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(54) UTILIZATION UNIT AND REFRIGERATION DEVICE

(57) A utilization unit (20) includes a case (50), a partition plate (53), a fan (24), an electric component box (61), a heat exchanger (23), a refrigerant sensor (65), a first transmission line (62), and an electric component box connector (63). The partition plate (53) divides the interior of the case (50) into a fan chamber (57) and a heat exchange chamber (58). The fan (24) and the electric component box (61) are disposed in the fan chamber (57). The heat exchanger (23) and the refrigerant sensor (65) are disposed in the heat exchange chamber (58). The refrigerant sensor (65) detects a leaked refrigerant. The first transmission line (62) extends from the electric component box (61) to the heat exchange chamber (58) through a passage (54) of the partition plate (53). The electric component box connector (63) is disposed in the heat exchange chamber (58). The relay connector (63) connects the first transmission line (62) and the refrigerant sensor (65).

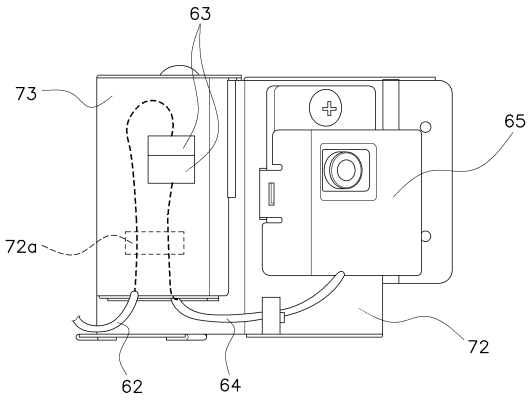

FIG. 8

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Description

TECHNICAL FIELD

[0001] This disclosure relates to a utilization unit provided with a refrigerant sensor configured to detect a leaked refrigerant, and a refrigeration apparatus including the utilization unit.

BACKGROUND ART

[0002] Patent Literature 1 (Japanese Laid-Open Patent Publication No. 2019-011914A) discloses a utilization unit including a case and a refrigerant sensor. The refrigerant sensor detects a refrigerant leaked in the case.

SUMMARY OF THE INVENTION

<Technical Problem>

[0003] When a refrigerant sensor detects a refrigerant, a material for the refrigerant sensor is changed in physical property. This change may cause performance deterioration or life shortening of the refrigerant sensor. The refrigerant sensor is thus ideally replaced with a new product each time the refrigerant sensor detects a refrigerant. Designing a utilization unit to facilitate replacement work for a refrigerant sensor is important in terms of maintenance work for a refrigeration apparatus having been installed.

<Solution to Problem>

[0004] A utilization unit according to a first aspect includes a case, a partition plate, a fan, an electric component box, a heat exchanger, a first sensor, a first transmission line, and a first connector. The partition plate divides the interior of the case into a fan chamber and a heat exchange chamber. The fan and the electric component box are disposed in the fan chamber. The heat exchanger and the first sensor are disposed in the heat exchange chamber. The first sensor detects a refrigerant having leaked. The first transmission line extends from the electric component box to the heat exchange chamber through a passage of the partition plate. The first connector is disposed in the heat exchange chamber. The first connector connects the first transmission line and the first sensor.

[0005] In this configuration, the first sensor can be separated from the electric component box with use of the first connector. This facilitates replacement of the first sensor. Specifically, a transmission line connecting the electric component box and the first sensor does not need to be extracted from and inserted to the partition plate for replacement of the first sensor. This can inhibit damage to the transmission line due to extraction or insertion, and can inhibit deterioration in sealing performance between the transmission line and the partition plate.

[0006] A utilization unit according to a second aspect is the utilization unit according to the first aspect, in which the case has a first surface and a second surface. The first surface has a blow-out port allowing conditioned air to pass therethrough. The second surface has a maintenance opening allowing treatment of the first sensor by a worker.

[0007] In this configuration, the maintenance opening and the blow-out port are provided in the different surfaces of the case. The maintenance opening can thus have a secured area for facilitation of maintenance work.

[0008] A utilization unit according to a third aspect is the utilization unit according to the second aspect, and further includes a second transmission line. The second transmission line extends from the first sensor to the first connector.

[0009] In this configuration, the second transmission line is provided to allow the first sensor to be spaced apart from the first connector. This enhances flexibility in positioning of the first sensor and facilitates maintenance work.

[0010] A utilization unit according to a fourth aspect is the utilization unit according to the third aspect, and further includes a transmission line retainer. The transmission line retainer retains the first connector, or retains both the first transmission line and the second transmission line.

[0011] In this configuration, part of a wire connecting the first connector and the first sensor is bound to a position of the transmission line retainer. The wire is less likely to be away from a hand of a worker to facilitate maintenance work.

[0012] A utilization unit according to a fifth aspect is the utilization unit according to the fourth aspect, and further includes a maintenance lid. The maintenance lid closes the maintenance opening. At least one of the first sensor or the transmission line retainer is fixed to the maintenance lid.

[0013] In this configuration, the first sensor or the transmission line retainer is fixed to the maintenance lid. The first sensor or the transmission line retainer is thus pulled out of the case when a worker detaches the maintenance lid, which facilitates maintenance work.

[0014] A utilization unit according to a sixth aspect is the utilization unit according to any one of the first to fifth aspects, and further includes a second sensor. The second sensor is disposed in the heat exchange chamber. The second sensor detects a phenomenon other than leakage of the refrigerant. A transmission line extending from the electric component box and connecting the second sensor is not connected to any connector.

[0015] In this configuration, the transmission line for the first sensor is provided with the first connector, whereas the transmission line for the second sensor is not provided with any connector. This facilitates replacement work for the first sensor that needs to be replaced,

and can inhibit superposition of noise caused by connector contact resistance or the like on a signal line for the second sensor that does not need to be replaced.

[0016] A utilization unit according to a seventh aspect is the utilization unit according to any one of the first to sixth aspects, and further includes a second connector. The second connector is configured to separate the first transmission line from the electric component box.

[0017] In this configuration, the second connector is provided to allow the first transmission line to be separated from the electric component box. This facilitates routing work for the first transmission line in a step of manufacturing the utilization unit.

[0018] A utilization unit according to an eighth aspect is the utilization unit according to any one of the first to seventh aspects, and further includes a sealing material. The sealing material is provided at the passage. The sealing material inhibits an air flow from passing through the passage.

[0019] In this configuration, the passage of the partition plate is provided with the sealing material. This inhibits an unpreferred air flow from passing between the fan chamber and the heat exchange chamber.

[0020] A refrigeration apparatus according to a ninth aspect includes the utilization unit according to any one of the first to eighth aspects.

[0021] The refrigeration apparatus thus configured facilitates replacement work for the first sensor.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022]

FIG. 1 is a schematic view of a refrigeration apparatus 100.
FIG. 2 is a perspective view of a utilization unit 20.
FIG. 3 is a schematic view of an internal configuration of the utilization unit 20.
FIG. 4 is a perspective view of the utilization unit 20 in a direction different from the direction of FIG. 2.
FIG. 5 is a perspective view of the utilization unit 20 with a maintenance lid 71 being detached.
FIG. 6 is a plan view of the utilization unit 20.
FIG. 7 is a perspective view of a main part of the utilization unit 20.
FIG. 8 is a front view of a transmission line retainer 72.
FIG. 9 is a perspective view of the transmission line retainer 72 and components detached from the transmission line retainer 72.

DESCRIPTION OF EMBODIMENTS

<Embodiment>

(1) Entire configuration

(1-1) Components constituting refrigerant circuit

[0023] FIG. 1 depicts a refrigeration apparatus 100 according to an embodiment. Examples of the refrigeration apparatus 100 can include various devices such an air conditioner, a refrigerator, a freezer, a hot water supplier, and a floor heater. The refrigeration apparatus 100 according to the present embodiment is an air conditioner. The refrigeration apparatus 100 is constituted by a heat source unit 10, a utilization unit 20, and a refrigerant pipe group 30 connecting the heat source unit 10 and the utilization unit 20. The refrigeration apparatus 100 includes a refrigerant circuit for circulation of a refrigerant R.

[0024] The heat source unit 10 includes, as components of the refrigerant circuit, a compressor 11, a four-way switching valve 12, a heat source heat exchanger 13, a heat source expansion valve 15, an accumulator 16, a liquid shutoff valve 17, and a gas shutoff valve 18.

[0025] The utilization unit 20 includes a utilization heat exchanger 23 as a component of the refrigerant circuit.

[0026] The refrigerant pipe group 30 includes a liquid connection pipe 31 and a gas connection pipe 32 as components of the refrigerant circuit.

(1-2) Cold heat utilization operation

[0027] Cold heat utilization operation is an operation in which the refrigeration apparatus 100 provides a user with cold heat.

[0028] The compressor 11 sucks a low-pressure gas refrigerant from a suction tube 11a and then compresses it to generate a high-pressure gas refrigerant to be discharged from a discharge tube 11b. During the cold heat utilization operation, the four-way switching valve 12 achieves connection indicated by solid lines in FIG. 1. The heat source heat exchanger 13 condenses the high-pressure gas refrigerant to generate a high-pressure liquid refrigerant. A heat source fan 14 promotes heat exchange between the refrigerant and the air in the heat source heat exchanger 13. The heat source expansion valve 15 decompresses the high-pressure liquid refrigerant to generate a low-pressure gas-liquid two-phase refrigerant. The low-pressure gas-liquid two-phase refrigerant passes through the liquid shutoff valve 17 and the liquid connection pipe 31 to reach the utilization heat exchanger 23.

[0029] The utilization heat exchanger 23 evaporates the gas-liquid two-phase refrigerant to generate a low-pressure gas refrigerant, generating cold heat to be supplied to a user during this process. A utilization fan 24 promotes heat exchange between the refrigerant and the air in the utilization heat exchanger 23. The low-pressure gas refrigerant passes through the gas connection pipe 32, the gas shutoff valve 18, and the four-way switching valve 12 to reach the accumulator 16.

[0030] The accumulator 16 separates a fluid component mixed in the low-pressure gas refrigerant and re-

serves the fluid component. The low-pressure gas refrigerant flowing out of the accumulator 16 is sucked from the suction tube 11a by the compressor 11.

(1-3) Hot heat utilization operation

[0031] Hot heat utilization operation is an operation in which the refrigeration apparatus 100 provides a user with hot heat.

[0032] The compressor 11 sucks a low-pressure gas refrigerant from the suction tube 11a and then compresses it to generate a high-pressure gas refrigerant to be discharged from the discharge tube 11b. During the hot heat utilization operation, the four-way switching valve 12 achieves connection indicated by broken lines in FIG. 1. The high-pressure gas refrigerant passes through the four-way switching valve 12, the gas shutoff valve 18, and the gas connection pipe 32 to reach the utilization heat exchanger 23.

[0033] The utilization heat exchanger 23 condenses the high-pressure gas refrigerant to generate a high-pressure liquid refrigerant, generating hot heat to be supplied to a user during this process. The utilization fan 24 promotes heat exchange between the refrigerant and the air in the utilization heat exchanger 23. The high-pressure liquid refrigerant passes through the liquid connection pipe 31 and the liquid shutoff valve 17 to reach the heat source expansion valve 15.

[0034] The heat source expansion valve 15 decompresses the high-pressure liquid refrigerant to generate a low-pressure gas-liquid two-phase refrigerant. The heat source heat exchanger 13 evaporates the low-pressure gas-liquid two-phase refrigerant to generate a low-pressure gas refrigerant. The heat source fan 14 promotes heat exchange between the refrigerant and the air in the heat source heat exchanger 13. The low-pressure gas refrigerant reaches the accumulator 16 via the four-way switching valve 12. The accumulator 16 separates a fluid component mixed in the low-pressure gas refrigerant and reserves the fluid component. The low-pressure gas refrigerant flowing out of the accumulator 16 is sucked from the suction tube 11a by the compressor 11.

(2) Detailed configuration of utilization unit 20

[0035] FIG. 2 depicts a configuration of the utilization unit 20. The utilization unit 20 includes a case 50, a partition plate 53, the utilization heat exchanger 23, the utilization fan 24, an electric component box 61, a refrigerant sensor 65, a thermistor 67, and a maintenance lid 71.

(2-1) Case 50

[0036] The case 50 accommodates components constituting the utilization unit 20 including the utilization heat exchanger 23 and the utilization fan 24. FIG. 2 does not depict part of the members of the case 50 to enable visual recognition of the interior of the utilization unit 20. The case 50 has a rectangular parallelepiped shape, and has a first side surface 50a, a second side surface 50b, a third side surface 50c, a fourth side surface 50d, an upper surface 50e, and a lower surface 50f. The first side surface 50a is provided with a blow-out port 51 configured to allow conditioned air to blow out. The second side surface 50b adjacent to the first side surface 50a is provided with a maintenance opening 52. The maintenance opening 52 allows treatment including replacement of the refrigerant sensor 65 by a maintenance worker. Though not depicted, the lower surface 50f is provided with a suction port for intake of air.

[0037] The partition plate 53 is provided in the case 50. The partition plate 53 divides an internal space of the case 50 into a fan chamber 57 and a heat exchange chamber 58. The partition plate 53 is provided with a passage 54 allowing wiring to pass therethrough. Examples of the passage 54 include a hole and a cutout.

(2-2) Utilization heat exchanger 23

[0038] The utilization heat exchanger 23 causes heat exchange between the refrigerant R and the air. The utilization heat exchanger 23 is disposed in the heat exchange chamber 58. The utilization heat exchanger 23 functions as an evaporator during the cold heat utilization operation. The utilization heat exchanger 23 functions as a condenser during the hot heat utilization operation.

(2-3) Utilization fan 24

[0039] The utilization fan 24 generates an air flow passing through the utilization heat exchanger 23. The utilization fan 24 is disposed in the fan chamber 57. The air flow having passed through the utilization heat exchanger 23 is discharged from the blow-out port 51.

(2-4) Electric component box 61

[0040] FIG. 3 is a schematic view of an internal configuration of the utilization unit 20. The electric component box 61 accommodates a power source unit and electric circuit components. The electric component box 61 is disposed in the fan chamber 57.

[0041] The electric component box 61 includes an electric component box connector 69. The electric component box connector 69 connects or disconnects wiring to or from the electric component box 61. The electric component box connector 69 includes a housing connected to a first transmission line 62 and a thermistor transmission line 66 to be described later.

(2-5) Refrigerant sensor 65

[0042] The refrigerant sensor 65 detects a refrigerant leaked from the refrigerant circuit. As depicted in FIG. 3,

the refrigerant sensor 65 is disposed in the heat exchange chamber 58.

[0043] Connection between the refrigerant sensor 65 and the electric component box 61 is achieved by the first transmission line 62 and a second transmission line 64. The present disclosure assumes that the term "transmission line" is not limited to a signal line and includes a power source line or a ground line.

[0044] The first transmission line 62 extends from the electric component box connector 69 in the fan chamber 57 to a relay connector 63 disposed in the heat exchange chamber 58 via the passage 54. The relay connector 63 includes two housings configured to be fitted to each other, and one is connected to the first transmission line 62 whereas the other is connected to the second transmission line 64. The second transmission line 64 connects the relay connector 63 and the refrigerant sensor 65. The passage 54 is provided with a sealing material 55. The sealing material 55 fills the gap of the passage 54 so as to allow the first transmission line 62 to pass therethrough and prevent an air flow from passing therethrough.

(2-6) Thermistor 67

[0045] The thermistor 67 detects temperature of a refrigerant. The thermistor 67 is disposed in the heat exchange chamber 58. Connection between the thermistor 67 and the electric component box 61 is achieved by the thermistor transmission line 66. The thermistor transmission line 66 passes through the passage 54. The thermistor transmission line 66 is not connected to any relaying connector.

(2-7) Maintenance lid 71

[0046] FIG. 4 and FIG. 5 shows perspective views of the utilization unit 20 on the side of the second side surface 50b. FIG. 6 is a plan view of the utilization unit 20. Part of the members of the case 50 are not depicted in FIG. 4 to FIG. 6 to enable visual recognition of the interior of the utilization unit 20.

[0047] As depicted in FIG. 4, the second side surface 50b is provided with the maintenance lid 71. The maintenance lid 71 closes the maintenance opening 52. FIG. 5 depicts the maintenance opening 52 not provided with the maintenance lid 71. FIG. 6 indicates that the refrigerant sensor 65 is positioned near the maintenance lid 71. A maintenance worker can execute replacement and the like of the refrigerant sensor 65 when the maintenance lid 71 is detached.

(3) Configurations around maintenance opening 52

[0048] FIG. 7 depicts configurations around the maintenance opening 52. The maintenance lid 71 closes the maintenance opening 52. The transmission line retainer 72 is fixed to the maintenance lid 71.

[0049] As depicted in FIG. 8 and FIG. 9, the transmission line retainer 72 retains both the first transmission line 62 and the second transmission line 64 at a clamp part 72a. There is provided a relay connector protector 73 fixed to the transmission line retainer 72. The relay connector protector 73 covers part of the first transmission line 62, the relay connector 63, and part of the second transmission line 64. Furthermore, the refrigerant sensor 65 is fixed to the transmission line retainer 72.

[0050] When the maintenance lid 71 is detached from the maintenance opening 52, the transmission line retainer 72, the relay connector protector 73, the first transmission line 62, the relay connector 63, the second transmission line 64, and the refrigerant sensor 65, which are directly or indirectly fixed to the maintenance lid 71, are ejected out of the case 50.

(4) Characteristics

[0051] (4-1) The relay connector 63 positioned near the maintenance opening 52 can separate the refrigerant sensor 65 from the electric component box 61. This facilitates replacement work for the refrigerant sensor 65. Specifically, a transmission line connecting the electric component box 61 and the refrigerant sensor 65 does not need to be extracted from and inserted to the partition plate 53 for replacement of the refrigerant sensor 65. This can inhibit damage to the transmission line due to extraction or insertion, and can inhibit deterioration in sealing performance between the transmission line and the partition plate 53.

[0052] (4-2) The case 50 has the maintenance opening 52 and the blow-out port 51 disposed in the different surfaces. The maintenance opening 52 can thus have a secured area for facilitation of maintenance work.

[0053] (4-3) The second transmission line 64 is provided to allow the refrigerant sensor 65 to be spaced apart from the relay connector 63. This enhances flexibility in positioning of the refrigerant sensor 65 and facilitates maintenance work.

[0054] (4-4) Part of a wire connecting the relay connector 63 and the refrigerant sensor 65 is bound to the clamp part 72a of the transmission line retainer 72. The wire is less likely to be away from a hand of a maintenance worker to facilitate maintenance work.

[0055] (4-5) The refrigerant sensor 65 and the transmission line retainer 72 are fixed to the maintenance lid 71. The refrigerant sensor 65 and the transmission line retainer 72 are thus pulled out of the case 50 when a maintenance worker detaches the maintenance lid 71, which facilitates maintenance work.

[0056] (4-6) A transmission line for the refrigerant sensor 65 is provided with the relay connector 63, whereas a transmission line for the thermistor 67 is not provided with any connector. This facilitates replacement work for the refrigerant sensor 65 that needs to be replaced, and can inhibit superposition of noise caused by connector contact resistance or the like on a signal line for the thermistor

that does not need to be replaced.

[0057] (4-7) The electric component box connector 69 is provided to allow the first transmission line 62 to be separated from the electric component box 61. This facilitates routing work for the first transmission line 62 in a step of manufacturing the utilization unit 20.

[0058] (4-8) The passage 54 of the partition plate 53 is provided with the sealing material 55. This inhibits an unpreferred air flow from passing between the fan chamber 57 and the heat exchange chamber 58.

(5) Modification examples

[0059] (5-1) The transmission line retainer 72 according to the above embodiment retains both the first transmission line 62 and the second transmission line 64. Alternatively, the transmission line retainer 72 may retain one of the housings of the relay connector 63. Yet alternatively, the transmission line retainer 72 may retain at least one of the first transmission line 62 or the second transmission line 64 in addition to the one of the housings of the relay connector 63.

[0060] (5-2) According to the above embodiment, the first transmission line 62 and the thermistor transmission line 66 pass through the common passage 54. Alternatively, the partition plate 53 may include a plurality of passages 54 and the first transmission line 62 and the thermistor transmission line 66 may pass through the passages 54 different from each other.

[0061] (5-3) According to the above embodiment, both the transmission line retainer 72 and the refrigerant sensor 65 are directly or indirectly fixed to the maintenance lid 71. Alternatively, only one of the transmission line retainer 72 and the refrigerant sensor 65 may be fixed to the maintenance lid 71.

[0062] (5-4) The refrigeration apparatus 100 according to the above embodiment is an air conditioner. The refrigeration apparatus 100 may alternatively be configured as a device other than the air conditioner, such as a refrigerator, a freezer, a hot water supplier, or a floor heater.

<Conclusion>

[0063] The embodiment of the present disclosure has been described above. It is understood that various changes to modes and details should be available without departing from the object and the scope of the present disclosure recited in the claims.

REFERENCE SIGNS LIST

[0064]

10: heat source unit
20: utilization unit
23: utilization heat exchanger (heat exchanger)
24: utilization fan (fan)
50: case
50a: first side surface (first surface)
50b: second side surface (second surface)
50c: third side surface
50d: fourth side surface
50e: upper surface
50f: lower surface
51: blow-out port
52: maintenance opening
53: partition plate
54: passage
55: sealing material
57: fan chamber
58: heat exchange chamber
61: electric component box
62: first transmission line
63: relay connector (first connector)
64: second transmission line
65: refrigerant sensor (first sensor)
66: thermistor transmission line
67: thermistor (second sensor)
69: electric component box connector (second connector)
71: maintenance lid
72: transmission line retainer
72a: clamp part
73: relay connector protector
100: refrigeration apparatus

CITATION LIST

PATENT LITERATURE

[0065] Patent Literature 1: JP 2019-011914 A

Claims

1. A utilization unit (20) comprising:

a case (50);
a partition plate (53) dividing an interior of the case into a fan chamber (57) and a heat exchange chamber (58);
a fan (24) and an electric component box (61) disposed in the fan chamber;
a heat exchanger (23) and a first sensor (65) disposed in the heat exchange chamber, the first sensor configured to detect a refrigerant having leaked;
a first transmission line (62) extending from the electric component box to the heat exchange chamber through a passage (54) of the partition plate; and
a first connector (63) disposed in the heat exchange chamber and configured to connect the first transmission line and the first sensor.

2. The utilization unit according to claim 1, wherein

the case has a first surface (50a) and a second surface (50b),
the first surface has a blow-out port (51) allowing conditioned air to pass therethrough, and
the second surface has a maintenance opening (52) allowing treatment of the first sensor by a worker.

3. The utilization unit according to claim 2, further comprising a second transmission line (64) extending from the first sensor to the first connector.

4. The utilization unit according to claim 3, further comprising a transmission line retainer (72) retaining the first connector or retaining both the first transmission line and the second transmission line.

5. The utilization unit according to claim 4, further comprising a maintenance lid (71) configured to close the maintenance opening,
wherein at least one of the first sensor or the transmission line retainer is fixed to the maintenance lid.

6. The utilization unit according to any one of claims 1 to 5, further comprising a second sensor (67) disposed in the heat exchange chamber and configured to detect a phenomenon other than leakage of the refrigerant,
wherein a transmission line extending from the electric component box and connecting the second sensor is not connected to any connector.

7. The utilization unit according to any one of claims 1 to 6, further comprising a second connector (69) configured to separate the first transmission line from the electric component box.

8. The utilization unit according to any one of claims 1 to 7, further comprising a sealing material (55) provided at the passage and inhibiting an air flow from passing through the passage.

9. A refrigeration apparatus (100) comprising the utilization unit according to any one of claims 1 to 8.

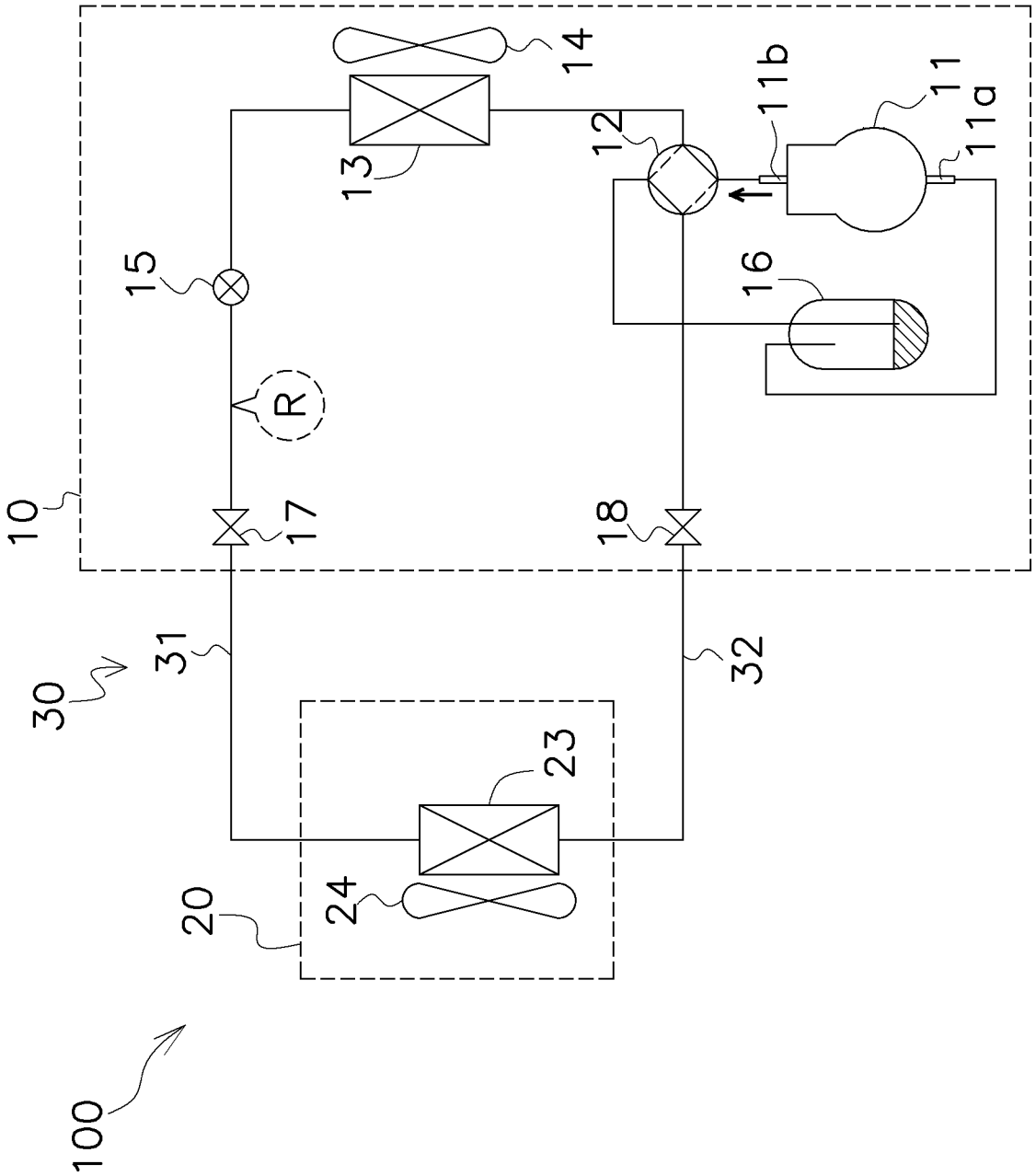


FIG. 1

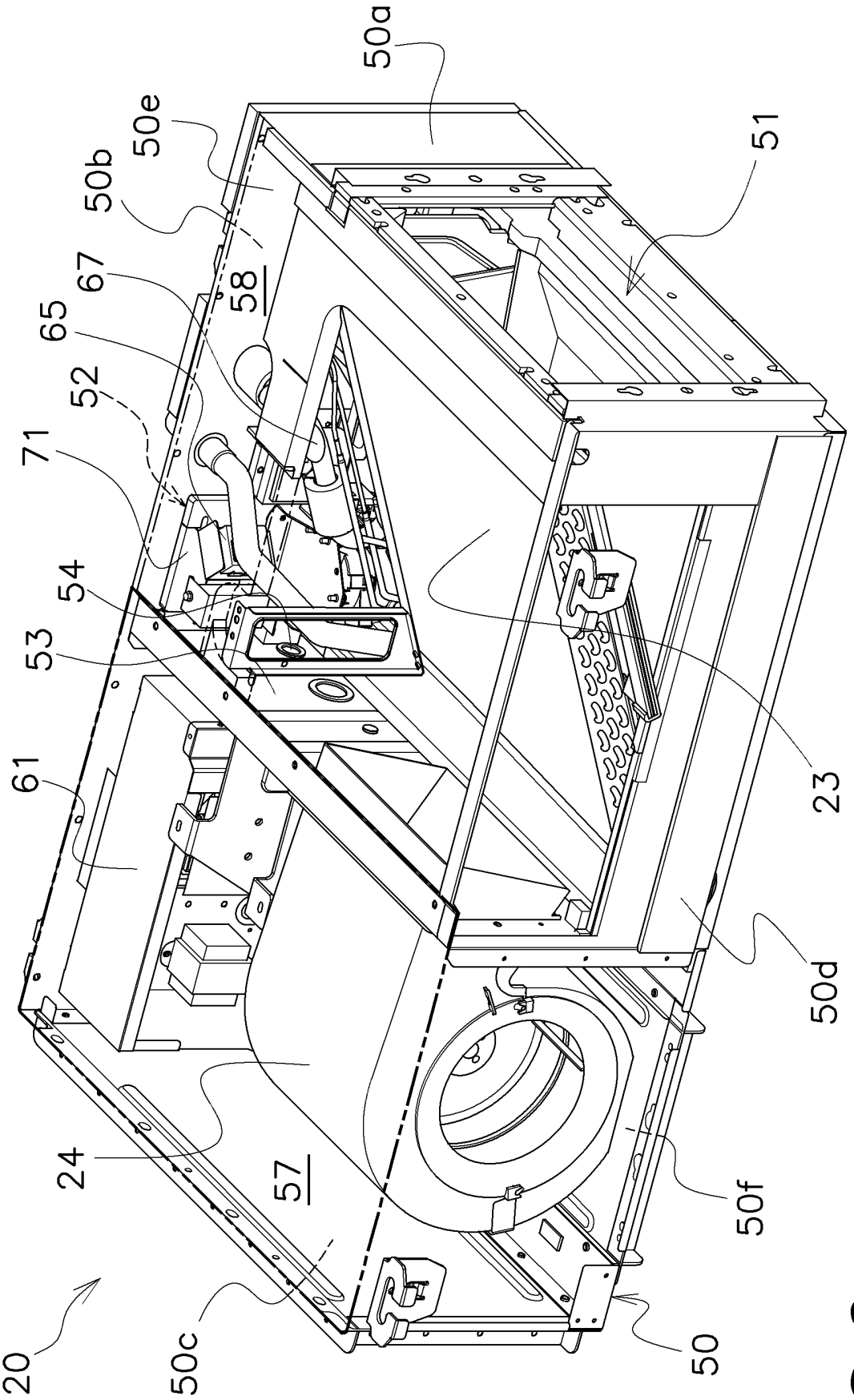
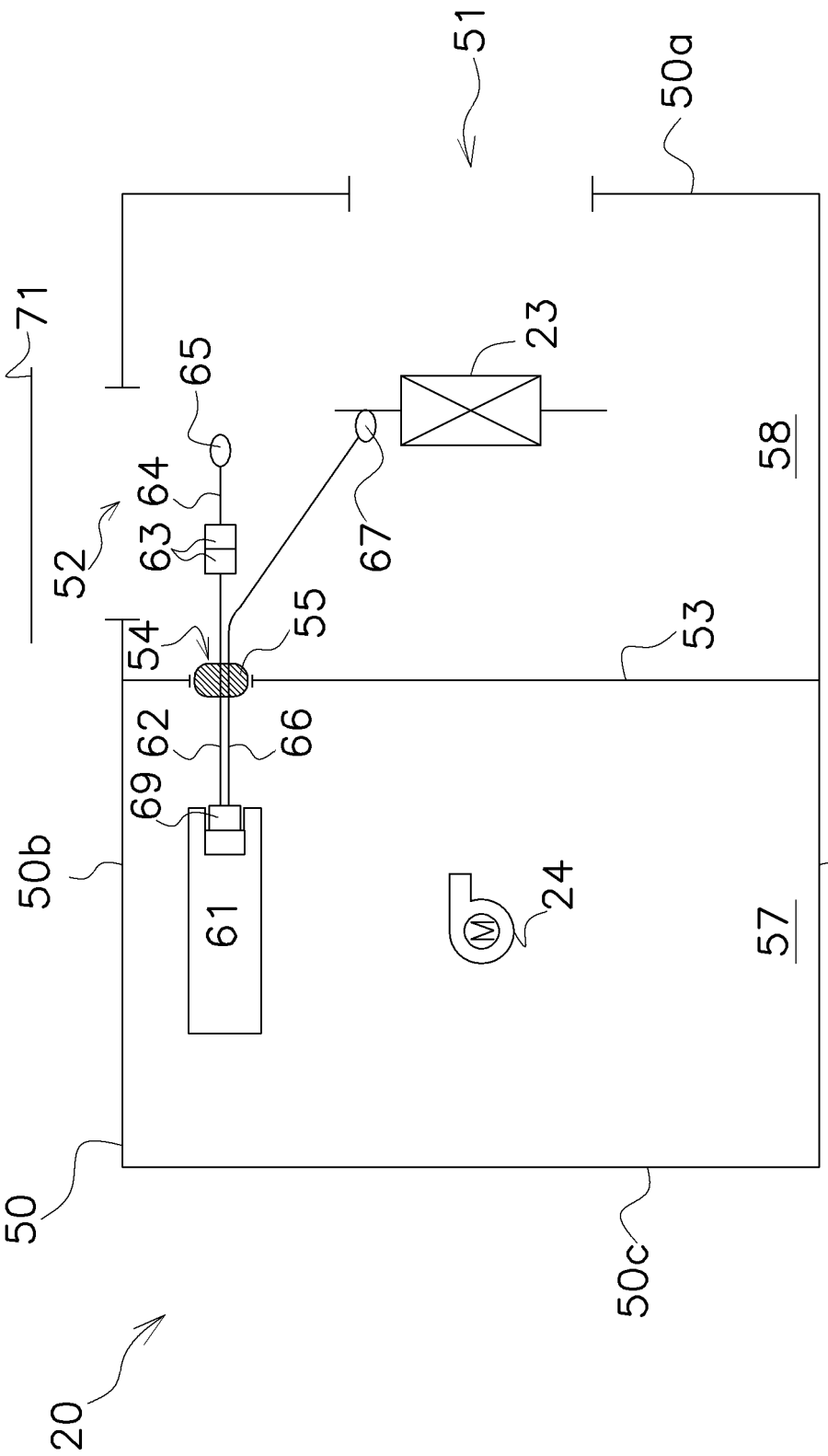


FIG. 2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50a
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69
50b
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24
57
50d
50
50c
20

FIG. 3

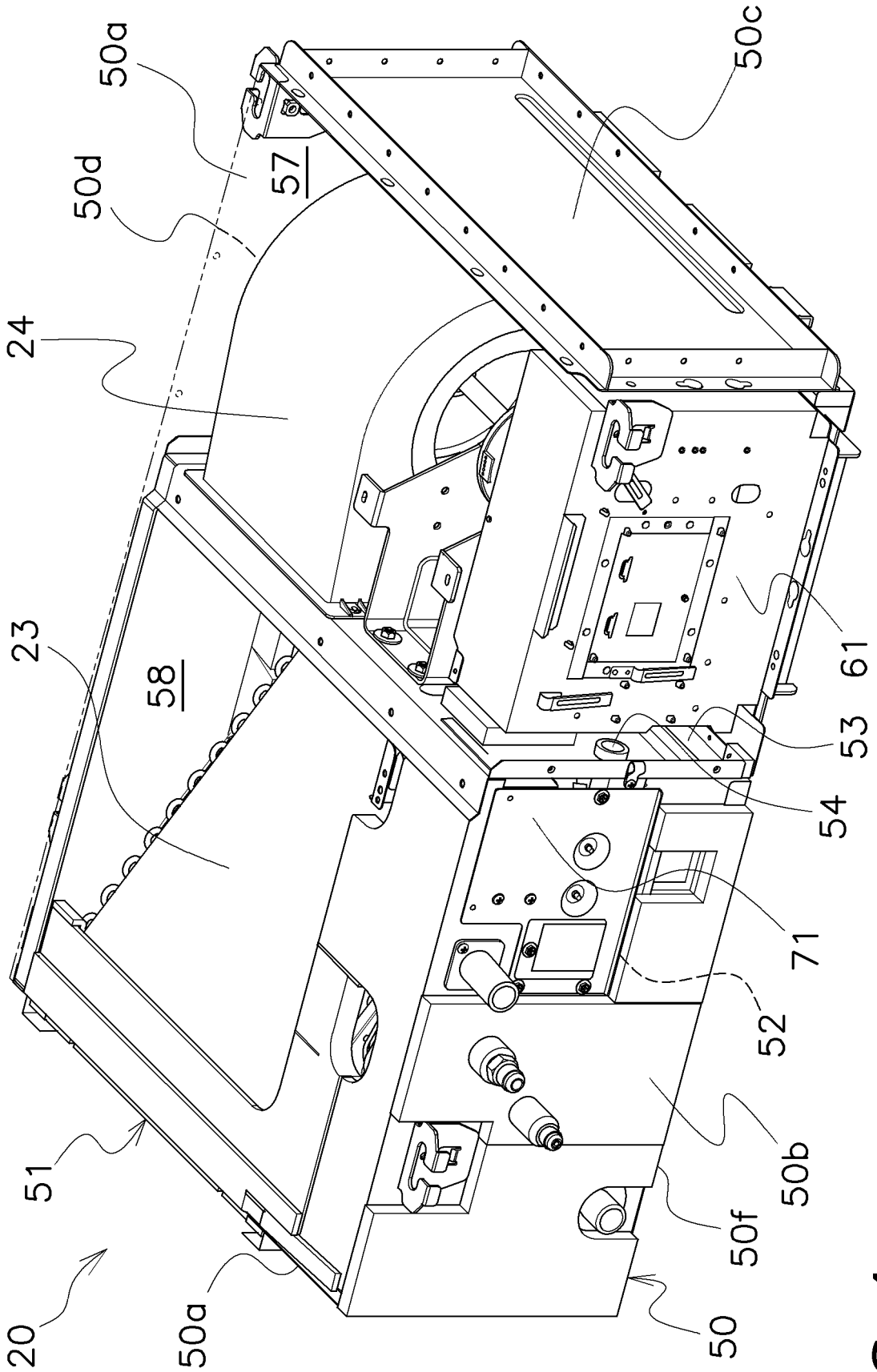

FIG. 4

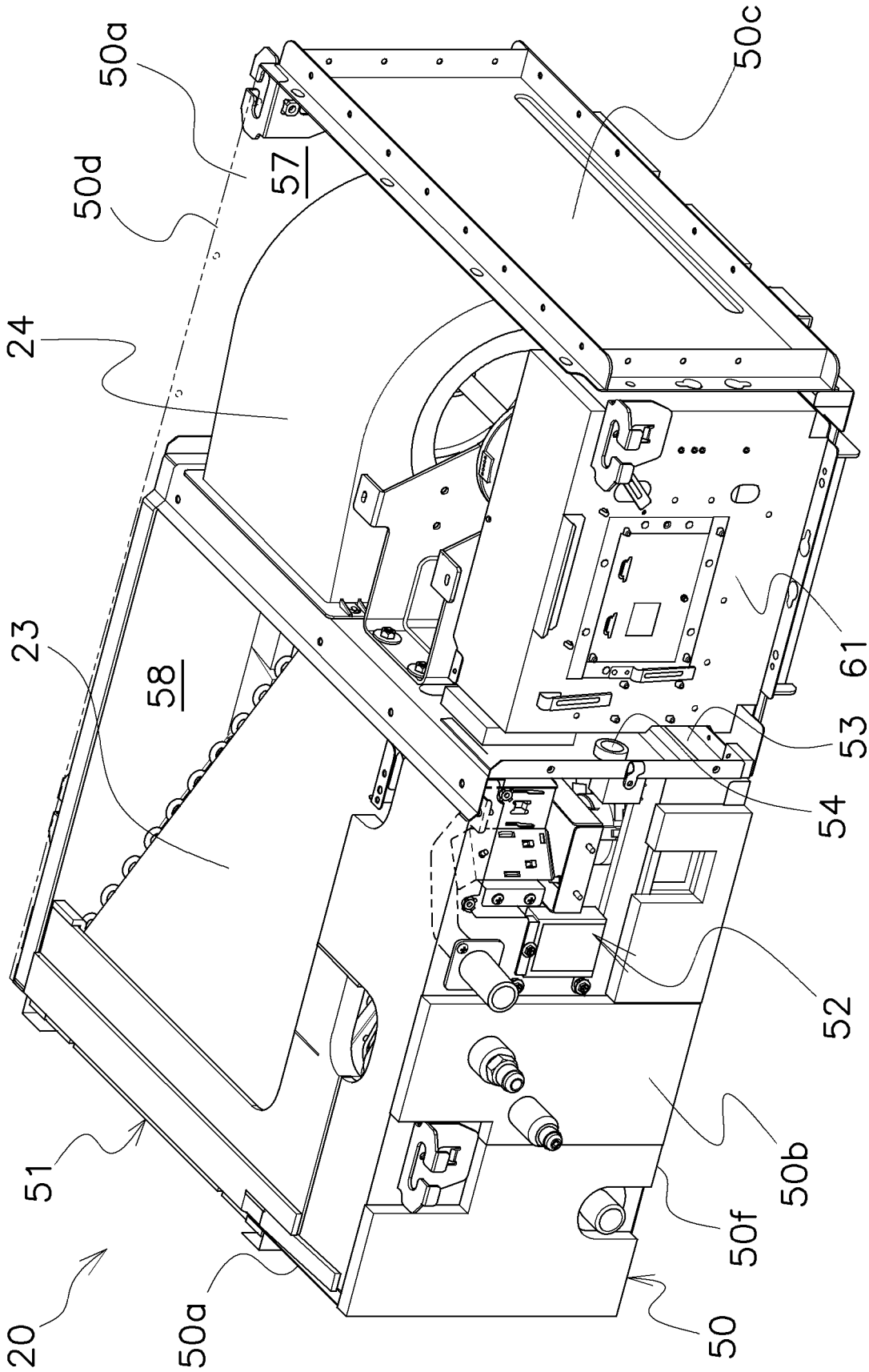

FIG. 5

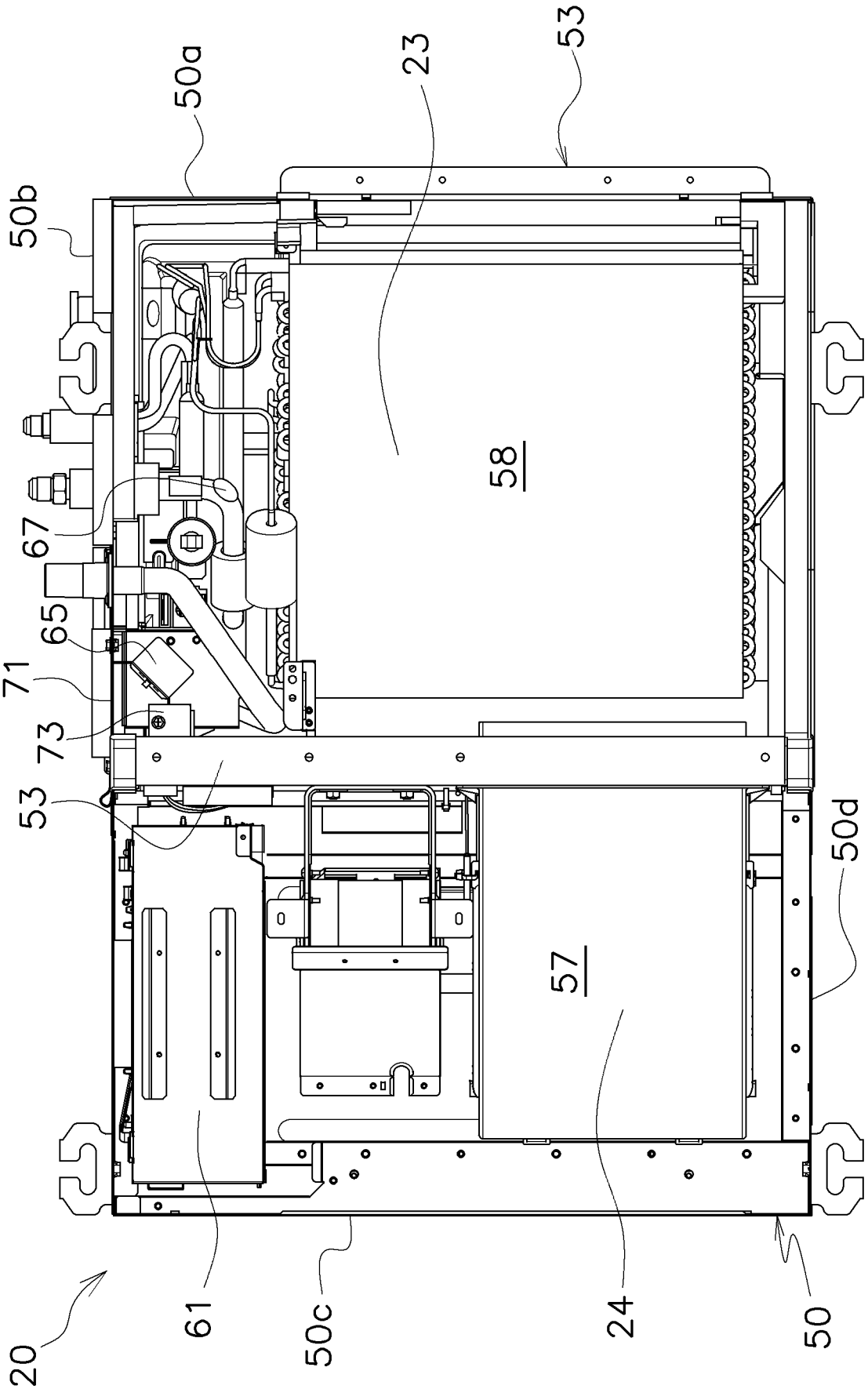

FIG. 6

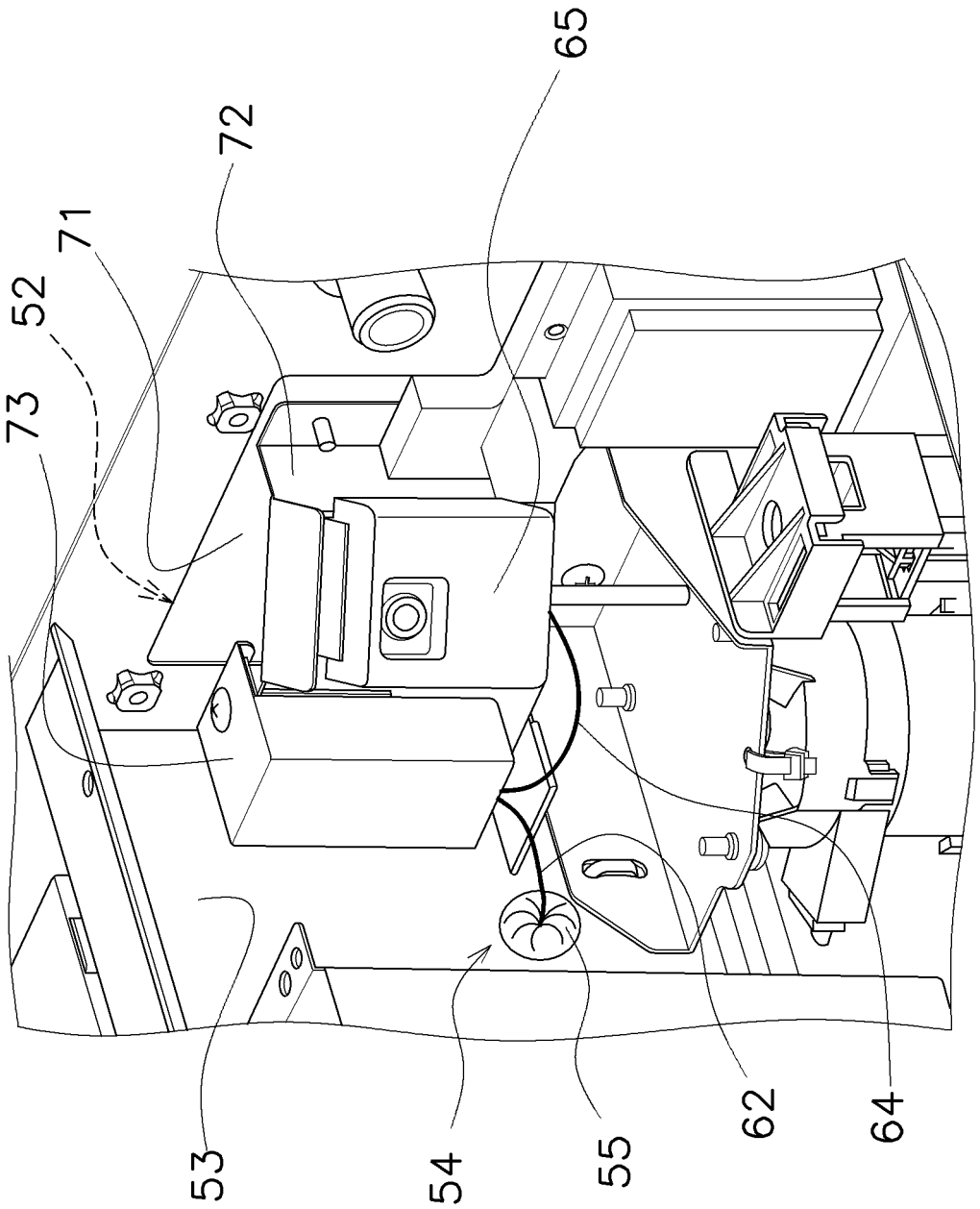

FIG. 7

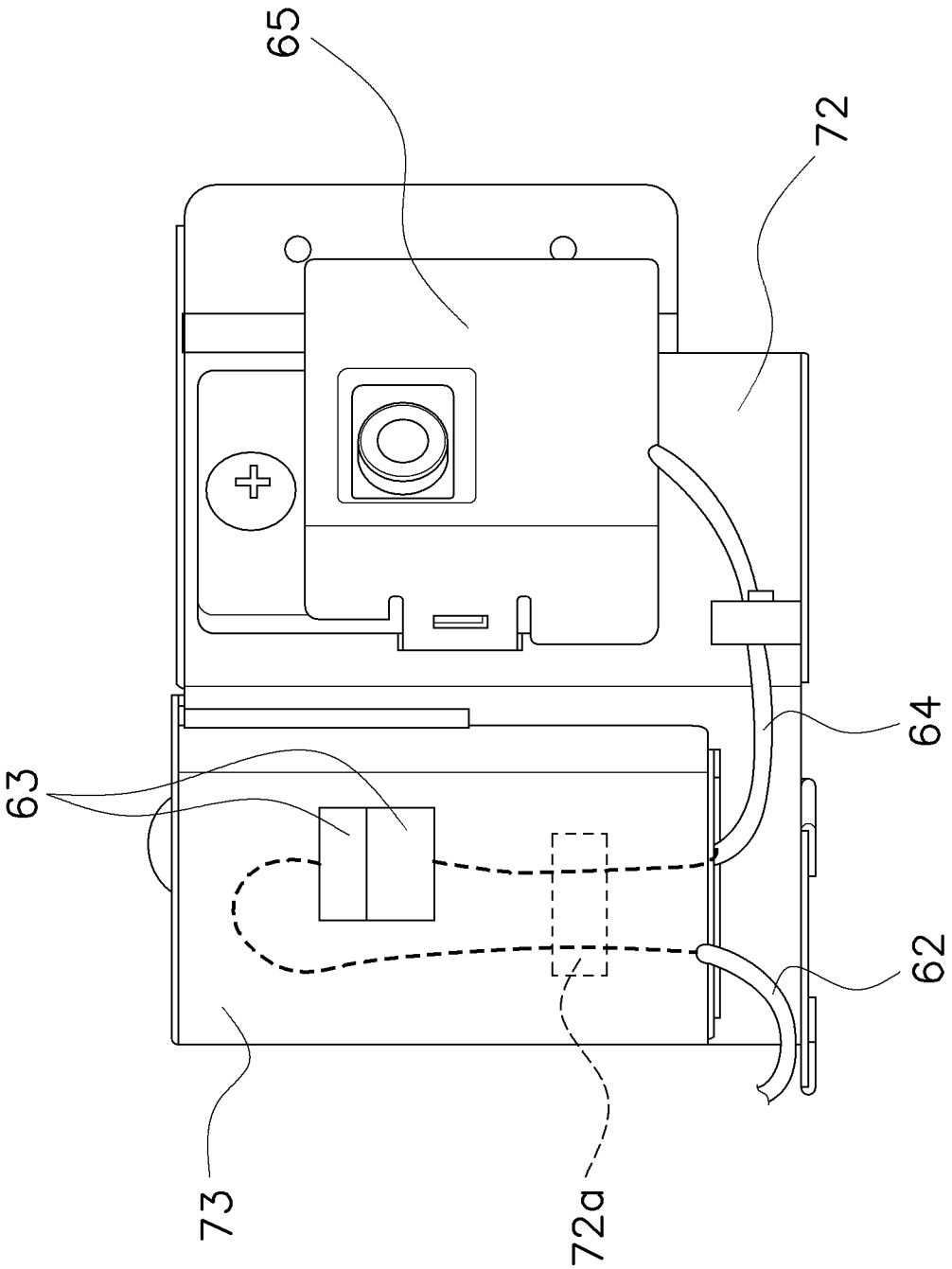

FIG. 8

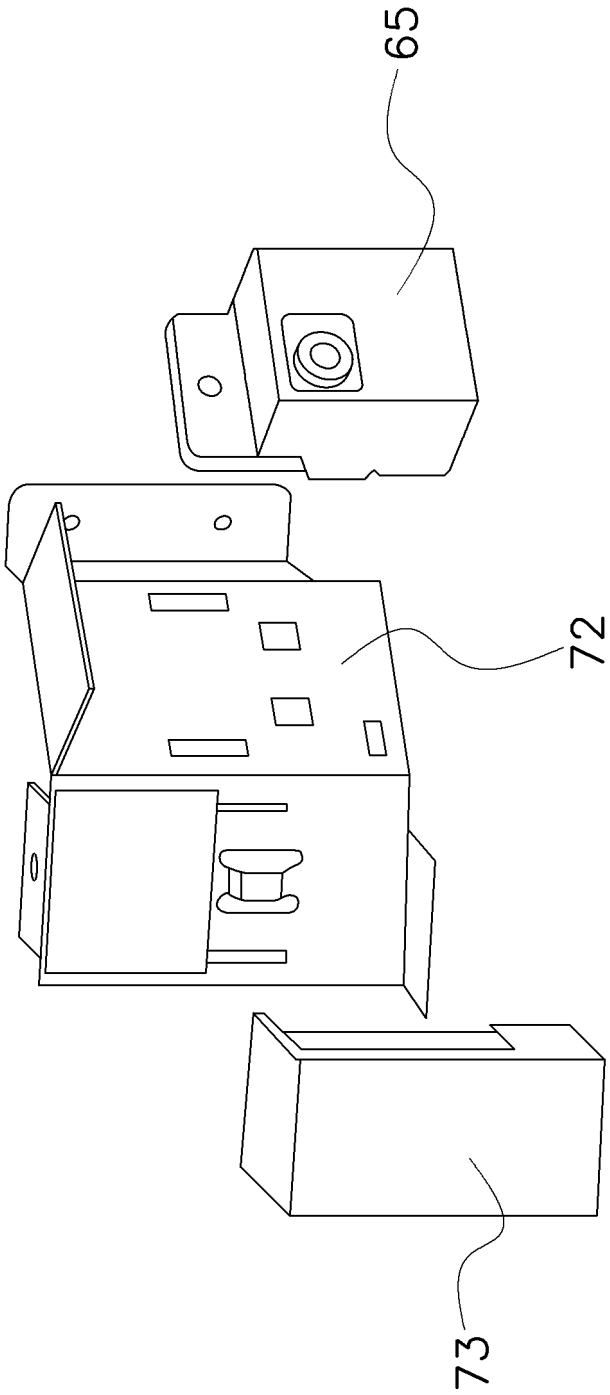

FIG. 9

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2024/014782

A. CLASSIFICATION OF SUBJECT MATTER

F24F 13/20(2006.01)i; ***F24F 11/89***(2018.01)i; ***F25B 49/02***(2006.01)i
FI: F24F1/0007 401E; F25B49/02 520M; F24F11/89

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)

F24F13/20; F24F11/89; F25B49/02; F24F1/0007; F24F1/02; F24F11/36

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 2021-014962 A (DAIKIN INDUSTRIES, LTD.) 12 February 2021 (2021-02-12) paragraphs [0018]-[0123], fig. 1-6	1-9
Y	JP 2013-200097 A (DAIKIN INDUSTRIES, LTD.) 03 October 2013 (2013-10-03) paragraphs [0030]-[0035], fig. 9	1-9
Y	JP 2001-132981 A (MITSUBISHI ELECTRIC CORPORATION) 18 May 2001 (2001-05-18) paragraphs [0019]-[0046], fig. 1-7	3-9
Y	JP 2005-140457 A (MITSUBISHI ELECTRIC CORPORATION) 02 June 2005 (2005-06-02) paragraph [0020], fig. 1	6-9
Y	JP 2-146455 A (MITSUBISHI ELECTRIC CORPORATION) 05 June 1990 (1990-06-05) specification, p. 2, upper left column, lines 5-16, p. 3, upper left column, line 17 to upper right column, line 14	6-9

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

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Date of the actual completion of the international search	Date of mailing of the international search report
20 June 2024	**02 July 2024**
Name and mailing address of the ISA/JP **Japan Patent Office (ISA/JP)** **3-4-3 Kasumigaseki, Chiyoda-ku, Tokyo 100-8915** **Japan**	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/JP2024/014782

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
JP 2021-014962 A	12 February 2021	US 2022/0128267 A1 paragraphs [0021]-[0173], fig. 1-6 EP 3998443 A1 CN 114080527 A	
JP 2013-200097 A	03 October 2013	(Family: none)	
JP 2001-132981 A	18 May 2001	(Family: none)	
JP 2005-140457 A	02 June 2005	(Family: none)	
JP 2-146455 A	05 June 1990	(Family: none)	

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2019011914 A **[0002] [0065]**