CLAIMS

[Claim 1] Portable cargo handling equipment for liquid hydrogen,

the portable cargo handling equipment being located between a ship-side cryogenic tank and a land-side cryogenic tank and transferring the liquid hydrogen from one of the ship-side cryogenic tank and the land-side cryogenic tank to the other,

the portable cargo handling equipment comprising:

a liquid hydrogen pipe through which the liquid hydrogen is guided and which includes

a first joint connectable to an end portion of a ship-side liquid pipe extending from the ship-side cryogenic tank and

a second joint connectable to an end portion of a land-side liquid pipe extending from the land-side cryogenic tank;

an emergency release coupling located at the liquid hydrogen pipe;

a shutoff valve located at a portion of the liquid hydrogen pipe which is located between the emergency release coupling and the second joint; and

an atmosphere open structure including

an atmosphere open passage including one end communicating with a portion of the liquid hydrogen pipe which is located between the first joint and the shutoff valve, and the other end that is open to an atmosphere,

an on-off valve that opens and closes the atmosphere open passage, and

a heater that is located at the atmosphere open passage and heats the liquid hydrogen guided by the atmosphere open passage or a hydrogen gas generated by evaporation of the liquid hydrogen and guided by the atmosphere open passage;

a hydrogen gas pipe including a third joint connectable to an end portion of

a ship-side gas pipe extending from the ship-side cryogenic tank;

a vent pipe through which the hydrogen gas guided from the ship-side cryogenic tank is discharged, the vent pipe including one end connected to the hydrogen gas pipe and the other end that is open to the atmosphere;

a second emergency release coupling which is located at the hydrogen gas pipe and is different from a first emergency release coupling that is the emergency release coupling; and

a connection pipe connecting the hydrogen gas pipe and a portion of the liquid hydrogen pipe which is located between the first joint and the shutoff valve, wherein:

the atmosphere open passage includes the connection pipe, the vent pipe, and a portion of the hydrogen gas pipe which is located between the connection pipe and the vent pipe;

the on-off valve is located at the connection pipe; and

the heater is located at the vent pipe or the portion of the hydrogen gas pipe which is located between the connection pipe and the vent pipe.

[Claim 2] The portable cargo handling equipment according to claim 1, wherein a diameter of the connection pipe is equal to or larger than a diameter of the liquid hydrogen pipe.

[Claim 3] The portable cargo handling equipment according to claim 1 or 2, further comprising a purge gas supplier that selectively supplies a nitrogen gas and a hydrogen

gas as a purge gas to the liquid hydrogen pipe.

[Claim 4] The portable cargo handling equipment according to any one of claims 1 to 3, further comprising circuitry configured to control opening and closing operations of the on-off valve so as to open the on-off valve after the shutoff valve is closed and before the emergency release coupling is uncoupled.

[Claim 5] The portable cargo handling equipment according to claim 4, wherein in addition to the opening and closing operations of the on-off valve, the circuitry controls opening and closing operations of the shutoff valve and uncoupling of the emergency release coupling.

[Claim 6] Portable cargo handling equipment for liquid hydrogen,

the portable cargo handling equipment being located between a ship-side cryogenic tank and a land-side cryogenic tank and transferring the liquid hydrogen from one of the ship-side cryogenic tank and the land-side cryogenic tank to the other,

the portable cargo handling equipment comprising:

a liquid hydrogen pipe through which the liquid hydrogen is guided and which includes

a first joint connectable to an end portion of a ship-side liquid pipe extending from the ship-side cryogenic tank and

a second joint connectable to an end portion of a land-side liquid pipe extending from the land-side cryogenic tank;

an emergency release coupling located at the liquid hydrogen pipe;

a shutoff valve located at a portion of the liquid hydrogen pipe which is located between the emergency release coupling and the second joint; and

an atmosphere open structure including

an atmosphere open passage including one end communicating with a portion of the liquid hydrogen pipe which is located between the first joint and the shutoff valve, and the other end that is open to an atmosphere,

an on-off valve that opens and closes the atmosphere open passage, and

a heater that is located at the atmosphere open passage and heats the liquid hydrogen guided by the atmosphere open passage or a hydrogen gas generated by evaporation of the liquid hydrogen and guided by the atmosphere open passage,

wherein:

the shutoff valve is a first shutoff valve; and

a second shutoff valve is located at the ship-side liquid pipe,

the portable cargo handling equipment further comprising circuitry configured to control opening and closing operations of the first shutoff valve and opening and closing operations of the second shutoff valve.

[Claim 7] The portable cargo handling equipment according to claim 6, wherein the first shutoff valve and the second shutoff valve are respectively a first air drive valve and a second air drive valve each of which switches between a closed state and an open state when air is supplied or when the supply of the air stops,

the portable cargo handling equipment further comprising an air supplier that is controlled by the circuitry and supplies the air to the first air drive valve and the second air drive valve.