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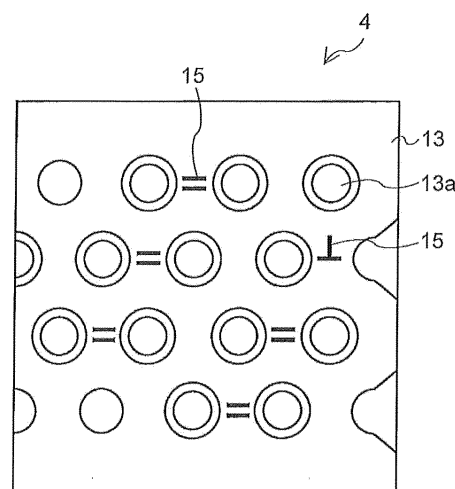
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(54) **AIR-CONDITIONING DEVICE AND METHOD FOR MANUFACTURING AIR-CONDITIONING DEVICE**

(57) An air-conditioning apparatus includes: a compressor, a first heat exchanger, an expansion unit and a second heat exchanger that are connected, by a pipe, in a refrigerant circuit through which refrigerant flows, wherein the first heat exchanger includes: a radiator fin, multiple tubes extending through the radiator fin and through which the refrigerant flows, and a side plate provided at end portions of the multiple tubes, and having multiple holes formed thereon, through which the multiple tubes are extended, wherein, on the side plate, between the holes corresponding to the multiple tubes to be connected, a marking corresponding to a type of a connection member that connects the multiple tubes is provided.

FIG. 3



Description

Technical Field

[0001] The present invention relates to an air-conditioning apparatus including a heat exchanger provided with side plates and a method of manufacturing the air-conditioning apparatus.

Background Art

[0002] A heat exchanger employed in an air-conditioning apparatus is configured with, for example, a radiator fin, a tube and a side plate. There are provided multiple radiator fins and tubes, and the multiple tubes are inserted into the multiple radiator fins. The side plate is provided at end portions of the tubes, and the side plate has multiple holes formed thereon through which the multiple tubes are inserted. In the heat exchanger, connection members that connect the multiple tubes are provided on the side plate. As the connection member, for example, a U-bent tube, a three-way bent tube, a bulge three-way tube and other tubes can be provided. Moreover, when the tube is a hairpin tube, the tube and the connection member are integrally formed.

[0003] The connection member provided to such a heat exchanger has various kinds of connection patterns (path patterns) that are complex. Therefore, a drawing on which a path pattern is provided is separately prepared. Then, a worker who manufactures the heat exchanger attaches parts to assemble the heat exchanger while alternately comparing the heat exchanger and the drawing providing the path pattern. When the number of parts related to the path pattern is large, it exceeds 100 per a single heat exchanger. Moreover, the parts include several types in some cases. Consequently, there is a possibility that the working hours are increased and a failure caused by an attachment mistake occurs.

[0004] Moreover, as described above, the parts related to the path pattern are mainly four types: the hairpin tube; the U-bent tube; the three-way bent tube; and the bulge three-way tube. In these connection members, there is no limitation to functions, an outer shape, attachment number and place, and so forth. Therefore, there is a possibility of increase in working hours due to inadequate confirmation of attachment places and inadequate confirmation of the connection member itself, and occurrence of failure caused by attachment mistake due to inadequate confirmation of attachment places and inadequate confirmation of the connection member itself.

[0005] Note that, when these connection members are attached by brazing, it is difficult to detach the members that have been attached once. Therefore, when an attachment mistake occurs, the whole heat exchanger including the radiator fins and the side plates has to be discarded.

[0006] Here, in Patent Literature 1, there is disclosed a method of manufacturing a heat exchanger including

multiple bent tubes. In Patent Literature 1, a heat exchanger is manufactured by attaching multiple bent tubes in advance to a support material having holes for inserting the bent tubes formed thereon, and fitting the support material to a tube inserted into a plate fin. In this manner, Patent Literature 1 employs the support material to eliminate the confirmation of attachment places of the bent tubes, thereby, intends to improve workability in assembly of the heat exchanger.

Citation List

Patent Literature

- [0007]** Patent Literature 1: Japanese Unexamined Patent Application Publication No. 2009-68805

Summary of Invention

Technical Problem

[0008] However, since the heat exchanger disclosed in Patent Literature 1 requires the support material, manufacturing costs are increased. Moreover, in Patent Literature 1, attachment of bent tubes only is disclosed, and attachment workability when there are multiple connection members is not at all considered.

[0009] The present invention has been made in view of the above circumstances, and provides an air-conditioning apparatus and a method of manufacturing the air-conditioning apparatus that reduce manufacturing costs and improve attachment workability even when there are multiple connection members.

Solution to Problem

[0010] An air-conditioning apparatus of an embodiment of the present invention includes: a compressor, a first heat exchanger, an expansion unit and a second heat exchanger that are connected, by a pipe, in a refrigerant circuit through which refrigerant flows, wherein the first heat exchanger includes: a radiator fin, a plurality of tubes extending through the radiator fin and through which the refrigerant flows, and a side plate provided at end portions of the tubes, and having a plurality of holes formed thereon through which the tubes are extended, wherein, on the side plate, between the holes corresponding to the tubes to be connected, a marking corresponding to a type of a connection member that connects the tubes is provided. **Advantageous Effects of Invention**

[0011] According to the present invention, on the side plate, between the holes corresponding to the multiple tubes to be connected, markings corresponding to the types of the connection members that connect the multiple tubes is provided. Therefore, positioning is performed with ease without any support material. Consequently, the manufacturing costs is reduced. Moreover, the markings are different by respective types of the con-

nection members, and thereby the connection member to be attached is recognized with ease. Therefore, the attachment workability is improved even when there are multiple connection members. Brief Description of Drawings

[0012]

[Fig. 1] Fig. 1 is a circuit diagram showing an air-conditioning apparatus 1 according to Embodiment 1 of the present invention.

[Fig. 2A] Fig. 2A is a side view showing a first heat exchanger 4 in Embodiment 1 of the present invention.

[Fig. 2B] Fig. 2B is a front view showing the first heat exchanger 4 in Embodiment 1 of the present invention.

[Fig. 3] Fig. 3 is a front view showing a side plate 13 of the first heat exchanger 4 in Embodiment 1 of the present invention.

[Fig. 4] Fig. 4 is a diagram showing types of markings 15 in Embodiment 1 of the present invention.

[Fig. 5] Fig. 5 is a flowchart showing a method of manufacturing the air-conditioning apparatus 1 according to Embodiment 1 of the present invention.

[Fig. 6] Fig. 6 is a front view showing the side plate 13 of the first heat exchanger 4 in Embodiment 1 of the present invention.

Description of Embodiments

[0013] Hereinafter, an embodiment of an air-conditioning apparatus 1 and a method of manufacturing the air-conditioning apparatus 1 according to the present invention will be described with reference to drawings. Note that the embodiment to be described below does not limit the present invention. Moreover, including Fig. 1, relations between sizes of respective components in the following drawings are different from those in actuality in some cases.

Embodiment 1

[0014] Fig. 1 is a circuit diagram showing an air-conditioning apparatus 1 according to Embodiment 1 of the present invention. The air-conditioning apparatus 1 will be described based on Fig. 1. As shown in Fig. 1, the air-conditioning apparatus 1 includes a refrigerant circuit 2. In the refrigerant circuit 2, a compressor 3, a first heat exchanger 4, an expansion unit 5 and a second heat exchanger 6 are connected by a pipe 7 to allow a flow of refrigerant.

[0015] The compressor 3 compresses the refrigerant. The first heat exchanger 4 is provided, for example, outdoor, and exchanges heat between outdoor air and the refrigerant. The first heat exchanger 4 is provided with an inflow header 4a on an inflow side of the refrigerant, and the inflow header 4a distributes the refrigerant discharged from the compressor 3 to each of tubes 12 of

the first heat exchanger 4. Moreover, the first heat exchanger 4 is provided with a first outflow header 4b on an outflow side of the refrigerant, and the first outflow header 4b collects the refrigerant flowing out of each tube 12 to allow the refrigerant to flow out to the expansion unit 5.

[0016] The expansion unit 5 expands the refrigerant and reduces the pressure of the refrigerant. The second heat exchanger 6 is provided, for example, indoor, and exchanges heat between indoor air and the refrigerant. The second heat exchanger 6 is provided with a distributor 6a on an inflow side of the refrigerant, and the distributor 6a distributes the refrigerant flowing out of the expansion unit 5 to each of tubes 12 of the second heat exchanger 6. Moreover, the second heat exchanger 6 is provided with a second outflow header 6b on an outflow side of the refrigerant, and the second outflow header 6b collects the refrigerant flowing out of each tube 12 to allow the refrigerant to flow out to the compressor 3.

[0017] Fig. 2A is a side view showing the first heat exchanger 4 in Embodiment 1 of the present invention, and Fig. 2B is a front view showing the first heat exchanger 4 in Embodiment 1 of the present invention. Next, the first heat exchanger 4 will be described. As shown in Fig. 2A and Fig. 2B, the first heat exchanger 4 includes a radiator fin 11, multiple tubes 12 and side plates 13. For example, multiple radiator fins 11 are provided and the multiple radiator fins 11 are disposed at intervals mutually. The outdoor air flows through the multiple radiator fins 11.

[0018] The multiple tubes 12 are inserted through the radiator fins 11 and allows the refrigerant to flow there-through.

[0019] The side plate 13 is provided at end portions of the tubes 12, and has multiple holes 13a formed thereon through which the multiple tubes 12 are inserted. The side plates 13 are provided, for example, at both end portions of the tubes 12 to sandwich the radiator fins 11. An upper end portion and a lower end portion of the side plate 13 are bent 90 degrees in the direction opposite to the radiator fins 11.

[0020] Fig. 3 is a front view showing the side plate 13 of the first heat exchanger 4 in Embodiment 1 of the present invention. Next, the side plate 13 of the first heat exchanger 4 will be described. As shown in Fig. 3, on the side plate 13, between the holes 13a corresponding to the multiple tubes 12 to be connected, markings 15 corresponding to the types of the connection members 14 that connect the multiple tubes 12 are provided.

[0021] As the connection member 14, for example, a U-bent tube 14A in a U shape, a three-way bent tube 14b in a T shape, a bulge three-way tube 14c in a non-T shape, and other tubes can be provided. Moreover, in Embodiment 1, the tube 12 is a hairpin tube, and the tube 12 and the connection member 14 are integrally formed.

[0022] Fig. 4 is a diagram showing types of the markings 15 in Embodiment 1 of the present invention. As shown in Fig. 4, in the case of the hairpin tube, the mark-

ing 15 is a single straight line. In the case of the U-bent tube 14A, the marking 15 is two parallel straight lines. In the case of the three-way bent tube 14b, the marking 15 is two straight lines that are orthogonally crossed. In the case of the bulge three-way tube 14c, the marking 15 is two straight lines that are crossed non-orthogonally, and an attachment direction is also indicated. Note that the sizes of the markings 15 are appropriately determined.

[0023] In Embodiment 1, the markings 15 are provided by a marking jig, and the marking jig is made of metal. On the marking jig, a shape corresponding to the type of the marking 15 is formed. Note that the marking 15 may be provided by a writing material, or may be provided by a sticker. Further, the marking 15 may be provided to cover the multiple holes 13a.

[0024] Fig. 5 is a flowchart showing a method of manufacturing the air-conditioning apparatus 1 according to Embodiment 1 of the present invention. Next, the method of manufacturing the air-conditioning apparatus 1 will be described. First, on the side plate 13, the multiple holes 13a, through which the multiple tubes 12 are inserted, are formed. Specifically, on a metal plate in a flat-plate shape to serve as the side plate 13 of the first heat exchanger 4, the multiple holes 13a are formed by, for example, burring processing (step ST1).

[0025] Next, on the side plate 13, the markings 15 corresponding to the type of the connection member 14 that connects the multiple tubes 12 are provided between the holes 13a corresponding to the multiple tubes 12 to be connected. Specifically, between the multiple holes 13a, the markings 15 are inscribed by a marking jig (step ST2). Then, the upper end portion and the lower end portion of the metal plate are bent 90 degrees. Accordingly, the side plate 13 of the first heat exchanger 4 is manufactured (step ST3). Thereafter, the first heat exchanger 4 is manufactured by employing the side plates 13, and the air-conditioning apparatus 1 is manufactured by incorporating the first heat exchanger 4 thereinto.

[0026] Next, an operation state of the air-conditioning apparatus 1 according to Embodiment 1 will be described. The compressor 3 sucks the refrigerant and compresses the refrigerant to discharge the refrigerant in a gas state of high temperature and high pressure. The discharged refrigerant flows into the first heat exchanger 4, and the first heat exchanger 4 condenses the refrigerant by heat exchange with the outdoor air. The condensed refrigerant flows into the expansion unit 5, and the expansion unit 5 expands the condensed refrigerant and reduces the pressure thereof. Then, the refrigerant reduced in pressure flows into the second heat exchanger 6, and the second heat exchanger 6 evaporates the refrigerant by heat exchange with the indoor air. At this time, the indoor air is cooled, and thereby cooling of the indoor space is performed. Then, the refrigerant evaporated and brought into a gas state of high temperature and low pressure is sucked by the compressor 3.

[0027] The air-conditioning apparatus 1 according to Embodiment 1 is used in performing the cooling opera-

tion in this manner; however, the air-conditioning apparatus 1 may be configured to make it possible to perform, not only the cooling operation, but also the heating operation by providing a flow switching unit in the refrigerant circuit 2.

[0028] Fig. 6 is a front view showing the side plate 13 of the first heat exchanger 4 in Embodiment 1 of the present invention. Next, action of the air-conditioning apparatus 1 according to Embodiment 1 will be described. In Fig. 6, solid-line arrows indicate attachment positions of the connection members 14 that are attached to the side plate 13 on one end portion of the first heat exchanger 4 and flow directions of the refrigerant. Further, in Fig. 6, broken lines indicate attachment positions of the connection members 14 that are attached to the side plate 13 on the other end portion of the first heat exchanger 4. In this manner, in the first heat exchanger 4, since the connection members 14 attached to the side plates 13 on both end portions are different, different markings 15 are provided to the side plate 13 on each of the both end portions.

[0029] As shown in Fig. 6, each connection member 14 is attached in accordance with the types of the markings 15. For example, at the portion where the marking 15 of two parallel straight lines is provided, the U-bent tube 14A is attached. Meanwhile, at the portion where the marking 15 of two straight lines that are orthogonally crossed is provided, the three-way bent tube 14b is attached. Further, on the broken line, although the marking 15 is not shown, the hairpin tube (the tube 12) is attached. Then, the refrigerant flowing in from the inflow header 4a flows through the hairpin tube (the tube 12), the U-bent tube 14A, the hairpin tube (the tube 12), and the three-way bent tube 14b in this order.

[0030] One of the refrigerant branched at the three-way bent tube 14b flows through the hairpin tube (the tube 12), the U-bent tube 14A, the hairpin tube (the tube 12), the U-bent tube 14A and the hairpin tube (the tube 12) in this order, and flows out to the first outflow header 4b. Meanwhile, the other one of the refrigerant branched at the three-way bent tube 14b flows through the hairpin tube (the tube 12), the U-bent tube 14A, the hairpin tube (the tube 12), the U-bent tube 14A and the hairpin tube (the tube 12) in this order, and flows out to the first outflow header 4b.

[0031] As described above, on the side plate 13, between the holes 13a corresponding to the multiple tubes 12 to be connected, markings 15 corresponding to the types of the connection members 14 that connect the multiple tubes 12 are provided. Therefore, positioning is performed with ease without any support material. Consequently, the manufacturing costs are reduced. Further, the markings 15 are different by respective types of the connection members 14, and thereby the connection members 14 to be attached are recognized with ease. Therefore, the attachment workability is improved even when there are multiple connection members 14.

[0032] Moreover, this configuration reduces time for

attaching the connection members 14 to the first heat exchanger 4. Moreover, since the attachment workability is improved, quality of the first heat exchanger 4 is improved. Further, even when the connection member 14 is attached by brazing, since occurrence of attachment mistake is suppressed, the risk of discarding the whole first heat exchanger 4 including the radiator fins 11 and the side plates 13 is reduced. This contributes to energy saving.

[0033] Note that, in Embodiment 1, the markings 15 are provided on the side plates 13 of the first heat exchanger 4, however, the markings 15 may be provided on the side plates 13 of the second heat exchanger 6. In this case, the refrigerant flowing in from the expansion unit 5 flows through the hairpin tube, the U-bent tube 14A, the three-way bent tube 14b and others, to flow out to the second outflow header 6b. Further, in Embodiment 1, the markings 15 are provided on the side plates 13 of the first heat exchanger 4, however, the markings 15 may be provided on the side plates 13 of the second heat exchanger 6.

[0034] Further, the tube 12 is a hairpin tube, and the tube 12 and the connection member 14 are integrally formed. This configuration improves attachment workability of the hairpin tube.

[0035] Even further, as the connection member 14, the U-bent tube 14A in the U shape is used. This configuration improves attachment workability of the U-bent tube 14A.

[0036] Still further, as the connection member 14, the three-way bent tube 14b in the T shape is used. This configuration improves attachment workability of the three-way bent tube 14b.

[0037] Then, as the connection member 14, the bulge three-way tube 14c in a non-T shape is used, and the marking 15 indicating the attachment direction of the connection member 14 is provided on the side plate 13. This configuration improves attachment workability of the bulge three-way tube 14c, and the attachment direction thereof is recognized with ease.

[0038] Further, on the side plate 13, the markings 15 are provided by the marking jigs. This improves workability in providing the markings 15.

[0039] Even further, on the side plate 13, the markings 15 are provided by the writing material. This improves workability in providing the markings 15.

[0040] Still further, on the side plate 13, the markings 15 are provided by the stickers. This improves workability in providing the markings 15.

[0041] Then, on the side plate 13, the marking 15 is provided to cover the multiple holes 13a. This improves workability in providing the marking 15.

[0042] Moreover, in a method of manufacturing an air-conditioning apparatus 1 having a refrigerant circuit 2 through which refrigerant flows, the refrigerant circuit 2 including a compressor 3, a first heat exchanger 4, an expansion unit 5 and a second heat exchanger 6 that are connected by a pipe 7, the first heat exchanger 4 includ-

ing a radiator fin 11, multiple tubes 12 that are inserted through the radiator fin 11 and allows the refrigerant to flow therethrough, and a side plate 13 that is provided at end portions of the multiple tubes 12, the method includes: a step of forming multiple holes 13a, through which the multiple tubes 12 are inserted, on the side plate 13; and a step of providing, on the side plate 13, between the holes 13a corresponding to the multiple tubes 12 to be connected, a marking 15 corresponding to a type of a connection member 14 connecting the multiple tubes 12. Therefore, positioning is performed with ease without any support material. Consequently, manufacturing costs are reduced. Moreover, the markings 15 are different by respective types of the connection members 14, and thereby the connection members 14 to be attached are recognized with ease. Therefore, the attachment workability is improved even when there are multiple connection members 14.

Reference Signs List

[0043] 1 air-conditioning apparatus 2 refrigerant circuit 3 compressor 4 first heat exchanger 4a inflow header 4b first outflow header 5 expansion unit 6 second heat exchanger 6a distributor 6b second outflow header 7 pipe 11 radiator fin 12 tube 13 side plate 13a hole 14 connection member 14a U-bent tube 14b three-way bent tube 14c bulge three-way tube 15 marking

Claims

1. An air-conditioning apparatus comprising:

a compressor, a first heat exchanger, an expansion unit and a second heat exchanger connected, by a pipe, in a refrigerant circuit through which refrigerant flows,
the first heat exchanger including
a radiator fin,
a plurality of tubes extending through the radiator fin and through which the refrigerant flows, and
a side plate provided at end portions of the plurality of tubes, and having a plurality of holes formed thereon, through which the plurality of tubes are extended,
on the side plate, between the holes corresponding to the plurality of tubes to be connected, a marking corresponding to a type of a connection member connecting the plurality of tubes being provided.

2. The air-conditioning apparatus of claim 1, wherein the plurality of tubes include a hairpin tube, and the plurality of tubes and the connection member are integrally formed.

3. The air-conditioning apparatus of claim 1 or 2,
wherein, as the connection member, a U-bent tube
having a U shape is employed.
4. The air-conditioning apparatus of any one of claims 1 to 3, wherein, as the connection member, a three-
way bent tube having a T shape is employed. 5
5. The air-conditioning apparatus of any one of claims 1 to 4, wherein, 10
as the connection member, a bulge three-way tube
having a non-T shape is employed, and
a marking indicating an attachment direction of the
connection member is provided on the side plate. 15
6. The air-conditioning apparatus of any one of claims 1 to 5, wherein, on the side plate, the marking is
provided by a marking jig.
7. The air-conditioning apparatus of any one of claims 1 to 6, wherein, on the side plate, the marking is
provided by a writing material. 20
8. The air-conditioning apparatus of any one of claims 1 to 7, wherein, on the side plate, the marking is
provided by a sticker. 25
9. The air-conditioning apparatus of any one of claims 1 to 8, wherein, on the side plate, the marking is
provided to cover the plurality of holes. 30
10. A method of manufacturing an air-conditioning ap-
paratus including a compressor, a first heat exchang-
er, an expansion unit and a second heat exchanger
connected, by a pipe, in a refrigerant circuit through 35
which refrigerant flows, the first heat exchanger in-
cluding a radiator fin, a plurality of tubes extending
through the radiator fin and through which the refrig-
erant flows, and a side plate provided at end portions
of the plurality of tubes, 40
the method comprising:

forming a plurality of holes, through which the
plurality of tubes are inserted, on the side plate;
and 45
providing, on the side plate, between the holes
corresponding to the plurality of tubes to be con-
nected, a marking corresponding to a type of a
connection member connecting the plurality of
tubes. 50

55

FIG. 1

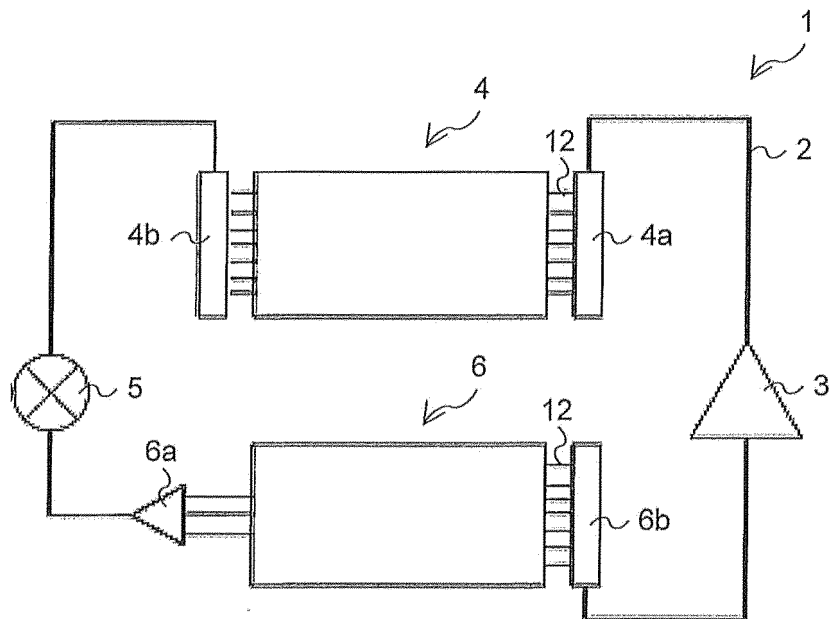


FIG. 2A

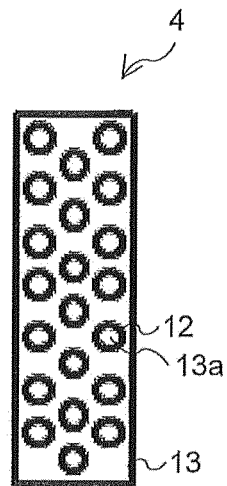


FIG. 2B

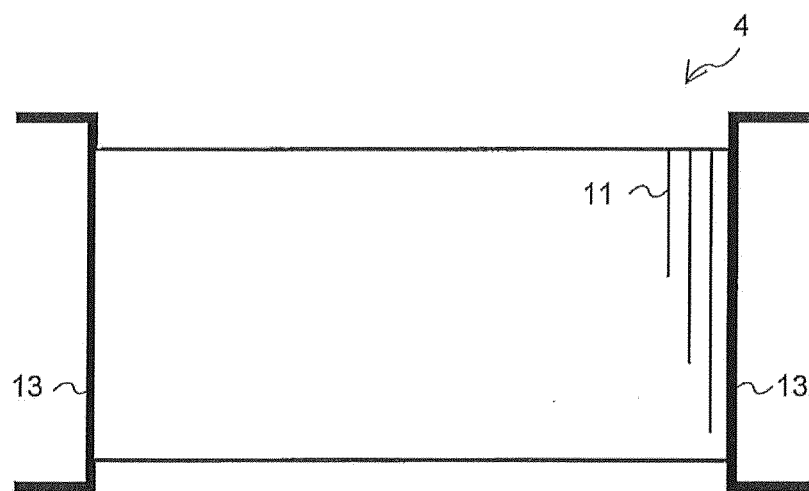


FIG. 3

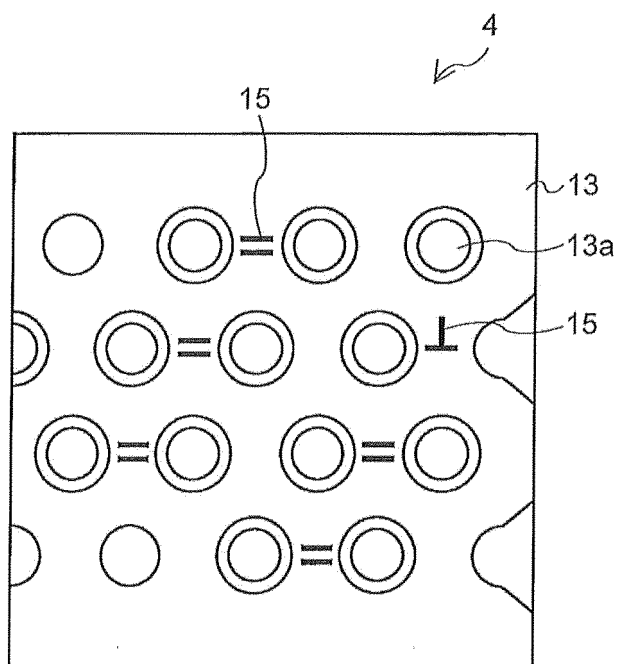


FIG. 4

TYPES OF MARKINGS			15
12	TUBE (HAIRPIN TUBE)	—	\
14a	U-BENT TUBE	=	≡
14b	THREE-WAY BENT TUBE	└	
14c	BULGE THREE-WAY TUBE	↗	→ ← →

FIG. 5

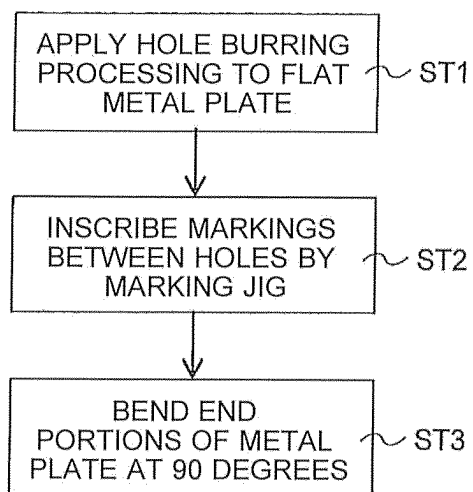
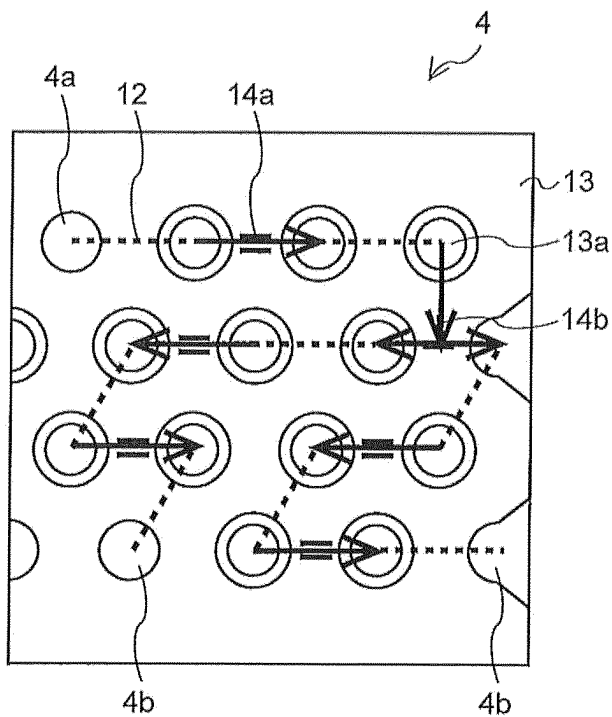


FIG. 6



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2016/059083

A. CLASSIFICATION OF SUBJECT MATTER

F28F9/26(2006.01)i, F25B39/00(2006.01)i, F28D1/047(2006.01)i, F28F9/013(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)

F28F9/26, F25B39/00, F28D1/047, F28F9/013

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

Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2016

Kokai Jitsuyo Shinan Koho 1971-2016 Toroku Jitsuyo Shinan Koho 1994-2016

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 A	JP 10-292992 A (Toshiba Corp.), 04 November 1998 (04.11.1998), paragraphs [0001] to [0038]; fig. 1 to 6 (Family: none)	1-4, 6-8, 10 5
Y A	JP 2010-133644 A (Hitachi Appliances, Inc.), 17 June 2010 (17.06.2010), paragraph [0030]; fig. 1 to 2 (Family: none)	1-4, 6-8, 10 5
Y A	JP 2011-089710 A (Daikin Industries, Ltd.), 06 May 2011 (06.05.2011), paragraphs [0066] to [0069]; fig. 3 to 4 (Family: none)	1-4, 6-8, 10 5

☒ 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

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"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
31 May 2016 (31.05.16)

Date of mailing of the international search report
14 June 2016 (14.06.16)

Name and mailing address of the ISA/
Japan Patent Office
3-4-3, Kasumigaseki, Chiyoda-ku,
Tokyo 100-8915, Japan

Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2016/059083

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	JP 2005-069670 A (Showa Denko Kabushiki Kaisha), 17 March 2005 (17.03.2005), paragraphs [0016], [0030], [0046] to [0048]; fig. 1 to 2 & US 2007/0144721 A1 paragraphs [0061] to [0063]; fig. 1 to 2 & WO 2005/012823 A1 & EP 1654511 A & KR 10-2006-0052945 A & CN 1849495 A & AU 2004261893 A	1-4, 6-8, 10 5
A	JP 2008-256315 A (Daikin Industries, Ltd.), 23 October 2008 (23.10.2008), paragraphs [0102] to [0116]; fig. 3 to 4 & EP 2157389 A1 paragraphs [0106] to [0120]; fig. 3 to 4	5

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

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2016/059083

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☒ Claims Nos.: 9
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
See extra sheet.
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

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Claim 9 has the wording "the side plate is provided with a marking in such a way that a plurality of the holes is covered".

Meanwhile, claim 1 has the wording "the side plate is provided with a marking between the holes corresponding to a plurality of the tubes to be connected, the marking corresponding to the type of the connection member for connecting the plurality of the tubes".

It is unclear whether the wording "provided with a marking in such a way that a plurality of the holes is covered" in claim 9 indicates that a "marking" per se is provided "so as to cover the holes" separately from the "marking" provided "between the holes", or the "holes are covered" by the "marking" positioned "between the holes".

Consequently, the statement in claim 9 is unclear, and therefore, it is impossible to carry out a search on said claim.

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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