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AN OUTDOOR UNIT FOR AN AIR CONDITIONING APPARATUS
OF A THROUGH-THE-WALL MULTITYPE

5 In conventional air conditioning apparatus of a
through-the-wall multitype, a single outdoor unit is
placed on the floor of a veranda, balcony or the like
outside a room of a building, while being connected to a
plurality of indoor units in the room and/or other rooms
via connection pipes which are led through a hole formed
10 through a wall of the building.

A disadvantage has been that the outdoor unit cannot
be installed outside a room without a veranda, balcony or
the like since the outdoor unit cannot be placed outside
the building.

15 In accordance with the present invention, however,
an outdoor unit for an air conditioning apparatus of a
through-the-wall multitype comprises: a casing capable
of being secured to an installation opening through a
wall of a room; a covering which covers a mouth at a
20 front portion of the casing, is freely attachable to and
detachable from the casing, and is to be accessible from
within the room; a bottom plate which is accommodated
within the casing, is freely movable inwardly and
outwardly of the casing through the mouth of the casing,
25 and is provided with a partition plate dividing the
bottom plate into front and rear parts; electrical
equipment, and pipe connection joints capable of being
connected via connecting pipes to a plurality of indoor
units, mounted on the bottom plate to the front of the
30 partition plate; an outdoor coil, a fan and a compressor
mounted on the bottom plate to the rear of the partition
plate; a ventilator grille which is formed on a rear
face or a side face of the casing and is to protrude
outside the room; and a connecting pipe outlet which is
35 formed in, or is capable of being formed in, a front face

of the covering or a side face of the covering and/or the casing and is to face inside the room.

Thus, the outdoor unit can be inserted through the installation opening from within the room and be supported by the wall with the outdoor coil, the fan and the compressor being separated from the inside of the room by the partition plate on the bottom plate of the outdoor unit.

Preferably, there are at least three of the ventilator grilles, two formed in opposed side faces and one in the rear face of the casing.

There are preferably at least four pairs of the pipe connection joints, each of said pairs being intended for connection to a respective indoor unit.

Preferably, when the outdoor unit is secured to an installation opening through a wall of a room, there are fasteners which extend from within the casing, through the side faces of the casing and into a wooden frame surrounding the side faces of the casing.

An outdoor unit, in accordance with the present invention, will now be described, by way of example only, with reference to the accompanying drawings, in which:-

Figure 1 is a schematic perspective view for the purpose of showing the external appearance of parts of an air conditioning apparatus including an outdoor unit in accordance with the preferred embodiment of the present invention;

Figure 2 is a perspective view similar to Figure 1, showing the state after removing the covering from the casing of the outdoor unit;

Figure 3 is a perspective view showing the outdoor unit of Figure 2, in the state of drawing out the bottom plate from the casing;

Figure 4 is a cross-sectional view, taken by a horizontal line, of the outdoor unit shown in Figure 1;

Figure 5 is a cross-sectional view, on an enlarged scale, showing a portion of the outdoor unit of Figure 1 fixedly installed within a hole of a building wall; and

Figure 6 is a cooling medium circuit diagram employed in the air conditioning apparatus of Figure 1.

Referring initially to Figure 1, an air conditioning apparatus of a through-the-wall multitype has one outdoor unit A connected to two indoor units B and B. However, the number of the indoor units B to be connected to the outdoor unit A can be selected within the range of the number of pipe connection joints with which the outdoor unit A is furnished. The outdoor unit A is equipped with components sufficient to supply cooling medium to all of the indoor units B connectable to the outdoor unit A, while each of the indoor units B is provided with components enabling heat-exchange with rooms in which the indoor units B are located.

Referring to Figures 4 and 6, the circuit construction of a cooling medium circuit with respect to the outdoor unit A includes outdoor coils (condenser) 10, an outdoor fan 11, a compressor 12, a dryer filter 13, a liquid receiver 14, a liquid suction gas heat exchanger 15, an accumulator 16, four electromagnetic valves 17, four pipe connection joints 18 at the liquid side, four pipe connection joints 19 at the gas side, a filter 20, and closing valves 21 and 22 for enclosure of the cooling medium. As is well known to those skilled in the art, the cooling medium is forcibly circulated by actuation of the compressor 12 from the pipe connection joints 19 for the gas through the filter 20, the closing valve 22, the liquid suction gas heat exchanger 15, the accumulator 16, the compressor 12, the outdoor coils 10, the dryer filter 13, the liquid receiver 14, the closing valve 21, the liquid suction gas heat exchanger 15, and the electromagnetic valves 17 to the pipe connection joints

18 for the liquid. Before the outdoor unit A is connected to the indoor units B, both of the closing valves 21 and 22 are closed to enclose the cooling medium by preventing free circulation of the cooling medium.

5 Then, after the outdoor unit A has been connected to the indoor units B, each of the closing valves 21 and 22 is opened so as to let the cooling medium circulate within the whole circuit.

10 On the other hand, the circuit construction for the cooling medium circuit with respect to each of the indoor units B includes indoor coils 40, an indoor fan 41, an expansion valve 42, a temperature sensor 43, a pipe connecting joint 44 at the liquid side and a pipe connecting joint 45 at the gas side. When the pipe
15 connecting joint 44 for the liquid side and the pipe connecting joint 45 for the gas side are respectively connected, through a connecting pipe 46 for the liquid side and a connecting pipe 47 for the gas side, to the pipe connection joint 18 for the liquid side and the pipe
20 connection joint 19 for the gas side, the cooling medium is able to be circulated, through the integral actuation with the outdoor unit A, from the pipe connecting joint 44 for the liquid side, through the expansion valve 42 and then the indoor coils 40, to the pipe connecting
25 joints 45 for the gas side.

Each component of the outdoor unit A as so far described is, as shown in Figures 3 and 4, mounted on a bottom plate 31 which is accommodated within a casing 30 in such a manner that it can be freely taken in and out
30 of the casing.

The casing 30 of the outdoor unit A, which is of a square chest-like configuration, has a mouth portion 32 formed in the front face thereof, an installation panel 33 formed in the front part of the side faces thereof and
35 ventilator grilles 34 and 35 for ventilation of air

formed in the rear face and in the rear part of the side faces thereof. A covering 36 is provided at the mouth portion 32 for protection of the same in such a manner as to be freely attached to and detached from the casing 30.

5 The external form of the casing 30 is so determined that the casing can be fully inserted into an installation opening 51 formed in a wall 50 and leading to the outside of the room. An outlet 37 for the pipes 46 and 47 connected to the indoor units B is formed in the portion
10 of the casing 30 protruding from the wall 50 to the inside of the room when the casing 30 is put into the installation opening 51. More generally, the outlet 37 could be formed in a front face of the covering 36 or in a side face of the covering and/or the casing facing
15 towards the inside of the room. It is to be noted that this outlet 37 may not be formed at the time when the casing 30 is processed, but may be formed in the casing 30 just before the outdoor unit A is inserted for fixing into the installation opening 51.

20 The bottom plate 31 is in the form of a dish or saucer and is accommodated in the casing 30 through the mouth portion 32 such that it is fixedly placed at a predetermined position on a bottom floor 30a of the casing 30. A handle 30b is provided at the front part of
25 the bottom plate 31. Moreover, the bottom plate 31 has a partition plate 38 standing on the upper face of the bottom plate 31 so that the bottom plate 31 is divided into rear and front parts. The outdoor coils 10, the fan 11 and the other components C for the cooling medium
30 circuit are mounted on the bottom plate 31 behind i.e. to the rear of the partition plate 38; whereas electrical equipment 25, and the pipe connection joints 18 and 19, are mounted on the bottom plate 31 to the front of the partition plate 38. As shown in Figures 3 and 4, the
35 circuit components C for the cooling medium circuit and

the pipe connection joints 18 and 19 are, while being separated by the partition plate 38, located adjacent the partition plate 38 respectively. The outdoor coils 10 are provided in the rear part of the bottom plate 31.

5 The actuation of the outdoor fan 11 provided in front of the outdoor coils 10 causes air to pass through the outdoor coils 10 from ventilator grilles 34 thereby to cool the outdoor coils 10. Thereafter, the air is discharged out of the casing from the ventilator grille
10 35. The connection joints 18 and 19 are, as shown in Figure 2, arranged in front of the partition plate 38 for easy access when the covering 36 is removed from the casing 30, and consequently, when the connection joints 18 and 19 are connected to the connecting pipes 47 and 46
15 of the indoor units B, the connecting pipes 46 and 47 can be easily drawn out of the outlet 37.

 The electrical equipment 25 includes ON-OFF control switches for the electromagnetic valves 17, a motor for the fan 11, a motor for the compressor 12, etc., all of
20 which are contained in an electrical box 26 placed in the front of the partition plate 38 on the bottom plate 31 in such a position that it can be easily handled when the covering 36 is taken off the casing 30.

 When the outdoor unit A having the construction as
25 described above is to be installed, only the casing 30 is first inserted into the installation opening 51 formed through the wall 50. Then the installation panel 33 facing the wall 50 is secured to a wooden frame 53, which has been preliminarily fixed to the wall 50, by an
30 installation fixture 52 as shown in Figure 5. Thereafter, the outer side surface of the casing 30 is adhered to the wooden frame 53 by a putty 54 for sealing therebetween. As mentioned, the wooden frame 53 is preliminarily fixed to the peripheral inner surface of
35 the installation opening 51 formed in the wall 50 of the

room. If there is a great gap between the wooden frame 53 and the casing 30, another wooden frame 55 should be provided and the casing 30 secured to both of the wooden frames 53 and 55. Into the casing 30, which is fixed as described, the bottom plate 31 with the outdoor coils 10, the fan 11, the components C for the cooling medium circuit, the electrical equipment 25 and the pipe connection joints 18 and 19 mounted thereon is inserted to be placed at a predetermined position. Then, the pipe connection joints 18 and 19 are connected respectively to one ends of the connecting pipes 46 and 47, the other ends thereof being connected to the pipe connecting joints 44 and 45 of the indoor units B. Subsequently, the pipes 46 and 47 are led out of the casing 30 through the outlet 37, and at the same time, a power cord (not shown) from the electrical equipment 25 is connected to a power source, with the front mouth portion 32 being covered by the covering 36. Thus, the air conditioning apparatus is brought into an operable state.

Accordingly, the outdoor unit according to the present invention, when installed in the installation opening through the wall, can be easily connected to indoor units through pipes and wirings, and at the same time, the components for the cooling medium circuit can be freely taken out into the inside of the room for repairing, etc., and therefore, the outdoor unit of the present invention is advantageous in that it can be installed in the wall for easy access such that the outdoor unit can be connected to indoor units from the inside of the room, even when there is no spare space for installation of the outdoor unit such as a veranda, balcony or the like conventionally used for installation, thereby contributing to an expansion of uses of the air conditioning apparatus of this type.

CLAIMS

1. An outdoor unit, for an air conditioning apparatus of a through-the-wall multitype, comprising: a casing capable of being secured to an installation opening through a wall of a room; a covering which covers a mouth at a front portion of the casing, is freely attachable to and detachable from the casing, and is to be accessible from within the room; a bottom plate which is accommodated within the casing, is freely movable inwardly and outwardly of the casing through the mouth of the casing, and is provided with a partition plate dividing the bottom plate into front and rear parts; electrical equipment, and pipe connection joints capable of being connected via connecting pipes to a plurality of indoor units, mounted on the bottom plate to the front of the partition plate; an outdoor coil, a fan and a compressor mounted on the bottom plate to the rear of the partition plate; a ventilator grille which is formed on a rear face or a side face of the casing and is to protrude outside the room; and a connecting pipe outlet which is formed in, or is capable of being formed in, a front face of the covering or a side face of the covering and/or the casing and is to face inside the room.

2. An outdoor unit according to claim 1, in which there are at least three of the ventilator grilles, two formed in opposed side faces and one in the rear face of the casing.

3. An outdoor unit according to claim 1 or claim 2, in which there are at least four pairs of the pipe connection joints, each of said pairs being intended for connection to a respective indoor unit.

4. An outdoor unit, for an air conditioning apparatus of a through-the-wall multitype, and



substantially as hereinbefore described with reference to the accompanying drawings.

5 5. An outdoor unit according to any preceding claim when secured to an installation opening through a wall of a room.

10 6. An outdoor unit according to claim 5, in which there are fasteners which extend from within the casing, through the side faces of the casing and into a wooden frame surrounding the side faces of the casing.

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