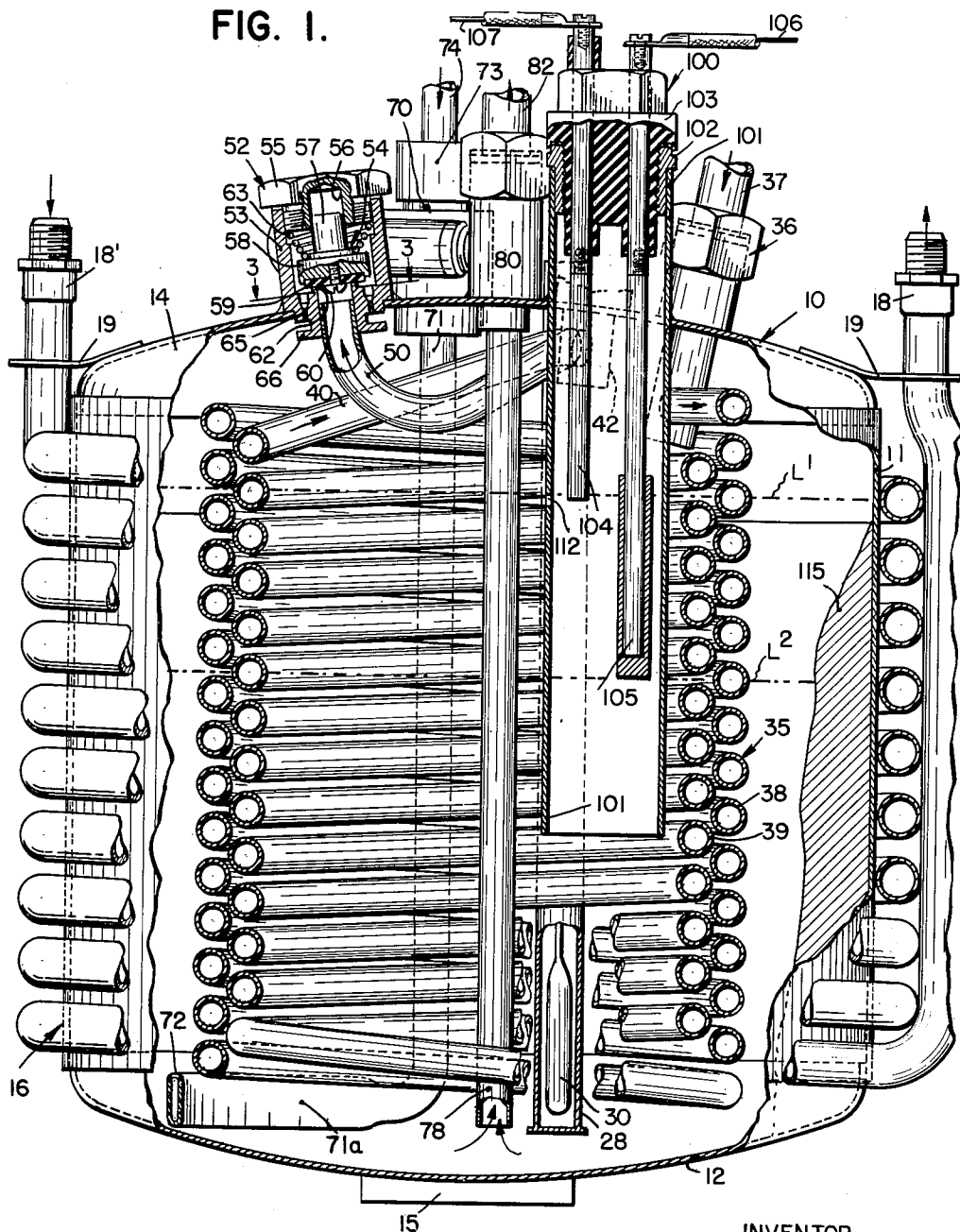


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CARBONATING APPARATUS

3 Sheets-Sheet 1

FIG. 1.



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2,586,499

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FIG. 5.

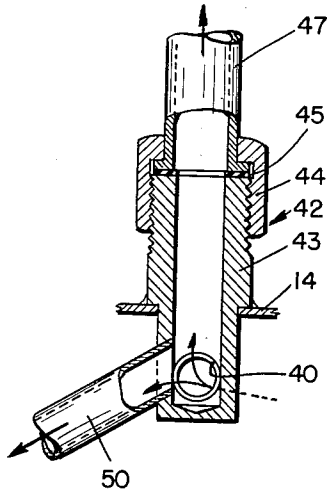


FIG. 6.

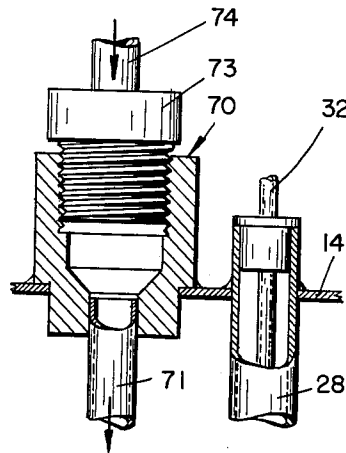
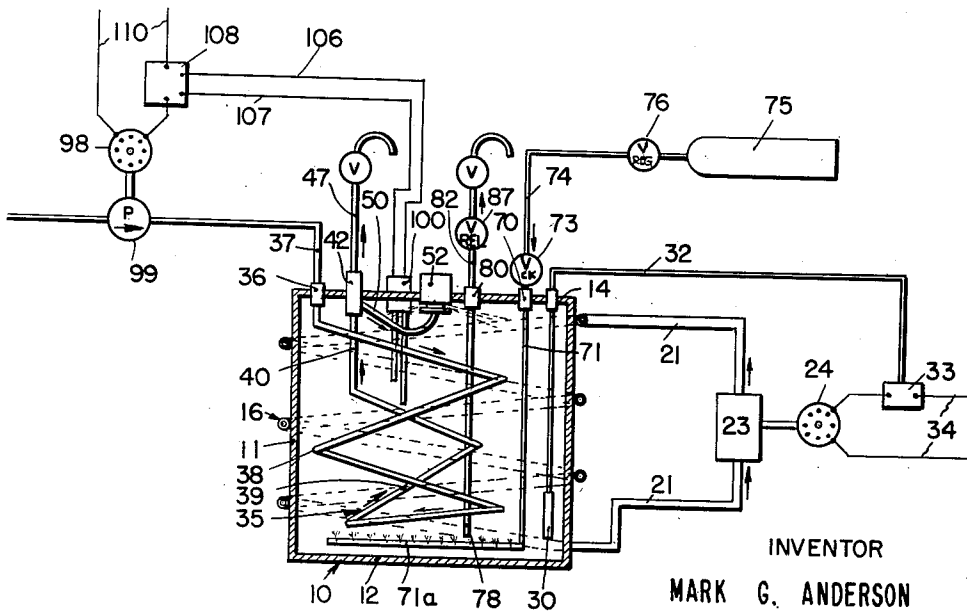


FIG. 7.



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CARBONATING APPARATUS

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4 Claims. (Cl. 261-11)

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This invention relates generally to apparatus for charging water or other suitable liquid with carbon dioxide gas.

It is a general object of this invention to provide carbonating apparatus suitable for use in many different installations, and a particular object to provide a new and improved carbonating apparatus for charging water designed to be incorporated in soda fountains.

It has long been the practice to construct soda fountains with an elongated trough or compartment which is filled with water providing a bath through which pipes containing liquid to be dispensed extend. The bath is cooled by suitable refrigerating coils. Carbonating apparatus ordinarily is located exteriorly of the soda fountain unit itself wherever space is available at a particular installation, and pipes are run from the apparatus and from a source of water through the bath to the soda water and plain water draught arms of the fountain. The bath is particularly objectionable in that it not only takes up valuable space in the fountain, but also presents an unsanitary body of water which gives off disagreeable odors unless the water is frequently changed.

Another disadvantage of the customary type of soda fountain is that the carbonating apparatus and refrigerating apparatus is located externally of the fountain and this entails a high installation cost for each fountain.

It is therefore a primary object of this invention to provide a novel carbonating apparatus for installation in a soda fountain unit which serves to carbonate and cool the water and which makes it possible to eliminate the long pre-cooling bath for pipes leading from the usual carbonating apparatus.

It is also an object to provide a carbonating apparatus which serves to cool a supply of uncarbonated water for the fountain.

It is a further object to provide a carbonating apparatus which can be used to cool a storage compartment in the fountain.

It is a further object to provide apparatus for effectively carbonating water or other liquid which operates on gas supplied to it at lower pressure than required by common types of carbonating apparatus. It is also an object to provide such apparatus which produces carbonated water containing a higher percentage of carbonation than apparatus commonly used with which I am familiar.

It is another object to provide apparatus capable of dispensing carbonated water at relatively low temperatures without danger of hav-

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ing the water freeze at a point in the apparatus where ice would interfere with the operation of the apparatus.

It is a particular object to provide apparatus which utilizes a body of carbonated liquid under refrigeration for pre-cooling the liquid that is to be carbonated.

These and other objects will be apparent from the drawings and following description thereof. Referring to the drawings, which are for illustrative purposes only:

Fig. 1 is a sectional elevation of a container and apparatus embodying the invention;

Fig. 2 is a plan view of the apparatus of Fig. 1, partly broken away;

Fig. 3 is a section on line 3-3 of Fig. 1;

Fig. 4 is a section on line 4-4 of Fig. 2;

Fig. 5 is a section on line 5-5 of Fig. 2;

Fig. 6 is a section on line 6-6 of Fig. 2; and
Fig. 7 is a diagrammatic view of apparatus embodying the invention.

More particularly describing the invention, reference numeral 10 generally indicates a tank or container which includes a main cylindrical wall 11, bottom wall 12, and top wall or head 14. The bottom and head are welded or otherwise bonded to the main wall 11 in order to provide a fluid tight container. The container is provided with three legs 15 evenly spaced around it.

In order to provide for cooling the container, an external refrigeration coil 16 surrounds the central wall 11 and is preferably welded or otherwise bonded thereto. This coil terminates in a pair of fittings 18 and 18' which are supported by brackets 19 secured to the head 14. The fittings 18, 18' are connected to suitable tubing leading from a compressor and suitable refrigerating apparatus to circulate refrigerant through the coil 16. For example, referring to Fig. 7, tubing 21 is shown leading to such apparatus 23 which includes a compressor driven by an electric motor 24.

It is desired to control the degree of cooling of the contents of the tank 10 and to accomplish this the tank is provided with a thermostatic control means which includes the enclosed tube 28 mounted in the head of the tank. Within the tube is a thermostatic device such as the bulb 30 shown, from which leads a capillary tube 32 which is used to control a switch 33 in the motor circuit 34 of the motor 24.

The thermostatic tube 28 is preferably mounted at a point somewhat inwardly of the wall of the tank adjacent a water cooling coil 35 presently to be described.

The tank is provided with a water inlet fitting 36 through which a tube 37 extends. The tube 37 is connected to a source of water such as a city water supply, and inside the tank communicates with the water cooling coil 35, the coil forming a continuation of the tube. The coil consists of an outer series of spiral convolutions 38 which descend to the bottom of the tank and an inner series 39 which extend upwardly inside the outer series. At the end of the inner series of convolutions 39 there is provided a short section of tubing 40 which terminates in a water outlet fitting 42 mounted in the head of the tank. The outlet fitting is welded or otherwise secured to the head and includes a body 43, a compression cap 44 threadedly mounted thereon and suitable packing 45.

A water outlet tube 47 is mounted in the fitting and may extend to any desired point, as for example the draught arm of a soda fountain.

A branch tube 50 leads from the water outlet fitting 42 to a combined spray head and check valve generally indicated by numeral 52. Thus tube 37, coil 35, tubing section 40, and branch tube 50 together form what may be termed a water inlet conduit. The device 52 includes a substantially cylindrical body element 53 which houses a check valve generally indicated by 54. A cap 55 threadedly mounted in the body is provided with a cylindrical recess 56 to receive shank 57 of the valve. An enlargement portion 58 of the valve supports a washer 59 which is held in place by a screw 60. The washer is adapted to engage an annular seat 62 and the valve is normally urged to closed position by a compression spring 63.

The body 53 is provided with a plurality of orifices 65 and directly in line with these orifices is a flange 66 formed on the body which acts as a deflector plate to break up into a spray liquid flowing through the orifices. Since the pressure in the tank ordinarily exceeds the pressure of the liquid in the water inlet conduit, as will later be explained, the valve is normally closed.

The tank is also provided with a gas inlet means whereby carbon dioxide under pressure can be introduced into the tank. This means includes a gas inlet fitting 70 in which is mounted a tube 71 leading to the bottom of the container. The lower end of the tube is flattened and extends around the bottom of the container through approximately 180°. The flattened section 71a of the tube is provided with a plurality of slots 72 for the escape of gas. On fitting 70 is a check valve 73 to prevent flow of liquid out of the tank. A tube 74 leads from the valve to a source of gas, such as tank 75 (Fig. 7), which is preferably fed to the tube through a pressure regulator valve 76 so that the pressure of the gas in the tube will be constant at a pressure slightly in excess of the normal water pressure in the water inlet tube.

The tank is provided with a carbonated water outlet tube 78, the lower end of which is open and adjacent the bottom 12 of the tank. This tube is mounted in an appropriate fitting 80 mounted in the head of the tank. The fitting includes a body 81 to which may be secured a tube 82 leading to any suitable point, such as the draught arm of a soda fountain. The tube 82 is mounted on the fitting by means of a compression nut 83 and a suitable washer 84 is provided.

The fitting 80 is provided with a laterally extending threaded opening 86 in which is mounted a safety valve 87 comprising a hollow stem 89

on which is mounted a cylindrical housing 90 containing a valve 91 and a spring 92. The outer end of the housing 90 is shown provided with an opening 93, and preferably another outlet is provided near the valve in the form of an opening 94.

In the operation of the carbonating apparatus of the invention, as previously indicated, the higher gas pressure in the tank prevents the entrance of water thereinto through the spray orifices 65 of the spray head and check valve device 52. It is desirable to provide means for causing the water to enter the tank when the level therein has fallen to a predetermined point. In order to accomplish this, means are provided for increasing the pressure of the water in the inlet line when the water in the tank has fallen to such predetermined level. This means includes a motor 98 which operates a pump 99 in the inlet line, the motor circuit being controlled by 100 which extends into the tank. The electrodes are mounted in a tube 101 which is open at its lower end. The upper end of the tube 101 accommodates a bushing 102 which may be soldered to the tube and the bushing receives a plug 103 in which are mounted electrodes 104 and 105.

Leading from the electrodes are the electrical conductors 106 and 107 which extend to a suitable control device 108 within the motor circuit 110. The tube 101 is provided with one or more openings 112 which permit the liquid in the tank to rise in the tube to the height of the opening. However, since the upper part of the tube is closed, liquid is prevented from rising unduly high in the tube to the base portion of the electrodes and shorting them. A shield may be provided to cover the exposed terminals.

In the operation of the device, gas is supplied to the tank at a constant pressure which may be in the neighborhood of seventy-five pounds per square inch, but which in any event exceeds the normal pressure of the water supply by a few pounds. Initially the tank is filled to a level L¹ by pumping water through the inlet tube and coil against the pressure of the gas in the tank. When the level of the liquid in the tank reaches the level L¹, the electrode means 100 connected to the motor circuit control means 108 is effective to shut off the motor and stop the pumping operation.

It will be apparent that once the tank is initially charged with water, the liquid in the tank is cooled by the external refrigeration coil and preferably the temperature of this is low enough to form a layer of ice 115 on the wall 11 of the tank. As the supply of carbonated water is drawn off through the carbonated water outlet tube, the liquid level in the tank drops until it reaches L², at which time the pump is again started by electrical control means 100 and 108 operating the motor 98, and water is pumped into the tank through the coil 35, being sprayed into the tank through the orifices 65 of the spray head and check valve device 52. The water is thus pre-cooled prior to being sprayed into the tank by passing through coil 35 which is submerged in the body of cold carbonated water in the tank. The pressure in the tank increases as the liquid level rises, since the gas in the tank must necessarily occupy a smaller amount of space, thereby facilitating and increasing the carbonation of the water. It will be apparent that cool water may be withdrawn through the water outlet tube 47 at any time without affecting the remainder of

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the apparatus, water passing through the pump when idle.

Preferably the refrigeration coil 16 is kept sufficiently cool that the water cooling coil 35 will be cooled to about 35° F. The refrigeration apparatus is controlled by the thermostatic device, including the bulb 30 in the tube 28 which is located adjacent the coil 35. As previously indicated, it is desirable to build up a layer of ice 115 within the tank, as shown in Fig. 1, in order to provide a reserve supply of frozen carbonated water. This ice forms a storage space for gas below the level of the liquid in the tank. During periods of heavy withdrawal, as new water enters the tank, the ice melts to some extent, releasing gas below the surface of the liquid and thereby aiding in effecting carbonation of the body of water. The ice also assists in cooling the incoming liquid during periods when large amounts of carbonated water are drawn off. It is also necessary to prevent freezing of the water in coil 35. This is prevented by a proper setting of the thermostatic control switch 33 and by having the thermostatic device positioned close to the external portion of the coil with the bulb 30 in the lower portion of the tank.

It has been found that the apparatus described provides an efficient, compact, carbonating apparatus capable of dispensing water having a relatively high percentage of carbonation.

Although the invention has been particularly shown and described, it is contemplated that various changes and modifications may be made without departing from the scope of the invention as set forth in the following claims.

I claim:

1. In carbonating apparatus, an enclosed tank, a liquid inlet conduit leading into said tank and including a coil in the tank, a back check valve in said inlet conduit, a spray head located beyond said check valve at the end of said inlet conduit, said spray head being located in the upper part of said tank whereby liquid passing through said coil is sprayed into said tank, a gas conduit leading into said tank, a back check valve in said gas conduit, said gas conduit being adapted to be supplied with carbon dioxide gas at a relatively constant pressure in excess of the normal pressure of the liquid in said inlet conduit and coil, a liquid outlet tube leading from said coil on the inlet side of said check valve to the exterior of said container, and a carbonated liquid outlet tube leading from said tank to the exterior thereof.

2. In carbonating apparatus, an enclosed tank, a liquid inlet conduit leading into said tank and

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including a coil in the tank, a back check valve in said inlet conduit, a spray head located beyond said check valve at the end of said inlet conduit, said spray head being located in the upper part of said container whereby liquid passing through said coil is sprayed into said container, means for admitting carbon dioxide gas to said container under pressure, a carbonated liquid draw off conduit leading from the interior of said container to the exterior thereof, and a refrigerating coil surrounding said container, said inlet coil being spaced inwardly of the walls of said container a substantial distance sufficient to permit of the freezing of a layer of carbonated water of substantial thickness on the wall of the tank without interfering with said inlet coil or causing water to freeze therein.

3. A method of carbonating water comprising spraying water into a confined space containing carbon dioxide gas under pressure to provide a body of carbonated liquid occupying a predetermined proportion of said space, freezing a portion of said body of liquid, permitting said proportion of liquid to diminish a predetermined amount through withdrawal thereof, and replenishing said liquid in said space to its original predetermined proportion after it has diminished said predetermined amount by spraying water into said container against the gas pressure in and built up in said confined space by said entering water.

4. A method of carbonating water comprising introducing water into a confined space containing carbon dioxide gas under pressure to provide a body of carbonated liquid occupying a portion of said space, freezing a portion of said body of liquid, permitting said liquid to diminish through withdrawal thereof, and replenishing said liquid in said space by introducing additional water into said container against the gas pressure in and built up in said confined space by said entering water.

MARK G. ANDERSON.

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