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2,262,940	11/1941	Ish-Shalom.....	259/4
2,271,896	2/1942	Lewis.....	261/115
2,564,765	8/1951	Mercier.....	55/178
2,746,641	5/1956	King.....	239/433 X
2,868,516	1/1959	Moseley.....	259/4
2,880,912	4/1959	Fishler.....	22/129.4
3,248,098	4/1966	Cornelius.....	261/115

[54] **CARBONATOR AND METHOD OF CARBONATION**
8 Claims, 4 Drawing Figs.

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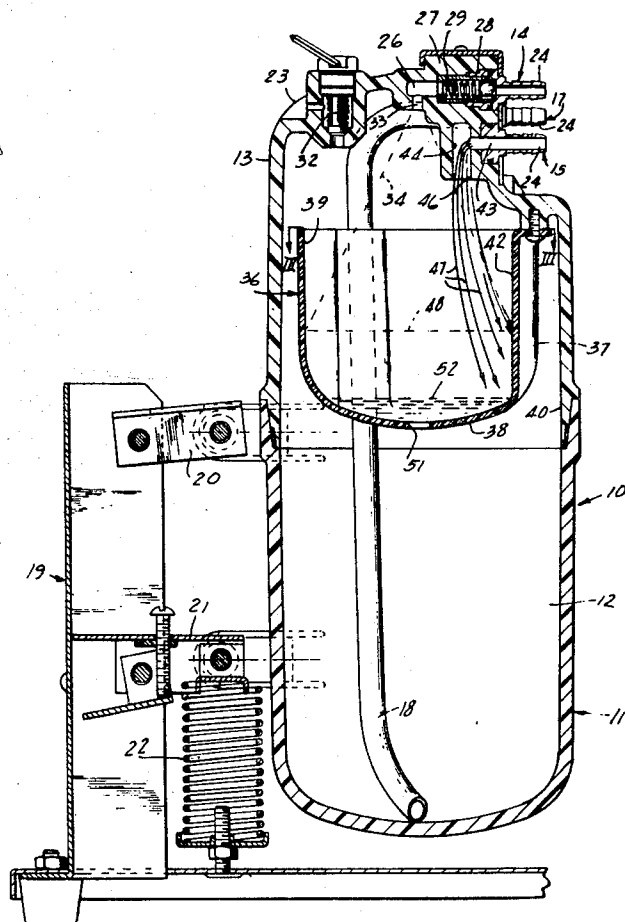
[51] **Int. Cl.**..... **B01f 3/04**

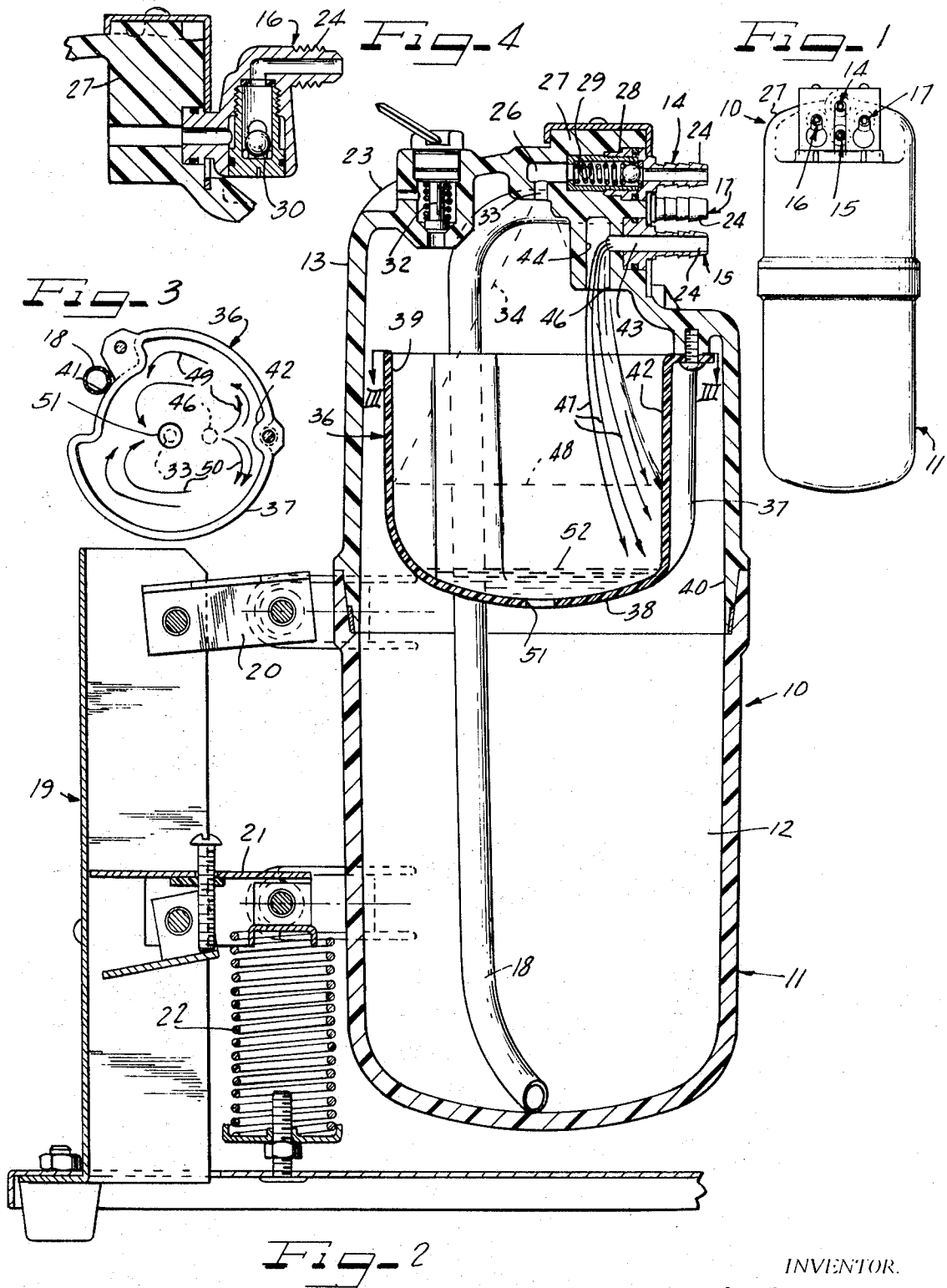
[50] **Field of Search**..... **261/52, 27,**
115, 79, DIG. 7, 18 R; 55/128; 259/4; 239/433;
222/129.4; 99/79

[56] **References Cited**
UNITED STATES PATENTS

1,498,812	6/1924	Sager.....	261/52
1,516,190	11/1924	Holderle et al.	259/4 X
2,217,841	10/1940	Holinger.....	261/27

ABSTRACT: A carbonator or carbonator-blender for producing and storing carbonated water or an admixture of carbonated water and syrup. An open-top bowl is disposed within a cylindrical CO₂-pressurized chamber formed within a pressure tank. A nozzle is provided within the chamber for directing a conical stream of pressurized water into the bowl and another nozzle directs a stream of syrup against the side of the water stream. The bowl is provided with an abutment to produce a swirling action of the water and syrup therewithin and an aperture is formed in the bottom of the bowl for draining the admixture of water and syrup into the lower portion of the chamber.





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CARBONATOR AND METHOD OF CARBONATION

BACKGROUND OF THE INVENTION

This invention relates generally to the field of carbonators and more particularly to carbonator blenders for producing and storing a carbonated admixture of water and syrup for use in the dispensing of soft drinks and the like.

Various problems have been experienced in the use of prior devices and methods. Carbonated water has lacked stability at atmospheric pressure. Stratification of syrup and water has taken place in the bottom of a carbonator blender. As a result, a Brix variation of from four to 18 has been experienced. Excessive foaming of the product in the carbonator and plugging of associated values as a result thereof has also been a problem.

An object of the present invention is to provide an improved carbonator and/or blending carbonator which produces an improved product and as a result of the improvements incorporated therein, the Brix of the blended product is virtually absolutely consistent. For example, the Brix is maintained with a variation which does not exceed plus or minus one-tenth, i.e., 12.0 ± 0.1 Brix. In addition, no measurable difference in carbonation is detectable at any time in the blended product. Foaming is also controlled such that only that which is required for carbonation and blending is generated, regardless of the temperature of the ingredients. Furthermore, all product stored in the carbonator is completely blended. As a result of improved carbonation stability less foaming or gas breakout is experienced during dispensing.

SUMMARY OF THE INVENTION

An open-top bowl disposed in a carbonating chamber receives a downwardly diverging conical stream of water under pressure which impinges the sidewall of the bowl, there being an aperture in the bottom of the bowl for draining the admixture therefrom at a rate which is sufficient to maintain a level of admixture within the bowl. A stream of syrup is directed against the side of the conical stream of water, and a flow-diverging abutment on the interior of the sidewall produces a swirling or turbulent action of the admixture within the bowl. The conical stream of water impinges the sidewall of the bowl along a line above the level of the admixture therein and breaks up surplus foam and confines foam which may be produced within the bowl.

Many other features as well as additional advantages and objects of the present invention will become manifest to those versed in the art upon making reference to the detailed description which follows 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 only.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is an elevational view of a blending carbonator constructed in accordance with the principles of the present invention.

FIG. 2 is an enlarged vertical cross-sectional view of the carbonator shown in FIG. 1 and includes mounting apparatus for the same.

FIG. 3 is a horizontal sectional view of the bowl-shaped member housed within the carbonator taken along lines III—III of FIG. 2.

FIG. 4 is an enlarged vertical cross-sectional view of a valve which is mounted in the carbonator at the CO₂ inlet.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Although the principles of the present invention are of utility in a method of and apparatus for carbonating water, the invention finds particular utility in the preparation of carbonated water-syrup product in the dispensing of soft drinks and in the preferred embodiment thereof illustrated herein comprises a blending carbonator indicated generally at reference numeral 10 in FIGS. 1 and 2. Other forms of apparatus can be constructed to embody the disclosed method.

The carbonator 10 may be more particularly characterized as comprising a pressure tank 11 which is essentially cylindrically shaped to provide a chamber 12 therewithin. Mounted in the upper section 13 of the tank 11 is a water inlet 14, a syrup inlet 15, a CO₂ inlet 16 and a product outlet 17.

The water inlet 14 is adapted for connection to a source of pressurized water, for example, a high-pressure positive displacement water pump. The line connection between the water inlet 14 and the high-pressure pump may include a flow regulator as well as a restrictive orifice in order to provide a predetermined flow rate of water at a predetermined pressure, for example, approximately 100 p.s.i.g.

The syrup inlet 15 is an optional feature which is required in the preferred embodiment and is adapted for connection to a source of syrup under pressure, the syrup supply apparatus being so constructed and arranged that the syrup may be at a pressure of about 80 p.s.i.g., for example, at the syrup inlet 15. When no syrup is provided, the device is referred to herein as a carbonator, and when syrup is provided, the device is referred to herein as a carbonator blender. The carbon dioxide gas inlet 16 is adapted for connection to a pressure-regulated supply of CO₂ gas for maintaining the chamber 12 of the tank 11 under suitable pressure, for example, 20–35 p.s.i.g.

The product outlet 17 is adapted for connection to any suitable dispensing apparatus such as, for example, a conventional manually operated soda fountain dispensing valve used in the dispensing of carbonated soft drinks.

The inlets 14–16 and the outlet 17 are in communication with the chamber 12, in which the water and syrup are thoroughly mixed and the admixture is carbonated and stored in the lower portion of the chamber 12 until it is drawn off for use through the product outlet 17 via a syphon tube 18 which extends from the outlet 17 down to the lower end of chamber 12. The supply of water and syrup into the chamber 12 may be controlled by suitable valve mechanisms employed in the lines which connect the water and syrup inlets 14 and 15 to the respective sources of the same.

The valve mechanisms may be of any suitable type including, for example, mechanical or electromechanical valves.

In one arrangement, for example, the supply valves may be of the solenoid-operated type, the switch mechanisms for the same being operative to open and close the valves in response to the quantity of water-syrup admixture in the chamber 12. In the illustrated embodiment the tank 11 is mounted on a frame indicated generally at reference number 19 which includes a pair of pivotal mounting brackets 20 and 21 which enable the tank 11 to move vertically with respect to the frame 19, and a spring 22 which biases the tank 11 upwardly. As water and syrup is introduced into the tank 11, thereby increasing the weight thereof, the tank will move slowly downwardly against the bias of the spring 22. Suitable switching mechanisms are associated with the frame 19 to close the valve mechanisms in the water and syrup lines after the tank is moved downwardly to a predetermined level with respect to the frame 19. As the product is drawn from the outlet 17 and the weight thereof decreases, the tank 11 will gradually rise relative to the frame 19, and the said switch mechanisms are actuated by such upward movement of the tank 11 to open the water and syrup lines until the quantity of admixture within the tank 11 again reaches a predetermined level.

As illustrated, the inlets 14–16 and the outlet 17 are disposed in an upper end 23 of the tank 11 and each comprises a conduit connection as indicated at reference numerals 24. The water inlet 14 also includes a horizontal passageway 26 formed in an upper wall 27 of the tank 11, which passageway 26 communicates with the conduit 24 and which includes an enlarged diameter portion 28 which houses a water inlet check valve 29. The carbon dioxide gas inlet 16 comprises a snifter valve 30 for permitting two-way flow of gas but precluding flow of liquid outwardly to the source of gas. A pressure relief valve 32 is also mounted in the top wall 27 of the tank 11.

In accordance with the principles of the present invention and to provide the improved product resulting therefrom, the water is introduced into the upper end of the extending cylindrical sidewall 37 which is closed at bottom by means of a 12 through a vertical cylindrical passageway 33 which communicates with the flow passageway 26 and which directs a spray of water in the form of an unbroken conical wall downwardly into the chamber 12. The conical wall of water as it emanates from the passageway 33, which passageway may be referred to as a water outlet or nozzle, is indicated schematically by the dashed lines at reference numeral 34. Situated below the water nozzle 33 is a bowl-shaped member 36 which receives the water being sprayed downwardly from the nozzle 33.

As illustrated in FIGS. 2 and 3, the bowl 36 comprises a vertically extending cylindrical sidewall 37 which is closed at the bottom by means of a bottom wall 38 and which is open at the top as indicated at reference numeral 39. The sidewall 37 is concentrically arranged with respect to an inner cylindrical wall 40 of the tank 11 and is disposed in radially inwardly on relation with respect thereto, thereby to provide a flow path protuberance enable the CO₂ to circulate freely within the chamber 12.

Formed on one side of the bowl sidewall 37 is a recess 41, past which the syphon tube 18 extends, and on an almost diametrically opposed side is formed an embossment or protuberance 42 which, in the embodiment illustrated, extends vertically in a semicylindrical configuration from the bottom wall 38 of the bowl 36 to the top open end 39 thereof.

The syrup inlet 15 also comprises a horizontal passageway 43 which communicates with its respective conduit connection 24 as well as with a vertical cylindrical flow passageway 44 which opens downwardly into the chamber 12 through a syrup outlet port indicated at reference numeral 46. The water outlet or nozzle 33 is disposed on the axis on the tank wall 40 and in axial alignment with the bowl 36, but the syrup outlet port 46 is offset with respect to the water nozzle 33 such that it is disposed radially outwardly of the conical wall of water emanating from the water nozzle 33. Accordingly, as the syrup discharges from the syrup outlet port 46 it is directed downwardly against the outer side of the conical wall of water and is carried thereby downwardly and radially outwardly along with the water in a manner illustrated schematically by the arrowed directional lines indicated at reference numeral 47.

The water nozzle 33 and the bowl 36 are so constructed and arranged that the curtain or conical wall of water emanating from the nozzle 33 impinges the cylindrical sidewall 37 along a line indicated schematically at reference numeral 48 which is spaced substantially upwardly from the bottom wall 38 of the bowl. In FIG. 3 the water nozzle 33 and the syrup outlet port 46 are indicated diagrammatically, and such illustration discloses that the protuberance 42 and the syrup outlet port 46 are arranged in radial alignment with reference to the axis of the bowl 36 and to the water nozzle 33.

During operation of the carbonator 10 the water passes through the flow passageway 26 at a high velocity and violently discharges from the right-angle nozzle 33 in the form of a cone spray having an included angle which may be in the order of about 45°. The lower edge of the conical water wall 34 impinges the vertical wall 37 of the bowl 36 thereby producing a foaming action in the water. While foam is created in the bowl 36, however, the water wall 34 provides an umbrella or enveloping effect on the foam to restrict it within the confines of the conical water wall as by providing a foam-breaking-up action and thereby to prevent the same from building up and flowing out of the bowl 36 over the open top end 39.

At the same time the syrup is discharged from the outlet port 46 in a relatively low-velocity stream and falls downwardly on the outer side of the conical water wall 34. The violent water spray bends the falling stream of syrup and drives the same against the sidewall 37 of the bowl 36 to disperse and admix the syrup thoroughly with the water.

As the water and syrup are driven to the wall 37, the mixture forcefully engages the rounded abutment 42, whereupon the mixture is divided into two divergent streams indicated respectively in FIG. 3 at reference numerals 49 and 50 which separate from each other each other in circumferentially opposite directions to create a swirling action and to further admix the water and syrup.

Thus the introduction of water and syrup into the bowl 36 occurs simultaneously, the chamber 12 being continuously pressurized with CO₂ gas. The violent agitation of the water and syrup admixture in the bowl 36 effects complete carbonation of the same throughout the admixture.

The interior bottom wall 38 of the bowl 36 is concavely shaped and has an outlet or aperture 51 centrally thereof to enable the admixture in the bowl 36 to drain therefrom into the lower end of the tank 11. The size of aperture 51 is related to the flow rates of the water and syrup so as to maintain a level of water-syrup admixture at the bottom of the bowl 36 as the water and syrup are being sprayed into the bowl. The level of admixture as indicated at reference numeral 52 is below the horizontal line 48 along which the lower edge of the conical water wall 34 impinges the sidewall 37 of the bowl 36. As the admixture drains from the aperture 51 it is stored in the lower end of the chamber 12 until it is drawn off through the product outlet 17. As a result of the thorough admixing of water and syrup and the complete carbonation of the admixture, the carbonation of the stored product remains stable and without stratification of the syrup and water. The Brix of the blended product is maintained at a very consistent level, approximately within 0.1, and all foaming action is confined within the bowl 36, thus conferring upon the carbonator 10 the ability to produce an improved product in any dispensing operation.

Although 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 modifications as reasonably come within the scope of my contribution to the art.

I claim as my invention:

1. A method of producing a carbonated beverage, comprising the steps of:

- pressurizing a chamber with carbon dioxide gas;
- directing a stream of water in the shape of a conical wall downwardly in the chamber against the inner sidewall of an open-top bowl to produce a carbonated water-foam which is confined in the lower portion of the bowl by the confining action of the conical wall of water; and
- draining the admixture through an opening in the lower most portion of the bottom of the bowl to the lower portion of the chamber at a rate sufficient to maintain a level of the admixture in the bottom of the bowl.

2. A method of producing a carbonated beverage according to claim 1 including the step of directing a stream of syrup downwardly in the chamber against the outer side of the conical wall of water to admix with the water in the bowl.

3. A method of producing a carbonated beverage according to claim 2 including the step of

dividing the conical wall of water into two divergent streams so as to direct the same away from each other in circumferentially opposite directions at a dividing area formed on the inner sidewall of the bowl, such area being in radial alignment with the downward stream of syrup with reference to the axis of the conical wall of water for creating a swirling action in the admixture.

4. A carbonator comprising a tank having a pressure chamber therewithin,

means for pressurizing said chamber with carbon dioxide gas, a substantially cylindrically shaped open-top bowl disposed in said chamber, means forming a nozzle for directing a stream of water in the shape of a conical wall downwardly in said chamber against the inner side of said bowl for producing a carbonated-water foam which is confined in the bowl by the confining action of the conical wall of water and

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means forming an aperture in the central portion of the bottom of said bowl for draining the admixture therefrom to the lower portion of the chamber at a rate sufficient to maintain a level of the admixture in the bottom of the bowl beneath the conical wall, said nozzle and said aperture being aligned substantially along the axis of said bowl.

5. A carbonator according to claim 4 including means formed on the inner sidewall of said bowl in radial alignment with said syrup directing means with reference to the axis of the conical wall of water for dividing the stream of syrup and portion of the conical wall into two divergent streams which separate from each other in circumferentially opposite directions for creating a swirling action of the admixture in the bowl.

6. A carbonator according to claim 4 having a snifter valve communicating with said chamber above said bowl and through which the carbon dioxide gas is admitted.

7. A carbonator according to claim 4 including means for directing a stream of syrup downwardly in the chamber in axially offset relation to the axis of said bowl and against the outer side of the conical wall of water to admix with the water

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in the bowl.

8. A carbonator comprising a tank having a pressure chamber therein,

means for pressurizing said chamber with carbon dioxide gas,

a bowl disposed in said chamber having a substantially cylindrically shaped wall extending upwardly from a bottom,

means above said bowl bottom forming a nozzle for directing a spray of water in the shape of a conical wall downwardly in said bowl against the inner wall for producing a carbonated water foam which is confined in the bowl by the confining action of the conical wall of water, and

means forming an aperture in the lowermost inner portion of said bowl for draining the admixture therefrom to a lower portion of the chamber at a rate sufficient to maintain a level of admixture in the bottom of the bowl beneath and during the conical spray, and for completely draining the bowl of admixed water.

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