June 18, 1946. J. H. GOLDBERG 2,402,132

CARBONATING DEVICE

Filed Feb. 21, 1945

Fig. 1.

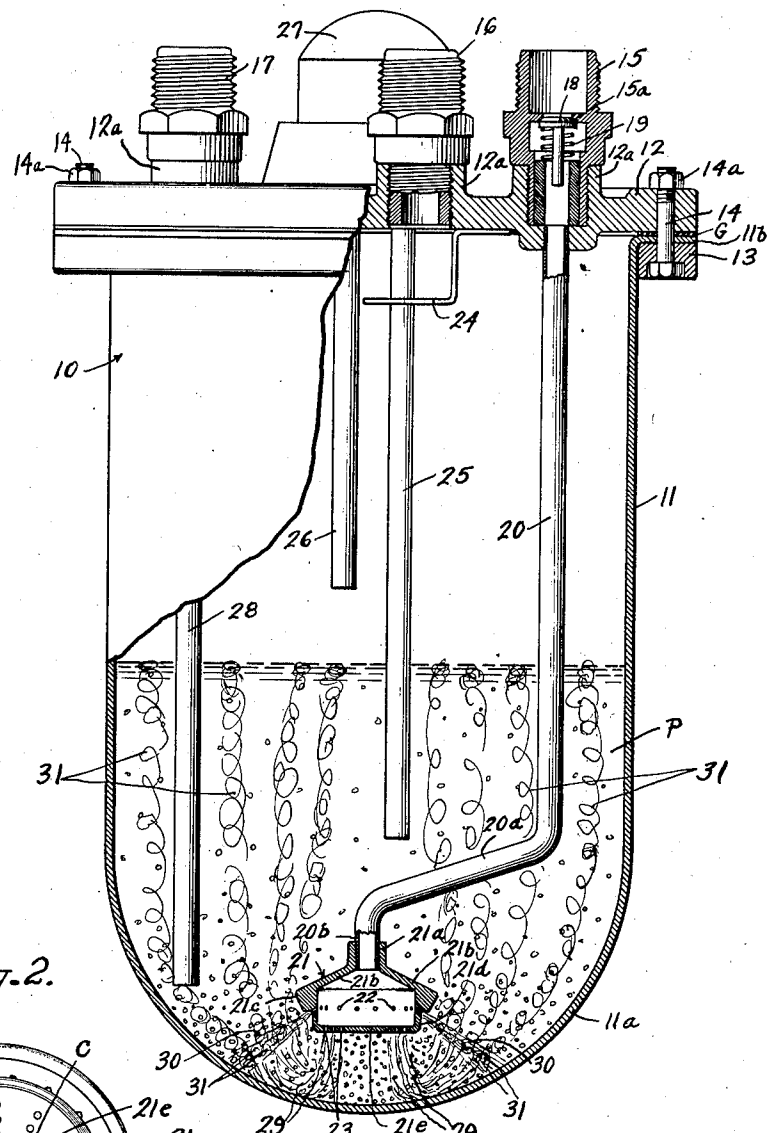
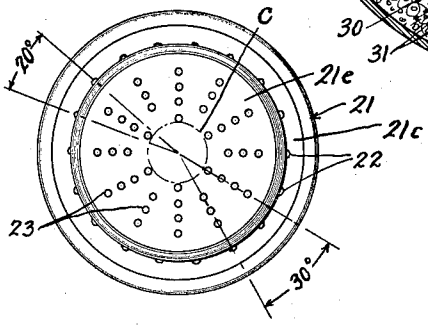



Fig. 2.




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Patented June 18, 1946

2,402,132

# UNITED STATES PATENT OFFICE

2,402,132

## CARBONATING DEVICE

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Application February 21, 1945, Serial No. 579,097

2 Claims. (Cl. 261—124)

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This invention relates to devices for incorporating gases into liquids to produce gas-saturated liquids without the aid of mechanical agitation.

Specifically, this invention relates to a carbonating device for automatically producing carbonated beverages containing high percentages of carbon dioxide.

While the invention will hereinafter be described in a specific embodiment of a carbonating apparatus for automatic beverage-vending machines, it should be understood that the principles of this invention are generally applicable to the charging of liquids with gases to produce high gas-content liquids without the aid of mechanical agitation.

Heretofore, efficient carbonation of water required the use of mechanically-driven agitating devices to bring about a thorough admixing of the carbon dioxide with the water. Attempts to spray carbon dioxide into a pond of water did not meet with success because the water would not retain appreciable amounts of the gas and a low charge product resulted.

In accordance with this invention, however, efficient high charging of water with carbon dioxide gas is obtained by spraying the gas into a pond of water in such a manner that the jets or streams of gas coact to produce an agitating effect for thoroughly admixing the gas with the water and for holding the gas in contact with the water for prolonged time intervals.

A feature of the invention resides in the provision of a spray head which ejects jets or streams of gas against the bottom wall of a water container to be deflected by the bottom wall in an upward direction around the spray head and then meet with additional streams or jets of gas inclined at an angle for cutting the rising streams and causing them to swirl for agitating the liquid.

An important object of this invention is to provide a carbonating device which will efficiently charge liquids with gases without requiring the use of mechanically-driven agitating devices.

Another object of the invention is to provide a carbonator which utilizes pressured gases to agitate the liquids being charged while remaining in prolonged contact with the liquids.

Another object of the invention is to provide a carbonator including a tank with a fragmental spherical bottom and a spray head mounted in closely spaced relation above the central portion of said bottom and having a first set of jet holes arranged to impinge streams of carbon dioxide against said bottom together with a second set of jet holes arranged to form umbrella-like streams

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which cut the impinged streams and cause them to agitate water in the container while maintaining the carbon dioxide in prolonged contact with the agitated water.

A specific object of this invention is to provide a carbonator for beverage-vending machines wherein water is automatically introduced into a tank whenever the water level therein drops below a predetermined level and wherein carbon dioxide is automatically sprayed into the bottom of the pond of liquid in the tank whenever the pressure in the tank drops below a predetermined pressure.

Another object of the invention is to provide a spray head especially adapted for carbonators wherein a first set of jet holes is provided for impinging gases in a downward direction while a second set of jet holes is provided at an angle of 50 to 60° from the horizontal to eject streams of gas around the streams ejected by the first mentioned holes for holding the gas in prolonged contact with the water.

Another object of the invention is to provide a spray head for carbonators and the like wherein a downwardly inclined umbrella of ejected material surrounds a plurality of vertically downwardly ejected streams to hold these jet streams in prolonged contact with liquid being carbonated or gasified while cooperating therewith to agitate the liquid.

Other and further objects of the invention will be apparent to those skilled in the art from the following detailed descriptions of the annexed sheet of drawings which, by way of preferred example only, illustrates one embodiment of the invention.

On the drawing:

Figure 1 is a vertical cross-sectional view, with parts in side elevation, of a carbonator device in accordance with this invention.

Figure 2 is a somewhat enlarged bottom plan view of the spray head according to this invention shown in the carbonator of Figure 1.

As shown on the drawing:

In Figure 1, the reference numeral 10 designates generally a carbonating device for an automatic beverage vending machine. The device 10 includes a cylindrical sheet metal tank 11 with a fragmental spherical bottom 11*a* and an outturned horizontal top flange 11*b*. A metal cover plate 12 closes the open top of the tank 11 and overlies the flange 11*b*. A mounting ring 13 surrounds the tank 11 and is bottomed on the flange 11*b*. Mounting bolts 14 pass through the mounting ring 13 and peripheral margin portion of the cover 12 and coact with nuts 14*a* for securing the

cover to the tank. The tank and cover are held in sealed relation by a gasket G interposed between the flange 11*b* and the peripheral margin of the cover 12.

The cover has a plurality of internally threaded boss portions such as 12*a* and nipples 15, 16 and 17 are threaded into these boss portions 12*a*.

The nipple 15 has a valve seat 15*a* therein coacting with a valve 18 that is urged against the seat by means of a coil spring 19. The nipple 15 discharges into a tube 20 which depends vertically into the tank 11 adjacent a side wall of the tank and has an inclined leg portion 20*a* extending to the central portion of the fragmental spherical bottom 11*a*. The end of the leg 20*a* has a vertical depending portion 20*b* which is externally threaded and receives, in threaded relation thereon, the spray head 21 of this invention.

As shown, the spray head has a neck portion 21*a* in threaded relation with the portion 20*b* of the tube and this neck portion 21*a* merges with an inclined top wall 21*b* that diverges outwardly and downwardly to a thickened rim 21*c*. A cylindrical wall 21*d* depends from the rim 21*c* inwardly from the outer edge of the rim and a flat bottom wall 21*e* is provided on the lower end of the cylindrical wall 21*d*.

A plurality of holes 22 are drilled through the junction between the cylindrical wall 21*d* and the rim 21*c*. These holes are inclined at an angle of about 52° from the horizontal and are spaced around the periphery of the cylindrical wall 21*d* at intervals of about 20° as shown in Figure 2. The bottom wall 21*e* has a plurality of holes 23 extending vertically therethrough. These holes are arranged in rows, as best shown in Figure 2, which radiate at 30° intervals beyond a central circle C having a center point at the radial center of the wall. As shown, rows of four holes alternate with rows of three holes.

The holes 22 are somewhat larger than the holes 23. For example, eighteen holes 22 can be provided with a #60 drill while forty-two holes 23 can be provided with a #65 drill.

Carbon dioxide gas is fed through the nipple 15 under pressure sufficient to unseat the valve 18 and eject the gas from the spray head 21 through the holes 22 and 23 into a pond P of water contained in the tank 11. The water for the pond P is introduced into the tank 11 through the nipple 16. The incoming water impinges on a baffle 24 carried by the cover 12 and drains quietly off of this plate to form the pond.

A long electrode 25 and a short electrode 26 depend into the tank 11 from a plug (not shown) mounted in a housing 27 on the cover 12. When the pond P drops below the bottom of the long electrode 25, a valve (not shown) in the feed line (not shown) to the nipple 16 is automatically opened so that water is supplied to the nipple and introduced into the tank to replenish the pond. Whenever the level of the pond rises above the level of the short electrode 26, this feed line valve is closed and the water feed is stopped.

The nipple 17 has a tube 28 depending therefrom into closely spaced relation with the bottom 11*a* of the tank. Carbonated water is ejected through the tube 28 and the nipple 17.

Whenever pressure in the tank 11 falls below a predetermined amount, the back pressure on the valve 18 is insufficient to hold the valve closed and the pressure of carbon dioxide fed to the nipple 15 will be sufficient to overcome the pressure of the spring 19 and unseat the valve. Carbon dioxide is thus introduced through the tube



20 into the spray head 21 where it is ejected through the holes 23 in the form of minute streams 29 surrounding the circle C. These streams 29 impinge on the rounded bottom 11*a* of the tank. The impinged streams are deflected by the rounded bottom 11*a* and rise in the pond P. As these streams rise, however, inclined streams 30 from the larger holes 22 cut the streams 29 into segments and cause an agitation of liquid in the pond, producing whirlpools 31 which serve to thoroughly admix the gas with the liquid.

As shown in Figure 1, the streams 30 form an umbrella surrounding the streams 29 and serve to hold the streams 29 in the bottom of the tank for a longer period of time thereby increasing the contact time between the gas and the water and insuring high carbonation. As shown, a high concentration of gas bubbles is held in the liquid under the umbrella-like streams 30.

The relationship between the holes 22 and 23 is such that fine needle-like streams 29 are ejected with great velocity in a straight downwardly direction to impinge on a rounded wall which deflects the streams to rise upwardly into the coarser inclined streams 30. The two streams thus interfere with each other, and create the whirlpools 31 in the liquid.

From the above descriptions it will be understood that the carbonator of this invention produces agitation of liquids being carbonated without the aid of mechanically-driven agitators and, in producing this agitation, simultaneously causes the gas to remain in intimate contact with the liquid for increased lengths of time. The carbonators of this invention are free from mechanically-driven parts, and operate automatically to deliver a highly carbonated liquid from a pond which is automatically replenished whenever it drops below a predetermined level, and automatically charged whenever the gas pressure thereon drops below a predetermined pressure.

It will, of course, be understood that various details of construction may be varied through a wide range without departing from the principles of this invention and it is, therefore, not the purpose to limit the patent granted hereon otherwise than necessitated by the scope of the appended claims.

I claim as my invention:

1. A gas and liquid mixing device comprising a liquids container having a rounded bottom in the form of a spherical surface, a spray head centrally located in said container having a first set of downwardly opening bottom orifices and a second set of downwardly inclined orifices therearound above the bottom orifices, said first and second sets of orifices being below the center of curvature of said spherical surface, and means for supplying gas to said spray head under sufficient pressure to form downward jets from the first set of orifices which impinge upon said bottom wall and are deflected by the spherical surface thereof to rise around the spray head together with downwardly inclined lateral jets from the second set of orifices which break up rising deflected gas jets and impede the rate of rise of said deflected gas to hold the gas in prolonged contact with liquid in the container.

2. A carbonator comprising a tank having a rounded bottom in the form of a spherical surface, a spray head centrally located in said tank having a first set of downwardly opening bottom orifices and a second set of downwardly inclined orifices therearound above the bottom orifices,

said first and second sets of orifices being below the center of curvature of said spherical surface, means for maintaining a body of water in said tank at levels above said orifices of the spray head, and means for supplying carbon dioxide to said spray head under sufficient pressure for forming downward streams from the first set of orifices which impinge upon said bottom walls



and are deflected by the spherical surface thereof to rise around the spray head together with downwardly inclined lateral streams from the second set of orifices which break up the rising deflected gas streams and impede the rate of rise of said deflected gas streams to hold the gas in prolonged contact with the water in the tank.

JOSEPH H. GOLDBERG.