Jan. 4, 1944. B. J. GARTLAND 2,338,108

METHOD OF PACKAGING BEVERAGES

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Fig. 1.

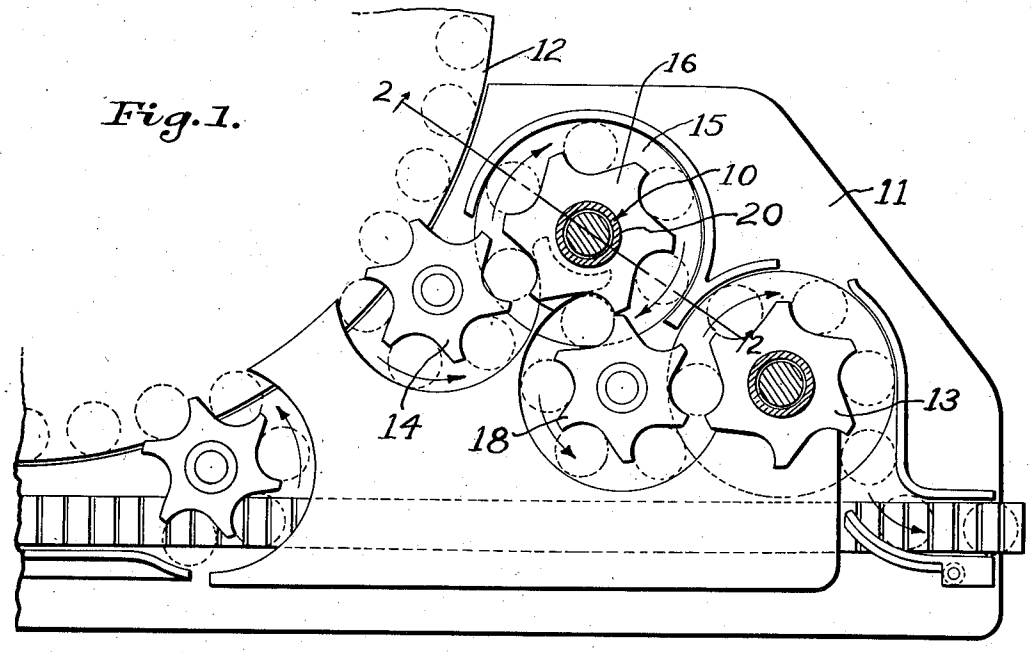
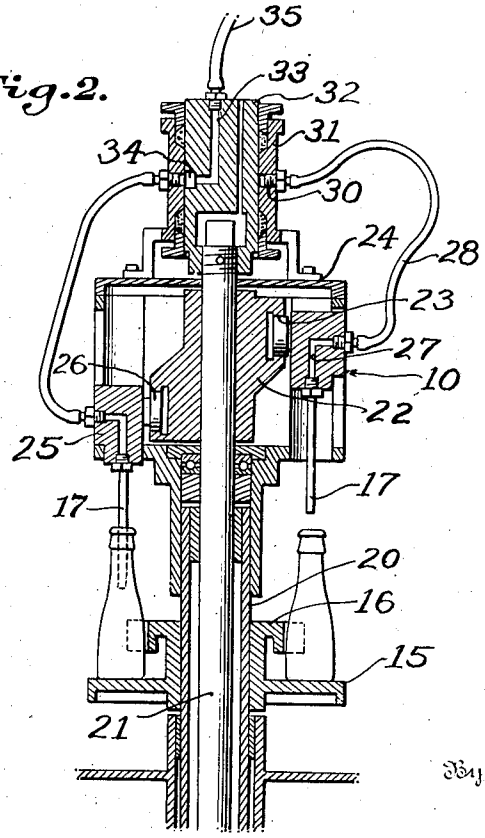


Fig. 2.



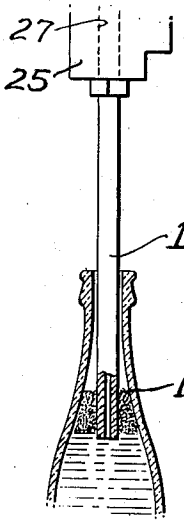


Fig. 3.

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Fig. 4.

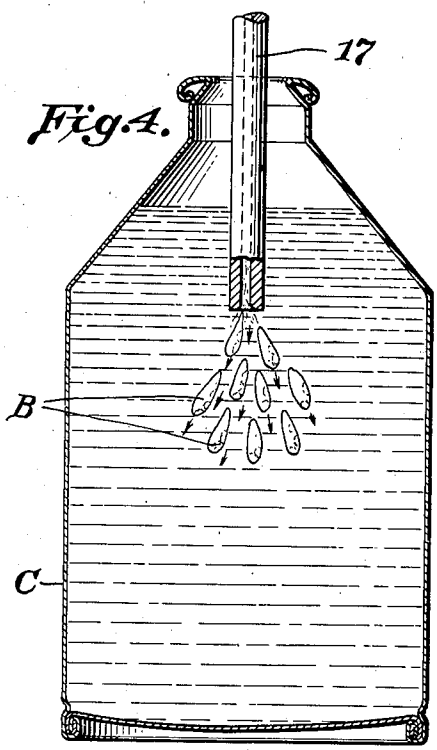


Fig. 5.

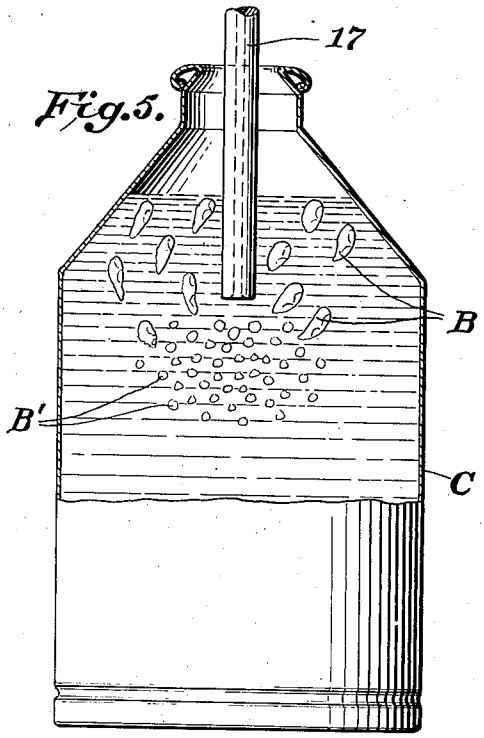


Fig. 6.

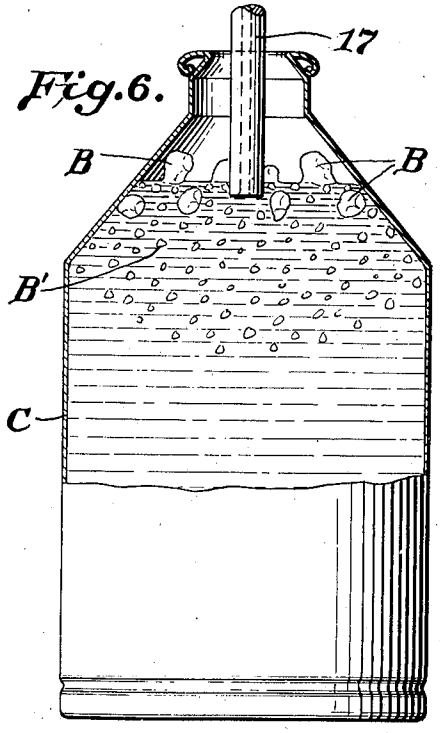
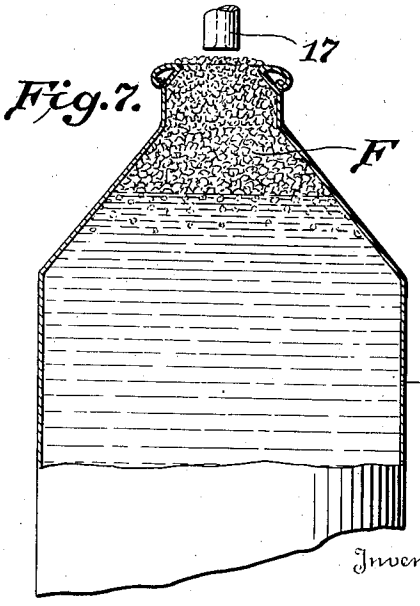


Fig. 7.



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UNITED STATES PATENT OFFICE

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METHOD OF PACKAGING BEVERAGES

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Application May 3, 1939, Serial No. 271,553

4 Claims. (Cl. 226—82)

The present invention relates to a method of packaging beverages.

The principal object of the invention is to provide a method for removing air from the head space of a receptacle containing a carbonated beverage, such as bear or a soft drink.

It has long been known that the presence of air in the head space of a carbonated beverage container is undesirable, due to the oxygen content of the air. In the bottling of beer, the presence of air in the head space has a particularly deleterious effect because it causes changes in the flavor and turbidity of the beverage.

It has heretofore been proposed to remove air from the head space of containers by filling such head space with an inert gas; for example, carbon dioxide. The difficulty with the prior method is that any movement of the container, such as is normal and necessary during its passage through a filling machine, results in a substantial portion of this gas being swept out of the mouth of the container and replaced by air. To overcome that difficulty, it has been necessary to decrease the speed of movement of the bottles between the gas-inserting means and the sealing means, and it has also been necessary to use a capping mechanism of such type that the capping heads will not descend too rapidly toward the bottle, because even this causes some of the gas to be swept from the bottle. It will be obvious that these expedients used to prevent inserted carbon dioxide from being swept from the head space of the bottles prevent the operation of the filling machine at a normal speed of production.

Various arrangements have also been proposed to cause the beverage to foam up into the container head space so that the air will be driven therefrom. One arrangement for causing the beverage to foam has been to tap the bottle with a view of so agitating the contents that foam will rise therefrom. The objection to this method is that since the entire contents of the container are vibrated or agitated, foam may rise from all of the liquid in the container, including the liquid at the lowest portion of the container. Such foaming is apt to become cumulative; that is, the particles of gas rising from the lower portion of the container gather other particles about them as they ascend through the liquid, and unless all conditions are carefully regulated, an altogether uncontrollable foaming may result, such as will partially drain the container of its contents. Another similar method heretofore proposed has been to inject a gas into the liquid from a nozzle submerged in the liquid. This method has also been objectionable for substantially the same reasons as referred to above with respect to tapping the container. That is, foam will rise from a substantial portion of the container contents and may become uncontrollable, unless the method is very carefully supervised. With both of the methods just referred to, the foam created in the head space of the container is rather coarse; i. e., is formed of relatively large bubbles and is therefore not very stable. Furthermore, since the bubbles are large, they will readily burst so that even if the foaming is so controlled that it merely completely fills the head space, at least some of the bubbles may break before capping is performed, permitting the return of air to the head space.

By the method of the present invention, a jet of a gas is injected into the liquid in the container through a nozzle having a relatively small orifice, and while the mouth of the nozzle is positioned in the extreme upper portion of the liquid. By having the gas or other fluid under a relatively high pressure and injecting it in a small stream, a local shock effect is given the immediately surrounding portion of the container contents so that only this portion of the liquid will foam. Because of the fact that only the upper portion of the liquid foams, the foam bubbles will be of extremely small size, since there is no possibility of a bubble of gas accumulating additional gas, as may occur when the gas bubble rises through a substantial depth of beverage. Hence the foam will be fine in character and extremely stable.

Referring to the drawings, wherein an apparatus for performing the method of my invention is diagrammatically disclosed,

Figure 1 is a fragmentary plan view, partly in horizontal section, of a filling machine equipped with mechanism for conducting the method of my invention;

Figure 2 is a vertical sectional view on the line 2—2 of Figure 1;

Figure 3 is a detail view showing a jet device which may be used to inject gas into a beverage, and

Figures 4 to 7 are vertical sectional views of a container showing the effect of injecting a fluid into the container contents.

In the drawings, the numeral 10 designates a gas-injecting mechanism provided on the stationary table 11 of a filling machine between the usual rotary filling table 12 and the sealing or crowning mechanism 13, so that bottles moving

from the filling table 12 to the sealing mechanism 13 will move through the gas-injecting mechanism 10. A continuously rotating dial 14 of a well-known construction is provided between the rotary filling table 12 and the gas-injecting mechanism 10 to remove filled and uncapped bottles from the filling table and position them upon a rotary table 15 forming part of the mechanism 10. A dial 16 is included in the mechanism 10 immediately above the rotary table 15 for the purpose of holding the bottles in proper alignment with the gas-injecting tubes 17. A second transfer dial 18 is provided to remove the bottles from the gas-injecting mechanism 10 and conduct them to the crowner 13.

Referring to Figure 2, which shows the gas-injecting mechanism 10 in detail, it will be observed that this mechanism rotates with a hollow shaft 20 which surrounds a normally stationary post 21. Post 21 has a cam casting 22 fixed thereto provided with a circumferentially extending cam track 23. The hollow shaft 20 has a housing 24 secured thereto which surrounds the cam casting 22, and a plurality of slide members 25 are vertically reciprocable in the housing 24, each slide member being provided with a cam roller 26 which moves along the cam track 23 of stationary cam casting 22. A right angled bore 27 is formed in each slide member 25, a horizontally extending passage of this bore being in communication with a flexible tube 28 which has its opposite end connected to a nozzle opening to a port 30 in a sleeve 31 fixed to the upper end of the housing 24 so as to be rotatable with the latter. The sleeve 31 surrounds a manifold 32 fixed to the upper end of the stationary post 21. Manifold 32 is provided with a right angled passage 33 including a horizontal portion which opens to an arcuate groove 34 extending partially about the peripheral surface of the manifold. The vertical portion of passage 33 has a tube 35 connected thereto, the opposite end of tube 35 being connected to a suitable source of an inert gas, such as carbon dioxide, not shown.

As best shown in Figure 2, a jet member 17 is connected to the vertically extending portion of the passage 27 of each slide member 25. By the arrangement described above, with the housing 24 and sleeve 31 rotating about the fixed cam 22 and fixed manifold 32, the jet members 17 may be moved downwardly into the mouths of containers when the latter are received upon the rotary table 15. At the moment that the lower end of a jet 17 is positioned below the level of the liquid in the container as indicated in Figures 3 and 4, the port 30 in sleeve 31 corresponding to that jet member will be in alignment with the arcuate groove 34 in manifold 32 with the result that a jet of the gas will be released in the liquid in the container.

With the jetted gas under proper pressure, a very dense and stable foam will immediately begin to rise from the immediately adjacent portion of the beverage as indicated at F in Figure 3, this foam continuing to form after the momentary jetting of gas and rising to fill the entire head space, including such area of the head space as was previously occupied by the jet member 17, which will be moved upwardly immediately jetting has occurred.

Figures 4 to 7, inclusive, illustrate the action which results from injection of gas in accordance with the present invention. Referring to Figure 4, this view shows the jetting nozzle 17 at the lowermost point in its downward movement into the liquid in the container. At this moment the mouth of the jetting member 17 may be from one-fourth of an inch to one inch below the surface of the liquid in the container, depending upon the point in the liquid from which it is desired to have foaming occur. As has been indicated above, the present invention contemplates causing the gas to rise only from the upper portion of the liquid.

At the moment that the jet member 17 reaches its lowest position in the contents, a jet of carbon dioxide or other suitable gas will be projected from the nozzle, this gas being at a relatively high pressure of the nature hereinafter referred to. The jet of gas issuing from the capillary passage of the jet 17 will forcibly impinge upon the surrounding container contents and divide into relatively large bubbles B. Very fine bubbles B' will immediately be formed in the liquid, due to the local shock resulting from the contact of the injected stream of gas with the liquid. It will be observed from Figure 5 that the bubbles B' will only be formed within the relatively small area of the beverage with which the injected stream contacted.

When the large bubbles B lose their downward velocity they will rise to the surface of the beverage as shown in Figure 6 and burst due to their size, but the smaller bubbles B', upon reaching the surface, will form a very stable foam within the head space of the container as indicated at F in Figure 7. As further indicated in Figure 7, no cumulative foaming will occur by the present method. That is, the only foam which will rise from the liquid will be that which rises from the impact receiving area of the beverage and when the immediate effect of this local shock has been dissipated, no further foaming will occur; no foam will rise at any time from areas other than the one with which the injected gas impacts; and because the bubbles B' are extremely small, they will not increase in size as they rise. That is to say, after the effect of the local shock or impact, there is caused no further foaming by continued introduction of gas, with the result that there is no continued formation of larger bubbles due to further gas introduction, the larger bubbles being maintained at a minimum and substantially all of the foam being the small-bubble type resulting from the impact. In fact, all of the foam created above the surface of the liquid, as shown in Figure 7, is of the small-bubble type, whereas if the introduction of gas were continued after the local shock or impact effect, there would be a substantial amount of large-bubble foam in the headspace. The present method is therefore sharply distinguished from all prior methods which permitted a general foaming of a beverage.

The foam formed in accordance with the present invention will have entirely expelled all of the air from the head space by the time that the container has moved about the second transfer dial 18 and beneath the crowning mechanism, so that the cap can be placed upon the container without trapping any air within the latter.

The fact that the entire head space is filled with a fine and very stable foam will prevent any air from displacing the foam by reason of rapid movement of the bottle toward the capping mechanism, or even by downward movement of the capping head toward the container.

With the proper coordination of the various

factors involved; i. e., the size of the passage of jet tube 17, the pressure under which the gas is injected, the duration of the injection, the depth of immersion of tube 17, the degree of carbonation and the temperature of the beverage, as well as the volume of the head space of the container, the volume of the foam to be formed in the head space may be so closely controlled that it will completely fill the head space and yet not rise too far over the mouth of the bottle or can. It is desirable to have the foam rise slightly above the mouth of the container as shown in Figure 7, in order that even the air in the cap will be forced therefrom as the cap is applied.

The diameter of the passage of jet 17 may range from 1/100 of an inch to 5/100 of an inch, with gas pressure ranging from one to fifteen pounds per square inch and injection periods of from 1/16 of a second to two seconds. The depth of immersion may vary from one-quarter of an inch to one inch. However, it will be understood that these figures are merely given for purposes of example and that they may vary over wider ranges, according to the nature and temperature of the beverage and the volume of the head space to be filled with foam, and so long as the various factors are so co-related as to produce a local shock effect upon the beverage to cause foam to rise only from the extreme upper portion of the beverage, rather than from the entire contents, or from a substantial portion of the contents. The volume of carbon dioxide released from the beverage, and hence the amount of foam generated, is controlled by limiting the magnitude of the shock. This, in turn, is due to the extremely small size of the nozzle orifice, the pressure of the gas, and the duration of injection.

As a specific example of the procedure followed in accordance with the invention, it has been found that a twelve ounce beer bottle of the short or stubby type containing unpasteurized beer at 38° F. will be properly foamed with a jet nozzle having a passage of 5/100 of an inch in diameter immersed to a depth of five-eighths of an inch, using carbon dioxide gas at a pressure of two pounds per square inch, at room temperature, and injecting such gas for ½ of a second.

It is desirable to use a gas of the same nature as is in solution in the liquid, and since carbon dioxide is the gas present in carbonated beverages, the use of that gas is preferred. However, any tasteless, odorless and non-toxic gas may be used.

It will be understood that the terminology used in the specification is for purposes of description, and that the scope of the invention is indicated by the claims.

I claim:

1. The method of packaging beverages containing carbon dioxide gas in solution, comprising substantially filling the container with the beverage but leaving above the surface of the beverage within the container a head space containing air, jetting a gaseous fluid against only the upper portion of the beverage, the pressure of the gas being so high that its impact upon the beverage will impart a shock to the latter to cause it to foam in the form of small impact-created bubbles to drive air from the container head space, and terminating the jetting immediately the effect of the local impact is adequate to provide a quantity of impact-created bubbles sufficient to fill the head space, so that the jetted gaseous fluid may escape and the head space will contain only small, impact-created bubbles.

2. A method as specified in claim 1 in which the mouth of the jetting nozzle is positioned below the surface of the beverage during the jetting.

3. A method as specified in claim 1 in which the jetting is continued for a period not exceeding one-half a second and in which the gas pressure is from not less than two pounds per square inch up to fifteen pounds per square inch.

4. A method as specified in claim 1 in which the jetting is continued for a period not exceeding one-half a second and in which the gas pressure is not less than two pounds per square inch.

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