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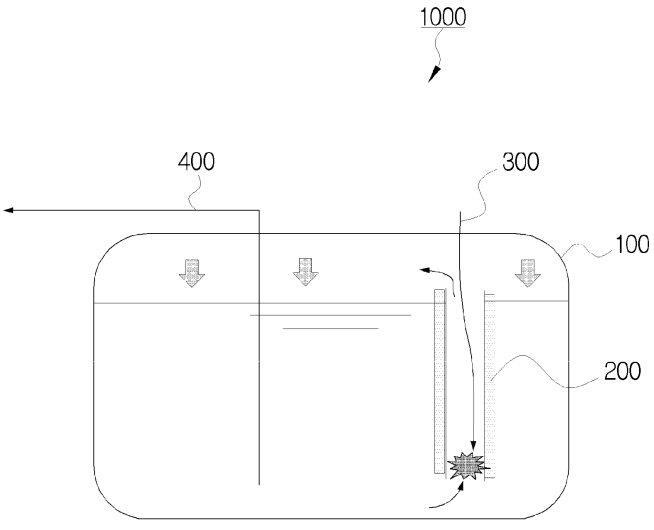
(54) FLUID TANK COMPRISING INTERNAL PRESSURIZER

(57) The present invention relates to a fluid tank comprising an internal pressurizer and, more particularly, to a fluid tank capable of storing a liquid fluid such as liquefied natural gas, heating a part of the liquid fluid to generate an evaporation gas, and, through the resulting pressurization, sending the liquid fluid to the outside, wherein the fluid tank comprises an internal pressurizer which is excellent in safety and capable of quickly pressurizing the fluid tank.

FIG. 2



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Description

[Technical Field]

[0001] The present invention relates to a fluid tank including an internal pressurizer, and more particularly, to a fluid tank including an internal pressurizer, the fluid tank being capable of storing a liquid fluid such as liquefied natural gas, heating a part of the liquid fluid to generate an evaporation gas, and sending the liquid fluid to the outside through the resulting pressurization.

[Background Art]

[0002] FIG. 1 is a diagram illustrating a fluid tank 10 according to the related art.

[0003] The fluid tank 10 according to the related art includes a tank main body 1 capable of storing a liquid fluid such as liquefied natural gas. Here, the inside of the tank main body 1 is pressurized to send the liquid fluid stored inside the tank main body 1 to the outside, thereby sending the liquid fluid to the outside through a sending pipe 5.

[0004] The fluid tank 10 according to the related art includes a pressurization means 3 such as an evaporator provided outside the tank main body 1, and supplies the liquid fluid to the pressurization means 3 through a lower pipe 2 connecting the tank main body 1 and the pressurization means 3 to each other. The pressurization means 3 such as an evaporator is operated to evaporate the liquid fluid to generate an evaporation gas and supplies the evaporation gas to the tank main body 1 through an upper pipe 4, thereby pressurizing the inside of the tank main body 1.

[0005] That is, a part of the liquid fluid stored inside the tank main body 1 is supplied to the pressurization means 3, and the inside of the tank main body 1 is pressurized using the evaporation gas generated through the operation of the pressurization means 3, thereby sending the liquid fluid to the outside.

[0006] Here, in the fluid tank 10 according to the related art, since the liquid fluid needs to be supplied to the pressurization means 3, for a smooth supply of the liquid fluid, the lower pipe 2 is connected to a lower portion of the tank main body 1 and the liquid fluid is supplied to the pressurization means 3 through the lower pipe 2. However, in a case of the above-described configuration, the fluid may be leaked from a connected portion between the lower portion of the tank main body 1 and the lower pipe 2.

[0007] In a case where the liquid fluid stored inside the fluid tank 10 is an ultra-low temperature liquefied natural gas, a safety accident of a user, such as an explosion caused by ultra-low temperature brittleness and fire, may occur.

[0008] In addition, the pressurization means 3 is provided outside the tank main body 1 and is connected through the lower pipe 2, the upper pipe 4, and the like, such that a liquid fluid or gaseous fluid flows. Therefore, a separate space is required for the pressurization means 3 to be provided on the outside, and a control valve or the like for controlling a fluid flowing around the pressurization means 3 needs to be additionally provided. Therefore, manufacturing costs and time for the fluid tank 10 increase, which is problematic.

[Disclosure]

[Technical Problem]

[0009] An object of the present invention is to provide a fluid tank including an internal pressurizer that is excellent in safety and is capable of quickly pressurizing the fluid tank, the fluid tank being capable of storing a liquid fluid such as liquefied natural gas, heating a part of the liquid fluid to generate an evaporation gas, and sending the liquid fluid to the outside through the resulting pressurization.

[Technical Solution]

[0010] In one general aspect, a fluid tank including an internal pressurizer includes: a tank main body 100 in which a liquid fluid is stored; a pressurization pipe 200 formed in a vertically penetrating shape at a selected position in the tank main body 100, and of which a selected lower side is positioned in the liquid fluid; a pressurization means 300 pressurizing the inside of the tank main body 100 by evaporating the liquid fluid accommodated in the pressurization pipe 200; and a sending pipe 400 of which an inlet is arranged on a lower side of the sending pipe 400 in the tank main body 100 so as to allow the liquid fluid to be introduced, and which is configured to send the liquid fluid stored in the tank main body 100 to the outside.

[0011] A selected upper side of the pressurization pipe 200 may be positioned on a level higher than that of the liquid fluid stored inside the tank main body 100.

[0012] The pressurization means 300 may be implemented by at least one of a heating means using electric energy, a heating means in which heat exchange is performed using a gaseous heating medium, or a heating means in which heat exchange is performed using a liquid heating medium.

[0013] The pressurization pipe 200 may be formed of an insulating material or may be insulated.

[0014] The tank main body 100 may further include a fluid remaining portion 110 protruding downward at a position corresponding to a position of the pressurization pipe 200, and the pressurization pipe 200 may extend downward so as to correspond to the fluid remaining portion 110.

[Advantageous Effects]

[0015] In the fluid tank including an internal pressurizer

according to the present invention, since pressurization of a liquid fluid such as liquefied natural gas is performed in the tank main body, there is no risk of leakage of the liquid fluid. Therefore, the fluid tank including an internal pressurizer is excellent in terms of safety.

[0016] Further, the fluid tank including an internal pressurizer according to the present invention does not require an external pressurization means or the like for pressurizing the fluid liquid, and thus, has an excellent space utilization efficiency. In addition, the fluid tank including an internal pressurizer according to the present invention does not have to additionally include, as a pressurization means, a pipe for flowing a gaseous fluid or liquid fluid, a valve for a flow rate control, and the like, and thus, manufacturing costs and time for the fluid tank may be reduced.

[0017] In addition, the fluid tank including an internal pressurizer according to the present invention selectively heats the liquid fluid to generate the evaporation gas. Therefore, pressurization for sending the liquid fluid is quickly performed.

[Description of Drawings]

[0018]

FIG. 1 is a diagram illustrating a fluid tank according to the related art.

FIG. 2 is a diagram illustrating a fluid tank including an internal pressurizer according to a first embodiment of the present invention.

FIG. 3 is another diagram illustrating the fluid tank including an internal pressurizer according to the first embodiment of the present invention.

FIG. 4 is a diagram illustrating a fluid tank including an internal pressurizer according to a second embodiment of the present invention.

[Detailed Description of Main Elements]

[0019]

1000:	Fluid tank including internal pressurizer
100:	Tank main body
110:	Fluid remaining portion
200:	Pressurization pipe
300:	Pressurization means
400:	Sending pipe

[Best Mode]

[0020] Hereinafter, a fluid tank including an internal pressurizer according to the present invention will be described in detail with reference to the accompanying drawings.

<First Embodiment>

[0021] FIG. 2 is a diagram illustrating a fluid tank including an internal pressurizer according to a first embodiment of the present invention, and FIG. 3 is another diagram illustrating the fluid tank including an internal pressurizer according to the first embodiment of the present invention.

[0022] Referring to FIGS. 2 and 3, a fluid tank 1000 including an internal pressurizer according to the first embodiment of the present invention includes a tank main body 100 in which a liquid fluid is stored and accommodated, and is formed so that the liquid fluid stored in the tank main body 100 may be sent to the outside (a source of demand for the fluid or the like) through pressurization of the inside of the tank main body 100.

[0023] Here, the liquid fluid to be stored and sent in the fluid tank 1000 including an internal pressurizer according to the first embodiment of the present invention is liquefied natural gas (LNG). It is a matter of course that, in addition to the liquefied natural gas, various liquid fluids such as liquefied hydrogen gas may be used as the liquid fluid, as long as the liquid fluid may be stored inside the tank main body 100 and then sent to the outside through pressurization.

[0024] The fluid tank 1000 including an internal pressurizer according to the first embodiment of the present invention includes the tank main body 100 in which a liquid fluid such as liquefied natural gas is stored, a pressurization pipe 200 provided inside the tank main body 100 and configured to accommodate a part of the liquid fluid, a pressurization means 300 provided inside the pressurization pipe 200 and configured to pressurize the inside of the tank main body 100 by heating the liquid fluid, and a sending pipe 400 configured to send the liquid fluid to the outside through the pressurization of the tank main body 100 performed by the pressurization means 300.

[0025] That is, in the fluid tank 1000 including an internal pressurizer according to the first embodiment of the present invention, the pressurization means 300 generates the evaporation gas by heating the liquid fluid accommodated in the pressurization pipe 200, and pressurizes the inside of the tank main body 100 by using the generated evaporation gas, such that the liquid fluid stored inside the fluid tank 100 may be sent to the outside through the sending pipe 400 by the resulting pressure.

[0026] More specifically, the tank main body 100 may be a tank for various purposes, such as a general tank in which a liquid fluid is stored, a vehicle fuel tank, a vessel fuel tank, or a tank lorry.

[0027] The pressurization pipe 200 is formed in a vertically penetrating shape at a selected position in the tank main body 100. The pressurization pipe 200 may be formed in a vertically hollow shape to accommodate a part of the liquid fluid stored inside the tank main body 100 therein, and may be pressurized by the pressurization means 300.

[0028] The pressurization means 300 is positioned in the hollow of the pressurization pipe 200, and generates the evaporation gas by heating the liquid fluid accommodated in the pressurization pipe 200, thereby making it possible to pressurize the inside of the tank main body 100.

[0029] The pressurization means 300 may be implemented by various means for heating the liquid fluid accommodated in the pressurization pipe 200. As an example, the pressurization means 300 may be implemented by a means capable of generating the evaporation gas by heating the liquid fluid accommodated in the pressurization pipe 200 through a supply of electric energy.

[0030] As another example, the pressurization means 300 may be implemented by a means that heats the liquid fluid through heat exchange between a gaseous heating medium, liquid heating medium, or the like and the liquid fluid in the tank main body 100 to generate the evaporation gas and pressurize the inside of the tank main body 100 using the evaporation gas, thereby sending the liquid fluid stored inside the tank main body 100.

[0031] Here, the liquid fluid accommodated in the hollow of the pressurization pipe 200 is heated by the pressurization means 300 to pressurize the tank main body 100, and thus it is preferable that the pressurization pipe 200 is formed of an insulating material or is insulated to improve liquid fluid heating efficiency.

[0032] Further, it is a matter of course that the pressurization pipe 200 needs to be formed so that a selected lower side is positioned in the liquid fluid to allow the liquid fluid to be introduced from below and be heated. Since the pressurization of the tank main body 100 may be efficiently performed only when the evaporation gas generated by the pressurization means 300 is supplied onto the gaseous fluid in the tank main body 100, it is preferable that the pressurization pipe 200 is formed so that a selected upper side is positioned on a level higher than that of the liquid fluid.

[0033] The sending pipe 400 is formed so that an inlet is arranged on a lower side of the sending pipe 400 in the tank main body 100 so as to allow the liquid fluid to be introduced, and the liquid fluid stored in the tank main body 100 may be sent to the outside.

[0034] It is preferable that, in the sending pipe 400, the inlet into which the liquid fluid is introduced and flows is positioned on a bottom surface of the tank main body 100, such that the liquid fluid may be sent to the outside even in a case where the flow rate of the liquid fluid is low.

[0035] As described above, the fluid tank 1000 including an internal pressurizer according to the first embodiment of the present invention may heat the liquid fluid by using the pressurization means 300 and pressurize the inside of the tank main body 100 by using the evaporation gas generated by the heating to send the liquid fluid accommodated in the tank main body 100 to the outside. Therefore, it is possible to store and send the liquid fluid in a safer manner as compared to the related art in which an evaporator is provided outside and a tank main body is pressurized by the operation of the evaporator.

[0036] That is, in a case where the evaporator is provided outside and the pressurization is performed, since the fluid in the tank main body needs to be supplied to the evaporator, the evaporator is positioned below the tank main body in most cases, and therefore, the fluid in the tank main body may be leaked, which may cause fire or explosion. On the other hand, in the fluid tank 1000 including an internal pressurizer according to the first embodiment of the present invention, the liquid fluid stored inside the fluid tank 1000 does not move, but is heated in the tank main body 100, and therefore, a possibility that the liquid fluid is leaked decreases.

[0037] Further, the fluid tank 1000 including an internal pressurizer according to the first embodiment of the present invention need not include an additional pipe for an external evaporator, a valve for controlling a fluid moving through the pipe, and the like, and thus it is possible to reduce manufacturing costs and time for the fluid tank 1000.

[0038] In addition, in the fluid tank 1000 including an internal pressurizer according to the first embodiment of the present invention, the inside of the tank main body 100 is pressurized by heating the liquid fluid accommodated in the pressurization pipe 200, rather than heating the entire liquid fluid accommodated in the tank main body 100, such that it is possible to reduce a time required for generating the evaporation gas by heating the fluid.

[0039] Further, referring to FIG. 3, it is preferable that the pressurization pipe 200 is formed at a right angle in a vertical direction and the liquid fluid is accommodated therein to increase accuracy for heating the liquid fluid. However, the pressurization pipe 200 may be formed in various shapes according to the shape or position of the heating means 300, or the shape or purpose of the tank main body 100, as long as the liquid fluid may be introduced from below and accommodated, and the evaporation gas generated by heating the liquid fluid may be discharged upward to pressurize the inside of the tank main body 100.

<Second Embodiment>

[0040] FIG. 4 is a diagram illustrating a fluid tank including an internal pressurizer according to a second embodiment of the present invention.

[0041] Referring to FIG. 4, a tank main body 100 of a fluid tank 1000 including an internal pressurizer according to the second embodiment of the present invention may further include a fluid remaining portion 110 formed as a groove by protruding downward at a position corresponding to a position of the pressurization pipe 200.

[0042] Further, the pressurization pipe 200 extends to the fluid remaining portion 110, such that the liquid fluid accommodated in the fluid remaining portion 110 may be accommodated in the pressurization pipe 200.

[0043] That is, in a case where the amount of liquid

fluid accommodated in the tank main body 100 is not large, it is difficult for the liquid fluid to be accommodated in the pressurization pipe 200. In this case, it is difficult to perform heating in the pressurization pipe 200, and thus, pressurization of the inside of the tank main body 100 may be difficult.

[0044] Therefore, in the fluid tank 1000 according to the second embodiment of the present invention, the tank main body 100 may include the fluid remaining portion 110 to preferentially store the liquid fluid stored inside the tank main body 100, thereby facilitating heating of the liquid fluid in the pressurization pipe 200.

[0045] Further, although it is preferable that the fluid remaining portion 110 may accommodate the liquid fluid as much as possible, it is a matter of course that the size of the fluid remaining portion 110 is at least larger than the diameter of the pressurization pipe 200, because the pressurization pipe 200 needs to extend to and positioned in the fluid remaining portion 110.

Claims

1. A fluid tank including an internal pressurizer, the fluid tank comprising:

   a tank main body 100 in which a liquid fluid is stored;
   a pressurization pipe 200 formed in a vertically penetrating shape at a selected position in the tank main body 100, and of which a selected lower side is positioned in the liquid fluid;
   a pressurization means 300 pressurizing the inside of the tank main body 100 by evaporating the liquid fluid accommodated in the pressurization pipe 200; and
   a sending pipe 400 of which an inlet is arranged on a lower side of the sending pipe 400 in the tank main body 100 so as to allow the liquid fluid to be introduced, and which is configured to send the liquid fluid stored in the tank main body 100 to the outside.

2. The fluid tank of claim 1, wherein a selected upper side of the pressurization pipe 200 is positioned on a level higher than that of the liquid fluid stored inside the tank main body 100.

3. The fluid tank of claim 1, wherein the pressurization means 300 is implemented by at least one of a heating means using electric energy, a heating means in which heat exchange is performed using a gaseous heating medium, or a heating means in which heat exchange is performed using a liquid heating medium.

4. The fluid tank of claim 1, wherein the pressurization pipe 200 is formed of an insulating material or is insulated.

5. The fluid tank of claim 1, wherein the tank main body 100 further includes a fluid remaining portion 110 protruding downward at a position corresponding to a position of the pressurization pipe 200, and
   the pressurization pipe 200 extends downward so as to correspond to the fluid remaining portion 110.

FIG. 1

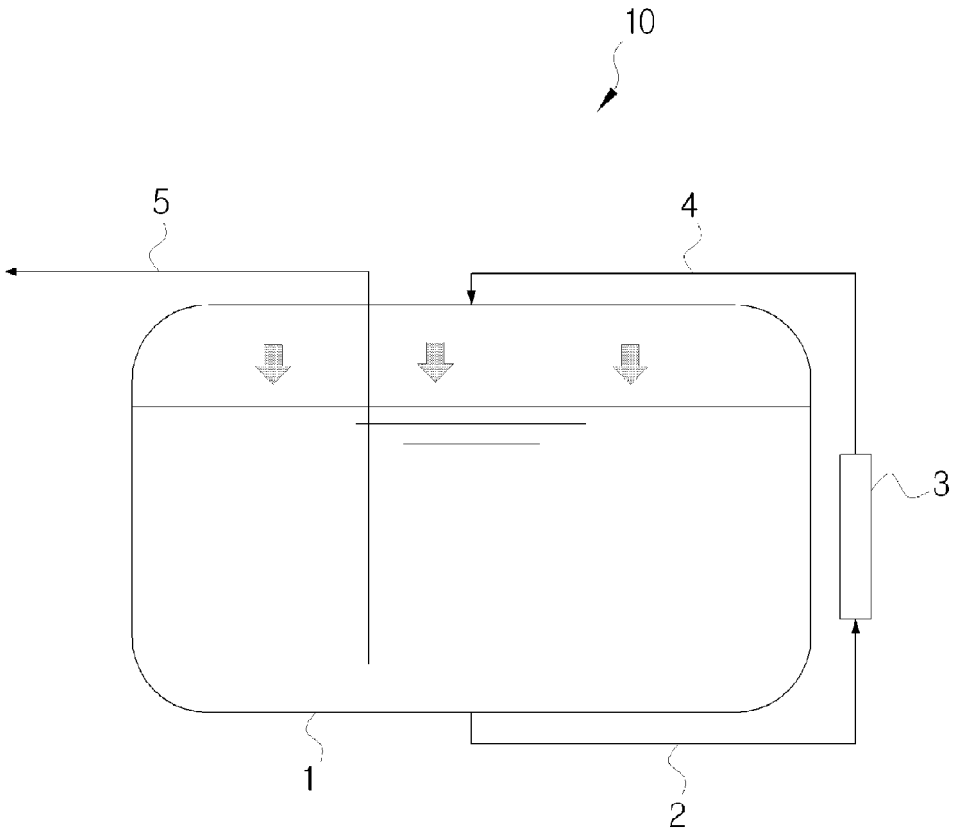


FIG. 2

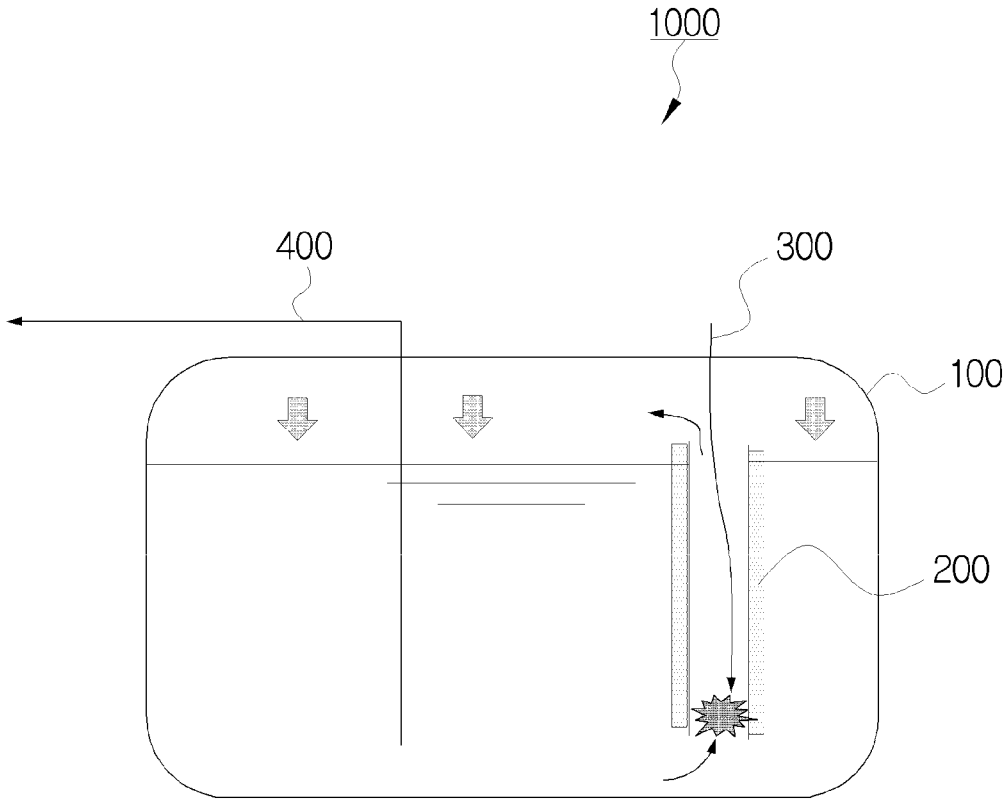


FIG. 3

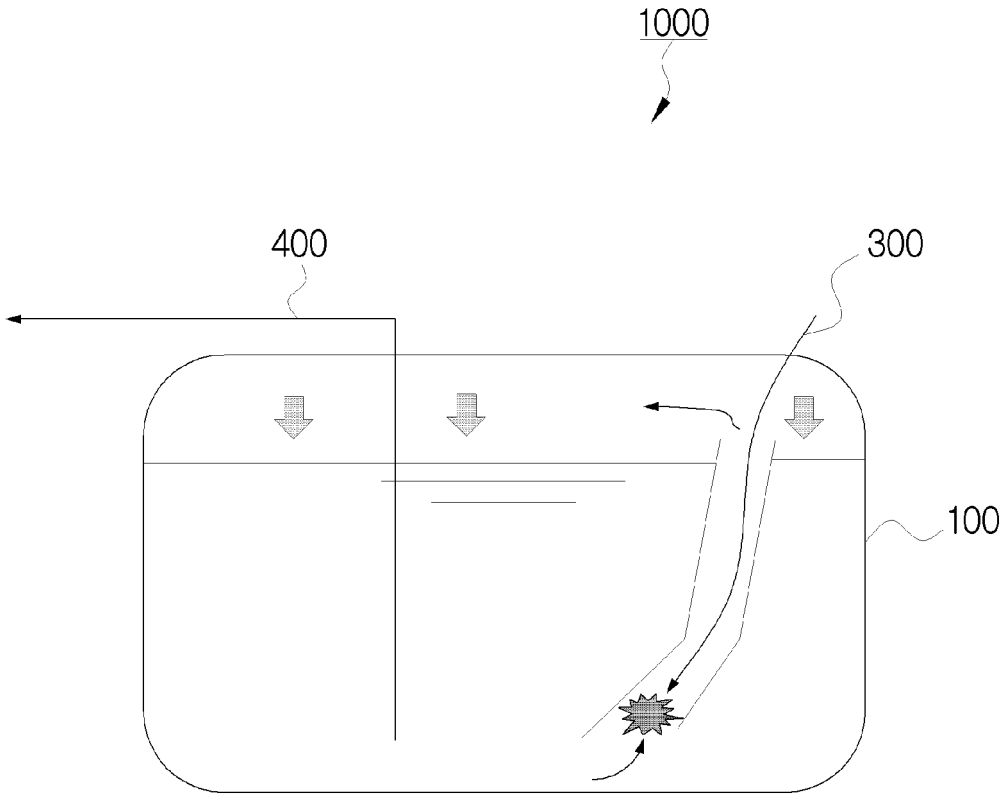
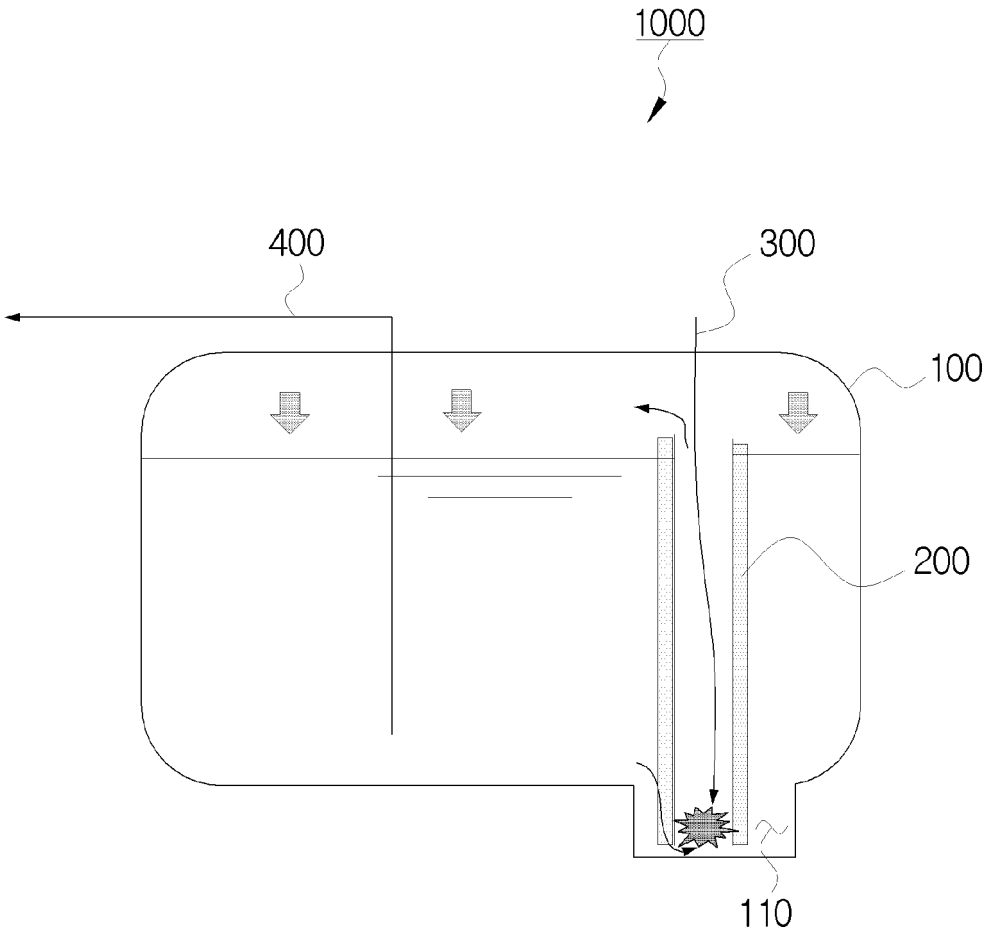


FIG. 4



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2019/007912

A. CLASSIFICATION OF SUBJECT MATTER

F17C 9/00(2006.01)i, F17C 13/00(2006.01)i

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)
F17C 9/00; B60K 15/03; B63B 25/16; B63B 27/24; F17C 7/02; F17C 9/02; F17C 9/04; F17D 1/20; F17D 3/01; F17C 13/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models: IPC as above
Japanese utility models and applications for utility models: IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS (KIPO internal) & Keywords: fluid, tank, storage, container, press, vapor, heat, supply pipe

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2000-130692 A (LINDE AG.) 12 May 2000 See paragraphs [0019]-[0023] and figure 1.	1-5
Y	KR 10-2011-0072775 A (KOREA AEROSPACE RESEARCH INSTITUTE) 29 June 2011 See paragraphs [0027], [0041]-[0043] and figure 2.	1-5
Y	KR 10-2013-0089538 A (HYUNDAI HEAVY INDUSTRIES CO., LTD.) 12 August 2013 See paragraph [0027] and figures 1-2.	5
X	US 4608831 A (GUSTAFASON, Keith W.) 02 September 1986 See column 6, lines 3-11, claims 1-2, 4 and figure 5.	1-4
Y		5
A	KR 10-2014-0018903 A (AKER ENGINEERING & TECHNOLOGY AS.) 13 February 2014 See paragraph [0021] and figure 1.	1-5

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

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
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Date of the actual completion of the international search	Date of mailing of the international search report
30 SEPTEMBER 2019 (30.09.2019)	**30 SEPTEMBER 2019 (30.09.2019)**
Name and mailing address of the ISA/KR Korean Intellectual Property Office Government Complex Daejeon Building 4, 189, Cheongsa-ro, Seo-gu, Daejeon, 35208, Republic of Korea Facsimile No. +82-42-481-8578	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2019/007912

Patent document cited in search report	Publication date	Patent family member	Publication date
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