

METHOD AND DEVICE FOR PRODUCING COFFEE

Technical Field

Example embodiments of the present invention relate to a method of making coffee and an apparatus of making coffee. More particularly, example embodiments of the present invention relate to a method of making coffee capable of keeping flavor at a relatively low temperature and an apparatus of making coffee realizing the method.

Background art

Generally, one example of iced coffee is Iced Americano, which has been widely sold in coffee shops. The Iced Americano is made by diluting Espresso with water and ice, which is extracted from ground coffee using a relatively high pressure. However, the Iced Americano is made by adding cold water and ice to Espresso having a crema of minute foam and having velvety texture and a form layer, which may cause a temperature of Iced Americano lower to enhance bitter taste and to deteriorate texture dramatically by breaking the foam layer.

Thus, it has been required for iced coffee to keep a density of foam rich and maintain texture.

Detailed description of the invention

Technical problem

Example embodiments of the present invention provide a method of making a coffee capable of keeping a rich density of form and a flavor.

Example embodiments of the present invention provide an apparatus of making a coffee capable of keeping a rich density of form and a flavor.

Technical solution

According to one aspect of the present invention, there is provided a method

of making coffee. After a cold-brewed coffee is extracted from coffee beans, nitrogen gas is charged into the cold-brewed coffee. The cold-brewed coffee into which nitrogen gas is dissolved, is cooled to form a nitrogen-charged coffee. Here, in order to extract the cold-brewed coffee from the coffee beans, the coffee beans are
5 grinded to form a ground coffee. The ground coffee is steeped into water to form a mixture having the ground coffee and water. Then, after an extracted coffee is extracted from the mixture, the extracted coffee is diluted with water.

In an example embodiment, a concentration (TDS) of the cold-brewed coffee is in a range from about 1.36% to about 1.58%.

10 In an example embodiment, dispensing the nitrogen-charged coffee into a cup may be further performed. Here, in order to dispense the nitrogen-charged coffee into the cup, the nitrogen-charged coffee is discharged from a nozzle and then nitrogen gas is additionally discharged from the nozzle while discharging the nitrogen-charged coffee.

15 According to one aspect of the present invention, there is provided a An apparatus of making coffee. The apparatus includes a keg storing a cold-brewed coffee, a nitrogen tank containing nitrogen gas, the nitrogen tank being connected with keg by a first line to be configured to provide nitrogen gas with the keg to form a nitrogen-charged coffee, a discharging unit being connected with the keg by a second
20 line to be configured to discharge the nitrogen-charged coffee, and a first cooling unit covering the second line to be configured to cool the nitrogen-charged coffee.

In an example embodiment of the present invention, the apparatus may further include a third line connecting the nitrogen tank with the discharge unit, the discharging unit may be configured to selectively open/close the second line and the
25 third line to selectively discharge the nitrogen-charged coffee or to discharge the

nitrogen-charged coffee and nitrogen gas at the same time.

In an example embodiment of the present invention, the apparatus may further include a second cooling unit receiving the keg, the second cooling unit being configured to cool the cold-brewed coffee in the keg.

5 Advantageous effects

According to example embodiments of the present invention, nitrogen gas is bubbled in a cold-brewed coffee to form a nitrogen-charged coffee. After discharging the nitrogen-charged coffee, a foam layer having a thickness may be formed on an upper surface of the nitrogen-charged coffee and the foam layer may
10 be maintained for a period of time. Thus, the nitrogen-charged coffee may keep a smooth texture, a concentration and a flavor until the nitrogen-charged coffee is drunken up.

Brief description of the drawings

FIG. 1 is a flow chart illustrating a method of making coffee in accordance with
15 an example embodiment of the present invention.

FIG. 2 is a flow chart illustrating a step of extracting a cold-brewed coffee in FIG. 1.

FIG. 3 is a cross-sectional view illustrating an apparatus of making coffee in accordance with an example embodiment of the present invention.

20 Best Mode of the invention

Hereinafter, with reference to drawings, it will be described in detail method of making coffee and apparatus of making coffee according to an embodiment of the present inventive concept. Exemplary embodiments of the inventive concept will be described below in more detail with reference to the accompanying drawings. The
25 inventive concept may, however, be embodied in different forms and should not be

construed as limited to the embodiments set forth herein. However, this is not intended to limit the embodiments according to the inventive concept as the specific disclosed forms; rather it should be understood that all of variations, equivalents or substitutes contained in the concept and technical scope of the present invention are also included. In the drawings, like reference numerals refer to like elements throughout. In the drawings, the dimensions of structures are exaggerated for clarity of illustration.

Though terms like "first" and "second" are used to describe various components, the components are not limited to these terms. These terms are used only to differentiate one component from another one. For example, without departing from the scope of the inventive concept, a first element could be termed a second element, and similarly a second element could be termed a first element.

In the following description, the technical terms are used only for explaining a specific exemplary embodiment while not limiting the present invention. The terms of a singular form may include plural forms unless referred to the contrary. Throughout the specification, when it is said that a part "includes" or "have", it means that the part may further intend to designate features, integers, steps, operations, elements, components, or the combination thereof. Further, it means that one or more other features, integers, steps, operations, elements, parts or combinations thereof, or the additional possibility are not precluded.

The terms used in embodiments of the present invention can be interpreted as meaning commonly known to those skilled in the art unless defined otherwise. In general, the terms defined in the dictionary should be considered to have the same meaning as the contextual meaning of the related art, and, unless clearly defined herein, should not be understood abnormally or excessively formal meaning.

FIG. 1 is a flow chart illustrating a method of making coffee in accordance with an example embodiment of the present invention.

Referring to FIG. 1, a method of making coffee according to example
5 embodiment of the present invention will be explained in detail.

At first, a cold-brewed coffee is extracted from coffee beans (step S110).

The cold-brewed coffee is formed by brewing the coffee beans in water, for example, a purified water at a relatively low temperature.

FIG. 2 is a flow chart illustrating a step of extracting a cold-brewed coffee in
10 FIG. 1.

Referring to FIG. 2, the coffee beans are grinded under a pressure to form a ground coffee (step S111).

The ground coffee has powders each having an average grind size of about 800 μm to about 900 μm . More particular, the average grind size may be in a range
15 of about 840 μm to about 860 μm . Preferably, the average diameter of the ground coffee is about 850 μm .

When the ground coffee has the powders each having an average grind size less than 800 μm , the ground coffee may be too over-extracted. Thus, the cold-brewed coffee may taste stale or bitter.

20 When the ground coffee has the powders each having an average diameter more than 900 μm , the ground coffee may be too under-extracted. Thus, the cold-brewed coffee may taste watery or plain.

Next, the ground coffee is steeped in water, for example, a purified water at a relatively low temperature (step S112). Thus, a mixture having the ground coffee
25 and the water is formed.

A ratio of the ground coffee with respect to water may be in a range of about 180 g/L to about 195 g/L. Further, water may be controlled to have a temperature of about 10°C to about 15°C and a steeping time may be from about 12 hours to about 24 hours. The steeping time may be adjusted according to characteristics of the coffee beans, which may vary in accordance with each origin of the coffee beans, and a roasting degree of the coffee beans.

A range of water hardness is between about 100 ppm and about 200 ppm. When water has the water hardness of less than 100 ppm, the cold-brewed coffee may taste weak flavor, even though the cold-brewed coffee tastes mild and have an improved acidity.

When water have the water hardness of more than 200 ppm, the cold-brewed coffee may taste sharply bitter, stale such that the cold-brewed coffee may not be smooth.

Thus, when the water has the water hardness of between about 100 ppm and about 200 ppm, the cold-brewed coffee may have balanced taste of sweetness, acidity and bitterness.

When the ratio of the ground coffee with respect to water is less than 180g/L or the steeping time is less than 12 hours, the ground coffee may be too under-extracted while brewing the ground coffee such that the cold-brewed coffee may taste watery or plain.

In contrast, when the ratio of the ground coffee with respect to water is more than 195g/L or the steeping time is over 24 hours, the ground coffee may be over-extracted while brewing the ground coffee such that the cold-brewed coffee may taste stale or bitter.

An extracted coffee is extracted from the mixture having the ground coffee

and water (step S113).

In particularly, the mixture passes through a filtering sheet to remove the ground coffee having a relatively large size from the mixture to form the extracted coffee.

5 The extracted coffee is diluted with water to form a cold-brewed coffee (step S114).

 The extracted coffee is attenuated with water to form the cold-brewed coffee having a concentration suitable for drinking. A concentration of TDS in the cold-brewed coffee against water is in a range of about 1.36 % to about 1.58 %. The
10 TSD is an abbreviation of total dissolved solids, which means a weight of the TSD in the cold-brewed coffee.

 When the concentration of the cold-brewed coffee is less than 1.36%, the cold-brewed coffee may taste watery or plain. Further, the cold-brewed coffee may not have a balanced taste. In contrast, when the concentration of the cold-brewed
15 coffee is more than 1.58%, the cold-brewed coffee may taste excessively bitter or have a taste too strong to drink.

 Further, a volume ratio between the extracted coffee and water may be in a range of about 1:0.8 to about 1:1.2. Water may include heavy water having a water hardness of about 100 ppm to about 200 ppm.

20 When the volume ratio is less than about 1:0.8, an amount of water is too little, whereas the concentration of the cold-brewed coffee is too high. Thus, the cold-brewed coffee may taste too bitter or have a bad balanced taste too strong to drink.

 When the volume ratio is more than about 1:0.2, an amount of water is too
25 much, whereas the concentration of the cold-brewed coffee is too low. Thus, the

cold-brewed coffee may taste watery or may not have a balanced taste.

Water is mixed to the extracted coffee to control an amount of the cold-brewed coffee easily. Thus, cost for making the cold-brewed coffee may decrease to improve a productivity of making the cold-brewed coffee. Further, the
5 volume ratio between the extracted coffee and water may be easily adjusted to control the concentration of the cold-brewed coffee. So, a standard of taste related to the cold-brewed coffee may be established conveniently.

In another example embodiment, the extracted coffee may be utilized without diluting the extracted coffee with water. In other words, the concentration of the
10 extracted coffee (TSD) may be adjusted in a range of about 1.36 % to about 1.58 % to omit a step of diluting the extracted coffee with water.

The cold-brewed coffee may be stored in a keg. The keg may be occupied with nitrogen gas. Thus, the cold-brewed coffee may be prevented from reacting with oxygen gas and from being oxidized.

15 The cold-brewed coffee may be stored at a temperature of about 1°C to about 10°C.

When the cold-brewed coffee is stored at a temperature of less than 1°C, the cold-brewed coffee may be frozen. Further, when the cold brewed coffee is stored at a temperature of more than 10°C, the cold-brewed coffee may be lukewarm to a
20 mouth or may have a degraded refreshing taste.

Referring to FIG.1 again, nitrogen gas is charged into the cold-brewed coffee (step S120).

In particular, *nitrogen gas is bubbled in the cold-brewed coffee stored in the* keg to charge nitrogen gas into the cold-brewed coffee. In order to perform charging
25 nitrogen gas into the cold-brewed coffee efficiently, nitrogen gas may be repeatedly

provided into the cold-brewed coffee. For example, nitrogen gas may charge into the cold-brewed coffee two times. Further, a pressure of nitrogen gas is in a range of about 6.0 bar to about 6.5 bar in the keg.

When the pressure of nitrogen gas is less than about 6.0 bar, the pressure of nitrogen gas is too low to charge nitrogen gas into the cold-brewed coffee sufficiently. Thus, the nitrogen charged coffee to be formed by charging nitrogen gas into the cold-brewed coffee, may not generate micro-sized foams. In the meantime, when the pressure of nitrogen gas is more than about 6.5 bar, the pressure of nitrogen gas is too high, which may cause a nitrogen-providing unit malfunctioned.

Next, the cold-brewed coffee in which nitrogen gas is dissolved is cooled to form a nitrogen-charged coffee. Nitrogen gas is provided in the keg to increase a pressure of nitrogen gas in the keg to supply the cold-brewed coffee into a discharging unit.

While the cold-brewed coffee is drained out from the keg to the discharging unit, the cold-brewed coffee in which nitrogen gas is dissolved may be cooled to have a predetermined temperature. For example, the predetermined temperature is from about 1°C to about 10°C. More particularly, the temperature is in a range of about 3°C to about 6°C. More preferably, the temperature is about 4°C.

When the temperature is less than 1°C, the cold-brewed coffee in which nitrogen gas is dissolved may be frozen. Meanwhile, when the temperature is more than 10°C, the cold-brewed coffee in which nitrogen gas is dissolved may be lukewarm in a mouth or may have a degraded refreshing taste. Thus, the cold-brewed coffee in which nitrogen gas is dissolved, may have a rich flavor, a good density of foam, a balanced taste, a good texture, etc.

The nitrogen-charged coffee is discharged into a cup(step S140).

The nitrogen-charged coffee is discharged from a nozzle into the cup. When the nitrogen-charged coffee is discharged from the nozzle, micro-sized foams may generated at a surface of the nitrogen-charged coffee due to nitrogen gas. The micro-sized foams may form a foam layer on the surface of the nitrogen-charged coffee. The foam layer may be maintained on the surface for a period of time to cover the nitrogen-charged coffee. Thus, the nitrogen-charged coffee may maintain a smooth and rich texture, a concentration of foam and a flavor until the nitrogen-charged coffee is drunken up.

In example embodiment of the present invention, after partially filling the cup with the nitrogen-charged coffee, the nitrogen-charged coffee and nitrogen gas may be discharged simultaneously from the nozzle to fill the cup additionally. Thus, the nitrogen-charged coffee dispensed into the cup may have rich foam on a top thereof. As a result, the nitrogen-charged coffee has the foam layer thick. Here, a volume of the nitrogen-charged coffee which firstly fills the cup, is defined as a first volume. Further, a volume of the nitrogen-charged coffee and nitrogen gas which are discharged simultaneously from the nozzle, is defined as a second volume.

A volume ratio of the first volume with respect to an overall volume of the nitrogen-charged coffee in the cup, may be in a range of about 60% to about 80%.

When the volume ratio is less than about 60%, the second volume may be excessively high. Thus, the foam layer may be too thick, which may cause inconvenience that coffee-drinker's mouth is smeared with foam of the nitrogen-charged coffee.

When the volume ratio is more than about 80%, the first volume may be excessively high. Thus, the foam layer formed around a upper surface of the nitrogen-charged coffee may be too thin.

FIG. 3 is a cross-sectional view illustrating an apparatus of making coffee in accordance with an example embodiment of the present invention.

Referring to FIG. 3, an apparatus 100 of making coffee in accordance with an example embodiment of the present invention includes a keg 110, a nitrogen tank 120,
5 a first line 130, a discharging unit 140, a second line 150, a first cooling unit 160, a third line 170 and a second cooling unit 180.

The keg 110 stores a coffee 10 therein. The keg 110 is filled with nitrogen gas. Thus, the cold-brewed coffee 10 may be prevented from being reacted with oxygen
10 and being oxidized.

The coffee 10 may include a cold-brewed coffee. For example, the coffee 10 may include the cold-brewed coffee made by a method of making the cold-brewed coffee explained with FIG. 2

The nitrogen tank 120 stores nitrogen gas therein. The nitrogen tank 120 is
15 connected to the keg 110 by the first line 130. The first line 130 may extend such that a end portion of the first line 130 is dipped into the coffee 10 of the keg 110.

Nitrogen gas is provided from the nitrogen tank 120 into the keg110 through the first line 130. In particular, nitrogen gas is bubbled in the coffee 10 to be dissolved in the coffee 10. Thus, a nitrogen-charged coffee may be formed in the
20 keg 110. In order to efficiently dissolve nitrogen gas in the coffee 10, nitrogen gas may be repeatedly provided into the coffee 10. For example, nitrogen gas is provided into the coffee 10 two times.

The nitrogen tank 120 may keep an internal pressure of nitrogen gas between about 6.0 bar to about 6.5 bar.

25 When the internal pressure is less than about 6.0 bar, nitrogen gas may not

be efficiently dissolved in the coffee 10 such that micro-sized foam may not occur to the coffee 10. When the internal pressure is more than about 6.5 bar, the pressure of nitrogen gas is too high, which may cause the nitrogen tank 120 or the first line 130 malfunctioned.

5 The discharging unit 140 is configured to discharge the nitrogen-charged coffee. The discharging unit 140 may include a nozzle 142 and a lever 144. The lever 144 may selectively open/close the nozzle 142 to determine whether the nitrogen-charged coffee is discharged or not. The nozzle 142 may be a passway by which the nitrogen-charged coffee is discharged. Alternatively, the lever 144 may
10 selectively open/close the second line 150 to determine whether the nitrogen-charged coffee is discharged or not.

 The discharging unit 140 is connected with the keg 110 by the second line 150. The second line 150 may extend such that a end portion of the second line 150 is dipped into a low portion of the keg 110.

15 Due to the internal pressure of nitrogen gas in the keg 110, the nitrogen-charged coffee may flow to the discharging unit 140 by the second line 150.

 The first cooling unit 160 surrounds the second line 150. The first cooling unit 160 may circulate cooling water along the second line 150 to cool the nitrogen-charged coffee which flows through the second line 150. Thus, the
20 nitrogen-charged coffee may be supplied into the discharging unit 140 with keeping a temperature of the nitrogen-charged coffee constant.

 Even though not shown in FIG. 3, the first cooling unit 160 may include a circulating line serving as a passway for cooling water, pump for circulating cooling water and a chiller for chilling cooling water to cool the nitrogen-charged coffee at a
25 predetermined temperature.

For example, the predetermined temperature is from about 1°C to about 10°C. More particularly, the temperature is in a range of about 3°C to about 6°C. More preferably, the temperature is about 4°C.

When the first cooling unit 160 may cool the nitrogen-charged coffee having a
5 temperature of less than 1°C, the nitrogen-charged coffee may be frozen to plug the second line 150. Meanwhile, when the first cooling unit 160 may cool the nitrogen-charged coffee having a temperature of more than 10°C, the nitrogen-charged coffee may be lukewarm in a mouth or may have a degraded refreshing taste. Thus, the nitrogen-charged coffee may have a rich flavor, a good
10 density, a good acidity, a good texture, etc.

In some example embodiments of the present invention, the apparatus 100 further includes a third line 170. The third line 170 may connect the nitrogen tank 120 to the discharging unit 140. In particular, the third line 170 may connect the nitrogen tank 120 to the nozzle 142 of the discharging unit 140. The nozzle 142 may
15 be a passway by which nitrogen gas is discharged. The lever 144 may selectively open/close the second line 150 and the third line 170 to determine whether the nitrogen-charged coffee is discharged and whether nitrogen gas is discharged. Thus, the discharging unit 140 may dispense only the nitrogen-charged coffee or dispense both the nitrogen-charged coffee and nitrogen coffee simultaneously
20 through the nozzle 142, depending on an operation of the lever 144

When the lever 144 is positioned at a center, the second line 150 and the third line 170 is kept to be close. When the lever 144 is pulled forwardly, the third line 170 is kept to be close and the second line 150 changes to be open such that the nitrogen-charged coffee is discharged from the nozzle 142 through the second line
25 150. When the lever 144 is pushed backwardly, both the third line 170 and the

second line 150 change to be open such that the nitrogen-charged coffee and nitrogen gas are simultaneously discharged from the nozzle 142 through the second line 150 and the third line 170, respectively.

When the nitrogen-charged coffee is discharged from the nozzle 142 to be provided into a cup, micro-sized foam may be formed on an upper surface of the nitrogen-charged coffee due to nitrogen gas which is dissolved in the nitrogen-charged coffee. Thus, the foam layer is formed on the upper surface of the nitrogen-charged coffee.

When the nitrogen-charged coffee and nitrogen gas are simultaneously discharged from the nozzle 142, micro-sized foam may be affluently formed on an upper surface of the nitrogen-charged coffee due to both nitrogen gas which is dissolved in the nitrogen-charged coffee and nitrogen gas additionally discharged from the nozzle 142. Thus, the foam layer becoming thicker is formed on the upper surface of the nitrogen-charged coffee.

When the nitrogen-charged coffee and nitrogen gas are simultaneously discharged from the nozzle 142, the foam layer may be excessively thick on the upper surface of the nitrogen-charged coffee. Thus, it may be necessary to adjust a ratio between a volume of the nitrogen-charged coffee which is supplied only through the second line 150 and a volume of nitrogen gas and a volume of the nitrogen-charged coffee and nitrogen gas which are simultaneously discharged from the nozzle 142 in order to control a thickness of the foam layer.

The foam layer may be maintained on the surface for a period of time to cover the nitrogen-charged coffee. Thus, the nitrogen-charged coffee may keep a smooth texture, a concentration and a flavor until the nitrogen-charged coffee is drunken up.

Even though not shown in FIG. 3, the first line 130, the second line 150 and

the third line 170 may include valves, respectively. The first line 130, the second line 150 and the third line 170 may be selectively open/close depending on an operation of the valves.

The second cooling unit 180 is configured to receive the keg 110. The
5 second cooling unit 180 cools the nitrogen-charged coffee stored in the keg 110. The second cooling unit 180 may include a refrigerator.

The second cooling unit 180 may chill the nitrogen-charged coffee having a temperature, as the first cooling unit 160 does. The second cooling unit 180 may chill the nitrogen-charged coffee having a temperature from about 1°C to about 10°C.

10 When an excessively large amount of the nitrogen-charged coffee is discharged from the discharging unit 140, the first cooling unit 160 may not be capable of cooling the nitrogen-charged coffee efficiently. Thus, the second cooling unit 180 may chill the nitrogen-charged coffee before providing nitrogen-charged coffee into the discharging unit 140 in order to assist the first cooling unit 160. Thus,
15 even though a large amount of the nitrogen-charged coffee is discharged from the discharging unit 140, the nitrogen-charged coffee may be discharged under a cooled status. As a result, the nitrogen-charged coffee may be prevented from being lukewarm in a mouth or degrading a refreshing taste.

Industrial applicability

20 According to example embodiments of the present invention, nitrogen gas is charged into a cold-brewed coffee so that a foam layer having a thickness may be formed on an upper surface of discharged the nitrogen-charged coffee. Thus, an iced coffee may keep a smooth texture, a rich density of form and a flavor.

Although a few exemplary embodiments of this invention have been
25 described, those skilled in the art will readily appreciate that many modifications are

possible in the exemplary embodiments without materially departing from the novel teachings and advantages of the present invention.

CLAIMS

1. A method of making coffee comprising:
 - extracting a cold-brewed coffee from coffee beans, the cold-brewed coffee being stored in a keg which is occupied with nitrogen gas for preventing the cold-brewed coffee from reacting with oxygen gas and from being oxidized;
 - charging nitrogen gas into the cold-brewed coffee by bubbling the nitrogen gas in the cold-brewed coffee stored in the keg;
 - cooling the cold-brewed coffee into which nitrogen gas is dissolved to form a nitrogen-charged coffee; and
 - dispensing the nitrogen-charged coffee into a cup,
 - wherein dispensing the nitrogen-charged coffee into the cup comprising:
 - discharging the nitrogen-charged coffee from a nozzle partially to fill the cup; and
 - simultaneously discharging the nitrogen-charged coffee and nitrogen gas from the nozzle to additionally fill the cup for generating a micro-sized foams further.
2. The method of making coffee of claim 1, wherein extracting the cold-brewed coffee from the coffee beans comprising:
 - grinding the coffee beans to form a ground coffee;
 - steeping the ground coffee into water to form a mixture having the ground coffee and water;
 - partially extracting an extracted coffee from the mixture; and
 - diluting the extracted coffee with water.
3. The method of making coffee of claim 1, wherein a concentration (TDS) of the cold-brewed coffee is in a range from about 1.36% to about 1.58%.
4. An apparatus of making coffee comprising:
 - a keg storing a cold-brewed coffee and being occupied with nitrogen gas for preventing the cold-brewed coffee from reacting with oxygen gas and from being oxidized;
 - a nitrogen tank containing nitrogen gas, the nitrogen tank being connected with keg by a first line to be configured to provide nitrogen gas by bubbling the nitrogen gas with the keg to form a nitrogen-charged coffee;
 - a discharging unit being connected with the keg by a second line to be configured to discharge the nitrogen-charged coffee;
 - a first cooling unit covering the second line to be configured to cool the nitrogen-charged coffee; and
 - a third line connecting the nitrogen tank with the discharge unit;

wherein the discharging unit is configured to selectively open/close the second line and the third line to selectively discharge the nitrogen-charged coffee or to discharge the nitrogen-charged coffee and nitrogen gas at the same time for generating a micro-sized foams additionally.

5. The apparatus of making coffee of claim 4, further comprising a second cooling unit receiving the keg, the second cooling unit being configured to cool the cold-brewed coffee in the keg.