

PTO/SB/16 (09-11)

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PROVISIONAL APPLICATION FOR PATENT COVER SHEET – Page 1 of 2

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

Express Mail Label No. *EU200855169US*

INVENTOR(S)

Given Name (first and middle [if any])	Family Name or Surname	Residence (City and either State or Foreign Country)
Gideon Williams	Duvall	Boca Raton, Florida, US

Additional inventors are being named on the _____ separately numbered sheets attached hereto.

TITLE OF THE INVENTION (500 characters max):

Systems and Method for Brewing Beverages with Independently Controlled Flow Rate, Temperature and Pressure

Direct all correspondence to:

CORRESPONDENCE ADDRESS

☐ The address corresponding to Customer Number:

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ENCLOSED APPLICATION PARTS (check all that apply)

☐ Application Data Sheet. See 37 CFR 1.76.

☐ CD(s), Number of CDs _____

☒ Drawing(s) Number of Sheets **2**

☐ Other (specify) _____

☒ Specification (e.g. description of the invention) Number of Pages **12**

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SIGNATURE

Gideon Williams Duvall

Date August 16, 2012

TYPED or PRINTED NAME

Gideon Williams Duvall

REGISTRATION NO. N/A
(if appropriate)

TELEPHONE

561.289.8924

Docket Number:

N/A

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SYSTEM AND METHOD FOR BREWING BEVERAGES WITH INDEPENDENTLY CONTROLLED FLOW
RATE, TEMPERATURE AND PRESSURE

FIELD OF THE INVENTION

5 The present invention relates to beverage brewing systems that utilize pressure, temperature and flow of solvent through solute contained within a filter.

BACKGROUND OF THE INVENTION

10 The creation of brewed or infused beverages through the infusion of a solvent with a solute contained within a filter media has been performed for millenniums. Over time it has come to be understood that the modification of brewing variables such as infusion temperature, pressure, and flow rate of solvent through solute change the resulting beverage's chemical composition and taste. Thus, many brewing systems have been developed that seek to enable flavor modification through selective modulation of one or more infusion variables.

15 However, few brewing systems facilitate dynamic modulation of one or more of these variables during an infusion. Of those that do, modulations of one or more variables during an infusion result in unintended changes to other brew variables. This lack of independent variable control makes the optimization and modification of infused beverages difficult.

20 For instance, currently available brewing systems that enable users to modify pressure during an infusion rely on back pressure generated in a brewing chamber by a resistive media typically composed of a filter and solute. In one configuration, brew chamber pressure modification is achieved by modulating the resistance of said resistive solute media while holding pumping energy constant. While this does result in a change in infusion pressure, it
25 also changes the infusion flow rate. In another conventionally available system, the user modifies infusion pressure through the variation of solvent pumping force while keeping the resistance of the resistive media constant. This too results in an increase in infusion pressure and simultaneous change in infusion flow rate. Thus, in conventional systems, the variables of pressure and flow rate during the infusion process are dependent upon each other. As
30 pressure and flow rate are both known to affect the chemical composition of the brewed infusion, there is an apparent need for a brewing system that affords independent modulation of infusion pressure and flow rate enabling the user to optimize infused solution chemical composition and produce consistent beverages.

It is well understood that infusion temperature also affects chemical composition of an
35 infused beverage solution. Thus, an operator may find it advantageous to modify brewing / infusion temperature during the brewing process to optimize flavor. Current brewing systems utilize boilers and brewing chambers with large thermal masses that are designed to provide consistent brewing temperature thus prohibiting the use of variable infusion temperatures to create optimal flavor. Therefore a beverage brewing system that affords precise, accurate and
40 dynamic temperature control would enable optimization of beverage flavor and thus is needed.

As previously explained, there is an acute need for a brewing system that affords the brewer independent, dynamic variation of brewing variables of temperature, pressure and flow rate during the production of brewed beverages.

45 SUMMARY OF THE INVENTION

The present invention relates to a system and method of brewing beverages that satisfies the outlined need, facilitating dynamic, independent control of pressure, temperature and flow rate of solvent through solute contained within a filter during the infusion process. An exemplary brewing system is composed of a Solvent Flow Management System (SFMS) configured such that a desired flow rate is maintained regardless of pressure variations. This SFMS is operably connected to a Solvent Temperature Management System (STMS) that selectively and dynamically modulates infusion temperature. The STMS is operably connected to a brewing chamber where solute resides within a filtering device and the infusion occurs. Operably connected to the brewing chamber is a Solution Pressure Management System (SPMS) which facilitates dynamic modulation of pressure within said brewing chamber.

BRIEF DESCRIPTION OF THE DRAWINGS

Exemplary embodiments of the present invention will become more fully understood from the detailed description and the accompanying drawings, wherein:

60 Figure 1 illustrates a non-limiting embodiment of the described beverage brewing system

Figure 2 illustrates an alternate non-limiting embodiment of the described beverage brewing system

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS OF THE PRESENT INVENTION

65 In this embodiment, flow rate of solvent is dictated and modified by the SFMS, temperature of solvent is modulated and controlled by the STMS and the pressure within the brewing chamber is modified by the SPMS. All of the aforementioned brewing variables are able to be independently varied by the user. Additionally, due to the complexity of the aforementioned systems, it may be found advantageous to utilize a programmable controller to
70 control and modify the aforementioned brewing variables of said brewing system.

 The SFMS is a system of moving fluid that provides accurate, metered, variable flow of solvent through the brewing system. Applicable systems may include a pumping means capable of providing flow at pressures and rates equal to or greater than those required by the brewer. Exemplary pumps are gear pumps, piston pumps, rotary vane pumps or any others
75 that satisfy the aforementioned criteria. Pumping means is preferably operably connected with a solvent flow meter(s) or an equivalent mechanism that acts as a feedback mechanism ensuring the desired flow rate and volume is dispensed. Additionally, pumping means is capable of modulating and maintaining the required fluid flow rate during the brewing process regardless of system pressure. SFMS may be a self-controlled system or coupled to an external
80 system controller that monitors and modulates performance.

The STMS is a system for providing rapidly variable, accurate and precise temperature fluid to the brewing chamber. Exemplary systems include instant or tankless water heating systems and the use of thermostatic mixing valves / systems. Regardless of the system utilized, an ideal STMS is capable of providing variations in temperature that are equal to or greater
85 than those desired by the operator. Ideal STMS have the ability to provide solvent temperature modulations at a rate of at least 50° F / sec that contacts solute and provide a minimum accuracy of +/- 3° F during the infusion. An optimal system takes into account thermal mass and temperature of solvent conduits operably connected to solute material when delivering solvent.

90 An ideal brewing chamber is a system that is operably connected to the SFMS, STMS, and SPMS. It includes a chamber with a basket/filter within, designed to selectively contain solute media and allow infused solution to pass through. An ideal brewing chamber has a minimal thermal mass such that infusion temperature can be rapidly modified. Additionally said brewing chamber is capable of withstanding pressures greater than those provided by the
95 brewing system.

Operably connected to brewing chamber is a SPMS that modulates the pressure within said brewing chamber by modifying infused solution flow resistance. SPMS includes a pressure measuring device operably connected to solute within brew chamber and a valve that is capable of modulating solution flow resistance thus increasing pressure within brewing
100 chamber. Exemplary valves include pressure regulators, needle, butterfly, globe and pinch valves or any other flow regulating device capable of regulating pressure within brew chamber.

Ideal valves are impervious to particulate matter, oils, and other dissolved solids that may exist in infused solution. Furthermore, SPMS optimally contains a minimal internal volume and adjusts pressure within the chamber to an accuracy of at least +/-5 psi and a minimum rate of
105 pressure change greater than 100 psi/sec. Additionally the internal volume should be readily cleanable.

A control system is ideally used to selectively modulate and monitor performance of SFMS, STMS, and SPMS during the brewing process. Additionally, the control system is able to be preprogrammed with brewing "formulas" that may be tailored to different personal
110 preferences and solute. These formulas may be recalled when desired thus minimizing the amount of labor, skill and time required to reproduce brewing results. Control system may include networking capabilities such as being connected to the internet enabling remote system monitoring and transmission of brewing "formulas" to the brewing system.

Benefits of the aforementioned system may be derived from inclusion of less than all
115 three solution control systems: SFMS, STMS and SPMS. For instance a beverage brewing system may include a STMS and SFMS or an alternate configuration may include a SFMS and SPMS operably connected to a brewing chamber.

Referring to Figure 1, an exemplary brewing system 100 is shown. Brewing system 100 includes SFMS 110, operably connected to STMS 120. STMS 120 is operably connected to
120 brewing / infusion chamber 130. Infusion chamber 130 is operably connected to SPMS 140. In operation, solvent 111 enters SFMS 110 where it is pumped at a chosen and selectively modulated rate throughout system 100. Solvent 111 then enters STMS 120 where it is

selectively thermally modulated to a chosen temperature. Subsequently, solvent 111 enters infusion chamber 130 where it comes in contact with solute 131 creating infused solution 112.

125 Particulate matter is removed via filter 132. Infused solution 112 passes through pressure SPMS 140. SPMS 140 selectively modulates the infusion pressure in infusion chamber 130. Infused solution 112 is then dispensed into container 150.

According to another embodiment, control system 160 is used to independently and automatically monitor and or modify flow rate, temperature and pressure of the infusion.

130 Control system 160 modifies flow rate of solvent 111 by accordingly adjusting SFMS 110. Additionally, control system 160 modulates solvent temperature through modulating STMS 120. Furthermore control system 160 adjusts pressure of the infusion by adjusting SPMS 140. During an infusion, one or more of the aforementioned infusion parameters may be selectively modified during said infusion. This dynamic modification of said variables may be utilized to
135 modify chemicals and / or dissolved solids infused into the resulting solution 112 producing a preferred beverage. Parameters required to produce said preferred beverage may be stored as programs or brewing formulas in control system 160 and recalled as desired to reproduce preferred beverage. Control system 160 may be programmed to provide optimal infusion for numerous solutes or multiple preferred infusions with the same solute. To ensure accuracy
140 and precision during the infusion process, feedback sensors, not shown, such as thermometers, pressure meters, and flow meters may be positioned throughout brewing system 100, as required, providing feedback to the appropriate control devices affording them the necessary data to modulate aspects of brewing system 100 to ensure programmed infusion conditions are achieved and maintained.

145 Control system 160 may track performance data such as the number, volume, and or infusion parameters of infused beverages produced by brewing system 100. This data may be combined with any recorded system errors or data that could be used to recommend and/or perform system maintenance. Data recorded by control system 160 may be accessed on site or remotely.

150 As will be commonly understood, brewing system 100 may be reconfigured such that SFMS 110 and STMS 120 are reversed such that solvent 111 initially flows into STMS 120 where solvent is thermally modulated to the appropriate temperature. Subsequently, thermally modulated fluid 111 would enter SFMS 110 then flow into infusion chamber 130.

A preferred beverage may be produced by the incorporation of only one or two of the
155 dynamically adjustable systems; SFMS 110, STMS 120 and SPMS 140. For instance, a preferred beverage may be produced by a brewing system 100 that incorporates a non-dynamically controlled SPMS 140 and a dynamically controlled SFMS 110 and STMS 120. Alternately, brewing system 100 may include a non-dynamically controlled SFMS 110 and SPMS 140 and a dynamically controlled STMS.

160 Referring to Figure 2, beverage brewing system 200 is an alternate configuration of brewing system 100. In configuration 200, Solvents 202 and 201 are pumped by SFMS 210 which is operably connected to STMS 220. After passing through STMS 220, thermally regulated solvents 202 and 201 combine creating solvent 203 and pass into operably connected
165 brewing/infusion chamber 230 where infusion of solute 232 and solvent 203 occurs creating

infusion 204. Infused solution 204 then passes through operably connected SPMS 240 and enters receptacle 250.

In configuration 200, SFMS 210 is composed of independently controlled pumping units 211 and 212 with pump 212 flowing solvent 202 and pump 211 flowing solvent 201. Said
170 pumps work in tandem to provide an additive flow rate that is equivalent to the total desired infusion flow rate. For example, if desired infusion flow rate is 1 cc/sec, pump 211 may pump at 0.7 cc/sec and pump 212 may pump at 0.3 cc/sec. SFMS 210 may be independently controlled or coupled to control system 280 which modulates pumps 211 and 212 to achieve a required flow rate of solvents 201 and 202, respectively, based on total desired flow rate of
175 solvent 203 and desired infusion temperature as explained below.

SFMS 210 is operably connected to STMS 220 where solvent 202 is thermally modulated by thermal modulator 222 and solvent 201 is thermally modulated by thermal modulator 221 such that the range of infusion temperatures desired by the user may be produced through their selective combination. Thermal modulations provided by thermal
180 modulators 221 and 222 dictate the solvent temperature range available for an infusion. For example, if a user desires to perform the infusion between 20° C and 100° C then thermal modulator 221 may yield solvent 201 at a temperature of 20° C or lower and thermal modulator 222 may yield solvent 202 at a temperature of 100° C or higher. In practice, to achieve infusion temperatures within this range, SFMS 210 will selectively pump solvents 201
185 and 202 through STMS at a rate that satisfies the desired overall infusion flow rate and temperature of solvent 203. For example, assuming a negligible thermal mass of the brewing

chamber and solution conduits, if the user desires an infusion flow rate of 1 cc/sec and an infusion temperature of 90° C, solvent 201 may be modulated to 100° C and solvent 202 modulated to 20° C. Pump 212 will flow solvent 202 at a rate of 1/8 cc/sec and pump 211 will
190 flow solvent 201 at a rate of 7/8 cc/sec. In order to improve accuracy of infusion temperature, thermal mass and temperature of brewing chamber 230 and solution conduits may be accounted for when determining solvent 201 and 202 flow rates. STMS 220 may be connected to control system 280 which may modulate and/or monitor temperature of the respective solvents as necessary. Solvent temperatures may be utilized by control system 280 to
195 modulate performance of SFMS to achieve desired infusion temperature and flow rate during an infusion.

STMS 220 is operably connected to brewing chamber 230 which is composed of chamber housing 231, and filter system 233 designed to contain solute 232. Brew chamber
200 housing 231 may be designed with a removable section that readily facilitates the insertion, removal and replacement of solute 232. In order to facilitate rapid, accurate and dramatic fluctuations in infusion temperatures, brew chamber 230 is optimally designed with a minimal thermal mass. Within brewing chamber 230, solvent 203 contacts solute 232 creating solution
204.

205 Operably connected to brew chamber 230 is SPMS 240 which selectively modulates infusion pressure via the addition of flow resistance generated by valve 242. As filter 233 and solute 232 may create a resistance to flow, a pressure monitoring device 241 is inserted

antecedent solute 232, operably connected to solvent 203 flow thereby enabling accurate infusion pressure measurement. In order to increase infusion pressure beyond that provided by solute 232 and filter 233, valve 242 may be selectively activated increasing solution 204 flow resistance thereby increasing infusion pressure. Once activated, valve 242 may be selectively deactivated, decreasing flow resistance and thus infusion pressure. Exemplary valves include needle, butterfly, globe and pinch valves or any other flow impeding device capable of regulating pressure within brew chamber. Ideal valves are impervious to particulate matter, oils, and other dissolved solids that may exist in infused solution, possess a minimal internal volume, are readily cleaned and possess a minimal thermal mass. In practice, pressure monitoring device 241 is used to monitor infusion pressure and valve 242 modulates infusion pressure. SPMS 240 may be connected to control system 280 which may modulate valve 242 based on inputs from pressure monitoring device 241 to achieve a desired infusion pressure. Operably connected to SPMS 240 is solution receptacle 250 which contains solution 204 once it exits beverage brewing system 200.

As will be commonly understood, brewing system 200 may be reconfigured such that SFMS 210 and STMS 220 are reversed such that solvent 202 and 201 initially flow into STMS 220 where they are heated to the appropriate temperature before subsequently entering SFMS 210 and then flow into infusion chamber 230.

According to another embodiment, control system 280 is used to independently and automatically modify flow rate, temperature and pressure of the infusion. Control system 280 modifies flow rate of solvents 201 and 202 by accordingly adjusting SFMS 210. Additionally,

control system 280 modulates solvent temperature through modulation of STMS 220.

230 Furthermore control system 280 adjusts pressure of the infusion by adjusting SPMS 240.

During an infusion, control system 280 may selectively modify one or more of the aforementioned infusion parameters in accordance with user's desires. This dynamic modification may be utilized to modify chemicals and/or dissolved solids infused into the resulting solution producing a preferred beverage. Parameters required to produce said

235 preferred beverage may be stored as programs or brewing formulas in control system 280 and recalled as desired to reproduce preferred beverage. Control system 280 may be programmed to provide optimal infusion for numerous solutes or multiple preferred infusions with the same solute. To ensure accuracy and precision during the infusion process, feedback sensors, not shown, such as thermometers, pressure meters, and flow meters may be positioned
240 throughout brewing system 200, as required, providing feedback to the appropriate control devices affording them the necessary data to modulate aspects of brewing system 200 to ensure programmed infusion conditions are achieved and maintained.

Although the invention is illustrated and described herein with reference to specific embodiments, the invention is not intended to be limited to the details shown. Rather, various
245 modifications may be made in the details within the scope and range of equivalents of the claims and without departing from the invention.

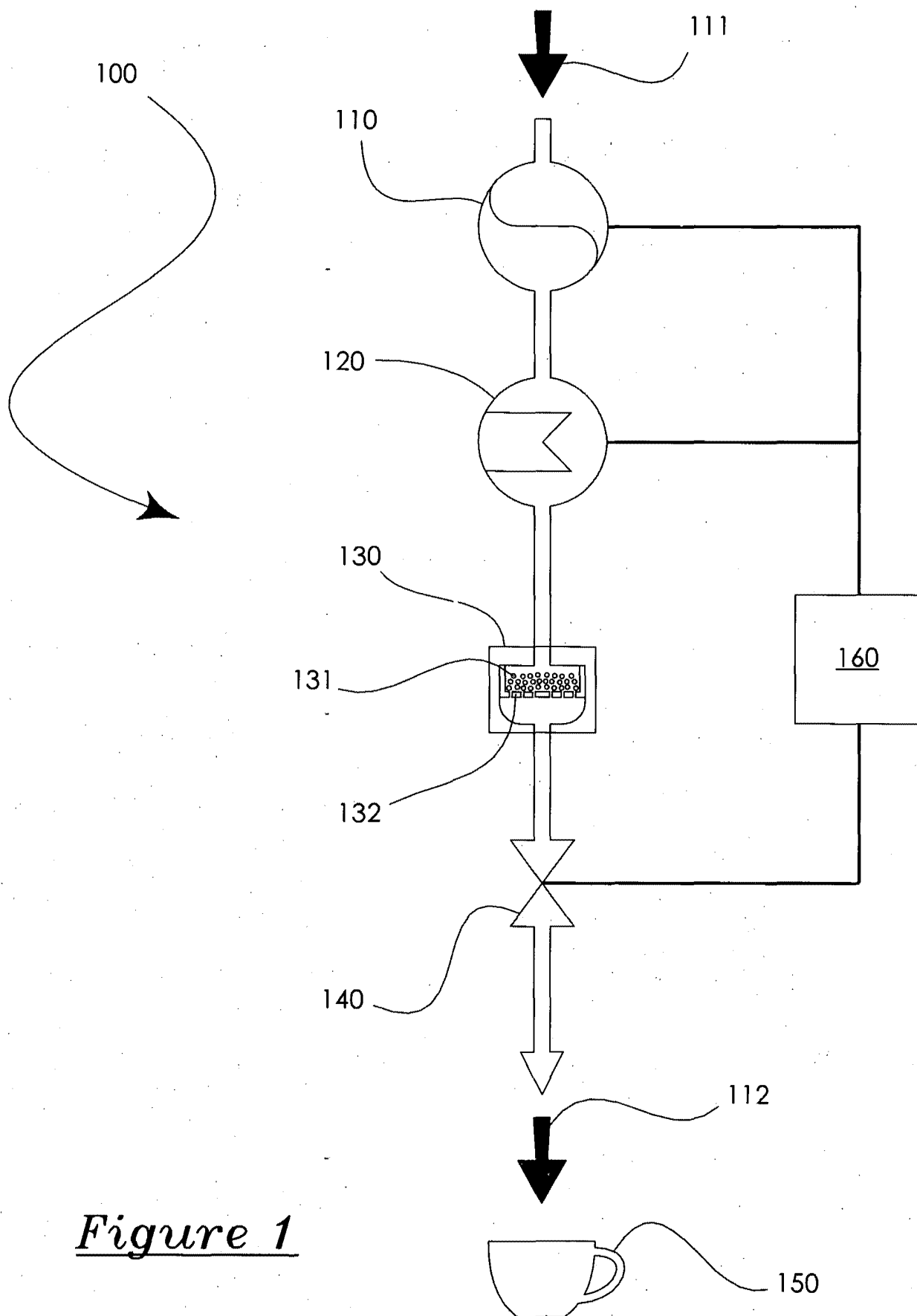


Figure 1

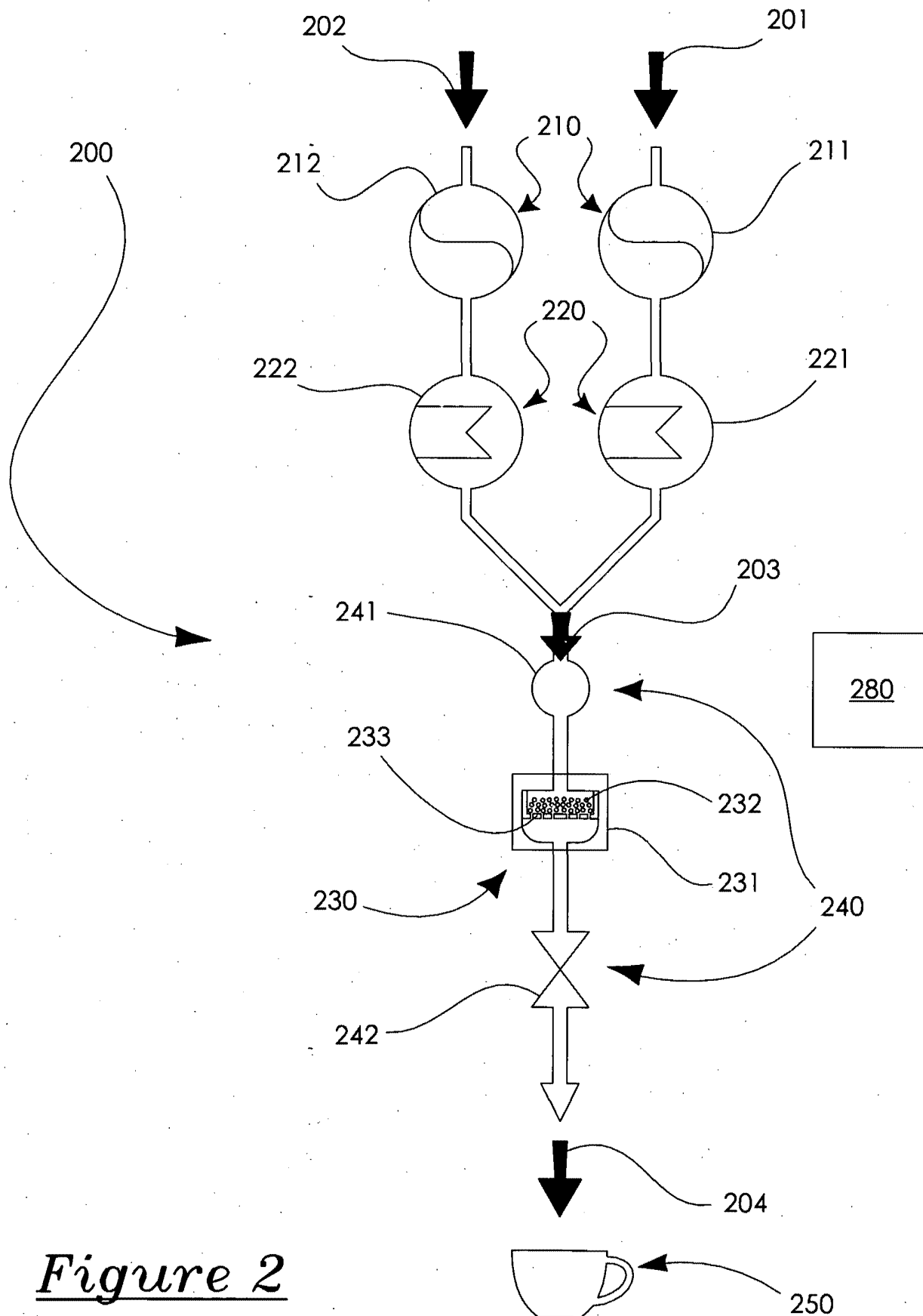


Figure 2

PATENT APPLICATION SERIAL NO. _____

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08/20/2012 CNGUYEN2 00000016 61742600

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO.	TOT CLAIMS	IND CLAIMS
61/742,688	08/16/2012		125			

Gideon Williams Duvall
6850 North Grande Drive
Boca Raton, FL 33433-2735

CONFIRMATION NO. 3893
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Date Mailed: 09/04/2012

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Applicant(s)

Gideon Williams Duvall, Boca Raton, FL;

Power of Attorney: None

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Projected Publication Date: None, application is not eligible for pre-grant publication

Non-Publication Request: No

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**** SMALL ENTITY ****

Title

Systems and method for brewing beverages with independently controlled flow rate, temperature and pressure

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