PUBLISHED M. J. M. DE MILLEVILLE Serial No.

MAY 25, 1943. METHOD AND APPARATUS FOR FILLING CONTAINERS 326,558

BY A. P. C. Filed March 29, 1940 3 Sheets-Sheet 1

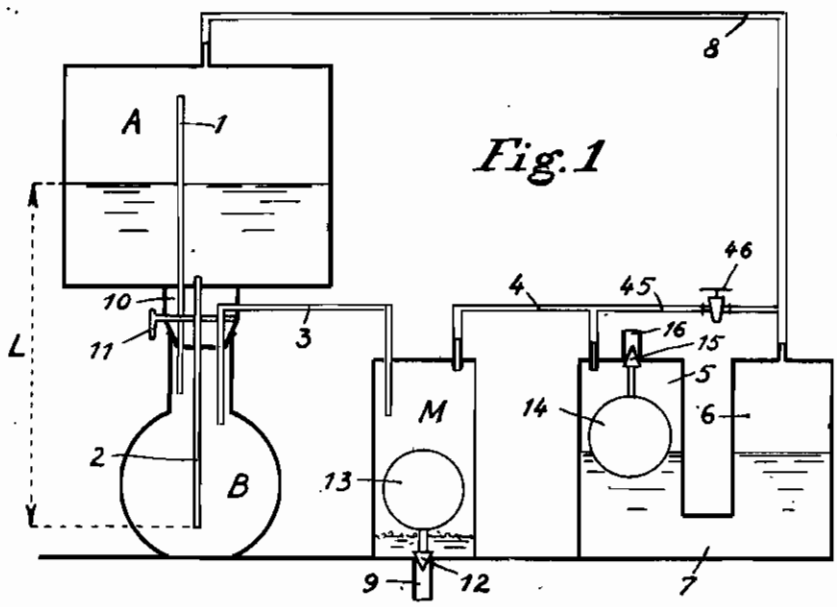

Fig. 1

Fig. 2

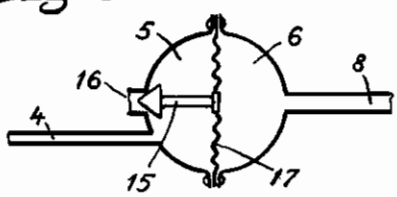

Fig. 6

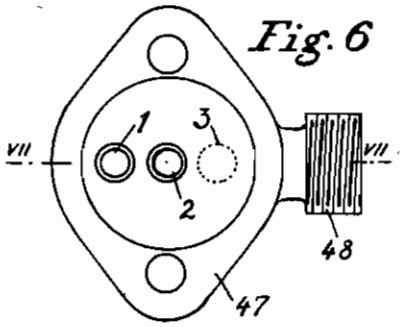

Fig. 7

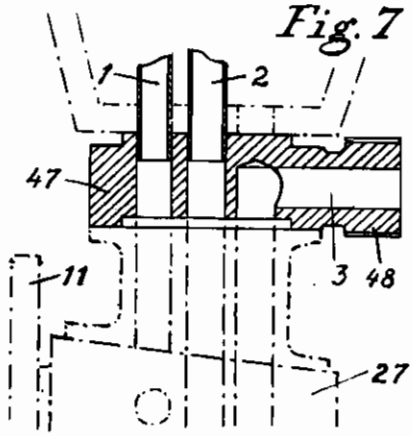

Fig. 3

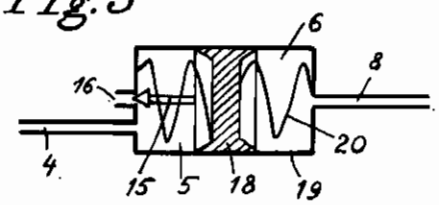

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Fig. 4

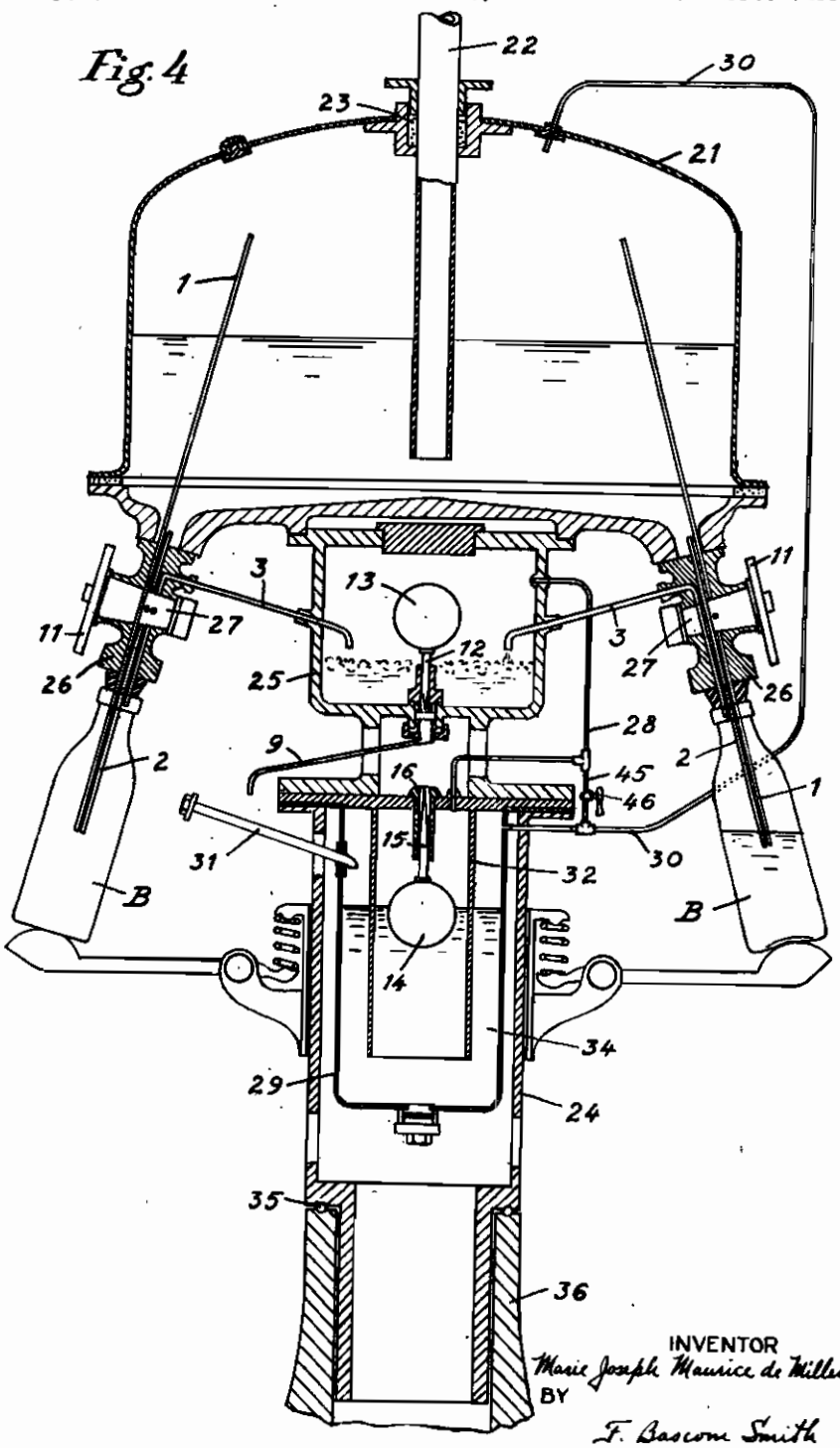

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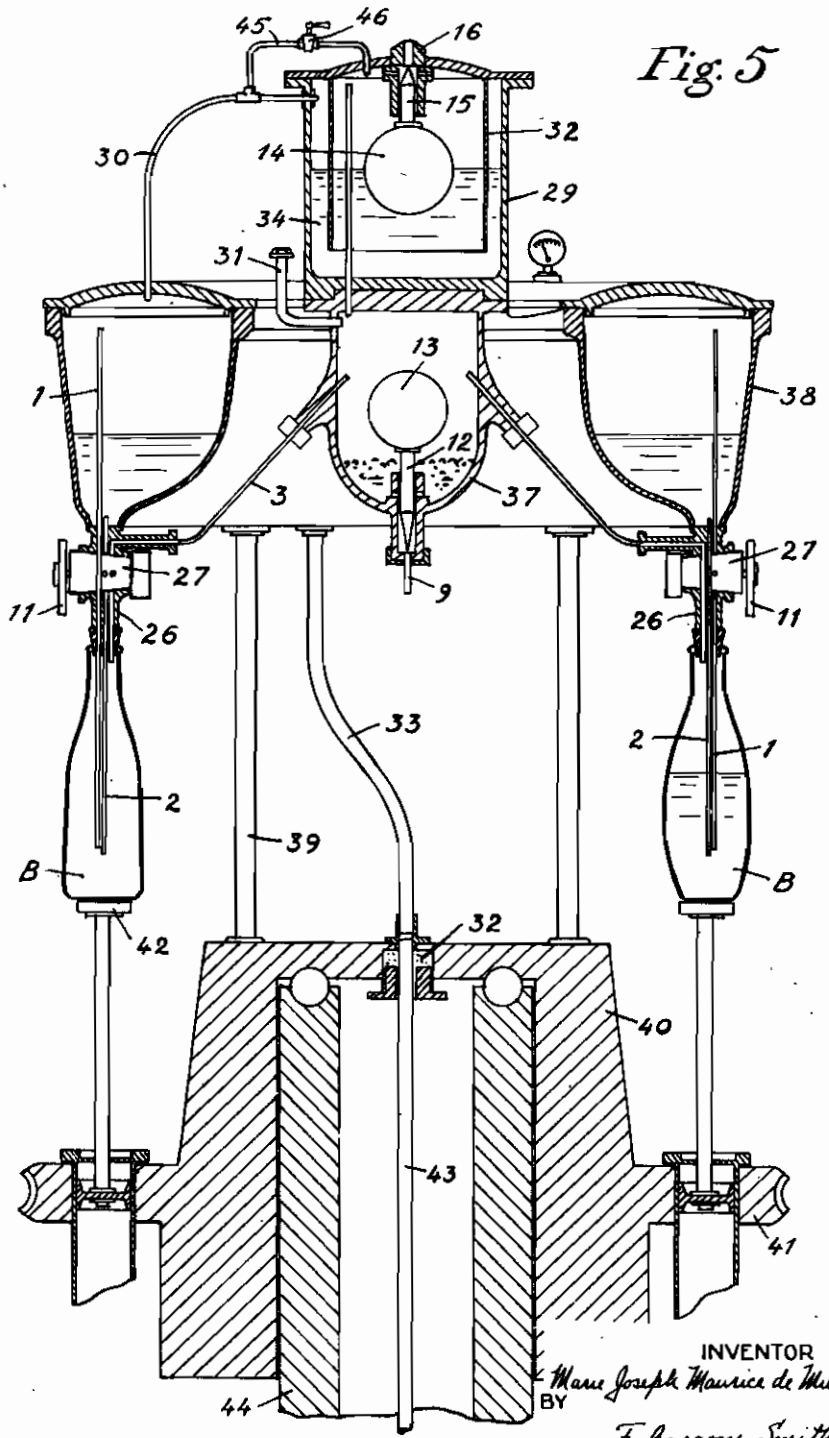
Fig. 5



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ALIEN PROPERTY CUSTODIAN

METHOD AND APPARATUS FOR FILLING CONTAINERS

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This invention relates to methods of and apparatus for filling containers with liquid.

In order to insure a good preservation of gaseous beverages, and especially of beer, it is important to avoid the incorporation of air in a beverage during the various operations necessary for its preparation and delivery either in casks or in bottles.

Brewers have made every effort in the bottling of beer to avoid the introduction of air during handling, and more particularly during filling, and despite their efforts quantities of air as high as 14 c.cm. per bottle have been trapped in the bottles in certain cases.

Heretofore, the process of filling bottles contained the step of making the beverage in the bottle foam at the end of the filling operation so that the air then contained in the bottle would be driven off. The results attained by this process are not only imperfect with beverages that do not foam easily, but with all beverages, since as the air is driven off part of the carbon dioxide is evacuated from the beverage. Furthermore, according to the only known manner for carrying out this process, the foam is sent back together with the air which it contains into the tank or reservoir of the filling apparatus. Thus, the whole reservoir is often contaminated during the filling of a single badly rinsed bottle by the overflow from said bottle, and an additional disadvantage of this method is that the air which is continuously driven off into the reservoir dilutes the carbon dioxide or other gas contained in the reservoir.

An object of the present invention is to avoid the above disadvantages and to provide a simple and satisfactory solution to the problem of filling containers with gaseous liquids without trapping air in the filled container.

A further object of the invention is to provide a novel method and apparatus for carrying out said method whereby gaseous beverages, such as beer, carbonated drinks, etc., under the pressure of carbon dioxide, air or any other gas, can be introduced into containers, such as, for example, bottles or casks.

The process, according to this invention, consists, among other steps, in evacuating the air and the foam in the container therefrom during the filling of the latter, said foam and air being discharged into a closed receiver which is independent of the supply tank and which is constantly under a pressure equal to that in the tank without any direct gaseous connection existing between said tank and said receiver. The container is filled before any liquid flows therein with the gas contained in the supply tank or reservoir, and gravity thereafter causes the liquid to flow into the container. The pressure of the reservoir can be transmitted to the foam receiver by liquid means comprising communicating vessels or by some mechanical means, such as a balancing piston, membrane, etc., said liquid or mechanical means causing the intermittent automatic escape of a part of the gaseous atmosphere evacuated from the container which is being filled. If containers are being filled with a foaming liquid, it is possible, according to the present invention, to provide means whereby the foam can be collected and intermittently removed from the filling apparatus.

Other objects and novel features will more fully appear from the following detailed description when the same is read in connection with the accompanying drawings. It is to be expressly understood, however, that the drawings are for purposes of illustration only and are not intended as a definition of the limits of the invention, reference for this latter purpose being primarily had to the appended claims.

In the drawings, wherein like reference characters refer to like parts throughout the several views;

Fig. 1 is a schematic view of a novel apparatus for carrying out the novel process of the present invention, said apparatus including a liquid pressure control means;

Figs. 2 and 3 are schematic diagrams illustrating mechanical means for transmitting pressure from the receiver to the reservoir;

Figs. 4 and 5 are sectional view of filling devices embodying the present invention, comprising a circular reservoir and an annular reservoir, respectively;

Fig. 6 is a plan view of a spout used in the above embodiments of the present invention; and

Fig. 7 is a sectional view taken substantially along line VII—VII of Fig. 6.

Fig. 1 is a diagrammatic illustration of one embodiment of the present invention comprising a reservoir or tank A of a beer filling apparatus having a plurality of spouts 10, one of which only is shown with its cock 11, said cock being preferably operated mechanically to control the flow through three pipes 1, 2, 3 associated therewith. Pipe 1 is a counter-pressure pipe intended to establish communication between a bottle B on one hand, and the gaseous atmosphere in tank A on the other hand at the beginning of the filling op-

eration; pipe 2 is the flow pipe whereby the liquid is passed from tank A to bottle B; and pipe 3 is the pipe through which air and foam are vented. Check valve means are preferably provided in combination with tubes 1, 2 and 3 in the well-known manner in order to hinder the undue outflow of gas and liquid in the event one of bottles B bursts. Filling spouts 10 and the pipes controlled thereby differ from the usual type in that pipe 3 not only does not terminate at the top of tank A but does not extend into said tank. Instead, tube 3 connects bottle 8 to the upper part of a foam receiver M which is, in turn, connected by a tube 4 to the upper part of one of the chambers of a liquid pressure responsive seal comprising vessels 5 and 6 connected by a passage 7, said vessels being partially filled with a liquid, such as water, glycerine, etc. Tube 4 is connected to chamber 5, and chamber 6 constantly communicates by means of a pipe 8 with the top of reservoir A.

At the base of receiver M a pipe 9 is provided to permit the discharge of the foam from said receiver, said discharge being controlled by a valve mechanism comprising a cone or pin valve 12 carried by a float 13. When a quantity of foam accumulates in receiver M which is sufficient to float member 13, valve 12 is raised from its seat and permits the escape of said foam through opening 9. It will be understood that in the event that the liquid which is to be drawn into bottle B does not foam freely, foam receiver M may be eliminated from the above apparatus and tube 3 is then directly connected to tube 4.

In chamber 5 a float 14 is supported at a predetermined level by the liquid in chambers 5 and 6 when the pressures in said chambers are equal. An obturator 15 is secured to or formed with float 14 and normally maintains an opening 16, provided at the top of chamber 5, closed. However, whenever the pressure in chamber 5 exceeds that in chamber 6, the level of the liquid in chamber 5 drops below that in chamber 6, and float 14 is accordingly displaced in a vertical direction, causing obturator 15 to permit the escape of a quantity of gas equal to the amount necessary to reestablish the pressure equilibrium between chambers 5 and 6. A conduit or tube 45 connects tube 4 with tube 6, and a valve 46 is provided in said conduit to control the flow of fluid therethrough.

In operation, the filling is begun by opening valve 46 to insure a pressure equilibrium between chambers 5 and 6, that is, between reservoir A and receiver M. The liquid is thus at the same level in chambers 5 and 6 and obturator 15 maintains opening 16 closed. Cock or valve 46 is then closed and cock 11 is operated to open tube 1 so that bottle B receives gas from receiver A, the latter having been filled by the usual means well-known in the art to a normal or mean level. The pressure in chamber B is thus equalized to that in reservoir A and the liquid, therefore, will be able to flow out from said reservoir into said bottle by the action of gravity as soon as tube 2 is opened. Furthermore, when liquid is being drawn under the pressure of carbon dioxide, for example, bottle B when connected to reservoir A receives an injection of carbon dioxide by which the air originally contained in the bottle is forced outward toward receiver M and chamber 5, and thus the liquid on entering chamber B does not encounter any air when the pressure in bottle B has become equal to that in reservoir A.

Cock 11 is thereafter further actuated and shuts counter-pressure pipe 1 and simultaneously opens pipe 2 and pipe 3. As shown in Fig. 1, the liquid flows from reservoir A into bottle B under a gravitational force set up by a column of liquid L, and as bottle B is filled with liquid the gaseous elements therein are driven out into receiver M and chamber 5. Accordingly, the pressure in chamber 5 becomes greater than that which originally existed in said chamber and because of this increase in pressure and the decrease in pressure in reservoir A, which occurs because of the flow of liquid therefrom, the level of the liquid in chamber 5 becomes lower than that in chamber 6. This actuates float 14 and obturator 15, and the latter thus uncovers opening 16, allowing the air forced out of bottle B during the filling of the same to be driven off. It will be noted that this air originally contained in the bottle does not pass through tank A and cannot affect the liquid in said tank. This escape of air causes a decrease of pressure in vessel 5 and in receiver M, which decrease allows the liquid to return to like levels in vessels 5 and 6, and float 14 again closes opening 16. At this moment the pressure in bottle B is equal to that in reservoir A and the liquid continues to fill the bottle under the action of gravity until the latter is completely filled.

The movement of float 14 is preferably limited to a very small amplitude (a few millimeters) so that there is no danger of any counter-pressure in the system. The height of liquid column L is always sufficiently great as compared to the liquid displaced in cylinder 5 so as not to affect the flow of liquid into bottle B. Furthermore, the decrease in pressure created in reservoir A as the liquid flows therefrom is immediately balanced by the movement of the liquid control means comprising chambers 5, 6 and passage 7, and said decrease in pressure may, if desired, cause reservoir A to be filled to its original level by suitable means well-known in the art. Accordingly, bottle B is filled without ever forcing back the air originally contained in said bottle into the tank or reservoir from which said bottle is filled.

After bottle B has been filled according to the above described method, cock 11 is operated to close pipes 2 and 3, and the filled bottle may thereafter be removed and replaced by an empty bottle, repeating the above described cycle of operations.

As shown in Fig. 2, the liquid control means 5, 6, 7 of Fig. 1 may be replaced by a membrane 17, which separates chambers 5 and 6 and carries needle valve 15. This apparatus works in the same manner as the liquid filled vessels, pressure changes moving the diaphragm and actuating the valve to permit fluid flow through opening 16.

Still another embodiment of the control means is shown in Fig. 3 and comprises a piston 18 reciprocally mounted in a cylinder 19 which it separates into two chambers 5 and 6, said piston being preferably maintained in central or equilibrium position by means of balancing springs 20. Increased pressure in chamber 5 moves piston 18 in the direction of chamber 6, and valve 15 carried by said piston is also moved to permit air to flow from opening 16 until the pressures in chambers 5 and 6 are equalized.

In Fig. 4, there is shown, by way of example, an automatic filling apparatus comprising a circular rotating tank of a type well-known in the art, said apparatus being modified in a novel manner to carry out the above described process. Each of spouts 26 of the filling apparatus comprises a cock, the plug 11 of which is operated

by an appropriate mechanism, and the core 27 of which opens and shuts pipes 1, 2, 3 described above in connection with Fig. 1. A tank 21 is carried by a frame 24 rotatably mounted on a fixed frame 36 by means of a thrust ball bearing 35, and liquid, for example, beer, is introduced into said tank by a pipe 22 which passes through a stuffing box 23 located in the upper wall of said tank. In this embodiment of the invention, the foam receiver M of Fig. 1 consists of a chamber 25 mounted on frame 24, said chamber being located underneath tank 21. The upper part of said chamber communicates by means of a pipe 28 with the top of the interior of a chamber 32 of a pressure responsive liquid seal corresponding to vessels 5, 6, 7 of Fig. 1. Chamber 32 is housed inside of rotating frame 24 under chamber 25 and has an open end. A cylindrical chamber 29 is concentrically mounted in relation to chamber 32 and surrounds the latter chamber, the annular space between said chambers corresponding to chamber 6 of Fig. 1, and the interior of chamber 32 corresponding to chamber 5 of Fig. 1. Accordingly, the upper part of the annular space communicates with the top of tank 21 by means of a pipe 30, and a float control valve 14, 15, 16 is provided in chamber 32. In order to permit the introduction of liquid 34 into the pressure responsive liquid seal, a tube 31 is provided and extends into the upper part of chamber 29 from the exterior of member 24, said tube also serving for rinsing the apparatus.

Fig. 5 illustrates the manner in which the invention may be applied to an automatic filler comprising an annular tank 38. The filling mechanism is provided in the same manner as that shown in Fig. 4 with spouts 26 and pipes 1, 2 and 3, the latter being controlled by cock 11. Foam receiver M of Fig. 1 in the present embodiment consists of a vessel 37 carried by tank 38 and located axially relative to the latter, and said vessel, in turn, carries the pressure responsive liquid seal constituted by chambers 29, 32 and liquid 34 and communicating with said tank and said vessel. Tank 38, foam collector 37 and chambers 29 and 32 are all mounted by means of columns 39 on a rotating frame 40, comprising a rim 41 preferably formed into a worm wheel and bearing supports or bolsters 42 on which are placed bottles B, said worm wheel being adapted to be moved by a worm (not shown). Tank 38 is preferably filled with liquid by means of a pipe 33 which extends from the base of said tank through the axis of frame 40, a fluid-tight connection being provided at 32 by means of which pipe 33 is connected to conduit 43 which extends through stationary frame 44.

The filling mechanism shown in Figs. 4 and 5 operates in the same manner as that shown in Fig. 1 and it will be expressly understood that a variety of valves well-known in the art could be utilized to replace cocks 11 or the liquid pressure responsive means which control valve 14, 15.

To apply economically the present invention to existing machines, it is only necessary to provide a receiver M and vessels 5 and 6, as shown in Fig. 2, with the illustrated connections and to modify the spouts. The latter can be accomplished by inserting a part 47 (Figs. 6 and 7) which disconnects one of the three pipes connected in present devices to the supply tank from the latter and connects said pipe by means of pipe 48 in the manner of pipe 3, as shown in Fig. 2. The other two pipes then serve the function of pipes 1 and 2.

It is obvious that the method and apparatus of this invention may be utilized effectively in all types of automatic or semi-automatic filling devices intended for the drawing of liquids under pressure of carbon dioxide or any other gas, for instance, compressed air. In the latter case, the process does not offer the advantage of permitting the filling to take place with the air exhausted from the container but, nevertheless, as explained above, will make it possible to avoid the contamination of a whole tank full of liquid which frequently occurs when the return of foam and air takes place through the tank. It will be understood that the filling can be accomplished according to the present invention with liquid in the supply tank under atmospheric pressure, in which case the same advantages exist as when using compressed air. A filling apparatus constructed according to the present invention can be manufactured as economically as those in ordinary use today and results in a considerable saving by substantially eliminating the possibility of fermentation after the beverage is bottled. It is to be noted that the bottling operation carried on according to the present invention is entirely automatic without any additional labor input or expensive change in apparatus. When bottling beer, the present invention permits the omission of expensive pasteurization processes which alter the taste of beer and increase the bottling expense.

It is to be expressly understood that the invention is not limited to the several embodiments illustrated and described. Various changes which will now be apparent to those skilled in the art may be made without departing from the spirit and scope of the invention.

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