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(54) **SHIP**

(57) A ship (1) includes: a hull (2); and a shipboard pipe (3) for a cryogenic fluid, the shipboard pipe (3) being routed on the hull (2). A hydraulically driven valve (4) is located on the shipboard pipe (3). A tray (7) to receive hydraulic oil leaked from the valve (4) is located above the hull (2) but below the valve (4). According to this configuration, in a case where the hydraulic oil is leaked from the valve (4), the leaked hydraulic oil is received by the tray (7).

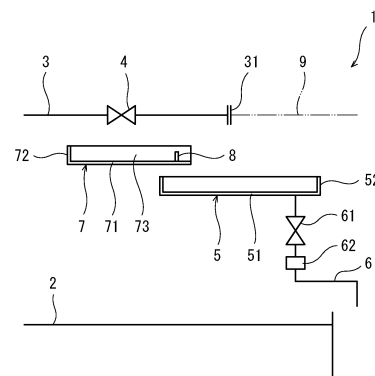


FIG. 1

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Description

Technical Field

[0001] The present disclosure relates to a ship including a shipboard pipe for a cryogenic fluid.

Background Art

[0002] Conventionally, in a ship such as a liquefied gas carrier, a shipboard pipe for a cryogenic fluid is routed on the hull (see Patent Literature 1, for example).

Citation List

Patent Literature

[0003] PTL 1: Japanese Laid-Open Patent Application Publication No. 2017-202783

Summary of Invention

Technical Problem

[0004] There is a case where a hydraulically driven valve is located on the shipboard pipe. In this case, if hydraulic oil is leaked from the valve, the leaked hydraulic oil may flow along the hull into the sea.

[0005] In view of the above, an object of the present disclosure is to provide a ship that is capable of, in a case where hydraulic oil is leaked from a hydraulically driven valve, preventing the leaked hydraulic oil from flowing into the sea.

Solution to Problem

[0006] In order to solve the above-described problems, a ship according to the present disclosure includes: a hull; a shipboard pipe for a cryogenic fluid, the shipboard pipe being routed on the hull; a hydraulically driven valve located on the shipboard pipe; and a tray to receive hydraulic oil leaked from the valve, the tray being located above the hull but below the valve.

Advantageous Effects of Invention

[0007] The present disclosure makes it possible to, in a case where hydraulic oil is leaked from a hydraulically driven valve, prevent the leaked hydraulic oil from flowing into the sea.

Brief Description of Drawings

[0008] FIG. 1 is a sectional view of a part of a ship according to one embodiment of the present disclosure.

Description of Embodiments

[0009] FIG. 1 shows a ship 1 according to one embodiment of the present disclosure. The ship 1 includes a hull 2 and a shipboard pipe 3 for a cryogenic fluid. The shipboard pipe 3 is routed on the hull 2.

[0010] In the present embodiment, the cryogenic fluid is liquefied gas. For example, the liquefied gas is liquefied petroleum gas (LPG, about -45°C), liquefied ethylene gas (LEG, about -100°C), liquefied natural gas (LNG, about -160°C), liquefied oxygen (LO_2 , about -180°C), liquefied hydrogen (LH_2 , about -250°C), or liquefied helium (LHe , about -270°C).

[0011] However, the cryogenic fluid need not be liquefied gas, but may be a different liquid. Alternatively, the cryogenic fluid may be a gaseous body.

[0012] For example, the ship 1 is a liquefied gas carrier. In this case, one or more cargo tanks are mounted on the hull 2, and the shipboard pipe 3 is a cargo pipe extending from (each of) the cargo tank(s).

[0013] The shipboard pipe 3 may be a double pipe including an inner pipe and an outer pipe, between which there is a thermal insulation layer. The thermal insulation layer is, for example, a vacuum layer, a pseudo-vacuum layer, a powder layer filled with powder having low thermal conductivity, or a gas layer filled with gas having low thermal conductivity. Alternatively, the shipboard pipe 3 may be a single pipe around with a thermal insulating material is wound. The double pipe whose thermal insulation layer is a vacuum layer or a pseudo-vacuum layer is suitable for, for example, liquefied hydrogen, which has an extremely low temperature. The double pipes of the other types, and the single pipe around with a thermal insulating material is wound, are suitable for, for example, LNG, which has a higher temperature than liquefied hydrogen.

[0014] A coupling 31 for connection to a pipe 9 of another facility is located at an end of the shipboard pipe 3. The pipe 9 of the other facility is, for example, a pipe of an on-land facility or a supply pipe of a bunkering ship.

[0015] In FIG. 1, the left-right direction is the ship width direction, and the direction orthogonal to the plane of FIG. 1 is the ship length direction. In the present embodiment, near the end of the shipboard pipe 3, the shipboard pipe 3 extends in the ship width direction.

[0016] A liquid receiver 5 is located above the hull 2. The liquid receiver 5 is a receiver to receive the liquefied gas that flows out of the end of the shipboard pipe 3 in a case where the shipboard pipe 3 is emergently separated from the pipe 9 of the other facility at the coupling 31. In the case where the shipboard pipe 3 is emergently separated from the pipe 9, although the shipboard pipe 3 is blocked by an unshown shutoff valve, the liquefied gas remaining in a part of the shipboard pipe 3, the part extending from the shutoff valve to the end of the shipboard pipe 3, partially flows out.

[0017] The liquid receiver 5 includes a bottom wall 51 and a peripheral wall 52. The peripheral wall 52 rises

from the peripheral edge of the bottom wall 51. For example, the shape of the liquid receiver 5 when seen in a plan view is rectangular. Alternatively, the shape of the liquid receiver 5 when seen in a plan view may be circular.

[0018] An ocean disposal pipe 6 to dispose of the liquefied gas received by the liquid receiver 5 into the ocean extends from the liquid receiver 5. In the present embodiment, the ocean disposal pipe 6 includes a vertical portion and a disposing portion. The vertical portion extends downward from the liquid receiver 5. The disposing portion extends horizontally from the lower end of the vertical portion, and then bends downward.

[0019] A valve 61 and a swivel joint 62 are located on the vertical portion of the ocean disposal pipe 6, and the swivel joint 62 is located below the valve 61. The swivel joint 62 is a joint that enables turning of the disposing portion of the ocean disposal pipe 6. The valve 61 may be a manually operated valve, or may be an electrically operated valve.

[0020] Specifically, at the time of closing the valve 61, the disposing portion of the ocean disposal pipe 6 is positioned above the hull 2 so as to be parallel to the ship length direction, whereas at the time of opening the valve 61 to dispose of the liquefied gas into the ocean, the disposing portion of the ocean disposal pipe 6 is turned such that the disposing portion above the hull 2 hangs over the ocean.

[0021] A hydraulically driven valve 4 is located on the shipboard pipe 3. That is, opening and closing of the valve 4 are performed by ON and OFF of the supply of a hydraulic liquid to the valve 4. In the present embodiment, the valve 4 is located on the shipboard pipe 3 at a position near the coupling 31.

[0022] A tray 7 is located above the hull 2 but below the valve 4. The tray 7 is a tray to receive the hydraulic oil that is leaked from the valve 4.

[0023] In the present embodiment, the valve 4 is located at a position away from the liquid receiver 5 in a horizontal direction (in the present embodiment, the valve 4 is located inward of the liquid receiver 5 in the ship width direction). The tray 7 is located at a position higher than the position of the liquid receiver 5. The tray 7 and the liquid receiver 5 partially overlap each other when seen in the vertical direction.

[0024] To be more specific, the tray 7 is rectangular when seen in a plan view. The tray 7 includes: a bottom plate 71; a back plate 72, which is positioned at the opposite side of the valve 4 from the liquid receiver 5 (in the present embodiment, the back plate 72 is positioned inward of the valve 4 in the ship width direction); and a pair of side plates 73, which are positioned at both sides of the valve 4 in a horizontal direction (in the present embodiment, the ship length direction) orthogonal to the axial direction of the shipboard pipe 3.

[0025] In the present embodiment, the tray 7 further includes a weir 8 on the bottom plate 71. The weir 8 is positioned between the valve 4 and the liquid receiver 5. The weir 8 extends in the ship length direction in a manner

to couple the side plates 73 to each other. The height of the weir 8 is set to be lower than the height of the back plate 72 and the height of the side plates 73.

[0026] In the ship 1 configured as described above, in a case where the hydraulic oil is leaked from the valve 4, the leaked hydraulic oil is received by the tray 7. This makes it possible to prevent the hydraulic oil from flowing along the hull 2 into the sea.

[0027] Further, since the present embodiment adopts the liquid receiver 5 and the ocean disposal pipe 6, in a case where the shipboard pipe 3 is emergently separated from the pipe 9 of the other facility, the liquefied gas that flows out of the end of the shipboard pipe 3 is received by the liquid receiver 5. This makes it possible to prevent the liquefied gas, which is a cryogenic fluid, from affecting the hull 2. Since the liquefied gas received by the liquid receiver 5 is disposed of into the ocean through the ocean disposal pipe 6, the leaked liquefied gas does not remain on the ship, but is safely discharged into the ocean.

[0028] In the present embodiment, the tray 7 includes the weir 8, and the tray 7 and the liquid receiver 5 partially overlap each other. Accordingly, in a case where the liquefied gas is leaked from the valve 4, if the amount of the leaked liquefied gas is small, the leaked liquefied gas is intercepted by the weir 8 of the tray 7 and evaporates on the tray 7, whereas if the amount of the leaked liquefied gas is large, the leaked liquefied gas overflows the weir 8 to flow into the liquid receiver 5, and is then disposed of into the ocean through the ocean disposal pipe 6. On the other hand, in a case where the hydraulic oil is leaked from the valve 4, the amount of the leaked hydraulic oil is not so large. Therefore, the leaked hydraulic oil is intercepted by the weir 8, and does not flow out into the ocean. Thus, the height of the weir 8 enables both storing the hydraulic oil and allowing the liquefied gas to flow into the liquid receiver.

(Variations)

[0029] The present disclosure is not limited to the above-described embodiment. Various modifications can be made without departing from the scope of the present disclosure.

[0030] For example, it is not essential that the tray 7 be located at a position higher than the position of the liquid receiver 5. Alternatively, the tray 7 may be located side by side with the liquid receiver 5. In this case, the tray 7 may be funnel-shaped (i.e., circular-shaped when seen in a plan view). Alternatively, the tray 7 may be integrated with the liquid receiver 5 by dividing a part of the liquid receiver 5 from the other part of the liquid receiver 5 by a partition.

[0031] In a case where the cryogenic fluid flowing through the shipboard pipe 3 is a gaseous body, the liquid receiver 5 can be eliminated, and the valve 4 may be located at any position on the shipboard pipe 3.

(Summary)

[0032] A ship according to the present disclosure includes: a hull; a shipboard pipe for a cryogenic fluid, the shipboard pipe being routed on the hull; a hydraulically driven valve located on the shipboard pipe; and a tray to receive hydraulic oil leaked from the valve, the tray being located above the hull but below the valve.

[0033] According to the above configuration, in a case where the hydraulic oil is leaked from the valve, the leaked hydraulic oil is received by the tray. This makes it possible to prevent the hydraulic oil from flowing along the hull into the sea.

[0034] The cryogenic fluid may be liquefied gas. A coupling for connection to a pipe of another facility may be located at an end of the shipboard pipe. The ship may further include: a liquid receiver to receive the liquefied gas that flows out of the end of the shipboard pipe in a case where the shipboard pipe is emergently separated from the pipe of the other facility at the coupling, the liquid receiver being located above the hull; and an ocean disposal pipe to dispose of the liquefied gas received by the liquid receiver into ocean. According to this configuration, in a case where the shipboard pipe is emergently separated from the pipe of the other facility, the liquefied gas that flows out of the end of the shipboard pipe is received by the liquid receiver. This makes it possible to prevent the liquefied gas, which is a cryogenic fluid, from affecting the hull. Since the liquefied gas received by the liquid receiver is disposed of into the ocean through the ocean disposal pipe, the leaked liquefied gas does not remain on the ship, but is safely discharged into the ocean.

[0035] For example, the valve may be located at a position away from the liquid receiver in a horizontal direction. The tray may be located at a position higher than a position of the liquid receiver, and the tray and the liquid receiver may partially overlap each other when seen in a vertical direction.

[0036] The tray may include: a bottom plate; a back plate that is positioned at an opposite side of the valve from the liquid receiver; a pair of side plates that are positioned at both sides of the valve; and a weir positioned between the valve and the liquid receiver. A height of the weir may be lower than a height of the back plate and a height of the pair of side plates. According to this configuration, in a case where the liquefied gas is leaked from the valve, if the amount of the leaked liquefied gas is small, the leaked liquefied gas is intercepted by the weir of the tray and evaporates on the tray, whereas if the amount of the leaked liquefied gas is large, the leaked liquefied gas overflows the weir to flow into the liquid receiver, and is then disposed of into the ocean through the ocean disposal pipe. On the other hand, in a case where the hydraulic oil is leaked from the valve, the amount of the leaked hydraulic oil is not so large. Therefore, the leaked hydraulic oil is intercepted by the weir, and does not flow out into the ocean. Thus, the height of the weir enables both storing the hydraulic oil and allow-

ing the liquefied gas to flow into the liquid receiver.

[0037] For example, the ship may be a liquefied gas carrier. The shipboard pipe may be a cargo pipe.

[0038] For example, it may be a double pipe including an inner pipe and an outer pipe, between which there is a thermal insulation layer.

Claims

1. A ship comprising:

a hull;
a shipboard pipe for a cryogenic fluid, the shipboard pipe being routed on the hull;
a hydraulically driven valve located on the shipboard pipe; and
a tray to receive hydraulic oil leaked from the valve, the tray being located above the hull but below the valve.

2. The ship according to claim 1, wherein

the cryogenic fluid is liquefied gas,
a coupling for connection to a pipe of another facility is located at an end of the shipboard pipe, and
the ship further comprises:

a liquid receiver to receive the liquefied gas that flows out of the end of the shipboard pipe in a case where the shipboard pipe is emergently separated from the pipe of the other facility at the coupling, the liquid receiver being located above the hull; and
an ocean disposal pipe to dispose of the liquefied gas received by the liquid receiver into ocean.

3. The ship according to claim 2, wherein

the valve is located at a position away from the liquid receiver in a horizontal direction, and
the tray is located at a position higher than a position of the liquid receiver, and the tray and the liquid receiver partially overlap each other when seen in a vertical direction.

4. The ship according to claim 3, wherein

the tray includes:

a bottom plate;
a back plate that is positioned at an opposite side of the valve from the liquid receiver;
a pair of side plates that are positioned at both sides of the valve; and
a weir positioned between the valve and the

liquid receiver, and

a height of the weir is lower than a height of the back plate and a height of the pair of side plates.

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5. The ship according to any one of claims 2 to 4, wherein

the ship is a liquefied gas carrier, and
the shipboard pipe is a cargo pipe.

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6. The ship according to any one of claims 1 to 5, wherein

the shipboard pipe is a double pipe including an inner pipe and an outer pipe, between which there is a thermal insulation layer.

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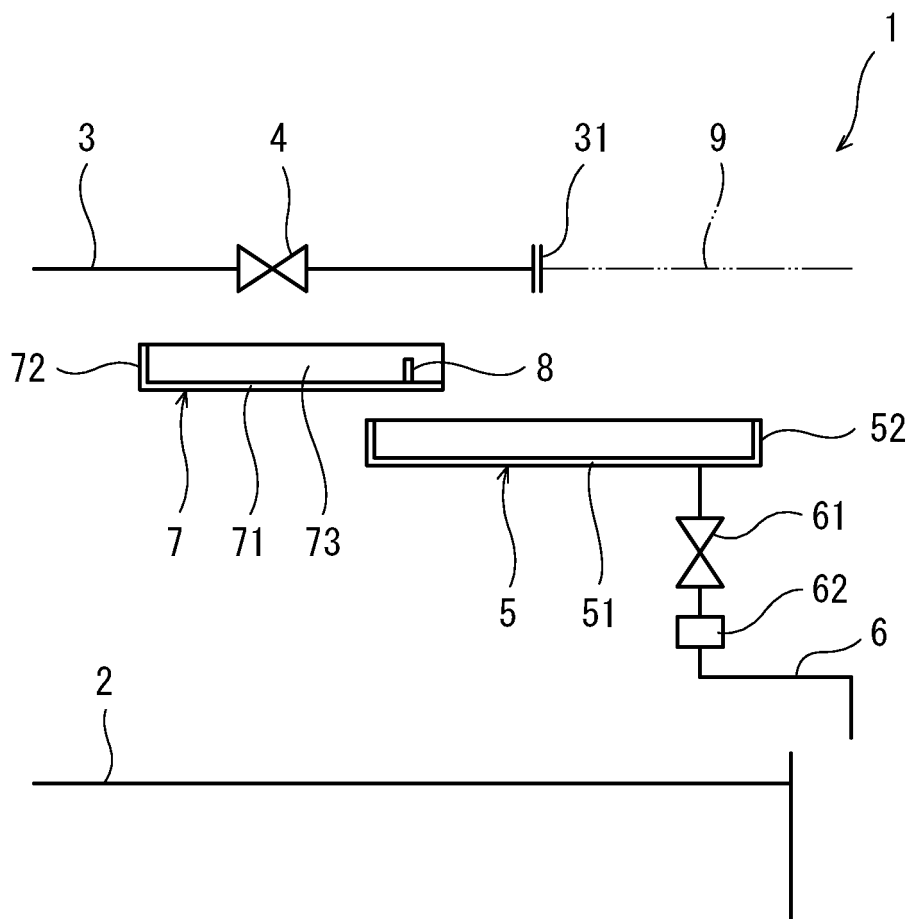


FIG. 1

INTERNATIONAL SEARCH REPORT

International application No.

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A. CLASSIFICATION OF SUBJECT MATTER B63B 25/08(2006.01)i; B63B 27/24(2006.01)i; F17D 5/00(2006.01)i; F16L 59/02(2006.01)i; F16L 9/18(2006.01)i FI: B63B27/24 H; B63B27/24 D; B63B25/08 B; F17D5/00; F16L9/18; F16L59/02 According to International Patent Classification (IPC) or to both national classification and IPC																					
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) B63B25/08; B63B27/24; F17D5/00; F16L59/02; F16L9/18 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Published examined utility model applications of Japan 1922-1996 Published unexamined utility model applications of Japan 1971-2022 Registered utility model specifications of Japan 1996-2022 Published registered utility model applications of Japan 1994-2022 Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)																					
C. DOCUMENTS CONSIDERED TO BE RELEVANT <table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>X</td> <td>Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 061425/1974 (Laid-open No. 150096/1975) (MITSUI ENGINEERING & SHIPBUILDING CO., LTD.) 13 December 1975 (1975-12-13), specification, page 1, line 11 to page 4, line 5, fig. 1-3</td> <td>1-2, 5-6</td> </tr> <tr> <td>A</td> <td>specification, page 1, line 11 to page 4, line 5, fig. 1-3</td> <td>3-4</td> </tr> <tr> <td>A</td> <td>Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 018045/1978 (Laid-open No. 121486/1979) (OSAKA GAS CO., LTD.) 25 August 1979 (1979-08-25)</td> <td>1-6</td> </tr> <tr> <td>A</td> <td>JP 6-329079 A (ISHIKAWAJIMA HARIMA HEAVY IND. CO., LTD.) 29 November 1994 (1994-11-29)</td> <td>1-6</td> </tr> <tr> <td>A</td> <td>US 2018/0312235 A1 (KEPPEL OFFSHORE & MARINE TECHNOLOGY CENTER PTE LTD.) 01 November 2018 (2018-11-01)</td> <td>1-6</td> </tr> <tr> <td>A</td> <td>JP 2019-503940 A (HYUNDAI HEAVY INDUSTRIES CO., LTD.) 14 February 2019 (2019-02-14)</td> <td>1-6</td> </tr> </tbody> </table>	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 061425/1974 (Laid-open No. 150096/1975) (MITSUI ENGINEERING & SHIPBUILDING CO., LTD.) 13 December 1975 (1975-12-13), specification, page 1, line 11 to page 4, line 5, fig. 1-3	1-2, 5-6	A	specification, page 1, line 11 to page 4, line 5, fig. 1-3	3-4	A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 018045/1978 (Laid-open No. 121486/1979) (OSAKA GAS CO., LTD.) 25 August 1979 (1979-08-25)	1-6	A	JP 6-329079 A (ISHIKAWAJIMA HARIMA HEAVY IND. CO., LTD.) 29 November 1994 (1994-11-29)	1-6	A	US 2018/0312235 A1 (KEPPEL OFFSHORE & MARINE TECHNOLOGY CENTER PTE LTD.) 01 November 2018 (2018-11-01)	1-6	A	JP 2019-503940 A (HYUNDAI HEAVY INDUSTRIES CO., LTD.) 14 February 2019 (2019-02-14)	1-6
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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/JP2021/047671

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