Sept. 11, 1956 S. S. AIDLIN 2,762,546

LIQUID FILLING APPARATUS

Filed Jan. 21, 1953 4 Sheets-Sheet 1

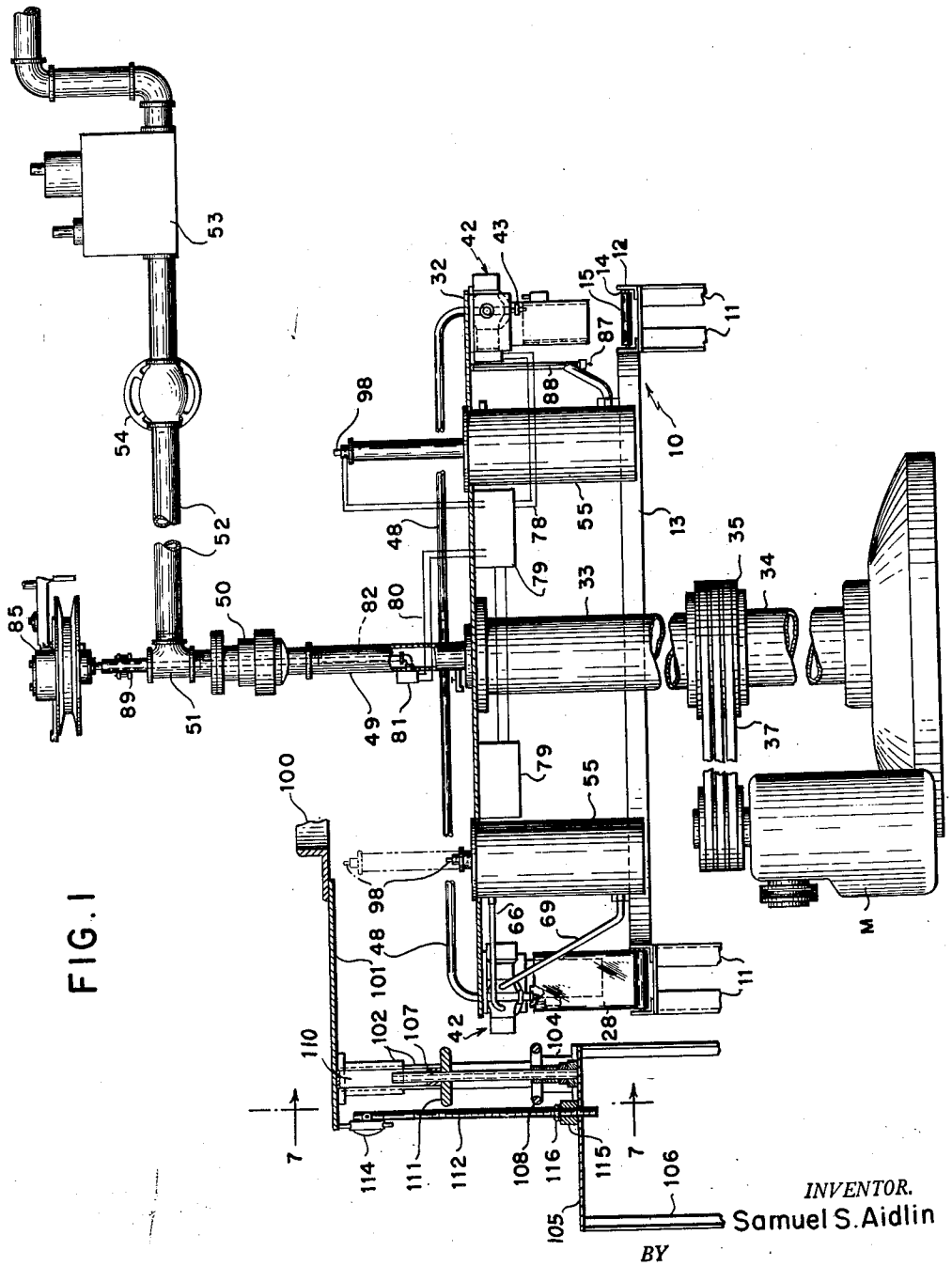


FIG. 1

INVENTOR.
Samuel S. Aidlin

BY

ATTORNEY

Sept. 11, 1956 S. S. AIDLIN 2,762,546

LIQUID FILLING APPARATUS

Filed Jan. 21, 1953 4 Sheets-Sheet 2

FIG. 2

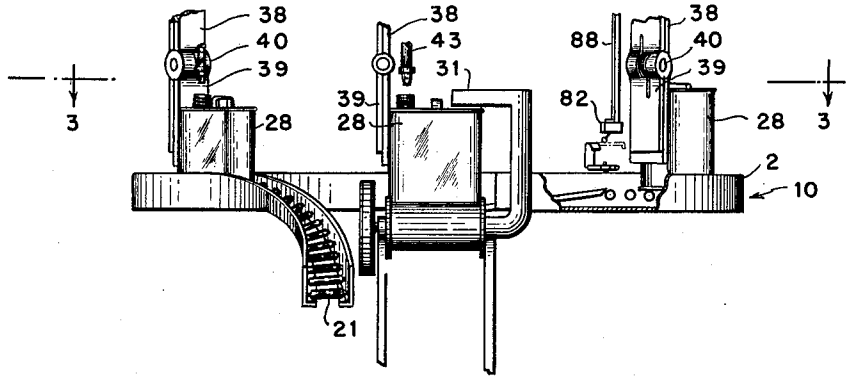
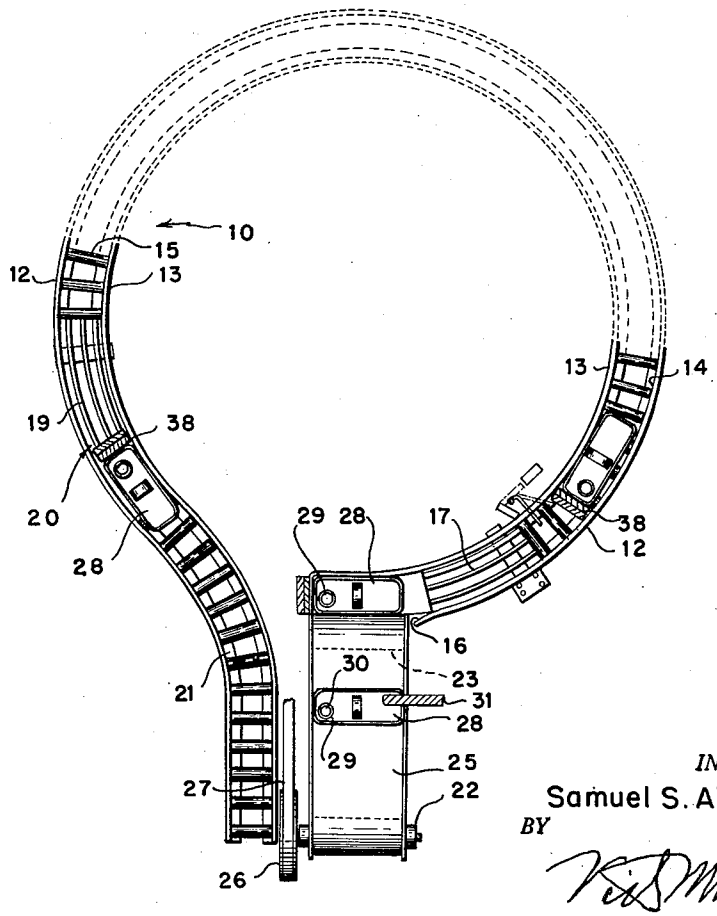


FIG. 3



INVENTOR.
Samuel S. Aidlin
BY
ATTORNEY

Sept. 11, 1956 S. S. AIDLIN 2,762,546

LIQUID FILLING APPARATUS

Filed Jan. 21, 1953 4 Sheets-Sheet 3

FIG.4

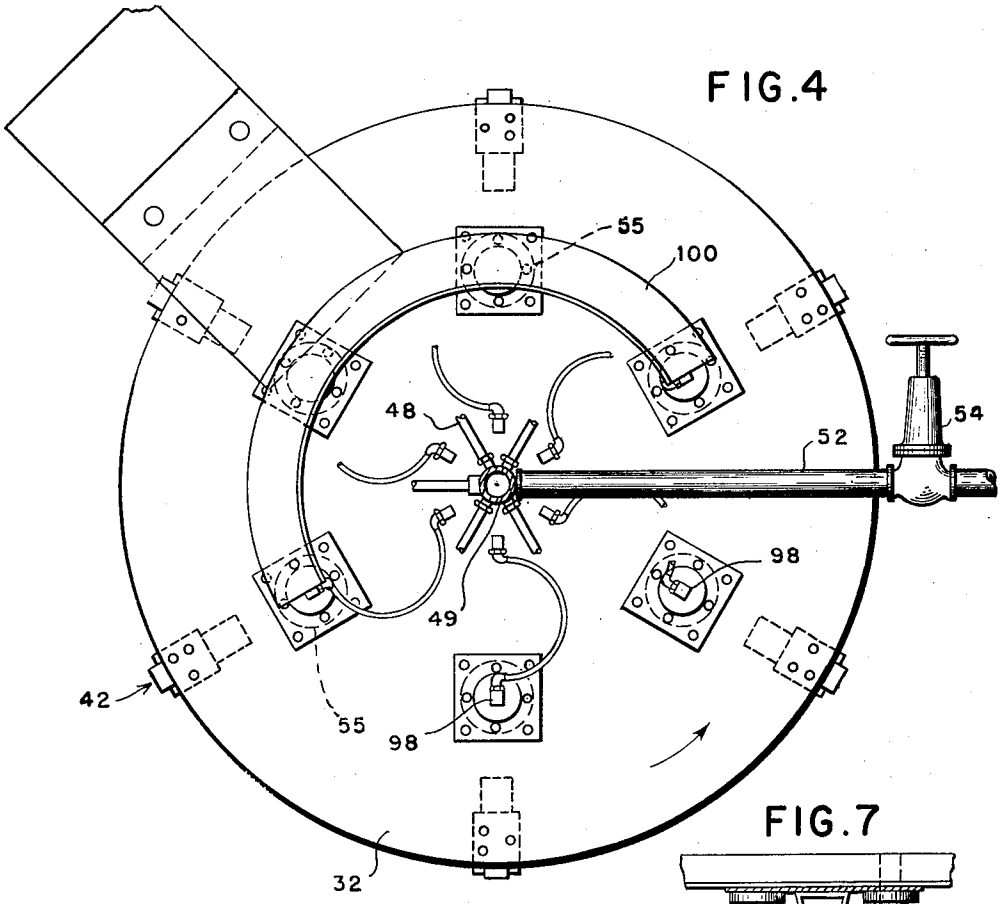


FIG.8

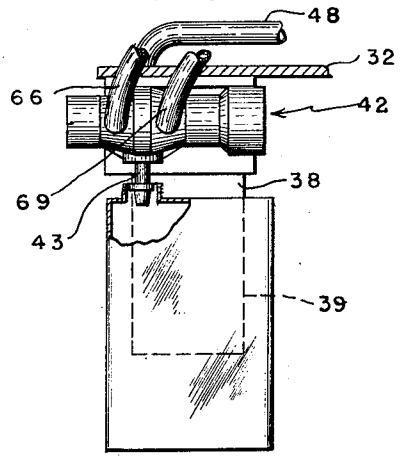
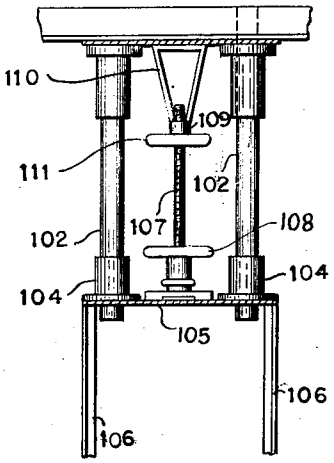


FIG.7



INVENTOR.

Samuel S. Aidlin

BY

ATTORNEY

Sept. 11, 1956 S. S. AIDLIN 2,762,546

LIQUID FILLING APPARATUS

Filed Jan. 21, 1953 4 Sheets-Sheet 4

FIG. 5

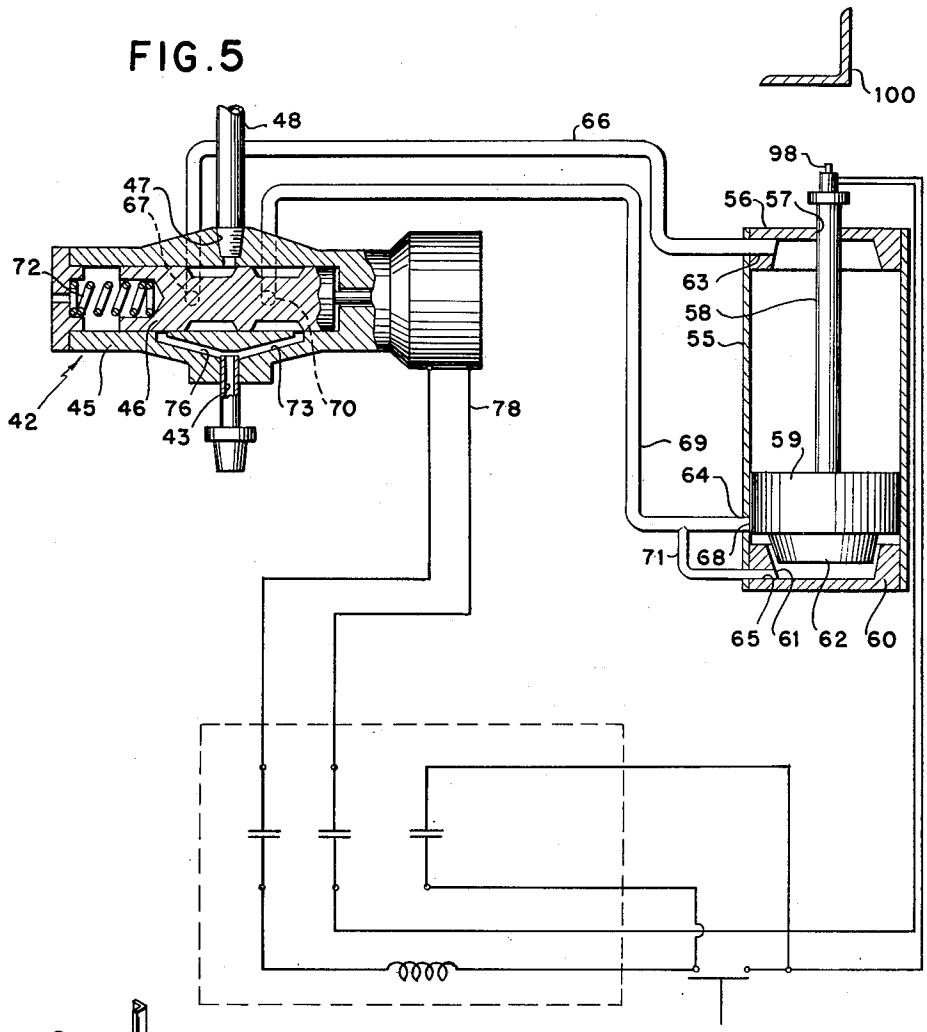
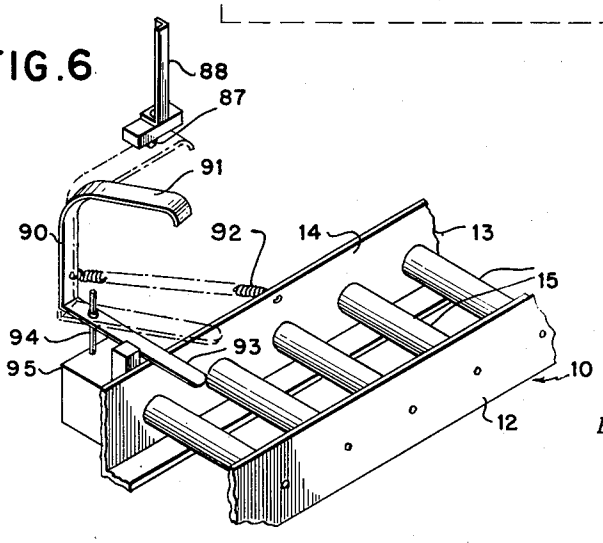


FIG. 6



INVENTOR.
Samuel S. Aidlin

BY

ATTORNEY

United States Patent Office 2,762,546 Patented Sept. 11, 1956

2,762,546

LIQUID FILLING APPARATUS

Samuel S. Aidlin, New York, N. Y.

Application January 21, 1953, Serial No. 332,351

30 Claims. (Cl. 226—97)

The present invention relates to apparatus for distributing quantities of liquid into receptacles, and more particularly to apparatus for filling containers with metered quantities of liquid, especially the filling of viscous liquid such as oils, syrups and the like, into containers having collapsible walls such as the metallic containers conventionally used for the packaging of petroleum and similar viscous products.

Heretofore, no practical apparatus had been devised for the mechanical and automatic metered distribution of viscous liquids into containers of the character described for a number of reasons.

The utilization of vacuum filling processes and apparatus has heretofore been found impractical for the purpose because of the tendency of the relatively thin walls of the containers to collapse under vacuum.

Other methods and apparatus such as the gravity method and apparatus for filling containers of the character described with viscous fluids have been found slow, difficult and messy. These drawbacks have been found to increase with any increase in the viscosity of the liquid due to a number of inherent characteristics of the liquids and the containers. Thus, viscous fluids have internal friction which slows their flow. They also adhere to the walls of the passages to further reduce the rate of flow. Moreover, the exact metering of the quantities of such fluid flowing into a container is made difficult if not impossible by the agitated level of the liquid surface due to the trapping of air which generally occurs in viscous liquids, and which is aggravated by the afterflow or dripping and made still more difficult by the usually small filling apertures generally provided in the containers, usually in the form of a relatively narrow neck which receives the container closure.

It is the primary object of the present invention, therefore, to provide apparatus for the filling of containers of the character described with liquids, particularly liquids of viscous consistency by an automatic and continuous process.

It is also an object of the present invention to provide apparatus of the character described from which the liquid is discharged into the containers under controlled pressure, to thereby increase the speed of the filling process.

It is another object of the present invention to provide apparatus of the character described which will mechanically, automatically and continuously fill a series of containers with measured quantities of a viscous liquid in uninterrupted succession.

It is still another object of the present invention to provide apparatus of the character described which will be put into filling operation by the presence of the container itself, to thereby avoid liquid discharge when a container is not positioned to receive such liquid, and thereby eliminate waste and uncleanliness.

It is a further object of the present invention to provide filling apparatus of the character described in which afterflow or dripping is reduced to a substantial minimum,

to thereby promote accuracy of measurement as well as neatness and cleanliness of the filling operation.

It is a still further object of the present invention to provide apparatus of the character described in which entrapment of air in the liquid or foaming is likewise reduced to a minimum for additional accuracy of measurement.

It is also a general object of the present invention to provide apparatus of the character described which is simple and easy to operate and which is capable of prolonged continuous operation without getting out of order and, therefore, easy and economical to maintain.

The foregoing and other advantages and superiorities of the filling apparatus of the present invention will become more readily apparent to those skilled in the art from the embodiment thereof partly diagrammatically shown in the accompanying drawing and from the description following. It is to be understood, however, that such embodiment is shown for purposes of illustration only, to make the principles and practices of the invention more readily comprehensible, and without any intent of limiting the invention to the specific details thereon shown.

In the drawings:

Fig. 1 is an elevational view, partly in section and partly foreshortened, of one embodiment of a filling apparatus of the present invention;

Fig. 2 is an elevational view, partly broken away, of the conveyor track of the apparatus of the invention, also showing fragment of the can advancing means;

Fig. 3 is a section taken on line 3—3 of Fig. 2;

Fig. 4 is a top plan view, more or less diagrammatic, of the apparatus of Fig. 1;

Fig. 5 is an enlarged, fragmentary, partly sectional view of one filling station of the apparatus, including a diagram of the electrical circuit thereof;

Fig. 6 is a fragmentary, detailed, perspective view of the container actuated mechanism for throwing the switch in the filling circuit of each filling station in the apparatus;

Fig. 7 is a fragmentary, elevational, enlarged view, partly in section, of the adjustable means for automatically throwing the switch for reversing the movement of the piston in the filling cylinder; and

Fig. 8 is a fragmentary, enlarged, elevational view, partly in section, showing the grouping of the filling valve, container and container moving means during the filling operation.

Generally stated, the apparatus of the invention consists of a preferably circular container supporting track with means for egress and ingress and with a turntable above said track on which are mounted a plurality of filling stations. Each filling station consists of a cylinder connected to a central source of material through a four-way solenoid valve the contents of which source are discharged under pump pressure through the valve into the cylinder, and from the cylinder back to the valve for discharge into the container. Each filling station also has individual means for aligning and moving a container with the valve and automatic means actuated by the moving container for electrically opening and adjusting the valve.

More specifically the cylinders are associated with the pistons that are operated by the pressure of the liquid itself within the cylinder to discharge liquid from the cylinder on both its upward and downward strokes; the apparatus having means for automatically and electrically adjusting the valve to permit discharge, alternately, from the top and from the bottom of the cylinder.

Referring now more specifically to the accompanying drawing, the container supporting track, generally desig-

nated as 10, may be supported on a number of legs 11, and may consist of a pair of facing spaced angle bars, which are each supported by one side of the uprights 11 with the other side in upright position forming, respectively, the side walls 12 and 13 of a rectangular trough shaped guideway 14. The bottom of the guideway 14 is provided along the greater part of its circular length with rollers 15, except for a part immediately adjacent its ingress end or opening 16, wherein such bottom is formed of inwardly and upwardly sloping rods 17, which start from a point below the level of the rollers 15 immediately at the ingress end of the track and rise gradually upwardly to the upper level of such rollers.

Similar rods 19 may be provided adjacent the egress end 20 of the track which slant downwardly and outwardly for a distance, with the lower end of such rods terminating at the discharge ramp 21.

The outer wall 12 of the track 14 immediately adjacent the ingress end 16 is cut away to form a side opening into the track in front of which is suitably mounted on suitably supported rollers 22 and 23, a horizontally disposed, endless, conveyor belt 25; one of the rollers, as 22, being connected to a pulley wheel 26 supporting a belt 27, which is in turn connected to a motor M to turn the upper layer of the belt 25 in the direction of the track 10. Thus, a can 28 placed transversely on the belt 25 will be moved towards the track opening 16 whence it will be engaged for a movement along the track 10 in a manner which will hereinafter be described.

Since most conventional cans 28 for the use of which the present apparatus is intended, such as the can illustrated, have their openings 29 at one corner of their top which openings are generally formed in a neck 30 that projects above the top, means may be provided to prevent any arrangement of the can with its opening out of filling position. Thus if the filling is to be effected into a can 28 having its opening 29 arranged to the left, means may be provided in the form of an arm 31, which closely overhangs the top of the can at the right portion of the belt 25 in position to engage the neck 30 of any can that is improperly arranged with its neck to the right and topple it off the belt.

The filling mechanism comprises a preferably circular plate or table 32, which is mounted fixedly preferably on a pipe or tubular post or upright 33 supported on the capstan 34, which is provided with suitable pulleys 35, whereby the capstan 34, the upright 33, and the table 32 may be rotated as a unit by means of the belt 37, which is activated by the motor M, which may be provided with suitable reduction gears for its dual purposes of moving the table 32 and the endless belt 25.

The table 32 is arranged to overhang the track 10 and is provided with a plurality of filling positions or stations, as many as may be desired or practicable in accordance with the size of the apparatus. Each filling position consists of a can-pushing member, dependent from the underside of the table 32 and preferably consisting of two parts, namely, an upper plate or bar section 38 secured to the underside of the table in register with the track 10 and a lower plate 39, which is hinged to the upper plate 38, as at 40, and is maintained in upright hinged position by means of a spring 41 of sufficient power to push a can 28 along the track 10 as the table 32 rotates, but which will permit the folding back of the plate 39 in case of jamming or other interruption of the movement of the can upon the track.

Each filling position also includes a four-way solenoid valve, generally designated as 42, including a discharge port and nozzle 43, arranged to be in register with and adapted to fit into the opening 29 of a can 28 which may be disposed on the track 10 with its opening properly oriented.

The valve 42 comprises a housing 45 in which is disposed the slidable plug 46, and which is provided with an inlet port 47 connected, as by means of a preferably

flexible inlet tube 48, to a manifold 49 secured in upright position at the center of the table 32. The manifold 49 may be connected by a swivel joint 50 to a coupling, 51 at the end of a conduit 52, which connects at the other end to a pump (not shown), which pump conveys the liquid under pressure from a reservoir (not shown) to the manifold 49. If desired, an air release valve 53 and/or a shut off valve 54 may be interposed in the conduit 52.

Each filling position includes a cylinder 55 supported dependently from the table 32, preferably inwardly of the valve 42. The cylinder 55 is provided with a top wall 56, having an opening 57 through which the arm 58 of the piston 59 extends upwardly and outwardly of the cylinder. The bottom wall 60 of the cylinder is preferably of substantial thickness and is provided with a frusto-conical, outwardly tapering recess 61 of relatively reduced diameter which forms a gradually reducing extension of the cylinder proper. The piston 59 is provided on its bottom with frusto-conical tapering portions 62 of reduced diameter, which is adatped to fit into the recess 61.

The cylinder 55 is provided with ports 63 and 64 disposed, respectively, at the upper extremity and at the lower extremity of its main body portion and with an additional, smaller port 65 formed in the bottom extremity of the recess 61.

One of the cylinder ports, as the upper cylinder port 63, is connected by a tube 66 to a third port 67 of the valve housing 45. The cylinder port 64 is connected by a tube 69 to the fourth of the valve housing ports 70. The auxiliary port 65 of the cylinder is connected by a tube 71 to the tube 69 intermediate its ends.

When not activated the valve plug 46 is held by the spring 72 in position where the port 67 is in connection with the inlet port 47 whereas the port 70 is shut off from such inlet port and is connected by a passageway 73 formed in the wall of the valve housing 45 and leading to the outlet port 43, so that fluid entering the valve 42 through the port 47 is conducted through the tube 66 into the upper part of the cylinder 55; the pressure of the fluid depressing the piston 59 to discharge all fluid below the piston through ports 68 and 70, successively, and through tube 69 into the valve 42, through the port 70, through the passageway 73, and out of the outlet port 43.

Conversely, when the solenoid within the valve 42 (not shown in detail) is activated, the plug 46 is magnetically moved against the pressure of the spring 72 to shut off cylinder port 67 from communication with the valve inlet port 47 and to bring it into communication with the passageway 76 connecting with the valve outlet port 43, and simultaneously bring valve port 70 into communication with the valve inlet port 47 and out of communication with the valve outlet port 43, so that fluid coming into the valve will travel through the valve port 70 and tube 69 to the bottom of the cylinder 55 to push the piston 59 upwardly and discharge liquid accumulated above the piston during the downward stroke through the port 63, the tube 66, the valve port 67 and the passageway 76 into the valve outlet port 43.

The solenoid of the valve is connected in an electric circuit as through wires 78 which lead to a box 79 associated with each filling position, preferably dependent from the underside of the table 32, and which contains a solenoid starting mechanism of any conventional type. All of the boxes 79 or their starting mechanisms may be connected in series, through one of the boxes 79 to a cable 80 to an outlet box 81 mounted on the manifold 49, which is in turn connected to a cable conducted through a tube 82 that passes through the manifold 49, swivel joint 50, coupling 51, gland 83 and electric reel or slip ring 85 which contacts terminals of a cable in an electric line (not shown).

The apparatus is so arranged that each filling operation

starts from the top of the cylinder 55, with the piston disposed at the bottom thereof, completely shut off ports 64 and 70, and with the current through the solenoid shut off, so that the valve 42 is connected with the top port 63 of the cylinder 55 and which is completely filled and incapable of receiving any additional fluid so that the filling station is in non-operating position.

Means are provided for automatically closing the solenoid circuit for movement of the plug to connect the valve inlet port 47 with the bottom port 64 of the cylinder 55 and to connect the top port 63 of the cylinder with the outlet plug 41, in the manner explained above, so that the piston 59 is permitted to be pressed upwardly to discharge the contents of the cylinder above the piston through port 63. Such means may comprise a limit switch, 87, supported below the table 32, as on a depending bar or rod 88 adjacent each pusher plate 37.

Pivotly mounted for rotation about its axis is an upright post 90 having a curved shoulder 91 at its top, which, in one position, is arranged to trip the limit switch 87 into operating position as it passes below it, but which is normally held rotated out of switch contacting position by means of a spring 92, which turns the post to maintain the shoulder out of contacting position. The post is provided at its bottom with a lateral arm 93 by which it is mounted on a pin 94 set in a bracket 95 extending from the track 10 which is normally held by spring 92 to extend in the direction of the track and to overhang it, which arm 93 is adapted to be contacted by a can disposed and pushed along the track 10 to be turned by the can and to thereby rotate the post 90 to bring the shoulder 91 into switch-throwing position.

The operation of the apparatus now becomes clear in part. A can 28 is placed on the conveyor belt 27 which carries it to the ingress opening 16 of the track where it is picked up by the first filling station that reaches it; the pusher plate 33 of the station urging it up the slope 17 to the higher level of the rollers 15, so that the discharge nozzle 43 enters into the can opening 29. As the can is pushed along on the track, it encounters the arm 93, and pushes it to turn the shoulder 92 in position to trip the switch 87. This closes the circuit that activates the solenoid and starts the filling of the bottom of the cylinder 55 causing the discharge of the contents of the top of the cylinder into the can 28 as described above. It will be apparent that if, for any reason, there is no can upon the track to be picked up by passing filling station, the limit switch 87 of that station will not be tripped and the station will remain inactive.

Means are provided for breaking of the solenoid circuit to reverse the flow of liquid within the valve 42 and to reverse the direction of movement of the piston 59 to discharge from the bottom of the cylinder 55. Such means may comprise a second limit-switch 98 connected in the solenoid starting mechanism in the box 79, which will break the circuit through the solenoid when it is thrown and permit the plug 46 to be moved back by the spring 72. Such second limit switch 98 may be positioned on top of the piston arm 58 and may be thrown by contact with a curved plate or arm 100 overhanging the table along at least the end half of the track 10. By this means the circuit-breaking limit-switch 98 is tripped by the plate 100 as its station moves under such overhanging plate and the piston arm 58 rises sufficiently to reach it, thus de-activating the solenoid, to permit the spring 72 to move the plug 46 into position to direct fluid passing through the valve from its inlet port to the top of the cylinder 55 and discharge fluid into the container from the bottom of the cylinder.

The balance of the filling operation now becomes apparent. As the movement of the piston 55 is reversed by the breaking of the solenoid circuit, fluid under pressure is introduced into the top port 63 of the cylinder and the piston 59 is moved to discharge the contents of the bottom of the cylinder, through port 64, to complete the filling of the can; the last portion of the fluid at the bottom of the cylinder, located in the recess 61, being discharged at a slower rate, through port 65, by piston bottom 62 to permit the settling of the fluid within the can 28 and allow for any afterdrip to be completed and for any trapped air bubbles to be freed. In this connection it is to be noted that the amount of afterdrip permitted by the apparatus can only be relatively minute because the flow of the fluid is cut off quite close to the point of discharge.

It will further be clear that the metered volume discharged by all of the filling stations in the apparatus may be uniformly adjusted by varying the length of the upward stroke of the piston 59 before the limit-switch 98 carried at the top of its piston arm 58 is thrown to break the solenoid circuit. This may be readily done in the apparatus of the present invention by mounting the curved, switch-throwing plate 100 on vertically adjustable supports, such as illustrated.

In the illustrated embodiment, the plate 100 is supported on a laterally extending horizontal plate 101, which extends beyond the track 10 where it rests upon and is secured to a pair of vertical stanchions 102, that are telescopically held in a pair of cylinders 104 secured on a table 105, which may be supported on standards 106 resting on a floor or other surface alongside of the track 10; the table 105 being provided with openings in register with the cylinders 104, through which the stanchions 102 may move.

Rotatably set on the table 105, between the cylinders 104, is a threaded post 107 on the lower end of which is fixed a wheel 108 by which the post may be turned about its axis. The upper end of the threaded post 107 is engaged within a tapped sleeve 109 supported from the underside of the plate 101 by a pair of diverging arms 110. By this arrangement, the post 107 may be turned to selectively raise or lower the switch-contacting plate 100 to thereby limit the upward stroke of the piston 59.

Another upright post 112, threaded at its lower portion, may be adjustably supported in the table 105, adjacent the stanchions 102, at the upper end of which a dial indicator 114 may be secured, which is also connected to the plate 101. The post 112 may be adjustably supported in place in a tapped stud 115 mounted on the table 105 and provided with a lock nut 116 by which it may be locked in adjusted position. By this arrangement, the grosser adjustments in the height of the switch drawing plate 101 may be effected by adjustment of the post 112 itself, together with the stanchions 102, whereas the finer adjustment may be effected without adjustment of the post 112 by means of the leeway provided by the dial indicator 114 which may be of any conventional construction and not thought necessary to be described in detail.

This completes the description of the illustrated embodiment of the filling apparatus of the present invention. It will be readily apparent that such apparatus is particularly adapted for use with liquids of high viscosity because the filling operation is executed by the application of positive pressure on the fluid. It will also be apparent that the apparatus operates in a continuous, rapid, accurate manner and without the likelihood of waste and is, therefore, highly economical. It will likewise be apparent that the apparatus of the present invention may be adjusted for filling different metered quantities of liquid for the purpose of filling containers of different sizes.

It will further be apparent that numerous variations and modifications in the apparatus of the present invention may be made by anyone skilled in the art, in accordance with the principles of the invention hereinabove set forth and without the use of any inventive ingenuity. I desire, therefore, to be protected for any and all such variations and modifications that may be made within

the spirit of the present invention and the scope of the claims hereto appended.

What I claim is:

1. Filling apparatus of the character described comprising at least one filling unit, said unit including a valve comprising a housing, said housing having four ports formed therein, including an inlet port and an outlet port, the other two of said ports each connected to the outlet port by a passageway formed in the housing wall, a plug movable within said housing, said plug being grooved on its surface to connect, in one of its positions within said housing, the said inlet port with the first of said last two ports and the second of said last two ports with one of said passageways, and in its other position to connect the second of said last two ports with said inlet port and the first of said last two ports with the other of said passageways, spring means within said housing for maintaining said plug in one of its positions and solenoid means connected in an electric circuit for moving said plug into its second position, a closed cylinder having a piston reciprocable therein, said piston having an arm extending through one end of said cylinder, said cylinder having an outlet formed adjacent each of its ends, one of said outlets connected to one of said last two valve ports and the other of said cylinder ports connected to the other of said last two valve ports and switch means for making and breaking said electric circuit through said solenoid.

2. Filling apparatus of the character described comprising at least one filling unit, said unit including a cylinder closed at both ends and a piston reciprocable with in said cylinder, said cylinder having a port formed in its wall at each end thereof, fluid inlet means adapted to be connected to a source of fluid and fluid outlet means adapted to discharge fluid into a container, means for selectively connecting each of said ports to said fluid inlet means and to said fluid outlet means, means normally maintaining one of said cylinder ports in connection with said fluid inlet means and the other of said ports with the fluid outlet means, means reversing said connections to have the second of said ports connected to the fluid inlet means and the first of said ports to the fluid outlet means and means for deactivating said reversing means.

3. The filling apparatus of claim 2 wherein said means for deactivating and reversing means is automatic and adjustable.

4. Filling apparatus of the character described comprising at least one filling unit, said unit including a cylinder closed at both ends and a piston reciprocable within said cylinder, said cylinder having a port formed in its wall at each end thereof, fluid inlet means adapted to be connected to a source of fluid and fluid outlet means adapted to discharge fluid into a container, means for selectively connecting each of said ports to said fluid inlet means and to said fluid outlet means, means normally maintaining one of said ports in connection with said fluid inlet means and the second of said ports in connection with the said fluid outlet means, electrically activated means connected in an electric circuit for reversing said port connections to have the second of said ports connected to the fluid inlet means and the first of said ports to the fluid outlet means and switch means in said electric circuit to break the same for deactivating said reversing means.

5. The filling apparatus of claim 4, including means for automatically moving said switch into circuit breaking position.

6. Filling apparatus of the character described, comprising at least one filling unit, said unit comprising a cylinder closed at both ends and a piston reciprocable within said cylinder, said cylinder having a port formed in its wall at each end thereof, a valve comprising a housing and a plug movable therewithin, said housing having four ports formed therein, said ports including an inlet port for connection to a source of fluid and an outlet port for discharging fluid therethrough, means connecting a third of said valve ports to one of said cylinder ports, means connecting the fourth of said ports to the second of said cylinder ports, a passageway formed in said housing connecting each of the said third and fourth valve ports to said outlet port, said plug being grooved on its surface to connect, in one of its positions within said housing, said inlet port with the third of said valve ports and the fourth of said valve ports with one of said passageways, and in its other position, to connect said inlet port with the fourth of said valve ports and said third valve port with the other of said passageways, spring means normally maintaining said plug to connect said valve inlet port with one of said last two valve ports and the other of said last two valve ports with one of said passageways, a solenoid associated with said plug and connected in an electric circuit adapted, when activated, to move said plug to connect said inlet port with the other of said last two valve ports and to connect the first of said last two valve ports to one of said passageways, switch means for closing the electric circuit through said solenoid and switch means for breaking the circuit through said solenoid.

7. The filling apparatus of claim 6, wherein automatic means are provided for throwing said circuit breaking switch.

8. The filling apparatus of claim 6, wherein adjustable automatic means are provided for throwing said last switch into circuit breaking position.

9. Filling apparatus of the character described, comprising at least one filling unit, said unit comprising a cylinder closed at each end, a piston reciprocable within said cylinder, said piston having a rod connected thereto extending to the exterior of said cylinder through an opening formed in one end thereof, said cylinder having a port formed in its wall adjacent each end thereof, a valve comprising a housing and a plug movable therewithin, said housing having four ports formed therein, said ports including an inlet port for connection to a source of fluid under pressure and an outlet port for discharging fluid into a container, means connecting a third of said valve ports to one of said cylinder ports, means connecting the fourth of said valve ports to the second of said cylinder ports, a passageway formed in said housing connecting each of said third and fourth ports to said outlet port, said plug being grooved on its surface to connect, in one of its positions within said housing, said inlet port with the third of said valve ports and the fourth of said valve ports with one of said passageways, and, in the other of its positions within said housing, to connect said inlet port with the fourth of said valve ports and said third valve port with the other of said passageways, spring means normally maintaining said plug in one of said positions within said housing, a solenoid associated with said plug and connected in an electric circuit adapted, when activated, to move said plug into the other of said positions within said housing, switch means for closing the electric circuit through said solenoid, a limit switch for breaking the circuit through said solenoid mounted on the free end of said piston rod, means arranged to contact said limit switch to move the same into circuit breaking position and means for adjustably mounting said contacting means relative said cylinder.

10. Filling apparatus of the character described, comprising at least one filling unit, means mounting said filling unit for movement in a circle, said filling unit including a fixed pusher member adapted to engage a container to move it along with the filling unit, a fluid outlet arranged to register with an opening in a container moved by said pusher member, a closed cylinder having a piston reciprocable therewithin, said cylinder having openings formed therewithin at each end thereof, means connecting each of said openings to a source of fluid, means connecting each of said openings to said fluid outlet, and means for selectively automatically shutting off each of said openings from said source of fluid and simul-

taneously placing the other of said openings in connection with said fluid outlet.

11. Filling apparatus of the character described, comprising, in combination, a track adapted to have a receptacle having an opening in its top moved therealong, at least one filling unit over said track, means supporting said filling unit for movement over said track, said filling unit including a pusher element adapted to engage a container on said track to move it therealong with the movement of said filling unit, a fluid outlet arranged to register with the opening in said container, a closed end cylinder having a piston reciprocable therewithin, said cylinder having outlet means formed therein at each end thereof, means connecting the outlet means at each end of the cylinder to a source of fluid, means connecting the outlet means at each end of said cylinder to said fluid outlet, and means for selectively automatically shutting off each of said outlet means from their connection with said source of fluid and simultaneously opening the other of said outlet means into connection with said fluid outlet.

12. Filling apparatus of the character described, comprising, in combination, a track adapted to have a receptacle having an opening moved therealong, a plurality of receptacle filling units, means mounting said filling units for movement over said track, each of said filling units including a fixedly mounted pusher member adapted to engage a receptacle disposed on said track to move it therealong as said unit is moved over said track, a fluid outlet arranged to register with the opening of the receptacle moved by its associated pusher member, a closed end cylinder having a piston reciprocable therewithin, said cylinder having outlet means at each end thereof, means connecting each of said cylinder outlet means to a source of fluid, means connecting each of cylinder outlet means with said fluid outlet, and means for selectively automatically shutting off each of said cylinder outlet means from connection with said source of fluid and simultaneously the other of said cylinder outlet means into connection with said fluid outlet.

13. Filling apparatus of the character described comprising, in combination, an approximately circular track adapted to have a receptacle having an opening in its top moved therealong, a plurality of filling units, means mounting said filling units for circular movement over said track, each of said filling units including a pusher member fixedly connected to said mounting means in position to engage a container disposed on said track to push it therealong as the filling unit moves over the said track, fluid outlet means, a closed end cylinder having a piston reciprocable therewithin, said cylinder having an opening formed in each end thereof, means connecting each of said openings with a source of fluid, means connecting each of said openings with said fluid outlet means and means for selectively automatically shutting off each of said apertures from connection with the source of fluid while simultaneously opening the other of said apertures into connection with said fluid outlet.

14. Filling apparatus of the character described comprising a plurality of filling units, means supporting said filling units in circular arrangement, means mounting said supporting means for rotary movement, each of said filling units including a fixed pusher member adapted to engage a container to be filled for moving the same with the filling unit, an outlet nozzle arranged to register with the opening of the container moved by said pusher member, a closed end cylinder having a piston reciprocable therewithin, said cylinder having outlet means formed therein at each of its ends, conduit means connecting each of said outlet means to a source of fluid, conduit means connecting each of said outlet means to said outlet nozzle, means normally shutting off the fluid conduit means to one of said outlet means and the outlet conduit means of the other of said apertures and means connected in an electric circuit for reversing said shutting off means to shut off said fluid conduit means from the second of said outlet means and the outlet conduit means from the first of said conduit means.

15. Filling apparatus of the character described comprising, in combination, a track adapted to have a receptacle having an opening moved therealong, a plurality of spaced filling units, means mounting each of said filling units for movement over said track, each of said filling units including a fixedly mounted pusher member adapted to engage a container disposed on said track to move it therealong as the station is moved over said track, a fluid outlet arranged to register with the opening in the container moved by its associated pusher member, a closed end cylinder having a piston movable therewithin, said cylinder having outlet means formed therein at each end thereof, conduit means connected to each of said outlet means, conduit means connected to a source of fluid, and means for successively connecting each of said outlet conduit means to said fluid conduit means and simultaneously connecting the other of said outlet conduit means to said fluid outlet.

16. Filling apparatus of the character described comprising, in combination, a track adapted to have a receptacle having an opening moved therealong, a plurality of spaced filling units, means mounting each of said filling units for movement over said track, each of said filling units including a fixedly mounted pusher member adapted to engage a container disposed on said track to move it therealong as the station is moved over said track, a fluid outlet arranged to register with the opening in the container moved by its associated pusher member, a closed end cylinder having a piston movable therewithin, said cylinder having outlet means formed therein at each end thereof, conduit means connected to each of said outlet means, conduit means connected to a source of fluid, and means for automatically successively connecting each of said outlet conduit means to said fluid conduit means and simultaneously connect the other of said outlet conduit means to said fluid outlet.

17. Filling apparatus of the character described comprising, in combination, a track adapted to have a receptacle having an opening moved therealong, a plurality of spaced filling units, means mounting each of said filling units for movement over said track, each of said filling units including a fixedly mounted pusher member adapted to engage a container disposed on said track to move it therealong as the station is moved over said track, a fluid outlet arranged to register with the opening in the container moved by its associated pusher member, a closed end cylinder having a piston movable therewithin, said cylinder having outlet means formed therein at each end thereof, conduit means connected to each of said outlet means, conduit means connected to a source of fluid, and means automatically activated by each of said filling units as it moves over said track for successively connecting each of said outlet conduit means to said fluid conduit means and simultaneously connect the other of said outlet conduit means to the fluid outlet.

18. Filling apparatus of the character described comprising, in combination, an approximately circular track adapted to have a receptacle having an opening in its top moved therealong, a plurality of spaced filling units, means mounting said filling units for circular movement over said track, each of said filling units including means for moving a receptacle along said track in synchronization therewith, a cylinder closed at both ends and having a piston reciprocable therewithin, said cylinder having a port formed in its wall at each end thereof, fluid inlet means adapted to be connected to a source of fluid, fluid outlet means arranged to discharge fluid into the opening of the receptacle moved on said track by said moving means, conduit means connected to each of said cylinder ports, means normally maintaining one of said conduit means in connection with said fluid inlet means and the other of said conduit means with said fluid outlet means, means for reversing said connections to have the second

of said conduit means connected to the fluid inlet means and the first of said conduit means connected to said fluid outlet means, and means for deactivating said reversing means.

19. The filling apparatus of claim 18 including automatic means for activating said reversing means and said deactivating means.

20. The filling apparatus of claim 18 wherein said reversing means and said deactivating means are automatically activated by said unit as it moves over the said track and wherein said deactivating means are adjustable.

21. Filling apparatus of the character described comprising, in combination, an approximately circular track adapted to have a receptacle having an opening moved therealong, a plurality of spaced filling units, means mounting said filling units for circular movement over said track, means for moving a receptacle along said track in register with each of said filling units, each of said filling units including a cylinder closed at both ends, said cylinder having a piston reciprocable therewithin and having a port formed in its wall at each end thereof, fluid inlet means adapted to be connected to a source of fluid, fluid outlet means arranged in register with the opening of a receptacle moved by said receptacle moving means, conduit means connected to each of said cylinder ports, means for selectively connecting each of said ports to said fluid inlet means and to said fluid outlet means, means normally maintaining one of said port conduit means in connection with the fluid inlet means and the second of said port conduit means in connection with the said fluid outlet means, electrically activated means including a switch connected in an electric circuit for reversing said port conduit connections, to have the second of said port conduits connected to the fluid inlet means and the first of said port conduits connected to the fluid outlet means, and switch means in said electric circuit to break the same for deactivating said reversing means.

22. The filling apparatus of claim 21 wherein means are provided for automatically activating said electrically activated means and for automatically throwing said circuit breaking switch as said filling unit is moved over said track.

23. The filling apparatus of claim 21 wherein said track is provided with an inlet terminal and an outlet terminal and with downwardly inclining portions at each of said terminals.

24. Filling apparatus of the character described comprising, in combination, an approximately circular track adapted to have a receptacle having an opening in its top moved therealong, a table over said track, means mounting said table for rotary movement, said table having a plurality of filling units supported thereon in spaced relation to one another, each of said units, including an arm dependently secured to said table over said track and adapted to engage the side of a container disposed on said track to move it therealong as said table rotates, a closed end cylinder dependently secured in vertical position on said table, said cylinder having a piston reciprocable therewithin, said cylinder having an outlet port at each end thereof, a valve secured to the underside of said table, said valve comprising a housing and a plug movable therewithin, said housing having four ports formed therein, said ports including an inlet port adapted to be connected to a source of fluid and an outlet port adapted to discharge fluid therethrough, said outlet port arranged to be in register with the opening in a container moved along said track by the pusher arm associated therewith, conduit means connecting a third of said valve ports to one of said cylinder ports, conduit means connecting the fourth of said valve ports to the second of said cylinder ports, diverging passageways formed in the wall of said housing connecting the interior thereof with said outlet port, said plug being grooved on its surface to connect, in one of its positions within said housing, said inlet port with a third of said valve ports and a fourth of said ports with one of said passageways and in its other position to connect said inlet port with the fourth of said valve ports and said third valve port with the other of said passageways, spring means normally maintaining said plug to connect said valve inlet port with one of said last two valve ports and the other of said last two valve ports to one of said passageways, a solenoid associated with said plug and connected in an electric circuit, adapted when activated to move said plug to connect said inlet port with the other of said last two valve ports and to connect the first of said last two valve ports to the other of said passageways, switch means for closing the electric circuit through said solenoid and switch means for breaking the electric circuit through said solenoid.

25. The filling apparatus of claim 24 wherein automatic means are provided for throwing said circuit breaking switch.

26. The filling apparatus of claim 24 wherein adjustable automatic means are provided for throwing said circuit breaking switch into circuit breaking position.

27. Filling apparatus of the character described comprising, in combination, an approximately circular track having an inlet and an outlet adapted to have a receptacle having an opening in its top moved therealong, a table over said track, means mounting said table for rotary movement, said table having a plurality of filling units supported thereon in circular arrangement and in spaced relation to one another, each of said units including a pusher arm dependently secured to said table over said track and adapted to engage the side of a container disposed on said track to move it therealong as said table rotates, a closed end cylinder dependently secured in vertical position on said table, said cylinder having a piston reciprocable therewithin, said piston having an arm extending upwardly and outwardly of said cylinder through openings formed in its upper end and through said table, said cylinder having an outlet port formed therein at each end thereof, a four-port solenoid valve secured to the underside of said table, said solenoid connected in an electric circuit, means connecting one port of said valve to a source of fluid under pressure, means connecting a second of said valve ports to the upper of said cylinder ports, means connecting a third of said valve ports to the lower of said cylinder ports, the last of said valve ports forming an outlet and arranged to register with the opening in a receptacle moved by the associated pusher arm, said valve including spring means normally maintaining the same in position wherein said third port thereof is in communication with the inlet port thereof and out of communication with said outlet port and said second valve port is in communication with said outlet port and out of communication with said inlet port, and means for activating said solenoid to adjust said valve to have its second port in communication with said inlet port and out of communication with said outlet port and said third valve in communication with said outlet port and out of communication with said inlet port, said means comprisng a limit switch in said circuit mounted on the free end of said piston rod and a plate overhanging said table in position to have its underside engaged by said limit switch to be thrown by contact therewith and a second limit switch in said solenoid circuit supported below said table, and automatically returnable means on said track adapted to be moved by a receptacle moved therealong into position to throw said second switch.

28. The filling apparatus of claim 27 including means for mounting said plate in vertically adjustable relation to said table.

29. The apparatus of claim 27 wherein said track includes a downwardly inclining terminal portion at its inlet end and at its outlet end.

30. Filling apparatus of the character described including a track adapted to have a receptacle moved therealong, means for moving a receptacle along said track and at least one filling unit mounted for movement along-

side said track in synchronism with said receptacle moving means, said unit including a vertically disposed cylinder having a piston reciprocable therewithin and having a port formed therein at each of its ends, a four-port solenoid valve having an inlet port adapted to be connected to a source of fluid under pressure and an outlet port, means connecting a third of said valve ports to the upper of said cylinder ports and means connecting the fourth of said valve ports to the lower of said cylinder ports.

References Cited in the file of this patent

UNITED STATES PATENTS

384,766	Kendall	June 19, 1888
1,003,256	Hardy	Sept. 12, 1911
1,630,960	Melum et al.	May 31, 1927
2,392,054	McKinnis	Jan. 1, 1946
2,525,295	Harrington	Oct. 10, 1950