

May 11, 1943.

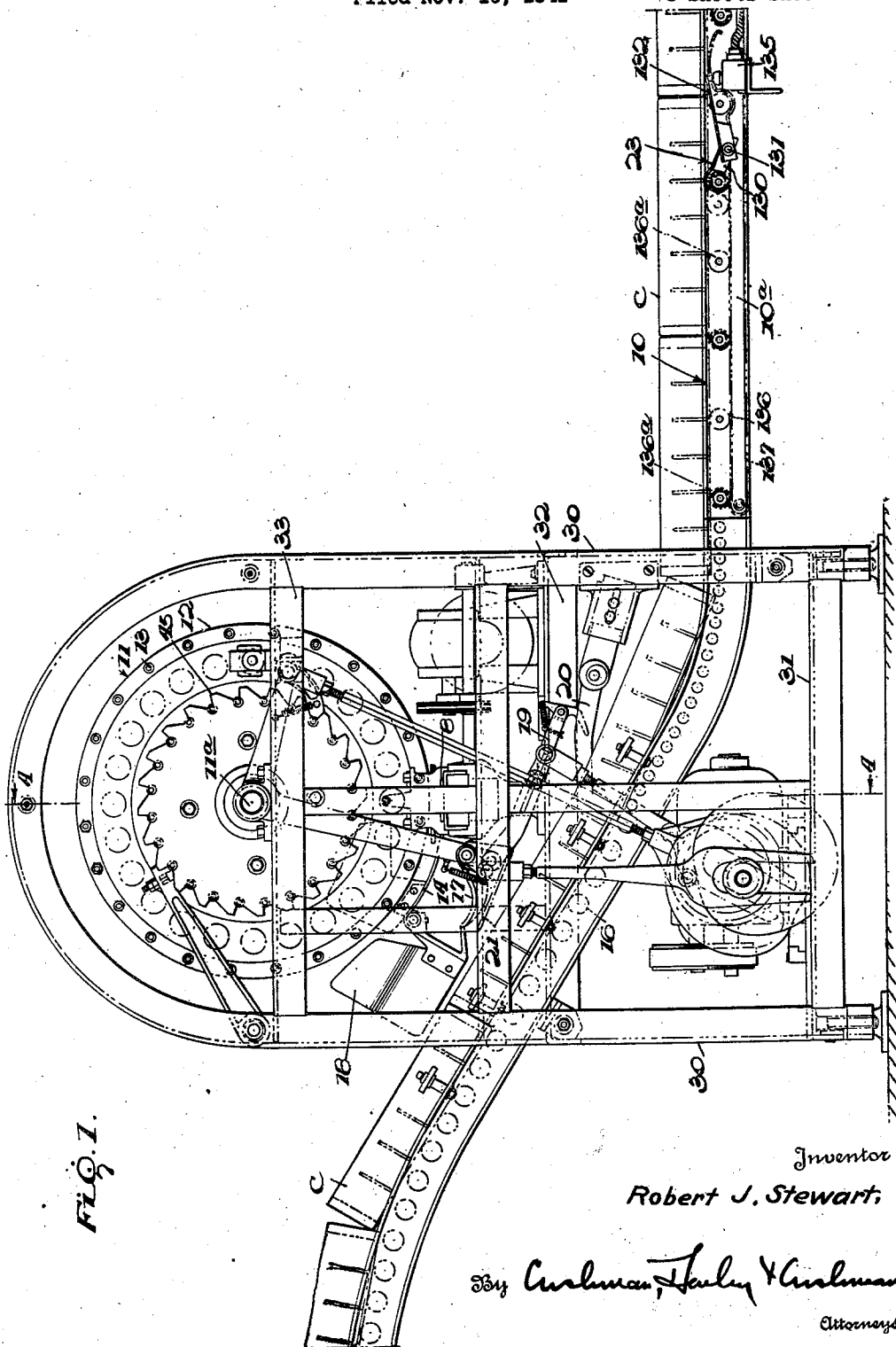
R. J. STEWART

2,319,167

CASING MACHINE

Filed Nov. 10, 1941

9 Sheets-Sheet 1



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R. J. STEWART

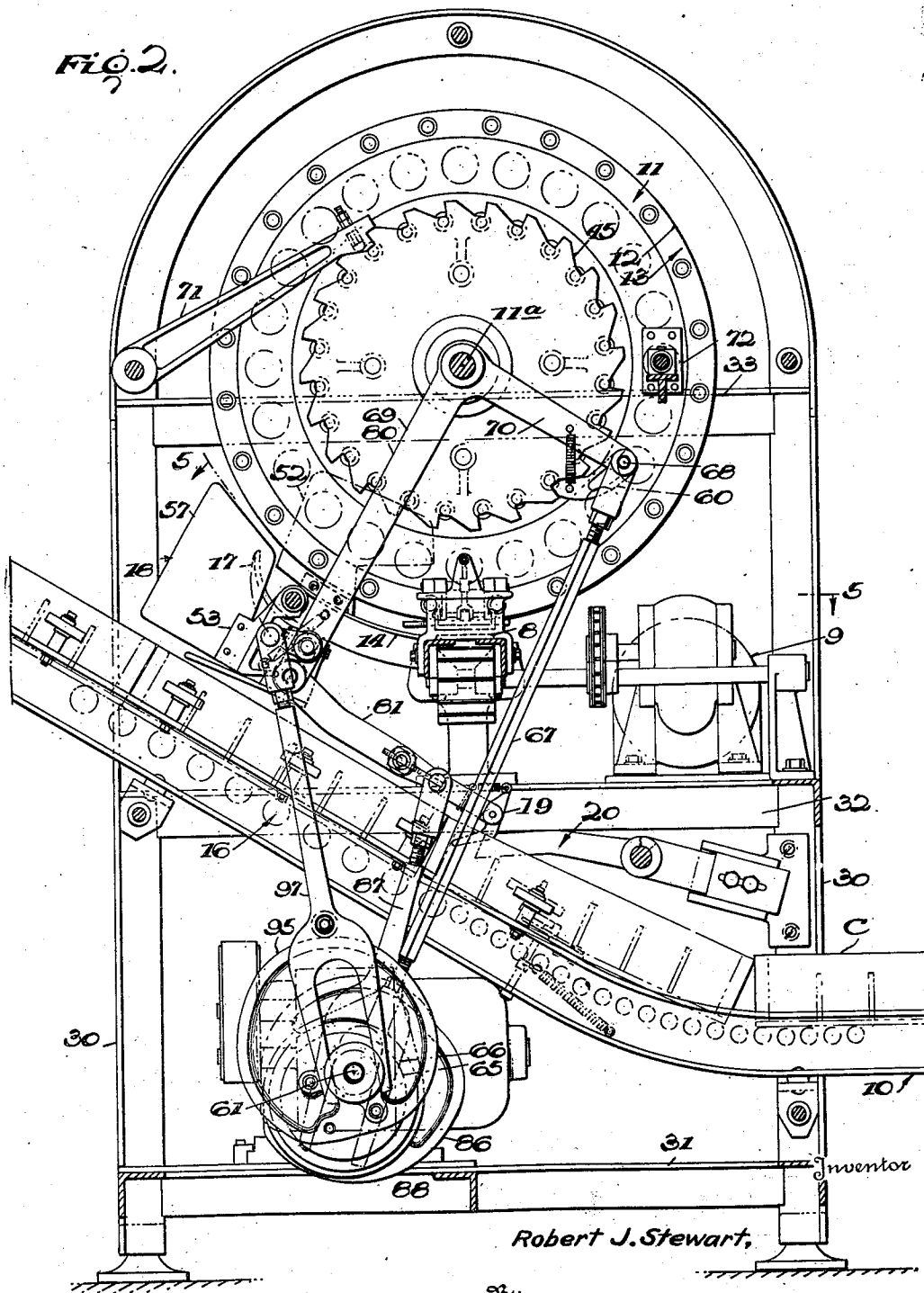
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FIG. 2.



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R. J. STEWART

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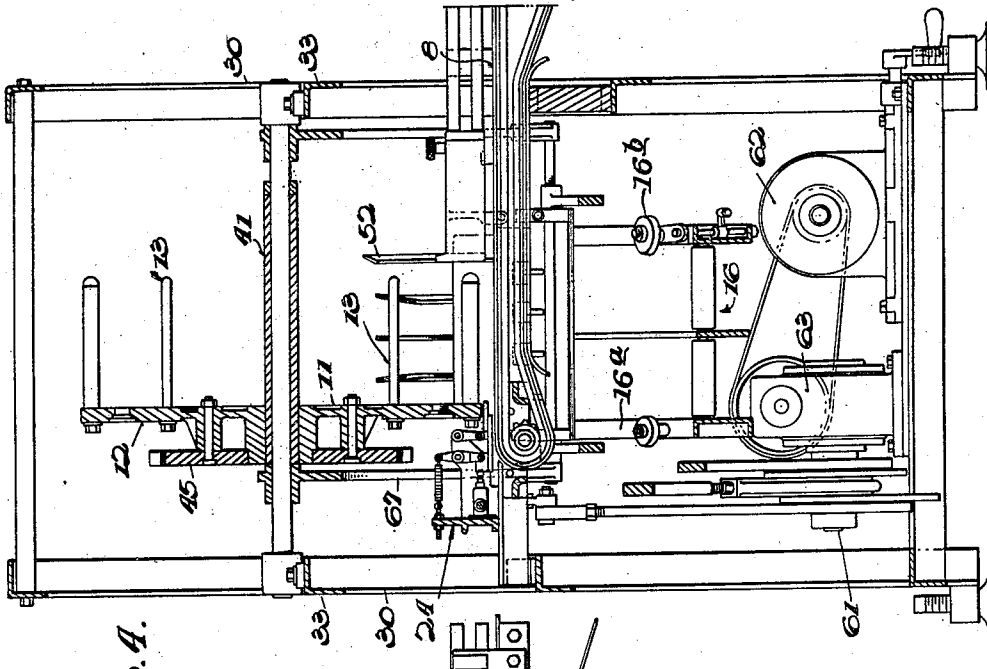


FIG. 4.

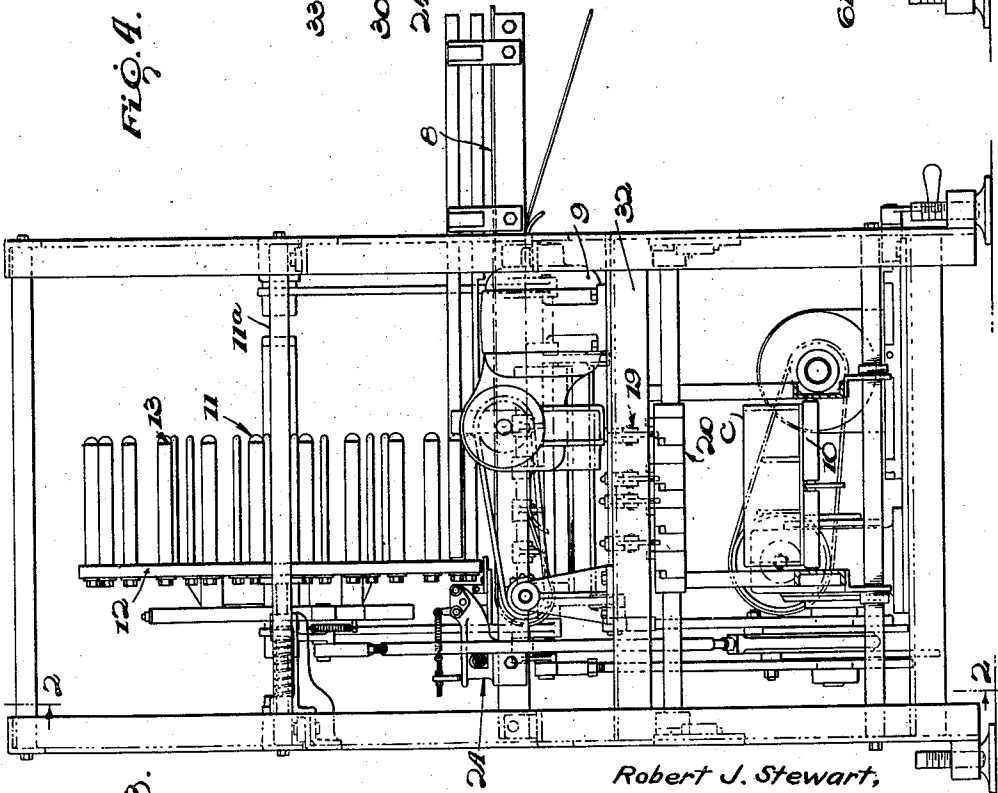


FIG. 3.

Robert J. Stewart,

334
Cushman, Fairly & Cushman
Attorneys

May 11, 1943.

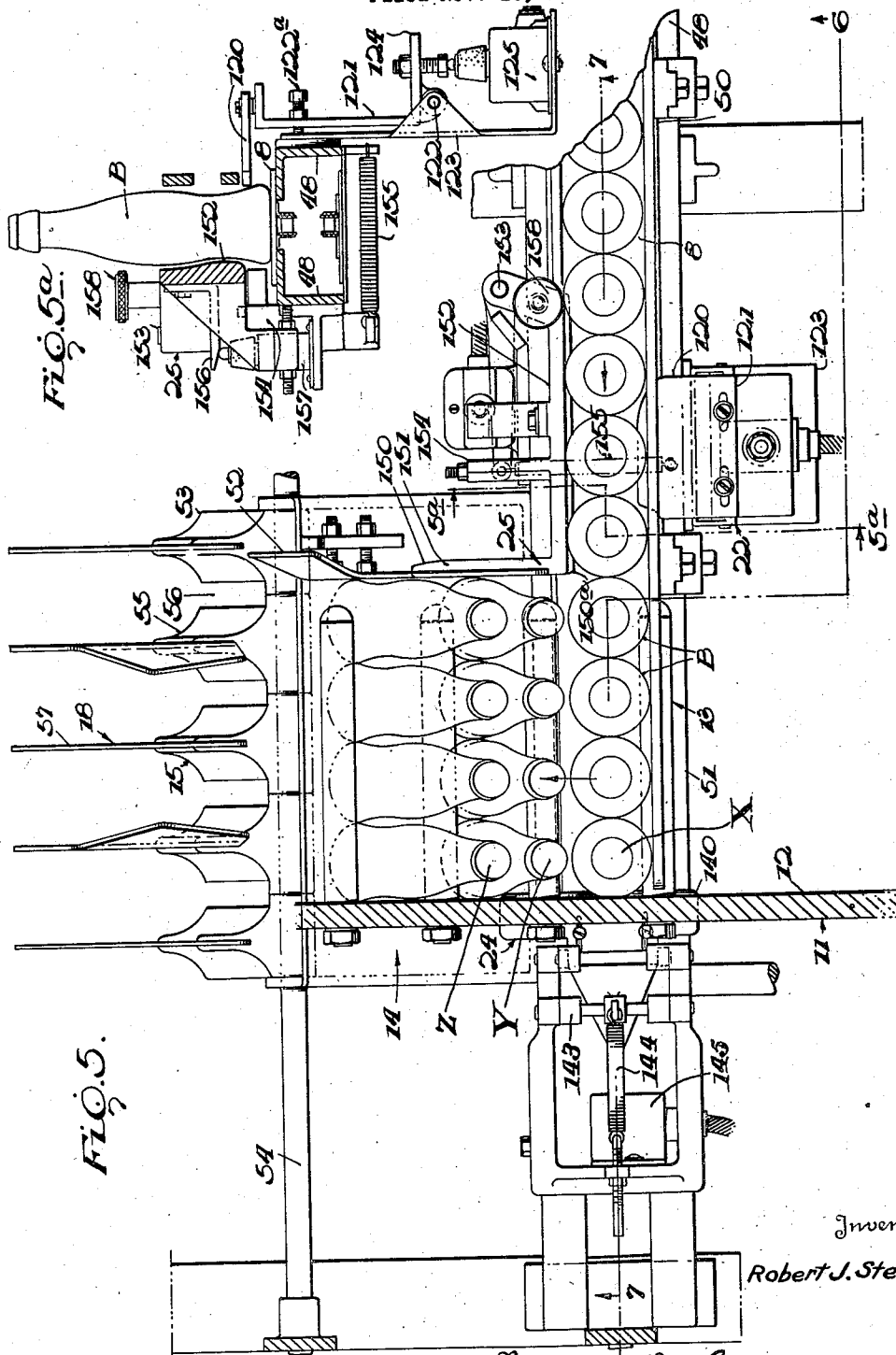
R. J. STEWART

2,319,167

CASING MACHINE

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Inventor

Robert J. Stewart,

By 10 Cushman, Faley & Cushman Attorneys.

May 11, 1943.

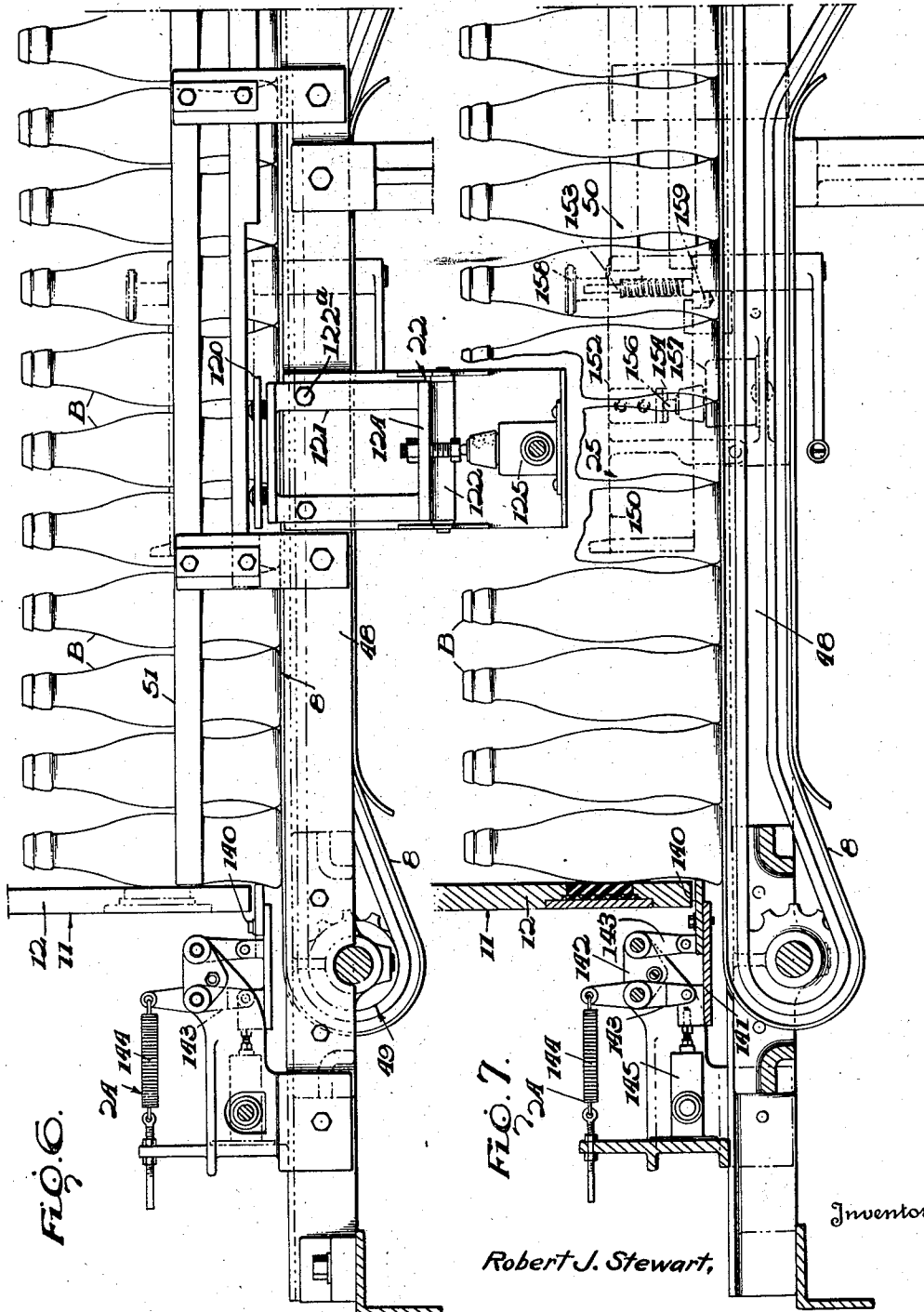
R. J. STEWART

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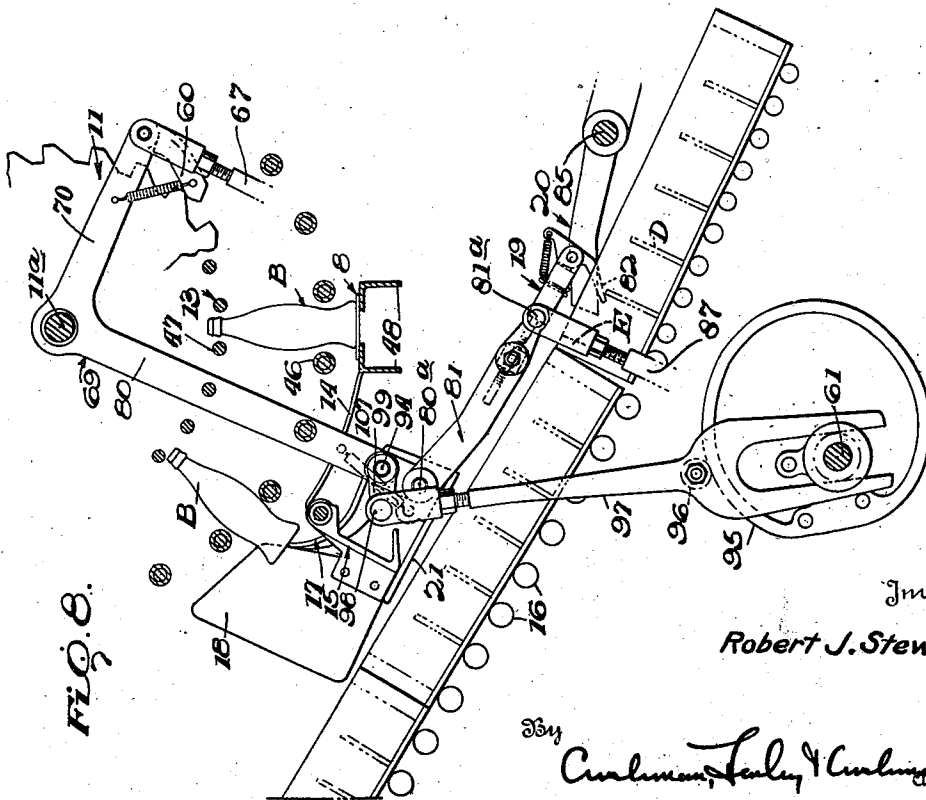
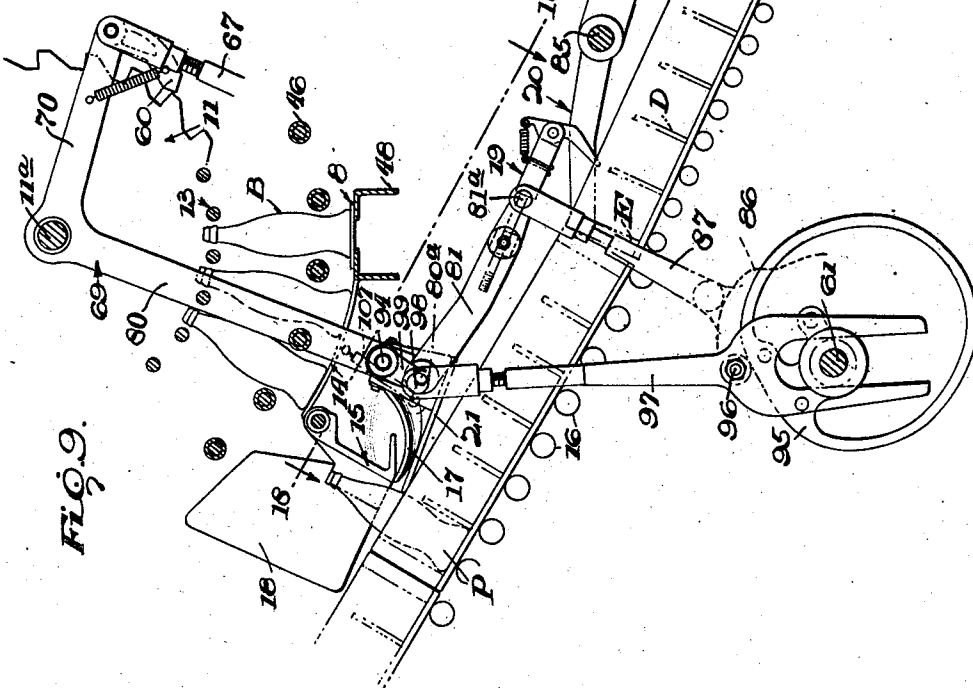
R. J. STEWART

2,319,167

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Inventor.

Robert J. Stewart.

By

Carlinson, Farley & Carlinson
Attorneys

May 11, 1943.

R. J. STEWART

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FIG. 10.

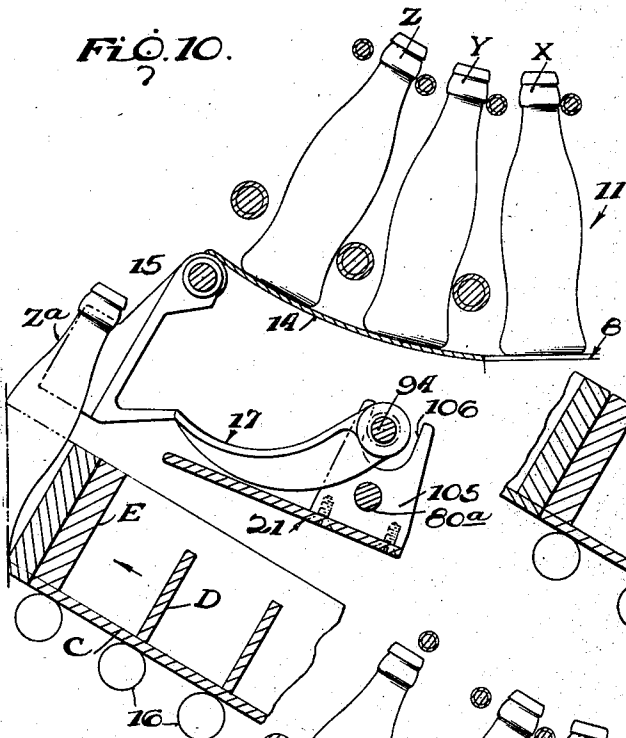


FIG. 11.

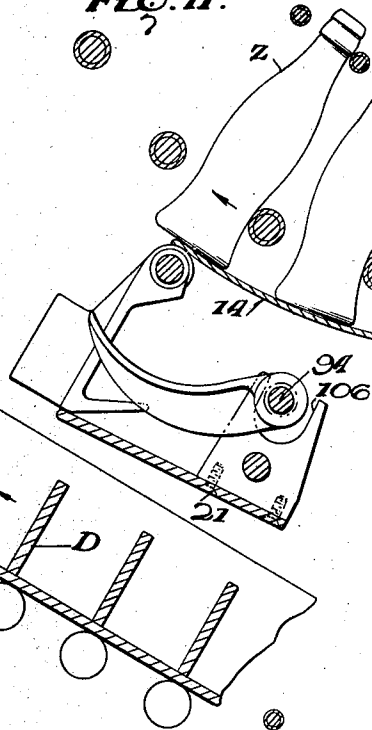


FIG. 12.

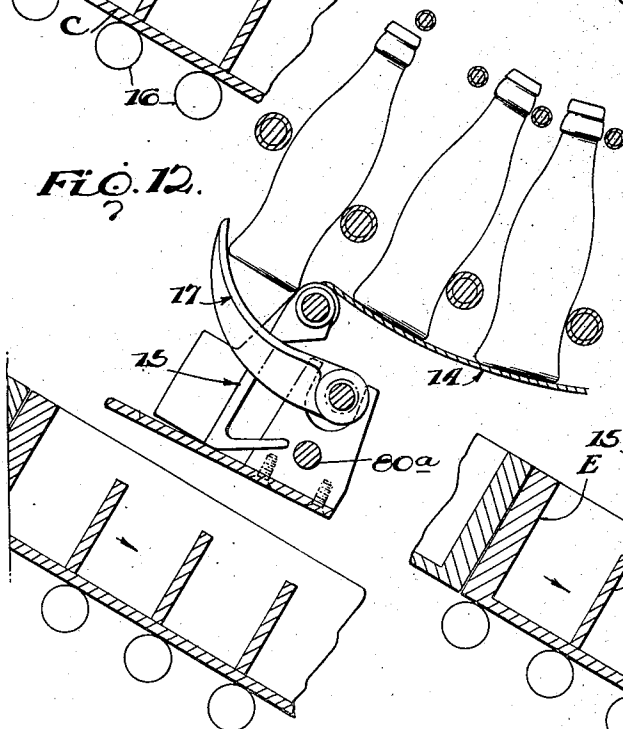
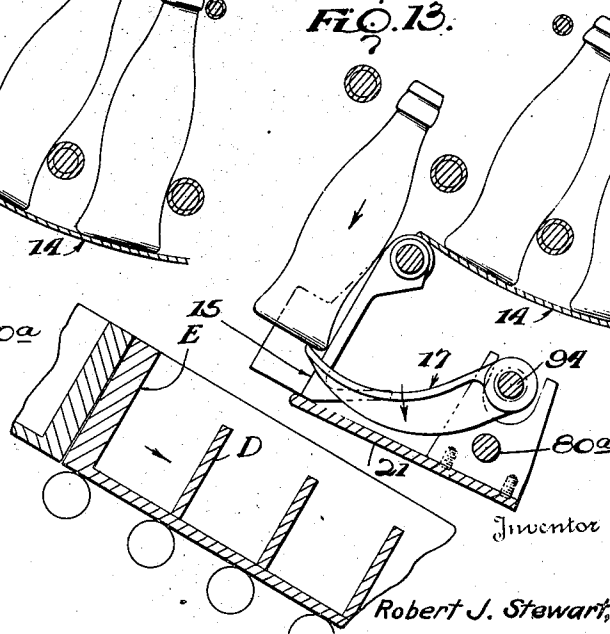


FIG. 13.



Inventor

Robert J. Stewart,

Cushman, Taylor & Cushman
Attorneys

May 11, 1943.

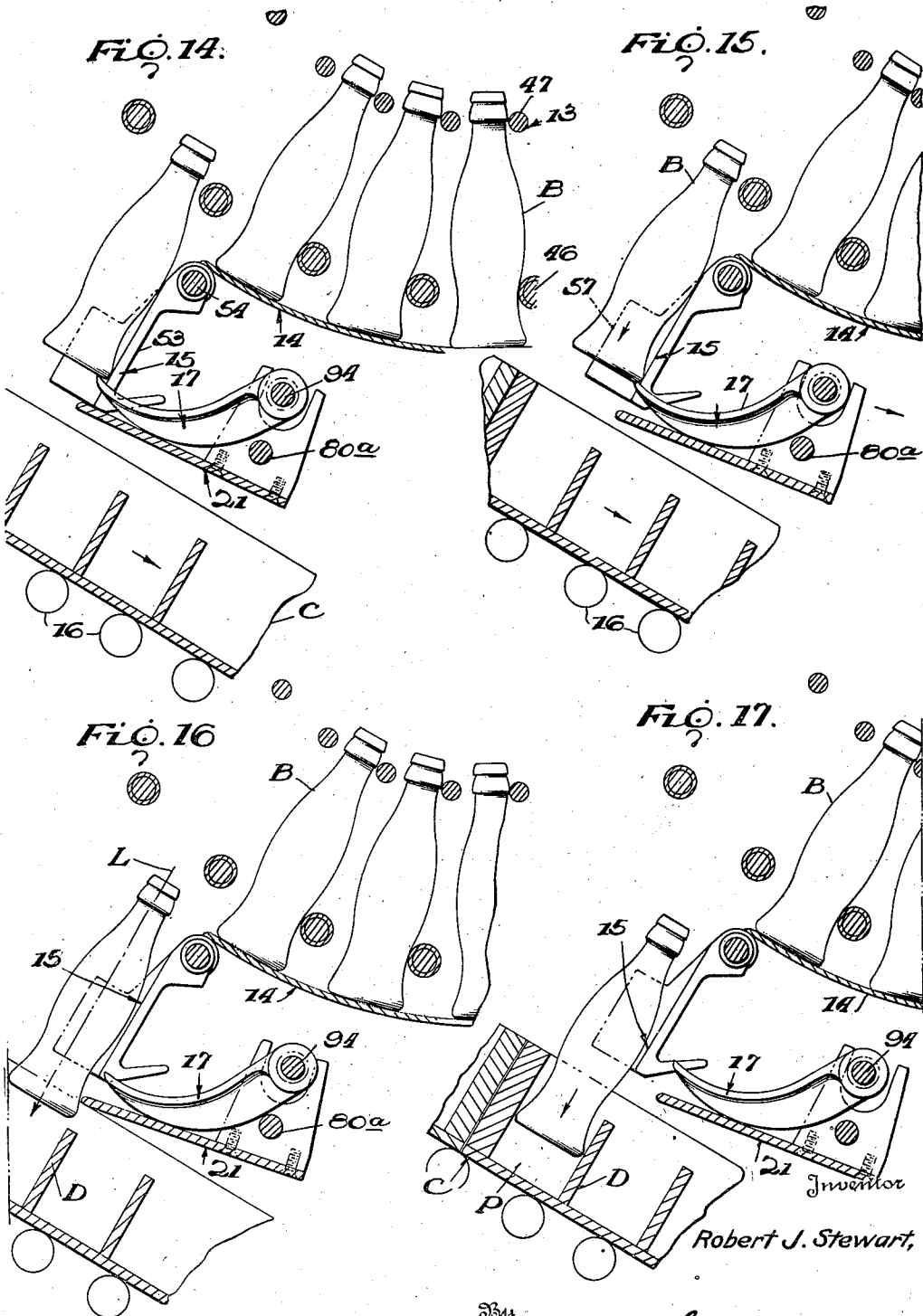
R. J. STEWART

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Robert J. Stewart,

By *Cushman, Touhy & Cushman*
Attorneys

May 11, 1943.

R. J. STEWART

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FIG. 18.

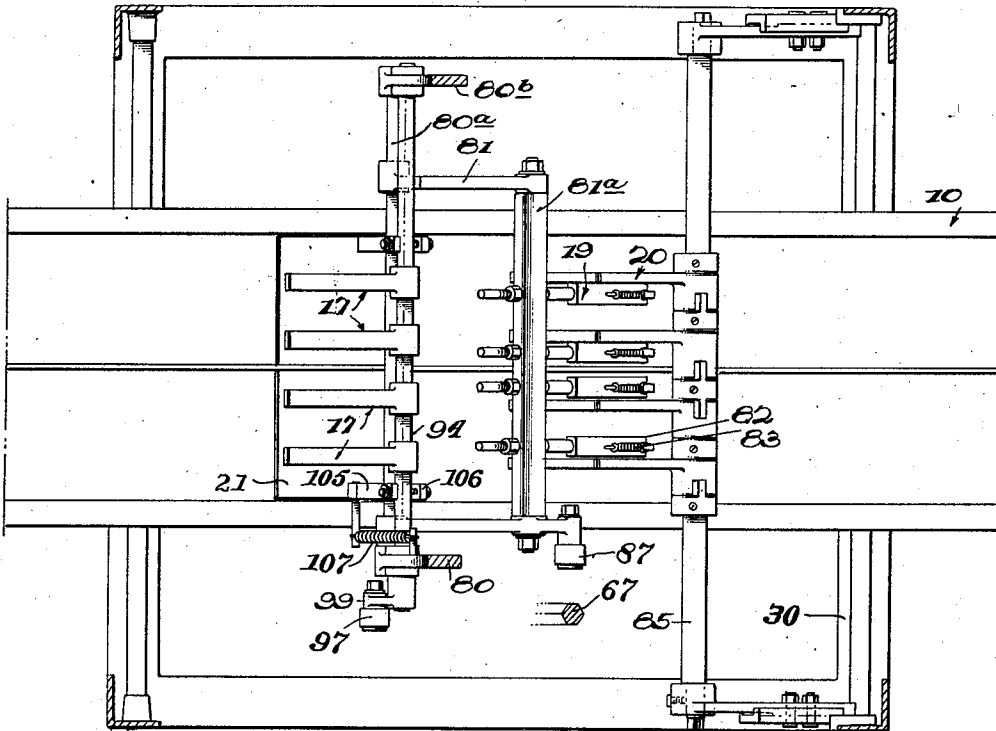
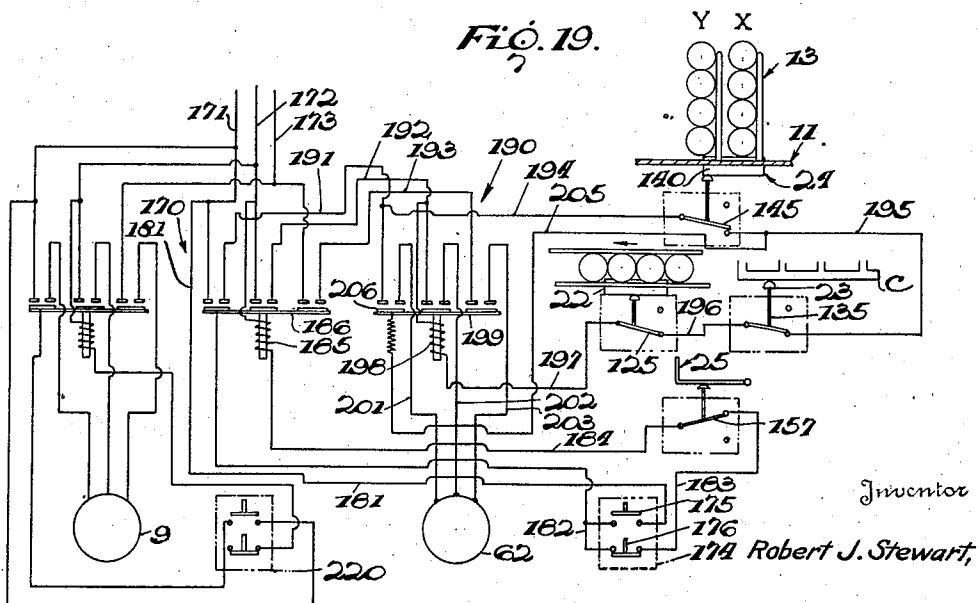


FIG. 19.



UNITED STATES PATENT OFFICE

2,319,167

CASING MACHINE

Robert J. Stewart, Baltimore, Md., assignor to
Crown Cork & Seal Company, Inc., Baltimore,
Md., a corporation of New York

Application November 10, 1941, Serial No. 418,613

10 Claims. (Cl. 226—14)

The present invention relates to a casing machine, and, more particularly, to a machine for delivering bottles or other articles to crates or other types of receptacle.

An important object of the invention is to provide an apparatus capable of operation at optimum speed to place articles in receptacles.

Another important object of the invention is to provide a casing machine whereby articles may be moved from a continuously moving line and successively placed in proper position in moving receptacles.

Another object of the invention is to provide a system of controls for a casing machine which will insure that the machine will only start operation when the supply of articles to be cased is adequate and the articles are in proper position. In addition, the control will prevent the machine from being placed in operation until the proper supply of receptacles is at hand and no articles are jammed with respect to the machine.

A still further object of the invention is to provide a mechanism responsive to jamming of articles and which will lock in the position to which it is moved by the occurrence of a jam. This arrangement insures that the machine cannot be accidentally started and, in addition, serves to prevent the operator from starting the machine until he has moved to the point at which the jam occurred to clear the same.

Another object of the invention is to provide easing fingers to control the dropping movement of articles into receptacles and which fingers are so mounted as to have a movement of optimum efficiency to direct the articles along proper lines and, in addition, prevent the articles from being broken.

It is particularly desirable in placing bottles in pocketed crates that the bottles move along a straight line which is normal to the plane of the bottom of the crate and centered with respect to the crate pockets. If bottles are not maintained in this line, they are very apt to drop upon a crate partition instead of into a crate pocket, due to the very small clearance provided in the crate pocket. The apparatus of the present invention assures that the crates will be maintained with their walls parallel to the line along which the bottles will drop and will also have their pockets aligned with that path. In addition, the machine maintains the bottles on the proper line during their dropping movement.

It has heretofore been proposed to control dropping movement of articles into a crate by fingers movable through an orbital path. However,

the fingers of the present invention are so mounted and operated that they will always be under positive control to move through an orbital path of the most desirable form.

Another object of the invention is to provide a bottle casing machine of the type including bottle and crate moving elements and wherein these elements are driven by means of optimum simplicity and which occupies a minimum space.

Other objects and advantages of the invention will be apparent from the following drawings, wherein—

Figure 1 is a rear elevation of the apparatus;

Figure 2 is a vertical sectional view on the line 2—2 of Figure 3;

Figure 3 is a side view of the apparatus, looking toward the machine from the right hand portion of Figures 1 and 2;

Figure 4 is a central vertical sectional view through the machine on the line 4—4 of Figure 1;

Figure 5 is a horizontal sectional view taken on the line 5—5 of Figure 2 but with certain operating elements omitted;

Figure 5a is a detail vertical section on the line 5a—5a of Figure 5;

Figure 6 is an enlarged and fragmentary vertical sectional view taken on the angled line 6—6 of Figure 5;

Figure 7 is a view similar to Figure 6 taken on the line 7—7 of Figure 5;

Figure 8 is a vertical section showing certain details of the operating mechanism;

Figure 9 is a view similar to Figure 8 but showing the elements at a successive stage in their operation;

Figures 10 to 17 are detail vertical sectional views of a portion of the mechanism shown in Figures 8 and 9 and showing the operating elements in successive stages of their cycle;

Figure 18 is a generally horizontal sectional view on the line 18—18 of Figure 9, with the guide chutes omitted; and

Figure 19 is a view diagrammatically showing the control circuits of the apparatus.

The construction and operation of the apparatus may be generally described as follows:

Referring to Figures 1 to 5, bottles B move to the apparatus on a bottle conveyor 8 (Figure 3) from a filling machine or the like, the conveyor 8 being driven by a motor 9 through suitable variable speed gearing. Receptacles or cases C, for example, bottle crates, move to the apparatus on a crate conveyor 10 moving along a line at right angles to the movement of the

bottle conveyor 8 and below the latter conveyor. Conveyor 10 is suitably driven by a motor which is not shown.

A drum device 11 (Figures 2 and 4) is freely rotatable about a horizontal shaft 11a journaled directly above bottle conveyor 8, the drum comprising a vertically arranged disc 12 and series of circumferentially spaced pins 13 projecting from its front face along lines parallel with its axis. The arrangement of the pins with respect to bottle conveyor 8 is indicated in Figure 8, from which it will be noted that the pins define pockets to receive the bottles in lines extending parallel with the drum axis, and with the vertical axes of the bottles extending radially of the drum.

The bottles or other articles to be cased are urged into the pockets of drum 11 by the continued movement of the conveyor 8. Drum 11 is rotated step by step about shaft 11a through a cam operated and pawl carrying lever generally indicated in Figures 8 and 9 and rotation of the drum causes a group of bottles corresponding to the width capacity of a crate, usually four bottles, to be moved step by step from bottle conveyor 8 and upwardly along a fixed plate 14 to the position illustrated at the left of Figure 8. When the bottles reach this position they will be pushed off the plate 14 to move downwardly along its skirt 15 toward the pockets of a crate C which is supported upon an upwardly inclined roller conveyor 16.

At the time the bottles reach the position shown at the left in Figure 8 and also shown at the left in Figure 12, one of a plurality of easing fingers 17 pivoted on a horizontal axis will engage the bottom of each bottle so that the bottle may only move downwardly along the skirt 15 and between vertically extending guide vanes 18 (Figure 5) in accordance with the downward movement of the fingers 17. Figures 12 to 17 diagrammatically illustrate the movement of the fingers 17 after they have engaged the bottom of the bottle and it will be observed from Figures 16 and 17 that the fingers 17 finally move behind the skirt 15 so as to become disengaged from the bottle, permitting the latter to drop into the pocket of the crate C as shown in Figure 17.

The crates C are advanced up the inclined conveyor 16 by a crate moving element 19 which engages the cross dividing walls D of the crates C and, alternatively, the end walls E. The type of crate disclosed in the drawings includes twenty-four pockets, arranged in six cross rows, with four pockets in each cross-row. Referring to Figures 8 and 9, stop arms or crate holding means 20 to engage the crate walls D or E are so positioned with respect to skirt 15 that they will cooperate with the crate moving element 19 to hold the crates in such position that a line of cross pockets will be in proper position to receive dropping bottles. As a result, the descending bottles will move into the cross line of pockets P, their only free dropping movement being that which occurs after the bottom of the bottle has reached a point immediately above the crate as indicated in Figure 15.

A generally horizontal plate 21 best shown in Figures 8, 9 and 10 to 17 moves forwardly and backwardly with the bottle easing fingers 17. The purpose of this plate is best illustrated in Figure 9 from which it will be observed that at the moment that the crates are being moved up inclined conveyor 16 by pulling element 19,

the forward edge of plate 21 will bear against the bottles just dropped into the crate being filled. This action of plate 21 will assist in moving the crates up incline 16. In the event the crate wall to be engaged by crate moving element 19 is broken, plate 21 can assume the entire pushing load. In addition, should a bottle drop to stand upon the upper edge of a crate cross wall, plate 21 will push the bottle into a crate pocket.

The apparatus includes controls to insure that the machine will only operate when a supply of bottles or other articles and crates or other receptacles are delivered thereto, and also controls to insure that the machine will only start when the proper number of bottles has been positioned in each pocket of the drum 12. It further includes a control to prevent the machine from operating in the event that a bottle is knocked over or becomes jammed while being moved into a drum pocket.

More particularly, a detector 22 best shown in Figure 5 functions to stop operation of the machine in the event that a gap occurs in the line of bottles delivered by conveyor 8 and a detector 23 on the crate conveyor 10 best shown in Figure 1 is responsive to the feed of crates to the machine. A detector 24 shown in Figure 5 is responsive to the feeding of bottles to the drum 11 and will prevent the drum from being started until the full number of bottles to be placed in the pocket of a crate is received in a drum pocket. A detector 25 also shown in Figure 5 is so positioned that should a bottle be in such position that, on the advancing movement of the drum, it straddles the drum pocket and the corner of detector 25, either while the bottle is in an upright or a horizontal position, the movement of the machine will be stopped.

The specific structure of the embodiment of the apparatus disclosed in the drawings includes a frame including four or more vertical upright elements 30 which support a lower horizontal framework 31 and superposed horizontal frame elements 32 and 33. As best shown in Figures 2, 3 and 4, the disc 12 of drum 11 is secured to a sleeve 41 which is freely rotatable upon a horizontal shaft 11a journaled on the upper horizontal framework 33. The disc 12 has a large ratchet wheel 45 fixed to the side thereof opposite that from which the pins 13 extend. The drum pins 13 preferably include a circular row of relatively large diameter pins 46 extending from the drum along a circular line near the periphery of disc 12 together with a circular series of pins 47 of somewhat smaller size arranged on a circle of somewhat smaller diameter. Referring to Figure 8, for example, it will be noted that a pin 46 and a pin 47 are both arranged along a line extending radially through the axis of drum 11. By this arrangement, a pair of adjacent pins 46 and a pair of adjacent pins 47 form a pocket between them in which a bottle may stand, the more closely spaced pins 47 causing the pocket to be reduced at its upper portion, that is, its portion nearest the diameter of the drum. It will be understood that the arrangement of the pins may be varied to define pockets of somewhat different configuration but which will still hold articles in such position that their vertical axes will extend radially with respect to the axis of the drum while moving with the drum.

The bottle conveyor 8 is preferably formed of metal links having a flat upper surface to sup-

port the articles and, as best shown in Figures 5 to 7, moves on a trackway 48 which extends across the frame of the apparatus somewhat above the horizontal framework 32. The conveyor moves about a sprocket wheel 49 positioned at the outer side of the disc 12 of drum 11 so that the top run of conveyor 8 will move bottles entirely within the pockets of the drum. The rotation of drum 11 in a clockwise manner relative to Figure 2 will cause bottles to be swept off one side of the conveyor 8 as indicated by the arrow in Figure 5. The framework 50 which guides the movement of the bottles on conveyor 8 may be extended as indicated at 57 on the opposite side of the conveyor 8 to a point adjacent the disc 12.

Referring to Figures 8 and 9, the plate 14 across which bottles move with drum 11 is fixed in the framework 30 and is curved upwardly from the conveyor trackway 48 so that it conforms to the diameter of the disc 12, thereby insuring that bottles may be smoothly moved from conveyor 8 to and along plate 14 without their position with respect to the axis of the drum being changed. As best shown in Figures 4 and 5, a vertical wall 52 extends along the plate 14 parallel with the disc 12 of the drum, the disc and wall thereby serving to generally direct the movement of bottles along plate 14.

The skirt 15 down which the bottles slide from the plate 14 to the crate pockets is shown in top plan in Figure 5. It will be observed from this view that skirt 15 comprises a plurality of depending blocks 53 supported at their upper ends, as also shown in Figure 14, by a cross bar 54 fixed to the frame of the apparatus. It will also be noted from Figure 5 that the blocks 53 are of such form that two adjacent blocks form a chute 55 down which a bottle may slide, with a vertically extending slot 56 between the blocks in which the fingers 17 operate.

Each block also supports a vertically extending plate or guide vane forming part of the group of vertical guide vanes 18, the purpose of these vanes being to prevent the bottles from moving sideways as they drop in the chutes 55 and, furthermore, to deflect and space the bottles just prior to and during their dropping movement so that each bottle will be transversely aligned with a crate pocket at the conclusion of its dropping movement. That is, at the time that the bottles are moved from the conveyor 8 by the drum 11, they are in contact and they must be spaced somewhat before they can properly drop into the crate pockets. Figure 5 illustrates the center vane 57 of group 18 as vertical while the two adjacent vanes are inclined toward the center plate at their portions nearest the conveyor 8 so as to space the two outermost bottles of a line of four from the two center bottles.

Referring to Figures 2, 8 and 9, the mechanism for moving the drum 11 step by step may be generally described as comprising a pawl device 60 operated from a cam shaft 61 driven by a motor 62 through a suitable speed reduction unit 63. Pawl 60 is moved in timed relation with the crate pulling element 19 and the bottle easing fingers 17. The detail structure of the operating mechanism is best shown in Figure 2 from which it will be noted that cam shaft 61 includes a camming element such as the eccentric 65 which is engaged by a strap 66 carried by a rod 67 pivotally connected as indicated at 68 to a bell-crank 69 keyed to the shaft 11a on which the drum 11

rotates. Bell-crank 69 includes a generally horizontally extending arm 70 which, at its pivot with rod 67, carries the spring urged pawl 60 adapted to engage the teeth or ratchet wheel 45.

As a result, when the rod 67 is moved downwardly, drum 11 will be given a clockwise movement to move a line of bottles forward from the conveyor 8. The pawl 60 will ride along ratchet wheel 45 upon upward movement of rod 67 so as to engage the next tooth. In order to prevent the drum from turning in the opposite direction, a stop arm 71 is pivoted on the upper portion of the frame 30 to drop into the ratchet teeth as they move beneath the same. In addition, a spring pressed plunger 72 may be mounted in the upper portion of the frame 30 to bear upon disc 12 and prevent overrunning. The pivot of stop arm 71 may be eccentrically mounted to render it adjustable.

Just below plate 14, as shown in Figure 8, the vertical arm 80 of bell-crank 69 supports one end of a cross rod 80a as best shown in Figure 18, the other end of rod 80a being supported by a lever 80b keyed to shaft 11a to swing with the bell-crank 69. A generally horizontal U-shaped bracket 81 is pivoted on rod 80a and the cross bar 81a of this bracket carries the crate pulling elements 19. Four elements 19 are preferably provided and, as shown in Figure 18, these elements are of rod formation and each carries a pawl 82 at its free end, each pawl being urged to a limit position by a spring 83 acting upon its upper portion. The elements 19 are adjustably mounted in cross rod 81a so that the position of each pawl lengthwise of inclined conveyor 16 may be varied.

As best shown in Figures 2 and 9, a cam follower 87 engaging a cam 86 carried on cam shaft 61 has its upper end pivotally connected to the frame 81. Cam 86 is so timed with respect to eccentric 65 that the raising and lowering of the elements 19 will have a timed relation with respect to the forward movement (clockwise movement in Figures 2, 8 and 9) of the vertical arm 80 of bell-crank 69 which controls the backward and forward movement of the crate pulling elements 19.

In more detail, during the time that the crate pulling elements 19 are moving forwardly with the forward rotation of drum 11, the elements 19 will be in lowered position so that they will be in engagement with a wall D or E of the crate immediately behind the crate to be filled. At the end of their forward stroke, cam 86 will cause the elements 19 to lift to release the crates, ordinarily permitting the line of crates to slide backwardly by gravity until the crate wall which has just been engaged by the pawls 82 of the elements 19 will contact with the stop arms 20. Then, as the bell-crank 69 is rotated in a counter-clockwise or backward direction by eccentric 65, the elements 19, still in raised position, will likewise move backwardly. At the conclusion of the backward movement of bell-crank 69, cam 86 will permit elements 19 to drop so that when their advancing movement again occurs, they will contact with the next succeeding cross wall of a crate. It is ordinarily preferred to have the backward movement of the elements 19 continued to a point well behind the crate wall to be engaged so that the engaging ends of the pawls 82 will drop down behind such walls and then come forward on their advancing movement to contact the walls. However, should a pawl

82 contact with a crate wall during backward movement of the pawl, the pawl will simply turn against the action of its spring 83 to slide over the wall. Elements 19 thus move in an elongated orbital path.

The crate pulling elements 19 preferably push the crates up the inclined conveyor 16 a sufficient distance that the rear cross wall of the pockets to be filled will be positioned directly in the path of the dropping bottles as indicated in Figure 13, and the crates then drop backwardly by gravity to the position indicated in Figure 15, in which position the crate stop arms 20 are in contact with the crate. In other words, the position of the crates with respect to the vertical bottle guiding skirt 15 is finally controlled by the stop arms 20.

The stop arms 20 are preferably mounted on an eccentric pivot so that their position can be adjusted lengthwise of conveyor 16.

Because of the fact that crates of the type being handled by the embodiment of the invention disclosed herein have their end walls E thicker than their dividing walls D, and also because two end walls E will always be immediately adjacent each other in the line of crates, it is not possible to align crate pockets with skirt 15 simply by advancing the crates on each forward stroke of pullers 19 by a distance corresponding to the distance between the center lines of adjacent pockets in a crate. Obviously, if such practice were followed, the rear wall of the pockets immediately behind the leading wall E of a crate would not reach skirt 15.

To compensate for the above condition, the pullers 19, on each forward stroke, advance the line of crates by a distance at least equal to the distance between pocket center-lines in a crate, plus the difference between the thickness of one dividing wall D and the thickness of two end walls E. If the stop arms 20 are then so positioned that the same number of end walls E will always be between their front faces and the front surface of skirt 15, the front surface of a rear wall of a crate pocket will always come to rest in exact alignment with skirt 15.

In practice, it is found desirable to have the distance between the front faces of stop arms 20 and the front surface of skirt 15 equal to the overall length of a crate, minus the inside dimension of one pocket. Also, it is most practicable to have the pullers 19 follow a somewhat longer stroke than that specified above for, by lengthening the stroke, it will be assured that the stop arms 20 will always readily drop into position. The stroke of the pullers 19 furthermore must be so arranged that their forward movement will begin far enough to the rear to readily drop behind two pairs of thick walls E.

As has been stated above, when operating upon crates of the type disclosed herein, the stop arms 20 finally control the alignment of the crate pockets beneath skirt 15 and the pullers 19 preferably act only as crate advancing or moving means. However, in some instances, even with crates of the type referred to, the pullers 19 may be used to both move and align the receptacles and the stop arms 20 may simply act as means to hold the receptacles at the point at which they are positioned by the pullers 19.

That is, if the dimensions of the crates were strictly maintained, the stop arms 20 could be positioned behind skirt 15 a distance equal to the overall length of a crate minus the inside diameter of a crate pocket and the forward stroke

of the pullers could terminate exactly at the point at which the stop arms 20 drop. That is, with the pullers having a stroke equal to the distance between crate pocket center lines plus the difference between one wall D and two walls E, the stroke could start that distance back of stop arms 20 even though the only time the pullers 19 would immediately contact with crate walls would be when striking an end wall E. This arrangement would eliminate the necessity of having the crates drop backwardly any substantial distance, because they would always stop exactly in alignment with skirt 15. In other words, all compensation for wall thickness would occur during the initial portion of the forward stroke of the pullers 19, instead of after the forward stroke is completed.

Referring to Figure 4, the inclined conveyor 16 is provided on one side with an adjustably mounted strip 16a which carries rollers against which the side walls of the crates are forced by spring-pressed rollers 16b on the opposite side of the conveyor frame. By this arrangement, the longitudinal partitions of the crates are maintained in alignment with the vanes of the bottle guiding plates 18.

As best shown in Figures 8 and 18, the bottle easing fingers 17 are fixed to a rocker shaft 94 journaled in bell-crank arm 80 and lever 80b above rod 80a. Hence, the swinging movement of bell crank 69 controls the forward and backward movement of fingers 17 into and out of the path of dropping movement of the bottles. However, the raising and lowering movement of fingers 17 is primarily controlled by a cam 95 fixed to the cam shaft 61 and which is engaged by a cam following roller 96 supported on a cam following rod 97 which includes a forked portion to engage the shaft 61. The upper end of rod 97 is pivotally connected as at 98 to a crank arm 99 extending from shaft 94 outwardly of arm 80 of bell-crank 69.

Turning of crank arm 99 by the cam 95 will cause fingers 17 to be moved upwardly as they advance with respect to the path of downward movement of the bottles and will move them downwardly after they have reached advanced position. As is hereinafter more fully described, the resulting movement given the free ends of the fingers 17 is orbital as indicated by the showings of Figures 10 to 17.

As has been hereinbefore stated, plate 21 functions as a crate pushing means in the event that the other pushing or pulling means 19 fails to make contact with a dividing wall D due to the fact that the upper portion of such wall D is broken. For this purpose, plate 21 has two upwardly extending ears 105 at its ends which are apertured to loosely fit on rod 80a as shown in Figures 10 and 18. Each ear 105 has a bifurcated upper portion to form legs 106 which loosely embrace easing finger shaft 94. Set screws mounted in the legs 106 opposite shaft 94 control the swinging movement of the plate. A spring 107 connected between bell-crank arm 80 and plate 21 urges the latter to its upward position as controlled by forward leg 106 and shown in Figure 10. In this position the plate will clear the top edge of the crate. Plate 21 will be urged to a downward position such as shown in Figure 16 by contact of the fingers 17 therewith, this position being controlled by the rear legs 106. The set screws carried by the rear legs will, of course, be so adjusted as not to hamper movement of the fingers 17.

In order to insure that the cam followers 67 and 97 will follow cams 86 and 95, respectively, springs may be connected between the followers and the machine frame to urge the followers downwardly.

The control devices to insure that the apparatus will stop when a gap occurs in the delivery of crates or bottles, or when a bottle becomes jammed between the rotating drum and the conveyor 8, and also to insure that the machine will not start unless the proper number of bottles is placed in a drum pocket, are as follows:

The detector 22 to insure that the machine will stop in the event that a gap occurs in the line of bottles upon the infeed bottle conveyor 8 comprises a plate 120 best shown in Figures 5, 5a, and 6 and positioned on the conveyor framework 48 alongside of the upper run of the conveyor 8 and at a point fairly close to the upper surface of the conveyor as shown in Figure 5a.

Plate 120 is fixed to a bracket 121 and bracket 121 is pivoted at its lower end on a horizontal line as indicated at 122 to a mounting plate 123 fixed to the side of the conveyor frame 48. At its lower end the bracket 121 includes a rearward projection 124 adapted to bear, through an adjustable set screw, upon an electric switch 125. The operating button of switch 125 against which the set screw bears is adapted to be urged to opened position by a spring within the switch of sufficient force to urge bracket projection 124 upwardly and thereby hold bracket 121 and plate 120 inwardly toward the center-line of bottle conveyor 8. Inward movement of bracket 121 is limited by a set screw 122a. The moving elements of detector 22 are so balanced on pivot 122 that no pressure is exerted upon the spring of switch 125 unless a bottle is contacting plate 120.

As best shown in Figure 5, plate 120 extends lengthwise of bottle conveyor 8 for a sufficient distance to insure that two bottles may contact therewith, thereby preventing the switch from being opened intermediate the passage of two bottles closely adjacent each other. Also, the entrance edge of plate 120 is beveled to enable incoming bottles to readily move the plate to switch closing position. As shown in Figure 5a, plate 120 is positioned so close to the upper surface of conveyor 8 that when a bottle is lying horizontal upon the conveyor, the wall of the bottle will not contact with plate 120 because the latter will be below the horizontal diameter of the bottle. This prevents detector 22 from being moved to closed position by an upset bottle.

As is hereinafter explained, the bottle feed detector 22 is not in circuit with the bottle conveyor driving motor 9 but only in circuit with the casing machine driving motor 62 so that motor 9 may operate continuously to deliver bottles, regardless of temporary stoppage of the casing machine driving motor 62.

Referring to Figure 1, the crate or receptacle detector 23 comprises an arm 130 fixed to a rod 131 extending between the side frame members 10a of conveyor 10. Rod 131 also has fixed there- to an arm 132 extending in the opposite direction from arm 130 and adapted to engage the operating button of an electrical switch 135, which button is urged upwardly to circuit closing position by a spring within the switch. Detector arm 130 is urged upwardly into the path of the crates by a coil spring on rod 131, so that it tends to move the operating element of switch 135 down-

wardly to circuit opening position. However, so long as the bottom wall of a crate is bearing upon arm 130, the latter will be held downwardly as indicated in Figure 1 so that switch 135 may remain in circuit closing position.

Crate conveyor 10 comprises a frame 10a having rollers 136 journaled therein to support the crates, the rollers being driven by an endless belt 137 engaging their lower surfaces and operated from a suitable source of power. In order to insure that the crates will be positively moved toward the lower end of the inclined conveyor 10, it is found desirable to cover spaced rollers 136a with rubber or other friction material to make a proper engagement with the bottom surfaces of the crates.

As is hereinafter explained, the crate conveyor driving motor is not in circuit with the crate detector 23, the latter only being in circuit with motor 62. This arrangement insures that stoppage of the casing machine will not result in a temporary gap in the delivery line of crates.

As shown in Figures 5, 6 and 7, the detector 24 to insure that the casing machine will only start when the proper number of bottles is positioned in a drum pocket comprises a blade 140 extending transversely of bottle conveyor 8. More particularly, blade 140 is fixed to a horizontally extending plate 141 pivotally connected to the lower ends of two parallel and vertical links 143 pivotally mounted on a support 142 fixed to the frame of the machine. One of the links 143 extends upwardly past its pivot and has a coil spring 144 connected thereto, which coil spring is secured at its opposite end to the support 142. Spring 144 thereby urges blade 140 inwardly into the path of incoming bottles on bottle conveyor 8. Spring 144 exerts just sufficient tension that it will hold plate 140 to the right in Figure 7 if only three bottles are pressing against the latter but will permit plate 140 to swing to the left under the pressure of four bottles. Plate 141 engages the operating button of an electrical switch 145, the arrangement being such that so long as blade 140 is urged to retracted position against the action of spring 144, switch 145 will be held in circuit closing position.

As shown in Figures 6 and 7, blade 140 is positioned so close to the upper surface of bottle conveyor 8 that should a bottle fall forwardly as it enters a leading drum pocket, the head of the bottle will be entirely above blade 140 so that the latter will not be moved into circuit closing position.

As shown in Figure 5, blade 140 preferably extends some distance along the path of movement of bottles or other articles with drum 11. More particularly, the blade is of such length transversely of conveyor 8 that the leading bottle will remain in engagement therewith to hold the blade in circuit closing position until just an instant prior to the moment that the line of bottles reaches position Y, the first position off conveyor 8 occurring by reason of one movement of drum 11.

Referring to Figures 5, 5a, and 7, the anti-jam detector 25 comprises an angled blade 150 including an arm 151 extending alongside the path of movement of bottles with drum 11 and an arm 152 extending alongside the path of movement of bottles with the conveyor 8. Blade 150 is pivoted at the outer end of arm 152 at a point 153 upon a support 154 secured to the frame 48 of conveyor 8. A spring 155 has one end thereof

connected to frame 48 and the opposite end connected to blade 150 to urge the blade to the position shown in Figure 5 wherein its arm 152 extends parallel with the center-line of conveyor 8. As shown in Figure 5a, arm 152 also has a projection 156 extending rearwardly therefrom, the undersurface of the outer end of projection 156 being beveled so that the operating button of an electrical switch 157 may normally extend upwardly into circuit closing position beneath the beveled portion.

In the event that a bottle becomes jammed between the corner 150a of blade 150 and one of the pins 13 of drum 11, blade 150 will be swung in a clockwise direction on its pivot 153 as viewed in Figure 5 so that the beveled portion of projection 156 will move past the operating button of switch 157 and the thicker portion of projection 156 will contact with the operating button to force the latter downwardly to circuit opening position. At the same time, a downwardly urged spring-pressed plunger 158 extending vertically of blade 150 adjacent its pivot 153 will be moved downwardly by its spring into a socket 159 (Figure 7). This movement of plunger 158 will lock the detector 25 in circuit opening position so that it cannot return to its normal position until the operator has drawn the plunger 158 upwardly. As is hereinafter explained, this arrangement prevents the machine from starting accidentally while an operator is endeavoring to remove broken glass from a point adjacent detector 25.

As shown in Figure 5a, the face of blade 150 is shaped to conform to the portion of bottles which will ordinarily be in engagement therewith. In addition, the blade is of such vertical width that a bottle lying down upon the conveyor 8 will contact therewith. Hence, if such a bottle becomes jammed between conveyor 8 and drum 11, blade 150 will be operated to circuit opening position.

The spring 155 which holds detector 25 inwardly as shown in Figure 5 is sufficiently strong that blade 150 will only be moved outwardly by a lateral movement of a bottle. However, detector 22, opposite blade 150, is so mounted that it will readily move outwardly upon mere movement of a bottle in contact with plate 120. By this arrangement, these two detectors can be mounted opposite each other and at the critical points it is desired to protect.

The circuits whereby the detectors 22, 23, 24 and 25 control the casing apparatus motor 62 are shown in Figure 19.

Referring to Figure 19, power is supplied to the apparatus through main leads 171, 172 and 173. A manual control switch 174 including a "start" button 175 and a "stop" button 176 is provided. Assuming that the switch associated with the anti-jam detector 25 is closed, the motor 62 will be started when "start" button 175 is closed, this being accomplished by the following primary controlling circuit:

Current will flow from power line 171 through lead 181 across "start" switch 175 and through lead 182 across the closed "stop" switch 176 to lead 183 and thence across closed switch 157 of detector 25 to a lead 184 including an electromagnetic holding coil 185 to power line 172. Energization of coil 185 will cause a carrier 186 to move contacts carried thereby to cause current to flow from the power lines 171, 172 and 173 through primary switch 170 to leads 191, 192 and 193, respectively.

With detector switch 125 closed due to bottles

opposite plate 120 on conveyor 8, detector switch 135 closed due to crates on conveyor 10, and detector switch 145 closed because four bottles are pressed against plate 140 by conveyor 8, current will now flow through the following secondary controlling circuit: From lead 191 through a lead 194 passing through switch 145 to a lead 195 passing through switch 135 and thence by a lead 196 through switch 125 to a lead 197 and a holding coil 198 to lead 192. Energization of coil 198 will cause a carrier 199 to close secondary switch 190 to place the motor leads 201, 202 and 203 in circuit with leads 191, 192 and 193 so that the motor 62 will be started.

"Start" button 175 may of course be released instantly it has been pressed and so long as the detector switches are closed, the motor will continue to operate because holding coils 185 and 198 will remain energized through the normally closed "stop" switch 176.

It will be noted that the switch 157 associated with the jam detector 25 is in the primary circuit directly in series between the holding coil 185 of primary switch 170 and the "stop" switch 176. Because of this, if a jam occurs at detector 25, regardless of the position of any of the other detector switches, the primary holding coil 185 will be deenergized, opening the primary circuit and also the circuit through the secondary holding coil 198 so that the motor 62 will stop. Obviously, the only way in which the circuit of the motor 62 can then be restored will be for the operator to again press the "start" button 175. In addition, as has been stated above, the blade 150 of detector 25 will lock in circuit opening position by the action of bolt 158 and the operator must unlock the detector before the circuit can be re-closed. Since bolt 158 is positioned close to the source of the jam, an operator moving to the detector is most apt, while there, to clear all broken glass from the operating elements before unlocking the detector. In the meantime, no other operator can start the machine until the operator near the jam has released bolt 158.

The bottle feed detector switch 125 and case detector switch 135 respectively associated with detectors 22 and 23, are so arranged in circuit with the switch 145 of detector 24 that through holding coil 198 of secondary switch 190 cannot initially be closed until all three of these detector switches are closed, nevertheless, the opening of the switch 145 of detector 24 after coil 198 has once been energized will not result in the coil being de-energized and the circuit through secondary switch 190 opened.

In more detail, when all three of the detector switches 145, 135, and 125 are closed because of the presence of bottles and crates on the bottle and crate conveyors, respectively, and also because four bottles are in contact with the blade 140 of detector 24, closing of the primary switch 170 will cause current to flow through holding coil 198 to close secondary switch 190 and cause motor 62 to start as has been stated above. However, whenever the switch 145 of detector 24 opens, as it regularly does as soon as bottles have moved from receiving position X in the drum 11 to the first position Y to which the drum will move them, the resulting opening of switch 145 will not break the circuit through holding coil 198 because of by-pass 205 extending from lead 195 to the moving contact 206 which is in connection with lead 191. It therefore follows that holding coil 198 will remain

energized until either the bottle detector switch 125 or the case detector switch 135 opens because of a failure of the supply of these articles.

In actual operation, the switch 145 of detector 24 opens intermittently at regular intervals during the operation of the machine due to the fact that when drum 11 moves a freshly received group of bottles from their position on the bottle conveyor 8 shown at X in Figure 19 to position Y in the same figure, blade 140 may move to open switch 145 because a very brief interval of time will elapse before the leading bottle now moving into position X strikes the blade. However, this will not interrupt the operation of the machine. It will be observed from what has been stated immediately above, that detector 24 is, in fact, a "starting" detector to make certain that the machine cannot start after any stoppage until four bottles are at position X.

It is found in actual operation that the machine will operate continuously if its speed of operation is properly synchronized with the rate of delivery of bottles on the conveyor 8 from a filling machine or the like and so long as the supply of crates is continued. That is, it can be assumed that the filling machine or other source of supply of bottles or other articles will be maintained in operation and, as long as this occurs, bottles will move in a continuous stream on conveyor 8. If a gap of more than two bottles occurs in the stream, the machine will then be stopped by the action of bottle detector 22 and will not re-start until the conveyor 8 moves four bottles to position X. However, in practice no means to count the bottles placed in position X within the drum 11 is necessary once the first group of bottles to be handled is placed in that position to close starting detector 24.

Figure 19 also illustrates the manner in which the driving motor 9 for the bottle conveyor 8 is controlled through a manual switch 220 in a well known manner. It will be observed that the bottle conveyor driving motor 9 is operated entirely independently of the motor 62 which drives the cam shaft 61 to thereby drive the drum 12 and the mechanisms associated therewith. Hence, none of the detectors 22, 23, 24 or 25 will affect the operation of the conveyor driving motor 9 and the latter must be separately manually controlled.

By having the motors of the crate conveyor 10 and the bottle conveyor 8 entirely independent of the detector circuits, the machine can re-start of its own accord after a temporary failure of either crates or bottles because the continued operation of these conveyors will correct the difficulty. For example, if the supply of bottles fails, even while conveyor 8 is still driven, operation of the drum 11 will discontinue due to the action of the detector 22. When this detector and detector 24 are again closed by resumption of feed of bottles on the conveyor, the motor 62 will again start, assuming that the crate detector 23 and anti-jam detector 25 are in circuit closing position, because only secondary switch 190 has been opened by opening of detector 22. However, should the jam detector 25 be actuated to circuit opening position, the primary circuit through switch 170 will be opened and will remain opened until the manual switch 174 is closed. When a jam occurs, the operator may stop the motors of the conveyors 8 and 10 by operating manual switches. However,

since both of these conveyors can simply slide beneath bottles and crates standing thereon, their continued operation on the occurrence of a jam cannot cause damage.

The cycle of operation shown in Figures 10 to 17 is as follows: As best shown in Figure 10, bottles will be moved from the upright position X in Figure 10, in which position they are standing upon the bottle infeed conveyor 8, in two successive steps across the supporting plate 14 and at the end of the second step the bottles at Z will still be entirely supported upon plate 14 with their vertical axes extending along a line passing through the axis of drum 11 so that the bottles will be inclined. On the next movement of drum 11, the line Z of bottles shown in Figure 10 will be pushed further across the supporting plate 14 as indicated in Figure 11 and at the completion of this movement of the drum this outermost line of bottles will be entirely clear of plate 14 and will begin to drop as shown in Figure 12.

Referring again to Figure 10, which shows the preceding line Za of bottles as having been just dropped into the pocket of a crate C, it will be observed that at this time the bottle easing fingers 17 are in a downward position due to the fact that the lowest portion of cam 95 is beneath the cam following roller 96 of rod 97. In addition, because bell-crank 69 is at its extreme counter-clockwise position as shown in Figure 2, the pivot 94 of the fingers 17 is retracted beneath plate 14 as far as possible. In the Figure 11 position the bell-crank 69 is being swung in a clockwise direction by rotation of the eccentric 65 acting on rod 67. As a result, the bottles are being pushed toward the outer edge of support 14 as described and, in addition, the rotation of the cam 95 is causing rod 97 to lift the crank 99 so as to rotate the shaft 94 carrying the fingers 17. In other words, as the fingers 17 are moved to the left in Figure 11 they are likewise swung upwardly. In Figure 12 the action of cam 95 has caused the fingers 17 to reach their maximum raised position and at the same time, the movement of bell-crank 69 which has turned the drum to cause the outer row of bottles to drop from plate 14 has also bodily moved the fingers 17 to their limit forward position with respect to the chutes or skirt 15.

As has been heretofore explained, the clockwise forward movement of bell-crank 69 will cause the crate moving element 19 including frame 81 and the pawls 82 to move forwardly to move the crates up the inclined conveyor from the Figure 10 position to that shown in Figure 12, wherein the crates are so far forward that the crate wall defining the rear wall of the row of pockets to be filled is advanced beyond the face of skirt 15 and is in the path of the bottles being dropped as shown in Figure 12. However, in the Figure 12 position, pawl raising and lowering cam 86 has acted upon rod 87 to lift the pawl carrying frame 81 so that the crates are beginning to slide down conveyor 16 to proper position against stops 23.

Referring to Figure 13, the bottles are now falling down the chute along inclined lines which are parallel to the walls of the crate pockets and under the control of the easing fingers 17 which are now moving backwardly by return movement of the bell-crank 69. The fingers have almost reached their lowered position under control of cam 95. The line of crates is still dropping backward along conveyor 16.

In Figures 14 and 15 all of the movements shown in Figure 13 are continuing, with the result that the bottle is moving downwardly with the fingers 17 as the latter are being further retracted and lowered.

In Figure 16, fingers 17 are entirely out of the path of the bottles and their backward movement with the bell-crank 69 is continuing. Also, the pockets of the crate which are to be filled are now properly aligned with the skirt or chute 15 due to the fact that the crates have moved back against the stop members 20. Furthermore, since the fingers are entirely lowered, the plate 21 is pressed down and bears on the upper surface of the crate.

Figure 17 shows the fingers 17 entirely retracted from the path of the falling bottles and in an entirely lowered position. However, the fingers are still moving rearwardly with the bell-crank 69. The bottles, now free to fall, are still dropping toward the bottom of the crate pockets. At this same time, the pulling elements 19 will still be in raised position, since they are still moving backwardly with bell-crank 69.

The return movement of bell-crank 69 with respect to drum 11 will carry the fingers 17 and plate 21 somewhat to the rear of the position shown in Figure 17 and to a position approximating that illustrated in Figure 10. When the forward or clockwise movement of bell-crank 69 is initiated under the action of eccentric 65, the fingers 17 will begin to swing forwardly and will also immediately begin to lift under the action of the cam 95. Before the forward movement of the bell-crank 69 begins, cam 86 will permit the pawl carrying frame 81 to drop so that the pawls 82 will drop into engagement behind the crate dividing wall D or a crate end wall E. As a result, when the forward motion of bell-crank 69 begins, the line of crates will be advanced as indicated in Figures 10 and 11.

The motion of the tips of the easing fingers 17 is along an orbital path of a generally triangular shape. That is, the fingers begin to lift immediately they move forwardly and their lifting motion terminates with the end of their forward movement. This may be described as their movement along one leg of the triangle. Then the fingers drop while in an almost entirely forward position, defining the other leg of the triangle. During their return movement, which occurs while the fingers are almost entirely lowered, the third leg of the triangle is defined.

Because the entire dropping movement of the fingers occurs while they are in well advanced position, their entire dropping occurs while they are in engagement with the bottles. This assures that a maximum portion of the dropping movement of a bottle will occur under the control of the fingers.

It will be noted that the inclined conveyor 16 extends along a line which is at right angles to the line along which the bottles move. As a result, the forward and rear walls of the pockets into which a bottle drops will be parallel with the line L along which the vertical axis of the bottle moves during its dropping. This fact, as well as the fact that the bottles are eased downwardly along their line of dropping, is of particular importance in positioning beverage containers in the type of crates ordinarily provided for the same. More particularly, many types of such crates have their square pockets of a dimension only one-sixteenth of an inch larger than the outside diameter of the bottle to be received

therein. As a result, the clearance about the bottle is extremely small and it is important to have the bottle moving along the proper line.

The plate 21, aside from assisting in the forward motion of the crates by acting during the forward or driving movement of bell-crank 69 upon the rear of the bottles just positioned in the crate, also acts upon the rear edge of any bottle which may catch upon the upper edge of the rear wall of a crate pocket to push such bottle slightly forwardly so that it will drop into the crate pocket.

By operating all of the moving elements of the machine by rotary cam devices, smooth and quiet operation is assured and the strain on the operating elements 67, 87 and 97 is minimized.

It will also be observed that bell-crank or lever element 69 entirely carries the fingers 17, plate 21 and pulling elements 19 and that all movement of elements 17, 19 and 21 relative to lever 69 are positively controlled. Because the vertically moving cam followers operating drum 11 and elements 17, 19 and 21 may be directly beneath the path of lever 69, the entire drive mechanism will occupy a minimum area horizontally of the machine.

The terminology used in the specification is for the purpose of description and not of limitation, the scope of the invention being defined in the claims.

I claim:

1. In a casing machine, article delivery means, article moving means to move articles in a path, a drive motor for said article moving means, a switch responsive to the presence of articles on said article delivery means, a switch responsive to the presence of articles in the path of the article moving means, a running control circuit for the drive motor including only the first-named of said two switches, and a starting circuit including both of said switches.

2. In combination, a support, a pair of conveyor elements movable relative to said support, one of said conveyor elements being adapted to receive articles from the other, means to drive at least one of said elements, means to control said driving means comprising a detector at the point of article transfer and movable relative to said support to driving means stopping position upon the exertion of pressure against said detector by an article, and manually releasable means to hold said detector in driving means stopping position.

3. In a casing machine including a stationary frame, article supporting means, receptacle supporting means, means to move articles from said article supporting means into a receptacle on said receptacle supporting means, a member pivoted on the machine frame, drive means to oscillate said member, receptacle engaging means pivotally carried by said member, and means directly connecting said receptacle engaging means to said driving means so that said receptacle engaging means will move relatively to said oscillating member to engage a receptacle.

4. In combination, an article conveyor, an article handling mechanism to which said conveyor delivers articles, a detector on one side of said conveyor mounted for movement outwardly from the conveyor by the lateral pressure of articles moving forwardly with said conveyor, a second detector on the other side of said conveyor and mounted for movement outwardly from the conveyor by lateral movement of the articles with respect to the conveyor, and means to drive the article handling mechanism operative when said

first detector is moved outwardly by articles and inoperative when said second detector is moved outwardly by articles.

5. In a casing machine, an article conveyor, a receptacle conveyor, article moving means to move articles from the article conveyor to receptacles on the receptacle conveyor, a drive motor for said last-named means, an article detector adjacent said article conveyor, a receptacle detector adjacent said receptacle conveyor, a jam detector at the point at which articles are engaged by said article moving means, a drive motor switch, a manual switch, a primary circuit including said manual switch and held closed by said jam detector, a secondary circuit normally held closed by said primary circuit and including said article and receptacle detectors and a drive motor switch controlling circuit normally held closed by said secondary circuit, whereby movement of said article and receptacle detectors to circuit opening position will open said drive motor controlling circuit without opening said primary circuit.

6. In a casing machine, an article conveyor, a receptacle conveyor, article moving means to move articles from said article conveyor to receptacles on said receptacle conveyor, an article detector adjacent said article conveyor, a receptacle detector adjacent said receptacle conveyor, a jam detector at the point at which said article moving means engages articles on said article conveyor, a drive motor for said article moving means, a circuit including said motor, a second circuit including said article and receptacle detectors to control said first-named circuit, and a third circuit including said jam detector to control said second circuit.

7. In a casing machine, an article conveyor, a receptacle conveyor, article moving means to move articles from the article conveyor to receptacles on said receptacle conveyor, an article detector responsive to the presence of articles on said article conveyor, a receptacle detector responsive to the presence of receptacles on said receptacle conveyor, a third detector responsive to the presence of articles at said article moving means, a drive motor for said article moving means, and a circuit controlling said drive motor having all three detectors arranged in series to prevent the motor from being started unless all detectors are in position to close said circuit, and means effective when said circuit is closed to hold it closed independently of said third detector.

8. In a casing machine, a base, an article sup-

port on said base, a receptacle support on said base below said article support, an article moving member movable with respect to said base and across said article support to move articles from the latter to drop into receptacles on said receptacle support, a bell crank pivoted on said base on a horizontal axis and including a substantially horizontal arm and a substantially vertical arm, driving means, means operatively connecting said driving means and the horizontal arm of the bell crank to oscillate the latter on its axis, means carried by the horizontal arm of said bell crank to move said article moving member, receptacle engaging means extending along and above said receptacle support and carried by the vertical arm of said bell crank to engage receptacles and advance them along said receptacle support, and means connecting said receptacle engaging means and said driving means to impart vertical lifting movement to said receptacle engaging means.

9. In a casing machine, a base, an article support on said base, a receptacle support on said base beneath said article support, means movable with respect to said base to move articles from said article support to drop into receptacles on said receptacle support, a lever pivoted on said base on a horizontal axis above said article support, fingers pivoted on said lever between said article support and said receptacle support to engage dropping articles to retard their dropping movement, a crank fixedly connected to said fingers, driving means for said lever, and a link connecting said crank and said driving means to swing said fingers vertically relative to said lever during their movement with the latter.

10. In a casing machine, a base, an article support on said base, a receptacle support on said base beneath said article support, an article moving member movable with respect to said base and across said article support to move articles from the latter to drop into a receptacle on said receptacle support, a lever pivoted on said base on a horizontal axis above said article support and engaging said article moving member to move the same, fingers pivoted on said lever between said article support and said receptacle support to engage dropping articles to retard their dropping movement, a crank fixedly connected to said fingers, driving means for said lever, and a link connecting said crank and said driving means to swing said fingers vertically relative to said lever during their movement with the latter.

ROBERT J. STEWART.