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[56] **References Cited**
UNITED STATES PATENTS
 2,735,276 2/1956 Thompson, Jr. 62/69
 3,359,748 12/1967 Thompson, Jr. 62/70
 3,400,551 9/1968 Booth et al. 62/70X
 3,468,137 9/1969 Welty 62/69

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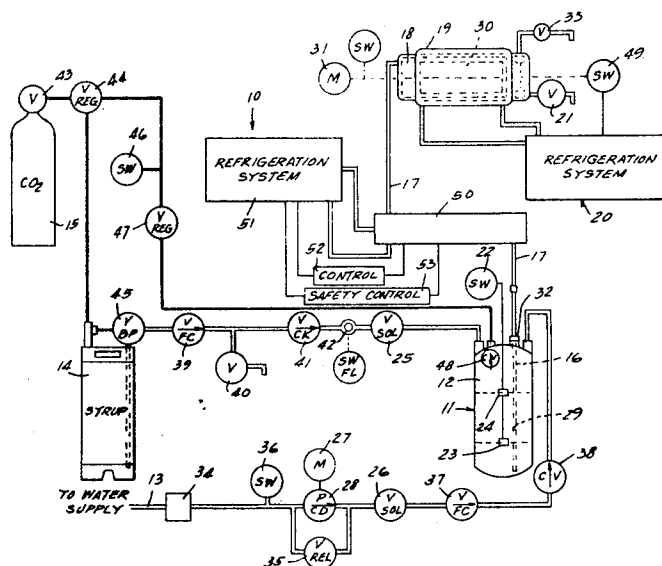
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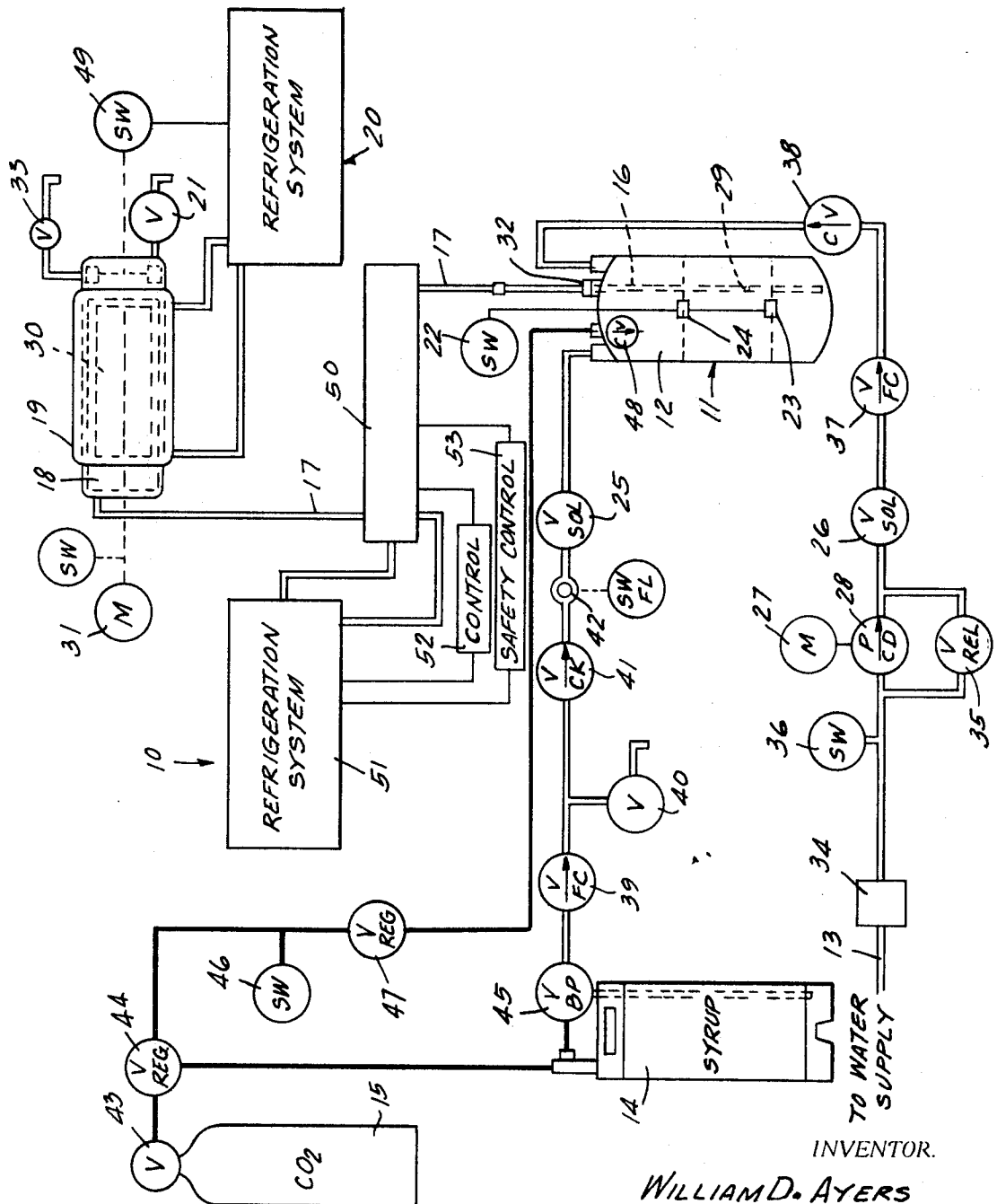
[54] **METHOD AND APPARATUS FOR PRODUCING AND DISPENSING A FOAMY CARBONATED BEVERAGE**

10 Claims, 1 Drawing Fig.

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 [50] Field of Search 222/464, 1, 146, 129.1, 4, 57, 70, 146 C, 129.3, 54; 62/68, 69, 70; 261/DIG. 7

ABSTRACT: Free carbon dioxide gas is injected as small bubbles into a number, less than all, of portions of carbonated beverage which are successively intermittently transferred to an area of reduced temperature for cooling such portions to serving temperature and to mix with and to replenish previously transferred portions. One specific type of apparatus for carrying out this method includes an aperture in an outlet tube that extends into a carbonator and is located so that it becomes alternately submersed in carbonated beverage stored in a carbonator and exposed to pressurized carbon dioxide gas above such liquid in the carbonator.





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METHOD AND APPARATUS FOR PRODUCING AND DISPENSING A FOAMY CARBONATED BEVERAGE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a method and means for producing and dispensing a foamy refrigerated carbonated beverage.

2. Prior Art

Where the production and dispensing of a refrigerated foamy beverage has been desired in the past, it has been the practice to violently agitate the beverage as it is being dispensed to cause some of the carbon dioxide gas to break out to create such foam. This method has the disadvantage that the taste of the drink becomes slightly flatter. This prior practice has a further problem in that the stability of a drink may vary a great deal due to various causes. For instance, it is well known that a bottle of seltzer water can be decapped and the beverage readily poured therefrom with a certain amount of gas breakout taking place. However, if the bottle has been agitated prior to decapping, the amount of breakout of gas that will take place is somewhat more. In similar fashion, deliberate agitation of a beverage being dispensed has produced a wide variety in the degree of foaminess, ranging from very little to too much.

It is also known to provide a pocket of carbon dioxide gas above the beverage that is being refrigerated so that the extra gas may supplement the breakout of gas. Such a practice has also produced erratic results as the pressure varies. If too much carbon dioxide gas passes through the dispensing valve, the product appears to spit out causing considerable splashing in the vicinity of the dispensing valve, much to the discomfort of nearby personnel. It has also been observed that if such refrigerated product is accompanied by suitable stirring, a gas pocket might reach the dispensing valve, and the expansion of such gas pocket has been known to blow the cup out of the server's hand. Also, in dispensers of the type that produce fine ice in the beverage, such a practice tends to cause ice crystals to stick together and to become too large.

SUMMARY OF THE INVENTION

In this invention, the beverage is stored under conditions wherein the carbonation level is stable, and thereafter portions of the carbonated beverage are transferred intermittently to an area of reduced temperature to cool such portions to serving temperature and to mix with and to replenish previously transferred portions. Doing so has the effect of rendering the beverage less saturated with carbon dioxide gas, making it more difficult for breakout to occur. Simultaneously with such intermittent transfers of portions of the quantity of carbonated beverage, there is injected free carbon dioxide gas as small bubbles into a number, less than all, of such transferred portions. Such gas bubbles can raise the level of carbonation to saturation with additional free bubbles being present, and such transfer can further provide surplus gas in the form of additional entrained bubbles of gas that are suspended but not necessarily yet absorbed in the liquid, and which readily expand on being dispensed.

Although this method can be practiced with various types of apparatus, one simple type of apparatus includes the provision of a small aperture in the outlet tube of a carbonator, the aperture being located so that it is submersed in the liquid most of the time to prevent injection of free carbon dioxide gas, and so as to be exposed to the carbonating gas in the carbonator for some of the time so as to permit gas to become entrained with the beverage portions being transferred.

Accordingly, it is an object of the present invention to provide a method and apparatus for producing and dispensing a foamy carbonated beverage wherein a high degree of reliability is provided as to foam production.

Another object of the present invention is to provide a method and apparatus for producing and dispensing a foamy

carbonated beverage which is not susceptible to "spitting" as it passes through the dispensing valve.

A still further object of the present invention is to provide surplus minute entrained carbon dioxide gas bubbles which are not readily absorbed by the product, to enable their free expansion on dispensing of such beverage product without reliance on breakup of the carbonation of such beverage product.

Many other advantages, features and additional objects of the present invention will become manifest to those versed in the art upon making reference to the detailed description and the accompanying sheet of drawings in which a preferred structural embodiment incorporating the principles of the present invention is shown by way of illustrative example.

The single FIGURE is a diagrammatic view of a system for producing and dispensing a foamy carbonated beverage embodying the method and apparatus of the present invention.

The present invention is particularly useful when embodied in a method and apparatus for producing and dispensing a foamy carbonated beverage such as shown in FIG. 1, generally indicated by the numeral 10. The apparatus 10 includes a carbonator 11 having a sealed chamber 12 connected to a source of water 13, a source of syrup 14, and a source of carbon dioxide gas 15. The carbonator 11 has an outlet tube 16 which is connected by a fluid conduit 17 which leads to a chamber 18 of a heat transfer member 19 that forms a part of a refrigeration means or system generally indicated by the numeral 20. The chamber 18 communicates with a dispensing valve 21 from which individual servings are withdrawn. The carbonator 11 is provided with means for controlling the amount of carbonated beverage in its chamber 12. If desired, such means can comprise a switch 22 responsive to the changes of mass of product in the carbonator 11 in a known manner. Alternatively, as illustrated diagrammatically, this means may comprise a control or switch 22 operated by a pair of electrodes 23, 24 respectively responsive to a predetermined minimum amount or level of carbonated beverage stored in the chamber 12, and responsive to a predetermined maximum amount or level of carbonated beverage stored in the chamber 12 of the carbonator 11. When the predetermined minimum amount is present, the control means 22 serve to energize a solenoid-type syrup valve 25, a solenoid-type water valve 26, and a motor 27 for operating a water pump 28 thereby enabling admixing additional water, syrup and carbon dioxide gas in the chamber 12. The electrode 24 is responsive to the presence of a sufficient quantity of carbonated beverage and thus is operative to terminate such admixing by deenergizing the solenoid valves 25, 26 and the motor 27.

The principal structural feature of this invention is the provision of an aperture 29 in the outlet tube 16 of the carbonator 11. The aperture 29 preferably has a diameter of about one thirty-second inch, and is so disposed on the outlet tube as to be alternately submersed in beverage and exposed to carbon dioxide gas. Preferably, it is submersed for over one-half of the time, and thus is disposed nearer to the minimum level controlled by the electrode 23 than it is to the maximum level controlled by the electrode 24. So far as I have been able to determine empirically, the ideal location for the aperture 29 is about one-sixth of the distance between these levels and taken from the lower level. This description presumes uniformity of horizontal cross section of the carbonator 11 between the maximum and minimum levels described.

Although the method and apparatus of this invention is of general utility, a particularly useful application is made in a system wherein the refrigeration means 20 has a capacity to freeze a portion of the beverage in the chamber 18 of the heat transfer member 19. Because of sugar content of the beverage, such refrigeration capacity requires that the heat transfer member be cooled to a temperature below 28° F. Within a fractional degree of this temperature, ice begins to form in that a portion of the beverage product begins to freeze therein.

The broader aspects of my invention lie in the method embodied in the exemplary apparatus 10. First, water from the source 13 and syrup from the source 14 and pressurized carbon dioxide gas from the source 15 are combined in the chamber 12 to provide a stored quantity of the carbonated beverage. The gas pressure in the carbonator forces product into the lower open end of the outlet tube 16 and thence through the fluid conduit 17 so that when the dispensing valve 21 is opened, intermittently, portions of the quantity of carbonated beverage in the carbonator 11 are correspondingly intermittently transferred to the chamber 18 which is an area of reduced temperature to cool such intermittently transferred portions to serving temperature and to mix with and to replenish previously transferred portions. According to this invention, free carbon dioxide gas as small bubbles is injected into a number, less than all, of such transferred portions, and by virtue of a stirrer 30 driven by a motor 31, such surplus gas bubbles are entrained and suspended throughout the carbonated beverage in the cooling chamber 18. Whenever a serving is then withdrawn therefrom, such entrained bubbles or fine foam within the chamber 18 expands. As stated previously, such fine bubbles are not injected into every one of such transferred portions as doing so renders the system susceptible to "spitting" and renders any ice particles in the chamber 18 subject to excessive agglomeration with each other. Thus, not only do less than all of the transferred portions receive such a gas injection, but less than half do, namely about one-sixth. Further, such additional gas is injected at the pressure of the carbon dioxide gas in the chamber 12 of the carbonator 11, and such injection is preferably effected simultaneously with the transfer of said number of portions. Thus a separate source of CO₂ gas can be utilized with a suitable timing mechanism to inject the gas at any desired point within the system. However, the provision of the aperture 29 in the manner described, is a particularly simple way of practicing this invention where the rest of the necessary components are already provided.

If it is desired to have the location of the aperture 29 adjustable, this can readily be accomplished by use of a packing gland 32 through which the outlet pipe 16 adjustably passes.

With the construction of the disclosed apparatus, free carbon dioxide gas bubbles are injected only when the liquid level in the carbonator chamber 12 is between the aperture 29 and the predetermined minimum level exemplified by the electrode 23. When the aperture 29 is exposed, gas enters the aperture and permits the liquid below the aperture to drop to the level of the surrounding liquid. When the next draw takes place, a very small amount of carbon dioxide gas represented by the volume of liquid that drops within the outlet pipe 16 is conducted as a slug of gas to the cooling chamber 18. During the passage of that slug of gas past the aperture 29, a slight amount of additional gas will enter. However, there is a greater pressure drop across the aperture 29 than there is along the length of the outlet tube below the aperture 29 so that in spite of the presence of the aperture 29, additional liquid is drawn upwardly through the outlet tube 16. However, since the pressure inside the tube at the aperture 29 is less than the gas pressure in the chamber 12, there will be further small gas bubbles injected into the flow of beverage.

In view of the fact that the aperture 29 is near the minimum level exemplified by the electrode 23, in the event that there be product expansion in the chamber 18 or in the event that some gas should bleed upwardly, this could theoretically cause the return of some product by reverse flow to the carbonator chamber 12. However, after a small amount of such reverse flow, which would occur only if the system were allowed to stand for a long time, the level would rise and shut off the aperture 29 whereby any further upward bleeding of gas would be immediately terminated.

It is preferable that no gas pocket be present at the top of the chamber 18, and a manual bleed valve 33 is provided to vent any gas pocket that may have formed, and to enable full filling of the chamber 18. Thus with no air pocket present at the top of the chamber 18, there is no likelihood of there being

spurting or spitting, and yet with the entrained fine gas bubbles dispersed throughout the product, there is a type of cushioning which enables smooth product flow during dispensing coupled with the reliable creation of the desired foam. Although no further description is necessary of the system 10 for an understanding of the invention, the following identification of components may be of interest to the reader.

The water supply 13 is connected through a filter 34 to the pump 28 which has a bypass relief valve 35 connected across it. A disabling switch 36 is connected to shut down the system in the absence of water pressure from the mains. A flow control valve 37 and a check valve 38 are also provided in the water line, the check valve 38 preventing backup of beverage into the water system, and the flow control valve 37 acting with a manually adjustable flow control valve 39 in the syrup line to provide the proper ratio of water to syrup. The setting of the valve 39 may be checked by timing a given flow therethrough taken from a sampling valve 40. The syrup line leads through a check valve 41 which prevents back flow of diluted syrup, there being a float switch 42 connected to disable the system 10 in the absence of syrup.

The source of carbon dioxide gas is controlled by a manual valve 43 which is connected to a pressure regulator 44 which provides gas pressure in the syrup source or tank 14 to propel the syrup. It also provides gas to a bypass valve 45 which, if open, permits the use of gas to purge out all syrup from the syrup line, as for changing flavors. The regulator 44 also leads to a pressure switch 46 connected to disable the system 10 in the event of gas failure, and gas is also brought to a further pressure regulator 47 by which the carbonating pressure is set. This line communicates with the chamber 12 through a snifter valve 48 which permits gas flow in both directions but which serves as a check valve to the reverse flow of liquid.

The refrigeration system 20 is under the control of a switch 49 which is responsive to a condition of the product in the chamber 18, for example, its viscosity or its temperature.

The fluid conduit 17 is provided with a precool plate 50 which is refrigerated by a refrigeration system 51 to the extent provided by a control 52 to a temperature above the freezeout point of the product. A further safety control 53 is provided to sense any temperature that might be indicative of ice formation in the precool plate 50.

Although various minor modifications might be suggested by those versed in the art, it should be understood that I wish to embody within the scope of the patent warranted hereon, all such embodiments as reasonably and properly come within the scope of my contribution to the art.

I claim as my invention:

1. Apparatus for producing and dispensing a foamy carbonated beverage, comprising:

- a carbonator having a sealed chamber arranged to be connected to sources of water, syrup and carbon dioxide gas for providing and storing the carbonated beverage under the pressure of said carbon dioxide gas;
- an outlet tube extending into the chamber of said carbonator through a quantity of the carbonated beverage and opening into the beverage;
- refrigeration means having a heat transfer member for cooling a quantity of the carbonated beverage therein;
- a fluid conduit connected between said outlet tube and said heat transfer means for transferring carbonated beverage from the chamber of said carbonator to said heat transfer means;
- a dispensing valve connected to said heat transfer means for withdrawing refrigerated carbonated beverage;
- means responsive to a predetermined minimum amount of carbonated beverage in said chamber of said carbonator for injecting into said chamber additional water, syrup and carbon dioxide gas, and responsive to a predetermined maximum amount of carbonated beverage in said chamber of said carbonator for terminating such injecting; and

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g. means defining an aperture in the wall of said outlet tube and located to be submersed in beverage in the presence of said predetermined maximum amount of carbonated beverage, and exposed to carbon dioxide gas in the presence of said predetermined minimum amount of carbonated beverage. 5

2. Apparatus for producing and dispensing a carbonated beverage according to claim 1, wherein said aperture is located nearer the level of said predetermined minimum amount of carbonated beverage than it is to the level of said predetermined maximum amount of carbonated beverage. 10

3. Apparatus for producing and dispensing a carbonated beverage according to claim 2, wherein said aperture is located about one-sixth the distance between said levels.

4. Apparatus for producing and dispensing a carbonated beverage according to claim 1, wherein said refrigeration means has the refrigerating capacity to freeze a portion of said carbonated beverage while in said heat transfer member. 15

5. A method for producing and dispensing a foamy carbonated beverage, comprising:

a. combining water, syrup and pressurized carbon dioxide gas in a chamber to provide a stored quantity of several servings of the carbonated beverage; 20

b. intermittently transferring portions of said quantity of carbonated beverage, each proportional to a serving dispensed, to an area of reduced temperature to cool such 25

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portions to serving temperature, and to mix with and to replenish previously transferred portions;

c. injecting free carbon dioxide gas as small bubbles directly into a number, less than all, of such transferred portions during their transfer; and

d. withdrawing servings of the refrigerated carbonated beverage.

6. A method for producing and dispensing a foamy carbonated beverage according to claim 5, wherein the number of transferred portions into which free carbon dioxide gas is injected is less than one-half.

7. A method for producing and dispensing a foamy carbonated beverage according to claim 6 wherein said number is about one-sixth.

8. A method for producing and dispensing a foamy carbonated beverage according to claim 5, wherein the free carbon dioxide gas that is injected is injected at the pressure of the carbon dioxide gas in said chamber.

9. A method for producing and dispensing a foamy carbonated beverage according to claim 5, wherein the serving temperature is below 28° F.

10. Apparatus for producing and dispensing a foamy carbonated beverage according to claim 1, wherein said aperture has a diameter of about one thirty-second inch.

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