(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 311 756 A1

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
20.04.2011 Bulletin 2011/16

(21) Application number: **09793828.6**

(22) Date of filing: **06.07.2009**

(51) Int Cl.:
B65D 85/82 *(2006.01)* ***F25D 5/00*** *(2006.01)*

(86) International application number:
PCT/CN2009/072635

(87) International publication number:
WO 2010/003353 (14.01.2010 Gazette 2010/02)

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK SM TR
Designated Extension States:
AL BA RS

(30) Priority: **07.07.2008 CN 200810130540**

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(54) **LEAKAGE SELF-HELP CONTAINER FOR STOCKING HAZARDOUS CHEMICAL PRODUCTS**

(57) A leakage self-rescue container for stocking dangerous chemicals comprises a first container for stocking dangerous chemicals, and a second container installed and fixed in the first container. The second container contains a substantially harmless liquefied gas and has an opening, which controllably communicates with the external environment. Where dangerous chemical products leak due to accidents or are threatened by high temperature, the liquefied gas in the second container releases so that the temperature in the first container decreases and thereby the pressure in the first container reduces so as to avoid the leakage or explosion caused by overpressure, or to increase the viscosity of the dangerous chemicals to reduce the leakage rate when the leakage occurs and to obtain valuable time for more effective rescue.

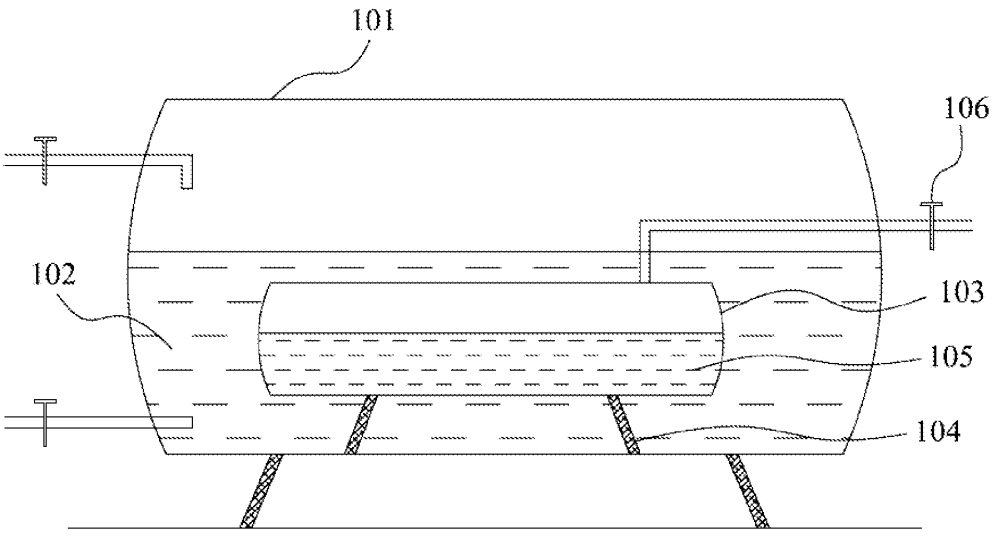

Figure 1

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Description

TECHNICAL FIELD

[0001] The present invention relates to a container for stocking dangerous chemicals, in particular, to a leakage self-rescue container for stocking dangerous chemicals.

BACKGROUND ART

[0002] Chemicals are indispensable to the industrial production and the people's living. Moreover, most of the chemicals are dangerous chemicals, in which most of them are fluids including gasses and liquids, especially liquids with low boiling points. During the production, storage, transportation and use of dangerous chemicals, leakage problems sometimes occur due to the aging of a container, high temperature and accidents, which will lead to the harm to the environment and even result in disastrous consequences. Prompt and effective self-rescue will gain more valuable time for rescue and therefore it will be more possible to reduce the harm and avoid the disastrous consequences.

SUMMARY OF INVENTION

[0003] When fluid dangerous chemicals leak, it is key on how to reduce the pressure of the storage container and increase the viscosity of dangerous products in order to reduce the leakage rate, decrease the total amount of leakage pollution, reduce difficulty of rescue and gain more time for rescue.

[0004] The present invention relates to a leakage self-rescue container for stocking dangerous chemicals comprising:

> a first container for stocking dangerous chemicals; and
> a second container installed and fixed in the first container, the second container contains a substantially harmless liquefied gas and has an opening, which controllably communicates with the external environment.

[0005] Where the dangerous chemicals in the first container leak due to accidents or the first container is threatened by high temperature, the temperature in the first container decreases and thereby the pressure in the first container reduces by releasing the liquefied gas in the second container so as to avoid the leakage or explosion of the first container caused by overpressure, or to increase the viscosity of the dangerous chemicals to reduce the leakage rate when the leakage occurs so that it can obtain valuable time for more effective rescue.

[0006] The leakage self-rescue container of the present invention can be used for stocking flammable, explosive, toxic, corrosive, radioactive or chemical polluted dangerous chemicals, in particular for stocking more dangerous gasses or fluids, especially dangerous chemicals such as fluids with low boiling points and the like. The dangerous chemicals include but are not limited to phosphorus oxychloride, gasoline, bromine, liquid ammonia, liquid chlorine, liquid hydrogen sulfide, hydrocyanic acid, methyl isocyanate, ethylene oxide, natural gas, liquefied petroleum gas, alcohol, chloroform, and the like.

[0007] The first container for stocking dangerous chemicals can be selected based on the properties of chemical products stocked in the container. Various conventional containers in the art for stocking dangerous chemicals can be used. The leakage self-rescue container of the present invention can be a separate container, and can be a container loaded by any vehicle.

[0008] A second container is installed in the first container. The second container contains a substantially harmless liquefied gas. Where the dangerous chemicals in the first container leak due to accidents or the first container is threatened by high temperature, the liquefied gas can be released in the form of gas from the second container by opening a vent valve on the second container. The release of the liquefied gas absorbs the heat of the surrounding environment (*i.e.* the first container) so that the temperature of the container decreases and thereby the pressure in the first container reduces so as to avoid the leakage or explosion caused by overpressure, or to increase the viscosity of the dangerous chemicals to reduce the leakage rate when the leakage occurs and to obtain valuable time for more effective rescue.

[0009] The second container can be fixed in the first container with a method well-known to one skilled in the art. Preferably, the relative position of the second container to the first container is that the center of the second container is closed to the center of the first container while the second container does not directly contact with the first container so that the second container mainly exchanges the heat with the interior of the first container but does not exchanges the heat with the external environment through the walls of the first container.

[0010] The liquefied gas in the second container can be selected from a gas, of which the critical temperature is above the ambient temperature and which is substantially harmless to environment and human. The liquefied gas is a gas under the air pressure at the ambient temperature, but it is a liquid under pressure at the ambient temperature. Where the leakage self-rescue container is not used, the second container is under pressure and the gas is maintained as a liquid. However, during usage, the second container communicates with the outside and the liquefied gas is gasified and absorbs the environmental heat. Preferably, the liquefied gas is liquid carbon dioxide, which is readily available and inexpensive.

[0011] The second container is a rigid and pressure-resistant container, preferably a steel tank or cylinder. The second container can be pressure-resistant in any shape such as cylindrical, spherical, snakelike tube and the like.

[0012] The second container of the present invention

has an opening, which controllably communicates with the external environment. The second container has one or more openings. In one embodiment, the opening is a manual vent valve. In another embodiment, the opening is an automatic vent valve. In another embodiment, the second container has not only a manual vent valve but an automatic vent valve.

[0013] In one embodiment, the first container also has a leak detection device. Where the leak detection device detects the leakage of the dangerous chemicals, the leakage signal is delivered to a control system. The control system controls to open the automatic vent valve automatically and sends out an alarm signal.

[0014] In another embodiment, the first container also has a temperature sensor. Where the temperature sensor detects that the ambient temperature is higher than the predetermined temperature, the abnormal temperature signal is delivered to a control system. The control system controls to open the automatic vent valve automatically and sends out an alarm signal.

[0015] When the liquefied gas of the present invention is selected to be liquid carbon dioxide, a person skilled in the art knows how to arrange the openings of the second container so as to prevent dry ice formed during the gasification of liquid carbon dioxide from blocking the openings.

[0016] The container of the present invention can be used as a storage container for producing, stocking, transporting and using liquid dangerous chemicals. It can reduce the security risks for producing, stocking, transporting and using liquid dangerous chemicals including more dangerous gasses and fluids, especially dangerous chemical fluids with low boiling points.

BRIEF DESCRIPTION OF DRAWINGS

[0017]

Figure 1 is a schematic diagram of an embodiment of the present invention.

Figure 2 is a schematic diagram of another embodiment of the present invention.

MODE OF CARRYING OUT INVENTION

[0018] The technical contents of the present invention are further illustrated by the following preferred embodiments of the present invention with reference to the drawings. It should be understood that the contents as shown in the drawings are merely used to illustrate the present invention rather than limiting the scope of the present invention.

[0019] In each figure, the same component has the same number. For example, the number of the first container is 101 in Figure 1, the number of the first container is 201 in Figure 2, and so on.

[0020] Figure 1 is a schematic diagram of an embodiment of the present invention. A second container 103 is fixed in a first container 101 for stocking dangerous chemicals 102 via supports 104. The second container 103 is cylindrical.

[0021] The second container 103 contains a liquefied gas 105. A liquid-level sensor (not shown) can be installed in the second container 103 to detect the amount of the liquefied gas 105 in the second container 103 at any time and to complement the liquefied gas 105 where needed.

[0022] The second container 103 has a vent valve 106, which controllably communicates with the external environment. The second container 103 may have one or more vent valves 106.

[0023] The liquefied gas 105 can be injected or complemented into the second container 103 through the vent valve 106 or other feed inlets (not shown).

[0024] When the first container 101 leaks due to an accident or is threatened by high temperature, the vent valve 106 is opened to release the liquefied gas 105 in the second container 103. During the release, the liquefied gas 105 absorbs the heat of the surrounding environment (*i.e.* the first container 101) so that the temperature of the first container 101 decreases and thereby the pressure in the first container 101 reduces so as to avoid the leakage or explosion of the first container 101 caused by overpressure, or to increase the viscosity of the dangerous chemicals 102 to reduce the leakage rate when the leakage occurs.

[0025] Figure 2 is a schematic diagram of another embodiment of the present invention. A snakelike tubular second container 203 is fixed in a first container 201 for stocking dangerous chemicals 202. The second container 203 contains a liquefied gas 205.

[0026] The second container 203 has a vent valve 206, which controllably communicates with the external environment, and a feed inlet 207, through which the liquefied gas 205 are injected. The second container 203 may have one or more vent valves 206 and one or more feed inlets 207.

[0027] The first container 201 has a leak detection device or a temperature sensor 208. When the leak detection device or the temperature sensor 208 detects that the first container 201 leaks or is threatened by high temperature, the detecting signal is delivered to a control system 209. The control system 209 controls to open or partly open the vent valve 206 to release the liquefied gas 205 in the second container 203. During the release, the liquefied gas 205 absorbs the heat of the surrounding environment (*i.e.* the first container 201) so that the temperature of the first container 201 decreases and thereby the pressure in the first container 201 reduces so as to avoid the leakage or explosion of the first container 201 caused by overpressure, or to increase the viscosity of the dangerous chemicals 202 to reduce the leakage rate when the leakage occurs.

Claims

1. A leakage self-rescue container for stocking dangerous chemicals comprising:

   a first container for stocking dangerous chemicals; and
   a second container installed and fixed in the first container, the second container contains a substantially harmless liquefied gas and has an opening, which controllably communicates with the external environment.

2. A leakage self-rescue container of claim 1, wherein the second container is a rigid and pressure-resistant container.

3. A leakage self-rescue container of claim 1 or 2, wherein the second container is cylindrical, a spherical or snakelike.

4. A leakage self-rescue container of any one of claims 1 to 3, wherein the relative position of the second container to the first container is that the center of the second container is closed to the center of the first container while the second container does not contact directly with the first container.

5. A leakage self-rescue container of any one of claims 1 to 4, wherein the substantially harmless liquefied gas is liquid carbon dioxide.

6. A leakage self-rescue container of any one of claims 1 to 5, wherein the opening is a manual vent valve.

7. A leakage self-rescue container of any one of claims 1 to 5, wherein the opening is an automatic vent valve.

8. A leakage self-rescue container of claim 7, wherein the first container has a leak detection device, when the leak detection device detects the leakage of the dangerous chemicals, the automatic vent valve is controlled to open automatically.

9. A leakage self-rescue container of claim 7, wherein the first container has a temperature sensor, when the temperature sensor detects that the ambient temperature is higher than the predetermined temperature, the automatic vent valve is controlled to open automatically.

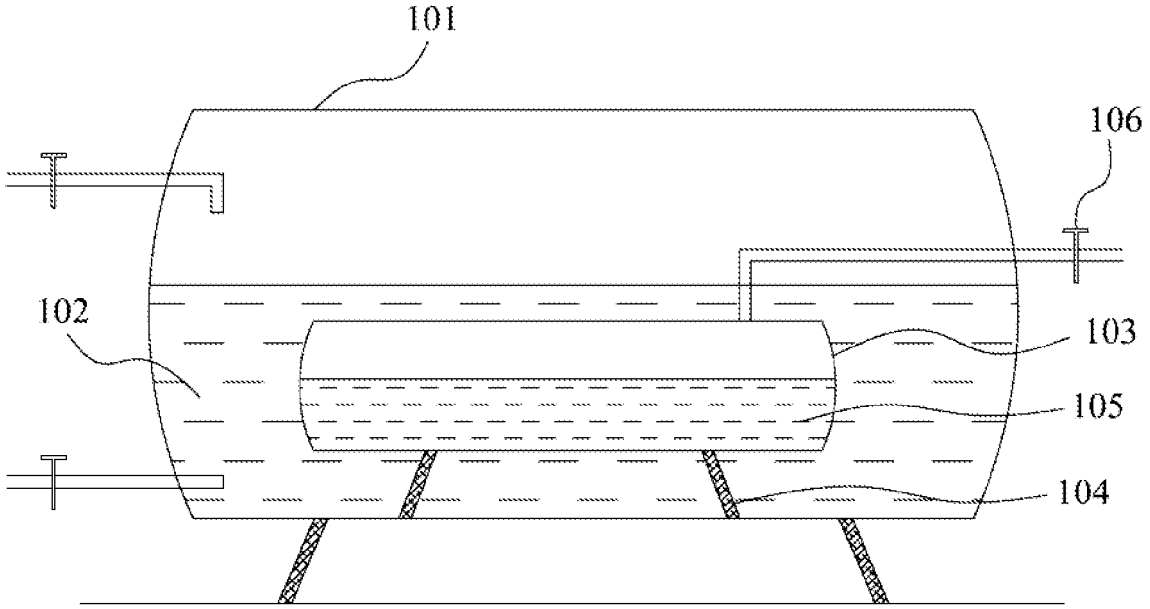

Figure 1

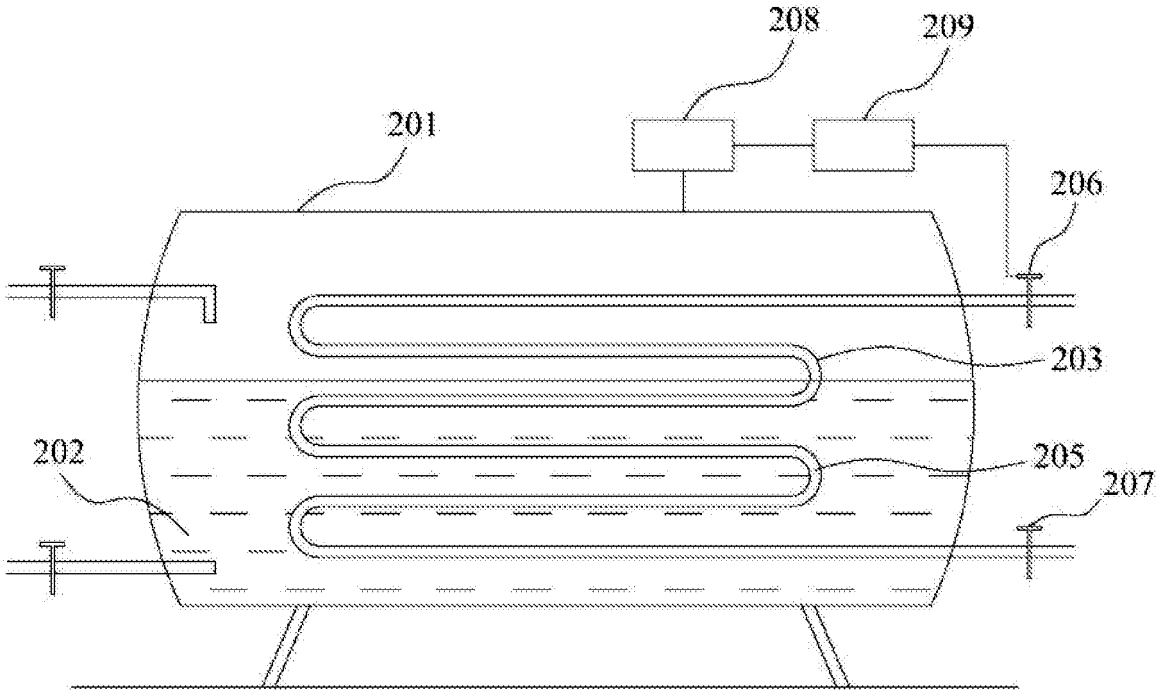

Figure 2

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2009/072635

A. CLASSIFICATION OF SUBJECT MATTER

See extra sheet

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)

IPC: B65D F25D

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 practicable, search terms used)

CNPAT,EPODOC, WPI, PAJ: leaking, hazardous, stock+, chemical, open, container, liquefied, gas

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US4723974 A (Stephen W. Ammerman) 9 Feb. 1988 (09. 02.1988) See pages 2-3, figures	1-7
X	US3698200 A (AIR PROD & CHEM) 17 Oct. 1972 (17. 10.1972) see the whole document	1-9
A	FR2601125 A (SOUCAZE SOUDAT JEAN) 8 Jan. 1988 (08. 01.1988) see the whole document	1-9
A	CN2714937 Y (TANG, Jian) 3 Aug. 2005 (03. 08.2005) see the whole document	1-9
A	CN1675110 A (AZ ELECTRONIC MATERIALS JAPAN [JP]) 28 Sep. 2005 (28. 09.2005) see the whole document	1-9

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"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

"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

"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

"&"document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
21 Sep. 2009(21.09.2009)	**01 Oct. 2009 (01.10.2009)**
Name and mailing address of the ISA/CN The State Intellectual Property Office, the P.R.China 6 Xitucheng Rd., Jimen Bridge, Haidian District, Beijing, China 100088 Facsimile No. 86-10-62019451	Authorized officer SHAO, Jitao Telephone No. (86-10)62085326

Form PCT/ISA /210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2009/072635

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
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US3698200 A	17. 10.1972	NL7113787 A	20. 06.1972
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Form PCT/ISA /210 (patent family annex) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2009/072635

CLASSIFICATION OF SUBJECT MATTER

B65D 85/82 (2006.01) i
F25D 5/00 (2006.01) i

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