

[DESCRIPTION]

[Invention Title]

LIQUID FUEL TREATMENT SYSTEM AND SHIP INCLUDING SAME

[Technical Field]

5 [1] The present disclosure relates to a liquid fuel treatment system and a ship including the same.

[Background Art]

[2] Recently, emissions of nitrogen oxides (NO_x), sulfur oxides (SO_x), carbon dioxide (CO₂), and the like included in exhaust gas discharged from ships have been regulated by international
10 treaties and the like, and such regulations are being strengthened every year.

[3] Since liquefied natural gas (LNG) does not contain sulfur and produces a small amount of carbon dioxide, liquefied natural gas has been used as an environmentally friendly fuel as one of countermeasures against exhaust gas regulations.

[4] However, liquefied natural gas is difficult to liquefy only by pressurization, and since it is
15 necessary to maintain a cryogenic state of about -165°C for liquefaction, a fuel tank and a fuel supply system need to be composed of special materials capable of withstanding cryogenic temperatures, and facilities for heat dissipation of the liquefied natural gas may additionally be required, and thus additional facility costs are required to configure the fuel tank and the like. In addition, since it is difficult to completely block heat entering the tank, the liquefied natural gas
20 evaporates due to the entering heat, and fuel efficiency may deteriorate due to boil-off gas generated at this time.

[5] Methanol (CH₃OH) may be used as a fuel for ships instead of such liquefied natural gas. Since a liquid fuel is in a liquid state at room temperature, the liquid fuel is easy to handle, does

not contain a sulfur component, and has a low carbon ratio of the fuel itself, thereby generating a small amount of carbon dioxide during combustion. Accordingly, studies have been conducted to efficiently use a liquid fuel as a fuel for ships.

[Disclosure]

5 [Technical Problem]

[6] The present disclosure has been made to solve the above-described problems of the related art, and an object of the present disclosure is to provide a liquid fuel treatment system and a ship including the same, which are capable of reducing emissions of sulfur oxides and carbon dioxide in exhaust gas by using a liquid fuel as a fuel.

10 [7] The problems to be solved by the present disclosure are not limited to those mentioned above, and other problems not mentioned herein will be clearly understood by those skilled in the art from the following description.

[Technical Solution]

[8] A liquid fuel treatment system according to an aspect of the present disclosure comprises:
15 a plurality of holds provided along a length direction of a hull; a bulkhead partitioning an internal space of at least one of the holds into a plurality of partition spaces along a left-right direction; and a partition part partitioning the partition spaces into a plurality of fuel spaces and having an openable and closable structure, wherein the partition part is opened when a first fuel among a first fuel and a second fuel having different boiling points is stored in the partition space, and is sealed
20 when the second fuel is stored in the partition space.

[9] Specifically, the partition part may be opened when the first fuel having a relatively lower boiling point is stored in the partition space, and may be sealed when the second fuel having a

relatively higher boiling point is stored in the partition space, such that a volume of the fuel space in which the second fuel is stored is less than or equal to a preset value.

[10] Specifically, when the second fuel having a relatively higher boiling point is stored in the partition space, at least a portion of the fuel space in which the second fuel is stored may be maintained as an empty space.

[11] Specifically, the liquid fuel treatment system may comprise: a hold wall separating the internal space of the hold along a front-rear direction; and outer tanks disposed on a left side and a right side of an area provided at a rear side of the internal space of the hold.

[12] Specifically, the liquid fuel treatment system may further comprise: a loading section provided between a pair of outer tanks and on which containers are loaded.

[13] Specifically, the liquid fuel treatment system may further comprise: a communication part configured to communicate the fuel spaces with each other by opening at least a portion of the partition part.

[14] A liquid fuel treatment system according to an aspect of the present disclosure comprises: a fuel supply part configured to supply a liquid fuel in a fuel tank to a fuel-consuming device; a first transfer valve disposed outside the fuel tank and configured to control supply of the liquid fuel; and a valve room accommodating the first transfer valve and forming an isolated space.

[15] Specifically, the valve room may be provided in a form completely sealing an inside and an outside thereof, and may maintain a pressure of the fuel tank at greater than or equal to a preset pressure.

[16] Specifically, the liquid fuel treatment system may further comprise: a ventilation part installed to ventilate an interior of the valve room.

[17] Specifically, the valve room may be provided in a form partially sealing an inside and an outside thereof, and the liquid fuel treatment system may further comprise: a leakage processing line configured to collect fuel leaked from the valve room.

[18] A liquid fuel treatment system according to an aspect of the present disclosure comprises:
5 a fuel tank configured to store a liquid fuel of any one of a first fuel and a second fuel having different boiling points; a cleaning part configured to supply a cleaning medium to the fuel tank; and a collection tank configured to collect waste water generated in a hull, wherein the collection tank stores the liquid fuel discharged from the fuel tank together with the cleaning medium.

[19] Specifically, the cleaning part may supply the cleaning medium to the fuel tank before
10 replacing the first fuel or the second fuel in the fuel tank with a liquid fuel having a different boiling point or before injecting the liquid fuel into the fuel tank.

[20] Specifically, the liquid fuel treatment system may further comprise: a controller configured to discharge the liquid fuel together with the cleaning medium to the outside when a concentration of the liquid fuel in the collection tank is less than or equal to a preset value.

[21] Specifically, the cleaning part may supply the cleaning medium to the fuel tank by using
15 a water supply pump provided at a rear side of the hull.

[22] Specifically, the collection tank may comprise: a first collection tank configured to collect the liquid fuel discharged from the fuel tank together with the cleaning medium; and a second collection tank isolated from the first collection tank by a bulkhead and configured to collect the
20 cleaning medium separated from the liquid fuel due to a difference in density.

[23] A ship according to an aspect of the present disclosure may comprise the liquid fuel treatment system.

[Advantageous Effects]

[24] The liquid fuel treatment system and the ship including the same according to the present disclosure have the following effects.

[25] The liquid fuel treatment system and the ship including the same according to the present disclosure may reduce emissions of sulfur oxides and carbon dioxide in exhaust gas by using a liquid fuel as a fuel.

[26] The effects of the present disclosure are not limited to the above-mentioned effects, and other effects not mentioned herein will be clearly understood by those skilled in the art from the description of the claims.

10 [Brief Description of Drawings]

[27] FIG. 1 is a view for explaining a ship according to a first embodiment of the present disclosure.

[28] FIG. 2 is a first conceptual diagram for explaining the liquid fuel treatment system according to the first embodiment of the present disclosure.

15 [29] FIG. 3 is a second conceptual diagram for explaining the liquid fuel treatment system according to the first embodiment of the present disclosure.

[30] FIG. 4 is a view for explaining the fuel supply tank according to the first embodiment of the present disclosure.

[31] FIG. 5 is a view for explaining the fuel supply tank according to the second embodiment of the present disclosure.

20 [32] FIG. 6 is a first conceptual diagram for explaining the liquid fuel treatment system according to the third embodiment of the present disclosure.

[33] FIG. 7 is a second conceptual diagram for explaining the liquid fuel treatment system according to the third embodiment of the present disclosure.

[34] FIG. 8 is a first conceptual diagram for explaining the liquid fuel treatment system according to the fourth embodiment of the present disclosure.

5 [35] FIG. 9 is a second conceptual diagram for explaining the liquid fuel treatment system according to the fourth embodiment of the present disclosure.

[36] FIG. 10 is a first conceptual diagram for explaining the liquid fuel treatment system according to the fifth embodiment of the present disclosure.

[37] FIG. 11 is a second conceptual diagram for explaining the liquid fuel treatment system
10 according to the fifth embodiment of the present disclosure.

[38] FIG. 12 is a conceptual diagram for explaining the liquid fuel treatment system according to the sixth embodiment of the present disclosure.

[39] FIG. 13 is a conceptual diagram for explaining the liquid fuel treatment system according to the seventh embodiment of the present disclosure.

15 [40] FIG. 14 is a conceptual diagram for explaining the liquid fuel treatment system according to the eighth embodiment of the present disclosure.

[41] FIG. 15 is a cross-sectional view taken along portion "A" for explaining the liquid fuel treatment system illustrated in FIG. 14.

[42] FIG. 16 is a conceptual diagram for explaining the liquid fuel treatment system according
20 to the ninth embodiment of the present disclosure.

[43] FIG. 17 is a conceptual diagram for explaining the liquid fuel treatment system according to the tenth embodiment of the present disclosure.

[44] FIG. 18 is a first conceptual diagram for explaining the liquid fuel treatment system according to the eleventh embodiment of the present disclosure.

[45] FIG. 19 is a second conceptual diagram for explaining the liquid fuel treatment system according to the eleventh embodiment of the present disclosure.

5 [46] FIG. 20 is a third conceptual diagram for explaining the liquid fuel treatment system according to the eleventh embodiment of the present disclosure.

[47] FIG. 21 is a first conceptual diagram for explaining the liquid fuel treatment system according to the twelfth embodiment of the present disclosure.

[48] FIG. 22 is a second conceptual diagram for explaining the liquid fuel treatment system
10 according to the twelfth embodiment of the present disclosure.

[49] FIG. 23 is a third conceptual diagram for explaining the liquid fuel treatment system according to the twelfth embodiment of the present disclosure.

[50] FIG. 24 is a fourth conceptual diagram for explaining the liquid fuel treatment system according to the twelfth embodiment of the present disclosure.

15 [51] FIG. 25 is a fifth conceptual diagram for explaining the liquid fuel treatment system according to the twelfth embodiment of the present disclosure.

[52] FIG. 26 is a conceptual diagram for explaining the liquid fuel treatment system according to the thirteenth embodiment of the present disclosure.

[53] FIG. 27 is a conceptual diagram for explaining the liquid fuel treatment system according
20 to the fourteenth embodiment of the present disclosure.

[54] FIG. 28 is a conceptual diagram of a ship for explaining the liquid fuel treatment system according to the fifteenth embodiment of the present disclosure.

[55] FIG. 29 is an enlarged view of portion "A" for explaining a hold of the ship illustrated in FIG. 28.

[56] FIG. 30 is a cross-sectional view taken along portion "B" for explaining a first area of the hold illustrated in FIG. 29.

5 [57] FIG. 31 is a cross-sectional view taken along portion "C" for explaining a second area of the hold illustrated in FIG. 29.

[58] FIG. 32 is an enlarged view of portion "D" for explaining the hold of the ship illustrated in FIG. 28.

[59] FIG. 33 is a first conceptual diagram of a ship for explaining the liquid fuel treatment
10 system according to the sixteenth embodiment of the present disclosure.

[60] FIG. 34 is a second conceptual diagram of a ship for explaining the liquid fuel treatment system according to the sixteenth embodiment of the present disclosure.

[61] FIG. 35 is a third conceptual diagram of a ship for explaining a cleaning part of the liquid fuel treatment system according to the sixteenth embodiment of the present disclosure.

15 [62] FIG. 36 is a first conceptual diagram of a cleaning part of the liquid fuel treatment system according to an embodiment of the present disclosure.

[63] FIG. 37 is a second conceptual diagram of a cleaning part of the liquid fuel treatment system according to an embodiment of the present disclosure.

[64] FIG. 38 is a conceptual diagram of a ship for explaining the liquid fuel treatment system
20 according to the seventeenth embodiment of the present disclosure.

[Best Modes of the Invention]

[65] The objects, specific advantages, and novel features of the present disclosure will become more apparent from the following detailed description and preferred embodiments in conjunction with the accompanying drawings. In attaching reference numerals to components in respective drawings in the present specification, it should be noted that identical components are assigned
5 identical numerals as much as possible even when they are illustrated in different drawings. In addition, in describing the present disclosure, when it is determined that a detailed description of related known technology may unnecessarily obscure the gist of the present disclosure, the detailed description will be omitted.

[66] In addition, the accompanying drawings are merely provided to facilitate understanding
10 of the embodiments disclosed in the present specification, and the technical idea disclosed in the present specification is not limited by the accompanying drawings, and it should be understood that all modifications, equivalents, and substitutes included within the spirit and technical scope of the present disclosure are included.

[67] In addition, terms including ordinal numbers such as first, second, and the like may be
15 used to describe various components, but the components are not limited by the terms. The terms are used only for the purpose of distinguishing one component from another component.

[68] In addition, it should be noted that terms indicating directions, such as front, rear, left, right, longitudinal, and transverse, are defined based on a ship including a bow, a stern, ship sides (port and starboard), a main deck, and a bottom.

[69] In addition, it should be noted that, in the present specification, the term ship is a concept
20 encompassing not only a merchant ship transporting cargo from a departure point to a destination, but also an offshore structure floating at a predetermined point on the sea and performing a specific operation.

[70] Hereinafter, preferred embodiments of the present disclosure will be described in detail with reference to the accompanying drawings.

[71]

[72] FIG. 1 is a view for explaining a ship according to a first embodiment of the present disclosure.

[73] Referring to FIG. 1, the ship 1 may comprise a fuel tank 2 configured to store a liquid fuel, and a fuel supply part 3 configured to supply the liquid fuel transmitted from the fuel tank 2 to a fuel-consuming device 14 as a fuel.

[74] In the present embodiment, the ship 1 may be used to mean all ships propelled by using a liquid fuel as a fuel. For example, when the ship 1 is a crude oil carrier, a crude oil storage tank may be provided inside the hull 11, and when the ship 1 is a container ship, containers may be loaded inside the hull 11. Hereinafter, a case in which the ship 1 is a crude oil carrier will be described as an example. However, the present disclosure is not limited thereto, and the ship 1 is not limited to a crude oil carrier, and may encompass a liquid fuel carrier transporting a liquid fuel such as methanol.

[75] The ship 1 may comprise a liquid fuel treatment system 10 configured to treat a liquid fuel. The liquid fuel treatment system 10 may treat the liquid fuel supplied to the fuel-consuming device 14, may treat the liquid fuel stored in the fuel tank 2, may treat the liquid fuel recovered from the fuel-consuming device 14, or may treat the liquid fuel leaked from a device provided in the ship 1. In addition, the liquid fuel treatment system 10 may treat the liquid fuel in order to supply the liquid fuel to the fuel-consuming device 14, but the present disclosure is not limited thereto.

[76] The ship 1 provided with the fuel tank 2 and the fuel supply part 3 may comprise a hull 11, a cargo tank 12, an engine room 13, and a fuel-consuming device 14. The ship 1 may comprise various configurations in addition to the above-described configurations, and in the present embodiment, only components necessary for the present disclosure will be described.

5 [77] The hull 11 comprises a main deck 111, side shell plates 112, a bottom plate 113, a bow 114, and a stern 115, thereby forming an exterior appearance of the ship 1. Hereinafter, the bow 114 and the stern 115 may indicate one area at a front side of the hull 11 and one area at a rear side of the hull 11, respectively.

[78] The fuel tank 2 may store a liquid fuel to be supplied to the fuel-consuming device 14.
10 The fuel tank 2 may comprise a fuel storage tank 21 configured to receive and store the liquid fuel from the outside and a fuel supply tank 22 configured to receive the liquid fuel from the fuel storage tank 21 and supply the liquid fuel to the fuel-consuming device 14. At least one of the fuel storage tank 21 and the fuel supply tank 22 may be provided in the hull 11. In the present specification, the fuel tank 2 may be used to mean the fuel storage tank 21 or the fuel supply tank
15 22. The fuel storage tank 21 and the fuel supply tank 22 may be interchangeably used.

[79] The fuel storage tank 21 may store the liquid fuel. The fuel storage tank 21 may supply the stored liquid fuel to the fuel supply tank 22 or the fuel-consuming device 14, and the fuel supply tank 22 may receive and store the liquid fuel from the fuel storage tank 21 or from the outside.

20 [80] The fuel tank 2 may be provided on the main deck 111 and may be provided inside the hull 11. In detail, the fuel storage tank 21 may be provided inside the hull 11, and the fuel supply tank 22 may be provided on the main deck 111, but the present disclosure is not limited thereto.

[81] A plurality of cargo tanks 12 are arranged in the hull 11 in a length direction and may store crude oil. The cargo tank 12 may have a bulkhead provided therein and may be divided into a plurality of spaces by the bulkhead. However, the present disclosure is not limited thereto. The cargo tank 12 may encompass a liquid fuel storage tank such as a methanol storage tank, and a
5 liquefied gas storage tank such as a liquefied natural gas storage tank. Of course, containers may be loaded in the hull 11 instead of the cargo tank 12.

[82] The engine room 13 is disposed at the stern 115 of the hull 11, and a fuel-consuming device 14 using a liquid fuel as a fuel may be accommodated therein.

[83] The fuel-consuming device 14 may be provided in the engine room 13 and may be
10 operated by receiving the liquid fuel stored in the fuel tank 2 through the fuel supply part 3. In the present embodiment, the fuel-consuming device 14 is not limited to being provided in the engine room 13, and may encompass various fuel-consuming devices provided at various locations and operated using a liquid fuel as a fuel.

[84] For example, the fuel-consuming device 14 may mean a device such as a propulsion
15 apparatus (engine) or a power generation apparatus installed for propulsion or power generation of the ship 1. The fuel-consuming device 14 may comprise, for example, a MELGI engine, an XDF-M engine, a DF engine included in a DFDE, a DF power generation engine, a DF boiler engine, a turbine engine, and the like.

[85] The fuel-consuming device 14 may comprise a first fuel-consuming device 141 operated
20 at a high pressure, such as a propulsion apparatus, and a second fuel-consuming device 142 operated at a low pressure, such as a power generation apparatus.

[86] FIG. 2 is a first conceptual diagram for explaining the liquid fuel treatment system 10 according to the first embodiment of the present disclosure.

[87] As illustrated in FIG. 2, in the liquid fuel treatment system 10 according to the first embodiment of the present disclosure, the first fuel-consuming device 141 may be connected to the fuel tank 2 through a high-pressure fuel supply line L11, and may be operated using, as a fuel, a high-pressure liquid fuel transmitted from the high-pressure fuel supply part 311 of the first fuel supply part 31. The second fuel-consuming device 142 may be connected to the fuel tank 2 through a low-pressure fuel supply line L12, and may be operated using, as a fuel, a low-pressure liquid fuel transmitted from the low-pressure fuel supply part 312 of the first fuel supply part 31.

[88] One first fuel-consuming device 141 or a plurality of first fuel-consuming devices 141 connected in parallel may be connected to the high-pressure fuel supply part 311, and one second fuel-consuming device 142 or a plurality of second fuel-consuming devices 142 connected in parallel may be connected to the low-pressure fuel supply part 312.

[89] The first fuel-consuming device 141 or the second fuel-consuming device 142 may be disposed at a relatively low position in order to maintain a pressure of the liquid fuel supplied from the fuel tank 2 at greater than or equal to a predetermined level. When the first fuel-consuming device 141 or the second fuel-consuming device 142 is disposed at a relatively low position as described above, a hammering phenomenon may occur in the high-pressure fuel supply line L11 or the low-pressure fuel supply line L12 when the liquid fuel fills the high-pressure fuel supply line L11 or the low-pressure fuel supply line L12.

[90] When air or gas exists in the high-pressure fuel supply line L11 or the low-pressure fuel supply line L12, the hammering phenomenon may occur more severely. When the liquid fuel and air are supplied together to the first fuel-consuming device 141 or the second fuel-consuming

device 142, fuel efficiency may decrease in the first fuel-consuming device 141 or the second fuel-consuming device 142, and functions of the first fuel-consuming device 141 or the second fuel-consuming device 142 may be damaged.

[91] Therefore, in order to dispose the first fuel-consuming device 141 or the second fuel-consuming device 142 at a relatively low position while preventing the hammering phenomenon from occurring severely, air and the like should be prevented from moving along the high-pressure fuel supply line L11 or the low-pressure fuel supply line L12.

[92] Accordingly, the liquid fuel treatment system 10 according to an embodiment of the present disclosure comprises discharge means configured to remove air or gas, such as a degassing tank DT, a first degassing line DL1, and a second degassing line DL2, which will be described later, so as to remove air or gas present in the high-pressure fuel supply line L11 or the low-pressure fuel supply line L12.

[93] The fuel tank 2 may store a liquid fuel and may supply the stored liquid fuel to the fuel-consuming device 14 through the fuel supply part 3. The fuel tank 2 may comprise a fuel storage tank 21 configured to store the liquid fuel and a fuel supply tank 22 configured to transmit the liquid fuel supplied from the fuel storage tank 21 to the fuel supply part 3.

[94] The liquid fuel treatment system 10 may comprise: a transfer pump P configured to pressurize the liquid fuel stored in the fuel storage tank 21 and supply the liquid fuel to the fuel supply tank 22; a fuel supply line L1 connecting the transfer pump P and the fuel supply tank 22 and configured to supply the liquid fuel discharged from the transfer pump P to the fuel supply tank 22; and a fuel return line L2 connecting the fuel supply tank 22 and the fuel storage tank 21 and configured to return the liquid fuel stored in the fuel supply tank 22 to the fuel storage tank 21. The fuel supply line L1 may encompass the high-pressure fuel supply line L11 and the low-

pressure fuel supply line L12. The fuel supply line L1 may connect the fuel tank 2 and the fuel-consuming device 14. The fuel supply line L1 may comprise a line connected from the fuel storage tank 21 to the fuel supply tank 22.

[95] Although the present embodiment describes that the fuel tank 2 comprises the fuel storage tank 21 and the fuel supply tank 22, the fuel supply tank 22 may be omitted. In this case, the fuel storage tank 21 may be configured to directly transmit the liquid fuel to the fuel supply part 3. That is, the fuel storage tank 21 may have both a liquid fuel storage function and a fuel supply function.

[96] The fuel tank 2 may be provided at a position exposed to an outside of the hull 11. In this case, the fuel tank 2 may be the fuel supply tank 22 provided on the main deck 111 as illustrated in FIG. 1, or may be the fuel storage tank 21 provided below the main deck 111.

[97] The fuel storage tank 21 may be provided outside the hull 11 or inside the hull 11.

[98] The fuel storage tanks 21 may be disposed on the main deck 111, one on each of left and right sides of the hull 11, but the present disclosure is not limited thereto.

[99] The fuel supply part 3 may supply the liquid fuel from the fuel tank 2 to the fuel-consuming device 14. The fuel supply part 3 may comprise: a first fuel supply part 31 configured to pressurize and heat the liquid fuel supplied from the fuel tank 2 to a pressure and a temperature required by the fuel-consuming device 14 and supply the liquid fuel to the fuel-consuming device 14; a second fuel supply part 32 configured to be opened when the liquid fuel supplied from the first fuel supply part 31 reaches a pressure required by the fuel-consuming device 14; an inert gas supply part 33 configured to purge the fuel tank 2, the fuel supply part 3, and the like; and a vent mast 34 configured to discharge gas and the like present in the fuel tank 2, the fuel supply part 3, and the like to the outside.

[100] The first fuel supply part 31 may receive the liquid fuel from the fuel tank 2, pressurize the liquid fuel to an appropriate pressure required by the fuel-consuming device 14, and heat the liquid fuel to an appropriate temperature. The first fuel supply part 31 may be a low-flashpoint fuel supply system (LFSS).

5 [101] When the fuel-consuming device 14 comprises a first fuel-consuming device 141 operated at a high pressure, such as a propulsion apparatus, and a second fuel-consuming device 142 operated at a low pressure, such as a power generation apparatus, the first fuel supply part 31 may comprise: a high-pressure fuel supply part 311 provided on the high-pressure fuel supply line L11 connecting the fuel tank 2 and the first fuel-consuming device 141; and a low-pressure fuel supply
10 part 312 provided on the low-pressure fuel supply line L12 connecting the fuel tank 2 and the second fuel-consuming device 142.

[102] The high-pressure fuel supply part 311 may receive the liquid fuel from the fuel tank 2, pressurize the liquid fuel to an appropriate pressure required by the first fuel-consuming device 141, and heat the liquid fuel to an appropriate temperature.

15 [103] The high-pressure fuel supply part 311 may comprise a first-1 pump P11, a first-1 heat exchanger HE11, a first-1 pressure control valve PCV11, a first degassing line DL1, a degassing tank DT, a first-2 pump P12, a first-2 heat exchanger HE12, a first-2 pressure control valve PCV12, and a first filter F1.

[104] The first-1 pump P11 is provided on the high-pressure fuel supply line L11 and may
20 pressurize the liquid fuel supplied from the fuel tank 2 to an appropriate pressure required by the degassing tank DT and supply the liquid fuel to the first-1 heat exchanger HE11.

[105] In the present embodiment, the first-1 pump P11 may be a magnetic drive pump (MP). The magnetic drive pump MP has an external magnet attached to a motor rotating part and an internal magnet attached to a pump rotating part, and when a motor is rotated, the pump rotating part may be rotated and operated by a rotational force of the motor and a magnetic force of the magnets. The external magnet provided in the motor rotating part in the pump and the internal magnet provided in the pump rotating part may be designed to have different polarities, and a magnetic force may be formed between the external magnet and the internal magnet.

[106] A mechanical seal is applied to a general fluid transfer pump, and the mechanical seal may seal the pump rotating part by using a spring and a carbon-based packing so that fluid cannot escape through the pump rotating part. In the mechanical seal, a contact surface is generated in the pump, and wear may occur in the packing and the like due to friction occurring at the contact surface, and leakage of fluid may occur according to wear of the packing and the like.

[107] Since the motor rotating part and the pump rotating part may be isolated from each other by a diaphragm therebetween, structural sealing such as packing is not applied to a moving part such as the pump rotating part, thereby preventing leakage of fluid due to wear of the packing and the like.

[108] The first-1 heat exchanger HE11 is provided on the high-pressure fuel supply line L11 and may primarily heat the liquid fuel supplied from the first-1 pump P11 and transmit the heated liquid fuel to the degassing tank DT. When a first return line RL1, which will be described later, is provided, the first-1 heat exchanger HE11 may be provided on the first return line RL1.

[109] The first-1 heat exchanger HE11 may comprise a configuration configured to discharge air, gas, and the like to the outside in order to remove air or gas in the high-pressure fuel supply line L11. For example, when the first-1 heat exchanger HE11 is of a shell and tube type, air, gas,

and the like may be collected at an upper portion of a shell body, and when the first-1 heat exchanger HE11 is of a shell and plate type, air, gas, and the like may be collected at an upper portion of the shell body or at a discharge nozzle of a plate. As described above, air or gas may be collected in a predetermined area of the first-1 heat exchanger HE11 and discharged to the outside.

5 [110] The first-1 pressure control valve PCV11 may be provided on a first return line RL1 through which the liquid fuel is returned from a downstream side of the first-1 heat exchanger HE11 to an upstream side of the first-1 pump P11, and may be controlled to an open state when the high-pressure fuel supply line L11 on the upstream side of the first-1 pump P11 is not filled with the liquid fuel, and may be controlled to a closed state when the high-pressure fuel supply
10 line L11 on the upstream side of the first-1 pump P11 is filled with the liquid fuel.

[111] The first degassing line DL1 may be provided to branch from the first return line RL1 on an upstream side of the first-1 pressure control valve PCV11. The first degassing line DL1 may degas gas from the liquid fuel before the liquid fuel is supplied to the degassing tank DT via the first-1 heat exchanger HE11.

15 [112] Gas such as air existing in the high-pressure fuel supply line L11 may move along the first degassing line DL1 and may be collected in a degassing header (not shown).

[113] An on/off valve (not shown) may be installed on the first degassing line DL1. When only the on/off valve is installed on the first degassing line DL1, a large amount of liquid together with gas may be discharged to the first degassing line DL1 due to a pressure difference between the
20 high-pressure fuel supply line L11 to which the first return line RL1 is connected and the first degassing line DL1. Accordingly, the pressure in the high-pressure fuel supply line L11 may rapidly decrease. A control valve (not shown) may be further provided on the first degassing line

DL1 to prevent the pressure in the high-pressure fuel supply line L11 from rapidly decreasing. A control valve may allow degassing to proceed slowly.

[114] As described above, during an initial operation of the high-pressure fuel supply part 311, the liquid fuel may be supplied to the first-1 pump P11 in a state in which the high-pressure fuel supply line L11 on the upstream side of the first-1 pump P11 is not completely filled with the liquid fuel or in a state in which gas is contained in the liquid fuel, and in this case, a problem may occur in that cavitation occurs because a net positive suction head required (NPSHr) of the first-1 pump P11 is not satisfied.

[115] In the present embodiment, the above-described problem is solved by providing the first-1 pressure control valve PCV11 and the first degassing line DL1 on the first return line RL1, and air or gas contained in the initially supplied liquid fuel is removed, and the liquid fuel is circulated through the first return line RL1 until the high-pressure fuel supply line L11 on the upstream side of the first-1 pump P11 is filled with the liquid fuel, after which the liquid fuel is supplied to the degassing tank DT.

[116] The degassing tank DT is provided on the high-pressure fuel supply line L11 and may remove air or gas contained in the liquid fuel supplied from the first-1 heat exchanger HE11 and supply the liquid fuel to the first-2 pump P12.

[117] Although air or gas contained in the liquid fuel supplied to the degassing tank DT has been removed through the above-described first degassing line DL1, it cannot be regarded as having been completely removed, and thus, in the present embodiment, the degassing tank DT is provided on the upstream side of the first-2 pump P12.

[118] The degassing tank DT may be configured to discharge air or gas collected in an upper portion thereof to the outside and transmit liquid collected in a lower portion thereof to the first-2 pump P12.

[119] The degassing tank DT may be provided not only with a device capable of removing air or gas but also with a device capable of controlling an operation of the first-2 pump P12 according to a level of the liquid fuel filled therein.

[120] That is, the degassing tank DT may be provided with a plurality of level switches at different heights to measure a level of the liquid fuel, and when the level of the liquid fuel falls below a predetermined level, the operation of the first-2 pump P12 may be stopped.

[121] For example, the degassing tank DT may be provided with a low-level switch and a high-level switch. The low-level switch may be installed at a lowest level of the degassing tank DT. The lowest level of the degassing tank DT may be designed to be higher than a height at which an impeller of the first-2 pump P12 is completely submerged in the liquid fuel. The high-level switch may be installed at a height at which a volume of the degassing tank DT becomes equal to a capacity that the first-2 pump P12 can discharge for one minute. As described above, it may be determined whether the impeller of the first-2 pump P12 is submerged in the liquid fuel by using the low-level switch provided in the degassing tank DT, and when the impeller of the first-2 pump P12 is not submerged in the liquid fuel, the first-2 pump P12 may not be operated.

[122] The degassing tank DT may be omitted. This is because, in the case of a liquid fuel, there is no problem such as vaporization due to fuel heating.

[123] The first-2 pump P12 is provided on the high-pressure fuel supply line L11 and may pressurize the liquid fuel supplied from the degassing tank DT to an appropriate pressure required

by the first fuel-consuming device 141 and supply the liquid fuel to the first-2 heat exchanger HE12.

[124] In the present embodiment, the first-2 pump P12 may be a magnetic drive pump, similarly or identically to the above-described first-1 pump P11.

5 [125] In the present embodiment, the first-2 pump P12 may be omitted, and only the first-1 pump P11 may be applied. In this case, the first-1 pump P11 may be configured to perform a function of the first-2 pump P12. However, due to a limitation in a maximum flow rate of an available pump, a plurality of first-1 pumps P11 may be connected in parallel according to a required flow rate of the first fuel-consuming device 141, and a flow rate ratio of the first-1 pump
10 P11 may be set to be 1.3 times the required flow rate of the first fuel-consuming device 141.

[126] The first-2 heat exchanger HE12 is provided on the high-pressure fuel supply line L11 and may secondarily heat the liquid fuel supplied from the first-2 pump P12 to an appropriate temperature required by the first fuel-consuming device 141.

[127] The first-2 heat exchanger HE12 may comprise a configuration configured to discharge
15 air, gas, and the like to the outside in order to remove air or gas in the high-pressure fuel supply line L11. For example, when the first-2 heat exchanger HE12 is of a shell and tube type, air, gas, and the like may be collected at an upper portion of a shell body, and when the first-2 heat exchanger HE12 is of a shell and plate type, air, gas, and the like may be collected at an upper portion of the shell body or at a discharge nozzle of a plate. As described above, air or gas may be
20 collected in a predetermined area of the first-2 heat exchanger HE12 and discharged to the outside.

[128] In the present embodiment, the first-2 heat exchanger HE12 may be omitted, and only the first-1 heat exchanger HE11 may be applied. In this case, the first-1 heat exchanger HE11 may be configured to perform a function of the first-2 heat exchanger HE12.

[129] The first-2 pressure control valve PCV12 may be provided on a return line (not shown) through which the liquid fuel is returned from a downstream side of the first-2 heat exchanger HE12 to the degassing tank DT, and may be opened when a pressure of the liquid fuel discharged from the first-2 pump P12 is higher than a pressure required by the fuel-consuming device.

5 [130] The first filter F1 may be provided on the high-pressure fuel supply line L11 and may remove foreign substances contained in the liquid fuel supplied from the first-2 heat exchanger HE12 and supply the liquid fuel to the first fuel-consuming device 141.

[131] The low-pressure fuel supply part 312 may receive the liquid fuel from the fuel tank 2, pressurize the liquid fuel to an appropriate pressure required by the second fuel-consuming device
10 142, and heat the liquid fuel to an appropriate temperature.

[132] The low-pressure fuel supply part 312 may comprise a second pump P2, a second heat exchanger HE2, a second pressure control valve PCV2, a second degassing line DL2, and a second filter F2.

[133] The second pump P2 is provided on the low-pressure fuel supply line L12 and may
15 pressurize the liquid fuel supplied from the fuel tank 2 to an appropriate pressure required by the second fuel-consuming device 142 and supply the liquid fuel to the second heat exchanger HE2.

[134] In the present embodiment, the second pump P2 may be a magnetic drive pump, similarly or identically to the above-described first-1 pump P11.

[135] The second heat exchanger HE2 is provided on the low-pressure fuel supply line L12 and
20 may heat the liquid fuel supplied from the second pump P2 to an appropriate temperature required by the second fuel-consuming device 142.

[136] The second heat exchanger HE2 may comprise a configuration configured to discharge air, gas, and the like to the outside in order to remove air or gas in the low-pressure fuel supply line L12. For example, when the second heat exchanger HE2 is of a shell and tube type, air, gas, and the like may be collected at an upper portion of a shell body, and when the second heat exchanger HE2 is of a shell and plate type, air, gas, and the like may be collected at an upper portion of the shell body or at a discharge nozzle of a plate. As described above, air or gas may be collected in a predetermined area of the second heat exchanger HE2 and discharged to the outside.

[137] In order to remove air or gas in the low-pressure fuel supply line L12, the second heat exchanger HE2 may comprise a configuration configured to discharge air and the like to the outside.

[138] The second pressure control valve PCV2 may be provided on a second return line RL2 through which the liquid fuel is returned from a downstream side of the second heat exchanger HE2 to an upstream side of the second pump P2, and may be controlled to an open state when the low-pressure fuel supply line L12 on the upstream side of the second pump P2 is not filled with the liquid fuel, and may be controlled to a closed state when the low-pressure fuel supply line L12 on the upstream side of the second pump P2 is filled with the liquid fuel.

[139] The second degassing line DL2 may be provided to branch from the second return line RL2 on an upstream side of the second pressure control valve PCV2. The second degassing line DL2 may degas gas in the liquid fuel before the liquid fuel is supplied to the second fuel-consuming device 142 via the second heat exchanger HE2. The second degassing line DL2 may be configured similarly to the above-described first degassing line DL1.

[140] The second filter F2 is provided on the low-pressure fuel supply line L12 and may remove foreign substances contained in the liquid fuel supplied from the second heat exchanger HE2 and supply the liquid fuel to the second fuel-consuming device 142.

[141] As described above, in the present embodiment, a first return line RL1 through which the liquid fuel is returned from a downstream side of the first-1 pump P11 to an upstream side of the first-1 pump P11 and a second return line RL2 through which the liquid fuel is returned from a downstream side of the second pump P2 to an upstream side of the second pump P2 may be provided. Pressure control valves PCV11 and PCV2 may be provided on the return lines RL1 and RL2, and since the pressure control valves PCV11 and PCV2 are open, an upstream side of the first-1 pump P11 or the second pump P2 may be filled with methanol.

[142] A return line through which the liquid fuel is returned from a downstream side of the first-2 pump P12 to an upstream side of the first-2 pump P12 may be provided, and a pressure control valve PCV12 may be provided on the return line.

[143] A level switch may be provided on an upstream side of the first-1 pump P11 or the second pump P2 to determine whether the first-1 pump P11, the second pump P2, and the return lines RL1 and RL2 are filled with the liquid fuel. When it is determined that the first-1 pump P11 or the second pump P2 and the return lines RL1 and RL2 are filled with the liquid fuel, the first-1 pump P11 or the second pump P2 may be operated.

[144] A degassing tank DT may be provided on an upstream side of the first-2 pump P12 to discharge air and the like in the fuel supply lines L11 and L12. A level of a drum may be controlled such that an impeller of the first-2 pump P12 is submerged in methanol. When it is determined that the first-2 pump P12 is filled based on a level switch provided in the degassing tank DT, the first-2 pump P12 may be operated.

[145] In addition, in the present embodiment, the fuel tank 2 may be installed at a position higher than the first-1 pump P11 such that an impeller of the first-1 pump P11 is submerged in methanol. The fuel tank 2 is preferably designed to be positioned about 3.3 m above the first-1 pump P11. Of course, the fuel tank 2 may be designed to be positioned above the second pump P2.

5 [146] Since the fuel tank 2 is positioned above the first-1 pump P11, the liquid fuel may fill the first-1 pump P11 and the second pump P2. Level switches may be provided on upstream sides of the first-1 pump P11 and the second pump P2, and it may be determined whether the first-1 pump P11 and the second pump P2 are filled with the liquid fuel through the level switches.

[147] The second fuel supply part 32 may be provided between the first fuel supply part 31 and
10 the fuel-consuming device 14 in order to fill the fuel-consuming device 14 with the liquid fuel.

[148] The second fuel supply part 32 may effectively block supply of the fuel by separating the first fuel supply part 31 and the fuel-consuming device 14 when the first fuel supply part 31 operates abnormally. The second fuel supply part 32 may comprise valves, filters, and various sensors for purposes such as double block and bleed, venting, pressure regulation, and nitrogen
15 supply. The second fuel supply part 32 may be a fuel valve train (FVT), which is a mechanism in which control valves for controlling supply of the liquid fuel to the fuel-consuming device 14 are intensively disposed.

[149] When the fuel-consuming device 14 comprises a first fuel-consuming device 141 operated at a high pressure, such as a propulsion apparatus, and a second fuel-consuming device 142
20 operated at a low pressure, such as a power generation apparatus, the second fuel supply part 32 may comprise: a first fuel supply valve part 321 provided on the high-pressure fuel supply line L11 connecting the fuel tank 2 and the first fuel-consuming device 141; and a second fuel supply

valve part 322 provided on the low-pressure fuel supply line L12 connecting the fuel tank 2 and the second fuel-consuming device 142.

[150] The first fuel supply valve part 321 may be provided between the high-pressure fuel supply part 311 and the first fuel-consuming device 141 in order to fill the first fuel-consuming
5 device 141 with the liquid fuel.

[151] The first fuel supply valve part 321 may be opened when the liquid fuel supplied from the high-pressure fuel supply part 311 reaches a pressure required by the first fuel-consuming device 141.

[152] The second fuel supply valve part 322 may be provided between the low-pressure fuel
10 supply part 312 and the second fuel-consuming device 142 in order to fill the second fuel-consuming device 142 with the liquid fuel.

[153] The second fuel supply valve part 322 may be opened when the liquid fuel supplied from the low-pressure fuel supply part 312 reaches a pressure required by the second fuel-consuming device 142.

[154] The first fuel supply valve part 321 and the second fuel supply valve part 322 may be
15 connected to the fuel tank 2 through a third return line RL3 and may return the liquid fuel through the third return line RL3. In the present embodiment, the third return line RL3 is described as being connected to the fuel supply tank 22 of the fuel tank 2, but may also be connected to the fuel storage tank 21.

[155] The first fuel-consuming device 141 and the second fuel-consuming device 142 may be
20 connected to the fuel tank 2 through a fourth return line RL4 and may return the liquid fuel through the fourth return line RL4. In the present embodiment, the fourth return line RL4 is described as

being connected to the fuel supply tank 22 of the fuel tank 2, but may also be connected to the fuel storage tank 21.

[156] As illustrated in FIG. 2, in the present embodiment, the high-pressure fuel supply line L11 connected to an upstream side of the first fuel-consuming device 141 or the low-pressure fuel supply line L12 connected to an upstream side of the second fuel-consuming device 142 may have a double-pipe structure. One of the pipes of the double-pipe structure may be a pipe into which the liquid fuel is introduced and may be connected to the high-pressure fuel supply line L11 or the low-pressure fuel supply line L12, and the other pipe may be connected to the fourth return line RL4 configured to return the liquid fuel inside the first fuel-consuming device 141 or the second fuel-consuming device 142 to the fuel tank 2.

[157] In addition, as illustrated in FIG. 2, in the present embodiment, an air inlet line AL1 and an air discharge line AL2 may be provided at an upstream side of the first fuel-consuming device 141 to which the high-pressure fuel supply line L11 is connected or at an upstream side of the second fuel-consuming device 142 to which the low-pressure fuel supply line L12 is connected, so as to implement a gas-safe area. In this case, the air may be dry air.

[158] The inert gas supply part 33 may be configured to purge the fuel tank 2, the fuel supply part 3, and the like.

[159] As illustrated in FIG. 2, the inert gas supply part 33 may be connected to the high-pressure fuel supply line L11 and the low-pressure fuel supply line L12 on upstream sides of the second fuel supply part 32 and may purge interiors of the high-pressure fuel supply line L11 and the low-pressure fuel supply line L12.

[160] That is, the inert gas supply part 33 is a configuration configured to supply an inert gas such as nitrogen gas (N₂) or carbon dioxide gas (CO₂), and may comprise a device configured to generate the inert gas or a device configured to store the inert gas. The inert gas supply part 33 may supply the inert gas to the fuel storage tank 21 and the fuel supply tank 22 constituting the fuel tank 2, the first fuel supply part 31, the second fuel supply part 32, the fuel-consuming device 14, and various lines, and may purge the liquid fuel with the inert gas.

[161]

[162] FIG. 3 is a second conceptual diagram for explaining the liquid fuel treatment system according to the first embodiment of the present disclosure.

10 [163] As illustrated in FIG. 3, the inert gas supply part 33 may be connected to the fuel storage tank 21 and the fuel supply tank 22 constituting the fuel tank 2 and may purge interiors of the tanks. The fuel storage tank 21 may be connected to the inert gas supply part 33 and may be purged by the inert gas supplied from the inert gas supply part 33.

15 [164] The vent mast 34 may be configured to discharge gas and the like present in the fuel tank 2, the fuel supply part 3, and the like to the outside.

[165] The vent mast 34 may be connected to the fuel storage tank 21 and the fuel supply tank 22 through a vent line L3, as illustrated in FIG. 3, and may regulate pressures inside the tanks by discharging gas inside the tanks to the outside.

20 [166] The pressure inside the tanks may be regulated as the gas inside the tanks is discharged to the outside through the vent mast 34. A pressure/vacuum relief valve (PVRV) may be provided at an end of the vent line L3. An opening degree of the pressure/vacuum relief valve PVRV may be controlled by a pressure sensor PS installed in the fuel storage tank 21. A rupture disc RD may be

installed at a portion of the vent line L3. The rupture disc RD is configured to automatically rupture when a dangerous situation is reached in which an internal pressure of the fuel storage tank 21 becomes too high to be relieved through the vent mast 34.

[167] In addition, the fuel storage tank 21 or the fuel supply tank 22 may be connected through
5 a bunkering line L4 to a bunkering part (not shown) provided on a port side and a starboard side of the hull 11. The pressure inside the tanks may be regulated as gas inside the tanks is discharged to the outside through the bunkering part 5. The bunkering part 5 may be a bunker station.

[168] An on/off valve SV may be provided on the bunkering line L4. The on/off valve SV may be turned on or off by the pressure sensor PS installed in the fuel storage tank 21. In addition, the
10 liquid fuel may be supplied to the fuel storage tank 21 or the fuel supply tank 22 through the bunkering line L4 via the bunkering part 5.

[169] FIG. 4 is a view for explaining the fuel supply tank according to the first embodiment of the present disclosure.

[170] As illustrated in FIG. 4, the fuel supply tank 22 may be formed such that a lower surface
15 thereof has a downward inclination at a predetermined angle from one side toward the other side. The fuel supply tank 22 may be formed in a polygonal structure including an upper surface (not shown), the lower surface (not shown), and a plurality of side surfaces (not shown). Here, the lower surface may be provided to have a downward inclination at a predetermined angle from one side surface toward the other side surface among the plurality of side surfaces.

20 [171] The fuel supply tank 22 may be provided with a bulkhead 228 therein. The fuel supply tank 22 may be formed in a polygonal structure and may be formed in a cylinder structure.

[172] The fuel supply tank 22 may comprise a storage part 22a configured to store the liquid fuel to be supplied to the fuel-consuming device 14, and a return part 22b partitioned from the storage part 22a by the bulkhead 228 and configured to collect the liquid fuel returned from the fuel supply part 3 or the fuel-consuming device 14.

5 [173] The bulkhead 228 may be formed in a double-bulkhead structure. The bulkhead 228 may comprise a first bulkhead 228a spaced apart from one side surface by a predetermined distance, connected to the upper surface, and extending by a predetermined length toward the lower surface, and a second bulkhead 228b spaced apart from the first bulkhead 228a toward the other side surface by a predetermined distance, connected to the lower surface, and extending by a
10 predetermined length toward the upper surface.

[174] The return part 22b may be separated from the storage part 22a by the second bulkhead 228b. The return part 22b may comprise a first return part 22b1 and a second return part 22b2 separated from the first return part 22b1 by the first bulkhead 228a.

[175] The first return part 22b1 may be formed by one side surface of the fuel supply tank 22
15 and the first bulkhead 228a, the second return part 22b2 may be formed by the first bulkhead 228a and the second bulkhead 228b, and the storage part 22a may be formed by the other side surface of the fuel supply tank 22 and the second bulkhead 228b.

[176] The return part 22b may be a space filled with the liquid fuel returned through the third return line RL3 connected to the second fuel supply part 32 or the fourth return line RL4 connected
20 to the fuel-consuming device 14. The third return line RL3 or the fourth return line RL4 may be connected to the upper surface of the fuel supply tank 22 corresponding to the return part 22b. In detail, the third return line RL3 or the fourth return line RL4 may be connected to the upper surface of the fuel supply tank 22 corresponding to the first return part 22b1.

[177] The return part 22b may have a lower surface inclined downward from one side surface toward the other side surface. In detail, the return part 22b may have a lower surface inclined downward toward the second bulkhead 228b. Foreign substances in the liquid fuel returned from the fuel supply part 3 or the fuel-consuming device 14 may be collected in an area adjacent to the
5 second bulkhead 228b.

[178] The storage part 22a may be a space filled with the liquid fuel supplied through the fuel supply line L1 connected to the fuel storage tank 21. The fuel supply line L1 may be connected to the upper surface of the fuel supply tank 22 corresponding to the storage part 22a. The storage part 22a may return the liquid fuel stored in the fuel supply tank 22 to the fuel storage tank 21 through
10 the fuel return line L2.

[179] The storage part 22a may have a lower surface inclined downward from one side surface toward the other side surface. In detail, the storage part 22a may have a lower surface inclined downward from the second bulkhead 228b toward the other side surface of the fuel supply tank 22. The liquid fuel may move toward the other side surface of the fuel supply tank 22. In addition,
15 the fuel supply line L1 may extend adjacent to the other side surface of the fuel supply tank 22. In addition, the fuel supply line L1 may extend adjacent to the lower surface of the fuel supply tank 22. In addition, the fuel return line L2 may be provided adjacent to the other side surface of the fuel supply tank 22. In detail, the fuel return line L2 may be provided on the lower surface of the fuel supply tank 22 adjacent to the other side surface of the fuel supply tank 22.

[180] Since the returned liquid fuel filled in the return part 22b may contain foreign substances and thus may be unsuitable for use as a fuel for the fuel-consuming device 14, a drain line L5 configured to discharge the returned liquid fuel to a drain tank (not shown) or the like may be provided on the lower surface of the fuel supply tank 22 corresponding to the second return part
20

22b2. In detail, the drain line L5 may be formed on the lower surface of the second return part 22b2 adjacent to the second bulkhead 228b. The drain line L5 may be opened and closed by a valve.

[181] In addition, a purging line L6 for purging an interior thereof may be provided on the upper surface of the fuel supply tank 22 corresponding to the second return part 22b2.

[182] In addition, a vent line L3 for discharging gas inside to the outside and a bunkering line L4 for transmitting gas and the like inside to an onshore facility and the like may be provided on the upper surface of the fuel supply tank 22 corresponding to the storage part 22a.

[183] In addition, fuel supply lines L11 and L12 configured to transmit the liquid fuel to the fuel-consuming device 14 may be provided at a lower portion of the other side surface of the fuel supply tank 22 corresponding to the storage part 22a.

[184] FIG. 5 is a view for explaining the fuel supply tank according to the second embodiment of the present disclosure.

[185] Referring to FIG. 5, in the fuel supply tank 22 according to the second embodiment of the present disclosure, the return part 22b may collect fuel leaked from at least one of the fuel storage tank 21, the fuel supply tank 22, and the fuel supply part 3.

[186] The return part 22b may be separated into a first return part 22b1 and a second return part 22b2 by the first bulkhead 228a. Fuel leaked from at least one of the fuel storage tank 21, the fuel supply tank 22, and the fuel supply part 3 may be introduced through an upper surface of the fuel supply tank 22 corresponding to the first return part 22b1.

[187] A drip tray (not shown) configured to collect liquid fuel leaked from at least one of the fuel storage tank 21, the fuel supply tank 22, and the fuel supply part 3 may be provided. The drip

tray may have various shapes. For example, the drip tray may comprise a bottom surface extending in a horizontal direction and side surfaces extending upward from both ends of the bottom surface and configured to accommodate the liquid fuel up to a predetermined height. The drip tray may be disposed below at least one of the fuel storage tank 21, the fuel supply tank 22, and the fuel supply part 3. The liquid fuel discharged from the fuel storage tank 21, the fuel supply tank 22, and the fuel supply part 3 may be transmitted to the drip tray by gravity. The drip tray may be applied without limitation as long as it is capable of collecting leaked liquid fuel.

[188] A leakage processing line L7 configured to transmit the liquid fuel leaked from at least one of the fuel storage tank 21, the fuel supply tank 22, and the fuel supply part 3 may be provided on the upper surface of the fuel supply tank 22. The leakage processing line L7 may be connected to the upper surface of the fuel supply tank 22 corresponding to the return part 22b. In detail, the leakage processing line L7 may be connected to the upper surface of the fuel supply tank 22 corresponding to the first return part 22b1. The leakage processing line L7 may connect the drip tray and the fuel supply tank 22. For example, the leakage processing line L7 may be connected to the bottom surface of the drip tray. The bottom surface of the drip tray may have a shape inclined downward toward the leakage processing line L7.

[189] In addition, the fuel storage tank 21 or the fuel supply tank 22 may be connected through a bunkering line L4 to a bunkering part (not shown) provided on a port side and a starboard side of the hull 11. The bunkering part may transmit the liquid fuel from the outside to the fuel storage tank 21 or the fuel supply tank 22. In addition, the bunkering part may transmit gas inside the fuel storage tank 21 or the fuel supply tank 22 to the outside to regulate an internal pressure thereof. An on/off valve SV may be provided on the bunkering line L4. The on/off valve SV may be turned on or off by the pressure sensor PS installed in the fuel storage tank 21.

[190] The return part 22b may collect liquid fuel leaked from the bunkering part. In detail, the drip tray may collect the liquid fuel leaked from the bunkering part, and the leaked liquid fuel may be transmitted to the return part 22b along the leakage processing line L7 connected to the drip tray. The drip tray may be disposed below the bunkering part.

5 [191] A filter 221 may be provided in the return part 22b. The filter 221 may filter foreign substances contained in the liquid fuel. The filter 221 may filter the liquid fuel returned through the third return line RL3 connected to the second fuel supply part 32 or the fourth return line RL4 connected to the fuel-consuming device 14. In addition, the filter 221 may filter the liquid fuel returned through the leakage processing line L7.

10 [192] The filter 221 may be provided between the first bulkhead 228a and the second bulkhead 228b. In detail, the filter 221 may be fixed to the first bulkhead 228a and the second bulkhead 228b. The filter 221 may be installed between a lower end of the first bulkhead 228a and an upper end of the second bulkhead 228b. The filter 221 may be installed in a horizontal direction between the lower end of the first bulkhead 228a and the upper end of the second bulkhead 228b.

15 [193] The liquid fuel may be returned to the first return part 22b1 through at least one of the third return line RL3, the fourth return line RL4, and the leakage processing line L7. When the liquid fuel is filled in the return part 22b to greater than or equal to a predetermined height, the liquid fuel may move to the storage part 22a through the filter 221. The liquid fuel may be separated from foreign substances due to a difference in density, and the liquid fuel stored at
20 greater than or equal to a predetermined height in the return part 22b may be transmitted to the storage part 22a. A line (not shown) configured to transmit the liquid fuel stored at greater than or equal to a predetermined height in the return part 22b to the storage part 22a may be provided in the fuel tank 2.

[194] The return part 22b may collect bilge water generated in the ship 1. The return part 22b may be connected to a bilge well (not shown) in which bilge water is collected. A bilge line (not shown) connected to the bilge well may be connected to the upper surface of the fuel supply tank 22. In detail, the bilge line may be connected to an upper portion of the first return part 22b1.

5 [195]

[196] FIG. 6 is a first conceptual diagram for explaining the liquid fuel treatment system according to the third embodiment of the present disclosure.

[197] Referring to FIG. 6, the liquid fuel treatment system 10 according to the third embodiment of the present disclosure may comprise: a fuel supply part 3 configured to supply the liquid fuel in
10 the fuel tank 2 to the fuel-consuming device 14 provided in the hull 11; a purging tank 4 configured to collect the liquid fuel returned from the fuel-consuming device 14 or the fuel supply part 3 together with a purging gas; and a transfer pump P configured to transmit the liquid fuel in the fuel tank 2 to the fuel-consuming device 14.

[198] The fuel tank 2 may be at least one of the fuel storage tank 21 and the fuel supply tank 22.
15 For example, the fuel tank 2 may be the fuel storage tank 21. The fuel tank 2 may be disposed below the fuel supply part 3. In addition, the fuel tank 2 may be disposed below the purging tank 4.

[199] The fuel supply part 3 may supply the liquid fuel to the fuel-consuming device 14 provided in the hull 11. The fuel supply part 3 may be provided above the fuel tank 2.

20 [200] The transfer pump P may be provided inside the fuel tank 2. The transfer pump P may be provided at a lower portion of the fuel tank 2. The liquid fuel may be transmitted to the fuel supply part 3 by the transfer pump P and may be supplied to the fuel-consuming device 14 through the

fuel supply part 3. The transfer pump P may be a submerged pump operated in the liquid fuel. The liquid fuel of the fuel-consuming device 14 or the fuel supply part 3 may be recovered (returned) to the fuel tank 2. The transfer pump P may be included in the fuel supply part 3. The transfer pump P may be disposed outside the fuel tank 2 and may be accommodated in a pump room 6, but
5 the present disclosure is not limited thereto.

[201] In addition, although the transfer pump P has been described in the present specification as supplying the liquid fuel to the fuel-consuming device 14 along the fuel supply line L1, the transfer pump P may transmit the liquid fuel to an outside of the hull 11 through the bunkering line L4. The transfer pump P may comprise a first-fuel transfer pump LP configured to transfer a
10 first fuel and a second-fuel transfer pump DP configured to transfer a second fuel.

[202] The liquid fuel may be recovered along a third return line RL3 connected to the fuel supply part 3. In detail, the liquid fuel may be recovered along the third return line RL3 connected to the second fuel supply part 32. In addition, the liquid fuel may be recovered along a fourth return line RL4 connected to the fuel-consuming device 14. The liquid fuel may be recovered when supply
15 of the liquid fuel to the fuel-consuming device 14 is stopped. At this time, the liquid fuel recovered along the third return line RL3 or the fourth return line RL4 may be collected in the purging tank 4.

[203] The liquid fuel collected in the purging tank 4 may be transmitted to the fuel tank 2 along a purging line PL. The liquid fuel collected in the purging tank 4 may be transmitted to the fuel
20 tank 2 by gravity. The purging tank 4 may be disposed above the fuel tank 2. A separate pumping means may be provided between the purging tank 4 and the fuel tank 2. The liquid fuel collected in the purging tank 4 may be transmitted to the fuel tank 2 by the pumping means.

[204] The liquid fuel in the fuel tank 2 may be transmitted to the fuel supply part 3 and supplied to the fuel-consuming device 14. The fuel tank 2 may be the fuel storage tank 21. That is, the fuel tank 2 may supply the liquid fuel to the fuel-consuming device 14 without passing through the fuel supply tank 22. In this case, the purging tank 4 may recover the liquid fuel from the fuel supply part 3 and the like. Here, the purging tank 4 may be the fuel supply tank 22. That is, the fuel supply tank 22 may recover the liquid fuel from the fuel supply part 3 and the like.

[205]

[206] FIG. 7 is a second conceptual diagram for explaining the liquid fuel treatment system according to the third embodiment of the present disclosure.

[207] Referring to FIG. 7, the fuel tank 2 may be provided at a lower portion of the hull 11. In detail, the fuel tank 2 may be provided in a hold 116 at a lower portion of the hull 11. The fuel tank 2 may be provided below a cabin 15 provided at a central portion of the hull 11. In addition, the fuel tank 2 may be provided below the bunkering part 5. In addition, the fuel tank 2 may be provided below the pump room 6. The fuel tank 2 may be surrounded by a cofferdam 7. The pump room 6 may accommodate pumps, valves, and instrumentation devices.

[208] The transfer pump P may be provided below the fuel tank 2. The transfer pump P may be provided between the bottom plate 113 and the fuel tank 2. The transfer pump P may be provided in a pump casing PC provided between the bottom plate 113 and the fuel tank 2. The liquid fuel in the fuel tank 2 may move to the transfer pump P by gravity. At this time, the fuel supply line L1 may be provided outside the fuel tank 2. The fuel supply line L1 may connect the transfer pump P provided below the fuel tank 2 and the fuel supply part 3 provided above the fuel tank 2.

[209] In the liquid fuel treatment system 10 according to the third embodiment of the present disclosure, the liquid fuel in the fuel tank 2 may be supplied to the fuel-consuming device 14 by the transfer pump P, and the liquid fuel recovered from the fuel supply part 3 or the fuel-consuming device 14 to the purging tank 4 may be transmitted to the fuel tank 2 by gravity.

5 [210] The ship 1 according to the present disclosure may comprise the liquid fuel treatment system 10 according to the third embodiment of the present disclosure. The ship 1 may be a container ship configured to transport containers C.

[211]

[212] FIG. 8 is a first conceptual diagram for explaining the liquid fuel treatment system
10 according to the fourth embodiment of the present disclosure.

[213] Referring to FIG. 8, the liquid fuel treatment system 10 according to the fourth embodiment of the present disclosure may comprise: a fuel supply part 3 configured to supply the liquid fuel in the fuel tank 2 to the fuel-consuming device 14 provided in the hull 11; a purging tank 4 configured to collect the liquid fuel returned from the fuel-consuming device 14 or the fuel
15 supply part 3 together with a purging gas; and a purging pump PP configured to transmit the liquid fuel stored in the purging tank 4 to the fuel tank 2.

[214] The fuel tank 2 may be spaced apart from a bottom surface on which the fuel tank 2 is disposed. The fuel tank 2 may be supported by a support part S. The support part S may be provided between the fuel tank 2 and the bottom surface on which the fuel tank 2 is disposed. A tank lower
20 space LS may be formed between the fuel tank 2 and the bottom surface on which the fuel tank 2 is disposed. The bottom surface on which the fuel tank 2 is disposed may be the main deck 111 of the hull 11. That is, the fuel tank 2 may be provided on the main deck 111.

[215] The fuel supply part 3 may transmit the liquid fuel in the fuel tank 2 to the fuel-consuming device 14 by gravity. The fuel supply part 3 may be provided below the fuel tank 2. The fuel-consuming device 14 may be disposed below the fuel supply part 3. A separate transfer pump may not be provided between the fuel tank 2 and the fuel supply part 3.

5 [216] The liquid fuel of the fuel-consuming device 14 or the fuel supply part 3 may be recovered to the fuel tank 2. The liquid fuel may be recovered along a third return line RL3 connected to the fuel supply part 3. In detail, the liquid fuel may be recovered along the third return line RL3 connected to the second fuel supply part 32. In addition, the liquid fuel may be recovered along a fourth return line RL4 connected to the fuel-consuming device 14. The liquid fuel may be
10 recovered to the fuel tank 2 when supply of the liquid fuel to the fuel-consuming device 14 is stopped.

[217] The liquid fuel recovered along the third return line RL3 or the fourth return line RL4 may be collected in the purging tank 4. The liquid fuel collected in the purging tank 4 may be transmitted to the fuel tank 2 along the purging line PL.

15 [218] A purging pump PP may be provided between the purging tank 4 and the fuel tank 2. Since the purging tank 4 may be disposed below the fuel tank 2, the liquid fuel collected in the purging tank 4 may be transmitted to the fuel tank 2 by the purging pump PP.

[219] FIG. 9 is a second conceptual diagram for explaining the liquid fuel treatment system according to the fourth embodiment of the present disclosure.

20 [220] Referring to FIG. 9, the fuel tank 2 may be provided on the main deck 111. The fuel supply part 3 may be disposed at a side of the fuel tank 2. In detail, the fuel supply part 3 may be the first fuel supply part 31. The first fuel supply part 31 may be provided below the fuel tank 2, and the

liquid fuel in the fuel tank 2 may be transmitted to the first fuel supply part 31 by gravity. The first fuel supply part 31 may be provided inside a pump room (not shown) provided at a side of the fuel tank 2.

[221] The second fuel supply part 32 may be disposed at the stern 115. The second fuel supply part 32 may be disposed at a side of an engine casing 16 provided on the main deck 111 above the engine room 13.

[222] In the liquid fuel treatment system 10 according to the fourth embodiment of the present disclosure, the liquid fuel in the fuel tank 2 may be supplied to the fuel-consuming device 14 by gravity, and the liquid fuel recovered from the fuel supply part 3 or the fuel-consuming device 14 to the purging tank 4 may be transmitted to the fuel tank 2 by the purging pump PP.

[223] The ship 1 according to the present disclosure may comprise the liquid fuel treatment system 10 according to the fourth embodiment of the present disclosure. The ship 1 may be a crude oil carrier configured to transport crude oil.

[224]

[225] FIG. 10 is a first conceptual diagram for explaining the liquid fuel treatment system according to the fifth embodiment of the present disclosure.

[226] Referring to FIG. 10, the liquid fuel treatment system 10 according to the fifth embodiment of the present disclosure may comprise: a fuel supply part 3 configured to supply the liquid fuel in the fuel tank 2 to the fuel-consuming device 14; a first transfer valve V1 disposed outside the fuel tank 2 and configured to regulate supply of the liquid fuel; and a valve room 8 configured to accommodate the first transfer valve V1 and form an isolated space.

[227] The first transfer valve V1 may regulate supply of the liquid fuel in the fuel tank 2. The first transfer valve V1 may be included in the fuel supply part 3. The first transfer valve V1 may be accommodated in the pump room 6.

[228] The valve room 8 may be provided in a form that completely seals an inside thereof from an outside thereof. The valve room 8 may block flow of liquid and gas between the inside and the outside thereof. When the liquid fuel leaks from the first transfer valve V1 provided inside the valve room 8, the valve room 8 may have a structure configured to prevent leakage of the liquid fuel and evaporated gas of the liquid fuel. For example, the valve room 8 may be of an enclosed type or a full containment type. Even when leakage occurs from the first transfer valve V1, the valve room 8 may block movement of gas to the outside, thereby maintaining a pressure of the fuel tank 2 at greater than or equal to a predetermined pressure

[229] The valve room 8 may form an isolated space. The valve room 8 may accommodate the first transfer valve V1 in an internal space thereof. The valve room 8 may comprise a lower panel 81, side panels 82 extending upward from ends of the lower panel 81, and an upper panel 83 covering a space formed by the side panels 82. The lower panel 81, the side panels 82, and the upper panel 83 may be connected such that the internal space is sealed.

[230] A second transfer valve V2 may be disposed inside the fuel tank 2. In addition, the second transfer valve V2 may be disposed at a lower portion of the fuel tank 2. The second transfer valve V2 may block flow of the liquid fuel when leakage of the liquid fuel occurs on a downstream side of the fuel tank 2. The second transfer valve V2 may block flow of the liquid fuel when leakage of the liquid fuel occurs from the first transfer valve V1. The second transfer valve V2 may be disposed on an upstream side of the first transfer valve V1.

[231] In the valve room 8, the lower panel 81 may be formed parallel to a lower surface 201 of the fuel tank 2. In addition, at least a portion of the valve room 8 may be disposed below the lower surface 201 of the fuel tank 2.

[232] FIG. 11 is a second conceptual diagram for explaining the liquid fuel treatment system according to the fifth embodiment of the present disclosure.

[233] The liquid fuel treatment system 10 may further comprise a ventilation part 9 installed to ventilate an interior of the valve room 8. The ventilation part 9 may communicate an interior of the valve room 8 with an exterior thereof. The ventilation part 9 may circulate air inside the valve room 8 and air outside the valve room 8.

[234] The ventilation part 9 may block circulation between the air inside the valve room 8 and the air outside the valve room 8 when leakage occurs from the first transfer valve V1. Accordingly, when leakage occurs from the first transfer valve V1, the valve room 8 may maintain a pressure of the fuel tank 2 at greater than or equal to a predetermined pressure.

[235] The ventilation part 9 may ventilate the interior of the valve room 8 when leakage occurs from the first transfer valve V1 for safety of an operator. That is, the ventilation part 9 may supply air outside the valve room 8 into the valve room 8. In this case, the ventilation part 9 may block air inside the valve room 8 from moving to the outside of the valve room 8. That is, the ventilation part 9 may control air outside the valve room 8 to flow toward the interior thereof while blocking air inside the valve room 8 from being discharged to the outside. Accordingly, even when leakage occurs from the first transfer valve V1, the valve room 8 may maintain the pressure of the fuel tank 2 at greater than or equal to a predetermined pressure.

[236] The ventilation part 9 may be installed on at least one of the lower panel 81, the side panels 82, and the upper panel 83. The ventilation part 9 may be formed to penetrate at least one of the lower panel 81, the side panels 82, and the upper panel 83. In detail, the ventilation part 9 may be formed in at least one of the side panels 82 and the upper panel 83. The ventilation part 9 may be disposed higher than the lower surface 201 of the fuel tank 2.

[237] The fuel tank 2 may be connected to the fuel-consuming device 14 through the fuel supply line L1. The fuel supply line L1 may pass through the valve room 8. The fuel supply line L1 may extend in a direction parallel to the lower surface 201 of the fuel tank 2.

[238] The first transfer valve V1 or the transfer pump P may be provided on the fuel supply line L1. The transfer pump P may be provided on a downstream side of the first transfer valve V1. The transfer pump P may supply the liquid fuel in the fuel tank 2 to the fuel-consuming device 14.

[239]

[240] FIG. 12 is a conceptual diagram for explaining the liquid fuel treatment system according to the sixth embodiment of the present disclosure.

[241] Referring to FIG. 12, the liquid fuel treatment system 10 according to the sixth embodiment of the present disclosure may comprise: a fuel supply part 3 configured to supply the liquid fuel in the fuel tank 2 to the fuel-consuming device 14; a first transfer valve V1 disposed outside the fuel tank 2 and configured to regulate supply of the liquid fuel; and a valve room 8 configured to accommodate the first transfer valve V1 and form an isolated space.

[242] The valve room 8 may be provided in a form that partially seals an inside thereof from an outside thereof. In the valve room 8, flow of liquid and gas between the inside and the outside thereof may be possible.

[243] When the liquid fuel leaks from the first transfer valve V1 provided inside the valve room 8, the valve room 8 may collect the liquid fuel and transmit the collected liquid fuel to the leakage processing line L7. The valve room 8 may be of a partial containment type.

[244] The leakage processing line L7 may be connected to a separately provided drain tank (not shown) or the return part 22b illustrated in FIG. 5, but the present disclosure is not limited thereto. A valve (not shown) configured to block flow of the liquid fuel may be provided on the leakage processing line L7.

[245] A drip tray (not shown) may be provided below the valve room 8. The drip tray may collect the liquid fuel leaked from the first transfer valve V1

[246]

[247] FIG. 13 is a conceptual diagram for explaining the liquid fuel treatment system according to the seventh embodiment of the present disclosure.

[248] Referring to FIG. 13, the liquid fuel treatment system 10 according to the seventh embodiment of the present disclosure may comprise: a fuel supply part 3 configured to supply the liquid fuel in the fuel tank 2 to the fuel-consuming device 14; a first transfer valve V1 disposed outside the fuel tank 2 and configured to regulate supply of the liquid fuel; and a valve room 8 configured to accommodate the first transfer valve V1 and form an isolated space.

[249] The fuel tank 2 may be configured to have a lower surface 201, a plurality of side surfaces 202, and an upper surface 203 and to form a fuel accommodation space therein. A tank lower space LS may be formed below the fuel tank 2. At least a portion of the fuel supply line L1 may extend in a vertical direction of the lower surface 201 of the fuel tank 2. That is, at least a portion of the fuel supply line L1 may extend into the tank lower space LS. In this case, the fuel supply line L1

may extend below the fuel tank 2, and an end thereof may be bent and extend in a direction parallel to the lower surface 201 of the fuel tank 2.

[250] The fuel tank 2 may be provided on the main deck 111 or may be provided spaced apart from the bottom plate 113, and the tank lower space LS may be formed between the main deck 111 or the bottom plate 113 and the lower surface 201 of the fuel tank 2. However, the present disclosure is not limited thereto.

[251] The valve room 8 may accommodate the first transfer valve V1 therein. The valve room 8 may be provided at a side of the fuel tank 2. At least a portion of the valve room 8 may be formed below the lower surface 201 of the fuel tank 2. The first transfer valve V1 may be provided below the lower surface 201 of the fuel tank 2.

[252] The valve room 8 may be provided in a form that completely seals an inside thereof from an outside thereof or may be provided in a form that partially seals the inside thereof from the outside thereof, but the present disclosure is not limited thereto.

[253]

[254] FIG. 14 is a conceptual diagram for explaining the liquid fuel treatment system according to the eighth embodiment of the present disclosure.

[255] Referring to FIG. 14, the liquid fuel treatment system 10 according to the eighth embodiment of the present disclosure may comprise: a fuel supply part 3 configured to supply the liquid fuel in the fuel tank 2 to the fuel-consuming device 14; a first transfer valve V1 disposed outside the fuel tank 2 and configured to regulate supply of the liquid fuel; and a valve room 8 configured to accommodate the first transfer valve V1 and form an isolated space.

[256] The valve room 8 and the pump casing PC may be provided below the fuel tank 2. The valve room 8 and the pump casing PC may be disposed below a cofferdam 7 provided between adjacent fuel tanks 2. The valve room 8 may be used for management of the fuel tank 2 and may be used as a tank connection space (TCS) connecting the fuel supply part 3 and the fuel tank 2.

5 [257]

[258] FIG. 15 is a cross-sectional view taken along portion "A" of FIG. 14 for explaining the liquid fuel treatment system illustrated in FIG. 14.

[259] Referring to FIG. 15, a tank lower space LS may be formed below the fuel tank 2. At least one of the valve room 8 and the pump casing PC may be disposed in the tank lower space LS. The fuel tank 2 may be formed spaced apart from the bottom plate 113 and, although not illustrated in the drawings, may be formed on the main deck 111.

[260] At least one fuel tank 2 may be provided in the hold 116. A plurality of fuel tanks 2 may be provided in the hold 116 in a left-right direction of the hull 11. The cofferdam 7 may be provided between the side shell plate 112 and the fuel tank 2. In addition, the cofferdam 7 may be provided between adjacent fuel tanks 2.

[261] The liquid fuel in the fuel tank 2 may be supplied to the fuel-consuming device 14 along the fuel supply line L1. At this time, at least a portion of the fuel supply line L1 may penetrate the fuel tank 2. In detail, the fuel supply line L1 may penetrate a space in the fuel tank 2 in which the liquid fuel is stored.

20 [262] In addition, the fuel supply line L1 may penetrate the cofferdam 7 provided between the fuel tanks 2 or the cofferdam 7 provided between the fuel tank 2 and the side shell plate 112. The

fuel supply line L1 may comprise a line through which the liquid fuel is transmitted from the fuel storage tank 21 to the fuel supply tank 22.

[263] Meanwhile, the fuel tank 2 may be provided therein with a bunkering line L4 connecting the bunkering part 5 and the fuel tank 2. The liquid fuel may be supplied to the fuel tank 2 by the bunkering part 5, or gas and the like inside the fuel tank 2 may be transmitted to the outside. The bunkering line L4 may comprise a liquid line L41 and a vapor line L42.

[264] A valve room 8 may be provided below the fuel tank 2. The first transfer valve V1 may be accommodated in the valve room 8.

[265] A pump casing PC may be provided below the fuel tank 2. The transfer pump P may be accommodated in the pump casing PC. The pump casing PC may be provided on one side of the valve room 8.

[266] The valve room 8 and the pump casing PC may share a bulkhead 8b. The valve room 8 and the pump casing PC may be formed by: a wall 8a forming an accommodation space; and a bulkhead 8b partitioning the accommodation space. The valve room 8 may be formed by the wall 8a and one surface of the bulkhead 8b, and the pump casing PC may be formed by the wall 8a and the other surface of the bulkhead 8b. The wall 8a may be formed of a material having greater rigidity than the bulkhead 8b, but the present disclosure is not limited thereto.

[267] The accommodation space formed by the wall 8a may be partitioned by the bulkhead 8b, and the respective spaces formed by partitioning the accommodation space may be the valve room 8 and the pump casing PC. In addition, the valve room 8 and the pump casing PC may be formed to have independent walls, but the present disclosure is not limited thereto.

[268] A separate pump room 6 may be provided above the fuel tank 2. The pump room 6 may accommodate a bilge pump and the like, but the present disclosure is not limited thereto.

[269] A drain part 204 may be provided inside the fuel tank 2. Liquid fuel leaked from the fuel tank 2, the fuel supply part 3, the bunkering part 5, the pump room 6, and the like may be collected in the drain part 204. In addition, when the fuel tank 2 is the fuel storage tank 21, the liquid fuel recovered from the fuel supply tank 22 may be collected in the drain part 204.

[270]

[271] FIG. 16 is a conceptual diagram for explaining the liquid fuel treatment system according to the ninth embodiment of the present disclosure.

[272] Referring to FIG. 16, the liquid fuel treatment system 10 according to the ninth embodiment of the present disclosure may comprise: a fuel supply part 3 configured to supply the liquid fuel in the fuel tank 2 to the fuel-consuming device 14; a first transfer valve V1 disposed outside the fuel tank 2 and configured to regulate supply of the liquid fuel; and a second transfer valve V2 disposed inside the fuel tank 2 and configured to block flow of the liquid fuel when leakage of the liquid fuel occurs on a downstream side of the fuel tank 2.

[273] The first transfer valve V1 may be disposed outside the fuel tank 2. In addition, the first transfer valve V1 may be provided on a downstream side of the fuel tank 2. The first transfer valve V1 may be provided below the fuel tank 2. The first transfer valve V1 may be provided on the fuel supply line L1 connecting the fuel tank 2 and the fuel-consuming device 14. The fuel supply line L1 may extend in a direction parallel to the lower surface 201 of the fuel tank 2.

[274] The second transfer valve V2 may be disposed inside the fuel tank 2. The second transfer valve V2 may be disposed at a lower portion of the fuel tank 2. The second transfer valve V2 may

block flow of the liquid fuel when leakage of the liquid fuel occurs on a downstream side of the fuel tank 2. The second transfer valve V2 may block flow of the liquid fuel when leakage of the liquid fuel occurs from the first transfer valve V1. The second transfer valve V2 may be disposed on an upstream side of the first transfer valve V1.

5 [275] The transfer pump P may be provided on a downstream side of the first transfer valve V1.
[276]

[277] FIG. 17 is a conceptual diagram for explaining the liquid fuel treatment system according to the tenth embodiment of the present disclosure.

[278] Referring to FIG. 17, the liquid fuel treatment system 10 according to the tenth
10 embodiment of the present disclosure may comprise: a fuel supply part 3 configured to supply the liquid fuel in the fuel tank 2 to the fuel-consuming device 14; a first transfer valve V1 disposed outside the fuel tank 2 and configured to regulate supply of the liquid fuel; and a second transfer valve V2 disposed inside the fuel tank 2 and configured to block flow of the liquid fuel when leakage of the liquid fuel occurs on a downstream side of the fuel tank 2.

15 [279] The valve room 8 may form an isolated space. The valve room 8 may accommodate the first transfer valve V1. The valve room 8 may be formed such that the lower panel 81 is parallel to the lower surface 201 of the fuel tank 2. In addition, at least a portion of the valve room 8 may be disposed below the lower surface 201 of the fuel tank 2.

[280] The transfer pump P may be provided on a downstream side of the first transfer valve V1.
20 The transfer pump P may be provided outside the valve room 8.
[281]

[282] FIG. 18 is a first conceptual diagram for explaining the liquid fuel treatment system according to the eleventh embodiment of the present disclosure.

[283] Referring to FIG. 18, the liquid fuel treatment system 10 according to the eleventh embodiment of the present disclosure may comprise: a fuel supply part 3 configured to supply the liquid fuel in the fuel tank 2 to the fuel-consuming device 14; a bunkering part 5 configured to transmit the liquid fuel from the outside to the fuel tank 2; and a leakage processing part 70 configured to treat the liquid fuel leaked from at least one of the fuel tank 2, the fuel supply part 3, and the bunkering part 5.

[284] The leakage processing part 70 may comprise: a drip tray 71 configured to collect the liquid fuel leaked from at least one of the fuel tank 2, the fuel supply part 3, and the bunkering part 5; a leakage processing line L7 connected to the drip tray 71 and configured to drain the liquid fuel collected in the drip tray 71; a drain sensor 72 provided on the leakage processing line L7; and a drain valve 73 configured to transmit the liquid fuel collected in the drip tray 71 to the leakage processing line L7 during bunkering.

[285] The drip tray 71 may have various shapes. For example, the drip tray 71 may comprise a bottom surface extending in a horizontal direction and side surfaces extending upward from both ends of the bottom surface and configured to accommodate the liquid fuel up to a predetermined height. The drip tray 71 may be disposed below at least one of the fuel tank 2, the fuel supply part 3, and the bunkering part 5. The liquid fuel discharged from the fuel tank 2, the fuel supply part 3, and the bunkering part 5 may be transmitted to the drip tray 71 by gravity. The drip tray 71 may be applied without limitation as long as it is capable of collecting leaked liquid fuel.

[286] The leakage processing line L7 may drain the liquid fuel collected in the drip tray 71. The leakage processing line L7 may be connected to a separately provided drain tank (not shown) or the return part 22b illustrated in FIG. 5, but the present disclosure is not limited thereto.

[287] The drain sensor 72 may be provided on the leakage processing line L7. The drain sensor 72 may measure a level (liquid level) of the liquid fuel collected in the drip tray 71. The drain sensor 72 may measure an amount of the liquid fuel leaked from at least one of the fuel tank 2, the fuel supply part 3, and the bunkering part 5. In addition, whether leakage of the liquid fuel has occurred from at least one of the fuel tank 2, the fuel supply part 3, and the bunkering part 5 may be determined by the drain sensor 72. Whether leakage of the liquid fuel has occurred may be automatically determined, but the present disclosure is not limited thereto.

[288] The drain sensor 72 may be a level switch and may measure the level by various methods, such as an air-purge type, a capacitance type, an ultrasonic type, a radiation type, and an electrode type, but the present disclosure is not limited thereto.

[289] The drain valve 73 may be provided on the leakage processing line L7. The drain valve 73 may be provided on an upstream side of the drain sensor 72. The drain valve 73 may transmit the liquid fuel collected in the drip tray 71 to the leakage processing line L7 when bunkering is performed by the bunkering part 5. The drain sensor 72 may measure a level of the liquid fuel transmitted along the leakage processing line L7.

[290] The drip tray 71 may have a structure exposed (opened) to the outside. Accordingly, foreign substances may be introduced into the drip tray 71. For example, when it rains, water may flow into the drip tray 71. At this time, the foreign substances introduced into the drip tray 71 may be transmitted to the drain sensor 72 along the leakage processing line L7. The drain valve 73 may block the liquid fuel containing foreign substances. Accordingly, the drain valve 73 may prevent

the liquid fuel containing foreign substances from being measured by the drain sensor 72 as a leakage amount of the liquid fuel.

[291] Referring to FIG. 18, the bunkering part 5 may comprise a first bunkering part 51 disposed on a port side of the hull 11 and a second bunkering part 52 disposed on a starboard side of the hull 11. However, the present disclosure is not limited by the arrangement of the bunkering part 5.

[292]

[293] FIG. 19 is a second conceptual diagram for explaining the liquid fuel treatment system according to the eleventh embodiment of the present disclosure.

[294] Referring to FIG. 19, the liquid fuel treatment system 10 according to the eleventh embodiment of the present disclosure may comprise: a fuel supply part 3 configured to supply the liquid fuel in the fuel tank 2 to the fuel-consuming device 14; a bunkering part 5 configured to transmit the liquid fuel from the outside to the fuel tank 2; and a leakage processing part 70 configured to treat the liquid fuel leaked from at least one of the fuel tank 2, the fuel supply part 3, and the bunkering part 5.

[295] The fuel tank 2 may comprise a fuel storage tank 21 and a fuel supply tank 22. A drip tray 71 may be disposed below at least one of the fuel storage tank 21, the fuel supply tank 22, the fuel supply part 3, and the bunkering part 5. In detail, a drip tray 71 may be provided below each of the fuel storage tank 21, the fuel supply tank 22, the fuel supply part 3, and the bunkering part 5. The drip tray 71 may comprise: a first drip tray 71a provided below the fuel storage tank 21; a second drip tray 71b provided below the fuel supply tank 22; a third drip tray 71c provided below the fuel supply part 3; and a fourth drip tray 71d provided below the bunkering part 5. The bunkering part 5 may comprise a first bunkering part 51 and a second bunkering part 52, and fourth drip trays

71d1 and 71d2 may be provided below the first bunkering part 51 and the second bunkering part 52, respectively.

[296] A drain sensor 72 may be provided in each drip tray 71. In detail, the drain sensor 72 may be provided above a surface on which the liquid fuel is collected in the drip tray 71. The drain
5 sensor 72 may be disposed at a predetermined height from a bottom surface of the drip tray 71. However, the drain sensor 72 is preferably disposed close to the bottom surface of the drip tray 71 in order to rapidly detect leakage of the liquid fuel. The drain sensor 72 may comprise: a first drain sensor 72a provided in the first drip tray 71a; a second drain sensor 72b provided in the second drip tray 71b; a third drain sensor 72c provided in the third drip tray 71c; and a fourth drain sensor
10 72d provided in the fourth drip tray 71d.

[297] The drain sensors 72a, 72b, 72c, and 72d may generate a leakage warning or transmit a leakage signal when leakage of the liquid fuel is detected. Accordingly, an area in which leakage has occurred may be identified based on the leakage warning or the leakage signal.

[298]

15 [299] FIG. 20 is a third conceptual diagram for explaining the liquid fuel treatment system according to the eleventh embodiment of the present disclosure.

[300] Referring to FIG. 20, the liquid fuel treatment system 10 according to the eleventh embodiment of the present disclosure may comprise: a fuel supply part 3 configured to supply the liquid fuel in the fuel tank 2 to the fuel-consuming device 14; a bunkering part 5 configured to
20 transmit the liquid fuel from the outside to the fuel tank 2; and a leakage processing part 70 configured to treat the liquid fuel leaked from at least one of the fuel tank 2, the fuel supply part 3, and the bunkering part 5.

[301] A drip tray 71 may be provided below each of the fuel storage tank 21, the fuel supply tank 22, the fuel supply part 3, and the bunkering part 5.

[302] A leakage processing line L7 connected to the drip tray 71 and configured to drain the liquid fuel collected in the drip tray 71 may be provided. The leakage processing line L7 may be provided for each of the drip trays 71. The leakage processing line L7 may comprise: a first leakage processing line L7a connected to the fuel storage tank 21; a second leakage processing line L7b connected to the fuel supply tank 22; a third leakage processing line L7c connected to the fuel supply part 3; and a fourth leakage processing line L7d connected to the bunkering part 5.

[303] The first leakage processing line L7a, the second leakage processing line L7b, the third leakage processing line L7c, and the fourth leakage processing line L7d may be connected to each other and integrated into a single line. After being integrated, the leakage processing lines L7a, L7b, L7c, and L7d may be connected to a separately provided drain tank (not shown) or the return part 22b illustrated in FIG. 5. However, the present disclosure is not limited thereto.

[304] The drain sensor 72 may be provided at a portion where at least two of the first leakage processing line L7a, the second leakage processing line L7b, the third leakage processing line L7c, and the fourth leakage processing line L7d are integrated. A location at which the first leakage processing line L7a, the second leakage processing line L7b, the third leakage processing line L7c, and the fourth leakage processing line L7d are integrated may be determined according to locations of the fuel storage tank 21, the fuel supply tank 22, the fuel supply part 3, the bunkering part 5, and a drain tank (not shown) connected to the leakage processing line L7. The first leakage processing line L7a, the second leakage processing line L7b, the third leakage processing line L7c, and the fourth leakage processing line L7d may be integrated at a location where a total length of the leakage processing lines is minimized.

[305] In addition, the drain sensor 72 may be disposed upstream of a portion where at least two of the first leakage processing line L7a, the second leakage processing line L7b, the third leakage processing line L7c, and the fourth leakage processing line L7d are integrated, such that a single drain sensor 72 may detect whether leakage has occurred in the at least two leakage processing
5 lines L7a, L7b, L7c, and L7d.

[306] Whether leakage of the liquid fuel has occurred from at least one of the fuel storage tank 21, the fuel supply tank 22, the fuel supply part 3, and the bunkering part 5 may be determined by the drain sensor 72.

[307] In the liquid fuel treatment system 10 according to the present embodiment, a length of
10 the leakage processing lines may be minimized in consideration of locations of the fuel tank 2, the fuel supply part 3, and the bunkering part 5, and the number of drain sensors may be reduced, thereby reducing facility costs.

[308] In the liquid fuel treatment system 10 according to the present embodiment, the leakage processing part has been described as being provided for each of the fuel storage tank 21, the fuel
15 supply tank 22, the fuel supply part 3, and the bunkering part 5, but the present disclosure is not limited thereto.

[309]

[310] FIG. 21 is a first conceptual diagram for explaining the liquid fuel treatment system according to the twelfth embodiment of the present disclosure.

20 [311] Referring to FIG. 21, the liquid fuel treatment system 10 according to the twelfth embodiment of the present disclosure comprises a fuel tank 2 configured to store one of a first fuel and a second fuel having different boiling points. The fuel tank 2 may comprise: a first storage

part 2a configured to store the first fuel or the second fuel; a second storage part 2b isolated from the first storage part 2a by a bulkhead 2c and configured to store the second fuel having a relatively higher boiling point; and a communication part 2d configured to communicate the first storage part 2a with the second storage part 2b by opening at least a portion of the bulkhead 2c.

5 [312] The first fuel and the second fuel may be liquid fuels that remain in a liquid state at room temperature and atmospheric pressure. The first fuel and the second fuel may be materials used as fuel for a ship. The second fuel may have a relatively higher boiling point than the first fuel. For example, the first fuel may be methanol, ethanol, or the like, and the second fuel may be diesel oil, heavy fuel oil, or the like, but the present disclosure is not limited thereto.

10 [313] The first fuel may be stored in the first storage part 2a. The second fuel may be stored in the first storage part 2a or the second storage part 2b. When the first fuel is stored in the first storage part 2a, the second storage part 2b may be formed as an empty space. When the first fuel is stored in the first storage part 2a, the second storage part 2b may be used as a cofferdam. That is, when the first fuel is stored in the first storage part 2a, the second storage part 2b may prevent
15 the first fuel from leaking to the outside of the fuel tank 2.

[314] Conversely, when the second fuel is stored in the first storage part 2a, the second storage part 2b may be filled with the second fuel. In addition, when the second fuel is stored in the first storage part 2a, at least a portion of the cofferdam 7 surrounding the fuel tank 2 may be filled with the second fuel. For example, the cofferdam 7 may be provided in at least a portion of a space
20 between the lower surface 201 of the fuel tank 2 and the bottom plate 113, and the cofferdam 7 may be filled with the second fuel.

[315] The first storage part 2a may be disposed above the second storage part 2b. The bulkhead 2c may be provided at a lower portion of the fuel tank 2. The bulkhead 2c may be disposed in a

direction parallel to the lower surface of the fuel tank 2. The bulkhead 2c may vertically separate the first storage part 2a and the second storage part 2b. The liquid fuel may move from the first storage part 2a to the second storage part 2b by gravity.

[316] A communication part 2d may be provided in the bulkhead 2c. The communication part 2d may open or block at least a portion of the bulkhead 2c. The liquid fuel may move through the communication part 2d provided in the bulkhead 2c. The communication part 2d may be implemented without limitation as long as it is capable of blocking movement of the liquid fuel, such as a valve

[317] The liquid fuel treatment system 10 may further comprise a second-fuel transfer pump DP provided outside the fuel tank 2 and configured to transfer the second fuel. A valve (reference numeral not shown) through which the fuel tank 2 and the second-fuel transfer pump DP communicate with each other may be provided on the lower surface 201 of the fuel tank 2. The valve provided on the lower surface 201 of the fuel tank 2 may be provided on the fuel supply line L1 connected to the second-fuel transfer pump DP. The fuel supply line L1 may be a line through which the second fuel is transferred. The fuel supply line L1 may pass through an interior of the fuel tank 2 or through at least a portion of the cofferdam 7. At this time, a first-fuel transfer pump LP for transferring the first fuel may be provided inside the fuel tank 2, but the present disclosure is not limited thereto.

[318]

[319] FIG. 22 is a second conceptual diagram for explaining the liquid fuel treatment system according to the twelfth embodiment of the present disclosure.

[320] Referring to FIG. 22, the liquid fuel treatment system 10 according to the twelfth embodiment of the present disclosure comprises a fuel tank 2 configured to store one of a first fuel and a second fuel having different boiling points. The fuel tank 2 may comprise: a first storage part 2a configured to store the first fuel or the second fuel; a second storage part 2b isolated from the first storage part 2a by a bulkhead 2c and configured to store the second fuel having a relatively higher boiling point; and a communication part 2d configured to communicate the first storage part 2a with the second storage part 2b by opening at least a portion of the bulkhead 2c.

[321] The fuel tank 2 may further comprise: a partition part 2e provided in the first storage part 2a and surrounding the first-fuel transfer pump LP, wherein, when the second fuel is stored in the first storage part 2a, the partition part 2e may isolate the first-fuel transfer pump LP from the second fuel. In detail, the partition part 2e may cover at least a portion of the first-fuel transfer pump LP. For example, at least a portion of the first-fuel transfer pump LP may be covered by the partition part 2e, and a remaining portion thereof may be covered by the side surface 202 and the upper surface 203 of the fuel tank 2.

[322] In addition, the partition part 2e may be formed to extend upward from the bulkhead 2c. Accordingly, at least a portion of the first-fuel transfer pump LP may be covered by the bulkhead 2c.

[323] A valve (reference numeral not shown) through which the liquid fuel is communicable may be provided in the partition part 2e. The first fuel may move to the first-fuel transfer pump LP through the valve of the partition part 2e. The first-fuel transfer pump LP may be a submerged pump, a submersible pump, or the like, and may be operated while being immersed in the first fuel. When the second fuel is supplied to the first storage part 2a, the second fuel may be blocked by the valve.

[324] The first-fuel transfer pump LP may be connected to the fuel supply line L1 configured to supply the liquid fuel in the fuel tank 2 to the fuel-consuming device 14. The fuel supply line L1 may be a line through which the first fuel is transferred. The fuel supply line L1 may pass through a space surrounded by the partition part 2e in the fuel tank 2.

5 [325] The fuel tank 2 may be connected to a bunkering line L4 configured to supply the liquid fuel from the outside to the fuel tank 2. The bunkering line L4 may be connected to the first storage part 2a of the fuel tank 2. When the liquid fuel is the second fuel, the liquid fuel may pass through the communication part 2d and be supplied to the second storage part 2b. When the liquid fuel is the first fuel, the liquid fuel may be blocked at the communication part 2d. In addition, the liquid
10 fuel may be supplied through the second storage part 2b, but the present disclosure is not limited thereto.

[326]

[327] FIG. 23 is a third conceptual diagram for explaining the liquid fuel treatment system according to the twelfth embodiment of the present disclosure.

15 [328] Referring to FIG. 23, the liquid fuel treatment system 10 according to the twelfth embodiment of the present disclosure comprises a fuel tank 2 configured to store one of a first fuel and a second fuel having different boiling points. The fuel tank 2 may comprise: a first storage part 2a configured to store the first fuel or the second fuel; a second storage part 2b isolated from the first storage part 2a by a bulkhead 2c and configured to store the second fuel having a relatively
20 higher boiling point; and a communication part 2d configured to communicate the first storage part 2a with the second storage part 2b by opening at least a portion of the bulkhead 2c.

[329] The fuel tank 2 may comprise a housing 2f. The housing 2f may comprise a housing body 2f1 and a housing cover 2f2. The fuel tank 2 may further comprise: a housing body 2f1 having one end extending from one surface of the fuel tank 2 and the other end having an opening; and a housing cover 2f2 configured to close the opening of the housing body 2f1, wherein, when the second fuel is stored in the first storage part 2a, the housing cover 2f2 may isolate the first-fuel transfer pump LP disposed inside the housing body 2f1 from the second fuel.

[330] The housing body 2f1 may be disposed above the bulkhead 2c. The housing body 2f1 may comprise a protrusion (reference numeral not shown) extending in a circumferential direction of the housing body 2f1 at the other end where the opening is formed.

[331] The housing cover 2f2 may be provided to face the housing body 2f1. The housing cover 2f2 may be coupled to the opening of the housing body 2f1 to cover the opening. The housing cover 2f2 may be coupled to the protrusion formed at the other end of the housing body 2f1. While the housing cover 2f2 is in contact with the protrusion of the housing body 2f1, the housing cover 2f2 and the protrusion may be fixed by a coupling part 2f3 movably coupled to the protrusion and the housing cover 2f2. The housing body 2f1 and the housing cover 2f2 may constitute a foot valve. However, the present disclosure is not limited by a method of closing the opening of the housing body 2f1.

[332] When the first fuel is supplied to the first storage part 2a, closing of the opening of the housing body 2f1 may be released. Accordingly, the first fuel may move into the housing body 2f1 and be transmitted to the first-fuel transfer pump LP. The first-fuel transfer pump LP may be a submerged pump, a submersible pump, or the like, and may be operated while being immersed in the first fuel. When the second fuel is supplied to the first storage part 2a, the second fuel may be blocked by the housing cover 2f2.

[333]

[334] FIG. 24 is a fourth conceptual diagram for explaining the liquid fuel treatment system according to the twelfth embodiment of the present disclosure.

[335] Referring to FIG. 24, the liquid fuel treatment system 10 according to the twelfth embodiment of the present disclosure comprises a fuel tank 2 configured to store one of a first fuel and a second fuel having different boiling points. The fuel tank 2 may comprise: a first storage part 2a configured to store the first fuel or the second fuel; a second storage part 2b isolated from the first storage part 2a by a bulkhead 2c and configured to store the second fuel having a relatively higher boiling point; and a communication part 2d configured to communicate the first storage part 2a with the second storage part 2b by opening at least a portion of the bulkhead 2c.

[336] The fuel tank 2 may further comprise: a pump casing PC provided in the second storage part 2b and surrounding the first-fuel transfer pump LP, wherein, when the second fuel is stored in the first storage part 2a, the pump casing PC may isolate the first-fuel transfer pump LP from the second fuel.

[337] The pump casing PC may accommodate the first-fuel transfer pump LP and may isolate the first-fuel transfer pump LP from the second storage part 2b. The pump casing PC may isolate the first-fuel transfer pump LP accommodated therein from the second fuel even when the second fuel is supplied to the second storage part 2b.

[338] In addition, a valve (reference numeral not shown) through which the liquid fuel is communicable may be provided in the bulkhead 2c. The valve may be connected to the first-fuel transfer pump LP by a separate line (reference numeral not shown). The first fuel may pass through the valve of the bulkhead 2c and move to the first-fuel transfer pump LP. When the second fuel is

supplied to the first storage part 2a, the second fuel may be blocked by the valve of the bulkhead 2c. Of course, the valve provided in the bulkhead 2c may be provided on a line connecting the first-fuel transfer pump LP and the fuel tank 2.

[339] In addition, the pump casing PC may be provided outside the fuel tank 2. For example, the pump casing PC may be provided in a space between the lower surface 201 of the fuel tank 2 and the bottom plate 113. For example, when the second fuel fills the space between the lower surface 201 of the fuel tank 2 and the bottom plate 113, the pump casing PC may isolate the first-fuel transfer pump LP from the second fuel.

[340] A plurality of valves may be provided in the bulkhead 2c. In detail, the bulkhead 2c may be provided with a valve connected to the first-fuel transfer pump LP and a valve configured to communicate the first storage part 2a with the second storage part 2b.

[341]

[342] FIG. 25 is a fifth conceptual diagram for explaining the liquid fuel treatment system according to the twelfth embodiment of the present disclosure.

[343] Referring to FIG. 25, the liquid fuel treatment system 10 according to the twelfth embodiment of the present disclosure comprises a fuel tank 2 configured to store one of a first fuel and a second fuel having different boiling points. The fuel tank 2 may comprise: a first storage part 2a configured to store the first fuel or the second fuel; a second storage part 2b isolated from the first storage part 2a by a bulkhead 2c and configured to store the second fuel having a relatively higher boiling point; and a communication part 2d configured to communicate the first storage part 2a with the second storage part 2b by opening at least a portion of the bulkhead 2c.

[344] The fuel tank 2 may further comprise a heating part 2g provided inside the fuel tank 2 and configured to heat the second fuel. The second fuel has a relatively high viscosity at low temperatures and therefore moves at a relatively low speed. Accordingly, since unloading or transfer operations of the second fuel require a long time, the heating part 2g may maintain the second fuel at or above a predetermined temperature in order to reduce unloading time and the like. The heating part 2g may be operated when the second fuel is stored in the first storage part 2a or the second storage part 2b. The heating part 2g may be a heating coil and may be operated while being immersed in the liquid fuel, but the present disclosure is not limited thereto.

[345] The heating part 2g may be provided in the first storage part 2a or the second storage part 2b. In detail, the heating part 2g may be provided in the second storage part 2b. When the second fuel is stored in the fuel tank 2, the communication part 2d of the bulkhead 2c may be opened such that the liquid fuel is allowed to move between the first storage part 2a and the second storage part 2b. In this case, when the heating part 2g heats the second fuel in the second storage part 2b, the second fuel in the second storage part 2b may move to the first storage part 2a, whereby the second fuel in the first storage part 2a and the second storage part 2b may be heated.

[346] In addition, when the first fuel is stored in the first storage part 2a, the communication part 2d of the bulkhead 2c may block movement of the liquid fuel between the first storage part 2a and the second storage part 2b. In this case, the second storage part 2b may be formed as an empty space.

[347] The heating part 2g may heat the fuel tank 2. In detail, the heating part 2g may heat the second storage part 2b. The heating part 2g may heat the first fuel when the first fuel is stored in the first storage part 2a. Heat from the second storage part 2b may be transferred to the first storage part 2a through the bulkhead 2c. When the heating part 2g heats the liquid fuel to a temperature

required by the fuel-consuming device 14, a heat exchanger provided between the fuel tank 2 and the fuel-consuming device 14 may be omitted.

[348] Although not shown in the drawings, the heating part 2g may be provided in at least one of the cofferdams 7 surrounding the fuel tank 2. For example, the heating part 2g may be provided in the cofferdam 7 covering the side surface 202 of the fuel tank 2. The heating part 2g may heat the second fuel when the second fuel is stored in the cofferdam 7.

[349] The liquid fuel treatment system 10 may further comprise a fuel supply part 3 configured to supply the liquid fuel received from the fuel tank 2 to the fuel-consuming device 14, wherein the fuel supply part 3 may comprise a temperature control part TC configured to control a temperature of the liquid fuel in response to a temperature required by the fuel-consuming device 14.

[350] The temperature control part TC may be provided between the fuel tank 2 and the fuel-consuming device 14. The temperature control part TC may heat or cool the liquid fuel. For example, the temperature control part TC may heat the liquid fuel. The temperature control part TC may control the temperature of the liquid fuel in response to the temperature required by the fuel-consuming device 14. The temperature required by the fuel-consuming device 14 may be higher than the temperature of the liquid fuel in the fuel tank 2.

[351] In addition, the temperature control part TC may be operated in consideration of the pressure and temperature inside the fuel tank 2. For example, when the pressure inside the fuel tank 2 is greater than or equal to a predetermined pressure, the heating part 2g may be operated to a relatively lesser extent in order to prevent the pressure inside the fuel tank 2 from increasing further, and the temperature control part TC may be operated to a relatively greater extent.

[352]

[353] FIG. 26 is a conceptual diagram for explaining the liquid fuel treatment system according to the thirteenth embodiment of the present disclosure.

[354] Referring to FIG. 26, the liquid fuel treatment system 10 according to the thirteenth embodiment of the present disclosure may comprise: a fuel tank 2 configured to store one of a first fuel and a second fuel having different boiling points; and a fuel supply part 3 configured to supply the liquid fuel received from the fuel tank 2 to the fuel-consuming device 14, wherein the fuel tank 2 may comprise: a first storage part 2a configured to store the first fuel or the second fuel; and a heating part 2g provided inside the fuel tank 2 and configured to heat the liquid fuel.

[355] The heating part 2g may control the temperature of the liquid fuel. A load of the heating part 2g may be adjusted according to a temperature required by the fuel-consuming device 14. The temperature required by the fuel-consuming device 14 may be a preset value. In addition, the load of the heating part 2g may be adjusted according to an internal condition of the fuel tank 2.

[356] The load of the heating part 2g may be controlled by a controller (not shown). The controller may control operation of the heating part 2g according to the temperature required by the fuel-consuming device 14 or according to an internal pressure or temperature of the fuel tank 2. The internal pressure or temperature of the fuel tank 2 may be measured by a temperature sensor or a pressure sensor provided in the fuel tank 2.

[357] Referring to FIG. 21, the fuel tank 2 may further comprise a second storage part 2b isolated from the first storage part 2a by a bulkhead 2c and configured to store a second fuel having a relatively higher boiling point.

[358] Referring to FIG. 21, the liquid fuel treatment system 10 may further comprise a second-fuel transfer pump DP provided outside the fuel tank 2 and configured to transfer the second fuel.

[359] The fuel tank 2 may further comprise a communication part 2d configured to communicate the first storage part 2a with the second storage part 2b by opening at least a portion of the bulkhead 2c.

[360] When the first fuel is stored in the first storage part 2a, the second storage part 2b may be formed as an empty space.

[361] Referring to FIG. 22, the fuel tank 2 may further comprise a partition part 2e provided in the first storage part 2a and surrounding the first-fuel transfer pump LP, wherein, when the second fuel is stored in the first storage part 2a, the partition part 2e may isolate the first-fuel transfer pump LP from the second fuel.

[362] Referring to FIG. 23, the fuel tank 2 may further comprise: a housing body 2f1 having one end extending from one surface of the fuel tank 2 and the other end having an opening; and a housing cover 2f2 configured to close the opening of the housing body 2f1, wherein, when the second fuel is stored in the first storage part 2a, the housing cover 2f2 may isolate the first-fuel transfer pump LP disposed inside the housing body 2f1 from the second fuel.

[363] Referring to FIG. 24, the fuel tank 2 may further comprise a pump casing PC provided in the second storage part 2b and surrounding the first-fuel transfer pump LP, wherein, when the second fuel is stored in the first storage part 2a, the pump casing PC may isolate the first-fuel transfer pump LP from the second fuel.

[364] Referring to FIG. 26, the heating part 2g may be provided in the second storage part 2b.

[365] The fuel supply part 3 may comprise a temperature control part TC configured to control a temperature of the liquid fuel in response to a temperature required by the fuel-consuming device 14.

[366]

[367] FIG. 27 is a conceptual diagram for explaining the liquid fuel treatment system according to the fourteenth embodiment of the present disclosure.

[368] Referring to FIG. 27, the liquid fuel treatment system 10 according to the fourteenth
5 embodiment of the present disclosure may comprise: a fuel tank 2 configured to store one of a first fuel and a second fuel having different boiling points; and a fuel supply part 3 configured to supply the liquid fuel received from the fuel tank 2 to the fuel-consuming device 14, wherein the fuel tank 2 may comprise a heating part 2g provided inside the fuel tank 2, wherein the fuel supply part 3 may comprise a temperature control part TC configured to control a temperature of the liquid fuel
10 in response to a temperature required by the fuel-consuming device 14, and wherein the liquid fuel treatment system 10 may further comprise a controller (not shown) configured to control operation of the heating part 2g and the temperature control part TC according to an internal condition of the fuel tank 2.

[369] The heating part 2g may be provided inside the fuel tank 2. The temperature control part
15 TC may be provided between the fuel tank 2 and the fuel-consuming device 14. In detail, the temperature control part TC may be provided downstream of the fuel tank 2 or the heating part 2g. The temperature control part TC may be a shell-and-tube type heat exchanger, a shell-and-plate type heat exchanger, or a water-bath type heat exchanger, but the present disclosure is not limited thereto.

[370] The heating part 2g and the temperature control part TC may be operated in consideration
20 of the pressure and temperature inside the fuel tank 2. For example, when the pressure inside the fuel tank 2 is greater than or equal to a predetermined pressure, operation of the heating part 2g

may be relatively reduced and operation of the temperature control part TC may be relatively increased in order to prevent the pressure inside the fuel tank 2 from increasing further.

[371] In this case, the controller may control operation of the heating part 2g and the temperature control part TC according to an internal pressure or temperature of the fuel tank 2. The fuel tank 2
5 may be provided with sensors such as a temperature sensor or a pressure sensor. The controller may control operation of the heating part 2g or the temperature control part TC based on the internal pressure or temperature of the fuel tank 2 measured by the sensors.

[372] The controller may relatively increase an operating load of the heating part 2g when an internal pressure of the fuel tank 2 is less than a reference pressure, and may relatively increase an
10 operating load of the temperature control part TC when the internal pressure of the fuel tank 2 is greater than or equal to the reference pressure. Although not limited thereto, the reference pressure may be a midpoint between an upper limit and a lower limit of a design pressure of the fuel tank 2. The controller may operate the heating part 2g such that the internal pressure of the fuel tank 2 is maintained at the reference pressure. At this time, the controller may adjust the operating load
15 of the temperature control part TC such that the liquid fuel delivered from the fuel tank 2 to the fuel-consuming device 14 reaches a temperature required by the fuel-consuming device 14. For example, when an amount of the liquid fuel stored in the fuel tank 2 is small, the controller may increase the load of the heating part 2g in order to maintain the internal pressure of the fuel tank 2 at the reference pressure, and thus the liquid fuel inside the fuel tank 2 may reach a relatively high
20 temperature. In this case, the controller may reduce the operating load of the temperature control part TC such that the liquid fuel reaches the temperature required by the fuel-consuming device 14.

[373] The controller may stop operation of the temperature control part TC when the internal pressure of the fuel tank 2 is less than or equal to a first preset pressure. Here, the first preset pressure may be a lower limit of the design pressure of the fuel tank 2. In this case, the controller may increase the operating load of the heating part 2g.

5 [374] The controller may stop operation of the heating part 2g when the internal pressure of the fuel tank 2 is greater than or equal to a second preset pressure. Here, the second preset pressure may be an upper limit of the design pressure of the fuel tank 2. In this case, the controller may reduce the operating load of the heating part 2g.

[375] That is, the controller may increase the operating load of the temperature control part TC
10 such that the liquid fuel delivered from the fuel tank 2 to the fuel-consuming device 14 reaches a temperature required by the fuel-consuming device 14 while operating the heating part 2g such that the internal pressure of the fuel tank 2 is maintained between the upper limit and the lower limit of the design pressure.

[376] The controller may relatively increase the operating load of the heating part 2g when a
15 temperature of the fuel tank 2 is less than a reference temperature, and may relatively increase the operating load of the temperature control part TC when the temperature of the fuel tank 2 is greater than or equal to the reference temperature. Although not limited thereto, the reference temperature may be a midpoint between a temperature corresponding to the upper limit of the design pressure of the fuel tank 2 and a temperature corresponding to the lower limit of the design pressure. In this
20 case, the controller may increase the operating load of the heating part 2g.

[377] The controller may operate the heating part 2g such that the temperature of the fuel tank 2 is maintained at the reference temperature. At this time, the controller may adjust the operating load of the temperature control part TC such that the liquid fuel delivered from the fuel tank 2 to

the fuel-consuming device 14 reaches the temperature required by the fuel-consuming device 14. For example, when an amount of the liquid fuel stored in the fuel tank 2 is large, the controller may reduce the load of the heating part 2g in order to maintain the internal pressure of the fuel tank 2 at the reference pressure, and thus the liquid fuel inside the fuel tank 2 may have a relatively low temperature. In this case, the controller may increase the operating load of the temperature control part TC such that the liquid fuel reaches the temperature required by the fuel-consuming device 14.

[378] In addition, when the temperature of the liquid fuel in the fuel tank 2 is greater than or equal to the reference temperature, the controller may block the liquid fuel from being delivered from the fuel tank 2 to the temperature control part TC. For example, the controller may control opening and closing of a valve (reference numeral not shown) provided in the fuel tank 2 or the fuel supply line L1. Of course, the controller may control a portion of the liquid fuel to be delivered from the fuel tank 2 to the temperature control part TC and a remaining portion of the liquid fuel to bypass the temperature control part TC. That is, the controller may control a flow rate of the liquid fuel delivered to the temperature control part TC.

[379] The fuel supply part 3 may comprise a bypass line BL branched from the fuel supply line L1 upstream of the temperature control part TC. The liquid fuel may bypass the temperature control part TC along the bypass line BL.

[380] In addition, when the internal pressure of the fuel tank 2 is less than or equal to the first preset pressure, the controller may control the liquid fuel supplied to the fuel-consuming device 14 to bypass the temperature control part TC. In this case, the controller may increase the operating load of the heating part 2g.

[381] In addition, the controller may control the heating part 2g to heat the liquid fuel to greater than or equal to a minimum reference temperature. Here, the minimum reference temperature may mean a minimum temperature at which the liquid fuel introduced into the temperature control part TC is capable of reaching the temperature required by the fuel-consuming device 14 after passing
5 through the temperature control part TC. For example, the minimum reference temperature may mean a temperature at which the temperature of the liquid fuel downstream of the temperature control part TC reaches the temperature required by the fuel-consuming device 14 when the temperature control part TC is operated at a maximum load.

[382]

10 [383] FIG. 28 is a conceptual diagram of a ship for explaining a liquid fuel treatment system according to a fifteenth embodiment of the present disclosure.

[384] Referring to FIG. 28, a liquid fuel-powered ship 1a may comprise a hull 11, an engine room 13, a fuel-consuming device 14, a cabin 15, an engine casing 16, a lashing bridge 17, a fuel tank 2, and the like. In addition, the liquid fuel-powered ship 1a may comprise a fuel supply part
15 3, a bunkering part 5, a pump room 6, and a cofferdam 7, and may further comprise various other components in addition thereto.

[385] The hull 11 comprises a main deck 111, side shell plates 112, a bottom plate 113, a bow 114, and a stern 115, and forms an exterior appearance of the liquid fuel-powered ship 1a. In addition, the liquid fuel-powered ship 1a is a container ship, and the hull 11 comprises a plurality
20 of holds 116 in which containers C are loaded. Of course, the liquid fuel-powered ship 1a may be a crude oil carrier. At least one hold 116 may be provided in the hull 11. For example, the hold 116 may comprise a first hold 1161 provided in a central portion of the hull 11 and a second hold

1162 provided adjacent to the stern 115, but the present disclosure is not limited by positions of the holds. In addition, the first hold 1161 may comprise a first area 1161a in which the fuel tank 2 is provided and a second area 1161b separated from the first area 1161a.

[386] The fuel tank 2 may be surrounded by the cofferdam 7. A pump room 6 and the cofferdam 7 may be arranged above the fuel tank 2, and a cabin 15 may be provided above the pump room 6, but the present disclosure is not limited thereto.

[387] Although the drawings illustrate that the fuel tank 2 is arranged in the hold 116, the hold 116 itself may constitute the fuel tank 2. That is, the hold 116 may directly store the liquid fuel. Accordingly, the fuel tank 2 may be loaded in the hold 116 such that the fuel tank 2 stores the liquid fuel, or the hold 116 may directly store the liquid fuel. In this case, the first area 1161a may store the liquid fuel. However, the present disclosure is not limited by whether the fuel tank 2 is installed in the hold 116.

[388] The fuel-consuming device 14 may be arranged in the engine room 13 and may comprise a first fuel-consuming device 141 and a second fuel-consuming device 142.

[389] The cabin 15 may be provided in a central portion of the main deck 111.

[390] The engine casing 16 may be provided on the main deck 111 above the engine room 13.

[391] The lashing bridge 17 may be provided to load containers C above the main deck 111 of the hull 11.

[392] The fuel tank 2 may comprise a fuel storage tank 21 configured to store and retain liquid fuel, and a fuel supply tank 22 configured to deliver the liquid fuel supplied from the fuel storage tank 21 to the fuel supply part 3.

[393] The fuel storage tank 21 may be provided in the hull 11. The fuel storage tank 21 may be provided below the cabin 15 in a central portion of the hull 11 and may be surrounded by a cofferdam 7. In addition, the fuel storage tank 21 may be provided inside the hull 11 adjacent to the engine room 13 or on the main deck 111, but the present disclosure is not limited thereto.

5 [394] The fuel supply tank 22 may be provided in the engine casing 16. In addition, the fuel supply tank 22 may be provided inside the hull 11 adjacent to the engine room 13, but the present disclosure is not limited thereto.

[395]

[396] FIG. 29 is an enlarged view of portion "A" of the ship shown in FIG. 28 for explaining a
10 hold of the ship.

[397] Referring to FIG. 29, the liquid fuel treatment system 10 according to the fifteenth embodiment of the present disclosure may comprise a hold wall 1161c configured to divide an internal space of at least one of the holds 116 into a plurality of areas along a front-rear direction. The hold wall 1161c may divide the internal space of the hold 116 into a first area 1161a arranged
15 at a front side and a second area 1161b arranged at a rear side. Accordingly, the hold 116 may comprise a first area 1161a and a second area 1161b separated from the first area 1161a by the hold wall 1161c.

[398] The hold 116 may extend to a height adjacent to the main deck 111. The hold 116 may face the main deck 111 with the pump room 6 therebetween. For example, the hold 116 may
20 contact a lower surface of the pump room 6, and the main deck 111 may contact an upper surface of the pump room 6. In addition, the hold 116 may extend to a lower surface of the main deck 111. A height of the first area 1161a of the hold 116 may be greater than a length thereof in the front-

rear direction. When the fuel tank 2 is installed in the hold 116, a height of the fuel tank 2 may be greater than or equal to 50%, 60%, 70%, 80%, or 90% of the height of the hold 116.

[399] The second area 1161b may comprise outer tanks VT arranged on left and right sides of the hull 11. The outer tanks VT may be arranged on the left and right sides of the hull 11. The
5 outer tanks VT may store the first fuel or the second fuel. The second area 1161b may further comprise a loading section LD provided between a pair of outer tanks VT and configured to load containers C. The outer tanks VT may be provided on left and right sides of the loading section LD.

[400]

10 [401] FIG. 30 is a cross-sectional view taken along line "B" for explaining the first area of the hold shown in FIG. 29.

[402] Referring to FIG. 30, the liquid fuel treatment system 10 according to the fifteenth embodiment of the present disclosure may comprise: a plurality of holds 116 provided in the hull 11 along a longitudinal direction; a bulkhead 2c configured to partition an internal space of at least
15 one of the holds 116 into a plurality of partition spaces 2h along a left-right direction; and a partition part 2j configured to partition the partition spaces 2h into a plurality of fuel spaces 2i and having an openable and closable structure, wherein the partition part 2j may be opened when the first fuel among a first fuel and a second fuel having different boiling points is stored in the partition spaces 2h, and may be sealed when the second fuel is stored in the partition spaces 2h.

20 [403] For example, when the first fuel is stored in the partition space 2h, the plurality of fuel spaces 2i may communicate with one another. In this case, the partition space 2h may form an

integrated storage part. Conversely, when the second fuel is stored in the partition space 2h, the plurality of fuel spaces 2i may be separated from one another.

[404] The partition part 2j may be opened when the first fuel having a relatively lower boiling point is stored in the partition space 2h and may be sealed when the second fuel having a relatively higher boiling point is stored in the partition space 2h such that a volume of each fuel space 2i in which the second fuel is stored is within a preset value. When the second fuel is stored in the partition space 2h, at least some of the fuel spaces 2i may be maintained as empty spaces. For example, when the second fuel is stored in the partition space 2h, the fuel spaces 2i provided at opposite left and right ends of the hull 11 may be maintained as empty spaces.

[405] The hold 116 may comprise: a first storage part 2a configured to store one of a first fuel and a second fuel having different boiling points; and a second storage part 2b separated from the first storage part 2a by the partition part 2j and configured to store the first fuel having a relatively lower boiling point. When the second fuel is stored in the partition space 2h, the second storage parts 2b provided at opposite left and right ends of the hull 11 may be maintained as empty spaces.

In this case, the first storage part 2a provided in a central portion of the hull 11 may be filled with the second fuel.

[406] The bulkhead 2c may partition an internal space of the hold 116. In detail, the bulkhead 2c may partition an internal space of the fuel tank 2 in a left-right direction of the fuel tank 2. The bulkhead 2c may be arranged in a direction perpendicular to a lower surface of the fuel tank 2. The bulkhead 2c may be arranged at a center of the hold 116. However, the present disclosure is not limited by an arrangement direction of the bulkhead 2c.

[407] The partition part 2j may partition the partition space 2h into a plurality of fuel spaces 2i. For example, the partition space 2h may be partitioned such that each fuel space 2i has a volume

of 500 m³ to 3,000 m³, and the second storage part 2b may have a volume smaller than that of the first storage part 2a. Each fuel space 2i may store a different fuel. For example, at least some of the fuel spaces 2i may store the first fuel, and remaining ones of the fuel spaces 2i may store the second fuel. A cofferdam 7 may be provided between adjacent fuel spaces 2i, but the present disclosure is not limited thereto.

[408] A volume of fuel stored in a single fuel space 2i may be limited so as to reduce an amount of fuel leaked when leakage occurs in the fuel space 2i. In this case, a volume of each fuel space 2i may be determined according to the fuel stored therein. For example, when the second fuel is stored in the fuel space 2i, the volume of a single fuel space 2i may be limited to be less than or equal to 2,500 m³.

[409] The volume of the fuel space 2i may be determined by partitioning of the partition part 2j. For example, when the relatively higher-boiling-point second fuel is stored in the fuel space 2i, the partition part 2j may divide the partition space 2h into a plurality of fuel spaces 2i such that a volume of each fuel space 2i is less than or equal to 2,500 m³. In addition, when the relatively lower-boiling-point first fuel is stored in the fuel space 2i, the volume of the fuel space 2i may be greater than 2,500 m³. Since the partition part 2j may partition the partition space 2h, the hold 116 may store either the first fuel or the second fuel.

[410] The fuel tank 2 may further comprise a communication part 2d configured to communicate the fuel spaces 2i with one another by opening at least a portion of the partition part 2j. The communication part 2d may be provided in the partition part 2j. The communication part 2d may be arranged at a lower portion of the hold 116. The communication part 2d may open or block at

least a portion of the partition part 2j. The liquid fuel may move through the communication part 2d provided in the partition part 2j. The communication part 2d may be implemented without limitation so long as it is capable of blocking movement of the liquid fuel, such as a valve. An area in which the liquid fuel is stored may be defined by the communication part 2d.

5 [411] The first fuel may have a lower calorific value than the second fuel. In order for the liquid fuel-powered ship 1a to travel the same sailing distance, a larger amount of the first fuel may need to be loaded than the second fuel. Accordingly, the first fuel may be loaded in an amount greater than or equal to twice that of the second fuel.

[412] The liquid fuel stored in the fuel tank 2 may be changed to another liquid fuel. In this case,
10 since the first fuel has a lower calorific value than the second fuel, the second fuel may be loaded in a smaller amount than the first fuel. When the first fuel stored in the fuel tank 2 is changed to the second fuel, the second fuel may be stored only in the first storage part 2a. In this case, the communication part 2d may be closed, and the fuel spaces 2i may be separated from one another. In addition, the second storage part 2b, in which the first fuel had been stored, may be maintained
15 as an empty space.

[413] Conversely, the second fuel stored in the fuel tank 2 may be changed to the first fuel. In this case, since the first fuel has a lower calorific value than the second fuel, the first fuel may be loaded in a larger amount than the second fuel. When the second fuel stored in the fuel tank 2 is changed to the first fuel, the fuel spaces 2i of the first storage part 2a that are separated by the
20 partition part 2j may be changed to store the first fuel, and the second storage part 2b, which had been maintained as an empty space, may also be changed to store the first fuel. At this time, the fuel spaces 2i may communicate with one another. For example, the fuel spaces 2i changed to

store the first fuel and the second storage part 2b may communicate with one another as the communication part 2d is opened.

[414] That is, when the second fuel stored in the fuel tank 2 is changed to the first fuel, at least some of the fuel spaces 2i formed by being separated by the partition part 2j in the first storage part 2a may be changed to store the first fuel, and the second storage part 2b, which had been
5 maintained as an empty space, may be changed to store the first fuel.

[415] Only some of the fuel spaces 2i may be changed from storing the second fuel to storing the first fuel. For example, the fuel spaces 2i arranged on a left side of the hull 11 may continue to store the second fuel, while the fuel spaces 2i arranged on a right side of the hull 11 may be changed
10 from storing the second fuel to storing the first fuel.

[416] Of course, while the fuel spaces 2i are empty, the first fuel or the second fuel may be injected into the fuel spaces 2i. In this case, the communication part 2d may be opened or closed according to the fuel injected into the fuel spaces 2i.

[417]

15 [418] FIG. 31 is a cross-sectional view taken along line "C" for explaining the second area of the hold shown in FIG. 29.

[419] Referring to FIG. 31, the liquid fuel treatment system 10 may comprise outer tanks VT provided in the second area 1161b of the internal space of the hold 116 and arranged on left and right sides of the hull 11. The outer tanks VT may be provided in the second area 1161b of the
20 first hold 1161. The outer tanks VT may be arranged on the left and right sides of the hull 11.

[420] The outer tanks VT may store the first fuel or the second fuel. The outer tanks VT may be maintained in an empty state depending on operating conditions. The plurality of outer tanks VT

may respectively store different fuels. The outer tanks VT may be supplementarily filled when a storage capacity of the first area 1161a is insufficient, but the present disclosure is not limited thereto. In addition, when the liquid fuel stored in the first area 1161a is depleted, the first fuel or the second fuel stored in the outer tanks VT may be supplied to the fuel-consuming device 14, but
5 the present disclosure is not limited thereto.

[421] Lower portions of the outer tanks VT may have a stepped shape. Since the lower portions of the outer tanks VT are configured to have a stepped shape, the lower portions of the outer tanks VT and stepped portions (reference numeral not shown) of the hold 116 may be arranged without misalignment, thereby improving structural stability.

10 [422] The liquid fuel treatment system 10 may further comprise a loading section LD provided between a pair of outer tanks VT in the second area 1161b of the internal space of the hold 116 and configured to load containers C. The outer tanks VT may be provided on left and right sides of the loading section LD. Liquid fuel may not be stored in a central portion of the second area 1161b.

15 [423] As described above, in the liquid fuel treatment system 10 according to the fifteenth embodiment of the present disclosure, the hold 116 may be divided in a left-right direction of the hull 11, and opening and closing of the partition part 2j, which divides an internal space of the hold 116 according to the fuel stored in the hold 116, may be changed. Accordingly, the liquid fuel may be efficiently stored in the hold 116.

20 [424] A loading section LD in which containers are loaded may be provided in the second area 1161b. Accordingly, compared with the ship 1a in which the fuel tank 2 is provided in the second area 1161b, the loading section LD may additionally accommodate greater than or equal to 200 TEU of containers.

[425] Meanwhile, the liquid fuel treatment system 10 may further comprise a bunkering part 5 arranged above the outer tanks VT and configured to deliver liquid fuel from outside to the fuel tank 2 or the outer tanks VT. However, the present disclosure is not limited thereto.

[426] FIG. 32 is an enlarged view of portion "D" of the ship shown in FIG. 28 for explaining the
5 hold of the ship.

[427] A gap portion G may be provided in the hold 116. The gap portion G may not only partition the internal space of the hold 116 in a front-rear direction but may also separate the hold 116 in the front-rear direction within the hull 11. The gap portion G separating the hold 116 in the front-rear direction may comprise a sealed bulkhead.

10 [428] The outer tank VT may be provided in the gap portion G. This may encompass a configuration in which the gap portion G itself constitutes the outer tank VT. When the fuel tank 2 provided in the first area 1161a and the outer tank VT provided in the second area 1161b are sufficiently filled with liquid fuel required for operation of the ship 1a, the gap portion G may not be filled with liquid fuel. In addition, the gap portion G itself, which partitions the holds 116 from
15 one another, may be omitted.

[429]

[430] FIG. 33 is a first conceptual diagram of a ship for explaining a liquid fuel treatment system according to a sixteenth embodiment of the present disclosure.

[431] Referring to FIG. 33, the liquid fuel treatment system 10 according to the sixteenth
20 embodiment of the present disclosure may comprise: a fuel tank 2 configured to store a liquid fuel that is one of a first fuel and a second fuel having different boiling points; a cleaning part 100 configured to supply a cleaning medium to the fuel tank 2; and a collection tank ST configured to

collect waste water generated in the hull 11, wherein the collection tank ST may store the liquid fuel discharged from the fuel tank 2 together with the cleaning medium. The collection tank ST may be a slop tank, but the present disclosure is not limited thereto.

[432] The cleaning part 100 may supply the cleaning medium to the fuel tank 2 before the first
5 fuel or the second fuel in the fuel tank 2 is replaced with a liquid fuel having a different boiling point. In detail, the cleaning part 100 may supply the cleaning medium from an upper portion of the fuel tank 2. The cleaning part 100 may prevent the first fuel and the second fuel from being mixed in the fuel tank 2. For example, the first fuel may be methanol or ethanol, and the second fuel may be diesel oil or heavy fuel oil, but the present disclosure is not limited thereto.

10 [433] In addition, the cleaning part 100 may supply the cleaning medium to the fuel tank 2 before supplying the liquid fuel to the fuel tank 2, but the present disclosure is not limited thereto.

[434] The liquid fuel discharged from the fuel tank 2 together with the cleaning medium may be delivered to the collection tank ST by gravity. The first fuel or the second fuel may be discharged to the collection tank ST together with the cleaning medium by gravity. The collection
15 tank ST may be arranged below the fuel tank 2. The liquid fuel discharged from the fuel tank 2 together with the cleaning medium may be delivered to the collection tank ST along a collection line L9.

[435] The cleaning part 100 may supply the cleaning medium to the fuel tank 2 by using a feed water pump SP provided at a rear portion of the hull. Here, the cleaning medium may be water and
20 is not limited to fresh water or seawater. The feed water pump SP may be arranged on a deck inside the engine room 13 and may supply the cleaning medium to the fuel tank 2 by pumping seawater from a sea chest (not shown) through a seawater supply line or by pumping fresh water from a fresh water tank (FWT).

[436] Although the cleaning part 100 is illustrated as being fixed to the fuel tank 2, the cleaning part 100 may be movable as well as fixed. In this case, the cleaning part 100 may be of a portable type in which an operator carries the cleaning part 100 while supplying the cleaning medium. However, the present disclosure is not limited thereto.

5 [437] The cleaning part 100 may supply the cleaning medium to the fuel tank 2 along a cleaning line L8. The cleaning line L8 may be connected to a bunkering line L4 configured to deliver liquid fuel from outside to the fuel tank 2. Accordingly, the cleaning part 100 may supply the cleaning medium to the fuel tank 2 along the bunkering line L4 configured to deliver liquid fuel from outside to the fuel tank 2. In detail, the cleaning part 100 may supply the cleaning medium to the fuel tank
10 2 along a first-fuel bunkering line L4a configured to deliver the first fuel from outside to the fuel tank 2.

[438] In addition, the cleaning line L8 may be connected to a fuel supply line L1 configured to deliver liquid fuel from the fuel tank 2 to the fuel-consuming device 14. The cleaning part 100 may supply the cleaning medium to the fuel tank 2 along the fuel supply line L1 configured to
15 deliver liquid fuel from the fuel tank 2 to the fuel-consuming device 14, but the present disclosure is not limited thereto.

[439]

[440] FIG. 34 is a second conceptual diagram of a ship for explaining the liquid fuel treatment system according to the sixteenth embodiment of the present disclosure.

20 [441] Referring to FIG. 34, the collection tank ST may collect a mixture of the cleaning medium used to clean the fuel tank 2 and the liquid fuel. The liquid fuel may have a property of being dissolved in or mixed with the cleaning medium. For example, the first fuel may have a property

of being dissolved in water. The first fuel may be discharged to the collection tank ST together with the cleaning medium through a cleaning pump CP. The first-fuel transfer pump LP may be used as the cleaning pump CP, and the first fuel may be discharged to the collection tank ST through the first-fuel transfer pump LP.

5 [442] The collection tank ST may comprise: a first collection tank ST1 configured to collect the liquid fuel discharged from the fuel tank 2 together with the cleaning medium; and a second collection tank ST2 isolated from the first collection tank ST1 by a bulkhead ST3. The first collection tank ST1 may be connected to the fuel tank 2 through a collection line L9.

[443] The first collection tank ST1 and the second collection tank ST2 may be connected by a
10 center line CL. The liquid fuel and the cleaning medium may move along the center line CL. The center line CL may be connected to the first collection tank ST1 at a position greater than or equal to a predetermined height, and the center line CL may be connected to the second collection tank ST2 at a position less than or equal to the predetermined height.

[444] When the first fuel in the fuel tank 2 is discharged to the collection tank ST, the first fuel
15 may be delivered to the collection tank ST in a state dissolved in the cleaning medium. In detail, the first fuel and the cleaning medium may be delivered to the first collection tank ST1.

[445] The collection tank ST may store a mixture of the first fuel and the cleaning medium for a predetermined period of time. At this time, foreign substances may settle to a bottom of the first collection tank ST1, and the first fuel and the cleaning medium may accumulate in an upper portion
20 of the first collection tank ST1 due to a difference in density. The first fuel and the cleaning medium collected in the upper portion of the first collection tank ST1 may be delivered to the second collection tank ST2 along the center line CL.

[446] As cleaning of the fuel tank 2 continues, the amount of the first fuel remaining in the fuel tank 2 may decrease. Accordingly, a concentration of the first fuel in the mixture of the first fuel and the cleaning medium delivered to the collection tank ST may decrease. When the concentration of the first fuel in the collection tank ST becomes less than or equal to a predetermined value, the first fuel may be discharged from the collection tank ST. The first fuel may be treated in the hull 11 or discharged outside the hull 11.

[447] The liquid fuel treatment system 10 may further comprise a controller (not shown) configured to discharge the liquid fuel together with the cleaning medium to the outside when a concentration of the liquid fuel in the collection tank ST is less than or equal to a predetermined value.

[448] The second fuel may be discharged to the collection tank ST together with the cleaning medium through the cleaning pump CP. The second-fuel transfer pump DP may be used as the cleaning pump CP, and the second fuel may be discharged to the collection tank ST through the second-fuel transfer pump DP. When the second fuel in the fuel tank 2 is discharged to the collection tank ST, the second fuel may be delivered to the collection tank ST together with the cleaning medium. In detail, the second fuel and the cleaning medium may be delivered to the first collection tank ST1.

[449] The collection tank ST may store a mixture of the second fuel and the cleaning medium for a predetermined period of time. At this time, the collection tank ST may separate the mixture of the cleaning medium and the second fuel. Foreign substances and the second fuel may settle to a bottom of the first collection tank ST1, and the cleaning medium may accumulate in an upper portion of the first collection tank ST1 due to a difference in density. The collection tank ST may be an oil-water separator.

[450] The cleaning medium separated from the second fuel in the first collection tank ST1 may move to the second collection tank ST2 along the center line CL. The second collection tank ST2 may collect the cleaning medium separated from the liquid fuel due to a difference in density. The center line CL may be connected to the first collection tank ST1 at a position greater than or equal to a predetermined height. The cleaning medium at an upper portion of the first collection tank ST1 may be transferred to the second collection tank ST2 along the center line CL. The center line CL may be connected to the second collection tank ST2 at a position below a predetermined height, but the present disclosure is not limited thereto.

[451] The second fuel may remain in the first collection tank ST1 together with foreign substances. The second fuel may be treated in the hull 11 or discharged outside the hull 11. The second fuel may be discharged to the outside through the second-fuel transfer pump DP.

[452] The cleaning medium collected in the second collection tank ST2 may be treated in the hull 11 or discharged outside the hull 11. The cleaning medium may be discharged outside the hull 11 by the transfer pump P or a cargo pump (not shown) configured to transfer cargo outside the hull 11.

[453]

[454] FIG. 35 is a third conceptual diagram of a ship for explaining the cleaning part of the liquid fuel treatment system according to the sixteenth embodiment of the present disclosure.

[455] Referring to FIG. 35, the cleaning part 100 may supply the cleaning medium to the fuel tank 2 along the cleaning line L8. The cleaning part 100 may supply the cleaning medium to an upper portion of the fuel tank 2.

[456]

[457] The cleaning line L8 may be connected to a bunkering line L4 configured to transfer liquid fuel from the outside to the fuel tank 2. Accordingly, the cleaning part 100 may supply the cleaning medium to the fuel tank 2 along the bunkering line L4 configured to transfer liquid fuel from the outside to the fuel tank 2. In detail, the bunkering line L4 may be connected to an upper portion of the fuel tank 2. Here, the cleaning line L8 may refer to the same line as the bunkering line L4.

[458] The cleaning part 100 may supply the cleaning medium to the fuel tank 2 along a first-fuel bunkering line L4a configured to transfer the first fuel from the outside to the fuel tank 2. The cleaning medium may be supplied to an upper portion of the fuel tank 2 through the first-fuel bunkering line L4a.

[459] The first fuel may be discharged to the collection tank ST together with the cleaning medium through the first-fuel transfer pump LP, and the second fuel may be discharged to the collection tank ST together with the cleaning medium through the second-fuel transfer pump DP.

[460] The first fuel may be discharged to the outside together with the cleaning medium through the first-fuel transfer pump LP along a first-fuel manifold (not shown), and the second fuel may be discharged to the outside together with the cleaning medium through the second-fuel transfer pump DP along a second-fuel manifold (not shown). The first-fuel manifold or the second-fuel manifold may be configured to transfer liquid fuel from the outside to the fuel tank 2 or to transfer liquid fuel from the fuel tank 2 to the outside. The manifold may comprise a flange connected to a loading arm or the like provided on land. The manifold may be provided at a central portion of the hull 11 in a longitudinal direction. The manifold may be installed on a bottom surface of the bunkering part 5, but the present disclosure is not limited thereto.

[461] The first-fuel transfer pump LP and the second-fuel transfer pump DP may be used to supply the liquid fuel stored in the fuel tank 2 to the fuel-consuming device 14, to supply the liquid

fuel stored in the fuel storage tank 21 to the fuel supply tank 22, to transfer the liquid fuel stored in the fuel tank 2 to the outside of the hull 11, or when liquid fuel is supplied from the outside to the fuel tank 2, but the present disclosure is not limited thereto.

[462] The first-fuel manifold (not shown) may be a vapor manifold.

5 [463] The first-fuel manifold may be connected to the first-fuel bunkering line L4a. The first fuel may be discharged to the outside of the hull 11 together with the cleaning medium along the first-fuel bunkering line L4a. The first-fuel bunkering line L4a may be a vapor line.

[464] The second-fuel manifold may be connected to the second-fuel bunkering line L4b. The second fuel may be discharged to the outside of the hull 11 together with the cleaning medium
10 along the second-fuel bunkering line L4b.

[465] The second-fuel manifold (not shown) may be provided above the engine room 13. The second-fuel manifold (not shown) may be provided at one side of the engine casing 16 arranged above the engine room 13. Alternatively, the second-fuel manifold (not shown) may be provided at one side of the cabin 15, but the present disclosure is not limited thereto.

15 [466] In the liquid fuel treatment system 10 according to the sixteenth embodiment of the present disclosure, the cleaning medium may be supplied to the fuel tank 2 through a first-fuel manifold through which the first fuel is transferred from the outside to the fuel tank 2, the first fuel and the cleaning medium may be transferred to the outside as a mixture by using the first-fuel transfer pump LP, and the second fuel and the cleaning medium may be transferred to the outside as a
20 mixture by using the second-fuel transfer pump DP.

[467]

[468] FIG. 36 is a first conceptual diagram of a cleaning part of a liquid fuel treatment system according to an embodiment of the present disclosure.

[469] Referring to FIG. 36, the cleaning part 100 may further comprise: a spray part 110 configured to spray at least a portion of the cleaning medium into the fuel tank 2. The spray part 110 may be arranged at an upper portion of the fuel tank 2. The spray part 110 may spray the cleaning medium into the fuel tank 2.

[470] The cleaning part 100 may further comprise: an eductor 120 configured to suction the liquid fuel in the fuel tank 2, and the cleaning medium remaining after being sprayed from the spray part 110 may be transferred to the eductor 120.

[471] The eductor 120 may discharge the liquid fuel remaining on a bottom of the fuel tank 2 together with the cleaning medium to the collection tank ST by using a pressure of the cleaning medium as a driving force. In addition, the remaining liquid fuel may be discharged to the outside of the hull 11. The first fuel may be discharged together with the cleaning medium to the collection tank ST or to the outside of the hull 11 through the first-fuel transfer pump LP, and the second fuel may be discharged together with the cleaning medium to the collection tank ST or to the outside of the hull 11 through the second-fuel transfer pump DP.

[472] The spray part 110 may be provided on the cleaning line L8, and the eductor 120 may be provided on the collection line L9, but the present disclosure is not limited thereto. The cleaning line L8 and the collection line L9 may pass through at least a portion of an interior of the fuel tank

2.

[473]

[474] FIG. 37 is a second conceptual diagram of a cleaning part of a liquid fuel treatment system according to an embodiment of the present disclosure.

[475] Referring to FIG. 37, the cleaning part 100 may further comprise a stripping pump 130 provided inside the fuel tank 2, wherein the stripping pump 130 may discharge the liquid fuel
5 remaining on a bottom of the fuel tank 2 together with the cleaning medium to the collection tank ST. In addition, the remaining liquid fuel may be discharged to the outside of the hull 11.

[476] The first fuel may be discharged together with the cleaning medium to the collection tank ST or to the outside of the hull 11 through the first-fuel transfer pump LP, and the second fuel may be discharged together with the cleaning medium to the collection tank ST or to the outside of the
10 hull 11 through the second-fuel transfer pump DP.

[477]

[478] The liquid fuel treatment system according to the sixteenth embodiment of the present disclosure may be provided in a crude oil carrier, but the present disclosure is not limited thereto.

[479]

15 [480] FIG. 38 is a conceptual diagram of a ship for explaining a liquid fuel treatment system according to the seventeenth embodiment of the present disclosure.

[481] Referring to FIG. 38, the liquid fuel treatment system 10 according to the seventeenth embodiment of the present disclosure may comprise: a fuel tank 2 configured to store a liquid fuel that is one of a first fuel and a second fuel having different boiling points; a fuel supply part 3
20 configured to supply the liquid fuel received from the fuel tank 2 to the fuel-consuming device 14; a cleaning part 100 configured to supply a cleaning medium to the fuel tank 2; and a transfer pump P configured to transfer the liquid fuel in the fuel tank 2 to the fuel-consuming device 14, wherein

the transfer pump P may discharge the liquid fuel in the fuel tank 2 together with the cleaning medium.

[482] The cleaning part 100 may supply the cleaning medium to the fuel tank 2 before the first fuel or the second fuel in the fuel tank 2 is replaced with a liquid fuel having a different boiling point. In addition, the cleaning part 100 may supply the cleaning medium to the fuel tank 2 before liquid fuel is introduced into the fuel tank 2.

[483] The liquid fuel treatment system 10 may further comprise: a controller (not shown) configured to discharge the liquid fuel together with the cleaning medium to the outside when a concentration of the liquid fuel in the fuel tank 2 is less than or equal to a preset value.

[484] The liquid fuel treatment system 10 may further comprise: a collection tank ST configured to collect waste water generated in the hull 11, wherein the collection tank ST may store the liquid fuel discharged from the fuel tank 2 together with the cleaning medium. The first fuel may be discharged to the collection tank ST together with the cleaning medium through the first-fuel transfer pump LP, and the second fuel may be discharged to the collection tank ST together with the cleaning medium through the second-fuel transfer pump DP.

[485] The collection tank ST may be arranged above the fuel tank 2.

[486] The cleaning part 100 may supply the cleaning medium to the fuel tank 2 by using a water supply pump SP provided at a rear portion of the hull 11. Here, the cleaning medium may be water and is not limited to fresh water or seawater. The water supply pump SP may be arranged on a deck inside the engine room 13 and may supply the cleaning medium to the fuel tank 2 by pumping seawater from a sea chest (reference numeral not shown) through a seawater supply line or pumping fresh water from a fresh water tank FWT.

[487] Although the cleaning part 100 is illustrated as being fixed to the fuel tank 2, the cleaning part 100 may be a movable type as well as a fixed type. In this case, the cleaning part 100 may be of a portable type in which an operator carries the cleaning part 100 while supplying the cleaning medium. However, the present disclosure is not limited thereto.

5 [488] The cleaning part 100 may supply the cleaning medium to the fuel tank 2 along the cleaning line L8. The cleaning part 100 may supply the cleaning medium to an upper portion of the fuel tank 2.

[489] The cleaning line L8 may be connected to a bunkering line L4 configured to transfer liquid fuel from the outside to the fuel tank 2. Accordingly, the cleaning part 100 may supply the cleaning
10 medium to the fuel tank 2 along the bunkering line L4 configured to transfer liquid fuel from the outside to the fuel tank 2. In detail, the bunkering line L4 may be connected to an upper portion of the fuel tank 2. Here, the cleaning line L8 may refer to the same line as the bunkering line L4.

[490] The cleaning part 100 may supply the cleaning medium to the fuel tank 2 along a first-fuel bunkering line L4a configured to transfer the first fuel from the outside to the fuel tank 2. In
15 addition, the cleaning part 100 may supply the cleaning medium to the fuel tank 2 along a fuel supply line L1 configured to transfer liquid fuel from the fuel tank 2 to the fuel-consuming device 14, but the present disclosure is not limited thereto.

[491] The first fuel may be discharged to the outside together with the cleaning medium through the first-fuel transfer pump LP, and the second fuel may be discharged to the outside together with
20 the cleaning medium through the second-fuel transfer pump DP. The first-fuel transfer pump LP may be provided inside the fuel tank 2. The second-fuel transfer pump DP may be provided in the engine room 13.

[492] The first fuel may be discharged upward from the fuel tank 2 together with the cleaning medium through the first-fuel transfer pump LP.

[493] The second fuel may be discharged downward from the fuel tank 2 together with the cleaning medium and may be discharged to the outside through the second-fuel transfer pump DP.

5 [494] The first fuel may be discharged to the outside together with the cleaning medium through the first-fuel transfer pump LP along a first-fuel manifold (not shown), and the second fuel may be discharged to the outside together with the cleaning medium through the second-fuel transfer pump DP along a second-fuel manifold (not shown).

[495] The first-fuel manifold (not shown) may be a vapor manifold.

10 [496] The second-fuel manifold (not shown) may be provided above the engine room 13.

[497] The second-fuel manifold (not shown) may be provided at one side of the engine casing 16 arranged above the engine room 13. Alternatively, the second-fuel manifold (not shown) may be provided at one side of the cabin 15, but the present disclosure is not limited thereto.

[498] The cleaning part 100 may further comprise: a spray part 110 configured to spray at least
15 a portion of the cleaning medium into the fuel tank 2.

[499] The cleaning part 100 may further comprise: an eductor 120 configured to perform suction of the liquid fuel in the fuel tank 2, and the cleaning medium remaining after being sprayed from the spray part 110 may be transferred to the eductor 120.

[500] The eductor 120 may discharge the liquid fuel remaining on a bottom of the fuel tank 2 to
20 the outside together with the cleaning medium by using a pressure of the cleaning medium as a driving force.

[501] The cleaning part 100 may further comprise a stripping pump 130 provided inside the fuel tank 2, wherein the stripping pump 130 may discharge the liquid fuel remaining on the bottom of the fuel tank 2 to the outside together with the cleaning medium.

[502] The liquid fuel treatment system according to the seventeenth embodiment of the present disclosure may be provided in a container ship, but the present disclosure is not limited thereto.

[503]

[504] As described above, the fuel supply tank 22 according to an embodiment of the present disclosure may collect fuel leaked into the return part 22b. In addition, the return part 22b may collect bilge water. A drain tank separately provided in the ship may be omitted.

[505] In addition, the liquid fuel treatment system 10 according to an embodiment of the present disclosure may comprise a purging tank 4 configured to collect liquid fuel returned from the fuel-consuming device 14 or the fuel supply part 3, and the liquid fuel may be supplied from the fuel storage tank 21 to the fuel-consuming device 14 through the fuel supply part 3. In this case, the fuel supply tank 22 may be omitted. The liquid fuel collected in the purging tank 4 may be transferred to the fuel storage tank 21 by gravity.

[506] In addition, the liquid fuel treatment system 10 according to an embodiment of the present disclosure may comprise a valve room 8 configured to accommodate the first transfer valve V1. The valve room 8 may be provided in a form that completely seals an interior thereof from an exterior thereof, and in this case, a pressure of the fuel tank 2 may be maintained at greater than or equal to a preset pressure. In addition, the valve room 8 may be provided in a form that partially seals an interior thereof from an exterior thereof, and in this case, liquid fuel may be collected and treated.

[507] In addition, the liquid fuel treatment system 10 according to an embodiment of the present disclosure may comprise a pump casing PC provided below the fuel tank 2 and configured to accommodate the transfer pump P, and a fuel supply line L1 connected to the transfer pump P may pass through an interior of the fuel tank 2.

5 [508] In addition, the liquid fuel treatment system 10 according to an embodiment of the present disclosure may comprise a second transfer valve V2 arranged inside the fuel tank 2. The second transfer valve V2 may block a flow of liquid fuel when leakage of the liquid fuel occurs downstream of the fuel tank 2.

[509] In addition, the liquid fuel treatment system 10 according to an embodiment of the present
10 disclosure may comprise a leakage processing part 70, wherein the leakage processing part 70 may comprise a drain sensor 72 provided on the leakage processing line L7, and the drain sensor 72 may detect leakage of liquid fuel during bunkering. However, when foreign substances such as water are supplied to the leakage processing part 70, the drain valve 73 provided on the leakage processing line L7 may block a flow of liquid fuel toward the drain sensor 72. Accordingly,
15 whether leakage has occurred may be accurately determined without being affected by foreign substances.

[510] The liquid fuel treatment system 10 according to an embodiment of the present disclosure may comprise a fuel tank 2 configured to store one of a first fuel and a second fuel having different boiling points, wherein the fuel tank 2 is divided into a first storage part 2a and a second storage
20 part 2b, and when the first fuel is stored in the fuel tank 2, the second storage part 2b may be maintained as an empty space.

[511] In addition, the liquid fuel treatment system 10 according to an embodiment of the present disclosure may comprise a heating part 2g provided inside the fuel tank 2 and configured to heat

the second fuel, wherein the heating part 2g may be used to heat the first fuel stored in the first storage part 2a.

[512] In addition, the liquid fuel treatment system 10 according to an embodiment of the present disclosure may comprise a heating part 2g provided inside the fuel tank 2 and a temperature control part TC configured to control a temperature of the liquid fuel in response to a temperature required by the fuel-consuming device, wherein operation loads of the heating part 2g and the temperature control part TC may be controlled according to an internal pressure or temperature of the fuel tank 2.

[513] In addition, the liquid fuel treatment system 10 according to an embodiment of the present disclosure may comprise a fuel tank 2 arranged in a first area 1161a of a hold 116, outer tanks VT arranged at left and right sides of a hull in a second area 1161b, and a loading section LD arranged between the outer tanks VT and configured to load containers. Accordingly, an outer tank VT provided in a gap portion G or an additional fuel tank separately provided from the fuel tank 2 may be omitted. In addition, additional containers may be loaded as compared with a ship 1 in which the fuel tank 2 extends to the second area 1161b.

[514] In addition, the liquid fuel treatment system 10 according to an embodiment of the present disclosure may comprise a cleaning part 100 configured to supply a cleaning medium to the fuel tank 2 and a collection tank ST configured to collect a mixture of the liquid fuel and the cleaning medium generated by the cleaning part 100. When the first fuel is discharged from the fuel tank 2, the first fuel may be diluted in the collection tank ST and discharged to the outside of the hull 11 or treated in the hull 11, and when the second fuel is discharged from the fuel tank 2, the second fuel may be separated from the cleaning medium in the collection tank ST and discharged to the outside of the hull 11 or treated in the hull 11.

[515] The cleaning part 100 may transfer the cleaning medium to the fuel tank 2 through a cleaning line L8, wherein the cleaning line L8 may be a fuel supply line L1 or a bunkering line L4. In addition, the mixture of the cleaning medium and the liquid fuel discharged from the fuel tank 2 may be discharged to the outside of the hull 11 by a transfer pump, and in this case, the mixture
5 of the cleaning medium and the liquid fuel may be discharged to the outside of the hull 11 along at least a portion of the fuel supply line L1 or at least a portion of the bunkering line L4.

[516] The present disclosure is not limited to the embodiments described above, and it should be understood that combinations of the above embodiments, or combinations of at least one of the above embodiments with known technologies, may also be included as other embodiments.

10 [517] Although the present disclosure has been described above mainly with reference to embodiments of the present disclosure, the embodiments are merely illustrative and do not limit the present disclosure, and those skilled in the art to which the present disclosure pertains will appreciate that various combinations, modifications, and applications not exemplified in the embodiments may be made without departing from the essential technical content of the
15 embodiments. Accordingly, technical ideas related to modifications and applications that can be easily derived from the embodiments of the present disclosure should be construed as being included in the scope of the present disclosure.

[CLAIMS]

[Claim 1]

A liquid fuel treatment system comprising:

a plurality of holds provided in a hull along a longitudinal direction;

5 a bulkhead configured to partition an internal space of at least one of the holds into a plurality of partition spaces along a left-right direction; and

a partition part configured to partition the partition spaces into a plurality of fuel spaces and having an openable and closable structure,

wherein the partition part:

10 is opened when a first fuel among a first fuel and a second fuel having different boiling points is stored in the partition spaces, and

is sealed when the second fuel is stored in the partition spaces.

[Claim 2]

The liquid fuel treatment system according to claim 1,

15 wherein the partition part:

is opened when the first fuel having a relatively lower boiling point is stored in the partition spaces, and

is sealed when the second fuel having a relatively higher boiling point is stored in the partition spaces such that a volume of each fuel space in which the second fuel is stored is less
20 than or equal to a preset value.

[Claim 3]

The liquid fuel treatment system according to claim 2,

wherein, when the second fuel having a relatively higher boiling point is stored in the

partition spaces, at least a portion of each fuel space in which the second fuel is stored is maintained as an empty space.

[Claim 4]

The liquid fuel treatment system according to claim 1, further comprising:

5 a hold wall configured to divide the internal space of the hold along a front-rear direction;
and

outer tanks arranged at left and right sides of an area provided at a rear portion of the internal space of the hold.

[Claim 5]

10 The liquid fuel treatment system according to claim 4, further comprising:

a loading section provided between a pair of the outer tanks and configured to load containers.

[Claim 6]

The liquid fuel treatment system according to claim 1, further comprising:

15 a communication part configured to communicate the fuel spaces with each other by opening at least a portion of the partition part.

[Claim 7]

A liquid fuel treatment system comprising:

a fuel supply part configured to supply liquid fuel in a fuel tank to a fuel-consuming device;
20 a first transfer valve arranged outside the fuel tank and configured to control supply of the liquid fuel; and

a valve room configured to accommodate the first transfer valve and form an isolated space.

[Claim 8]

The liquid fuel treatment system according to claim 7,

wherein the valve room:

is provided in a form that completely seals an interior thereof from an exterior thereof,

5 and

maintains a pressure of the fuel tank at greater than or equal to a preset pressure.

[Claim 9]

The liquid fuel treatment system according to claim 7, further comprising:

a ventilation part installed to ventilate an interior of the valve room.

10 [Claim 10]

The liquid fuel treatment system according to claim 7,

wherein the valve room is provided in a form that partially seals an interior thereof from an exterior thereof, and

the liquid fuel treatment system further comprises a leakage processing line configured to
15 collect fuel leaked from the valve room.

[Claim 11]

A liquid fuel treatment system comprising:

a fuel tank configured to store liquid fuel of one of a first fuel and a second fuel having different boiling points;

20 a cleaning part configured to supply a cleaning medium to the fuel tank; and

a collection tank configured to collect waste water generated in a hull,

wherein the collection tank stores liquid fuel discharged from the fuel tank together with the cleaning medium.

[Claim 12]

The liquid fuel treatment system according to claim 11,
wherein the cleaning part supplies the cleaning medium to the fuel tank before the first
fuel or the second fuel in the fuel tank is replaced with a liquid fuel having a different boiling point
or before liquid fuel is introduced into the fuel tank.

[Claim 13]

The liquid fuel treatment system according to claim 11, further comprising:
a controller configured to discharge the liquid fuel together with the cleaning medium to
an outside when a concentration of the liquid fuel in the collection tank is less than or equal to a
preset value.

[Claim 14]

The liquid fuel treatment system according to claim 11,
wherein the cleaning part supplies the cleaning medium to the fuel tank by using a water
supply pump provided at a rear portion of the hull.

[Claim 15]

The liquid fuel treatment system according to claim 11,
wherein the collection tank comprises:
a first collection tank configured to collect liquid fuel discharged from the fuel tank
together with the cleaning medium; and
a second collection tank isolated from the first collection tank by a bulkhead and
configured to collect the cleaning medium separated from the liquid fuel due to a difference in
density.