

(19)



(11)

EP 2 074 359 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:

02.08.2017 Bulletin 2017/31

(51) Int Cl.:

F25D 3/12 ^(2006.01) **F25D 3/08** ^(2006.01)
F25D 3/02 ^(2006.01) **B65D 6/00** ^(2006.01)
B65D 8/04 ^(2006.01) **B65D 8/18** ^(2006.01)
B65D 90/02 ^(2006.01) **F25J 1/00** ^(2006.01)

(21) Application number: **07853805.5**

(22) Date of filing: **05.10.2007**

(86) International application number:

PCT/US2007/080608

(87) International publication number:

WO 2008/045802 (17.04.2008 Gazette 2008/16)

(54) **DRINKING VESSEL DRY ICE FILLING APPARATUS AND METHOD**

TROCKENEISFÜLLVORRICHTUNG FÜR TRINKGEFÄß UND VERFAHREN

APPAREIL ET PROCÉDÉ POUR CHARGER UN RÉCIPIENT POUR BOISSON AVEC DE LA GLACE
SÈCHE

(84) Designated Contracting States:

**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IS IT LI LT LU LV MC MT NL PL PT RO SE
SI SK TR**

(30) Priority: **06.10.2006 US 850002 P**

04.10.2007 US 867459

(43) Date of publication of application:

01.07.2009 Bulletin 2009/27

(73) Proprietor: **JetChill Ltd**

**Jesmond
Newcastle
NE2 1NH (GB)**

(72) Inventor: **Nielsen, Peter**

Liberty, MO 64068 (US)

(74) Representative: **Gill, David Alan**

**WP Thompson
138 Fetter Lane
London EC4A 1BT (GB)**

(56) References cited:

US-A- 1 706 436 US-A- 1 981 830
US-A- 3 607 303 US-A- 5 331 822
US-A1- 2004 035 144 US-A1- 2005 039 484
US-A1- 2007 074 359 US-B1- 7 275 395
US-B2- 6 868 694 US-B2- 7 228 793

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

EP 2 074 359 B1

Description

[0001] The Invention is an apparatus and method to load solid phase carbon dioxide, or dry ice, into a dry ice drinking vessel. The Invention also is a beverage serving system including the dry ice drinking vessel. The Invention is particularly useful to load dry ice into a perforated dry ice chamber within a dry ice drinking vessel to allow the carbon dioxide to be exposed to a beverage subsequently placed within the drinking vessel to cause a smoking and boiling visual effect and to chill the beverage.

[0002] A dry ice drinking vessel is described in U.S. Patent 6,868,694, issued March 22, 2005 to the inventor of the present Invention and in other pending patent applications described above. The issued patent and pending applications teach a drinking vessel having an interior volume that is equipped with a dry ice chamber communicating with the interior volume through perforations. When dry ice is loaded into the chamber and a beverage is introduced into the drinking vessel, the beverage flows through the perforations and contacts the dry ice. The heat from the beverage causes the dry ice to sublime, creating a smoking and bubbling effect in the beverage and also chilling the beverage.

[0003] The dry ice drinking vessel of U.S. Patent 6,868,694 is equipped with a water-tight door in the bottom of the dry ice drinking vessel to allow dry ice pellets to be loaded into the dry ice chamber. The process of charging the dry ice drinking vessel of U.S. Patent 6,868,694 includes opening the water-tight door, placing dry ice pellets into the dry ice chamber, and then closing the water tight door.

[0004] Also US 1 706 436 discloses a container for food products to be chilled or warmed and including a chamber in the lid of the container having closable apertures and within which a brick of dry ice can be formed. Related patent US 1 981 830 disclosed a refrigerating apparatus for forming dry ice bricks such as those used in the chamber of US 1 706 436.

[0005] The prior art does not disclose the apparatus and method of the present Invention for loading dry ice into the dry ice chamber of the dry ice drinking vessel.

[0006] According to one aspect of the present invention, there is provided a charging apparatus for charging a dry ice drinking vessel with dry ice, the apparatus comprising a body conforming generally to a predetermined shape of an interior of the dry ice drinking vessel for selectable engagement with the interior of the dry ice drinking vessel, the body being plumbed to receive liquid carbon dioxide from a pressure vessel, the body including: an orifice via which carbon dioxide originating from the pressure vessel can be discharged from the apparatus and introduced into a dry ice chamber of the vessel via a first perforation of the chamber; and a filter arranged to engage with a second perforation of the chamber for trapping the dry ice introduced into the dry ice chamber of the vessel, the filter being attached to a free end of the

body and arranged to allow passage of gas while preventing escape of dry ice powder from the chamber, the apparatus also comprising means to selectively discharge said carbon dioxide via said orifice.

[0007] According to another aspect of the invention there is provided a dry ice drinking vessel having a dry ice chamber and an interior, the dry ice chamber being in communication with the interior by way of primary and secondary perforations and the interior of said dry ice drinking vessel having a predetermined shape, the primary perforation comprising an inlet for charging of the chamber with carbon dioxide and the secondary perforation comprising an outlet for expulsion of air and gaseous carbon dioxide from the dry ice chamber.

[0008] According to yet another aspect of the invention there is provided a method for charging a dry ice drinking vessel with dry ice, the method comprising:

a. placing a dry ice drinking vessel as defined above in engagement with a charging apparatus as defined above, the method comprising placing said interior of the dry ice drinking vessel in engagement with said body, so that

said orifice is aligned with said primary perforation,

said opening is aligned with said secondary perforation, and

said filter is interposed between said secondary perforation and said opening and in engagement with said secondary perforation;

b. opening a valve, said valve selectively controlling a flow of carbon dioxide from a pressure vessel, said flow of carbon dioxide discharging through said orifice;

c. receiving said carbon dioxide by said dry ice chamber through said primary perforation;

d. collecting dry ice formed within said dry ice chamber from the received carbon dioxide, and releasing gas from said dry ice chamber through said secondary perforation and said filter; and

e. removing said interior of the dry ice drinking vessel from engagement with said body.

[0009] It should be appreciated that the Invention can comprise an apparatus and method for loading dry ice into a perforated dry ice chamber defined by a dry ice drinking vessel. The dry ice drinking vessel has an interior communicating with the dry ice chamber by at least a primary and a secondary perforation. To load solid dry ice into the dry ice chamber, liquid carbon dioxide is allowed to expand from the liquid to the gaseous phase and is simultaneously introduced into the dry ice chamber of the dry ice drinking vessel. The liquid carbon dioxide flashes into gas because of the sudden drop in pressure.

The sudden change in state of the carbon dioxide causes a sudden drop in temperature of the carbon dioxide and causes a portion of the carbon dioxide gas to freeze into dry ice. The dry ice is trapped in the dry ice chamber by a filter, charging the dry ice chamber of the drinking vessel.

[0010] The carbon dioxide is maintained in liquid form under high pressure at room temperature in a pressure vessel. A valve and piping controls the flow of the liquid carbon dioxide from the pressure vessel. The apparatus has a body that is configured to selectively engage the interior of the dry ice drinking vessel. The body includes an orifice. The orifice is plumbed to receive carbon dioxide from the pressure vessel by way of the valve. When the interior of the dry ice drinking vessel is placed in engagement with the body, the orifice is aligned with a central perforation of the chamber. The carbon dioxide is propelled from the orifice through the primary perforation and into the dry ice chamber when the valve is opened.

[0011] The liquid carbon dioxide from the pressure vessel may flash into carbon dioxide gas and then into dry ice upon exiting the orifice. Alternatively, the change of state may begin upstream of the orifice at an expansion valve located within the system piping.

[0012] The frozen dry ice takes the form of a powder. Air in the dry ice chamber and the portion of the gaseous carbon dioxide that does not freeze are expelled by the pressure of the incoming carbon dioxide from the dry ice chamber through one or more secondary perforations. An opening in the body is aligned with the one or more secondary perforations when the interior of the dry ice drinking vessel is in engagement with the body. The frozen carbon dioxide is prevented from being expelled from the chamber by a filter. The filter is mounted to the body and is interposed between the one or more secondary perforations and the opening defined by the body. The portion of the carbon dioxide gas that does not freeze passes through the filter, while the filter substantially prevents the dry ice powder from exiting through the secondary perforations in the dry ice chamber.

[0013] The interior of the dry ice drinking vessel and the body may be placed in selectable engagement. The interior defines an interior longitudinal axis and the body defines a body longitudinal axis. The interior and the body longitudinal axes are coincident when the body and interior are in engagement. The orifice appears on the body longitudinal axis at a free end of the body and the primary perforation appears at a corresponding location on the interior longitudinal axis, which provides for the alignment of the orifice and primary perforation.

[0014] The filter and the opening in the body may be annularly arranged about the orifice on the cylindrical body. The one or more secondary perforations are arranged to align with the opening and the filter when the body and interior are in engagement. The body holds the filter in position against the secondary perforations when the body and interior are in engagement.

[0015] The body may be hollow. The shape of the body

corresponds to the shape of the drinking vessel. If the drinking vessel interior is cylindrical, the body also will be cylindrical. The filter may be attached to the free end of the body and the periphery of the filter is bonded to and supported by the free end of the body. The filter may be circular to conform to the cylindrical interior of the dry ice drinking vessel. The filter is selected to allow the passage of carbon dioxide gas in the quantities that are discharged by the apparatus while preventing escape of dry ice powder.

[0016] The cylindrical body and the circular filter engage the inside surface of the interior of the drinking vessel when the body is placed into engagement with the drinking vessel. The cylindrical body holds the circular filter in place against the secondary perforations of the chamber, thus filtering the carbon dioxide powder from the escaping carbon dioxide gas and air, when the apparatus is engaged with a drinking vessel and liquid carbon dioxide is being discharged into the chamber. The filter also serves to restrict bypassing of the primary perforation by dry ice flowing from the orifice.

[0017] In use, the drinking vessel is placed in engagement with the body, with the body engaging the interior of the drinking vessel, the orifice is aligned with the primary perforation and the filter is in engagement with the secondary perforations. The valve is opened and liquid carbon dioxide is injected into the chamber. Alternatively, the liquid carbon dioxide flashes into carbon dioxide gas upstream of the orifice. Expelled air and carbon dioxide gas pass through the secondary perforations of the chamber and through the filter. Frozen carbon dioxide powder is filtered from the gas stream by the filter and is retained in the dry ice chamber. When the chamber contains an adequate amount of carbon dioxide powder, the flow of liquid carbon dioxide gas is stopped and the drinking vessel removed from the apparatus.

[0018] A beverage is dispensed into the drinking vessel and a portion of the beverage freezes into a composite solid with the carbon dioxide powder. The carbon dioxide in the resulting dry ice/beverage composite then sublimates, causing a boiling, smoking effect of the beverage. The creation of the dry ice/beverage composite has the benefit of extending the visual effect compared with charging the dry ice drinking vessel with dry ice pellets because the dry ice in the composite sublimates slower than the dry ice alone. The creation of the dry ice using liquid carbon dioxide to create the dry ice also is a benefit because the liquid carbon dioxide may be easily transported and stored indefinitely at room temperature, unlike dry ice pellets.

[0019] The apparatus may include a pressure relief valve to prevent application of excessive pressure to the apparatus. The apparatus may include a fixture to hold the drinking vessel in the correct position when the drinking vessel is being charged with dry ice. The fixture may comprise a dry ice charging station having a base containing the pressure vessel and the valve. The dry ice charging station may include a dry ice drinking vessel

containment to enclose the dry ice drinking vessel during charging. The apparatus may include an electrically operated valve to control the flow of liquid carbon dioxide.

[0020] Embodiments of the invention are illustrated with reference to the following drawings:

Fig. 1 is a schematic view of the apparatus.

Fig. 2 is a partial cutaway detail perspective view of the apparatus of the invention.

Fig. 3 is a detail cross section of an alternative embodiment of the apparatus.

Fig. 4 is a cross section side view of the apparatus in operation to charge a dry ice drinking vessel with dry ice.

Fig. 5 is an illustration of formation of the dry ice/beverage composite.

Fig. 6 is a perspective view of a charging station for use in a restaurant or nightclub.

Fig. 7 is a partial cross section view of the charging station for use in a restaurant or nightclub.

[0021] The invention is an apparatus and method for charging a dry ice drinking vessel with dry ice. Figs. 1 through 4 illustrate the apparatus of the invention. Fig. 5 shows a charged dry ice drinking vessel in use. Fig. 6 shows a charging station incorporating the invention.

[0022] From Fig. 1, a charging system 2 comprises a body 4 to a pressure vessel 6 containing liquid carbon dioxide 8. Pressure vessel 6 is equipped with a straw 10 so that liquid carbon dioxide 8 is drawn from the bottom of the pressure vessel 6. Body 4 is plumbed to pressure vessel 6 by piping 12. A manual valve 14 allows the pressure vessel 6 to be manually shut off.

[0023] As shown by Fig. 1, the manual valve 14 is plumbed to an electrically-operated valve 16. Electrically-operated valve 16 is connected to a switch 20 and to a power supply 18. Upon activation of switch 20 by a user, valve 16 opens, allowing liquid carbon dioxide 8 to flow from pressure vessel 6. Valve 16 may be timed to allow liquid carbon dioxide 8 to flow for a predetermined time, for example, two seconds. The predetermined time is selected to provide an adequate charge of dry ice 56 to drinking vessel 28. Applicant believes that remote bottle opener part number 1809 by Nitrous Direct is suitable for valve 16. Applicant believes that a push button switch is suitable for switch 20.

[0024] 'T' connector 22 joins body 4 and pressure relief valve 24 to piping 12. Pressure relief valve 24 is conventional and prevents over-pressuring of the charging system 2 by the carbon dioxide 8. Pressure relief valve part number WMV 4-50 from Nitrous Direct, 516 River Highway D169, Mooresville, NC 28117, is suitable for pressure relief valve 24.

[0025] Fig. 2 is a cutaway detail perspective view of the body 4 of the charging system 2 of the invention. Fig. 3 is detail partial cross section of a side view of an alternative embodiment of charging system 2. From Figs. 2, coupling 30 is plumbed to the T coupling 22 illustrated

by Fig. 1. Expansion valve 32 is retained in position by coupling 30 and receives liquid carbon dioxide 8 from T-coupling 22. Expansion valve 32 is selected to meter a suitable flow of liquid carbon dioxide 8. Alternatively, liquid carbon dioxide 8 may be metered by valve 16, shown by Fig. 1.

[0026] Fitting 34 engages expansion valve 32 by a female thread portion 36. As the liquid carbon dioxide 8 passes through expansion valve 32, the liquid carbon dioxide flashes into carbon dioxide gas with an accompanying drop in temperature. A portion of the carbon dioxide gas freezes to dry ice powder. Fitting 34 receives metered carbon dioxide from expansion valve 32 while the carbon dioxide is flashing to vapor and freezing. Fitting 34 conveys carbon dioxide to orifice 38. In use, a quick release connector, Lincoln air nipple ¼ male, model 11659, for use with air tools has proved suitable for fitting 34, but any suitable fitting 34 may be used.

[0027] Body 4 is a hollow cylinder. PVC plumbing pipe has proven suitable for body 4 in practice, but any suitable material may be used. Pop rivet 40 rigidly connects body 4 to female thread portion 36 of fitting 34. Body 4 has a free end 42. Free end 42 is bonded to a filter 44 at a periphery 46 of filter 44. Filter 44 covers the otherwise open free end 42 of body 4. Fitting 34 penetrates filter 44 and orifice 38 is coplanar with filter 44. Fitting 34 is bonded to filter 44. Any filter 44 suitable for allowing passage of carbon dioxide gas and air while having a pore size small enough to trap frozen carbon dioxide powder is suitable for filter 44. A filter 44 manufactured by Porex Corporation, 500 Bohannon Road, Fairburn, GA, 30213 has proven suitable in practice, but any suitable filter 44 may be used. The preferred filter 44 is ultra-high molecular weight polyethylene 1/8 inches thick coarse, Porex model PE 90-130U.

[0028] Fig. 3 illustrates an alternative embodiment of charging system 2. From Fig. 3, a union 64 joins expansion valve 32 and fitting 34. Rivet 16 connects body 4 to union 64. A Western BF 4 HP coupler, ¼ NPT female has proven suitable for union 64. Expansion valve 32 may be dispensed with and metering tasks handled by manual valve 14 or by electrically-operated valve 16.

[0029] Fig. 4 is a cross section of the charging system 2 in use. A dry ice drinking vessel 28 (as illustrated by Fig. 5) is placed in an inverted position and in engagement with free end body 4. Drinking vessel 28 defines a dry ice chamber 48. The dry ice chamber 48 features a primary perforation 50 and secondary perforations 52. Primary and secondary perforations 50, 52 communicate between dry ice chamber 48 and an interior 26 of dry ice drinking vessel 28.

[0030] When the apparatus 2 is in engagement with the interior 26 of drinking vessel 28, orifice 38 is held in alignment with primary perforation 50. Filter 44 is supported by fitting 34 and body 4 and is held by fitting 34 and body 4 so that filter 44 covers secondary perforation 52. Alignment of the primary perforation 50 and the orifice 38 is achieved by providing the body 4 with a body lon-

itudinal axis 53 and providing the interior 26 with an interior longitudinal axis 55. The orifice 38 falls on the body longitudinal axis 53 and the primary perforation 50 falls on the interior longitudinal axis 55. The body 4 and interior 26 are configured so that the body and interior longitudinal axes 53, 55 fall substantially on the same line when the interior 26 is placed in engagement with the body 4. The longitudinal axes 53, 55 will fall substantially on the same line if the shape of the body 4 is selected to conform to the shape of the interior 26 - if the interior 26 is cylindrical, the body 4 also will be cylindrical.

[0031] Body 4 is illustrated by Figs. 2 and 6 as cylindrical in shape, but the body 4 may be any shape that will engage with the interior 26 of the dry ice drinking vessel 28.

[0032] In use, liquid carbon dioxide 8 is supplied through coupling 30. The liquid carbon dioxide 8 is metered by expansion valve 32 and discharged into fitting 34. Carbon dioxide (indicated by arrow 54) passing through fitting 34 is in the process of flashing into vapor and freezing. Carbon dioxide shown by arrow 54 is discharged through primary perforation 50 into dry ice chamber 48. The carbon dioxide entering the dry ice chamber 48 comprises a mixture of carbon dioxide vapor and dry ice powder 56. Carbon dioxide vapor that is not frozen (indicated by arrows 58) exits chamber 48 through secondary perforation 52. The carbon dioxide vapor indicated by arrows 58 flows through body 4 and exits from body 4. Dry ice powder 56 is prevented from exiting the dry ice chamber 48 by the filter 44. When sufficient dry ice powder 56 has accumulated in chamber 48, the electrically-operated valve 16 is closed and the flow of liquid carbon dioxide 8 stopped.

[0033] As shown by the cross section view of Fig. 5, upon charging dry ice drinking vessel 28 with dry ice powder 56, drinking vessel 28 may be placed in an upright position and a beverage 58 dispensed into drinking vessel 28. Beverage 58 flows through primary and secondary perforations 50, 52 into dry ice chamber 48. Beverage 58 contacts dry ice powder 56. A portion of beverage 58 immediately freezes around dry ice powder 56, forming a solid dry ice/beverage composite 60. The dry ice powder 56 in the dry ice/beverage composite 60 immediately begins to sublime, releasing carbon dioxide vapor as bubbles 62. Bubbles 62 cause a boiling, bubbling effect within beverage 58.

[0034] Dry ice/beverage composite 60 is too large to pass through perforations 28, 30. As a result, dry ice 36 poses no danger to a person drinking from dry ice drinking vessel 28.

[0035] Figs. 6 and 7 illustrate a preferred dry ice charging station 66 according to the Invention that is useful for charging dry ice drinking vessels 28 in a commercial setting. As shown by Fig. 6, base 68 and dry ice drinking vessel holding portion 70 are provided. The dry ice drinking vessel holding portion 70 may be composed of a substantially transparent material, indicated by lines 72. Any suitable substantially transparent material, such as acryl-

ic plastic, may be used for the dry ice drinking vessel holding portion 70 to allow a server or a customer to observe the dry ice charging station 66 in operation. A removable lid 74 protects a server and a customer from inadvertent discharge of carbon dioxide 8. Lid 74 may be equipped with interlocks to prevent operation of electrically operated valve 16 with the lid 74 in the open position.

[0036] As shown by Fig. 7, a base 68 contains an electrically operated valve 16, piping 12, T-coupling 22 and pressure relief valve 24. Push button electrical switch 20 to operate electrically operated valve 16 is mounted on a front side of the dry ice charging station 66. Power supply 18 (not shown on Fig. 7) is provided by wall current. Piping 12 connects the charging station 66 to a manual valve 14 and pressure vessel 6. The charging station 66 therefore receives liquid carbon dioxide 8 from an external pressure vessel 6 through manual valve 14.

[0037] In the preferred embodiment illustrated by Figs. 6 and 7, no expansion valve 32 is provided and fitting 34 is a straight piece of ¼ inch diameter tubing. Fitting 34 defines orifice 38. In the preferred embodiment, rivet 40 is omitted and fitting 34 and body 4 are supported by base 68 using any conventional means, such as an adhesive, a coupling or a compression fitting. In the preferred embodiment of Figs. 6 and 7, Body 4 is a composed of PVC plumbing pipe.

[0038] In use, an operator will remove the lid 74, exposing the free end 42 of body 4. The operator will invert the dry ice drinking vessel 28 and place the dry ice drinking vessel 28 into engagement with the body 4 as illustrated by Fig. 4 and described above relating to that figure. The operator will replace the lid 74 and depress push button electrical switch 20. Push button electrical switch 20 causes electrical valve 16, shown by Fig. 1, to open, releasing liquid carbon dioxide 8. The liquid carbon dioxide 8 exiting the electrically operated valve 16 flashes into vapor, a portion of which freezes into dry ice 56. The dry ice 56 and carbon dioxide vapor 58 are propelled within fitting 34 through orifice 38 and into dry ice chamber 48, as described above relating to Fig. 4. Carbon dioxide gas 38 that does not freeze into dry ice 56 escapes through filter 44 into body 4 while dry ice 56 is prevented from escaping the dry ice chamber 48 by filter 44. Carbon dioxide gas escapes from body 4 through holes 76.

[0039] When the dry ice chamber 48 is adequately charged with dry ice 56, the operator releases switch 20, stopping the flow of liquid carbon dioxide 8 through electrically operated valve 16. The operator opens lid 74 and removes the dry ice drinking vessel 28 from engagement with the body 4. The operator adds a beverage 58 to the interior 26 of the dry ice drinking vessel 28, as described above relating to Fig. 5.

[0040] In describing the above embodiments of the invention, specific terminology was selected for the sake of clarity. However, the invention is not intended to be limited to the specific terms so selected.

Claims

1. A charging apparatus (2) for charging a dry ice drinking vessel (28) with dry ice, the apparatus comprising a body (4) conforming generally to a predetermined shape of an interior of the dry ice drinking vessel (28) for selectable engagement with the interior of the dry ice drinking vessel, the body (4) being plumbed to receive liquid carbon dioxide from a pressure vessel (6), the body including:
 - an orifice (38) via which carbon dioxide originating from the pressure vessel (6) can be discharged from the apparatus and introduced into a dry ice chamber (48) of the vessel (28) via a first perforation (50) of the chamber (48); and a filter (44) arranged to engage with a second perforation (52) of the chamber (48) for trapping the dry ice introduced into the dry ice chamber of the vessel, the filter (44) being attached to a free end of the body (4) and arranged to allow passage of gas while preventing escape of dry ice powder from the chamber (48),

the apparatus also comprising means (20) to selectively discharge said carbon dioxide via said orifice (38).
2. The apparatus of Claim 1 wherein said filter (44) has a pore size, said pore size being selected substantially to stop said a solid dry ice from passing through said filter.
3. The apparatus of Claim 1 or 2, wherein said orifice (44) is located at said free end of said body (4) and said filter (44) and an opening in said body are located at said free end of said body.
4. The apparatus of Claim 3, wherein said body (4) is generally cylindrical, and said opening and said filter are annularly arranged about said orifice.
5. The apparatus of Claim 3 or 4, wherein said means to selectively discharge said carbon dioxide comprises an electrically operated valve (20).
6. The apparatus of Claim 5, the apparatus further comprising:
 - a. a base (68), said base containing said electrically operated valve;
 - b. a dry ice drinking vessel containment (70) attached to said base (68), said dry ice drinking vessel containment containing said body, said dry ice drinking vessel containment containing said dry ice drinking vessel when said interior is in engagement with said body;
 - c. a lid (74) selectively closing said dry ice drink-
7. A system for charging a dry ice drinking vessel with dry ice, comprising a charging apparatus (2) according to any of Claims 1 to 6 and a dry drinking vessel (28), the dry ice drinking vessel (28) arranged to be charged by way of the charging apparatus (2) the dry ice drinking vessel (28) having a dry ice chamber (48) and an interior, the dry ice chamber (48) being in communication with the interior by way of primary (50) and secondary (52) perforations and the interior of said dry ice drinking vessel having a predetermined shape, the primary perforation (50) comprising a charging inlet for charging of the chamber (48) with carbon dioxide and the secondary perforation (52) comprising an expulsion outlet for expulsion of air and gaseous carbon dioxide from the dry ice chamber (48).
8. The system of claim 7 as dependent on Claim 3, wherein, when said body (4) and said interior of said dry ice drinking vessel (28) are in engagement, said opening is aligned with said secondary perforation (52), said filter being supported by said body and interposed between said secondary perforation and said opening, and the orifice (38) of the body (4) is aligned with the primary perforation (50).
9. The system of Claim 8, wherein said body (4) defines a body longitudinal axis and said interior of said dry ice drinking vessel defines a dry ice drinking vessel longitudinal axis, said body longitudinal axis and said dry ice drinking vessel longitudinal axis being generally coincident when said interior of said dry ice drinking vessel is in engagement with said body, said orifice being located on said body longitudinal axis and said primary perforation being located on said dry ice drinking vessel longitudinal axis, whereby said orifice (38) and said primary perforation are aligned when said dry ice drinking vessel is in engagement with said body.
10. A method for charging a dry ice drinking vessel with dry ice, the method comprising:
 - a. placing a dry ice drinking vessel (28) according to Claim 7 in engagement with a charging apparatus (2) according to any one of Claims 3 to 6, the method comprising placing said interior of the dry ice drinking vessel in engagement with said body (4), so that

said orifice (38) is aligned with said primary perforation (50),
 said opening is aligned with said secondary perforation (52), and
 said filter (44) is interposed between said

- secondary perforation (52) and said opening and in engagement with said secondary perforation;
- b. opening a valve, said valve selectively controlling a flow of carbon dioxide from a pressure vessel (6), said flow of carbon dioxide discharging through said orifice (38);
- c. receiving said carbon dioxide by said dry ice chamber (48) through said primary perforation (50);
- d. collecting dry ice formed within said dry ice chamber (48) from the received carbon dioxide, and releasing gas from said dry ice chamber through said secondary perforation (52) and said filter (44); and
- e. removing said interior of the dry ice drinking vessel from engagement with said body (4).
11. The method of Claim 10 wherein said interior of the dry ice drinking vessel defines a drinking vessel longitudinal axis, said body defines a body longitudinal axis, said drinking vessel longitudinal axis and said body longitudinal axis being generally coincident when said interior of the dry ice drinking vessel is in engagement with said body.
12. The method of Claim 11 wherein said primary perforation (50) is located on said drinking vessel longitudinal axis and said orifice is located on said body longitudinal axis.
13. The method of Claim 12 wherein said body (4) is generally cylindrical, said orifice (38) is located at a free end of said body, and said opening is defined by said free end of said body, said opening and said filter being annularly disposed about said orifice.
14. The method of Claim 13 wherein said step of placing the dry ice drinking vessel in engagement with said body (4) further comprises:
- a. removing a lid, said charging station defining a containment selectively closed by said lid, said body being contained within said containment;
- b. placing said interior of the dry ice drinking vessel in engagement with said body; and
- c. replacing said lid on said charging station containment to close said containment, the dry ice drinking vessel being enclosed within said containment when said interior is in engagement with said body and said lid is replaced, said charging station including a base, said electrically operated valve being contained within said base.

Patentansprüche

1. Befüllungsvorrichtung (2) zum Befüllen eines Trockeneis-Trinkgefäßes (28) mit Trockeneis, wobei die Vorrichtung einen Körper (4) aufweist, der zum auswählbaren Ineingriffbringen mit dem Inneren des Trockeneis-Trinkgefäßes einer vorbestimmten Form eines Inneren des Trockeneis-Trinkgefäßes (28) allgemein entspricht, wobei der Körper (4) Anschlüsse zur Aufnahme von flüssigem Kohlendioxid aus einem Druckbehälter (6) hat, wobei der Körper Folgendes aufweist:

eine Öffnung (38), über die aus dem Druckbehälter (6) stammendes Kohlendioxid aus der Vorrichtung ausgelassen und über eine erste Perforation (50) der Kammer (48) in eine Trockeneiskammer (48) des Gefäßes (28) eingeführt werden kann; und
ein Filter (44), das für den Eingriff mit einer zweiten Perforation (52) der Kammer (48) zum Einschließen des in die Trockeneiskammer des Gefäßes eingeführten Trockeneises angeordnet ist, wobei das Filter (44) an einem freien Ende des Körpers (4) angebracht ist und angeordnet ist, um Gas durchzulassen, während es das Entweichen von Trockeneispulver aus der Kammer (48) verhütet,
wobei die Vorrichtung auch ein Mittel (20) zum wahlweisen Auslassen des genannten Kohlendioxids über die genannte Öffnung (38) aufweist.
2. Vorrichtung nach Anspruch 1, wobei das genannte Filter (44) eine Porengröße hat, wobei die genannte Porengröße ausgewählt ist, um das genannte feste Trockeneis im Wesentlichen am Passieren durch das genannte Filter zu verhindern.
3. Vorrichtung nach Anspruch 1 oder 2, wobei die genannte Öffnung (44) am genannten freien Ende des genannten Körpers (4) liegt und das genannte Filter (44) und ein Durchgang in dem genannten Körper am genannten freien Ende des genannten Körpers liegen.
4. Vorrichtung nach Anspruch 3, wobei der genannte Körper (4) allgemein zylindrisch ist und der genannte Durchgang und das genannte Filter ringförmig um die genannte Öffnung angeordnet sind.
5. Vorrichtung nach Anspruch 3 oder 4, wobei das genannte Mittel zum wahlweisen Auslassen des genannten Kohlendioxids ein elektrisch betätigtes Ventil (20) aufweist.
6. Vorrichtung nach Anspruch 5, wobei die Vorrichtung ferner Folgendes aufweist:

- a. eine Basis (68), wobei die genannte Basis das genannte elektrisch betätigte Ventil enthält;
 b. ein an der genannten Basis (68) angebrachtes Behältnis (70) für ein Trockeneis-Trinkgefäß, wobei das genannte Behältnis für ein Trockeneis-Trinkgefäß den genannten Körper enthält, wobei das genannte Behältnis für ein Trockeneis-Trinkgefäß das genannte Trockeneis-Trinkgefäß enthält, wenn das genannte Innere mit dem genannten Körper in Eingriff ist;
 c. einen Deckel (74), der das genannte Behältnis (70) für ein Trockeneis-Trinkgefäß wahlweise schließt.
7. System zum Befüllen eines Trockeneis-Trinkgefäßes mit Trockeneis, das eine Befüllungsvorrichtung (2) nach einem der Ansprüche 1 bis 6 und ein Trockeneis-Trinkgefäß (28) aufweist, wobei das Trockeneis-Trinkgefäß (28) angeordnet ist, um mittels der Befüllungsvorrichtung (2) befüllt zu werden, wobei das Trockeneis-Trinkgefäß (28) eine Trockeneiskammer (48) und ein Inneres hat, wobei die Trockeneiskammer (48) durch eine primäre (50) und eine sekundäre (52) Perforation mit dem Inneren in Verbindung ist und das Innere des genannten Trockeneis-Trinkgefäßes eine vorbestimmte Form hat, wobei die primäre Perforation (50) einen Befüllungseinlass zum Befüllen der Kammer (48) mit Kohlendioxid aufweist und die sekundäre Perforation (52) einen Ausstoßauslass zum Ausstoßen von Luft und gasförmigem Kohlendioxid aus der Trockeneiskammer (48) aufweist.
8. System nach Anspruch 7, wenn abhängig von Anspruch 3, wobei, wenn der genannte Körper (4) und das genannte Innere des genannten Trockeneis-Trinkgefäßes (28) miteinander in Eingriff sind, der genannte Durchgang auf die genannte sekundäre Perforation (52) ausgerichtet ist, wobei das genannte Filter von dem genannten Körper getragen wird und zwischen die genannte sekundäre Perforation und den genannten Durchgang zwischengelegt ist, und die Öffnung (38) des Körpers (4) auf die primäre Perforation (50) ausgerichtet ist.
9. System nach Anspruch 8, wobei der genannte Körper (4) eine Körperlängsachse definiert und das genannte Innere des genannten Trockeneis-Trinkgefäßes eine Trockeneis-Trinkgefäßlängsachse definiert, wobei die genannte Körperlängsachse und die genannte Trockeneis-Trinkgefäßlängsachse allgemein zusammenfallen, wenn das genannte Innere des genannten Trockeneis-Trinkgefäßes mit dem genannten Körper in Eingriff ist, wobei die genannte Öffnung auf der genannten Körperlängsachse liegt und die genannte primäre Perforation auf der genannten Trockeneis-Trinkgefäßlängsachse liegt, wodurch die genannte Öffnung (38) und die genannte primäre Perforation aufeinander ausgerichtet sind, wenn das genannte Trockeneis-Trinkgefäß mit dem genannten Körper in Eingriff ist.
10. Verfahren zum Befüllen eines Trockeneis-Trinkgefäßes mit Trockeneis, wobei das Verfahren Folgendes aufweist:
- a. Ineingriffbringen eines Trockeneis-Trinkgefäßes (28) nach Anspruch 7 mit einer Befüllungsvorrichtung (2) nach einem der Ansprüche 3 bis 6, wobei das Verfahren das Ineingriffbringen des genannten Inneren des Trockeneis-Trinkgefäßes mit dem genannten Körper (4) aufweist, so dass
- die genannte Öffnung (38) auf die genannte primäre Perforation (50) ausgerichtet ist, der genannte Durchgang auf die genannte sekundäre Perforation (52) ausgerichtet ist und das genannte Filter (44) zwischen die genannte sekundäre Perforation (52) und den genannten Durchgang zwischengelegt und mit der genannten sekundären Perforation in Eingriff ist;
- b. Öffnen eines Ventils, wobei das genannte Ventil einen Kohlendioxidfluss aus einem Druckbehälter (6) wahlweise reguliert, wobei der genannte Kohlendioxidfluss durch die genannte Öffnung (38) ausgelassen wird;
- c. Aufnehmen des genannten Kohlendioxids durch die genannte Trockeneiskammer (48) über die genannte primäre Perforation (50);
- d. Sammeln von in der genannten Trockeneiskammer (48) aus dem aufgenommenen Kohlendioxid gebildetem Trockeneis und Ablassen von Gas aus der genannten Trockeneiskammer durch die genannte sekundäre Perforation (52) und das genannte Filter (44) und
- e. Außereingriffbringen des genannten Inneren des Trockeneis-Trinkgefäßes mit dem genannten Körper (4).
11. Verfahren nach Anspruch 10, wobei das genannte Innere des Trockeneis-Trinkgefäßes eine Trinkgefäßlängsachse definiert, der genannte Körper eine Körperlängsachse definiert, die genannte Trinkgefäßlängsachse und die genannte Körperlängsachse allgemein zusammenfallen, wenn das genannte Innere des Trockeneis-Trinkgefäßes mit dem genannten Körper in Eingriff ist.
12. Verfahren nach Anspruch 11, wobei die genannte primäre Perforation (50) auf der genannten Trinkgefäßlängsachse liegt und die genannte Öffnung auf

der genannten Körperlängsachse liegt.

13. Verfahren nach Anspruch 12, wobei der genannte Körper (4) allgemein zylindrisch ist, die genannte Öffnung (38) an einem freien Ende des genannten Körpers liegt und der genannte Durchgang von dem genannten freien Ende des genannten Körpers definiert wird, wobei der genannte Durchgang und das genannte Filter ringförmig um die genannte Öffnung angeordnet sind.

14. Verfahren nach Anspruch 13, wobei der genannte Schritt des Ineingriffbringens des Trockeneis-Trinkgefäßes mit dem genannten Körper (4) ferner Folgendes aufweist:

- a. Abnehmen eines Deckels, wobei die genannte Befüllungsstation ein Behältnis definiert, das wahlweise mit dem genannten Deckel geschlossen wird, wobei der genannte Körper in dem genannten Behältnis enthalten ist;
- b. Ineingriffbringen des genannten Inneren des Trockeneis-Trinkgefäßes mit dem genannten Körper und
- c. Aufsetzen des genannten Deckels auf das genannte Befüllungsstationsbehältnis, um das genannte Behältnis zu schließen, wobei das Trockeneis-Trinkgefäß in dem genannten Behältnis eingeschlossen ist, wenn das genannte Innere mit dem genannten Körper in Eingriff ist und der genannte Deckel aufgesetzt ist, wobei die genannte Befüllungsstation eine Basis beinhaltet, wobei das genannte elektrisch betätigte Ventil in der genannten Basis enthalten ist.

Revendications

1. Appareil de charge (2) servant à charger de la glace sèche dans un récipient pour boisson à glace sèche (28), l'appareil comportant un corps (4) se conformant généralement à une forme prédéterminée d'une partie intérieure du récipient pour boisson à glace sèche (28) à des fins de mise en prise sélectionnable avec la partie intérieure du récipient pour boisson à glace sèche, le corps (4) étant raccordé pour recevoir du dioxyde de carbone liquide en provenance d'un récipient sous pression (6), le corps comprenant :

un orifice (38) par le biais duquel du dioxyde de carbone provenant du récipient sous pression (6) peut être déchargé en provenance de l'appareil et introduit dans une chambre de glace sèche (48) du récipient (28) par le biais d'une première perforation (50) de la chambre (48) ; et un filtre (44) agencé à des fins de mise en prise avec une deuxième perforation (52) de la cham-

bre (48) servant à retenir la glace sèche introduite dans la chambre de glace sèche du récipient, le filtre (44) étant attaché à une extrémité libre du corps (4) et agencé pour permettre le passage du gaz tout en empêchant tout échappement de poudre de glace sèche en provenance de la chambre (48),

l'appareil comportant également un moyen (20) servant à décharger de manière sélective ledit dioxyde de carbone par le biais dudit orifice (38).

2. Appareil selon la revendication 1, dans lequel ledit filtre (44) a un diamètre de pore, ledit diamètre de pore étant sélectionné sensiblement pour arrêter tout passage de ladite glace sèche solide au travers dudit filtre.

3. Appareil selon la revendication 1 ou la revendication 2, dans lequel ledit orifice (44) est situé au niveau de ladite extrémité libre dudit corps (4) et ledit filtre (44) et une ouverture dans ledit corps sont situés au niveau de ladite extrémité libre dudit corps.

4. Appareil selon la revendication 3, dans lequel ledit corps (4) est généralement cylindrique, et ladite ouverture et ledit filtre sont agencés de manière annulaire autour dudit orifice.

5. Appareil selon la revendication 3 ou la revendication 4, dans lequel ledit moyen servant à décharger de manière sélective ledit dioxyde de carbone comporte une soupape à commande électrique (20).

6. Appareil selon la revendication 5, l'appareil comportant par ailleurs :

- a. une base (68), ladite base contenant ladite soupape à commande électrique ;
- b. un dispositif de confinement de récipient pour boisson à glace sèche (70) attaché à ladite base (68), ledit dispositif de confinement de récipient pour boisson à glace sèche contenant ledit corps, ledit dispositif de confinement de récipient pour boisson à glace sèche contenant ledit récipient pour boisson à glace sèche quand ladite partie intérieure est en prise avec ledit corps ;
- c. un couvercle (74) servant à fermer de manière sélective ledit dispositif de confinement de récipient pour boisson à glace sèche (70).

7. Système servant à charger de la glace sèche dans un récipient pour boisson à glace sèche, comportant un appareil de charge (2) selon l'une quelconque des revendications 1 à 6 et un récipient pour boisson à glace sèche (28), le récipient pour boisson à glace sèche (28) étant agencé pour être chargé par l'inter-

- médiaire de l'appareil de charge (2), le récipient pour boisson à glace sèche (28) ayant une chambre de glace sèche (48) et une partie intérieure, la chambre de glace sèche (48) étant en communication avec la partie intérieure par le biais de perforations primaire (50) et secondaire (52) et la partie intérieure dudit récipient pour boisson à glace sèche ayant une forme prédéterminée, la perforation primaire (50) comportant une entrée de charge servant à charger du dioxyde de carbone dans la chambre (48) et la perforation secondaire (52) comportant une sortie d'expulsion servant à des fins d'expulsion de l'air et du dioxyde de carbone gazeux en provenance de la chambre de glace sèche (48).
8. Système selon la revendication 7, dépendante de la revendication 3, dans lequel, quand ledit corps (4) et ladite partie intérieure dudit récipient pour boisson à glace sèche (28) sont en prise, ladite ouverture est alignée sur ladite perforation secondaire (52), ledit filtre étant supporté par ledit corps et intercalé entre ladite perforation secondaire et ladite ouverture, et l'orifice (38) du corps (4) est aligné sur la perforation primaire (50).
9. Système selon la revendication 8, dans lequel ledit corps (4) définit un axe longitudinal de corps et ladite partie intérieure dudit récipient pour boisson à glace sèche définit un axe longitudinal de récipient pour boisson à glace sèche, ledit axe longitudinal de corps et ledit axe longitudinal de récipient pour boisson à glace sèche étant généralement coïncidents quand ladite partie intérieure dudit récipient pour boisson à glace sèche est en prise avec ledit corps, ledit orifice étant situé sur ledit axe longitudinal de corps et ladite perforation primaire étant située sur ledit axe longitudinal de récipient pour boisson à glace sèche, ce par quoi ledit orifice (38) et ladite perforation primaire sont alignés quand ledit récipient pour boisson à glace sèche est en prise avec ledit corps.
10. Procédé servant à charger de la glace sèche dans un récipient pour boisson à glace sèche, le procédé comportant les étapes consistant à :
- a. placer un récipient pour boisson à glace sèche (28) selon la revendication 7 en prise avec un appareil de charge (2) selon l'une quelconque des revendications 3 à 6, le procédé comportant l'étape consistant à placer ladite partie intérieure du récipient pour boisson à glace sèche en prise avec ledit corps (4), de telle sorte que ledit orifice (38) est aligné sur ladite perforation primaire (50), ladite ouverture est alignée sur ladite perforation secondaire (52), et
 - b. ouvrir une soupape, ladite soupape commandant de manière sélective un écoulement de dioxyde de carbone en provenance d'un récipient sous pression (6), ledit écoulement de dioxyde de carbone se déchargeant au travers dudit orifice (38) ;
 - c. recevoir ledit dioxyde de carbone par ladite chambre de glace sèche (48) au travers de ladite perforation primaire (50) ;
 - d. recueillir la glace sèche formée à l'intérieur de ladite chambre de glace sèche (48) à partir du dioxyde de carbone reçu, et libérer le gaz en provenance de ladite chambre de glace sèche au travers de ladite perforation secondaire (52) et dudit filtre (44) ; et
 - e. séparer ladite partie intérieure du récipient pour boisson à glace sèche de toute mise en prise avec ledit corps (4).
11. Procédé selon la revendication 10, dans lequel ladite partie intérieure du récipient pour boisson à glace sèche définit un axe longitudinal de récipient pour boisson, ledit corps définit un axe longitudinal de corps, ledit axe longitudinal de récipient pour boisson et ledit axe longitudinal de corps étant généralement coïncidents quand ladite partie intérieure du récipient pour boisson à glace sèche est en prise avec ledit corps.
12. Procédé selon la revendication 11, dans lequel ladite perforation primaire (50) est située sur ledit axe longitudinal de récipient pour boisson et ledit orifice est situé sur ledit axe longitudinal de corps.
13. Procédé selon la revendication 12, dans lequel ledit corps (4) est généralement cylindrique, ledit orifice (38) est situé au niveau d'une extrémité libre dudit corps, et ladite ouverture est définie par ladite extrémité libre dudit corps, ladite ouverture et ledit filtre étant disposés de manière annulaire autour dudit orifice.
14. Procédé selon la revendication 13, dans lequel ladite étape consistant à placer le récipient pour boisson à glace sèche en prise avec ledit corps (4) comporte par ailleurs les étapes consistant à :
- a. retirer un couvercle, ladite station de charge définissant un dispositif de confinement fermé de manière sélective par ledit couvercle, ledit corps étant confiné à l'intérieur dudit dispositif de confinement ;
 - b. placer ladite partie intérieure du récipient pour

boisson à glace sèche en prise avec ledit corps ;
et

c. remettre en place ledit couvercle sur ledit dispositif de confinement de station de charge pour fermer ledit dispositif de confinement, le récipient pour boisson à glace sèche étant enfermé à l'intérieur dudit dispositif de confinement quand ladite partie intérieure est en prise avec ledit corps et ledit couvercle est remis en place, ladite station de charge comprenant une base, ladite soupape à commande électrique étant confinée à l'intérieur de ladite base.

5

10

15

20

25

30

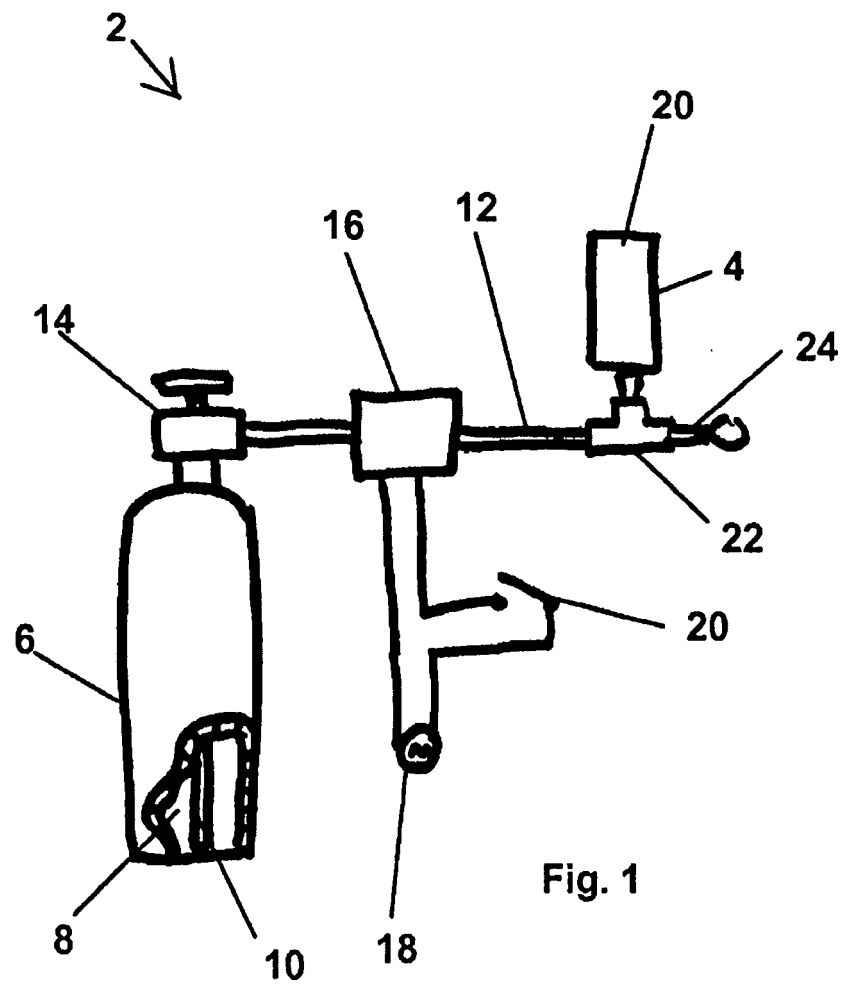
35

40

45

50

55



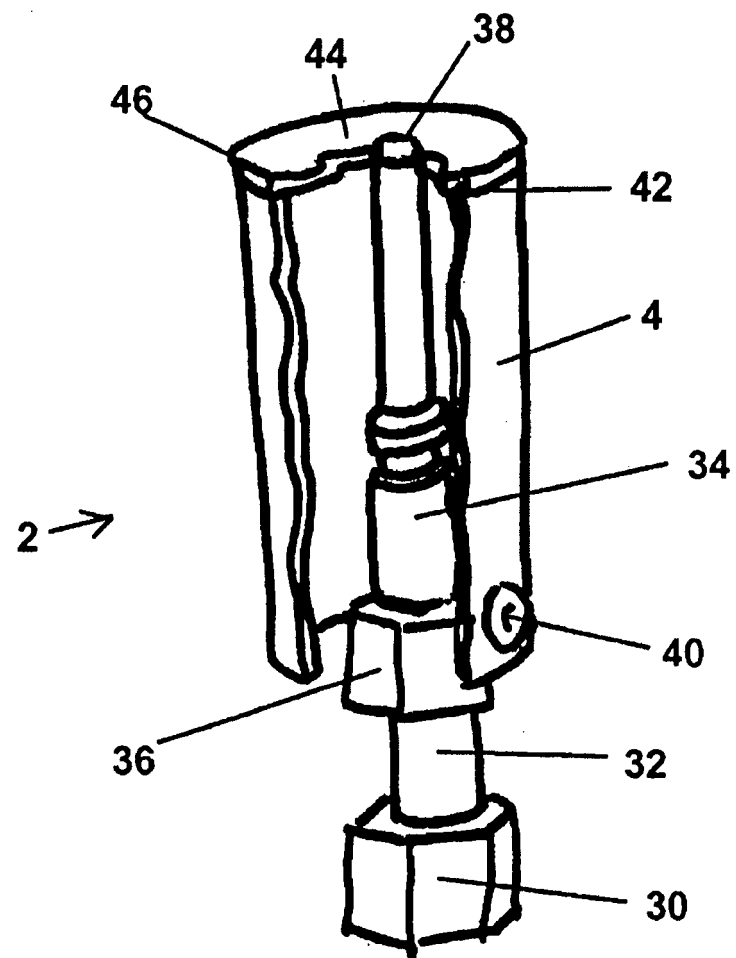
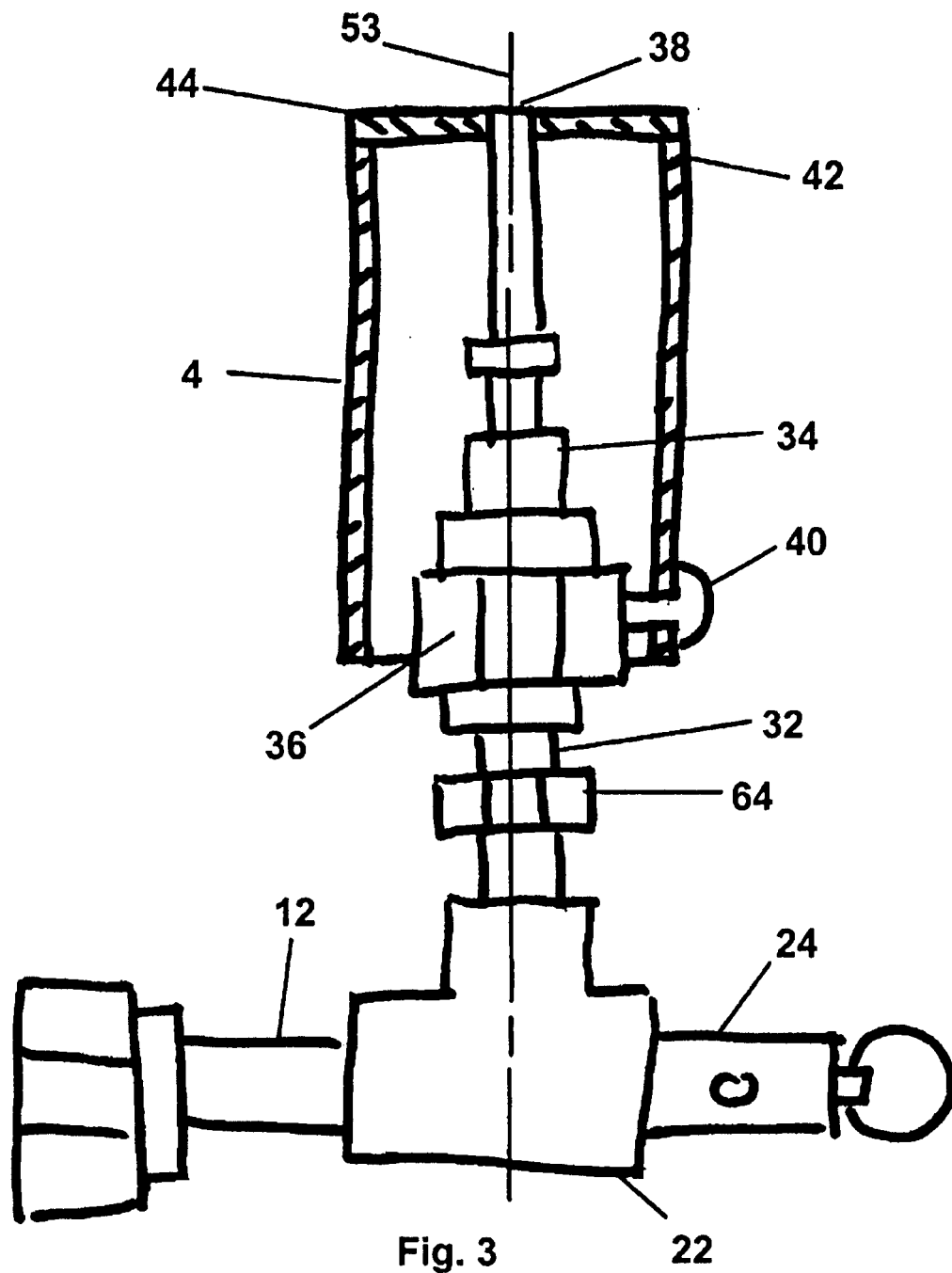
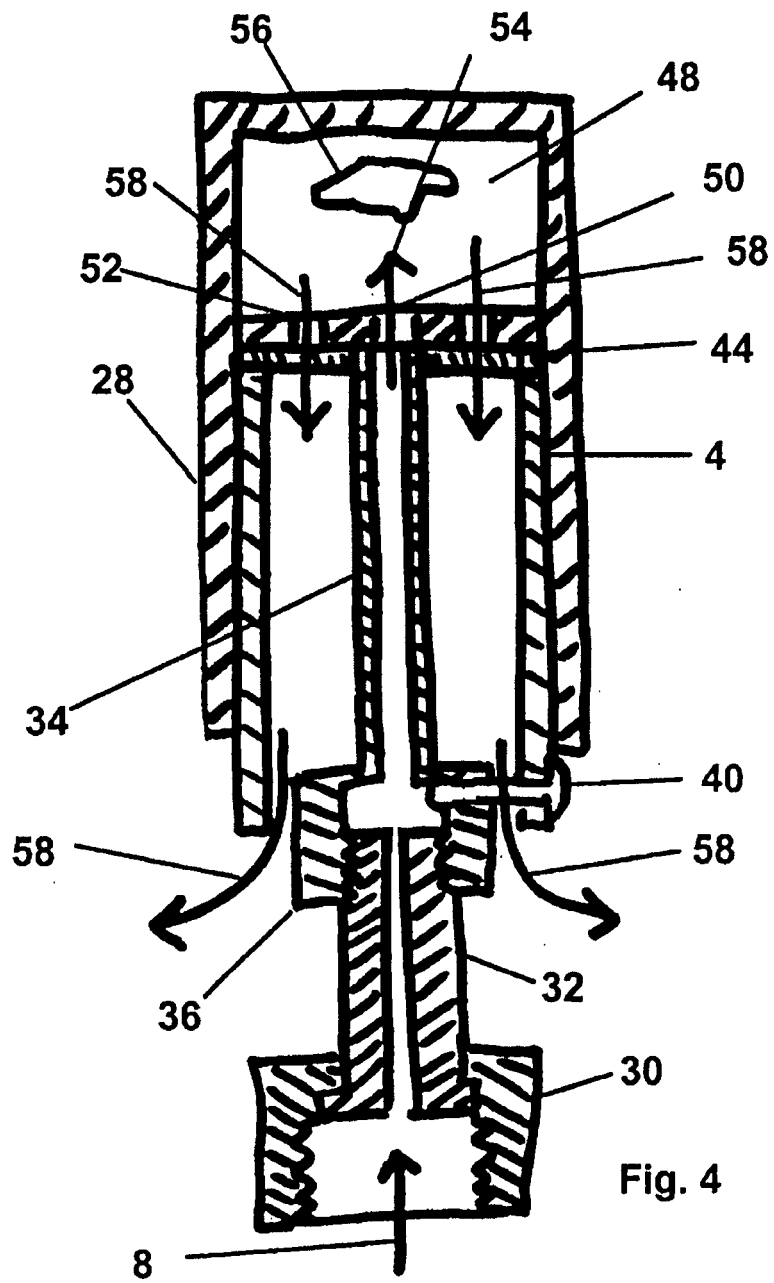


Fig. 2





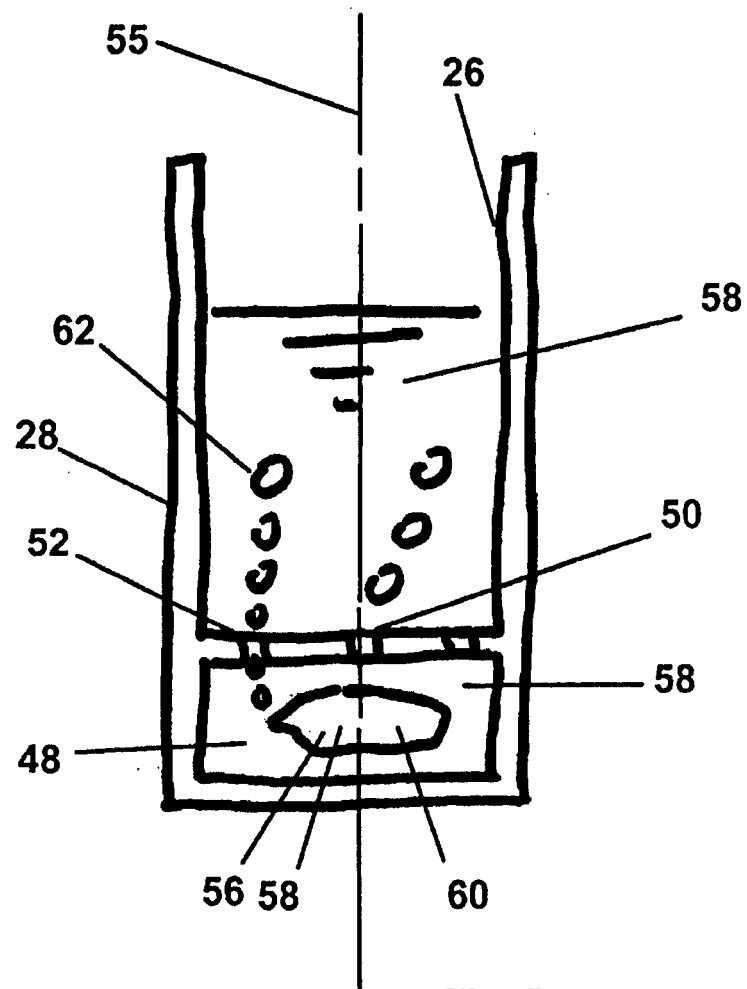


Fig. 5

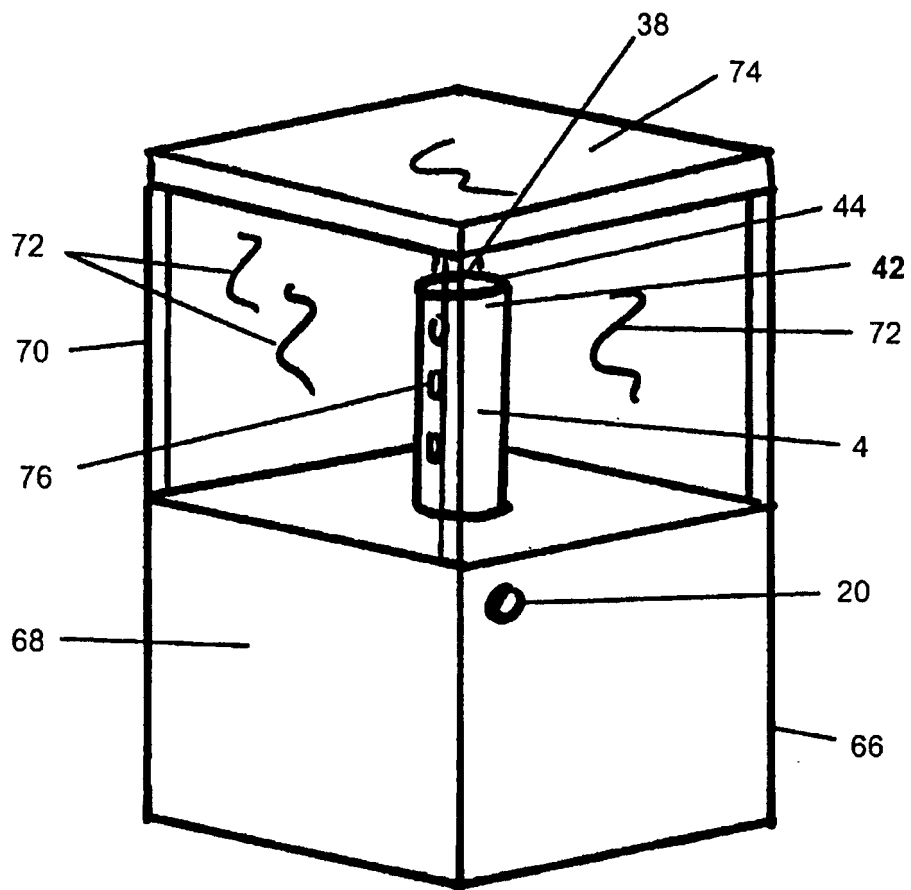


Fig. 6

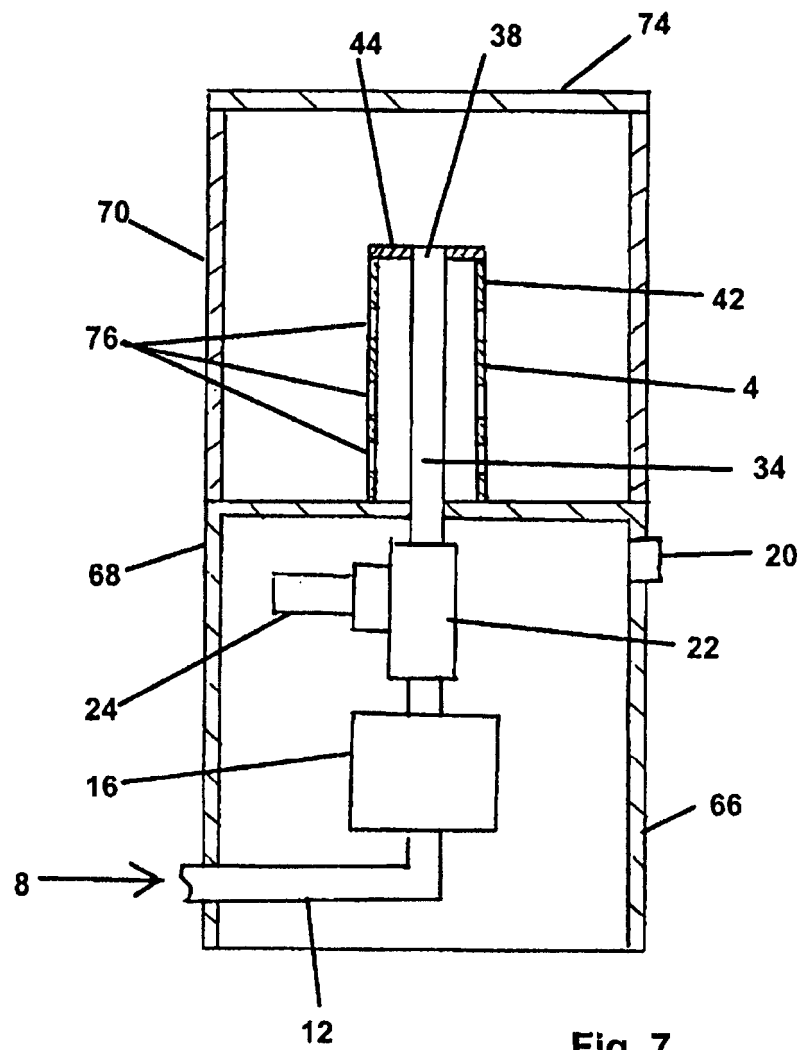


Fig. 7

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 6868694 B [0002] [0003]
- US 1706436 A [0004]
- US 1981830 A [0004]