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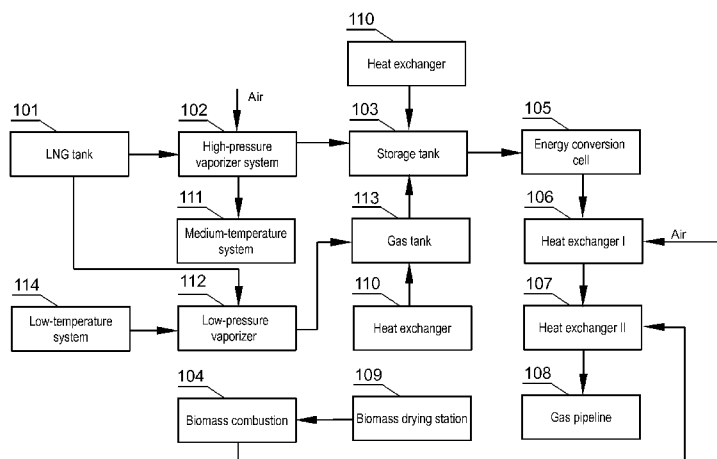


Fig. 1

(57) **Abstract:** A method for regasifying liquefied natural gas (LNG), comprising the steps of: inputting a batch of the liquefied natural gas to a vaporizer (102); in the vaporizer (102), converting the liquefied natural gas to a gaseous state by heating it from a first temperature (T_1) to a second temperature (T_2) and heating the gas from the second temperature (T_2) to a third temperature (T_3) higher than the critical temperature of the gas to increase the pressure of the gas to a second pressure (p_2) of at least 7MPa; connecting the gas outlet of the vaporizer (102) to a storage tank (103) having a chamber with a pressure lower than the pressure of the vaporizer (102); and allowing the gas from the vaporizer (102) to flow and expand into the storage tank (103) due to the pressure difference between the vaporizer (102) and the storage tank (103).

WO 2017/005708 A1

A METHOD FOR REGASIFYING LIQUEFIED NATURAL GAS AND A SYSTEM FOR REGASIFYING LIQUEFIED NATURAL GAS

TECHNICAL FIELD

5 The present invention relates to a method for regasifying liquefied natural gas as and a system for regasifying liquefied natural gas.

BACKGROUND

10 Typically, natural gas contains about 80 – 98 vol % of methane and, after condensation, its volume is reduced 600 times, which makes it economically feasible for transport.

15 Liquefied natural gas (LNG) is transported at atmospheric pressure, in the temperature of about -160 °C, i.e. below the critical gas temperature (which is -82,5 °C for pure methane). It is known that above the critical gas temperature, the methane can be in a gaseous phase only, regardless of the pressure conditions. LNG may be transported by sea, for example by tank ships called LNG carriers.

20 In the destination port, the liquefied gas is transferred to ground LNG storage tanks which are also called LNG-receiving terminal tanks. From the LNG storage tanks the liquefied gas is transferred to a regasification plant to convert the LNG to the gaseous state.

25 The main components of the regasification are vaporizers that convert the LNG to the gaseous state. There are various types of vaporizers, that may have different construction, conversion efficiency and way of heating of the natural gas. Typically, the type of the vaporizer is selected due to the location of the LNG regasification plant and due to the accessibility of the heating medium.

30 The principle of operation of vaporizers depends i.a. on the their construction and on the type of the heating medium. For example, vaporizers supplied with sea water operate as spray coolers consisting of suitably ribbed pipes or plates with wavy profile. The LNG flows through the pipes or through the slits between two adjacent plates, wherein the heating medium in the form of a thin water layer heats the gas flowing in countercurrent, on the outer surface of the pipes or plates. The vaporizers of this type provide efficient heat exchange between the heating medium and the LNG and have a relatively high regasification yield. The construction of the

vaporizers provides indirect heat exchange between the heating medium and the gas.

On the other hand, air-heated vaporizers have the form of multi-sectional heat exchangers, wherein the LNG flows as a gas stream through the pipes, and the air (as the heating medium) flows as a stream within the inter-pipe space. Into the stream of vaporized LNG, between the respective vaporizer sections, there is provided a volume of natural gas having a temperature higher than the temperature of the stream. Therefore, in this type of vaporizers, the heating is conducted both directly (by the air which cools down when it transmits the heat) and indirectly (by introducing the hot air).

There are also known vaporizers with a gas burner for heating, which operate in a Rankine-Brayton cycle.

The exhausted heating medium, i.e. the "cold" that constitutes the byproduct of the LNG regasification, is typically used as a cooling medium for various technological processes, for example to produce oxygen and nitrogen by distillation of liquefied air or to separate hydrocarbon gases in a petrochemical or refining industry.

There are also known methods for regasification of the LNG as well as LNG regasification systems that utilize low temperature technologies.

For example, a European patent application EP1634023 discloses a method for regasifying LNG, comprising splitting a liquid natural gas feed into a first portion and a second portion; using a refrigeration content of the first portion to cool a heat source in the plant and thereby generating a heated first portion; expanding the heated first portion as a working fluid to produce electric power and an expander outlet stream; feeding the expander outlet stream into a demethanizer; and using the second portion as reflux for the demethanizer.

A PCT application WO2012102849 discloses a method for regasifying LNG, comprising: providing heat to a LNG regasification process from a power plant; and, if the heat is not sufficient, providing additional heat to the LNG regasification process from a cooling tower operated in a warming tower configuration. The "cold" obtained in the regasification process is used to cool down the exhaust gases of the gas turbine.

Therefore, the known LNG regasification systems enable LNG to be converted back to the gaseous state by using various heat sources. The "cold" constituting the

byproduct of the regasification process is used in the low temperature processes, which provides the reduction of total energy consumption in the regasification process.

5 There is a need to provide an alternative method for regasifying of LNG that will improve energy usage in the regasification system, enabling an effective heat transfer between the heating medium and the natural gas.

SUMMARY

10 There is disclosed a method for regasifying liquefied natural gas, comprising the steps of: inputting a batch of the liquefied natural gas to a vaporizer; in the vaporizer, converting the liquefied natural gas to a gaseous state by heating it from a first temperature (T_1) to a second temperature (T_2) and heating the gas from the second temperature (T_2) to a third temperature (T_3) higher than the critical temperature of the gas to increase the pressure of the gas to a second pressure (p_2)
15 of at least 7MPa; connecting the gas outlet of the vaporizer to a storage tank having a chamber with a pressure lower than the pressure of the vaporizer; and allowing the gas from the vaporizer to flow and expand into the storage tank due to the pressure difference between the vaporizer and the storage tank.

20 The batch of the liquefied natural gas may fill from 85% to 99% of the volume of the chamber of the vaporizer.

The method may further comprise increasing the temperature of the gas in the storage tank to the range from +10 °C to +250°C.

25 The method may further comprise transferring the gas from the storage tank, to an energy conversion cell comprising an energy converter; and allowing the gas to expand and converting the energy of gas expansion to electrical energy.

30 The method may further comprise heating the gas from the first temperature (T_1) to the second temperature (T_2) by means of a lower quality heating medium; and heating the gas from the second temperature (T_2) to the third temperature (T_3) by means of a higher quality heating medium; wherein the lower quality heating medium has a lower temperature than the higher quality heating medium.

The lower quality heating medium can be a byproduct of a freezing, freeze-drying or recycling process.

The higher quality heating medium can be a byproduct of a freeze-drying or biomass combustion process.

The method may further comprise heating the gas expanded in the energy conversion cell in a heat exchange system and introducing the gas to a gas pipeline.

The method may comprise heating the gas expanded in the energy conversion cell in a first heat exchanger by air and subsequent heating in a second heat exchanger by heat constituting a product of the biomass combustion process.

There is also disclosed a system for regasifying liquefied natural gas, comprising: at least one high-pressure vaporizer having a high-pressure chamber provided with a heat exchange system configured to receive a batch of the liquefied natural gas, wherein the high-pressure chamber is configured to store gas in a pressure of at least 7 MPa; a storage tank having an inlet connected to the outlet of the high-pressure chamber of the vaporizer.

The storage tank may comprise a heat exchange system for heating the gas within the storage tank.

The system may further comprise an energy conversion cell connected to the storage tank and comprising energy converters for converting the gas expansion work into electric energy.

The energy converter of the energy conversion cell can be a turbine or a lift engine.

The energy conversion cell can be connected to the heat exchange system for heating the natural gas after the gas expansion in the energy conversion cell.

The heat exchange system may comprise an air heat exchanger and a heat exchanger connected to a biomass combustion system.

The system may be configured to operate according to the method as described above.

BRIEF DESCRIPTION OF DRAWINGS

The method and system presented herein are shown by means of example embodiments in a drawing, in which:

Fig. 1 shows a block diagram of a system for LNG regasification.

Fig. 2 shows schematically a high-pressure LNG vaporizer.

DETAILED DESCRIPTION

Fig. 1 shows schematically a block diagram of a system and a method for regasifying liquefied natural gas (LNG) i.e. for conversion of the LNG back to the

gaseous state having particular parameters (preferably, corresponding to legal regulatory provisions) that enable the gas to be transported in the gaseous state via gas pipelines. The LNG may be introduced to the regasification system from an LNG storage tank 101 by means of a thermally insulated pipeline provided with a pump system configured to pump the LNG.

The regasification system comprises a system of high-pressure vaporizers 102 for conversion of the LNG back to the gaseous state. The number of the vaporizers in the system 102 may depend on the processing capacity of the regasification system and on the pressure stability that is required within the system. For example, the vaporizers system 102 can comprise one high-pressure vaporizer, two high-pressure vaporizers, three high-pressure vaporizers or more than three high-pressure vaporizers.

The LNG is periodically introduced (in batches) to the vaporizers system 102. The mass (volume) of one LNG batch should correspond to the processing capacity of the vaporizers 102.

In the high-pressure vaporizers system 102, the LNG is regasified in a multi-phase process. At the first phase, the LNG is converted to the gaseous state by increasing the LNG temperature from a first temperature T_1 (which is -160°C) to a second temperature T_2 (which is equal the critical temperature of natural gas). The critical temperature of natural gas may vary depending on the chemical composition of the natural gas. For example, the critical temperature of pure methane is $-82,5^{\circ}\text{C}$, and the critical temperature of a gas composition contaminated with ethane can be higher (such as -48°C). At the next phase, the temperature of the gas increased from the critical temperature of the gas composition (T_2) to the third gas temperature (T_3), such as $+10^{\circ}\text{C}$. Due to the conversion of the LNG to the gaseous state and further increase of the gas temperature, from T_1 to T_3 , the pressure of the gas in the vaporizer increases from a first pressure p_1 corresponding to the residual gas pressure in the system (which is about $0,1\text{MPa}$), to a final pressure p_2 which can be at least 7MPa , and more preferably at least 10MPa , or at least 20MPa , or at least 50MPa , or at least 70MPa , or at least 100MPa . The higher the final pressure p_2 , the better the final efficiency of the regasification process. It is possible to obtain such a high pressure (without additional compression of the gas) when the chamber of the high-pressure vaporizer is filled as much as possible with the LNG. Preferably, 85%

to 99% of the volume of the chamber 204 of the high-pressure vaporizer should be filled with the LNG.

In order to improve the efficiency of the regasification process, heat in the form of a heating medium is introduced to the vaporizers system 102 in two phases. At the first phase of the regasification process, when the temperature is increased from the first temperature T_1 to the second temperature T_2 , lower quality heat is used as the heating medium, preferably in the form of a fluid having a temperature that is higher than the critical gas temperature, preferably having a temperature equal to the ambient temperature. For example, the lower quality heat medium may have a temperature between -30°C and $+50^{\circ}\text{C}$. For example, the lower quality heat can be: heat constituting a byproduct produced by the cooling system of a frozen food warehouse, or heat from the environment in winter (the difference between the temperature of LNG and the circulating medium is low), or heat constituting a byproduct of the following processes: freeze-drying, recycling or heat from environment. At the next phase, the gas is heated from the second temperature T_2 to the third gas temperature T_3 , which can be equal to the ambient temperature. At this phase, higher quality heat is introduced to the vaporizers system 102. The higher quality heat constitutes the heating medium, preferably in the form of a fluid of the temperature that is higher than the temperature of the lower quality heating medium. Preferably, the temperature of the higher quality heating medium is higher than the ambient temperature. Preferably, the temperature of the higher quality heating medium is between 50°C and 250°C . Liquids or gases can be used as the higher quality heating medium, such as a byproduct of a freeze-drying process, or a steam produced in the process of re-sublimation or heat obtained in the process of combustion of biomass. After the gas reaches the third temperature T_3 and the final pressure p_2 , the gas is to be decompressed in order to recover the mechanical energy, which can be used for example to power an electric generator.

The heat that is necessary to carry out the regasification process may be supplied to the vaporizers system 102 in various ways. For example, when air is used as the heating medium (e.g. heat from environment for heating the LNG to the critical gas temperature and hot air for heating the gas to the temperature above the critical gas temperature), the heat exchange system of the vaporizers 102 may be provided with a system of ventilators that enable the introduction of the air into the heat exchange system. The air exhausted in the heat exchange process (which is

cooled, deprived of moisture and dried) may be used in various low-temperature processes, for example, the air may be used for drying biomass, which improves the combustion efficiency (yield) of the drying process and enables reduction of water content in the biomass, which further provides higher combustion temperature.

5 Fig. 2 shows schematically a vaporizer 102 for use in the regasification system. The thermally insulated high-pressure vaporizer 102 comprises an inlet 201, by which the LNG having a first temperature T_1 and a pressure of about 0,1MPa is periodically introduced, in batches, to a first chamber 202 of the vaporizer. From the first chamber, the LNG flows by gravity into a second chamber 204 of the vaporizer
10 by a passage 203. The second chamber 204 is provided with a heat exchange system 205, for example in the form of cooling coil with the heating medium in the form of a liquid or a gas flowing through the coil. After a predetermined amount of the LNG is introduced into the second chamber 204, the passage 203 is closed, and the LNG collected in the second chamber 204 is converted back to the gaseous state by
15 means of increasing the LNG temperature from the first temperature T_1 to the second temperature T_2 , and next, increasing the natural gas temperature to the third temperature T_3 (for example, to 200°C). Due to the liquid-to-gas conversion and subsequent heating of the natural gas, the pressure of the natural gas in the second chamber 204 of the vaporizer increases from the first pressure p_1 to the second
20 pressure p_2 . After the natural gas reaches the temperature and pressure parameters (T_3, p_2), the natural gas is decompressed in order to fill, in a gaseous form, the storage tank 103 (which can be also called an expansion tank).

In order to decompress the gas collected in the second chamber 204 of the vaporizer, the gas is released from the second chamber 204 by opening the outlet
25 206 of the second chamber 204, which is connected by pipes with a storage storage tank 103. Due to the pressure difference between the vaporizer chamber (p_2) and the chamber of the storage tank 103 (lower than p_2), the gas flows towards the lower pressure tank providing spontaneous collection of the gas within the storage tank 103 chamber. Such construction reduces the energy expenditure associated with the transfer of the gas from the vaporizer 102 to the storage tank 103. Moreover, the
30 storage storage tank 103 provides reduction of pressure fluctuations within the regasification system.

After the regasification, the flow of the gas between the vaporizer 102 and the storage tank 103 is blocked by closing the outlet 206 of the vaporizer, which enables

to introduce into the second chamber 204 of the vaporizer a next batch of the LNG to be regasified. Additionally, in order to reduce the pressure in the chamber 204 of the vaporizer to the pressure which equals the pressure of the LNG chamber 101, the gas that remains in the vaporizer chamber 204 may be pumped out of the chamber
5 204 to the gas pipeline.

The expansion of gas is an endothermic process, which causes reduction of the temperature of the decompressed gas from the third temperature T_3 to a fourth temperature T_4 that is lower than the third temperature T_3 . The fourth temperature T_4 of the gas after its expansion may be different depending on the initial gas
10 parameters, i.e. the parameters of the gas before the expansion. The fourth temperature T_4 may be, for example, from -50°C to 0°C .

The gas from the storage tank 103 is introduced to the energy conversion cell 105 and the gas is heated from the fourth temperature T_4 to the fifth temperature T_5 , which may be from $+10$ to $+250^{\circ}\text{C}$ by means of a heat exchange system 110, which
15 is connected to the storage tank 103 and supplied with the higher quality heat having parameters as discussed above. For example, heat produced by the biomass combustion system 105 co-operating with the regasification system can be used as the higher quality heat. The biomass combustion system can be provided with a drying station 109. Heating of the gas before its introduction into the energy
20 conversion cell 105 causes rise of the gas pressure. Preferably, the gas pressure rises to the level from 10 MPa to 100 MPa. The gas that is heated in the storage tank is introduced into the energy converter of the energy conversion cell 105.

In the energy conversion cell 105 the gas is decompressed to the pressure which is higher than the pressure of the gas in the gas pipeline 108. This results in a
25 gas expansion work, which, by means of the energy converter, is converted into electric energy and may be transmitted to an electric power line or it may be used in the regasification system for example to power pumps, ventilators, control systems or gas heating systems.

The gas cooled in the energy conversion cell 105, by means of
30 decompression, is introduced to a system of heat exchangers 106, 107 enabling the gas to be heated to the required temperature. The heated gas having the required parameters (T , p) from the heat exchangers system spontaneously enters the gas pipeline 108 and it is supplied to customers.

The first heat exchanger 106 is supplied with air and it enables pre-heating of the gas. The second heat exchanger 107 is supplied with the heat from the biomass combustion process 104 and it enables heating of the gas, preferably to the temperature of +10°C. The “cold” that is collected by the heating medium of the heat exchangers 106, 107 is used in the installations co-operating with the regasification system, wherein cooled and dried air leaving the first heat exchanger 106 is used for drying the biomass in the biomass drying station 109, and the cooled heating medium leaving the second heat exchanger 107 is used as the heat exchanging medium in the medium-temperature system 111 co-operating with the regasification system, which may be, for example, systems for production frozen food or freeze-dried products.

The regasification system enables collection of the “cold” at each phase of the process, by means of the system of heat exchangers in which liquid or gas may be used as the heating medium, which depends on the construction of the heat exchangers co-operating with the vaporizers system 205, the storage tank 110 and the first and second heat exchanger 106, 107 for heating the gas before it enters the gas pipeline. The “cold” that is produced during the liquid-to-gas conversion process as well as during gas expansion, constitutes the byproduct of the regasification process and it is supplied to the various process where it is used - this provides a suitable way of reprocessing of the produced “cold” in an environment friendly manner.

The regasification system may additionally comprise a system of conventional vaporizers 112 having a variable volume, which can operate in the conditions of residual pressure in the system of about 0,1MPa, and which can receive the “cold” used in the low-temperature system 114, such as for example in the processes of oxygen and nitrogen production by air rectification. As the vaporizers there may be used conventional continuous operation mode vaporizers with an air heat exchange system. The gas of a substantially low pressure (0,1MPa or so), after regasification, may be transferred into a gas tank 113, and subsequently the gas may be compressed to the required pressure by heating the gas, and then the gas can be transferred to the storage tank 103.

The “cold” produced in the regasification batch process may be used in the process of production of frozen food, freeze-dried food products for humans or animals, in some stages of drugs production as well as in the process of production

organic products. The “cold” produced in the regasification process may be additionally used in the processes of recycling of low-temperature polymers and plastics, such as for example, low-temperature depolymerization or shredding or in the warehouses or cold rooms for cooling. The “cold” may be also used in the processes of electricity generation or in the processes of production of mechanical energy in a “mono” process: from the cold with the potential of environment as the main heat source, or in a “dual” process with the potential of combustion of the ecological fuels as the main heat source. The “cold” produced in the regasification system may be also used to produce ice-water for buildings, hotels, malls, spa centers and large volume laboratories for testing machinery and vehicles in low temperatures, or for research processes related to roads and bridges. The “cold” may be also used in sports facilities such as, for example ice rinks or snow-covered terrains for skiing which are located near the regasification system. Moreover, the “cold” may be used in the low-temperature technology centers that carry out research on the use of the low temperatures in biology or physics, such as for example to conduct research on Peltier’s and Seebeck’s superconductivity phenomena.

The heat required to raise the temperature of natural gas either in the liquid or in the gaseous state is derived from various processes, co-operating with the regasification system, in which the heat constitutes byproduct, such as for example the processes of freeze-drying or recycling processes. The regasification system is also additionally supplied with heat from biomass combustion, wherein the dried air that constitutes the exhausted heating medium, after the gas heating process carried out in the heat exchanger, is used for drying the biomass. The use of alternative heat sources as well as the use of biomass combustion or incineration system reduce heat absorption from the environment, for example from water, which further reduces possible local temperature decreases which could be dangerous for the local biocoenosis.

The use of high-pressure vaporizers in the regasification system provides improves the energy efficiency of the whole regasification system. Reaching of high gas pressure (such as at least 7MPa, or more preferably at least 10MPa, or at least 20MPa, or at least 50MPa, or at least 70MPa, or at least 100MPa) provides spontaneous transfer of the gas to the storage tank – without the necessity of using additional equipment such as force pumps which require additional power supply.

The maintenance of the gas at the high pressure, such as of about 100MPa, in the storage tank, provides further spontaneous transfer of the gas from the storage tank to the energy conversion cell and to the gas pipeline according to the pressure gradient – without the necessity of using additional equipment such as force pumps; the gas enters the gas pipeline due to its own pressure.

The construction of the regasification system as well as the implementation of the vaporizers system reduces the necessity of using additional pumps to transfer natural gas between the respective elements of the regasification system, which further provides the reduction of energy consumption and emission of CO₂ of the regasification system.

Moreover, providing the two-phase regasification process in the vaporizer, in which at the first phase the liquid-to-gas conversion is carried out by means of heating LNG to its critical temperature by the heat of lower quality, and at the second phase the gas in the gaseous state is heated, by means of heat of higher quality, to the temperature that provides the optimal rise of gas pressure in the regasification process, additionally improves the energy efficiency (energy saving) in the regasification process.

CLAIMS:

1. A method for regasifying liquefied natural gas (LNG), comprising the steps of:
 - inputting a batch of the liquefied natural gas to a vaporizer (102);
 - 5 – in the vaporizer (102), converting the liquefied natural gas to a gaseous state by heating it from a first temperature (T_1) to a second temperature (T_2) and heating the gas from the second temperature (T_2) to a third temperature (T_3) higher than the critical temperature of the gas to increase the pressure of the gas to a second pressure (p_2) of at least 7MPa;
 - 10 – connecting the gas outlet of the vaporizer (102) to a storage tank (103) having a chamber with a pressure lower than the pressure of the vaporizer (102); and
 - allowing the gas from the vaporizer (102) to flow and expand into the storage tank (103) due to the pressure difference between the vaporizer (102) and the storage tank (103).
- 15 2. The method according to claim 1, wherein the batch of the liquefied natural gas fills from 85% to 99% of the volume of the chamber (204) of the vaporizer (102).
3. The method according to any of previous claims, further comprising increasing
20 the temperature of the gas in the storage tank (103) to the range from +10 °C to +250°C.
4. The method according to claim 3, further comprising transferring the gas from the storage tank (103), to an energy conversion cell (105) comprising an energy
25 converter; and allowing the gas to expand and converting the energy of gas expansion to electrical energy.
5. The method according to any of previous claims, comprising:
 - heating the gas from the first temperature (T_1) to the second temperature (T_2) by
30 means of a lower quality heating medium; and
 - heating the gas from the second temperature (T_2) to the third temperature (T_3) by means of a higher quality heating medium;

- wherein the lower quality heating medium has a lower temperature than the higher quality heating medium.
6. The method according to claim 5, wherein the lower quality heating medium is a byproduct of a freezing, freeze-drying or recycling process.
7. The method according to claim 5, wherein the higher quality heating medium is a byproduct of a freeze-drying or biomass combustion process.
8. The method according to claim 4, further comprising heating the gas expanded in the energy conversion cell (105) in a heat exchange system (106, 107) and introducing the gas to a gas pipeline (108).
9. The method according to claim 8, comprising heating the gas expanded in the energy conversion cell (105) in a first heat exchanger (106) by air and subsequent heating in a second heat exchanger (107) by heat constituting a product of the biomass combustion process.
10. A system for regasifying liquefied natural gas (LNG), comprising:
- at least one high-pressure vaporizer (102) having a high-pressure chamber (204) provided with a heat exchange system (205) configured to receive a batch of the liquefied natural gas, wherein the high-pressure chamber (204) is configured to store gas in a pressure of at least 7 MPa;
 - a storage tank (103) having an inlet connected to the outlet of the high-pressure chamber (204) of the vaporizer (102).
11. The system according to claim 10, wherein the storage tank (103) comprises a heat exchange system (110) for heating the gas within the storage tank (103).
12. The system according to any of claims 10-11, further comprising an energy conversion cell (105) connected to the storage tank (103) and comprising energy converters for converting the gas expansion work into electric energy.

13. The system according to claim 12, wherein the energy converter of the energy conversion cell (105) is a turbine or a lift engine.

5 14. The system according to claim 12, wherein the energy conversion cell (105) is connected to the heat exchange system (106, 107) for heating the natural gas after the gas expansion in the energy conversion cell (105).

10 15. The system according to claim 14, wherein the heat exchange system comprises an air heat exchanger (106) and a heat exchanger (107) connected to a biomass combustion system (107).

16. The system according to any of claims 10-15, configured to operate according to the method of claims 1-9.

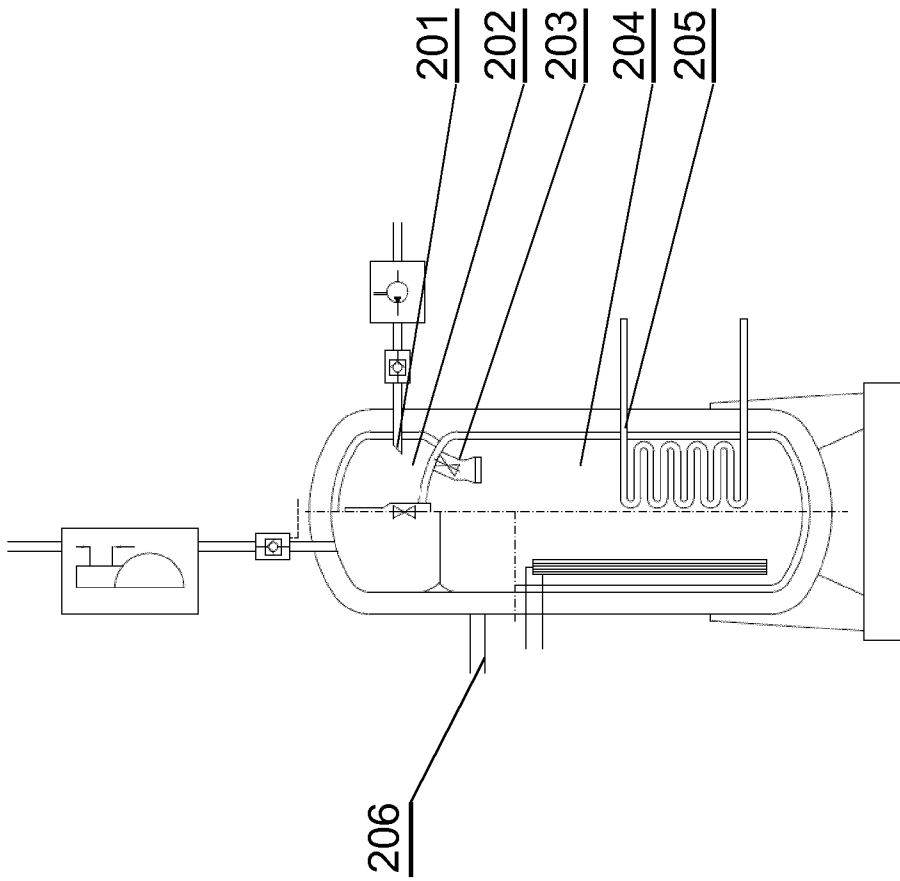


Fig. 2

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2016/065750

A. CLASSIFICATION OF SUBJECT MATTER
INV. F17C5/06 F17C7/04
ADD.
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED
Minimum documentation searched (classification system followed by classification symbols)
F17C

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)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2006/036441 A1 (FLUOR TECH CORP [US]; MAK JOHN [US]) 6 April 2006 (2006-04-06) figure 1 -----	1-16
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Further documents are listed in the continuation of Box C.

See patent family annex.

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Date of the actual completion of the international search 15 November 2016	Date of mailing of the international search report 24/11/2016
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