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W. A. WHEATLEY ETAL

3,157,011

AIR ELIMINATION METHOD AND APPARATUS

Filed July 20, 1961

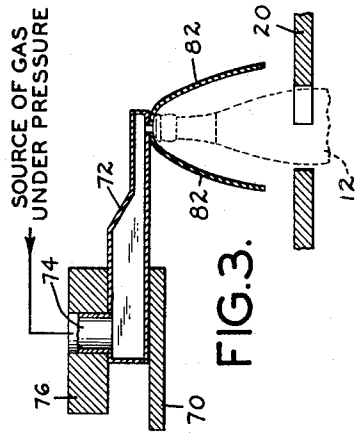
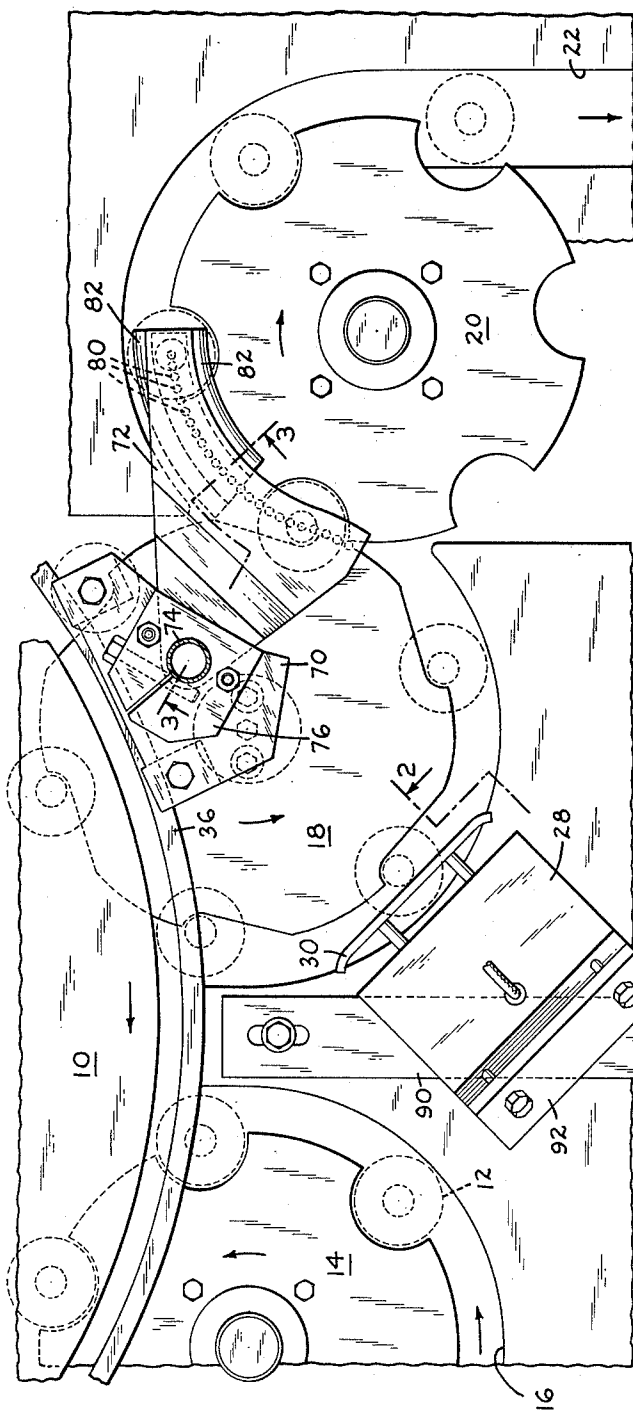


FIG. 1.

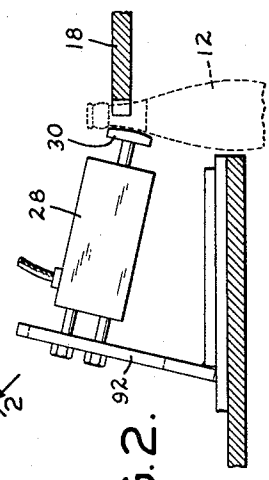


FIG. 2.

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AIR ELIMINATION METHOD AND APPARATUS
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 3 Claims. (Cl. 53-22)

This invention relates to means for eliminating undesired air from a container prior to sealing thereof, and more particularly to a method and apparatus for removing trapped air from a bottle of an effervescent liquid prior to crowning.

The presence of trapped air in a bottle of carbonated beverage, such as a flavored soft drink, results in a noticeable loss of flavor of the contents as well as a decrease in its shelf life. Consequently, much effort has been expended to develop practical means for purging air from the containers prior to the crowning or hermetic sealing operation. One of the more successful among these techniques involves the use of means to generate a foam in the carbonated liquid prior to crowning whereby the rising foam in the bottle displaces the air therefrom. Prior art systems utilizing this technique have suffered from the disadvantage that the generated foam tends to overrun the open end of the bottle and leave a sticky residue on its exterior surface as well as on the bottling apparatus itself. Additional rinsing or washing operations therefore are necessary in many applications. Moreover, the overflow of foam from the bottles may result in a loss of a detectable portion of the contents thereof, if the foaming action is not carefully controlled. The resulting variation in fill heights of the bottles may be objectionable in instances where accuracy is demanded.

Accordingly, it is the primary object of the present invention to provide a method and apparatus for eliminating undesired air from partially filled containers of effervescent liquids, utilizing the foaming principle, but avoiding the aforementioned disadvantages thereof.

Another object of the present invention is to provide improved method and apparatus for eliminating undesired air from a partially filled container of carbonated beverage wherein the fill height may be accurately maintained.

An additional object of this invention is to provide an improved method and apparatus for purging air from a partially filled container of effervescent substance wherein substantially all of the air is eliminated without loss of contents thereof.

In accordance with the present invention, the benefits of the foaming technique are utilized while at the same time, its disadvantages are avoided. The foaming is controlled so that the generated foam does not overflow the bottle thus eliminating the necessity for an additional rinsing operation. Any air left in the bottle is then displaced by carbon dioxide or other suitable gas applied to the open ends of the bottles under sufficient pressure to achieve the required displacement. Means are also provided to retain a blanket or atmosphere of this gas adjacent the open ends of the bottles as they proceed to the crowning apparatus, whereby no further air is permitted to enter the crowning area. By means of this arrangement, substantially all of the trapped air in the bottles is displaced and, since no foam overflows the bottles, the contents remain the same and accurate fill heights may be maintained.

The foregoing and other objects, features and advantages of the present invention will become apparent from the following more detailed description thereof, when taken in conjunction with the attached drawings, in which

FIGURE 1 is a plan view of the present invention in

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position on a conventional bottling arrangement which is partially shown;

FIGURE 2 is a section through the apparatus taken on line 2-2 of FIG. 1; and

FIGURE 3 is a section through the apparatus of FIG. 1 taken at line 3-3.

A bottling apparatus incorporating the present invention is shown in part in FIG. 1. The conventional bottling machinery includes a filling station 10 in which the empty bottles 12 are filled with the beverage to be bottled. The filler may be of the "pre-mix" type where the syrup flavoring and carbonated water are mixed prior to filling, or the constituents may be separately fed to the bottles and mixed therein. The empty bottles are supplied to the filling station by means of an entry star-wheel or spider 14, which, rotating in a counterclockwise direction as indicated by the arrow, transfers the bottles 12 from the intake chute 16 onto the table of the filler 10. By the time the bottles have substantially completed a revolution around the filler table, they have been filled with the carbonated beverage. They are then removed from the filler by means of an exit star-wheel or spider 18, also rotating in a counterclockwise direction as indicated. The filler does not completely fill the bottle, but leaves a small amount of air therein, in accordance with conventional procedures. The filled bottles are transferred from the exit spider 18 to a star-wheel 20 over which is mounted the conventional capping or crowning apparatus (not shown) for applying the seal to the open end of the bottle. The crowned bottle is then fed through chute 22 to be loaded in cases for shipment. It will be realized from the foregoing that the above-described apparatus is completely conventional in form and only sufficient detail to permit understanding of the present invention is included herein.

At a point on the bottling apparatus adjacent the exit star wheel 18 is mounted an exciter unit 28, such as an ultrasonic transducer of the type disclosed in Pray U.S. Patent No. 2,916,266. This unit includes a shoe portion 30 positioned to contact each of the bottles 12 as it passes the transducer on its way out of the filling station. As is described in greater detail in the aforementioned patent, the ultrasonic energy from the unit 28 causes the content of the bottles to foam rapidly and thereby expel a portion of the air left at the top of the bottle after the filling operation. As shown more clearly in FIG. 2, the transducer unit 28 is mounted on a bracket 90 adjustably fastened to the table of the bottling machinery. A support member 92 mounts the transducer 28 at an angle so that the shoe 30 thereof contacts the bottles at their upper ends adjacent the necks. This arrangement of mounting has been found particularly desirable in the cases of bottles having fluted or otherwise varied thickness walls over their major portion. However, the positioning of the shoe may be varied as desired to accommodate the particular bottling problems presented. The power output of the transducer 28 is so adjusted that the amount of energy transmitted to the fluid content of the bottle generates a foam which approaches but does not reach the upper end of the bottle.

Mounted on the support ring 36 of the filling station 10 is a bracket plate 70. A manifold or chamber 72 having an intake port 74 is clamped to the plate 70 by means of a member 76 bolted or otherwise fastened thereto. The plates 70 and 76 serve to sandwich the end of chamber 72 to firmly fix it into position relative to the support ring 36 and the path of the bottles 12. The mounting arrangement is so placed as to position the chamber 72 over the path of the bottles as they transfer from the exit star wheel 18 to the star wheel 20.

As seen more clearly in the section of FIG. 3, the manifold 72 is thicker at its clamped end and tapers down

to a thinner portion where it overlies the path of the bottles. The latter portion is elongated and fixed at a height to provide slight clearance to the upper ends of the bottles as they pass from the exit star wheel 18 to the capping star wheel 20. The chamber 72 has in its underside a plurality of apertures 80 disposed to be over the open ends of the bottles as they pass thereunder. Instead of a plurality of discrete holes, a single elongated slot or a combination of slots and holes may be used. Fixed to the underside of the chamber 72 and extending over a portion of its length are a pair of side walls or skirts 82. The open end of the conduit 74 is coupled to a source of gas under a pressure slightly higher than atmospheric pressure, for example, of the order of 5 lbs. per square inch. This gas may most conveniently be of a type that is contained in the beverage and which causes the foam, e.g., carbon dioxide, although any gas which would produce no deleterious effect on the beverage may be used.

As the bottles leave the filling station 10 and are picked up by the exit star wheel 18, they are agitated by the transducer shoe 30 and foaming of the contents results. The foam thus generated does not quite reach the top of the bottle and serves to partially displace the air left after the filling operation. As the bottles move under the chamber 72 and into successive registry with the apertures 80, the gas pressure provided thereat forcibly displaces the remainder of the air remaining in the bottle. The skirt members 82 are effective to retain a blanket of the gas in the area surrounding the open ends of the bottles to prevent more air from entering into this area and consequently from getting back into the containers. As the bottle leaves the chamber 72 it is immediately crowned, and is then ready for packing and shipping. It will be noted that since no foam is withdrawn from the bottle or allowed to overflow, the total contents of the bottle remains unchanged from filling to crowning. This is particularly desirable where the maintenance of extremely accurate fill heights in the bottles is demanded.

While the principles of the invention have been described in conjunction with apparatus for bottling carbonated beverages, it will be apparent that these principles are equally applicable to packaging of other types of effervescent fluids. Moreover, it will be understood that modifications of the various elements of the apparatus of the present invention will occur to those skilled in the art, and accordingly, it is intended that the scope of the invention be limited only by the appended claims.

We claim:

1. In a method of packaging an effervescent liquid in

which the individual containers are continuously moved along a predetermined path during the packaging operation, the steps of partially filling each of the containers with said liquid, exciting the liquid in each of the containers at a point along said path to generate a foam tending to fill a portion of the remainder of the container, whereby a substantial portion of the air remaining in the container is expelled, thereafter applying under pressure a gas other than air to the open ends of the containers along a substantial length of said path subsequent to said point to displace air remaining in the containers, confining the excess gas applied to the containers to establish an atmosphere of said gas along said length of path at a level to envelop the open ends of the containers as they pass therethrough to prevent entry of additional air, and then hermetically sealing the open ends of the containers.

2. In apparatus for packaging an effervescent liquid which includes conveyor means for continually moving a series of containers along a predetermined path and means for partially filling said containers with the liquid at a point along said path, means for removing the air remaining in said containers comprising means for exciting the liquid in each container to generate a foam tending to fill a portion of the remainder of the container, a chamber disposed above a substantial length of said path having outlet means in its underside for applying under pressure a gas other than air to the open ends of said containers as they pass thereunder, whereby air remaining in said container is displaced, means to entrap excess gas from said outlet means to establish an atmosphere of said gas surrounding the open ends of said containers as they pass under said chamber to prevent entry of additional air, and means to hermetically seal the open ends of said containers.

3. Apparatus according to claim 2 wherein said means to entrap excess gas from said outlet means comprises a skirt depending from each side of said chamber on opposite sides of said bottles as they pass beneath said chamber.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,157,011

November 17, 1964

William A. Wheatley et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 4, line 19, for "continually" read
-- continuously --.

Signed and sealed this 6th day of April 1965.

(SEAL)

Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents