

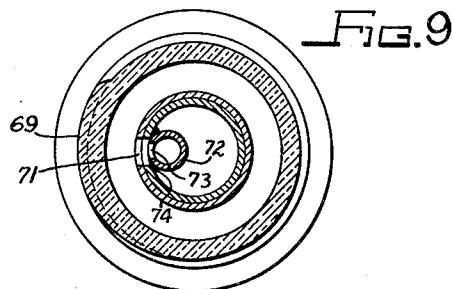
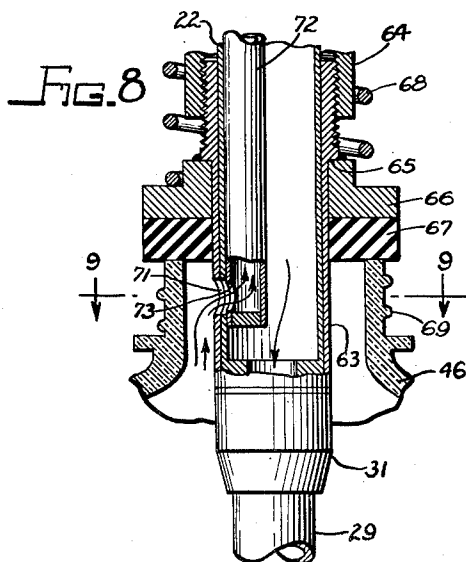
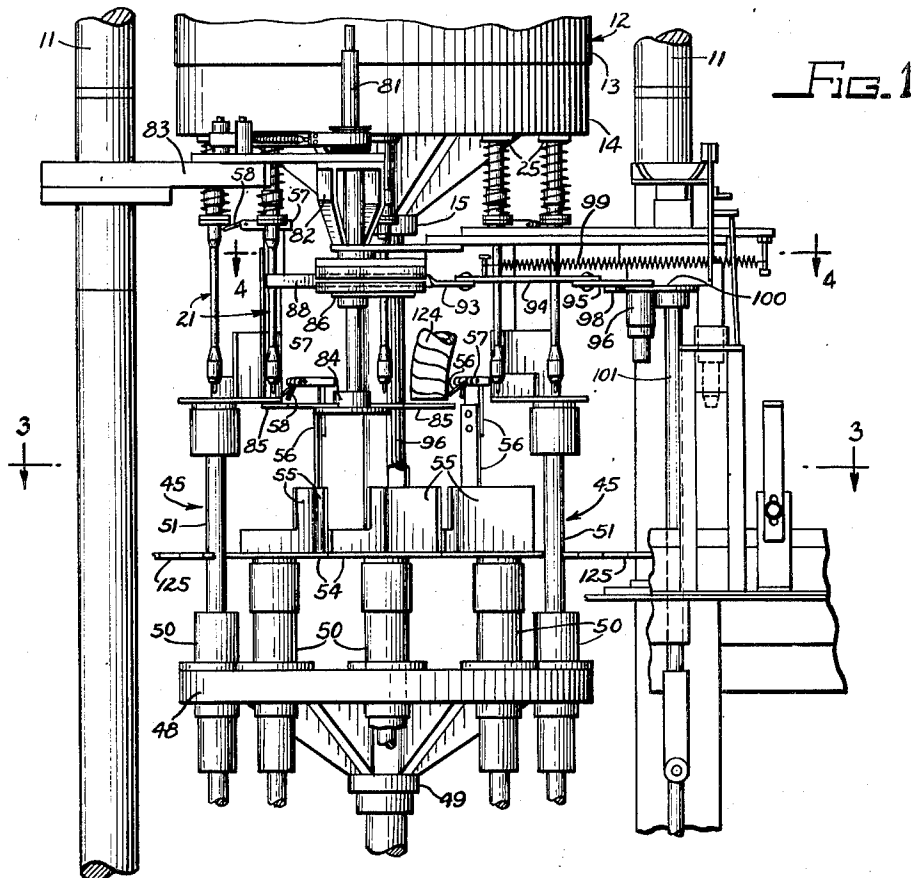
Jan. 5, 1954

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BOTTLE FILLING MACHINE

2,665,045

Filed Sept. 28, 1949

4 Sheets-Sheet 1



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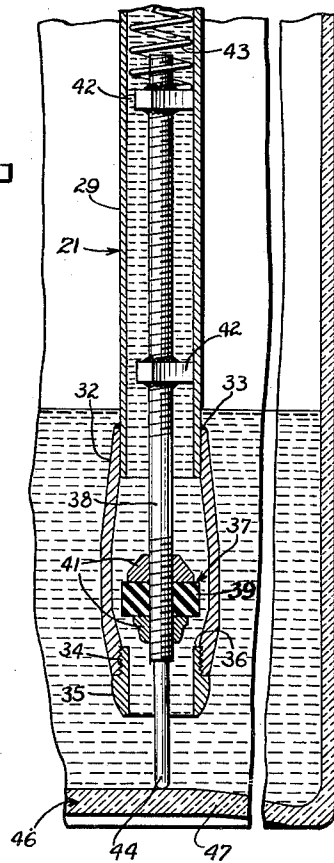
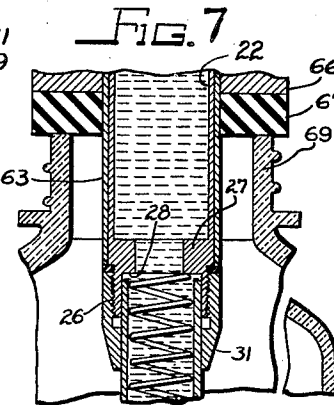
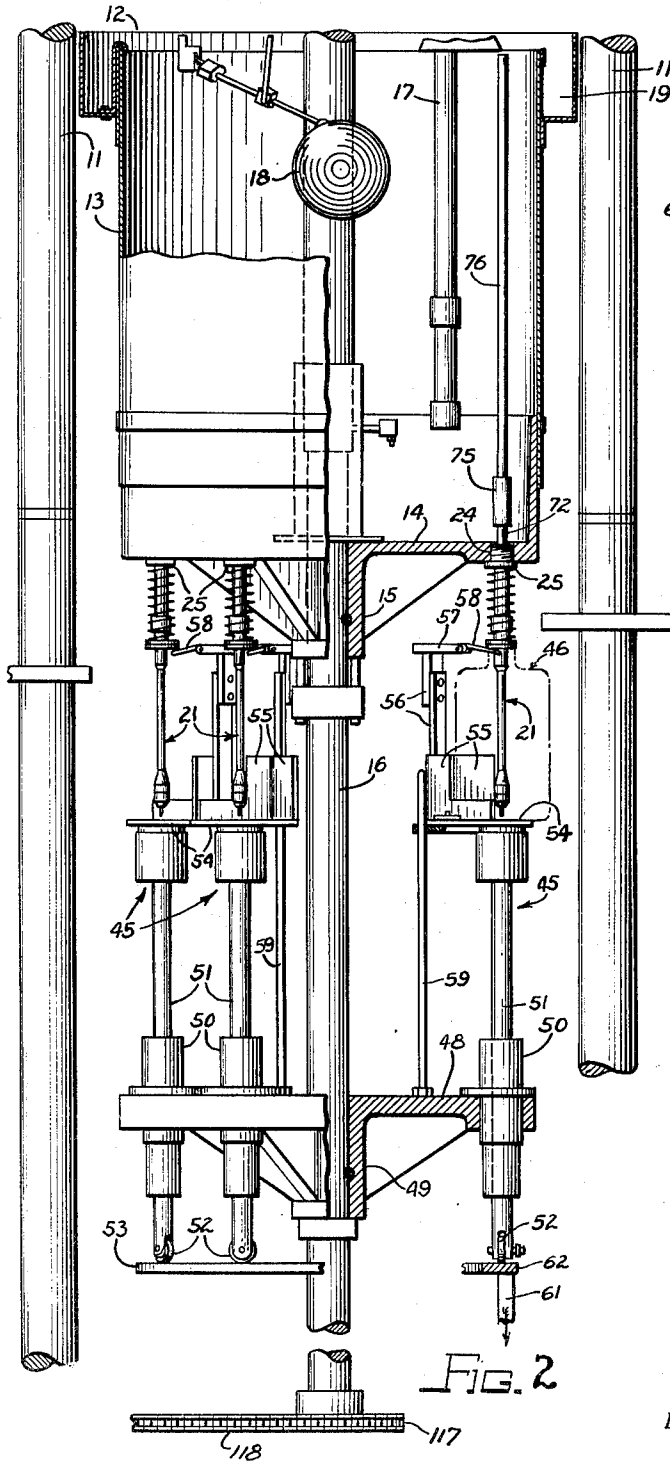


FIG. 2

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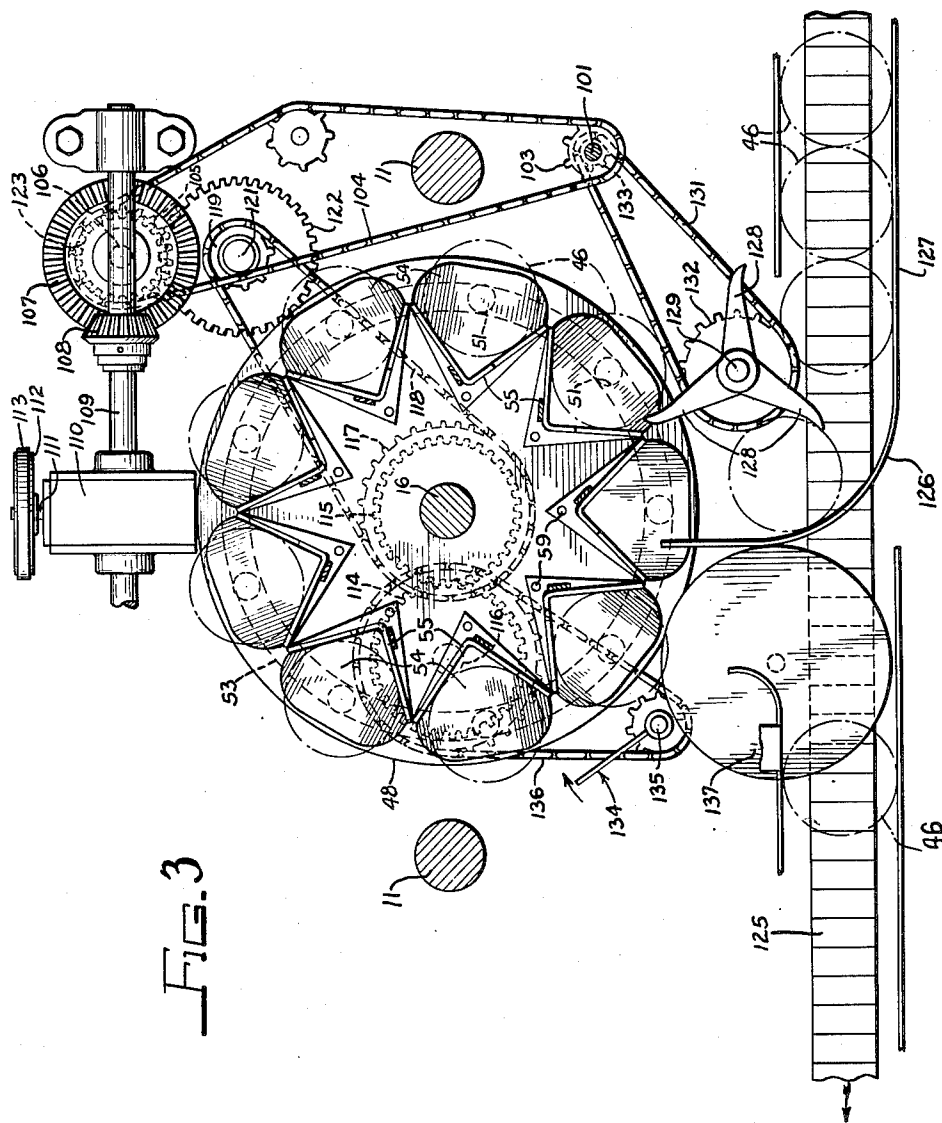
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4 Sheets-Sheet 3



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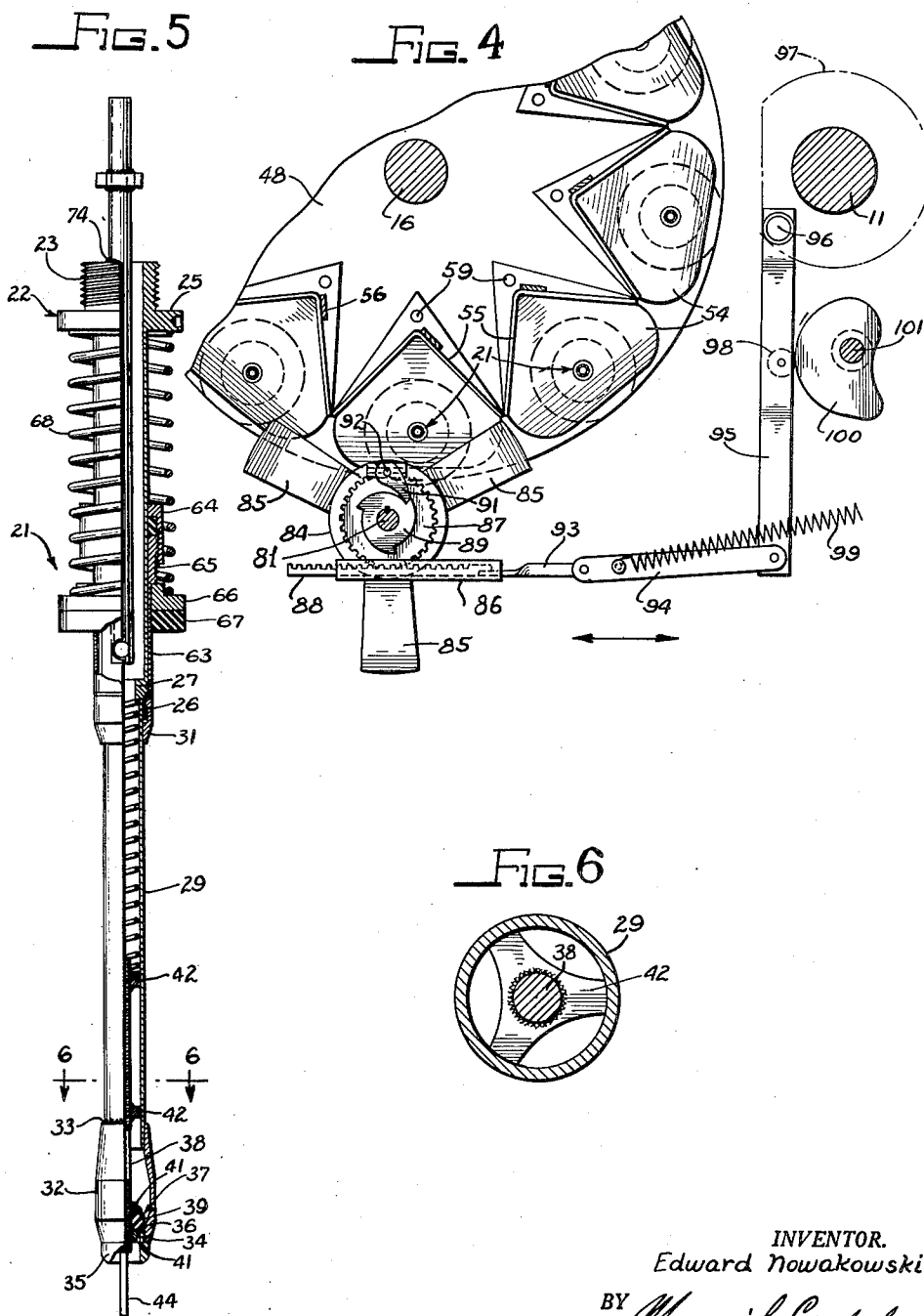
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4 Sheets-Sheet 4



## UNITED STATES PATENT OFFICE

2,665,045

## BOTTLE FILLING MACHINE

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3 Claims. (Cl. 226—98)

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The invention relates to improvements in bottle filling machines and is more especially concerned with the provision in such a machine of a novel, non-foaming bottle filling valve and novel coordinated means to prevent excess fluid from dripping from the valves onto the bottles as they are advanced into and out of filling position.

Bottle filling machines usually include suitable step-by-step conveyor means to carry empty bottles into position beneath a filling valve, whereupon the valve is opened automatically to release a predetermined quantity of fluid into the bottle. When the bottle is filled to a predetermined level, the valve is closed off and the conveyor carries the filled bottle out from beneath the valve and positions the next succeeding bottle therebeneath to repeat the filling cycle. When bottles are filled with liquids which tend to foam when agitated during the filling operation such as, for example, shampoos, the flow into the bottle must stop before the bottle is completely filled or the foam will overflow and run down the outside of the bottle. Obviously, this is very objectionable; first, because when the foam subsides the bottle is not filled to the required level and, second, it becomes necessary to clean the outside of the bottle thoroughly before it is capped, labelled and packaged.

The present filling machine embodies a novel valve structure and associated mechanisms especially adapted for use in filling bottles or other containers with a liquid substance which tends to foam when agitated. The present construction is such that it will permit the bottle to be filled without the overflow caused by foaming thus avoiding the usual requirement that the bottle lip and outside surface be cleaned after filling.

It is, therefore, an object of the present invention to provide a filling machine with novel means to prevent overflowing resulting from foaming of the material handled thereby.

Another object of the invention is to provide a novelly constructed valve.

Another object is to provide novel means to prevent any drip from the valve being deposited on the bottles moving therebeneath.

Another object is to provide a novel means to coordinate the opening and closing of the valve with the drip catching means.

Other and further objects of the invention will appear from the following description and accompanying drawings and will be pointed out in the annexed claims.

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In the accompanying drawings there has been disclosed a structure designed to carry out the various objects of the invention, but it is to be understood that the invention is not confined to the exact features shown as various changes may be made within the scope of the claims which follow.

In the drawings:

Fig. 1 is a fragmentary front elevational view of a bottle filling machine illustrating features of the present invention, but showing the conveyor and bottle positioning means broken away.

Fig. 2 is a side elevational view of the portion of the machine illustrated in Fig. 1 showing parts thereof broken away to illustrate the detail construction thereof.

Fig. 3 is a horizontal sectional view taken substantially on line 3—3 of Fig. 1.

Fig. 4 is a horizontal sectional view taken substantially along line 4—4 of Fig. 1.

Fig. 5 is an elevational view of one of the valves, said valve being shown in one-half section.

Fig. 6 is a sectional detail view taken on line 6—6 of Fig. 5.

Fig. 7 is an enlarged fragmentary central sectional view of the valve shown in Fig. 5, illustrating a bottle in filling position thereover.

Fig. 8 is a fragmentary sectional detail view similar to Fig. 7, taken at right angles to the plane of Fig. 7.

Fig. 9 is a horizontal sectional view taken substantially on line 9—9 of Fig. 8.

The bottle filling apparatus selected for the purpose of illustrating the features embodied in the present invention preferably includes a plurality of vertical stationary posts 11 which extend from a suitable base (not shown) to a header for purposes of supporting various mechanisms. The posts 11 are arranged around a vertically disposed reservoir 12. As best shown in Fig. 2, the reservoir 12 consists of a substantially deep cylindrical shell 13 having its lower margin firmly secured, as by welding, to a cast cup-shaped bottom 14. The bottom 14 has an axial boss or hub 15 depending therefrom, which hub receives therethrough a vertically mounted rotatable shaft 16. The structure is such that the reservoir 13 is firmly mounted on the shaft 15 so that it will rotate in unison with said shaft when the latter is rotatably driven in a manner to be described presently.

The reservoir 12 is adapted to contain a liquid, such as for example, a shampoo, and is provided with a filling inlet 17 and a float controlled valve

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including a float 18. An overflow trough 19 surrounds the upper margin of the reservoir. A plurality of bottle filling valves, generally indicated at 21, extend downwardly from the bottom of the reservoir as shown. There are nine such valves in the apparatus illustrated and each of these valves normally is closed so as to prevent liquid from being dispensed therethrough. Each valve includes, also, means operable at predetermined intervals to open the valve for filling a bottle positioned thereover.

As best illustrated in Figs. 5 and 7, each valve includes a tubular fitting 22 which is externally threaded at its open upper end, as at 23, so as to be firmly mounted in a tapped opening 24 (Fig. 2) in the reservoir bottom 14. The threaded end of the fitting 22 preferably includes a sealing flange 25 and its lower end is formed with a reduced diameter which is externally threaded as at 26. Upon referring to Fig. 7, it will be noted that the lower end of the fitting 22 has an internal flange 27 providing a shoulder 28. A tubular extension 29, having an outside diameter corresponding substantially with the inside diameter of the shouldered externally threaded end 26 of the fitting, is attached to said fitting preferably by having its upper end thrust into substantial abutment with the shoulder 28. A packing gland 31, carried by the tubular extension 29, is screw threaded onto the threaded fitting end 26 to prevent inadvertent displacement of the tubular fitting and to prevent leakage.

Still referring to Fig. 7, the lower end of the tubular fitting 29 is provided with a tubular extension 32 which has, in at least a portion thereof, an inside diameter considerably larger than the inside diameter of the tubular extension 29. The extension 32 preferably is welded, at 33, to the tubular extension 29 and its free lower end is internally threaded as at 34 to receive in threading engagement therewith a nipple 35. The nipple 35 has an inside diameter substantially less than the inside diameter of the fitting 32 so as to provide a shoulder 36.

A valve element 37 is mounted for vertical reciprocation in the extension 32. As best shown in Fig. 7, this valve element consists of a threaded stem 38 having adjacent its lower end a resilient washer 39 held in an adjusted position by abutting collars 41. The stem 38 extends upwardly into the tubular extension 29 and is threaded to receive spacers 42 which maintain the stem 38 in axial alignment within said extension 29. A spring 43 is arranged within the tubular extension 29 and has its lower end bearing against the top spacer 42 and its upper end bearing against the shoulder 28. In this manner, the valve element 37 normally is held in a closed position with the resilient washer 39 seated on the shoulder 36 of nipple 35.

It should be quite evident that the valve 21 normally is filled with liquid which is permitted to flow downwardly therefrom only when the resilient washer 39 is raised off of its valve seat 36. In order to facilitate opening movement of the valve element 37, the stem 38 has an extension 44 which projects beyond the end of the nipple 35. Engagement with and upward movement of the stem extension will carry the resilient washer 39 off of the seat 36 and permit the contents of the reservoir 12 to flow through the open valve into any container provided therebeneath. It might be observed that free passage of liquid through the tubular extension 29 is as-

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sured by milling the spacers 42 in the manner indicated in Fig. 6.

As has been noted hereinbefore, the receptacle 12 has a plurality of said bottle filling valves 21 depending from its bottom 14. These valves are circumferentially spaced apart and each are disposed vertically over a bottle elevating mechanism generally indicated at 45. The mechanism 45, described in detail later, is adapted to receive a bottle delivered thereto, in a manner to be described hereinafter, while it is in a lowered position. Immediately following the positioning of a bottle on an elevating mechanism, said mechanism is raised to elevate the bottle and telescope it over the axially aligned valve 21. As shown in Figs. 2 and 7, a bottle 46 is in filling position over a related valve. When in such position, the bottom 47 of the bottle 46 has struck the stem extension 44 and urged said extension upwardly to open the valve and permit fluid to flow into the bottle. The filling of the bottle continues while the reservoir 12 and the elevating mechanism are rotating about their axis 16 in a counter-clockwise direction. When the elevated bottle has reached a station located in advance of the station at which empty bottles are elevated over the valves, the elevated bottle has been filled to the desired level whereupon said bottle and its elevating mechanism are lowered into such position as to be clear of the valve. As soon as the filled bottle starts its downward movement, the valve 21 is closed. The filled bottle then is conveyed, in a manner to be described presently, out from beneath the valve and is directed away from the filling mechanism.

The bottle elevating mechanisms 45, previously referred to, are carried by a circular flange or turntable 48 having its hub 49 firmly secured to the rotatable shaft 16 below the reservoir 12. The flange is provided with a plurality (nine) of circumferentially spaced vertical guides 50, one in axial alignment with each valve 21. A vertical stem 51 is freely slidable in each guide. The lower end of each stem 51 carries a roller 52 which normally rides along an elevated track 53 during rotation of the flange 48. The track is semi-circular in shape and is concentric with the flange 48. The upper end of each stem 51 has a shelf 54 firmly secured thereon. As best shown in Figs. 2 and 3, each shelf 54 has a pair of vertical diverging walls 55 constituting a backing to limit movement of a bottle being positioned thereon. At least one of the diverging walls 55 on each shelf 54 has a vertical extension 56 (Fig. 2) carrying a horizontal arm 57. The arm 57 is provided at its projecting end with a hingedly connected fork 58, which fork is engaged by the neck of the bottle so as to insure alignment of the bottle mouth with the related valve 21. Additional means to insure alignment of a bottle with the related valve is provided by a vertical guide rod 59 which has its lower end firmly anchored in the flange 48 and extends through an aperture in the shelf.

Vertical reciprocation of an elevating mechanism containing an empty bottle and of the elevating mechanism containing the filled bottle is obtained by providing vertically reciprocal push rods 61 (one shown) at the loading and unloading stations. Each of these push rods has a horizontal top plate 62 suitably arched to conform with the curvature of the track 53. When in elevated positions, the top plates 62 are in the same plane as the track 53. When in their lowermost positions they are located far below

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said track at a distance corresponding to the distance through which the bottle is to be elevated or lowered. It is therefore believed to be sufficient to note that said reciprocal push rods move through the distances noted hereinabove. As a consequence of this reciprocation, an empty bottle positioned on a lowered shelf 54 is raised into telescoped position over its related valve and is held in that position for filling until the reservoir and flange 48 substantially complete their cycle of rotation. At that time the elevating mechanism roller 52 moves onto the top plate 62 of the second push rod which then moves into its lowered position.

Before entering into a detailed description of the means for feeding empty bottles to and conveying filled bottles from the filling apparatus, it should be noted that each valve is provided with means to cooperate with the open mouth of the bottle to prevent overflowing resulting from foaming. To this end the valve 21 includes an external sleeve 63 slidably mounted on the fitting 22. The upper end of the sleeve has an enlarged externally threaded diameter to receive a packing nut 64 thereon. A shoulder 65 formed at the base of the threaded enlargement provides an abutment for a collar 66 having a resilient washer 67 firmly secured to its bottom face. The collar 66 preferably is welded to the shoulder 65. A tension spring 68 disposed between the collar 66 and fitting flange 25 normally urges the sleeve 63 and collar 66 downwardly into the position substantially as illustrated in Fig. 5.

When a bottle is telescoped over the valve, the rim of the bottle neck 69 abuts the resilient washer 67 and urges said washer and its associated parts upwardly against the resiliency of the spring 68. In this manner the mouth of the bottle is sealed against the escape of any foam or liquid. The sealing washer is mounted in the manner described so as to compensate for any normal variations in the overall height of stock bottles.

To vent the bottles during the filling operation, the sleeve 63 and fitting 22 are provided with substantially registering openings 71 (Fig. 8). These openings are located below the lowermost position assumed by the sealing washer 67. A vent tube 72, having a port 73 communicating with the openings 71, is firmly secured to the inside surface of the fitting 22, preferably as by welding at 74. The vent tube extends upwardly beyond the upper end of the fitting 22 and has coupling means 75 (Fig. 2) at its upper end for connection with a vertical tubular extension 76. It will be noted, upon references to Fig. 2, that the extension 76 terminates substantially at the top of the reservoir 12. In this manner the air displaced within the sealed bottle during the filling operation is vented through the openings 71 and 73 and vent tube 72.

The bottle filling apparatus is provided with novel means to prevent drip from the valves from falling onto the outside of the bottles prior to and after they have been filled. To this end a vertical shaft 81 (Fig. 1) is journaled in a spider 82 carried on a built-up frame structure 83 extending horizontally from and mounted on one of the posts 11. As shown in Fig. 1, the shaft 81 extends below the bracket 82 and carries on its lower end a hub 84 having three radially extending circumferentially spaced blades 85. The shaft 81 is so positioned with respect to the depending valves on the reservoir 12 that the blades 85 thereon may be successively

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positioned beneath the valves while said valves are located at the bottle discharging stations.

Intermittent step-by-step rotation of the shaft 81 is obtained through a cam actuated rack mechanism best shown in Figs. 1 and 4. As there illustrated, the shaft 81 carries a bracket 86 mounted below the spider 82. This bracket includes suitable bearings for the shaft 81 and is adapted to provide means for supporting a gear 87 loosely on said shaft. A rack 88, reciprocally mounted in the bracket 86, is adapted to mesh at all times with the gear 87. Mounted immediately above the gear 87 and keyed or otherwise secured firmly to the shaft 81 is a ratchet wheel 89 having a spring pressed pawl 91, pivotally secured at 92 on the gear 87, in engagement therewith.

The rack 88 is adapted to be reciprocated in timed sequence with the rotation of the shaft 16 so as to impart step-by-step rotation to the shaft 81. Such reciprocation is effected by providing a link structure including links 93 and 94 which operatively connect the rack to a follower 95 pivotally secured at one end, as at 96, to a flange 97 on one of the posts 11. The follower 95 carries a roller 98 which, owing to the tension of a spring 99, rides upon the peripheral edge of a cam 100 carried on a vertical shaft 101. Obviously, rotation of the cam shaft 101 will impart reciprocable movement to the rack 88.

The shaft 101 extends downwardly through suitable bearings provided in the frame of the machine and has a pair of sprocket wheels 102 and 103 (Fig. 3) firmly secured to its lower end. The sprocket wheel 103 is connected as by a chain 104 with a sprocket 105 carried on a vertical stud shaft 106. The stud shaft 106 also carries a horizontal bevel gear 107 which meshes with a companion bevel gear 108 carried on a horizontal shaft 109 extending outwardly from a gear reduction box 110. A shaft 111 also extends out of said gear reduction box 110, which shaft carries a pulley 112 having a belt 113 trained thereover. The belt 113 operatively connects the pulley 112 with a suitable source of power (not shown).

Rotation of the reservoir shaft 16 also is obtained through operative connections between said shaft and the gear box 110. As shown in Fig. 3, the reservoir shaft 16 has a gear 115 secured firmly adjacent its lower end, which gear meshes with a gear 114 carried by a vertical stud shaft 116. The shaft 16 also carries a sprocket 117. A chain 118 is trained over the sprocket 117 and over a sprocket 119 carried on a second stud shaft 121 having a pinion 122 secured firmly thereon. The pinion 122 meshes with a pinion 123 on the stud shaft 106. The ratios between the various gears, pinions and sprockets are such that the intermittently rotatable shaft 81 carrying the drip catching blades 85 moves through one-sixth of a revolution each time the rack is reciprocated. The rack is reciprocated twice each time the reservoir 12 and its depending valves and associated elevators advance one station. As a consequence, a blade 85 is moved between the lower end of the valve and the open top of a filled bottle after said bottle is lowered. It remains in this position while the filled bottle is being pushed out from beneath the valve in a manner to be described presently. Any drip from the valve will fall onto the top surface of the blade, and when the blade continues its movement during machine operation, it is subsequently located beneath a suction line 124, which draws off the drip.

Empty bottles may be delivered to the filling machine in any approved manner. However, it is preferred that they be conveyed towards said machine as by means of a link belt 125 extending across the front of said machine on a vertical plane corresponding to the plane of the elevators when said elevators are in their lowered positions.

Upon referring to Fig. 3, it will be noted that bottles carried toward the machine on the link belt 125 are deflected substantially at right angles to said belt by the curved end 126 of a guide wall 127. When a bottle is carried against the curved end 126 of said wall it is engaged by one of a plurality of radial arms 128 mounted for rotation in a horizontal plane on a vertical shaft 129. Rotation is imparted to the shaft 129 by means of a chain 131 trained over a sprocket 132 on said shaft and a second sprocket 133 carried on a cam shaft 131. The rotation of the arms 128 is coordinated with the rotation of the reservoir shaft 16 so that as a bottle is pushed transversely off of the link belt 125, it moves onto a lowered shelf 54. When a bottle is filled and said filled bottle is again carried into its lowered position, it may be removed from its shelf 54 preferably by means of a pusher arm 134 extending radially from a vertical shaft 135 operatively connected as by a chain 136 to the driven shaft 116. When the pusher arm 134 moves in a clockwise direction over the lowered shelf 54 and behind the filled bottle thereon, said bottle is urged off of said shelf and onto a turn table 137 from where it subsequently is moved onto the receding portion of the link belt conveyor 125.

Although an exemplary form of construction has been disclosed in the accompanying drawings and described in detail in the foregoing specification, it should be understood that the invention is primarily concerned with the construction and operation of the filling valves and the means for preventing liquid or foam from flowing onto the outside surfaces of the containers. It should be understood further that the invention is capable of embodying a wide variety of modifications in detail construction without departing from the spirit of the invention or the scope of the appended claims.

I claim:

1. In a filling machine, a vertically depending valve including an open ended tubular body connected at its upper end with a source of supply and having a valve seat adjacent its open lower end, a valve element in said tubular body normally cooperating with the valve seat to close the valve, means engageable by the bottom of a container when said container is telescoped upwardly over said tubular body effective to move the valve element and open said valve, means on the body to close the filling opening of the container while the valve is open, and a vent passageway within the tubular body opening into the container below the closing means and communicating with atmosphere.

2. In a bottle filling machine including a supply reservoir for liquid and a plurality of normally closed dispensing valves depending from said reservoir, a turn-table below said container, said turn-table including bottle receiving compartments, means to deliver bottles one at a time to said turn-table compartments, continuously operable means to rotate the turn-table and reservoir in unison to retain the bottles beneath said respective valve, means operable to elevate a bottle compartment and telescope the bottle therein upwardly over a valve for filling and to lower said compartment when the bottle is filled, said valve being opened and closed by the raising and lowering of the bottle, a paddle wheel rotatable in one direction only operable intermittently in conjunction with the said telescoping means to catch drip, and means to remove liquid deposited on said paddle wheel.

3. In a bottle filling machine including a supply reservoir for liquid and a plurality of normally closed dispensing valves depending from said reservoir, a turn-table below said container, vertically reciprocable bottle receiving compartments on said turn-table one beneath each valve, means including an endless conveyor to deliver bottles to said compartments, means operable to rotate the turn-table and supply reservoir in unison, cam means operable to elevate selected bottle receiving compartments to telescope bottles therein over related dispensing valves, means engageable by an elevated bottle to open the valve therein, said cam means being effective to lower the bottle and permit the valve to close when the bottle is filled, a paddle wheel rotatable in one direction only to successively locate one of its paddles beneath a valve immediately after a related bottle has been withdrawn from thereover, reciprocable means actuable to rotate said paddle wheel, negative pressure means to remove stress from the paddle wheel, and a power operated sweeper arm actuable to sweep filled bottles from the compartments.

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