United States Patent [19]

Copping

[11] **3,804,133**

[45] **Apr. 16, 1974**

[54] **BOTTLE PURGING METHOD**

[75] Inventor: **Bruce G. Copping,** Akron, Ohio

[73] Assignee: **A-T-O Inc.,** Cuyahoga Falls, Ohio

[22] Filed: **Dec. 7, 1971**

[21] Appl. No.: **205,602**

[52] **U.S. Cl.** **141/6,** 53/7, 141/37

[51] **Int. Cl.** **B67c 3/10,** B67c 3/28, B67d 5/02

[58] **Field of Search** 141/4, 5, 6, 37; 53/7, 53/79

[56] **References Cited**

UNITED STATES PATENTS

2,953,169	9/1960	Breeback	141/6
2,016,384	10/1935	Meyer	141/5 X
3,012,591	12/1961	McCormack	53/7 X
3,477,192	11/1969	Brown	53/7 X

FOREIGN PATENTS OR APPLICATIONS

1,162,710	2/1964	Germany	141/6
1,532,531	8/1970	Germany	141/5
716,434	8/1965	Canada	53/7

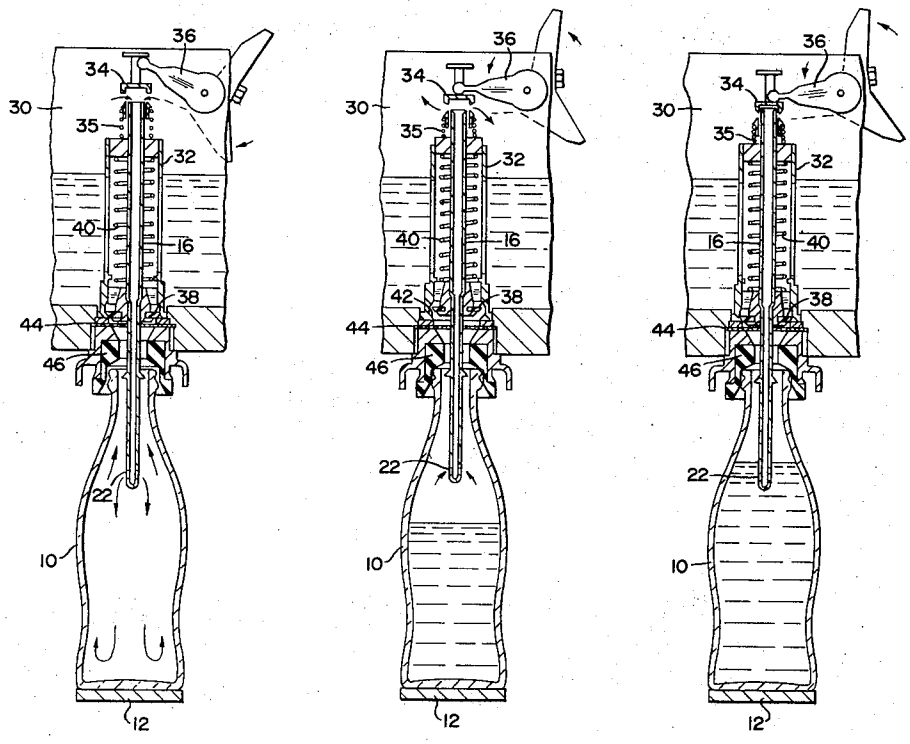
Primary Examiner—Wayne A. Morse, Jr.

Attorney, Agent, or Firm—Oldham & Oldham Co.

[57] **ABSTRACT**

A method of filling a container with beer including the step of purging the container with a volume of gas, primarily carbon dioxide, greater than the volume of the container when the container is open to the atmosphere, immediately thereafter sealing the container, and supplying counterpressure gas to the container. The method may include using up to about 2.5 volumes of the carbon dioxide for the purging action, and directing the stream of purging gas downward from the container on the central axis thereof. Carbon dioxide is used as the counterpressure gas and normally is supplied from a counterpressure chamber. Fresh carbon dioxide gas is fed into the counterpressure gas supply chamber to maintain a desired carbon dioxide concentration therein.

2 Claims, 6 Drawing Figures



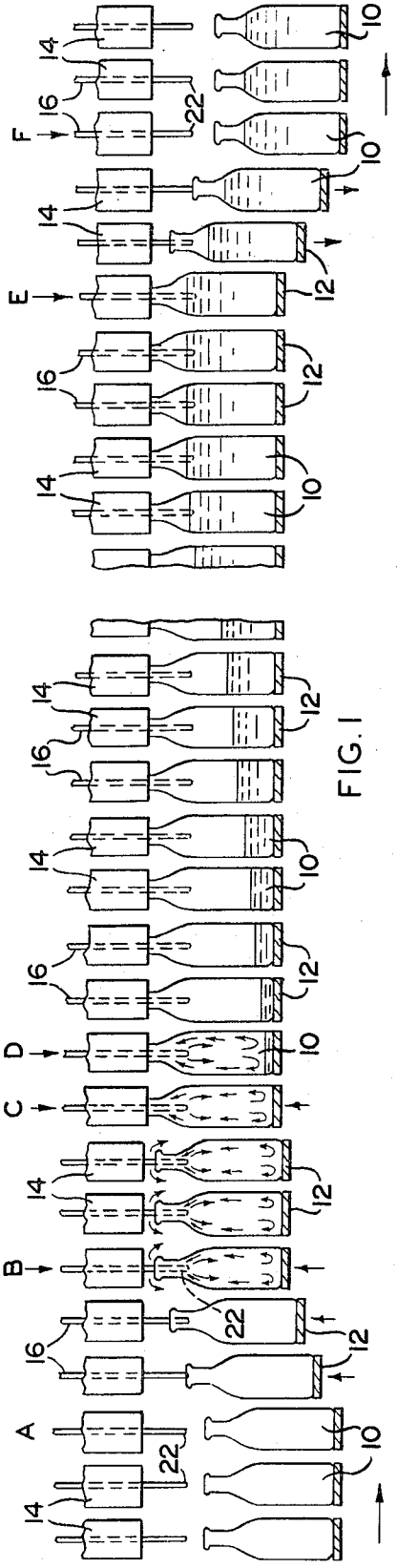


FIG. 1

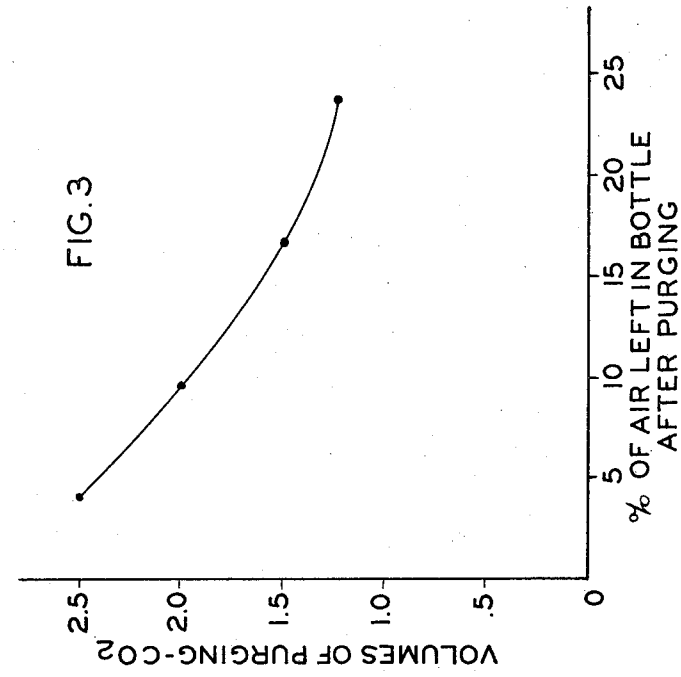


FIG. 3

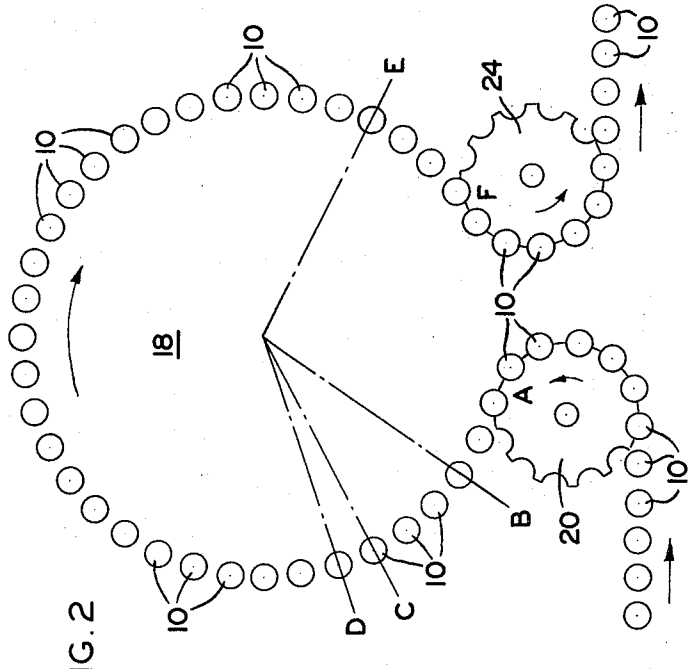


FIG. 2

INVENTOR.
BRUCE G. COPPING
BY
Oldham & Oldham
ATTORNEYS.

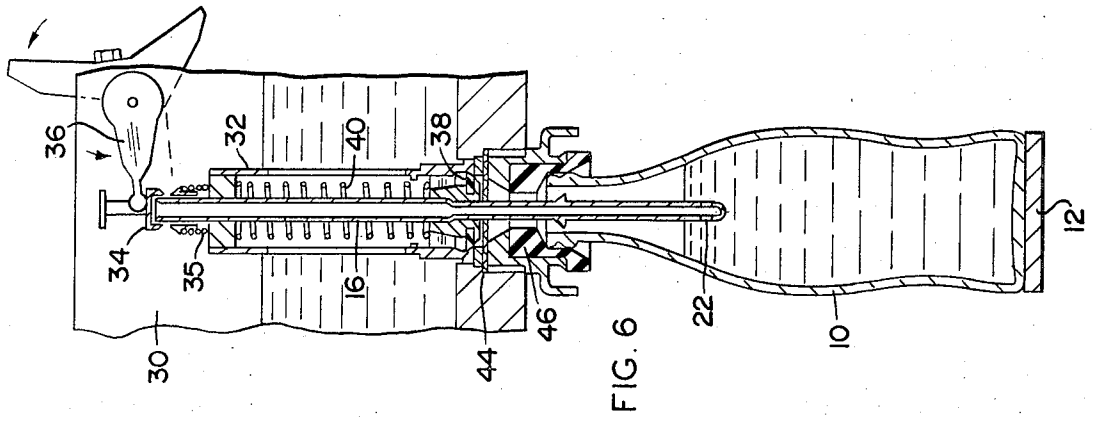


FIG. 6

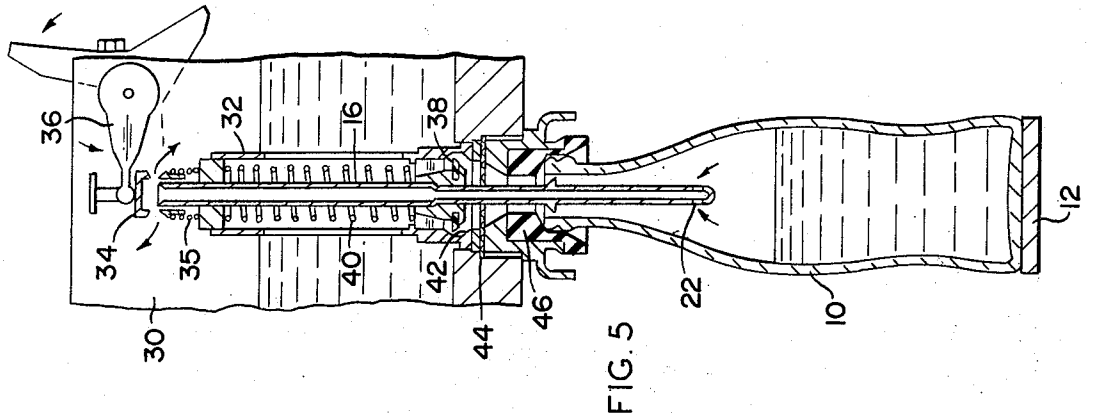


FIG. 5

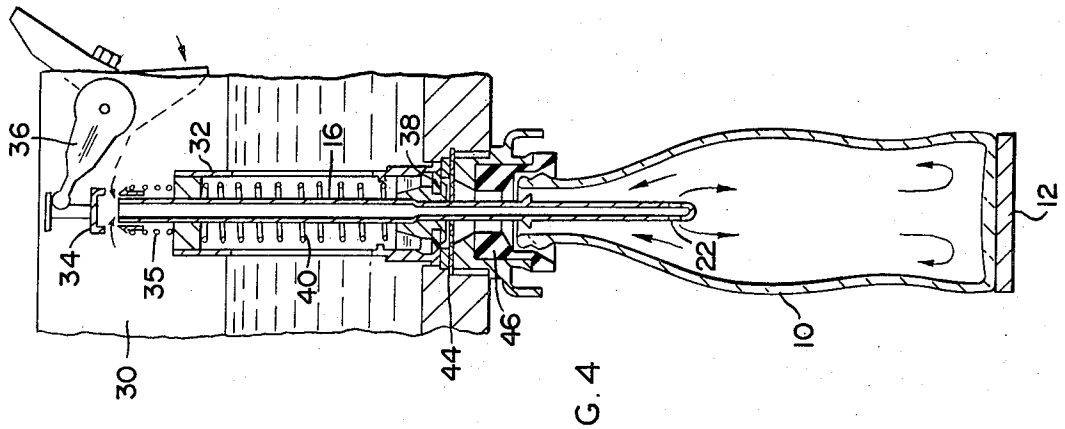


FIG. 4

INVENTOR.
BRUCE G. COPPING
BY Oldham & Oldham
ATTORNEYS.

BOTTLE PURGING METHOD

This invention relates to container filling methods, and especially to a method of filling containers with beer.

BACKGROUND OF THE INVENTION

It is well known in the processing of beer, and particularly in filling containers therewith, that any air dissolved in the beer or carried in the beer container in the neck or top space thereof results in oxidation of the beer with deterioration of taste and reduced shelf life.

While efforts have been made heretofore to overcome the problem of having air in beer containers, insofar as I am aware, none of such efforts have been completely satisfactory. These previous proposals may have been quite costly to use, may have slowed down the rate of the container filling machine in an undesirable manner, or they may have been objectionable for other reasons. One patent in this field is Breeback U.S. Pat. No. 2,953,169.

The general object of the present invention is to provide a novel and improved method of filling containers with beer and characterized by the step of purging the container with carbon dioxide or other inert gas when the container is open to the atmosphere prior to filling the container with the beer.

Another object of the invention is to seal an empty container rapidly after it has been purged with carbon dioxide gas, introduce counterpressure gas into the container promptly, and fill the container with beer in a conventional manner.

Another object of the invention is to utilize conventional filling machines and methods and to modify them in accordance with the previous invention whereby the rapidity of action of the bottle or container filling machine is only slightly reduced, and an improved packaged container filled with beer has been provided with minimum changes in the filling machines and methods used, the invention being applicable to any known container filling machines or apparatus.

Further objects of the invention are to return gas from a container as it is filled or counterpressure gas supply chamber in the apparatus and to provide for the amount of purging gas to exceed the amount of gas returning from the container and adding fresh carbon dioxide gas to the gas supply chamber equal to this excess so as to maintain a predetermined concentration of carbon dioxide in the counterpressure chamber or means in the apparatus.

Another object of the invention is to provide a relatively inexpensive, easily practiced method utilizing only a minimum of low cost materials so as to obtain filled beer containers having a minimum of air entrapped therein.

The foregoing and other objects and advantages of the invention will be made more apparent as the specification proceeds.

Reference now is particularly directed to the accompanying drawings wherein:

FIG. **1** is a diagrammatic view of a container filling method embodying the principles of the present invention;

FIG. **2** is a diagrammatic view of a container filling machine used in practice of the invention;

FIG. **3** is a graph showing the approximate percentage of air left in the container after purging in accordance with the present invention;

FIG. **4** is a fragmentary vertical section of one known type of a filler head with the counterpressure valve open;

FIG. **5** is a section, like that of FIG. **4**, but with both the counterpressure valve and beverage valve open; and

FIG. **6** is a section, like that of FIG. **4**, but with both valves closed.

SUBJECT MATTER OF THE INVENTION

The present invention, as one embodiment thereof, relates to methods of and apparatus for filling a container with beer and wherein carbon dioxide counterpressure gas is used in the method and is provided from a pressure supply chamber therefor and where the method comprises purging the container with a volume of gas, predominantly carbon dioxide, greater than the volume of the container when the container is open to the atmosphere, immediately thereafter sealing the container by conventional bottle filling means, supplying counterpressure gas to the purged container, and filling the container in a known manner. The method also may include the steps of directing the stream of purging gas downwardly of the container on its central axis, returning or flowing gas from the container back to the pressure supply chamber as the container is filled with beer, and supplying additional carbon dioxide gas to the chamber to offset the gas lost in purging and to maintain a predetermined concentration of carbon dioxide therein.

When referring to corresponding members shown in the drawings and referred to in the specification, corresponding numerals are used to facilitate comparison therebetween.

Reference is made to U.S. Pat. No. 3,443,608 which shows one filling machine known today and wherein the filling heads are moved down to engage the containers which are carried on a rotary plate held in a fixed plane while filling heads move to and from engagement with such containers and fill the same. However, many previously known and widely used filling machines or apparatus in use at this time provide members, such as air operated cylinders, for raising a support platform or bracket on which an individual bottle is positioned up into engagement with an individual filling head whereby the bottle is raised and lowered during the filling procedure by suitable automatically controlled means connecting to the cylinder or other power means provided for controlling the positions of the individual containers or bottles being processed and filled.

With reference to the details of the structure shown in FIG. **1**, this is a flattened projection, diagrammatically shown, of the operation of a known container filling machine and showing the association of the individual filling heads with the individual containers. Thus, a plurality of containers **10** are shown each one of which is positioned on a different bracket or lug **12** that in turn has the vertical position thereof controlled by conventional means (not shown) such as an air or pressure actuated cylinder provided in the apparatus. Such cylinder is adapted to have pressure means supplied thereto so as to raise and lower the containers **10** in the manner shown in FIG. **1**, which is representative of the

actions or positioning of the bottles as they are filled in many known filling machines in existence today. A plurality of individual filling heads **14** are shown and these can be of any conventional construction, or the filling heads may be positioned in a filling compartment as described hereinafter. These filling heads **14** are mounted in circumferentially spaced relationship in fixed positions on a filling machine and the bottles or containers **10** and the plates **12** on which they are mounted are carried by a suitable rotary member or assembly provided in the machine whereby the containers are brought into engagement with the filling heads and the filling heads and containers are both rotated around the machine at the common speed. Each of the filling heads **14** has a counterpressure supply tube **16** provided therein and which tube **16** may be movable with the filling valve in the head **14** with which it is associated or be movable independently thereof as desired and be controlled by conventional means.

In FIGS. **1** and **2**, position A is indicated where the bottle or container **10** enters the filling turret **18** of the machine. The turret **18** is of conventional construction and has containers fed thereto by a star wheel **20** or the like in a conventional manner from a stream of supplied containers.

At the other positions indicated diagrammatically in FIGS. **1** and **2**, the following actions occur:

Position B, the neck of raised bottle **10** reaches a position just short of sealing on the filling valve, and a purging flow of counterpressure gas, primarily carbon dioxide, begins. One or more suitable apertures are shown at **22** in the bottom of a counterpressure supply tube and the carbon dioxide gas, under pressure, is discharged primarily in a downwardly directed manner on the center axis of the container. This flows down into the bottle and rapidly drives out most of the original air present in the container. This purging occurs because the sealing of a bottle is delayed for a fraction of a second after flow of counterpressure gas begins rather than before.

Position C is the next position reached by a bottle and at that time the purging is completed and the bottle has been raised to seal on the filling valve lower end and build up of counterpressure begins. At the very next bottle station, position D, the buildup of counterpressure gas is completed and flow of product into the bottle begins. Note that at the beginning of product flow most of the original air has been purged from the bottle and the atmosphere in the bottle or container is largely carbon dioxide.

Position E shows that the bottle filling is completed and at this position the lowering of the bottle begins as it is readily released from the filling head by just lowering its support bracket **12** by the control provided therefor.

At Position F, the lowering of the bottle is completed and the filled bottle is ready for release by the turret **18.** The bottle enters a discharge star or wheel **24** as conventionally provided in container filling apparatus.

In various tests of the method of the invention, it has been found that use of from about 1.25 to 2.5 volumes of purging gas in relation to the volume of the container to be filled will provide effective purging action and leave varying percentages of air in the bottle after the purging gas, carbon dioxide, has been forced into the bottle under pressure. This purging action occurs very rapidly because of the pressure normally on such counterpressure gas, the size of the apertures **22,** etc. and as indicated hereinbefore, the bottle moves from position B to position C in a relatively short time so that immediately after the purging has been completed, the container is sealed from the atmosphere. At position E, the counterpressure is established and flow of the beverage into the container starts. This action is completed when the container reaches position D after which the bottle is lowered or the filling head is raised and the remainder of the conventional bottle or container capping action occurs by use of conventional machinery.

It will be recognized that conventional or known control means are associated with the apparatus shown in FIGS. **1** and **2** for controlling the lifting action of the cylinders for the plates or brackets **12,** the positioning of and supply of beverage to the filling heads **14,** the action of the various control valves provided in the apparatus, etc.

With reference to the details of one typical type of a filling head apparatus as shown in FIGS. **4, 5** and **6,** a filling bowl **30** is provided and it has a supply of counterpressure gas in the upper portion thereof together with the beverage, usually beer, received in the lower portion of the bowl. This bowl **30** has a plurality of individual filling heads or controls indicated at **32** provided around peripherally spaced portions of the bowl whereby the bottles **10** can be engaged by individual filling heads or assemblies for conventional filling action. The individual filling heads each include a charging valve **34** operatively associated with the upper open end of a filling tube or probe **16** and with the position of the control or charging valve **34** in relation to sealing engagement with the upper end of the probe being controlled by a lever arm **36** suitably positioned in the apparatus. A spring **35** urges the charging valve **34** to its open position. The filling valve **38** is resiliently positioned in the filling head by control spring **40** which normally urges the filling valve **38** up from its associated valve seat **42** but which spring will not function against the counterpressure existing in the bowl **30.** In this particular embodiment of a filling head, normally a wire screen **44** is provided in the path of flow of the beverage from the bowl **30** down into the associated bottle **10,** but naturally when desired such screen can be eliminated. At the lower end of each of the filling heads or assemblies, a resilient gasket **46** is provided for sealing engagement with the upper end of one of the bottles **10** as raised by its associated bracket **12** and support means associated therewith.

FIG. **4** shows the position of the different charging valves **34** and filling valves **38** when the bottle has reached the position or station C as indicated in FIGS. **1** and **2** of the drawings. It will be realized that this movement of the individual bottles **10** up into sealed engagement with an individual filling head has occurred after the flow of counterpressure gas for purging action has been provided. Hence, in the FIG. **4** position corresponding to position B, the charging valve **34** is in its open or operative position and the filling valve is still closed. However, it will be realized that the control or lever arm **36** has raised the charging valve **34** to its open position when the bottle in its arcuate movement around the turntable **18** reaches position B. Thus, counterpressure gas will flow from the top portion of the filler bowl down into the bottle for purging action as the bottle is moved from its position or station B to station C. Any number of intermediate bottle position-

ing stations can be provided between the stations B and C as required, but normally two or three index arcuate movements of the turntable are all that would be required in order to provide the desired purging action of the original air in the bottle, as outlined hereinbefore.

When counterpressure is established in the bottle **10** at the station C, as such pressure is established almost instantaneously when the bottle is brought into engagement with the gasket **46,** then the control spring **40** and the counterpressure conditions established in the bottle operate to raise the filling valve **38** into the open position shown in FIG. **5.** Then beverage will flow down into the container **10** and counterpressure gas will exhaust upwardly through the tube or probe **16.**

Upon completion of the filling of the bottle when the bottle reaches the station E, then the valve operating lever arm **36** is operated by associated means in the machine to move the charging valve **34** downwardly and this in turn prevents further escape of counterpressure gas from the bottle **10.** The valve **38** is moved down against its seat **42** by conventional means such as the lever arm **36** or other known apparatus to terminate bottle filling action. Thereafter the bottle is then lowered by its positioning bracket **12** and the bottle progresses to station F for discharge from the turret **18** through the associated means.

From the foregoing, it is submitted that a novel and improved method of purging air from a bottle or other container is provided by which only a minimum, or no air is retained in a bottle containing beer or other beverage. The method is relatively inexpensive to operate and requires only a minimum of change to standard or existing bottle filling apparatus.

Any suitable carbon dioxide supply means (not shown) connects to the filler bowl **30** as by a pressure control valve to maintain a desired concentration and/or normal pressure of counterpressure gas, carbon dioxide, in the upper portion of the enclosed filler bowl **30.** Flow of such carbon dioxide gas thus will automatically occur as volumes of the gas are released by the purging action and are not replaced in the bottle filling action.

The holes in the counterpressure supply tube preferably are so formed and/or directed as to cause the gas discharged to flow primarily axially downwardly of the container.

Hence, it is believed that the objects of the invention have been achieved.

While one complete embodiment of the invention has been disclosed herein, it will be appreciated that modification of this particular embodiment of the invention may be resorted to without departing from the scope of the invention.

What is claimed is:

1. A method of filling a container with beer comprising the steps of

purging the container when it is open to the atmosphere with a volume of gas predominantly carbon dioxide greater than the volume of the container, immediately thereafter sealing the empty container and supplying counterpressure gas thereto and filling the container with beer, counterpressure conditions when established in the container actuating the container filling action, and including the steps of supplying the purging gas for the purging action on the center axis of the container and from an area within and below the top of the container, and directing the purging gas downwardly of the container.

2. A method of filling a container with beer wherein carbon dioxide counterpressure gas is used and is provided from a pressure supply chamber therefor comprising the steps of

purging the container with a volume of gas predominantly carbon dioxide from said chamber greater than the volume of the container when the container is open to the atmosphere, and immediately thereafter sealing the container and rapidly supplying counterpressure gas thereto from said chamber, flowing gas from the container back to the said pressure supply chamber, supplying additional carbon dioxide gas to said chamber to maintain a predetermined pressure therein, actuating container filling means immediately upon counterpressure conditions being set up in the container, and filling the container with beer, and including the steps of purging the container by directing a stream of purging gas downwardly of the container on the center axis thereof, and supplying the stream of purging gas from an area within the container and below the top thereof.

* * * * *