Oct. 1, 1963 R. C. BOUCHER 3,105,525

MACHINE AND METHOD FOR FILLING CONTAINERS

Filed March 30, 1960 7 Sheets-Sheet 1

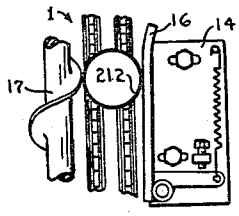


Fig.-3

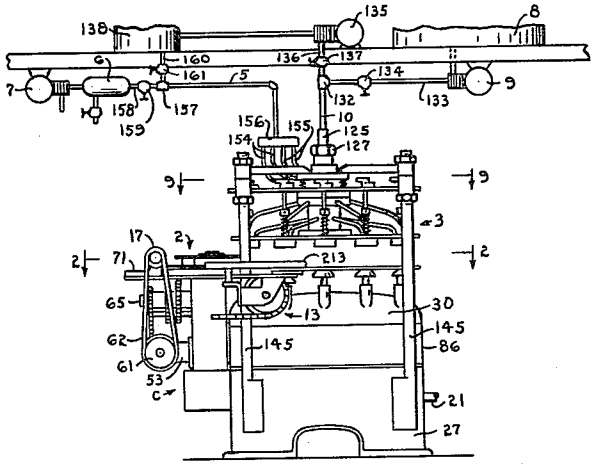


Fig.-1

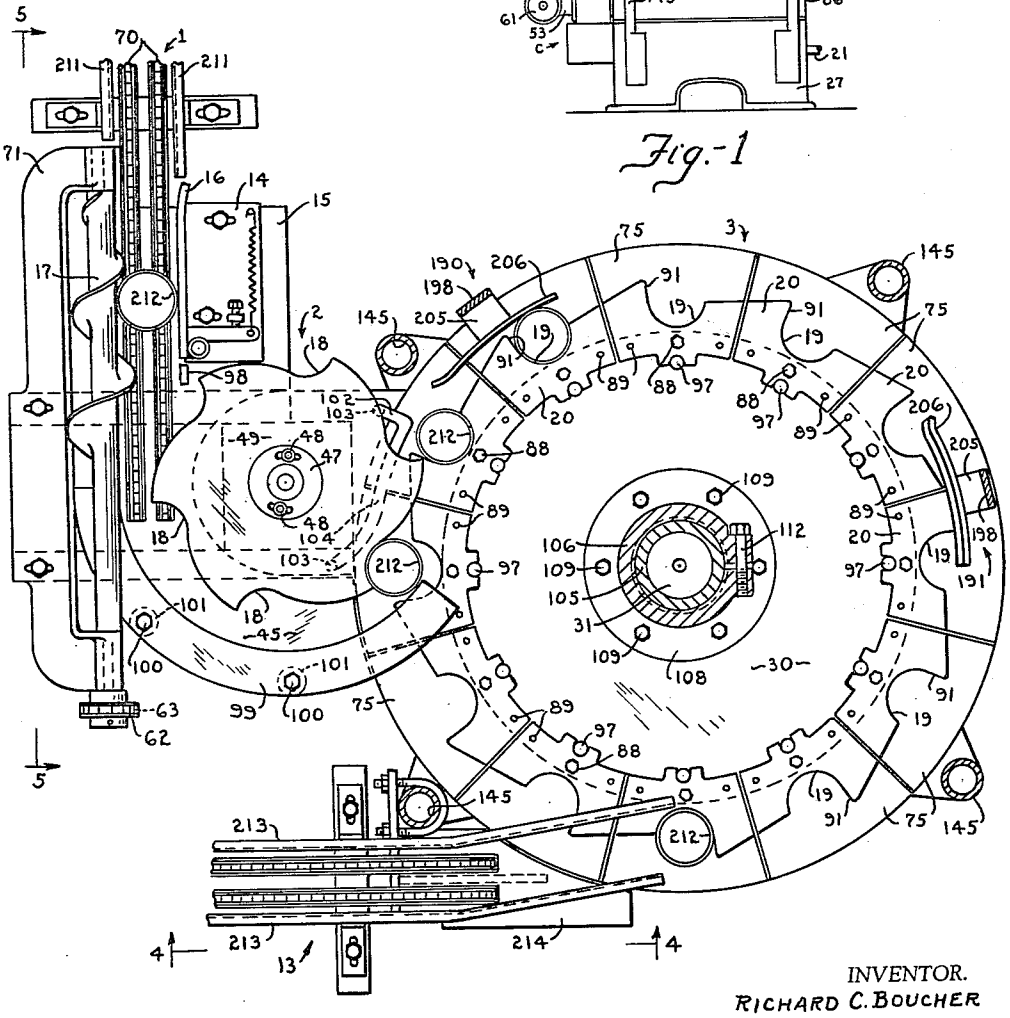


Fig.-2

INVENTOR.
RICHARD C. BOUCHER

BY
Charles S. Penfold
ATTORNEY

Oct. 1, 1963 R. C. BOUCHER 3,105,525

MACHINE AND METHOD FOR FILLING CONTAINERS

Filed March 30, 1960 7 Sheets-Sheet 2

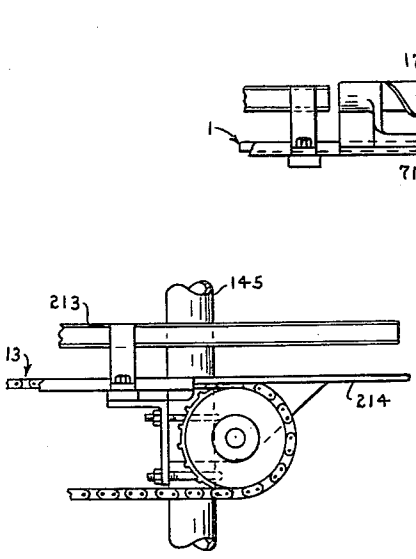


Fig.-4

Fig.-5

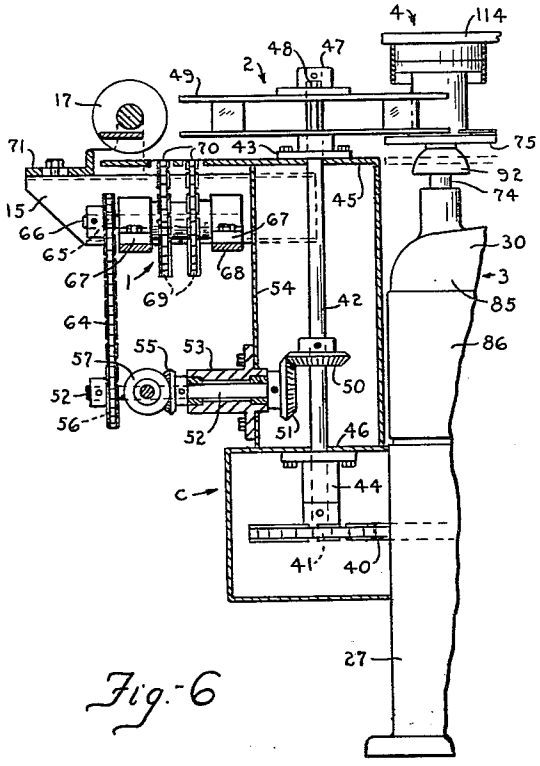


Fig.-6

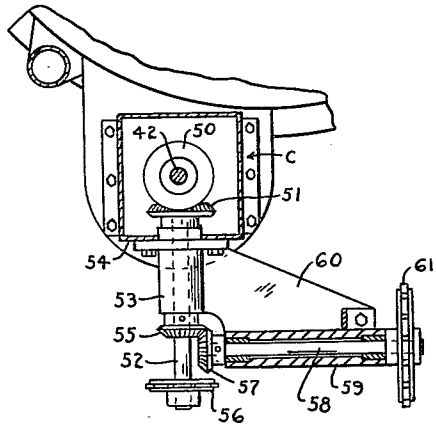


Fig.-7

INVENTOR.
RICHARD C. BOUCHER

BY
Charles L. Penfold
ATTORNEY

Oct. 1, 1963 R. C. BOUCHER 3,105,525

MACHINE AND METHOD FOR FILLING CONTAINERS

Filed March 30, 1960 7 Sheets-Sheet 3

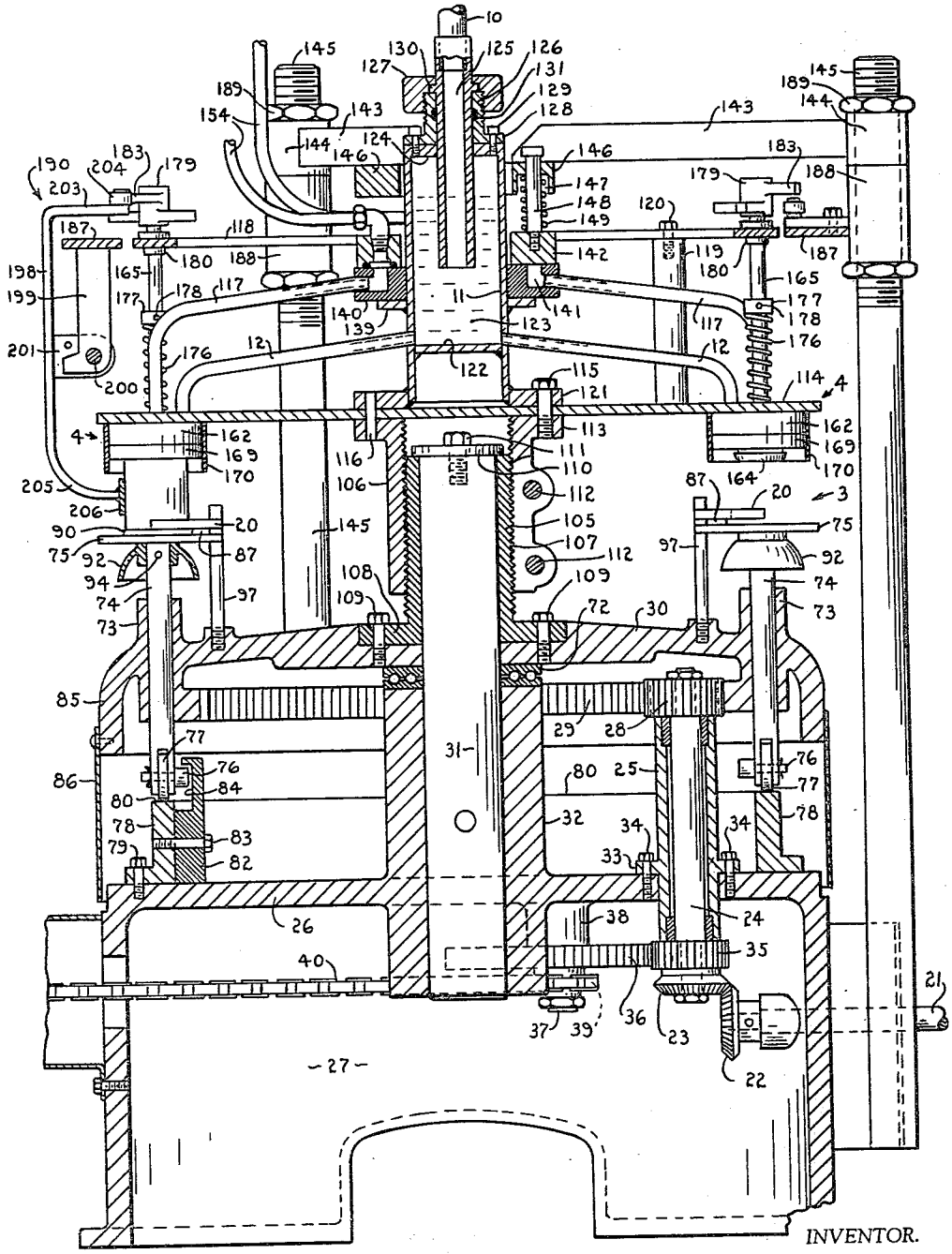


Fig. 8

INVENTOR.
RICHARD C. BOUCHER

BY
Charles A. Penfold
ATTORNEY

Oct. 1, 1963 R. C. BOUCHER 3,105,525

MACHINE AND METHOD FOR FILLING CONTAINERS

Filed March 30, 1960 7 Sheets-Sheet 4

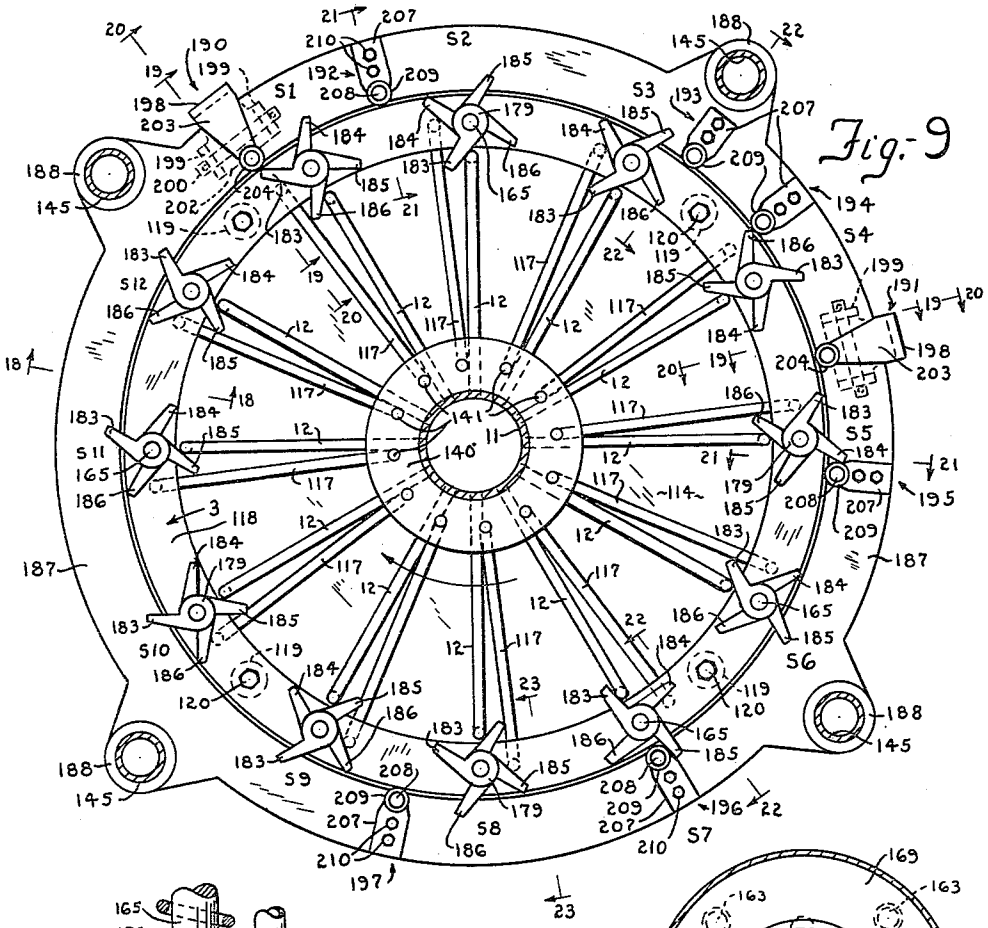


Fig. 9

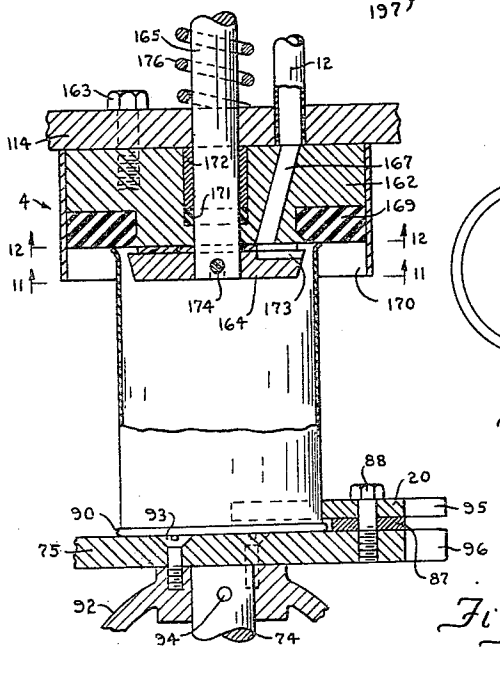


Fig. 10

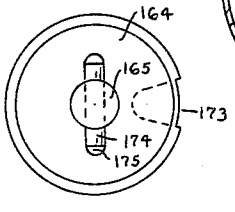


Fig. 11

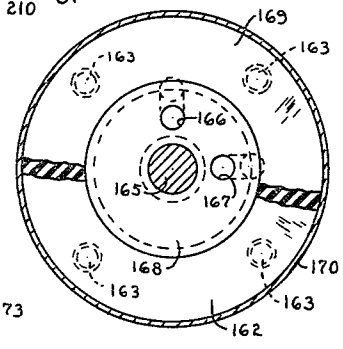


Fig. 12

INVENTOR.
RICHARD C. BOUCHER

BY Charles L. Penfold
ATTORNEY

Oct. 1, 1963 R. C. BOUCHER 3,105,525

MACHINE AND METHOD FOR FILLING CONTAINERS

Filed March 30, 1960 7 Sheets-Sheet 5

Fig.-14

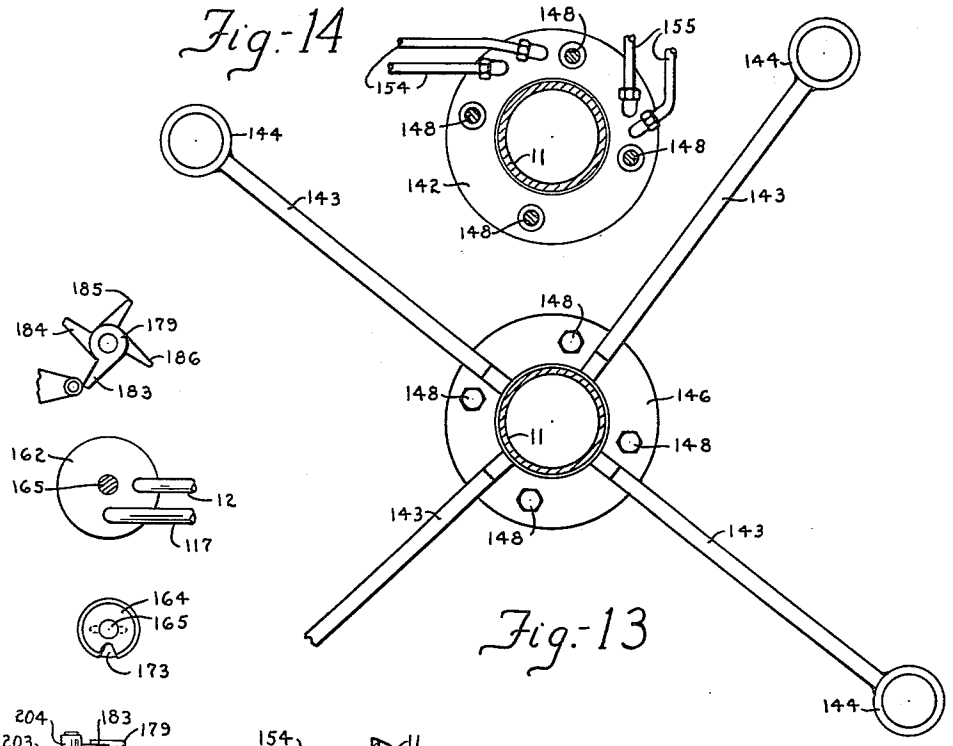


Fig.-13

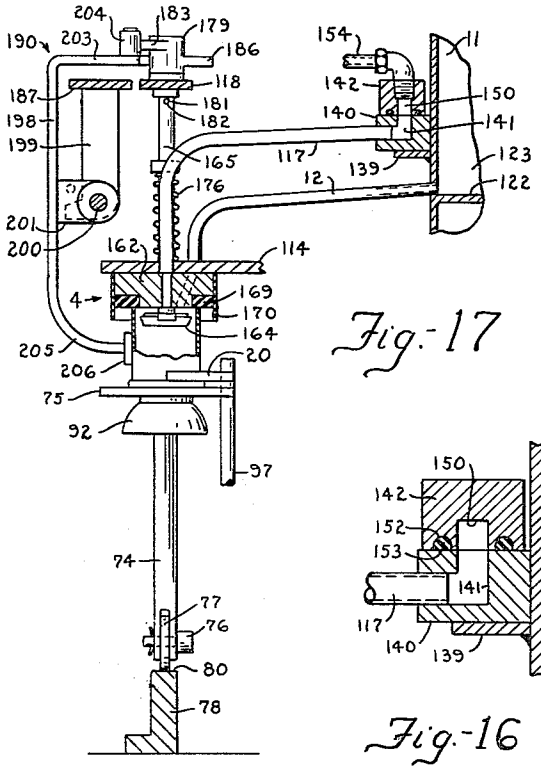


Fig.-17

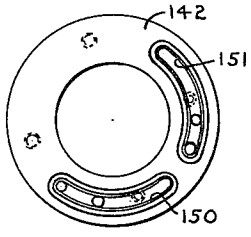


Fig.-15

Fig.-16

INVENTOR.
RICHARD C. BOUCHER

BY
Charles S. Penfold
ATTORNEY

MACHINE AND METHOD FOR FILLING CONTAINERS

Filed March 30, 1960 7 Sheets-Sheet 6

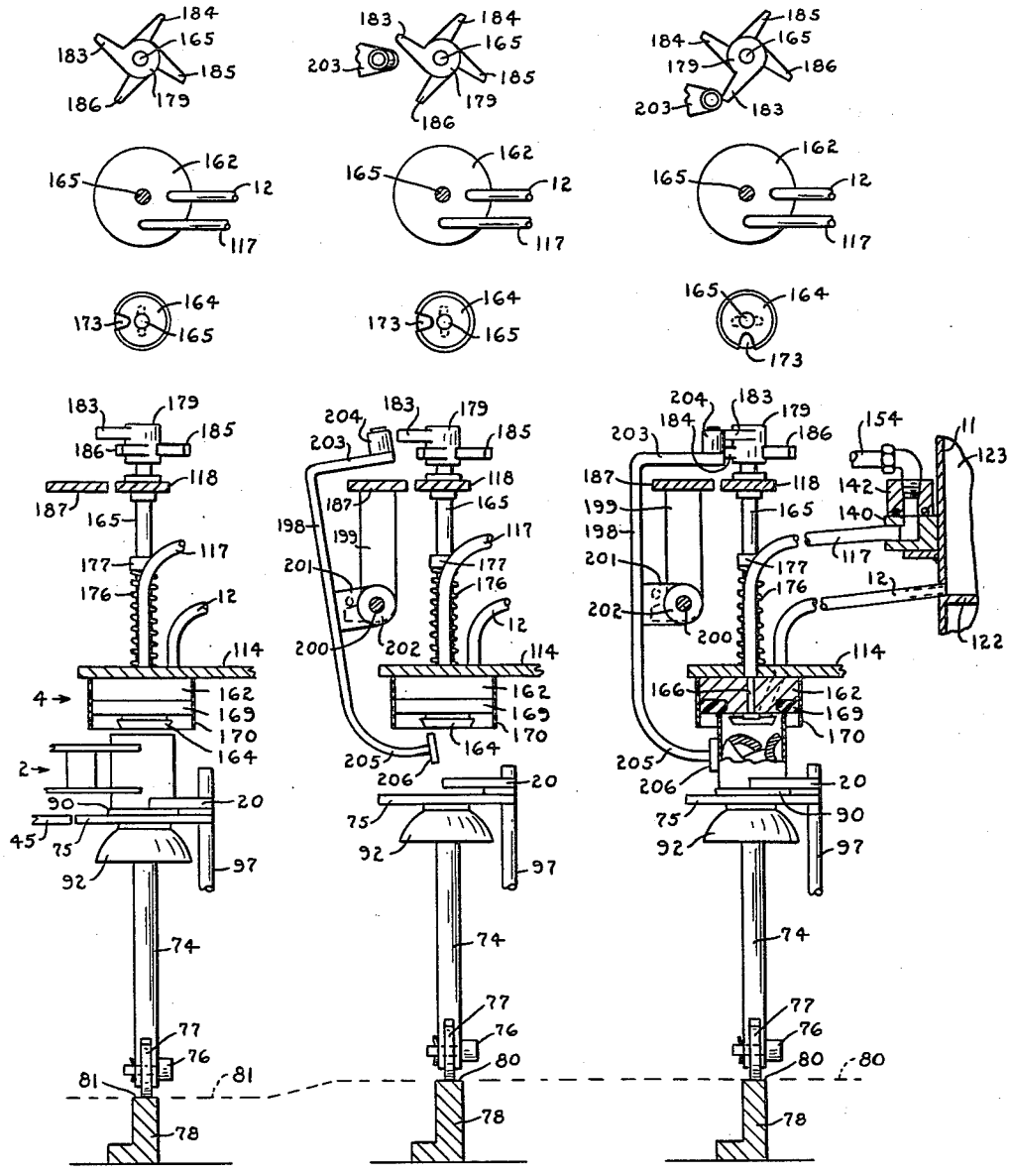


Fig. 18 Fig. 19 Fig. 20

INVENTOR.
RICHARD C. BOUCHER
BY
Charles S. Penfield
ATTORNEY

Oct. 1, 1963 R. C. BOUCHER 3,105,525

MACHINE AND METHOD FOR FILLING CONTAINERS

Filed March 30, 1960 7 Sheets-Sheet 7

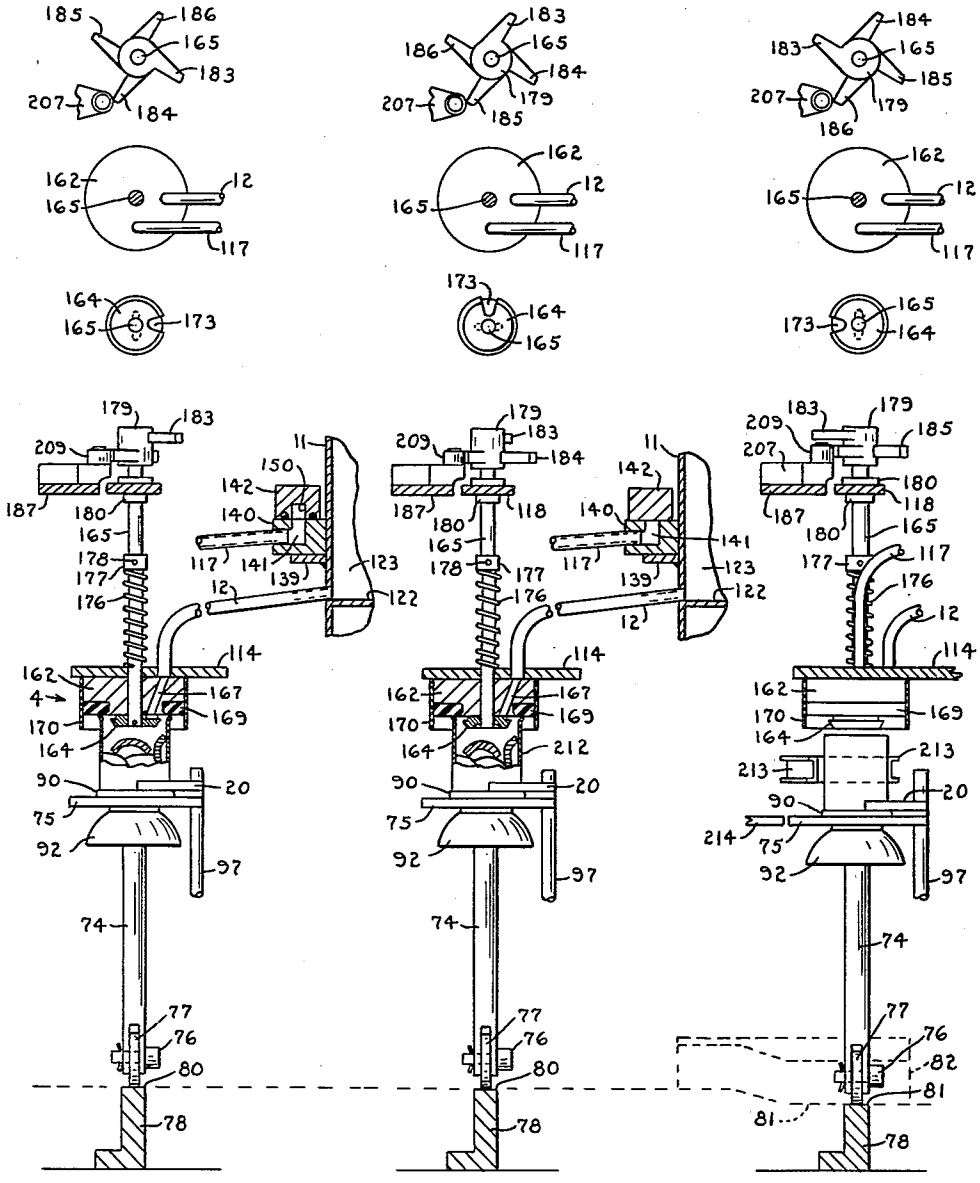


Fig.-21 Fig.-22 Fig.-23

INVENTOR.
RICHARD C. BOUCHER

BY Charles L. Penfold

ATTORNEY

United States Patent Office 3,105,525 Patented Oct. 1, 1963

3,105,525

MACHINE AND METHOD FOR FILLING CONTAINERS

Richard C. Boucher, 427 Parkview, Bryan, Ohio

Filed Mar. 30, 1960, Ser. No. 18,737
7 Claims. (Cl. 141—61)

The subject invention relates generally to an apparatus or system for filling containers with a liquid and more particularly is directed to a machine for and a method of filling empty cans or cans partially filled with fruit or vegetables with a liquid, such as a syrup or juice, to a predetermined level.

It is recognized that various conventional machines for filling containers are in use. Some of these machines include intricate valve structure for pre-measuring at a remote location the quantity of liquid to be dispensed to each container while others are of a complicated character and require exacting adjustment and costly maintenance. There are also machines which are comprised of many components or parts which have to be disassembled and reassembled in order to permit proper cleaning of various conduits and valves to comply with health codes, all of which requires considerable time, effort and expense. Moreover, some of the conventional machines are extremely cumbersome and need expensive electronic controls for their operation.

With the foregoing in mind, one of the principal objects of the invention is to provide a machine which overcomes the undesirable features of construction inherent in the conventional machines above referred to, including other machines, and offers many advantages thereover with respect to cost of manufacture and assembly, efficiency in operation and durability.

More particularly, a significant object of the invention is to provide a machine in which a can is temporarily sealed so that any air therein can be readily withdrawn or evacuated, after which a liquid, such as syrup, can be fed to the can to a predetermined level with reference to the upper rim of the can.

An important object of the invention is to provide, among other things, a unique valve mechanism, assembly or structure, which is adapted for disposition in each can to take up a predetermined amount of space therein while the air is being evacuated and the liquid is introduced. The valve mechanism, when withdrawn from the can, leaves a head space so as to facilitate attachment of a cover to the can.

A specific object of the invention is to provide a valve mechanism of the character above referred to, including controls therefor which assist in accurately regulating the amount of syrup or juice to be fed to each can in order to prevent wasteful overflow, splash and unsanitary conditions resulting therefrom.

A particular object of the invention is to provide a machine in which a single source of power is primarily utilized to synchronically drive or operate various components of the machine.

A very important object of the invention is to provide a machine or system in which the valve mechanisms, reservoirs, tanks, or manifolds, and feed and vacuum lines can be readily cleansed without the necessity of completely disassembling and reassembling such components and reestablishing certain timing cycles.

Also, an object of the invention is to provide a method whereby air is evacuated from a container and then filled with a liquid in a unique manner.

Another object of the invention is to provide a novel setup whereby the machine can be readily adjusted to accommodate containers or cans of various sizes.

A significant object of the invention is to provide a machine with suitable adjustments in order that the various operating mechanisms can be readily synchronized and so that the cans are continuously in motion from the time they enter the machine to their discharge.

A further object of the invention is to provide a rotatable carriage having seats thereon for individually supporting the cans and means whereby if a can is not placed on a seat the valve mechanism for normally controlling the flow of liquid to the can will be rendered inoperative to prevent release of the liquid.

A further object of the invention is to provide a novel arrangement whereby a vacuum established in each can assists in pulling liquid into the can at the moment the latter is connected to the supply of liquid through the agency of the valve mechanism.

Other attributes of the invention reside in providing a machine or system which offers advantages with respect to manufacture and assembly, efficiency and durability.

Many other objects and advantages of the invention will appear after the description hereinafter set forth is considered in conjunction with the drawings annexed hereto.

In the drawings:

FIGURE 1 is an elevational view of the apparatus or system on a reduced scale;

FIGURE 2 is an enlarged horizontal section taken substantially on line 2—2 of FIGURE 1, illustrating the manner of conveying cans to and from the machine;

FIGURE 3 is a partial horizontal view of a part of an infeed conveyor for moving cans to the machine to be filled;

FIGURE 4 is an elevational view looking in the direction of the arrows 4—4 in FIGURE 2 showing a part of a conveyor for removing the cans from the machine after they have been filled;

FIGURE 5 is an elevational view looking in the direction of the arrows 5—5 in FIGURE 2, exemplifying additional structure of the infeed conveyor shown in FIGURE 3;

FIGURE 6 is a vertical sectional view taken substantially on line 6—6 of FIGURE 5 showing further details of the infeed conveyor and associated structure;

FIGURE 7 is a horizontal section taken substantially on line 7—7 of FIGURE 5 and depicts certain features of the machine shown in FIGURES 5 and 6, including related structure;

FIGURE 8 is an enlarged partial vertical section taken through the machine to illustrate, among other things, the structure or means employed to elevate the cans for cooperation with unique valve mechanisms operatively connected with liquid supply and vacuum lines or conduits;

FIGURE 9 is a horizontal section taken substantially on line 9—9 of FIGURE 1 and depicts certain framework, arrangement of the liquid supply and vacuum lines, and means utilized to operate the valve mechanisms;

FIGURE 10 is an enlarged partial elevational view of the machine illustrating the operative relation of a can with a valve mechanism;

FIGURE 11 is a view looking upwardly from line 11—11 of FIGURE 10, showing certain details of the valve mechanism;

FIGURE 12 is a horizontal section taken substantially on line 12—12 of FIGURE 10 depicting other details of the valve mechanism;

FIGURE 13 is an enlarged view of an assembly used in connection with the vacuum lines;

FIGURE 14 is a partial horizontal view of a part of the vacuum system;

FIGURE 15 is a horizontal view showing other parts of the vacuum system;

FIGURE 16 is an enlarged partial vertical sectional view of structure showing one of the conduit connections used with the vacuum system;

FIGURE 17 is a diagrammatic elevational view exemplifying the operative relationship between a can elevating means, valve mechanism, cam means for operating the valve mechanism, and liquid supply and vacuum lines;

FIGURE 18 is a diagrammatic vertical sectional view similar to FIGURE 17 and taken substantially on line 18—18 of FIGURE 9 to show a can being conveyed in a horizontal direction;

FIGURE 19 is a view similar to FIGURE 18 taken substantially on line 19—19 of FIGURE 9 with a can removed to render a valve mechanism inoperative to prevent the flow of air or liquid therethrough;

FIGURE 20 is a vertical sectional view similar to FIGURE 19, taken substantially on line 20—20 of FIGURE 9, showing a can elevated and cooperating with a valve mechanism, the valve of such mechanism having been rotated one quarter turn or ninety degrees to a position to communicatively connect the interior of a can with a vacuum line to withdraw any air from the container;

FIGURE 21 is a view similar to FIGURE 20 showing the valve rotated another ninety degrees to a position in which the vacuum line is closed and a liquid is fed to the can;

FIGURE 22 is a view depicting the valve rotated another ninety degrees to prevent connection of the vacuum and liquid lines with the interior of the can; and

FIGURE 23 is a view similar to FIGURE 22 with the valve rotated a further ninety degrees to return it to its original position, with the supply and vacuum lines still closed as also evidenced in FIGURES 18 and 19, and the can lowered for delivery to a take-off conveyor.

Referring first and generally to FIGURES 1, 2 and 8 of the drawing, numeral 1 generally designates a conveyor for transporting cans to a rotary conveyor 2, which transfers the cans to a rotatable carriage or turret 3 where each can is elevated for cooperation with an overhead valve mechanism 4 which is operable to control the withdrawal of any air in the can out through a line 5 to a vacuum liquid separator tank 6 by a pump 7, after which a liquid or syrup in a reservoir 8 is forced by a pump 9 through a main line 10 to a manifold 11 on the carriage and from the manifold to the can through a line 12 until the can is properly filled and later removed from the machine by a chain conveyor 13 to a capping apparatus (not shown) which operates in conjunction with the subject machine.

Referring more particularly to the above organization or system, the conveyor 1 is of the chain type and serves to direct the cans longitudinally and generally tangentially to the rotary conveyor 2 which is preferably in the form of a star wheel. A member 14 is slidably adjustable on a support 15 at one side of the conveyor 1 and carries a pivotally mounted spring pressed gate or lever 16 for urging each can against a horizontal screw 17 which extends parallel to the opposite side of the conveyor for spacing and feeding the cans to circumferentially spaced recesses 18 provided in the rotary conveyor 2 for transfer in an arcuate path onto rests and into circumferentially spaced notches 19 provided in holders 20 constituting components of the carriage. The relative speeds of the conveyors 1, 2 and 13, screw 17 and carriage are synchronized or timed through the agency of suitable driving mechanism which will now be described.

The driving mechanism may be designed and constructed in various ways, but as exemplified in FIGURES 2 and 5 through 8, preferably comprises a plurality of shafts operatively connected by means of various gears, sprockets and chains. More particularly in this regard, there is provided a primary or main horizontal drive shaft 21 which is preferably operatively connected with a driving means of a capping apparatus associated with the discharge conveyor 13, but if desired, may be operated by any suitable power means, such as an electric motor. As shown in FIGURE 8 this shaft is provided with a bevel gear 22 which meshes with a bevel gear 23 keyed to the lower end of a vertical driven shaft 24 journalled in a tubular bearing 25 carried by a top wall 26 of a base or housing 27 of the machine or apparatus. A spur gear 28 is secured to the upper end of the vertical shaft 24 and meshes with a large ring gear or rack 29 formed integrally within a head 30 of the carriage for rotating the carriage on a solid center post 31 fixed in a socket or tubular part 32 formed integrally with the top wall 26 of the base. The tubular bearing 25 extends through an opening therefor in the top wall of the base and a flange 33 on the bearing is detachably secured to the wall by screws 34.

The lower end of the vertical shaft 24 also carries a spur gear 35 which meshes with a spur gear 36 on a stationary stub shaft 37 disposed in a boss 38 depending from the top wall 26 of the base. A sprocket 39 is integral with the spur gear 36 and a chain 40 connects this sprocket with a sprocket 41 carried by an elongate vertical shaft 42 journalled in a pair of bearings 43 and 44 respectively detachably mounted on upper and lower horizontal walls 45 and 46 of a casing structure generally designated C supported at one side of the base as depicted in FIGURES 1, 6 and 7. The upper wall 45 constitutes a platform or a bridge over which the cans are caused to travel from the conveyor 1 to the carriage by the rotary conveyor 2. It will be noted that the vertical shaft 42 and sprocket 41, including a portion of the chain 40, are housed in the casing.

The upper end of the elongate vertical shaft 42, as shown in FIGURES 2 and 6 has a flanged fitting 47 keyed thereto and screws 48 extend through an upper plate 49 of two such plates comprising the rotary conveyor 2 and slots in the flange of the fitting so as to afford relative rotational adjustment of this conveyor about the longitudinal axis of the shaft for timing purposes. The plates are preferably joined together in axially spaced parallel relationship by suitable ribs as shown in FIGURE 6.

A bevel gear 50 is keyed to the vertical shaft 42 intermediate its ends and meshes with a bevel gear 51 keyed to an inner end of a horizontal shaft 52. This horizontal shaft, as viewed in FIGURES 6 and 7, is journalled in a tubular bearing 53 on a side wall 54 of the casing structure. A bevel gear 55 and a sprocket 56 are keyed to the outer extremity of the horizontal shaft 52. The bevel gear 55 meshes with a bevel gear 57 keyed to the inner end of a horizontal shaft 58 disposed at right angles to the horizontal shaft 52. The horizontal shaft 58 is journalled in a tubular bearing 59 on a support 60 which is reenforced by a brace as shown in FIGURE 5. A sprocket 61 is keyed to the outer end of the horizontal shaft 58 and this sprocket is connected by a chain 62 to a sprocket 63 keyed to the screw 17 as shown in FIGURES 5 and 7. The sprocket 61 is preferably adjustably supported on the shaft 58 for timing purposes in a manner similar to that employed in adjusting the conveyor 2 relative to shaft 42. The sprocket 56 on the shaft 52 is connected by a chain 64 to a sprocket 65 keyed to an upper horizontal shaft 66 journalled in a pair of bearings 67 mounted on a hanger 68 carried by the support 15. A pair of sprockets 69 are keyed to the shaft 66. Chains 70 of the conveyor 1 connect with these sprockets and also with a pair of sprockets on a shaft (not shown). It will be noted that the bearings, such as 43, 44 and 53, are detachably mounted to facilitate installation of the shafts.

With the above unique driving mechanism, rotation of the main drive shaft 21 will cause simultaneous rotation of the various interconnected shafts to simultaneously operate the screw 17, conveyors 1 and 2 and the carriage 3. The screw 17 is journalled in aligned bearings on a bracket 71 which is adjustably mounted on a part of the support 15 and the rotary conveyor is also adjustable as

alluded to above, so as to facilitate proper transportation of the cans.

The carriage or turret 3, as stated above, is rotatably mounted for movement about the axis of the vertical stationary post 31 anchored to the top wall 26 of the base 27. The carriage, as clearly depicted in FIGURES 2, 8 and 9, includes what may be termed, an upper valve supporting assembly and a lower horizontal can supporting assembly. These two assemblies are connected for rotation as one unit through the agency of the gear 28 on the driven shaft 24 which engages the large internal ring gear 29 on the head 30 of the lower assembly. A ball bearing unit 72 is preferably interposed between the upper end of the socket 32 and the head 30 to promote efficient rotation of the carriage. The head 30, as depicted in FIGURE 8, is preferably formed with a plurality of circumferentially spaced vertical tubular bearings 73 which reciprocally support tappets or shafts 74. A planar seat or rest 75 is fixed on the upper end of each of the shafts and the lower end of each shaft is preferably bifurcated and carries a headed detachable cross-pin 76 on which a roller or wheel 77 rotates. These rollers rollingly engage an outer annular cam 78 detachably anchored to the top wall of the base by screws 79. This cam has a horizontal upper cam surface or track 80 and a horizontal cam surface 81 disposed at a level below the surface 80. When the rollers are in engagement with the lower cam surface or track 81 the seats 75 on the shafts are disposed in the plane of the platform 45 and when the rollers engage the upper cam surface 80 the shafts and seats will be elevated to maintain the cans on the seats in proper cooperation with the valve mechanisms 4. An inner annular cam member 82 is detachably secured in and against the outer cam 78 by screws 83 and is provided with an external cam groove 84 shaped in correspondence with cam surfaces 80 and 81 of the cam 78 and receives the heads of the cross-pins 76 to assist in automatically returning the shafts to their lower positions so that the seats are disposed in the same plane as the platform 45.

The head 30 includes a cylindrical exterior wall 85 and a cylindrical apron or shield 86 is detachably secured thereto in a depending encircling relation to the cams 78 and 82 and the lower extremities of the shafts which carry the rollers, and in overlapping relation to the upper part of the base 27 to protect the shafts and rollers and prevent entry of a product and/or liquid which may spill or splash over during the filling operations. As clearly exemplified, for example, in FIGURES 2, 8 and 10, twelve seats 75 are preferably employed which are generally trapezoidal in shape and constitute corresponding segments of an annulus. A spacer 87 is secured between each of the seats and a holder 20 by a screw 88 and dowels 89 so that the notches 19 in the holders will partially embrace each can at a location above its lower rim 90 as evidenced in FIGURE 10 to hold or stabilize each can as it is carried by a seat about the vertical axis of the post 31. Each of the holders is provided with an outwardly extending radial edge or abutment 91 tangent to the notch so as to assist in guiding a can into the notch and in driving the can once it is transferred thereto by the rotary conveyor 2. An inverted cup 92 is preferably secured to the underside of each seat by a screw 93 and a pin 94 which respectively extend through the seat into the cup and the cup and shaft. The cups serve as shrouds or umbrellas which prevent entry and seepage of any spilled liquid between the shafts 74 and the tubular bearings 73 in which they are elevated and lowered by the cams 78 and 82.

The inner edges of the holders 20 and seats 75 carried by each shaft are preferably respectively provided with arcuate notches 95 and 96 which slidably receive a vertical guide or spindle 97 threadedly connected to the head 30 in order to prevent rotation of the shaft and components carried thereby so that the roller 77 is held in proper operative relation to the cams 78 and 82.

As shown in FIGURE 2, a guide 98 is fixed alongside the conveyor 1 in spaced parallel relation to the screw 17 to assist in guiding the cans to the rotary conveyor 2 and an arcuate guide 99 is secured to and spaced from the platform in partial concentric relation to the conveyor 2 by bolts 100 and tubular spacers 101 surrounding the bolts to maintain the cans in the recesses 18 of the conveyor. Another guide 102 has its ends secured by screws or bolts 103 to the platform so that an undulated portion 104 of the guide is disposed in a predetermined relationship to the seats 75 and notches 19 to assist in properly positioning the cans with respect thereto. Suitable guides are also adjustably associated with the conveyors 1 and 13 to assist in respectively guiding the cans to and from the machine.

The upper or overhead valve supporting assembly of the carriage 3 is operatively connected and axially adjustable with respect to the lower can supporting assembly through the agency of a pair of tubular couplings 105 and 106 as depicted in FIGURES 2 and 8. The coupling 105 includes an externally threaded tubular portion 107 and a base flange 108, the latter of which is detachably secured by screws 109 in a circular recess provided in the head 30. The coupling member 105 is journalled on the post for rotation with the head and a washer 110 is detachably secured by a screw 111 against the upper end of the post 31 in overlapping relation to the member to adjustably hold the head 30 against the ball bearing unit 72 to stabilize the rotational movement of the complete carriage.

The coupling member 106 is preferably split and internally threaded and provided with opposed pairs of apertured ears through which a pair of the bolts 112 or screws extend for firmly clamping member 106 about the tubular portion 107 of the member 105. The coupling member 106 is provided with a radial flange 113 which is detachably secured to a lower planar round plate 114 of the upper valve supporting assembly by screws 115 and dowels 116 as shown in FIGURE 8. With this unique organization the coupling members can be readily adjusted to obtain the desired axial or vertical spacing between the two assemblies of the carriage to accommodate cans of various heights or sizes and then firmly secured together by the bolts 112 for rotation as a unit as stated above.

The plate 114 of the carriage supports twelve valve mechanism 4, the cylindrical manifold 11, the branch lines 12, above referred to, through which the liquid flows from the manifold 11 to the valve mechanisms, and branch lines 117 which assist in communicatively connecting the valve mechanisms with the main vacuum line 5. The valve supporting assembly also includes an upper annular ring 118 fixed in spaced relation to the lower plate 114 by a plurality of circumferentially spaced axially extending spacers 119, the lower ends of which are preferably welded to the lower plate and their upper ends to the ring by screws 120 as shown in FIGURES 8 and 9.

The manifold 11 and the manner in which it is mounted on the carriage and communicatively connected to the lines 12 and reservoir 8 will now be described more in detail. The screws 115 and dowels 116 which secure the coupling member 106 to the plate 114 also extend through a base flange 121 welded to the lower end of the manifold. A bottom wall 122 is welded to the interior of the manifold above the flange 121 to provide a chamber 123 from which liquid is dispensed to the lines 12. The manifold also includes a top wall 124 having an opening therein through which a tube 125 depends into the chamber 123. A tubular fitting has an exteriorly threaded portion 126 for connection with a nut 127 and a radial flange 128 which is detachably secured to the top wall 124 of the manifold by screws 129 as shown in FIGURE 8. The tube 125 has an outer circumferential flange 130 which is held against the upper end of the threaded portion 126 by the nut which embraces the

flange. An O-ring 131 is seated in an internal annular groove formed in the tubular portion 126 for sealing the connection between the fitting and tube. The arrangement is preferably such that the tube remains substantially stationary with the main supply line 10 when the carriage rotates about the longitudinal axis of the post 31. The tube preferably extends an appreciable distance into the manifold 11 so that an air space may be provided above the level of the liquid to cushion any back pressure or pounding as the cans reach their capacity of liquid under pressure from the pump 9. The manifold 11 is sealed to prevent contamination of the liquid therein and therefore has an advantage over certain conventional apparatus in which the syrup or liquid is contained in what is commonly referred to as an "open bowl."

The tube 125, as illustrated in FIGURE 1, is attached to the main supply pipe 10 and the latter by a T-fitting 132 to a line 133 connected to the reservoir 8 and pump 9. A valve 134 is interposed in the line 133. The fitting 132 is connected to a pump 135 by a line 136 in which a valve 137 is interposed and the pump is connected to a reservoir 138 containing a solution for cleaning purposes to be subsequently described.

The manner of operatively connecting the branch vacuum lines 117 to the main vacuum line 5 and the latter to the tank 6 and reservoir 138, as exemplified in FIGURES 1, 8, 9 and 13 through 16, will now be described. The manifold 11 for the liquid is provided with an exterior circumferential shelf 139 welded thereto at a location below the ring 118. An annular part 140 is fixed on the shelf for movement with the manifold and provided with L-shaped passages 141 to which the lines 117 are connected. An annular element or vacuum shoe 142 is mounted in a fixed depending position from an overhead spider-like support so that the annular part 140 may rotate relative to the element. More specifically in this regard, the spider-like support, as depicted in FIGURES 8 and 13, includes four radially extending arms or spokes 143 having outer ends which are joined to tubular formations 144, the latter of which respectively slidably receive four threaded pillars or uprights 145 anchored to the sides of the base 27 of the machine. The inner ends of the arms are joined to a center ring 146 having a clearance opening therein through which the manifold 11 projects. The underside of the ring 146 is preferably provided with circular recesses 147 and screws 148 extend through this ring and recesses and threadedly connect with the annular element 142. Helical springs 149 respectively surround the screws, with their upper ends seated in the recesses 147 and their lower ends engaging the element 142 for urging the ring 146 and element in opposite directions so that the element will be resiliently held in intimate contact with the part 140.

The underside of the element 142 is preferably provided with a pair of corresponding arcuate recesses 150 and 151, each of which is adapted to communicatively connect a plurality of the L-shaped passages 141 as evidenced in FIGURE 15. In order to insure an efficient sealed connection or connections between the passages and the arcuate recesses, the underside of the element 142 is also preferably provided with grooves 152 surrounding the recesses in which gaskets 153 are disposed for engaging the upper surface of the annular part 140 as best shown in FIGURES 15 and 16. A pair of conduits 154, as shown in FIGURE 14, are attached to the annular element 142 for connection with the arcuate recess 150 and a similar pair 155 for connection with the other arcuate recess 151. The pairs of conduits are also joined to a manifold 156 and the latter to the main vacuum line 5. The purpose of the manifold 156 and running pairs of conduits therefrom to the arcuate recesses is to provide sufficient vacuum and at the same time prevent interconnection between certain of the branch vacuum lines 117 when the air is being evacuated from different cans. As shown in FIGURE 1, the line 5 carries a T-fitting 157 which is connected to the vacuum tank 6 by a line 158. A valve 159 is interposed in the line 158 and a line 160 connects the fitting 157 with the reservoir 138. A valve 161 is interposed in the line 160. These valves, along with the valves 134 and 137, will be described more in detail subsequently in connection with the cleaning operation.

The valve mechanisms 4 carried by the plate 114 of the carriage will now be described. The valve mechanisms are circumferentially spaced and each mechanism, as depicted in FIGURES 9, 10, 11 and 12, preferably includes an annular planar part 162 detachably fixed to the underside of the plate 114 by screws 163 and a lower planar valve element 164 carried by the lower end of a vertical rotatable valve stem or shaft 165 for rotating the element relative to the fixed part 162. The valve part 162 is provided with an angularly disposed axially extending passage 166 and a vacuum line 117 extends through a hole in the plate 114 and connects with this passage. The part 162 is similarly provided with a passage 167, spaced ninety degrees from the passage 166, which connects with a liquid branch line 12. The valve part 162 is preferably formed with a reduced cylindrical axial extension having a radial flange at its end to define a groove or neck 168 about which a gasket or seal 169 is detachably secured. A cylindrical skirt 170 is secured about the valve part and extends therebelow a sufficient distance to encompass the gasket, valve element and an upper portion of a can in order to control any slight leakage resulting during the travel and/or filling of an imperfect can which does not properly engage a seal. This skirt also assists in holding the gasket in place.

It will be noted that each of the stems 165 extends through the plate 114 and the valve part 162 and that a gasket 171 and bearing 172 are arranged in a cylindrical recess provided in the part to seal the connection between the shaft and related components and promote rotation of the shaft.

Each of the valve elements 164 is preferably bevelled at its periphery to facilitate piloting of the element into a can without damaging the latter. The upper surface of each of the elements is also provided with a generally triangular shaped recess 173 which intersects the periphery of the element as shown in FIGURES 10 and 11, so that by rotating the element the recess can be brought into selective connection with the passage 166 for communication with the vacuum tank 6 or passage 167 for communication with the reservoir 8, all of which will be described more in detail subsequently. The upper surface of the element is preferably treated or covered with a friction reducing material, such as a layer of Teflon to reduce friction between the valve part and valve element as well as afford a good contact area and thereby substantially prevent leakage of air or the product from the valve and obviously, such a material may be applied to the underside of the valve part 162 in lieu of the valve element or to both of these components.

As noted above, the valve elements are respectively connected to the lower ends of the valve stems. More specifically in this respect each element is preferably detachably fastened to a stem by a cross-pin 174 which extends transversely through a hole in the stem for disposition in a diametrical recess or groove 175 provided in the underside of the element as depicted in FIGURE 11. The stem extends into an axial hole in the valve element and by manually moving the stem downwardly in spaced relation to the valve part and against the force of a helical spring 176 about the stem the element can be slid upwardly along the stem so that the cross-pin can be removed to permit release of the valve element from the stem for repair or replacement or substitution of a new one of a greater or lesser size depending on the size of can to be filled and the head space which is to be left in the can. The spring 176 bears against the plate 114 and a collar 177 secured to the stem by a pin 178, as

shown in FIGURE 8, for normally resiliently maintaining the valve element against the valve part and a star member, generally designated 179, is fixed on the upper end of the stem above the ring 118 through which each stem extends for support. In order to promote efficiency the upper extremities of the stems are respectively journalled in bearings 180 fixed on the ring. Each of the stems can be manually retracted downwardly as evidenced in FIGURE 17 so that a pin 181 can be inserted into a transverse hole 182 in the stem to hold the valve element in spaced relation to the fixed valve part for cleaning purposes in a manner which will be subsequently described.

The star members 179 are identical and each includes an upper arm 183 and three lower arms 184, 185 and 186. The arms are adapted to engage a plurality of circumferentially spaced abutment means mounted on an annulus or ring 187, the latter of which is secured to four tubular members 188 which slidably receive the pillars 145 and rest on nuts 189 as depicted in FIGURE 8. The tubular formations 144 of the spider-like support, above referred to, bear on the tubular members 188 so that this support and the annulus 187 can be readily adjusted vertically and clamped in place on the pillars by the nuts.

As clearly shown in FIGURE 9, a corresponding pair of movable or pivotal abutment means, generally designated 190 and 191, are mounted on the annulus for engagement by the upper arms 183 of the stars and a plurality of corresponding abutment means, generally designated 192, 193, 194, 195, 196 and 197, are stationarily mounted on the annulus for engagement by the three lower arms 184, 185 and 186.

The abutment means 190 and 191 may be designed and constructed in various ways but as illustrated in FIGURES 8, 9, 17, 19 and 20, each preferably comprises a lever 198 pivoted intermediate its ends to the lower end of a hanger having a pair of depending portions 199 secured to the underside of the annulus 187. These depending portions carry a horizontal shaft 200 and each lever has an offset 201 provided with a tubular bearing 202 journalled on the shaft between the portions 199. The upper extremity of each lever is provided with an inturned portion 203 with a cam roller 204 at its end disposed above the annulus 187 for engaging the upper arms 183 of the star members 179 and its lower extremity is provided with an inturned portion 205 having a horizontal shoe 206 at its end for engaging a can if one is mounted on a seat opposite the lever as depicted in FIGURES 17 and 20 to locate the cam roller 204 in a position for engagement by the upper arms of the stars 179. The arrangement is preferably such that if a can is not on a seat opposite the lever, the lever will automatically swing or pivot to locate the cam roller 204 out of the path of the upper arms and as a result the valve stem and valve element will not be rotated. As shown in FIGURE 19, the offset 201 is provided with an abutment for engaging a stop so that the shoe will not strike the valve element 164 when the lever is tilted. In other words, the valve element is rendered inoperative to prevent escape of liquid and connection with the vacuum. This feature is important as it prevents operation of the valve whenever a can is not fed to the carriage by the conveyor 2.

The abutment means 192 through 197, as mentioned above, are identical and stationarily mounted on the annulus 187. They may be designed and constructed as desired but as depicted each preferably comprises a planar member 207 having an upturned pintle 208, which rotatably supports a cam roller 209. Each member is preferably detachably secured for radial adjustment on the annulus 187 by a pair of screws or bolts 210. It is to be understood that the machine can be constructed so that the carriage will accommodate a greater or a lesser number of cans depending on the capacity or output desired, provided, of course, that the timing sequence between the valve mechanisms and the abutment means 190 through 197 is properly established with respect to the other operating components.

In view of the foregoing, the operation of the machine will now be described. When the machine is operating to fill the cans, the valves 134 and 159 are open to place the liquid supply and vacuum apparatus in condition for use and the valves 137 and 161 are closed to render the cleaning apparatus inoperative. The cans, which are partially filled with a fruit or vegetable as viewed in FIGURE 20, for example, are transported on the conveyor 1 where the screw 17 feeds them in a predetermined spaced relationship to the recesses 18 of the star wheel conveyor 2. If a can fails to properly engage the screw 17, the spring pressed gate 16 will be cammed slightly outwardly by the can to allow the can to drop back one pitch of the screw and then properly proceed along the conveyor 1. As noted above and as shown in FIGURE 2, a pair of guides 211 are adjustably mounted at the entrance end of the conveyor 1 to assist in aligning the cans thereon.

The cans, as shown in FIGURE 2, are selectively transferred by the conveyor 2 onto the seats 75 of the carriage and as the cans are rotated therewith they are selectively elevated by the shafts 74 through the agency of the rollers 77 thereon which ride from the lower cam surface 81 on the cam 78 onto the upper cam surface 80. The guides 99 and 102 assist in respectively holding the cans in the recesses 18 of the conveyor and the notches 19 of the carriage. More specifically, and referring particularly to FIGURES 2, 8 and 9, after a can 212, for example, is moved onto a seat 75, the carriage will convey the can for a short circumferential distance, during which the roller on the shaft 74 engages the lower cam surface 81, as viewed in FIGURE 18, and as the roller rides up and onto the upper cam surface 80 the shaft 74 will be shifted vertically to cause the upper rim of the can to intimately engage a seal 169 thereabove, as depicted in FIGURES 8, 10, 17 and 20. Each can is held in relation to a seal throughout substantially its complete travel with the carriage. As the can 212 moves clockwise with the carriage about the vertical axis of the post 31, the shoe 206 on the lower end of the lever 198 of the abutment means 190 will engage the periphery of the can and cause the lever to swing clockwise as viewed in FIGURES 17 and 20 to locate the roller 204 on the lever in the path of the upper arm 183 of the star 179 to effect rotation of the valve stem 165 and valve element 164 in unison through an arc of ninety degrees, which connects the recess 173 in the element with the passage 166 in the valve part 162 to communicatively connect a branch vacuum line 117 with the interior of the can as depicted in FIGURE 20, so that the vacuum pump 7 and apparatus associated therewith will withdraw air from the can. In other words, when the star 179 and valve element 164 are at what may be termed a station or position designated S1 in FIGURE 9 of the drawing, the valve places the can in communication with the vacuum. It will be noted that there are eleven additional stations S2, S3, S4, S5, S6, S7, S8, S9, S10, S11 and S12 which will be presently referred to and subsequently in connection with the cleaning operations of the machine. The above period of evacuation continues for a predetermined distance until the arm 184 on the star 179 engages the roller 209 of the abutment means 207 on the annulus to successively effect another quarter or ninety degree turn of the stem and valve element which simultaneously disconnects the recess 173 from the passage 166 and places the recess 173 in the element in registry with the passage 167 in the valve part 162 to communicatively connect a branch line 12 therewith so that the liquid will be forced at a pressure greater than atmosphere into the can, as depicted in FIGURES 10 and 21, until the pressure therein equals that produced by the pump 9. The pressure employed for this pur-

pose is preferably in the neighborhood of twelve pounds to insure an efficient discharge of liquid into the can, but if desired the pressure may be varied. The arrangement is such that liquid can flow into the can while the can is being carried from the abutment means 192 to the abutment means 193, which includes stations S2 and S3, until the flow is interrupted by the arm 185 engaging the roller of such abutment means to impart a further turn of ninety degrees to the valve element 164 to disconnect its recess 173 from the passage 167 and branch line 12 connected therewith as shown in FIGURE 22. It should be noted that the vacuum setup in the can assists in drawing the liquid into the can the moment the valve element connects the liquid supply line 12 with the can.

As the carriage continues to revolve the arm 186 is caused to engage the roller 209 on the abutment means 194 to rotate the valve element another ninety degrees as indicated at station S4 to restore it to the position it originally had at station S12 just prior to its rotation by the abutment means 190 so that the valve element can be rotated four additional times to repeat the cycling of removing air and adding liquid to the can.

More particularly in this regard, after the valve element has been rotated by the abutment means 194 the upper arm 183 will be placed for engagement with the roller 204 on the pivotal abutment means 191 to rotate the element ninety degrees to reestablish communication between the interior of the can and the vacuum branch line 117, as shown in FIGURE 20, until the arm 184 engages the roller on the abutment means 195 to rotate the element another quarter turn to interrupt the connection with the vacuum line and simultaneously reestablish communication with the supply of liquid through the branch line 12. In other words, liquid can be fed to the can from the time the valve element is rotated by the abutment means 195 until it is rotated again by the abutment means 196, which includes station S6.

Attention is directed to the fact, that it is not practical to operate any machine with an absolute vacuum, and as a result a small amount of air may remain in each can following the first operation of evacuation initiated by the abutment means 190. When the liquid or syrup is introduced to a can following this first operation of withdrawing air, the pressure is usually sufficient to create turbulence to disturb the fruit or vegetable to dislodge any air that may be left in pockets or cavities thereof so that on the second cycle of vacuuming initiated by the abutment means 191 substantially all of the air is removed from each can.

When the arm 185 engages the roller on the abutment means 196, the valve element is rotated to disconnect the element with the liquid supply and as the can travels farther with the carriage the arm 186 of the star engages the roller on the abutment means 197 to restore the element to its original position as at stations S4, and S9 through S12, so that the upper arm 183 is again presented to engage the roller on the abutment means 190 when another can is at this location.

After the liquid has been fed to the can 212 the second time, and the valve element is turned to a closed or inoperative position to disconnect the liquid or vacuum lines the can is shunted onto the take-off conveyor 13 by a pair of guides 213 as depicted in FIGURES 2 and 4, and the seat 75 which has carried the can throughout its travel with the carriage is gradually lowered due to the fact that the roller 77 on the shaft 74 descends onto the lower cam surface 81 of the outer cam 78 through the assistance of the inner cam 82. The roller rolls on the surface 81 from a point at or adjacent the station S8 to or adjacent station S12. As a can is conveyed from station S12 to station S1, the roller gradually rides onto the upper cam surface 80 to force the can against a resilient seal or pad 169 as previously described.

Summarizing the above to some extent it will be manifest that the pivotal abutment means 190 and 191 serve to respectively communicatively connect each can with the vacuum line; that the abutment means 192 and 195 respectively connect each can with the liquid supply; that the abutment means 193 and 196 respectively shut off the liquid supply; and that the abutment means 194 and 197 respectively return the valve element to its original position for the two complete cycling operations.

It will also be apparent that since the valve element 164 of each valve mechanism is located within the confines of each can during its circuit of travel on the carriage from at least station S1 through S7, a predetermined amount of space is continuously taken by the element, so that after the can has been twice subjected to a vacuuming operation and a filling operation, a predetermined head space is left in each can. The organization serves to efficiently remove the air and obtain an accurate amount of liquid in each can, while providing a space of a size sufficient to facilitate application of a top or cap thereto by apparatus operatively associated with the take-off conveyor 13. Placement of the valve elements in the cans also serves to promptly terminate the flow of liquid into the cans, as distinguished from a setup where the valve is located remote from the discharge end of a line, which allows an amount of liquid in excess of that required to flow therethrough. In this connection it should be noted that the connections of the branch lines 12 with the manifold 11 are located directly above the bottom wall of the manifold so that practically all of the liquid in the manifold can be discharged therefrom prior to initiating the cleaning operation.

One extremity of the take-off conveyor 13 is preferably detachably mounted on one of the pillars 145 for vertical adjustment as shown in FIGURES 2 and 4, with a small platform 214 located on a level with the seats 75 which successively pass thereby in order that the cans will slide onto the chains of the conveyor which are supported on sprockets. The guides 213 are adjustably mounted on the conveyor structure. It will be noted that the guides extend into the machine above the plane of the notched can holders 20 with one of the guides being located to engage and cam each can off its seat and away from its holder onto the platform. It should also be noted that if any can should stick to a seal 169, the holder associated with such can will pull the can away from the seal when the shaft and seat supporting the can is lowered.

As alluded to above, one of the important objects of the invention is to provide a system which can be readily and efficiently cleaned without dismantling and reassembling the components and readjusting the same. The apparatus utilized for this purpose, includes the reservoir 138 containing a suitable cleaning solution and the pump 135. To use this apparatus, the valves 134 and 159 respectively associated with the liquid supply and vacuuming apparatus are closed and the valves 137 and 161 previously closed for the filling and vacuuming operations are opened to communicatively connect the reservoir 138 and pump 135 with the system. More specifically in this respect, and in order to prepare the machine for cleaning, empty cans are conveyed into the machine and onto the seats 75 and into engagement with the seals 169 at stations S1 through S7 as may be apparent from FIGURE 9, after which the valve stems 165 at these stations are pressed downwardly to compress the springs 176 so that the pins 181 can be inserted into the holes 182, as viewed in FIGURE 17, to axially displace the valve elements 164 away from the valve parts 162, in order that the passages 166 and 167 respectively leading to the vacuum and liquid lines 117 and 12, are both in direct communication with the interior of each can, thus by-passing the recess 173 in the element. The cleaning solution in the reservoir is then forced by the pump through the main supply line 10 to the manifold 11, and from here to the cans through the branch lines 12 to passages 167. The cleaning solution flows from the cans back to the reservoir successively via

the passages 166, branch lines 117, annular part 140, arcuate recesses 150 and 151 in the annular element 142, through the pairs of lines 154 and 155 to the manifold 156, and lines 5 and 160.

After the solution has been circulated through the cans for a sufficient time to properly clean this portion of the machine these cans filled with the solution are removed after the pins 181 are withdrawn from the seven valve stems above referred to, after which empty cans are conveyed into the machine onto the seats and into engagement with seals 169 at stations S1 through S12. The valve stems at these stations are then pressed downwardly so that the pins can be inserted into the holes 182 in these stems to hold the valve elements 164 thereon in spaced relation to the valve parts 162, whereupon the carriage is turned until station S8 is located opposite the abutment means 190 so that the empty cans at stations S8 through S12 are placed in communication with the branch lines 12 and 117. The solution is then circulated through this portion of the machine and these cans from the main supply line through lines 12 and passages 167 to the cans and back to the reservoir as before. When the machine is properly cleaned the cans are removed, including the pins from the valve stems, after which the valves 137 and 161 are closed and the valves 134 and 159 are opened in order that the machine can be again placed in operation for evacuating air from the cans and filling them with the liquid desired. With this unique setup the valve mechanisms, various lines and manifolds can be expeditiously and efficiently cleansed to promote sanitation in accord with the standards of various health codes on this subject as well as reduce the expense incurred with disassembly and reassembly of such components.

Having thus described my invention, it is obvious that various modifications may be made in the same without departing from the spirit of the invention, and, therefore, I do not wish to be understood as limiting myself to the exact form, construction, arrangement, and combination of parts herein shown and described.

I claim:

1. A machine of the kind described comprising a source of liquid cleaning solution, a frame, a carriage movable on the frame and provided with a seal and a pair of passages including a passage through which filling liquid normally flows and a passage communicating with a source of vacuum, pipes connecting the passages with the source of solution, a valve operatively associated with the passages, means for supporting a container against the seal, means for actuating the valve to connect both passages with the interior of the container, and a closed conduit system for circulating the solution through the machine, said system including each of said passages and the container.

2. A filling machine comprising a movable carriage having a valve body with a planar surface, a seal mounted on said body and having a flat container-contacting surface substantially in the plane of said planar surface, means defining a pair of passages in said valve body having lower ends terminating substantially in the plane of the contact surface of said seal, a valve rotatably mounted in said carriage and having a flat contact surface disposed below and slidably engaged in sealing relation with the planar surface of said valve body and having a flow control recess adapted to be selectively aligned with either of said passages of said valve body, means for respectively communicatively connecting said pair of passages with a source of vacuum and a source of liquid, means for supporting a container against the seal and enclosing said valve, and means for rotating the valve to selectively connect said recess with said passages to communicate the source of vacuum or the source of liquid with the interior of the container while the latter is sealed.

3. A filling machine comprising a source of vacuum, a source of liquid to be filled into containers, a source of cleaning solution, a rotatable carriage provided with a seal and a first and a second passage, means for connecting the first passage with the source of cleaning solution and the source of vacuum, and connecting the second passage with said cleaning solution and with the source of liquid to be filled into containers, a rotary valve operatively associated with the passages to open and close the discharge ends thereof, a selectively operable valve means operatively associated with each of said three sources for controlling flow to and from said sources, means for supporting a container against the seal, means for actuating the rotary valve to successively communicate said passages with the interior of the container when the valve means associated with the source of cleaning solution is closed and the valve means associated with the source of vacuum and the source of liquid are opened, means for locking the rotary valve in a position to open both passages when the valves associated with the sources of liquid and vacuum are closed and the valve associated with the source of solution is opened, and means for circulating the cleaning solution from its source through one of said passages to the container and from the container back to the source by way of the other passage.

4. A filling machine comprising a frame provided with circumferentially spaced abutments, a carriage rotatable in said frame, a member secured to said carriage, means defining a pair of passages extending through said carriage and said member and having openings at a lower end portion of said member, a seal secured to said member and surrounding the openings of said passages, means for supporting a container against said seal, a stem extending through said carriage and centrally through said member, a valve fixed on the lower end of said stem for disposition in the container, said stem being mounted for longitudinal movement in said carriage and in said member to move said valve between an upper position abutting the lower end portion of said member and a lower position removed from said end portion, said stem being further mounted for rotation in said carriage to selectively move said valve between positions opening and closing the ends of said passages when said valve is in said upper position, means carried by the upper end of said stem for engaging the abutments to periodically rotate said stem and said valve so the latter will be caused to selectively connect said passages with the interior of the container, and means for holding said valve in said lower position to connect both passages with the interior of the container.

5. In a filling machine, means providing a source of cleaning solution, a valve body having two flow passages therethrough and a valve seat portion at one end of each passage, a seal disposed about said valve seat portions, a valve mounted for linear movement and rotary movement in said valve body, said valve having a flow control head movable during linear movement of said valve from a position in contact with said valve body and closing said passages to a position spaced from said body and opening passages, means for moving a container having an opening at one end into position around said flow control head and against said seal, means for locking said valve in the passage-opening position spaced from said valve body, and means for forcing the solution from the source to the container through one passage and then back to the source through the other passage when the valve is in said locked position.

6. A machine of the kind described comprising a source of liquid cleaning solution, a carriage provided with a seal and a pair of passages including a passage through which filling liquid normally flows and a passage communicating with a source of vacuum, conduits connecting said passages with the source of solution, a valve operatively associated with said passages, means for supporting a container against said seal, means for actuating the valve to connect both passages with the interior of

the container, and a closed conduit system for circulating the solution through the machine including each of said passages and said conduits.

7. In a filling machine, a carriage having a valve body with a planar surface, a seal mounted on said body and having a flat container contacting surface substantially in the plane of said planar surface, means defining a pair of passages in said valve body having lower ends terminating substantially in the plane of the contact surface of said seal, a valve rotatably mounted in said carriage and having a flat contact surface disposed below and slidably engaged in sealing relation with the planar surface of said valve body and having a flow control aperture adapted to be selectively aligned with either of said passages of said valve body, means for supporting a container against the seal and enclosing said valve, and means for rotating said valve to selectively connect said aperture with each of said passages while the container is sealed against said valve body.

References Cited in the file of this patent

UNITED STATES PATENTS

582,623	Dolley	May 18, 1897
1,046,715	Arnold	Dec. 10, 1912
1,889,629	Bohmer et al.	Nov. 29, 1932
1,965,246	Meyer	July 3, 1934
2,070,301	Souther	Feb. 9, 1937
2,298,475	Fechheimer	Oct. 13, 1942
2,421,708	McKinnis	June 3, 1947
2,601,542	McGihon	June 24, 1952
2,637,478	McGihon	May 5, 1953
2,658,657	Fechheimer	Nov. 10, 1953
2,660,357	Fechheimer	Nov. 24, 1953
2,660,358	Fechheimer	Nov. 24, 1953
2,660,360	Gricar et al.	Nov. 24, 1953
2,779,358	Fechheimer et al.	Jan. 29, 1957
2,789,589	Fechheimer	Apr. 23, 1957
2,896,381	Lange	July 28, 1959
2,903,023	Battinich	Sept. 8, 1959