

June 3, 1958

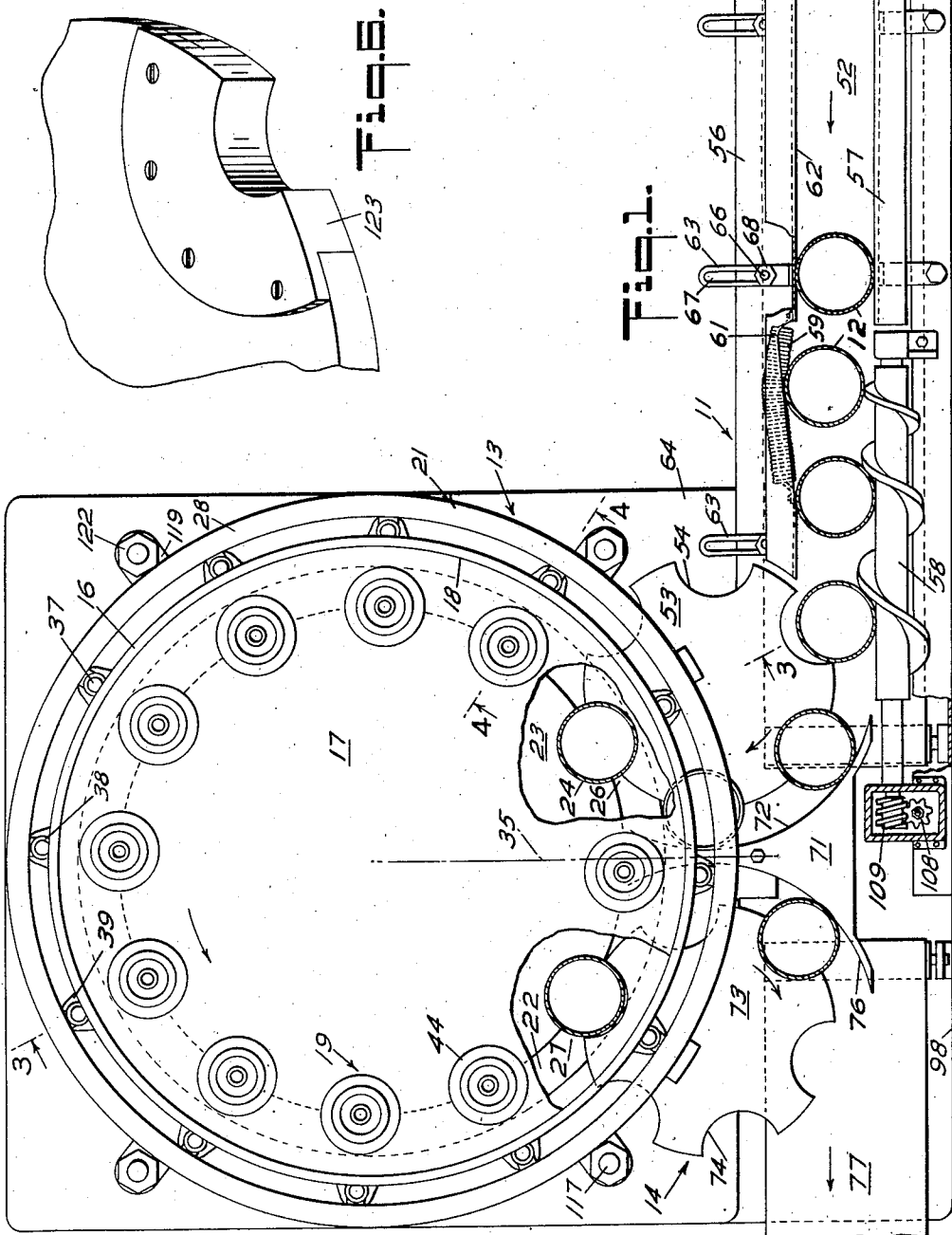
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2,837,127

APPARATUS AND METHOD FOR FILLING CONTAINERS WITH LIQUID

Filed June 18, 1954

5 Sheets-Sheet 1



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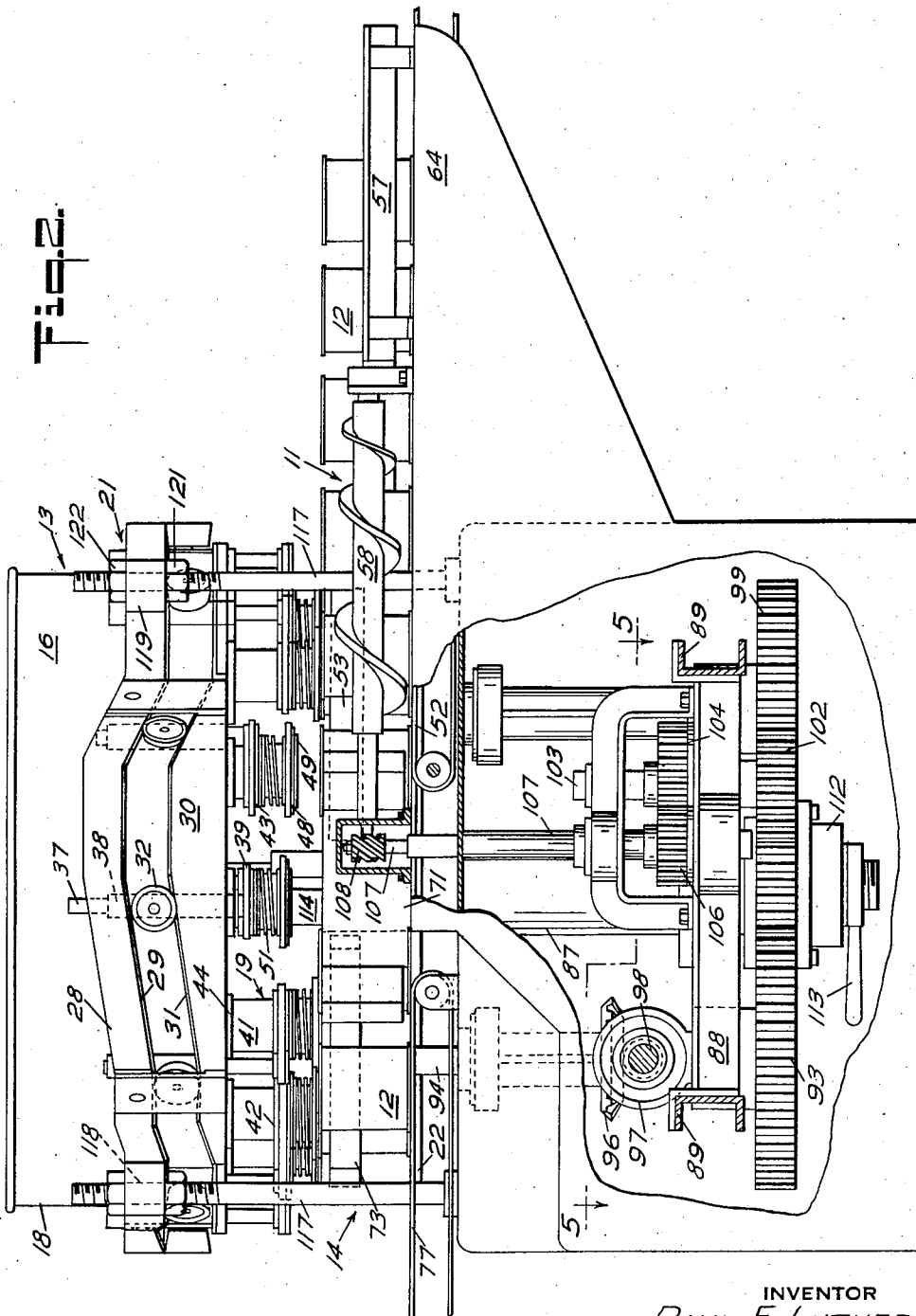
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APPARATUS AND METHOD FOR FILLING CONTAINERS WITH LIQUID

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5 Sheets-Sheet 2



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APPARATUS AND METHOD FOR FILLING CONTAINERS WITH LIQUID

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5 Sheets-Sheet 3

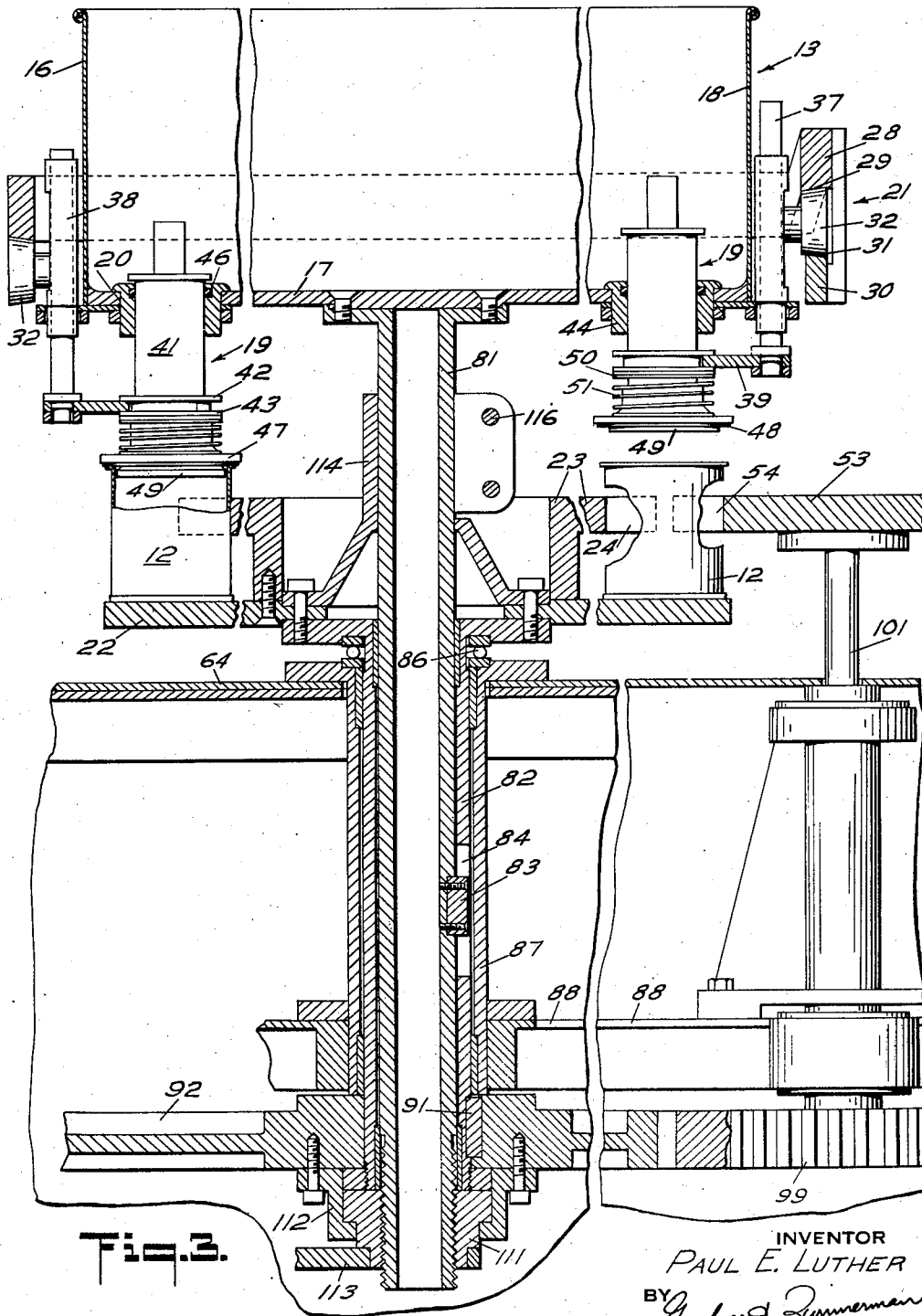


Fig. 3.

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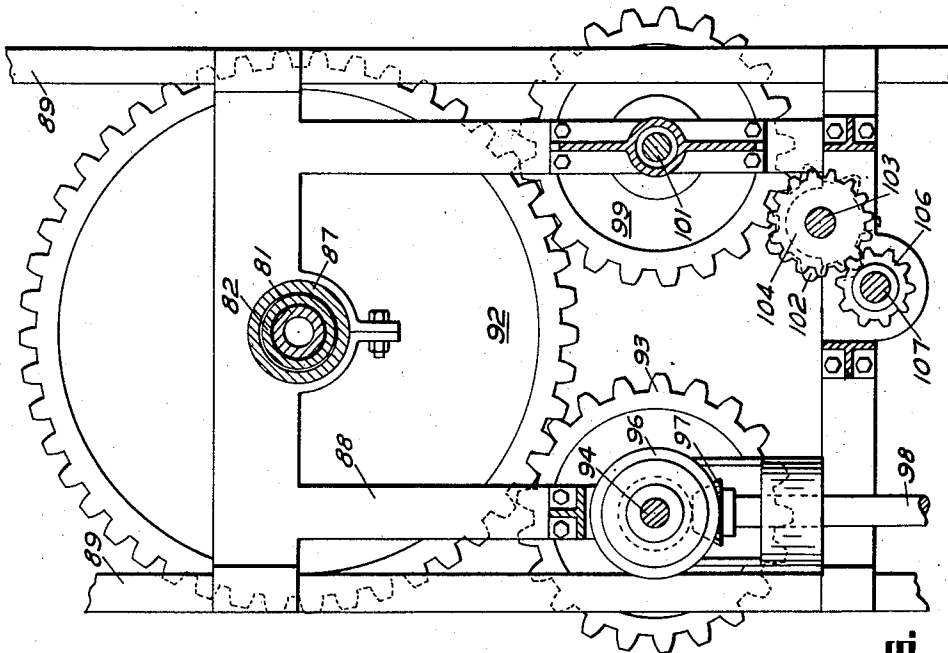
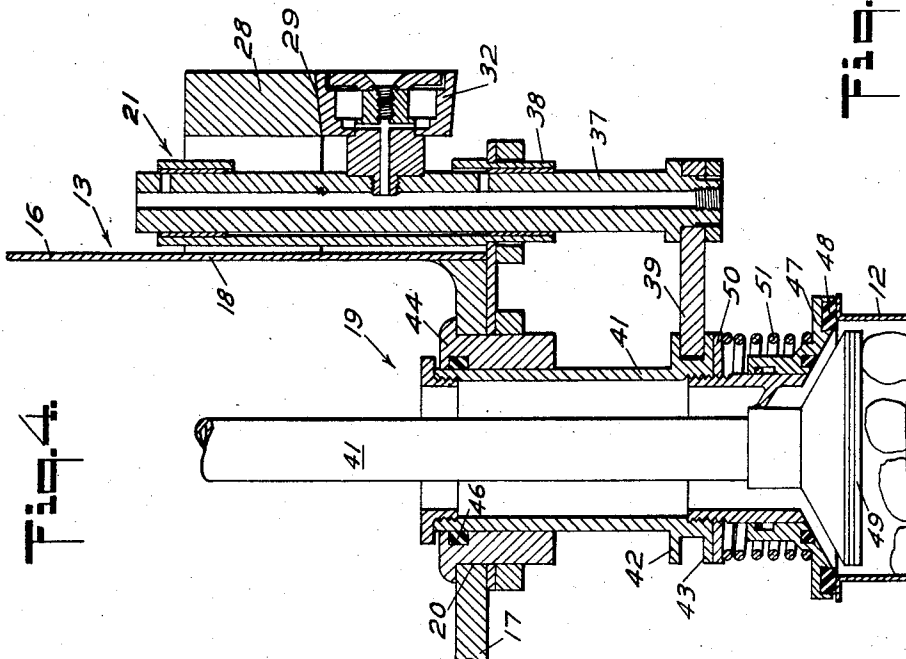
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APPARATUS AND METHOD FOR FILLING CONTAINERS WITH LIQUID

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5 Sheets-Sheet 4



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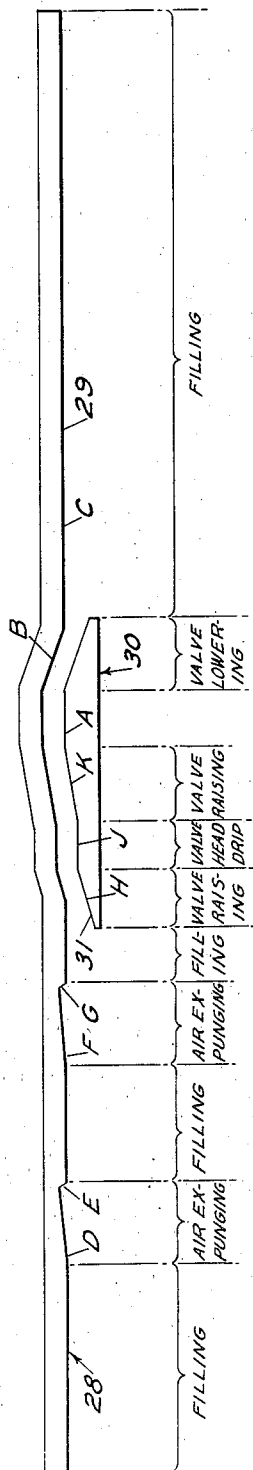
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APPARATUS AND METHOD FOR FILLING CONTAINERS WITH LIQUID

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5 Sheets-Sheet 5

Fig. 7.



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APPARATUS AND METHOD FOR FILLING CONTAINERS WITH LIQUID

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Application June 18, 1954, Serial No. 437,685

8 Claims. (Cl. 141—12)

This invention relates to the filling of containers with liquid, and is more particularly directed towards an apparatus and method for adding liquid such as juice or syrup to containers previously filled with solid or semi-solid material such as fruit.

Existing apparatus used by the canning industry for filling cans or like containers with liquid after fruits or similar products have been packed therein have limitations which slow down or otherwise make the above mentioned process inefficient. For example, the cans are usually conveyed to a liquid filling means by a constant pitch worm and when cans of a different diameter are introduced into the apparatus the worm must be changed to one whose pitch diameter will correspond to the new can diameter. Also, during the generally horizontal movement of the cans to and through the prior art machines, the cans are raised from one plane of the conveyor to a higher plane at the filling means so as to actuate the filling valve mechanism. During this angular ascent of the cans there is bound to be a certain amount of spillage of the fruit and as some of the fruit will extend above the top level of the can, in order to keep spillage at a minimum the ascent must be so gradual as to cause these top pieces of fruit to be urged within the confines of the cans by the valves of the filling means. Likewise, during the descent of a liquid filled can, the liquid will also tend to spill over the top of the can. While the cans are in the filling means, approximately fifty percent of the time is required to raise the cans from the conveyor plane to the filling plane and thereafter to lower them to a take-off plane, so that actually, liquid filling of the cans is taking place approximately only fifty percent of the time, thereby reducing the efficiency of the apparatus by that percentage.

Another problem encountered is that often the open tops of the cans are deformed during shipping and handling prior to filling so that in many instances the open ends are elliptical rather than round making it impossible for the valves of the filling means to seat thereon so that such deformed cans have not been useable.

Difficulty is also encountered when the filling means must be raised or lowered to accommodate cans of different heights, as during the process, the valves get out of alignment with the can moving mechanism and require time consuming adjustment to get the apparatus into proper operating condition.

Numerous other operational and constructional shortcomings are present in the prior art devices, and the above remarks are intended to only illustrate a few of the more important difficulties.

It is therefore an object of the present invention to provide an apparatus and method for the filling of cans with liquid whereby a greater number of cans may be filled in the same amount of time than with apparatus and methods heretofore utilized.

Another object of my invention is to provide a method and apparatus of the character described in which there

2

is substantially no spillage of the liquid or solid material from the cans.

A still further object of the invention is to provide apparatus of the type described in which the cans are maintained in a single horizontal plane during their movement to, through and from the liquid filling means.

Yet another object of the invention is to provide improved apparatus for uniformly conveying cans of varying diameters.

Another object of this invention is to provide improved means for vertical adjustment of the apparatus while maintaining a predetermined alignment of the cans with the valves, whereby the apparatus may accommodate cans of varying heights.

Still another object of the invention is to provide apparatus of the type described in which cans having deformed open tops may still be used by bringing the cans into round before filling the same with liquid.

Another object of this invention is to provide a method and apparatus for introducing liquid into a container having a plurality of substantially solid articles therein whereby the interstices between such articles will be completely filled with liquid without danger of air spaces appearing therein.

A further object of my invention is to provide a method and apparatus of the character described in which means are provided for eliminating the normally encountered dripping of liquid from the lower surface of the filler valves upon their removal from the filled container.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth in the following description of the preferred form of the invention which is illustrated in the drawings accompanying and forming part of the specification. It is to be understood, however, that variations in the showing made by the said drawings and description may be adopted within the scope of the invention as set forth in the claims.

Referring to said drawings:

Figure 1 is a top plan view of the apparatus of the present invention for filling containers with liquid, with portions broken away for clearer illustration.

Figure 2 is a front elevational view of the apparatus, portions of the housing being broken away in order to show the drive mechanism.

Figure 3 is an enlarged vertical sectional view taken substantially in the plane indicated by the line 3—3 of Figure 1.

Figure 4 is an enlarged vertical sectional view taken substantially on the line 4—4 of Figure 1, showing the valve and its associated cam mechanism of the liquid filling means.

Figure 5 is a sectional plan view taken substantially on the line 5—5 of Figure 2.

Figure 6 is a perspective view of a portion of a star wheel provided with a bushing to accommodate a can of smaller diameter.

Figure 7 is a diagrammatic representation of the cam mechanism of the invention, illustrating both cams as laid out along a straight line.

In broad terms, the apparatus of the present invention includes a conveying means 11 which carries cans or similar containers 12 which may be filled with substantially solid pieces of food such as fruit or the like along a generally horizontal plane at a uniform rate of speed to a filling means 13 where a liquid such as syrup or juice is introduced into the cans, which are then removed from the apparatus by a take-off means 14.

Referring first to the filling means 13 it will be seen that such means comprises a substantially vertically disposed rotatable cylindrical tank or bowl 16 having a bot-

tom 17 and sides 18 which contains the liquid that is subsequently introduced into the cans 12. The bottom 17 of the bowl is provided adjacent its periphery at regularly spaced intervals with a plurality of valves 19 mounted in openings 20 and which are operated by a cam mechanism 21 later to be described. The valves may be of the type disclosed in my prior patent, No. 2,574,746, and are arranged to be opened when a can is forcibly urged against a lower annular portion thereof. Disposed subjacent the bowl 16 and operatively connected thereto is a rotatable circular platform 22 to which is rigidly secured in vertical spaced relation a main star wheel 23 provided at its periphery with a plurality of substantially semi-circular notches or openings 24. As will be seen in Figure 3 the cans 12 rest on the platform 22 and are partially encircled by the openings 24 of the main star wheel 23 which engage the cans at a point somewhat over half their height and the rotation of the platform and star wheel in synchronism with the tank rotation maintains the cans in a fixed position while in the filling means 13. The semi-circular openings 24 of the main star wheel have a radius substantially the same as the cans, and the centers of said semi-circular openings 24 are aligned directly under the centers of the valves 19. Thus it will be seen that the cans, during the liquid filling process are held stationary relative to, and in alignment with, the valves. The main star wheel 23 will, of course, be provided with as many openings 24 as there are valves 19 in the bowl 16.

The bowl 16, the platform 22 and the star wheel 23, which constitutes the major portion of the filling means 13, rotate together at a uniform rate of speed, as will be explained later, and when a can 12 has been carried by the conveying means 11 to a pick up station 26 an opening 24 of the main star wheel engages the can 12 and rotates it with the filling means for somewhat more than 300 degrees during which time the valve which is aligned directly over the can opens, liquid fills the can, and the valve closes just before the filling means 13, carrying the can 12, reaches a discharge station 27 where the can is picked up and carried away by the takeoff means 14.

As previously mentioned, apparatus of the prior art has raised the cans from one plane along which they have been carried by the conveying means to a higher plane in order to effect the opening of the valves and a similar lowering of the cans to the plane of the take-off means to close the valves after the cans have been filled with the liquid. This has necessitated moving the cans up and down along an inclined surface before and after the valves are opened which has caused a great deal of waste due to spillage of both fruit and liquid. It should also be noted that in order to maintain spillage at a minimum the ascent and descent of the cans from one plane to another has had to be so gradual that approximately fifty percent of the time that the cans are in the filling means has been consumed by opening and closing of the valves rather than filling the cans with liquid. In view of the fact that the liquid requires a certain amount of time to run into the cans, the prior art machines were required to be run at a much slower speed than the present apparatus wherein the valves are open for a greater portion of the time that the cans are in the filling means. Another problem arising from the angular ascent of the cans to open the valves lies in the fact that in order to meet various weight requirements, the fruit when packed extends above the top level of the cans and is intended to be compressed therein by the action of the cans rising to engage the valve in an open position. Due to the angular relationship between the lower valve surface and the upper end of the can, upon initial engagement therebetween the valves tend to push the top pieces of fruit out of the cans rather

than compress them therein before the valves are finally seated in their open position.

In the present invention, to overcome the above problems, instead of raising the cans to effect an opening of the valves, I maintain the cans in a single horizontal plane throughout the entire process and provide means for lowering valves from a raised, closed position to a seated open position on the cans. In order to accomplish this I have provided the cam mechanism 21 which comprises a pair of stationary cams 28 and 30, the former encircling the bowl in radially spaced relation and the latter being positioned subjacent cam 28, which is required to extend for only a portion of the bowl periphery. Cam 28 is provided with a lower cam surface 29 and cam 30 is provided with an upper cam surface 31, such spaced cam surfaces engaging a plurality of rollers 32, each one being carried by a valve 19.

In Figure 7 of the drawings, the two cams have been projected along a straight path so as to better illustrate their particular cam surfaces and at what points the respective rollers 32 engage portions of the surfaces to carry out the filling operation of the present invention.

Broadly speaking, cam surface 29 is designed to engage the upper peripheral portion of a roller to urge the roller and its associated valve downwardly for engagement with and opening by a can. Conversely, cam surface 31 is arranged to engage the lower peripheral portion of a roller to effect ascension of the roller and its valve, and disengagement of the valve at the appropriate time in the cycle.

With particular reference to Figure 7, the zero point represents a radial line through the bowl midway of the delivery and take-off means, such as the line 35 of Figure 1. At this point, a roller 32 will be riding on a raised horizontal portion A of cam 30 and its associated valve 19 will be likewise in an inoperative uppermost position. After the bowl continues its rotation for approximately 10 degrees, the roller is forced downwardly by the downward slope B of cam 28 thereby causing the valve to descend towards the container about to be introduced. At approximately the 25 degree position, the roller will have descended sufficiently to effect engagement of the valve with a container, and the descension continues for a few more degrees to permit the valve head to enter the container. It will be understood that the mere lowering of a valve will not cause liquid to flow therethrough, the latter only occurring when the valve is brought down on a container.

At this stage in the cycle of operation, there is no need for a continuation of cam 30, as the roller will be maintained in its lowermost position by remaining in engagement with the lower horizontal portion C of cam 28.

It would normally be expected to maintain the roller and valve in such lowermost position until the filled container was ready for discharge. While this appears satisfactory in theory, it has been found that where liquid is flowing into the open top of a container previously loaded with pieces of fruit, vegetables or the like, the liquid level appears satisfactory immediately after filling, but within a few seconds, the liquid level would drop. This undesirable occurrence results from air entrapment below the liquid level during the filling operation, and subsequent escape of the air after the filling. In order to overcome this, and as a feature of the present invention, means are provided for eliminating any air pockets during the filling operation. Still referring to Figure 7, and bearing in mind that while the roller is in engagement with cam portion C the valve head will be within the container and compressing the articles therein, the valve head is caused to be raised by the valve spring (later to be described), the cam 28 permitting such action by being provided with an upwardly inclined sloped portion D. It will be noted that the slope is very gradual and amounts to approximately three-fourths of the valve opening in approximately 18 degrees of bowl rotation. However, this

raising of the valve head will permit the articles in the container to rise or otherwise shift their position and permit any entrapped air to escape. To further insure such escapement, the valve head is then forcibly returned to its lowermost position by a sharply descending portion E on cam 28. While the raising was affected during approximately 18 degrees, the descension is performed in approximately 2 degrees. This sudden jarring will have the effect of picking up a container and knocking it sharply, and will insure the liquid filling of all of the interstices between the solid articles in the container, by reason of the hydraulic force created by the rapidly descending head.

Preferably this air expunging cycle commences after approximately 232 degrees of rotation and the container will be substantially filled. If desired, and as indicated, this expunging cycle may be repeated one or more times, for example at approximately 282 degrees, by providing cam portions F and G which correspond to portions D and E. Following each such cycle, the roller will again engage the lowermost horizontal cam portion C.

After the roller has been in contact with cam portions C, D, E, F and G and the bowl has rotated approximately 315 degrees from zero, cam 30 must commence its service in raising the roller, and consequently the valve from the container. Thus, an upwardly inclined portion H is provided on cam 30 which causes the roller to rise, the valve actually closing after approximately 325 degrees. However, it should be made clear that after portion H continues for approximately 15 degrees it levels off in a flat portion J, such latter portion being sufficiently high to merely effect a slight disengagement of the valve head from the liquid in the container. Thus for the approximate 10 degrees of length of cam portion J, the valve is held level, with the valve head just out of contact with the liquid in the container. This important feature permits the liquid which has been carried upwardly by or on the valve head to drip back into the container, and serves the further purpose of permitting the liquid to become calm before the discharge of the container.

Following cam portion J is an upwardly inclined cam portion K which completes the raising of the roller and valve to the start of the cam cycle on cam portion A.

From the foregoing description of cams 28 and 30, together with a reference to Figure 7, the following table will illustrate a complete cycle of operation:

Effective Cam Portion	Cycle	Valve Position	No. of degrees from start (approx.)
A-----		raised (closed)-----	0-10
B-----	Valve lowering-----	lowering (closed)-----	10-25
C-----	liquid filling-----	lowered (open)-----	25-325
D-E-----	air expunging-----	gradually raised and suddenly dropped (open)-----	232-252
F-G-----	air expunging-----	do-----	282-302
H-----	valve raising-----	raising (open)-----	315-330
J-----	valve head drip-----	intermediate (closed)-----	330-340
K-----	valve raising-----	raising (closed)-----	340-360

In order to transmit vertical movement from the roller 32 to its valve 19, as shown in Figure 4, the roller is secured to a vertical post 37 which is slidably mounted in a sleeve 38 vertically disposed between the sides 18 of the bowl and the inner periphery of the cam 28. The lower extremity of the post 37 carries a horizontally disposed yoke member 39 whose forked end engages a valve housing 41 of the valve 19 between two flanges 42 and 43. The valve housing 41 is slidably mounted in a collar 44 secured in the bottom 17 of the bowl 16, and a rubber sealing ring 46 set in a recessed portion of the collar 44 maintains a liquid tight relation between the valve and the collar. The roller 32 while engaging the horizontal portion C of the cam 28 maintains the valve in its lowermost open position as shown in Figure 4. When the

roller is urged downwardly along cam portion B, it moves the post 37, and therefore the yoke 39 and the valve 19 downwardly. When a can 12 is at the pick up station 26 the roller 32 has traveled a short distance down the descending portion B of the cam 28 thereby moving the valve 19 downwardly approximately one quarter of its vertical travel to the position of the right hand valve (shown in Figure 3). As the roller follows the cam surface B the valve moves downwardly until a flanged member 47 thereof provided with a sealing gasket 48 contacts the top rim of the can 12 forming a liquid tight seal and the valve head 49 moves on down against the pressure of a spring 51, positioned between member 47 and a collar 50 to open the valve, allowing the syrup to flow from the bowl 16 through the valve into the can. It will therefore be seen that it is necessary to have a can positioned in the opening 24 of the main star wheel 23 in order to open the valve as the flanged member 47 must bear against the top of the can in order to overcome the pressure of the spring 51 before the opening of the valve can be effected. In this way, if no can is positioned in an opening 24 the valve remains closed throughout its downward travel.

When the valve has reached its lowermost position, the roller 32 is in engagement with cam portion C maintaining the valve in its lowermost position as shown by the left hand valve in Figure 3 while the filling means rotates as previously explained. Shortly before the filling means has rotated the can 12 to the discharge station 27 the roller 32 leaves the cam portion C and engages the gradually upwardly inclined portion H of cam 30 which moves the valve 19 upwardly first releasing the spring pressure on the valve head 49 to instantly close the valve, cutting off the flow of syrup, and then removing the flanged member 47 up out of engagement with the top rim of the can to allow its removal at the discharge station by the take-off means 14.

As previously mentioned the cans are supplied to the filling means 13 by a conveying means 11 comprising a conveyor belt 52 which carries the cans from a source of supply (not shown) to a small star wheel 53 provided with semi-circular openings 54 in its periphery which picks the cans off the conveyor belt and carries them to the filling means 13. As seen in Figure 1 an adjustable guide bar 56 mounted above and overlying one side of the conveyor belt 52 extends to the periphery of the star wheel 53. Mounted in substantially the same plane as the adjustable guide member 56 but spaced therefrom to overlie the other side of the conveyor belt is a short stationary guide bar 57 approximately half the length of the adjustable guide member 56, and a variable progressive pitch worm 58, which terminates approximately at an extension of the vertical center line of the star wheel 53, is provided to properly position the cans for reception by the star wheel 53. The cans 12 are maintained in alignment on the conveyor belt 52 while they pass between the adjustable guide member 56 and the stationary guide bar 57. When they are carried past the guide bar 57, they engage the first wrap of the worm.

In the prior art a worm of constant pitch has been utilized to feed the cans to the star wheel which has necessitated changing the worm whenever cans of different diameters were to be fed into the apparatus. Also, the prior art worms were used to hold back the cans and therefore the cans were subject to movement between the final wraps of the worm with consequent mistiming. The variable progressive pitched worm of my invention will accommodate cans of any diameter, however, and feed them into the star wheel 53 at the required rate of speed. As will be seen in Figure 1, the first wraps of the worm are positioned sufficiently close together so that only a single can of the smallest diameter to be used in the apparatus can be placed therebetween. Succeeding wraps are progressively spaced further apart with the last wrap delivering the cans to the star wheel

53 at the proper speed. The first one and one-half wraps of the worm actually slows down the intercepted container on the belt, and then the wraps are positioned to accelerate the container faster than the speed of the belt. The final wrap is synchronized with the forward speed of star wheel 53, and as such wrap actually advances rather than holds back the container, the container will always be in time with the star so as to be received in an opening in the latter.

The adjustable guide bar 56 is provided with a coil spring 59 mounted in a cut-out portion 61 thereof opposite the worm 58, substantially parallel with the vertical face 62 of the guide member 56. When a container is moved laterally of the belt by engagement with a wrap of the worm, the spring will be deflected and resiliently urge the container against the worm while preventing the container from passing over the wrap to prematurely advance into a forward pocket. Because of the above described timing the cans, regardless of their size, will be fed into the star wheel 53 at the proper speed, thereby avoiding ganging up, jamming and tipping over of the cans at this point.

When cans of small diameter are to be fed into the apparatus the adjustable guide member 56 is moved in closer to the stationary guide bar 57 and the worm 58 to maintain the cans in the desired position on the conveyor belt. In order to accomplish this the guide member 56 is provided with brackets 63 adjustably mounted on a housing 64 by means of bolts 66 extending through the housing 64 and slots 67 of the brackets 63, the ends of said bolts being threaded to receive nuts 68 which when loosened allows the adjustment of the guide member 56.

When the star wheel 53 has carried a can off the conveyor belt a guide member 71 having a substantially semi-circular vertical face 72 co-operates to guide the can as it rotates with the star wheel 53 in a clockwise direction (as viewed in Figure 1) onto platform 22 and the pick up station 26 at which point the main star wheel 23 and the feeding star wheel 53 are in tangential relationship whereby an opening 24 of the main star wheel 23 meshes with an opening 54 of the small star wheel 53. As will be seen in Figure 1 the diameter of the small star wheel 53 is substantially half that of the main star wheel 23 and is provided with a fractional number of semi-circular openings in its periphery, and as both star wheels rotate at the same rate of speed, as will later be explained, whenever an opening 24 of the main star wheel reaches the pick up station 26 a similar opening 54 of the small star wheel 53 is likewise positioned at the pick up station where the two openings mesh to encircle the upper portion of the can which brings any deformed elliptical cans back into round before they enter the filling means whereby the filler valve may be properly seated and actuated.

The can has in this way been carried from the source of supply to the filling means along a common horizontal plane where it rests on the platform 22 of the filling means. Continued rotation of the two star wheels effects the disengagement of the can from the small star wheel 53 and entry into the filling means 13, where it rotates with the filling means in a counter clockwise direction to the discharge station 27 where it is removed from the apparatus by the take-off means 14. The latter comprises a star wheel 73 provided with semi-circular openings 74 similar to the star wheel 53, a guide surface 76 and a conveyor belt 77. The star wheel 73 cooperates with the main star wheel 23 for removal of the cans in the same manner as the star wheel 53 introduced the cans into the filling means. That is, when a can has reached the discharge station 27 the rotation of the main star wheel 23 and the star wheel 73 are so timed together that an opening 24 and an opening 74 are meshing to encircle the can which is then guided away from the filling means 13 by the star wheel 73 and a vertical semi-

circular guide surface 76 of the guide member 71 which is identical to the vertical guide face 72 that cooperates with the star wheel 53. Continued rotation of the star wheel 73 carries the can onto the conveyor belt 77 which moves at the same rate of speed as does the star wheel 73 and the can is thereupon removed from the apparatus for capping or any other desired operation.

From the foregoing it will be clearly seen that the star wheels 23, 53 and 73 and the worm 58 rotate at the same rate of speed in order to provide uniform movement of the cans throughout the apparatus. To this end, I have provided a vertically disposed hollow center shaft 81 whose upper extremity is bolted or otherwise rigidly secured to the bottom 17 of the bowl 16, as shown in Figure 3, and extends downwardly through a sleeve 82, the upper extremity of which is bolted to the bottom of the platform 22 to which is secured in vertical spaced relation the main star wheel 23. The hollow center shaft 81 is provided with a key 83 vertically movable in a keyway 84 of the sleeve 82 to allow for vertical adjustment of the bowl 16 in relation to the star wheel 23, as will later be discussed, however, the key 83 maintains simultaneous rotation of the shaft 81 and the sleeve 82 so that the bowl 16 and the star wheel 23 rotate as a unit. The sleeve 82 is journaled in roller bearings 86 mounted in a guide column 87 extending downwardly from the top of the housing 64 and is secured at its lower extremity to a horizontally disposed framework 88 supported by two longitudinally extending channel members 89 welded or otherwise secured to the sides of the housing 64. The lower extremity of the sleeve 82 is keyed at 91 to a main gear 92 meshing with a gear 93 whose diameter is approximately one-half of the main gear. The gear 93 is secured to the lower extremity of a vertically disposed shaft 94 which is journaled in a bearing mounted on the framework 88. Keyed to shaft 94 somewhat above the framework 88 is a bevel gear 96 which engages at right angles a bevel gear 97 rigidly secured to one end of a horizontally disposed shaft 98 which extends through the housing 64 to a motor (not shown). Therefore, it will be seen that when the motor rotates the shaft 98 motive power is supplied through the bevel gears 96 and 97 to the gear 93 and thence to the main gear 92, which rotates the filling means 13. Meshing with the main gear 92 and identical to gear 93 is another gear 99 secured to the lower extremity of a vertically disposed shaft 101 journaled in bearings mounted in framework 88. The upper extremity of the shaft 101 rigidly carries the small star wheel 53 of the conveying means 11, while the upper extremity of the shaft 94 to which is secured the gear 93 carries the star wheel 73 of the take-off means 14. Therefore, by maintaining a ratio of one to two the gears rotate the star wheels at the same rate of speed. In order to transmit similar uniform rotation to the worm 58 I have provided an idler gear 102 which meshes with the gear 99 and is secured to the lower extremity of a stub shaft 103 journaled in bearings mounted in the framework 88 above which is secured to the shaft another idler gear 104 engaging a gear 106 which is keyed to a vertically disposed shaft 107 the lower extremity of which is journaled in bearings mounted in the framework 88. The shaft 107 extends upwardly to the housing 64 and its upper extremity carries a helical gear 108 which drives at right angles a helical gear 109 rigidly carried by an extension of the worm 58.

Means are provided for vertical adjustment of the bowl 16 in relation to the platform 22 of the filling means 13 in order to permit the filling of cans of various heights. To this end I have threaded the lower extremity of the center shaft 81 which engages a rotatable internally threaded circular member 111 and as shown in Figure 3 is positioned immediately subjacent the lower flanged extremity of the sleeve 82 and held in place by a retaining ring 112 which is bolted to the lower surface of the main

gear 92. The threaded member 111 at its lower end is provided with a reduced portion on which fits a handle 113. Rotation of the handle 113 causes similar rotation of the threaded member 111 which acts as a rack on the threaded extremity of the center shaft 81 effecting the vertical adjustment of the bowl 16 within the limits of the key 83 permitted by the keyway 84 provided in the sleeve 82. It will be noted however that the key 83 allows for vertical movement only of the bowl 16 so the vertical alignment of the valves 19 with the semi-circular openings 24 of the main star wheel remain fixed and are never altered. When the bowl has been adjusted to the desired height in relation to the platform 22 a clamping member 114 which is mounted on the upper surface of the platform 22 is tightened by means of bolts 116 to insure vertical rigidity of the bowl.

Adjustment of the bowl height requires a similar adjustment of the cam 28 since the rollers 32 being carried by the valves 19 move up or down with the bowl. I have therefore provided adjustable supporting means for the cam 28 which means includes a plurality of vertically disposed support rods 117 which are mounted on the housing 64 and whose upper threaded extremities pass through apertures 118 in ears 119 provided on the outer periphery of the cam 28. Adjusting nuts 121 and 122 by being screwed up or down on the threaded portion of the support rods 117 move the cam into proper relation with the rollers 32.

When cans of smaller diameter are to be fed into the apparatus the semi-circular openings 24, 54 and 74 of star wheels 23, 53 and 73 are provided with bushings 123 as illustrated in Figure 6 which have semi-circular openings of substantially the same diameter as the cans to be used in order to maintain the uniform feed of cans throughout the apparatus as heretofore described.

Commencing now with a complete cycle of operation, the cans 12 which have been filled with pieces of fruit or the like are introduced into the conveying means 11 on the conveyor belt 52 where they are maintained in position thereon between the adjustable guide member 56 and the stationary guide bar 57. When the conveyor belt carries the cans beyond the stationary guide bar, the progressive pitch worm 58 spaces the cans apart from one another and the spring 59 mounted on the stationary guide member maintains the cans in contact with the worm. The last three-quarters of the worm wrap corresponds to the movement of the star wheel 53 so the cans are uniformly fed from the conveyor belt to the said star wheel where the vertical face 72 of guide member 71 co-operates with the semi-circular openings 54 of the star wheel to rotate the cans in a clockwise direction to the pick up station 26 of the filling means 13. The star wheel 53 and the main star wheel 23 rotate at the same rate of speed and when a can has been delivered to the pick up station an opening 54 of the star wheel 53 and an opening of the main star wheel 23 are in mesh so that the can is substantially encircled therewithin. At this point a valve 19 is aligned directly over the can and has commenced its downway descent by means of the rollers 32 engaging the descending portion B of the upper cam 28. The bowl 16, the platform 22, and the main star wheel 23 rotate together in a counter clockwise direction and the can is rotated with the filling means out of engagement with the openings of the star wheel 53. The valve then descends into seated open position on the top of the can which is thereupon filled with liquid during a greater part of the rotation of the filling means during which time the roller of the valve 19 is in constant engagement with the cam surface C, including the air expunging cycles. A short time before the filling means has reached the discharge station 27 the roller leaves the gradually inclined portion H of the lower cam 30 thereby closing the valve, permitting liquid to drip from the valve head, and then raising it so the can is free to be removed at the discharge station by the star wheel 73 where an opening 74 therein

meshes with the opening 24 of the main star wheel. The star wheel 73 rotates in a clockwise direction and guides the can from the filling means in a circular path defined by the vertical face 76 of the guide member 71 onto the take-off conveyor belt 77 where the filled can is removed from the apparatus.

I claim:

1. Liquid filling apparatus comprising a tank having a horizontally disposed bottom, means on said bottom defining a plurality of circumferentially spaced openings, a valve having a cylindrical housing in free communication with said tank mounted for vertical sliding movement in each of said openings and having a valve head for sealing the lower opening of said housing, spring means normally urging said valve head in sealing engagement and adapted to yield to open said housing when said housing is moved downwardly upon a container, means for rotating said tank about a vertical axis, stationary cam means extending around said tank, roller members operatively engaged with said cam means, and means positioned exteriorly of said tank connecting each of said roller members with the housings of the respective valves whereby said housings will be moved vertically upon rotation of said tank, said connecting means including a vertically slidable member respectively operatively connected to said roller members and said valves, and means supporting said latter member for vertical sliding movement.

2. Apparatus as set forth in claim 1 in which said cam means is provided with upper and lower cam surfaces, said upper surface engaging the upper peripheral portions of said rollers and said lower surface engaging the lower peripheral portions of said rollers, said upper surface extending for approximately 300 degrees around said bowl whereby said rollers and said valves are urged to a lowered position, and said lower surface extending substantially between the ends of said upper surface and including upwardly and downwardly inclined portions whereby said rollers may be raised above said upper surface for raising said valves and returned to said upper surface for maintaining the valves in their lower position.

3. Liquid filling apparatus comprising a generally cylindrical tank having a plurality of circumferentially spaced openings in the bottom thereof, a valve mounted for vertical movement in each of said openings, a vertically disposed drive shaft secured at the upper end thereof to the bottom of said tank, a threaded member adjacent the lower end of said shaft and engageable with the latter, a horizontally disposed platform for containers to be filled releasably secured to said shaft intermediate the ends thereof, drive means for rotating said shaft, and means effecting vertical movement of said shaft and said tank relative to said platform while maintaining the radial positioning therebetween and without effecting rotation of said shaft.

4. Liquid filling apparatus comprising a tank having a horizontally disposed bottom portion, a plurality of circumferentially spaced valves mounted for vertical reciprocatory movement in said bottom, each of said valves including a depending valve head resiliently urged into sealing engagement therewith, means for rotating said tank about a vertical axis, means for conveying a plurality of containers subjacent said tank bottom along a horizontal path in vertical alignment with the respective valves whereby upon descension of the latter and engagement with said containers the valves will open by separation from said valve heads, means for raising and lowering said valves including a peripherally extending cam and cam rollers operatively connected to the respective valves, means for maintaining said valves in raised and lowered positions, and means for raising said valve heads from a lowered position comprising an upwardly sloping surface on said cam without disengagement from said containers and a sharply downwardly sloping surface for suddenly returning the valve heads to said lowered position.

5. Liquid filling apparatus comprising a tank having a horizontally disposed bottom portion, a plurality of circumferentially spaced valves mounted for vertical reciprocatory movement in said bottom, each of said valves having a depending valve head, means normally urging said heads into sealing engagement with said valves, means for rotating said tank about a vertical axis, means for conveying a plurality of containers subjacent said tank bottom along a horizontal path in vertical alignment with the respective valves whereby upon descension of the latter and engagement with said containers the valves will raise upwardly relative to said heads and open, means for raising and lowering said valves including a pair of vertically spaced cams positioned exteriorly of and extending around said tank and a plurality of cam rollers operatively connected to the respective valves, means for maintaining said valves in raised and lowered positions, and means including an upwardly inclined surface on the lower of said cams for slightly raising said valve heads above the liquid in said container and a horizontal surface for maintaining said valve heads in such slightly raised position whereby liquid thereon may drip into said container.

6. A method of filling containers with liquid which comprises moving a series of containers along a single horizontal plane with their open ends uppermost, moving a plurality of liquid filler valves each having a sealing head in a horizontal plane overlying said first mentioned plane, sequentially lowering said valves during the horizontal movement thereof to engage said cans, continuing downward movement of said heads so as to enter said containers and open said valves, intermittently jarring the liquid in said container to remove and expunge air pockets therefrom, and then raising and closing said valves.

7. A method of filling containers having solid articles therein with liquid which comprises moving a series of containers along a single horizontal plane with their open ends uppermost, moving a plurality of liquid filler valves

having depending valve heads in a horizontal plane overlying said first mentioned plane, sequentially lowering said valves during the horizontal movement thereof to engage said cans and containing downward movement of said valve heads into said containers to open said valves, raising and closing said valves while maintaining their position over said containers whereby liquid on said valve heads may drip into said containers, and then further raising said valves and moving said containers from under the same while still moving in a horizontal plane.

8. A method as set forth in claim 7 including expunging air from said cans intermediate said initial lowering of said valves and said raising and closing said valves.

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