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(54) **Outdoor unit of conditioning apparatus**

(57) A bottom plate (1) on which at least a heat exchanger (2) is placed is provided, and the bottom plate has a conduit forming wall (1c) formed upright thereon along the heat exchanger, and a water conduit (1d) formed by the conduit forming wall has a drain hole (1b)

and a downwardly tilted surface (1e) continuous with the drain hole, thereby preventing drain water from flowing other than below the heat exchanger and allowing the bottom plate to be reinforced by the conduit forming wall.

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to an outdoor unit of an air conditioning apparatus and, more particularly, to improvement of a drain water discharge structure.

2. Description of the Related Art

[0002] When a heating mode of operation is performed in an outdoor unit of a separate type air conditioning apparatus, a heat exchanger is deprived of heat by a turning fan. At this time, the heat exchanger condenses the water vapor in the air, causing its surface to be frosted. As time progresses, such frost develops and finally impedes air flow through the heat exchanger and prevents heat from moving. This inhibits heat exchange and heating in a room. To avoid this, the outdoor unit generally performs defrosting operation for a predetermined period of time, thereby melting the frost for resumption of heat exchange. After that, heating and defrosting modes of operation are repeated.

[0003] During the defrosting mode of operation, the frost on the external surface of the heat exchanger melts and drops down as drain water droplets. Conventional outdoor units have a drain water discharge conduit provided on its bottom plate beneath the heat exchanger for discharging the drain water. Such a drain water discharge conduit has a horizontal section formed at a lowest portion thereof, the horizontal section having a drain hole through which the drain water is discharged (for example, see Japanese Unexamined Patent Application Publication No. 2005-188837 (Fig. 1) and Japanese Unexamined Patent Application Publication No. 2005-213779 (Figs. 6 and 8)).

SUMMARY OF THE INVENTION

[0004] Drain water droplets from such an outdoor unit drop onto the discharge conduit into the drain hole through which the drain water is discharged to the outside. However, in a cold area the drain water may freeze before reaching the drain hole at low ambient temperatures. In particular, the drain water may freeze in the horizontal section around the drain hole, blocking the drain hole or the drain water discharge conduit. If this happens, not only does the frozen drain water inhibit the discharge of the drain water to the outside, but also may cause the horizontal section to further expand to such a degree that the flow of the drain water is degraded, which causes a great amount of water remaining inside the unit to more and more tend to freeze. In addition, each time heating and defrosting modes of operation are repeated, the frozen drain water further develops, causing the heat exchanger to malfunction and damaging the outdoor unit.

[0005] The present invention has been achieved to solve the above-described problems. A first object of the present invention is to provide an outdoor unit which ensures that drain water is discharged on a rapid manner, and a drain hole is prevented from freezing so that the drain water can be discharged even in a cold area.

[0006] A second object of the present invention is to provide an outdoor unit which has a bottom plate having a shallow depth, thereby improving the workability as well as strength.

[0007] An outdoor unit of an air conditioning apparatus according to the present invention includes a bottom plate on which at least a heat exchanger is placed, a conduit forming wall formed upright on the bottom plate along the heat exchanger, and a water conduit formed by the conduit forming wall which has a drain hole and a downwardly tilted surface continuous with the drain hole.

[0008] According to an outdoor unit of an air conditioning apparatus of the present invention, a bottom plate has a conduit forming wall formed upright thereon along the heat exchanger, and a water conduit formed by the conduit forming wall has a drain hole and a downwardly tilted surface continuous with the drain hole, which allows drain water droplets to flow to the drain hole without reducing its flow rate. This ensures that drain water passages concentrate and that drain water reaches the drain hole without freezing, thereby preventing the blockage of the drain hole or the water conduit. Also, the conduit forming wall formed upright on the bottom plate along the heat exchanger serves as a reinforcement rib of the bottom plate. Accordingly, workability as well as strength can be improved without deepening the bottom plate in the direction of the depth.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009]

Fig. 1 is a perspective view showing a bottom plate of an outdoor unit of an air conditioning apparatus according to an embodiment of the present invention;

Fig. 2 is a perspective view showing the bottom plate of an outdoor unit of an air conditioning apparatus according to an embodiment of the present invention, on which a heat exchanger and a compressor are mounted;

Fig. 3 is a top view showing the bottom plate on which a blower and a partition in addition to those as shown in Fig. 2 are mounted; and

Fig. 4 is a perspective view showing the entire outdoor unit of an air conditioning apparatus according to an embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0010] The present invention is described based on an embodiment as shown in the figures.

Fig. 1 is a perspective view showing a bottom plate of an outdoor unit of an air conditioning apparatus according to an embodiment of the present invention. Fig. 2 is a perspective view showing the bottom plate on which a heat exchanger and a compressor are mounted. Fig. 3 is a top view showing the bottom plate on which a blower and a partition in addition to those as shown in Fig. 2 are mounted. Fig. 4 is a perspective view showing the appearance of the entire outdoor unit.

[0011] An outdoor unit 100 of an air conditioning apparatus according to this embodiment includes a heat exchanger 2, a compressor 3, a blower 4, and a partition 5 mounted on a steel bottom plate 1 in the form of a rectangular solid, as shown in Figs. 1 to 4. These components are enclosed by an enclosure constructed of a peripheral wall 6 and a top plate 7.

[0012] The bottom plate 1 includes a frame 1a (hereinafter referred to as "peripheral frame") surrounding the bottom plate 1 and a conduit forming wall 1c formed upright along the heat exchanger 2. A water conduit 1d is formed by partitioning with the conduit forming wall 1c and the peripheral frame 1a. The conduit forming wall 1c prevents drain water from flowing into below the heat exchanger 2 or out of the water conduit 1d. The water conduit 1d has a normally open drain hole 1b for discharging drain water to the outside and a downwardly tilted surface 1e (equal to the bottom face of the water conduit) continuous with the drain hole 1b. The bottom plate 1 is also formed as a whole to be downwardly tilted toward the drain hole 1b.

[0013] The water conduit 1d has a plurality of heat exchanger mounting bases 1f formed at an edge and a corner thereof. The heat exchanger 2 is placed and secured on the mounting bases 1f. The mounting bases 1f are formed to have a height smaller than that of the adjacent conduit forming wall 1c or the peripheral frame 1a. The bottom plate 1 has the peripheral frame 1a, the conduit forming wall 1c, the tilted surface 1e, and the heat exchanger mounting bases 1f integrally formed thereon by press working.

[0014] When the air conditioning apparatus according to this embodiment performs heating operation, the surface of the heat exchanger 2 in the outdoor unit 100 becomes frosted. Defrosting mode of operation is performed for a certain period of time to melt the frost on the surface. Water generated by such defrosting mode of operation drops as drain water onto the downwardly tilted surface 1e continuous with the drain hole 1b in the water conduit 1d on the bottom plate 1 and is guided to the drain hole 1b. Accordingly, such drain water flows at a high rate only below the heat exchanger 2, while concentrating. This prevents the drain water from freezing in the water conduit 1d before it reaches the drain hole 1b even at low ambient temperatures in a cold area, thereby securely discharging the drain water.

[0015] The mounting bases 1f formed to have a height smaller than that of the adjacent conduit forming wall 1c or the peripheral frame 1a ensures that the drain water

downwardly flowing on the external surface of the heat exchanger 2 drops onto the water conduit 1d through the lower end of the heat exchanger 2.

[0016] As described above, the outdoor unit of an air conditioning apparatus according to this embodiment includes the downwardly tilted surface 1e continuous with the drain hole 1b and the conduit forming wall 1c formed upright along the heat exchanger 2 so as to prevent the drain water from flowing other than below the heat exchanger 2, which allows drain water passages to concentrate, raises the drain water flow rate, and prevents the drain water from freezing before it reaches the drain hole 1b, thereby securing that the drain water is discharged to the outside. This prevents the drain hole 1b and the water conduit 1d from being blocked.

[0017] The conduit forming wall 1c formed to have an upright structure also serves as a reinforcement rib of the bottom plate 1. This improves workability of steel sheet working (sheet metal working) as well as the strength of the bottom plate 1 without deepening the bottom plate 1 in the direction of the depth.

Claims

1. An outdoor unit (100) of an air conditioning apparatus, comprising:

a bottom plate (1) on which at least a heat exchanger (2) is placed;
a conduit forming wall (1c) formed upright on the bottom plate along the heat exchanger; and
a water conduit (1d) formed by the conduit forming wall which has a drain hole (1b) and a downwardly tilted surface (1e) continuous with the drain hole.

FIG. 1

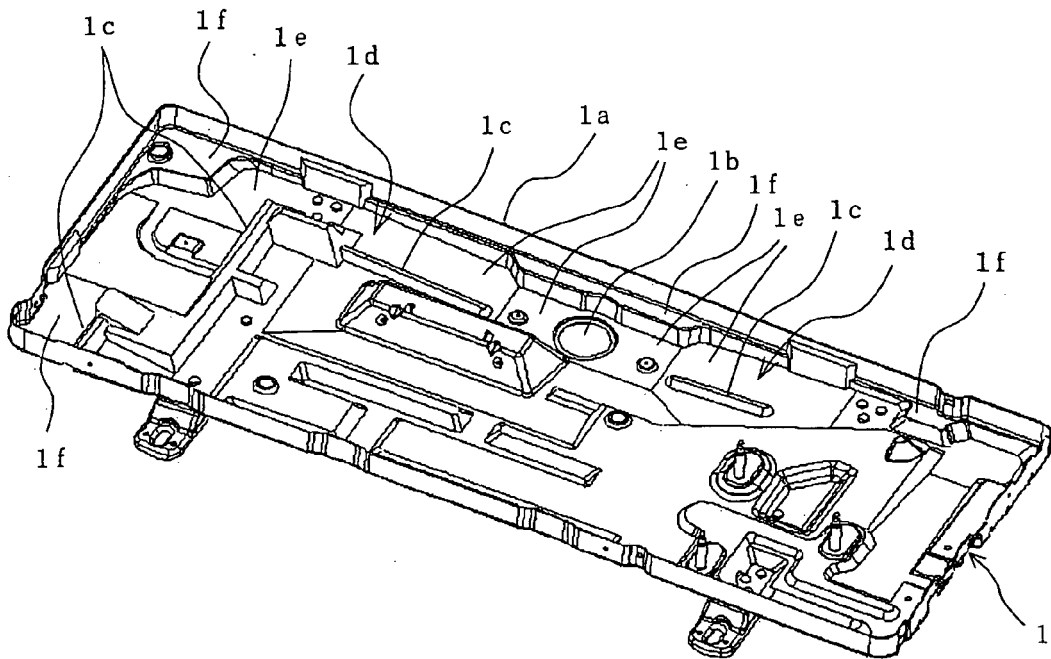


FIG. 2

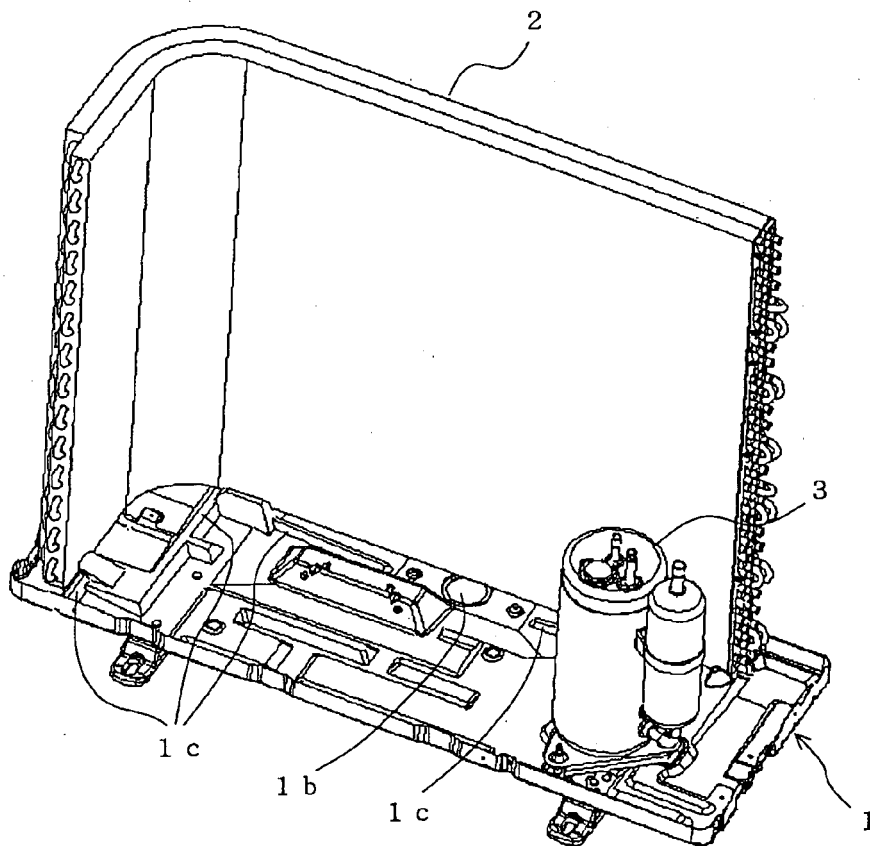


FIG. 3

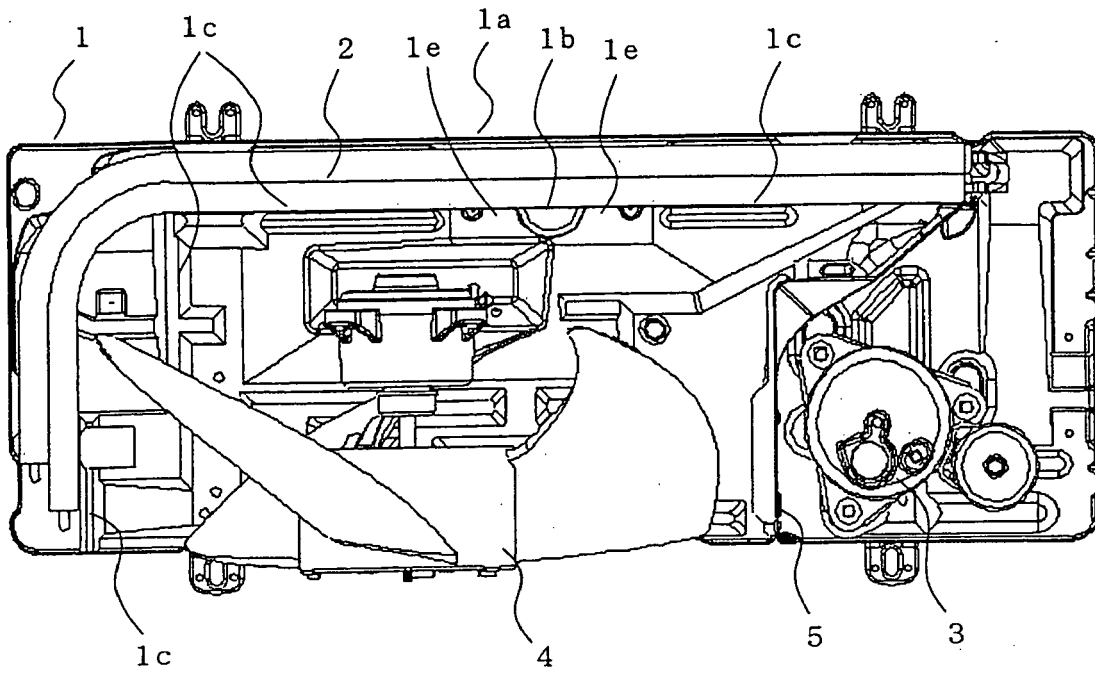
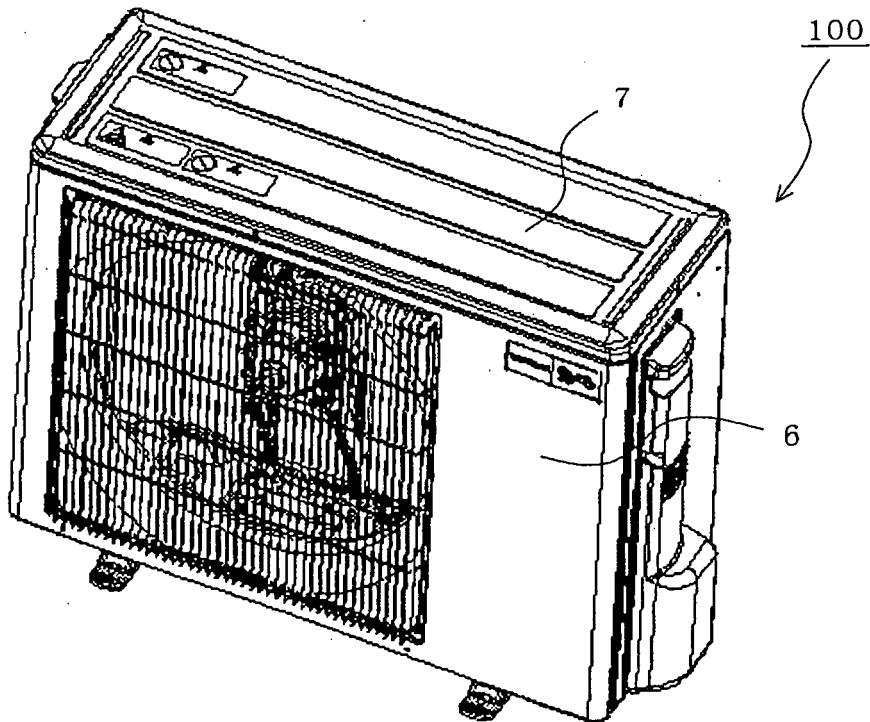


FIG. 4





EUROPEAN SEARCH REPORT

Application Number
EP 09 00 9377

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 1 403 590 A (BSH BOSCH SIEMENS HAUSGERÄTE [DE]) 31 March 2004 (2004-03-31) * paragraph [0012] - paragraph [0015]; figure 4 *	1	INV. F24F1/00 F24F1/22
X	WO 01/65184 A (TOSHIBA CARRIER CORP [JP]; SUGIYAMA SHIGEKI [JP]; ISHIKAWA YUTAKA [JP]) 7 September 2001 (2001-09-07) * page 11, line 12 - page 19, line 11; figures 2-4,5A *	1	
A	US 2005/034471 A1 (SHIN SANG HO [KR]) 17 February 2005 (2005-02-17) * abstract *	1	
A	WO 2008/084277 A (CARRIER CORP [US]; BERETTA FABIO [IT]; RABITO MAURIZIO [IT]; MARCUCCI) 17 July 2008 (2008-07-17) * abstract; figure 1 *	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			F24F
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		5 November 2009	González-Granda, C
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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05-11-2009

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1403590 A	31-03-2004	AT 346268 T ES 2275990 T3 ES 2215470 A1	15-12-2006 16-06-2007 01-10-2004
WO 0165184 A	07-09-2001	AU 3419501 A CN 1406328 A DE 60113238 D1 DE 60113238 T2 EP 1259765 A2 JP 3523823 B2 JP 2001317766 A TW 225141 B	12-09-2001 26-03-2003 13-10-2005 13-07-2006 27-11-2002 26-04-2004 16-11-2001 11-12-2004
US 2005034471 A1	17-02-2005	CN 1580663 A KR 20050018481 A	16-02-2005 23-02-2005
WO 2008084277 A	17-07-2008	NONE	

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2005188837 A [0003]
- JP 2005213779 A [0003]