

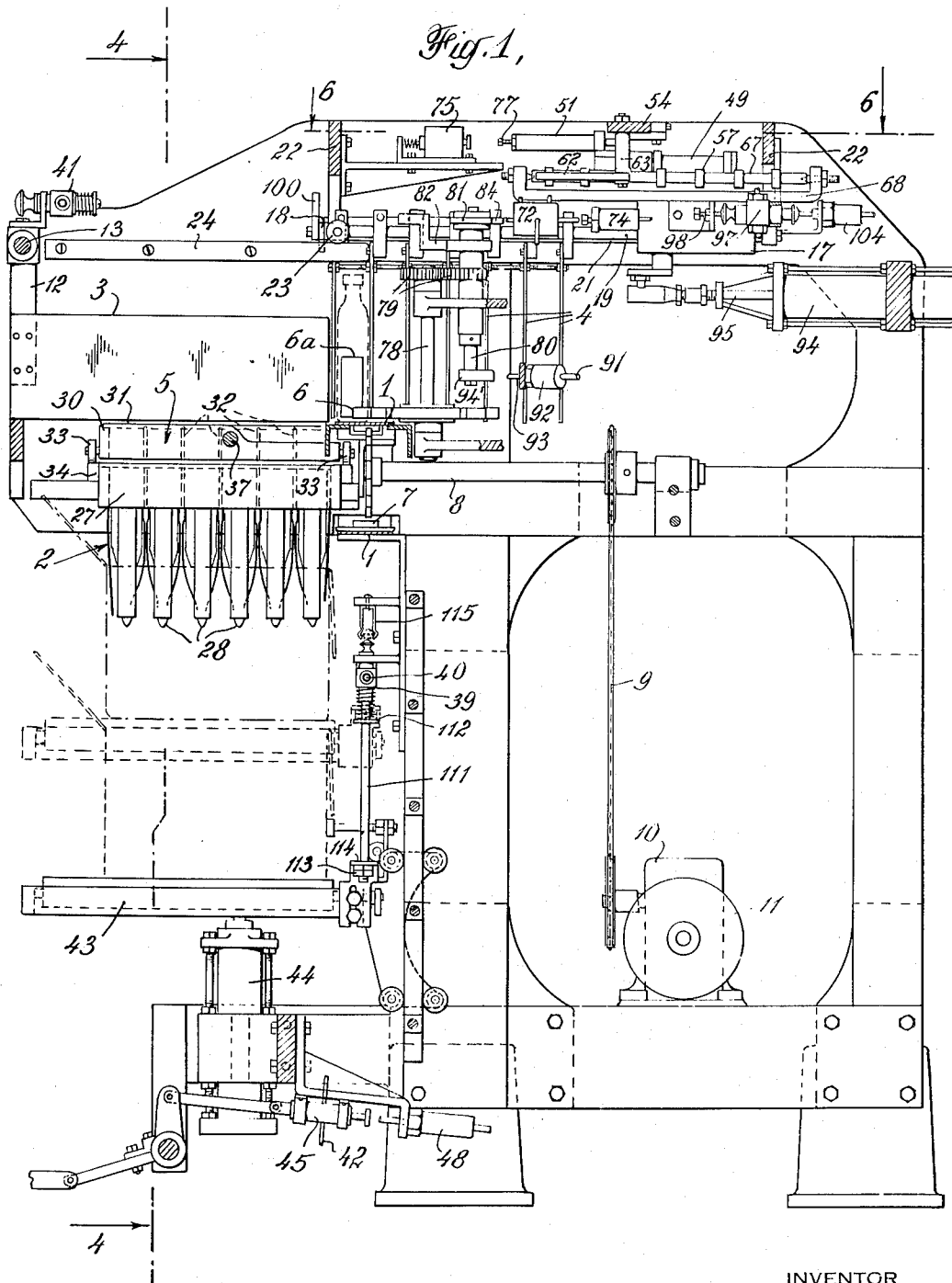
Dec. 20, 1955

E. ARDELL
BOTTLE PACKER

2,727,664

Filed June 8, 1950

7 Sheets-Sheet 1



INVENTOR
EDGAR ARDELL

BY

Pennie, Edmonds, Morton and Pierson
ATTORNEYS

Dec. 20, 1955

E. ARDELL
BOTTLE PACKER

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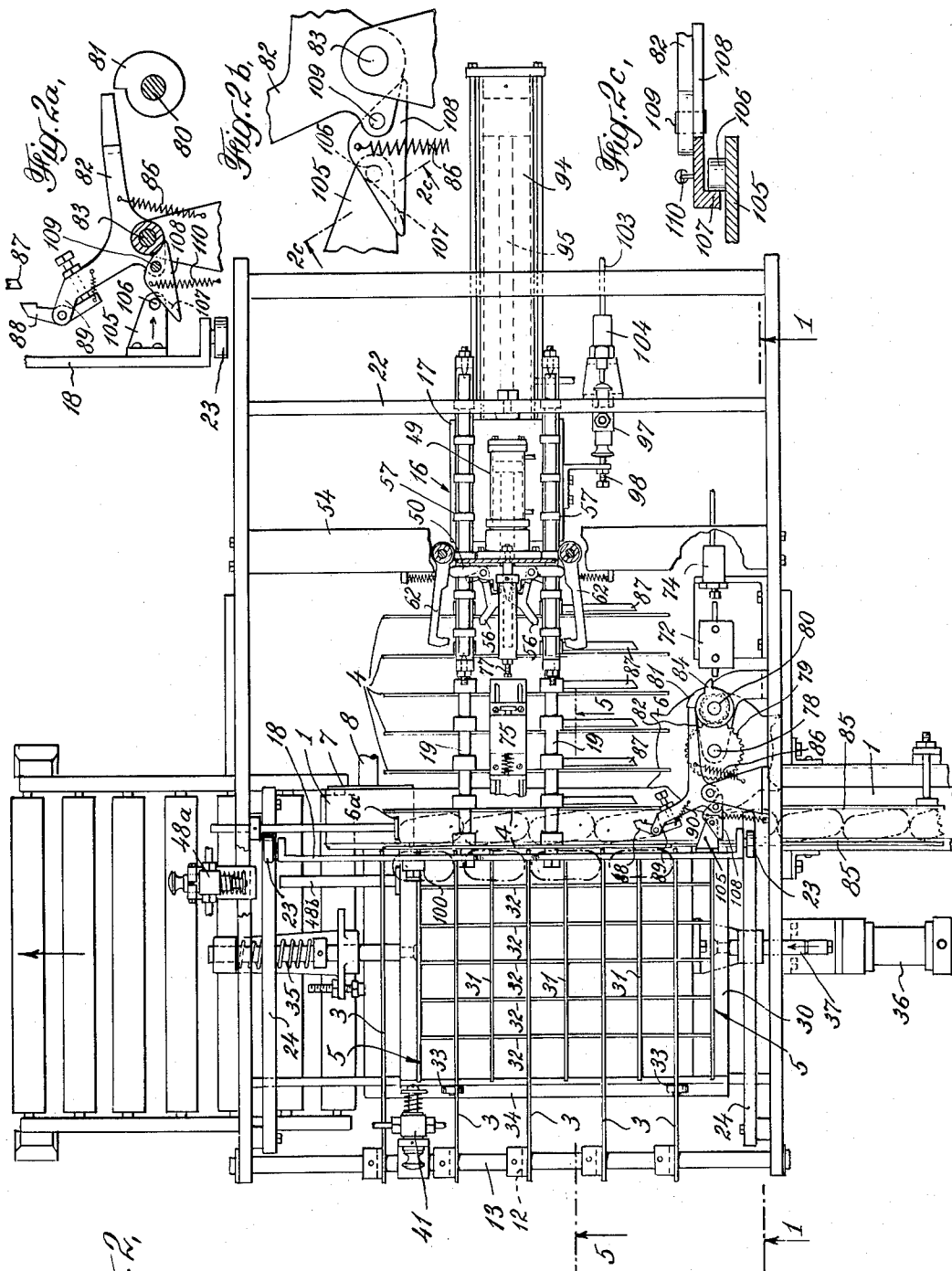


Fig. 2,

INVENTOR
EDGAR ARDELL

BY

Pemie, Edmonds, Morton and Barrows
ATTORNEYS

Dec. 20, 1955

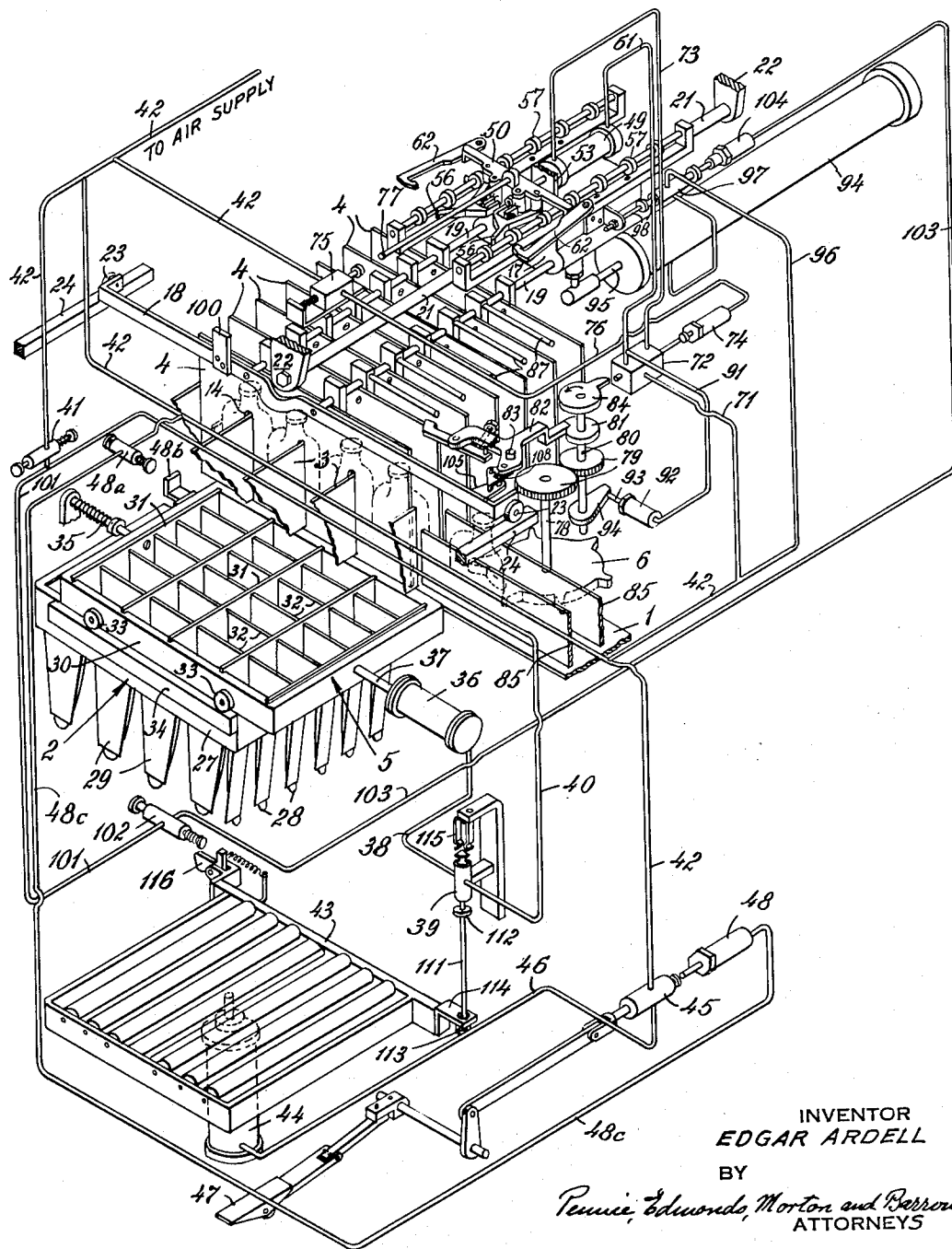
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Fig. 3,

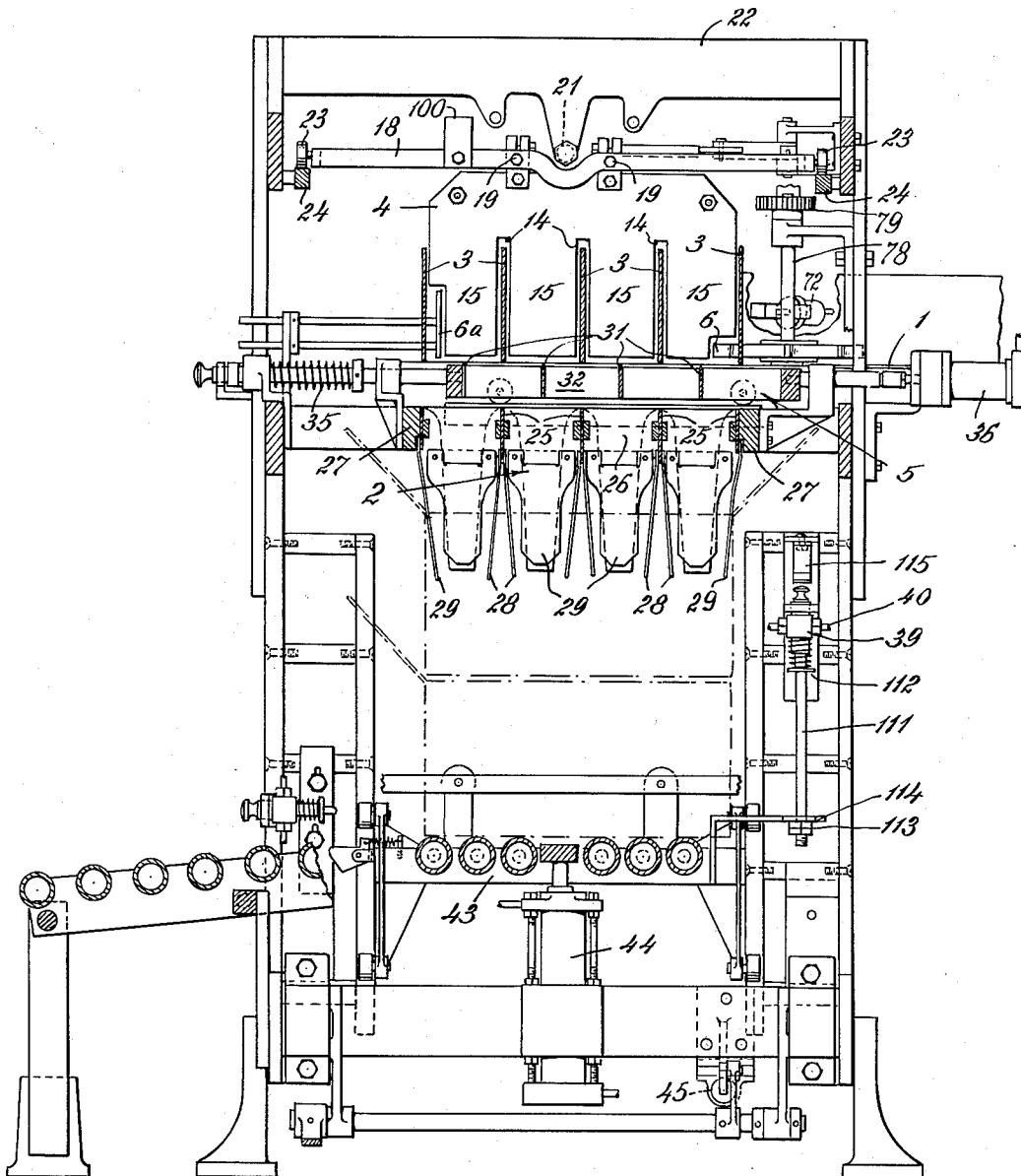


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Fig. 4,



BY

BY
Pence, Edmonds, Morton and Barrows
ATTORNEYS

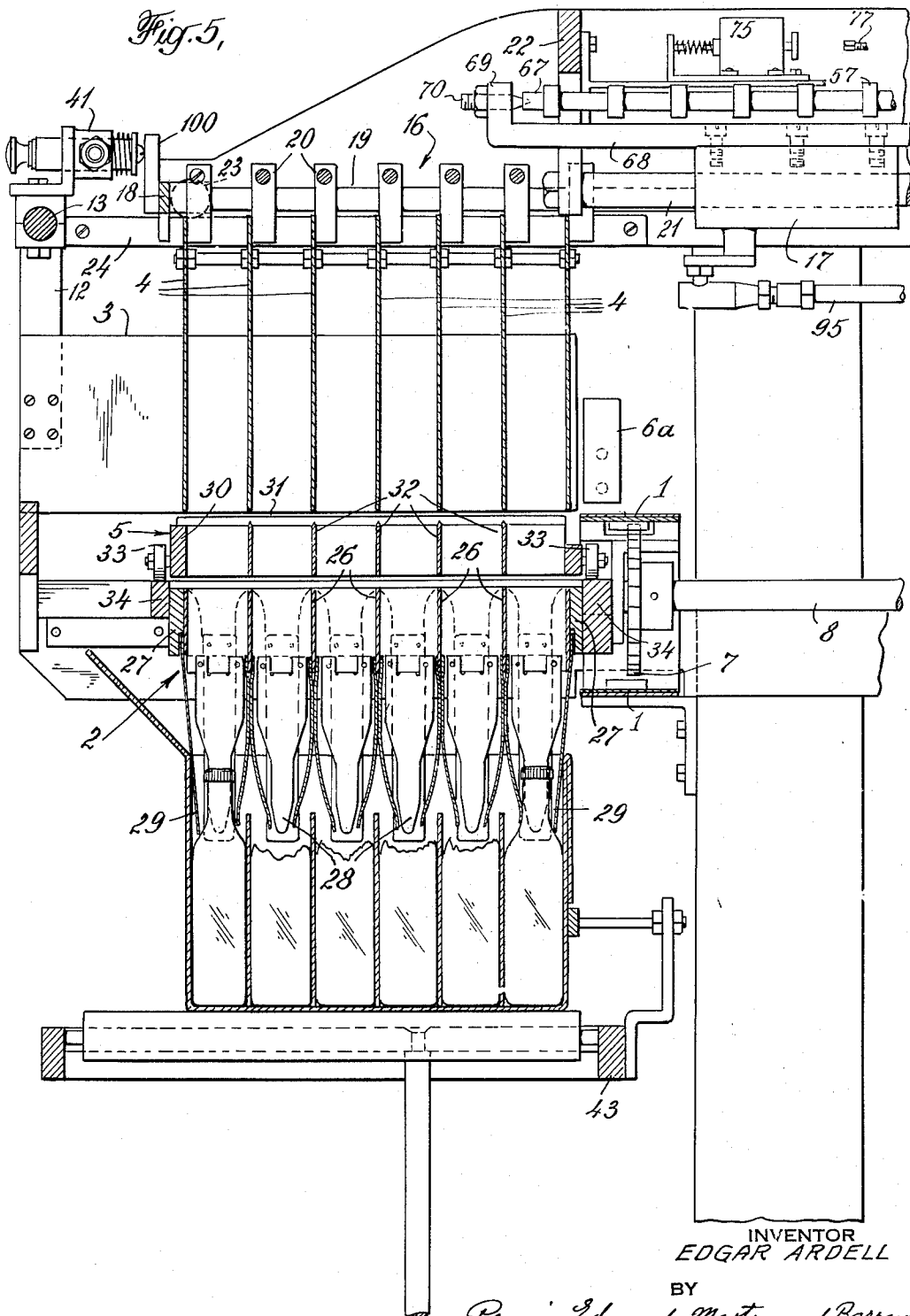
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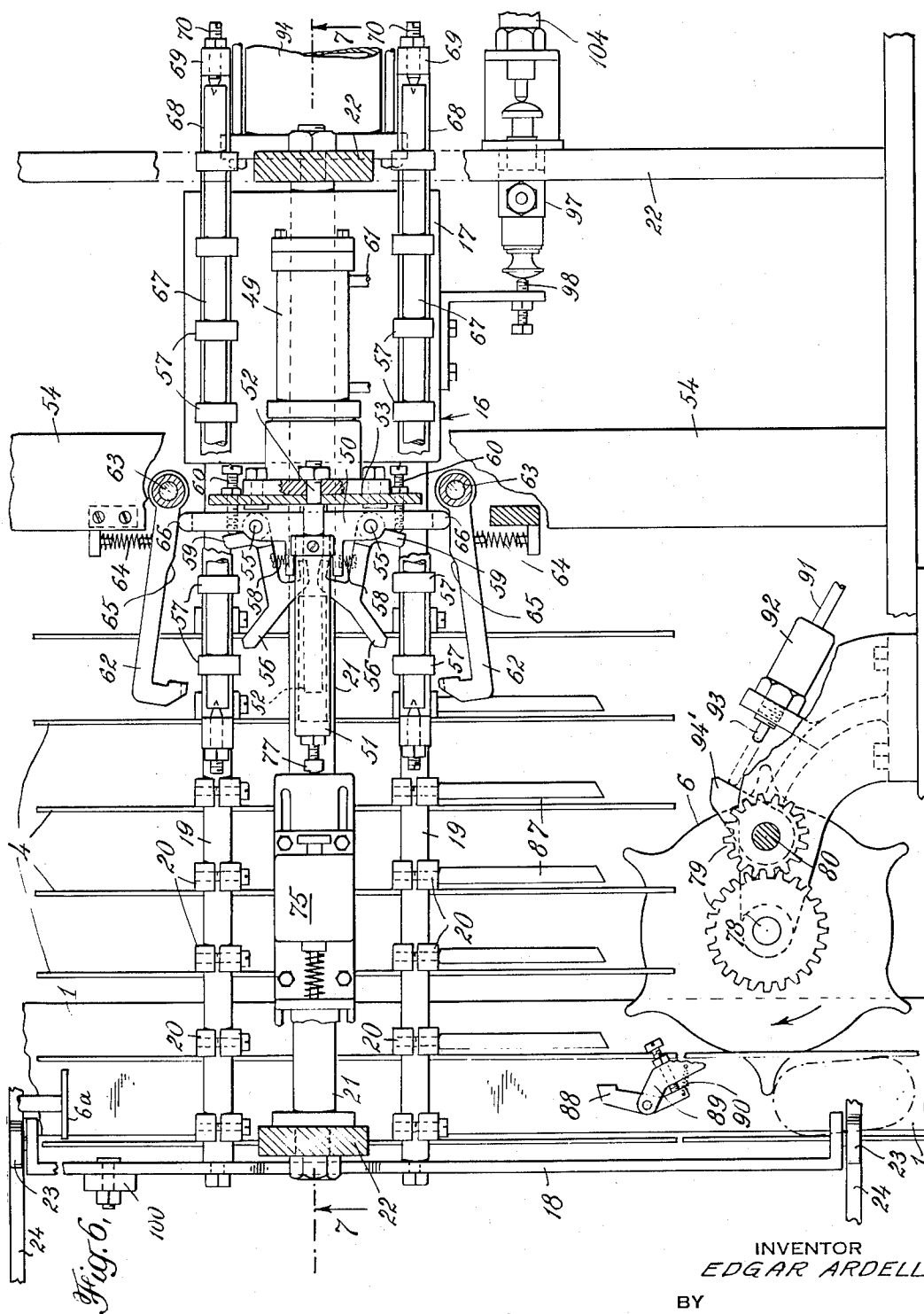
E. ARDELL

2,727,664

BOTTLE PACKER

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INVENTOR
EDGAR ARDELL

BY

Pennie, Edmonds, Morton and Barrows
ATTORNEYS

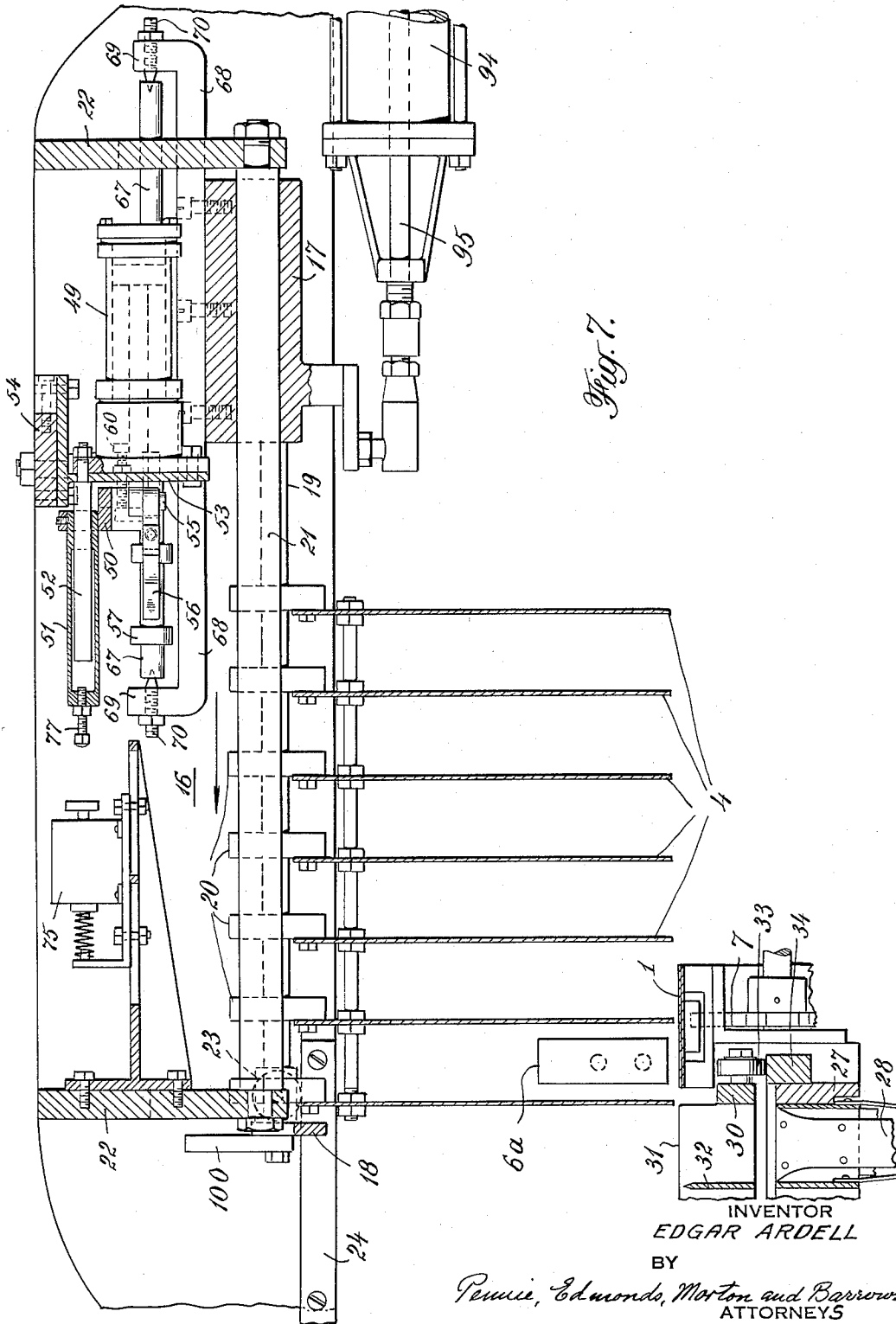
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E. ARDELL
BOTTLE PACKER

2,727,664

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2,727,664

BOTTLE PACKER

Edgar Ardell, Middletown, Conn., assignor to Emhart Manufacturing Company, a corporation of Delaware

Application June 8, 1950, Serial No. 166,919

15 Claims. (Cl. 226—14)

This invention relates to apparatus for packing articles in cases such as shipping cases and the like wherein the articles are arranged in rows lengthwise and crosswise of the case. More particularly, the invention relates to apparatus for loading or packing bottles in such cases, especially oval, oblong or flat bottles, as well as those which are round or square.

Apparatus has heretofore been devised and used with exceptional commercial success for the automatic packing of round or square articles, such as bottles, in cases, but difficulty has been experienced in the automatic packing of articles which are oval, oblong or flat, in horizontal cross-section as there is a tendency for such bottles to jam or stick in the guide-ways of such prior apparatus. Accordingly, the primary object of the present invention is to provide apparatus which will automatically pack or load into cases articles, such as bottles, of the oval, oblong or flat type.

It is often desirable to avoid the necessity of having two types of apparatus in the same plant, that is, one type for packing or loading round or square bottles, and a different type for packing bottles of the oval type. Therefore, another object of the invention is to provide an apparatus which is capable of automatically packing any of the common types of bottles, e. g., bottles of the oval type as well as bottles of the round or square type.

Another object of the invention is the provision of apparatus for packing oval, oblong or flat bottles wherein the load-forming mechanism operates without tendency for the bottles to jam or stick in the guide-ways or other parts thereof.

Bottles, on account of their being fragile, are customarily packed in cell cases wherein partitioning divides the interior of the case into a number of cells corresponding to the number of bottles. On account of the thickness of such partitioning, usually corrugated board, it is necessary to so arrange the bottles of the charge that they are separated from one another both lengthwise and crosswise of the case. Such separation in both directions presents something of a problem, particularly, with oval, oblong or flat bottles. It is therefore, another object of the invention to provide a bottle packing apparatus in which the separation of such bottles in both directions of the charge is accomplished in a simple manner and by means of mechanism which is capable of loading shipping cases at a rapid rate.

The invention will be understood by referring to the accompanying drawings illustrating one example of the invention which has been chosen for the purposes of the disclosure. In these drawings:

Fig. 1 is a view of the apparatus partly in side elevation and partly in vertical section taken on line 1—1 of Fig. 2;

Fig. 2 is a plan view of the apparatus with parts broken away;

Fig. 2a is a detail view showing certain parts of Fig. 2 in different positions, and drawn to an enlarged scale;

Fig. 2b is a fragmentary view of certain of the parts of

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Fig. 2a in still different positions and drawn to a slightly greater scale;

Fig. 2c is a detail transverse section taken on line 2c—2c of Fig. 2b;

Fig. 3 is a schematic projectional view to illustrate the operation of the apparatus and the fluid pressure lines and connections;

Fig. 4 is a view partly in front elevation and partly in vertical section taken on line 4—4 of Fig. 1 with certain parts omitted for clearness;

Fig. 5 is a vertical section taken on line 5—5 of Fig. 2 drawn to an enlarged scale;

Fig. 6 is a horizontal section taken on line 6—6 of Fig. 1 drawn to an enlarged scale, certain parts being removed and certain parts being broken away; and

Fig. 7 is a vertical section taken on line 7—7 of Fig. 6 and drawn to the same enlarged scale.

In general, the operation of the apparatus of the present invention is as follows. The bottles are fed into the apparatus from a single feed line or conveyor 1 (Figs. 2 and 3) and the charge is formed directly above a charge-directing device indicated generally by reference numeral 2. Immediately upon completion of its formation, the charge is dropped by gravity through the charge-directing device into the case below.

The charge forming mechanism comprises a plurality of equally spaced parallel guides 3 arranged in stationary position over the charge directing device or mechanism 2, and supported only at their left ends (Figs. 1 and 5). Cooperating with these spaced stationary guides, there is a movable series of uniformly spaced parallel guides or plates 4 at right angles to the stationary guides and constructed and arranged (as later described) to intermesh with the stationary guides by horizontal movement as a unit lengthwise of such guides to form with the stationary guides individual cells for the articles of the charge. The charge-directing mechanism 2 is a grid-like structure provided with pockets or chutes of the same shape and dimensions as the individual cells formed by the intermeshing stationary and movable groups of guides 3 and 4 and positioned vertically below these cells.

Suitable mechanism is provided to support the charge and control the time of its descent into the shipping case, e. g., a laterally shiftable auxiliary grid-like structure 5 which is arranged below the stationary guides 3 and above charge-directing mechanism 2. This auxiliary grid structure includes pockets of the same shape and dimensions as those of charge-directing mechanism 2 and is shiftable to alternately block free vertical passage of the bottles and to allow such passage, thereby, in one position, supporting the charge, and in the other position, causing it to drop into the case.

Conveyor 1 carries the bottles to be packed into the space between the pair of movable guides nearest to the left, and unsupported, ends of stationary guide members 3 (Figs. 2 and 3). Mechanism is provided to stop the flow of bottles on this conveyor, e. g., a star wheel mechanism 6, after a pre-determined number have entered. The group of bottles which have been allowed to pass the star wheel 6 is carried forward until the foremost bottle engages a stop member 6a (Figs. 1, 2 and 4). These four bottles are in contact with one another (Fig. 2), but the arrangement of the star wheel mechanism is such that the last or fourth bottle is spaced from the next succeeding or fifth bottle which is held back by the star wheel.

With the four bottles in this position (Figs. 2 and 3) the unitary series of movable guides 4 is advanced one step to bring the next pair of guides 4 over conveyor 1 (ready to receive a second group of 4 bottles), and advance the first group of four bottles between stationary guides 3. Although the four bottles are positioned by the stop 6a approximately in line with the respective spaces between

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the stationary guides 3, the four contacting bottles have to be separated from each other to allow adjacent bottles to advance on opposite sides of their adjacent stationary guides 3. Such separation is accomplished by pushing the four bottles sidewise to cause the respective pairs of adjacent bottles to engage the right-hand ends (Figs. 2 and 3) of the respective stationary guides 3, thus causing the bottles of each pair to wedge themselves onto the opposite sides of one of these guides. This pushing movement is produced by the movable guides 4 as they move leftward. At the end of the first step movement of the guides 4, the first four bottles occupy the four pockets formed by the interlacement of the five stationary guides 3 and the first two movable guides 4. While these four bottles are thus being pressed against the ends of stationary guides 3 they are kept in line, cross-wise, by the first two movable guides 4.

The step operation of movable guides 4 is repeated until rows of articles have been carried by the conveyor between each pair of the movable guides, completing the charge which in this instance consists of six rows of four bottles each, the bottles being supported on the shiftable auxiliary grid structure 5. Thereupon grid 5 is shifted to allow the charge to descend into the case, and the movable series of guides 4 is returned to its original position to start a new cycle for a succeeding charge.

Now, referring in detail to the apparatus as shown in the accompanying drawings, bottle conveyor 1 is an endless conveyor of any suitable construction which is trained over an idler pulley (not shown) at one side of the apparatus (Fig. 2) and over a driving pulley 7 fixed to a driving shaft 8 which rotates in suitable bearings mounted on the machine frame. Shaft 8 is driven by a chain 9 (Fig. 1) through a speed reducer 10 from an electric driving motor 11.

Shaft 8 is located beyond the left or rear side of movable guides 4 when viewed from the front of the apparatus which is at the left in Fig. 2. Hence the bottles are carried on the conveyor as they move into the spaces between the several guides 4. Consequently the bottles are not subjected to line pressure of one bottle against another as they are moved in, and jamming between the guides is impossible. It will be understood that the upper reach of conveyor 1 which supports the bottles is located just below the lower edges of guides 4.

The stationary guides 3 of the charge forming mechanism are heavy gauge metal plates mounted in upright or edgewise position, their height depending upon the height of the bottles to be packed. Each of these plates is supported on a single hanger 12 which is fixed to the outer end of the plate and clamped or otherwise secured to a stationary rod 13 extending across the front of the machine between the side frame members. These hangers support plates 3 in horizontal position with their lower edges just clearing the top of auxiliary grid 5 and with their rear or inner ends adjacent the side of conveyor 1 and also adjacent the first guide of the movable guides 4 (Fig. 1).

The movable series of guides 4 also consists of a number of edgewise mounted plates of heavy gauge metal, these plates, however, being slotted vertically at 14 (Fig. 4) in order to permit guides 4 to intermesh with stationary guides 3 as the movable guides advance step-by-step toward the left as shown in Figs. 1, 2, and 3. These slots sub-divide each of plates 4 into a series of bottle guiding sections 15 which extend downwardly between the stationary plates 3 and push the bottles ahead of them and also form the front and rear walls of the rectangular cells for the individual bottles. Each of these cells therefore has two stationary walls, portions of stationary guides 3, and two movable walls, sections 15 which are portions of the movable guides 4.

In order to provide for the movement of the series of guide plates 4 as a unit, they are mounted on a carriage which is indicated generally by reference numeral 16 (Fig.

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7). This carriage is a composite structure made up of a body 17 at its right end, a slender elongated cross member 18 at its left end and two spaced parallel horizontal rods 19 which interconnect body 17 and cross member 18. Rods 19 serve as supports for the movable guide plates 4 which are secured to these rods each by a pair of clamps 20.

For the purpose of supporting carriage 16 for horizontal movement, its body member 17 is arranged to slide on a stationary bar 21 which is secured at its opposite ends to downward extensions of two cross frame members 22 (Figs. 1 and 7). Cross member 18 at the front ends of rods 19 is provided at each end with rollers 23 which afford rolling support for the forward end of the carriage on rails 24 mounted on frame members of the apparatus.

Charge directing mechanism 2 which receives the charge of bottles from the charge forming intermeshing series of plates 3 and 4 comprises a reticulated structure having a series of equally spaced edgewise mounted metal strips 25 arranged vertically beneath each of the stationary bottle guide plates 3 (Fig. 4), there being five of these strips spaced cross-wise of the machine. At right angles to strips 25 and intersecting them are similar cross-strips 26 (Fig. 5), there being seven of these strips to correspond with the seven movable guide plates 4. Cross-strips 26 are on the same spacing as guide plates 4, and when carriage 16 is in its extreme outermost position as shown in Fig. 5, the movable plates 4 are positioned vertically above the cross-wise strips 26. Strips 25 and cross-strips 26 form a rigid grid structure which is surrounded by a rectangular supporting frame 27, and this frame is supported by means of cross frame members which are secured to the side frame plates of the apparatus.

In order to control the downward movement of the individual bottles as they drop into the case to be packed the individual bottle pockets formed by the intersecting strips 25 and 26 are provided with downwardly extending spring fingers 28 which are normally bowed inwardly toward one another at the lower ends as shown in Fig. 5 and which extend below the upper edges of the partitions within the case so as to guide the individual bottles into the individual cells of the packing case. Somewhat similar but stiffer spring fingers 29 are arranged around the periphery of rectangular frame 27 to engage the walls of the case.

The auxiliary or movable grid 5 is a cellular structure not unlike the main grid of charge-directing mechanism 2. It comprises a rectangular framework 30 having the same dimensions as frame 27 of the main grid, and criss-crossed between the members of frame 30 are longitudinal strips 31 and cross-wise strips 32. These two sets of strips subdivide the area within frame 30 into twenty-four rectangular pockets of the same dimensions as the pockets in the main grid formed by strips 25 and 26, and arranged in the same way, namely in four rows of six pockets each. Frame 30 is supported on two pairs of friction reducing rolls 33 on each side which operate on rails 34 mounted alongside of the cross members of main grid frame 27.

When movable grid 5 is in the position shown in Figs. 2, 3 and 4, to which position it is biased by means of a compression spring 35, the rectangular strips 31 are positioned about mid-way of stationary guide plates 3 so as to support the four rows of bottles as they are moved to the left in Figs. 2 and 3 by the movable guide plates 4 to form the charge. So that during this movement the bottoms of bottles will clear the cross-strips 32 of auxiliary grid 5, the upper edges of longitudinal strips 31 project somewhat above the cross-strips.

In order to shift auxiliary grid 5 to the left as viewed in Fig. 4 and bring its pockets into registry with the pockets of the main grid 2 and cause the bottles of the charge to descend into the case as shown in Fig. 4, a small fluid pressure operated cylinder 36 is arranged on the right side of the apparatus. The piston rod 37 of this cylinder pro-

jects through a guide collar on the frame and is attached to the right side of frame 30 of the auxiliary grid.

The supply of fluid pressure to cylinder 35 is through a line 38, a normally closed valve 39, line 40 and a second normally closed spring biased valve 41, to which is connected a line 42 for supplying a suitable fluid under pressure, e. g., air. It will be understood that when valve 39 is in its closed position, line 38 is connected to an exhaust port (not shown) so as to allow the piston of cylinder 36 to be moved to the right by spring 35.

The case to be packed is supported beneath the charge forming device 2 on an elevating table 43 which may conveniently be of the roller type to facilitate introduction and discharge of the cases. Table 43 is raised by the piston rod of an air cylinder 44, and the supply of air to this cylinder is from the supply line 42, an operating valve 45 and pipe 46. Valve 45 is open when in its right-hand position as shown in Figs. 1 and 3 and is moved to this position by rocking a foot treadle 47. Valve 45 is closed by means of a valve actuating cylinder 48 whose piston rod is biased to the right by an internal spring. Air is supplied to cylinder 48 from supply line 42 through normally closed spring biased valve 48a which is opened by a projection 48b on auxiliary grid frame 30.

The intermittent or step-by-step motion is imparted to carriage 16, to advance movable guide plates 4, by means of the mechanism shown more particularly in Figs. 6 and 7. This mechanism comprises an air cylinder 49 whose piston rod projects from its left end and is attached to an actuating frame 50. This frame is guided for sliding movement by means of a tubular member 51, the right end of which is contracted in diameter (Fig. 7) to make a sliding fit with a short stationary rod 52. Rod 52 is mounted in fixed position at its right end on a bracket 53 secured to the bottom of a cross frame member 54. Air cylinder 49 is also mounted on this bracket.

Actuator frame 50 carries pivoted to it at 55 a pair of actuator fingers 56, the left ends of which are constructed and arranged to engage successively a series of collars 57 which are a part of body 17 of carriage 16 as will be presently described. Collars 57 have the same spacing as bottle guide plates 4.

Fingers 57 are biased outwardly away from each other by means of two small compression springs 58. The inner hooked portions of fingers 56 shown in Fig. 6 engage parts on actuator frame 50 to limit the outward pivoting movement of the fingers under the action of these springs. Each finger 56 has a lateral projection 59 which engages the end of an adjustable retracting screw 60, these screws being mounted in stationary bracket 53.

The construction and arrangement of this mechanism is such that when air is supplied to the right end of cylinder 49 through a pipe 51, moving actuator frame 50 to the left, pusher fingers 56 swing outwardly about their pivots 55 as the lateral projections 59 move forward with respect to the ends of retracting screws 60 and the left ends of the fingers engage the right sides of the first pair of collars 57 and push carriage body 17 and carriage 16 forward to the left to advance bottle guide plates 4 one step.

The end of the stroke of the step movement is determined by means of a pair of latch members 62 which are pivoted on the frame of the machine at 63 and which move inward as actuator frame 50 moves to the left as is about to be explained, and engage the left surfaces of the second pair of collars 57. This swinging movement of latch members 62 takes place under the action of compression springs 64 and cam surfaces 64 on each latch in cooperation with two projections 66, one on each side of actuator frame 50. As this frame moves to the left, projections 66 slide along the lower surfaces of latch member 62 and, upon reaching cam surfaces 65, the latch members swing inward.

The two series of collars 57 are provided preferably as

integral portions of two horizontal rods 67. These rods are mounted each on an elongated member 68 having upturned end portions 69, each having a tapped aperture in which are positioned threaded members 70 having conical center points similar to lathe centers. The rods 67 are supported between these pairs of center points.

The reason for this construction is threefold. First, by turning up on the members 70 the rods 67 are clamped securely to bracket 68 and carriage 16. Second, it provides for longitudinal adjustment of the position of the two rods 67 and their collars. Third, it affords a way of replacing rods 67 with another set of rods having a different collar spacing whenever it is required to set up the machine with the movable plates 4 arranged on a wider or narrower spacing in order to suit a different size bottle.

The air supply to the pusher finger actuating cylinder 49 is from supply line 42 through a pipe 71 to a 4-way valve 72 and thence through pipes 61 and 73 to cylinder 49. The control of valve 72 to operate actuator frame 50 to the left so as to advance carriage 16 for the guide plates 4 a step to the left is by means of mechanism connected with star wheel 6 as is about to be described.

When such step movement has been completed, that is, the piston of cylinder 49 has reached the end of its stroke, valve 72 is shifted to the left, that is, in the opposite position, by means of a valve actuating cylinder 74 similar to cylinder 48. Air to cylinder 74 is supplied from supply line 42 through a spring biased normally closed valve 75, thence through pipe 76 to cylinder 74. Valve 75 is shifted to the left to its open position by means of an actuator 77 in the form of an adjustable screw mounted on the left end of tubular member 51. That is, when the piston of cylinder 49 moves actuator frame 50 and pusher fingers 56 to the end of their stroke, actuator 77 engages valve 75 and opens it. This, through valve 72, connects air supply to cylinder 49 and actuator frame 50 returns to its right-hand position.

The star wheel operated mechanism for actuating valve 72 to open position is shown more particularly in Figs. 1, 2 and 3. Star wheel 6 is mounted on a vertical shaft 78 which through gearing 79 turns a parallel vertical shaft 80 in the opposite direction. Fixed to shaft 80 is a latch cam 81 and cooperating with this cam is a latch member 82 pivoted at 83 to the frame of the machine. Also on shaft 80 is a cam 84 which operates valve 72.

The arrangement is such that shaft 80 turns through one revolution while four bottles are passing star wheel 6. It will be understood that star wheel 6 is turned by the line pressure of the bottles which are being moved forward on conveyor 1 between two vertical guides 85 which are substantially in line with the pair of plates 4 to which bottles are being delivered.

When the end of latch 82 engages the shoulder of latch cam 81 as shown in Figs. 2 and 3, star wheel 6 is held against rotation and this holds back the line of bottles on conveyor 1, the conveyor sliding under the bottoms of the bottles and carrying the four bottles which have passed the star wheel forward against stop 6a which is adjustably mounted as indicated in Fig. 2 and is so positioned as to stop the center of the group of four bottles opposite the end of the center stationary guide 3. Momentary outward swinging of latch 82 will permit the shoulder of latch cam 81 to pass to the left of the end of the latch to initiate the entrance of four bottles, whereupon latch 82 may be immediately returned into contact with cam 81 by its biasing spring 86 and will engage the shoulder of cam 81 as soon as the four bottles have passed the star wheel and again stop the line of bottles on the conveyor.

Such actuation of latch 82 is accomplished by means of a series of horizontal rods 87, one for each of the movable plates 4 except the first plate, for a reason which will appear later. These rods project from the right hand collars 20 by which plates 4 are secured to right hand supporting rod 19. The ends of these rods 87 engage a trigger 88 which is pivoted on the end of actuating

arm 89 of latch 82. Trigger 88 is biased by a spring 90 against an adjustable stop. As the rods 87 successively engage trigger 88 during their step-by-step leftwise movement, each rod actuates latch 82 to released position to start the entry of a row of bottles. When, however, plates 4 return to their right hand position, rods 87 merely swing trigger 88 freely about its pivot.

The configuration of valve actuating cam 84 is such that just before the end of a revolution of shaft 80, this cam moves valve 72 to the right to the position in which it is shown in Figs. 2 and 3. This admits air to the right end of cylinder 49 and starts the next step movement of carriage 16 and its movable guide plates 4. The force which turns star wheel 6 while cam 84 is moving valve 72 is provided, not by any of the bottles of the form which have passed the star wheel to form the row, but by the first bottle of the supply line which is on the opposite side of star wheel 6. The construction and arrangement of star wheel 6 is such as to permit the passage of the last of the four bottles and still arrest the movement of the fifth bottle and with this fifth bottle exerting a turning movement on the star wheel. This insures that the row of bottles is in place against stop member 6a before the step movement of plates 4 commences.

When a line of bottles has built up on the conveyor and is pressing against the foremost bottle which is in contact with the star wheel, this line pressure is added to the pressure of the foremost bottle and the operation of valve 72 by cam 84 is positive and quick. However, should there be a gap in the supply line, with only a single bottle tending to turn star wheel 6, or perhaps a few others adding their pressure to this bottle, the tendency for cam 84 to move valve 72 may be insufficient and hesitating, resulting in only a partial opening instead of a complete opening of the valve, the valve stem being still in contact with the steeply curved surface of the cam. Such partial opening of the valve may allow enough air to pass the valve to operate cylinder 74 as soon as carriage 16 has completed its stroke. This would tend to force the stem of valve 72 back toward the right and, due to the steepness of cam 84, actually turn the cam backwards somewhat and result in a teetering or fluttering operation of valve 72.

In order to overcome this tendency, the arrangement is such that the opening of valve 72 causes air to flow through a branch pipe 91 to a small cylinder 92 whose piston rod 93 is spring biased. Accordingly piston rod 93 moves outward from the normal full-line position shown in Fig. 6 to the dotted line position and engages an arm 94 on shaft 80, thereby assisting the bottle line pressure in turning cam 84 against the friction of valve 72 to complete the opening of this valve. A momentary operation of piston rod 93 is sufficient. This mechanism also overcomes any tendency of the shoulder of latch cam 81 to rebound from the end of latch 82.

It has been mentioned that star wheel shaft 78 operates cam shaft 80 through a gearing 79. In order to make the apparatus adjustable to the handling of different sizes and shapes of bottles, it is necessary to be able to replace the star wheel 6 as shown with star wheels of different configuration and having different numbers of teeth. It is also desirable that regardless of the type of star wheel used and the number of bottles admitted to form a row, that cam shaft 80 should always make a single revolution during the row formation. This double shaft construction affords an extremely convenient arrangement for changing star wheels and retaining the single revolution of shaft 80 feature, it being understood that the two gears 79 will usually be replaced by others of different sizes whenever the size of star wheel 6 is changed.

When carriage 16 and movable guide plates 4 have completed their step-by-step movement carrying a full charge of bottles onto the auxiliary grid 5 and over charge-directing device 2, and the charge has been dropped into the case on table 43, then the carriage and guide plates are

returned to their original right-hand position by means of a second cylinder 94. Piston rod 95 of this cylinder is appropriately connected with body 17 of carriage 16 as shown in Fig. 7.

The control of air to cylinder 94 from supply line 42 is through a pipe 96 and a 3-way valve 97. This valve is moved to the right when carriage 16 reaches its right hand position, the position shown in Figs. 1, 2 and 3, by means of an actuating screw 98 mounted on a bracket attached to body 17 of carriage 16. When the carriage is at the opposite end of its stroke, this actuating screw has moved away from valve 97, and the valve is actuated to open position by means of a valve actuating air cylinder 104.

Air is supplied to this cylinder from supply line 42 through valve 41 which is opened by a lug 100 projecting upwardly from cross member 18 of carriage 16 when the carriage reaches the left end of its movement. Thence the air connection is through pipe 101 to a valve 102 which interlocks this operation with lift table 43 so that table carriage 16 and plates 4 cannot return until the charge has descended into the case and case table 43 has lowered so as to open valve 102. Air passes through valve 102 and pipe 103 to valve actuating cylinder 104 which now moves valve 97 to its open position thus admitting air to cylinder 94 and returning carriage 16 and plates 4 to the right.

As soon as this return movement is completed it is necessary to admit the entrance of the first row of bottles by releasing latch 82 from latch cam 81 of the star wheel mechanism. This is accomplished by the final portion of the return motion of carriage 16. Near one end of cross member 18 of this carriage there is a small projecting bracket 105 (Figs. 2, 3, 2a, 2b and 2c). On the upper surface of this bracket is short pin 106 which engages a flange 107 depending from the forward sloping edge of a triangular member 108 which is pivoted at 109 to latch 82 near its hub. As pin 106 moves toward the right, it cams flange 107 downwardly, referring to Fig. 2a.

Triangular member 108 is prevented from swinging on its pivot in this direction by the engagement of its forward end with the hub of latch 82 and thus latch 82 is rotated about its pivot to released position and the star wheel 6 commences rotation to admit the first row of bottles. During the remainder of the right-hand movement of pin 106, it passes the end of flange 107 and reaches the position shown in Fig. 2b. Then on the first step advance of carriage 16 and guide plates 4 to the left for the next charge formation, pin 106 reengages the inner surface of flange 107, and triangular member 108 swings freely in the opposite direction tensioning its spring 110.

The operation of the apparatus through a complete cycle will now be traced. Assuming that a complete row, in this instance four bottles, has been admitted past star wheel 6 between the first row of movable plates 4, and that a step movement of carriage 16 and plates 4 to the left is about to start, various parts of the apparatus will be in the positions shown in Figs. 1-3, 6-7. For example, star wheel operated cam 84 has pushed the stem of valve 72 to the right or open position, and air is thus admitted from supply line 42 through pipe 61 to the right end of cylinder 49. Also air pressure has simultaneously been admitted through branch pipe 91 to cylinder 92 and its piston rod 93 has moved arm 94' to insure the complete opening of valve 72 by cam 84. It will be understood, however, that in the operation of the apparatus, the parts are only momentarily in these positions.

This admission of air to cylinder 49 causes its piston to move actuator frame 50 to the left causing pusher fingers 56 to engage collars 57 and produce a step movement of carriage 16 and movable guide plates 4. This moves the first row of bottles (Fig. 2) to the left against the right ends of stationary guide plates 3, which force the bottles to separate from one another on opposite sides of these respective plates. This shifting movement of the

bottles on conveyor 1 readily takes place since the bottles are free of the line pressure of any considerable number of bottles such as the line of bottles which normally is being advanced by conveyor 1 on the opposite side of star wheel 6, and also since the group or row of four bottles is centered on the guide plates 39b in Fig. 2; that is, the center of the row is opposite the center guide plate. Thus, the two bottles nearest the center need to move apart only the thickness of the plate, and the outer two bottles have to shift only about twice that much.

During such step movement of carriage 16 the foremost or left hand rod 87 on this carriage engages trigger 88 and operates latch 82 to release it from latch cam 81, the line pressure of the bottles against star wheel 6 instantly causing rotation of the star wheel and movement of the shoulder of latch cam 81 to the left of the end of latch 82. Depending upon the rapidity of operation the foremost bottle may momentarily engage the side of the second plate 4 which may hold back the line of bottles momentarily until the step-movement of the plates has been substantially completed.

At the end of this step movement actuating screw or rod 77 on actuator frame 50 opens valve 75 which admits air from supply line 42 through pipe 76 to cylinder 74 and thus causes the movement of valve 72 in the opposite direction. Air pressure is now admitted through pipe 73 to the left end of cylinder 49, and actuator frame 50 returns to its right hand position ready to commence another step movement which is initiated as soon as the four bottles for the second row have left the star wheel and the fifth bottle has rotated star wheel 6 again to the position shown so as to reopen valve 72.

The cycle just described repeats until all six of the spaces between plates 4 have been filled with bottles and the sixth step operation of carriage 16 by air cylinder 49 has taken place. At this time the entire charge is within the cells formed by the intermeshing plates 3 and 4 and these cells are in registry with the pockets of the charge forming device 2.

During this last step operation of carriage 16, lug 100 engages and opens valve 41 admitting air pressure to branch pipes 40 and 101. Pipe 40 leads to valve 39, and under normal operation the operator of the machine will have placed an empty case on table 43 and will have operated treadle 47 so as to open valve 45 and raise the table to bring the case into receiving position beneath the charge-forming device 2. Under normal operation the operator will have done this by the time lug 100 opens valve 41 so that air pressure will immediately pass through valve 39 and operate cylinder 36 which shifts auxiliary grid 5 to the left, allowing the charge to drop into the case. If the operator has not yet raised the case to receiving position, the charge will be held by the auxiliary grid until this has taken place.

To operate valve 39, its stem is provided with an elongated rod 111 having a collar 112 near the top and a similar device 113 near the bottom. A projection 114 on table 43 has an aperture which receives rod 111 loosely therein. Consequently when table 43 reaches the top of its stroke, collar 112 and rod 111 are lifted, opening the valve and causing it to be held in open position by means of a spring clamp 115.

This arrangement insures a complete operation or shifting of auxiliary grid 5 by air cylinder 36 to cause the dropping of the charge of bottles into the case. Occasionally the operator reverses foot treadle 47 after the table has risen and opened valve 39, in order to lower the table and re-adjust an incorrectly positioned case. If valve 39 could be opened and then immediately closed, a shifting of auxiliary grid 5 would take place which would allow the bottles to drop followed by immediate return shift of the grid which would clamp the bottles in the grid before they have dropped through it.

Such a jam is difficult to clear, whereas by holding valve 39 in open position by clip 115, once it is open, the aux-

iliary grid is positively shifted to drop the bottles and the charge goes down regardless of whether the case is in the proper position to receive it. Such a situation is much easier to clear up, as it is usually merely a question of packing part of the case by hand.

When auxiliary grid 5 reaches its shifted left hand position, a lug 48b on the left side of the grid frame actuates air valve 48a which admits air through pipe 48c to valve actuating cylinder 48. This returns valve 45 to its left or closed position and lift table 43 descends. At the bottom of its descent, projection 114 engages collar 113 and returns valve 39 to closed position.

During the downward movement of table 43, a pivoted cam member 116 mounted on the table moves the stem of air valve 102 to the left, opening the valve. This admits air through pipe 103 to valve actuating cylinder 104 so as to open 3-way valve 97 and cause cylinder 94 to return carriage 16 and movable plates 4 from their position over auxiliary grid 5 and charge-directing mechanism 2 to their right hand position as shown, e. g., in Fig. 3. During the upward movement of table 43 cam member 115, striking the lower side of the stem of valve 102 is swung downward about its pivot and flips by the end of the valve stem, under the action of a biasing spring.

The opening of valve 102 is momentarily only and the piston of cylinder 104 is immediately retracted by an internal spring as shown as valve 102 closes. The stem of valve 97 is returned to its normally closed position by actuating screw 98 on carriage body 17 as soon as the carriage reaches its right hand position. It will be understood that in its closed position valve 97 connects the left end of cylinder 94 to the atmosphere through an exhaust port so as not to interfere with the step-by-step movement of carriage 16 and guide plates 4 during the next charge forming operation.

As carriage 16 arrives at its right hand position, the mechanism shown in Figs. 2a, 2b and 2c previously described actuates the star wheel latch 82 to unlock the star wheel and let in the first row of bottles of the succeeding charge, thus commencing another operating cycle of the apparatus.

The present invention has been disclosed in considerable detail in connection with a single embodiment in a bottle packing apparatus. It will be understood that changes in the construction, arrangement and operation of the apparatus may be made without departing from the spirit of the invention, the scope of which is set forth in the appended claims.

I claim:

1. In apparatus for packing articles in cases, a charge-forming mechanism comprising stationary and movable groups of article guides, the guides of each group being mounted in fixed equally spaced relation to each other with the guides of one group disposed at right angles to the guides of the other group, the guides of both groups being positioned to operate at the same level on the sides of the articles, said groups of guides being constructed and arranged to intermesh with one another to form four-walled individual compartments for the articles of the charge, means for feeding articles between guides of said movable group, and means for moving said group into intermeshing relation with said stationary group thereby to form the charge.

2. In apparatus for packing articles in cases, a charge-forming mechanism comprising stationary and movable groups of vertical plates, the plates of each group being mounted in fixed equally spaced relation to each other with the plates of one group disposed at right angles to the plates of the other group, the plates of both groups being positioned to operate at the same level on the sides of the articles, said groups being constructed and arranged to intermesh with one another to form four-walled individual compartments for the articles of the charge, means for feeding articles between plates of said movable group, and means for moving said group into inter-

meshing relation with said stationary group thereby to form the charge.

3. In apparatus for packing articles in cases, a charge-forming mechanism comprising stationary and movable groups of vertical plates, the plates of each group being mounted in fixed equally spaced relation to each other with the plates of one group disposed at right angles to the plates of the other group, the plates of both groups being positioned to operate at the same level on the sides of the articles, the plates of said movable group being vertically slotted to intermesh with the plates of the stationary group to form four-walled individual compartments for the articles of the charge, means for feeding articles between plates of said movable group, and means for moving said group into intermeshing relation with said stationary group thereby to form the charge.

4. In apparatus for packing articles in cases, a charge-directing device, a support therebeneath for an empty case, a charge-forming mechanism comprising stationary and movable groups of article guides, the guides of each group being mounted in fixed equally spaced relation to each other with the guides of one group disposed at right angles to the guides of the other group and in substantially coextensive guiding relation to the articles, said groups being constructed and arranged to intermesh with one another to form four-walled individual compartments for the articles of the charge, means for feeding articles between guides of said movable group, means for moving said group into intermeshing relation with said stationary group to form the charge, and means associated with said charge-directing device for releasing the charge to drop into said case.

5. In apparatus for packing articles in cases, a charge-directing device, a support therebeneath for an empty case, a charge-forming mechanism comprising stationary and movable groups of vertical plates, the plates of each group being mounted in fixed equally spaced relation to each other with the plates of one group disposed at right angles to the plates of the other group, the plates of both groups being positioned to operate at the same level on the sides of the articles, the plates of said movable group being vertically slotted to intermesh with the plates of said stationary group to form four-walled individual compartments for the articles of the charge, means for feeding articles between plates of said movable group, a step-by-step actuator for moving said movable group from non-intermeshing position with said stationary group to intermeshing relation therewith, said actuator advancing said group a distance equal to the plate spacing at each step, means for feeding a row of articles between a pair of said movable plates prior to each step movement of said actuator, and means associated with said charge-directing device for releasing the charge into said case.

6. In apparatus for packing rounded articles in ship-pings cases, a charge-directing device, an elevating table for raising an empty case into receiving position with respect to said device, a charge-forming mechanism comprising a series of equally spaced parallel stationary guides to form a plurality of rows of articles, said guides being disposed above said charge-directing device, a movable unitary series of uniformly spaced parallel guides for forming rows of articles at right angles to said stationary guides, both of said series of guides being positioned to operate at the same level on the sides of the articles said movable guides being constructed and arranged to intermesh with said stationary guides by horizontal movement lengthwise of said stationary guides, means for feeding a line of rounded articles between the pair of said movable guides which is nearest the ends of said stationary guides, intermittently operating mechanism for separating a group containing a predetermined number of articles from said line and positioning them with the center of said group opposite the center guide of said stationary guides, means operating alternately with said intermittently operating mechanism for moving said pair

of said movable guides from non-intermeshing position with said stationary guides to intermeshing position thereby forming the charge, and means associated with said charge-directing device for releasing the charge to drop into said case.

7. In apparatus for packing articles in cases, a charge forming mechanism comprising a series of equally spaced parallel stationary guides to form a plurality of rows of articles, a movable unitary series of uniformly spaced parallel guides for forming a plurality of rows of articles at right angles to said stationary guides, both of said series of guides being positioned to operate at the same level on the sides of the articles, said movable guides being disposed at an outer position opposite the ends of said stationary guides and being constructed and arranged to intermesh with said stationary guides by horizontal movement from said outer position, means for feeding articles between said movable guides at said outer position thereof, and means for moving said unitary series of guides from said outer position into intermeshing position with said stationary guides to form said articles into a charge with the individual articles thereof disposed each in its own cell formed by the walls of said intermeshing guides.

8. In apparatus for packing articles in cases, a charge forming mechanism comprising a series of equally spaced parallel stationary guides to form a plurality of rows of articles, a movable unitary series of uniformly spaced parallel guides for forming a plurality of rows of articles at right angles to said stationary guides, both of said series of guides being positioned to operate at the same level on the sides of the articles, said movable guides being disposed at an outer position opposite the ends of said stationary guides and being constructed and arranged to intermesh with said stationary guides by horizontal movement from said outer position, means for feeding articles between said movable guides at said outer position thereof, means for moving said unitary series of guides from said outer position into intermeshing position with said stationary guides to form said articles into a charge with the individual articles thereof disposed each in its own cell formed by the walls of said intermeshing guides, a charge-directing device arranged beneath said stationary series of guides, means for supporting a case beneath said charge-directing device, and means associated with said charge-directing device for releasing said charge to drop into the case.

9. In apparatus for packing articles in cases, a charge forming mechanism comprising a series of equally spaced parallel stationary guides to form a plurality of rows of articles, a movable unitary series of uniformly spaced parallel guides for forming a plurality of rows of articles at right angles to said stationary guides, both of said series of guides being positioned to operate at the same level on the sides of the articles, said movable guides being disposed at an outer position opposite the ends of said stationary guides and being constructed and arranged to intermesh with said stationary guides by horizontal movement from said outer position, means for intermittently feeding articles between the pair of said movable unitary guides which are adjacent the ends of said stationary guides at said outer position, a step-by-step actuator for said movable unitary series of guides for advancing said guides a distance equal to the guide spacing at each step, and means for operating said actuator following each operation of said intermittent article feeding means to move said unitary series of guides from said outer position into intermeshing relation with said stationary guides to form said articles into a charge with the individual articles thereof disposed each in its own cell formed by the walls of said intermeshing guides.

10. In apparatus for packing articles in cases, a charge forming mechanism comprising a series of equally spaced parallel stationary guides to form a plurality of rows of articles, a movable unitary series of uniformly spaced

parallel guides for forming a plurality of rows of articles at right angles to said stationary guides, both of said series of guides being positioned to operate at the same level on the sides of the articles, said movable guides being disposed at an outer position opposite the ends of said stationary guides and being constructed and arranged to intermesh with said stationary guides by horizontal movement from said outer position, means for intermittently feeding articles between the pair of said movable unitary guides which are adjacent the ends of said stationary guides at said outer position, a step-by-step actuator for said movable unitary series of guides for advancing said guides a distance equal to the guide spacing at each step, means for operating said actuator following each operation of said intermittent article feeding means to move said unitary series of guides from said outer position into intermeshing relation with said stationary guides to form said articles into a charge with the individual articles thereof disposed each in its own cell formed by the walls of said intermeshing guides, means for stopping said actuator upon the complete intermeshing of said movable and stationary guides, and means for returning said movable unitary series of guides to said outer position.

11. In apparatus for packing articles in cases, a charge forming mechanism comprising a series of equally spaced parallel stationary guides to form a plurality of rows of articles, a movable unitary series of uniformly spaced parallel guides for forming a plurality of rows of articles at right angles to said stationary guides, both of said series of guides being positioned to operate at the same level on the sides of the articles, said movable guides being disposed at an outer position opposite the ends of said stationary guides and being constructed and arranged to intermesh with said stationary guides by horizontal movement from said outer position, means for intermittently feeding articles between the pair of said movable unitary guides which are adjacent the ends of said stationary guides at said outer position, a step-by-step actuator for said movable unitary series of guides for advancing said guides a distance equal to the guide spacing at each step, means for operating said actuator following each operation of said intermittent article feeding means to move said unitary series of guides from said outer position into intermeshing relation with said stationary guides to form said articles into a charge with the individual articles thereof disposed each in its own cell formed by the walls of said intermeshing guides, means for stopping the said actuator upon the complete intermeshing of said movable and stationary guides, a charge-directing device arranged beneath said stationary guides, means for supporting a case beneath said charge-directing device, means associated with said device for releasing said charge to drop into the case, and means for returning said movable unitary series of guides to said outer position.

12. A packing apparatus as set forth in claim 11 in which a table is arranged to lift the empty case into receiving position beneath the charge-directing device, and wherein the means for returning the movable unitary series of guides is actuated by said table during its descent after the case upon it has received the charge.

13. A packing apparatus as set forth in claim 12 in which the means for releasing the charge into the case is actuated by the rise of the case lifting table.

14. Apparatus for packing articles in shipping cases as claimed in claim 9 in which the means for intermittently feeding the articles between the movable guides comprises a continuously operating endless conveyer, a star wheel mechanism associated therewith, said star wheel mechanism being actuated by the line pressure of the articles on said conveyer for admitting a group of articles between said guides, said star wheel mechanism including two shafts operatively connected with one another, one of said shafts mounting the star wheel and the other shaft having the control mechanism associated therewith, said star wheel being replaceable with another having a different number of teeth, the arrangement being such that said second shaft makes one revolution to admit the article group regardless of the number of teeth on the star wheel.

15. Apparatus for packing articles in cases as claimed in claim 9 in which the means for intermittently feeding the articles between the unitary guides comprises a continuously operating endless conveyer, a star wheel mechanism associated with said conveyer, said star wheel mechanism being actuated by the line pressure of the articles on the feed conveyer, said star wheel mechanism including a cam operatively connected with said star wheel having a stopping shoulder thereon, a latch to engage said shoulder to stop the rotation of the star wheel after a predetermined number of articles have been passed by the star wheel, a second cam operatively connected with said star wheel and with said stopping cam, control means for said step-by-step actuator operating means, said control means being operated by said second cam, and means actuated by said control means for rotating said second cam in the direction to actuate said control means and to move said stopping cam shoulder against said latch.

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