United States Patent

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[54] **SELF-CONTAINED ABSORPTION GAS CHARGER FOR LIQUIDS**
7 Claims, 3 Drawing Figs.

[52] **U.S. Cl.** **261/122**
[51] **Int. Cl.** **B01f 3/04**
[50] **Field of Search** ..... 261/122 (Carb.)

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

721,723	3/1903	Murphy	261/122
2,805,846	9/1957	Dewan	(261/Carb.)

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ABSTRACT: A pressuretight receptacle contains the water or other liquid to be saturated with gas, such as carbon dioxide gas supplied to it from a conventional carbon dioxide cylinder, through an elongated capillary tube leading to a porous sintered powdered metal diffuser which creates a myriad of small bubbles of the gas which, passing upward through the liquid, saturates the liquid with gas. The elongated capillary tube retards the flow of gas to the diffuser and thereby prevents the gas bubbles from being discharged therefrom too rapidly for the liquid to absorb them. The surplus gas not absorbed by the liquid collects in the top space above the liquid level and serves as a pressurized chamber to dispense the carbonated liquid through a dispensing pipe leading to the bottom of the receptacle. The diffuser is supported by a pipe through which the capillary tube extends and is protected thereby.

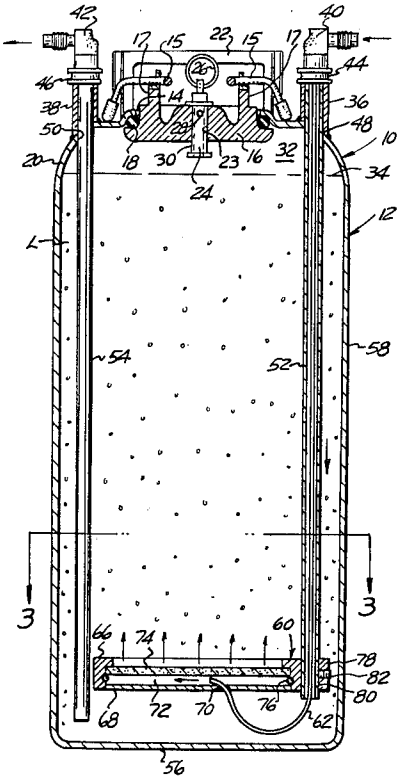


FIG. 1

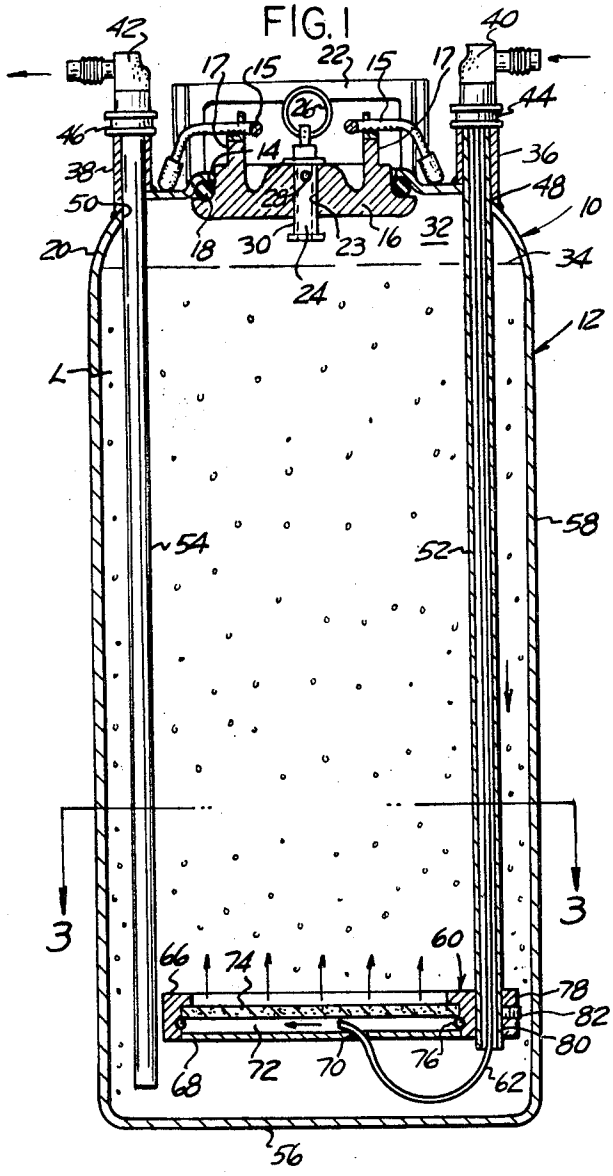


FIG. 2

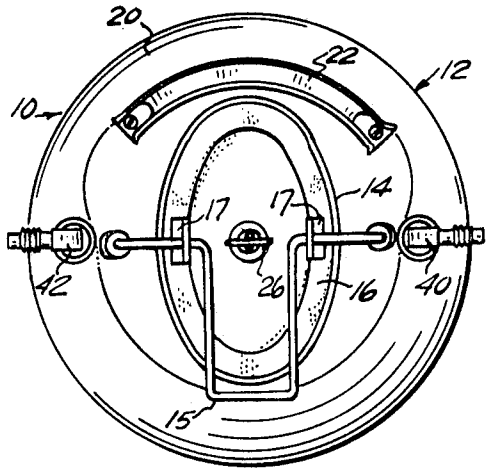
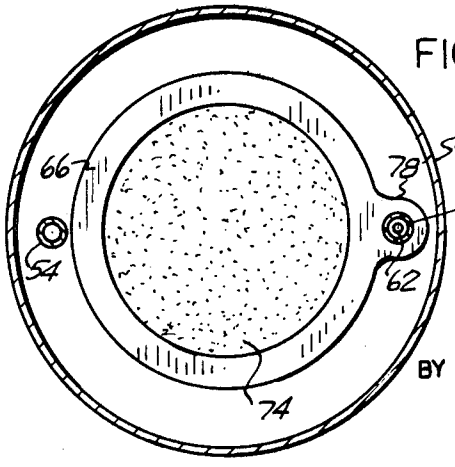


FIG. 3



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SELF-CONTAINED ABSORPTION GAS CHARGER FOR LIQUIDS

BACKGROUND OF THE INVENTION

Hitherto, carbonators have been made with the incoming gas flow attemptedly retarded by the use of a disc or a plug with a tiny hole having a diameter of the order of 0.015 inches. Such a flow-retarding hole **47** in a plug **46** is shown in FIGS. **4** and **5** of the Coleman Pat. U.S. Pat. No. 2,250,295 of July 21, 1941 for "Carbonating Apparatus." A hole of this small diameter was found necessary in order to give a satisfactory retardation of flow, yet it was so tiny that it constantly was obstructed by foreign matter, causing the carbonator to become inoperative. Furthermore, the drilling of such small holes in the stainless steel necessary to avoid corrosion caused frequent breakage of the tiny drills needed, and consequently entailed an excessively high cost for each plug or disc. The present invention overcomes this difficulty by providing an elongated small bore tube which, although it has twice the internal diameter as the plug, nevertheless gives satisfactory flow retardation yet is free from becoming obstructed like the plug or disc.

In the drawings:

FIG. **1** is a central vertical section through a self-contained absorption gas charger for liquids, according to one form of the invention;

FIG. **2** is a top plan view of the gas charger shown in FIG. **1**; and

FIG. **3** is a cross section taken along the line **3–3** in FIG. **1**.

Referring to the drawing in detail, FIG. **1** shows a self-contained absorption gas charger for liquids, generally designated **10**, according to one form of the invention as consisting of an elongated pressuretight liquid receptacle **12** preferably of stainless steel or other corrosion-resisting and stain-resisting metal. The top wall **20** of the receptacle **12** is provided with an oval liquid filling opening **14** which receives an oval closure member **16** containing an O-ring **18** clamped upward against the inner edge of the opening **14** by a double-arm bent clamping lever **15** pivotally mounted in bearing bosses **17** on the top of the closure member **16**. A handle **22** connected at its opposite ends to the top wall **20** of the receptacle **12** enhances handling of the gas charger **10**. The closure member **16** is centrally bored at **23** to receive a so-called purge cock **24** having a handle **26** which, when pulled upward to uncover the port **28** in the purge cock body **30** releases any accumulated gas in the upper chamber **32** above the level **34** of the liquid L in the receptacle **12**.

The liquid receptacle **12** at opposite sides of the top **20** thereof is provided with tubular inlet and outlet bosses **36** and **38** respectively provided with quick-disconnect gas inlet and gas-charged liquid outlet couplings **40** and **42** for incoming gas and outgoing gas-charged liquid respectively. The quick-disconnect couplings **40** and **42** are conventional and available on the open market, and are of such nature that pulling upward on either of the clamping rings **44** or **46** enables the coupling **49** or **42** to be immediately disconnected from its particular boss **36** or **38**. The tubular bosses **36** and **38** communicate with ports **48** and **50** in the dome-shaped top **20** of the receptacle **12**. Extending downward within the bosses **36** and **38** and secured thereto are vertical pipes **52** and **54** respectively terminating near the bottom wall **56** of the receptacle **12**. The latter is conveniently of a 5-gallon capacity which renders it portable and has a cylindrical sidewall **58** connecting the bottom wall **56** to the dome-shaped top wall **20**. The pipe **54** serves as a gas-charged liquid-dispensing or discharge pipe.

The pipe **52** serves as an elongated diffuser support to carry a gas diffuser, generally designated **60**, and also as a protective housing for an elongated metering small bore or capillary tube **62** leading to the diffuser **60**. The capillary or gas-flow-retardation tube **62** has a length of about 18 inches and an internal diameter of about 0.035 inches to impart proper retardation

to the gas, such as carbon dioxide, flowing downward from the quick-disconnect gas coupling **40** so that it does not except at too high a speed and pressure from the minute pores of the diffuser **60**. The capillary tube **62** at its upper end is supported in the mouth of the tubular boss **36** by a closure plug **64** which prevents the incoming gas from passing directly down through pipe **52** and forces it to traverse the capillary tube **62**.

The diffuser **60** consists of an annular inwardly flanged body **66** with a bottom closure plate **68** through a hole **70** in which the capillary tube **62** passes in a pressuretight connection to discharge into a diffuser gas chamber **72** beneath a minutely porous diffuser disc or plate **74**. The latter is preferably formed of finely divided sintered powdered metal, such as stainless steel, through the minute pores of which the gas passes upward in a myriad of tiny bubbles. The pores are of the order of 5 microns in size, where a micron equals 1/25400 inch or 0.0000394 inch. An O-ring **76** prevents undesired leakage of gas. The diffuser body **66** has a radially-projecting boss **78** (FIGS. **1** and **3**) which is bored vertically at **80** to snugly receive the lower end of the pipe **52** to which it is clamped by the setscrew **82**.

In connection with the operation of the invention as an absorption carbonator, there are four principle factors in carbonating water: (1) agitation or the mixing of water and gas by stirring the water in the gas atmosphere; (2) the pressure of the gas within the receptacle; (3) the temperature of the liquid, such as water, to be saturated with gas, since cold water has a strong affinity for absorbing carbon dioxide gas; and (4) the length of time during which carbonation is conducted. In the present invention there are no moving parts and hence no agitation or other mechanism, and the carbonation takes place entirely by absorption.

In the operation of the invention, if the device has been previously used, the operator first pulls upward on the handle **26** of the purge cock **24** to release any gas remaining in the upper chamber **32**. He then removes the closure member **16**, fills the receptacle **12** with the liquid to be gas charged, and then replaces the closure member **16**. The liquid to be gas charged with carbon dioxide, for example, may consist of water, beer, wine or premixed water and flavored syrups such as are used for soft drinks, leaving a space of about 2 inches for the top gas chamber **32**. The operator then connects the outlet coupling **42** to a faucet, fountain connection or other means of dispensing the gas-charged liquid. Finally, the operator connects the gas coupling **40** to a gas cylinder (not shown) through a suitable conventional pressure regulator (not shown) set at 50 to 75 pounds per square inch. When the gas valve (not shown) is opened, gas flows through the gas intake coupling **40** downward through the capillary or flow-retardation tube **62** where its speed of flow is greatly retarded before it is discharged into the diffuser chamber **72**, whence it passes upward through the microscopic pores in the diffuser disc **74**, emerging in the form of an enormous number and continuous stream of very tiny bubbles. These bubbles make their way upward through the liquid L in the receptacle **12**, most of them being absorbed before they reach the top chamber **32** beneath the top wall **29** of the receptacle **12**. The gas flow is so regulated through the elongated metering capillary tube **62** that 5 to 10 minutes is required to raise the gas pressure in the top chamber **32** to that set on the input pressure regulator (not shown) mentioned above. During this time period, a continuous slow feeding of tiny gas bubbles through the liquid L produces, as shown by experience, a carbonation of 3½ to 4 volumes of carbonation by the time the gas flow is halted by the equalization of the pressure in the top chamber **32** to that set on the input pressure regulator.

Carbonated liquid, such as soda water, is withdrawn through the gas outlet coupling **42** as the liquid is dispensed, thereby lowering the pressure in the top chamber **32** and causing a renewed flow of gas to take place through the gas-metering capillary tube **62** to the diffuser **60**. Carbonation again ceases when the pressure in the top chamber **32** again rises to the pressure set on the gas intake pressure regulator.

Since this carbonator is self-contained without requiring any external power and without any moving parts, with the sole connection required being to the gas cylinder and the dispensing nozzle or faucet respectively, the carbonator is inexpensive to manufacture, completely portable and thus can be carried in vehicles on boats, to picnics, at the pool side, to banquets, small group parties or family gatherings in a patio without requiring any experience or skill to operate it.

I claim:

1. A self-contained absorption gas charger for liquids, comprising:

a vertically disposed receptacle having near the top thereof a gas inlet connection and a gas-charged-liquid outlet connection adapted to be connected to a source of compressed gas and to a gas-charged-liquid dispensing device respectively,

said receptacle also having a closable liquid filling opening therein,

a gas diffuser disposed in said receptacle near the bottom thereof,

said diffuser including a diffuser plate of minutely porous sintered powdered metal having a diffuser chamber adjacent thereto,

an elongated diffuser support extending downward from the upper portion of said receptacle to said diffuser,

said diffuser being secured to said diffuser support,

an elongated small-bore gas-flow-retardation tube extending from said gas inlet connection to said diffuser and communicating with said diffuser chamber,

said tube being small enough to substantially retard and control gas flow,

and gas-charged-liquid discharge pipe extending from a location near the bottom of said receptacle to said gas-charged-liquid outlet connection.

2. A self-contained absorption gas charger for liquids, according to claim 1, wherein said gas-flow-retardation tube has an internal diameter not exceeding thirty-five thousandths of an inch.

3. A self-contained absorption gas charger for liquids, according to claim 2, wherein the length of said tube is approximately 18 inches.

4. A self-contained absorption gas charger for liquids, according to claim 1, wherein said diffuser support is connected to said receptacle near said gas inlet connection, and wherein said gas-flow-retardation tube extends downward adjacent said diffuser support.

5. A self-contained absorption gas charger for liquids, according to claim 1, wherein said diffuser support consist of a pipe connected to said receptacle near said gas inlet connection, and wherein said gas-flow-retardation tube extends downward inside said pipe.

6. A self-contained absorption gas charger for liquids, according to claim 5, wherein said diffuser has a bored portion at one side thereof, and wherein the lower end portion of said pipe is secured in said bored portion.

7. A self-contained absorption gas charger for liquids, according to claim 1, wherein said diffuser has pores therein of a size approximating 5 microns.