

Aug. 15, 1967

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3,335,767

ACCURATE MEASURE ROTARY FILLING MACHINE

Filed Dec. 8, 1964

7 Sheets-Sheet 1

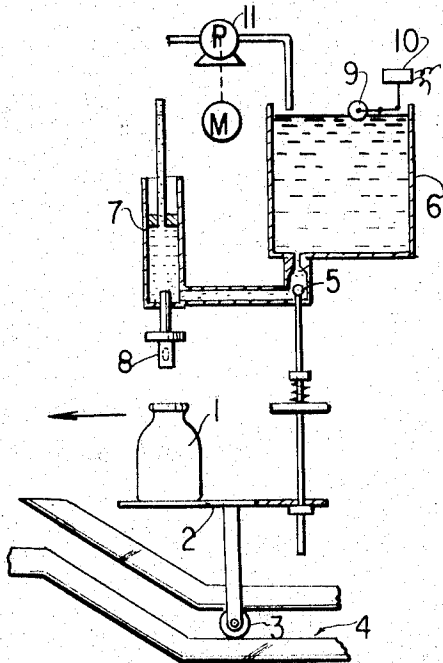


FIG. 1a

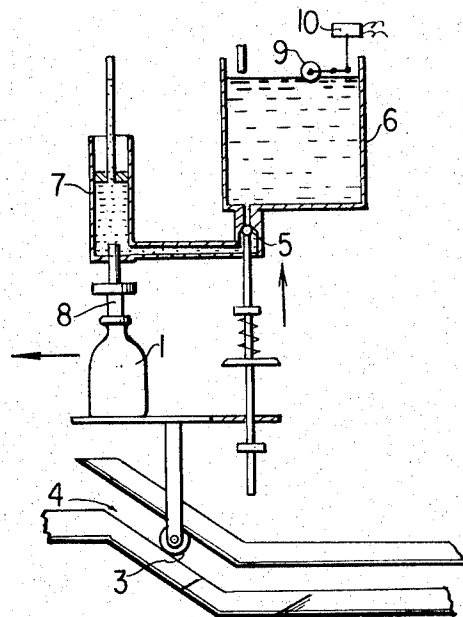


FIG. 1b

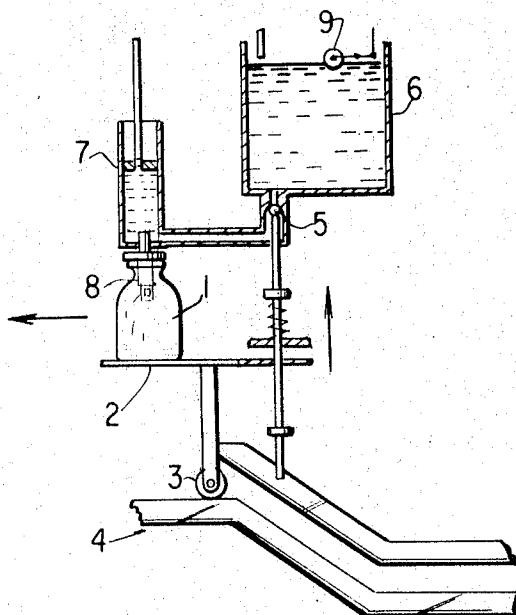


FIG. 1c

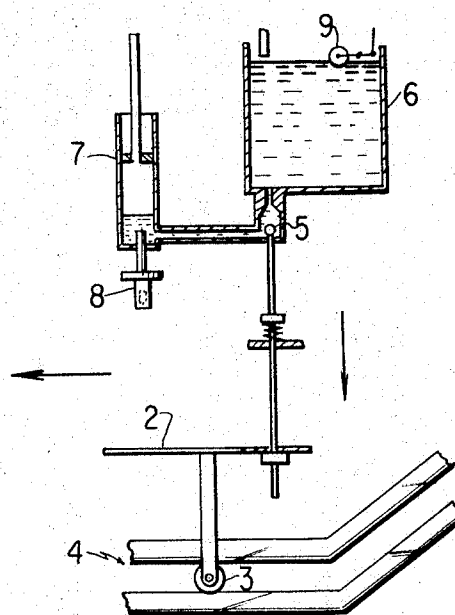


FIG. 1d

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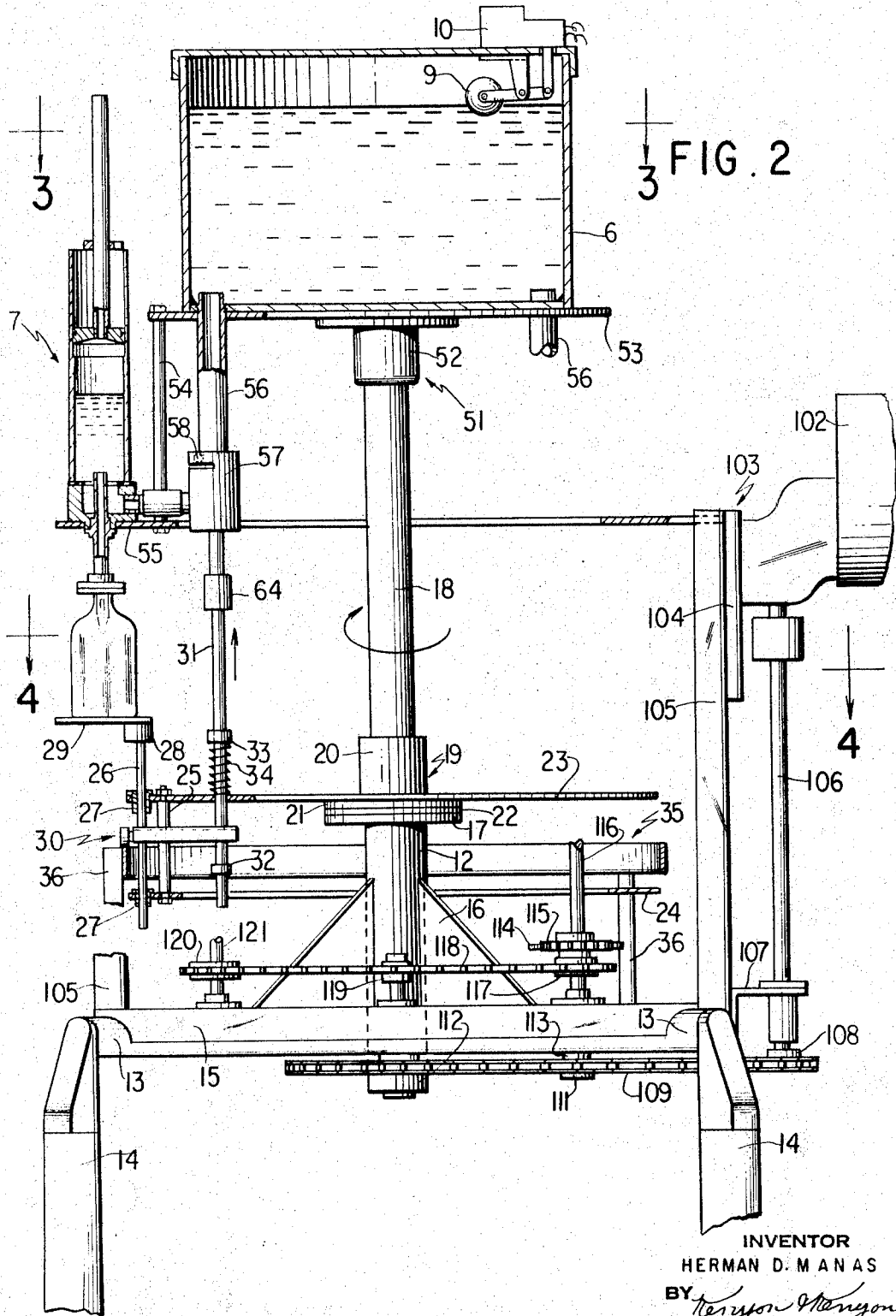
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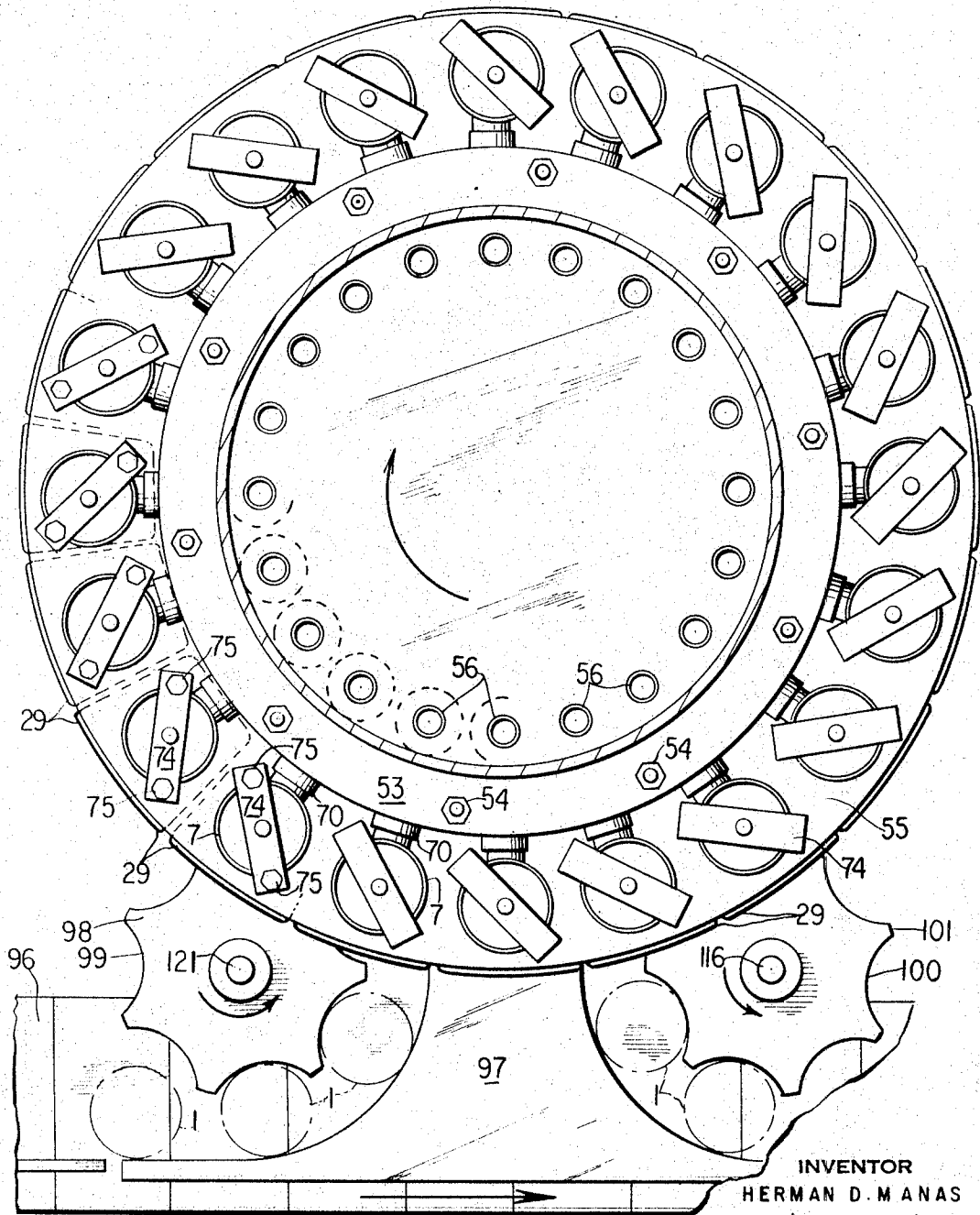
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ACCURATE MEASURE ROTARY FILLING MACHINE

Filed Dec. 8, 1964

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FIG. 3



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3,335,767

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Filed Dec. 8, 1964

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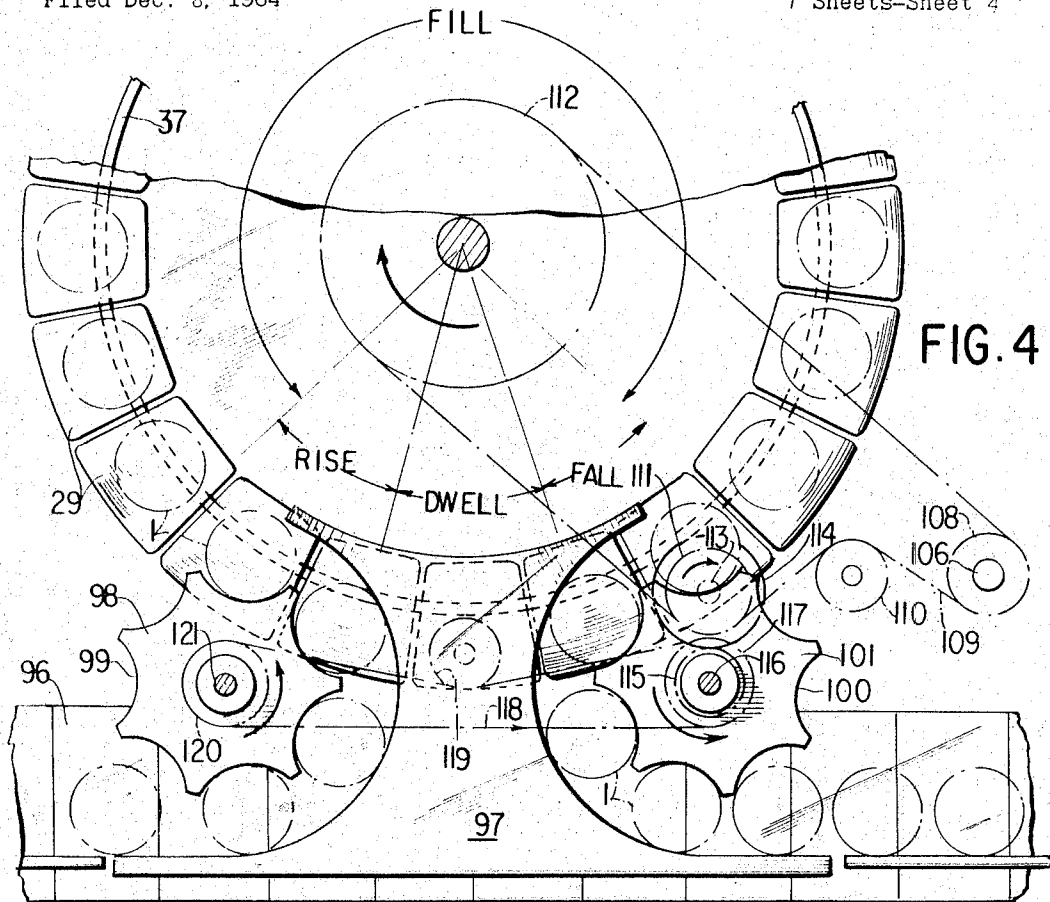


FIG. 4

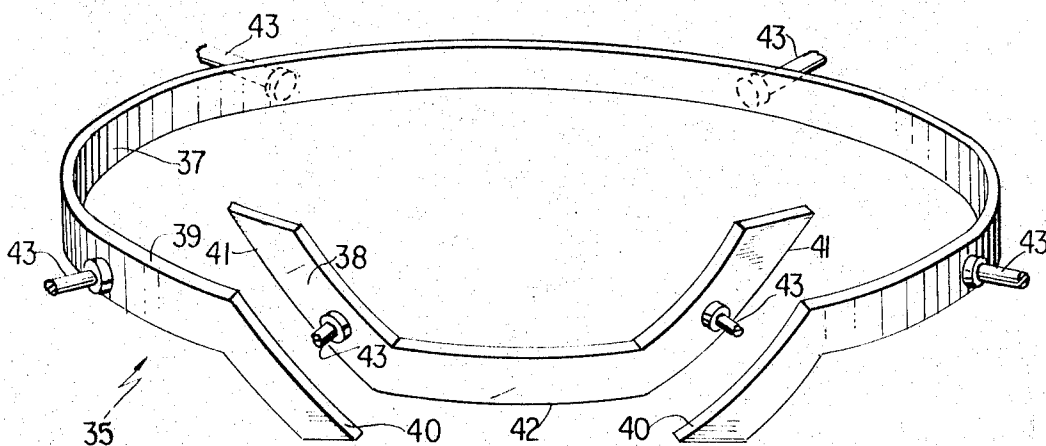


FIG. 5

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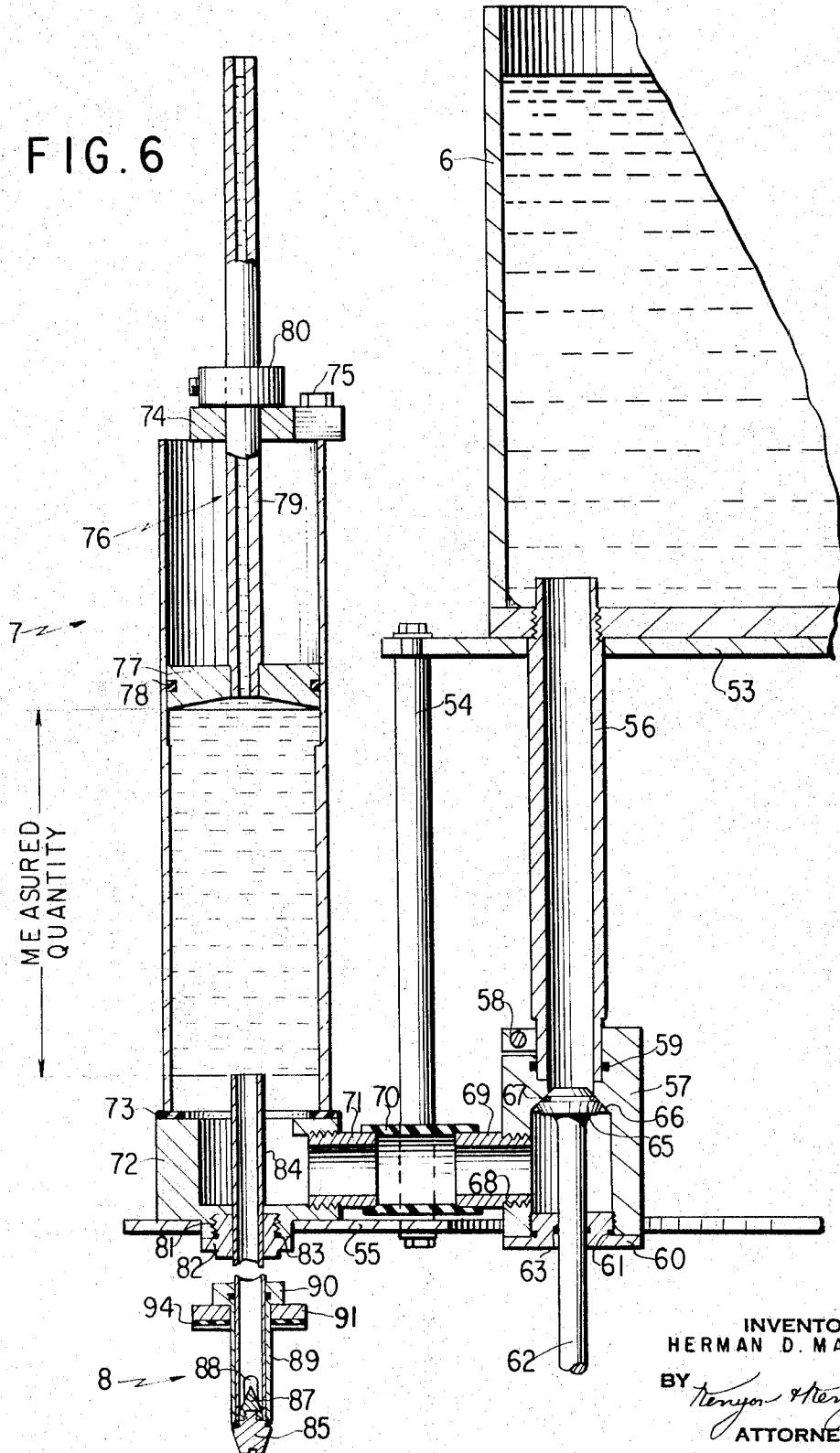
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ACCURATE MEASURE ROTARY FILLING MACHINE

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FIG. 6



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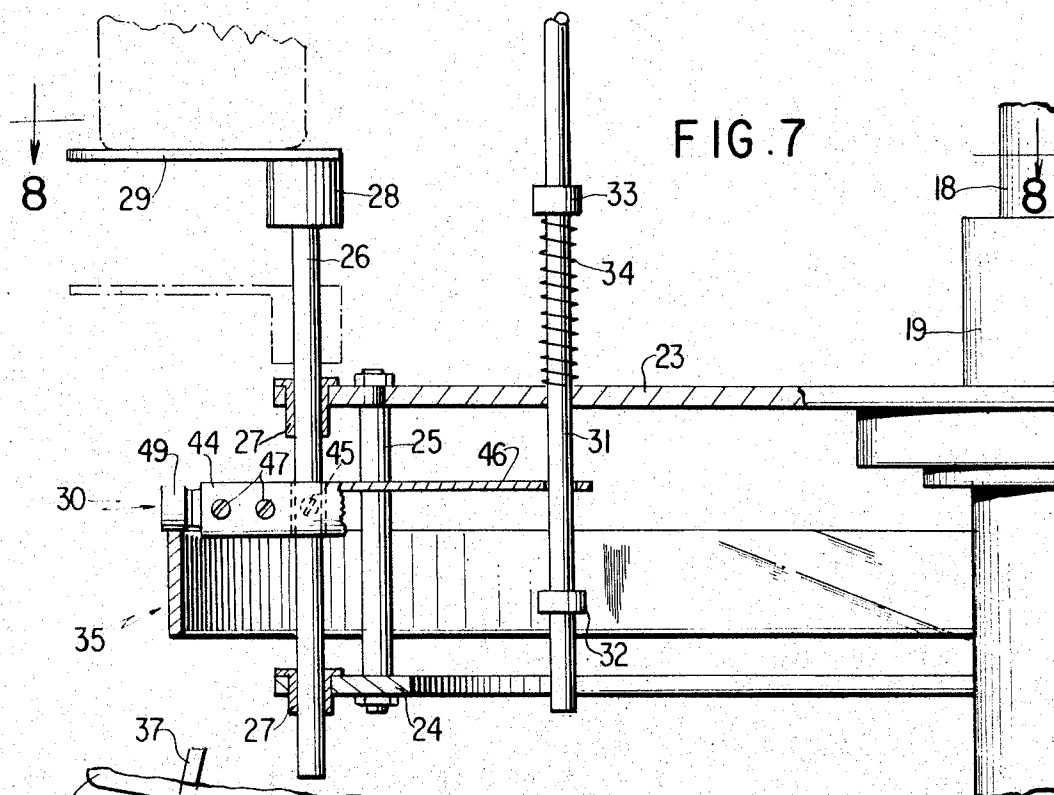


FIG. 7

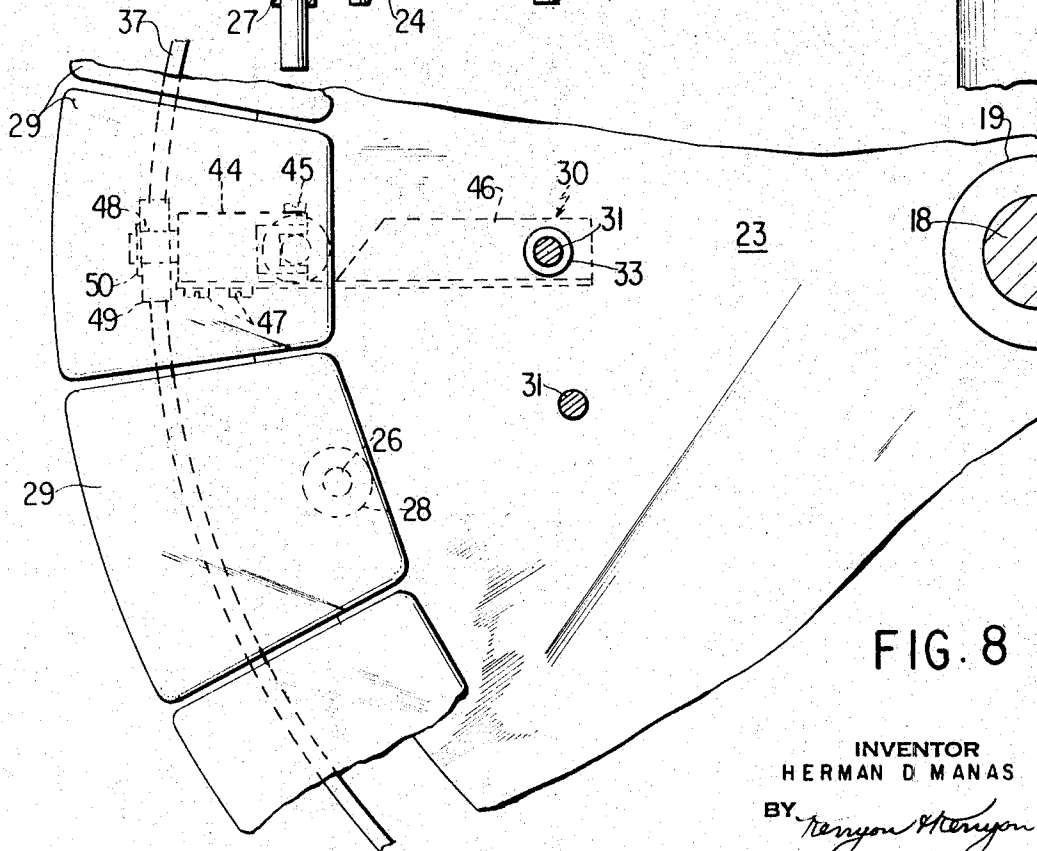


FIG. 8

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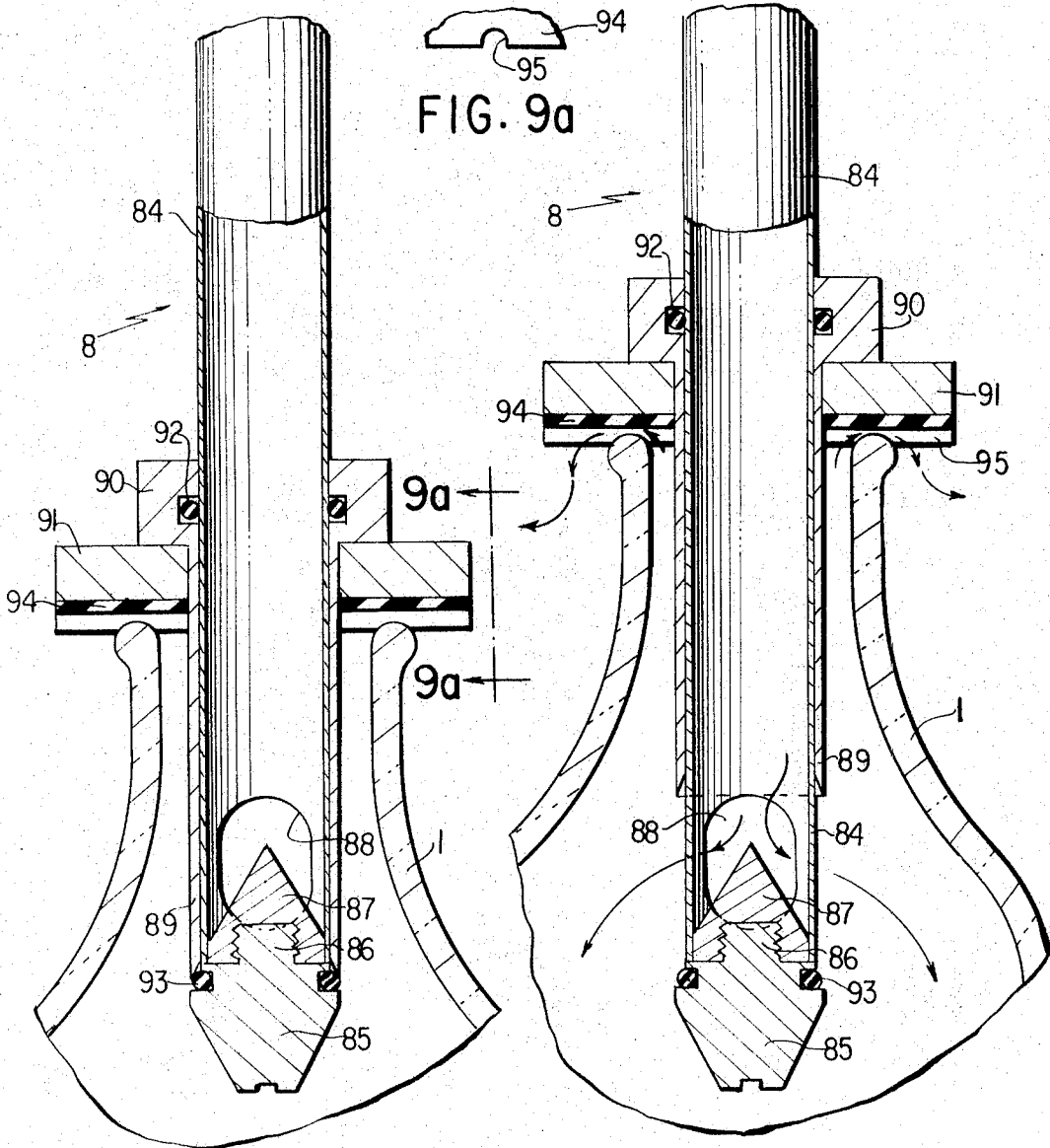
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Filed Dec. 8, 1964

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FIG. 9

FIG. 10



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ACCURATE MEASURE ROTARY FILLING MACHINE

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Filed Dec. 8, 1964, Ser. No. 416,804

4 Claims. (Cl. 141-147)

ABSTRACT OF THE DISCLOSURE

Rotary filling machine intended for accurate measure filling of containers being fed along a conveyor including a driven rotary table adjacent the conveyor, individual vertically reciprocal platforms carried by the table, a cam for elevating and lowering the platforms, fluid delivery means for delivering a measured quantity of fluid to a container on a platform of the rotary table from a fluid holder in controlled manner supplied from a source, the control being effected by valves operated by vertical reciprocation of the platforms while the rotary table is driven.

This invention relates to a rotary filling machine. More particularly, this invention relates to an accurate measure rotary filling machine.

It has been common practice in the fluid container filling art to revolve a series of containers on a table about a fixed axis and to fill them by means of plunger nozzles during their revolution. The plunger nozzles are generally of the kind that are brought into contact with the rim surfaces of the containers and the fluid is delivered through them into the containers by gravity or under a forced pressure. The fluid which flows into the containers has customarily been measured by an indicator means on the individual containers.

This type of fluid container filling has a number of disadvantages. First, the plunger nozzles which conduct the fluid into the containers tend to seal the containers during the filling operation, thus causing a pressure to build up in the containers. This becomes serious especially when the containers are made of plastic. Any excessive pressure will cause expansion of a plastic container and will so distort the volume therein that the content indicator on the container will not measure the actual amount of fluid therein.

Second, by placing the fluid content indicator on the containers, there is a problem in determining the actual point to which the containers are to be filled so that all the containers contain the same amount. This problem is due to the fact that the volumes of the containers vary either because of their individual geometric differences or because differently shaped containers are used.

Accordingly, it is an object of this invention to provide a means to accurately fill a fluid container.

It is another object of this invention to provide a means to accurately fill a fluid container with a predetermined amount of fluid.

It is another object of this invention to provide a means to accurately fill a fluid container without building up a pressure in the fluid container.

It is another object of this invention to synchronize the speed of a rotary filling machine with respect to the nature of the filling fluid to insure that the desired proper amount of fluid is placed in each container.

According to the present invention, a rotary filling machine is provided with a revolving table upon which a series of containers are mounted by individual lift platforms. The individual lift platforms are each connected with a rotatable cam follower which rolls along a cam

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surface. The cam surface comprises a ring concentric to the table axis and has a major portion of its upper surface in one plane. A minor portion of the cam surface is situated below the plane of the major portion and serves to define the limits of a fall, dwell and rise period for the rotatable cam follower as it rolls along the cam surface. The containers to be filled are fed individually one at a time onto successive lift platforms of the revolving table by means of a conveyor which runs in a direction tangential to the revolving table. The point at which each individual container is placed upon a lift platform is intermediately on the rise period of the cam follower on the cam surface.

The rotary filling machine is further provided with a feed tank which is fixed to and revolves with the revolving table. A plurality of conduit means are provided in the bottom of the feed tank and each one is connected to a fill cylinder. Each fill cylinder is provided with a fill nozzle in its bottom and an adjustable piston intermediate its top and bottom. The fill nozzle of each fill cylinder is positioned at a point which is vertically aligned with the mouth of a container when the container is mounted on a lift platform. The adjustable piston has an extended tube thereon with a constricted central bore therein. The adjustable piston is positioned in the fill cylinder at a point below the surface of fluid in the feed tank so that when the fill cylinder is filled with fluid from the feed tank to the bottom of the piston the desired quantity of fluid will be contained between the bottom of the piston and the top of the fill nozzle. The extended tube central bore will also continue to fill to the level of the fluid in the feed tank. When the fluid level in the extended tube reaches the fluid level in the feed tank the filling operation will stop. The amount of fluid in the extended tube bore will be of a minuscule amount and will not affect the total amount of fluids delivered into the containers to any unreasonable degree. The fill cylinder is marked with graded lines in order to indicate the amount of fluid contained therein to be delivered to the containers. Further, the extended tube may also be marked with graded lines to indicate the amount of fluid in the fill cylinder to be delivered to the containers.

The fill cylinders are filled with fluid from the feed tank during the dwell periods of the rotatable cam followers on the cam surfaces and are shut off from the feed tank by means of a valve upon completion of the dwell period. As the container in the lift platform is raised upwardly during completion of the rise period of the cam follower, the fill nozzle penetrates the mouth of the container. As the rim surface of the container approaches its upmost height upon completion of the rise period of the cam follower, it pushes a sleeve which surrounds the fill nozzle upwardly so as to expose a plurality of apertures in the base of the fill nozzle. This causes the fluid in the fill cylinder to empty through the fill nozzle into the container. The filling operation is completed during a revolution of the container on the revolving table and as the containers approach the conveyor means they are individually fed off the table onto the conveyor.

It is noted that the conveyor and rotary filling machine are operated in synchronism so that the containers are fed onto the table lift platforms uniformly. Further, the amount of fluid which is fed into the fill cylinders is controlled by the dwell period of the same follower on the cam surface. Hence, depending on the nature and amount of fluid desired in the fill cylinders, the speed of the rotary filling machine can be adjusted to provide the desired amount of fluid.

The level of fluid in the feed tank is kept within predetermined limits by means of a conduit which is con-

nected to a pump which pumps the fluid from a reservoir to the feed tank. A float switch is provided on the feed tank to maintain the level of the fluid above a predetermined level in the feed tank. As the fluid falls below the required level, the float switch will activate the pump to deliver additional fluid to the feed tank.

The nature and substance of this invention, as well as its objects and advantages will be more clearly perceived and fully understood by referring to the following detailed description and claims taken in connection with the accompanying drawings in which:

FIG. 1a is a schematic view of the rotary filling machine showing the dwell period during which the fill cylinder is being filled with fluid from the feed tank;

FIG. 1b is a schematic view of the rotary filling machine showing the rise period at the point at which a valve cuts off the flow of fluid from the feed tank to the fill cylinder;

FIG. 1c is a schematic view of the rotary filling machine showing the filling period of the liquid container immediately following the rise period;

FIG. 1d is a schematic view of the rotary filling machine showing the dwell period immediately following the fall period during which the feed tank refills the fill cylinder;

FIG. 2 is a front elevational view partly in cross-section of a part of the rotary filling machine taken at a point during the fill period of the container;

FIG. 3 is a view of the rotary filling machine taken on line 3—3 of FIG. 2;

FIG. 4 is a cross-sectional view taken on line 4—4 of FIG. 2;

FIG. 5 is a perspective view of the lift platform cam means;

FIG. 6 is a cross-sectional view of the feed tank and fill cylinder filling ducts;

FIG. 7 is a cross-sectional view of the cam follower, valve stem actuating means and lift platform adjusting means;

FIG. 8 is a view taken on lines 8—8 of FIG. 7;

FIG. 9 is a cross-sectional view of a container in initial contact with a nozzle filling means;

FIG. 9a is a view taken on line 9a—9a of FIG. 9, and

FIG. 10 is a cross-sectional view of a container in contact with the nozzle filling means during the filling period of the container.

Referring to FIGS. 1a, 1b, 1c and 1d, a series of schematic views, FIG. 1a shows a container 1 after it has just been mounted on a lift platform 2. The cam follower 3 is in the dwell period of its cycle around the cam surface means 4 and the valve 5 is in the open position to permit fluid from the feed tank 6, to fill the fill cylinder 7. FIG. 1b shows the cam follower 3 in its rise period during which the valve 5 shuts off the fluid flow from the feed tank 6 to the fill cylinder 7 and the fill nozzle 8 begins entry into the container 1. FIG. 1c shows the cam follower 3 on the uppermost cam surface and the container 1 being filled by fluid from the fill nozzle 8. The valve 5 remains in a closed position with respect to the feed tank 6 as the lift platform 2 rises to its uppermost position. FIG. 1d shows the cam follower 3 at a point in its dwell period during the filling period of the fill cylinder when the valve 5 is open with respect to the feed tank 6. In all these figures, a float 9 and switch arrangement is shown which provides an actuating means for a motor and pump assembly 10 to feed fluid from a reservoir (not shown) to the feed tank 6 when the fluid level in the feed tank 6 drops below a predetermined level.

Referring next to FIG. 2, the rotary filling machine lower head hollow main stem 12 is supported at its base by base members 13 which radiate outwardly from the hollow main stem 12 and are mounted on stationary support legs 14. The base members 13 are connected to each other by means of struts 15 which are welded to the base

members 13 near their radially outward ends. The lower head hollow main stem 12 is braced by means of gusset plates 16 welded to the base of the lower head hollow main stem 12 and the individual base members 13. The top of the lower head main stem 12 is provided with a thrust flange 17 which is secured to the main stem 12 in any suitable manner, for example, by welding.

A drive shaft 18 is rotatably received by suitable bearing sleeves within the lower head hollow main stem 12. The drive shaft 18 is provided at an intermediate point with a support flange 19 which comprises a cylindrical collar 20 secured to the drive shaft 18 and a thrust flange 21. A plastic thrust ring 22 is positioned around the drive shaft 18 below the thrust flange 21 and provides a thrust surface for the relatively rotatable thrust flanges 17, 21.

A lower head top plate 23 is secured to the flange 21 by any suitable means, such as bolts. A lower head bottom plate 24 is mounted a fixed distance from the lower head top plate 23 by a series of circumferentially spaced rod and bolt means 25. The top plate 23 has three concentric rows of holes therein and the bottom plate 24 has two concentric rows of holes therein which are in vertical alignment with the two outermost rows of holes in the top plate 23. The rod and bolt means 25 pass through each pair of vertically aligned holes in the innermost row of the vertically aligned holes in the top plate 23 and bottom plate 24.

A container lift shaft 26 passes through each pair of vertically aligned holes in the outermost row of holes in the upper plate 23 and lower plate 24. Each container lift shaft is slidably guided by a guide bushing 27 in the top plate 23 and bottom plate 24. A hub 28 is suitably secured to the top of each container lift shaft 26 by any suitable means, such as a locking screw. A container lift platform 29 is secured to the hub 28 by any suitable means, such as screws, and is made of any material which will not be affected by the fluid being used for fill purposes. A cam follower 30 is secured to the container lift shaft 26 at a point between the top plate 23 and bottom plate 24.

A valve stem connecting rod 31 passes through the innermost row of holes in the top plate 23 and the cam follower 30. Each valve stem connecting rod 31 is provided with a shaft collar 32 below the cam follower and a shaft collar 33 above the top plate 23. A coil spring 34 is placed around the valve stem connecting rod 31 between the collar 33 and top plate 23.

A cam means 35 is mounted on the struts 15 by vertical cam support brackets 36. The cam means 35 is selectively positioned intermediately of the top plate 23 and bottom plate 24, to provide a support surface for the cam follower 30.

Referring next to FIG. 5, the cam means 35 is shown as comprised of a main segment 37 and a front segment 38. The main segment 37 of the cam means comprises a major surface portion 39 in a level plane and two minor surface portions 40, one at each end of the major portion, which are inclined out of the plane of the major portion. The front segment 38 comprises two inclined end portions 41 parallel to and spaced from the inclined portions 40 of the main segment 37 and a level surface portion 42 which is parallel to and spaced below the plane of the major surface portion 39 of the main segment 37. The main segment 37 and front segment 38 are each provided with suitable connecting pins 43 which vertically and adjustably connect the cam means 35 to the vertical cam support brackets 36.

Referring next to FIGS. 7 and 8, the cam follower 30 is shown comprised of a cam follower bracket 44 which is secured to the container lift shaft 26 by suitable screw means 45 and a valve actuating angle 46 through which the valve stem connecting rod 31 passes. The valve actuating angle 46 is secured by screws 47 to the cam follower bracket 44. The cam follower 30 further comprises a stub shaft 48 which projects outwardly from

the cam follower bracket 44 and upon which a suitable roller 49 is rotatably mounted, for example, by means of a press-fitted plastic sleeve in the roller or in any other suitable way. The roller 49 is retained in place on the stub shaft 48 by means of a split retaining ring 50 which is snapped into a suitable groove in the stub shaft 48.

As the drive shaft 18 rotates in the lower head main stem 12, it carries the lower head top plate 23 and bottom plate 24 with it. The rotating top plate 23 in turn carries the container lift shaft 26 and valve stem connecting rod 31 with it. The cam follower 30 is thus caused to have its roller 49 roll on the upper surface of the fixed cam means 35.

The roller 49 travels around the major co-planar surface portion 39 of the cam means main segment 37 until it reaches an inclined end surface portion 40. The roller 49 will then continue to roll on the inclined end surface portion 40, but will fall downwardly with respect to the lower head top plate 23. As the cam follower 30 falls, it carries the container lift shaft 26, hub 28 and container lift platform 29 with it as shown in dotted lines in FIG. 7. The front segment 38 of the cam means 35 is utilized to insure the downward motion of the cam follower 30 and to maintain the roller in its lowermost position during the dwell period which is represented by the level surface portion 42 of the cam means front segment 38.

At a point on the inclined surface portion 40 before the roller 49 reaches the level surface portion 42 of the cam means front segment 38, the valve actuating angle 46 comes into contact with collar 32 on the valve stem connecting rod 31. Thereafter, the cam follower 30 forces the valve stem connecting rod downwardly through the hole in the top plate 23 and the coil spring 34 is compressed between the collar 33 and top plate 23.

After passing through the well period, the roller 49 rolls on the other inclined end surface portion 40 of the cam means main segment 37 in an upward direction with respect to the top plate 23. This causes the container lift shaft 26, hub 28 and platform 29 to return to their original planes. So also, the downward force on the valve stem connecting rod 31 is released and the coil spring 34 returns the rod 31 to its original plane.

Referring again to FIG. 2, the upper end of drive shaft 18 has a feed tank 6 mounted thereon by suitable flange means 51. The flange means 51 comprises a support collar and flange 52 and a tank support disc 53. The tank support disc 53 is provided with a pair of concentric rows of holes. The feed tank 6, which has a concentric row of holes in its bottom, is mounted on the tank support disc 53 in such a manner that the series of concentric holes in the feed tank 6 are vertically aligned with the innermost row of holes in the tank support disc 53 and the walls of the feed tank 6 lie between the two concentric rows of holes in the tank support disc 53.

Spacer bars 54 pass through the outermost row of holes in the feed tank support disc 53 and mount a nozzle block support ring 55 vertically below the feed tank support disc 53.

Referring next to FIG. 6, a valve block support tube 56 is threadably mounted in the bottom of the feed tank 6 and passes through the innermost row of holes in the feed tank support disc 53. The lower end of the valve block support tube 56 supports a through bored main valve block 57 by any suitable means, such as by a split collar and bolt means 58. An O-ring 59 or similar packing is placed between the internal bore wall of the main valve block 57 and the external surface of the valve block support tube 56 to seal the members against leakage of fluid.

The main valve block 57 has a valve stem guide bushing 60 threadably secured in the bore at the bottom thereof. An O-ring 61 or other similar packing suitably seals the main valve block 57 and valve stem guide bushing 60 surfaces against fluid leakage. A main valve stem 62 is slidably received within the valve stem bushing 60

and an O-ring 63 or similar packing seals the surfaces of the main valve stem 62 and valve stem guide bushing 60 against fluid leakage. The main valve stem 62 is joined to the valve stem connecting rod 31 by means of a coupling 64.

The head 65 of the main valve stem 62 is provided with a conical surface which is adapted to contact a conical bore portion 66 of the main valve block 57 so as to shut off any flow of fluid from the valve block support tube 56 into the main valve block. The surface of the head 65 is provided with an O-ring 67 or similar packing to seal the head 65 and conical bore portion 66 against fluid leakage when in contacting relationship.

The main valve block 57 is further provided with a threaded bore 68 into which a threaded hose nipple 69 is secured. The other end of the hose nipple 69 is press-fitted into a plastic tube 70 and a second hose nipple 71 is press-fitted into the opposite end of the plastic tube 70. The second hose nipple 71 is threadably received within a bore of a fill cylinder mounting block 72.

The fill cylinder mounting block 72 has a gasket such as a rubber sealing ring 73 mounted on the uppermost surface. A hollow transparent fill cylinder 7 is positioned on the rubber sealing ring 73 and is tied down in compressive sealing engagement with the sealing ring 73 by means of a holddown strap 74. The holddown strap 74 passes over the top of the fill cylinder 7 and is secured to the nozzle block support ring 55 by a pair of bolts 75, one at each end of the holddown strap 74 as shown in FIG. 3.

The fill cylinder 7 is provided with an adjustable piston 76 which comprises piston head 77 which is slidably received within the bore of the fill cylinder and is suitably sealed with respect thereto as by means of an O-ring 78. The piston head 77 has a central bore into which a constricted bore tube 79 is fixed. The constricted bore tube 79 passes through the holddown strap 74 and is mounted thereon with respect to a locking collar 80. The constricted bore tube 79 is of sufficient length to extend to at least the height of the fluid contained in the feed tank 6. The constricted bore tube 79 and fill cylinder 7 may each have a series of gradation lines thereon to indicate the amount of fluid in the fill cylinder 7 to be delivered to the container 1.

As shown in FIG. 6, the measured quantity of fluid which is necessary for the container to be filled is located in the volume defined by the top of the fill nozzle 8 and the bottom of the piston head 77. The additional fluid in the constricted bore tube 79 is of an insignificant amount and does not materially affect the amount of fluid delivered to the container 1.

The fill cylinder mounting block 72 is further provided with a threaded bore 81 at the lowermost surface into which a nozzle guide bushing 82 is threadably secured. The nozzle guide bushing 82 and bore 81 are sealed as by an O-ring 83 against leakage. A fill nozzle 8 is press-fitted into the guide bushing 82 and maintained in position thereby. The upper end of fill nozzle 8 projects upwardly into the fill cylinder to a predetermined level therein.

Referring next to FIGS. 9, 9a and 10, the fill nozzle 8 comprises a fixed tubular shaft 84 which is press-fitted into the nozzle guide bushing 82 and which has a conical head 85 attached at its lowermost end. The conical head 85 has a threaded projection 86 at its uppermost end upon which a cone-shaped member 87 is threadably mounted.

The lower portion of the fixed shaft 84 is provided with a plurality of apertures 88 through which fluid may flow. The fill nozzle 8 further comprises a slidable tubular shaft 89 which fits telescopically on shaft 84, and has a thrust flange 90 at the uppermost end. A thrust collar 91 is secured on the slidable shaft 89 adjacent the thrust flange 90 by any suitable means, such as by press-fitting. The relatively slidable surfaces of the fixed shaft 84 and

slidable shaft 89 are sealed by an O-ring 92 inserted within a groove in the thrust flange 90.

The conical head 85 is provided with a diametric portion of greater dimension than the slidable shaft 89 and is provided with an O-ring 93 which acts as a bumper stop means for the slidable shaft 89 as well as a seal when the slidable shaft 89 is at its lowermost position. The slidable shaft 89 is adapted to overlie the apertures 88 in the fixed shaft 84 in sealing relationship. The thrust collar 91 is provided with a cushioning means such as a rubber ring 94 on its bottom surface. The ring 94 has a plurality of radially extending grooves 95 in the lowermost surface, as shown in FIG. 9a.

In operation, as the nozzle 8 is inserted in a container 1, the ring 94 comes into contact with the lip of the container 1. Upon further insertion into the container 1, the ring 94 deforms slightly under the pressure, but the grooves 95 remain open. Further, the ring 94 and thrust collar 91 exert an upward force on the thrust flange 90 which causes it to move the slidable shaft 89 upwardly along the fixed shaft 84 causing the apertures 88 to become exposed to the interior of the container 1. The fill nozzle 8 is so positioned with respect to the nozzle guide bushing 82 and the mouth of a container 1 that the slidable shaft 89 completely exposes the apertures 88 to the interior of the container 1, as shown in FIG. 10, so that the fluid may flow into the container 1 from the fill cylinder 7. The grooves 95, as noted above, remain open so that as fluid is fed into the container 1, the air originally contained therein may escape through the grooves 95 without building up pressure in the container 1.

Referring next to FIGS. 3 and 4, a conveyor 96 conveys a series of containers 1 in the direction indicated by the arrow on the conveyor 96 to a guide member 97 which directs the containers 1 in a direction towards the container lift platform 29 of the rotary filling machine which rotates in the direction of the arrow thereon. An intake star member 98 is positioned between the guide member 97 and container lift platforms 29 to feed each container 1 onto a container lift platform 29. The star member 98 rotates in a direction indicated by the arrow thereon and is provided with a plurality of grooves 99 each of which is sized to rotatably guide one container 1 between the star member 98 and guide member 97.

The containers 1 are each fed onto a container lift platform 29 by guide member 97 and star member 98 at a point in the rise period of the cam follower 30 around the cam means 35. As each container 1 continues to be guided into its filling position on the container lift platform 29, the container lift platform is raised by means of the cam follower 30 moving on the upwardly inclined surface portion 40. Each container 1 is thereby raised until the cam follower 30 reaches the upper level portion of the cam means 35 which represents the container filling period of the cam follower 30 around the cam means 35. At this point, each container 1 will have enveloped a fill nozzle 8 and will have exposed the apertures 88 in the fill nozzle fixed shaft 84 by having forced the fill nozzle slidable shaft 89 upwardly. The fluid which is contained in the fill cylinder 7 will also have begun to drain into the container 1. The container filling operation will continue as each cam follower 30 and container 1 rotates around the axis of the drive shaft 18.

At a point in the container filling period, preferably at the start of the fall period of the cam follower 30 around the cam means 35, each container 1 will have received the desired measured quantity of fluid from the fill cylinder 7 and will be ready for discharge. The cam follower 30 then proceeds into the fall period and the container lift platform 29 begins to descend. The filled container 1 is then directed by the guide member 97 in a direction away from the container lift platform 29 and into a groove 100 in a discharge star member 101 which rotates in a direction indicated by the arrow thereon.

The discharge star member 101 moves the filled container 1 along the guide member 97 until it is again positioned on the moving conveyor 96.

After each container 1 is discharged, the cam follower 30 continues to move downwardly on the downwardly inclined surface portion 41 until it reaches the level surface portion 40 which represents the dwell period of the cam follower around the cam means 35. During the fall period, the valve 5 is opened by reason of the main valve stem 62 being moved downwardly by the cam follower 30 and fluid from the feed tank 6 begins to refill the fill cylinder 7. The fill cylinder 7 is continuously filled during the dwell period of the cam follower 30. At a point in the rise period of the cam follower 30 around the cam means 35, the valve 5 is closed by reason of the main valve stem 62 being moved upwardly by the coil spring 34 and the flow of fluid into the fill cylinder 7 ceases. The fill cylinder 7 is then ready to fill another container with the fluid therein. The flow of fluid from the feed tank 6 may also be stopped by reason of the fluid which is fed into the fill cylinder 7 achieving the same level in the extended tube 79 as the fluid in the feed tank; thereby insuring that there will be no spillage from the fill cylinder 7.

In order to provide the fill cylinder 7 with the proper amount of dischargeable fluid, the piston 77 is positioned at a desired fill quantity level in the fill cylinder 7 and the speed of the rotary filling machine is regulated with respect to the distance that the cam follower 30 travels from that point in the fall period when it actuates the opening of valve 5, through the dwell period, to that point in the rise period when it closes the valve 5. Thus, since this distance remains fixed, the speed of the rotary filling machine directly determines the amount of fluid delivered to the fill cylinder 7 from the feed tank 6. Further, since the distance which each container 1 travels from the point of initial filling to the point of stoppage of filling is fixed in relation to the rotary filling machine, the speed of the rotary filling machine will also directly determine the point in the container filling period at which the container 1 is completely filled with the desired quantity of fluid. Also, the position of the piston 77 in the fill cylinder 7 can be utilized to regulate the fill quantity to be delivered to a container at any selected rotary speed and viscosity of the fill fluid.

The drive means for the rotary filling machine is shown partly in section in FIG. 2 and schematically in FIG. 4. A motor 102 is mounted on a motor and gear frame 103 which is secured to the rotary filling machine under the conveyor 96. The frame 103 comprises a motor mount 104 which is secured and braced at its base to a strut 15 and a pair of vertical legs 105 which are secured at their bases to another strut 15. The legs 105 are joined at the tops thereof by a beam member (not shown). The beam member (not shown) carries a pair of support brackets (not shown) for the intake and discharge star members 98, 101.

The motor 102 drives a motor shaft 106 which is mounted in a motor frame bracket 107 which carries a twenty-four tooth star and drive shaft sprocket 108 at its lower end. The sprocket 108 drives a chain 109 which meshes with a drive shaft take-up idler 110, a twenty-four tooth drive shaft sprocket 111 and an eighty tooth drive shaft sprocket 112 which is secured to the lower end of the drive shaft 18. The motor 102 thus causes the drive shaft 18 to rotate in the direction indicated by the arrow shown in FIG. 4.

The drive shaft sprocket 111 is fixedly mounted on the lower end of a stud shaft 113 which carries a sixty tooth reverse direction spur gear 114 on its upper end. The drive shaft sprocket 111 and spur gear 114 rotate in the direction indicated by the arrow on the spur gear 114 shown in FIG. 4. The spur gear 114 mesh with a twenty-four tooth sprocket 115 which is mounted on a shaft 116. The shaft 116 is thus driven in a direction

counter to the spur gear 114. A twenty-four tooth star sprocket 117 is mounted on shaft 116 below the sprocket 115 and rotates in the same direction as the shaft 116. The shaft 116 is mounted on the strut 15 by means of a bracket (not shown) and the beam member (not shown). The shaft 116 carries the discharge star member 101 on the top end thereof.

The star sprocket 117 drives a chain 118 about a nineteen tooth idler take-up sprocket 119 and a second twenty-four tooth star sprocket 120. The second star sprocket 120 is mounted on a shaft 121 which carries the intake star member 98 on the top thereof. The shaft 121 is mounted in the same manner as shaft 116 on the strut 15 and beam member (not shown). The motor 102 thus causes the intake and discharge star members 98, 101 to rotate in the direction indicated by the arrows thereon in FIG. 3 and FIG. 4 which is counter to the direction of rotation of the drive shaft 18.

The motor 102 can be regulated so that the speed of the motor shaft 106 can be accelerated or decelerated to vary the speed of the rotary filling machine.

The conveyor 96 which is shown in FIGS. 3 and 4 is adapted to be secured to the motor and gear frame 103 of the rotary filling machine by suitable means, such as clips. This will aid in promoting a uniform flow of containers 1 to the rotary filling machine.

While I have thus described the invention, I do not wish to be limited to the precise details described, as changes may be readily made within the scope of the claims without departing from the spirit of my invention.

I claim:

1. A rotary filling machine comprising a fixed support; a rotatable shaft mounted on said fixed support for rotation thereon; an annular plate fixedly mounted on and radially extended from said rotatable shaft; a second plate located below the radially outermost portion of said annular plate; a plurality of circumferentially spaced vertical bars securing said two plates together; a plurality of circumferentially spaced vertically adjustable platforms slidably mounted on the radially outermost portion of said first-named annular plate; a plurality of lift shafts each slidably mounting one of said platforms in said annular plate and said second plate; a cam surface means fixedly mounted on said support comprising an interrupted annular ring having downwardly inclined end portions and an upper cam follower receiving surface and a ring segment positioned between said downwardly inclined end portions and having upwardly inclined end portions parallel to and spaced above said downwardly inclined end portions and a lower cam follower receiving surface; a cam follower secured to each of said lift shafts and rotatably mounted on said cam surface means; a support disc fixedly mounted and extending radially outwardly from the top of said rotatable shaft; a feed tank fixedly mounted on said support disc for containing fluid; a nozzle block support ring fixedly mounted on and below the radially outermost portion of said support disc; a plurality of circumferentially spaced nozzle blocks mounted on said nozzle block support ring, each having

a nozzle projecting downwardly therefrom; a plurality of circumferentially spaced fill cylinders each mounted in sealing engagement with respect to each of said nozzle blocks; an adjustable piston mounted in each of said fill cylinders; a plurality of circumferentially spaced valve block support tubes secured in the bottom of said feed tank and extending downwardly therefrom; a valve block secured to the lowermost end of each said valve block support tubes and operably connected with respect to a said nozzle block; a conduit means for affecting said operable connection; a valve stem passing through each said valve block having fluid passageways, a conically shaped head received in such valve block and adapted to close off the fluid passageway in such valve block from its said valve block support tube and having a stem portion slidably received within said annular plate and said cam follower; a first collar fixedly mounted on said stem portion above said annular plate; a second collar fixedly mounted on said stem portion below said cam follower on a plane intermediate said upper and lower cam follower receiving surfaces; a coil spring enveloping said valve stem between said first collar and said annular plate; and a drive means for rotating said rotatable shaft relative to said fixed support.

2. A rotary filling machine as set forth in claim 1 having a container feed means positioned adjacent said annular plate for delivering individual containers to each of said adjustable platforms.

3. A rotary filling machine according to claim 1 wherein each adjustable piston has a centrally bored piston head slidably engaging the walls of the hollow fill cylinder in which it is positioned and a longitudinally extending constricted bore tube mounted in the central bore of each such piston head, the top of said feed tank lying in a plane above the top end of the constricted bore tube.

4. A rotary filling machine according to claim 1, wherein said cam follower has a portion extending inward of said cam surface means and being slidably positioned around said valve stem portion between said pair of collars, said cam follower contacting one of said collars upon moving downwardly and forcing said valve stem downwardly whereby said head is moved to open said fluid passageway to allow fluid to pass therethrough and when said cam follower moves upwardly said coil spring forces the other of said collars upwardly whereby said head is moved to close said fluid passageway to prevent fluid from passing therethrough.

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