(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 1 923 648 A2**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
21.05.2008 Bulletin 2008/21

(51) Int Cl.:
F25B 29/00 *(2006.01)* ***F25B 9/00*** *(2006.01)*
F25D 31/00 *(2006.01)*

(21) Application number: **07119518.4**

(22) Date of filing: **29.10.2007**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC MT NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR MK RS

(30) Priority: **20.11.2006 JP 2006312889**

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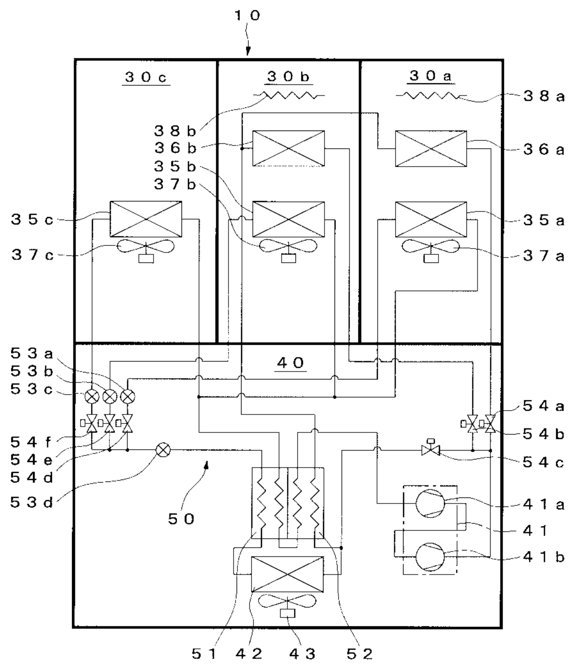
(54) **Cooling/heating apparatus**

(57) The present invention provides a cooling/heating apparatus which allows improvement in heating efficiency in a first heat exchanger (36a,36b) provided in a housing to be heated. That is, among a plurality of housing, a third heat exchanger (42) is provided to exchange heat of a refrigerant flowing out of the first heat exchanger (36a,36b) provided in the housing heating goods with heat of the refrigerant sucked into by a compressor (41a, 41b). Therefore, by increasing a temperature of the refrigerant sucked into by the compressor, a temperature of the refrigerant discharged from the compressor can be increased.

Fig. 4



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Description

[0001] The present invention relates to a cooling/heating apparatus which has a plurality of housings and cools or heats the respective housings.

[0002] Conventionally, there is known that kind of cooling/heating apparatus comprising a plurality of housings for housing goods and a refrigerant circuit including a first heat exchanger provided in each housing, a second heat exchanger provided outside the housings and a compressor. That cooling/heating apparatus is designed to cool or heat goods housed in each housing by each first heat exchanger which exchanges heat of a refrigerant and air in each housing.

[0003] In the conventional cooling/heating apparatus, the refrigerant circuit is provided with an internal heat exchanger exchanging heat of the refrigerant flowing out of the second heat exchanger and being circulated toward the first heat exchanger provided in a housing to be cooled with heat of the refrigerant flowing out of the first heat exchanger provided in the housing to be cooled and circulated toward the compressor. That dissipates heat from the refrigerant flowing out of the second heat exchanger by heat-exchanging with the refrigerant flowing out of the first heat exchanger provided in the housing to be cooled in order to improve a cooling effect in the first heat exchanger provided in the housing to be cooled.

[0004] On the other hand, in the first heat exchanger provided in a housing to be heated, the housing is heated by dissipating heat from the refrigerant to be discharged from the compressor. At that time, the refrigerant in a low temperature flowing out of the first heat exchanger provided in the housing to be cooled is heat-exchanged, in the internal heat exchanger with the refrigerant having been heat-exchanged with the outside air in the second heat exchanger and dissipated heat, thus absorbing heat. The temperature of the refrigerant sucked into by the compressor is approximately the same as the temperature of the outside air and a comparatively low temperature. Therefore, the refrigerant with a low temperature, approximately the same as the temperature of the outside air, cannot obtain a temperature sufficiently increased even if the refrigerant is compressed by the compressor, and the heat dissipation amount in the first heat exchanger provided in the housing to be heated cannot be secured sufficiently.

[0005] An object of the present invention is to provide a cooling/heating apparatus which allows improvement in heating efficiency in a first heat exchanger provided in a housing to be heated.

[0006] In order to attain the object, the present invention comprises: a plurality of housings housing goods; a first heat exchanger provided in each housing and respectively cooling or heating the housed goods; a second heat exchanger provided outside the housings; a compressor provided outside the housings; a third heat exchanger exchanging heat of a refrigerant flowing out of the first heat exchanger provided in each housing heating the goods of the plurality of housings with heat of the refrigerant sucked into by the compressor; and a fourth heat exchanger exchanging heat of the refrigerant circulating from the second heat exchanger toward the first heat exchanger provided in each housing cooling the goods with heat of the refrigerant flowing out of the first heat exchanger provided in each housing cooling the goods.

[0007] Thereby, the refrigerant sucked into by the compressor absorbs heat in the third heat exchanger and a temperature of the refrigerant discharged from the compressor can be increased. Accordingly, by increasing the temperature of the refrigerant discharged from the compressor, the amount of heat generated by the increased temperature of the refrigerant is utilized as a heating source for the housing to be heated. Thereby heating efficiency can be improved.

[0008] The above described objects and other objects, features and advantages of the present invention will become apparent with the following description and the accompanying drawings.

[0009] **In the Drawings:**

FIG. 1 is an entire perspective view of an automatic vending machine illustrating an embodiment of the present invention;
FIG. 2 is a front sectional view of the automatic vending machine;
FIG. 3 is a sectional side view of the automatic vending machine;
FIG. 4 is a schematic configuration diagram of the automatic vending machine illustrating a refrigerant circuit;
FIG. 5 is an entire perspective view of a first internal heat exchanger and a second internal heat exchanger;
FIG. 6 is a schematic configuration diagram of the automatic vending machine illustrating the case of cooling all of a first housing, a second housing and a third housing; and
FIG. 7 is a schematic configuration diagram of the automatic vending machine illustrating the case of heating the first housing and cooling the second housing and a third housing.

[0010] An automatic vending machine as a cooling/heating apparatus of the present invention comprises an automatic vending machine body 10 having opening in the front face and an outer door 20 opening and closing the front face of the automatic vending machine body 10.

[0011] The automatic vending machine body 10 has the inside partitioned into an upper portion and a lower portion. Thereby, the upper portion is provided with a product housing 30 and the lower portion is provided with a machine room 40.

[0012] The front face of the outer door 20 is provided with a sample display 21 for housing and displaying sample products, a product selection switch 22, a coin slot

23, a banknote slot 24, a return lever 25, a return coin port 26 and a product slot 27. One end side of the outer door 20 in the right-and-left direction is rotationably supported by an end side of the automatic vending machine body 10 in the right-and-left direction.

[0013] The upper side, the rear side, the bottom side and the both of the left and the right sides of the product housing 30 are formed of a heat insulating material 31. The front side of the product housing 30 is designed to be opened and closed by a heat insulating inner door 32. In addition, the product housing 30 is partitioned into right-and-left blocks with a heat insulating partition plate 33 and is provided with a first housing 30a, a second housing 30b and a third housing 30c. Each of the first housing 30a, the second housing 30b and the third housing 30c is provided with a plurality of product housing columns 34 capable of stacking and housing products vertically and of taking out the products one by one from the lower end side.

[0014] The first housing 30a is provided with a first evaporator 35a as a first heat exchanger for cooling the products housed in the first housing 30a; a first radiator 36a as a first heat exchanger for heating the products housed in the first housing 30a; a first fan 37a for distributing the air to be heat-exchanged with a refrigerant circulating through the first evaporator 35a or the first radiator 36a; and a first electric heater 38a for compensating for the heat amount falling short at the occasion of heating the product with the first radiator 36a.

[0015] The second housing 30b is provided with a second evaporator 35b as a first heat exchanger for cooling the products housed in the second housing 30b; a second radiator 36b as a first heat exchanger for heating the products housed in the second housing 30b; a second fan 37b for distributing the air to be heat-exchanged with the refrigerant circulating through the second evaporator 35b or the second radiator 36b; and a second electric heater 38b for compensating for the heat amount falling short at the occasion of heating the product with the second radiator 36b.

[0016] The third housing 30c is provided with a third evaporator 35c as a first heat exchanger for cooling the products housed in the third housing 30c and a third fan 37c for distributing the air to be heat-exchanged with the refrigerant circulating through the third evaporator 35c.

[0017] In the present embodiment, cooling and heating of the housed products can be switched in the first housing 30a and the second housing 30b. The third housing 30c is arranged only to cool the products.

[0018] The machine room 40 is provided with an intake port and an exhaust port so as to distribute the outside air inside thereof. The machine room 40 is provided inside thereof with a compressor 41 for compressing the refrigerant; a third radiator 42 as a second heat exchanger for releasing waste heat to the air being distributed inside the machine room 40; and a machine room fan 43 for distributing the outside air inside the machine room 40.

[0019] The compressor 41 is a two-stage compressor including a lower stage side compressing part 41a and a higher stage side compressing part 41b, compresses the sucked into refrigerant in the lower stage side compressing part 41a and compresses and discharges the refrigerant compressed in the lower stage side compressing part 41a further in the higher stage side compressing part 41b. The two-stage compressor compresses a refrigerant in two stages and therefore can deal with high operation pressure and high differential pressure, and is applied to, for example, a refrigerant circuit which uses carbon dioxide and the like as a refrigerant.

[0020] In addition, a refrigerant circuit 50 as illustrated in FIG. 4 is configured in the product housing 30 and the machine room 40. Carbon dioxide being a natural refrigerant and being in a supercritical state on the high-pressure side is used as a refrigerant. The refrigerant circuit 50 includes: the first evaporator 35a; the second evaporator 35b; the third evaporator 35c; the first radiator 36a; the second radiator 36b; the compressor 41; the third radiator 42; a first internal heat exchanger 51 as a fourth heat exchanger for exchanging heat of the refrigerant flowing out of the third radiator 42 with heat of the refrigerant flowing out of the first evaporator 35a, the second evaporator 15b and the third evaporator 15c; a second internal heat exchanger 52 as a third heat exchanger for exchanging heat of the refrigerant sucked into by the compressor 41 with heat of the refrigerant flowing out of the first radiator 36a and the second radiator 36b; first to third expansion valves 53a, 53b and 53c as first decompressor and a fourth expansion valve 53d as second decompressor for decompressing the refrigerant; and first to sixth electromagnetic valves 54a, 54b, 54c, 54d, 54e and 54f for opening and closing flow paths of the refrigerant. Those components are connected by copper pipes or stainless pipes.

[0021] A refrigerant discharge side of the compressor 41 is connected to refrigerant inflow sides of the first radiator 36a and the second radiator 36b in parallel. Flow paths on the refrigerant inflow sides of the first radiator 36a and the second radiator 36b are provided with the first electromagnetic valve 54a and the second electromagnetic valve 54b respectively. Refrigerant outflow sides of the first radiator 36a and the second radiator 36b are connected to a high pressure refrigerant inflow side of the second internal heat exchanger 52 in parallel. A high pressure refrigerant outflow side of the second internal heat exchanger 52 is connected to a refrigerant inflow side of the third radiator 42. In addition, the refrigerant discharge side of the compressor 41 is connected to a flow path on the refrigerant inflow side of the third radiator 42 through the third electromagnetic valve 54c. A refrigerant outflow side of the third radiator 42 is connected to a high pressure refrigerant inflow side of the first internal heat exchanger 51. A high pressure refrigerant outflow side of the first internal heat exchanger 51 is connected to the first evaporator 35a, the second evaporator 35b and the third evaporator 35c in parallel. Flow paths on refrigerant inflow sides of the first evaporator

35a, the second evaporator 35b and the third evaporator 35c are respectively provided with the first expansion valve 53a, the second expansion valve 53b and the third expansion valve 53c. Flow paths on upstream sides of the first expansion valve 53a, the second expansion valve 53b and the third expansion valve 53c are respectively provided with the fourth electromagnetic valve 54d, the fifth electromagnetic valve 54e and the sixth electromagnetic valve 54f. In addition, a flow path between the high pressure refrigerant outflow side of the first internal heat exchanger 51 and the fourth, fifth, and sixth electromagnetic valves 54d, 54e and 54f is provided with the fourth expansion valve 53d. Refrigerant outflow sides of the first evaporator 35a, the second evaporator 35b and the third evaporator 35c are connected to a low pressure refrigerant inflow side of the first internal heat exchanger 51. A low pressure refrigerant outflow side of the first internal heat exchanger 51 is connected to a low pressure refrigerant inflow side of the second internal heat exchanger 52. In addition, a low pressure refrigerant outflow side of the second internal heat exchanger 52 is connected to a refrigerant absorption side of the compressor 41.

[0022] The first internal heat exchanger 51 and the second internal heat exchanger 52 are respectively double-pipe heat exchangers provided integrally by forming double pipes in a spiral shape as illustrated in FIG. 5 and connecting their low pressure side refrigerant flow paths each other. In addition, the first internal heat exchanger 51 is arranged above the second internal heat exchanger 52 and the refrigerant on the low pressure side circulates from the first internal heat exchanger 51 toward the second internal heat exchanger 52. Moreover, the first internal heat exchanger 51 and the second internal heat exchanger 52 are covered by a heat insulating material for shielding heat exchange with the outside air.

[0023] A refrigerant inflow side 51a of an inner pipe of the first internal heat exchanger 51 is connected to the outflow side of the third radiator 42. A refrigerant outflow side 51b of the inner pipe is connected to the refrigerant inflow sides of the first evaporator 35a, the second evaporator 35b and the third evaporator 35c. In addition, a refrigerant inflow side 51c of an outer pipe of the first internal heat exchanger 51 is connected to the refrigerant outflow sides of the first evaporator 35a, the second evaporator 35b and the third evaporator 35c. A refrigerant outflow side 51d of the outer pipe is connected to a refrigerant inflow side 52c of an outer pipe of the second internal heat exchanger 52.

[0024] A refrigerant inflow side 52a of an inner pipe of the second internal heat exchanger 52 is connected to the refrigerant outflow sides of the first radiator 36a and the second radiator 36b. A refrigerant outflow side 52b of the inner pipe is connected to the refrigerant inflow side of the third radiator 42. In addition, a refrigerant inflow side 52c of the outer pipe of the second internal heat exchanger 52 is connected to a refrigerant outflow side 51d of the outer pipe of the first internal heat exchanger 51. A refrigerant outflow side 52d of the outer pipe of the second internal heat exchanger 52 is connected to the refrigerant absorption side of the compressor 41.

[0025] The automatic vending machine configured as described above will be described based on FIG. 6 for the case where the first housing 30a, the second housing 30b and the third housing 30c are all cooled. In that case, the first electromagnetic valve 54a and the second electromagnetic valve 54b are closed; the third electromagnetic valve 54c, the fourth electromagnetic valve 54d, the fifth electromagnetic valve 54e and the sixth electromagnetic valve 54f are opened; and the first fan 37a, the second fan 37b, the third fan 37c, the compressor 41 and the machine room fan 43 are activated.

[0026] The refrigerant discharged from the compressor 41 circulates from the third electromagnetic valve 54c, the third radiator 42 to the high pressure side of the first internal heat exchanger 51 sequentially; circulates through the fourth expansion valve 53d; and, thereafter, is divided to flow into the flow paths provided with the fourth electromagnetic valve 54d, the fifth electromagnetic valve 54e and the sixth electromagnetic valve 54f. The refrigerant circulating through the flow path provided with the fourth electromagnetic valve 54d circulates through the first expansion valve 53a and the first evaporator 35a to flow into the low pressure side of the first internal heat exchanger 51. The refrigerant circulating through the flow path provided with the fifth electromagnetic valve 54e circulates through the second expansion valve 53b and the second evaporator 35b to flow into the low pressure side of the first internal heat exchanger 51. The refrigerant circulating through the flow path provided with the sixth electromagnetic valve 54f circulates through the third expansion valve 53c and the third evaporator 35c to flow into the low pressure side of the first internal heat exchanger 51. The refrigerant flowing out of the low pressure side of the first internal heat exchanger 51 passes through the low pressure side of the second internal heat exchanger 52 and is sucked into by the compressor 41.

[0027] At that occasion, the refrigerant does not circulate through the refrigerant flow path on the high pressure side of the second internal heat exchanger 52. Therefore, the refrigerant circulating through the refrigerant flow path on the low pressure side of the second internal heat exchanger 52 is sucked into by the compressor 41 without undergoing heat-exchange.

[0028] Next, the case where the first housing 30a is heated and the second housing 30b and the third housing 30c are cooled will be described based on FIG. 7. In that case, the second electromagnetic valve 54b, the third electromagnetic valve 54c and the fourth electromagnetic valve 54d are closed; the first electromagnetic valve 54a, the fifth electromagnetic valve 54e and the sixth electromagnetic valve 54f are opened; and the first fan 37a, the second fan 37b, the third fan 37c, the compressor 41, the compressor fan 41e and the machine room fan 43 are activated.

[0029] The refrigerant discharged from the compressor 41 circulates from the first electromagnetic valve 54a, the first radiator 36a, the high pressure side of the second internal heat exchanger 52, the third radiator 42 to the high pressure side of the internal heat exchanger 51 sequentially; circulates through the fourth expansion valve 53d; and, thereafter, is divided to flow into the flow paths provided with the fifth electromagnetic valve 54e and the sixth electromagnetic valve 54f. The refrigerant circulating through the flow path provided with the fifth electromagnetic valve 54e circulates through the second expansion valve 53b and the second evaporator 35b to flow into the low pressure side of the first internal heat exchanger 51. The refrigerant circulating through the flow path provided with the sixth electromagnetic valve 54f circulates through the third expansion valve 53c and the third evaporator 35c to flow into the low pressure side of the first internal heat exchanger 51. The refrigerant flowing out of the low pressure side of the first internal heat exchanger 51 circulates through the low pressure side of the second internal heat exchanger 52 and is sucked into by the compressor 41.

[0030] At that occasion, the refrigerant with a comparatively high temperature having undergone heat-exchange in the first radiator 36a with the air inside the first housing 30a circulates through the refrigerant flow path on the high pressure side of the second internal heat exchanger 52. Therefore, the refrigerant circulating through the refrigerant flow path on the low pressure side of the second internal heat exchanger 52 is heated and sucked into by the compressor 41 so that the temperature of the refrigerant discharged from the compressor 41 increases. Thereby, in the case of replenishing products into the first housing 30a, for example, it become possible to shorten the time for heating the products to a predetermined temperature. In addition, by shortening the run time of an electric heater 38a as a complementary heating source, reduction in the amount of power consumption can be intended.

[0031] In addition, the refrigerant flowing into the flow paths provided with the fourth electromagnetic valve 54d, the fifth electromagnetic valve 54e and the sixth electromagnetic valve 54f is decompressed to a predetermined pressure by the fourth expansion valve 53d and, thereafter, flows into respective flow paths. Therefore, the fourth electromagnetic valve 54d, the fifth electromagnetic valve 54e and the sixth electromagnetic valve 54f are less influenced by the pressure of the carbon dioxide refrigerant being in high pressure.

[0032] In addition, in the case where the second housing 30b is heated and the first housing 30a and the third housing 30c are cooled, the first electromagnetic valve 54a, the third electromagnetic valve 54c and the fifth electromagnetic valve 54e are closed; the second electromagnetic valve 54b, the fourth electromagnetic valve 54d, and the sixth electromagnetic valve 54f are opened; and the first fan 37a, the second fan 37b, the third fan 37c, the compressor 41, the compressor fan 41e and the machine room fan 43 are activated.

[0033] Moreover, in the case where the first housing 30a and the second housing 30b are heated and the third housing 30c is cooled, the third electromagnetic valve 54c, the fourth electromagnetic valve 54d and the fifth electromagnetic valve 54e are closed; the first electromagnetic valve 54a, the second electromagnetic valve 54b and the sixth electromagnetic valve 54f are opened; and the first fan 37a, the second fan 37b, the third fan 37c, the compressor 41, the compressor fan 41e and the machine room fan 43 are activated.

[0034] Thus, the automatic vending machine of the present embodiment comprises the second internal heat exchanger 52 exchanging heat of the refrigerant flowing out of the first radiator 36a and the second radiator 36b with heat of the refrigerant sucked into by the compressor 41 and therefore the temperature of the refrigerant sucked into by the compressor 41 is increased to enable an increase in temperature of the refrigerant discharged from the compressor 41. Thereby, the amount of heat generated by the increased temperature of the refrigerant is utilized as a heating source for the first housing 30a and the second housing 30b. Thereby heating efficiency can be improved.

[0035] In addition, the first internal heat exchanger 51 and the second internal heat exchanger 52 have been configured integrally and, therefore, are not required to be connected to the refrigerant circuit 50 respectively but can be treated as one component. Thereby, a decrease in man-hour for assembly and space saving on installation space can be intended.

[0036] In addition, since the first internal heat exchanger 51 has been arranged above the second internal heat exchanger 52, a low pressure refrigerant can be caused to circulate from the first internal heat exchanger 51 to the second internal heat exchanger positioned under the first heat exchanger 51. Thereby, pressure loss in the refrigerant flow path due to retention of refrigerating machine oil can be reduced.

[0037] In addition, since the first housing 30a and the second housing 30b are respectively provided with the first radiator 36a and the second radiator 36b dedicated for heat dissipation and the first evaporator 35a and the second evaporator 35b dedicated for heat absorption, the number of the electromagnetic valves to be used can be reduced compared with the case of using a common heat exchanger for heat dissipation and heat absorption. Thereby, reduction in manufacturing cost can be intended.

[0038] At the occasion of cooling all of the first housing 30a, the second housing 30b and the third housing 30c, the refrigerant discharged from the compressor 41 is caused to directly flow into the third radiator 42 without passing through the second internal heat exchanger 52. Therefore, at the occasion of cooling all of the first housing 30a, the second housing 30b and the third housing 30c, the refrigerant sucked into by the compressor 41 will not be heated by the refrigerant discharged from the compressor 41. Thereby, the temperature of the refrigerant discharged from the compressor 41 will not unnecessarily increase.

[0039] In addition, since the fourth expansion valve 53d has been provided in the flow paths on the upstream sides of the flow paths provided with the fourth electromagnetic valve 54d, the fifth electromagnetic valve 54e and the sixth electromagnetic valve 54f, the refrigerant decompressed to a predetermined pressure by the fourth expansion valve 53d can be caused to circulate through the fourth electromagnetic valve 54d, the fifth electromagnetic valve 54e and the sixth electromagnetic valve 54f. Thereby, the fourth electromagnetic valve 54d, the fifth electromagnetic valve 54e and the sixth electromagnetic valve 54f are less influenced by the pressure of the carbon dioxide refrigerant being in high pressure to enable prevention of an occurrence of operation failure of the fourth electromagnetic valve 54d, the fifth electromagnetic valve 54e and the sixth electromagnetic valve 54f.

[0040] In addition, since carbon dioxide has been used as the refrigerant, influence to the environments such as ozone depletion and global warming can be minimized.

[0041] Here, in the above described embodiment, the refrigerant used in the refrigerant circuit 50 has been carbon dioxide. However, also in the case of using a fluorocarbon refrigerant or a hydrocarbon refrigerant, the same effects as those of the above described embodiment can be obtained.

[0042] In addition, in the above described embodiment, as the decompressor of the refrigerant circuit 50, the first to the fourth expansion valves 53a, 53b, 53c and 53d have been used. However, decompressor with a capillary tube and the like can be used.

[0043] The embodiment described in the present specification is exemplary and not limitative. The scope of the invention is disclosed in the accompanying claims. All variations falling into the meaning of those claims will be included in the present invention.

Claims

1. A cooling/heating apparatus comprising:

    a plurality of housings (30a, 30b and 30c) for housing goods;
    a first heat exchanger (35a, 35b, 35c, 36a and 36b) provided in each housing (30a, 30b and 30c) and respectively cooling or heating the housed goods;
    a second heat exchanger (42) provided outside the housings (30a, 30b and 30c);
    a compressor (41) provided outside the housings (30a, 30b and 30c);
    a third heat exchanger (52) for exchanging heat of a refrigerant flowing out of the first heat exchanger (36a and 36b) provided in each housing (30a and 30b) heating the goods of the plurality of housings (30a, 30b and 30c) with heat of the refrigerant sucked into by the compressor (41); and
    a fourth heat exchanger (51) for exchanging heat of the refrigerant circulating from the second heat exchanger (42) toward the first heat exchanger (35a, 35b and 35c) provided in each housing (30a, 30b and 30c) cooling the goods with heat of the refrigerant flowing out of the first heat exchanger (35a, 35b and 35c) provided in each housing (30a, 30b and 30c) cooling the goods.

2. The cooling/heating apparatus according to claim 1, wherein:

    each housing (30a and 30b) has the first heat exchanger (36a and 36b) dedicated for heat dissipation and the first heat exchanger (35a and 35b) dedicated for heat absorption.

3. The cooling/heating apparatus according to claim 1, comprising refrigerant circulation means:

    at an occasion of cooling all of the plurality of housings (30a, 30b and 30c), the refrigerant discharged from the compressor (41) is caused to flow directly into the second heat exchanger (42) without passing through the third heat exchanger (52).

4. The cooling/heating apparatus according to claim 2, comprising refrigerant circulation means:

    at an occasion of cooling all of the plurality of housings (30a, 30b and 30c), the refrigerant discharged from the compressor (41) is caused to flow directly into the second heat exchanger (42) without passing through the third heat exchanger (52).

5. The cooling/heating apparatus according to claim 1, wherein:

    the third heat exchanger (52) and the fourth heat exchanger (51) are provided integrally.

6. The cooling/heating apparatus according to claim 5, wherein:

    the fourth heat exchanger (51) is arranged above the third heat exchanger (52).

7. The cooling/heating apparatus according to claim 1, comprising:

    first decompressor (53a, 53b and 53c) for decompressing the refrigerant circulating from the

second heat exchanger (42) toward the first heat exchanger (35a, 35b and 35c) provided in each housing (30a, 30b and 30c) cooling the goods;
a valve (54d, 54e and 54f) for opening and closing a flow path of the refrigerant on an upstream side of the first decompressor (53a, 53b and 53c); and
second decompressor (53d) for decompressing the refrigerant circulating through the flow path of the refrigerant on the upstream side of the valve (54d, 54e and 54f).

8. The cooling/heating apparatus according to any one of claims 2 to 6, comprising:

first decompressor (53a, 53b and 53c) for decompressing the refrigerant circulating from the second heat exchanger (42) toward the first heat exchanger (35a, 35b and 35c) provided in each housing (30a, 30b and 30c) cooling the goods;
a valve (54d, 54e and 54f) for opening and closing a flow path of the refrigerant on an upstream side of the first decompressor (53a, 53b and 53c); and
second decompressor (53d) for decompressing the refrigerant circulating through the flow path of the refrigerant on the upstream side of the valve (54d, 54e and 54f).

9. The cooling/heating apparatus according to any one of claims 1 to 7, wherein:

carbon dioxide is used as the refrigerant.

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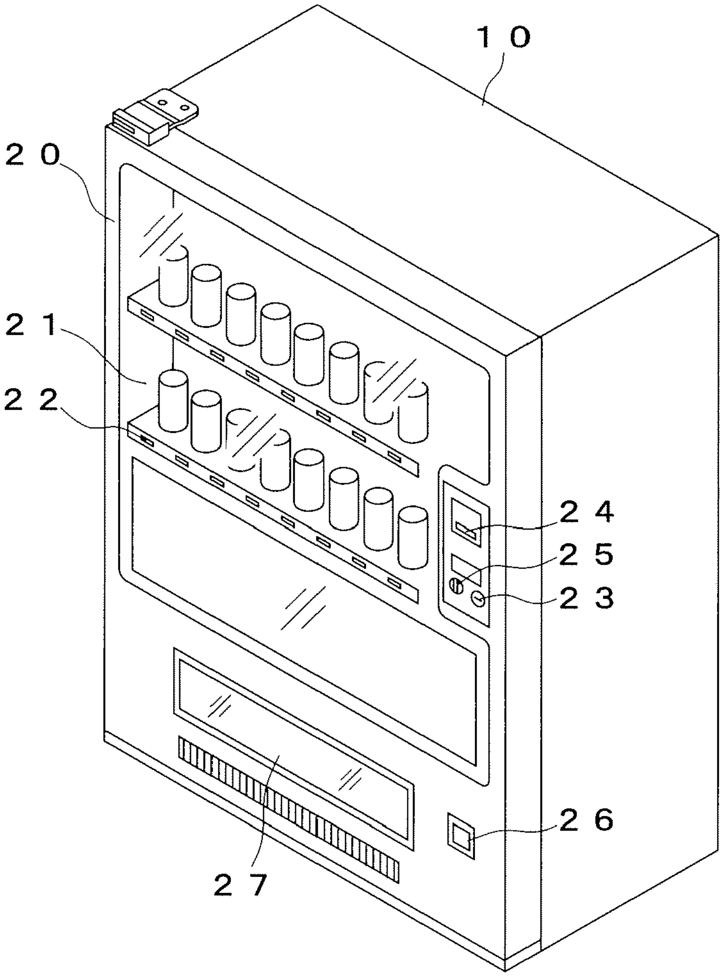

Fig. 2

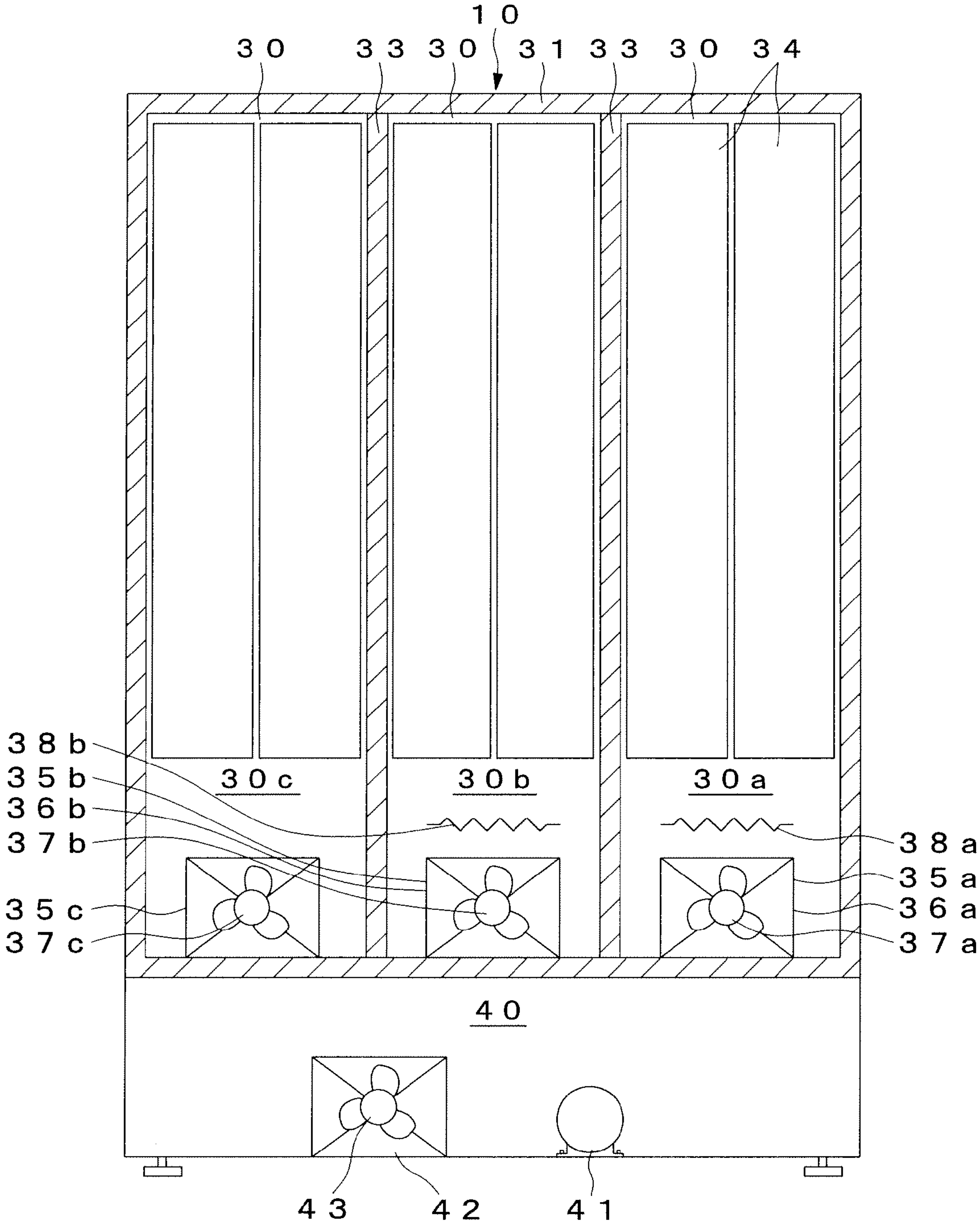
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Fig. 3

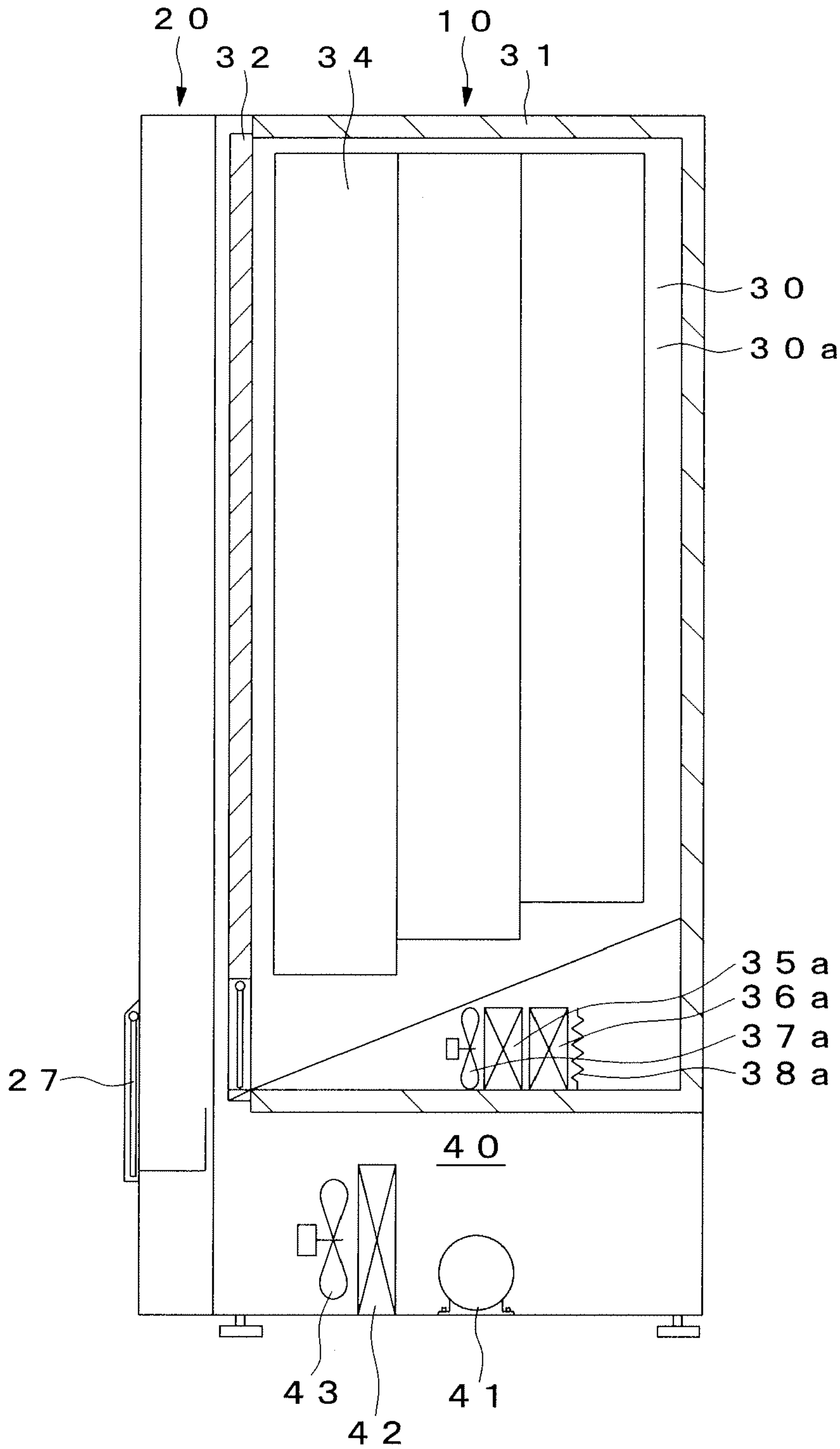

Fig. 4

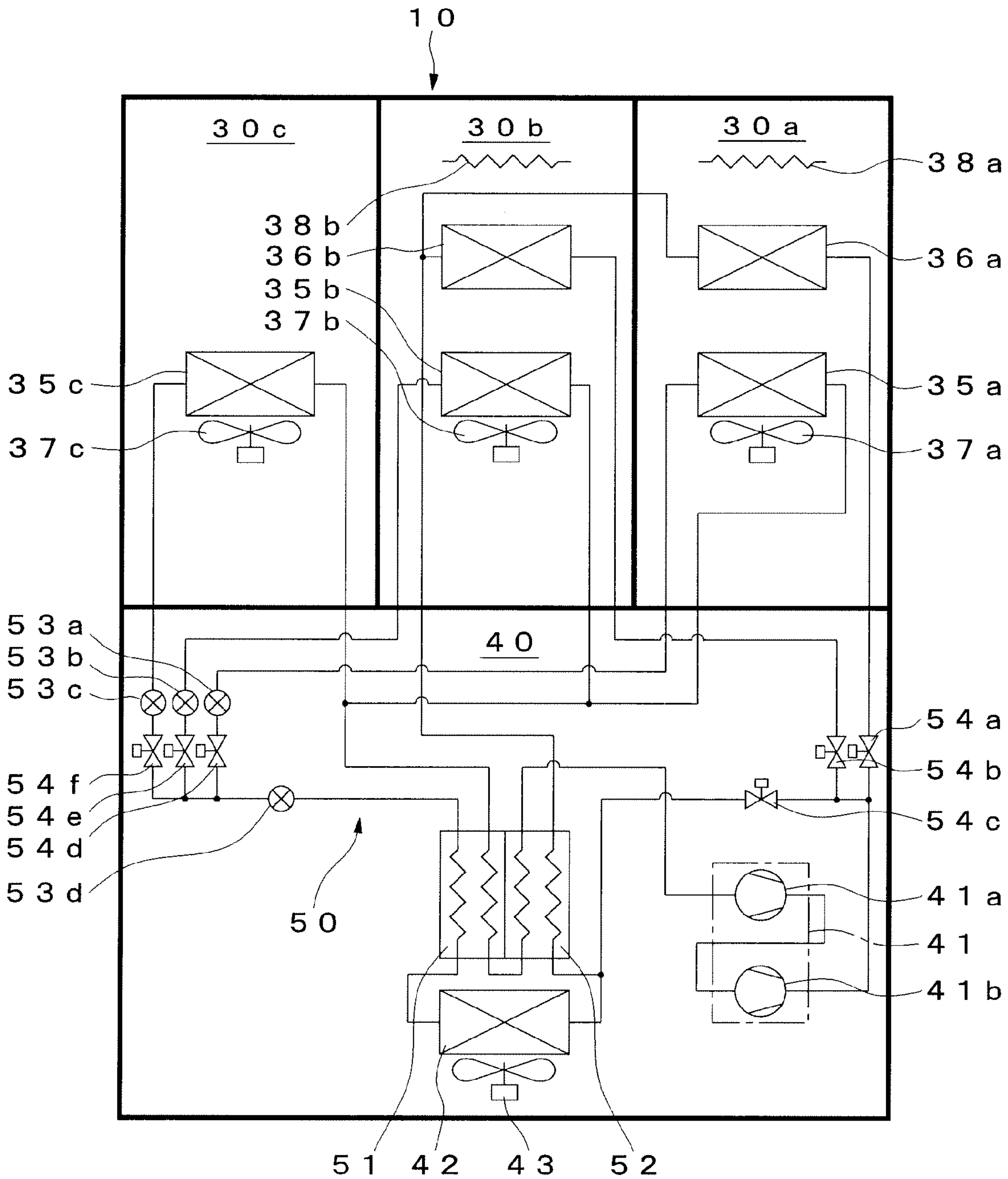
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Fig. 5

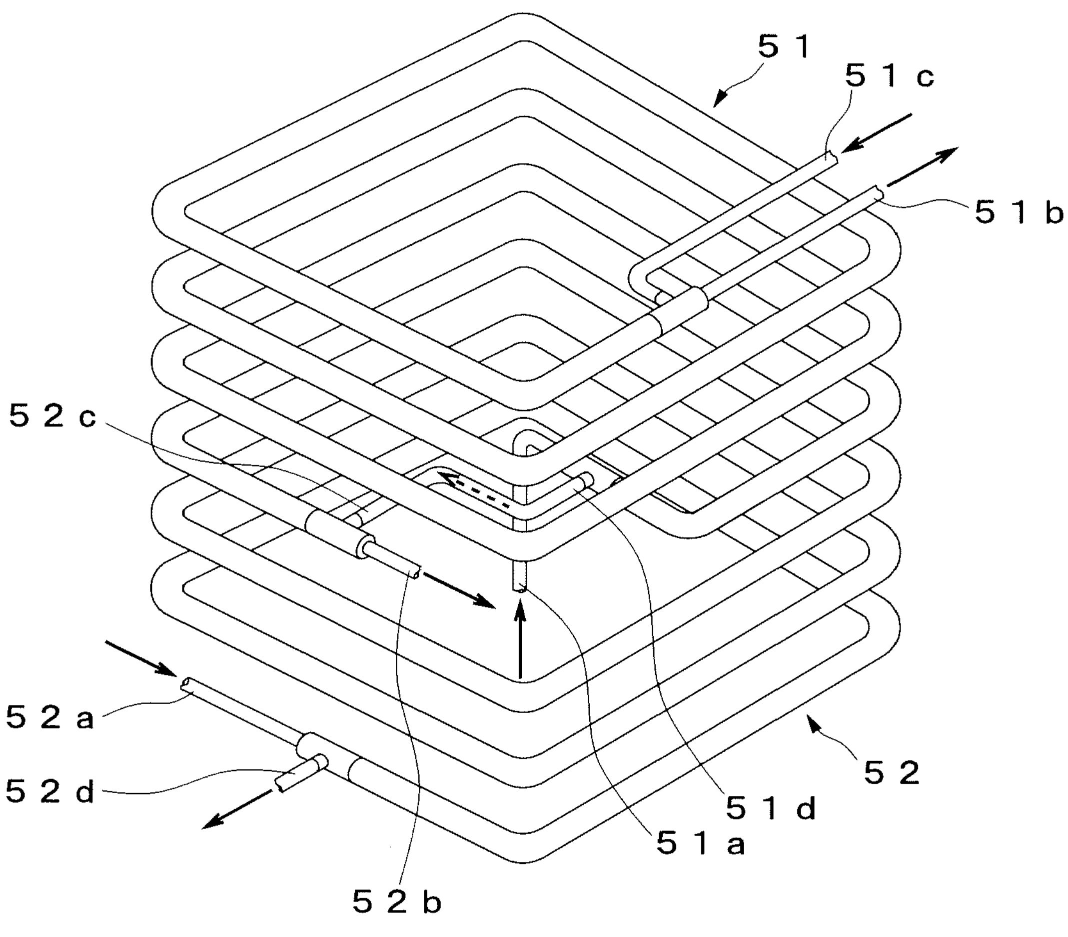

Fig. 6

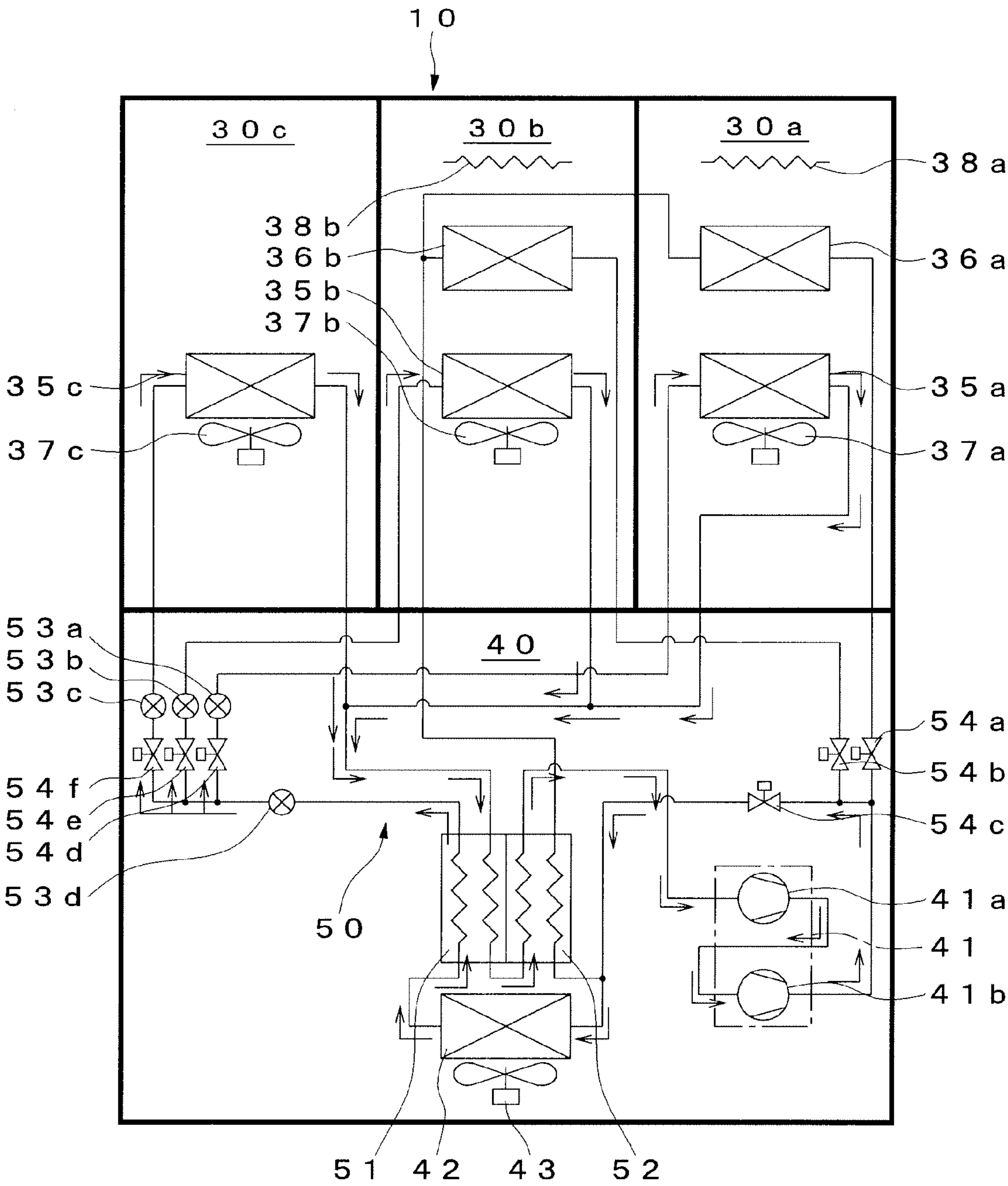
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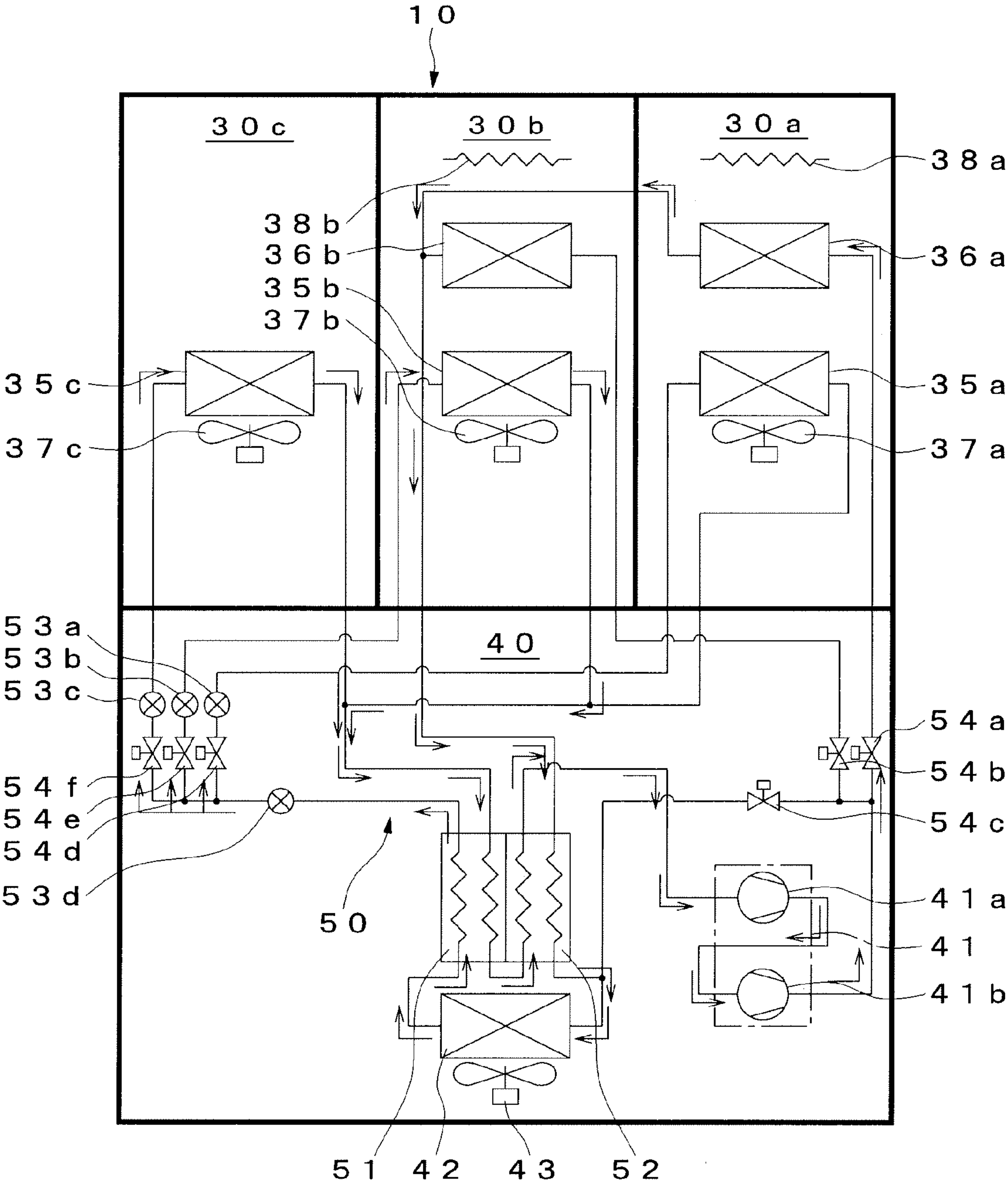
Fig. 7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35c
35a
37c
37a
53a
53b
53c
40
54a
54b
54f
54e
54c
54d
53d
50
41a
41
41b
51
42
43
52