(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
9 October 2008 (09.10.2008)

PCT

(10) International Publication Number
WO 2008/119979 A2

(51) International Patent Classification: Not classified

(21) International Application Number:
PCT/GB2008/001129

(22) International Filing Date: 28 March 2008 (28.03.2008)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
0706106.2 29 March 2007 (29.03.2007) GB

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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI,

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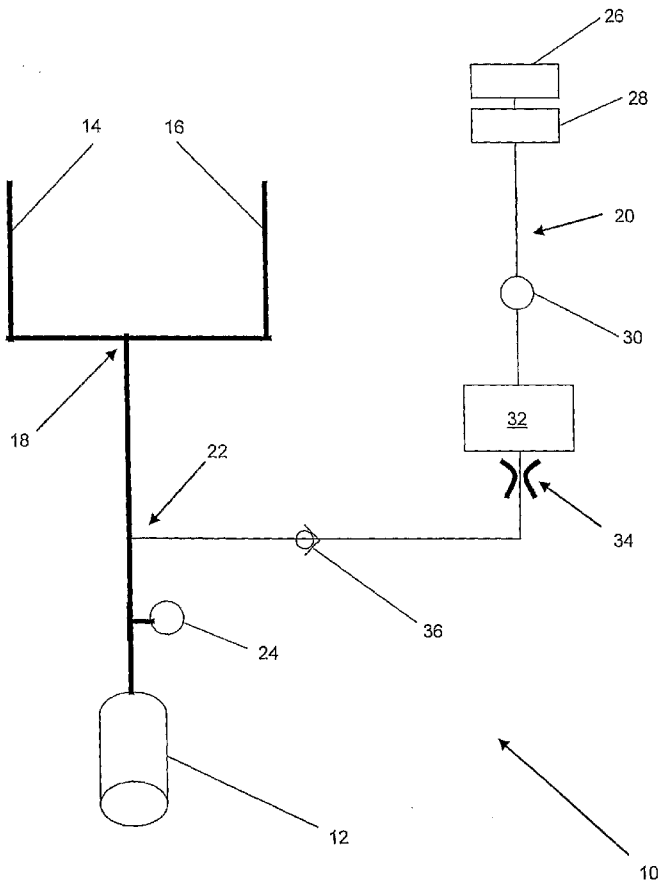
(54) Title: METHOD FOR CONTROLLING A BEVERAGE DISPENSER



(57) Abstract: A line (20) for supplying CO_2 from a CO_2 supply (26) to a product barrel (12) of a carbonated beverage machine is provided with a solenoid valve (32) upstream of and i fluid connection with an orifice (34) sized such that, in use, the flow through the orifi (34) is choked so as to deliver a constant flow rate of CO_2 into the product barrel (12) when the solenoid valve (32) is open.

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FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *without international search report and to be republished upon receipt of that report*

METHOD FOR CONTROLLING A BEVERAGE DISPENSER

This invention relates to frozen beverage machined and in particular, but not exclusively, to a method and apparatus for controlling the rate of delivery of carbon dioxide (CO_2) in a frozen carbonated beverage machine.

Frozen carbonated beverages are typically formed from three ingredients, namely water, syrup and CO_2. These ingredients must be mixed in a product barrel in the correct ratio in order to deliver a drink having the correct consistency.

The amount of CO_2 is particularly important in achieving the desired overrun, that is to say the desired "fluffiness" of the carbonated drink.

It is known to control the amount of CO_2 delivered to the product barrel as follows. An upstream pressure sensor measures the gas pressure at exit from a known regulator. A solenoid valve is positioned after the pressure sensor in order to control the flow of CO_2 so as to deliver a pressure downstream of the valve of 4psi lower than the pressure at exit from the regulator. The downstream pressure effectively equates to the barrel pressure as the CO_2 line passes through the downstream pressure sensor and into the product barrel.

However, since the flow rate of the CO_2 is not known in the above system, the open time of the solenoid valve does not correspond exactly to the volume of gas being delivered to the product barrel. Accordingly the consistency of the beverage cannot be controlled accurately.

It is an object of the present invention to at least mitigate the above problem.

According to a first aspect of the invention there is provided a CO_2 line for a carbonated beverage machine, the CO_2 line arranged to deliver CO_2 from a CO_2 tank to a product barrel, the line comprising

a solenoid valve upstream of and in fluid connection with an orifice, the orifice being sized such that, in use, the flow through the orifice is choked so as to deliver a constant flow rate of CO_2 into the barrel when the solenoid valve is open.

Thus the flow rate of the CO_2 in the line is fixed by the orifice so that the volume of CO_2 entering the product barrel is known for a given period of opening of the solenoid valve. In this way the ratio of the ingredients in the product barrel can be far more accurately controlled.

A further advantage is that the ratio of ingredients in the product barrel is controlled on flow rate (ie, unit volume per time) rather than pressure. This is advantageous since volume is the parameter which directly affects the ratio of ingredients and is therefore a far more effective control parameter of drink consistency than pressure.

Preferably, there is a regulator arranged in the fluid line upstream of the solenoid valve to regulate the pressure of the CO_2 delivered to the solenoid valve to a pressure sufficiently high that the pressure difference across the orifice results in a choked flow. Most preferably the regulated pressure is 70psi.

According to a second aspect of the invention, there is provided a carbonated beverage machine comprising:
a product barrel for receiving a beverage; and
a CO_2 line according to the first aspect of the invention.

Preferably, the beverage received in the product barrel comprises a concentrate and a diluent.

Preferably, the product barrel is refrigerated so as to at least partially freeze the product within the barrel.

According to a third aspect of the invention there is provided a method of controlling the production of a carbonated beverage comprising:
adding a beverage to a product barrel;
regulating a supply pressure of CO_2 to a set value;
controlling the amount of CO_2 added to the barrel by opening a valve for a controlled period of time so as to pass CO_2 through an orifice so that the flow is choked, wherein the volume of CO_2 added is a controlled by the valve open time.

Preferably, the method further comprises cooling the product barrel so as to at least partially freeze the product therein.

The invention will now be described by way of example, and with reference to accompanying Figure 1 which shows a schematic representation of the CO_2 line of the present invention.

In Figure 1, a beverage machine 10 is shown schematically having a product barrel 12 for mixing water, syrup and CO_2 prior to dispensing. The machine has a water line 14 and a syrup line 16 which come together at a T-junction 18. The machine also has a CO_2 line 20 which joins the water-syrup line at a second T-junction 22. Downstream of the second T-junction 22 is a pressure sensor 24 which measures the product barrel pressure.

The CO_2 line has a CO_2 tank 26 and a pressure regulator 28 upstream of a "sold-out" sensor 30. The pressure regulator 28 regulates the pressure to in the region of 70psi. Downstream of the sold out sensor is a solenoid valve 32 and fixed orifice 34. Whilst the valve 32 and orifice 34 are shown in close proximity in the figure they could be arranged more distant from one another. Since the barrel pressure is in the region of 30 psi the pressure differential across the orifice 34 is sufficient to choke the orifice meaning that the flow rate downstream of the orifice is fixed. Thus, the volume of CO_2 delivered from the solenoid valve into the product barrel is known for a given period of opening of the valve. The CO_2 line is further provided with a non-return valve 36 so as to maintain the pressure in the product barrel.

Although in the embodiment described the CO_2, water and syrup lines merge prior to entering the barrel, any or all of the lines could enter the barrel separately.

Claims:

1 A CO_2 supply line for a carbonated beverage machine, the CO_2 line arranged to deliver CO_2 from a CO_2 supply to a product barrel, the line comprising:

a solenoid valve upstream of and in fluid connection with an orifice,

the orifice being sized such that, in use, the flow through the orifice is choked so as to deliver a constant flow rate of CO_2 into the barrel when the solenoid valve is open.

2 The CO_2 line according to claim 1 further comprising a regulator arranged therein, upstream of said solenoid valve.

3 The CO_2 line according to claim 2, wherein said regulator is arranged to regulate the pressure of the CO_2 delivered to said orifice to a pressure sufficiently high so that the pressure difference across the orifice results in a choked flow therethrough.

4 The CO_2 line according to any one of claims 1 to 3 further comprising:

a non return valve to prevent backflow of CO_2 in the line from the barrel.

5 A carbonated beverage machine comprising:

a product barrel for receiving a beverage; and

a CO_2 line according to any one of claims 1 to 4.

6 A carbonated beverage machine according to claim 5 wherein:

the beverage received in the product barrel comprises a concentrate and a diluent.

7 A carbonated beverage machine according to claim 5 or claim 6 wherein the product barrel is refrigerated so as to at least partially freeze the product within the barrel.

8 A method of controlling the production of a carbonated beverage comprising:

adding a beverage to a product barrel

regulating a supply pressure of CO_2 to a set value;

controlling the amount of CO_2 added to the barrel by opening a valve for a controlled period of time so as to pass CO_2 through an orifice so that the flow is choked, wherein

the volume of CO_2 added is a controlled by the valve open time.

9 The method according to claim 8 further comprising:

cooling the product barrel so as to at least partially freeze the product therein.

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