Dec. 25, 1934. L. DE MARKUS 1,985,767

FILLING MACHINE

Filed May 8, 1931 7 Sheets-Sheet 1

Fig. 1.

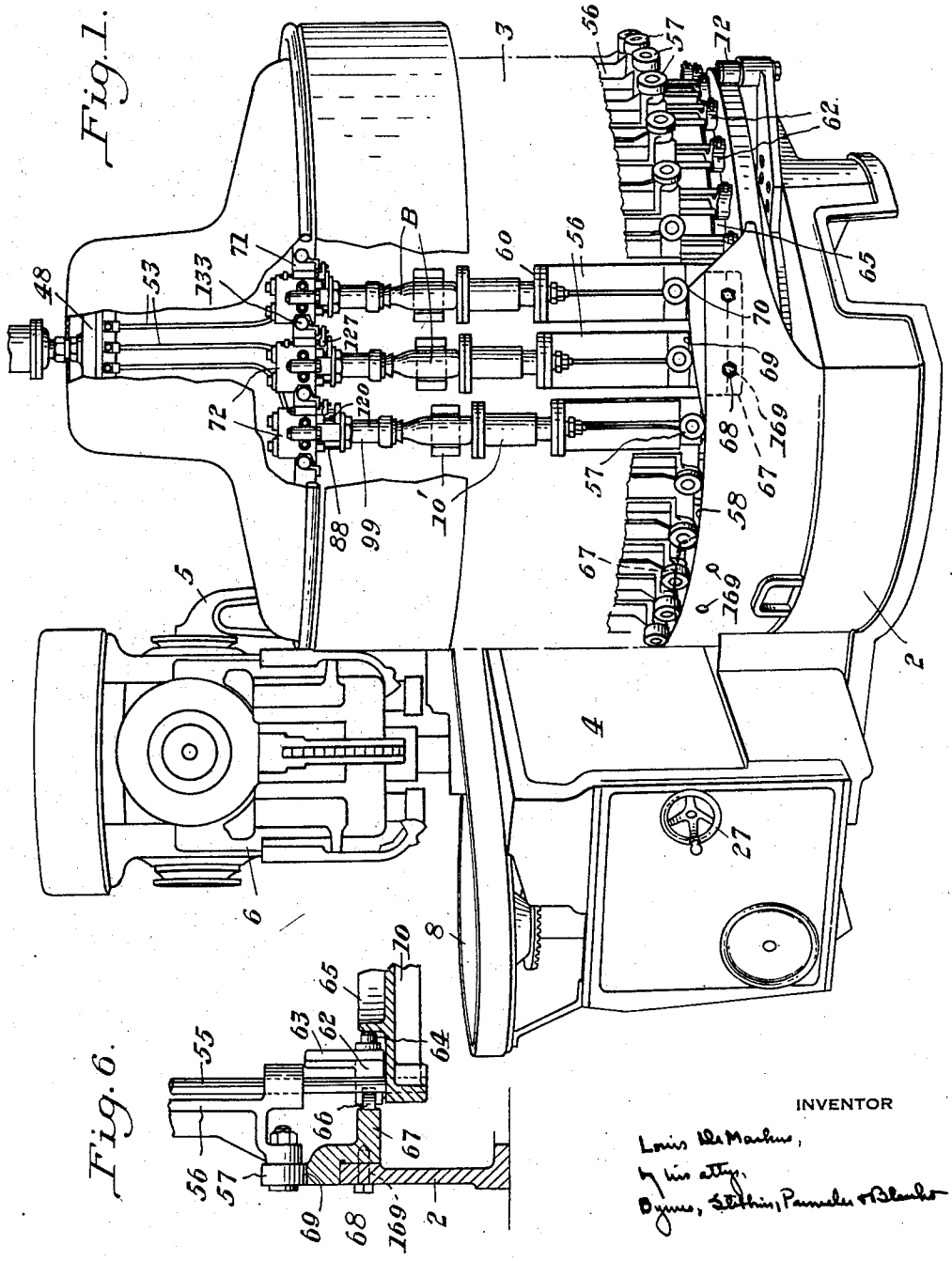


Fig. 6.

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Dyrne, Stithin, Parmelee & Blanke

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FILLING MACHINE

Filed May 8, 1931 7 Sheets-Sheet 2

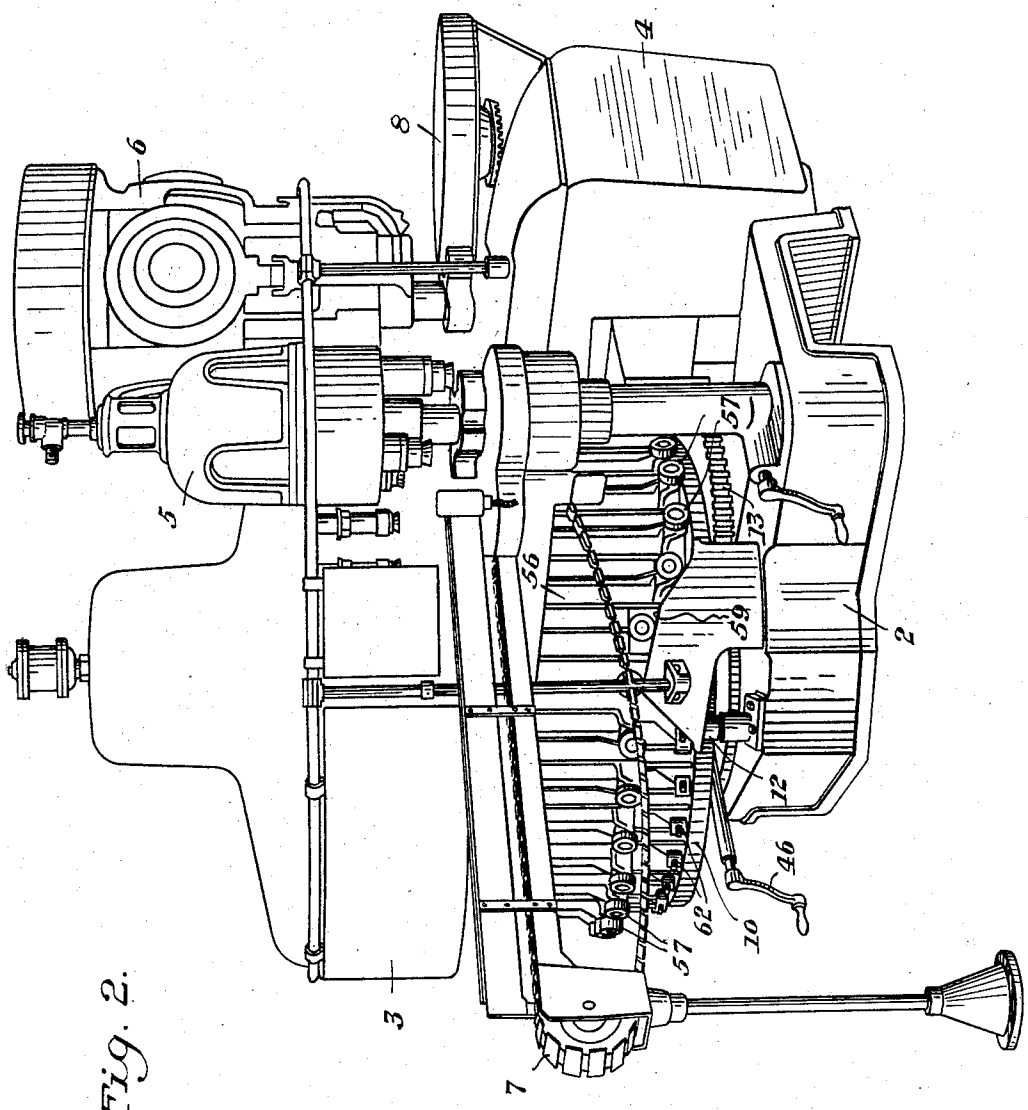


Fig. 2.

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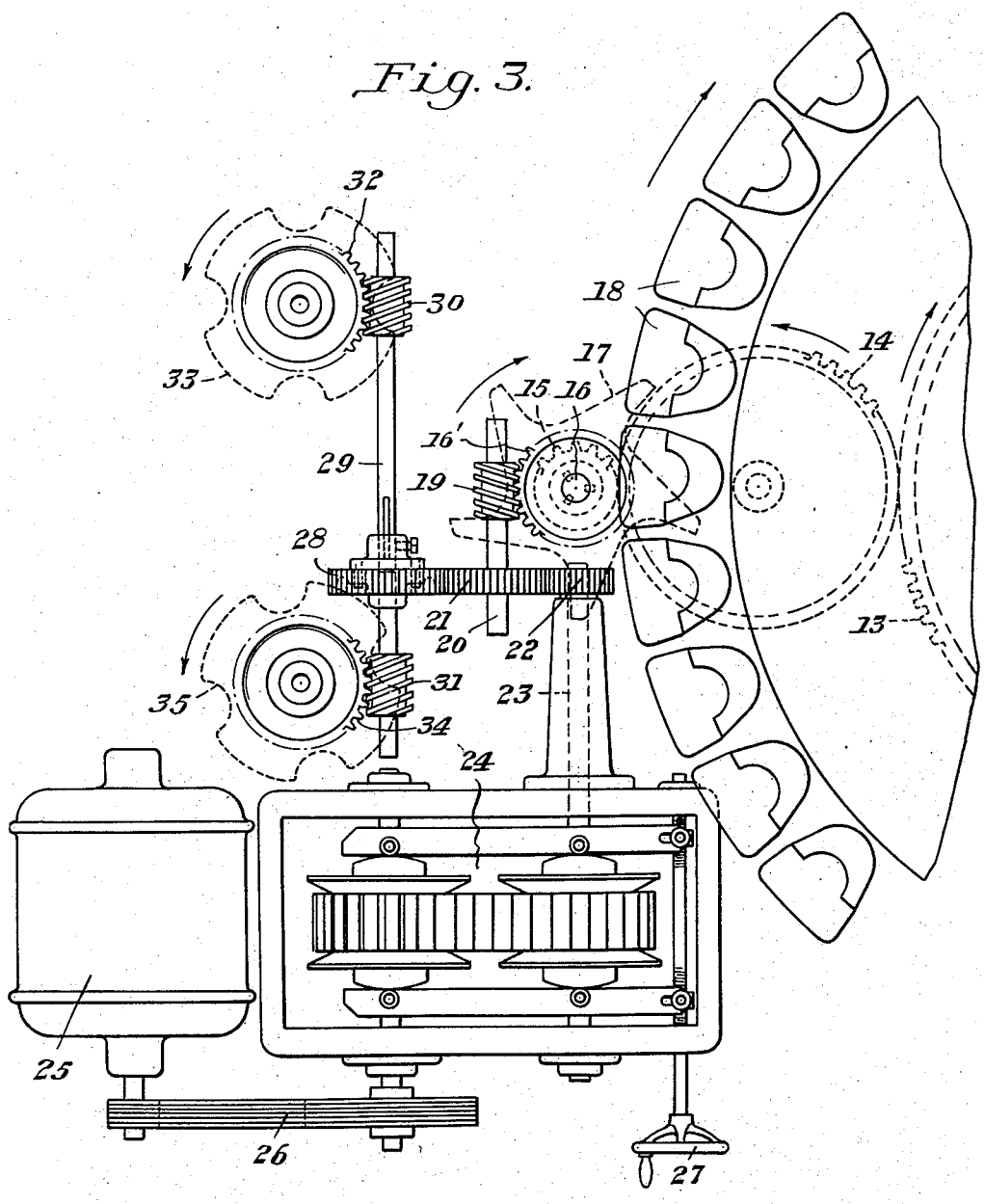
Byrnes, Stebbins, Parmelee & Bleuke

Dec. 25, 1934. L. DE MARKUS 1,985,767

FILLING MACHINE

Filed May 8, 1931 7 Sheets-Sheet 3

Fig. 3.



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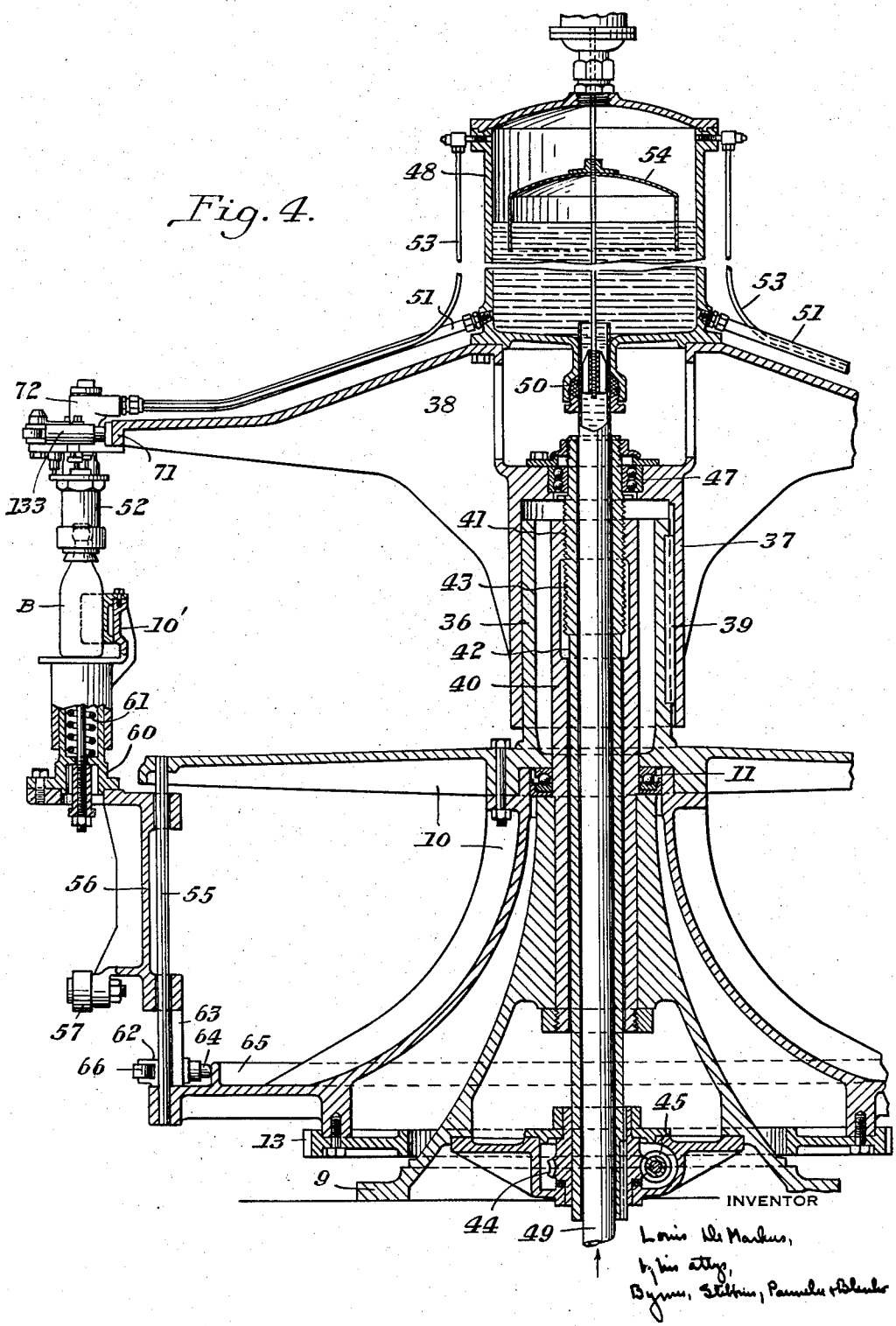
Byrnes, Stebbins, Pannell & Blenko

Dec. 25, 1934. L. DE MARKUS 1,985,767

FILLING MACHINE

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Fig. 4.



Dec. 25, 1934. L. DE MARKUS 1,985,767

FILLING MACHINE

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Fig. 5.

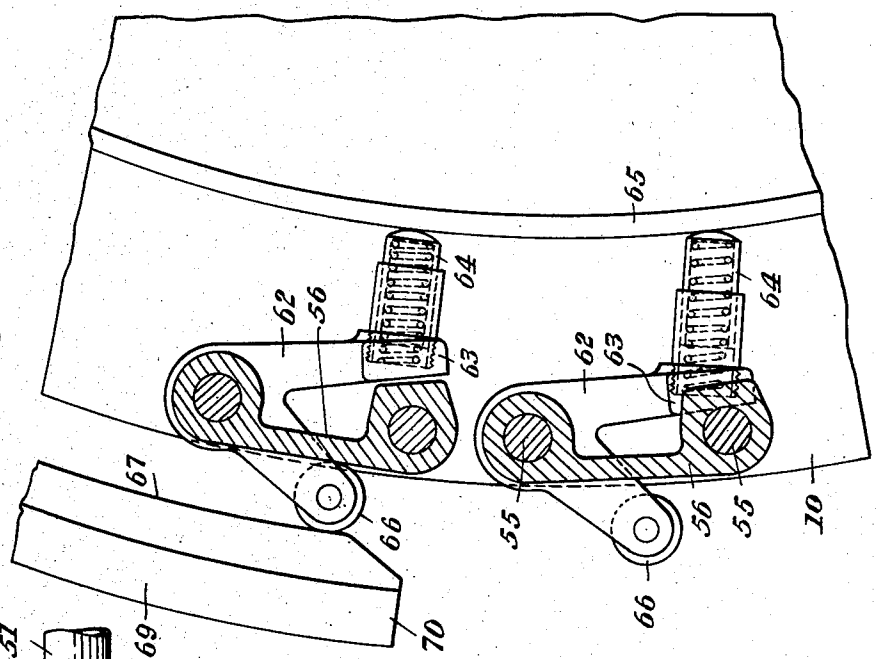
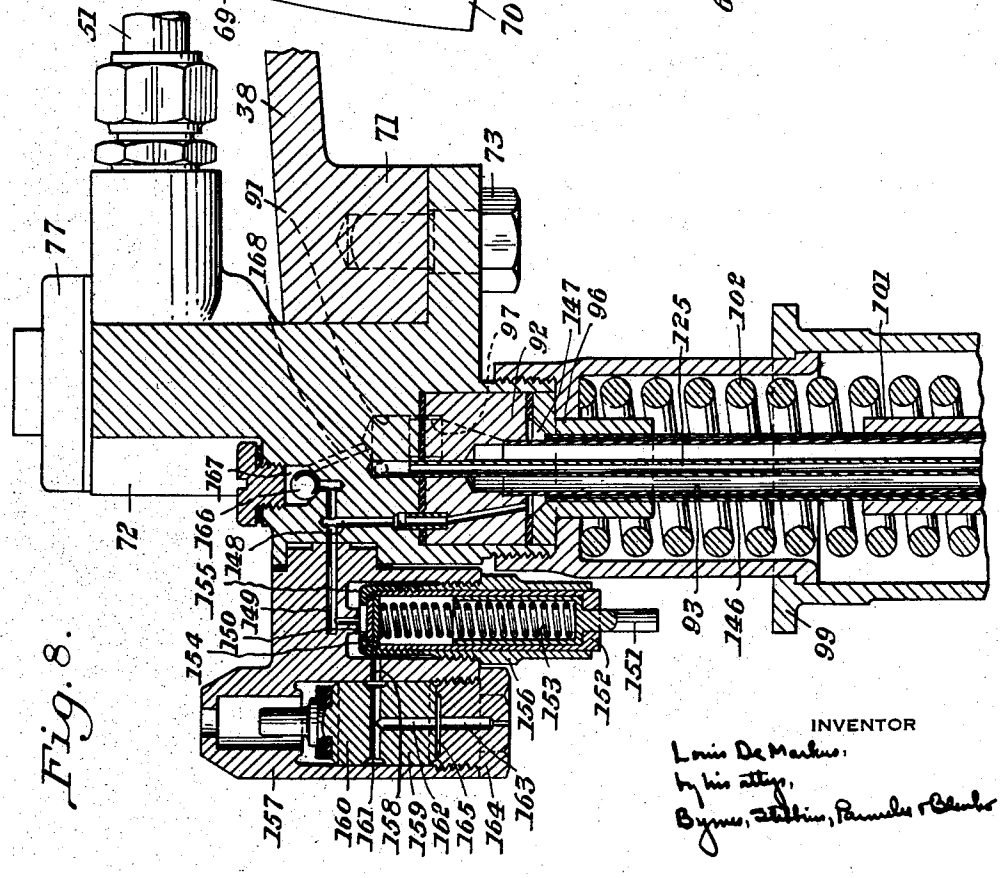


Fig. 8.



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Dec. 25, 1934. L. DE MARKUS 1,985,767

FILLING MACHINE

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Fig. 7.

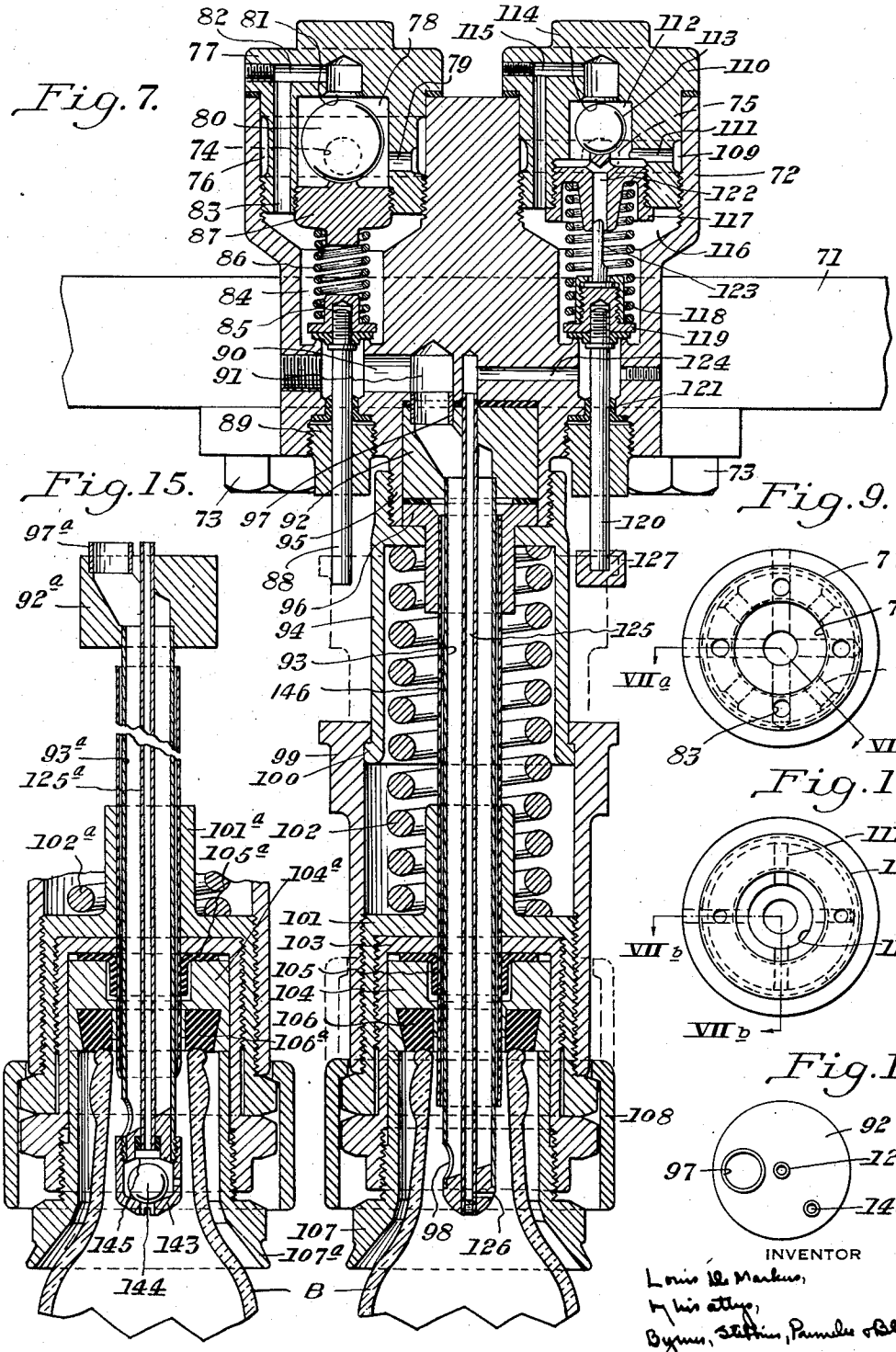


Fig. 15.

Fig. 9.

Fig. 10.

Fig. 11

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FILLING MACHINE

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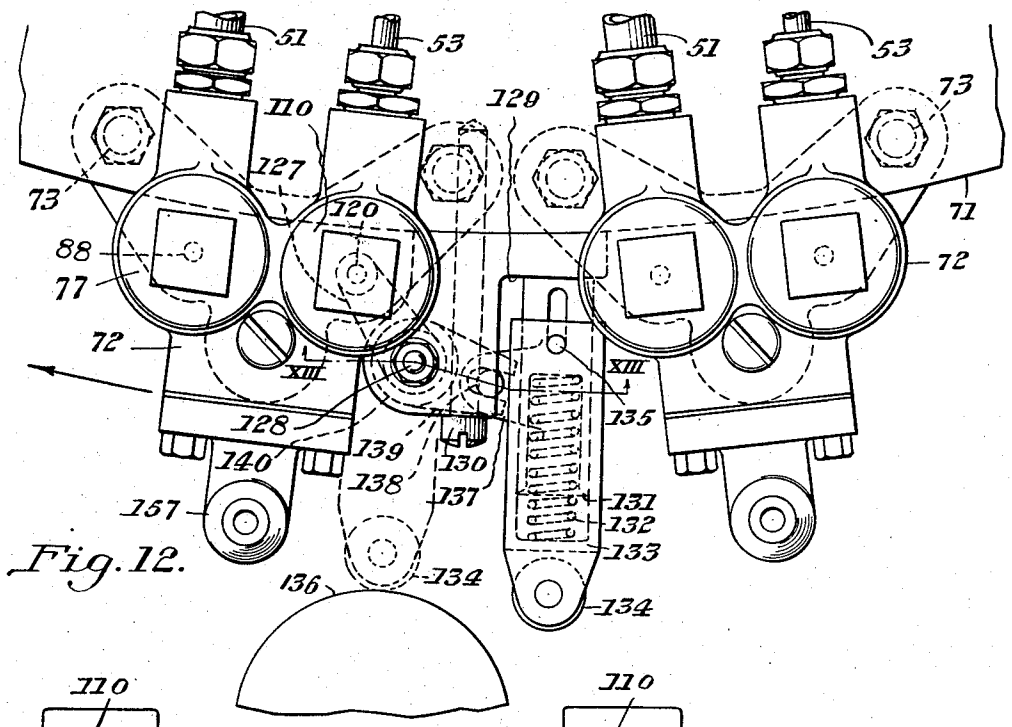


Fig. 12.

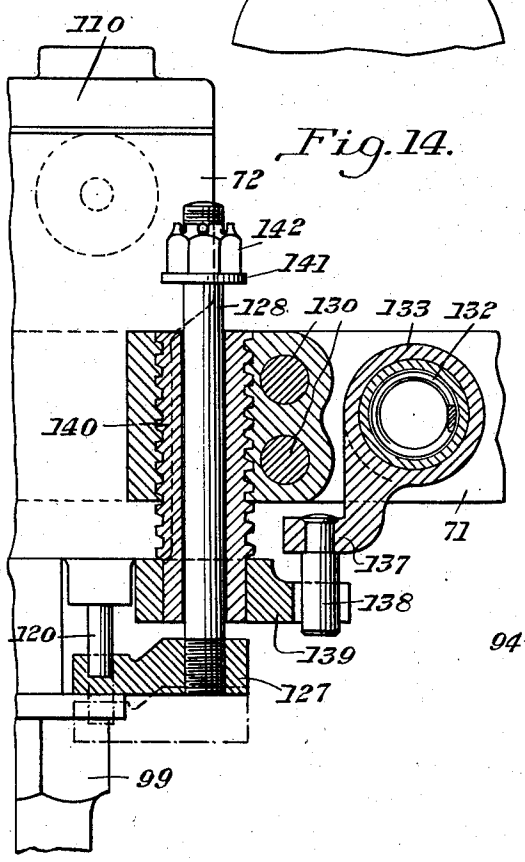


Fig. 14.

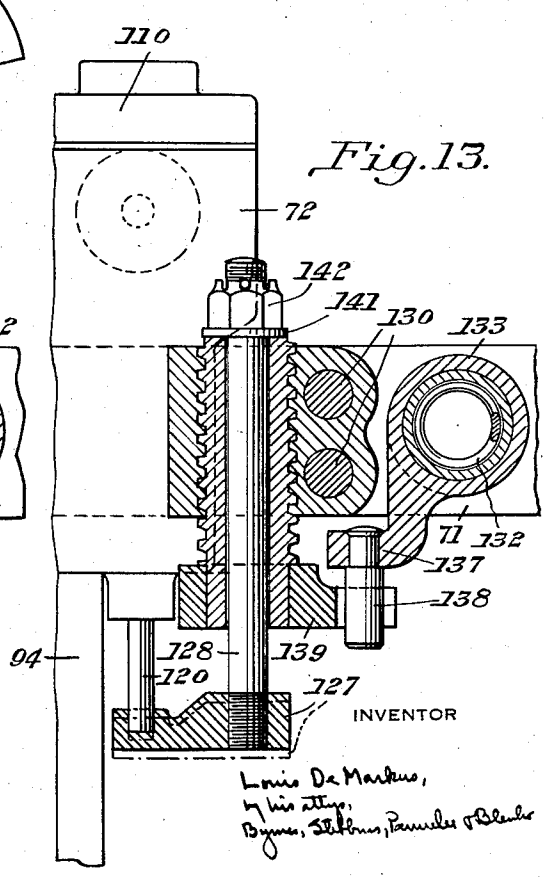


Fig. 13.

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Patented Dec. 25, 1934 1,985,767

UNITED STATES PATENT OFFICE

1,985,767

FILLING MACHINE

Louis De Markus, Pittsburgh, Pa., assignor to McKenna Brass & Manufacturing Company, Inc., Pittsburgh, Pa., a corporation of Pennsylvania

Application May 8, 1931, Serial No. 535,882

20 Claims. (Cl. 226—98)

This invention relates to filling machines and is herein particularly described as applied to the bottling of carbonated beverages.

One of the great problems in soft drink bottling is that of foaming. A large number of factors enter into this problem and attempts have been made to solve it in various ways. I have, however, discovered a fruitful cause of foaming which has heretofore been unappreciated, and by overcoming it am able to materially improve filling conditions.

In modern filling machines provision is made for supplying an initial pressure—commonly termed the counter-pressure—within the bottle prior to filling, and for maintaining such pressure throughout the filling operation. It is also common practice in machines of this character to rely on gravity alone to cause the flow of liquid from the liquid container of the machine to the bottles. The counter-pressure tube is generally inserted in the bottle so that as the liquid level rises therein the opening of the counter-pressure tube becomes submerged. A quantity of gas is thus trapped in the neck of the bottle and flow ceases. In this manner the filling height is controlled independently of the exact time period. Nevertheless, while the filling is not determined by the filling time, it is essential that the machine be operated sufficiently slowly so that the liquid has enough time to fill the bottle by reason of gravity flow. After the bottle is filled, it is necessary to relieve the top pressure by snifting before removing the bottle from the filling head. If snifting is not carefully controlled there is danger of the bottle foaming at the moment that the top pressure is released. I overcome this by a novel form of snift.

However, I have found that a large amount of the foaming is caused by water getting into the counter-pressure tube. As above stated, the lower end of this tube becomes submerged toward the completion of a filling step. Because of limitations of space, the tube is always small, and capillarity alone is sufficient to retain a small amount of water within the tube after the bottle has been removed from the head. As the head continues its movement, another bottle is supplied, the counter-pressure valve is opened, and gas flows through the counter-pressure tube into the empty bottle. In so doing it makes a foam of the liquid within the tube and blows this foam into the bottle. Even though such foam may be very small in amount, its presence is conducive to foaming of the entering water, even though such water would fill foam free if it were not for the initial small amount of foam put into the bottle by the application of counter-pressure. Broadly stated, I provide for keeping the counter-pressure tube free of foam or water at the time of insertion thereof into the container to be filled. More specifically, I prefer to momentarily open the counter-pressure valve prior to the insertion of a bottle in the head so as to blow out any contained liquid therein. However, the same result may be obtained by employing check means, such as a ball float, which prevents the liquid from initially entering the tube.

Heretofore filling machines have been constructed so that there is a material time lapse after filling before the bottle is removed from the head. This is particularly true in the case of large bottles, such as quarts. Assuming the usual construction wherein the filling heads travel in a circular path, approximately 315 degrees of the circumference may be utilized for bottle travel, the remaining 45 degrees being employed for the feeding and discharging. During this 315 degrees of travel it is necessary to raise the filling head to filling position, fill the bottles, lower them to the proper elevation for discharge, and snift the top pressure. Usually the bottles are lowered about 90 degrees of rotation prior to their discharge. This distance is necessary with small bottles because a proper snifting time must be provided. However, in the case of large bottles the speed of the machine must be reduced in order to get sufficient filling time. This means that an undue length of time is given for snifting. The total amount of gas to be snifted does not vary materially for bottles of different capacity. I therefore provide for adjusting the point in the orbital path of the bottle where snifting occurs, and, coupling this with the provision of a variable speed drive, am able to utilize a materially larger portion of the orbital path of the bottles for filling, and to cut down the length of such path for snifting, on large bottles. With small bottles a proportionately smaller part of the path will be utilized for filling, but with the larger sizes this may be materially increased. I am thereby enabled to operate the machine at a speed for large size bottles which, although not so great as the speed employed for smaller sizes, is still materially greater than the speeds heretofore possible. This greatly increases the capacity of the machine. This aspect of my invention is particularly valuable in connection with the improved snift and other features hereinafter described.

In the accompanying drawings illustrating a

present preferred embodiment of the invention,

Figure 1 is a perspective view, partly broken away, showing a filling machine;

Figure 2 is a perspective view of the machine taken from the opposite side;

Figure 3 is a diagram of the drive;

Figure 4 is a central vertical section of the upper portion of the machine;

Figure 5 is a horizontal section of a detail of the machine showing the release mechanism for permitting lowering of the bottle supports;

Figure 6 is a vertical section to reduced scale showing the apparatus of Figure 5;

Figure 7 is a vertical section through one of the filling heads; (In the upper part of this view there are shown two ball-retaining caps. As to these caps, the section is on the lines VII*a*—VII*a* of Figure 9 and VII*b*—VII*b* of Figure 10.)

Figure 8 is a vertical section through the upper portion of the filling head, the section being taken at right angles to the section of Figure 7;

Figures 9 and 10 are bottom views of ball-retaining caps illustrated in Figure 7;

Figure 11 is a top plan view of one of the pieces of the filling head;

Figure 12 is a top plan view, partly broken away, of a portion of the machine showing the means for clearing the counter-pressure tube of fluid;

Figure 13 is a section taken on the line XIII—XIII of Figure 12;

Figure 14 is a similar view, but showing the parts in different position; and

Figure 15 is a view corresponding to a portion of Figure 7, but showing a modification.

The filling machine illustrated in the drawings comprises a base 2 supporting the filling machine proper, this being indicated generally by the reference character 3, a housing 4 for the motor drive, a syruping unit 5, a crowning unit 6, and the usual conveying mechanism for supplying and taking away bottles to be filled. In Figures 1 and 2 I have illustrated a feeding conveyor 7 and an accumulator table 8 for filled bottles.

Referring to Figure 4, there is shown a standard 9 carrying a rotatable table 10. The table 10 runs on a roller bearing 11 and is held against axial displacement by such bearing and by outboard bearings 12. These outboard bearings are the subject matter of my copending application Serial No. 535,883, filed May 8, 1931. The table carries a gear 13 which (Figure 3) meshes with an intermediate gear 14 connected to a driving pinion 15. The driving pinion 15 is carried on a shaft 16 carrying a star wheel 17 for feeding bottles to bottle holders 18 carried by the table 10 and for taking off the bottles after they have been filled. The shaft 16 carries a worm wheel 16' meshing with a worm 19 on a shaft 20. The shaft 20 carries a gear 21 meshing with a pinion 22 on a shaft 23. The shaft 23 is the driven shaft of a variable speed coupling 24 of the well-known Reeves type. This coupling is driven from a motor 25 through a chain belt 26. The speed of the filling machine is controlled by a hand wheel 27 which effects adjustment of the Reeves coupling.

The gear 21 also meshes with a gear 28 on a shaft 29, which shaft carries worms 30 and 31. The worm 30 meshes with a worm wheel 32 which drives a pocketed feed wheel 33 for the syruping mechanism 5. The worm 31 meshes with a worm wheel 34 which drives a similar pocketed feed wheel 35 for the crowning mechanism 6. In Figure 3 these wheels are shown out of their normal position for clarity of illustration. However, the general type of feed mechanism which I employ is well known and requires no detailed description.

Referring again to Figure 4, there is shown a barrel 36 extending upwardly from the table 10, this barrel telescoping with a sleeve 37, forming part of a bonnet indicated generally by the reference character 38. A key 39 is provided, the keyway in the sleeve 37 being elongated so that the bonnet may be adjusted vertically with respect to the table 10, although forced to rotate therewith. The table 10 is formed with an axial opening through which extends a sleeve 40 having screw threads 41 formed therein. An inner sleeve 42 carrying cooperating threads 43 lies within the sleeve 40. The outer sleeve 40 is fixed in the standard 9; while the inner sleeve 42 extends downwardly there-through, and makes a spline connection with a worm wheel 44 meshing with a worm 45. The worm 45 is rotatable by a hand-crank 46 (see Figure 2) and rotation thereof is effective for raising or lowering the bonnet 38 with respect to the table 10. When the hand-crank 46 is turned the worm-wheel 44 is rotated, thus causing rotation of the inner sleeve 42 in one direction or the other, and causing the same to thread upwardly or downwardly through the threads of the sleeve 40. A radial thrust bearing 47 connects the inner sleeve 42 with the upper portion of the sleeve 37 of the bonnet 38.

A water tank 48 is carried on top of the bonnet 38. It is supplied through a tube 49 extending upwardly within the sleeve 42 and through a packing gland 50. As the bonnet is raised or lowered the tube 49 projects a greater or less distance into the water tank. Conduits 51 lead from the water tank 48 to each of the filling heads of the machine. These filling heads are spaced equally around the bonnet 38 and are indicated generally by the reference character 52. Each filling head also is connected through a tube 53 to the upper portion of the water tank 48. The tubes 53 constitute the source of gaseous counter-pressure for their several heads. The supply of gas and liquid to the water tank 48 is controlled by a valve 54 operating through mechanism well known in the art.

In the operation of a machine of this character the bottles are fed to the bottle holders 10' and the bottle holders are then raised to bring the bottles into operative engagement with the filling heads. During filling the bottles are held in elevated position, as shown in Figure 4, and after the filling has been completed the bottle holders are lowered so as to permit of discharging the filled bottles. The bottle elevating and lowering mechanism is best shown in Figures 1, 2, 4 and 5.

The table 10 between its upper and lower portions carries paired rods 55 which support slides 56 carrying the bottle holders 10. Each slide 56 is provided with a cam roller 57. During the time of discharging and receiving bottles the rollers 57 run on a cam track 58. This cam track is divided into two portions; and in Fig. 2 there is shown an elevating portion 59 which raises the slides 56 and brings the bottles into engagement with the heads. The bottle holders proper are slidably mounted on bases 60 carried by the slides 56 and are urged upwardly by springs 61. This provision is made to eliminate choke and to take care of the usual variations in bottle height.

When changing from one size bottle to another the bonnet 38 will, of course, be raised or lowered relative to the table 10 by means of the hand-crank 46.

Since it is only necessary that the bottles be held in elevated position during the major portion of their time on the machine, wear of the rollers 57 and the drag of the machine which would be encountered by extending the cam track all the way around the machine is eliminated by locking the slides 56 in elevated position. This is done by mounting on one of each pair of rods 55 an arm 62 (see Figures 5 and 6), which arm has an upwardly extending finger 63. Each arm also has a spring-pressed plunger 64 bearing against a flange 65 on the table 10 effective for biasing the arms to the position shown at the bottom of Figure 5. The elevating portion 59 of the cam track 58 raises each slide 56 in turn to a point where the arm 62 may be rotated by the bullet 64 so as to move the finger 63 beneath the slide, thus locking the bottle holder in elevated position. After the filling operation, the bottle holders must be lowered and it is necessary to rotate the arms 63 in a counter-clockwise direction so as to move the fingers 63 from under their corresponding slides. This is done by means of cam rollers 66 on each of the arms 62 and a cam plate 67. The cam plate 67 is secured to the base 2 by screws 68, and the base is drilled at different points along the cam track 58 (see Figure 1) so that the cam plate 67 may be placed in different positions for reasons hereinafter described. The cam plate 67 also has a cam face 69 extending downwardly to the cam track 58. The peak 70 of the cam face 69 is of sufficient height to engage the rollers 57 and raise the slides 56 very slightly above the normal high point as determined by the fingers 63. This slight elevation occurs just prior to the time that the corresponding cam rollers 66 engage the cam plate 67. As a consequence, all sliding friction between the finger 63 and the bottom of the slide 56 at the time the finger is moved out of the way to permit lowering is eliminated. After the arm 62 has been moved to the position shown in the upper portion of Figure 5, the head is free to be lowered and the rate of lowering is determined by the cam face 69.

The head mechanism is illustrated in Figures 7 to 14 inclusive. The bonnet 38 is provided at its outer edge with a flange 71 to which castings 72 forming the main portions of the heads 52 are secured by bolts 73. The water conduit 51 terminates in an opening 74 and the gas conduit 53 terminates at 75. The opening 74 leads to an annulus 76 formed in a cap 77 screwed in the casting 72. The cap is shown in bottom view in Figure 9. It is centrally bored at 78 and holes 79 connect the central bore 78 with the annulus 76. A ball-check valve 80 lies in the central opening 78 and a seat 81 is provided therefor. Beyond the ball seat 81 a passage 82 extends radially and then downwardly within the cap 77 to terminate at 83 in a valve chamber 84. The valve 85 bears against a seat formed in the casting 72 and is normally held against the seat by a spring 86. The spring is carried by a plug 87 screwed in the cap 77, which plug also serves to retain the ball 80 in the central opening 78 and seal off such opening from the valve chamber 84. To reach the valve 85 water must flow from the opening 74 to the annulus 76, thence through the openings 79 to the ball chamber and thence through the passage 82. The function of the ball 80 is to prevent an excessive rate of liquid flow. Under ordinary circumstances the ball remains in the position shown, but in the event of a burst bottle or some other untoward happening causing the water to tend to flow very rapidly, the ball moves upwardly by reason of the increased rate of flow against the seat 81 and cuts off the further flow of water.

The valve 85 has a stem 88 extending through a packing 89. When the valve is open water is free to flow through a cross passage 90 to an opening 91 in the casting 72. The casting is bored to receive a block 92 carrying a filling tube 93. The block 92 is held in position by a sleeve 94 threaded over a boss 95 on the casting 72. When the sleeve 94 is screwed in place it communicates its pressure through a flanged fitting 96 to the block 92. The block is provided with a short tube 97 which extends into the opening 91. Gaskets are provided above and below the block 92, as shown, so that when the sleeve 94 is screwed into place a non-leaking water passage is provided from the valve chamber 84 to the outlet opening 98 of the filling tube.

The sleeve 94 carries a slide 99, the downward movement of which is limited by a flange 100 on the sleeve 94. The slide 99 is threaded to receive a plug 101 bearing against a compression spring 102 within the sleeve 94 and the slide 99. This spring normally urges the slide downwardly to the position shown. The plug 101 is counter-bored to receive a shell 103 within which is a block 104 carrying a packing 105 and a sealing rubber 106 adapted to engage the lip of a bottle B. The block 104 is held in place by a bottle guide 107 and a sleeve 108 extending around the bottom portion and the slide 99 is dropped over the several parts so as to hold them against rotation.

When a bottle holder carrying an empty bottle is raised by the elevating cam 59, it moves the bottle B up to the head until the lip engages the sealing rubber 106. Continued elevation of the bottle holder causes the bottle to raise the slide 99 against the resistance of the spring 102. This upward movement of the slide 99 is utilized for actuating the water valve as well as the other valves within the head.

Prior to the opening of the water valve it is desirable to place the interior of the bottle under pressure. This is done by supplying gas from the conduit 53 which, as above stated, terminates in the head at 75. The opening 75 communicates with an annulus 109 in a cap 110 which is shown in bottom view in Figure 10. Radial openings 111 lead to a central chamber 112 containing a ball 113. A ball seat 114 is formed at the top of the chamber 112, and beyond it there is a passage 115 extending radially and then downwardly to a valve chamber 116. The ball is held in place by a plug 117, which plug supports the spring 118 for a counter-pressure valve 119. The counter-pressure valve has a stem 120 extending through a packing 121. The plug 117 is drilled at 122 so as to provide a passage direct from the ball chamber 112 to the valve chamber 116. The function of the ball 113 is analogous to that of the ball 80, namely, to check the flow of gas in the event of a broken or chipped bottle, but provision must be made to by-pass the gas around this ball check at the time of filling the bottle with counter-pressure gas, because a large rush of gas occurs at the instant the valve 119 is opened. Such a gas rush is necessary if counter-pressure is to be built up rapidly. Consequently, when the valve 119 is

opened the gas flows through the passage 122 into the valve chamber 116. However, the valve 119 carries a stem 123 which projects into the passage 122. The upper portion of the stem is of reduced area but the lower portion is of the same size as the passage 122 so that when the valve 119 is in process of opening gas is free to flow through the passage 122, but when the valve 119 is fully opened, the passage 122 is choked off by the stem 123.

Gas flowing past the valve 119 enters a passage 124 communicating with a counter-pressure tube 125. The counter-pressure tube lies within the water tube 93 and terminates at 126.

The stem 120 of the counter-pressure valve terminates in a recess formed in an arm 127, which arm is carried by a slide 128 (Figure 13). The bottom of the arm 127 is at a lower level than the bottom of the stem 88 of the water valve and therefore when the slide 99 is raised, the counter-pressure valve is opened before the water valve. After counter-pressure has been built up in the bottle and the water valve has been opened, water flows past the water valve and through the water tube 93 to the bottle. It will be understood that the counter-pressure within the bottle is equal to the pressure on top of the water in the water chamber 48, and therefore the water flow will be occasioned by gravity alone. So long as the opening 126 remains uncovered there is free gaseous communication between the space above the water in the bottle and the space above the water in the water chamber 48, but as soon as the opening 126 is submerged this communication is cut off and a small quantity of gas is trapped in the neck of the bottle above the opening 126. The pressure of this gas builds up very rapidly and checks the flow of water. The amount of filling of the bottle is therefore determined by the position of the opening 126 and is independent of time. After the filling has been completed the gas and water valves may be closed and the bottle snifted and discharged for crowning.

By reason of the fact that submergence of the opening 126 is essential to filling control, and by reason of the fact that there must be built up within the neck of the bottle a pressure sufficient to balance the gravity head of the liquid, a small amount of water necessarily enters the opening 126 of the counter-pressure tube 125. When a bottle is discharged this water remains in the tube. As above stated, I have found that it is a prolific cause of foaming, and I therefore make provision for momentarily opening the valve 119 prior to the supplying of the next bottle, for by so doing the counter-pressure tube is blown clear of contained water. This is important because even a small drop of water, if left in the counter-pressure tube, will cause a small amount of foam, and the presence thereof in the bottle will induce more foaming of the entering water.

The momentary opening of the valve 119 is effected by mechanism best illustrated in Figures 12 to 14. A bracket 129 is secured to the flange 71 of the bonnet 38 alongside each head 52 by cap screws 130. The bracket 129 carries a post 131 which is bored to receive a compression spring 132. A sleeve 133 fits over the post 131 and carries a cam roller 134. The sleeve 133 is held on the post by a pin 135 extending through a slot in the post. As the machine rotates the roller 134 engages a post 136 lying between the syruper 5 and the crowner 6, and this post acts as a cam to force the sleeve 133 inwardly. It will be borne in mind that at this time there is no bottle in the head with which the particular sleeve 133 is associated.

The sleeve 133 carries an extension 137 from which projects a pin 138. The pin engages a fork 139 on the bottom of a hollow screw 140. The screw carries a high pitch thread so that the slight rotation thereof obtained by camming the sleeve 133 inwardly is effective for causing a material upward movement of the screw 140. The slide 128 extends through the hollow screw 140, and when such slide is in its lowermost position, the stem 120 of the valve 119 is in its low position corresponding to a closed position of the valve 119, and the arm 127 lies just below it. The corresponding position of the slide 128 is determined by a washer 141 backed by a castle nut 142. The washer 141 rests on top of the screw 140. When the screw 140 is rotated by the camming action of the post 136, the slide 128 is raised slightly, thus opening the valve 119 a short distance. This valve opening is momentary, for as soon as the roller 134 passes the post 136 the spring 132 urges it outwardly, thus rotating the screw 140 in the opposite direction, and lowering the slide 128 and the arm 127. In Figure 13 the lowermost position of the arm 127 is shown in dot-and-dash lines, and the amount of lift occasioned by the mechanism just described will also be clear from this view because the solid lines show the parts when raised by the camming action of the post 136.

As shown in Figure 14, the slide 128 moves upwardly freely through the screw 140 when the slide 99 is raised to open the valves 119 and 85.

When the valve 119 is momentarily opened by the mechanism just described, a small quantity of gas is blown through the counter-pressure tube 125, effectually discharging any residual water therein.

In Figure 15 there is illustrated a modified structure according to which the mechanism of Figures 12 to 14 inclusive is dispensed with and provision is made for sealing the counter-pressure tube against the entry of liquid. In Figure 15 parts corresponding to similar parts in the embodiment of my invention above described have been given the same reference characters with an "*a*" suffixed thereto.

Figure 15 shows a water tube 93*a* with a counter-pressure tube 125*a* therein. The water tube carries a cage 143 having therein a ball 144 of lignum vitæ or other suitable wood. As the water level rises in the bottle the ball 144 is lifted by flotation against a seat 145 at the bottom of the counter-pressure tube 125*a*, thus preventing the entry of any water.

The counter-pressure tube having been cleared or kept clear of water, a fresh bottle is supplied and filled in the manner above described. When the filling is completed, the bottle holder is lowered so as to cut off the supply of gas and water; but before removing the bottle from the head, it is necessary to release the top pressure, as otherwise there will be danger of foaming. This is done by the snift mechanism illustrated in Figure 8.

The water tube 93 fits inside of a tube 146 whose inside diameter is somewhat larger than the outside diameter of the water tube 93, thus providing an annular passage through which gas may travel upwardly to an annular chamber 147 within the fitting 96. A passage 148 leads from the annulus 147 to a cross passage 149 leading to a valve seat 150. This is the snift valve. When the slide 99 is in its lower position the snift valve is opened; but when the slide is raised it engages a stem 151 of

the snift valve. The stem 151 extends into a casing 152 and is there flared out and recessed to carry a spring 153, the upper end of which bears against a washer 154. A cap 155 is screwed over the upper end of the casing 152 and holds the parts in assembled position. The cap also bears, at its lower edge, against the upper edge of a guide sleeve 156 which is screwed into the snift valve body 157. The casing 152 is freely slidable in the guide sleeve 156. As the slide 99 is raised it engages the stem 151 prior to engaging the arm 127 for the counter-pressure valve or the stem 88 of the water valve. It raises the snift valve against the seat 150 and seals off the snift passage. Further movement of the sleeve 99 upwardly merely compresses the spring 153 while holding the snift valve closed. Consequently, when the counter-pressure valve 119 is opened, gaseous pressure builds up within the bottle but cannot escape through the snift valve. After the filling has been completed and the slide 99 begins to lower, the water valve is first closed, then the counter-pressure valve is closed, and finally the snift valve is opened. It is desirable to meter or limit the rate at which the top pressure is released through the snift valve, because if it is done too suddenly there is danger of sudden evolution of gas and consequent foaming of the liquid contents. I therefore lead the gas after it passes the snift valve through a passage 158 to a rate controller 159. This rate controller consists of a slide valve 160 in the casing 157. The slide valve 160 has an annulus 161 with which the passage 158 communicates when the valve is in its lowermost position, as illustrated in Figure 8. A cross passage connects the annulus with a center opening 162 in alinement with a discharge opening 163 in the plug 164 which closes the bottom of the opening containing the last controlling valve 160. The opening 163 has a restricted orifice so that when gas rushes through it builds up pressure within the space 165 below the slide valve 160 and tends to raise the same and cut off the annulus 161 from the passage 158. This provides a momentary check for the flow of gas through the snift valve. As soon as the flow is cut off the pressure at 165 is dissipated through the orifice of the passage 163 and the slide valve 160 again drops to re-establish the communication between the annulus 161 and the passage 158. This operation is repeated until the pressure has been reduced.

It will be noted from Figure 8 that the cross passage 149 is extended to the right of the passage 148 to a point below a ball valve 166. The ball valve lies in a chamber 167 having communication through a passage 168 to the opening 91. This passage is provided so as to permit of free draining of the water tube after the valve 85 has been closed so that the contents of such tube will go into the bottle then being filled. It will be borne in mind that flow continues until the gaseous pressure in the top of the bottle balances the gravity head of the liquid. At this moment flow will cease, although the valve 85 remains open. The built-up pressure balances the column of water extending up through the water tube 93 and beyond the valve 85. When the valve 85 is closed it is necessary to allow gas to enter at the top of the water column in the tube 93, for otherwise it would not flow downwardly until the release of the pressure above the liquid in the bottle. However, the provision of the passage 168 permits this water column to descend into the bottle.

The purpose of the ball check 166 is to give a dry snift. At the moment of snifting the water column will be standing in the water tube 93. If there were no check valve present there would be danger of water being blown through the passage 168 into the snift tube for the reason that the pressure above the liquid in the bottle is exerted at the base of the water column while the gaseous pressure tends to pass off through the annulus between the tubes 93 and 146 and through the passage 148. The gas passage is relatively restricted, and the frictional resistance offered to the flow of gas may be less than the resistance to the flow of liquid through the passage 168. The ball check 166 overcomes this difficulty.

The length of time required for snifting bottles of different sizes does not vary greatly. However, since the rate of flow of liquid into the bottle is determined by the gravity head, which head remains constant, it takes materially longer to fill a quart bottle than a half-pint bottle. It is therefore necessary to slow down the machine by adjusting the variable speed transmission 24, when large bottles are to be filled. Referring to Figure 1, however, it will be noted that a large portion of the periphery of the machine is occupied by the travel of the bottles in their lowered position prior to discharge. This distance is necessary at the high speeds employed for filling splits, in order to get sufficient snifting time. However, if the machine is operating at a lower speed the snifting time can be obtained in fewer degrees of revolution. I therefore provide a series of openings 169 in the base 2 for the screws 68, so that the cam plate 67 may be adjusted to different positions around the periphery. This gives more filling time and permits of increased capacity.

I have illustrated and described present preferred embodiments of the invention. It will be understood, however, that it is not limited to the forms shown but may be otherwise embodied or practiced within the scope of the following claims.

I claim:

1. A filling machine comprising a filling head having a counter-pressure tube arranged to extend into a container, means for supplying counter-pressure therethrough, and means for expelling foam or water from the tube after removal from the container prior to the time of insertion of the said tube into another container.

2. A filling machine comprising a filling head having a counter-pressure tube arranged to extend into a container, a source of pressure therefor, a valve for establishing a connection between the pressure source and the counter-pressure tube, and means for momentarily opening the valve prior to the insertion of the counter-pressure tube into the container.

3. A filling machine comprising a filling head having a counter-pressure tube arranged to extend into a container, a source of pressure therefor, a valve for establishing a connection between the pressure source and the counter-pressure tube, and means for opening the valve prior to the insertion of the counter-pressure tube into the container.

4. A filling machine comprising a head movable in a path, the head having a counter-pressure tube arranged to extend into a container, means for supplying containers to the head at a point in the path, means for taking off the containers at another point, a source of pressure, a

valve effective for establishing a connection between the source of pressure and the counter-pressure tube, and means for actuating the valve during the time between which a container is taken off from the head and a fresh container is supplied.

5. A filling machine comprising a filling head having a counter-pressure tube adapted to extend into a container, a source of pressure, a valve effective for establishing a connection between such pressure source and the counter-pressure tube, the head having means for actuating the valve after a container has been supplied thereto, and additional means for actuating the valve prior to the supplying of another container to such head.

6. A filling machine comprising a head movable in an orbital path, the head having a counter-pressure tube and a valve for establishing a gaseous connection to such tube, means for feeding containers to the head, means for taking off filled containers, and means for actuating the valve between the time of taking off a container from the head and feeding a container thereto.

7. A filling machine comprising a head movable in an orbital path, the head having a counter-pressure tube, a valve therefor and liftable means on the head for actuating the valve, and supplemental means for actuating the valve at a time when it is free of a container.

8. A filling machine comprising a filling head having a counter-pressure tube, a valve therefor, a member engaging the valve, means for imparting motion to such member in order to open the valve, and means movable on actuation of the filling head for engaging such member and opening the valve.

9. A filling head comprising a counter-pressure tube, a water tube, a snift tube, a snift valve closable for the filling operation and openable when the filling is terminated, and means automatically movable to position for limiting the rate of release of the accumulated pressure through the snift tube upon opening of the snift valve.

10. A filling head comprising a counter-pressure tube, a water tube, a snift tube, a snift valve closable for the filling operation and openable when the filling is terminated, and means beyond the snift valve for checking the escape of pressure therethrough, said checking means being operable in response to increase in pressure beyond the snift tube to check such escape of pressure.

11. A filling head comprising a counter-pressure tube, a water tube, a snift tube, a snift valve closable for the filling operation and openable when the filling is terminated, and a chatter valve beyond the snift valve for limiting the rate of release of accumulated pressure.

12. A filling head comprising a counter-pressure tube, a water tube, a snift tube, a connection between the snift tube and the water tube, and check means therein for preventing passage of water from the water tube to the snift tube.

13. A filling machine comprising a filling head movable in an orbital path, the filling head having a counter-pressure tube, a water tube and a snift tube, a valve for controlling the snift tube, the valve being adapted to be in closed position during the filling operation and to be opened after the filling operation, and cam means effective for controlling the opening of the snift valve, the cam means being adjustable to different positions along the orbital path.

14. A filling machine comprising a filling head movable in an orbital path, the filling head having a counter-pressure tube, a water tube and a snift tube, valve mechanism for controlling the counter-pressure tube, the water tube and the snift tube, said valve mechanism being adapted to obturate the snift tube during the filling operation and to open the same after the filling operation, means adjustable to different points in the travel of the head in its orbit for effecting operation of said valve mechanism to terminate the filling operation and effect opening of the snift tube, and a variable speed drive for moving the head in such path.

15. A filling machine comprising a head movable in an orbital path, the head having counter-pressure means, filling means and snift means, and valves controlling the several means, the head having a portion adapted for raising and lowering to actuate such valves, an elevating cam and a lowering cam adjustable to different positions.

16. A filling machine comprising a head movable in an orbital path, the head having counter-pressure means, filling means and snift means, and valves controlling the several means, the head having a portion adapted to be engaged by a container and raised or lowered, the valves being so positioned as to be actuated upon such raising or lowering, a holder for the container, an elevating cam for raising the holder, and a lowering cam adjustable to different positions.

17. A filling machine comprising a head movable in an orbital path, the head having counter-pressure means, filling means and snift means, and valves controlling the several means, the head having a portion adapted to be engaged by a container and raised or lowered, the valves being so positioned as to be actuated upon such raising or lowering, a holder for the container, an elevating cam for raising the holder, and means adjustable to different positions along such path for effecting lowering of the holder.

18. A filling machine comprising a head movable in an orbital path, cam means adjustable to different positions in the travel of the head in its orbit for elevating and lowering the head, the head having counter-pressure means, filling means and snift means, and valve mechanism controlled by the elevating and lowering of the head for opening and closing the counter-pressure means and filling means so as to deliver a predetermined quantity of fluid and for opening the snift means after the filling operation.

19. A filling machine comprising a filling head having a counter-pressure tube arranged to extend into a container, means for supplying counter-pressure therethrough, and means for admitting pressure momentarily to the tube before insertion thereof into the container.

20. A filling machine comprising a filling head having a compartment therein in which water and gas under pressure may be contained, a tube extending from the filling head into a container, said tube communicating with the gas space of said compartment, means for supplying a small amount of gas under pressure through the tube into the container, and means for continuing the supply of gas to the container when the first-mentioned means is shut off.

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