Fig. 8, but showing a modification; and

Fig. 10 is a side elevation, similar to Fig. 1, but showing a modified form of the invention.

Fig. 1 shows in side elevation a preferred embodiment of the invention, adapted for handling cases 10 containing bottles 12, removing the bottles from the cases and delivering the bottles and the cases to respective receiving or conveying means. Full cases 10 may be delivered to the machine in any suitable manner, for example by a conveyer belt, indicated at 15, which passes over and is driven by a roller 16. Conveyer 15 preferably has its loading end at a low elevation relative to its delivery end, shown in Fig. 1, so that it can conveniently be loaded manually. The cases are transferred from belt 15 to positive feeding means 17, here illustrated as the associated pair of spaced parallel endless chains 20, which pass over sprocket wheels 21, 21*a*, and carry pusher cross bars 22, mounted on the chains as by brackets 23 (Fig. 6). Associated with the chain assembly is the deadplate 18, which is adapted to support the cases as they are advanced by pusher bars 22, and which may be replaced in whole or in part by movable supporting means such as rollers or a freely movable belt. Pusher bars 22 are spaced along chains 20 at intervals which are greater than the length of a case 10. Cases are fed from conveyer 15 onto deadplate 18 between successive pusher bars in any usual manner, for example by speed-up

roller 19 and an automatically operated gate mechanism (not shown) which holds up the cases, allowing belt 15 to slide under them, until just after a pusher bar has been lifted by sprockets 21a into position above the deadplate. A case is then released by the gate and rapidly accelerated by roller 19 to place it on the deadplate before the following pusher bar is lifted up behind it. That bar then engages the rearward endwall of the cases, as shown in Figs. 1, 2 and 6, and feeds the case positively along deadplate 18. The transverse position of each case on deadplate 18 is defined in any suitable manner, as by a fixed guide rail 48 along one side of the deadplate at a level to engage the case side wall; and a resilient guide rail 49 along the other side of the deadplate adapted to press each case into sliding contact with the fixed rail 48. The case is advanced beneath safety stop mechanism 25, to be described, and under one end of transfer device 26, details of which are shown in Figs. 2–8. That device removes the bottles 12 from the case and delivers them to receiving means of any suitable kind, here shown illustratively as the conveyer belt 27, which passes over roller 28 and is driven by any suitable means such as an electric motor, shown schematically at 28a. The The cases 10, after their bottles have been removed by transfer means 26, drop away from the lower side of transfer device 26 beyond the end of deadplate 18, and are received by any suitable means such as a conveyer, shown illustratively as roller conveyer 30.

Any other suitable type of positive feeding means may be used in place of the typical embodiment 17.

The various parts of the mechanism can be supported in any suitable manner which maintains the correct relationship between them. In the present embodiment, transfer device 26 is constructed as a unit, and is supported by means to be described on a rigid main frame 32 with the help of diagonal braces 35. Main frame 32 also carries a subframe 33 upon which sprockets 21, 21a are journaled. Also mounted on subframe 33 are journals for roller 16 and for an accelerating roller 19, which is part of the conventional means, not otherwise illustrated, for feeding cases from belt 15 to deadplate 18 between successive pusher bars 22. At least the left hand end of subframe 33 (as seen in Fig. 1) is preferably adjustable in height with respect to main frame 32 to adjust the vertical spacing between plate 18 and transfer device 26. Such adjustment may be accomplished, for example, by means of the slotted bolt holes 34 shown in Fig. 4, by which the two frames are bolted together.

Power means for driving conveyer belt 15 and the feeding chains 20 are preferably mounted on main frame 32, and are illustratively shown in Fig. 1. Motor 37 drives countershaft 38 through a variable speed arrangement 39 and a reduction gearing 40. Countershaft 38 is linked as by belt 41 to the shaft 42 on which the pair of sprockets 21 is rigidly mounted; and belt or chain drives 44 and 45 connect rollers 16 and 19 to the shaft 43 which carries the other pair of sprockets 21a. Thus endless chains 20 serve to drive feeding conveyer 15 as well as to positively feed cases along deadplate 18 toward transfer unit 26. The entire main frame 32, with its carried mechanism, is preferably movable as a unit, and is shown mounted on casters 46.

Bottle-receiving means 24, typically shown as comprising conveyer 27, may be structurally quite separate from main frame 32, so long as its relative height is suitable. Conveyer 27 is shown supported on a rigid frame 29. Case-receiving conveyer 30 is shown mounted on brackets 31 which are separate from both frame 29 and frame 32, but which clearly can alternatively be associated with either or both of those structures.

Transfer device 26 comprises one or more longitudinal passageways or channels 61 adapted to receive and support a longitudinal row of bottles. Each channel 61 is formed by a pair of opposing spaced ways 64 and longitudinal guide surfaces below and parallel to the ways. In the present embodiment (described in detail below in connection with Fig. 8) the guide surfaces are provided by vertical plates 60 which form side walls of the channels, and some of which act as partitions between neighboring channels 61. The transverse separation of the ways of each channel is related to the particular style of bottle to be handled. The way-spacing is somewhat greater than the diameter of the bottle neck 67 at its narrowest point, but is less than the greatest diameter of the flange or head 68 which surmounts the bottle neck. Thus the bottle neck 67 is freely receivable between a pair of ways 64 when it approaches a channel 61 from one end; but once the neck has fully entered between the ways, the larger head portion 68 prevents the bottle from leaving the channel transversely.

The operation of the transfer mechanism is illustrated by the present preferred embodiment, which is clearly shown in Figs. 2–8. The bottles are moved by feeding means 17 (chains 20 and crossbars 22) into the various channels 61 of the transfer device at its receiving end 62. As each bottle enters a channel, it is supported by feeding means 17 (plate 18) with its axis of symmetry substantially normal to the longitudinal axis of the channel, and with the narrowest part of its neck 67 alined with ways 64 of the channel. Hence the bottle necks enter the ways freely, the larger head portion 68 of the bottle being in general entirely above and clear of the ways as the bottle enters the channel. The ways are preferably flared at their receiving ends, as shown best at 70 in Fig. 6, to facilitate entrance of any bottles which may not be accurately alined laterally with the channel.

When feeding means 17 releases the bottles at some point well past the receiving end 62 of the channels, the flanged head portions 68 engage ways 64 and support the bottles, which thus hang from the ways. In that condition the bottles can slide along the ways in response to whatever longitudinal forces are exerted on them.

Channels 61 and their ways 64 may be substantially horizontal, so that bottles hanging freely from the ways are moved along the channels mainly or entirely by pressure of other bottles entering; or the ways may be slanted downward in the direction of feed, as in the present embodiment, so that gravity at least assists in moving the bottles along the ways. The slope may even be so great that gravity is sufficient by itself to slide the bottles from the upper to the lower end of the ways. In any case, the guide surfaces provided by the faces of plate 60 are useful in confining the bottles of each row substantially in a definite, generally vertical plane, so that the longitudinal forces between neighboring bottles are transmitted di-

rectly by contact of their aligned cylindrical body portions 69.

At the delivery end 63 of transfer device 26 the bottles slide out from the delivery ends of ways 64 and are received by any suitable means. The particular receiving means illustrated at 24 includes a conveyer belt 27, which is shown driven by a motor 28a. The illustrated receiving means includes also a deadplate 75 (Figs. 3 and 7), which is substantially horizontal and is placed at such a level that the bottoms of the suspended bottles contact its upper surface just before their necks leave the delivery ends of ways 64. Support of the bottles is thus transferred from ways 64 to deadplate 75 at some position between the positions of bottles 12a and 12b in Fig. 3. The bottles then leave channels 61 in a generally vertical position, fully supported by deadplate 75, and without any tendency to be upset as their necks leave the ways. The bottles can then slide from the tapered edge 76 of plate 75 onto a conveyer belt such as 27, or be handled in any other usual manner.

Deadplate 75 may be supported in any suitable manner that preserves the proper vertical relation between its upper surface and the delivery end of ways 64, that relation varying, for example, with the height of the bottles handled. A convenient and efficient manner of mounting deadplate 75 is to pivot it with respect to transfer unit 26 on a transverse horizontal pivot axis which is approximately in the vertical plane of the delivery ends of ways 64. The vertical distance from the ends of the ways to the plate is then approximately independent of the angle of slant of the plate. Thus the tapered delivery end 76 of the plate can accommodate itself to slight variations in the level of conveyer belt 27 without disturbing the described action of the plate in receiving bottles from the ways. Such a mounting is illustratively shown in Fig. 3. The brackets 77 are rigidly connected to plate 75 and are pivoted at 78 to the two outermost channel forming plates 60. Brackets 77 are preferably adjustable in length, as by bolts in slotted holes indicated at 79, so that they can conveniently be adapted to bottles of different lengths.

The above described operation of transfer device 26 in transferring bottles from feeding means 17 to receiving means 24 does not require that the bottles be initially contained in cases, but can operate also on separate bottles which are fed to it in a suitable manner. However, an important use of the invention is for unloading bottles from cases, and the illustrations show a machine adapted particularly for that operation. The type of case illustratively shown in the drawings, and which the illustrated mechanism is adapted to handle, is divided by longitudinal and transverse separators 80 into twenty-four compartments 81, each of which is adapted to receive one bottle. The loaded bottles form four longitudinal rows in the case, with six bottles in each row. The necessary modifications of the mechanism to adapt it for handling cases of a different type will be obvious.

As is best seen in Fig. 6, the number of channels 61 in transfer mechanism 26 is at least as great as the number of longitudinal rows of bottles in each case; and the transverse positions of the channels with respect to the advancing cases, guided by rails 48 and 49, is such as to align each row of bottles with a channel. That alignment need not be perfect, since the bottles have considerable clearance from the walls of their compartments 81, and can be tipped to one side or other by the flaring entrance faces 70 of the ways if that is necessary to bring their necks into accurate alignment with the ways.

As already indicated, the necks 67 of the loaded bottles project above the end walls 82 of the case. The height of case side walls 83 is relatively immaterial, but is here shown the same as that of the end walls. The lower edges of the channel dividing plate 60 are tapered upward at 65 toward the receiving end 62 of transfer device 26, so that as cases 10 are fed along deadplate 18 they can pass freely beneath the receiving ends of ways 64 and also beneath the tapered lower edges 65 of plates 60 for a distance of approximately the length of one case. During that part of the motion the case continues to be supported on deadplate 18, and the bottles in the case preferably enter their various channels 61 with their necks extending upward between ways 64 before the case runs off plate 18 far enough to begin to tip. The relative level of deadplate 18 and ways 64 is so adjusted, taking account of the bottle dimensions and the thickness of the case bottom 84, that approximately the narrowest portions of the bottle necks are at the level of the ways. Hence whatever contact there is between the bottles and the ways is lateral and offers little resistance to motion of the case.

As positive feeding motion continues, the case passes onto the downwardly bent portion 18a of deadplate 18, so that its path tends to diverge downwardly from the direction of ways 64. If gravity alone does not cause the case to drop away from ways 64, the forward end wall of the case comes into sliding contact with the tapered lower edges 65 of plates 60. The resulting wedging action presses the forward end of the case downward, so that the bottles are lowered until they are no longer supported by the case, but hang from ways 64 by their heads 68. Deadplate 18 preferably extends, diverging downwardly as at 18a, nearly to the outer periphery of sprocket wheels 21, where it terminates to clear pusher bars 22 as they are carried around the sprockets. Thus a case 12 is allowed to fall progressively away from the suspended bottles as the feeding motion progresses, or, if the friction between the case and the bottles ahead of it in channels 61 is sufficient to prevent it from falling under gravity alone, it is progressively wedged or cammed away from the bottles by sliding contact of its end walls with edges 65 of plates 60.

In Fig. 2 the case 10b is shown in the position it ordinarily assumes as its pusher bar 22b reaches the sprocket wheels 21. The forward end wall of the case has been wedged downward nearly out of contact with the bottles. Further motion of the pusher bar 22b in an arc about sprocket shaft 42 tends to draw the rearward end of the case downward, and, with the arrangement shown, both the forward and rearward ends of the case become clear of the bottles at approximately the same moment. Thus the case falls free of the bottles without any tendency to become jammed. After the case is completely free of the bottles, as indicated in phantom at 10c in Fig. 2, the bottles which were in the case, and also those forward of them in ways 64, hang freely from the ways, the only force tending at the instant to move them along the ways being that of gravity. If the freed bottles do not then slide down the ways gravitationally, the following case (10a in Fig. 2) continues to be positively

fed along deadplate 18, and its forward end wall soon reaches the most rearward of the hanging bottles and pushes them positively before it along ways 64. They in turn push the bottles ahead of them, so that the entire row of bottles hanging in each channel 61 is advanced a definite distance (normally equal, in the present instance, to six bottle diameters) by each advancing case. That feeding action, supplemented or even fully replaced by gravity, expels the bottles at the delivery end 63 of the transfer mechanism, as shown in Fig. 3. Thus the bottles are positively fed across deadplate 75 (if that is used) and are delivered to receiving means 24 at the same average rate at which loaded bottles are fed to the machine by feeding means 17. And the same thing is true if the bottles slide down the inclined ways gravitationally and without being pushed from behind. It is here assumed that receiving means 24 operates at such a speed that bottles are removed by it as fast as they are delivered to it. (See below.) The normal rate of flow of bottles to receiving means 24 thus depends upon and is controllable by, among other things, the speed adjustment of variable speed device 39 (Fig. 1). If the flow of loaded cases is interrupted, the outflow of unloaded bottles is interrupted correspondingly. In particular, if one or more compartments 81 of a case are initially empty, the only effect is to slow down the flow in the corresponding channel of the transfer mechanism.

The empty cases, which fall away from the lower side of transfer mechanism 26 as described, can be disposed of in any desired manner. It has been found very convenient in practice to flip the cases over as they fall free of the suspended bottles, and receive them upside down on a roller conveyer or the like. The shock of landing on the conveyer jars loose any foreign matter, such as used bottle crowns, which may have been lodged in the case. Such material is emptied from the box on the rollers of conveyer 30, and can fall freely between those rollers, so that the conveyer is not blocked.

A convenient and simple means for thus flipping the empty cases is a shelf or crossbar, as indicated at 87 in Figs. 1 and 2, which is placed a short distance below the point of release of the empty cases and displaced (in the present instance) to the rear of the line of fall of the centers of gravity of the cases, so that the rearward portions of the cases strike the bar. In Fig. 2 an empty case 10c is shown in phantom as its rearward portion strikes cross bar 87. The falling case is thus rotated counter-clockwise as seen in Fig. 2, and falls through some such positions as 10*d* and 10*e*, landing upside down at 10*f* on conveyer 30. For purposes of illustration the vertical distance from bar 87 to conveyer 30 has been reduced in Fig. 2. Crossbar 87 can be supported in the described position in any suitable manner. It is shown illustratively rigidly mounted on diagonal braces 35.

As the loaded cases are fed from conveyer 15 (Fig. 1) to positive feeding means 17, a case may occasionally fail to enter properly between successive pusher bars 22, so that one end of the case rides on the top of a bar. Under those conditions the case would strike receiving end 62 of transfer mechanism 26, jamming positive feeding means 17, interrupting operation and possibly damaging the mechanism. This is obviated according to the present invention by introducing a safety stop and shut-off mechanism 25, which is shown best in Figs. 2 and 6. Transverse stop bar 91 is rigidly mounted by means of brackets 92 above feeding means 17 at such a height that a loaded case properly positioned between pusher bars 22 passes comfortably beneath it. A short distance to the rear of stop bar 91 and at approximately the same level is a flexibly mounted trigger arm 94. Arm 94 is so arranged that when it is deflected to the left as seen for example in Fig. 6, it actuates an electric switch shown schematically at 95. That switch is electrically connected in the power circuit of motor 37 (Fig. 1) so that when it is opened it cuts off power to the motor. In the present preferred embodiment, arm 94 is made of flexibly resilient material, such as spring steel. One end of the arm is rigidly mounted at 96 and its other end extends freely generally parallel to stop bar 91. Switch button 97 is mounted just forward of the trigger arm so that forward flexure of the arm will depress the button and open switch 95.

When a case which is accidentally riding on a pusher bar 22 reaches trigger arm 94, either the case or the bottles in it contact the arm and bend it sufficiently to open switch 95 and turn off the power to the conveyer drive. The momentum of the conveyer mechanism and of the motor itself may be sufficient to carry the misplaced case somewhat beyond the position of stop bar 91, so that the case or its bottles strike that bar also. That stops the case, but the pusher bar beneath it continues to be carried forward by chains 20. Thus the pusher bar slides along the bottom of the case, usually allowing the latter to drop back into a normal position on deadplate 18. If that occurs, as it does in the majority of instances, trigger arm 94 is released from its deformed position and snaps back into its normal position, shown in Fig. 6. That releases switch button 97, closing switch 95 and restoring power to driving motor 37. Thus normal operation of the mechanism is restored. If the misplaced case fails to become dislodged, it continues to deflect trigger arm 94 after the feeding mechanism has coasted to a stop. The machine then stands idle, avoiding any damage, until an attendant clears the obstruction. By combining a switch control (trigger arm 94) and a positive stop (stop bar 91) in the manner described, damage to transfer mechanism 26 is positively avoided and a large proportion of those cases which are misplaced are automatically replaced without appreciable interruption of the operation.

The factors which control the rate of the positive feed of unloaded bottles to receiving means 24 have already been discussed. In the present illustrative embodiment, receiving means 24 comprises a conveyer belt 27 which is driven at a definite rate by motor 28*a*. Thus, the rate of removal of bottles placed upon the conveyer is determined by its speed and overall structure independently of the operation of the decasing mechanism proper. If that rate of removal exceeds the rate of flow of bottles to conveyer 27 the maximum capacity of the conveyer (and of whatever machine it may feed) will not be utilized. On the other hand, if the rate of conveyer 27 is inadequate to take care of all the bottles deposited on it by the positive action of the case unloader, bottles will accumulate on conveyer 27 (assuming that the force that can be transmitted from feeding means 17 is not sufficient to slide the bottles along the entire length of conveyer 27) and may finally jam the mechanism, tending to cause damage. These alternatives can be avoided theoretically by precise ad-

justment of variable speed mechanism 39 or by otherwise manually controlling the rate of delivery of bottles from the machine. The present invention provides convenient means of obtaining such adjustment automatically. As the bottles leave the channels and slide across the surface of plate 75 (if that is used) onto conveyer belt 27, they ordinarily are pressed against bottles already on the belt, and tend to spread out laterally on conveyer 27 (Fig. 7), sliding across its surface (and that of plate 75) in whatever direction their motion is not blocked. The lateral spreading of the bottles is limited by fixed edge guides 103 and by movable edge guides such as gates 100. The movable guides are supported in such a manner as to be movable over the surface 27. As illustrated, gates 100 are hinged at 101 on the outermost plates 60 of transfer means 26 and are urged by springs 102 to swing forwardly above the surface of conveyer 27, pressing the bottles together on the conveyer. If the conveyer rate is too low, bottles tend to accumulate on it and on plate 75 if present, forcing gates 100 back against the pressure of springs 102. On the contrary, if the conveyer rate is high, or, for example, if the case unloading machine stops temporarily, the number of bottles on conveyer 27 is gradually reduced, and springs 102 force gates 100 forward again sliding the bottles forward and together on the surface of conveyer 27 and/or deadplate 75 into a compact and stable group. Thus considerable flexibility is provided so that even rather rough manual control of the rate of operation of the bottle unloading machine is entirely adequate to maintain a steady flow of bottles from receiving conveyer 27 to whatever machine may be fed from it. Such control is made completely automatic by providing a switch 105, electrically connected in series with driving motor 37, and operatively linking the switch to one of the movable guides, here represented by the gates 100, so that as the guide is moved back by an accumulates of bottles on conveyer 27 the switch is opened, and as the guide moves forwardly the switch is again closed. The operation of the case unloader is thus temporarily interrupted whenever an excess of bottles collects at its delivery end, and is reestablished automatically as soon as that excess has been removed.

An illustrative example of a suitable switch linkage comprises the arm 106, pivoted at 107 on gate 100 and spring urged as by spring 108 into sliding contact with the switch handle 110 of switch 105, which is mounted on the side of transfer mechanism 26. Abutments, such as the ends of notch 109, are so located on the inner face of arm 106 as to operatively engage switch handle 110 at selected angular positions of gate 100. As illustrated in Fig. 7, gate 100 is shown in solid lines at that angle at which the outer end of notch 109 engages switch handle 110 as the gate swings forward, closing switch 105. The gate position shown in phantom 100*a* is that at which the inner end of notch 109 engages switch handle 110 as the gate swings back, opening switch 105. If the gate swings beyond either of the two positions shown, switch handle 110 merely rides out of notch 109, camming arm 106 against the pressure of spring 108. The length of notch 109 determines the angle between the gate position 100*a* at which the flow of bottles to receiving conveyer 27 is stopped by the opening switch 105 and the gate position shown in full lines in Fig. 7 at which that flow is resumed by closing switch 105. With the arrangement described, and with the speed of the case unloader set to deliver bottles to conveyer 27 at a normal rate slightly higher than the capacity of that conveyer, the maximum capacity of conveyer 27 and that machine which it feeds can be utilized without danger of congestion and yet without the need of constant manual speed regulation.

The surface of receiving conveyer 27 and the side walls 100 and 103 (as shown, for example, in Fig. 7) may be considered as constituting the bottom and sides of a chute. The bottles then leave channels 61 under gravity or under the force of gravity combined with some feeding force as discussed above, and are received by the chute, along which they are pushed by the same forces. The bottles may then be delivered from the chute to any desired destination. Or a non-driven type of conveyer may be used, the advancing bottles themselves actuating the conveyer. If any receiving means is used which can receive bottles at an effectively unlimited rate, as, for example, a chute, the above considerations regarding overall speed control ordinarily will not be necessary.

The various channels and ways of transfer device 26 can be constructed in any suitable manner. The detailed structure shown particularly in Fig. 8 has practical advantages, including simplicity, rigidity and easy replacement of parts. Plates 60, which form side walls of channels 61, and of which the lower edges 65 also perform the function of wedging the cases downward, extend above ways 64 and are supported entirely from the top by cross tie bolts 120 and spacers 125. The bolt and spacer units are placed at suitable intervals along the length of the device, as indicated in the figures. The ways 64 are formed of angle pieces 121, one flange lying against a plate 60, to which it is secured by the same spacers 125 and bolts 120, and the other flange extending normal to the plate. Two flanges which extend toward each other from opposite walls 60 of a channel 61 are directly opposed, and their edges 122 form the actual contact faces of ways 64. The separation of opposed flange edges 122 can be accurately determined by suitable selection of the dimensions of angle pieces 121 and of the length of spacers 125. When nuts 124 are tightened on tie bolts 120, the entire assembly is held together firmly. An advantage of this construction is the ease with which the parts can be disassembled, for example to replace ways 64 if their edges become worn, or to replace spacers 125 by a different size to adapt the device to another type of bottle. It is only necessary to remove bolts 120 to completely disassemble all the parts just described.

An alternative manner of forming the ways of transfer device 26 is illustrated in Fig. 8*a*, and has the advantage that individual ways can be replaced very rapidly and without disassembling the device as a whole. The ways 64*a* are here supported directly on plates 60, which in turn may be mounted in the manner already described. Each of ways 64*a* is formed with upper and lower flanges 131 and 131*a*, which are clamped between the face of a plate 60 and upper and lower clamping strips 132 and 132*a* respectively. Lower strips 132*a* are riveted or bolted to plates 60, with which they form acute-angled crotches 130 adapted to receive flanges 131*a* of the ways. Upper strips 132 are releasably mounted, as by bolts 133, on plates 60 in position to engage flanges 131, and to clamp them against plates 60 and at the same time to seat lower flanges 131*a* firmly in crotches 130. Way forming members

64a are thus held rigidly in place, but can be independently removed by loosening bolts 133 and sliding the member longitudinally out from between the opposed strips 132 and 132a. A row of clips separately mounted on plate 60 can be used in place of each of the clamping strips above described, but continuous strips are generally preferred as giving more positive support to the ways 64a. The particular illustrated structure of ways 64a, in combination with the mounting method described, gives the working edge 134 of the ways great transverse rigidity both vertically and horizontally.

Transfer mechanism 26 is preferably mounted as a unit on frame 32 by means of the bolts 120 rather than by connections directly to plates 60, thus avoiding any tendency to distort those plates or alter the spacing of ways 64. A convenient means of mounting transfer unit 26 comprises the U-bolts 115 which enclose certain of the spacers 125 and are secured by their nuts directly to the cross member 116 on the main frame 32 and to the cross member 117 which joins the upper ends of diagonal braces 35.

A further advantage of the described structure of unit 26 results when spacers 125 are made adjustable in length. As indicated in Fig. 8, the spacers can, for example, be made in two parts 126 and 127 which are connected together by axial screw threads 128. Tool fittings such as radial holes 129 are preferably provided in both members of the spacer, or, for example, hexagonal or square stock may be used for both halves of the spacers, providing a wrench hold. With such adjustable spacers the clearance between ways 64 can be readily adjusted by loosening nuts 124 and screwing the two members 126, 127 of each spacer together or apart as may be required, and then retightening nuts 124. The slight change in spacing between channels 61 which results from such adjustment of the way spacing is not of practical importance since the bottles are sufficiently loose in the case, as already described.

Fig. 9 shows a modification of the structure described which is well adapted for handling cases whose walls extend above the tops of the bottles. A side wall of such a case is shown in section at 183, and an end wall in elevation at 182. A notch 135 is cut in end wall 182 in line with each longitudinal row of bottles and extending below the level of the bottle necks 67, in order to give access for ways 164 to enclose the bottle necks. Alternatively, the entire end wall may be lower than the bottle necks. Hereafter, in the specification and claims the statement that the bottle necks extend above the end walls of the case is intended to include arrangements such as Fig. 9 in which portions of the end wall not opposite a longitudinal row of bottles may extend above the tops of the bottles. If (either in this form or that previously described) the cases are fed to the transfer mechanism with the longest dimension transverse of the direction of feeding motion, the terms "end" and "side" and the like as here used are to be interpreted with reference to the axis of the feeding motion, rather than the longitudinal axis of the case.

In Fig. 9 bottle supporting ways 164 are shown which extend laterally from the bottle necks only a short distance, so that they can enter relatively narrow slots 135 in case ends 182. Such ways may conveniently comprise two oppositely formed strips 136 of sheet metal as indicated in the figure, with their upper portions clamped together by the tie bolts 120 and spacers 137. Channel defining plates 160 are shown mounted on the same bolts, as before. In the present modification the lower wedging edges 165 of plates 160 are at a correspondingly higher level with respect to the ways 164 than are the corresponding parts in Fig. 8, to cooperate properly with the higher case ends 182. As before, the wedging action should not begin early enough to interfere with smooth entrance of all the bottles in the case into their respective channels in the transfer mechanism.

Returning now to the preferred embodiment, the wedging or camming surfaces typically shown as the lower edges 65 of plates 60 can be provided as separate structures, suitably supported in the defined relation to ways 64, and that construction may be particularly desirable if plates 60 are entirely or substantially eliminated (see above). Where plates 60 are used to perform the camming action on cases 10, the camming edges 65 of the plates can all be at the same level, so that they all share in the described wedging action. However, it is preferred that the edges 65 of the two outermost of plates 60 be appreciably above the level of the edges of the inner plates, as indicated by the dotted line 65a in Fig. 2, and as shown best in Fig. 5. The cases are then held clear of the outermost plates 60 by contact with the relatively protruding inner plates. By thus cutting back the outer plates the possibility is avoided that a forward corner of a case might become wedged against the inner face of one of them. The level of the lower edge of the central one of plates 60 as shown in Fig. 5 is like that of the outer plates. It thus remains clear of the cases, and the latter are wedged downward entirely by the two symmetrically placed rails formed by the two plates 60 which lie next to the outermost plates.

An advantage of the present invention is the ready accessibility of the bottoms of the suspended bottles 12 as they pass along channels 61 between the point at which they become clear of cases 10 and their delivery to receiving means 24 or deadplate 75. This permits inspection of the bottles from below as well as from above. Such inspection is facilitated by providing viewing means such as the mirror 138 which is shown illustratively in Fig. 1 mounted on frame 29 of the receiving conveyer 27.

In the preferred manner of operation, described above, the feed of loaded case 10 to transfer means 26 is positive, and the rate of delivery of unloaded bottles to receiving means 24 is therefore controlled in large part by the rate of that feed. However, other types of operation are also included within the scope of the invention. Fig. 10 is a schematic showing of an illustrative example of a system which does not use positive feed. Cases are there delivered by a suitable conventional means (not shown) to the upper end of roller conveyer 140, which acts by gravity and delivers cases to transfer means 141 under a constant feeding force, rather than at a constant rate. The feeding force depends upon the length (the number of cases on the conveyer) and inclination of conveyer 140, and is thus determinable within wide limits.

Transfer unit 141 may be supposed for purposes of illustration to be identical with unit 24, already described, and to operate in the same general manner. It delivers unloaded bottles to receiving means 142, which is typically a conveyer belt, and may be the same receiving means as before described. The feeding force from the

row of cases 10 on feeding conveyer 140 is transmitted from one bottle to another along the channels of transfer means 141 to the group of bottles on receiving conveyer 142. The total gravitational force of the cases and of the bottles in 141 is sufficient to move bottles onto the receiving conveyer (across a plate 75 like that of Figs. 3 and 7, if that plate is used), but may not be sufficient to slide the bottles forwardly on the surface of the conveyer. Thus only the motion of conveyer 142, driven for example by motor 143, shown schematically, removes bottles from the delivery end of transfer means 141, that removal taking place at a definite rate. Those bottles are immediately replaced by bottles sliding along the ways of transfer means 141 under the described gravitational force. Thus the rate of bottle flow through transfer means 141, and hence also the rate of flow of cases down feeding conveyer 140, is controlled completely by the effective capacity rate of receiving conveyer 142. So long as the feeding conveyer is kept properly charged with cases, the rate of operation of the system will be such as to just fully utilize the capacity of the receiving means 142.

The modified form in Fig. 10 may be considered to be the same as the preferred form previously described, but with a gravity feed 140 substituted for the positive feed device 17 of the preferred form; and it is thus representative of any type of non-positive feeding means. In the modified form, as in the form of Fig. 1, the receiving means can either be a conveyer as in Fig. 10, or can be a mere plate or chute, as explained in connection with Fig. 1. Such a receiving chute may be substantially horizontal so that the bottles are crowded forward on it as the feeding pressure will slide them over the surface. With a positive type of feed (as in Fig. 1) that sliding motion may continue more or less indefinitely. With non-positive feed, such as the gravity feed of Fig. 10, if bottles are not removed from the receiving surface the bottles will stop flowing when the feeding force can no longer overcome the friction of the accumulated bottles. Thus in effect the rate of flow will then be controlled by the rate of removal of bottles from that surface, by whatever means may be employed. In some cases it may be preferable not to use any receiving surface at all. For example, if bottles are to be discharged into a washing bath, the delivery end of the transfer device may discharge directly into a tank of water.

Fig. 10 also illustrates an alternative arrangement for handling the unloaded cases, which arrangement is applicable to a positive feed system such as that of Fig. 1, as well as to the gravity feed system of Fig. 10. Receiving means for the empty cases in Fig. 10 are provided by the ramp 145 which forms a continuation of feeding conveyer 140, but curves downward from the line of feed of that conveyer. That curve allows the cases, after the contained bottles have entered the channels of transfer means 141, to drop gradually away from the suspended bottles, becoming completely free from the bottles as indicated in phantom at 10*g*. From that position the empty cases slide smoothly down ramp 145 to the position indicated at 10*h*, from which they can be removed in any suitable manner.

I claim:

1. Means for removing objects of the type of headed bottles from open-topped cases having end walls lower than the heads of the contained objects; comprising the combination of transfer means which includes a pair of spaced parallel ways forming an open-ended object receiving channel of a width less than the diameter of the object heads, said channel having object-receiving and object-delivery ends, means for advancing object-containing cases longitudinally toward the receiving end of the channel with their contained objects alined with the channel and with the object heads above the channel-forming ways, to feed the objects into the object-receiving end of the channel, the case advancing means comprising a case carrying surface, driven conveyer means including transverse pushers travelling at an elevation above said surface, a fixed stop located at an elevation above the pusher bars, driving means for the conveyer means, and control means for the driving means including a control actuating member located at an elevation above the pushers and adapted to be contacted by a case which is supported on a pusher before that case contacts the fixed stop.

2. Means for removing objects of the type of headed bottles from open-topped cases having end walls lower than the heads of the contained objects; comprising the combination of transfer means which includes a pair of spaced parallel ways forming an open-ended object receiving channel of a width less than the diameter of the object heads, said channel having object-receiving and object-delivery ends, means for advancing object-containing cases longitudinally toward the receiving end of the channel with their contained objects alined with the channel and with the object heads above the channel-forming ways, to feed the objects into the object-receiving end of the channel, the case advancing means comprising a case carrying surface, driving means for normally advancing the cases and their contained objects along the surface in predetermined respective normal paths, and control means for the driving means including a control actuating member spaced above the case carrying surface and adapted to clear cases and objects that are in their normal paths and to be contacted by cases and objects that are outside of their normal paths.

3. Means for removing objects of the type of headed bottles from open-topped cases having end walls lower than the heads of the contained objects; comprising the combination of transfer means which includes a pair of spaced parallel ways forming an open-ended object receiving channel of a width less than the diameter of the object heads, said channel having open object-receiving and object-delivery ends, means for advancing object-containing cases longitudinally toward the receiving end of the channel with their contained objects alined with the channel and with the object heads above the channel-forming ways, to feed the objects into the object-receiving end of the channel, and receiving means for the objects at the delivery end of the channel, the case advancing means and the receiving means each comprising a positively driven conveyer, and including means whereby the driving of one conveyer is controlled by variation of the number of objects on the other conveyer.

4. Means for removing objects of the type of headed bottles from open-topped cases having end walls lower than the heads of the contained objects; comprising the combination of transfer means which includes a pair of spaced parallel ways forming an open-ended object receiving channel of a width less than the diameter of

the object heads, said channel having open object-receiving and object-delivery ends, means for advancing object-containing cases longitudinally toward the receiving end of the channel with their contained objects alined with the channel and with the object heads above the channel-forming ways, to feed the objects into the object-receiving end of the channel, and receiving means for the objects at the delivery end of the channel, the case advancing means comprising a moving conveyer and driving means therefor, and the object-receiving means constituting a surface extending longitudinally under the delivery end of the channel, and including laterally movable side walls above that surface forming a way for passage of the objects and adapted to be moved laterally outwardly by crowding of said objects on that surface, and control means for the conveyer driving means actuated by lateral movement of a side wall.

5. A transfer unit for purposes such as described comprising structure including a plurality of parallel plates in spaced vertical planes and extending lengthwise in a horizontal direction, longitudinally extending channel forming elements projecting from opposed faces of adjacent pairs of plates, each said element being independently removably mounted on its associated plate, and means for securing the plates and their carried ways in spaced parallel relation.

6. A transfer unit for purposes such as described comprising structure including a plurality of parallel plates in spaced vertical planes and extending lengthwise in a horizontal direction, longitudinally extending channel forming ways projecting from opposed faces of adjacent pairs of plates, and means for securing the plates and ways in spaced parallel relation comprising transverse tie bolts located near the upper edges of the plates and transverse spacers between adjacent plates.

7. The transfer unit defined in claim 6, and in which the spacers are tubular and surround the tie bolts, each spacer composed of two parts in mutual screw-threaded engagement, whereby the over-all length of the spacer may be adjusted.

8. A transfer unit for purposes such as described comprising structure including a plurality of parallel plates in spaced vertical planes and extending lengthwise in a horizontal direction, longitudinally extending channel forming ways projecting from opposed faces of adjacent pairs of plates, and means for securing the plates and ways in spaced parallel relation, the lower edges of at least one of the plates extending obliquely with relation to the ways to form camming surfaces.

9. Means for transferring from one support to another objects of the type of headed bottles having flat bases; comprising the combination of transfer means which includes a pair of spaced parallel ways forming an open-ended object receiving channel having open object-receiving and object-delivery ends, the width of the channel being less than the diameter of the object heads, whereby the objects are insertible between the ways at the object receiving end of the channel and are slidable along the channel while suspended by their heads from the ways, and object receiving means at the delivery end of the channel comprising an element having a substantially flat object receiving surface, mounting means for the element comprising means establishing a horizontal pivot axis transverse of the length of the channel substantially at the delivery end thereof, means supporting the element with its object receiving surface extending substantially horizontally below the pivot axis in spaced parallel relation therewith, the element being rotatable bodily about the pivot axis through at least a small arc, the last said means being adjustable to vary the distance from the object receiving surface to the delivery end of the channel through a range that includes the vertical distance between the base and the lower portion of the head of one of the said objects.

FRANK E. TAYLOR.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,454,051	Heulings	May 8, 1923
1,593,825	Higgins	July 27, 1926
1,783,806	Loebe et al.	Dec. 2, 1930
1,938,947	Whitmore	Dec. 12, 1933
2,213,774	Taylor	Sept. 3, 1940
2,354,103	Butler	July 18, 1944
2,377,431	Lakso	June 5, 1945
2,524,656	Eyster	Oct. 3, 1950
2,543,578	Hutaff	Feb. 27, 1951