excess nitrogen to the pressurized beer portion, and returning the pressurized beer portion with excess nitrogen to the holding tank.

JP 61-173771 suggests filling the beer in a container, such as a can, dropping liquid nitrogen (LN2) on the beer surface, and sealing up the above-mentioned container.

US 2014/0339269 A1 relates to a packaging for filling and extraction of beer with addition of nitrogen in the beer. The nitrogen is deposited directly into the packaging in contact with the beer.

US 4,827,965 relates to nitrogen/carbon dioxide mixing valves in which nitrogen and carbon dioxide are admitted, through separate valves actuated by single high hysteresis actuator, into a mixing device when the mixture is fed to a beer keg. The mixture composition remains substantially constant when the N2 and CO2 gases are at substantially different pressure.

None of the above documents deal with the specific problem of introducing nitrogen into a collapsible beverage container filled by a pre-carbonized beverage.

The object according to the present invention is thus to provide technologies for introducing nitrogen into a beverage container comprising a pre-carbonized beverage.

Summary of the invention

According to a first aspect of the present invention obtained by a method of introducing nitrogen into a beverage, the method comprising the steps of:

providing a collapsible beverage container defining an inner volume, the beverage container comprising a cylindrical neck part, the cylindrical neck part having a circumferential rim defining an opening for allowing access to the inner volume, the cylindrical neck part further comprising an outer circumferential flange encircling the cylindrical neck part,

filling the beverage into the inner volume via the opening,

providing a connecting element comprising a cylindrical housing and a circular closure plate, the cylindrical housing comprising a set of inwardly oriented

locking parts,

positioning the connecting element in a first position in which the cylindrical housing is at least partially covering the cylindrical neck part, the set of inwardly oriented locking parts being located adjacent the cylindrical neck part between the outer circumferential flange and the circumferential rim and the circular closure plate being located spaced apart relative to the circumferential rim, thereby defining a fluid path between the connecting element and the cylindrical neck part,

placing a collar about the cylindrical neck part, the collar sealing against the connecting element and the beverage container thereby establishing an annular space outside the cylindrical neck part, the collar comprising a gas inlet for allowing access to the annular space,

injecting gas into the inner space of the beverage container via the gas inlet, the annular space, the fluid path and the opening, and

moving the connecting element towards the cylindrical neck part, thereby causing the connecting element to move from the first position to a second position in which the set of inwardly oriented locking parts moves to an arresting position wherein the outer circumferential flange being located between the opening and the set of inwardly oriented locking parts for arresting the connecting element to the cylindrical neck part, and in which the circular closure plate seals against the circumferential rim, and wherein said gas is nitrogen (N_2), a compound including nitrogen, such as N_2O, or a mixture including nitrogen, such as a mixture of CO_2 and N_2.

The collapsible beverage container as such is known from e.g. EP 1 798 190 B1 and is typically blow molded and of a polymeric material. Such collapsible beverage containers typically comprise an inner volume of between 5 and 50 liters, such as about 25 liters. The beverage container comprises a body part constituting the major part of the beverage container and a neck part which constitutes a minor part of the beverage container. The beverage container is collapsible, i.e. during dispensing the beverage container is capable of being compressed as the beverage is forced out of the beverage container. For the purpose of filling the beverage into the beverage container and dispensing the beverage from the beverage container, the beverage container comprises an opening defined at a rim at the neck part of the beverage container. The neck further comprises an outer circumferential flange for cooperating with a connecting element.

The connecting element constitutes the closing part for closing off the opening of the beverage container. The connecting element also provides an interface to a tapping line of the beverage dispensing assembly for dispensing the beverage from the

to maintain a sealed connection between the collar and the connecting part during the transition from the first position to the second position, the connecting element may be provided with an outer cylindrical wall adapted to slidably seal against the collar.

According to a further embodiment of the first aspect, the collar comprises an upper sealing element sealing against the connecting element, and a lower sealing element sealing against the beverage container. Conversely, the collar may be provided with matching sealing lips for sealing against the connecting element and against the neck part, shoulder part or body part of the beverage container.

According to a further embodiment of the first aspect, the set of inwardly oriented locking parts comprises 2-10 flexible, sloped and spaced apart protrusions. In order to establish a proper fluid part, the protrusions are preferably spaced apart in the annular direction for providing pass through channels when injecting the gas.

According to a second aspect of the present invention obtained by system for introducing nitrogen into a beverage, the system comprising:

a collapsible beverage container defining an inner volume filled by the beverage, the beverage container comprising a cylindrical neck part, the cylindrical neck part having a circumferential rim defining an opening for allowing access to the inner volume, the cylindrical neck part further comprising an outer circumferential flange encircling the cylindrical neck part,

a connecting element comprising a cylindrical housing and a circular closure plate, the cylindrical housing comprising a set of inwardly oriented locking parts, the connecting element being positionable in a first position in which the cylindrical housing is at least partially covering the cylindrical neck part, the set of inwardly oriented locking parts being located adjacent the cylindrical neck part between the outer circumferential flange and the circumferential rim and the circular closure plate being located spaced apart relative to the circumferential rim, thereby defining a fluid path between the connecting element and the cylindrical neck part,

a collar placeable about the cylindrical neck part, the collar sealing against the connecting element and the beverage container thereby establishing an annular space outside the cylindrical neck part, the collar comprising a gas inlet for injecting gas into the inner space of the beverage container via the annular space, the

fluid path and the opening, and

a piston for moving the connecting element towards the cylindrical neck part, thereby causing the connecting element to move from the first position to a second position in which the set of inwardly oriented locking parts moves to an arresting position wherein the outer circumferential flange being located between the opening and the set of inwardly oriented locking parts for arresting the connecting element to the cylindrical neck part, and in which the circular closure plate seals against the circumferential rim, and

wherein said gas is nitrogen (N_2), a compound including nitrogen, such as N_2O, or a mixture including nitrogen, such as a mixture of CO_2 and N_2.

It is understood that the above system according to the second aspect of the invention may be used together with the above methods according to the first aspect.

According to a third aspect of the present invention, there is provided a collapsible beverage container defining an inner volume filled by a beverage, said beverage container comprising:

a cylindrical neck part comprising:

a circumferential rim defining an opening for allowing access to said inner volume; and

an outer circumferential flange encircling said cylindrical neck part,

wherein a gas is introduced in said beverage using the method according to any of claims 1-12, and wherein said gas is nitrogen (N_2), a compound including nitrogen, such as N_2O, or a mixture including nitrogen, such as a mixture of CO_2 and N_2.

Brief description of the drawings

FIG. 1 illustrates a collapsible beverage container before filling.

FIG. 2 illustrates the flushing of the inner volume of the beverage container.

FIG. 3 illustrates the beverage container when it is being filled by beverage.

FIG. 4 illustrates the container when being provided with a connecting element.

FIG. 5 illustrates the beverage container during the nitrogen injection and capping.

FIG. 6 illustrates the beverage container during the nitrogen injection.

FIG. 7 illustrates the beverage container during the capping of the beverage container.

FIG. 8 illustrates the removal of the collar and the piston from the beverage container.

FIG. 9 illustrates the capped beverage container.

Detailed description of the drawings.

FIG. 1 shows a perspective view of a collapsible beverage container 10 before filling. The collapsible beverage container 10 comprises a body part 12, a shoulder part 14 and a neck part 16. The neck part 16 comprises a rim 18 defining an opening 20. The neck part 16 further comprises a first circumferential flange 22 and a second circumferential flange 24.

The beverage container 10 is preferably made of blow molded plastic, such as PET. The beverage container defines an inner volume 28. Typical values for the inner volume are between 2 liters and 50 liters.

Claims

1. A method of introducing nitrogen into a beverage, said method comprising the steps of:

providing a collapsible beverage container defining an inner volume, said beverage container comprising a cylindrical neck part, said cylindrical neck part having a circumferential rim defining an opening for allowing access to said inner volume, said cylindrical neck part further comprising an outer circumferential flange encircling said cylindrical neck part,

filling said beverage into said inner volume via said opening,

providing a connecting element comprising a cylindrical housing and a circular closure plate, said cylindrical housing comprising a set of inwardly oriented locking parts,

positioning said connecting element in a first position in which said cylindrical housing is at least partially covering said cylindrical neck part, said set of inwardly oriented locking parts being located adjacent said cylindrical neck part between said outer circumferential flange and said circumferential rim and said circular closure plate being located spaced apart relative to said circumferential rim, thereby defining a fluid path between said connecting element and said cylindrical neck part,

placing a collar about said cylindrical neck part, said collar sealing against said connecting element and said beverage container thereby establishing an annular space outside said cylindrical neck part, said collar comprising a gas inlet for allowing access to said annular space,

injecting gas into said inner space of said beverage container via said gas inlet, said annular space, said fluid path and said opening, and

moving said connecting element towards said cylindrical neck part, thereby causing said connecting element to move from said first position to a second position in which said set of inwardly oriented locking parts moves to an arresting position wherein said outer circumferential flange being located between said opening and said set of inwardly oriented locking parts for arresting said connecting element to said cylindrical neck part, and in which said circular closure plate seals against said circumferential rim, and

wherein said gas is nitrogen (N_2), a compound including nitrogen, such as N_2O, or a mixture including nitrogen, such as a mixture of CO_2 and N_2.

2. The method according to claim 1, wherein said beverage is a carbonated beverage, preferably beer, more preferably stout or porter.

3. The method according to any of the claims 1-2, wherein said collar comprises a first collar half part and a second collar half part, when placing said collar about said neck part, said first collar half part and said second collar half part mutually sealing against each other forming said collar.

4. The method according to any of the preceding claims, wherein said cylindrical neck part comprises a further outer circumferential flange constituting a delimitation between said cylindrical neck part and a body part of said beverage container, said collar sealing against said body part of said beverage container adjacent said further outer circumferential flange.

5. The method according to any of the preceding claims, wherein said connecting element is moved towards said neck part using a piston.

6. The method according to any of the preceding claims, wherein said beverage container is a blow molded beverage container, preferably made of plastic.

7. The method according to any of the preceding claims, wherein said gas is injected at a pressure of above 2 barg, such as 3 to 4 barg, and even higher, such as 5 to 10 barg, or even 10-15 barg.

8. The method according to any of the preceding claims, wherein said circular closure plate comprises a pierceable membrane.

9. The method according to any of the preceding claims, wherein said gas inlet comprises a check valve and/or a pressure gauge.

10. The method according to any of the preceding claims, wherein said connecting element comprises an outer cylindrical wall adapted to slidably seal against said collar.

11. The method according to any of the preceding claims, wherein said collar comprises an upper sealing element sealing against said connecting element, and a lower sealing element sealing against said beverage container.

12. The method according to any of the preceding claims, wherein said set of inwardly oriented locking parts comprises 2-10 flexible, sloped and spaced apart protrusions.

13. A system for introducing nitrogen into a beverage, said system comprising:

a collapsible beverage container defining an inner volume filled by said beverage, said beverage container comprising a cylindrical neck part, said cylindrical neck part having a circumferential rim defining an opening for allowing access to said inner volume, said cylindrical neck part further comprising an outer circumferential flange encircling said cylindrical neck part,

a connecting element comprising a cylindrical housing and a circular closure plate, said cylindrical housing comprising a set of inwardly oriented locking parts, said connecting element being positionable in a first position in which said cylindrical housing is at least partially covering said cylindrical neck part, said set of inwardly oriented locking parts being located adjacent said cylindrical neck part between said outer circumferential flange and said circumferential rim and said circular closure plate being located spaced apart relative to said circumferential rim, thereby defining a fluid path between said connecting element and said cylindrical neck part,

a collar placeable about said cylindrical neck part, said collar sealing against said connecting element and said beverage container thereby establishing an annular space outside said cylindrical neck part, said collar comprising a gas inlet for injecting gas into said inner space of said beverage container via said annular space, said fluid path and said opening, and

a piston for moving said connecting element towards said cylindrical neck part, thereby causing said connecting element to move from said first position to a second position in which said set of inwardly oriented locking parts moves to an arresting position wherein said outer circumferential flange being located between said opening and said set of inwardly oriented locking parts for arresting said connecting element to said cylindrical neck part, and in which said circular closure plate seals against said circumferential rim, and

wherein said gas is nitrogen (N_2), a compound including nitrogen, such as N_2O, or a mixture including nitrogen, such as a mixture of CO_2 and N_2.

14. A collapsible beverage container defining an inner volume filled by a beverage, said beverage container comprising:

a cylindrical neck part comprising:

a circumferential rim defining an opening for allowing access to said inner volume; and

an outer circumferential flange encircling said cylindrical neck part,

wherein a gas is introduced in said beverage using the method according to any of claims 1-12, and wherein said gas is nitrogen (N_2), a compound including nitrogen, such as N_2O, or a mixture including nitrogen, such as a mixture of CO_2 and N_2.