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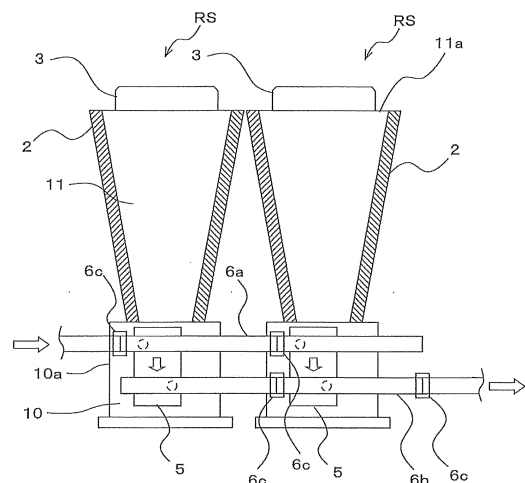
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(54) **HEAT SOURCE DEVICE AND HEAT SOURCE SYSTEM PROVIDED WITH HEAT SOURCE DEVICE**

(57) A heat source device having a refrigeration cycle in which a compressor, a heat source heat exchanger, an expansion valve, and a heat medium heat exchanger are connected, the heat source device includes a heat exchange chamber that houses at least the heat source heat exchanger and a mechanical chamber that houses at least the compressor and the heat medium heat exchanger. A heat medium pipe is connected to the heat medium heat exchanger, one end of the heat medium pipe is located inside the mechanical chamber, and the other end of the heat medium pipe is located outside the mechanical chamber.

FIG. 6



Description

Technical Field

5 **[0001]** The present invention relates to heat source devices that supply cooling and heating energy to a heat medium such as cool and hot water or brine and heat source systems having the heat source device.

Background Art

10 **[0002]** In recent years, cool and hot water supply systems have been commonly used in buildings such as office buildings, in which air-conditioning apparatuses are installed on each floor, and a heat medium such as cool water or hot water is supplied from a heat source device to the air-conditioning apparatuses to generate conditioned air and supply the generated conditioned air to rooms intended to be air-conditioned. Here, the heat source device refers to an apparatus that generates cool water or hot water by mainly using a heat pump refrigeration cycle. Further, cool water
15 or hot water refers to a heat medium generated by heat exchange by an evaporator or a condenser of the refrigeration cycle (for example, see Patent Literature 1).

[0003] Further, in such a heat source device, when the amount of a heat medium to be heated or cooled is over the capacity of a single heat source device, a plurality of heat source devices are installed, the heat medium heat exchangers of the respective heat source devices are connected to a heat medium pipe, and the heat medium heated or cooled by
20 the respective heat source devices is collected into the heat medium pipe.

[0004] When a plurality of heat source devices are connected, issues have been raised in saving of work (reduction in man-hours) in connection work of the heat source devices and the heat medium pipe, or space saving for installation. For example, in the conventional heat source devices which attempt saving of work or space saving for installation, a configuration has been proposed in which "the inlet and outlet pipe joints are installed on the right and left sides of the
25 heat pump device 1. Alternatively, a first heat pump device and a second heat pump device are provided, each including a heat exchanger near one side face of the right and left side surfaces which is adjacent to the side surface where an operating unit is installed, a compressor near the other side surface, and the inlet and outlet pipe joint installed on one side surface. The compressor, the heat exchanger, the refrigeration circuit, and the inlet and outlet pipe joint that form
30 the second heat pump device are disposed in a state rotated by substantially 180 degrees from those of the first heat pump device with respect to a normal which passes the center of the bottom of the first heat pump device, and at least one set of the first and second heat pump devices 1 A and 1 B are disposed with the side surfaces having the inlet and outlet pipe joints facing each other" (see Patent Literature 2).

Citation List

35 Patent Literature

[0005]

40 Patent Literature 1: Japanese Unexamined Patent Application Publication No. 2013-29215
Patent Literature 2: Japanese Unexamined Patent Application Publication No. 2008-267724 (abstract, Figs. 1 to 5)

Summary of Invention

45 Technical Problem

[0006] By using the heat source device described in Patent Literature 2, the length of the heat medium pipe that connects the heat source devices can be reduced. Accordingly, an effect can be obtained to a certain extent on space saving for installation. However, in the heat source device described in Patent Literature 2, a connection port of the heat
50 medium heat exchanger protrudes to the outside of the casing, and the connection port and the heat medium pipe are connected outside the casing. Since the heat medium pipe that connects the heat source devices is installed outside the heat source device, care should be taken for installation at a worksite especially in routing and layout of the cold and hot water pipe having a large opening diameter that supplies cold and hot water, and this may limit installation of the heat source devices. Further, according to the heat source device described in Patent Literature 2, since the heat
55 medium pipe that connects the heat source devices is installed outside the heat source device, the man-hours of the connection work of the heat medium pipes at a worksite are not effectively reduced and saving of work is still desired.

[0007] The present invention has been made to solve these problems, and has an object of providing a heat source device that includes a heat source device designed to be compact, simplifies routing and layout of the cool and hot water

pipes in installation of the heat source device on a roof or in a mechanical chamber to minimize the installation space, and reduces the labor at a worksite, and providing a heat source system having the heat source device.

Solution to Problem

[0008] A heat source device according to one embodiment of the present invention has a refrigeration cycle in which a compressor, a heat source heat exchanger, an expansion valve, and a heat medium heat exchanger are connected, the heat source device including: a heat exchange chamber that houses at least the heat source heat exchanger; and a mechanical chamber that houses at least the compressor and the heat medium heat exchanger. A heat medium pipe is connected to the heat medium heat exchanger, one end of the heat medium pipe is located inside the mechanical chamber, and the other end of the heat medium pipe is located outside the mechanical chamber. Advantageous Effects of Invention

[0009] According to the heat source device of the present invention, one end of the heat medium pipe is located inside the mechanical chamber, and the other end of the heat medium pipe is located outside the mechanical chamber. Accordingly, routing and layout of the heat medium pipes in installation of the heat source device on a roof or in a mechanical chamber can be simplified to minimize the installation space, and the labor at a worksite can be reduced. Brief Description of Drawings

[0010]

[Fig. 1] Fig. 1 is a configuration diagram illustrating a thermal circuit of a heat source device according to Embodiment 1.

[Fig. 2] Fig. 2 is a side sectional view of a single heat source device according to Embodiment 1.

[Fig. 3] Fig. 3 is a front sectional view of a single heat source device according to another example of Embodiment 1.

[Fig. 4] Fig. 4 is a perspective view of a condenser of the heat source device according to Embodiment 1.

[Fig. 5] Fig. 5 is a configuration diagram illustrating a thermal circuit in which a plurality of heat source devices according to Embodiment 1 are connected.

[Fig. 6] Fig. 6 is a side sectional view in which the plurality of heat source devices according to Embodiment 1 are connected.

[Fig. 7] Fig. 7 is a front sectional view in which a plurality of heat source devices according to another example of Embodiment 1 are connected.

[Fig. 8] Fig. 8 is a side sectional view in which a plurality of heat source devices according to Embodiment 2 are connected.

[Fig. 9] Fig. 9 is a front sectional view in which a plurality of heat source devices according to another example of Embodiment 2 are connected.

[Fig. 10] Fig. 10 is a side sectional view in which a plurality of heat source devices according to Embodiment 3 are connected.

[Fig. 11] Fig. 11 is a front sectional view in which a plurality of heat source devices according to another example of Embodiment 3 are connected. Description of Embodiments

[0011] With reference to the drawings, embodiments of the present invention will be described. It should be noted that the following embodiments do not limit the present invention.

[0012] A heat source device RS of the present invention functions as a heat source of a cool and hot water supply system.

[0013] The following description mainly provides a configuration that generates cool water by the heat source device RS.

[0014] Fig. 1 is a configuration diagram illustrating a thermal circuit of a heat source device according to Embodiment 1.

[0015] Fig. 2 is a side sectional view of a single heat source device according to Embodiment 1.

[0016] Fig. 3 is a front sectional view of a single heat source device according to another example of Embodiment 1.

[0017] The heat source device RS according to Embodiment 1 includes a thermal circuit illustrated in Fig. 1. The thermal circuit includes a refrigeration cycle apparatus in which refrigerant sequentially circulates through a compressor 1, a condenser 2, an air-cooled condenser fan 3, an expansion valve 4, and an evaporator 5 that are connected by a refrigerant pipe. The evaporator 5 of the refrigeration cycle apparatus is connected to a cool water inlet pipe 6a and a cool water outlet pipe 6b of a cool water pipe 6.

[0018] As illustrated in Figs. 2 and 3, the heat source device RS includes a mechanical chamber 10 formed in a substantially cuboid shape and disposed at a lower position to house the compressor 1, the evaporator 5, and the cool water pipe 6. Further, a heat exchange chamber 11 having a shape which expands upwardly in a side view is disposed at an upper position of the mechanical chamber 10. A pair of condensers 2 are disposed on the heat exchange chamber 11 so as to expand upwardly in a side view. The heat exchange chamber 11 is closed at the top by a top plate 11 a. An air-cooled condenser fan 3 that exhausts air from the heat exchange chamber is provided on the top plate 11 a.

[0019] As illustrated in Figs. 2 and 3, the cool water pipe 6 connected to the evaporator 5 is disposed so as to penetrate

the mechanical chamber 10 in a horizontal direction in a side view. As illustrated in Fig. 2, one end of the cool water inlet pipe 6a and one end of the cool water outlet pipe 6b are disposed to protrude from one of opposite side surfaces 10a of the mechanical chamber 10 to the outside of the mechanical chamber 10. Further, the other end of the cool water inlet pipe 6a and the other end of the cool water outlet pipe 6b are housed in the mechanical chamber 10 inside the other of the opposite side surfaces 10a.

[0020] Since the cool water pipe 6 is disposed to penetrate into the mechanical chamber 10, installation work for an external pipe can be eliminated and an installation space for the cool water pipe 6 does not need to be secured around the heat source device RS. Accordingly, the heat source device RS can be easily installed in a limited installation space on a roof or in a mechanical chamber.

[0021] A configuration of the condenser 2 will be described.

[0022] Fig. 4 is a perspective view of a condenser of the heat source device according to Embodiment 1.

[0023] As illustrated in Fig. 4, the condenser 2 is a fin and tube heat exchanger that is made up of flat tubes 2a having openings of a plurality of refrigerant flow paths 2b and heat transfer fins 2c formed in a flat plate shape and connected between the adjacent flat tubes 2a. The flat tube 2a and the heat transfer fin 2c are made of a material such as copper or aluminum and are thermally connected to each other.

[0024] Since the flat tubes 2a can be arranged at a smaller pitch than that of circular tubes, the flat tubes 2a can be densely arranged in the fin and tube heat exchanger.

[0025] The following formula 1 expresses heat exchange performance ($A_o \cdot K$) of the overall heat exchanger, as:

$$1/A_o \cdot K = 1/A_o \cdot \alpha_{ao} + 1/A_c \cdot \alpha_c + 1/A_i \cdot \alpha_i \text{ (formula 1)}$$

where A_o is a heat transfer area on air side and K is a heat transfer coefficient of the heat exchanger on the basis of the outer surface area.

[0026] When A_o is a heat transfer area on air side and α_{ao} is a heat transfer coefficient on air side, a heat exchange performance ($A_o \cdot \alpha_{ao}$) on air side increases since the heat transfer area on air side A_o increases due to high installation density of the flat tubes 2a.

[0027] Further, a contact heat exchange performance ($A_c \cdot \alpha_c$) between the heat transfer fin 2c and the flat tube 2a increases since they are brazed and have a high heat transfer coefficient α_c .

[0028] When A_i is a heat transfer area on refrigerant side and α_i is a heat transfer coefficient on refrigerant side, an in-tube heat exchange performance ($A_i \cdot \alpha_i$) increases since the heat transfer area A_i increases due to high installation density of the flat tubes 2a and a plurality of refrigerant flow paths 2b.

[0029] Therefore, since a heat exchange performance ($A_o \cdot K$) of the overall heat exchanger increases, the condenser 2 can be reduced in size compared with the heat exchanger of the same heat exchange capacity that uses a circular tube as a heat transfer tube. Further, since the amount of refrigerant filled in a refrigeration cycle is also reduced, a refrigerant container such as an accumulator can be reduced in size, and thus the heat source device RS can be reduced in size.

[0030] Accordingly, the heat source device RS can be easily installed in a limited installation space on a roof or in a mechanical chamber.

[0031] Further, as in the present embodiment, in a top flow type heat source device RS in which the air-cooled condenser fan 3 is disposed on the top of the heat exchange chamber 11, a distance between the air-cooled condenser fan 3 and the lower stage of the condenser 2 increases with increase in size of the condenser 2. Accordingly, the heat exchange air amount in the lower stage decreases, which lowers the performance. However, by decreasing the size of the condenser 2, distribution of the heat exchange air amount can be maintained within a predetermined range, thereby suppressing decrease in heat exchange performance.

[0032] Next, an operation of the heat source device RS according to Embodiment 1 will be described.

[0033] When an actuating signal is inputted to the cool and hot water supply system, a cool water pump 7 provided in the cool water pipe 6 that is connected to the heat source device RS is first actuated.

[0034] Then, the compressor 1 and the air-cooled condenser fan 3 mounted in the heat source device RS are actuated.

[0035] The compressor 1 compresses low pressure gas refrigerant into high pressure gas refrigerant. The gas from the compressor 1 is fed to the condenser 2 via an oil separator (not shown in the figure). The type of the compressor 1 is not specifically limited, and compressors such as a scroll compressor, a rotary compressor, and a screw compressor may be used as the compressor 1. The compressor 1 is configured to control the capacity thereof, for example, by combining control of the number of a plurality of compressors and control of rotational speed of a single compressor.

[0036] The condenser 2 exchanges heat between high pressure gas refrigerant received from the compressor 1 and external air to cool and thus condense and liquify the refrigerant. The condenser 2 is an air-cooled heat exchanger which includes the air-cooled condenser fan 3. When the air-cooled condenser fan 3 is actuated, external air passes through

the condenser 2, is subjected to heat exchange, and flows into the heat exchange chamber 11. Then, the external air is exhausted upward by the air-cooled condenser fan 3 disposed on the top plate 11 a of the heat exchange chamber 11.

[0037] The liquid refrigerant condensed by the condenser 2 is fed to the expansion valve 4. The expansion valve 4 is configured to perform a closing function, a flow control function by adjustment of opening degree in accordance with cooling load of the evaporator 5, and a decompressing and expansion function by a single valve. The opening degree of the expansion valve 4 is controlled so that the degree of superheat of outlet refrigerant of the evaporator 5 becomes constant by a temperature sensor (not shown in the figure) and a pressure sensor (not shown in the figure) that detect a refrigerant temperature and a refrigerant pressure on a downstream side of the evaporator 5, and a controller that transmits a signal of those sensors.

[0038] The expansion valve 4 decreases the pressure of refrigerant by allowing the liquid refrigerant condensed by the condenser 2 to pass through. The evaporator 5 is a heat exchanger that takes heat from water (heat medium) on a secondary side by evaporation of refrigerant and generates cool water. The evaporator 5 is an indirect heat exchanger that includes a refrigerant flow path and a water flow path and is configured to exchange heat between refrigerant and water in a non-contact manner. The evaporator 5 of this embodiment is, for example, a plate type heat exchanger.

[0039] Refrigerant gasified by the evaporator 5 is fed back to the compressor 1 via an accumulator (not shown in the figure). With the above configuration, the thermal circuit of the heat source device RS of the present embodiment supplies cool water into the cool and hot water supply system.

[0040] In the above description of the heat source device RS according to Embodiment 1, cool water is obtained from the heat source device RS as a heat medium. However, a four-way valve may be provided in the refrigeration cycle apparatus to form a heat pump cycle by switching the four-way valve, and the condenser 2 functions as an evaporator and the evaporator 5 functions as a condenser to obtain hot water.

[0041] Next, a heat source system in which a plurality of heat source devices RS according to Embodiment 1 are connected will be described.

[0042] Fig. 5 is a configuration diagram illustrating a thermal circuit in which a plurality of heat source devices according to Embodiment 1 are connected.

[0043] Fig. 6 is a side sectional view in which a plurality of heat source devices according to Embodiment 1 are connected.

[0044] Fig. 7 is a front sectional view in which a plurality of heat source devices according to another example of Embodiment 1 are connected.

[0045] As illustrated in Fig. 5, a plurality of heat source devices RS according to Embodiment 1 can be used in a manner of connecting one another. A portion of the thermal circuit enclosed by the dotted line indicates a single unit of the heat source device RS.

[0046] The cool water pipe 6 is connected through the heat source devices RS to serve as a thermal circuit. That is, the evaporators 5 are connected to the cool water inlet pipe 6a in parallel so that cool water flows from the cool water inlet pipe 6a, branches into the respective evaporators 5, and is cooled therein. The cool water cooled in the evaporators 5 flows into the cool water outlet pipe 6b, merges together at each heat source device RS, and is discharged from the most downstream heat source device RS.

[0047] Next, a connection position of the cool water pipe 6 when a plurality of heat source devices RS are connected will be described.

[0048] As described above, the cool water pipe 6 is disposed to penetrate the mechanical chamber 10 of the heat source device RS in a horizontal direction in a side view, one end of the cool water inlet pipe 6a and one end of the cool water outlet pipe 6b are disposed to protrude from one of opposite side surfaces 10a of the mechanical chamber 10 to the outside of the mechanical chamber 10, and the other end of the cool water inlet pipe 6a and the other end of the cool water outlet pipe 6b are housed in the mechanical chamber 10 inside the other of the opposite side surfaces 10a.

[0049] Accordingly, as illustrated in Fig. 6, a connecting section 6c of the cool water pipe 6 is located in the mechanical chamber 10. The connecting section 6c may be a generally available steel pipe joint that may be appropriately selected from, for example, a socket or a union threaded onto an external thread of a steel pipe, and a flange joint if the opening diameter of the cool water pipe 6 is large. Further, each end of the cool water inlet pipe 6a and the cool water outlet pipe 6b that is not connected to the external cool water pipe 6 is closed by a plug to prevent cool water, which is a heat medium, from flowing out, thereby providing a water sealing.

[0050] Further, a flexible joint having flexibility may be disposed at the connecting section 6c. The flexible joint may be of a known type, such as a bellows type made of a rubber or a braided type made of a stainless steel.

[0051] Accordingly, since a space is provided in the mechanical chamber 10 to house the connecting section 6c of the cool water pipe 6, the connecting section 6c having a large opening diameter is not exposed outside the heat source device RS, and accordingly, pipes are orderly laid out around the heat source device RS. Moreover, on-site installation of the cool water pipe 6 around the heat source device RS is eliminated, which contributes to minimization of installation space.

[0052] In connection of a plurality of heat source devices RS, the connecting sections 6c of the cool water pipe 6 are

designed to be positioned at predetermined positions. Accordingly, positioning of the heat source devices RS can be easy and air for heat exchange can flow as designed, ensuring a rated capacity of the heat source devices RS. Further, since the cool water pipe 6 protrudes from one of surfaces of the mechanical chamber 10, an installation direction of the heat source device RS can be easily recognized during installation work.

[0053] Moreover, since a flexible joint is disposed at the connecting section 6c, even if pipe axes of the cool water pipes 6 of the adjacent heat source devices RS are slightly misaligned in connection of the pipes, the position can be adjusted within the range of flexibility of the flexible joint.

[0054] The above configuration example has been described in which the cool water pipe 6 penetrates the mechanical chamber 10 in a direction of side view of the heat source device RS as illustrated in Fig. 6. However, as illustrated in Fig. 7, a configuration, in which the cool water pipe 6 penetrates the mechanical chamber 10 in a direction of front view of the heat source device RS may also be applicable.

[0055] In this case as well, since the connecting section 6c is disposed in the mechanical chamber 10, the same effect as that of the above example can be achieved.

Embodiment 2

[0056] The heat source device RS according to Embodiment 2 has the same basic configuration as that of the heat source device RS according to Embodiment 1 except the position of the end of the cool water pipe 6 with respect to the mechanical chamber 10.

[0057] Accordingly, the position of the end of the cool water pipe 6 of the heat source device RS according to Embodiment 2 will be described.

[0058] Fig. 8 is a side sectional view in which a plurality of heat source devices according to Embodiment 2 are connected.

[0059] Fig. 9 is a front sectional view in which a plurality of heat source devices according to another example of Embodiment 2 are connected.

[0060] In Fig. 8, one end of the cool water inlet pipe 6a protrudes from a left side surface of the mechanical chamber 10 in the drawing, and the other end of the cool water inlet pipe 6a is located in the mechanical chamber 10.

[0061] Further, one end of the cool water outlet pipe 6b is located in the mechanical chamber 10 in the drawing, while the other end of the cool water outlet pipe 6b protrudes from a right side surface of the mechanical chamber 10.

[0062] That is, the cool water inlet pipe 6a and the cool water outlet pipe 6b protrude from the mechanical chamber 10 in different directions.

[0063] Accordingly, since a space is provided in the mechanical chamber 10 to house the connecting section 6c of the cool water pipe 6, the connecting section 6c having a large opening diameter is not exposed outside the heat source device RS, and accordingly, pipes are orderly laid out around the heat source device RS, similarly to Embodiment 1.

[0064] Moreover, when the cool water inlet pipe 6a of the heat source device RS on the most upstream side is disposed to penetrate from the mechanical chamber 10, only the cool water outlet pipe 6b of the heat source device RS on the most downstream side protrudes from the mechanical chamber 10. Accordingly, the cool water inlet pipe 6a and the cool water outlet pipe 6b can be connected to the cool water pipe 6 of an inlet side and the cool water pipe 6 of an outlet side, respectively, from the outside of the mechanical chamber 10. Since the heat source device RS on the most upstream side does not need to be connected to the cool water pipe 6 of an outlet side and the heat source device RS on the most downstream side does not need to be connected to the cool water pipe 6 of an inlet side, an unnecessary connecting section 6c of the cool water pipe 6 can be prevented from being exposed to the outside of the mechanical chamber 10. Accordingly, pipes are orderly laid out, and an unnecessary connecting section 6c of the cool water pipe 6 is not exposed to the outside in terms of design as well.

[0065] The above configuration example has been described in which the cool water pipe 6 penetrates the mechanical chamber 10 in a direction of side view of the heat source device RS as illustrated in Fig. 8. However, as illustrated in Fig. 9, a configuration, in which the cool water pipe 6 penetrates the mechanical chamber 10 in a direction of front view of the heat source device RS may also be applicable.

[0066] In this case as well, since the connecting section 6c is disposed in the mechanical chamber 10, the same effect as that of the above example can be achieved.

Embodiment 3

[0067] The heat source device RS according to Embodiment 3 has the same basic configuration as that of the heat source device RS according to Embodiment 1 except the position of the end of the cool water pipe 6 with respect to the mechanical chamber 10.

[0068] Accordingly, the position of the end of the cool water pipe 6 of the heat source device RS according to Embodiment 3 will be described.

[0069] Fig. 10 is a side sectional view in which a plurality of heat source devices according to Embodiment 3 are connected.

[0070] Fig. 11 is a front sectional view in which a plurality of heat source devices according to another example of Embodiment 3 are connected.

[0071] In Fig. 10, both ends of the cool water inlet pipe 6a are located in the mechanical chamber 10 in the drawing.

[0072] Further, both ends of the cool water outlet pipe 6b are also located in the mechanical chamber 10 in the drawing.

[0073] That is, four ends of the cool water inlet pipe 6a and the cool water outlet pipe 6b are located in the mechanical chamber 10.

[0074] The adjacent connecting sections 6c are connected to each other with a short pipe 6d interposed therebetween.

[0075] Further, instead of the short pipe 6d, a flexible joint having flexibility can be used. The flexible joint may be of a known type, such as a bellows type made of a rubber or a braided type made of a stainless steel.

[0076] Accordingly, since a space is provided in the mechanical chamber 10 to house the connecting section 6c of the cool water pipe 6, the connecting section 6c having a large opening diameter is not exposed outside the heat source device RS, and accordingly, pipes are orderly laid out around the heat source device RS, similarly to Embodiment 1.

[0077] Moreover, when a flexible joint is disposed between the connecting sections 6c, even if pipe axes of the cool water pipes 6 of the adjacent heat source devices RS are slightly misaligned in connection of the pipes, the position can be adjusted within the range of flexibility of the flexible joint.

[0078] The above configuration example has been described in which the cool water pipe 6 penetrates the mechanical chamber 10 in a direction of side view of the heat source device RS as illustrated in Fig. 10. However, as illustrated in Fig. 11, a configuration, in which the cool water pipe 6 penetrates the mechanical chamber 10 in a direction of front view of the heat source device RS may also be applicable.

[0079] In this case as well, since the connecting section 6c is disposed in the mechanical chamber 10, the same effect as that of the above example can be achieved.

[0080] Further, in Embodiments 1 to 3 described above, the ends of the cool water pipes 6 are located at different positions with respect to the mechanical chamber 10. However, the heat source system may also be provided in which the heat source devices RS of Embodiments 1 to 3 are combined as appropriate and connected.

[0081] The condenser 2 described in Embodiments 1 to 3 corresponds to a heat source heat exchanger of the present invention.

[0082] Similarly, the evaporator 5 corresponds to a heat medium heat exchanger, the cool water pipe 6 corresponds to a heat medium pipe, and the side surface 10a corresponds to a side wall section.

Reference Signs List

[0083] 1 compressor 2 condenser (heat source heat exchanger) 2a flat tube 2b refrigerant flow path 2c heat transfer fin 3 air-cooled condenser fan, 4 expansion valve 5 evaporator (heat medium heat exchanger) 6 cool water pipe (heat medium pipe) 6a cool water inlet pipe 6b cool water outlet pipe 6c connecting section 6d short pipe 7 cool water pump 10 mechanical chamber 10a side surface (side wall surface) 11 heat exchange chamber 11 a top plate RS heat source device

Claims

1. A heat source device having a refrigeration cycle in which a compressor, a heat source heat exchanger, an expansion valve, and a heat medium heat exchanger are connected, the heat source device comprising:

a heat exchange chamber that houses at least the heat source heat exchanger; and
a mechanical chamber that houses at least the compressor and the heat medium heat exchanger, wherein the heat medium heat exchanger is connected to a heat medium pipe,
one end of the heat medium pipe is located inside the mechanical chamber, and
the other end of the heat medium pipe is located outside the mechanical chamber.

2. The heat source device of claim 1, wherein
the heat medium pipe includes a first heat medium pipe and a second heat medium pipe,
the mechanical chamber has a first side wall surface and a second side wall surface which are opposite to each other,
one end of the first heat medium pipe is located inside the first side wall surface of the mechanical chamber,
the other end of the first heat medium pipe is located outside the second side wall surface of the mechanical chamber,
one end of the second heat medium pipe is located inside the first side wall surface of the mechanical chamber, and
the other end of the second heat medium pipe is located outside the second side wall surface of the mechanical

chamber.

3. The heat source device of claim 1, wherein
the heat medium pipe includes a first heat medium pipe and a second heat medium pipe,
the mechanical chamber has a first side wall surface and a second side wall surface which are opposite to each other,
the one end of the first heat medium pipe is located inside the first side wall surface of the mechanical chamber,
the other end of the first heat medium pipe is located outside the second side wall surface of the mechanical chamber,
the one end of the second heat medium pipe is located outside the first side wall surface of the mechanical chamber,
and
the other end of the second heat medium pipe is located inside the second side wall surface of the mechanical chamber.
4. The heat source device of claims 2 or 3, wherein
the first heat medium pipe is a heat medium inlet pipe that is configured to supply a heat medium to the heat medium heat exchanger and
the second heat medium pipe is a heat medium outlet pipe that is configured to discharge the heat medium after heat exchange from the heat medium heat exchanger.
5. The heat source device of any one of claims 1 to 4, wherein the heat source heat exchanger is a fin and tube heat exchanger that uses a flat tube as a heat transfer tube.
6. A heat source system in which a plurality of heat source devices of claim 1 or claim 5 as dependent on claim 1 are connected, wherein
the one end of a heat medium pipe is connected to the other end of a heat medium pipe adjacent to the one end at a connecting section.
7. The heat source system of claim 6, wherein the connecting section is provided with a flexible joint having flexibility.
8. The heat source system in which a plurality of heat source devices of claim 2 or 3 or claim 4 or 5 as dependent on claim 2 or 3 are connected, wherein
the one end of a first heat medium pipe is connected to the other end of a first heat medium pipe adjacent to the one end at a first connecting section and
the one end of a second heat medium pipe is connected to the other end of a second heat medium pipe adjacent to the one end at a second connecting section in the plurality of the heat source devices.
9. The heat source system of claim 8, wherein the first connecting section and the second connecting section are provided with a flexible joint having flexibility.

FIG. 1

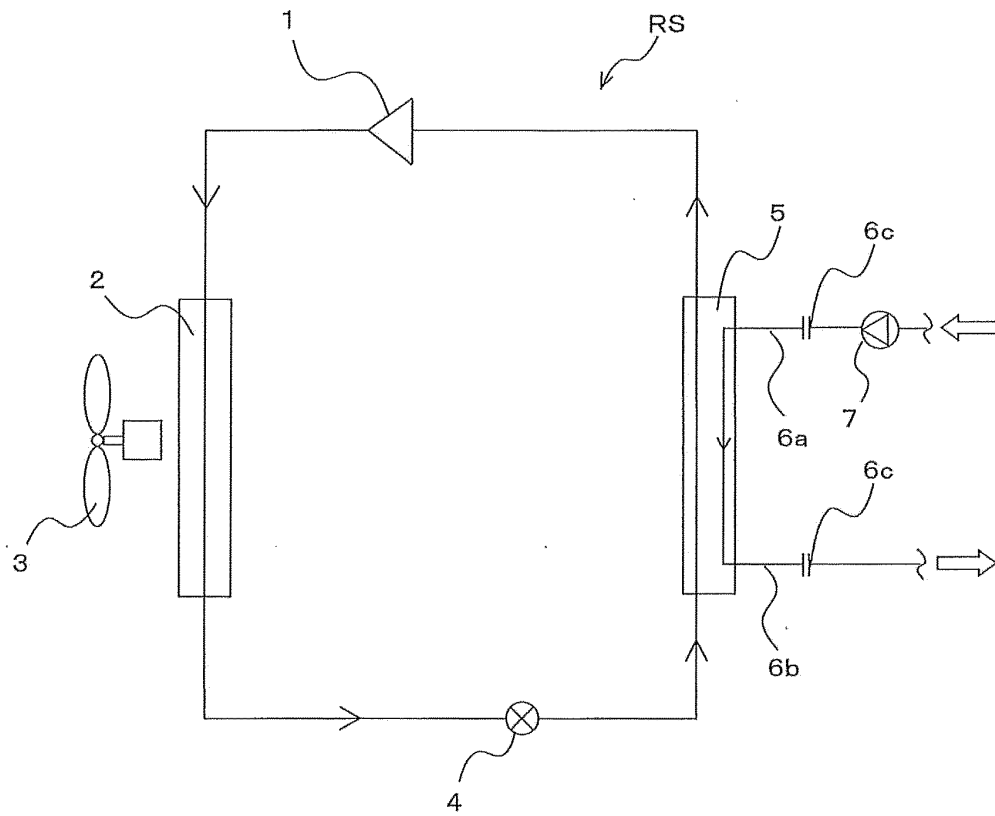


FIG. 2

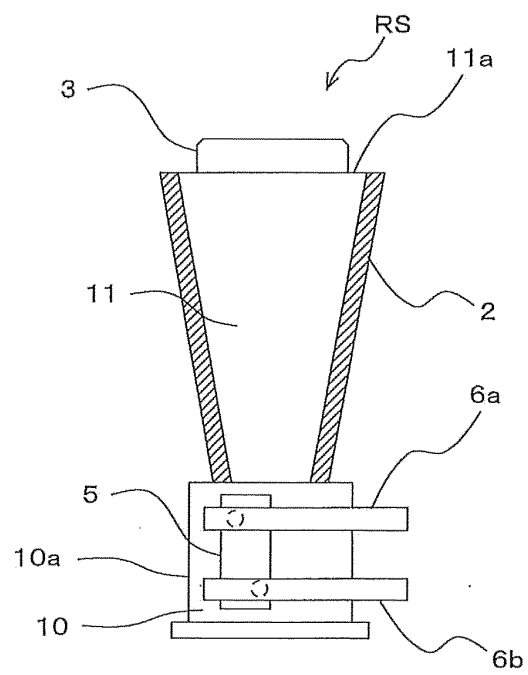


FIG. 3

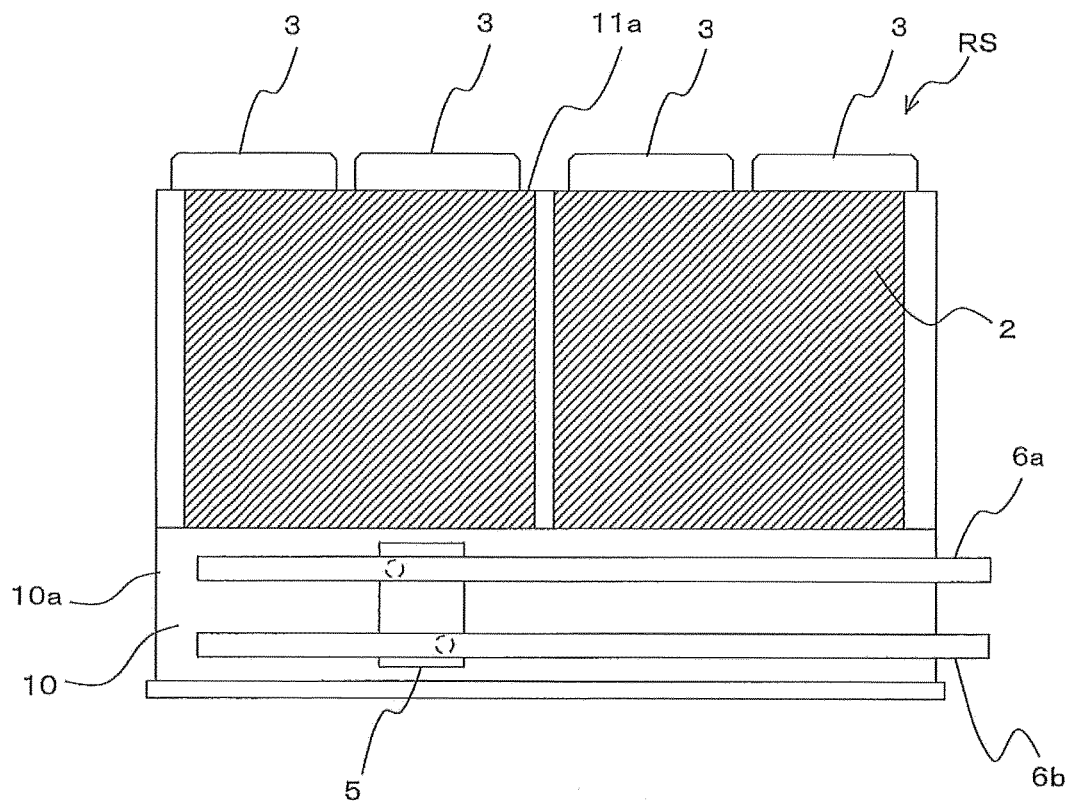


FIG. 4

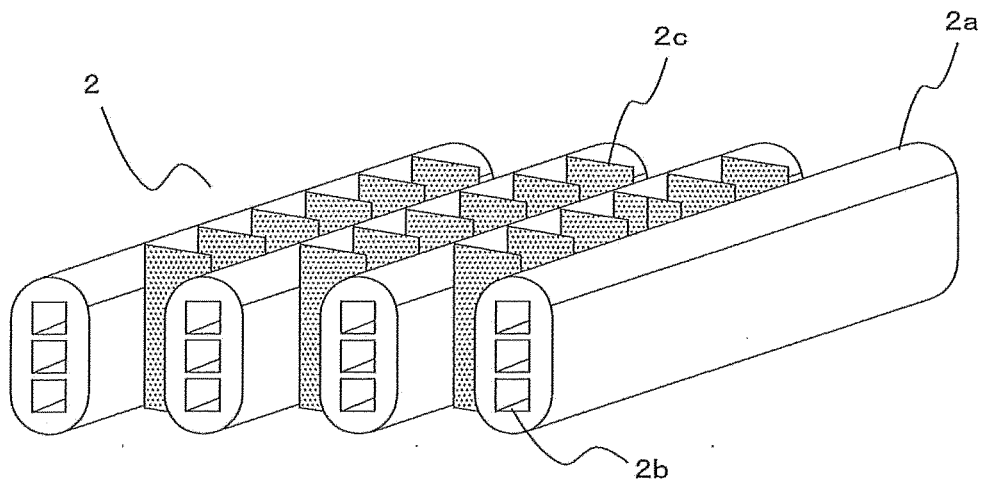


FIG. 5

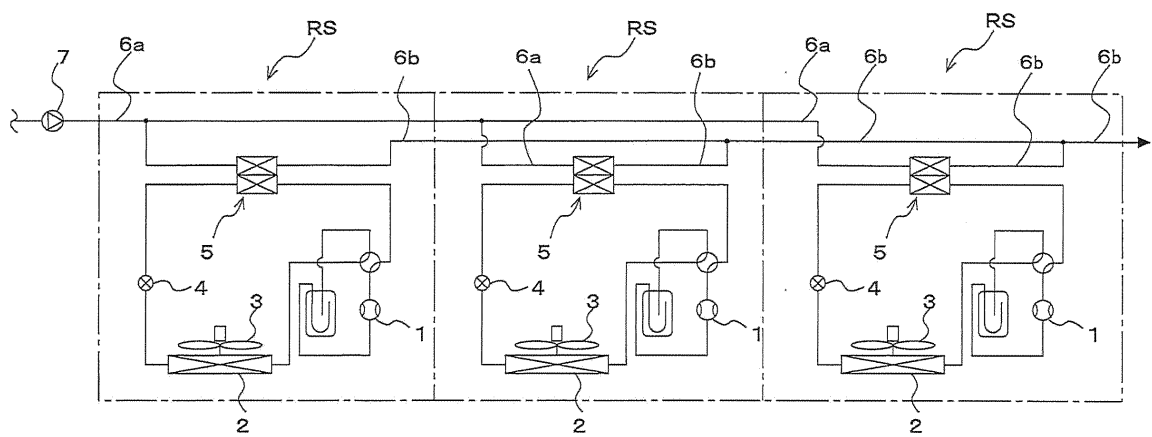


FIG. 6

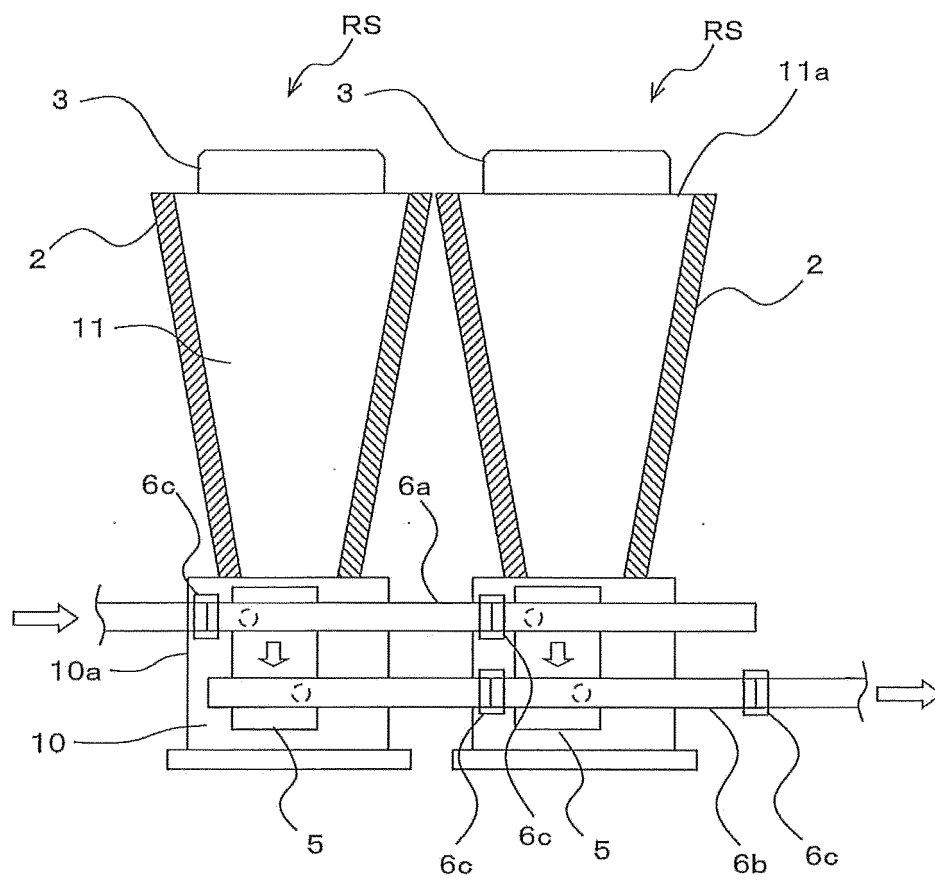


FIG. 7

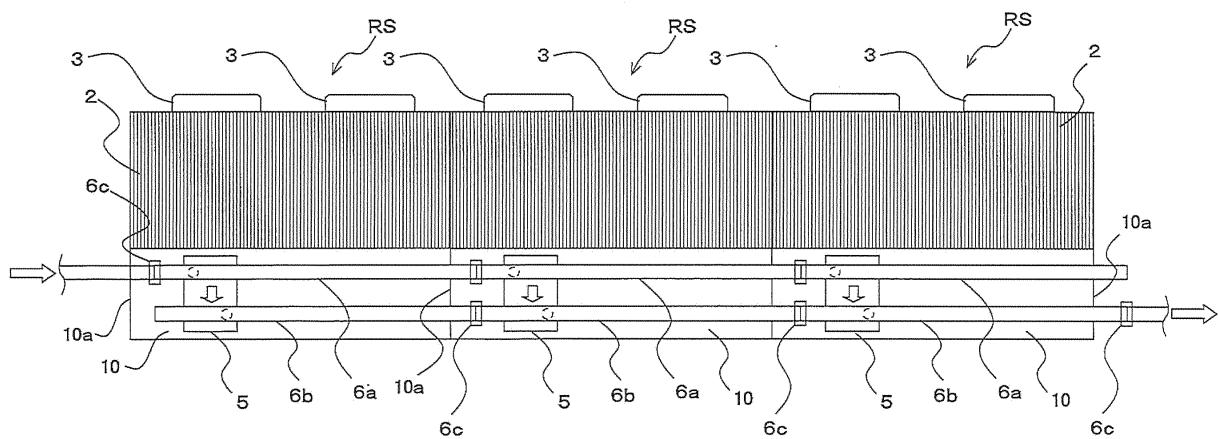


FIG. 8

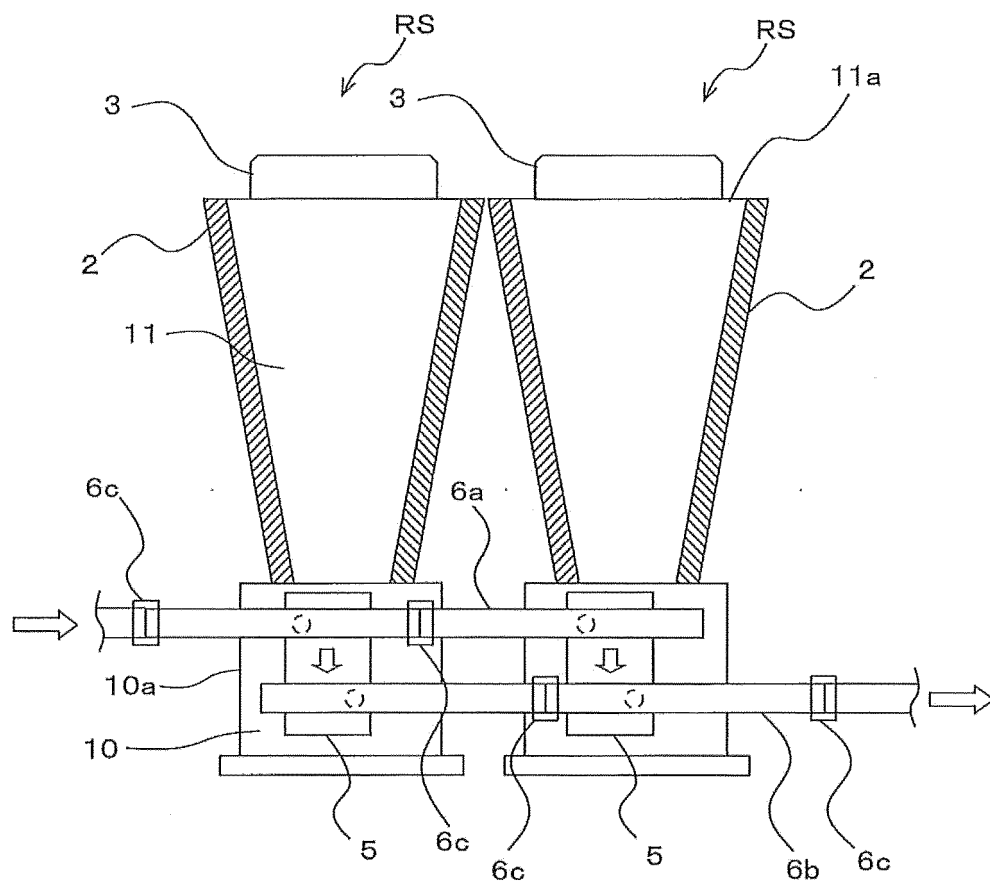


FIG. 9

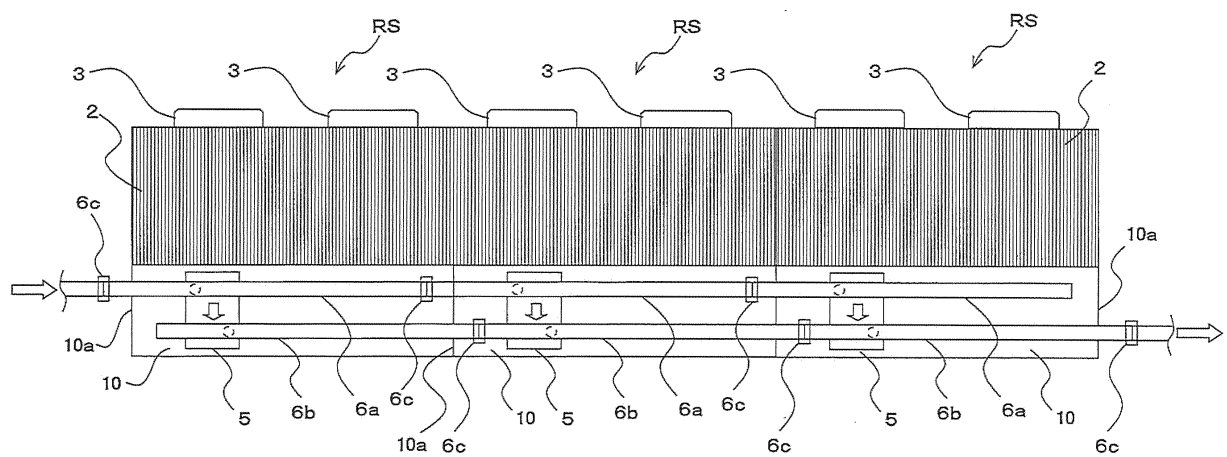


FIG. 10

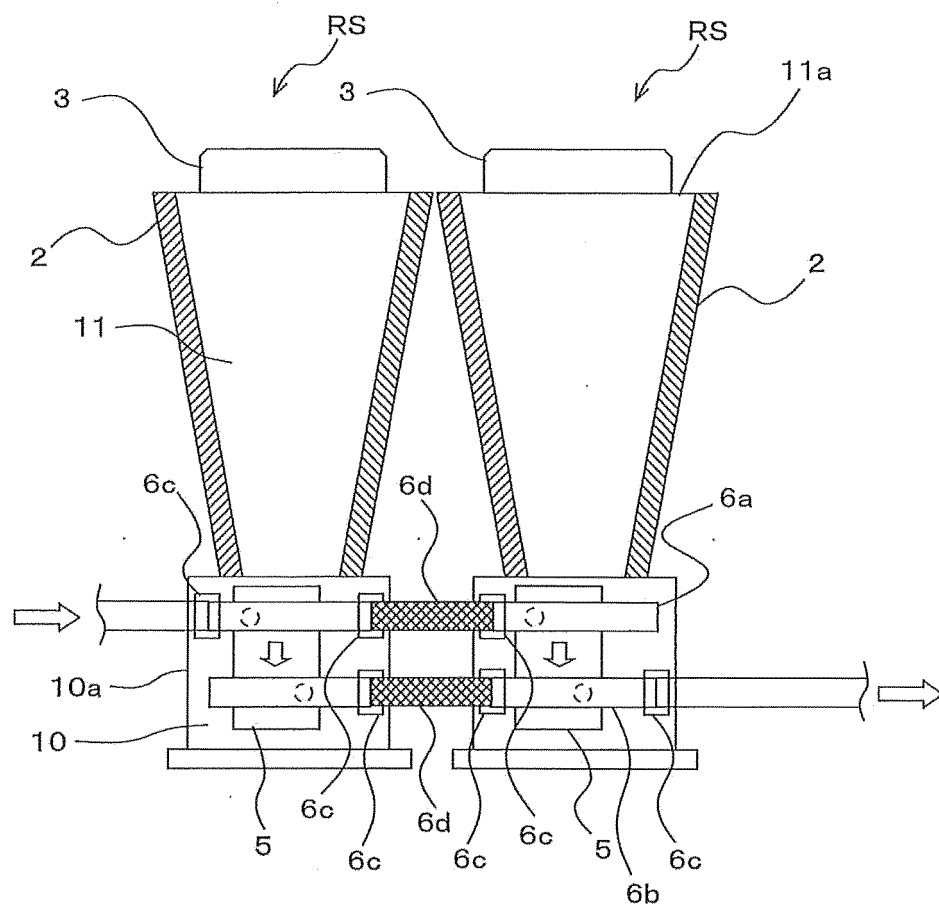
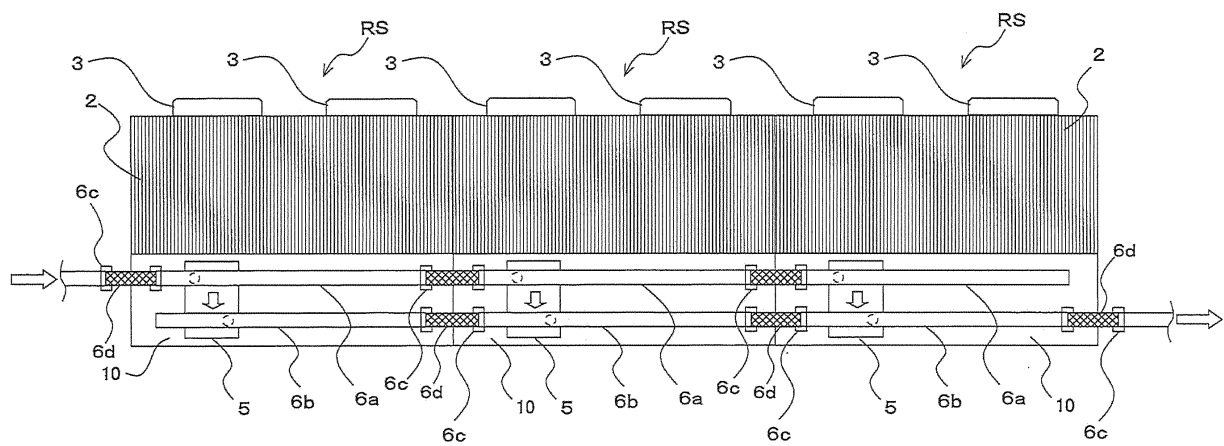


FIG. 11



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2014/067620

A. CLASSIFICATION OF SUBJECT MATTER

F25B1/00(2006.01)i, F24F1/28(2011.01)i, F24F1/30(2011.01)i, F25B13/00
(2006.01)i, F25B29/00(2006.01)i

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)
F25B1/00, F24F1/28, F24F1/30, F25B13/00, F25B29/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2014
Kokai Jitsuyo Shinan Koho 1971-2014 Toroku Jitsuyo Shinan Koho 1994-2014

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2012/0131935 A1 (LG ELECTRONICS INC.), 31 May 2012 (31.05.2012), paragraphs [0007] to [0012], [0036] to [0042]; fig. 1, 3 & EP 2431677 A2 & WO 2010/131874 A2 & KR 10-2010-0121961 A & CN 102460029 A	1-9
Y	US 2008/0127662 A1 (Michael E. Stanfield), 05 June 2008 (05.06.2008), paragraphs [0057], [0074]; fig. 4 to 8, 20, 24 & WO 2007/149473 A2 & MX 2008016457 A	1-9
Y	JP 2003-279194 A (Denso Corp.), 02 October 2003 (02.10.2003), paragraphs [0018], [0034]; fig. 2, 4, 5 (Family: none)	5-9

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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Date of the actual completion of the international search
12 September, 2014 (12.09.14)

Date of mailing of the international search report
30 September, 2014 (30.09.14)

Name and mailing address of the ISA/
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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2014/067620

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4991876 A (EuroFlex S.A.), 12 February 1991 (12.02.1991), column 2, line 56 to column 3, line 9; claim 7 (column 12, line 36 to column 13, line 45) & CA 1307552 A	7, 9
A	US 2009/0151388 A1 (Mark PLATT), 18 June 2009 (18.06.2009), entire text; all drawings (Family: none)	1
A	US 2011/0197617 A1 (Bonchang HWANG), 18 August 2011 (18.08.2011), entire text; all drawings & KR 10-2011-0094503 A	1
A	JP 8-12023 B2 (Multistack International Ltd.), 07 February 1996 (07.02.1996), entire text; all drawings & US 4852362 A & EP 190167 A & WO 1986/000977 A1 & DE 3582152 D & SU 1558311 A & NO 861133 A & NZ 212762 A & PH 24213 A & AU 4601085 A & ES 545468 A & FI 861054 A & BR 8506838 A & CA 1280599 A & DK 131486 A & EG 17918 A & HK 9692 A & IN 165547 A & ZA 8505370 A & SG 9392 G & MA 20493 A & AR 241957 A & KR 10-1994-0001585 B & AT 61656 E	1

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REFERENCES CITED IN THE DESCRIPTION

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