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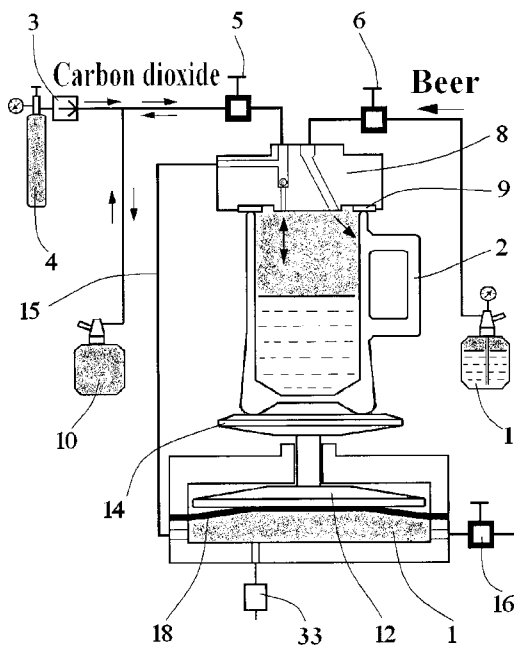
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- of inventorship (Rule 4.17(iv))

[Continued on next page]

(54) Title: DISPENSING OF FIZZY BEVERAGES UNDER COUNTER - PRESSURE



**Fig. 2**

(57) Abstract: The invention relates to an appliance for dispensing fizzy beverages into bottles, mugs or glasses under counter-pressure. In a first step the beverage container is mounted to the appliance in a pressure-proof chamber and then the container is pressurised by connecting it to a source of inert gas. During the filling of the container with beverage, the gas pressure is controlled in order to maintain it within given limits. The gas which is displaced by the beverage is fed to an expansion tank.



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## DISPENSING OF FIZZY BEVERAGES UNDER COUNTER - PRESSURE

5

## Technical field

The claimed inventions (method and apparatus) united by the common inventive  
10 conception (idea) relate to food industry, specifically to commercial appliances and may  
be used in retail trade for filling beer and other effervescent or/and fizzy beverages (beer,  
kvass, lemonade, cola, mineral water, etc.) in containers of different type and size -  
plastic or glass bottles (to be taken away), mugs or glasses (including disposable cups),  
manually or automatically, from an isobaric (pressurized) container (for example, so  
15 called "keg"), cistern or tank at retail establishments, shops, kiosks, cafes, bars and  
restaurants, including filler vending machines standing in streets, parks, establishments  
and public places (railway stations, airports, trade centers, exhibition halls, etc.)

## Background Art

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There is known a method for filling of effervescent and/or fizzy beverages under  
counterpressure, embodied in different apparatuses and appliances with tools for  
control of counterpressure, sealing means for different join of the neck of the container to  
the apparatus or with an airproof chamber for placing the container (see the patents and  
25 patent applications: RU2368828; RU2364568; RU2381174; RU2009122998; RU2337053;  
RU2266862; RU2168458; RU66741; RU98411; RU81717; RU2181100; RU2000111838;  
RU84010; RO2009122601; RU2008145355; RU2006143170; RU98754; RU94560;  
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RU36371; RU101679; RU85464; CN2049643; AU3370278; AU3370178; AU20055176;  
30 GB1131559; GB1078708; GB284748; GB213831. see also the video clip by Russian  
company PEGAS <http://www.youtube.com/v/cROKivyouOg>). The drawback of all of them  
consists in the comparative slowness of the process, inconvenience in handling and  
maintenance, greater demand in consumables and less versatility.

A method embodied in “Device for Hand Dispensing of Foamy and/or Carbonated Beverages “Pegas-M” (see the patent of Russia RU2337053, see also video clip by Russian company “PEGAS” <http://www.youtube.com/v/cROKivyouOg> ) is the most similar to the method of claim 1 of the invention and is chosen as its prototype.

5 The said method foresees sealed join of the neck of the polyethylene bottle to the body of the dispensing device by an operator, opening of gas cock connected with gas bomb, creation of preliminary counterpressure by means of letting carbon dioxide into the container and instant shutting of the cock. Further, through the opening of the beverage supply cock by the operator, the beverage is fed under pressure from the keg  
10 into the bottle and the last is gradually filled up. While filling up, foaming, from the one side, and increasing of counterpressure and interruption of the filling process on the other side are avoided by means of slow deflation of carbon dioxide from the bottle into the atmosphere by means of a throttling cock, which is controlled manually by the operator. In other words, if the operator opens it overly, this causes excessive drop of  
15 counterpressure, beer foams, loses gas and taste, but if the operator opens it insufficiently and gives less possibility to gas for displacement into the atmosphere – liquid will press from the bottom upwards the bottle, the counterpressure in it will grow more and the filling process will slow down or stop. When the bottle is filled, the operator shuts the beverage cock, lets the remains of gas out from the bottle by opening of the  
20 throttling cock, releases the neck holder and removes off the device.

The drawback of the said method consists firstly in comparative slowness of the process caused by complexity of handling consisting in necessity of manual control of counterpressure, also greater demand in consumables, because all the amount of carbon dioxide that was let in for creation of counterpressure in the bottle is expelled in  
25 the atmosphere. Also this method is less versatile because doesn't provide filling of bigger containers (e.g. polypropylene 5 liter vessel, which doesn't resist more than 2 atmosphere internal pressure). The main is that this method couldn't been used for open containers – for filling under counterpressure beer into a mug, mineral water or cola into glass (including plastic cup), because it doesn't provide possibility of sealed mounting  
30 of its neck. Also, the said method couldn't provide possibility for process mechanization excluding necessity of control by the operator.

The same “Device for Hand Dispensing of Foamy and/or Carbonated Beverages “Pegas-M” (see the patent of Russia RU2337053, see also video clip by Russian company “PEGAS” <http://www.youtube.com/v/cROKivyouOg> ) is the most similar to the

apparatus of the independent claims 3, 13 and 22 of the invention and is chosen as its prototype.

5 The prototype comprises a device for supply of draught beverages – a beer keg and a carbon dioxide bomb for creation of counterpressure in the container, which are connected by pipes to carbon dioxide and beverage supply valves (in a form of a tree-  
position cock) and joined to the holding base equipped with tight holder for the threaded  
bottle neck. Also comprises a tool for preserving/controlling of counterpressure in the  
container in a form of a manually controlled throttling cock.

10 The drawback of the prototype consists in comparative slowness and inconvenience of the filling process caused by necessity of manual control of counterpressure, also, greater demand in consumables, because all the amount of carbon dioxide that was let in for creation of counterpressure in the bottle is expelled in the atmosphere. Also this method is less versatile because doesn't provide filling of  
15 bigger containers (e.g. polypropylene 5 liter vessel, which doesn't resist more than 2 atmosphere internal pressure). The main is that this method couldn't been used for open containers – for filling under counterpressure beer into a mug, mineral water or cola into glass (including plastic cup), because it doesn't provide possibility of sealed mounting of its neck. The design of the said device is complicated and correspondingly unreliable – only the tree-position cock comprises about 40 details that need periodical  
20 cleaning/maintenance. Also, the said device couldn't provide possibility for process mechanization excluding necessity of control by the operator.

The method described in the video clip by Russian company "PEGAS" <http://www.youtube.com/v/cROKivyouOg> is the most similar to the method of claim 29 of the invention and is chosen as its prototype.

25 The said method foresees loose (without fixing of neck) placing of the beer mug or glass in an airproof chamber of the dispersing device by the operator, opening of the gas cock (valve) connected to the gas bomb, inlet of carbon dioxide in the container and by means of it creation of preliminary counterpressure in the chamber and instant shut of the valve. Further, through the beverage supply valve opened by the operator  
30 beverage is fed under pressure from the beverage keg into the mug and the last gets filled gradually. While filling up, foaming, from the one side, and increasing of counterpressure and interruption of the filling process on the other side are avoided by means of slow deflation of carbon dioxide from the chamber into the atmosphere by means of a throttling cock, which is controlled manually by the operator. When the mug

is filled up with beverage, the operator shuts the beverage cock, lets the remains of gas out from the chamber by opening of the throttling cock, opens the chamber and removes the mug out of it.

. The drawback of the said method consists firstly in comparative slowness of the process caused by complexity of handling consisting in necessity of manual control of counterpressure, also greater demand in consumables, because all the amount of carbon dioxide that was let in for creation of counterpressure in the chamber is expelled in the atmosphere. Also, the said method couldn't provide possibility for process mechanization excluding necessity of control by the operator.

The device described in the video clip by Russian company "PEGAS" <http://www.youtube.com/v/cROKivyouOg> is the most similar to the apparatus of claim 31 of the invention and is chosen as its prototype.

The prototype comprises a device for supply of draught beverages – a beer keg and a mug, and a carbon dioxide bomb for creation of counterpressure in an airproof chamber where the mug is placed in, which are connected by pipes to carbon dioxide and beverage supply valves and joined to the said chamber. Also comprises a tool for preserving/controlling of counterpressure in the chamber in a form of a manually controlled throttling cock.

The drawback of the prototype consists in comparative slowness and inconvenience of the filling process caused by necessity of manual control of counterpressure, also, greater demand in consumables, because all the amount of carbon dioxide that was let in for creation of counterpressure in the chamber is expelled in the atmosphere, also, the said device couldn't provide possibility for process mechanization excluding necessity of control by the operator as well.

#### Aim of the Invention

The claimed inventions united by the common inventive idea are directed to the integrated achievement of the following technical/beneficial effect:

1. increase of filling process productivity (at least twice);
2. simplification of handling of filling process, that excludes need in manual control of counterpressure and provides steadiness of filling process without foaming regardless of qualification of the operator;

3. filling without loose of gas content in the beverage, that preserves the best qualities and taste of the beverage;
4. possibility to construct a trade apparatus (that is a unique result) for automatic filling of disposable cups and for half-automatic (mechanized) filling under counterpressure of polyethylene (1-10 liters) and glass containers of different type and volume, and mugs;
5. complete saving of inert gas (carbon dioxide) used for creation of counterpressure in the container, that means reduction in cost of process and of gas bombs supply;
6. simplification of design of the filling apparatus – it doesn't comprise any more a counterpressure controlling cock having a throttling channel, threaded lock for fixing container (while filling bottles), etc., that all required daily preventive maintenance (cleaning).

15 **Disclosure of the Invention**  
(novelty, inventive step)

The given problem is solved and the technical/beneficial effect is achieved by the method declared in the independent claim 1 of the invention because the method for retail filling of effervescent beverages under counterpressure, providing a consecutive cycle: sealed mounting of a neck of a container to be filled with beverage on an apparatus manually or mechanically, by an operator or a consumer, opening a gas cock connected by means of a pipe to a source of gas under pressure, for example a bomb, and creation of preliminary counterpressure by means of inlet of inert gas, for example of carbon dioxide or cleaned air, into the container, inlet under pressure of effervescent beverage into the same container from a tank, for example a keg, by means of opening a beverage supply cock, and gradual filling during which foaming of beverage on the one hand and increase of counterpressure and interruption of the filling process on the other hand are avoided by means of creating a possibility for displacement of the gas from the container when preserving/controlling counterpressure within needed limits, but after filling up the container with the beverage, the method provides shutting-off the beverage cock, outlet of remaining gas from the container and removal of the container off the apparatus,

possesses the following distinguishing essential features:

- the displacement of the gas from the container when preserving/controlling the counterpressure within the needed limits is provided by means of an expansion tank connected to the pipe between the source of the gas and the gas cock, and in conditions of open gas cock, by means of backward pass through which a free and self-sustained cross flow of the gas displaced from the container during the beverage filling, is performed;
- a volume of the expansion tank is chosen not less than twice bigger than a volume of the container to be filled with the beverage, in consequence of which the preserving/controlling of counterpressure is provided with variation within limits not exceeding its 50%.

The given problem is solved and the technical/beneficial effect is achieved by the apparatuses declared in the independent claims 3, 10 and 22 of the invention, because the apparatus for retail filling of effervescent beverages under counterpressure, comprising a feature for supplying effervescent beverage to be poured under pressure and a source of inert gas or cleaned air for creation of counterpressure in the container, for example a bomb or a pump, which are connected by pipes to cocks feeding the container with beverage and gas correspondingly, and joined to a mounting body equipped with container's neck sealing means, comprises also a device for preserving/controlling the counterpressure in the container,

possesses the following distinguishing essential features:

- the device for preserving/controlling counterpressure in the container is comprised in a form of an expansion tank connected to the pipe between the source of the gas and the gas cock;
- a volume of the expansion tank is not less than twice bigger than a volume of the container to be filled with beverage;
- for sealed mounting of the neck of the container to the body comprises a pneumatic cylinder, a moving member of which is equipped with a heel supporting a bottom of the container and working volume is connected to an outlet leading from the gas cock to the neck of the container;
- for sealed mounting of the neck of the container to the body comprises a diaphragm pneumatic cylinder;
- the heel supporting the bottom of the container or the moving member of the pneumatic cylinder are equipped with flexible element, for example with a spring or a diaphragm, elastic force of which exceeds the total weight of the empty

container to be filled, the heel and the moving member of the pneumatic cylinder – a piston or the cylinder itself;

- the pneumatic cylinder is selected so that its working area is bigger than cross-section of the neck of the container, and the difference between them multiplied by value of counterpressure exceeds the total weight of the filled up container, the heel and the moving element of the pneumatic cylinder – the piston or the cylinder itself;
- is equipped with changeable supporting heels, correspondingly adopted by size to the bottoms of the containers to be filled, having different length and shape;
- in order to avoid damage of the container, the piston of the pneumatic cylinder or the cylinder are made with a stroke limiter;
- the mounting body is equipped with changeable adaptors, equipped with a sealing element or made of materials with sealing abilities and adapted correspondingly to the necks of containers of different types and sizes;
- the pipe for inert gas or cleaned air, which create counterpressure is supplied with an extreme pressure or pressure reducing valve mounted on the pneumatic cylinder;
- for the automation of filling process, automatically controlled cocks for gas and beverage feeding are employed in the apparatus;
- is equipped with the control transducer of the upper level of the filled beverage;
- the control transducer of the upper level of the filled beverage comprises a float dropped into the container.

The given problem is solved and the technical/beneficial effect is achieved by the method declared in the independent claim 29 of the invention because the method for retail filling of effervescent beverages under counterpressure, providing a consecutive cycle: placing of an open container to be filled with beverage in an airproof chamber, manually or mechanically, by an operator or a consumer, opening a gas cock connected by means of a pipe to a source of gas under pressure, for example a bomb, and creation of preliminary counterpressure by means of inlet of inert gas, for example of carbon dioxide or cleaned air, into the chamber and the container, inlet under pressure of effervescent beverage into the same container from a tank, for example a keg, by means of opening a beverage supply cock, and gradual filling during which foaming of beverage on the one hand and increase of counterpressure and interruption of the filling process on the other hand are avoided by means of creating a possibility for displacement of the

gas from the chamber and the container when preserving/controlling counterpressure within needed limits, but after filling up the container with the beverage, the method provides shutting-off the beverage cock, outlet of remaining gas from the chamber and removal of the container off the apparatus, possesses the following distinguishing essential features:

- the gas displacement when preserving/controlling the gas counterpressure within the needed limits is provided by means of an expansion tank connected to the pipe between the source of the gas and the gas cock, and in conditions of open gas cock, by means of backward pass through which a free and self-sustained cross flow of the gas displaced from the chamber and the container into the expansion tank during the beverage filling, is performed;
- the volume of the expansion tank is chosen not less than twice bigger than a volume of the chamber for placing container to be filled with the beverage, in consequence of which the preserving/controlling of counterpressure is provided with variation within limits not exceeding its 50%.

The given problem is solved and the technical/beneficial effect is achieved by the declared apparatus (independent claims 31 of the invention), because the apparatus for retail filling of effervescent beverages under counterpressure, comprising a feature for supplying effervescent beverage to be poured under pressure and a source of inert gas or cleaned air for creation of counterpressure in a container, for example a bomb or a pump, which are connected by pipes to beverage and gas feeding cocks and to an airproof chamber for placing open container, comprises also a device for preserving/controlling counterpressure in the chamber and the container,

possesses the following distinguishing essential features:

- the device for preserving/controlling counterpressure in the chamber and the container is comprised in a form of an expansion tank connected to the pipe between the source of the gas and the gas cock;
- the volume of the expansion tank is not less than twice bigger than a volume of the airproof chamber;
- the pipe of inert gas is supplied with an extreme pressure or pressure reducing valve, which is mounted on the airproof chamber.

There is the following cause-effect connection between the distinctive features and the achieved technical/beneficial results:

- due to incorporation of the extension tank in the counterpressure preserving/controlling system, the operator gets free of complex procedure of attentive and masterful control of cocks and therefore steadiness and stability of filling process is realized that grows productivity;
- 5 - as a fallout, used carbon dioxide is nearly fully saved in the extension tank, moreover, if the whole amount of this carbon dioxide was expelled in the atmosphere before, now it is replenished with gas emitted from the beverage itself during the filling, flows and remains into the extension tank and is let out of it only under excessive pressure through the induction valve;
- 10 - as soon as there is no more need in attentive and adjusting control by operator, there arises possibility of simple automation and creation of trade apparatuses for dispense under counterpressure. Apparatuses for filling effervescent beverages in open containers are well known, but filling under counterpressure ensures better quality and taste of the beverage;
- 15 - the design of the filling apparatus is simplified – it doesn't comprise any more the counterpressure controlling cock having throttling channel, fixing threaded lock (while filling bottles), etc, that required daily preventive maintenance (cleaning).

The said distinguishing essential features of the declared inventions, their unity and combination, according to the information available to the author are new against the  
20 known methods and devices and in his opinion doesn't follow for the specialist obviously from the common knowledge as well.

#### Embodiments of the Invention (industrial applicability)

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The essence of the invention is disclosed by means of figures that show the following:

Fig.1 – a basic diagram of apparatus “Perto” for manual (or half-automatic) filling under counterpressure of effervescent beverages (e.g. beer) into plastic or glass bottles;

30 Fig.2 - a basic diagram of apparatus “Perto” for manual (or half-automatic) filling under counterpressure of beer into a mug or a glass;

Fig.3 - a basic diagram of apparatus for filling under counterpressure of effervescent beverages (mineral water, cola) into plastic disposable cups;

Fig.4 - a basic diagram of apparatus "Perto" for manual (or half-automatic) filling under counterpressure of beer into an open mug, glass or plastic cup.

The declared apparatuses of independent claims 3, 10, 22 and 29 comprise the device (1) for supply of draught beverages under pressure, e.g. beer isobar keg, and the source of inert gas for creation of counterpressure in the container (2), e.g. gas bomb (4) supplied with reduction (pressure lowering) check valves (3), the said device and source connected with pipes to the gas supply cock (5) and beverage supply cock (6) and joined to the neck (7) of the container to be filled (6) holding base (8). The last is supplied with sealing mean (9) that comprises a ring, for example of gum, that corresponds the neck (7) of the container (2). The apparatuses also comprise the tool for preserving/controlling counterpressure in the container (2), the said tool is embodied in a form of an extension tank (10) connected to the pipe between the source of the inert gas (4) and the gas cock (5). The volume of the expansion tank (10) is chosen not less than twice bigger than the volume of the container (2) to be filled with the beverage and a vessel discharged from effervescent beverage, for example, the beer isobaric keg may be used for this purpose.

The declared apparatus of claim 10 comprises in addition a pneumatic cylinder (11) designed for sealed mounting of the neck (7) of the container (2) to the body, a piston (12) or a cylinder of which are equipped with a heel (14) supporting a bottom (13) of the container (2) and its working volume is conjointly connected by the pipe (15) to an outlet leading from the gas cock (5) to the neck (7) of the container (2). On the pipe (15) connecting the pneumatic cylinder (11) and the neck (7) of the container (2) (or on the pneumatic cylinder (11) itself) a cock (16) for outlet of the remained gas from the container is provided. It is preferable (structurally optimal) the pneumatic cylinder (11) to be of a diaphragm type. The heel (14) supporting the bottom (13) of the container (2), or the piston (12), or the cylinder are equipped with flexible element, for example with a spring (17) or a diaphragm (18), elastic force of which exceeds the total weight of the empty container (2) to be filled, the heel (14) and the moving member of the pneumatic cylinder – the piston (12) or the cylinder itself. The pneumatic cylinder (11) is selected so that its working area is bigger than cross-section of the neck (7) of the container (2), and the difference between them multiplied by value of counterpressure exceeds the total weight of the filled up container (2), the heel (14) and the moving element of the pneumatic cylinder – the piston (12) or the cylinder itself. The apparatus is supplied with changeable supporting heels (14), correspondingly adopted by size to the bottoms (13) of the containers (2) to be filled, having different length and shape. In order to avoid

damage of the container (2), the piston (12) of the pneumatic cylinder (11) or the cylinder are made with a stroke limiter (19). The mounting body (8) is equipped with changeable adaptors (aren't shown on the figures), equipped with sealing element (9) or made of materials with sealing abilities and adapted correspondingly to the necks (7) of  
5 containers (2) of different types and sizes.

The declared automatic apparatus of independent claim 22 is designed for filling disposable plastic or paper (cellulose) cups under counterpressure. Rigidity of disposable plastic cups (20) is not adequate against the counterpressure, therefore the heel (14) for filling effervescent beverages is embodied in a form of a seat (21) matched  
10 to the overall exterior shape of cups (20). An upper neck of the seat (21) is adopted for underneath support of the neck of the cup (20) and the sizes of the seat (21) are performed so that spacing between the seat and the external side of the cup (20) is created. In order to counterpoise pressure on the internal and external sides of the cup (20) and avoid its damage, the pipe (15) equipped with cock (16) for the outlet of  
15 remained gas, conjointly connects the internal volume of the cup (20) with volume created by the spacing (22) between the seat (21) and the cup (20). A means for the sealed mounting of the cup (20) to the body (8) is embodied in a form of an electromechanical device (e.g. gearing) equipped with servomotor (23) for vertical feed of the seat (21). It comprises a central stand (24) for the empty cup that plays a role of a tray  
20 for serving the filled taken off cup (20) to the customer. Such embodiment is optimal for half-automatic (where the cup is put on and taken off manually) filling apparatuses. What about the filling automat, some amount of plastic cups is loaded in beforehand and the apparatus may comprise a device for automatic cup load-unload (isn't shown on the figures).

The declared apparatus of independent claim 31 is designed for filling open  
25 containers, specifically mugs, glass or disposable plastic or paper (cellulose) cups under counterpressure. It comprises an airproof chamber (25) for placing in a container, the said chamber having a hermetically closed door (26) with a handle (27). An aperture of the door (26) of the chamber (25) is equipped with a sealing rubber (28). A float (29) is  
30 hung above the mug placing spot and is positioned with possibility of interaction with an electric transducer (30) connected to the beverage filling control device.

For the purpose of automation of the filling process, in all the embodiments of the apparatuses described above, the counterpressure creating inert gas intake-outlet cock (5), beverage supply cock (6) and the remained gas outlet cock (16) may be embodied

electrically controlled (they are well known), but the apparatuses may be equipped with a button (31) and a control device - interface (32), that after the pushing button, automatically provides opening-shutting of the cocks and (in case of filling disposable plastic cups) the necessary consistency in the work of the servomotor (23). For this purpose the apparatuses may be equipped with transducers of different types, for example, of inductive type (30) connected with the control device monitoring counterpressure and beverage filling. In all the embodiments of apparatuses described above it is preferable and they are equipped with extreme pressure or pressure reducing valve (33) that is joined to the counterpressure creating inert gas pipe (15) at any place, for example, is mounted on the adjacent pneumatic cylinder (11). The valve (33) is set up on maximal pressure 1,5 kg/sq.sm (atmosphere).

The declared filling apparatuses of independent claims 3 and 10 of the invention operate, and the method of independent claim 1 is consistently embodied in them in the following way:

The operator mounts the container (2) to be filled up, for example, a polyethylene or glass bottle, a cup or a mug on the apparatus. Therefore the operator press the bottom of the container (2) on the hill (14) supplied with the spring (17) of the piston (12) of the pneumatic cylinder (11) or with springy diaphragm (18), the said hill descends, retracts the neck (7) and fits it under the holding body (8) equipped with the sealing rubber ring (9), the operator looses the hand and the container by force and by means of the spring (17) or the diaphragm (18) presses by the neck (7) against the rubber ring (9). After that the operator opens fully the gas cock (5) connected by pipe to the gas source (4) under pressure, for example, with a bomb supplied with non return valve (3). The inert gas, for example, carbon dioxide enters the container (2) via the pipe performed in the holding body (8) and connecting the gas cock (5) with the neck (7) of the container (2), with the pressure 1,5 kg/sq.sm (atmosphere). At the same time the same gas enters simultaneously in the pneumatic cylinder (11) adjoined to the bottom (13) of the container (2) and as soon as its working area is bigger than the cross-section of the neck (7) of the container (2), the container (2) and its neck (7) press to the sealing rubber ring (9) by themselves so that the stroke limiter (19) excludes the excessive press and the damage of the container (2). The conterpressure is created in the container (2) instantly. The operator leaves the gas cock (5) open in the same position. After that the operator opens to the beverage supply cock (6). The beverage is supplied under pressure to the container (2) from the tank (1), for example from the keg so that its flow is directed to the

wall of the container (2) at an angle (to lower foaming). The container (2) fills up gradually from the bottom upwards and compresses the carbon dioxide. At this, without operator's interference the gas discharges from the container (2) back into the supply pipe. The gas couldn't return to the bomb (4) equipped with the reduction return valve (3). At this, during the filling the container (2) with beverage, the counterpressure increases proportionally and when gets equal to the beverage supply pressure (2.5-3 atmosphere), the filling would interrupt, but only if there wouldn't be the extension tank (10) joined constantly to the pipe connecting the gas cock (5) and the gas bomb (4).

The gas discharged from the container (2) flows to the extension tank (10) and thus the preserving/controlling of the counterpressure is performed by itself in the limits that depend on proportion between the volumes chosen for the container (2) and the extension tank (10). For example, if the volume of the extension tank (10) is 3 times bigger than the volume of the container (2), the change of counterpressure will take place within 25% only (1-1.25 atmosphere), but if its twice bigger, than within 1-1.5 atmosphere. Thus, foaming of the beverage on the one hand and increase of counterpressure and interruption of the filling process on the other hand are avoided by means of creating possibility for displacement of the gas from the container (2) and preserving/controlling counterpressure within needed limits that is performed by itself without the interference of the operator. When the container (2) is filled up, the operator shuts firstly the beverage cock (6), then the gas cock (5). Afterwards, the operator opens cock (16) for letting the remains of the gas out from the container (2), the remained gas expels into the atmosphere that releases the container from the holder instantly and the operator immediately shuts the cock (16). Thus the only amount of the gas remained in the container filled up with the beverage and in the diaphragm pneumatic cylinder (11) will expel into the atmosphere and form the spending of carbon dioxide that is negligible. Moreover, actually there takes place compensation of this waste, because the effervescent beverage is as a rule supplied by discharge of the inert gas from the same bomb and it is accompanied with excessive gas that still gathers in the extension tank, but the excess is let out via reduction valve (33). The process completes by taking the filled up container (2) out of the apparatus.

The declared filling apparatus of independent claim 22 of the invention embodied as an automat operates, and the filling method of independent claim 1 in distinction from the said above (in terms of filling disposable plastic cups) is embodied in it in the following way:

A customer puts (or it starts automatically) disposable plastic cup (20) to be filled with beverage on the stand (24) and press button on control panel (31). By starting the servomotor (23) the control device (32) provides firstly ascent of the seat (21) with the cup (20) and tight press against the body (8), shutdown of the servomotor (23) and then  
5 opening of carbon dioxide supplying electrically controlled cock (5), that creates counterpressure in the cup (20). At this, the remained gas outlet cock (16) is closed, but counterpressure creating gas cock (5) is open and preserving/controlling of counterpressure occurs by itself due to overflow of the inert gas discharged from the cup (20) into the extension tank (10). When the cup (20) is filled up with the beverage, the  
10 control device (32) shuts firstly the beverage cock (6), then the gas cock (5) and then opens even for 1 second and shuts again the remained gas outlet cock (16). After that, the control device (32) starts the servomotor (23) in the opposite direction that releases the cup (20) from the seat (21) and descends the cup by the stand (24) to the starting position, where the customer takes it away.

15 The declared apparatus with an airproof chamber of independent claim 31 of the invention operates, and the filling method of independent claim 29 is embodied in it in distinction from the said above in the following way:

A customer or a barman puts a mug or a glass to be filled with beverage in the chamber (25) and shuts the door (26). The handle (27) fixes the utmost positions of the  
20 door (26) at the same time. Further the customer or the barman press button on the control panel (31). The control device (32) provides opening of the carbon dioxide supplying electrically controlled cock (5) and inlet of carbon dioxide in the chamber (25). The gas press the door (26) from the inside and compresses the rubber sealing (28), that creates counterpressure in the chamber. Instantly occurs an automatic opening of  
25 the carbon dioxide supplying electrically controlled cock (6) and filling of the container (2) with the beverage starts. At this, the remained gas outlet cock (16) is closed, but the counterpressure creating gas cock (5) is open and preserving/controlling of counterpressure occurs by itself due to overflow of the inert gas discharged from the chamber (25) into the extension tank (10). When filling up the mug (2) the beverage level  
30 elevates the float (29), which switches on the transducer (30). The control device (32) shuts firstly the beverage cock (6), then the gas cock (5) and then opens even for 1 second and shuts again the remained gas outlet cock (16). After that the customer or the barmen open the door (26) and take the filled up mug (2) away.

As we see, the filling process takes the course without interference of the operator, without need in manual control, in a smooth manner, without foaming and quickly, that didn't take place in the known devices.

5 The declared methods and apparatuses give an opportunity (that preserves the maximal gas saturation of the beverage) of quick and easy filling of bottles, mugs and glasses, including disposable, including automatic, without spending carbon dioxide on counterpressure. Such an achievement is not known to the author.

10 The author has embodied and tested sample apparatuses according to the declared inventions, by means of which the declared method were fulfilled. The results of the tests completely proved the said technical/beneficial effect.

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## CLAIMS

1. A method for retail filling of effervescent beverages under counterpressure, providing  
5 a consecutive cycle: sealed mounting of a neck of a container to be filled with  
beverage on an apparatus manually or mechanically, by an operator or a consumer,  
opening a gas cock connected by means of a pipe to a source of gas under pressure,  
for example a bomb, and creation of preliminary counterpressure by means of inlet of  
10 inert gas, for example of carbon dioxide or cleaned air, into the container, inlet under  
pressure of effervescent beverage into the same container from a tank, for example a  
keg, by means of opening a beverage supply cock, and gradual filling during which  
foaming of beverage on the one hand and increase of counterpressure and  
interruption of the filling process on the other hand are avoided by means of creating  
15 a possibility for displacement of the gas from the container when  
preserving/controlling counterpressure within needed limits, but after filling up the  
container with the beverage, the method provides shutting-off the beverage cock,  
outlet of remaining gas from the container and removal of the container off the  
apparatus, *wherein* the displacement of the gas from the container when  
20 preserving/controlling the counterpressure within the needed limits is provided by  
means of an expansion tank connected to the pipe between the source of the gas and  
the gas cock, and in conditions of open gas cock, by means of backward pass  
through which a free and self-sustained cross flow of the gas displaced from the  
container during the beverage filling, is performed;
2. The method according to the claim 1, *wherein* a volume of the expansion tank is  
25 chosen not less than twice bigger than a volume of the container to be filled with the  
beverage, in consequence of which the preserving/controlling of counterpressure is  
provided with variation within limits not exceeding its 50%;
3. An apparatus for retail filling of effervescent beverages under counterpressure,  
30 comprising a feature for supplying effervescent beverage to be poured under  
pressure and a source of inert gas or cleaned air for creation of counterpressure in  
the container, for example a bomb or a pump, which are connected by pipes to cocks  
feeding the container with beverage and gas correspondingly, and joined to a  
mounting body equipped with container's neck sealing means, comprises also a  
35 device for preserving/controlling the counterpressure in the container, *is*

*characterized by* being adapted for implementation of the method according to the claim 1, wherefore the device for preserving/controlling counterpressure in the container is comprised in a form of an expansion tank connected to the pipe between the source of the gas and the gas cock;

- 5 4. The apparatus according to the claim 3, *wherein* a volume of the expansion tank is not less than twice bigger than a volume of the container to be filled with beverage;
5. The apparatus according to the claim 3, *wherein* the mounting body is equipped with changeable adaptors, equipped with a sealing element or made of materials with sealing abilities and adapted correspondingly to the necks of containers of different
- 10 types and sizes;
6. The apparatus according to the claim 3, *wherein* in order to create counterpressure, the pipe of inert gas or cleaned air is supplied with an extreme pressure or pressure reducing valve;
7. The apparatus according to the claim 3, *wherein* for the automation of filling process,
- 15 automatically controlled cocks for gas and beverage feeding are employed in the apparatus;
8. The apparatus according to the claim 3 and the claim 7, *characterized by* providing it with a control transducer of the upper level of the filled beverage;
9. The apparatus according to the claim 3 and the claim 8, *wherein* the control
- 20 transducer of the upper level of the filled beverage comprises a float dropped into the container;
10. An apparatus for retail filling of effervescent beverages under counterpressure, that comprises a device for feeding an effervescent beverage under pressure and a
- 25 source of inert gas or cleaned air for creation of counterpressure in a container, for example, a bomb or a pump, which are connected by pipes to cocks feeding the container with beverage and gas correspondingly, and joined to a mounting body equipped with container's neck sealing means, comprises also a device for preserving/controlling counterpressure in the container, *is characterized by* being
- 30 adapted for implementation of the method according to the claim 1, wherefore a device for preserving/controlling counterpressure in the container is comprised in a form of an expansion tank connected to the pipe between the source of the gas and the gas cock, and for sealed mounting of the neck of the container to the body comprises a pneumatic cylinder, a moving member of which is equipped with a heel

supporting a bottom of the container and working volume is connected to an outlet leading from the gas cock to the neck of the container;

11. The apparatus according to the claim 10, *wherein* a volume of the expansion tank is not less than twice bigger than a volume of the container to be filled with beverage;
- 5 12. The apparatus according to the claim 10, *characterized by* comprising a diaphragm pneumatic cylinder for sealed mounting of the neck of the container to the body;
13. The apparatus according to the claim 10, *wherein* the heel supporting the bottom of the container or the moving member of the pneumatic cylinder are equipped with flexible element, for example with a spring or a diaphragm, elastic force of which  
10 exceeds the total weight of the empty container to be filled, the heel and the moving member of the pneumatic cylinder – a piston or the cylinder itself;
14. The apparatus according to the claim 10, *wherein* the pneumatic cylinder is selected so that its working area is bigger than cross-section of the neck of the container, and the difference between them multiplied by value of counterpressure exceeds the total  
15 weight of the filled up container, the heel and the moving element of the pneumatic cylinder – the piston or the cylinder itself;
15. The apparatus according to the claim 10, *characterized by* equipping it with changeable supporting heels, correspondingly adopted by size to the bottoms of the containers to be filled, having different length and shape;
- 20 16. The apparatus according to the claim 10, *wherein* in order to avoid damage of the container, the piston of the pneumatic cylinder or the cylinder are made with a stroke limiter;
17. The apparatus according to the claim 10, *wherein* the mounting body is equipped with changeable adaptors, equipped with sealing element or made of materials with  
25 sealing abilities and adapted correspondingly to the necks of containers of different types and sizes;
18. The apparatus according to the claim 10, *wherein* the pipe for inert gas or cleaned air, which create counterpressure is supplied with an extreme pressure or pressure reducing valve mounted on the pneumatic cylinder;
- 30 19. The apparatus according to the claim 10, *wherein* for the automation of filling process, automatically controlled cocks for gas and beverage feeding are employed in the apparatus;
20. The apparatus according to the claim 10 and claim 19, *characterized by* providing it with the control transducer of the upper level of the filled beverage;

21. The apparatus according to the claim 10 and the claims 19-20, *wherein* the control transducer of the upper level of the filled beverage comprises a float dropped into the container;
- 5 22. An apparatus for retail filling of effervescent beverages under counterpressure, that comprises a device for feeding an effervescent beverage under pressure and a source of inert gas or cleaned air for creation of counterpressure in the container, for example, a bomb or a pump, which are connected by pipes to cocks feeding the container with beverage and gas, and joined to a mounting body equipped with  
10 container's neck sealing means, comprises also a device for preserving/controlling counterpressure in the container, *is characterized by* being adapted for implementation of the method according to the claim 1, wherefore a device for preserving/controlling counterpressure in the container is comprised in a form of an expansion tank connected to the pipe between the source of the gas and the gas  
15 cock, and for sealed mounting of the neck of the container – disposable cup – to the body comprises a female seat in a form of the cup, where an upper neck of seat is adopted for underneath support of the neck of the cup, also, in order to avoid damage of cups, there is a spacing performed between the seat and the side of the cup, and volume created by the said spacing is connected to an outlet leading from  
20 the gas cock to the neck of the cup;
23. The apparatus according to the claim 22, *wherein* a volume of the expansion tank is not less than twice bigger than a volume of the cup to be filled with beverage;
24. The apparatus according to the claim 22, *characterized by* comprising a servomotor in order to move the seat with the cup for the sealed mounting of the neck of the cup  
25 to the body;
25. The apparatus according to the claim 22, *wherein* the pipe for inert gas or cleaned air, which create counterpressure is supplied with an extreme pressure or pressure reducing valve;
26. The apparatus according to the claim 22, *wherein* for the automation of filling  
30 process, automatically controlled cocks for gas and beverage feeding are employed in the apparatus;
27. The apparatus according to the claim 22 and claim 26, *characterized by* providing it with a control transducer of the upper level of the filled beverage;

28. The apparatus according to the claim 22 and the claims 26-27, *wherein* the control transducer of the upper level of the filled beverage comprises a float dropped into the container;

5 29. A method for retail filling of effervescent beverages under counterpressure, providing a consecutive cycle: placing of an open container to be filled with beverage in an airproof chamber, manually or mechanically, by an operator or a consumer, opening a gas cock connected by means of a pipe to a source of gas under pressure, for example a bomb, and creation of preliminary counterpressure by means of inlet of  
10 inert gas, for example of carbon dioxide or cleaned air, into the chamber and the container, inlet under pressure of effervescent beverage into the same container from a tank, for example a keg, by means of opening a beverage supply cock, and gradual filling during which foaming of beverage on the one hand and increase of counterpressure and interruption of the filling process on the other hand are avoided  
15 by means of creating a possibility for displacement of the gas from the chamber and the container when preserving/controlling counterpressure within needed limits, but after filling up the container with the beverage, the method provides shutting-off the beverage cock, outlet of remaining gas from the chamber and removal of the container off the apparatus, *wherein* the gas displacement when  
20 preserving/controlling the gas counterpressure within the needed limits is provided by means of an expansion tank connected to the pipe between the source of the gas and the gas cock, and in conditions of open gas cock, by means of backward pass through which a free and self-sustained cross flow of the gas displaced from the chamber and the container into the expansion tank during the beverage filling, is  
25 performed;

30. The method according to the claim 29, *wherein* a volume of the expansion tank is chosen not less than twice bigger than a volume of the chamber for placing container to be filled with the beverage, in consequence of which the preserving/controlling of counterpressure is provided with variation within limits not exceeding its 50%;

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31. An apparatus for retail filling of effervescent beverages under counterpressure, comprising a feature for supplying effervescent beverage to be poured under pressure and a source of inert gas or cleaned air for creation of counterpressure in a container, for example a bomb or a pump, which are connected by pipes to beverage

and gas feeding cocks and to an airproof chamber for placing open container, comprises also a device for preserving/controlling counterpressure in the chamber and the container, *is characterized by* being adapted for implementation of the method according to the claim 29, wherefore a device for preserving/controlling counterpressure in the chamber and the container is comprised in a form of an expansion tank connected to the pipe between the source of the gas and the gas cock;

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32. The apparatus according to the claim 31, *wherein* a volume of the expansion tank is not less than twice bigger than a volume of the airproof chamber;

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33. The apparatus according to the claim 31, *wherein* in order to create counterpressure, the pipe of inert gas is supplied with an extreme pressure or pressure reducing valve, which is mounted on the airproof chamber;

34. The apparatus according to the claim 31, *wherein* automatically controlled cocks for gas and beverage feeding are employed in the apparatus;

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35. The apparatus according to the claim 31 and the claim 34, *characterized by* providing it with a control transducer of the upper level of the filled beverage;

36. The apparatus according to the claim 31 and the claims 34-35, *wherein* the control transducer of the upper level of the filled beverage comprises a float dropped into the container.

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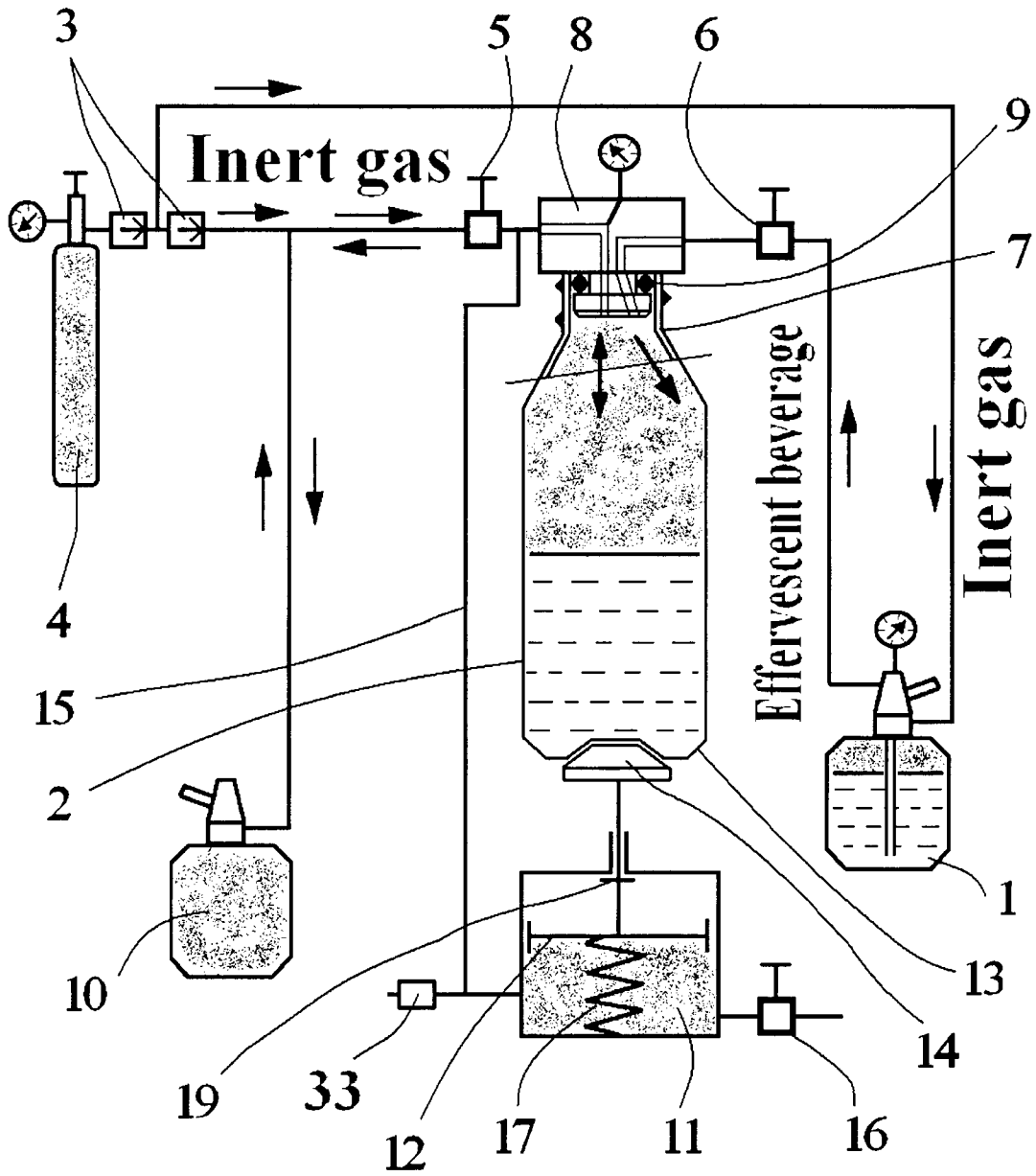
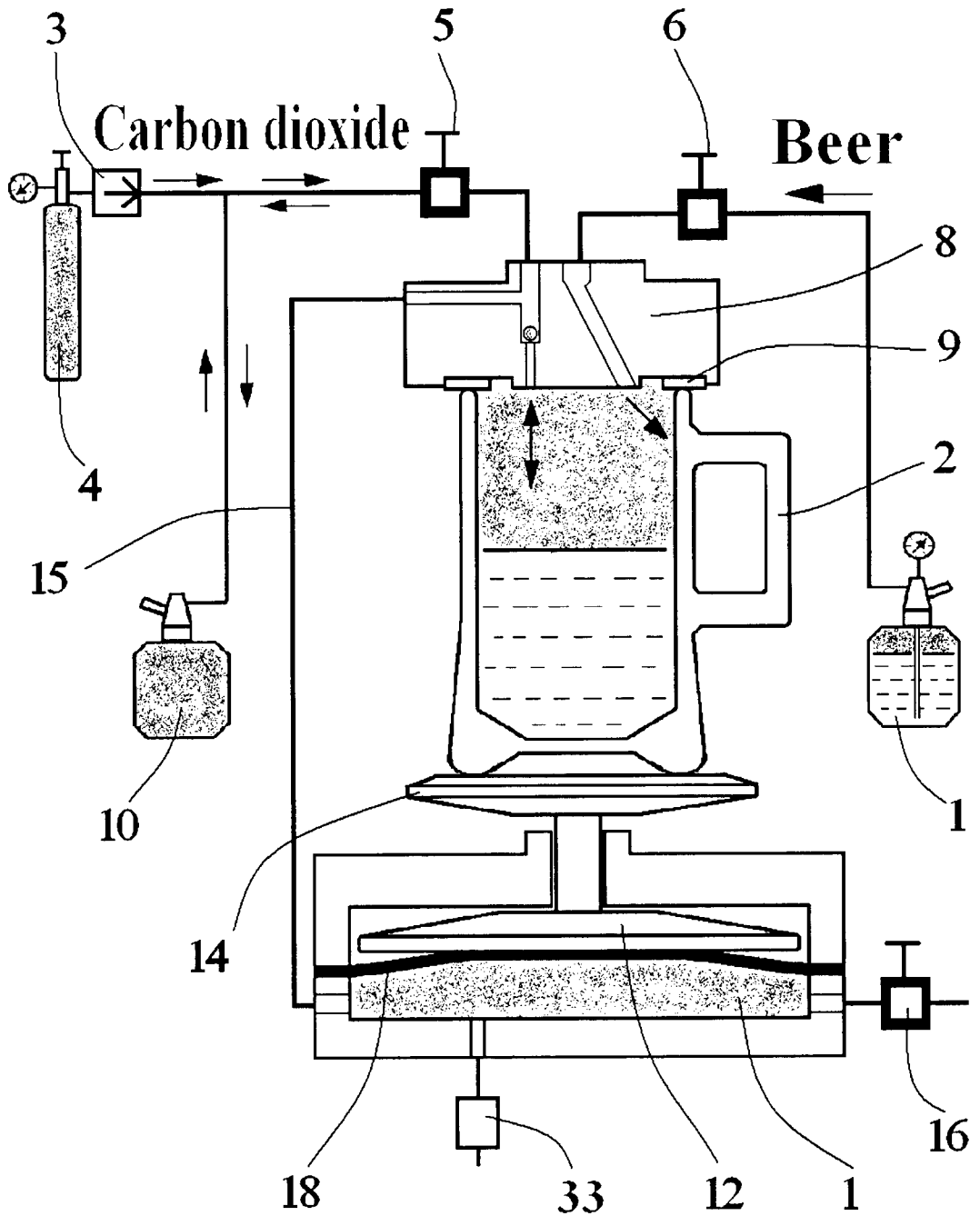
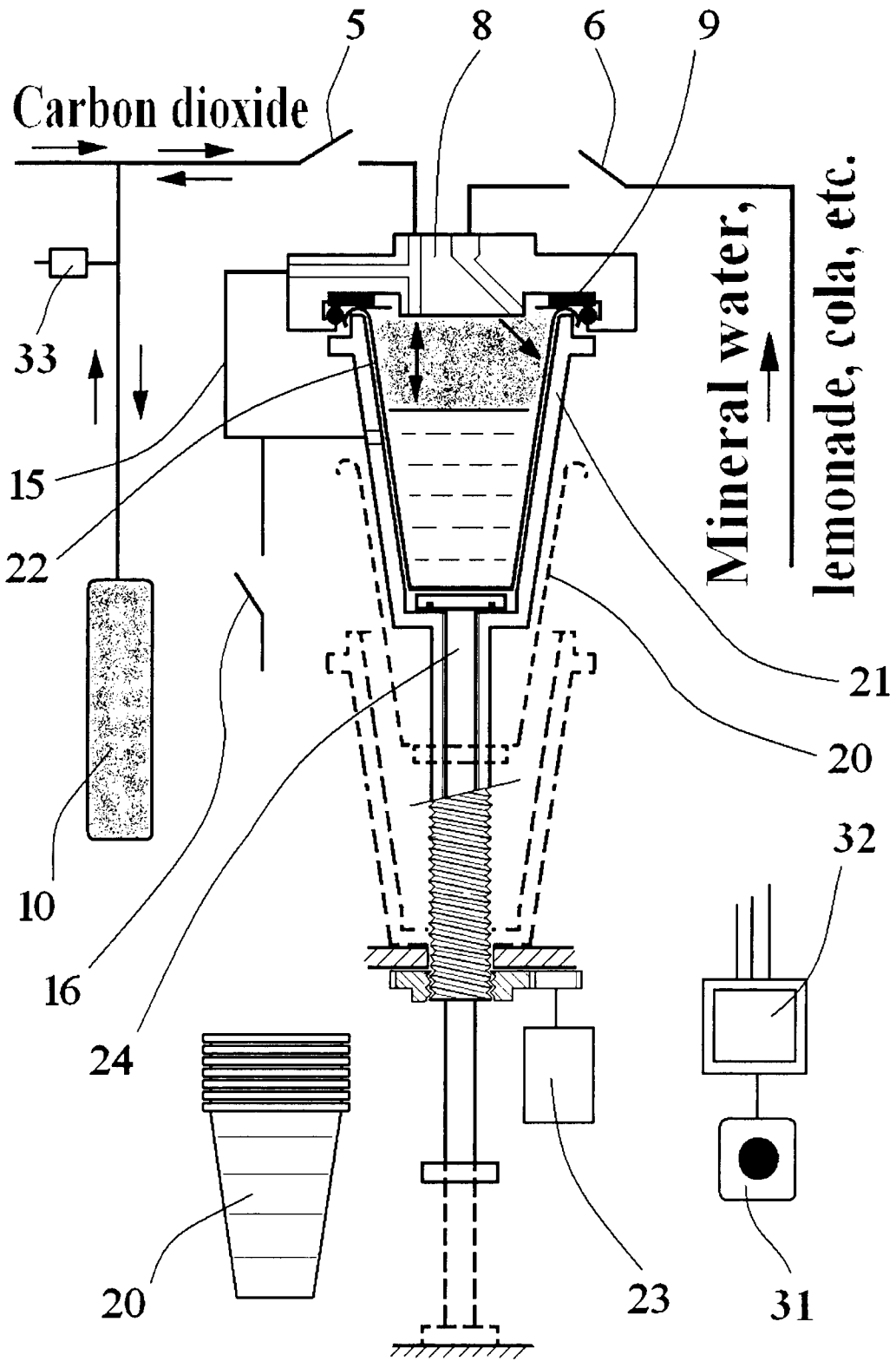


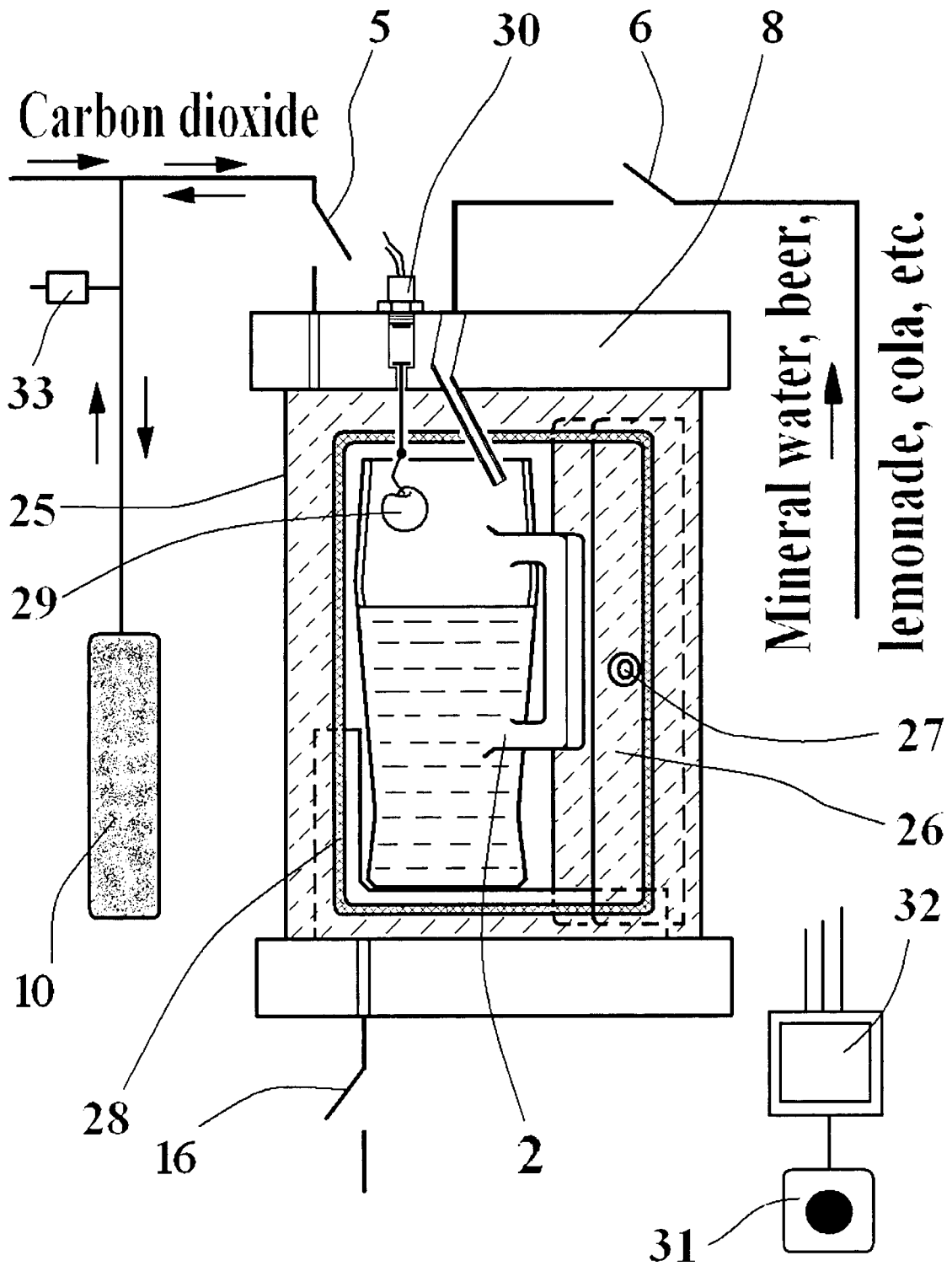
Fig. 1



**Fig. 2**



**Fig. 3**



**Fig. 4**

**INTERNATIONAL SEARCH REPORT**

International application No  
PCT/GE2011/000005

**A. CLASSIFICATION OF SUBJECT MATTER**  
 INV. B67D1/08                      B67D1/04                      B67D1/00  
 ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**  
 Minimum documentation searched (classification system followed by classification symbols)  
 B67D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)  
 EPO-Internal, WPI Data

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Further documents are listed in the continuation of Box C.

See patent family annex.

\* Special categories of cited documents :

<p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>	<p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&amp;" document member of the same patent family</p>
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Date of the actual completion of the international search  29 March 2012	Date of mailing of the international search report  12/04/2012
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Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer  Müller, Claus
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## INTERNATIONAL SEARCH REPORT

International application No

PCT/GE2011/000005

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