

[0011]

A refrigerant intermediary device according to an aspect of the present invention includes a refrigerant container configured to contain refrigerant; a first inlet, provided for an outer periphery of the refrigerant container, through which a vapor-phase refrigerant and a first liquid-phase refrigerant flowing in; a first outlet, provided for the outer periphery of the refrigerant container, through which the vapor-phase refrigerant flowing out; a second inlet, provided for the outer periphery of the refrigerant container, through which a second liquid-phase refrigerant flowing in; and a second outlet, provided for the outer periphery of the refrigerant container, through which the first liquid-phase refrigerant and the second liquid-phase refrigerant flowing; wherein the first inlet includes a plurality of inlets, the first outlet includes a single outlet, the second inlet includes a single inlet, and the second outlet includes a plurality of outlets; wherein the plurality of inlets of the first inlet are located in positions such that lines along inflowing directions of the vapor-phase refrigerant and the first liquid-phase refrigerant do not intersect one another.

[0012]

A cooling device including a refrigerant intermediary device according to a second aspect of the present invention includes a heat receiving unit configured to contain refrigerant for receiving heat from a heat source; a condensing unit configured to condense and liquefy the vapor-phase refrigerant that is a vapor-state refrigerant evaporated in the heat receiving unit, and generate the second liquid-phase refrigerant; a primary vapor tube connecting the condensing unit with the first outlet; a primary liquid tube connecting the condensing unit with the second inlet; a secondary vapor tube connecting the heat receiving unit with the first inlet; and a secondary liquid tube connecting the heat receiving unit with the second outlet; and a refrigerant intermediary device respectively connected

with the heat receiving unit and the condensing unit, wherein the refrigerant intermediary device is located above the heat receiving unit and includes a refrigerant container configured to contain refrigerant; a first inlet, provided for an outer periphery of the refrigerant container, through which a vapor-phase refrigerant and a first liquid-phase refrigerant flowing in; a first outlet, provided for the outer periphery of the refrigerant container, through which the vapor-phase refrigerant flowing out; a second inlet, provided for the outer periphery of the refrigerant container, through which a second liquid-phase refrigerant flowing in; and a second outlet,

provided for the outer periphery of the refrigerant container, through which the first liquid-phase refrigerant and the second liquid-phase refrigerant flowing; wherein the first inlet includes a plurality of inlets, the first outlet includes a single outlet, the second inlet includes a single inlet, and the second outlet includes a plurality of outlets; wherein the plurality of inlets of the first inlet are located in positions such that lines along inflowing directions of the vapor-phase refrigerant and the first liquid-phase refrigerant do not intersect one another.

[Advantageous Effects of Invention]

10 [0014]

According to the refrigerant intermediary device, the cooling device including the refrigerant intermediary device, and the cooling method of the present invention, it is possible to introduce a gas-liquid separation structure without complexing a tube structure and prevent the cooling performance of the cooling device from decreasing.

[Brief Description of Drawings]

[0015]

[FIG. 1A]

20 FIG. 1A is a top view illustrating a schematic configuration of a gas-liquid separation structure in accordance with the first example embodiment of the present invention.

CLAIMS:

1. A refrigerant intermediary device, comprising:
 - a refrigerant container configured to contain refrigerant;
 - a first inlet, provided for an outer periphery of the refrigerant container, through which a vapor-phase refrigerant and a first liquid-phase refrigerant flowing in;
 - a first outlet, provided for the outer periphery of the refrigerant container, through which the vapor-phase refrigerant flowing out;
 - a second inlet, provided for the outer periphery of the refrigerant container, through which a second liquid-phase refrigerant flowing in; and
 - a second outlet, provided for the outer periphery of the refrigerant container, through which the first liquid-phase refrigerant and the second liquid-phase refrigerant flowing; wherein
 - the first inlet includes a plurality of inlets,
 - the first outlet includes a single outlet,
 - the second inlet includes a single inlet,
 - and the second outlet includes a plurality of outlets; wherein
 - the plurality of inlets of the first inlet are located in positions such that lines along inflowing directions of the vapor-phase refrigerant and the first liquid-phase refrigerant do not intersect one another.
2. The refrigerant intermediary device according to claim 1,
 - wherein the first inlet and the first outlet are located on the outer periphery of the refrigerant container away from the second inlet and the second outlet.
3. The refrigerant intermediary device according to claim 1 or 2,
 - wherein the refrigerant container is composed of a rectangular parallelepiped shaped container,
 - the first inlet is located on an upper part of a side surface of the container,

the first outlet is located on an upper surface of the container,
the second inlet is located on a lower part of a side surface of the container,
and

the second outlet is located on at least on one of a lower part of a side surface
of the container and an undersurface of the container.

4. The refrigerant intermediary device according to claim 1 or 2,
wherein the refrigerant container is composed of a cylindrical tube.

5. The refrigerant intermediary device according to any one of claims 1, 2, 3, and 4, further comprising a partition with a plurality of open holes inside the refrigerant container.

6. A cooling device including a refrigerant intermediary device, comprising:

a refrigerant intermediary device according to any one of claims 1,

2, 3, 4, and 5;

a heat receiving unit configured to contain refrigerant for receiving heat from a heat source;

a condensing unit configured to condense and liquefy the vapor-phase refrigerant that is a vapor-state refrigerant evaporated in the heat receiving unit, and generate the second liquid-phase refrigerant;

a primary vapor tube connecting the condensing unit with the first outlet;

a primary liquid tube connecting the condensing unit with the second inlet;

a secondary vapor tube connecting the heat receiving unit with the first inlet;

and

a secondary liquid tube connecting the heat receiving unit with the second outlet,

wherein the refrigerant intermediary device is respectively connected with the heat receiving unit and the condensing unit, and located above the heat receiving unit.

7. The cooling device including the refrigerant intermediary device according to claim 6,

wherein the heat receiving unit includes a plurality of evaporation units each of which is thermally connected with the heat source and stores the refrigerant, and the plurality of evaporation units are located in a vertical direction.