March 27, 1945. R. J. STEWART 2,372,457

METHOD FOR PACKAGING BEVERAGES

Filed Feb. 13, 1941 3 Sheets-Sheet 1

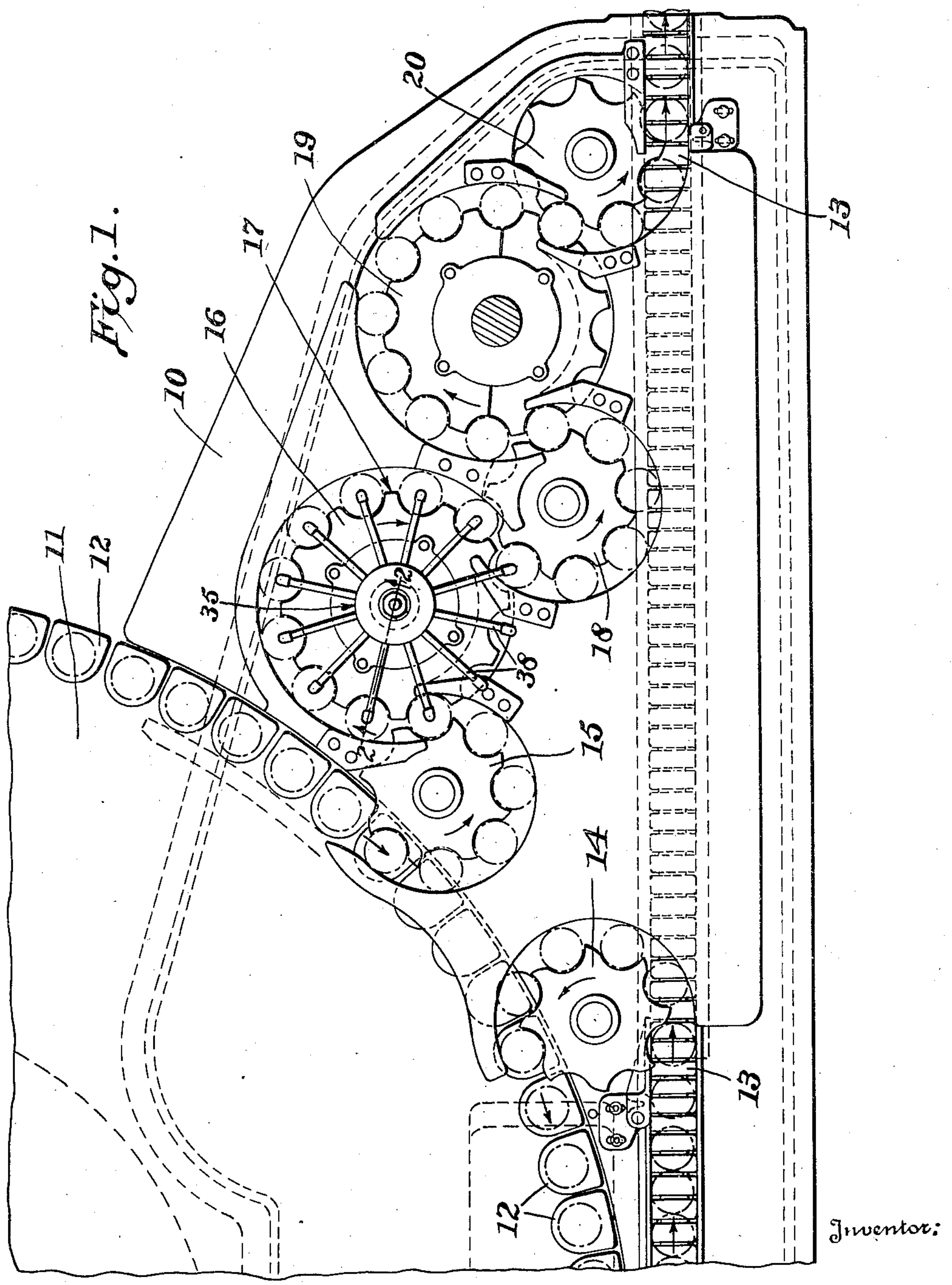


Fig. 1.

Inventor:

Robert J. Stewart,

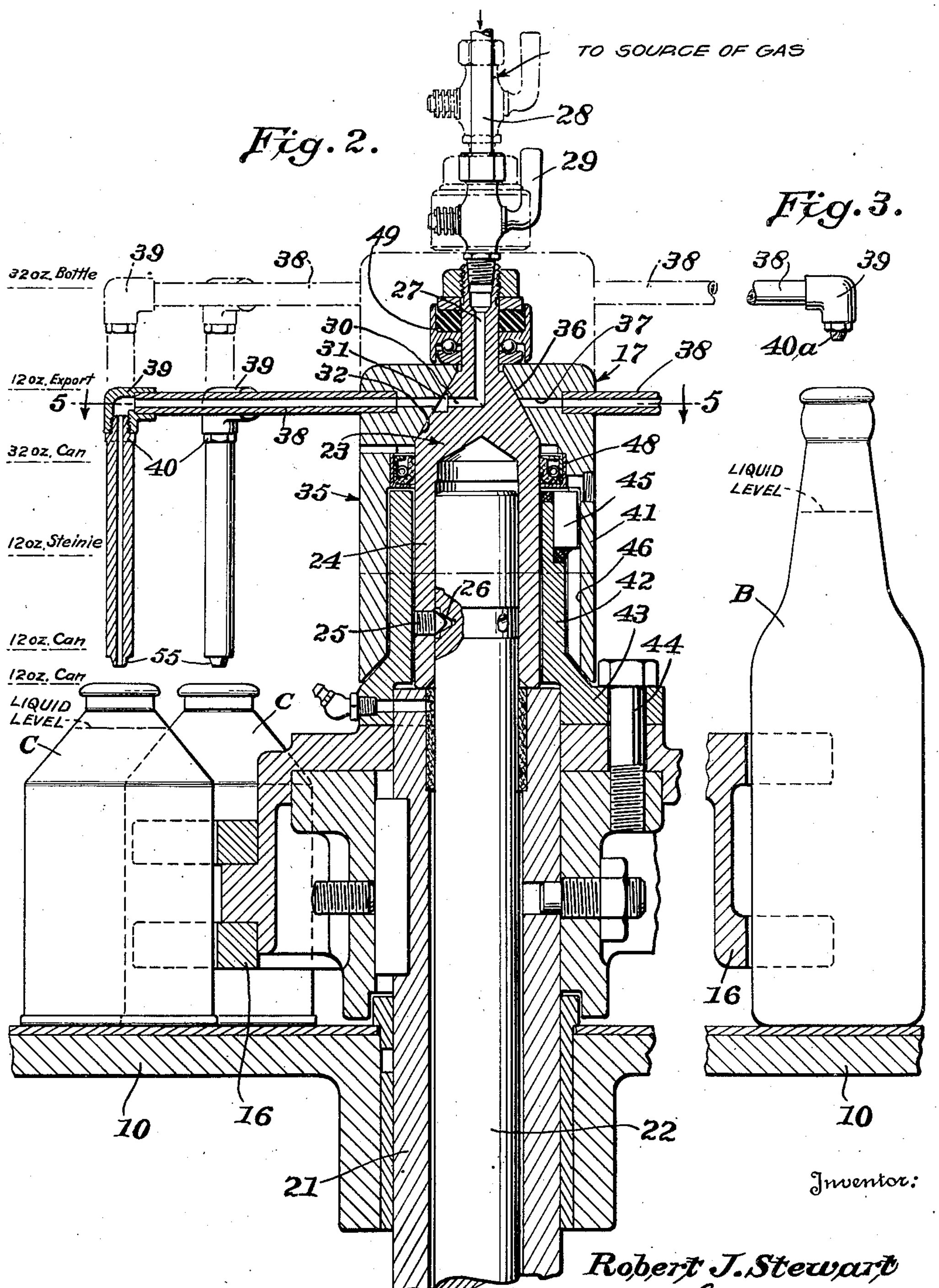
By Cushman, Darby & Cushman

Attorneys.

March 27, 1945. R. J. STEWART 2,372,457

METHOD FOR PACKAGING BEVERAGES

Filed Feb. 13, 1941 3 Sheets-Sheet 2



Inventor:

Robert J. Stewart

By Cushman, Darby & Cushman

Attorneys.

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Filed Feb. 13, 1941 3 Sheets-Sheet 3

Fig. 4.

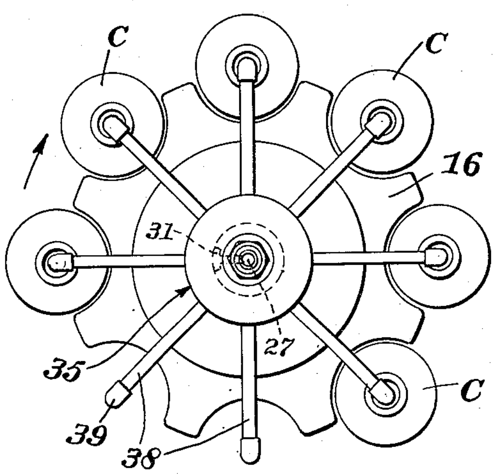


Fig. 7.

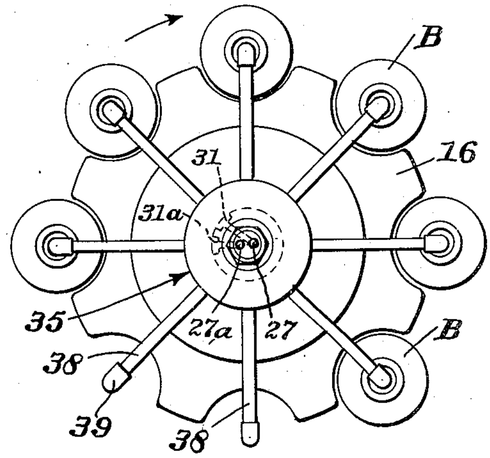


Fig. 5.

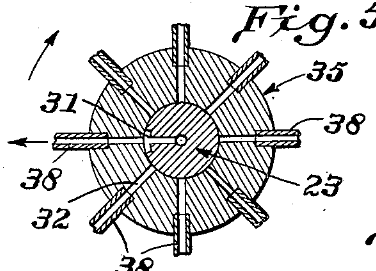


Fig. 8.

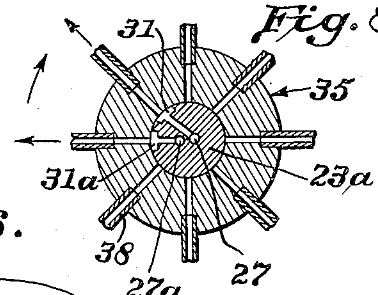
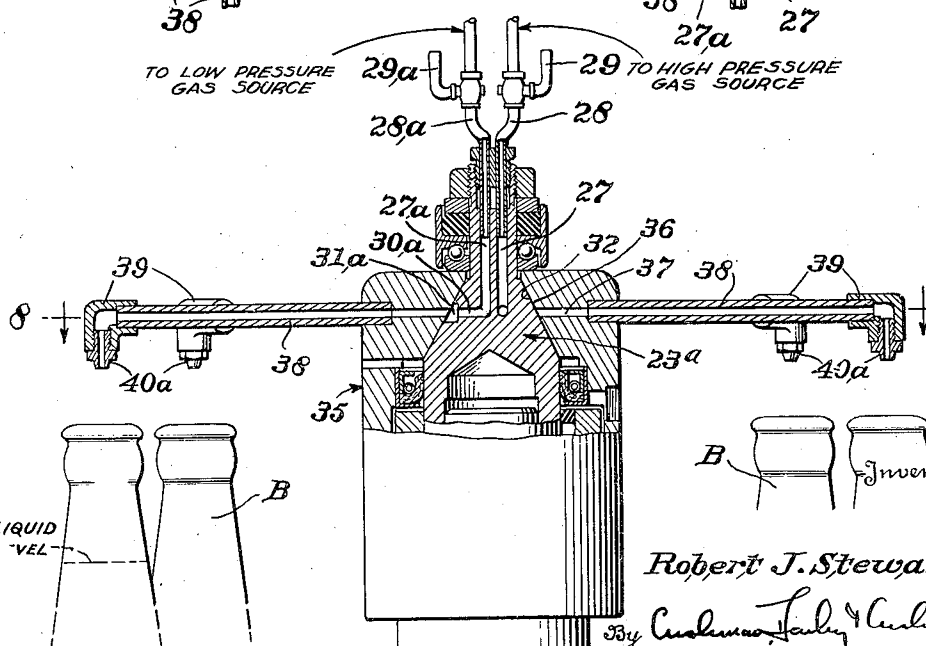


Fig. 6.



Inventor:

Robert J. Stewart,

By Cushman, Darby & Cushman

Attorneys.

Patented Mar. 27, 1945

2,372,457

UNITED STATES PATENT OFFICE

2,372,457

METHOD FOR PACKAGING BEVERAGES

Robert J. Stewart, Baltimore, Md., assignor to Crown Cork & Seal Company, Inc., Baltimore, Md., a corporation of New York

Application February 13, 1941, Serial No. 378,801

1 Claim. (Cl. 226—68)

The present invention relates to a method for packaging beverages.

In the packaging of beverages such as beer or soft drinks, it has heretofore been recognized as desirable to eliminate air from the space in the container above the beverage before sealing the container and various expedients have been proposed and utilized for this purpose.

The present invention involves a method for packaging beer and other gas containing beverages in containers and by means of which at least the upper portion of the beverage in the container is agitated to cause gas to be released in the form of foam which will rise in the container head space. Since the gas forming the foam is heavier than air, and the foam is very stable and fine, its rise will force all air from the container head space. By then sealing the container before the foam has dispersed, air will be excluded from the container.

The idea of causing a beverage to foam by jetting a stream of gas such as carbon dioxide at normal temperature into the beverage from a point above the container mouth has heretofore been regarded as impractical and altogether unsatisfactory, due to the fact that tests showed that beverage receptacles thus foamed still contained an excessive amount of air in their head spaces.

I have discovered that the reason for the unsuccessful results mentioned immediately above was that during the jetting, air was entrained into the beverage because of the force of the jet as well as its substantial diameter. Since this prior jetting was performed under such pressure that the jetted stream would move a substantial distance down into the beverage, the entrained air would be temporarily entrapped in the beverage or in the foam resulting from the jetting. The rise of foam would force from the mouth of the container the air originally in the head space, but the air drawn in by entrainment would not be released from the beverage or from the foam until after sealing and would then fill the head space.

Beer has also been caused to foam by jetting streams of beer into the same. This has also been unsatisfactory because of entrainment of air, as well as because of the fact that the stream of beer was under such pressure that it foamed immediately it left the jetting nozzle and at least when it struck the surface of the beverage and thereby trapped air. In other words, the foam formed by that method was not heavy gas from the beverage, but was simply mechanical foam formed of air and the jetted liquid. As a result, the foam in the head space would contain a large portion of air which would be released in the head space after sealing.

By the present invention the gas is jetted from a point closely adjacent and slightly above the mouth of the container, the jetted stream being very small and only under sufficient pressure to move a very slight distance into the beverage. Because of the small size of the jetted stream, little if any air will be entrained. Because of the low pressure of the jet, any air which it may entrain will only move down against the beverage surface rather than into the beverage. Such air will therefore be driven from the head space by the rising gas-filled foam along with other air in the head space.

By only foaming the upper portion of the beverage, by a local shock effect, the present invention also avoids a serious difficulty of some prior jetting arrangements. That is, in numerous prior jetting systems, the jet was under such force that even the beverage near the bottom of the container was agitated and the result was that the beverage would foam uncontrollably and a substantial portion would be wasted.

By jetting only to a depth close to the surface of the beverage and maintaining the jet of minimum diameter, I create only the foam necessary to drive air from the head space and, in addition, preclude entrainment of air into the body of the beverage.

Some previous methods have necessitated the use of jetting nozzles which would descend into containers and the apparatus used to perform such methods therefore included jetting tubes mounted to move with the containers and also reciprocate with respect to the containers. These arrangements were naturally rather complicated both as to valve structure and operating elements. In other mechanisms, each container was stopped so that a jetting tube could move down into the same.

The present invention, involving jetting from a point above the mouth of the container, enables the use of a non-reciprocating jet tube and thereby eliminates small movable parts. It also permits the use of an extremely efficient valve mechanism. The invention is thereby readily adaptable to high production filling machines.

I have found that foaming can be confined to the upper portion of the beverage by use of a nozzle arranged to jet from a point above the mouth of the container, since if the size and pressure of the jetted stream is limited, even the comparatively long stream thus necessary in some instances will not entrain air into the beverage.

Previous methods involving the use of jets of substantial diameter would not be practicable for jetting from a point above the container mouth due to the large annulus of air which would be entrained by the long jetted stream.

Another object of the invention is to provide an apparatus which will be readily applicable to all commonly used types of beer containers.

The six types of containers in which beer is retailed vary in height from about five and one-quarter inches to about twelve inches, with a total range of height of almost six-and-three-quarter inches. In order that the present mechanism need not be vertically movable through such a long path, the present invention provides two types of jet nozzles which may be used with a short vertical adjustment to handle all types of beer containers as well as soft drink containers.

The invention also contemplates the use in some instances of a preliminary jetting of gas at low pressure, that is, at a pressure insufficient to cause foaming. Gas thus jetted into the container head space will force all air from the head space and when the second jet, at sufficient pressure to induce foaming, is used it cannot entrain any air into the beverage because the head space now contains an inert gas. Such an arrangement is extremely efficient in assuring that the container will have no air in its contents or head space after it is sealed.

Other objects and advantages of the invention will be apparent from the following specification and drawings wherein:

Figure 1 is a plan view of the stationary table of a beer filling machine, with the upper portions of the filling and crowning elements removed;

Figure 2 is a vertical sectional view on the line 2—2 of Figure 1 showing the jetting of a can of minimum height;

Figure 3 is a view similar to Figure 2, but showing the jetting of a tall bottle;

Figure 4 is a top plan view of the structure of Figure 2;

Figure 5 is a horizontal sectional view of the central portion of the Figure 2 structure taken on the line 5—5 of Figure 2;

Figure 6 is a view similar to Figure 2, but showing a modified structure;

Figure 7 is a top plan view of the Figure 6 structure; and

Figure 8 is a horizontal sectional view of the central portion of the Figure 6 structure, the view being taken on the line 8—8 of Figure 6.

Figure 1 discloses a filling machine of the type used for filling beer and comprises a stationary table 10 and a rotary filling table 11 provided with bottle supporting platforms 12, each of which has a filling head, not shown, vertically aligned therewith. The stationary table 10 has a straight line conveyor 13 moving across the same and containers are moved into the apparatus on this conveyor to be engaged by an infeed dial 14 which positions them upon the bottle supporting platforms 12 of the filling table 11.

During their movement about the filling table 11, the bottles or other containers are filled in the usual manner to a point somewhat below the level of the mouth of the container. When the containers reach the transfer dial 15 they are removed from the platforms 12 and conducted to a rotary dial 16 forming a portion of a jetting apparatus 17. During their travel about the dial 16 gas is jetted into the container head space, as hereinafter described, and the containers then move about a rotary dial 18 to the usual crowning mechanism 19 from which they are removed by an outfeed dial 20 which returns them to the straight line conveyor 13.

As indicated in Figure 1, and as is the usual practice, the various dials are surrounded by guide plates which coact with the dials to define the path of travel of the containers.

Referring to Figure 2, the dial 16 forming part of the jetting apparatus 17 is spaced above the surface of the stationary table 10 and is fixed to a hollow rotating shaft 21 extending beneath the stationary table for rotation in the usual manner. Within the tubular shaft 21 there is positioned a post 22 which is normally stationary, i. e., does not rotate with shaft 21. The upper end of post 22 has a valve body element 23 fixed thereto including a depending flange or sleeve portion 24 which fits about the upper portion of post 22. A set screw 25 threaded in the sleeve portion 24 engages a recess 26 in post 22 so that valve body element 23 will be secured to the post and held against rotation.

Valve body element 23 is provided with a vertical bore 27 to which a gas line 28 including a pet cock 29 is connected. The lower end of bore 27 opens to a bore 30 extending horizontally and radially of element 23 and which opens to a recess 31 in the inclined or conical face 32 of element 23.

A rotating valve element 35 is mounted on the stationary valve element 23, element 35 having an inclined or conical bore 36 therein, which closely engages the conical face 32 of element 23. Element 35 is also provided with a plurality of radial bores 37 positioned in such horizontal plane that during rotation of element 35 as hereinafter described they will be successively aligned with the recess 31. The outer ends of the bores 37 are enlarged to receive horizontal tubes which carry right angled fittings 39 provided with downwardly facing threaded bores in which jet nozzles such as indicated at 40 may be positioned. A bore 37 and associated jet fittings are provided for each of the pockets of the dial 16.

Rotatable valve element 35 includes a depending flange 41 which surrounds an upstanding flange 42 formed integral with a bracket 43 fixed to the upper portion of dial 16 by bolts such as 44 so that bracket 43 will rotate with the dial 16. The upstanding flange 42 includes a key 45 preferably formed of hard metal welded to the flange 42, and which key engages a vertical keyway 46 on the depending flange 41 of rotatable valve element 35.

It will be noted from the above that valve body element 23 will be non-rotatable while valve element 35 will rotate about it, such rotation occurring because of the connection of element 35 to the dial 16 secured to the rotating tubular shaft 21.

The vertical position of the elements 23 and 35 with respect to the work table 10 and the dial 16 can be adjusted by raising the post 22 within the shaft 21 by means of any suitable gearing, not shown. Such lifting of post 22 will directly lift the fixed valve element 23 and the latter will raise element 35. The key connection between element 35 and bracket 43 will enable valve element 35 to be rotated with the bracket and dial in various vertical positions with respect to the latter. A flexible element may be included in the gas supply pipe 28 in order to accommodate lifting of element 23.

Suitable bearings are provided between element 23 and element 35 as indicated at 48. Also, a resilient pressure member 49 is provided about the extreme upper portion of element 23 to antifrictionally bear upon the upper surface of element 35 so as to hold the latter in a tightly sealed position on body element 23 without retarding its rotation.

As is indicated by the dotted lines included in Figure 2, the standard containers in which beer is sold vary through a substantial height range. For example, the shortest types of beer containers are twelve ounce cans which are approximately five and one-quarter inches in height while the tallest containers are thirty-two ounce bottles of a height of approximately twelve inches. Between these two ranges there are twelve ounce cans only slightly higher than the five and one-quarter inch type, then twelve ounce bottles of an intermediate height, thirty-two ounce cans, and twelve ounce "export" or "tall" bottles about nine-and-a-quarter inches in height. As a result, beer filling machines must ordinarily be of such design that they may handle containers of six different heights with a range of approximately six-and-three-quarter inches from the lowest in height to the tallest.

In order that all of these containers may be accommodated upon the present apparatus without necessitating valve element supports of such height as to permit a six-and-three-quarter inch vertical adjustment, the present invention involves the use of valve elements having a range of vertical adjustment with respect to dial 16 of approximately half the necessary vertical range, the extreme short and tall containers being accommodated by providing two types of jet nozzles, one being a long nozzle 40 such as shown in Figure 2 and the other being a short nozzle 40*a* shown in Figure 3. For example, the short nozzle 40*a* is used with twelve ounce tall bottles as illustrated at B in Figure 3, and also with the tallest or thirty-two ounce cans and bottles, with the apparatus being adjusted to its highest vertical position for the thirty-two ounce bottles and to a slightly lower position for the thirty-two ounce cans and twelve ounce "export" bottles. The longer nozzle 40 may be used with the remaining and shorter containers, with the apparatus adjusted to the proper vertical position with respect to the dotted lines of Figure 2 which diagrammatically indicate the heights of the six types of containers and illustrates a short twelve ounce can C.

It is desirable in jetting into all types of containers to have the extreme lower portion of the nozzles 40 and 40*a* closely adjacent the plane of the lip of the container mouth. It is ordinarily found desirable to space the nozzles 40 and 40*a* from one-quarter inch above the plane of the container lip to about half an inch.

If a tall beer bottle B is being jetted the mouth of the jet 40 will then be about two inches above the surface of the beer in the bottle and it will ordinarily be desirable to use a fairly high pressure of gas. Nevertheless, if the beer happens to be at a temperature slightly higher than the usual 40° F. bottling temperature, or is of a freely foaming type, or if the temperature of the bottling room is such as to cause the beer to foam quite readily, it may only be necessary to use the lowest pressure contemplated by the present invention.

Generally speaking, the carbon dioxide jetted in accordance with the present invention will be at normal or room temperature and will be jetted from ports of from .015 to .030 of an inch in diameter, with the pressure ranging from thirty pounds per square inch at the minimum diameter to fifteen pounds per square inch at the maximum diameter. The period of jetting will be relatively short, ranging from 1/25 of a second in duration to one second. The period of jetting should be held to a minimum in order to hold possibility of entrainment of air to a minimum. It will be observed that by using the higher pressure, for example, thirty pounds per square inch, with the smallest jet, the small jet can be used where the level of the liquid is a substantial distance below the jet, as in a tall beer bottle, thereby reducing the circumference of the surrounding body of air which can be entrained by the jet and still providing a stream of gas of the necessary size and pressure to cause foaming of the upper portion of the beer.

It will be apparent from the above that the larger size jet is ordinarily used with containers such as cans wherein the surface of the beer is close to the mouth of the container and hence will be close to the jet. Naturally, if the stream of gas travels only a short distance it cannot entrain any substantial quantity of air even with a larger jet, particularly if the pressure of the jet is lowered.

The period of jetting can be adjusted by changing the size of the jetting recess 31 on the fixed element 23, or by varying the horizontal width of the ports 37 in the rotating element 35. However, it is desirable to supply with the machine sets of jet nozzles such as 40 and 40*a* having ports of various sizes within the ranges stated above so that the bottler may adjust the jetting by adjustment of the size of the jetted stream and its pressure rather than by an adjustment of the period of jetting. The pressure of the gas can be varied to some extent by operation of the pet cock 29. As is indicated above, it is desirable to keep the mouth of the jet close to the lip of the container and use a jet of only such pressure as reach the beverage surface with sufficient force to cause foaming of only the extreme upper portion of the beverage, keeping the stream of gas of as small diameter as possible in order to avoid a large annulus of entrained air.

Figures 6, 7 and 8 show a modified form of the invention wherein the fixed valve body element 23*a* is provided with an additional vertical bore 27*a* having a pipe 28*a* including a pet cock 29*a* connected thereto, the lower portion of bore 27*a* opening to a horizontal and radial bore 30*a* which terminates in a recess 31*a* in the conical wall 32 of element 23*a*.

The line 28*a* is connected to a source of carbon dioxide or other inert gas at a somewhat lower pressure than that delivered through the line 28, preferably at about from one-quarter to 2 pounds pressure. During the rotation of the valve element 35 a stream of gas at low pressure will be jetted into each container when the tube 38 of that container moves past recess 31*a*. The pressure of this jet will be insufficient to cause the beer to foam, but will simply force from the head space of the container all air contained therein. Such removal of air will occur because of the fact that the stream of heavy gas will move down against the surface of the beverage and spread and then lift all air from the head space.

Subsequently, as indicated in Figure 8, the rotation of the mechanism will bring the same tube 38 opposite the recess 31 communicating with the high pressure line 28 so that a stream of sufficient force to cause foaming of the upper portion of the beverage will be directed against the surface of the beverage in the manner which has been described above.

With the apparatus and method disclosed in Figures 6 to 8, possibility of air being entrained by the jetting stream will be even more surely eliminated due to the fact that the head space of the container will be filled with an inert gas at the time that forceful jetting occurs. It is found by this method, and with the jetting nozzle closely spaced adjacent the mouth of the container, any such air as might be entrained from a point between the mouth of the container and the jet nozzle will be prevented from entering the container by the body of heavy gas surrounding the jetted stream within the head space of the container.

Mere replacement of the air in the container head space with a body of heavy inert gas is not sufficient to insure that all air will be excluded from the container head space when the container is subsequently sealed. More particularly, if a jet of inert gas under insufficient pressure to cause foaming is simply directed into the container head space to replace air, and if the container is then rapidly moved through the distance necessary to place it under a crowning head, such inert gas will be swept from the container. As a result, the head space will again contain a substantial amount of air at the moment a crown is applied. It is necessary, therefore, to cause the beverage to foam intermediate the jetting of the low pressure gas and the subsequent crowning, since the foam bubbles which will thereby rise in the head space are sufficiently stable and have sufficient surface tension to prevent them being swept from the container or broken during the rapid movement of the container to the crowning mechanism. It will be apparent that by having the foam rise slightly above the level of the lip of the container before the cap is applied, the resulting mound of foam will replace even the air contained in the sealing cap.

The terminology used in the specification is employed for the purpose of description and not for limitation, the scope of the invention being indicated in the claim.

I claim:

The method of packaging readily foaming beverages in containers which comprises partially filling a container with the beverage so as to leave a body of air above the surface of the beverage, quietly flowing an inert gas into the head space of the container to fill such head space with a quiet body of an inert gas, subsequently jetting into the beverage a stream of inert gas at sufficient pressure to cause the beverage to foam, and then sealing the container.

ROBERT J. STEWART.