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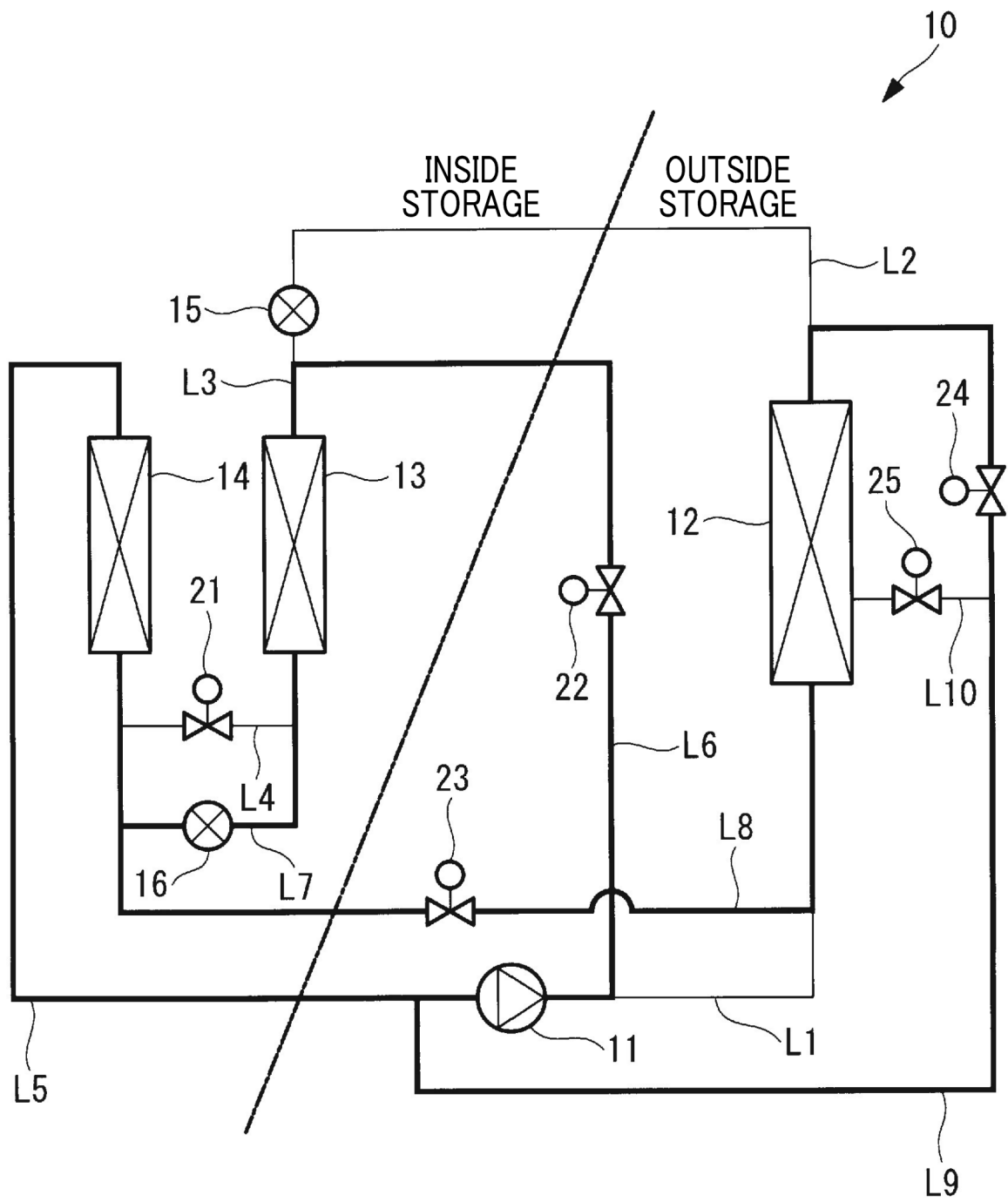
(54) **REFRIGERATION MACHINE FOR TRANSPORTATION**

(57) A refrigeration machine (10) for transportation comprises: a compressor (11) that compresses a refrigerant; an external heat exchanger (12) that performs heat exchange between the refrigerant and external air; a first internal heat exchanger (13) that performs heat exchange between the refrigerant and internal air; a second internal heat exchanger (14) that performs heat exchange between the refrigerant and the internal air; a sixth refrigerant pipe (L6) that guides the refrigerant discharged from the compressor (11) to the first internal heat exchanger (13) in a drying operation mode; a drying operation expansion valve (16) that expands the refrigerant

discharged from the first internal heat exchanger (13) in the drying operation mode; a seventh refrigerant pipe (L7) that guides the refrigerant expanded by the drying operation expansion valve (16) to the second internal heat exchanger (14) in the drying operation mode; an eighth refrigerant pipe (L8) that guides the refrigerant expanded by the drying operation expansion valve (16) to the external heat exchanger (12) in the drying operation mode; and a ninth refrigerant pipe (L9) that guides the refrigerant discharged from the external heat exchanger (12) to the compressor (11) in the drying operation mode.

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FIG. 2



Description

Technical Field

[0001] The present disclosure relates to a transport refrigerator.

Background Art

[0002] In a transport refrigerator that is provided in a vehicle having a refrigerated storage and cools the inside of the refrigerated storage, the inside of the refrigerated storage may be dried (for example, PTL 1).

[0003] PTL 1 discloses a refrigeration cycle device that can circulate a refrigerant through a path of a compressor → a first evaporator → a second expansion valve → a second evaporator → the compressor. In this device, when the refrigerant is circulated through the above-described path, the first evaporator is used as a condenser to heat air in a refrigerated storage, and condensation water adhering to a wall surface in the refrigerated storage is evaporated. In addition, the second evaporator is used as an evaporator to cool air including the evaporated condensation water, and the condensation water adhering to the wall surface in the refrigerated storage is moved to a surface of the second evaporator. The condensation water adhering to the surface of the second evaporator falls on a floor surface in the refrigerated storage and is discharged to the outside of a vehicle cabin through a drainage hole. In this way, the air in the refrigerated storage is dehumidified.

Citation List

Patent Literature

[0004] [PTL 1] Japanese Unexamined Patent Application Publication No. 2007-71438

Summary of Invention

Technical Problem

[0005] However, in the device disclosed in PTL 1, the capacity of the first evaporator, which is used as a condenser, to heat air may decrease depending on the outside air temperature or the internal temperature of the storage. In this case, there is a possibility that it will take a long time to dry the inside of the refrigerated storage.

[0006] The present disclosure has been made in view of the above circumstances, and an object of the present disclosure is to provide a transport refrigerator that can shorten the time required for drying the inside of a storage.

Solution to Problem

[0007] In order to solve the problem, the transport

refrigerator according to the present disclosure adopts the following means.

[0008] According to an aspect of the present disclosure, there is provided a transport refrigerator having a drying operation mode for drying an inside of a storage, the transport refrigerator including: a compressor that compresses a refrigerant; an external heat exchanger that is provided outside the storage and performs heat exchange between the refrigerant and air outside the storage; a first internal heat exchanger that is provided inside the storage and performs heat exchange between the refrigerant and air in the storage; a second internal heat exchanger that is provided inside the storage and performs heat exchange between the refrigerant and the air in the storage; a first refrigerant supply pipe that guides the refrigerant discharged from the compressor to the first internal heat exchanger in the drying operation mode; an expansion valve to which the refrigerant discharged from the first internal heat exchanger is guided and which expands the refrigerant in the drying operation mode; a second refrigerant supply pipe that guides the refrigerant expanded by the expansion valve to the second internal heat exchanger in the drying operation mode; a third refrigerant supply pipe that guides the refrigerant expanded by the expansion valve to the external heat exchanger in the drying operation mode; and a return pipe that guides the refrigerant discharged from the external heat exchanger to the compressor in the drying operation mode.

Advantageous Effects of Invention

[0009] According to the present disclosure, it is possible to shorten the time required for drying the inside of the storage.

Brief Description of Drawings

[0010]

FIG. 1 is a schematic diagram showing a configuration of a transport refrigerator according to an embodiment of the present disclosure and shows a flow of a refrigerant in a cooling operation mode.

FIG. 2 is a schematic diagram showing the configuration of the transport refrigerator according to the embodiment of the present disclosure and shows a flow of the refrigerant in a first drying operation mode. FIG. 3 is a schematic diagram showing the configuration of the transport refrigerator according to the embodiment of the present disclosure and shows a flow of the refrigerant in a second drying operation mode.

FIG. 4 is a schematic diagram showing the configuration of the transport refrigerator according to the embodiment of the present disclosure and shows a flow of the refrigerant in a third drying operation mode.

FIG. 5 is a block diagram showing a control device of the transport refrigerator according to the embodiment of the present disclosure.

FIG. 6 is a table showing open and closed states of each valve in each operation mode of the transport refrigerator according to the embodiment of the present disclosure.

FIG. 7 is a flowchart showing a process performed by the control device of the transport refrigerator according to the embodiment of the present disclosure.

FIG. 8 is a Mollier diagram showing the transport refrigerator according to the embodiment of the present disclosure.

Description of Embodiments

[0011] Hereinafter, an embodiment of a transport refrigerator according to the present disclosure will be described with reference to the drawings.

[0012] A transport refrigerator 10 according to the present embodiment is applied to a vehicle having a refrigerated storage. The transport refrigerator 10 is used to regulate the temperature of air in the refrigerated storage. In the following description, the inside of the refrigerated storage is referred to as the "inside of the storage", and the outside of the refrigerated storage is referred to as the "outside of the storage". In addition, in FIGS. 1 to 4, the left side of a one-dot chain line on the paper indicates the inside of the storage, and the right side of the one-dot chain line on the paper indicates the outside of the storage.

[Structure of Transport Refrigerator]

[0013] First, a structure of the transport refrigerator 10 will be described with reference to FIGS. 1 to 4.

[0014] As shown in FIGS. 1 to 4, the transport refrigerator 10 includes a compressor 11 that compresses a refrigerant, an external heat exchanger 12 that is provided outside the storage, a first internal heat exchanger 13 and a second internal heat exchanger 14 that are provided inside the storage, and a cooling operation expansion valve 15 and a drying operation expansion valve (expansion valve) 16 that are provided inside the storage.

[0015] The external heat exchanger 12 has a plurality of heat transfer tubes (not shown) and exchanges heat between the refrigerant flowing through the heat transfer tubes and air outside the storage. Each of the first internal heat exchanger 13 and the second internal heat exchanger 14 includes a plurality of heat transfer tubes (not shown) and exchanges heat between the refrigerant flowing through the heat transfer tubes and air in the storage. The second internal heat exchanger 14 is disposed on the upstream side of the first internal heat exchanger 13 in the flow of the air in the storage.

[0016] The transport refrigerator 10 includes a first refrigerant pipe L1 that connects the compressor 11

and the external heat exchanger 12, a second refrigerant pipe L2 that connects the compressor 11 and the cooling operation expansion valve 15, a third refrigerant pipe L3 that connects the cooling operation expansion valve 15 and the first internal heat exchanger 13, a fourth refrigerant pipe L4 that connects the first internal heat exchanger 13 and the second internal heat exchanger 14, and a fifth refrigerant pipe L5 that connects the second internal heat exchanger 14 and the compressor 11.

[0017] In addition, the transport refrigerator 10 includes a sixth refrigerant pipe (first refrigerant supply pipe) L6 that connects an intermediate position of the first refrigerant pipe L1 and an intermediate position of the third refrigerant pipe L3, a seventh refrigerant pipe (second refrigerant supply pipe) L7 that connects the first internal heat exchanger 13 and the second internal heat exchanger 14, an eighth refrigerant pipe (third refrigerant supply pipe) L8 that connects an intermediate position of the seventh refrigerant pipe L7 and an intermediate position of the first refrigerant pipe L1, a ninth refrigerant pipe (return pipe) L9 that connects an intermediate position of the second refrigerant pipe L2 and an intermediate position of the fifth refrigerant pipe L5, and a tenth refrigerant pipe (intermediate position refrigerant pipe) L10 that connects an intermediate position of the external heat exchanger 12 and the ninth refrigerant pipe L9.

[0018] The refrigerant flows through each of the pipes.

[0019] A first on-off valve 21 is provided in the fourth refrigerant pipe L4. In addition, a second on-off valve 22 is provided in the sixth refrigerant pipe L6. Further, a third on-off valve 23 is provided in the eighth refrigerant pipe L8. Furthermore, a fourth on-off valve 24 is provided in the ninth refrigerant pipe L9. In addition, a fifth on-off valve 25 is provided in the tenth refrigerant pipe L10. Each on-off valve can switch between a state in which the refrigerant flows through the installed refrigerant pipe and a state in which the refrigerant does not flow through the installed refrigerant pipe.

[0020] In the first refrigerant pipe L1, a connection position with the sixth refrigerant pipe L6 is located closer to the compressor 11 than a connection position with the eighth refrigerant pipe L8. In addition, in the ninth refrigerant pipe L9, a connection position with the tenth refrigerant pipe L10 is located closer to the fifth refrigerant pipe L5 than the fourth on-off valve 24.

[0021] Further, the compressor 11, the external heat exchanger 12, the second on-off valve 22, the third on-off valve 23, the fourth on-off valve 24, and the fifth on-off valve 25 are disposed outside the storage. The first internal heat exchanger 13, the second internal heat exchanger 14, the cooling operation expansion valve 15, the drying operation expansion valve 16, and the first on-off valve 21 are disposed inside the storage. The connection position between the fifth refrigerant pipe L5 and the ninth refrigerant pipe L9 is located outside the storage.

[0022] A control device (controller) 30 includes, for example, a central processing unit (CPU: processor), a

main memory, a secondary storage (memory), and the like. Further, the control device 30 may include a communication unit for transmitting and receiving information to and from another device.

[0023] The main memory is configured as, for example, a writable memory, such as a cache memory or a random access memory (RAM), and is used as a work area for performing the reading of an execution program of the CPU, the writing of processing data by the execution program, and the like.

[0024] The secondary storage is a non-transitory computer readable storage medium. The secondary storage is, for example, a magnetic disk, a magneto-optical disk, a CD-ROM, a DVD-ROM, a semiconductor memory, or the like.

[0025] As an example, a series of processes for implementing various functions is stored in the secondary storage in the form of a program, and the CPU reads out the program into the main memory and executes information processing and arithmetic processing to implement various functions. In addition, for example, the following forms may be applied: a form in which the program is installed in advance in the secondary storage; a form in which the program is provided in a state in which the program is stored in a computer-readable storage medium; and a form in which the program is distributed via wired or wireless communication means. Examples of the computer-readable storage medium include a magnetic disk, a magneto-optical disk, a CD-ROM, a DVD-ROM, and a semiconductor memory.

[0026] As shown in FIG. 5, the control device 30 receives the pressure measured by a pressure sensor 31 that measures the pressure of the refrigerant drawn into the compressor 11. The pressure sensor 31 is provided in, for example, a pipe (the fifth refrigerant pipe L5, the ninth refrigerant pipe L9, or the like) provided on a suction side of the compressor 11.

[0027] In addition, the control device 30 controls switching between the open and closed states of the first on-off valve 21, the second on-off valve 22, the third on-off valve 23, the fourth on-off valve 24, and the fifth on-off valve 25. Further, the control device 30 controls the opening degrees of the cooling operation expansion valve 15 and the drying operation expansion valve 16.

[0028] The control device 30 has a plurality of operation modes. Specifically, the control device 30 has a cooling operation mode for cooling the inside of the storage and a drying operation mode for dehumidifying and drying the inside of the storage. The control device 30 has a plurality of drying operation modes. The plurality of drying operation modes include a first drying operation mode, a second drying operation mode, and a third drying operation mode.

[0029] Next, the flow of the refrigerant in each operation mode will be described with reference to FIGS. 1 to 4 and FIG. 6. In FIGS. 1 to 4, a thick line portion indicates a portion through which the refrigerant flows.

[Cooling Operation Mode]

[0030] The cooling operation mode is selected to cool the inside of the storage or to keep the inside of the storage cold. The cooling operation mode will be described with reference to FIGS. 1 and 6. Further, in FIG. 6, "SV" indicates an "on-off valve", "EEV1" indicates the "cooling operation expansion valve 15", and "EEV2" indicates the "drying operation expansion valve 16".

[0031] As shown in FIG. 1, when the cooling operation mode is selected, the control device 30 turns on the first on-off valve 21 and the cooling operation expansion valve 15. In addition, the control device 30 turns off the second on-off valve 22, the third on-off valve 23, the fourth on-off valve 24, the fifth on-off valve 25, and the drying operation expansion valve 16.

[0032] As shown in FIG. 1, in the cooling operation mode, the refrigerant compressed by the compressor 11 is discharged from the compressor 11 and is supplied to the external heat exchanger 12 via the first refrigerant pipe L1. The refrigerant supplied to the external heat exchanger 12 is cooled and condensed by exchanging heat with the outside air. The condensed refrigerant is guided to the cooling operation expansion valve 15 disposed inside the storage via the second refrigerant pipe L2. The refrigerant introduced into the cooling operation expansion valve 15 is depressurized and expanded. The refrigerant depressurized by the cooling operation expansion valve 15 is supplied to the first internal heat exchanger 13 via the third refrigerant pipe L3. The refrigerant supplied to the first internal heat exchanger 13 is heated by exchanging heat with the air in the storage, and a portion of the refrigerant evaporates. The refrigerant that has completed heat exchange in the first internal heat exchanger 13 is supplied to the second internal heat exchanger 14 via the fourth refrigerant pipe L4. The refrigerant supplied to the second internal heat exchanger 14 is heated and evaporated by exchanging heat with the air in the storage. The refrigerant that has completed heat exchange in the second internal heat exchanger 14 is guided to the compressor 11 via the fifth refrigerant pipe L5 and is drawn into the compressor 11. In the cooling operation mode, this cycle is repeated.

[0033] Further, the air in the storage is guided to the second internal heat exchanger 14 and then guided to the first internal heat exchanger 13. That is, the second internal heat exchanger 14 is disposed on the upstream side of the first internal heat exchanger 13 in the flow of the air in the storage.

[First Drying Operation Mode]

[0034] The first drying operation mode is selected to dehumidify and dry the inside of the storage. The first drying operation mode will be described with reference to FIGS. 2 and 6. As shown in FIG. 6, when the first drying operation mode is selected, the control device 30 turns on the second on-off valve 22, the third on-off valve 23, the

fourth on-off valve 24, and the drying operation expansion valve 16. In addition, the control device 30 turns off the first on-off valve 21, the fifth on-off valve 25, and the cooling operation expansion valve 15.

[0035] The first drying operation mode is suitable for a case where the outside air temperature is high. Specifically, in an environment in which the outside air temperature is high, when the temperature of the refrigerated storage is changed from a low temperature to room temperature, condensation water adheres to a wall surface of the refrigerated storage. The present invention is particularly suitable for removing the condensation water.

[0036] As shown in FIG. 2, in the first drying operation mode, the refrigerant compressed by the compressor 11 is discharged from the compressor 11 and is supplied to the first internal heat exchanger 13 via a portion of the first refrigerant pipe L1, the sixth refrigerant pipe L6, and a portion of the third refrigerant pipe L3. The refrigerant supplied to the first internal heat exchanger 13 is cooled and condensed by exchanging heat with the air in the storage. At this time, the air in the storage that has exchanged heat with the refrigerant is heated.

[0037] The refrigerant condensed by the first internal heat exchanger 13 is guided to the drying operation expansion valve 16 disposed inside the storage via the seventh refrigerant pipe L7. The refrigerant introduced into the drying operation expansion valve 16 is depressurized and expanded. A portion of the refrigerant depressurized by the drying operation expansion valve 16 is supplied to the second internal heat exchanger 14 via the seventh refrigerant pipe L7. In addition, a portion of the refrigerant depressurized by the drying operation expansion valve 16 is supplied to the external heat exchanger 12 via the seventh refrigerant pipe L7 and the eighth refrigerant pipe L8 branching from the seventh refrigerant pipe L7.

[0038] The refrigerant supplied to the second internal heat exchanger 14 is heated and evaporated by exchanging heat with the air in the storage. That is, the refrigerant absorbs the heat of the air in the storage. At this time, the air in the storage that has exchanged heat with the refrigerant is cooled. The refrigerant that has completed heat exchange in the second internal heat exchanger 14 is guided to the compressor 11 via the fifth refrigerant pipe L5 and is drawn into the compressor 11.

[0039] In addition, the refrigerant supplied from the drying operation expansion valve 16 to the external heat exchanger 12 is heated and evaporated by exchanging heat with the air outside the storage (outside air). That is, the refrigerant absorbs the heat of the air in the storage. The refrigerant that has completed heat exchange in the external heat exchanger 12 passes through the second refrigerant pipe L2 and the ninth refrigerant pipe L9 and merges with the refrigerant flowing through the fifth refrigerant pipe L5. The refrigerant that has flowed to the fifth refrigerant pipe L5 is guided to the compressor 11 and is drawn into the compressor 11.

[0040] In the first drying operation mode, this cycle is repeated.

[0041] Further, the air in the storage is sequentially supplied to the second internal heat exchanger 14. In addition, the air in the storage is guided to the second internal heat exchanger 14 and then guided to the first internal heat exchanger 13. That is, the second internal heat exchanger 14 is disposed on the upstream side of the first internal heat exchanger 13 in the flow of the air in the storage.

[0042] This flow of the refrigerant makes it possible to dissipate heat from the high-temperature and high-pressure refrigerant gas compressed by the compressor 11 through the first internal heat exchanger 13 and to increase the temperature of the air in the storage. In this way, the condensation water adhering to the wall surface in the storage is evaporated. Air containing moisture resulting from the evaporation of the condensation water is guided to the second internal heat exchanger 14. In the second internal heat exchanger 14, the refrigerant absorbs the heat of the air in the storage to cool the air, and the moisture contained in the air is condensed. The condensed moisture adheres to the surface of the heat transfer tube of the second internal heat exchanger 14. The adhered condensate is collected and discharged to the outside of the storage. In this way, the inside of the storage is dehumidified and dried.

[Second Drying Operation Mode]

[0043] The second drying operation mode is selected to dehumidify and dry the inside of the storage. The second drying operation mode will be described with reference to FIGS. 3 and 6. As shown in FIG. 6, when the second drying operation mode is selected, the control device 30 turns on the second on-off valve 22 and the drying operation expansion valve 16. The control device 30 turns off the first on-off valve 21, the third on-off valve 23, the fourth on-off valve 24, the fifth on-off valve 25, and the cooling operation expansion valve 15.

[0044] The second drying operation mode is particularly suitable for a case where the outside air temperature is low. Specifically, the present invention is suitable for a case where the inside of the storage is cleaned and then dried in an environment in which the outside air temperature is low.

[0045] As shown in FIG. 3, in the second drying operation mode, the refrigerant compressed by the compressor 11 is discharged from the compressor 11 and is supplied to the first internal heat exchanger 13 via a portion of the first refrigerant pipe L1, the sixth refrigerant pipe L6, and a portion of the third refrigerant pipe L3. The refrigerant supplied to the first internal heat exchanger 13 is cooled and condensed by exchanging heat with the air in the storage. At this time, the air in the storage that has exchanged heat with the refrigerant is heated.

[0046] The refrigerant condensed by the first internal heat exchanger 13 is guided to the drying operation

expansion valve 16 disposed inside the storage via the seventh refrigerant pipe L7. The refrigerant introduced into the drying operation expansion valve 16 is depressurized and expanded. A portion of the refrigerant depressurized by the drying operation expansion valve 16 is supplied to the second internal heat exchanger 14 via the seventh refrigerant pipe L7.

[0047] The refrigerant supplied to the second internal heat exchanger 14 is heated and evaporated by exchanging heat with the air in the storage. That is, the refrigerant absorbs the heat of the air in the storage. At this time, the air in the storage that has exchanged heat with the refrigerant is cooled. The refrigerant that has completed heat exchange in the second internal heat exchanger 14 is guided to the compressor 11 via the fifth refrigerant pipe L5 and is drawn into the compressor 11.

[0048] In the second drying operation mode, this cycle is repeated.

[0049] Further, the air in the storage is sequentially supplied to the second internal heat exchanger 14. In addition, the air in the storage is guided to the second internal heat exchanger 14 and then guided to the first internal heat exchanger 13. That is, the second internal heat exchanger 14 is disposed on the upstream side of the first internal heat exchanger 13 in the flow of the air in the storage.

[Third Drying Operation Mode]

[0050] The third drying operation mode is selected to dehumidify and dry the inside of the storage. The third drying operation mode will be described with reference to FIGS. 4 and 6. As shown in FIG. 6, when the third drying operation mode is selected, the control device 30 turns on the second on-off valve 22, the third on-off valve 23, the fifth on-off valve 25, and the drying operation expansion valve 16. In addition, the control device 30 turns off the first on-off valve 21, the fourth on-off valve 24, and the cooling operation expansion valve 15.

[0051] The third drying operation mode is suitable for a case where the outside air temperature is a medium temperature. The medium temperature is a temperature that is lower than the temperature suitable for the first drying operation mode and is higher than the temperature suitable for the second drying operation mode.

[0052] As shown in FIG. 4, in the third drying operation mode, the refrigerant compressed by the compressor 11 is discharged from the compressor 11 and is supplied to the first internal heat exchanger 13 via a portion of the first refrigerant pipe L1, the sixth refrigerant pipe L6, and a portion of the third refrigerant pipe L3. The refrigerant supplied to the first internal heat exchanger 13 is cooled and condensed by exchanging heat with the air in the storage. At this time, the air in the storage that has exchanged heat with the refrigerant is heated.

[0053] The refrigerant condensed by the first internal heat exchanger 13 is guided to the drying operation expansion valve 16 disposed inside the storage via the

seventh refrigerant pipe L7. The refrigerant introduced into the drying operation expansion valve 16 is depressurized and expanded. A portion of the refrigerant depressurized by the drying operation expansion valve 16 is supplied to the second internal heat exchanger 14 via the seventh refrigerant pipe L7. In addition, a portion of the refrigerant depressurized by the drying operation expansion valve 16 is supplied to the external heat exchanger 12 via the seventh refrigerant pipe L7 and the eighth refrigerant pipe L8 branching from the seventh refrigerant pipe L7.

[0054] The refrigerant supplied to the second internal heat exchanger 14 is heated and evaporated by exchanging heat with the air in the storage. That is, the refrigerant absorbs the heat of the air in the storage. At this time, the air in the storage that has exchanged heat with the refrigerant is cooled. The refrigerant that has completed heat exchange in the second internal heat exchanger 14 is guided to the compressor 11 via the fifth refrigerant pipe L5 and is drawn into the compressor 11.

[0055] In addition, the refrigerant supplied from the drying operation expansion valve 16 to the external heat exchanger 12 is heated and evaporated by exchanging heat with the air outside the storage (outside air) in some of the heat transfer tubes of the external heat exchanger 12. That is, the refrigerant absorbs the heat of the air in the storage. The refrigerant that has flowed through some of the heat transfer tubes of the external heat exchanger 12 is discharged to the tenth refrigerant pipe L10. The refrigerant discharged to the tenth refrigerant pipe L10 passes through the tenth refrigerant pipe L10 and a portion of the ninth refrigerant pipe L9 and merges with the refrigerant flowing through the fifth refrigerant pipe L5. The refrigerant that has flowed to the fifth refrigerant pipe L5 is guided to the compressor 11 and is drawn into the compressor 11.

[0056] In the third drying operation mode, this cycle is repeated.

[0057] Further, the air in the storage is sequentially supplied to the second internal heat exchanger 14. In addition, the air in the storage is guided to the second internal heat exchanger 14 and then guided to the first internal heat exchanger 13. That is, the second internal heat exchanger 14 is disposed on the upstream side of the first internal heat exchanger 13 in the flow of the air in the storage.

[0058] Next, a process performed by the control device 30 according to the present embodiment will be described.

[0059] The control device 30 determines the drying operation mode based on the pressure of the refrigerant drawn into the compressor 11. The pressure of the refrigerant drawn into the compressor 11 is acquired, for example, by measuring the pressure of the refrigerant with the pressure sensor 31 provided in the pipe (the fifth refrigerant pipe L5, the ninth refrigerant pipe L9, or the like) provided on the suction side of the compressor 11. In addition, a method for acquiring the pressure of the

refrigerant drawn into the compressor 11 is not limited thereto.

[0060] The control device 30 performs a drying operation process when performing operation in the drying operation mode. The drying operation process performed by the control device 30 will be described with reference to a flowchart shown in FIG. 7.

[0061] When starting the drying operation process, first, the control device 30 performs the operation in the first drying operation mode (Step S1). Then, the control device 30 acquires the pressure of the refrigerant drawn into the compressor 11 (hereinafter, referred to as "suction pressure") and determines whether or not the suction pressure is greater than a first setting value (Step S2). When determining that the suction pressure is greater than the first setting value, the control device 30 proceeds to Step S3. In Step S3, the control device 30 determines whether or not to continue the drying operation mode. Step S3 will be described in detail below. When determining that the suction pressure is equal to or less than the first setting value, the control device 30 proceeds to Step S4.

[0062] When proceeding to Step S4, the control device 30 performs the operation in the third drying operation mode. Then, the control device 30 acquires the suction pressure and determines whether or not the suction pressure is greater than a second setting value (Step S5). In addition, the second setting value is a value less than the first setting value. When determining that the suction pressure is greater than the second setting value, the control device 30 proceeds to Step S3. In Step S3, the control device 30 determines whether or not to continue the drying operation mode. When determining that the suction pressure is equal to or less than the second setting value, the control device 30 proceeds to Step S6.

[0063] When proceeding to Step S6, the control device 30 performs the operation in the second drying operation mode. Then, the control device 30 proceeds to Step S3.

[0064] In Step S3, the control device 30 determines whether or not to continue the drying operation mode. When determining to continue the drying operation mode, the control device 30 returns to Step S1. When determining not to continue the drying operation mode, the control device 30 ends the drying operation mode.

[0065] Further, in the above description, an example has been described in which the process returns to Step S1 when it is determined to continue the drying operation mode. However, the present disclosure is not limited thereto. For example, when it is determined to continue the drying operation mode, the drying operation mode currently operating may be continued. That is, when the process proceeds from Step S2 to Step S3, the process may return to Step S1 to continue the first drying operation mode. When the process proceeds from Step S5 to Step S3, the process may return to Step S4 to continue the third drying operation mode. When the process proceeds from Step S6 to Step S3, the process may return to Step S6 to continue the second drying operation mode.

[0066] In addition, whether or not to continue the drying operation mode may be determined, for example, based on measurement data. Specifically, for example, the determination may be performed based on the measured humidity in the storage. It may be determined to continue the drying operation mode when the humidity in the storage is greater than a predetermined threshold value. It may be determined to end the drying operation mode when the humidity in the storage is equal to or less than the predetermined threshold value.

[0067] In addition, for example, the amount of condensate discharged from the inside of the storage may be measured, and whether or not to continue the drying operation mode may be determined based on the measurement data. It may be determined to continue the drying operation mode when the amount of condensate is equal to or less than a predetermined threshold value. It may be determined to end the drying operation mode when the amount of condensate is greater than the predetermined threshold value.

[0068] In addition, whether or not to continue the drying operation mode may be determined based on the operation time. It may be determined to continue the drying operation mode when the operation time is equal to or less than a predetermined threshold value. It may be determined to end the drying operation mode when the operation time is greater than the predetermined threshold value.

[0069] In addition, the above-described drying operation process is an example, and the present disclosure is not limited thereto. For example, in the above description, the drying operation mode is determined based on the pressure of the refrigerant drawn by the compressor 11. However, the drying operation mode may be determined based on other indices. Specifically, for example, the drying operation mode may be determined based on the temperature of the refrigerant drawn by the compressor 11. In this case, the first drying operation mode may be selected when the temperature of the refrigerant is greater than a first refrigerant temperature threshold value, the third drying operation mode may be selected when the temperature of the refrigerant is greater than a second refrigerant temperature threshold value and is equal to or less than the first refrigerant temperature threshold value, and the third drying operation mode may be selected when the temperature of the refrigerant is greater than a third refrigerant temperature threshold value and is equal to or less than the second refrigerant temperature threshold value.

[0070] In addition, for example, the drying operation mode may be determined based on the outside air temperature. In this case, the first drying operation mode may be selected when the outside air temperature is greater than a first outside air temperature threshold value, the third drying operation mode may be selected when the outside air temperature is greater than a second outside air temperature threshold value and is equal to or less than the first outside air temperature threshold value, and

the third drying operation mode may be selected when the outside air temperature is greater than a third outside air temperature threshold value and is equal to or less than the second outside air temperature threshold value.

[0071] Further, for example, the drying operation mode may be determined based on whether or not frost has occurred in the external heat exchanger 12. In this case, the first drying operation mode or the third drying operation mode may be selected when frost has not occurred in the external heat exchanger 12, and the second drying operation mode may be selected when frost has occurred in the external heat exchanger 12. Whether or not frost has occurred in the external heat exchanger 12 may be determined based on the superheat degree of the external heat exchanger 12. Specifically, it may be determined that frost has occurred when the superheat degree of the external heat exchanger 12 is equal to or less than a predetermined superheat degree threshold value.

[0072] Next, a Mollier diagram in the first drying operation mode will be described with reference to FIG. 8. In FIG. 8, a solid line indicates the first drying operation mode, and a one-dot chain line indicates the cooling operation mode.

[0073] As shown in FIG. 8, the pressure of the refrigerant compressed by the compressor 11 increases to P₃, and enthalpy also increases. The high-pressure refrigerant gas compressed by the compressor 11 flows into the first internal heat exchanger 13 and is condensed. At this time, the enthalpy decreases. The condensed refrigerant is adiabatically expanded by the drying operation expansion valve 16. The refrigerant expanded by the drying operation expansion valve 16 is branched into the second internal heat exchanger 14 and the external heat exchanger 12. The refrigerant supplied to the second internal heat exchanger 14 is depressurized to P₂. In addition, the refrigerant supplied to the external heat exchanger 12 is depressurized to P₁. The refrigerant supplied to the second internal heat exchanger 14 absorbs the heat of the air in the storage and evaporates. At this time, the enthalpy increases. The refrigerant supplied to the external heat exchanger 12 absorbs the heat of the outside air and evaporates. At this time, the enthalpy increases. The refrigerant that has completed heat exchange in the second internal heat exchanger 14 and the refrigerant that has completed heat exchange in the external heat exchanger 12 merge and are drawn into the compressor 11.

[0074] Heating capacity Q in the first drying operation mode is represented by the following Expression (1).

$$Q = \Delta h_3 (Gr_1 + Gr_2) \quad (1)$$

where Δh_3 : a difference between the pressure of the refrigerant before flowing into the first internal heat exchanger 13 and the pressure of the refrigerant discharged from the first internal heat exchanger 13
Gr₁: a flow rate of the refrigerant passing through the

external heat exchanger 12

Gr₂: a flow rate of the refrigerant passing through the second internal heat exchanger 14

[0075] On the other hand, when the outside air temperature is low and the amount of heat absorbed from the outside air decreases, P₁ decreases. When P₁ decreases, there is a possibility that the compressor 11 will operate outside its operating range or frost will occur in the external heat exchanger 12. Therefore, the drying operation is performed in the second drying operation mode in which the refrigerant is not guided to the external heat exchanger 12.

[0076] The heating capacity Q in the second drying operation mode is represented by the following Expression (2). The heating capacity in the second drying operation mode is lower than the heating capacity in the first drying operation mode.

$$Q = \Delta h_3 Gr_2 \quad (2)$$

[0077] According to the present embodiment, the following operational effects are obtained.

[0078] In the present embodiment, in the drying operation mode, the drying operation expansion valve 16 to which the refrigerant discharged from the first internal heat exchanger 13 is guided and which expands the refrigerant and the eighth refrigerant pipe L8 for guiding the refrigerant expanded by the drying operation expansion valve 16 to the external heat exchanger 12 are provided. Therefore, in the drying operation mode, a portion of the refrigerant that has been cooled by the first internal heat exchanger 13 and expanded by the drying operation expansion valve 16 can be guided to the external heat exchanger 12. When the refrigerant is supplied to the external heat exchanger 12, the refrigerant supplied to the external heat exchanger 12 is heated by exchanging heat with the outside air. That is, the refrigerant absorbs the heat of the outside air. As described above, in the circuit in which the refrigerant circulates, the refrigerant absorbs the heat of the outside air. Therefore, it is possible to increase the amount of refrigerant circulating and thus to increase the heating capacity of the first internal heat exchanger 13. Therefore, since the air in the storage can be further heated by the first internal heat exchanger 13, it is possible to increase the drying capacity. As a result, it is possible to shorten the time required for drying the inside of the storage.

[0079] In addition, in the present embodiment, the control device 30 having the first drying operation mode and the second drying operation mode is provided.

[0080] In the first drying operation mode, the refrigerant discharged from the first internal heat exchanger 13 is guided to the second internal heat exchanger 14 and the external heat exchanger 12. Therefore, both the second internal heat exchanger 14 and the external heat exchanger 12 can function as evaporators. In the external heat exchanger 12, the refrigerant absorbs the heat of the

outside air. Therefore, it is possible to further increase the amount of refrigerant circulating. As a result, the heating capacity of the first internal heat exchanger 13 can be increased by the amount of heat absorbed by the external heat exchanger 12. As described above, in the first drying operation mode, since heat is absorbed by the external heat exchanger 12, it is possible to appropriately dry the inside of the storage, for example, in a situation in which the outside air temperature is high.

[0081] On the other hand, in the second drying operation mode, the refrigerant discharged from the first internal heat exchanger 13 is guided to the second internal heat exchanger 14, but is not guided to the external heat exchanger 12. Therefore, the refrigerant discharged from the first internal heat exchanger 13 absorbs heat only from the air in the storage. As a result, the heating capacity of the first internal heat exchanger 13 can be less likely to be affected by the temperature of the outside air. As described above, in the second drying operation mode, it is possible to appropriately dry the inside of the storage, for example, in a situation in which the outside air temperature is low.

[0082] As described above, the situations in which the inside of the storage can be appropriately dried are different between the first drying operation mode and the second drying operation mode. In the present embodiment, since the control device 30 has the first drying operation mode and the second drying operation mode, it is possible to select either the first drying operation mode or the second drying operation mode according to the situation of the transport refrigerator 10. Therefore, when the drying operation mode is selected according to the situation of the transport refrigerator 10, it is possible to appropriately dry the inside of the storage.

[0083] In addition, in the present embodiment, the control device 30 has the third drying operation mode, in which the refrigerant guided from the first internal heat exchanger 13 to the external heat exchanger 12 is guided to the compressor 11 via the tenth refrigerant pipe L10 or the like, as the drying operation mode. In the third drying operation mode, the refrigerant absorbs the heat of the outside air, using a portion of the external heat exchanger 12. Therefore, the amount of heat absorbed from the outside air in the third drying operation mode is less than the amount of heat absorbed from the outside air in the first drying operation mode. On the other hand, the amount of heat absorbed from the outside air in the third drying operation mode is larger than that in the second drying operation mode in which the refrigerant is not guided to the external heat exchanger 12. As described above, in the third drying operation mode, the amount of heat absorbed from the outside air is different from that in the first drying operation mode and the second drying operation mode.

[0084] Therefore, it is possible to select any one of the first drying operation mode, the second drying operation mode, and the third drying operation mode according to the situation of the transport refrigerator 10 such as the

outside air temperature. Since the drying operation mode can be selected according to the situation of the transport refrigerator 10, it is possible to appropriately dry the inside of the storage.

[0085] Further, in the present embodiment, the control device 30 determines one drying operation mode from a plurality of drying operation modes based on the pressure of the refrigerant drawn into the compressor 11. The pressure of the refrigerant drawn into the compressor 11 corresponds to the heating capacity of the first internal heat exchanger 13. Therefore, the drying operation mode is selected based on the pressure of the refrigerant drawn into the compressor 11, which makes it possible to appropriately dry the inside of the storage.

[0086] Furthermore, the present disclosure is not limited to the above-described embodiment and can be appropriately modified without departing from the gist of the present disclosure.

[0087] For example, in the above-described embodiment, an example in which the tenth refrigerant pipe L10 is provided and the third drying operation mode is provided has been described. However, the present disclosure is not limited thereto. For example, the tenth refrigerant pipe L10 may not be provided, and the third drying operation mode may not be provided.

[0088] The transport refrigerator according to the above-described embodiment is understood as follows, for example.

[0089] According to a first aspect of the present disclosure, there is provided a transport refrigerator (10) having a drying operation mode for drying an inside of a storage, the transport refrigerator including: a compressor (11) that compresses a refrigerant; an external heat exchanger (12) that is provided outside the storage and performs heat exchange between the refrigerant and air outside the storage; a first internal heat exchanger (13) that is provided inside the storage and performs heat exchange between the refrigerant and air in the storage; a second internal heat exchanger (14) that is provided inside the storage and performs heat exchange between the refrigerant and the air in the storage; a first refrigerant supply pipe (L6) that guides the refrigerant discharged from the compressor to the first internal heat exchanger in the drying operation mode; an expansion valve (16) to which the refrigerant discharged from the first internal heat exchanger is guided and which expands the refrigerant in the drying operation mode; a second refrigerant supply pipe (L7) that guides the refrigerant expanded by the expansion valve to the second internal heat exchanger in the drying operation mode; a third refrigerant supply pipe (L8) that guides the refrigerant expanded by the expansion valve to the external heat exchanger in the drying operation mode; and a return pipe (L9) that guides the refrigerant discharged from the external heat exchanger to the compressor in the drying operation mode.

[0090] In the above configuration, the expansion valve to which the refrigerant discharged from the first internal

heat exchanger is guided and which expands the refrigerant and the third refrigerant supply pipe that guides the refrigerant expanded by the expansion valve to the external heat exchanger in the drying operation mode are provided. Therefore, in the drying operation mode, a portion of the refrigerant that has been cooled by the first internal heat exchanger and expanded by the expansion valve can be guided to the external heat exchanger. When the refrigerant is supplied to the external heat exchanger, the refrigerant supplied to the external heat exchanger is heated by exchanging heat with the outside air. That is, the refrigerant absorbs the heat of the outside air. As described above, in the circuit in which the refrigerant circulates, the refrigerant absorbs the heat of the outside air. Therefore, it is possible to increase the amount of refrigerant circulating and thus to increase the heating capacity of the first internal heat exchanger. Therefore, since the air in the storage can be further heated by the first internal heat exchanger, it is possible to increase the drying capacity. As a result, it is possible to shorten the time required for drying the inside of the storage.

[0091] In addition, according to a second aspect of the present disclosure, the transport refrigerator according to the first aspect further includes a control device (30) having, as the drying operation mode, a first drying operation mode in which the refrigerant discharged from the compressor is guided to the first internal heat exchanger and the refrigerant discharged from the first internal heat exchanger is guided to the second internal heat exchanger and the external heat exchanger and a second drying operation mode in which the refrigerant discharged from the compressor is guided to the first internal heat exchanger, the refrigerant discharged from the first internal heat exchanger is guided to the second internal heat exchanger, and the refrigerant discharged from the first internal heat exchanger is not guided to the external heat exchanger.

[0092] In the above-described configuration, the control device having the first drying operation mode and the second drying operation mode is provided.

[0093] In the first drying operation mode, the refrigerant discharged from the first internal heat exchanger is guided to the second internal heat exchanger and the external heat exchanger. Therefore, both the second internal heat exchanger and the external heat exchanger can function as evaporators. In the external heat exchanger, the refrigerant absorbs the heat of the outside air. Therefore, it is possible to further increase the amount of refrigerant circulating. As a result, the heating capacity of the first internal heat exchanger can be increased by the amount of heat absorbed by the external heat exchanger. As described above, in the first drying operation mode, since heat is absorbed by the external heat exchanger, it is possible to appropriately dry the inside of the storage, for example, in a situation in which the outside air temperature is high.

[0094] In addition, in the second drying operation

mode, the refrigerant discharged from the first internal heat exchanger is guided to the second internal heat exchanger, but is not guided to the external heat exchanger. Therefore, the refrigerant discharged from the first internal heat exchanger absorbs heat only from the air in the storage. As a result, the heating capacity of the first internal heat exchanger can be less likely to be affected by the temperature of the outside air. As described above, in the second drying operation mode, it is possible to appropriately dry the inside of the storage, for example, in a situation in which the outside air temperature is low.

[0095] As described above, the situations in which the inside of the storage can be appropriately dried are different between the first drying operation mode and the second drying operation mode. In the above-described configuration, since the control device has the first drying operation mode and the second drying operation mode, it is possible to select either the first drying operation mode or the second drying operation mode according to the situation of the transport refrigerator. Therefore, when the drying operation mode is selected according to the situation of the transport refrigerator, it is possible to appropriately dry the inside of the storage.

[0096] Further, according to a third aspect of the present disclosure, the transport refrigerator according to the second aspect further includes an intermediate position refrigerant pipe (L10) that is connected to an intermediate position of the external heat exchanger and guides the refrigerant from the intermediate position to the compressor. The control device has, as the drying operation mode, a third drying operation mode in which the refrigerant guided from the first internal heat exchanger to the external heat exchanger is guided to the compressor via the intermediate position refrigerant pipe.

[0097] In the above-described configuration, the control device has, as the drying operation mode, the third drying operation mode in which the refrigerant guided from the first internal heat exchanger to the external heat exchanger is guided to the compressor via the intermediate position refrigerant pipe. In the third drying operation mode, the refrigerant absorbs the heat of the outside air using a portion of the external heat exchanger. Therefore, the amount of heat absorbed from the outside air in the third drying operation mode is less than the amount of heat absorbed from the outside air in the first drying operation mode. In addition, the amount of heat absorbed from the outside air in the third drying operation mode is larger than that in the second drying operation mode in which the refrigerant is not guided to the external heat exchanger. As described above, in the third drying operation mode, the amount of heat absorbed from the outside air is different from that in the first drying operation mode and the second drying operation mode.

[0098] Therefore, it is possible to select any one of the first drying operation mode, the second drying operation mode, and the third drying operation mode according to the situation of the transport refrigerator such as the outside air temperature. Since the drying operation mode

can be selected according to the situation of the transport refrigerator, it is possible to appropriately dry the inside of the storage.

[0099] Furthermore, according to a fourth aspect of the present disclosure, in the transport refrigerator according to the second aspect or the third aspect, the control device determines one drying operation mode from a plurality of the drying operation modes, based on a pressure of the refrigerant drawn into the compressor.

[0100] In the above-described configuration, the control device determines one drying operation mode from the plurality of drying operation modes based on the pressure of the refrigerant drawn into the compressor. The pressure of the refrigerant drawn into the compressor corresponds to the heating capacity of the first internal heat exchanger. Therefore, the selection of the drying operation mode based on the pressure of the refrigerant drawn into the compressor makes it possible to appropriately dry the inside of the storage.

Reference Signs List

[0101]

- 10: transport refrigerator
- 11: Compressor
- 12: External heat exchanger
- 13: First internal heat exchanger
- 14: Second internal heat exchanger
- 15: Cooling operation expansion valve
- 16: Drying operation expansion valve (expansion valve)
- 21: First on-off valve
- 22: Second on-off valve
- 23: Third on-off valve
- 24: Fourth on-off valve
- 25: Fifth on-off valve
- 30: Control device
- 31: Pressure sensor
- L1: First refrigerant pipe
- L2: Second refrigerant pipe
- L3: Third refrigerant pipe
- L4: Fourth refrigerant pipe
- L5: Fifth refrigerant pipe
- L6: Sixth refrigerant pipe (first refrigerant supply pipe)
- L7: Seventh refrigerant pipe (second refrigerant supply pipe)
- L8: Eighth refrigerant pipe (third refrigerant supply pipe)
- L9: Ninth refrigerant pipe (return refrigerant pipe)
- L10: Tenth refrigerant pipe (intermediate position refrigerant pipe)

Claims

1. A transport refrigerator having a drying operation

mode for drying an inside of a storage, the transport refrigerator comprising:

- a compressor that compresses a refrigerant;
- an external heat exchanger that is provided outside the storage and performs heat exchange between the refrigerant and air outside the storage;
- a first internal heat exchanger that is provided inside the storage and performs heat exchange between the refrigerant and air in the storage;
- a second internal heat exchanger that is provided inside the storage and performs heat exchange between the refrigerant and the air in the storage;
- a first refrigerant supply pipe that guides the refrigerant discharged from the compressor to the first internal heat exchanger in the drying operation mode;
- an expansion valve to which the refrigerant discharged from the first internal heat exchanger is guided and which expands the refrigerant in the drying operation mode;
- a second refrigerant supply pipe that guides the refrigerant expanded by the expansion valve to the second internal heat exchanger in the drying operation mode;
- a third refrigerant supply pipe that guides the refrigerant expanded by the expansion valve to the external heat exchanger in the drying operation mode; and
- a return pipe that guides the refrigerant discharged from the external heat exchanger to the compressor in the drying operation mode.

2. The transport refrigerator according to claim 1, further comprising:
 - a control device having, as the drying operation mode, a first drying operation mode in which the refrigerant discharged from the compressor is guided to the first internal heat exchanger and the refrigerant discharged from the first internal heat exchanger is guided to the second internal heat exchanger and the external heat exchanger and a second drying operation mode in which the refrigerant discharged from the compressor is guided to the first internal heat exchanger, the refrigerant discharged from the first internal heat exchanger is guided to the second internal heat exchanger, and the refrigerant discharged from the first internal heat exchanger is not guided to the external heat exchanger.
3. The transport refrigerator according to claim 2, further comprising:
 - an intermediate position refrigerant pipe that is connected to an intermediate position of the

external heat exchanger and guides the refrigerant from the intermediate position to the compressor,

wherein the control device has, as the drying operation mode, a third drying operation mode in which the refrigerant guided from the first internal heat exchanger to the external heat exchanger is guided to the compressor via the intermediate position refrigerant pipe.

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4. The transport refrigerator according to claim 2 or 3, wherein the control device determines one drying operation mode from a plurality of the drying operation modes, based on a pressure of the refrigerant drawn into the compressor.

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FIG. 1

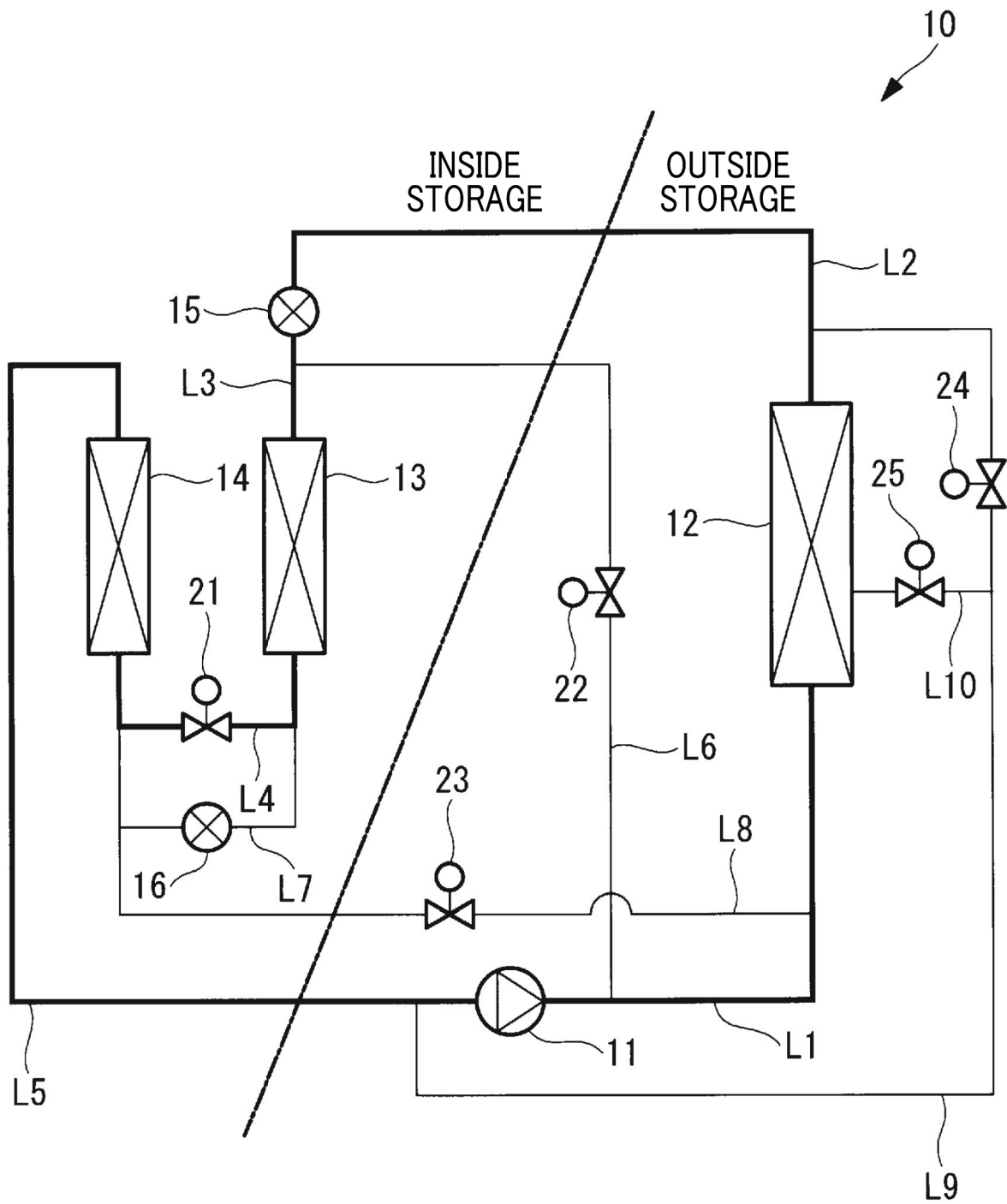


FIG. 2

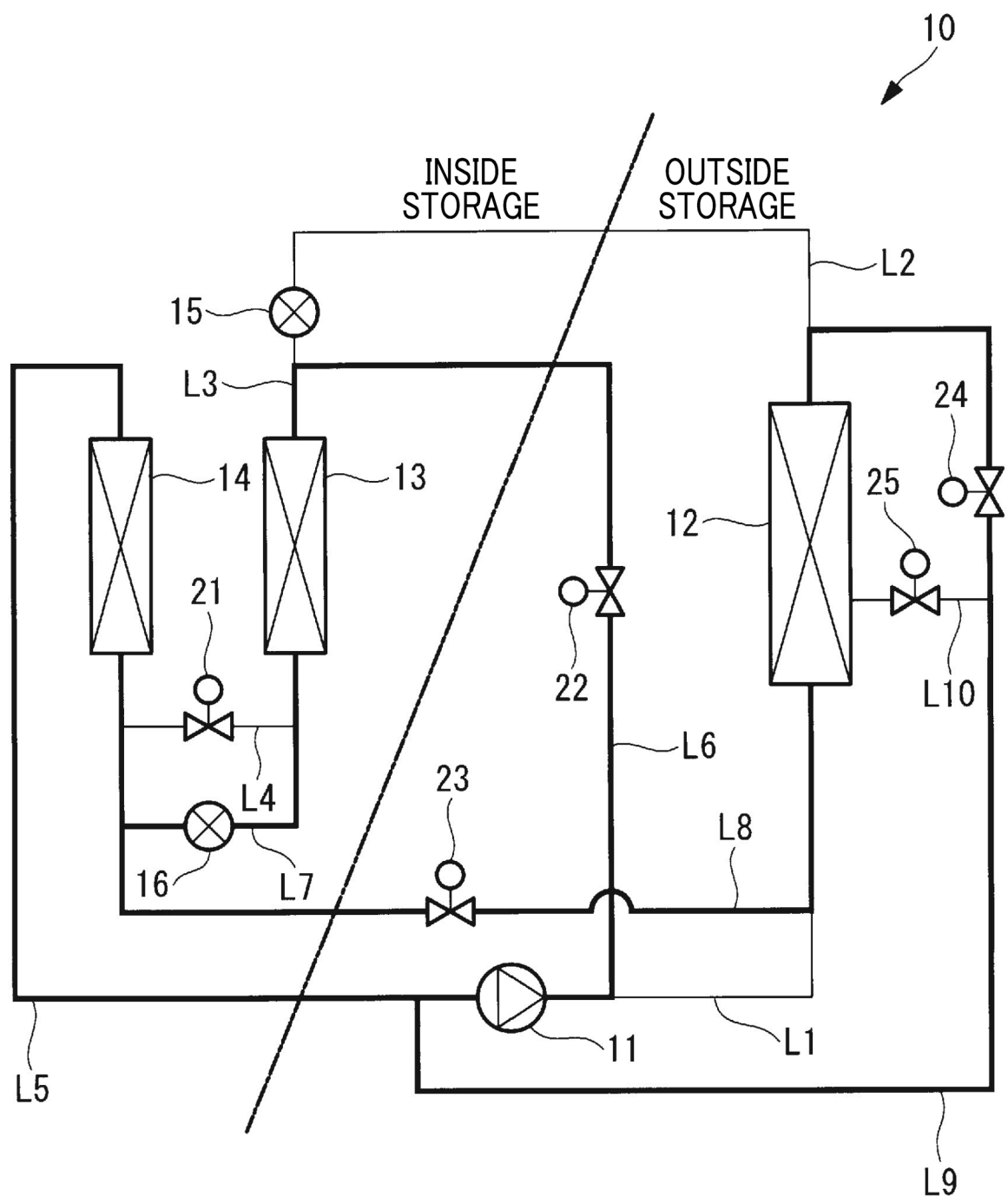


FIG. 3

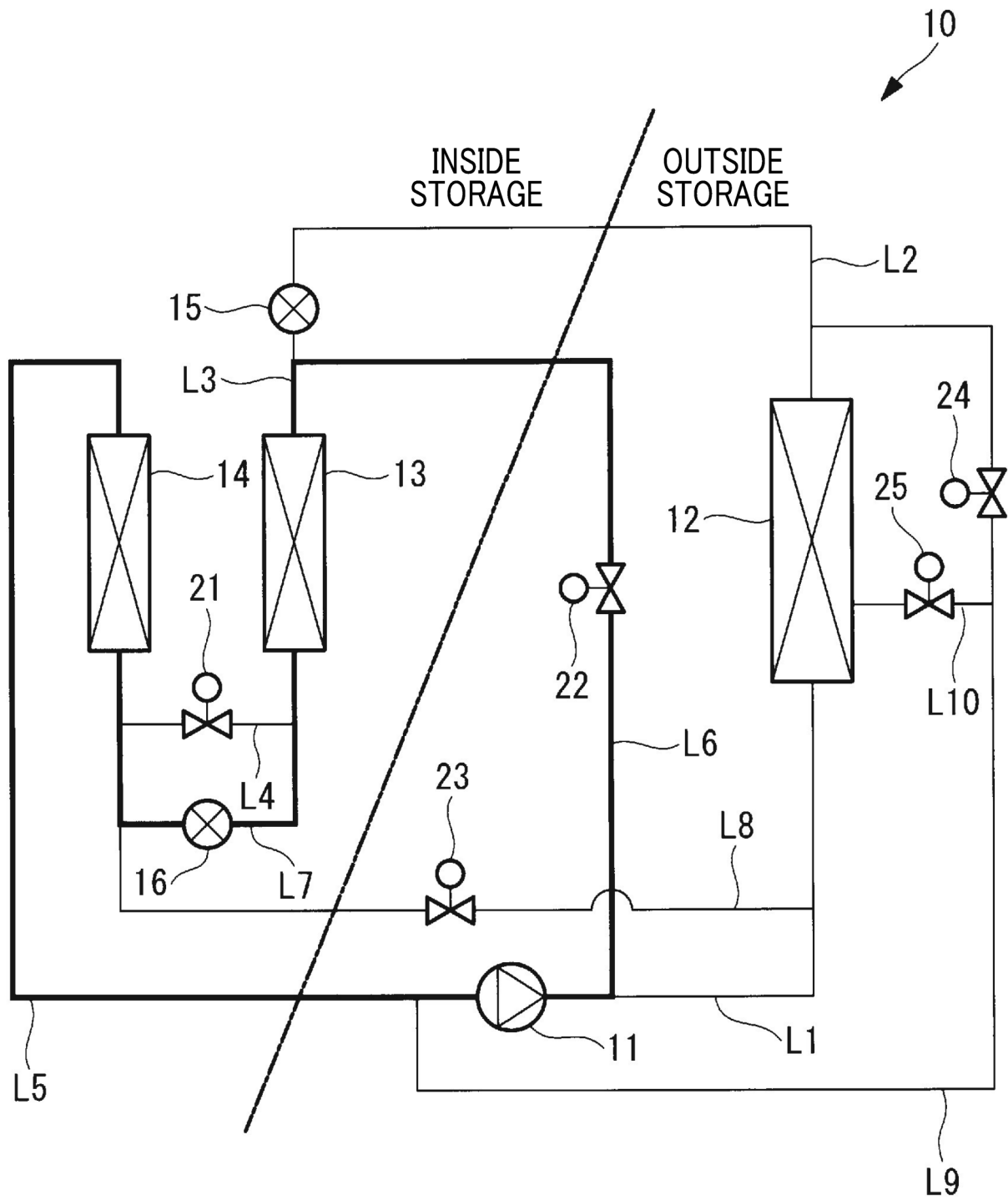


FIG. 4

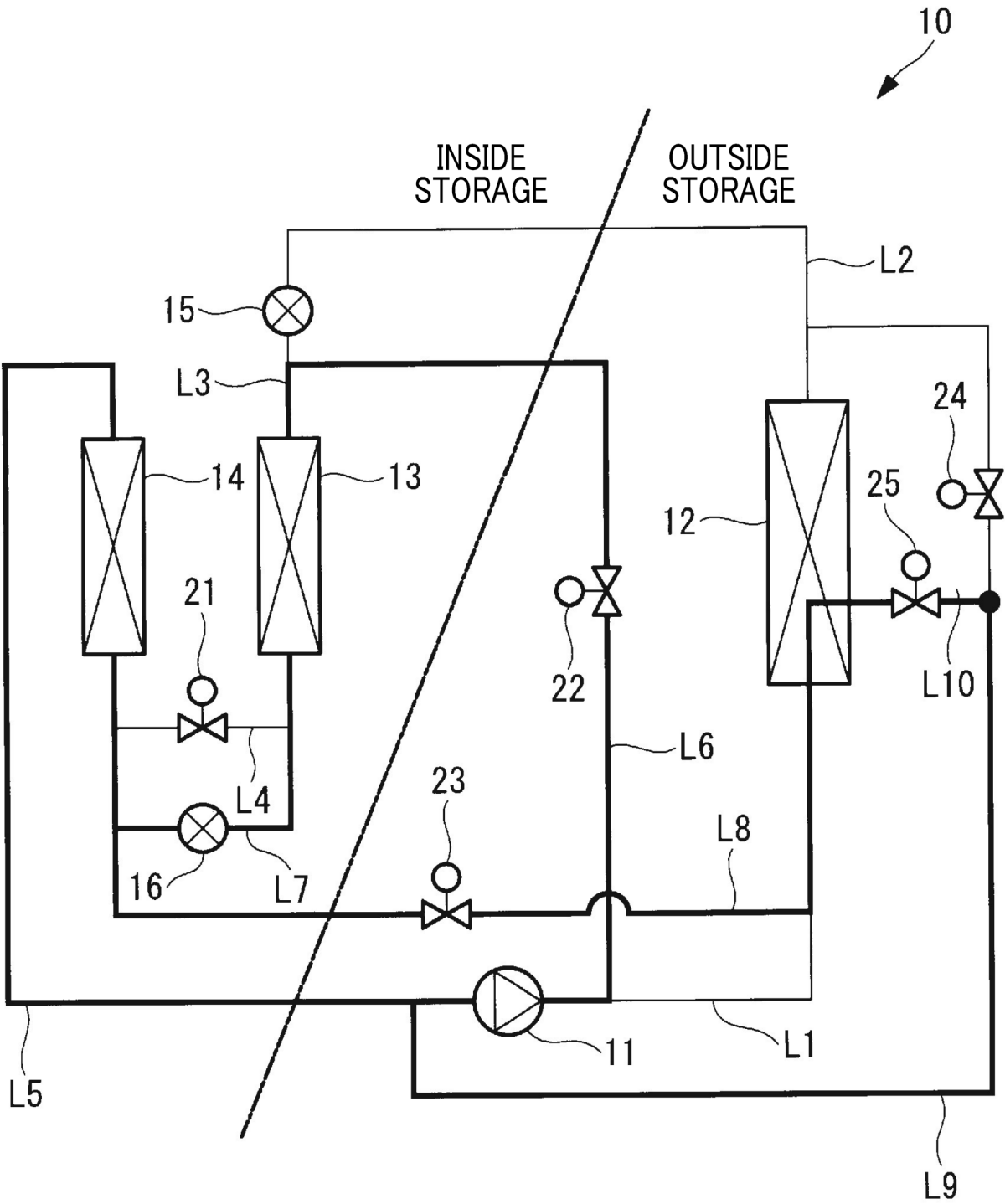


FIG. 5

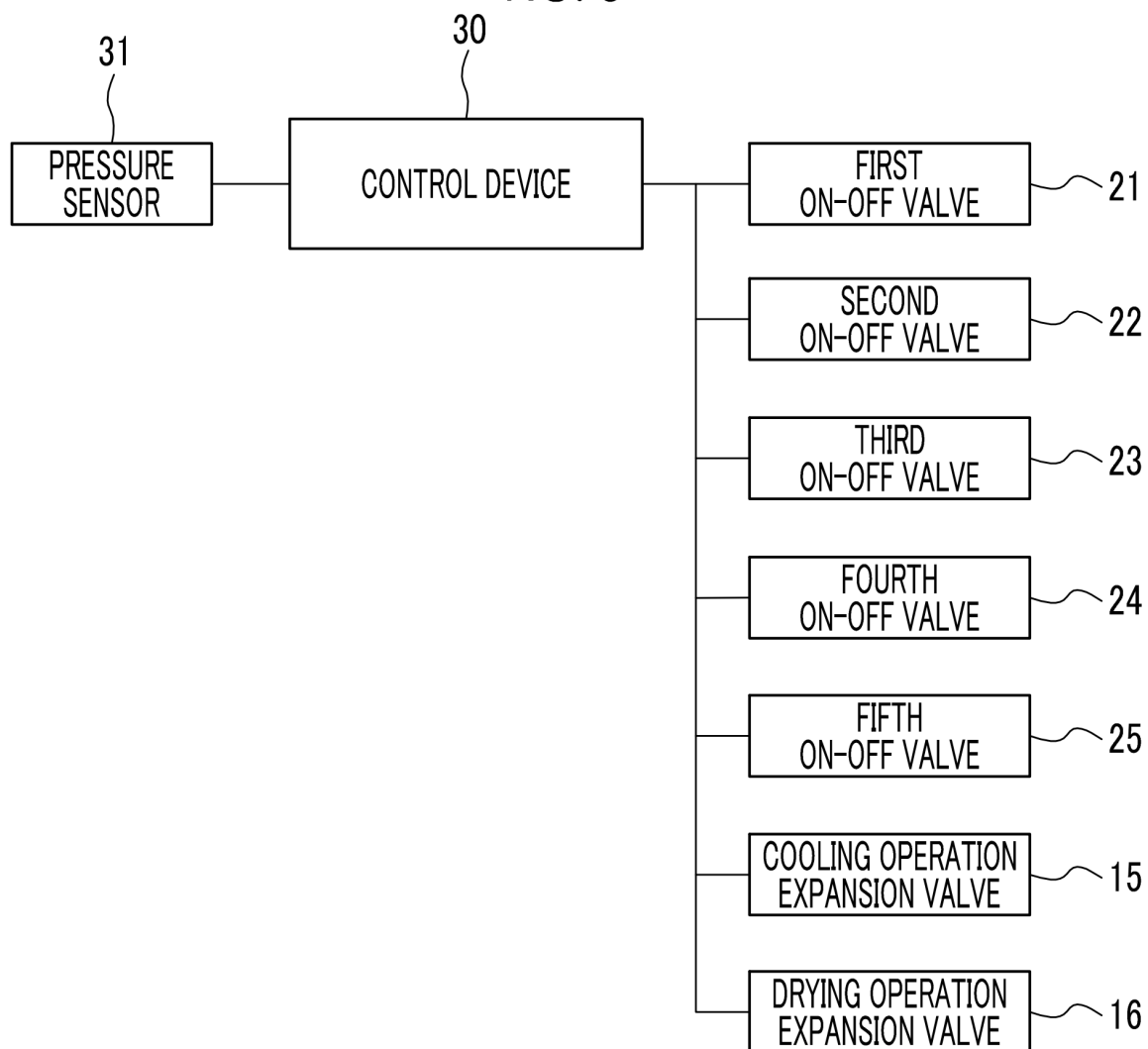


FIG. 6

MODE	SV1	SV2	SV3	SV4	SV5	EEV1	EEV2
COOLING OPERATION	ON	OFF	OFF	OFF	OFF	ON	OFF
FIRST DRYING OPERATION (HIGH OUTSIDE AIR TEMPERATURE)	OFF	ON	ON	ON	OFF	OFF	ON
SECOND DRYING OPERATION (LOW OUTSIDE AIR TEMPERATURE)	OFF	ON	OFF	OFF	OFF	OFF	ON
THIRD DRYING OPERATION (MEDIUM OUTSIDE AIR TEMPERATURE)	OFF	ON	ON	OFF	ON	OFF	ON

FIG. 7

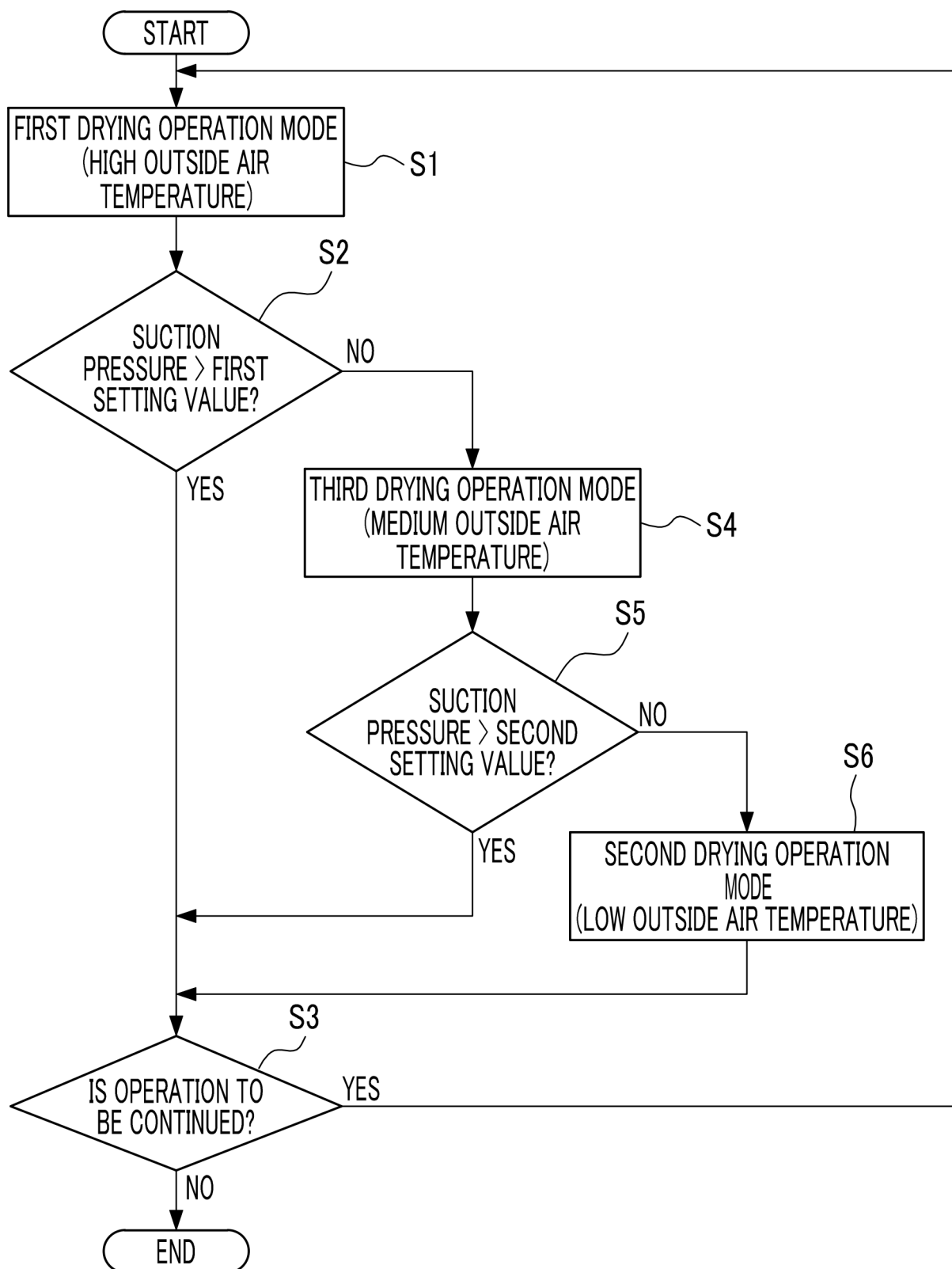
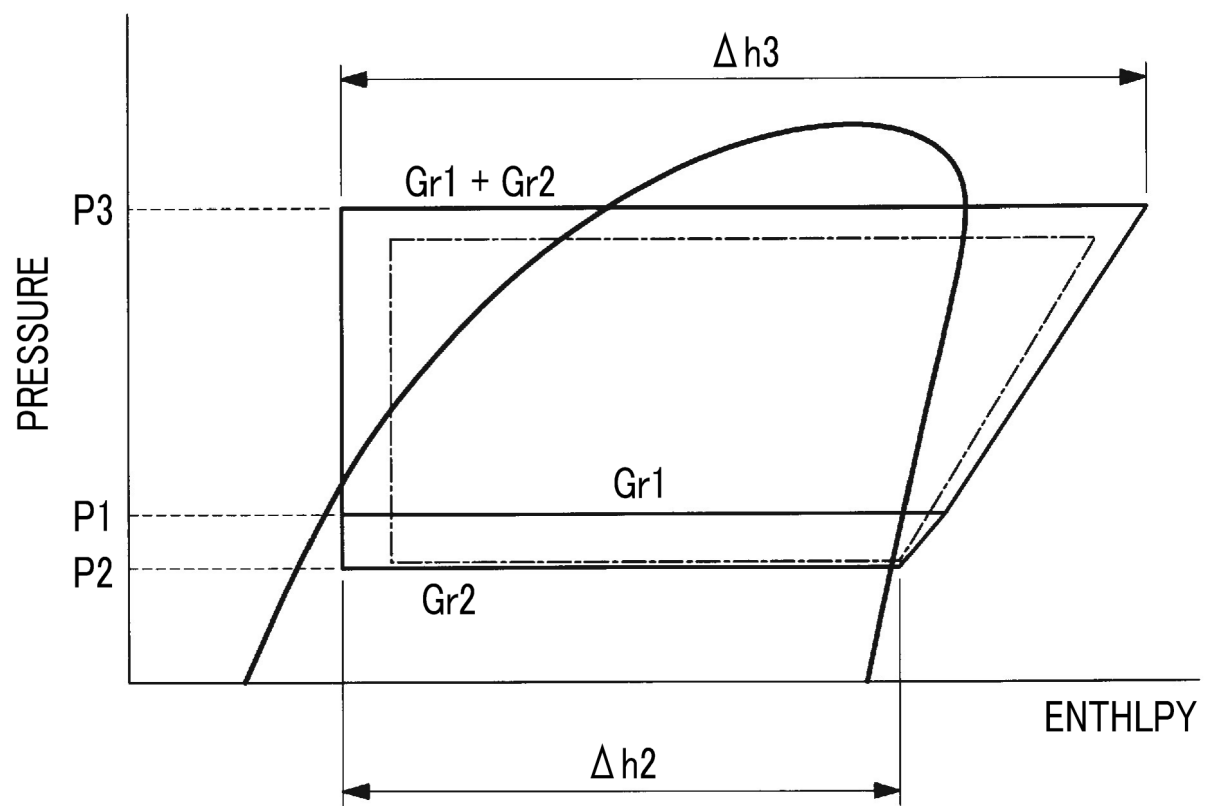


FIG. 8



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2024/014637

A. CLASSIFICATION OF SUBJECT MATTER

F25D 11/00(2006.01)i; **F25B 29/00**(2006.01)i; **F25D 23/00**(2006.01)i
FI: F25D11/00 101D; F25B29/00 391Z; F25D23/00 302L

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)

F25D11/00; F25D23/00; ; F25B1/00; F25B29/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Published examined utility model applications of Japan 1922-1996
Published unexamined utility model applications of Japan 1971-2024
Registered utility model specifications of Japan 1996-2024
Published registered utility model applications of Japan 1994-2024

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	JP 6-109344 A (KUBOTA CORPORATION) 19 April 1994 (1994-04-19) paragraphs [0015]-[0021], [0023], [0024], fig. 1-2, 4-5	1-4
Y	JP 2007-71438 A (DENSO CORPORATION) 22 March 2007 (2007-03-22) paragraphs [0023], [0037]-[0045], fig. 1-2	1-4
Y	JP 11-63768 A (DAIKIN INDUSTRIES, LTD.) 05 March 1999 (1999-03-05) paragraphs [0019], [0022], [0032], fig. 1-3	1-4
Y	JP 2003-83629 A (MITSUBISHI HEAVY INDUSTRIES, LTD.) 19 March 2003 (2003-03-19) paragraphs [0001], [0040]-[0043], fig. 6	1-4
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 49779/1982 (Laid-open No. 153979/1983) (SANYO ELECTRIC CO.) 14 October 1983 (1983-10-14) specification, p. 7, line 6 to p. 8, line 17, fig. 2	3-4
Y	JP 6-82122 A (DAIKIN INDUSTRIES, LTD.) 22 March 1994 (1994-03-22) paragraphs [0022]-[0027], fig. 4	4

☐ 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

21 June 2024

Date of mailing of the international search report

02 July 2024

Name and mailing address of the ISA/JP

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Telephone No.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/JP2024/014637

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
JP	6-109344	A	19 April 1994	(Family: none)	
JP	2007-71438	A	22 March 2007	(Family: none)	
JP	11-63768	A	05 March 1999	(Family: none)	
JP	2003-83629	A	19 March 2003	(Family: none)	
JP	58-153979	U1	14 October 1983	(Family: none)	
JP	6-82122	A	22 March 1994	(Family: none)	

REFERENCES CITED IN THE DESCRIPTION

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