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(72) Inventors:
• **Takei, Hidenori**
Ora-gun Gunma (JP)
• **Arai, Hiroshi**
Kiryu-shi Gunma (JP)
• **Tsuchiya, Yoshiro**
Ota-shi Gunma (JP)

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(74) Representative: **Glawe, Delfs, Moll & Partner**
Patentanwälte
Postfach 26 01 62
80058 München (DE)

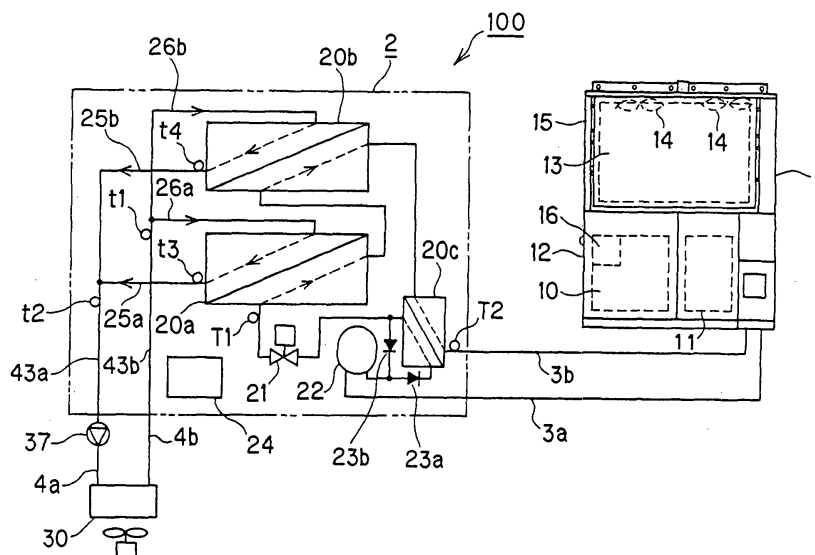
(71) Applicant: **Sanyo Electric Co., Ltd.**
Moriguchi-shi Osaka (JP)

(54) **Refrigerating machine having refrigerant/water heat exchanger**

(57) Plural plate type refrigerant/water heat exchangers 20a, 20b are connected in parallel to a cold/hot water circuit containing cold/hot water pipes 4a, 4b connected to a use-side heat exchanger 30, and also they are connected in series to a refrigerant circuit containing refrigerant pipes 3a, 3b connected to a heat source unit 1. Furthermore, there are provided a refrigerant heat exchanger 20c for heat-exchange refrigerant flowing at the upstream side of the refrigerant/water heat

exchangers 20a, 20b with refrigerant flowing at the downstream side thereof, a first refrigerant temperature sensor for detecting the temperature of the refrigerant flowing at the upstream side and a second refrigerant temperature sensor for detecting the temperature of the refrigerant flowing at the downstream side, and the refrigerating machine is operated by selecting and using the temperature detected by the first or second refrigerant temperature sensor.

FIG. 1



Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a refrigerating machine having a heat source unit and a heat exchanger unit connected to each other.

2. Description of the Related Art

[0002] There has been known a refrigerating machine equipped with a heat source having therein a compressor for compressing refrigerant and discharging the refrigerant thus compressed, and a heat exchange unit having a refrigerant/water heat exchanger for heat-exchanging the refrigerant supplied from the heat source with water to generate cold/hot water and supply the cold/hot water thus generated to a use-side heat exchanger, the heat source and the heat exchange unit being connected to each other (for example, see JP-A-08-233405 and JP-A-08-233398).

[0003] In the conventional refrigerating machine as described above, particularly in the refrigerating machine disclosed in JP-A-08-233405, a plurality of double-pipe type refrigerant/water heat exchangers each formed in a coil shape are provided as the refrigerant/water heat exchanger mounted in the heat exchange unit, and a cold/hot water circuit connected to the use-side heat exchanger and a refrigerant circuit connected to the heat source unit are connected to the plural refrigerant/water heat exchangers in parallel. The flow amount of the cold/hot water supplied to the use-side heat exchanger is secured because the cold/hot water is simultaneously supplied from each of the plural refrigerant/water heat exchangers connected to the cold/hot water circuit in parallel. However, the refrigerant supplied from the heat source unit cannot be efficiently heat-exchanged, and in order to solve this problem, the length over which the cold/hot water and the refrigerant are heat-exchanged with each other must be increased. That is, each of the plural refrigerant/water heat exchangers must be designed in a large size, and thus the heat exchanger unit cannot be designed in a compact size, so that it has been impossible to miniaturize the refrigerating machine.

[0004] Furthermore, the double-pipe type refrigerant/water heat exchangers are disposed to be stacked in the vertical direction, and thus the center-of-gravity position is high, so that there is such a risk that these refrigerant/water heat exchangers may fall down when they are transported or set up. In addition, the refrigerant is made to flow between the inner and outer tubes of each double-pipe type heat exchanger and the cold/hot water is made to flow in the inner pipe in consideration of the flow resistance and the heat exchange efficiency. Therefore, when cold water is supplied from the heat

exchange unit to the use-side heat exchanger, the temperature sensor must be inserted in the inner tube to carry out an antifreeze operation, and it is not easy to process the heat exchanger.

[0005] Still furthermore, in the refrigerating machine described in the above publication, heat insulating materials or the like are provided to the external packages of control devices for controlling the heat source unit and the heat exchange unit to prevent the inside of each control being dewed. Particularly in the heat exchange unit for supplying cold/hot water, the refrigerant/water heat exchangers accommodated are varied in temperature irrespective of the ambient temperature by driving the heat source unit, and thus the heat-exchanger side control device accommodated in the heat exchange unit is liable to be dewed, so that sufficient insulation must be carried out on the control device concerned, result in increase of the cost.

[0006] Furthermore, in the refrigerating machine disclosed in JP-A-08-233398, only both the temperature at the going side and the temperature at the return side of the cold/hot water supplied from the heat exchange unit to the use-side heat exchanger are detected, so that it is merely possible to carry out only the power-weighted operation. Furthermore, since supercooling of refrigerant supplied from the heat source unit to the heat exchange unit cannot be sufficiently performed, so that the refrigerant cannot be heat-exchanged efficiently.

SUMMARY OF THE INVENTION

[0007] Therefore, the present invention has been implemented in view of the foregoing situation, and has a first object to provide a refrigerating machine having a compact and highly-efficient heat exchange unit.

[0008] Furthermore, the present invention has a second object to provide a refrigerating machine having a heat exchange unit which can be prevented from falling down when it is transported or set up, and also easily preventing freezing of cold/hot water supplied to a use-side heat exchanger.

[0009] Still furthermore, the present invention has a third object to provide a refrigerating machine which can prevent dewing of a control device and suppress cost-up.

[0010] Still furthermore, the present invention has a fourth object to provide a refrigerating machine having a heat exchange unit which can enhance heat-exchange efficiency and selectively carry out each of a power-weighted operation and an energy-saving-weighted operation.

[0011] In order to attain the above object, a refrigerating machine (100) comprising a heat source unit (1) having a compressor (11) for compressing and discharging refrigerant and a heat exchange unit (2) having a heat exchanger for heat-exchanging the refrigerant and cold/hot water supplied to a use-side heat exchanger (30), is characterized in that the heat exchanger com-

prises a refrigerant/water heat exchanger constructed by plural plate type heat exchangers (20a, 20b).

[0012] Accordingly to the above construction, the refrigerant/water heat exchanger is constructed by the plural plate type heat exchangers, so that the heat exchange unit can be miniaturized and thus the refrigerating machine itself can be miniaturized.

[0013] Furthermore, the above refrigerating machine further comprises a refrigerating circuit through which the refrigerant supplied from the heat source unit (1) flows and a cold/hot water circuit through which the cold/hot water supplied to the use-side heat exchange (30) flows, wherein the plural plate type heat exchangers (20a, 20b) are connected to the refrigerant circuit in series so that the refrigerant successively flows through the plate type heat exchangers and is returned to the heat source unit (1), and the plural plate type heat exchangers (20a, 20b) are connected to the cold/hot water circuit in parallel so that the cold/hot water simultaneously flows through the plural plate type heat exchangers (20a, 20b) in parallel.

[0014] According to the above construction, the refrigerant is made to flow through the plural plate type heat exchangers sequentially (in series), and thus the heat exchange efficiency of the refrigerant can be enhanced. Furthermore, the cold/hot water supplied to the use-side heat exchanger is made to flow through the plural plate type heat exchangers in parallel, and thus the flow amount of the cold/hot water to be supplied to the use-side heat exchanger can be secured. In addition, the flow rate of the cold/hot water is reduced, and thus the plate type heat exchangers, etc. can be prevented from corroding.

[0015] Still furthermore, in the above refrigerating machine, the heat source unit (1) has a gas engine (1) and the compressor is driven by the gas engine.

[0016] According to the above construction, the compressor is driven by the engine using gas as fuel, and thus inexpensive gas can be used.

[0017] Still furthermore, in the above refrigerating machine, the heat source unit (1) and the heat exchanger (20a, 20b) in the heat exchange unit (2) are connected to each other through a refrigerant pipe (3a, 3b), and the heat exchanger (20a, 20b) in the heat exchange unit (2) and the use-side heat exchanger (30) are connected to each other through a water pipe and a circulating pump.

[0018] According to the above refrigerating machine, the refrigerant compressed and discharged by the compressor is circulated only in the heat source unit and the heat exchange unit, and thus the use amount of the refrigerant can be reduced.

[0019] Still furthermore, the above refrigerating machine further comprises a refrigerant heat exchanger (20c) for heat-exchanging the refrigerant supplied from the heat source unit (1) and the refrigerant returned to the heat source unit (1), and a receiver tank (22) for temporarily stocking the refrigerant circulated in the heat exchange unit (2), wherein the refrigerant/water heat ex-

changers (20a, 20b), the refrigerant heat exchanger (20c) and the receiver tank (22) are disposed so as to be substantially uniformly dispersed in the heat exchange unit (2).

[0020] According to the above refrigerating machine, the refrigerant/water heat exchangers, the refrigerant heat exchanger and the receiver tank are disposed in the heat exchange unit so as to be substantially uniformly disperse, so that the center-of-gravity position of the heat exchange unit can be located substantially at the center position of the heat exchange unit, and also the height position of the center of gravity can be lowered.

[0021] Still furthermore, in the above refrigerating machine, the number of the plural refrigerant/water heat exchangers is set to an even number, the even number of refrigerant/water heat exchangers are disposed so as to be substantially uniformly dispersed in the heat exchange unit, the refrigerant heat exchanger is disposed in the neighborhood of any one of the refrigerant/water heat exchangers (20a, 20b), and the receiver tank (22) is disposed at the opposite side to the refrigerant heat exchanger (20c) with respect to the center of the heat exchange unit (2).

[0022] According to the above refrigerating machine, an even number of refrigerant/water heat exchanges which are the heaviest elements are disposed uniformly in the heat exchange unit, the refrigerant heat exchanger which is the second heaviest element is disposed in the neighborhood of any one of the refrigerant/water heat exchangers, and the receiver tank which is substantially equal in weight to the refrigerant heat exchanger is disposed at the opposite side to the refrigerant heat exchanger with respect to the center of the heat exchange unit, whereby the center of gravity of the heat exchange unit can be easily set to substantially the center position.

[0023] Still furthermore, in the above refrigerating machine, the plural refrigerant/water heat exchangers, the refrigerant heat exchanger and the receiver tank are disposed in the neighborhood of the edge portion of the inside of the heat exchange unit so as to be substantially uniformly dispersed, and refrigerant outlet/inlet ports (34a, 34b, 53a, 53b) and cold/hot water outlet/inlet ports (35a, 35b, 54a, 54b) of each heat exchanger of the plural refrigerant/water heat exchangers (20a, 20b) and the refrigerant heat exchanger (20c) are disposed so as to confront refrigerant outlet/inlet ports and cold/hot water outlet/inlet ports of the other heat exchangers.

[0024] According to the above refrigerating machine, the plural refrigerant/water heat exchangers, the refrigerant heat exchanger and the receiver tank are disposed in the neighborhood of the edge portion in the heat exchange unit, the refrigerant outlet/inlet port and the cold/hot water outlet/inlet port of each heat exchanger of the refrigerant/water heat exchangers and the refrigerant heat exchanger are disposed so as to confront the refrigerant outlet/inlet ports and the cold/hot water outlet/inlet ports of the other heat exchangers, so that

only the refrigerant pipes, etc. connected to the heat exchangers, etc. are disposed at the center portion of the heat exchange unit. Therefore, a space for maintenance of the heat exchange unit can be provided at the center portion.

[0025] Still furthermore, each of the refrigerant/water heat exchangers comprises cold/hot water layers (33, 52) through which cold/hot water flows and refrigerant layers (32, 51) through which the refrigerant flows, the outermost layers (36a, 36b) of each of the refrigerant/water heat exchangers are set to cold/hot water layers, and a temperature sensor (t3, t4) for detecting the temperature of the cold/hot water flowing out from the refrigerant/water heat exchanger is provided in the neighborhood of the cold/hot water outlet port of the refrigerant/water heat exchanger.

[0026] According to the above refrigerating machine, the outermost layers in each refrigerant/water heat exchanger are set to the cold/hot water layers through which the cold/hot water flows, and the temperature sensor for detecting the temperature of the cold/hot water flowing out from the refrigerant/water heat exchanger is provided in the neighborhood of the cold/hot water outlet port of the refrigerant/water heat exchanger. Therefore, the temperature of the cold/hot water can be more accurately detected, and the cold/hot water can be prevented from being frozen.

[0027] Still furthermore, in the above refrigerating machine, the temperature sensor (t3, t4) is provided on the outer surface of the refrigerant/water heat exchanger in the neighborhood of the cold/hot water outlet port (35b) and subjected to a heat-insulation treatment to keep the temperature sensor (t3, t4) thermally insulated from the outside air.

[0028] According to the above refrigerating machine, the temperature sensor is provided on the outer surface of the refrigerant/water heat exchanger in the neighborhood of the cold/hot water outlet port of the refrigerant/water heat exchanger while being subjected to the heat insulation treatment. Therefore, the installation of the temperature sensor is easily carried out, and the temperature of the cold/hot water detected by the temperature sensor is not affected by the outside air.

[0029] Still furthermore, the above refrigerating machine further comprises a receiver tank (22) for temporarily stocking the refrigerant in the heat exchange unit, wherein the heat source unit (1) has a heat source side control device (16) for controlling the compressor (11), the heat exchange unit (2) has a heat exchange side control (24) device for controlling the refrigerant/water heat exchanger, and heat transfer means (44) is provided between the receiver tank (22) and the heat exchange side control device (24).

[0030] According to the above refrigerating machine, the receiver tank is provided in the heat exchange unit, and thus the amount of the refrigerant circulated in the heat exchange unit can be secured. When a trouble occurs in the heat source unit, the refrigerant at the heat

source unit side is withdrawn to the heat exchange unit so that repair, maintenance, etc. can be easily carried out. In addition, the heat transfer means is provided between the receiver tank and the heat exchange side control device, so that the heat insulation of the heat exchange side control device can be simplified.

[0031] Still furthermore, in the above refrigerating machine, the heat transfer means comprises a heat-transferable angle provided between a drum portion of the receiver tank and the side surface of the heat exchange side control device to transfer heat between the receiver tank and the heat exchange side control device.

[0032] According to the above refrigerating machine, the heat transfer means comprises the heat transferable angle provided between the drum portion of the receiver tank and the side surface of the heat exchange side control device, and thus the heat transfer can be easily performed.

[0033] Still furthermore, in the above refrigerating machine, the heat transfer means is formed by bringing a part of the side surface of the heat exchange side control device into surface contact with the outer peripheral surface of the receiver tank.

[0034] According to the above refrigerating machine, the heat transfer means is formed by bringing a part of the side surface of the heat exchange side control device into surface contact with the outer peripheral surface of the receiver tank, and thus the heat transfer can be easily performed without using an angle or the like.

[0035] Still furthermore, a refrigerating machine comprising a heat source unit (1) having a compressor (11) for compressing and discharging refrigerant, and a heat exchange unit (2) having a heat exchanger for heat-exchanging the refrigerant with cold/hot water supplied to a use-side heat exchanger (30), the heat source unit (1) and the heat exchange unit (2) being connected to each other, is characterized in that the heat exchange unit (2) is provided with a refrigerant/water heat exchanger (20a, 20b) for heat-exchanging the refrigerant supplied from the heat source unit (1) and the cold/hot water supplied to the use-side heat exchanger (30), a refrigerant heat exchanger (20c) for heat-exchanging refrigerant flowing at an upstream side of the refrigerant/water heat exchanger (20a, 20b) with refrigerant flowing at a downstream side of the refrigerant/water heat exchanger (20a, 20b), a first refrigerant temperature sensor (T1) for detecting the temperature of the refrigerant flowing at the upstream side and a second refrigerant temperature sensor (T2) for detecting the temperature of the refrigerant flowing at the downstream side, and the refrigerating machine is operated on the basis of selected one of the temperature detected by the first refrigerant temperature sensor (T1) and the temperature detected by the second refrigerant temperature sensor (T2).

[0036] According to the above refrigerating machine, the refrigerant heat exchanger for heat-exchanging the refrigerant flowing at the upstream side of the refrigerant/water heat exchangers with the refrigerant flowing

at the downstream side is provided in addition to the refrigerant/water heat exchangers for heat-exchanging the refrigerant supplied from the heat source unit with the cold/hot water supplied to the use-side heat exchanger. Therefore, the super-cooling of the refrigerant flowing into the refrigerant/water heat exchangers can be sufficiently performed, and thus the heat exchange efficiency of the refrigerant can be enhanced. In addition, the first refrigerant temperature sensor for detecting the temperature of the refrigerant flowing at the upstream side of the refrigerant heat exchanger and the second refrigerant temperature sensor for detecting the temperature of the refrigerant flowing at the downstream side are provided, and each of the power-weighted operation and the power-saving-weighted operation can be selectively performed by using selecting any one of the temperature detected by the first refrigerant temperature sensor and the temperature detected by the second refrigerant temperature sensor.

[0037] In the above refrigerating machine, the refrigerating machine is operated in a power-saving-weighted mode on the basis of the temperature of the refrigerant flowing at the upstream side of the refrigerant/water heat exchanger (20a, 20b) by selecting the temperature of the refrigerant detected by the first refrigerant temperature sensor (T1), and the refrigerating machine is operated in a power-weighted mode on the basis of the temperature of the refrigerant flowing at the downstream side of the refrigerant/water heat exchanger (20a, 20b) by selecting the temperature of the refrigerant detected by the second refrigerant temperature sensor (T2).

[0038] According to the above refrigerating machine, by selecting the temperature of the refrigerant detected by the first refrigerant temperature sensor, the temperature of the refrigerant flowing at the upstream side of the refrigerant heat exchanger is detected and the power-saving-weighted operation is carried out. Furthermore, by selecting the temperature of the refrigerant detected by the second refrigerant temperature sensor, the temperature of the refrigerant flowing at the downstream side of the refrigerant heat exchanger is detected and the power-weighted operation is carried out, so that the switching operation between the power-weighted operation and the power-saving-weighted operation can be easily performed without altering the software of the program for controlling the refrigerating machine.

[0039] Furthermore, in the above refrigerating machine, the selection of one of the temperature of the refrigerant detected by the first refrigerant temperature sensor and the temperature of the refrigerant detected by the second refrigerant temperature sensor is carried out by a switch provided in the heat source unit or by an operation switch provided to a remote controller for instructing the operation of the refrigerating machine.

[0040] According to the above refrigerating machine, the selection of one of the temperature of the refrigerant detected by the first refrigerant temperature sensor and the temperature of the refrigerant detected by the second refrigerant temperature sensor is carried out by a switch provided in the heat source unit or by an operation switch provided to a remote controller for instructing the operation of the refrigerating machine, and thus the selecting operation can be easily performed.

ond refrigerant temperature sensor is carried out by a switch provided in the heat source unit or by an operation switch provided to a remote controller for instructing the operation of the refrigerating machine, and thus the selecting operation can be easily performed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0041]

Fig. 1 is a diagram showing a system construction containing a refrigerant circuit of a refrigerating machine;

Fig. 2 is a development elevation of a refrigerant/water heat exchanger;

Fig. 3 is a development elevation of a refrigerant heat exchanger;

Fig. 4 is a diagram showing the structure of a heat exchange unit;

Figs. 5A and 5B are diagrams showing a receiver tank and a heat exchange side control device which are connected to each other; and

Fig. 6 is a diagram showing circulation of refrigerant and cold/hot water when cold water is supplied from the refrigerating machine.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0042] Preferred embodiments according to the present invention will be described hereunder with reference to the accompanying drawings.

[0043] Fig. 1 is a diagram showing a system construction containing a refrigerant circuit of a refrigerating machine to which the present invention is applied. A refrigerating machine 100 comprises a heat source unit 1 and a heat exchange unit 2 which are connected to each other through refrigerant pipes 3a, 3b.

[0044] A heat source unit 1 is equipped with an engine room containing therein a gas engine 10, a compressor 11 driven by the gas engine 10 and a heat-source side control device for controlling the gas engine 10, etc. and carrying out communications with a heat exchange side control device 24 of the heat exchange unit 2 described later, and the engine room is disposed on a base frame. Furthermore, a heat-radiation room 15 containing therein an outdoor heat exchanger 13, an air blowing fan 14 for blowing air to the outdoor heat exchanger 13, etc. is provided at the upper side of the engine room 12.

[0045] In the heat exchange unit 2 are mounted a plurality of refrigerant/water heat exchangers 20a, 20b of plate type heat exchangers, a refrigerant heat exchanger 20c, an electrically-driven expansion valve 21 for controlling the flow rate of refrigerant flowing through the refrigerant/water heat exchangers 20a, 20b and the refrigerant heat exchanger 20c, a receiver tank 22 for temporarily stocking the refrigerant, check valves 23a, 23b, and a heat exchange side control device 24 for adjusting

the opening degree of the electrically-driven expansion valve 21 on a temperature signal from various kinds of temperature sensors described later and making communications with a heat source side control device 16 of the heat source unit 1.

[0046] The connection arrangement of refrigerant pipes in the heat exchange unit 2 will be described. A refrigerant pipe 3a extending from the heat source unit 1 is connected to one end of the receiver tank 22, and the other end of the receiver tank 22 is connected to a first refrigerant inlet port 53a (see Fig. 3) of the refrigerant heat exchanger 20c through a check valve 23a. The check valve 23a is provided so that the refrigerant flows from the receiver tank 22 to the refrigerant heat exchanger 20c. Furthermore, the other end of the receiver tank 22 is connected to a check valve 23b whose one end is connected to a first refrigerant outlet port 53b (see Fig. 3) of the refrigerant heat exchanger 20c, and the check valve 23b is provided so that the refrigerant flows from the first refrigerant outlet port 53b of the refrigerant heat exchanger 20c to the other end of the receiver tank 22. Furthermore, the first refrigerant outlet port 53b of the refrigerant heat exchanger 20c is connected to a refrigerant inlet port 34a (see Fig. 2) of the refrigerant/water heat exchanger 20a through the electrically-driven expansion valve 21, and a refrigerant outlet port 34b (see Fig. 2) of the refrigerant/water heat exchanger 20a is connected to the refrigerant inlet port of the refrigerant/water heat exchanger 20b. The refrigerant outlet port of the refrigerant/water heat exchanger 20b is connected to a second refrigerant inlet port 54a (see Fig. 3) of the refrigerant heat exchanger 20c, and the second refrigerant outlet port 54b (see Fig. 3) of the refrigerant heat exchanger 20c is connected to the refrigerant pipe extending from the heat source unit 1. That is, the refrigerant/water heat exchangers 20a, 20b are connected in series to the refrigerant circuit.

[0047] Furthermore, cold/hot water pipes extend from the heat exchange unit 2, and are connected to a use-side heat exchanger 30 disposed in a room, for example. A cold/hot water pipe 25a extending from the cold/hot water outlet port 35b (see Fig. 2) of the refrigerant/water heat exchanger 20a is connected to a cold/hot water pipe 25b extending from the cold/hot water outlet port of the refrigerant/water heat exchanger 20b, and it is connected as the cold/hot water pipe 4a through the circulating pump 37 to the cold/hot water inlet port of the use-side heat exchanger 30. A cold/hot water pipe 26a extending from the cold/hot water inlet port 35a (see Fig. 2) of the refrigerant/water heat exchanger 20a is connected to a cold/hot water pipe 26b extending from the cold/hot water inlet port of the refrigerant/water heat exchanger 20b, and it is connected as the cold/hot water pipe 4b to the cold/hot water outlet port of the use-side heat exchanger 30a. That is, the refrigerant/water heat exchangers 20a, 20b are connected in parallel to the cold/hot water circuit connected to the use-side heat exchanger 30.

[0048] Accordingly, at the refrigerant circuit side for the refrigerant supplied from the heat source unit 1, a flow passage of the refrigerant to be heat-exchanged with the cold/hot water supplied from the heat exchange unit 2 to the user-side heat exchanger 30 can be set to be long, so that the heat exchange efficiency between the refrigerant and the cold/hot water can be enhanced. In addition, at the cold/hot water circuit side, the flow rate of the cold/hot water in the refrigerant/water heat exchangers 20a and 20b and the respective cold/hot water pipes thus connected can be reduced without reducing the flow amount of the cold/hot water supplied from the heat exchange unit 2 to the use-side heat exchanger 30, whereby the pipes, etc. can be prevented from being corroded by the cold/hot water. Furthermore, even when the flow amount of the cold/hot water circulated to the respective cold/hot water heat exchangers 20a and 20b is reduced, the flow amount of the cold/hot water supplied from the heat exchange unit 2 to the use-side heat exchanger 30 can be secured, so that the pipe diameter of each of the cold/hot water pipes 25a, 25b, 26a, 26b can be reduced. In addition, the piping can be performed by using copper pipes, so that pipes can be easily processed and thus the manufacturing cost can be reduced.

[0049] A refrigerant inlet port sensor (first refrigerant detecting temperature sensor) T1 is provided in the refrigerant pipe in the neighborhood of the refrigerant inlet port 34a of the refrigerant/water heat exchanger 20a, and a refrigerant outlet port sensor (second refrigerant temperature detecting sensor) T2 is provided in the refrigerant pipe 3b in the neighborhood of the second refrigerant outlet port 54b of the refrigerant/water heat exchanger 20c. A cold/hot water outlet port sensor t2 is provided at a position where the cold/hot water pipes 25a and 25b extending from the refrigerant/water heat exchangers 20a, 20b intercommunicate with each other, and a cold/hot water inlet port sensor t1 is provided at a position where the cold/hot water pipes 26a and 26b intercommunicate with each other. In addition, anti-freeze sensors (temperature sensors) t3, t4 are provided at the cold/hot outlet ports of the refrigerant/water heat exchangers 20a, 20b connected to the cold/hot water pipes 25a, 25b respectively, and the temperature signals detected by these temperature sensors are detected by the heat exchanger side control device 24.

[0050] Here, the refrigerant/water heat exchangers 20a, 20b, 20c and the respective sensors T1, T2, t1 to t4 will be described.

[0051] As shown in the development elevation of Fig. 2, the refrigerant/water heat exchanger 20a comprises tube plates 31a and 31b and plural partition plates 31c sandwiched between the pipe plates 31a and 31b, and it is designed so that refrigerant layers 32 through which refrigerant flows and cold/hot water layers 33 through which cold/hot water flows are alternately stacked several times over.

[0052] The refrigerant inlet port 34a and the cold/hot

water outlet port 35b are provided to the upper portion of the pipe plate 31a, and the refrigerant outlet port 34b and the cold/hot water inlet port 35a are provided to the lower portion of the pipe plate 31a. The refrigerant flowing from the refrigerant inlet port 34a into the refrigerant/water heat exchanger 20a flows into the refrigerant layers 32 which are intermittently arranged one by one, and are heat-exchanged with the cold/hot water while flowing through the refrigerant layers 32. Finally, the refrigerant thus heat-exchanged flows out from the refrigerant outlet port 34b. Likewise, the cold/hot water flowing from the cold/hot inlet port 35a flows into the cold/hot water layers 33 which are intermittently arranged one by one, and are heat-exchanged with the refrigerant while flowing through the cold/hot water layers 33 to be cooled or heated. Finally, the cold/hot water thus heat-exchanged flows out from the cold/hot water outlet port 35b.

[0053] The refrigerant/water heat exchanger 20a is designed so that the cold/hot water layers 33 are provided at the outermost layers 36a, 36b, and the anti-freeze sensor t3 is provided in the neighborhood of the cold/hot water outlet port 35b on the outer surface of the pipe plate 31a. The reason for the above arrangement of the anti-freeze sensor t3 is as follows. That is, when cold water is supplied from the heat exchange unit 2 to the use-side heat exchanger 30, the temperature of the cold/hot water in the neighborhood of the refrigerant inlet port 34a into which the refrigerant supplied from the heat source unit 1 flows and also in the neighborhood of the cold/hot water outlet port 35b is lowest. Therefore, the temperature of the cold water which is heat-exchanged with the refrigerant and cooled at this position is detected by using the anti-freeze sensor t3, it is judged on the basis of the temperature thus detected by a heat-exchange side control device 24 whether the cold water is frozen or not, and the judgment result is transmitted to the heat-source side control device 16 to control the operation of the gas engine 10 and the compressor 11, so that the freeze of the cold water can be surely prevented. Furthermore, it is preferable that the anti-freeze sensor t3 is provided in the outermost layer 36a in the neighborhood of the cold/hot outlet port 35b. However, the anti-freeze sensor t3 is actually provided on the outer surface of the pipe plate 31a because of difficulties in workability of the refrigerant/water heat exchanger 20a, and subjected to a heat-insulation treatment by using a heat-insulating material or the like to keep the anti-freeze sensor t3 thermally insulated from the outside air. The refrigerant/water heat exchanger 20b and the anti-freeze sensor t4 are designed in the same manner as the refrigerant/water heat exchanger 20a and the anti-freeze sensor t3, and thus the description thereof is omitted.

[0054] The refrigerant heat exchanger 20c will be described. As shown in Fig. 3, the refrigerant heat exchanger 20c has the same construction as the refrigerant/water heat exchanger 20a, 20b, and it comprises pipe plates 50a and 50b and plural partition plates 50c

sandwiched between the pipe plates 50a and 50b. The refrigerant heat exchanger 20c is designed so that first refrigerant layers 51 through which refrigerant flowing through the check valve 23a to the refrigerant/water heat exchanger 20a flows and second refrigerant layers 52 through which refrigerant flowing out from the refrigerant/water heat exchanger 20b and returning through the refrigerant pipe 3b to the heat source unit 1 flows are alternately stacked several times over.

[0055] For example, the upper portion of the pipe plate 50a is equipped with a first refrigerant inlet port 53a into which the refrigerant flowing from the receiver tank 22 through the check valve 23a flows, and a second refrigerant outlet port 54b from which the refrigerant heat-exchanged with cold/hot water in the refrigerant/water heat exchanger 20a, flowing through the refrigerant pipe 3b and returning to the heat source unit 1 flows. The lower portion of the pipe plate 50a is provided with a first refrigerant outlet port 53b from which the refrigerant flowing from the receiver tank 22 through the check valve 23a flows out, and a second refrigerant inlet port 54a into which the refrigerant flowing out from the refrigerant outlet port 34b of the refrigerant/water heat exchanger 20a flows. The refrigerant flowing through the check valve 23a into the first refrigerant inlet port 53a flows into the first refrigerant layers 51 which are intermittently arranged one by one, is heat-exchanged with the refrigerant flowing out from the refrigerant port of the refrigerant/water heat exchanger 20b and flowing through the second refrigerant layers 52 to be super-cooled while passing through the refrigerant layers 51, and then flows out from the first refrigerant outlet port 53b. Likewise, the refrigerant flowing through the refrigerant/water heat exchanger 20b and flowing into the second refrigerant inlet port 54a flows into the second refrigerant layers 52 which are intermittently arranged one by one, is heat-exchanged with the refrigerant flowing through the check valve 23a to be superheated while flowing through the second refrigerant layers 52, and flows out from the second refrigerant outlet port 54b.

[0056] Furthermore, with respect to the flow directions of the refrigerant and cold/hot water flowing in the refrigerant/water heat exchangers 20a, 20b, when cold water is supplied from the heat exchange unit 2 to the use-side heat exchanger 30, the refrigerant and the cold/hot water flow in the opposite directions to each other. The flow direction of the refrigerant flowing through one way in the refrigerant heat exchanger 20c and the flow direction of the refrigerant flowing through the other way in the refrigerant heat exchanger 20c are likewise opposite to each other. Furthermore, when hot water is supplied from the heat exchange unit 2 to the use-side heat exchanger 30, the refrigerant and the hot water flow in the same direction in the refrigerant/water heat exchangers 20a, 20b, and the refrigerant flowing in one way and the refrigerant in the other way flow in opposite directions in the refrigerant heat exchanger 20c, so that they flow in the opposite directions like the

case where the cold water is supplied from the heat exchange unit 2 to the use-side heat exchanger 30.

[0057] Next, the overall structure of the heat exchange unit 2 will be described.

[0058] As shown in Fig. 4, the heat exchange unit 2 has a base frame 40, and L-shaped members 41a to 41h are assembled on the base frame 40 to thereby construct a housing base 42.

[0059] Cold/hot water pipes 43a, 43b constituting parts of the cold/hot water pipes 4a, 4b of Fig. 1 respectively are provided in the neighborhood of confronting edge portions 40a, 40b on the base frame 40 so as to be disposed along the edge portions 40a, 40b. Each of the cold/hot water pipes 43a and 43b is designed as a straight pipe which can be opened at both the ends thereof, and the cold/hot water pipes 4a, 4b can be extended toward any one of the edge portions 40c and 40d in accordance with a setup condition.

[0060] Furthermore, the refrigerant/water heat exchanger 20a and the refrigerant heat exchanger 20c are disposed at the edge portion 40c side of the base frame 40, and the refrigerant/water heat exchanger 20b, the receiver tank 22 and the heat exchange side control device 24 are provided at the edge portion 40d side confronting the edge portion 40c. That is, the refrigerant/water heat exchangers 20a, 20b, the refrigerant heat exchanger 20c, the receiver tank 22, etc. which are heavy units are substantially disposed in the neighborhood of the edge portions in the heat exchange unit (for example, on the base portion 40) so as to be substantially uniformly disposed.

[0061] Furthermore, the refrigerant/water heat exchanger 20a, the refrigerant heat exchanger 20c and the refrigerant/water heat exchanger 20b are disposed so that the refrigerant outlet/inlet ports and the cold/hot water outlet/inlet ports of the refrigerant/water heat exchanger 20a and refrigerant heat exchanger 20c confront the refrigerant outlet/inlet ports and cold/hot water inlet/output ports of the refrigerant/water heat exchanger 20b.

[0062] Accordingly, the center-of-gravity position of the heat exchange unit 2 can be set around the center of the base frame 40, and also the height position of the center of gravity can be set to a low position, so that there can be prevented such a risk that the heat exchange unit 2 falls down when it is transported or installed. Furthermore, only the pipe group containing the refrigerant pipe in which the refrigerant supplied from the heat source unit 1 is circulated, the cold/hot water pipes 25a and 25b connected to the cold/hot water pipes 43a and 43b, the cold/hot water pipes 26a and 26b is disposed at the center portion in the heat exchange unit 2, so that the center portion concerned can be set as a maintenance space for the heat exchange unit 2 and thus maintenance performance can be enhanced.

[0063] Still furthermore, the heat exchange unit 2 is equipped with the receiver tank 22, and thus even when each of the refrigerant/water heat exchangers 20a and

20b is designed as a plate type heat exchanger, the capacity of refrigerant circulated in each of the refrigerant/water heat exchangers 20a and 20b can be secured, and also when a trouble occurs in the heat source unit 1 or the like, the refrigerant in the heat source unit 1 is withdrawn to the receiver tank 22 to carry out a repair or maintenance work of the heat source unit 1.

[0064] In this embodiment, the refrigerant/water heat exchanger is divided into two refrigerant/water heat exchangers (20a, 20b). However, the division number of the refrigerant/water heat exchanger is not limited to two, but it may be equal to three or more. In this case, the number of refrigerant/water heat exchangers thus divided may be set to an even number, and the even number of refrigerant/water heat exchangers may be uniformly dispersively disposed in the heat exchange unit. In addition, the refrigerant heat exchanger is disposed in the neighborhood of any one of the above refrigerant/water heat exchangers, and the receiver tank may be disposed at the opposite position to the refrigerant heat exchanger with the center of the heat exchange unit. Furthermore, when the plural refrigerant/water heat exchangers are dispersively disposed, the refrigerant inlet/outlet ports and the cold/hot water outlet/inlet ports of the refrigerant/water heat exchangers and the refrigerant heat exchangers which are disposed so as to confront one another may be disposed so as to confront one another.

[0065] As shown in the side view of the inside of Fig. 5A, a substantially M-shaped angle 44 extending to the drum portion of the receiver tank 22 is equipped to the side surface of the heat exchanger side control device 24 at the receiver tank 22 side. Fig. 5B is a top view showing the inside of the heat exchange unit 2. As shown in Fig. 5B, the receiver tank 22 is designed to have a cylindrical shape extending in the vertical direction, and thus the M-shaped angle 44 is used to prevent the receiver tank 22 from staggering when it is transported or the like, and also serves as heat transfer means for transferring heat of the receiver tank 22 to the heat exchange side control device 24 to prevent occurrence of dew in the heat exchange side control device 24. In this embodiment, the heat-transferable angle 44 is provided between the receiver tank 22 and the heat exchange side control device 24, however, a part of the side surface of the heat exchange side control device 24 may be formed so as to be in surface contact with the outer peripheral surface of the drum portion of the receiver tank 22. Liquid refrigerant is stocked in the receiver tank 22, and thus the temperature of the receiver tank 22 is increased to about 40.C when the refrigerating machine 100 is under operation. By transferring the temperature of the receiver tank 22 to the heat exchange side control device 24, dew condensation in the heat exchange side control device 24 can be prevented, and also a heat insulating material which is normally provided so as to cover the outer wall of the heat exchange side control device for the purpose of prevention of dew

condensation can be deleted, so that the manufacturing cost can be reduced.

[0066] Next, the operation of the refrigerating machine 100 will be described with reference to Fig. 6.

[0067] First, in a case where cold water is supplied from the heat exchange unit 2 to the use side heat exchange 30, when an instruction is output to the heat source unit 1 to operate the heat source unit 1, the heat source side control device 16 receives this instruction from a remote controller (not shown) or the like and starts the operation of the gas engine 10. When the operation of the gas engine 10 is started, the operation of the compressor 11 is started by the driving force of the gas engine 10, and gas refrigerant under high temperature and high pressure is discharged. The gas refrigerant thus discharged flows into the outdoor heat exchanger 13, and radiates its heat to the outside air by air blowing of the air blow fan 14, so that the gas refrigerant becomes liquid refrigerant under low temperature and high pressure. Then, the liquid refrigerant thus achieved is supplied through the refrigerant pipe 3a to the heat exchange unit 2.

[0068] The liquid refrigerant circulates in the direction of an arrow X, flows through the refrigerant pipe 3a into the receiver tank 22 of the heat exchange unit 2, and then flows through the check valve 23a into the refrigerant heat exchanger 20c. The refrigerant flowing into the refrigerant heat exchanger 20c is heat-exchanged with the gas refrigerant under high temperature and low pressure which flows through the refrigerant/water heat exchangers 20a, 20b and supercooled, pressure-reduced in the electrically-driven expansion valve 21 and then flows into the refrigerant/water heat exchanger 20a.

[0069] In the refrigerant/water heat exchanger 20a, the refrigerant thus pressure-reduced cools the cold/hot water flowing from the cold/hot water pipe 26a into the refrigerant/water heat exchanger 20a, so that it is evaporated. At this time, substantially a half of the refrigerant is evaporated, and thus the refrigerant is set to a gas-liquid mixed state. Subsequently, the refrigerant flows into the refrigerant/water heat exchanger 20b and cools the cold/hot water flowing through the cold/hot water pipe 26b into the refrigerant/water heat exchanger 20b to be evaporated. At this time, most of the refrigerant is evaporated, and thus at this time point, the liquid refrigerant becomes gas refrigerant under high temperature and low pressure. In the refrigerant heat exchanger 20c, the gas refrigerant concerned is heat-exchanged with the refrigerant which is about to flow into the refrigerant/water heat exchanger 20a to be super-heated. The refrigerant thus super-heated 1 is made to flow through the refrigerant pipe 3b and returned to the heat source unit 1, and thus it is returned through an accumulator (not shown) to the compressor 11.

[0070] The cold/hot water circulates to the use-side heat exchanger 30 is cooled by the refrigerant and becomes cold water, and it is made to flow out from the

cold/hot water pipes 25a, 25b of the refrigerant/water heat exchangers 20a and 20b by actuating the circulating pump 37. As indicated by an arrow Y, the cold/hot water (i.e., cold water) flowing out from the cold/hot water pipe 25a and the cold/hot water (i.e., cold water) flowing out from the cold/hot water pipe 26a are confluent into the cold/hot water pipe 43a, and flow through the cold/hot pipe 4a into the use-side heat exchanger 30, so that a heat medium connected to a load (not shown) is cooled by the cold water. The cold/hot water heat-exchanged with the heat medium in the use-side heat exchanger 30 is distributed through the cold/hot water pipes 4b and 43b to the cold/hot water pipes 26a and 26b, and cooled in the refrigerant/water heat exchangers 20a and 20b again.

[0071] However, at this time, if the circulating pump 37 is not actuated because of a breakdown or the like, the cold/hot water is frozen and thus expanded, so that the refrigerant/water heat exchangers 20a and 20b may be broken down.

[0072] Therefore, anti-freeze sensors t3 and t4 are provided in the neighborhood of the cold/hot water outlet ports of the refrigerant/water heat exchangers 20a and 20b respectively, and when at least one of the anti-freeze sensors t3 and t4 detects that a temperature signal of the cold/hot water indicates a first predetermined temperature Temp1 or less, it is judged in the heat exchange side control device that there is a risk that the cold/hot water flowing through at least one of the refrigerant/water heat exchangers 20a and 20b may be frozen, and the heat exchange side control device 24 transmits an instruction signal to the heat source side control device 16 through a communication line (not shown) to stop the gas engine 10 of the heat source unit 1. Here, it is desirable that the first predetermined temperature Temp1 is set to a slightly higher temperature than the temperature at which the cold/hot water starts freezing.

[0073] Furthermore, as described above, in each of the refrigerant/water heat exchangers 20a, 20b, the cold/hot layers 33 are provided at the outermost layers 36a and 36b, so that the temperature of the cold/hot water can be surely detected by the anti-freeze sensors t3 and t4. Accordingly, the cold/hot water is prevented from being cooled to the extent that it is frozen, and thus the freezing of the cold/hot water can be avoided.

[0074] If both the temperature signals output from the anti-freeze sensors t3 and t4 are above a second predetermined temperature Temp2 higher than the first predetermined temperature, and further at this time the operation of the refrigerating machine 100 is instructed by a remote controller (not show) or the like, the operation of the gas engine 10 is started again and cold water is supplied from the heat exchange unit 2 to the use-side heat exchanger 30. Here, it is preferable that the second predetermined temperature Temp2 is set to the first predetermined temperature Temp1 or more and it is set to the lowest temperature at which there is no risk that the cold/hot water is frozen.

[0075] Furthermore, in the refrigerating machine 100, the refrigerant outlet port sensor T2 is provided on the refrigerant pipe in the neighborhood of the second refrigerant outlet port 54b. Any one of the temperature signal of the refrigerant detected by the refrigerant inlet port sensor T1 provided on the refrigerant pipe in the neighborhood of the refrigerant inlet port 34a of the refrigerant/water heat exchanger 20a and the temperature signal of the refrigerant detected by the refrigerant outlet port temperature sensor T2 is selected and the operation of the thermal heat exchange unit 2 is controlled on the basis of the selected temperature signal by the heat exchange side control device 2, whereby one of the power-weighted operation of the refrigerating machine 100 and the power-saving-weighted operation of the refrigerating machine 100 can be selectively performed without altering the software of programs stored in the heat exchange side control device 24.

[0076] That is, by adopting the temperature signal of the refrigerant detected by the refrigerant inlet port sensor T1, it is judged by the heat exchange side control device 24 that the temperature of the refrigerant circulated in the heat exchange unit 2 is low, the heat exchange side control device 24 outputs an instruction through a communication wire (not show) to the heat source side control device 16 of the heat source unit 1 so that the heat source unit 1 operates with reducing the driving power, whereby the power-saving-weighted operation can be performed. On the other hand, by adopting the temperature signal of the refrigerant detected by the refrigerant outlet port sensor T2, it is judged by the heat exchange side control device 24 that the temperature of the refrigerant circulated in the heat exchange unit 2 is high, and the heat exchange side control device 24 outputs an instruction through a communication wire (not shown) to the heat source side control device 16 of the heat source unit 1 so that the heat source unit 1 operates with sufficient driving power, whereby the power-weighted operation can be performed.

[0077] The switching operation between the refrigerant inlet port sensor T1 and the refrigerant outlet port sensor T2 may be carried out by providing a switch or the like in the heat exchange side control device 24 or in the heat source side control device 16 and carrying out the switching operation of the switch or the like. Furthermore, any one of the temperature signals detected by the sensors T1 and T2 may be selected by providing a selecting switch to the remote controller or the like and carrying out the operation of the selecting switch.

Claims

1. A refrigerating machine (100) comprising a heat source unit (1) having a compressor (11) for compressing and discharging refrigerant and a heat exchange unit (2) having a heat exchanger for heat-exchanging the refrigerant and cold/hot water sup-

plied to a use-side heat exchanger (30), **characterized in that** the heat exchanger comprises a refrigerant/water heat exchanger constructed by plural plate type heat exchangers (20a, 20b).

2. The refrigerating machine according to claim 1, further comprising a refrigerating circuit through which the refrigerant supplied from the heat source unit (1) flows and a cold/hot water circuit through which the cold/hot water supplied to the use-side heat exchanger (30) flows, wherein the plural plate type heat exchangers (20a, 20b) are connected to the refrigerant circuit in series so that the refrigerant successively flows through the plate type heat exchangers and is returned to the heat source unit (1), and the plural plate type heat exchangers (20a, 20b) are connected to the cold/hot water circuit in parallel so that the cold/hot water simultaneously flows through the plural plate type heat exchangers (20a, 20b) in parallel.
3. The refrigerating machine according to claim 1, wherein the heat source unit (1) has a gas engine (1) and the compressor is driven by the gas engine.
4. The refrigerating machine according to claim 1, wherein the heat source unit (1) and the heat exchanger (20a, 20b) in the heat exchange unit (2) are connected to each other through a refrigerant pipe (3a, 3b), and the heat exchanger (20a, 20b) in the heat exchange unit (2) and the use-side heat exchanger (30) are connected to each other through a water pipe and a circulating pump.
5. The refrigerating machine according to claim 1, further comprising a refrigerant heat exchanger (20c) for heat-exchanging the refrigerant supplied from the heat source unit (1) and the refrigerant returned to the heat source unit (1), and a receiver tank (22) for temporarily stocking the refrigerant circulated in the heat exchange unit (2), wherein the refrigerant/water heat exchangers (20a, 20b), the refrigerant heat exchanger (20c) and the receiver tank (22) are disposed so as to be substantially uniformly dispersed in the heat exchange unit (2).
6. The refrigerating machine according to claim 5, wherein the number of the plural refrigerant/water heat exchangers is set to an even number, the even number of refrigerant/water heat exchangers are disposed so as to be substantially uniformly dispersed in the heat exchange unit, the refrigerant heat exchanger is disposed in the neighborhood of any one of the refrigerant/water heat exchangers (20a, 20b), and the receiver tank (22) is disposed at the opposite side to the refrigerant heat exchanger (20c) with respect to the center of the heat exchange unit (2).

7. The refrigerating machine according to claim 5, wherein the plural refrigerant/water heat exchangers, the refrigerant heat exchanger and the receiver tank are disposed in the neighborhood of the edge portion of the inside of the heat exchange unit so as to be substantially uniformly dispersed, and refrigerant outlet/inlet ports (34a, 34b, 53a, 53b) and cold/hot water outlet/inlet ports (35a, 35b, 54a, 54b) of each heat exchanger of the plural refrigerant/water heat exchangers (20a, 20b) and the refrigerant heat exchanger (20c) are disposed so as to confront refrigerant outlet/inlet ports and cold/hot water outlet/inlet ports of the other heat exchangers.
8. The refrigerating machine according to claim 5, wherein each of the refrigerant/water heat exchangers comprises cold/hot water layers (33, 52) through which cold/hot water flows and refrigerant layers (32, 51) through which the refrigerant flows, the outermost layers (36a, 36b) of each of the refrigerant/water heat exchangers are set to cold/hot water layers, and a temperature sensor (t3, t4) for detecting the temperature of the cold/hot water flowing out from the refrigerant/water heat exchanger is provided in the neighborhood of the cold/hot water outlet port of the refrigerant/water heat exchanger.
9. The refrigerating machine according to claim 8, wherein the temperature sensor (t3, t4) is provided on the outer surface of the refrigerant/water heat exchanger in the neighborhood of the cold/hot water outlet port (35b) and subjected to a heat-insulation treatment to keep the temperature sensor (t3, t4) thermally insulated from the outside air.
10. The refrigerating machine according to claim 1, further comprising a receiver tank (22) for temporarily stocking the refrigerant in the heat exchange unit, wherein the heat source unit (1) has a heat source side control device (16) for controlling the compressor (11), the heat exchange unit (2) has a heat exchange side control (24) device for controlling the refrigerant/water heat exchanger, and heat transfer means (44) is provided between the receiver tank (22) and the heat exchange side control device (24).
11. The refrigerating machine according to claim 10, wherein the heat transfer means comprises a heat-transferable angle provided between a drum portion of the receiver tank and the side surface of the heat exchange side control device to transfer heat between the receiver tank and the heat exchange side control device.
12. The refrigerating machine according to claim 10, wherein the heat transfer means is formed by bringing a part of the side surface of the heat exchange side control device into surface contact with the outer peripheral surface of the receiver tank.
13. A refrigerating machine comprising a heat source unit (1) having a compressor (11) for compressing and discharging refrigerant, and a heat exchange unit (2) having a heat exchanger for heat-exchange the refrigerant with cold/hot water supplied to a use-side heat exchanger (30), the heat source unit (1) and the heat exchange unit (2) being connected to each other, **characterized in that** the heat exchange unit (2) is provided with a refrigerant/water heat exchanger (20a, 20b) for heat-exchanging the refrigerant supplied from the heat source unit (1) and the cold/hot water supplied to the use-side heat exchanger (30), a refrigerant heat exchanger (20c) for heat-exchanging refrigerant flowing at an upstream side of the refrigerant/water heat exchanger (20a, 20b) with refrigerant flowing at a downstream side of the refrigerant/water heat exchanger (20a, 20b), a first refrigerant temperature sensor (T1) for detecting the temperature of the refrigerant flowing at the upstream side and a second refrigerant temperature sensor (T2) for detecting the temperature of the refrigerant flowing at the downstream side, and the refrigerating machine is operated on the basis of selected one of the temperature detected by the first refrigerant temperature sensor (T1) and the temperature detected by the second refrigerant temperature sensor (T2).
14. The refrigerating machine according to claim 13, wherein the refrigerating machine is operated in a power-saving-weighted mode on the basis of the temperature of the refrigerant flowing at the upstream side of the refrigerant/water heat exchanger (20a, 20b) by selecting the temperature of the refrigerant detected by the first refrigerant temperature sensor (T1), and the refrigerating machine is operated in a power-weighted mode on the basis of the temperature of the refrigerant flowing at the downstream side of the refrigerant/water heat exchanger (20a, 20b) by selecting the temperature of the refrigerant detected by the second refrigerant temperature sensor (T2).
15. The refrigerating machine according to claim 13, wherein the selection of one of the temperature of the refrigerant detected by the first refrigerant temperature sensor and the temperature of the refrigerant detected by the second refrigerant temperature sensor is carried out by a switch provided in the heat source unit or by an operation switch provided to a remote controller for instructing the operation of the refrigerating machine.

FIG. 1

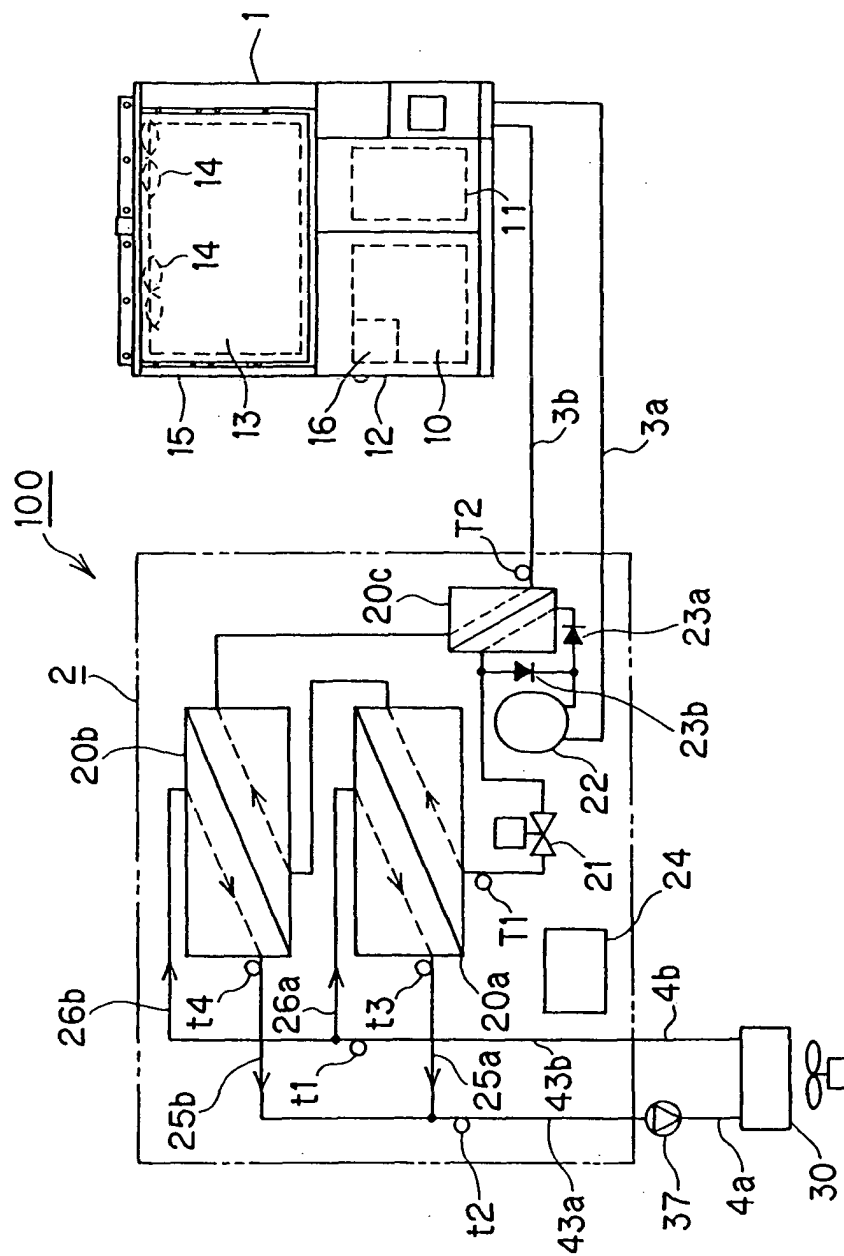


FIG. 2

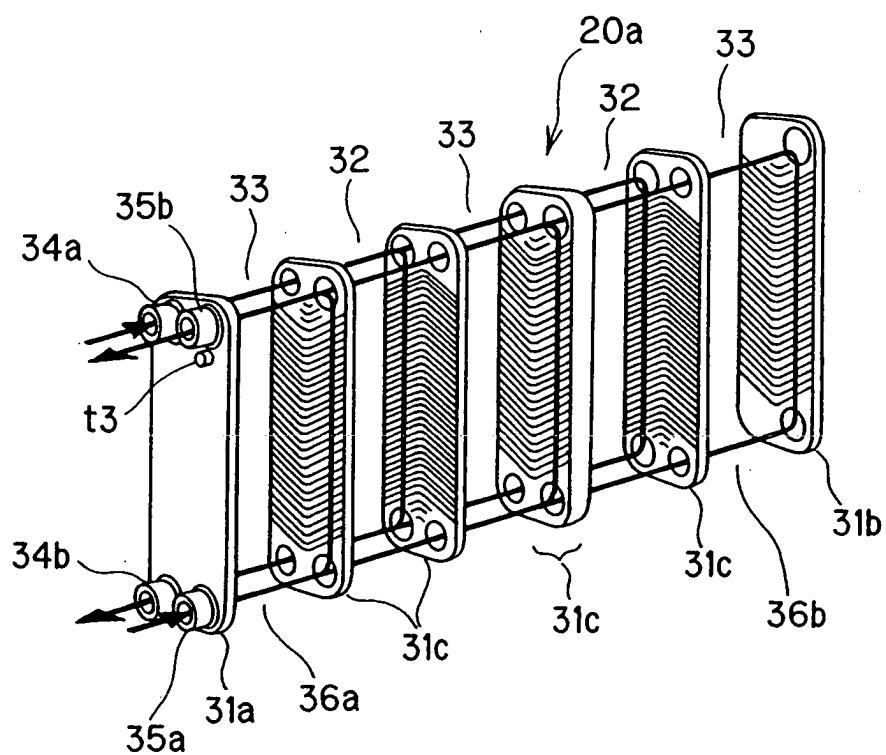


FIG. 3

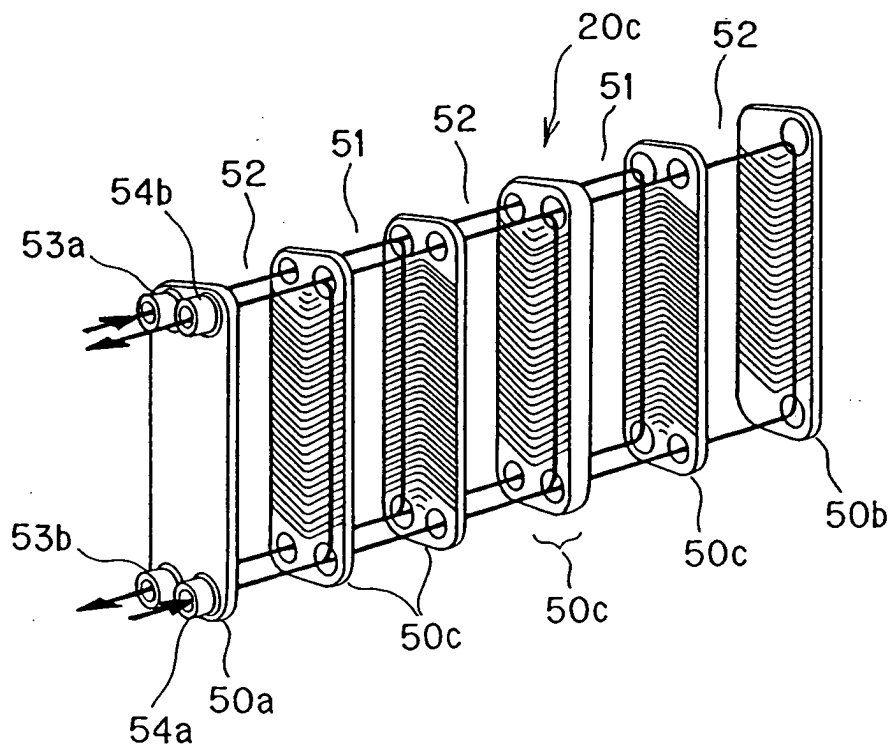
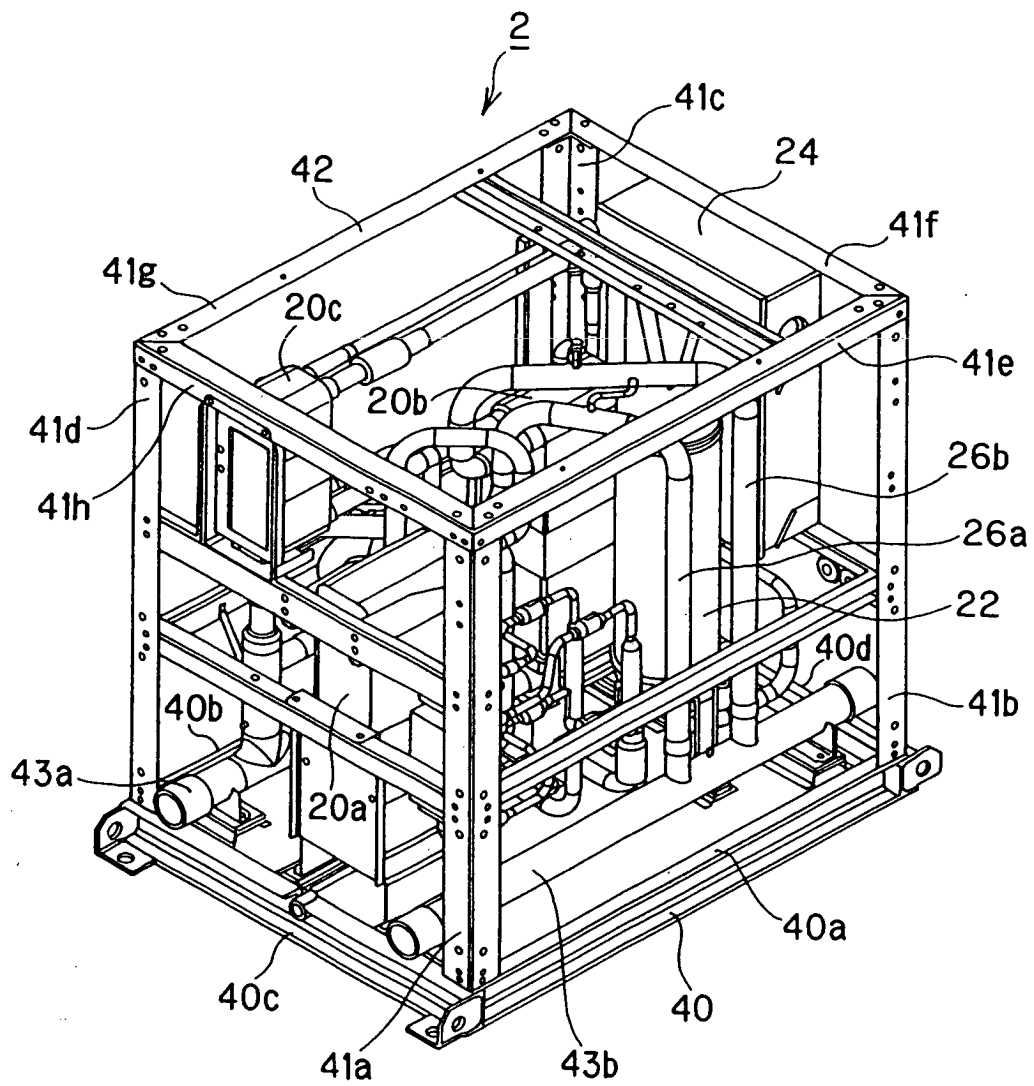


FIG. 4



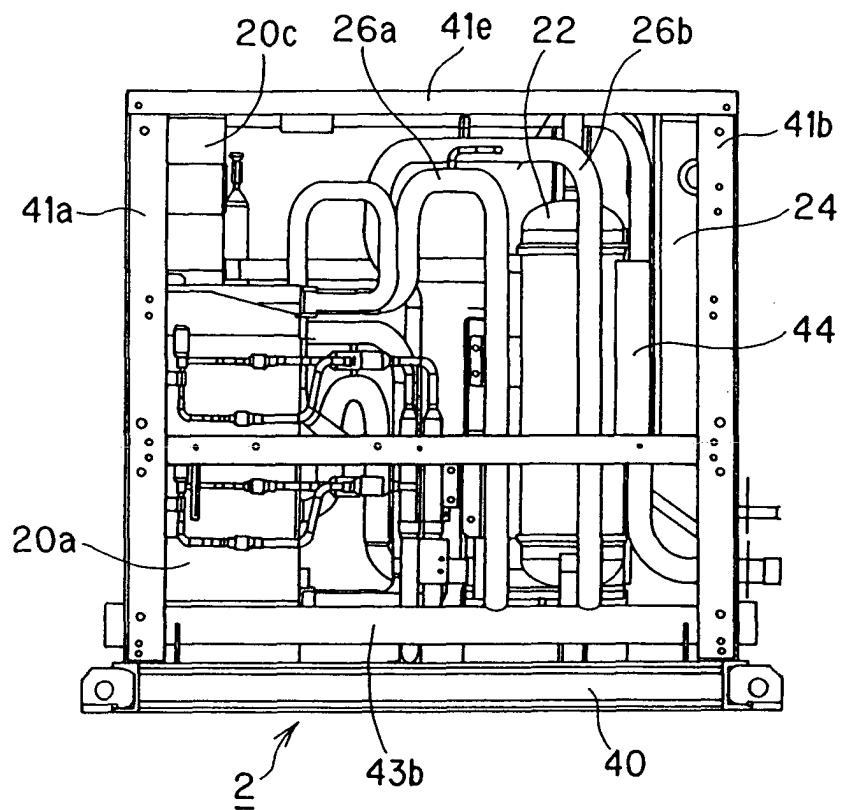


FIG. 5A

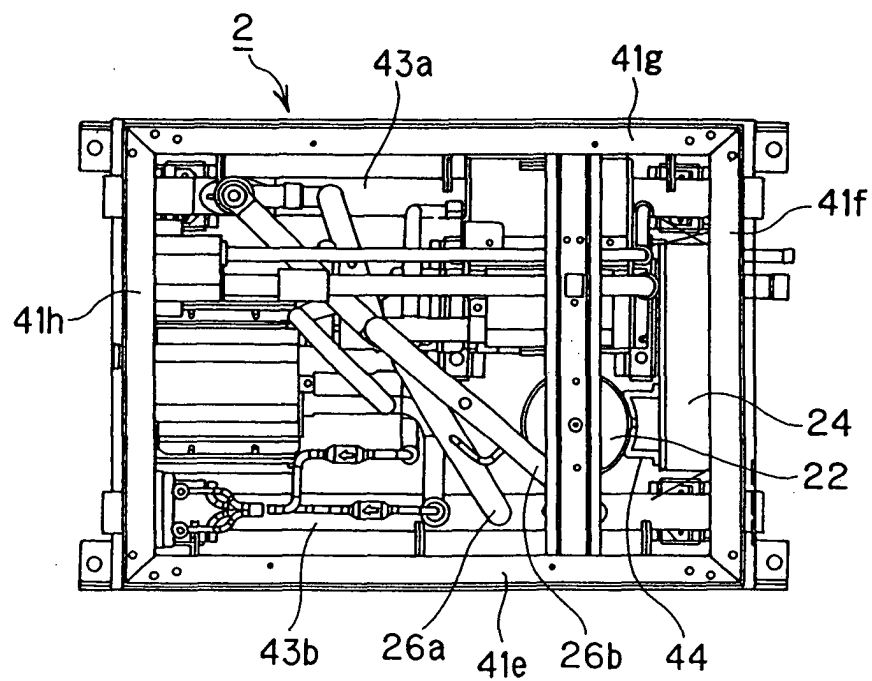


FIG. 5B

FIG. 6

