Title
Indoor unit for air conditioner

International Patent Classification(s)
F24F 13/22 (2006.01)  F24F 13/30 (2006.01)

Application No: 2008321997  Date of Filing: 2008.11.04

Priority Data

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<td>2007-292765</td>
<td>2007.11.12</td>
<td>JP</td>
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Publication Date: 2009.05.22
Accepted Journal Date: 2011.03.17

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Related Art
JP 2006-29702
JP 2001-248857
JP 2007-218537
Title: INDOOR UNIT FOR AIR CONDITIONER

Abstract: An indoor unit for an air conditioner has a box-shaped body casing (1). A pair of air inlets (5) is provided in the front face of the body casing (1). A pair of air outlets (7) is provided on both sides of each air inlet (5). Inside the body casing (1) is formed a pair of air paths (6) leading from each air inlet (5) to the adjacent air outlets (7). Inside the body casing (1) are provided turbo fans (8) so as to correspond to respective air inlets (5), and on both sides of each turbo fan (8) is provided a pair of heat exchangers (9) as to correspond to the pair of air outlets (7). Below the pair of heat exchangers (9) and the turbo fan (8) is provided a drain pan (15). In the drain pan (15) is received refrigerant piping (21a-21d) for connecting the pair of heat exchangers (9) to each other.

Abstract in Japanese: 空気調和機用室内機は、箱型の本体ケーシング1を備える。該本体ケーシング1の前面に一対の空気吸込口5が設けられ、各空気吸込口5の両側に一対の空気吹出口7が設けられている。上記本体ケーシング1の内面は、一対の空気吹出口7を挟みに一対の空気吸込口5が設けられる。

INDOOR UNIT FOR AIR CONDITIONER

TECHNICAL FIELD

The present invention relates to a configuration of an air conditioner indoor unit that can be made slim and compact.

BACKGROUND ART

Patent Document 1, for example, discloses a conventional wall-mounted indoor unit of a general air conditioner. The indoor unit has two front and rear drain pans, a plurality of lambdoid cross fin type heat exchangers supported on the drain pans, and a cross flow fan arranged between the heat exchangers. After passing through the heat exchangers, air is blasted into a room through a scroll passage.

However, since the heat exchangers and the cross flow fan are arranged and aligned in a front-rear direction, there is a limit on the reduction the thickness of the indoor unit.

To solve this problem, the applicant of the present invention has attempted to minimize the thickness of indoor units, for example, as described in the indoor units of Patent Documents 2 and 3. For example, one such indoor unit includes a centrifugal fan having a small axial dimension and a pair of heat exchangers arranged on both sides of the centrifugal fan. Each of the heat exchangers is an aluminum layered type, which is small in size and high in heat exchange efficiency. After being drawn from a central portion of a front surface of the indoor unit, air is blasted forward from air outlet ports, which are formed on both sides of the indoor unit through the heat exchangers. This configuration reduces the thickness of the indoor unit.

In the layered type heat exchangers, a header and
refrigerant outlet/inlet ports are concentrated on one side of each heat exchanger, as described in, for example, Patent Document 3. Accordingly, if each heat exchanger is arranged above the header, pipes are concentrated in a lower portion of the indoor unit. If the heat exchanger is arranged below the header, the pipes are concentrated in an upper portion of the indoor unit.

However, when the pipes are arranged in the upper portion, the size of the indoor unit must be enlarged in order to create the space for accommodating the pipes.

Also, when the air conditioner is in cooling operation, condensed water on surfaces of the pipes drips. It is likely that the dew drops may hit a component such as a fan and be splashed to the outside of the indoor unit. If a heat insulating material is wrapped around the pipes in order to prevent water condensation, the size of the indoor unit is further enlarged.


Any discussion of documents, acts, materials, devices, articles or the like which has been included in the present specification is not to be taken as an admission that any or all of these matters form part of the prior art base or were common general knowledge in the field relevant to the present invention as it existed before the priority date of each claim of this application.

Throughout this specification the word "comprise", or variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated element,
integer or step, or group of elements, integers or steps, but not the exclusion of any other element, integer or step, or group of elements, integers or steps.

5 SUMMARY OF THE INVENTION

In accordance with one aspect of the present invention, an air conditioner indoor unit is provided that includes a box-shaped casing, an air inlet port formed in a central portion of a front surface of the casing, a pair of air outlet ports formed on both sides of the front surface of the casing, a pair of air passages formed in the casing and extending from the air inlet port to the air outlet ports, a fan that is arranged upstream from the air passages and corresponds to the air inlet port, a pair of heat exchangers that are arranged downstream from the air passages and correspond to the air outlet ports, and a refrigerant pipe connecting the heat exchangers to each other. A drain pan is arranged below the heat exchangers and the fan, and the refrigerant pipe is received in the drain pan. A partition plate is arranged between the fan and the drain pan. The partition plate extends horizontally below the fans and the heat exchangers.

In an embodiment of the present invention, dew drops formed on surfaces of the heat exchangers are drained to the drain pan. The drain pan thus reliably collects the drained water. Also, a number of refrigerant pipes, which are concentrated below the heat exchangers, are received in the space in the drain pan without interfering with other components.

Accordingly, it is unnecessary to create additional space for the refrigerant pipes. The indoor unit body thus can be made more compact.

Further, dew drops formed on the refrigerant pipes are collected in the drain pan without being splashed to the
outside.

The casing preferably has a back plate, and the drain pan is preferably formed integrally with the back plate of the casing.

In an embodiment of the present invention, the heat exchangers and the fan are incorporated as an integral body and unitized with the drain pan. Since the heat exchangers and the fan are received in the casing while being unitized, the indoor unit is manufactured, assembled, and maintained easily.

In an embodiment of the present invention, an air flow from the fan is prevented from affecting the refrigerant pipes and changing the phase of the refrigerant flowing in the refrigerant pipes. Further, the air flow from the fan is straightened by the partition plate and smoothly blasted toward the air outlet ports, which are arranged on both sides.

The partition plate also prevents the air flow from the fan from blowing out of the outlet ports through the drain pan without passing through the heat exchangers.

The air blowing performance of the indoor unit is thus improved.

The two heat exchangers preferably each extend across the corresponding one of the air passages and are inclined in mutually different directions.

In an embodiment of the present invention, a necessary heat exchange surface area is ensured in the indoor unit and the thickness of the indoor unit is minimized. Accordingly, the indoor unit becomes slimmer.

Positioning members for positioning the heat exchangers are preferably arranged on both sides in the drain pan.

In an embodiment of the present invention, this configuration greatly facilitates the assembly of the heat
exchangers with the drain pan, thus improving the production efficiency.

Stepped portions for positioning the heat exchangers are preferably formed in a bottom portion of the drain pan. In an embodiment of the present invention, this configuration greatly facilitates the assembly of the heat exchangers with the drain pan, thus improving the production efficiency.

Each of the stepped portions of the drain pan is preferably formed by a wide portion corresponding to an upper portion of the drain pan and a narrow portion corresponding to the bottom portion of the drain pan, and a heat insulating material is preferably arranged on an outer surface of the narrow portion formed in the bottom portion of the drain pan.

In an embodiment of the present invention, this configuration allows the insulating material to be easily mounted and attached, and the stepped portions are used further effectively.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view showing an air conditioner indoor unit, as a whole, according to a first embodiment of the present invention;

Fig. 2 is a cross-sectional view showing the indoor unit illustrated in Fig. 1 with a front cover in an open state;

Fig. 3 is a cross-sectional plan view showing the indoor unit of Fig. 1;

Fig. 4 is a perspective view showing the internal structure of the indoor unit of Fig. 1;

Fig. 5 is a perspective view showing the configuration of a main heat exchanger of the indoor unit of Fig. 1;

Fig. 6 is a perspective view showing the configuration
of an auxiliary heat exchanger of the indoor unit of Fig. 1;
Fig. 7 is a perspective view showing the arrangement of refrigerant pipes in the indoor unit of Fig. 1;
Fig. 8 is a perspective view showing the refrigerant pipes illustrated in Fig. 7 in a state received in a drain pan;
Fig. 9 is a plan view showing the configuration of a positioning portion of the heat exchanger of the indoor unit of Fig. 1;
Fig. 10 is a longitudinal cross-sectional view showing the positioning portion illustrated in Fig. 9;
Fig. 11 is a longitudinal cross-sectional view showing the positioning portion of Fig. 9 as viewed from the side;
Fig. 12 is a longitudinal cross-sectional view showing the indoor unit of Fig. 1 with a partition plate installed, as viewed from the front;
Fig. 13 is a plan view showing a positioning portion of a heat exchanger of an air conditioner indoor unit according to a second embodiment of the present invention;
Fig. 14 is a longitudinal cross-sectional view showing the positioning portion illustrated in Fig. 13;
Fig. 15 is a longitudinal cross-sectional view showing the positioning portion of Fig. 13 as viewed from the side;
Fig. 16 is a cross-sectional view showing the configuration of a heat insulating material bonded to a lower surface of the positioning portion of Fig. 13;
Fig. 17 is a perspective view showing an example of the layout of refrigerant pipes of an air conditioner indoor unit according to an embodiment of the present invention;
Fig. 18 is a perspective view showing the configuration of the interior of an air conditioner indoor unit, as a whole, according to a third embodiment of the present invention;
Fig. 19 is a perspective view showing the arrangement of refrigerant pipes of the indoor unit illustrated in Fig. 18; and

Fig. 20 is a perspective view showing the refrigerant pipes illustrated in Fig. 19 received in a drain pan as in the state (the integrated state) illustrated in Fig. 8.

BEST MODE FOR CARRYING OUT THE INVENTION

10 (First Embodiment)

The configuration of an air conditioner indoor unit according to a first embodiment of the present invention will now be described with reference to Figs. 1 to 12.

As illustrated in Figs. 1 to 3, the air conditioner indoor unit is a twin type formed by a pair of indoor subunits that are arranged side by side. The indoor subunits each include a fan and two heat exchangers, which are arranged on both sides of the fan.

The air conditioner indoor unit has a flat cassette type body casing 1, which is elongated in a lateral direction and thin in a front-rear direction. The body casing 1 is formed by a back panel (a back plate) 1a, two side panels (side plates) 1b, a front panel (a front plate) 1c, an upper panel (a top plate) 1d, and a bottom panel (a bottom plate) 1e. The back panel 1a forms an attachment surface to which fan motors 8b of turbofans 8, which will be described later, are attached.

Out of these panels 1a, 1b, 1c, 1d, 1e, the panels 1b, 1c, 1d, 1e, except for the back panel 1a, are formed by a single continuous plate.
The two indoor subunits, which are arranged adjacent to each other, are formed identically. Accordingly, only one of the indoor subunits will be described.

As illustrated in Fig. 3, a circular air inlet port 5, which functions as a bellmouth, is formed in a central portion of a part of the front panel lc that forms one of the indoor subunits. A turbofan 8 serving as a centrifugal fan, which has a small depth, is arranged inside the air inlet port 5.

Each turbofan 8 has a main plate 8d, a shroud 8c, and a plurality of blades 8a (an impeller), which are arranged between the shroud 8c and the main plate 8d.

A pair of rectangular air outlet ports 7, each of which has a predetermined width and extends in a vertical direction, are formed on both sides of each air inlet port 5 of the front panel lc. The two of the air outlet ports 7 that are arranged adjacent to each other in a central portion of the body casing 1 are formed as a common outlet port for the two adjacent indoor subunits.

In the body casing 1, two air passages 6 extend from each air inlet port 5 having the bellmouth structure and separate toward the corresponding air outlet ports 7, which are arranged on both sides of the air inlet port 5. The turbofan 8 corresponding to the shroud 8c is formed in the air passages 6 and at the back of the air inlet port 5.

Specifically, the turbofan 8 is received in the air inlet port 5 with a clearance around the turbofan 8. The turbofan 8 is attached to the back panel 1a of the body casing 1 with the fan motor 8b, which is arranged inside the impeller.

As illustrated in Fig. 4, for example, the back panel
la has a necessary height H and is formed integrally with a back plate 16 of a drain pan 15, which is located below the back panel la (the back panel la is formed by extending the back plate 16, which is the same plate forming the back panel la, upward).

With reference to Fig. 3, a pair of heat exchangers 9 are located on both sides of each turbofan 8 in the air passages 6. The heat exchangers 9 are located at the positions corresponding to the air outlet ports 7, which are arranged below the air passages 6. The two heat exchangers 9 are arranged in the corresponding two air passages 6, which extend from the central portion of the body casing 1 toward both sides, in such a manner that the heat exchangers 9 extend across the corresponding air passages 6 and greatly incline in mutually different directions.

As has been described, the two heat exchangers 9 are greatly inclined with respect to the corresponding air passages 6. Accordingly, as is clear from Fig. 3, a necessary heat exchange surface area is effectively ensured, and the width (the depth) of the indoor unit body in the front-rear direction is minimized. As a result, the indoor unit body is made slimmer.

In the present embodiment, as illustrated in, for example, Fig. 5, each of the heat exchangers 9 is formed by a compact aluminum layered type heat exchanger, which includes flat heat transmission pipes (porous pipes) 9a and flat heat-transfer fins (which are, for example, corrugated fins) 9b and exhibits extremely high heat transmission performance. A pair of refrigerant headers 20 (20a, 20b) are arranged below each heat exchanger 9. A plurality of refrigerant pipes 21a, 21b, 21c, 21d (see Fig. 7) are connected to the corresponding refrigerant headers 20 (20a, 20b) in a concentrated manner.
As illustrated in, for example, Figs. 4 and 9 to 11, each heat exchanger 9 is supported with the refrigerant headers 20, which are arranged at the lower end of the heat exchanger 9, received in the drain pan 15. Specifically, the refrigerant headers 20 are fixed and accurately positioned at predetermined positions on a bottom surface 15a of the drain pan 15 by positioning members 22, 23. In this manner, the heat exchangers 9 are supported by and integrated with the drain pan 15.

The positioning members 22, 23 include positioning members 22a, 23a, 22b, 23b. The positioning members 22b, 23b each have a small height in the vertical direction. The height of each positioning member 22a, 23a is greater than the height of each positioning member 22b, 23b. The positioning members 22b, 23b each include a tapered surface for setting the inclination angle of the heat exchanger 9. Recesses 22c, 23c are each formed by the corresponding positioning members 22a, 23a, 22b, 23b and the inner surface of the drain pan 15. Each one of the recesses 22c, 23c is fixedly engaged with the end portion and the outer peripheral portion of the corresponding one of the refrigerant headers 20, which corresponds to the front or rear corner of the heat exchanger 9. The recesses 22c, 23c are formed in correspondence with the inclination angles of the corresponding heat exchangers 9.

Accordingly, by pressing the refrigerant headers 20 of each heat exchanger 9 into the recesses 22c, 23c in such a manner as to engage the refrigerant headers 20 with the recesses 22c, 23c as illustrated in Figs. 9 to 11, the heat exchanger 9 is easily installed in a stable state at a desired height and a desired inclination angle.
Further, in the present embodiment, as illustrated in Figs. 4 and 7, for example, a pair of supercooling heat exchangers 19 are provided. The supercooling heat exchangers 19 function as condensers when the air conditioner is in heating operation and as evaporators when the air conditioner is in cooling operation. The two supercooling heat exchangers 19 are arranged substantially symmetrically between each turbofan 8 and the heat exchangers 9 arranged on both sides of the turbofan 8. With reference to Fig. 6, each of the supercooling heat exchangers 19 is configured as a small-sized cylindrical heat exchanger with fins, which is configured simply by wrapping a spine fin 19a around a heat exchange tube 21d, which is a continuous refrigerant pipe. Each supercooling heat exchanger 19 is arranged in such a manner that the heat exchange tube 21d extends in the vertical direction.

In the body casing 1, a vacuum heat insulating material 10 is bonded to the inner surfaces of the back panel 1a, the side panel 1b, and the front panel 1c, which face each heat exchanger 9. Each of the vacuum heat insulating materials 10 is flat and a vacuum is formed in the vacuum heat insulating material 10. With reference to, for example, Figs. 16, which will be explained below, each vacuum heat insulating material 10 has a hollow synthetic resin sheet 10a and an aluminum foil 10c. The inside of the resin sheet 10a is filled with a shape retaining glass wool 10b. The aluminum foil 10c is bonded to the outer periphery of the sheet 10a.

As has been described, in the present embodiment, the heat exchangers 9, each of which is a compact aluminum layered type and has a high heat exchange efficiency, are arranged on both sides of the corresponding turbofan 8 in the inclined state. After being drawn through each air inlet port 5, which is arranged in a front central portion, air is
blasted forward from the air outlet ports 7 on both sides. This configuration minimizes the thickness of the indoor unit body. Further, as illustrated in Fig. 4 (a view from front) and Fig. 8 (a view from behind without the portion corresponding to the back plate 16), the drain pan 15 (the bottom surface 15a), which is shaped like a plate and extends in correspondence with the entire portion of the indoor unit body, is arranged below the two heat exchangers 9 and the associated turbofan 8. A large number of refrigerant pipes 21a to 21d connected to the corresponding heat exchangers 9 are accommodated in the drain pan 15 using the vacant space in the drain pan 15 having a predetermined depth.

That is, as has been described, in each heat exchanger 9, which is the layered type, the refrigerant headers 20 and the inlet and outlet ports of the refrigerant pipes 21a to 21d are concentrated on one side of the heat exchanger 9. Accordingly, if the heat exchangers 9 are arranged above the refrigerant headers 20 as illustrated in Fig. 7, the refrigerant pipes 21a to 21d are concentrated below the heat exchangers 9. Contrastingly, if the heat exchangers 9 are arranged below the refrigerant headers 20 as illustrated in Fig. 17, the refrigerant pipes 21a to 21d are concentrated above the heat exchangers 9. In this case, the indoor unit body must be enlarged in size to ensure the space for accommodating the pipes. Also, when the air conditioner is in cooling operation, dew drops formed on the refrigerant pipes may drip and hit a structure such as a fan, and thus may be splashed to the outside of the unit. If a heat insulating material is wrapped around the pipes to prevent dew condensation, the size of the indoor unit will be further enlarged.

To solve this problem, in the present embodiment, the drain pan 15 is arranged below the two heat exchangers 9,
which are arranged for each turbofan 8, and the turbofan 8, with reference to Figs. 4 and 8, for example. The drain pan 15 receives the refrigerant pipes 21a to 21d, which connect each pair of heat exchangers 9 together. In this manner, all of the pipes are received in the drain pan 15, thus solving the above-described problem.

In this configuration, the condensed water on the surfaces of the heat exchangers 9 is drained to the drain pan 15. The drain pan 15 thus reliably collects the condensation water. Further, a large number of refrigerant pipes 21a to 21d, which are concentrated below the heat exchangers 9, are accommodated in the vacant space in the drain pan 15 without interfering with other components.

Accordingly, it is unnecessary to create additional space for the pipes. This further reduces the size of the indoor unit body in size.

Also, dew drops formed on the refrigerant pipes 21a to 21d are collected directly by the drain pan 15 without being splashed to the outside.

In the above-described configuration, the drain pan 15 is formed integrally with the back panel 1a of the indoor unit casing, as has been described.

Since the drain pan 15 is formed integrally with the back panel 1a of the indoor unit casing, using which the turbofans 8 are mounted, the heat exchangers 9 and the associated turbofan 8 are incorporated as an integral body and unitized with the drain pan 15. Accordingly, while being unitized, the drain pan 15, the heat exchangers 9, and the turbofans 8 are accommodated in the body casing 1 of the indoor unit as an integral body. This facilitates the
assembly, manufacture, and maintenance of the indoor unit.

However, when the above-described configuration is employed, it is necessary to partition the air chamber of each turbofan 8 from the space in the drain pan 15 in some way. Specifically, through such partitioning, the air flow from the turbofan 8 must be smoothly straightened toward the corresponding air outlet ports 7 and prevented from affecting the refrigerant pipes 21a to 21d in order to prevent change of the phase of the refrigerant.

It is also necessary to prevent the air flow from each turbofan 8 from blowing out of the air outlet ports 7 through the drain pan 15 without passing through the corresponding heat exchanger 9.

To satisfy these needs, in the present embodiment, a partition plate 17 is arranged in such a manner as to separate the turbofans 8 and the heat exchangers 9 from the drain pan 15 (and the refrigerant pipes 21a to 21d), as illustrated in Fig. 12. This prevents the refrigerant pipes 21a to 21d from being cooled by the air flow from the turbofans 8. Also, by shaping the partition plate 17 as needed in correspondence with the shape of each turbofan 8, flow straightening performance is improved so that air blowing performance is improved. Although the partition plate 17 is flat in the present embodiment, the partition plate 17 may be formed in an arcuate shape or a scroll shape.

In this configuration, the partition plate 17 prevents the air flows from the turbofans 8 and the heat exchangers 9 from affecting the refrigerant pipes 21a to 21d. Accordingly, the phase of the refrigerant flowing in the refrigerant pipes 21a to 21d is prevented from changing.
Further, the partition plate 17 smoothly straightens the air flow from each turbofan 8 toward the air outlet ports 7, thus improving the air blowing performance of the turbofan 8. This improves the heat exchange efficiency of each heat exchanger 9.

Also, the partition plate 17 prevents the air flow from each turbofan 8 from blowing out of the air outlet ports 7 via the drain pan 15 without passing through the corresponding heat exchanger 9.

Additionally, in the present embodiment, front covers 2, 3 are arranged at the front side of the front panel 1c as necessary, as illustrated in, for example, Figs. 1 and 2. In this case, for example, the two center front covers 2 cover the air inlet ports 5 and the air outlet ports 7 at the center. The two front covers 3 on both sides each cover the corresponding one of the air outlet ports 7, which are located on both sides of the body casing 1.

The center front covers 2 are each supported by a support member 21, which is configured as, for example, a link, in such a manner that each front cover 2 is selectively opened and closed in the front-read direction (or a direction inclined with respect to the front-rear direction). When the front covers 2 are open, as illustrated in Fig. 2, air is drawn into the air inlet ports 5 from above and below in the vertical direction. In this state, the common air outlet ports 7, which are located at the center, are held open and the air is blown out of the air outlet ports 7.

In contrast, each of the front covers 3 on both sides is supported by a hinge structure in such a manner that each front cover 3 is selectively opened and closed. When the front covers 3 are open, the air outlet ports 7 on both sides
of the casing are held open and the air is blown out of the air outlet ports 7.

If the front covers 2, 3 are all closed as illustrated in Fig. 1, the indoor unit as a whole forms a simple slim cabinet structure having a flat front surface.

(Second Embodiment)

The configuration of an air conditioner indoor unit according to a second embodiment of the present invention will hereafter be explained with reference to Figs. 13 to 16.

The second embodiment is different from the first embodiment in that the drain pan 15 includes stepped portions 15b. Specifically, positioning members 24, 25 for setting inclination angles are arranged in the drain pan 15. The stepped portions 15b are formed in a lower portion of the drain pan 15, with reference to Figs. 13 to 15. The upper stepped surface of each stepped portion 15b functions as a positioning member for a height direction. Each stepped portion 15b is formed by a wide portion corresponding to an upper portion of the drain pan 15 and a narrow portion corresponding to a bottom portion of the drain pan 15. A vacuum heat insulating material 10 having a minimized thickness is arranged at the outer surface of the narrow portions of the stepped portions 15b (the outer surface of the bottom portion of the drain pan 15), as illustrated in, for example, Fig. 16.

The vacuum heat insulating material 10 is formed by, for example, a hollow sheet 10a formed of synthetic resin and an aluminum foil 10c. The inside of the hollow sheet 10a is filled with a shape retaining glass wool 10b. The aluminum foil 10c is bonded to the outer periphery of the sheet 10a.
Typically, a heat insulating material is bonded to the drain pan 15 in order to prevent dew condensation. However, to provide a slim indoor unit such as the above-described one, it is required to decrease the thickness of the heat insulating material (particularly in the front side and the backside), too. To meet this requirement, the positioning members 22b, 23b of the above-described first embodiment are replaced by the stepped portions 15b formed in the drain pan 15. Each stepped portion 15b functions as positioning means for the height direction. Further, by bonding the heat insulating material 10 to the outer surface of the stepped portion 15b, the heat insulating material 10 is prevented from projecting outward with respect to the outer surface of the drain pan 15 as much as possible.

The other portions of the second embodiment are configured identically to the corresponding portions of the second embodiment. The second embodiment has the same advantages as those of the first embodiment.

(Third Embodiment)

The configuration of an air conditioner indoor unit according to a third embodiment of the present invention will now be described with reference to Figs. 18 to 20.

The third embodiment is characterized in that each supercooling heat exchanger 19 of the first embodiment is configured by a flat cross fin coil type supercooling heat exchanger 19, which is illustrated in, for example, Figs. 18 to 20, instead of the heat exchanger having the cylindrical spine fin.

Through such configuration, the supercooling heat
exchange efficiency is further improved.

Specifically, the thickness of the cross fin coil type supercooling heat exchanger 19 is significantly less than the aforementioned spine fin type supercooling heat exchanger. This configuration saves space and reduces the pressure loss of each turbofan 8, thus raising heat exchange performance by 50% or more for a constant fan resistance. Accordingly, the supercooling heat exchange efficiency is improved.

For the cross fin coil type supercooling heat exchangers 19, refrigerant pipes 21d having U-shaped pipe structures may be employed. This makes it possible to arrange all of the refrigerant pipes 21a to 21d extending from the refrigerant headers 20, which include the refrigerant pipe 21d connecting the adjacent supercooling heat exchangers 19 to each other, in the drain pan 15. This allows all of the refrigerant pipes 21a to 21d to be accommodated in the drain pan 15, and thus brings about the advantage that the indoor unit is further reduced in size. Also, dew drops formed on the surfaces of the refrigerant pipes 21a to 21d are completely prevented from being splashed to the outside of the indoor unit.

In each cross fin coil type supercooling heat exchanger 19, a plate fin extends perpendicular to a heat transmission pipe. When the supercooling heat exchanger 19 is installed to be upright, the portion corresponding to the plate fin is arranged horizontally, thus causing a minor problem about water drainage.

To promote the water drainage of the plate fin, it is preferable to install each supercooling heat exchanger 19 in a slanted manner so that the supercooling heat exchanger 19 is slightly inclined in a horizontal direction with respect
to a vertical direction, instead of installing the supercooling heat exchanger 19 linearly in the vertical direction.

5 The other portions of the third embodiment are configured identically to the corresponding portions of the first embodiment. The third embodiment has the same advantages as those of the first embodiment.
THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. An air conditioner indoor unit comprising:
   a box-shaped casing,
   an air inlet port formed in a central portion of a
   front surface of the casing,
   a pair of air outlet ports formed on both sides of
   the front surface of the casing,
   a pair of air passages formed in the casing and
   extending from the air inlet port to the air outlet ports,
   a fan that is arranged upstream from the air passages
   and corresponds to the air inlet port,
   a pair of heat exchangers that are arranged
   downstream from the air passages and correspond to the air
   outlet ports,
   a refrigerant pipe connecting the heat exchangers to
   each other,
   a drain pan arranged below the heat exchangers and
   the fan, the refrigerant pipe being received in the drain
   pan, and
   a partition plate arranged between the fan and the
   drain pan,
   wherein the partition plate extends horizontally
   below the fans and the heat exchangers.

2. The air conditioner indoor unit according to claim 1,
   wherein the casing has a back plate, and the drain pan is
   formed integrally with the back plate of the casing.

3. The air conditioner indoor unit according to claim 1
   or claim 2, wherein the two heat exchangers each extend
   across the corresponding one of the air passages and are
   inclined in mutually different directions.

4. The air conditioner indoor unit according to any one
   of claims 1 to 3, wherein positioning members for
positioning the heat exchangers are arranged on both sides in the drain pan.

5. The air conditioner indoor unit according to any one of claims 1 to 3, wherein stepped portions for positioning the heat exchangers are formed in a bottom portion of the drain pan.

6. The air conditioner indoor unit according to claim 5, wherein each of the stepped portions of the drain pan is formed by a wide portion corresponding to an upper portion of the drain pan and a narrow portion corresponding to the bottom portion of the drain pan, a heat insulating material being arranged on an outer surface of the narrow portion formed in the bottom portion of the drain pan.

7. An air conditioner indoor unit substantially as hereinbefore described with reference to the accompanying drawings.
Fig. 4