(19) Europäisches Patentamt
European Patent Office
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(11) **EP 3 971 495 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
23.03.2022 Bulletin 2022/12

(21) Application number: **20809110.8**

(22) Date of filing: **09.05.2020**

(51) International Patent Classification (IPC):
F25B 41/06 *(2006.01)*

(52) Cooperative Patent Classification (CPC):
F25D 19/00; F28D 7/00; F28F 21/08

(86) International application number:
PCT/CN2020/089327

(87) International publication number:
WO 2020/233419 (26.11.2020 Gazette 2020/48)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **17.05.2019 JP 2019093399**

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(54) REFRIGERATOR

(57) The present invention provides a refrigerator, comprising: a refrigerant circuit 10 comprising: a suction pipe 17 made of aluminum and comprising a recess 171 formed in a lengthwise direction and recessed radially inwardly; and a capillary tube 15 embedded in the recess 171. In the present invention, with the capillary tube being embedded in the recess of the suction pipe made of aluminum, an operation of joining the suction pipe to the capillary tube can be performed easily, and the heat transfer efficiency between the refrigerant circulating in the suction pipe and the refrigerant circulating in the capillary tube can be improved.

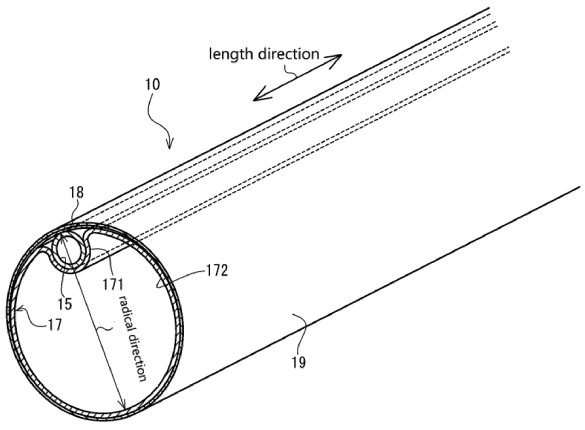

Fig. 3

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Description

TECHNICAL FIELD

[0001] The present invention relates to a refrigerator.

BACKGROUND

[0002] Usually, a refrigerator has a refrigerant circuit which is configured in a way that the refrigerant discharged from a compressor circulates through a condenser, a capillary tube, an evaporator and a suction pipe in turn, and returns to the compressor again from the suction pipe.

[0003] The refrigerant in the evaporator absorbs the heat in the refrigerator and vaporizes. However, in a case where the refrigerant in the evaporator does not vaporize sufficiently, it might occur that the liquid refrigerant flows into the suction pipe from the evaporator. The suction pipe is also connected to the compressor. If a countermeasure is not taken, the liquid (heavier-mass) refrigerant will return to the compressor, which might be one of factors causing the compressor to fail.

[0004] To prevent this case, a structure is employed in which an outer surface of the suction pipe and an outer surface of the capillary tube are in thermal contact. The temperature of the refrigerant circulating in the capillary tube is high, so the thermal contact between the suction pipe and the capillary tube enables the heat exchange between the refrigerant flowing through the suction pipe and the refrigerant flowing through the capillary tube. As a result, the refrigerant in the suction pipe vaporizes and the vaporized refrigerant flows into the compressor, so that the liquid refrigerant can be prevented from flowing into the compressor.

[0005] Incidentally, suction pipes made of copper are mostly used so far, but suction pipes made of cheaper aluminum have been developed for the refrigerant circuit of the refrigerator to reduce the costs of the products. The following patent document 1 discloses a refrigerant circuit having a suction pipe made of aluminum.

[0006] Patent document 1 JP2013092287A is cited herein as a prior art patent document. The technique disclosed in patent document 1 relates to a refrigerant circuit and a refrigerator having the same, wherein the refrigerant circuit comprises a suction pipe made of aluminum and a capillary tube made of an aluminum alloy, and the refrigerant circuit is structured in a way that the suction pipe and the capillary tube are joined in a molten state.

[0007] However, the suction pipe and the capillary tube of the refrigerant circuit involved in patent document 1 are joined by laser emitted from a laser welder. Furthermore, when the suction pipe is joined to the capillary tube, a pressing roller is used to form a press-fitted state of the suction pipe and the capillary tube.

[0008] To this end, dedicated devices must be introduced to manufacture the refrigerant circuit disclosed in patent document 1. In addition, these devices need to be operated difficulty in a long period of time to properly join the suction pipe to the capillary tube. Therefore, although the refrigerant circuit disclosed in patent document 1 uses the suction pipe made of aluminum cheaper than copper, the problem of high product costs still exists.

[0009] Furthermore, the suction pipe and the capillary tube disclosed in the patent document 1 are in thermal contact only via a substantially linear molten-joining portion. Therefore, since the formed thermal contact region is local, there is room for improvement of the heat exchange efficiency of the refrigerant circulating in the suction pipe and the refrigerant circulating in the capillary tube.

SUMMARY

[0010] In view of the above problems, an object of the present invention is to provide a refrigerator, aiming to reduce costs of products, make an operation of joining of the suction pie and the capillary tube easier, and meanwhile improve the heat exchange efficiency between the refrigerant circulating in the suction pipe and the refrigerant circulating in the capillary tube.

[0011] Means to solve the problem.

[0012] In order to solve the above problems, the refrigerator according to the present invention includes a refrigerant circuit, the refrigerant circuit comprising:

a suction pipe made of aluminum and comprising a recess formed in a lengthwise direction and recessed radially inwardly; and
a capillary tube, the capillary tube is embedded in the recess.

[0013] Further, the recess comprising:

a bottom wall which is located on a radially inner side of the suction pipe, the capillary tube being disposed on the bottom wall;
a first side wall connected with a first side edge of the bottom wall and rising outward in a radial direction, the first side wall being in contact with the capillary tube; and
a second side wall connected with a second side edge of the bottom wall and rising outward in a radial direction, the second side wall being in contact with the capillary tube;
as viewed from a cross section, the bottom wall is curved corresponding to a curvature of an outer surface of the capillary tube, and the bottom wall is in contact with a surface of the capillary tube.

[0014] Further, as viewed from the cross section, the first side wall is a flat plate-shaped, or the first side wall is curved corresponding to the curvature of the outer surface of the capillary tube, and the first side wall is in contact with the surface of the capillary tube.

[0015] Further, as viewed from the cross section, the

second side wall is a flat plate-shaped, or the second side wall is curved corresponding to the curvature of the outer surface of the capillary tube, and the second side wall is in contact with the surface of the capillary tube.

[0016] Further, the refrigerator further comprises an auxiliary heat exchange member, the auxiliary heat exchange member being mounted at the suction pipe and configured to cover the recess and the capillary tube embedded in the recess.

[0017] Further, the auxiliary heat exchange member is an aluminum tape.

[0018] Further, the refrigerator further comprises a heat-shrinkable tube receiving the suction pipe in which the capillary tube is embedded, the heat-shrinkable tube pressing the capillary tube towards the recess.

[0019] Further, the topmost portion of the capillary tube is received in the recess

[0020] The refrigerator according to the present invention can achieve reduction of costs of products by using the suction pipe made of aluminum. In addition, due to the structure with the capillary tube being embedded in the recess of the suction pipe, an operation of joining the suction pipe to the capillary tube can be performed easily, and the suction pipe and the capillary tube can be maintained in excellent thermal contact; therefore, the loss of heat transfer between the refrigerant circulating in the suction pipe and the refrigerant circulating in the capillary tube can be reduced.

[0021] In addition, since the capillary tube is in contact with each of the bottom wall, the first side wall and the second side wall of the recess of the suction pipe and in contact with the bottom wall surface, the refrigerator according to the present invention has a simple structure and can further reduce the loss of heat transfer between the suction pipe and the capillary tube.

[0022] Furthermore, the refrigerator according to the present invention is structured in a way that the auxiliary heat transfer member covering the capillary tube embedded in the recess of the suction pipe is mounted at the suction pipe, the loss of heat transfer between the refrigerant circulating in the suction pipe and the refrigerant circulating in the capillary tube can be further reduced.

[0023] Furthermore, in the refrigerator according to the present invention, since the capillary tube is pressed by the heat-shrinkable tube towards the recess, the thermal contact of the suction pipe and the capillary tube can be maintained better; therefore, the loss of heat transfer between the refrigerant circulating in the suction pipe and the refrigerant circulating in the capillary tube can be reduced.

[0024] Furthermore, the refrigerator according to the present invention is structured in a way that since the topmost portion of the capillary tube is received in the recess, the swelling of the heat-shrinkable tube that might be caused by the heat-shrinkable tube pressing the topmost portion of the capillary tube can be prevented; therefore, the operation of receiving the suction pipe in which the capillary tube is embedded into the heat-shrinkable tube can be performed simply and conveniently, and meanwhile the heat-shrinkable tube with a smaller diameter can be used; as a result, reduction of the costs of products can be achieved.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025]

FIG. 1 is a side vertically-sectional view of a refrigerator according to an embodiment of the present invention;

FIG. 2 is a perspective view of a refrigerator according to an embodiment of the present invention as viewed from rear, wherein a refrigerant circuit is shown.

FIG. 3 is a partially perspective view of the refrigerant circuit, illustrating a form of thermal contact region of a suction pipe and a capillary tube.

FIG. 4 is a cross-sectional view of the refrigerant circuit, illustrating the thermal contact region of the suction pipe and the capillary tube.

DETAILED DESCRIPTION

[0026] A refrigerator according to an embodiment of the present invention will be described hereunder in detail with reference to figures. In addition, when the refrigerator 1 according to the present embodiment is described, an "up-down" direction corresponds to a height direction of the refrigerator 1, a "left-right" direction corresponds to a widthwise direction of the refrigerator 1, and a "front-rear" direction corresponds to a depth direction of the refrigerator 1.

[0027] First, an overall structure of the refrigerator 1 according to the present embodiment will be described reference to FIG. 1. Here, FIG. 1 is a side vertically-sectional view of the refrigerator 1. As shown in the figure, the refrigerator 1 according to the present embodiment comprises a heat-insulating cabinet 2 which is equivalent to a main body of the refrigerator. The heat-insulating cabinet 2 comprises a plurality of storage compartments in which foods and the like are stored. In addition, which is not particularly limited herein, the plurality of storage compartments correspond to a refrigerating compartment 3 and a freezing compartment 4 in turn from top to bottom.

[0028] Each storage compartment provided in the heat-insulating cabinet 2 has an opening in the front, and heat-insulating doors D1 and D2 are provided to seal these openings in a closeable and openable manner. Here, the heat-insulating door D1 seals the front opening of the refrigerating compartment 3 in such a way that upper and lower ends of the right side (as viewed from the front of the refrigerator for example) are rotatably supported on the heat-insulating cabinet 2. In addition, the heat-insulating door D2 is disposed to seal the front opening of the freezing compartment 4 in such a way that the

heat-insulating door D2 may be drawn out or pushed in in a front-rear direction relative to the heat-insulating cabinet 2.

[0029] Furthermore, the heat-insulating cabinet 2 comprises an outer cabinet 2a made of a steel plate, an inner cabinet 2b made of a synthetic resin, and a heat-insulating material 2c made of foamed polyurethane (polyurethane foam), the heat-insulating material 2c being filled in a gap formed between the outer cabinet 2a and the inner cabinet 2b. A heat-insulating partition wall (for example, a member shown by reference numeral 6 in FIG. 1) is disposed inside the heat-insulating cabinet 2. The refrigerating compartment 3 and the freezing compartment 4 are partitioned by the heat-insulating partition wall 6.

[0030] In addition, the structure of the refrigerant circuit 10 will be described with reference to FIG. 2. A compressor 11 for compressing the refrigerant is disposed in a machine room M provided at the rear side of the bottom of the refrigerator. The compressor 11 is one of the components of the refrigerant circuit 10. Here, the refrigerant circuit 10 is a channel in which the refrigerant circulates to cool the interior of the storage compartments of the refrigerator 1.

[0031] FIG. 2 is a perspective view of the refrigerator 1 as viewed from rear, wherein the refrigerant circuit 10 is shown. As shown in Fig. 2, the refrigerant circuit 10 comprises a compressor 11, a condenser (a wave peak condenser) 12, a frame-type pipe 13 for preventing dew condensation, a dryer 14 for dehumidifying the refrigerant, a capillary tube 15, an evaporator 16 and a suction pipe 17.

[0032] The components of the refrigerant circuit 10 in the present embodiment are connected in the order described above. Further, the suction pipe 17 is connected to the compressor 11, thereby forming a circulation passage of the refrigerant. In addition, the suction pipe 17 in the present embodiment is made of aluminum which is cheaper than copper. In addition, an outer surface of the suction pipe 17 is preferably coated to prevent electric corrosion. In addition, the capillary tube 15 involved in the present embodiment is made of, but not limited to copper.

[0033] The refrigerant compressed by the compressor 11 is discharged to the condenser 12 which for example extends to left and right side walls and a bottom wall of the refrigerator 1, and then flows through the condenser 12 and flows to the frame-type pipe 13 connected to the condenser 12 (for example, the frame-type pipe 13 extends to the periphery of the front openings of the storage components). Furthermore, the refrigerant reaches the evaporator 16 via the dryer 14 and the capillary tube 15, and then returns to the compressor 11 via the suction pipe 17.

[0034] As shown in FIG. 2, the pipelines of the capillary tube 15 and the suction pipe 17 are laid adjacent to the rear side of the refrigerator 1. More specifically, thermal contact is performed in regions HC1, HC2 and HC3 (the regions are hereinafter referred to as a "thermal contact region". In addition, a length of the thermal contact region is referred to as a "heat exchange length".). As a result of the heat exchange between the refrigerant circulating in the capillary tube 15 and the refrigerant circulating in the suction pipe 17, the temperature of the refrigerant in the capillary tube 15 falls, and the temperature of the refrigerant in the suction pipe 17 rises.

[0035] The higher the heat exchange efficiency between the refrigerant circulating in the capillary tube 15 and the refrigerant circulating in the suction pipe 17 is, the more efficiently the refrigerant in the suction pipe 17 vaporizes and returns to the compressor 11. Therefore, a situation in which the liquid refrigerant returns from the suction pipe 17 to the compressor 11 is prevented, and the damage of the compressor 11 can be effectively prevented. However, the thermal contact region of the capillary tube 15 and the suction pipe 17 is not limited to the illustrated case.

[0036] Next, the form of the thermal contact region of the capillary tube 15 and the suction pipe 17 will be illustrated with reference to FIG. 3 and FIG. 4. FIG. 3 is a partial perspective view of the refrigerant circuit 10, which shows the thermal contact region of the capillary tube 15 and the suction pipe 17. In addition, FIG. 4 is a cross-sectional view of the refrigerant circuit 10.

[0037] As shown in FIG. 3 and FIG. 4, the suction pipe 17 comprises a recess 171 that is recessed inward in a radial direction of the suction pipe 17. In addition, the recess 171 has an opening on an upper surface side. Furthermore, as shown in FIG. 3, the recess 171 is formed along a length direction of the suction pipe 17.

[0038] The capillary tube 15 in the present embodiment is embedded in the recess 171. According to the present embodiment, the capillary tube 15 and the suction pipe 17 can be brought into thermal contact by embedding the capillary tube 15 into the recess 171 of the suction pipe 17. Therefore, the contacting (joining) operation of the capillary tube 15 and the suction pipe 17 can be easily performed, and the production costs of the products can be reduced.

[0039] As shown in FIG. 4, the recess 171 involved in the present embodiment comprises a first side wall 171S1, a second side wall 171S2 and a bottom wall 171B. The first side wall 171S1 is connected to a first side edge 171B1 of the bottom wall 171B and rises outward in a radial direction. In addition, an end edge 171T1 of the rising frontmost portion of the first side wall 171S1 is joined to an end edge 1721 of a main body portion 172 (a portion other than the recess 171) of the arcuate cross section of the suction pipe 17.

[0040] Similarly, the second side wall 171S2 is connected to a second side edge 171B2 of the bottom wall 171B and rises outward in the radial direction. In addition, an end edge 171T2 of the rising frontmost portion of the second side wall 171S2 is joined to the other end edge 1722 of the main body portion 172 of the arcuate cross section of the suction pipe 17.

[0041] Furthermore, length directions of the bottom wall 171B, the first side wall 171S1 and the second side wall 171S2 are formed along the length direction of the suction pipe 17. In addition, for ease of description, the bottom wall 171B, the first side wall 171S1 and the second side wall 171S2 are described as separate components, but they may be integrated in structure.

[0042] The capillary tube 15 embedded in the recess 171 is in contact with both the first side wall 171S1 and the second side wall 171S2 of the recess 171, and is placed on the bottom wall 171B. In this way, the capillary tube 15 and the suction pipe 17 (the recess 171) can be in contact with each other at multiple places. Therefore, according to the present embodiment, the joining operation of the capillary tube 15 and the suction pipe 17 can be performed simply and conveniently; in addition, even when aluminum is used in place of the raw material of the suction pipe 17, the thermal contact between the capillary tube 15 and the suction pipe 17 can be maintained well.

[0043] Furthermore, as shown in FIG. 4, the bottom wall 171B is preferably curved corresponding to a curvature 15R of an outer surface 15S of the capillary tube 15. Since the bottom wall 171B has such a curved structure, the bottom wall 171B contacts the capillary tube 15. As a result, the thermal contact between the capillary tube 15 and the suction pipe 17 can be maintained better, and the heat transfer loss between the refrigerant in the capillary tube 15 and the refrigerant in the suction pipe 17 can be greatly reduced.

[0044] In addition, although both first side wall 171S1 and the second side wall 171S2 shown in the figure are substantially flat plate-shaped, they may be in a state in which they are curved corresponding to the curvature of the outer surface 15S of the capillary tube and contact the surface of the capillary tube 15, like the bottom wall 171B. With the first side wall 171S1 and the second side wall 171S2 being curved in this way, the thermal contact between the capillary tube 15 and the suction pipe 17 may be maintained better.

[0045] Furthermore, as shown in FIG. 3 and FIG. 4, the thermal contact region between the capillary tube 15 and the suction pipe 17 in the refrigerant circuit 10 preferably further comprises an auxiliary heat exchange member 18 for improving the heat exchange efficiency of the capillary tube 15 and the suction pipe 17. The auxiliary heat exchange member 18 is mounted at the suction pipe 17 to cover the capillary tube 15 embedded in the recess 171.

[0046] The type of the auxiliary heat exchange member 18 is not particularly limited, as long as it can serve as a heat exchange medium between the capillary tube 15 and the suction pipe 17, but it is preferably an aluminum tape with low cost and suitable thermal conductivity. In addition, in a case where the auxiliary heat exchange member 18 is an aluminum tape, the following is preferable: the capillary tube 15 can be fixed by a simple operation of bridging the auxiliary heat exchange member 18 from the end edge 171T1 of the recess 171 to the end edge 171T2 and adhering the auxiliary heat exchange member 18 on the outer surface of the suction pipe 17.

[0047] Furthermore, as shown in FIG. 3 and FIG. 4, the refrigerant circuit 10 is preferably provided with a heat-shrinkable tube 19 that receives the suction tube 17 (covering the outer surface of the suction tube 17) into which the capillary tube 15 is embedded. Since the suction tube 17 is received in the heat-shrinkable tube 19, the capillary tube 15 can be embedded into the recess 171 while being squeezed toward the recess 171; therefore, the thermal contact between the capillary tube 15 and the suction pipe 17 can be maintained better.

[0048] In addition, as shown in FIG. 4, it is more preferable that the topmost portion 15T of the capillary tube 15 is received in the recess 171 of the suction pipe 17. Unlike the present embodiment, assuming that the topmost portion 15T of the capillary tube 15 protrudes outward out of the recess 171, a diameter of the heat-shrinkable tube 19 must be increased in proportion to the protruding portion. Conversely, in the present embodiment, since the topmost portion 15T of the capillary tube 15 is received in the recess 171, the suction tube 17 in which the capillary tube 15 is embedded can be received by the heat-shrinkable tube 19 with a short diameter. Since the heat-shrinkable tube 19 with a shorter diameter can be used, further reduction of the costs of the products can be achieved.

[0049] According to the present embodiment shown in FIGS. 3 and 4, as compared with the form in the prior art in which the capillary tube is simply placed on the tubular suction pipe without the recess 171 being formed and the heat-shrinkable tube is wound around the capillary tube and the suction pipe to fix them, the form in the present invention can shorten the heat exchange length by about 20% (in the case of the form of the prior art, the heat exchange length is about 1800 mm, but in the case of the form of the present embodiment, the heat exchange length can be shortened to 1500 mm.). Therefore, since a usage of metal components such as the suction pipe can be reduced, further reduction of the costs of the products can be achieved.

[0050] Embodiments of the present invention have already described in detail. However, the forgoing depictions are intended to facilitate understanding the content of the present invention and not to limit the disclosure of the present invention. The present invention may include those solutions that may be modified and improved without departing from the spirit of the present invention. In addition, the present invention equivalents of the present invention.

Claims

1. A refrigerator (1), wherein the refrigerator (1) comprises a refrigerant circuitr (10), the refrigerant circuitr (10) comprising:

a suction pipe (17) made of aluminum and comprising a recess (171) formed in a lengthwise direction and recessed radially inwardly; and
a capillary tube (15), the capillary tube (15) is embedded in the recess (171).

2. The refrigerator (1) according to claim 1, wherein the recess (171) comprising:

a bottom wall (171B) which is located on a radially inner side of the suction pipe (17), the capillary tube (15) being disposed on the bottom wall (171B);
a first side wall (171S1) connected with a first side edge of the bottom wall (171B) and rising outward in a radial direction, the first side wall (171S1) being in contact with the capillary tube (15); and
a second side wall (171S2) connected with a second side edge (171B2) of the bottom wall (171B) and rising outward in a radial direction, the second side wall (171S2) being in contact with the capillary tube (15);
as viewed from a cross section, the bottom wall (171B) is curved corresponding to a curvature of an outer surface of the capillary tube (15), and the bottom wall (171B) is in contact with a surface of the capillary tube (15).

3. The refrigerator (1) according to claim 2, wherein as viewed from the cross section, the first side wall (171S1) is a flat plate-shaped, or the first side wall (171S1) is curved corresponding to the curvature of the outer surface of the capillary tube (15), and the first side wall (171S1) is in contact with the surface of the capillary tube (15).

4. The refrigerator (1) according to claim 2, wherein as viewed from the cross section, the second side wall (171S2) is a flat plate-shaped, or the second side wall (171S2) is curved corresponding to the curvature of the outer surface of the capillary tube (15), and the second side wall (171S2) is in contact with the surface of the capillary tube (15).

5. The refrigerator (1) according to claim 1, wherein the refrigerator (1) further comprises an auxiliary heat exchange member (18), the auxiliary heat exchange member (18) being mounted at the suction pipe (17) and configured to cover the recess (171) and the capillary tube (15) embedded in the recess (171).

6. The refrigerator (1) according to claim 5, wherein the auxiliary heat exchange member (18) is an aluminum tape.

7. The refrigerator (1) according to claim 1, wherein the refrigerator (1) further comprises a heat-shrinkable tube (19) receiving the suction pipe (17) in which the capillary tube (15) is embedded, the heat-shrinkable tube (19) pressing the capillary tube (15) towards the recess (171).

8. The refrigerator (1) according to claim 7, wherein the topmost portion (15T) of the capillary tube (15) is received in the recess (171).

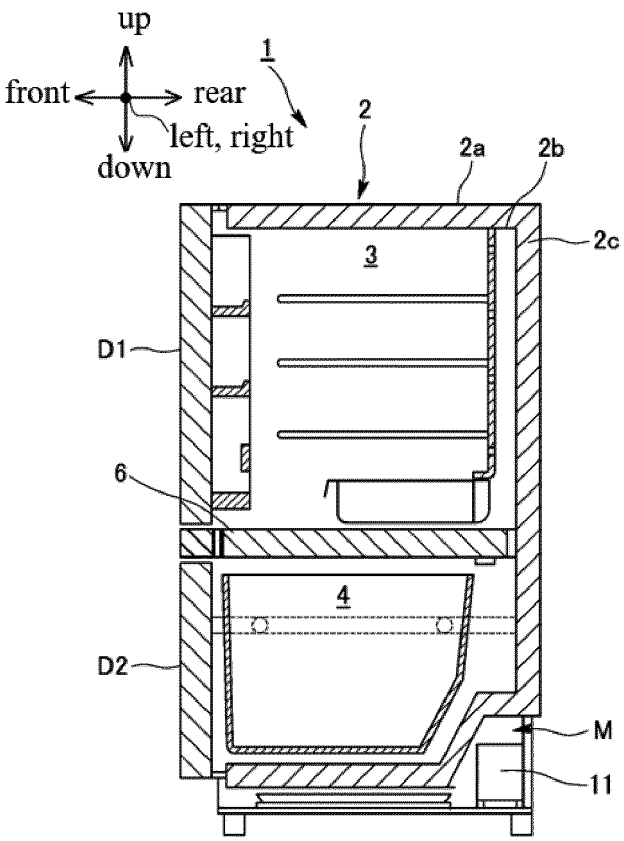

Fig. 1

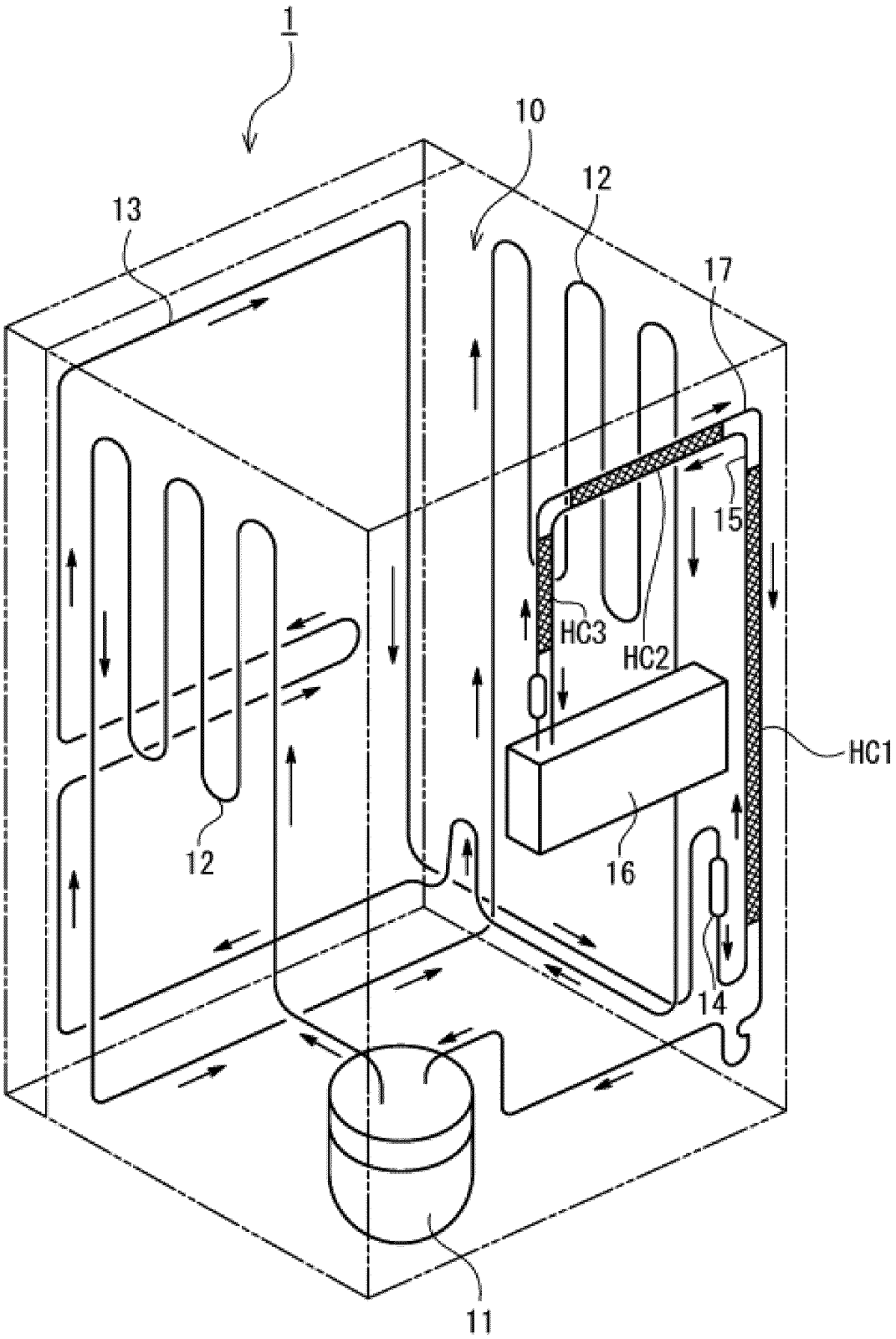

Fig. 2

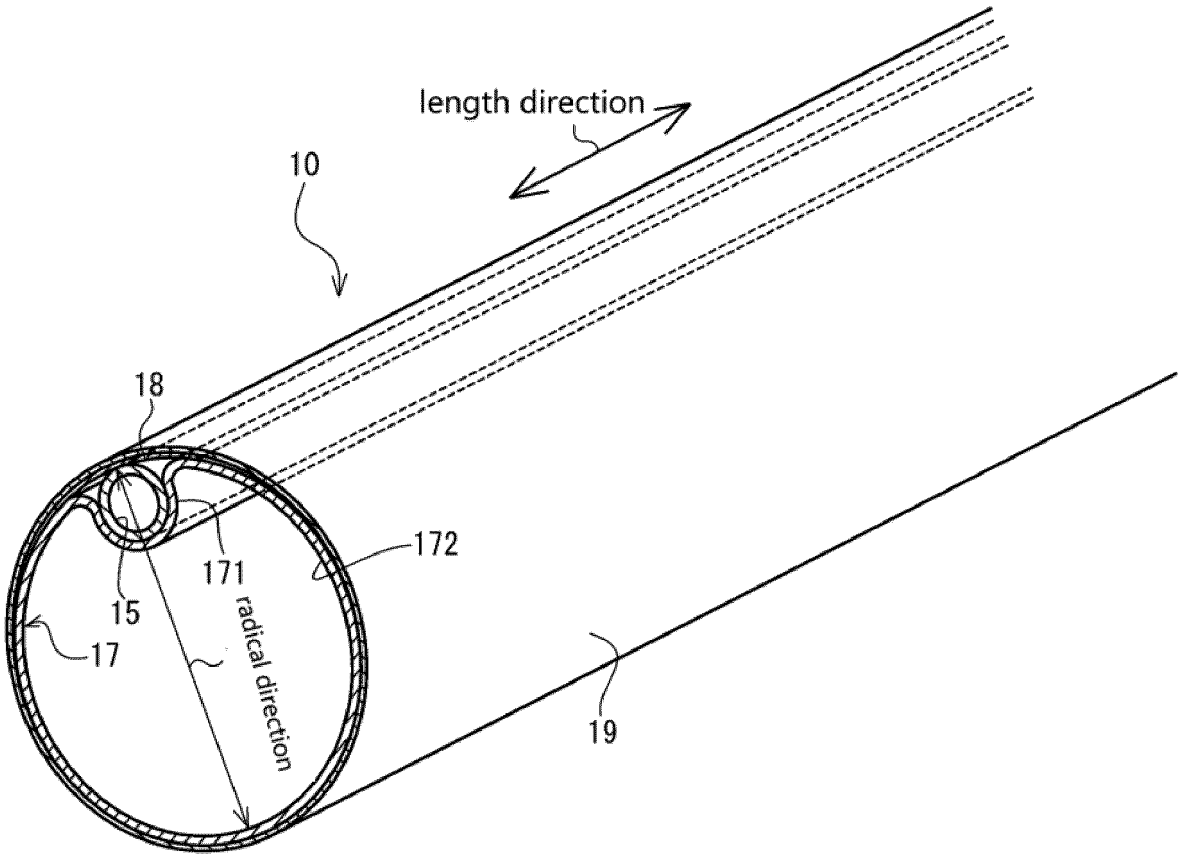

Fig. 3

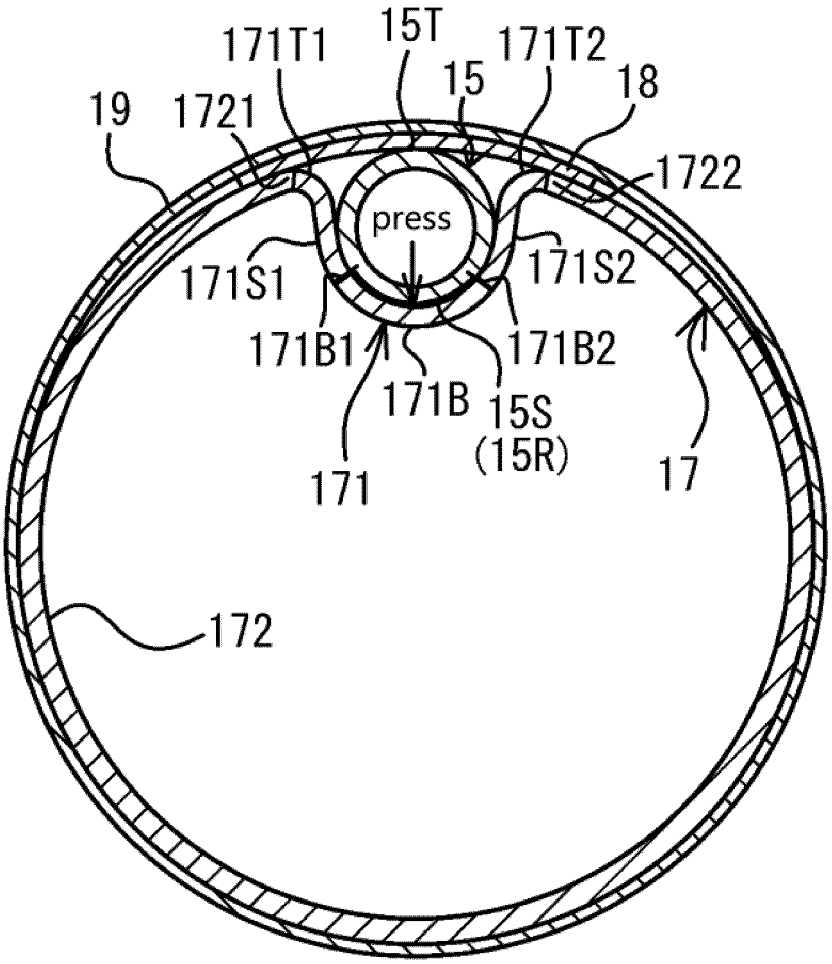
171T1
15T
171T2
15
18
19
1721
1722
press
171S1
171S2
171B1
171B2
171B
15S
(15R)
171
17
172

Fig. 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2020/089327

A. CLASSIFICATION OF SUBJECT MATTER

F25B 41/06(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F25B; F25D

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

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

CNTXT, CNABS, CNKI, SIPOABS, DWPI, 吸气管, 回气管, 毛细管, 凹, 槽, 铝带, 热缩管, 换热, 热交换, suction, return, pipe, capillary, groove, aluminium, strip, pyrocondensation, heat, exchange

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 206695452 U (HENAN KELONG GROUP CO., LTD.) 01 December 2017 (2017-12-01) description, paragraphs [0001]-[0008], and figures 1-2	1-8
X	CN 105526748 A (HEFEI MIDEA REFRIGERATOR CO., LTD. et al.) 27 April 2016 (2016-04-27) description, paragraphs [0025]-[0035], and figures 2-3	1-8
X	CN 208398439 U (CHANGZHOU CHANGZHENG EVAPORATOR CO., LTD.) 18 January 2019 (2019-01-18) description, paragraphs [0011]-[0012], and figure 1	1-8
X	CN 102313403 A (HAIER GROUP CORPORATION et al.) 11 January 2012 (2012-01-11) description, paragraphs [0002]-[0024], and figures 1-5	1-4
X	CN 103673422 A (GUANGDONG HOMA APPLIANCES CO., LTD.) 26 March 2014 (2014-03-26) description, paragraphs [0014]-[0016], and figure 1	1-4

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

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
20 July 2020	**24 July 2020**
Name and mailing address of the ISA/CN **China National Intellectual Property Administration (ISA/CN)** **No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088** **China** Facsimile No. **(86-10)62019451**	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2020/089327

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
CN 206695452 U	01 December 2017	None	
CN 105526748 A	27 April 2016	None	
CN 208398439 U	18 January 2019	None	
CN 102313403 A	11 January 2012	None	
CN 103673422 A	26 March 2014	None	

Form PCT/ISA/210 (patent family annex) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2013092287 A **[0006]**