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(54) **HEAT PUMP HOT WATER SUPPLY OUTDOOR UNIT**

(57) A heat pump water-heater outdoor unit has a bottom plate which has a rectangular bottom surface, a compressor which is provided on the bottom plate and compresses a refrigerant, a soundproofing material which covers a side surface of the compressor, and a soundproofing material placement portion which is provided on the bottom plate and holds a lower end of the soundproofing material at a position higher than the bottom surface. The soundproofing material placement portion covers corner portion that is closest to the compressor out of corner portions of the bottom plate. The bottom plate includes an edge portion which extends upward from each side of the bottom surface. The soundproofing material placement portion holds the lower end of the soundproofing material at a position higher than an upper end of the edge portion.

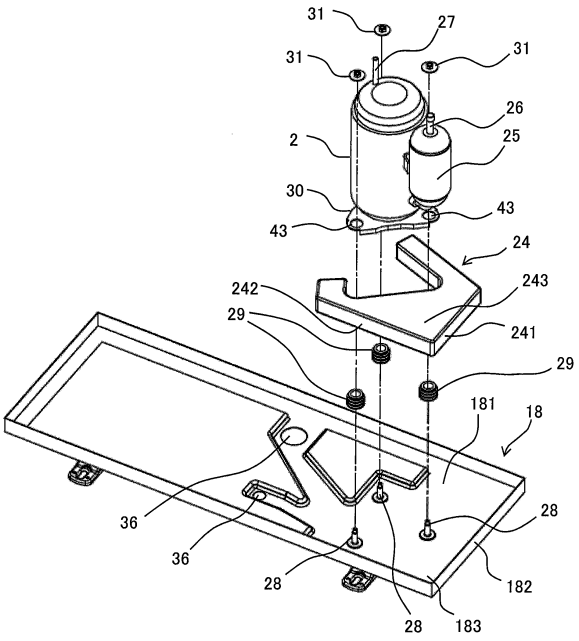

FIG. 4

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Description

[Technical Field]

[0001] The present invention relates to a heat pump water-heater outdoor unit.

[Background Art]

[0002] A heat pump hot water supply system which uses heat of the air and is excellent in energy efficiency is widely used. In a heat pump water-heater outdoor unit of the heat pump hot water supply system, an evaporator which causes a refrigerant to absorb the heat of the air, a propeller fan which blows air to the evaporator, a compressor which compresses the refrigerant, and a water-refrigerant heat exchanger which heats water with the compressed refrigerant having high temperature and high pressure are mounted. In order to reduce noise generated during operation, the periphery of the compressor is covered with a soundproofing material. The compressor is installed on a bottom plate serving as a base of the heat pump water-heater outdoor unit. There are cases where water condensed on the surface of the evaporator flows down to the bottom plate and collects. Such water is referred to as "drainage". The soundproofing material includes a substance having water absorption properties such as, e.g., felt. When the soundproofing material absorbs the drainage, there is a possibility that the compressor will be corroded by water in the drainage. When the soundproofing material absorbs the drainage, there is a possibility that soundproofing properties of the soundproofing material will be degraded. It is preferable to prevent the soundproofing material from coming into contact with the drainage having collected on the bottom plate such that the soundproofing material does not absorb the drainage.

[0003] An outdoor unit disclosed in PTL 1 described below is configured in the following manner. A soundproofing material covering the side surface of a compressor includes a sound absorbing material having water absorption properties. A bottom plate on which the compressor is installed has a soundproofing material placement portion on which the soundproofing material is placed, and a surrounding portion which is positioned around the soundproofing material placement portion and is formed integrally with the soundproofing material placement portion. The soundproofing material placement portion is at a position higher than that of the surrounding portion. With this configuration, even when drainage flows down and collects on the surrounding portion of the bottom plate, contact of the drainage with the soundproofing material placed on the soundproofing material placement portion is suppressed. With this, penetration of the drainage into the sound absorbing material is suppressed.

[Citation List]

[Patent Literature]

[0004] [PTL 1] Japanese Patent Application Publication No. 2013-53827

[Summary of Invention]

[Technical Problem]

[0005] The outdoor unit in PTL 1 has the following problems. Depending on the situation of an installation environment such as a porch or a berm, there are cases where the outdoor unit is tilted toward the compressor and installed. In these cases, the drainage having flowed down to the bottom plate collects at a corner portion on the compressor side, and the soundproofing material may be thereby soaked in the drainage. When the soundproofing material absorbs water, a problem may arise in that a shell of the compressor is corroded, and a problem may arise in that the soundproofing properties of the soundproofing material are degraded.

[0006] The present invention has been made in order to solve the above-described problems, and an object thereof is to provide a heat pump water-heater outdoor unit capable of preventing a soundproofing material which covers the side surface of a compressor from absorbing water having collected on a bottom plate irrespective of the situation of an installation environment.

[Solution to Problem]

[0007] A heat pump water-heater outdoor unit according to the present invention includes: a bottom plate having a rectangular bottom surface; a compressor provided on the bottom plate, the compressor compressing a refrigerant; a soundproofing material configured to cover a side surface of the compressor; and a soundproofing material placement portion provided on the bottom plate, the soundproofing material placement portion holding a lower end of the soundproofing material at a position higher than the bottom surface. The soundproofing material placement portion is configured to cover corner portion that is closest to the compressor out of corner portions of the bottom plate.

[Advantageous Effects of Invention]

[0008] According to the heat pump water-heater outdoor unit of the present invention, one corner portion that is closest to the compressor out of corner portions of the bottom plate is covered with the soundproofing material placement portion. Consequently, it is possible to prevent the soundproofing material covering the side surface of the compressor from being soaked in drainage which collects at the corner portion. With this, it becomes possible to suppress corrosion of a shell of the compressor and

degradation of soundproofing properties irrespective of the situation of the installation environment.

[Brief Description of Drawings]

[0009]

FIG. 1 is a view of piping of a heat pump hot water supply system including a heat pump water-heater outdoor unit of Embodiment 1.

FIG. 2 is a perspective view showing the appearance of the heat pump water-heater outdoor unit of Embodiment 1.

FIG. 3 is an exploded perspective view of the heat pump water-heater outdoor unit of Embodiment 1.

FIG. 4 is an exploded perspective view showing a bottom plate and a compressor of the heat pump water-heater outdoor unit of Embodiment 1.

FIG. 5 is a perspective view showing the bottom plate, the compressor, and a soundproofing material of the heat pump water-heater outdoor unit of Embodiment 1.

FIG. 6 is a cross-sectional view of the compressor, the bottom plate, a soundproofing material placement portion, and the soundproofing material in Embodiment 1.

FIG. 7 is a perspective view of the soundproofing material placement portion before the soundproofing material placement portion is mounted to the compressor in Embodiment 1 when viewed from above.

FIG. 8 is a perspective view of the soundproofing material placement portion before the soundproofing material placement portion is mounted to the compressor in Embodiment 1 when viewed from below.

FIG. 9 is a view obtained by viewing the internal structure of the heat pump water-heater outdoor unit to which the soundproofing material placement portion in Embodiment 1 is mounted through an upper surface.

[Description of Embodiments]

[0010] Hereinbelow, an embodiment will be described with reference to the drawings. Common elements in the drawings are designated by the same reference numerals, and the duplicate description thereof will be simplified or omitted. In addition, the present disclosure may include any combinations of, among configurations described in the following embodiment, configurations which may be combined.

Embodiment 1.

[0011] FIG. 1 is a view of piping of a heat pump hot water supply system including a heat pump water-heater outdoor unit of Embodiment 1. As shown in FIG. 1, a heat pump hot water supply system 100 includes a heat pump water-heater outdoor unit 10, and a tank unit 50. The heat pump water-heater outdoor unit 10 is installed outdoors. The tank unit 50 may be installed outdoors or may also be installed indoors.

[0012] The heat pump water-heater outdoor unit 10 includes a compressor 2, a heat exchanger 3, a first expansion valve 4a, a second expansion valve 4b, an evaporator 5, an internal heat exchanger 6, and a fan 7. The heat pump water-heater outdoor unit 10 includes a refrigerant circuit, and performs operation of a refrigeration cycle, i.e., a heat pump cycle. The compressor 2 compresses low-pressure refrigerant gas. A refrigerant may be, e.g., carbon dioxide. The heat exchanger 3 exchanges heat between a high-temperature high-pressure refrigerant discharged from the compressor 2 and water or another liquid heating medium. The liquid heating medium may be, e.g., a calcium chloride aqueous solution, an ethylene glycol aqueous solution, or alcohol.

[0013] Each of the first expansion valve 4a and the second expansion valve 4b is an example of a decompression device which decompresses a high-pressure refrigerant to change the high-pressure refrigerant into a low-pressure refrigerant. The decompressed low-pressure refrigerant is brought into a gas-liquid two-phase state. The evaporator 5 is a heat exchanger which exchanges heat between the low-pressure refrigerant and the air. In the evaporator 5, the low-pressure refrigerant evaporates by absorbing heat of the air. The fan 7 blows air to the evaporator 5, and heat exchange in the evaporator 5 can be thereby facilitated. The internal heat exchanger 6 includes a high-pressure flow path and a low-pressure flow path. The internal heat exchanger 6 exchanges heat between the high-pressure refrigerant flowing in the high-pressure flow path and the low-pressure refrigerant flowing in the low-pressure flow path. The low-pressure refrigerant gas evaporated in the evaporator 5 is sucked into the compressor 2 via the low-pressure flow path of the internal heat exchanger 6.

[0014] The refrigerant circuit in the present embodiment includes a first channel 8 in which the refrigerant having passed through the heat exchanger 3 reaches the evaporator 5 via the high-pressure flow path of the internal heat exchanger 6, and a second channel 9 in which the refrigerant having passed through the heat exchanger 3 bypasses the internal heat exchanger 6 and reaches the evaporator 5. The first expansion valve 4a is installed in the first channel 8 on the downstream side of the high-pressure flow path of the internal heat exchanger 6. The second expansion valve 4b is installed in the second channel 9. By adjusting the openings of the first expansion valve 4a and the second expansion valve 4b, it is possible to change a ratio between the flow

rate of the refrigerant which reaches the evaporator 5 from the heat exchanger 3 via the internal heat exchanger 6 and the flow rate of the refrigerant which bypasses the internal heat exchanger 6 and reaches the evaporator 5 from the heat exchanger 3.

[0015] The tank unit 50 includes a hot water storage tank 52, a water pump 53, a flow path switching valve 54, and a bypass flow path 55. The heat pump water-heater outdoor unit 10 and the tank unit 50 are connected via external pipings 56 and 57.

[0016] In the hot water storage tank 52, water before heating and hot water after heating are stored. In the hot water storage tank 52, temperature stratification in which an upper side has high temperature and a lower side has low temperature is formed due to a difference in the specific gravity of water caused by temperature. To the upper portion of the hot water storage tank 52, a hot water supply pipe (not shown) for supplying hot water to a terminal such as, e.g., a hot water faucet, a shower, or a bathtub is connected. To the lower portion of the hot water storage tank 52, a water supply pipe (not shown) for supplying water from a water source such as a water supply is connected. When hot water is supplied from the hot water storage tank 52, hot water in the upper portion of the hot water storage tank 52 is sent to the hot water supply pipe by water pressure which is applied to the inside of the hot water storage tank 52 from the water supply pipe. Water in an amount equal to that of hot water having flowed out to the hot water supply pipe flows into the hot water storage tank 52 from the water supply pipe, and the hot water storage tank 52 is thereby kept in a fully filled state.

[0017] The lower portion of the hot water storage tank 52 is connected to an inlet of the water pump 53 via a conduit. An outlet of the water pump 53 is connected to the flow path switching valve 54. The flow path switching valve 54 is connected to a water inlet of the heat exchanger 3 of the heat pump water-heater outdoor unit 10 via the external piping 56.

[0018] The heat pump hot water supply system 100 can perform heat storage operation which accumulates hot water heated by the heat pump water-heater outdoor unit 10 in the hot water storage tank 52. During the heat storage operation, the following operation is performed. The compressor 2, the fan 7, and the water pump 53 are operated. Water having flowed out from the lower portion of the hot water storage tank 52 flows into the heat exchanger 3 of the heat pump water-heater outdoor unit 10 through the water pump 53, the flow path switching valve 54, and the external piping 56. The water is heated by the refrigerant in the heat exchanger 3 and becomes hot water. The temperature of hot water heated in the heat exchanger 3 may be, e.g., about 65°C to about 90°C. Hot water having flowed out from the heat exchanger 3 returns to the tank unit 50 through the external piping 57, and flows into the upper portion of the hot water storage tank 52 through a tank upper pipe 58.

[0019] The flow path switching valve 54 can switch the flow path such that water discharged from the water pump 53 is caused to pass through the bypass flow path 55 instead of the heat pump water-heater outdoor unit 10, and flow into the tank upper pipe 58.

[0020] The heat pump water-heater outdoor unit of the present invention is not limited to the heat pump water-heater outdoor unit constituting part of a hot water supply system such as the above-described heat pump hot water supply system 100, and may also be the heat pump water-heater outdoor unit which is used for the purpose of heating the liquid heating medium in, e.g., a hot-water heating system. That is, the liquid heating medium heated by the heat pump water-heater outdoor unit of the present invention may be supplied to an indoor heating appliance such as, e.g., a floor heating panel which is installed under a floor, a radiator or a panel heater which is installed on an indoor wall surface, or a fan convector.

[0021] FIG. 2 is a perspective view showing the appearance of the heat pump water-heater outdoor unit 10 of Embodiment 1. FIG. 3 is an exploded perspective view of the heat pump water-heater outdoor unit 10 of Embodiment 1. As shown in FIG. 2, the heat pump water-heater outdoor unit 10 includes a plurality of leg portions 41. The leg portions 41 are fixed to the ground or a floor surface.

[0022] As shown in FIG. 3, the heat pump water-heater outdoor unit 10 includes a bottom plate 18, a front panel 19, a side panel 20, and a top panel 21. The bottom plate 18, the front panel 19, the side panel 20, and the top panel 21 constitute an outer shell, i.e., a cabinet of the heat pump water-heater outdoor unit 10. The bottom plate 18, the front panel 19, the side panel 20, and the top panel 21 are preferably made of metal. The bottom plate 18 corresponds to a base or a frame of the heat pump water-heater outdoor unit 10. Constituent devices such as the compressor 2 are mounted on the bottom plate 18. The leg portions 41 are fixed to the lower surface of the bottom plate 18.

[0023] The front panel 19 covers the front surface and the left side surface of the heat pump water-heater outdoor unit 10. The side panel 20 covers part of the rear surface and the right side surface of the heat pump water-heater outdoor unit 10. The top panel 21 covers the upper surface of the heat pump water-heater outdoor unit 10.

[0024] The evaporator 5 is disposed so as to cover the rear surface and the left side surface of the heat pump water-heater outdoor unit 10. The fan 7 is disposed between the evaporator 5 and the front panel 19. The fan 7 in the present embodiment includes a propeller fan. The internal portion of the outer shell of the heat pump water-heater outdoor unit 10 is partitioned into a fan room 15 in which the fan 7 is disposed and a machine room 14. The fan room 15 is separated from the machine room 14 by a partition plate 16. The compressor 2 and refrigerant piping are disposed in the machine room 14. In FIG. 3, depiction of soundproofing materials 32 and 33 described later is omitted. A case 13 is disposed below the fan 7. The heat exchanger 3 is stored in the case 13 in a state in which the heat exchanger 3 is covered with

a heat insulating material.

[0025] The front panel 19 has an opening at a position which faces the fan 7. A grille 23 which covers the opening is mounted to the front panel 19. When the fan 7 is operated, outside air, i.e., the air flows into the fan room 15 through the evaporator 5, and is discharged to the outside of the heat pump water-heater outdoor unit 10 from the grille 23.

[0026] The heat pump water-heater outdoor unit 10 includes an electrical component storage box 17. The electrical component storage box 17 is disposed in space which occupies part of the upper portion of the fan room 15 and the upper portion of the machine room 14. In the electrical component storage box 17, an electrical component such as, e.g., an inverter power supply which drives and controls a motor of the compressor 2 and a motor of the fan 7 is stored. A terminal block is provided near the electrical component storage box 17. The terminal block is used when external electrical wiring is connected. A service panel 22 is detachably attached to the side panel 20. The service panel 22 protects the terminal block. A connection portion cover 42 is detachably attached to the side panel 20 below the service panel 22. The connection portion cover 42 protects a connection portion (not shown) to which the external pipings 56 and 57 are connected.

[0027] FIG. 4 is an exploded perspective view showing the bottom plate 18 and the compressor 2 of the heat pump water-heater outdoor unit 10 of Embodiment 1. As shown in FIG. 4, the bottom plate 18 has a shape in which a plurality of projections and depressions, stepped portions, and slopes which have height differences of, e.g., about 1 cm are formed. The bottom plate 18 has a rectangular bottom surface 181, and an edge portion 182 which extends upward from each side of the bottom surface 181. The bottom plate 18 may be formed by press working such as, e.g., drawing. The bottom plate 18 has water shielding properties.

[0028] In the bottom plate 18, a plurality of (two in the present embodiment) drain holes 36 for discharging drainage are formed. It is preferable that the drain hole 36 is provided at the lowest position in the bottom plate 18. The number of drain holes 36 may be two or more. The temperature of the evaporator 5 becomes low during the operation of the heat pump water-heater outdoor unit 10, and hence there are cases where water contained in air passing through the evaporator 5 is condensed on the surface of the evaporator 5. The condensed drainage flows down due to gravity. The bottom plate 18 receives the drainage. The drainage flows toward the position of the drain hole 36 with the height differences formed in the bottom plate 18, and is discharged from the drain hole 36 to space below the bottom plate 18.

[0029] The compressor 2 includes a shell. The shape of the shell may be a cylindrical shape shown in the drawing. A compression device which compresses the refrigerant and a motor which drives the compression device are stored inside the shell of the compressor 2, through the depiction thereof is omitted. The compression device may be any of, e.g., reciprocation-type, scroll-type, and rotary-type compression devices.

[0030] A suction muffler 25 is positioned adjacent to the shell of the compressor 2. The suction muffler 25 is coupled to the side surface of the shell of the compressor 2. The shape of the suction muffler 25 may be a cylindrical shape smaller than that of the shell of the compressor 2. A suction pipe 26 is connected to the suction muffler 25. Low-pressure refrigerant gas is sucked into the compressor 2 through the suction pipe 26 and the suction muffler 25. A discharge pipe 27 is connected to the compressor 2. High-pressure refrigerant gas compressed in the compressor 2 is discharged to the discharge pipe 27.

[0031] A compressor leg portion 30 is fixed to the bottom portion of the shell of the compressor 2. The compressor 2 is mounted on the bottom plate 18 via the compressor leg portion 30. The compressor leg portion 30 has a strength which allows the compressor leg portion 30 to support the weight of the compressor 2 and the suction muffler 25. The compressor leg portion 30 is preferably made of metal. The compressor leg portion 30 corresponds to a base portion which supports the compressor 2. The compressor leg portion 30 in the embodiment is a plate-like member. The upper surface of the compressor leg portion 30 is joined to the bottom surface of the shell of the compressor 2. The compressor leg portion 30 may be welded to the shell of the compressor 2. A plurality of (three in the present embodiment) holes 43 are formed in the compressor leg portion 30.

[0032] A plurality of (three in the present embodiment) bolts 28 for coupling the compressor 2 to the bottom plate 18 are installed on the bottom plate 18. Each bolt 28 protrudes upward. The bolt 28 may also be a weld bolt which is welded to the upper surface of the bottom plate 18. The heat pump water-heater outdoor unit 10 includes a plurality of (three in the present embodiment) vibration isolation members 29. Each vibration isolation member 29 is disposed between the upper surface of the bottom plate 18 and the lower surface of the compressor leg portion 30. The vibration isolation member 29 is a member having elasticity such as, e.g., rubber or a spring. The shape of the vibration isolation member 29 may be a cylindrical shape shown in the drawing or a columnar shape. The vibration isolation member 29 has a hole through which the bolt 28 can pass. The bolt 28 passes through the hole of the vibration isolation member 29 and the hole 43 of the compressor leg portion 30. A nut 31 is screwed on the bolt 28. The vibration isolation member 29 and the compressor leg portion 30 are held between the bottom plate 18 and the nut 31, and the compressor 2 is thereby coupled to the bottom plate 18. On the bottom plate 18, a soundproofing material placement portion 24 is disposed so as to surround the periphery of the compressor leg portion 30. The configuration of the soundproofing material placement portion 24 and the function thereof will be described later in detail.

[0033] During the operation of the compressor 2, vi-

bration is generated by torque fluctuation of a rotator inside the compressor 2, unbalance of the rotator, and pulsation of refrigerant pressure. Particularly in the compressor 2 of the heat pump water-heater outdoor unit 10, high compression pressure is required, and hence the vibration of the compressor 2 tends to be increased. According to the present embodiment, the weight of the compressor 2 and the suction muffler 25 is applied to the bottom plate 18 via the vibration isolation member 29. The vibration isolation member 29 absorbs the vibration during the operation of the compressor 2, whereby it is possible to reliably suppress the transmission of the vibration of the compressor 2 to the bottom plate 18.

[0034] Assuming that the vibration isolation member 29 is not provided and the compressor 2 is directly fixed to the upper surface of the bottom plate 18, the following problem arises. The vibration of the compressor 2 is transmitted to the bottom plate 18, and the vibration of the bottom plate 18 is further transmitted to the front panel 19, the side panel 20, the top panel 21, the partition plate 16, and the evaporator 5. As a result, there is a possibility that the vibrations of the bottom plate 18, the front panel 19, the side panel 20, the top panel 21, the partition plate 16, and the evaporator 5 will generate noise, particularly low-frequency noise. The low-frequency noise is sound including low frequency which cannot be perceived by the sense of hearing of a human being.

[0035] According to the present embodiment, by providing the vibration isolation member 29, it is possible to reduce the vibrations of the bottom plate 18, the front panel 19, the side panel 20, the top panel 21, the partition plate 16, and the evaporator 5. Therefore, it is possible to reliably suppress generation of noise, particularly low-frequency noise.

[0036] FIG. 5 is a perspective view showing the bottom plate 18, the compressor 2, and the soundproofing materials 32 and 33 of the heat pump water-heater outdoor unit 10 of Embodiment 1. As shown in FIG. 5, the heat pump water-heater outdoor unit 10 includes the soundproofing materials 32 and 33. The soundproofing material 32 at least partially covers the side surface of the compressor 2. In the present embodiment, the soundproofing material 32 covers the entire side surfaces of the compressor 2 and the suction muffler 25. The soundproofing material 32 becomes cylindrical by being wound around the compressor 2 and the suction muffler 25. The compressor 2 and the suction muffler 25 are positioned inside the cylindrical soundproofing material 32. The soundproofing material 33 covers the compressor 2 and the suction muffler 25 from above. The soundproofing material 33 is disposed so as to close an opening at the upper end of the cylindrical soundproofing material 32. In the soundproofing material 33, holes 44 for passage of the suction pipe 26 and the discharge pipe 27 are formed. According to the present embodiment, by providing the soundproofing materials 32 and 33, it is possible to reliably suppress leakage of noise during the operation of the compressor 2 to the outside of the heat pump water-heater outdoor unit 10.

[0037] Each of the soundproofing materials 32 and 33 includes a sound absorbing material. The sound absorbing material is made of a material having fine voids. The sound absorbing material may include at least one of, e.g., felt, glass wool, and rock wool. Each of the soundproofing materials 32 and 33 may further include a sound insulating material. The sound absorbing material may constitute an inner layer of each of the soundproofing materials 32 and 33, and the sound insulating material may constitute an outer layer of each of the soundproofing materials 32 and 33. The sound insulating material is made of a material having a density higher than that of the sound absorbing material. The sound insulating material may be formed of, e.g., a rubber material or a resin material.

[0038] The drain hole 36 provided in the bottom plate 18 is clogged with a foreign object such as, e.g., dead leaves or mud, and the drain hole 36 may be thereby blocked. In the case where the drain hole 36 is blocked, water having flowed down from the evaporator 5 or the like is not discharged from the drain hole 36. The evaporator 5 is constantly cooled during the operation of the heat pump water-heater outdoor unit 10. Consequently, the amount of condensed water generated on the surface of the evaporator 5 is large than that of an outdoor unit of an air conditioner. In the case where the drain hole 36 is blocked, there is a possibility that a large amount of drainage will collect on the bottom plate 18.

[0039] Depending on the situation of an installation environment such as a porch or a berm, there are cases where the heat pump water-heater outdoor unit 10 is installed in a state in which the heat pump water-heater outdoor unit 10 is tilted toward the compressor 2. In these cases, there is a possibility that a large amount of drainage will collect on the bottom plate 18, particularly in an area in the vicinity of a corner portion 183 closest to the compressor 2.

[0040] The sound absorbing material of each of the soundproofing materials 32 and 33 has fine voids, and hence the sound absorbing material has water absorption properties. Assuming that the lower end of the soundproofing material 32 comes into contact with a pool of the drainage on the bottom plate 18, the sound absorbing material of the soundproofing material 32 absorbs water. The sound absorption performance of the sound absorbing material having absorbed water is degraded. In addition, the water absorbed in the sound absorbing material comes into contact with the compressor 2, and the compressor 2 may be thereby corroded. In order to avoid these harmful effects, it is necessary to reliably prevent the lower end of the soundproofing material 32 from coming into contact with the pool of the drainage on the bottom plate 18.

[0041] As shown in FIG. 4 and FIG. 5, the heat pump water-heater outdoor unit 10 of the present embodiment includes the soundproofing material placement portion 24 which retains the position of the lower end of the

soundproofing material 32. The soundproofing material placement portion 24 is disposed on the bottom plate 18. The soundproofing material placement portion 24 is shaped such that part of the soundproofing material placement portion 24 extends along the corner portion 183 of the bottom plate 18. More specifically, the soundproofing material placement portion 24 has a first side 241 which is configured so as to extend along the side surface of the edge portion 182 of the bottom plate 18 on a right side surface side, and a second side 242 which is configured so as to extend along the side surface of the edge portion 182 of the bottom plate 18 on a front surface side. An angle formed between the first side 241 and the second side 242 is 90 degrees. The soundproofing material placement portion 24 is disposed such that the first side 241 and the second side 242 are in contact with the edge portions 182 including the corner portion 183 of the bottom plate 18. According to such an arrangement, the corner portion 183 of the bottom plate 18 is covered with the soundproofing material placement portion 24.

[0042] According to the present embodiment, by providing the soundproofing material placement portion 24, the following effect can be obtained. Even in the case where the pool of the drainage has occurred on the bottom plate 18 due to the blockage of the drain hole 36, it is possible to reliably prevent the situation in which the pool of the drainage occurs at the corner portion 183 and the lower end of the soundproofing material 32 is soaked in the pool of the drainage. It is possible to reliably prevent water from being absorbed in the sound absorbing material of the soundproofing material 32. It is possible to reliably prevent the occurrence of harmful effects such as a harmful effect in which the sound absorption performance of the sound absorbing material of the soundproofing material 32 is degraded and a harmful effect in which the compressor 2 is corroded.

[0043] FIG. 6 is a cross-sectional view of the compressor 2, the bottom plate 18, the soundproofing material placement portion 24, and the soundproofing materials 32 and 33 in Embodiment 1. FIG. 6 shows the appearance of the compressor 2 instead of the cross section thereof.

[0044] As shown in FIG. 6, an upper surface 243 of the soundproofing material placement portion 24 is at a position above the upper end of the edge portion 182 of the bottom plate 18. More specifically, when a height from the bottom surface 181 of the bottom plate 18 to the upper end of the edge portion 182 is h1 and a height from the bottom surface 181 of the bottom plate 18 to the upper surface 243 of the soundproofing material placement portion 24 is h2, the soundproofing material placement portion 24 and the bottom plate 18 are configured so as to satisfy $h2 > h1$. The upper surface 243 of the soundproofing material placement portion 24 is in contact with the lower end surface of the soundproofing material 32. Even when drainage W collects at the corner portion 183 of the bottom plate 18, the surface thereof does not become higher than the height h1 of the edge portion 182. According to the configuration of the present embodiment, it is possible to reliably hold the lower end surface of the soundproofing material 32 at the position above the surface of the pool of the drainage. Accordingly, even in the case where the pool of the drainage has occurred on the bottom plate 18 when the drain hole 36 is blocked, it is possible to reliably prevent the lower end of the soundproofing material 32 from coming into contact with the pool of the drainage, and reliably prevent the sound absorbing material of the soundproofing material 32 from absorbing water.

[0045] FIG. 7 is a perspective view of the soundproofing material placement portion 24 before the soundproofing material placement portion 24 is mounted to the compressor 2 in Embodiment 1 when viewed from above. In addition, FIG. 8 is a perspective view of the soundproofing material placement portion 24 before the soundproofing material placement portion 24 is mounted to the compressor 2 in Embodiment 1 when viewed from below. Further, FIG. 9 is a view obtained by viewing the internal structure of the heat pump water-heater outdoor unit 10 to which the soundproofing material placement portion 24 in Embodiment 1 is mounted through the upper surface.

[0046] As shown in FIG. 7 and FIG. 8, on the lower surface of the soundproofing material placement portion 24, a concave drain flow path 244 is provided. The drain flow path 244 has an inlet 245 and an outlet 246 which are opened on the sides of the side surfaces of the soundproofing material placement portion 24. As shown in FIG. 8 and FIG. 9, in the soundproofing material placement portion 24, the inlet 245 is opened on the evaporator side, and the outlet 246 is opened on the drain hole 36 side. The inlet 245 is opened more widely than the outlet 246.

[0047] According to the present embodiment, by providing the drain flow path 244, the following effect can be obtained. As shown in FIG. 9, the drainage having flowed down from the evaporator 5 passes through the drain flow path 244 from the inlet 245, flows out from the outlet 246, and is discharged to the drain hole 36. With this, it is possible to prevent the drainage from collecting at the corner portion 183 of the bottom plate 18. The inlet 245 is widely opened toward the evaporator 5, and hence it is easy to take in the drainage having flowed down from the evaporator 5. In addition, the outlet 246 is narrowly opened toward the drain hole 36, and hence it is possible to effectively prevent the drainage having flowed out from the outlet 246 from flowing to other areas. Thus, according to the present embodiment, it is possible to increase the drainage efficiency of the drainage to reliably prevent the soundproofing material 32 from being soaked in the drainage.

[0048] Note that the soundproofing material placement portion 24 is disposed on the bottom plate 18 by using the vibration isolation members 29 as positioning members. As shown in FIG. 7 and FIG. 8, the soundproofing material placement portion 24 does not have an annular

shape but has an arc-like shape. More specifically, the soundproofing material placement portion 24 is disposed to surround two sides of a triangle of the compressor leg portion 30 to which the compressor 2 is fixed so as to arc. According to the present embodiment, by providing the arc-shaped soundproofing material placement portion 24, the following effect can be obtained. Even in a state in which the compressor 2 is fixed to the bottom plate 18, it is possible to install the soundproofing material placement portion 24 on the bottom plate 18. With this, it is possible to mount the soundproofing material placement portion 24 irrespective of assembly procedure.

[Reference Signs List]

[0049]

2	Compressor
3	Heat exchanger
4a	First expansion valve
4b	Second expansion valve
5	Evaporator
6	Internal heat exchanger
7	Fan
8	First channel
9	Second channel
10	Heat pump water-heater outdoor unit
13	Case
14	Machine room
15	Fan room
16	Partition plate
17	Electrical component storage box
18	Bottom plate
181	Bottom surface
182	Edge portion
183	Corner portion
19	Front panel
20	Side panel
21	Top panel
22	Service panel
23	Grille
24	Soundproofing material placement portion
241	First side
242	Second side
243	Upper surface
244	Drain flow path
245	Inlet
246	Outlet
25	Suction muffler
26	Suction pipe
27	Discharge pipe
28	Bolt
29	Vibration isolation member
30	Compressor leg portion
31	Nut
32, 33	Soundproofing material
36	Drain hole
41	Leg portion
42	Connection portion cover
43	Hole
44	Hole
50	Tank unit
52	Hot water storage tank
53	Water pump
54	Flow path switching valve
55	Bypass flow path
56, 57	External piping
58	Tank upper pipe
100	Heat pump hot water supply system

Claims

1. A heat pump water-heater outdoor unit comprising:

a bottom plate having a rectangular bottom surface;
a compressor provided on the bottom plate, the compressor compressing a refrigerant;
a soundproofing material covering a side surface of the compressor; and
a soundproofing material placement portion provided on the bottom plate, the soundproofing material placement portion holding a lower end of the soundproofing material at a position higher than the bottom surface,
wherein the soundproofing material placement portion is configured to cover one corner portion that is closest to the compressor out of corner portions of the bottom plate.

2. The heat pump water-heater outdoor unit according to claim 1,
wherein the bottom plate includes an edge portion which extends upward from each side of the bottom surface, and
wherein the soundproofing material placement portion is configured to hold the lower end of the soundproofing material at a position higher than an upper end of the edge portion.

3. The heat pump water-heater outdoor unit according to claim 1 or 2,
wherein a drain flow path for allowing drainage to flow is formed on a lower surface of the soundproofing material placement portion facing the bottom surface.

4. The heat pump water-heater outdoor unit according to claim 3,
wherein an evaporator is disposed on a rear surface side of the heat pump water-heater outdoor unit,
wherein a drain hole for discharging the drainage is formed in the bottom surface, and
wherein the soundproofing material placement portion is configured such that an inlet of the drain flow

path is opened toward the evaporator, and an outlet of the drain flow path is opened toward the drain hole.

5. The heat pump water-heater outdoor unit according to claim 4,
wherein the soundproofing material placement portion is configured such that an opening of the inlet is larger than an opening of the outlet.

6. The heat pump water-heater outdoor unit according to any one of claims 1 to 5,
wherein the soundproofing material placement portion is configured to surround a periphery of the compressor so as to arc, and
wherein the heat pump water-heater outdoor unit is configured such that the soundproofing material placement portion is placeable on the bottom plate in a state in which the compressor is disposed on the bottom plate.

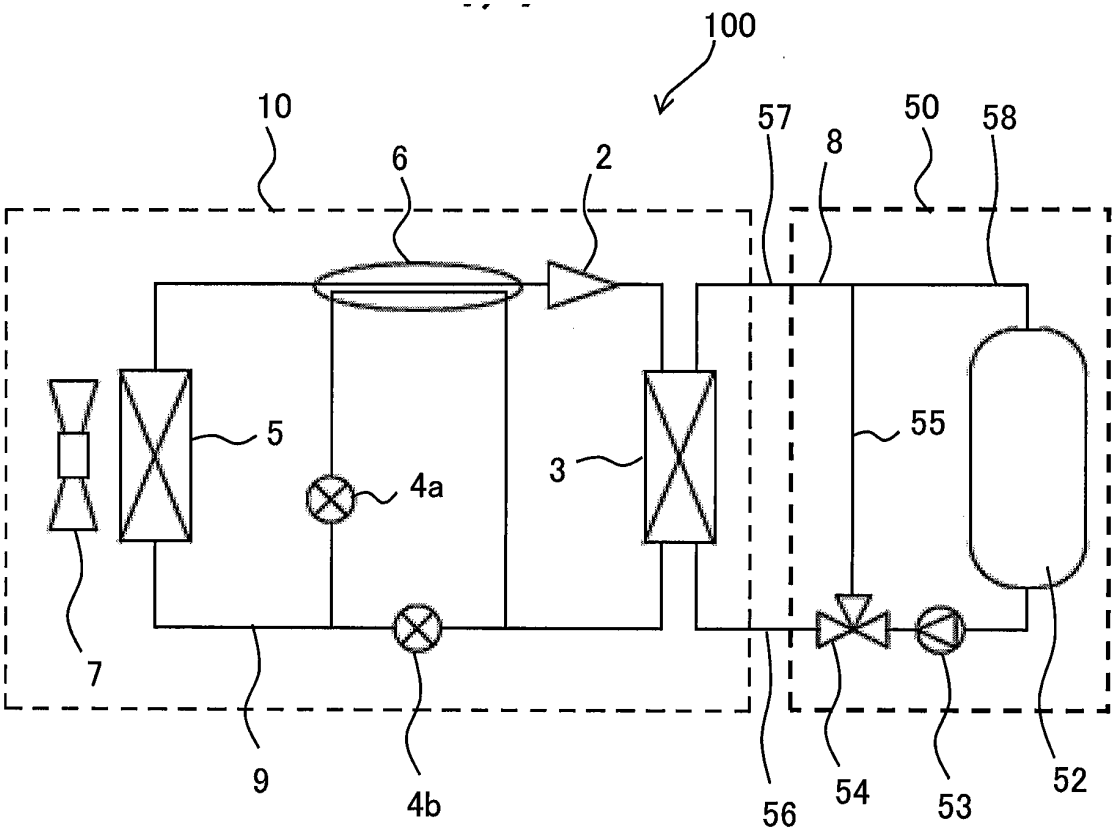
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FIG. 1

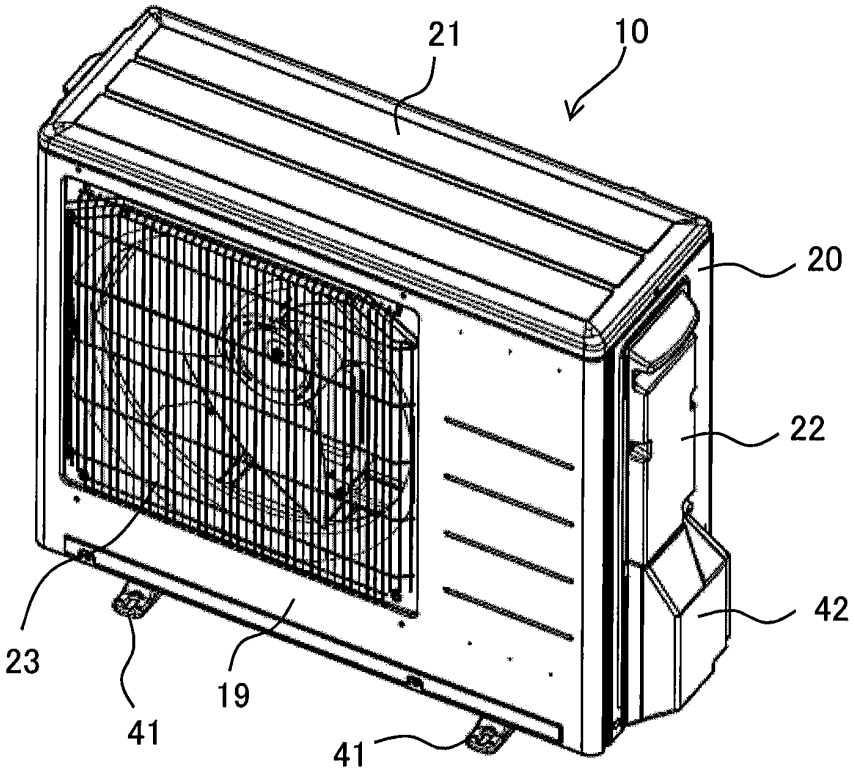
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FIG. 2

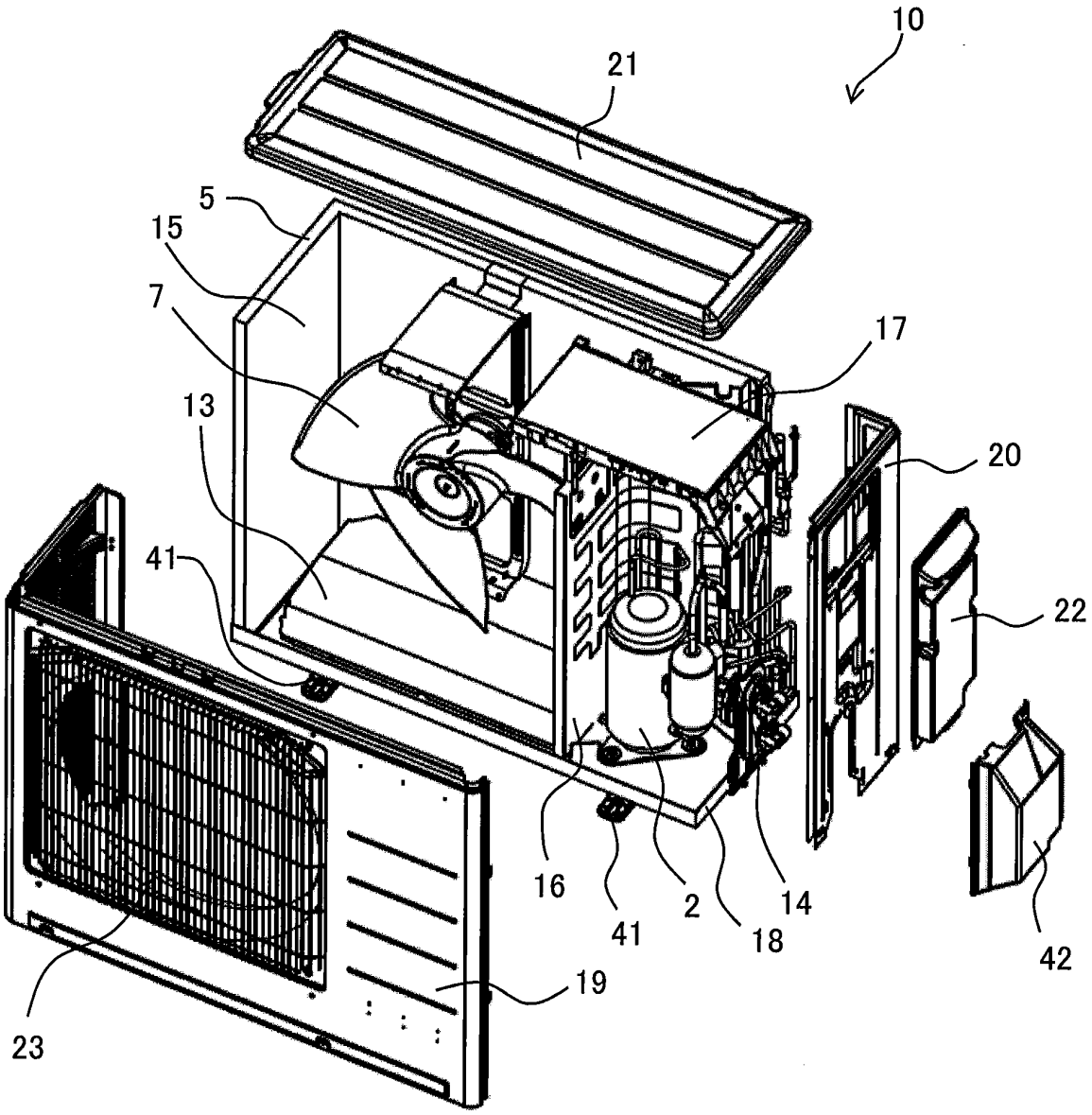

FIG. 3

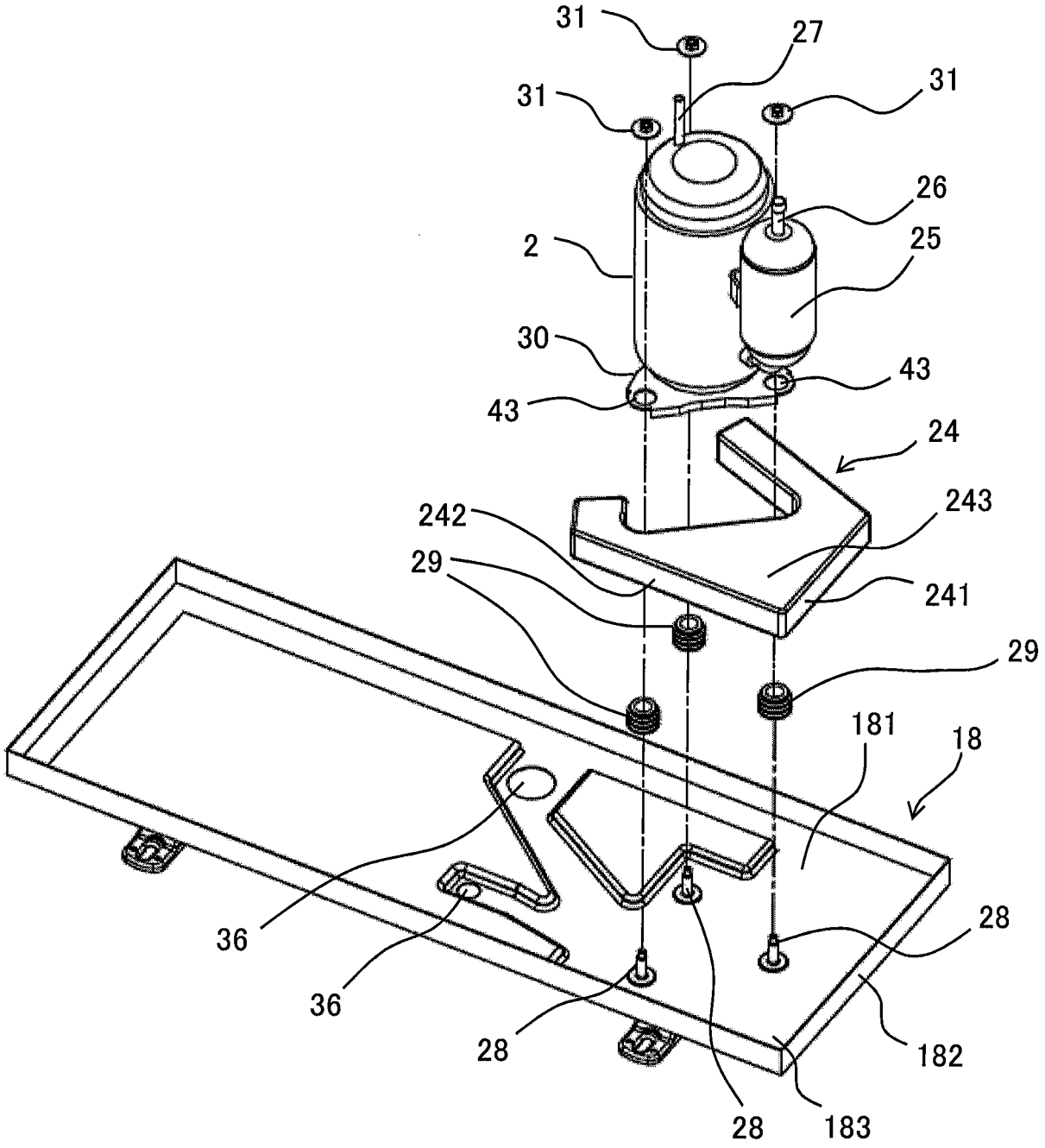
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FIG. 4

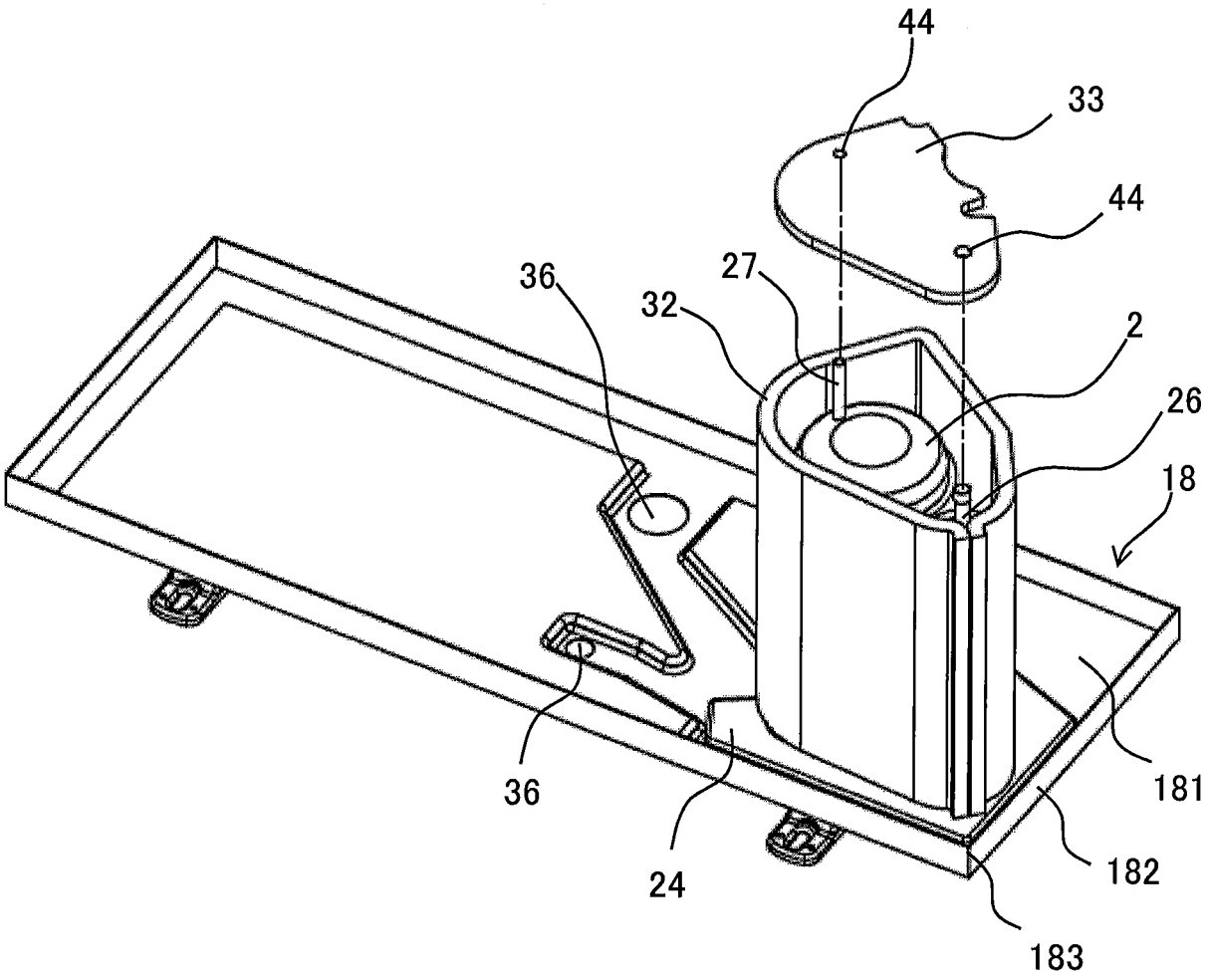

FIG. 5

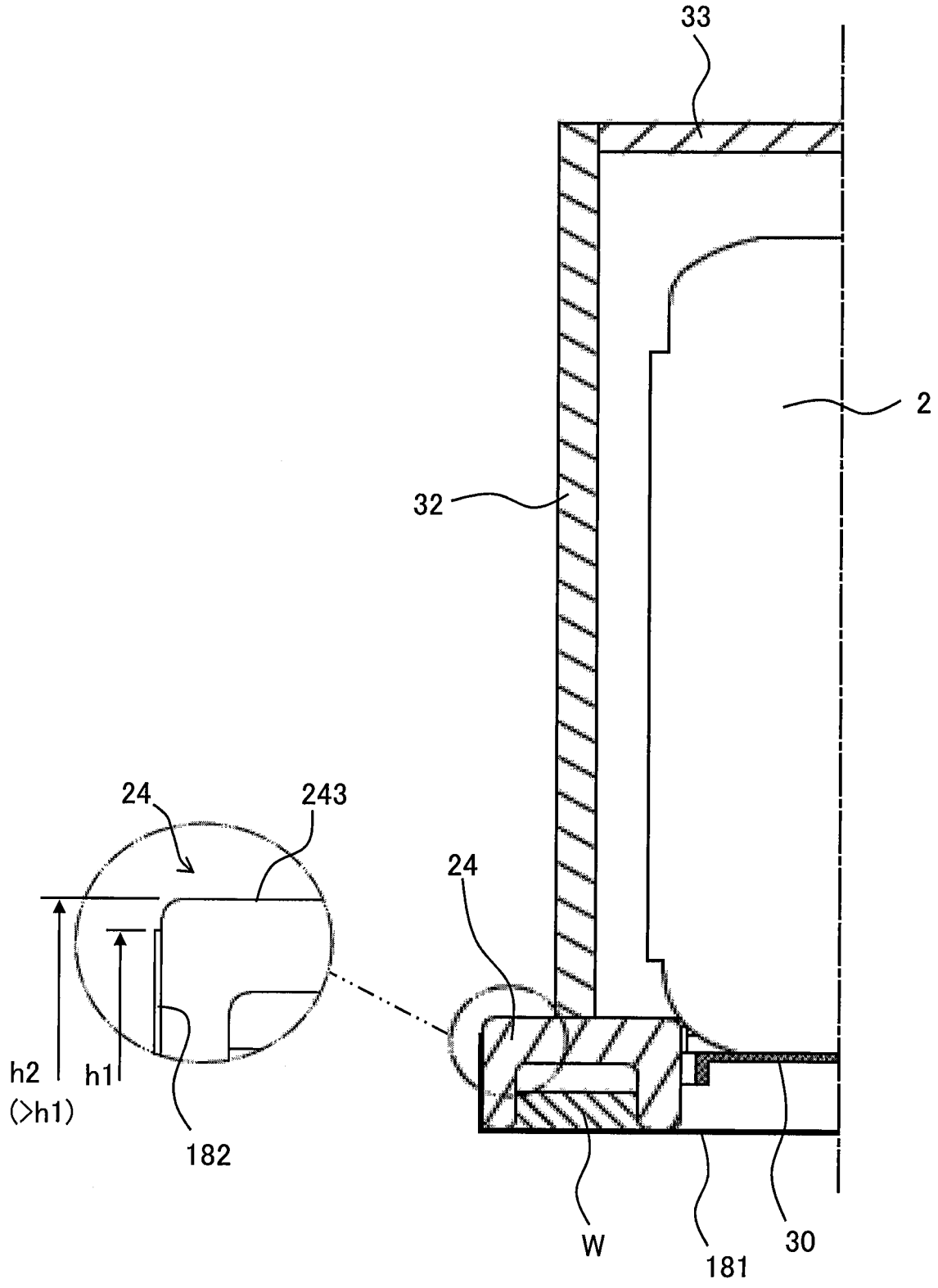

FIG. 6

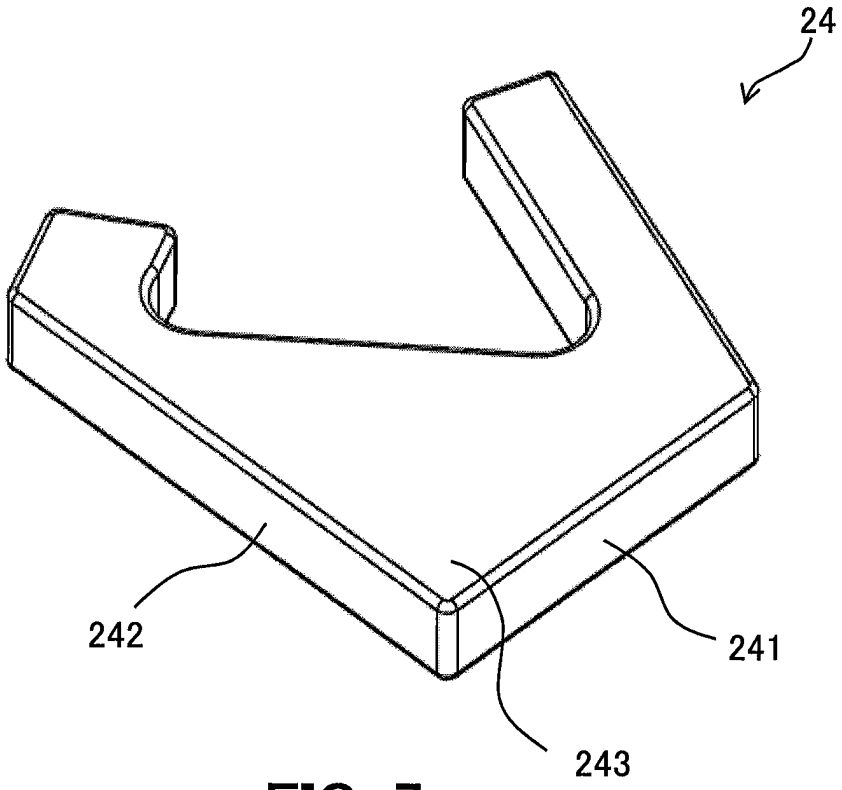

FIG. 7

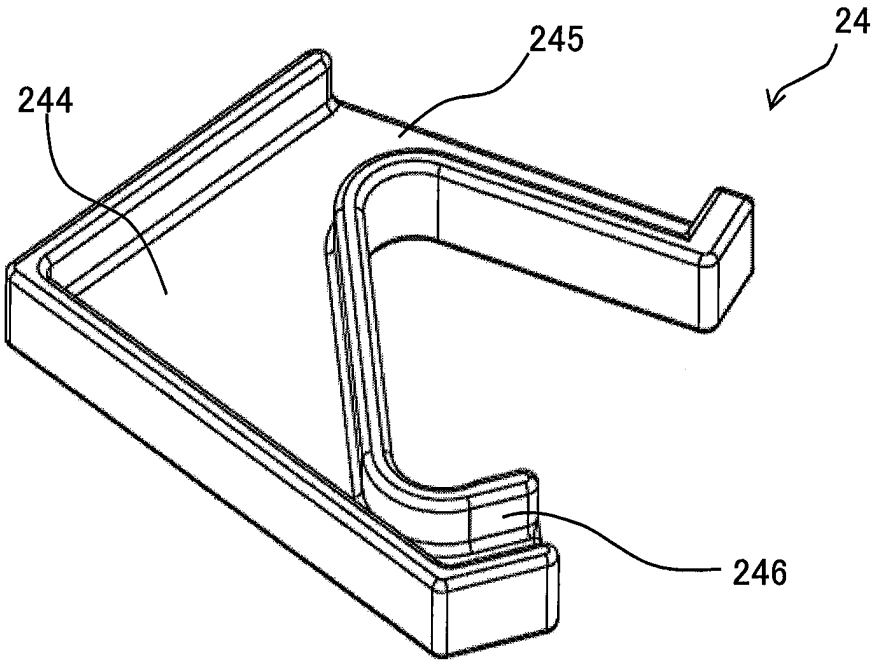

FIG. 8

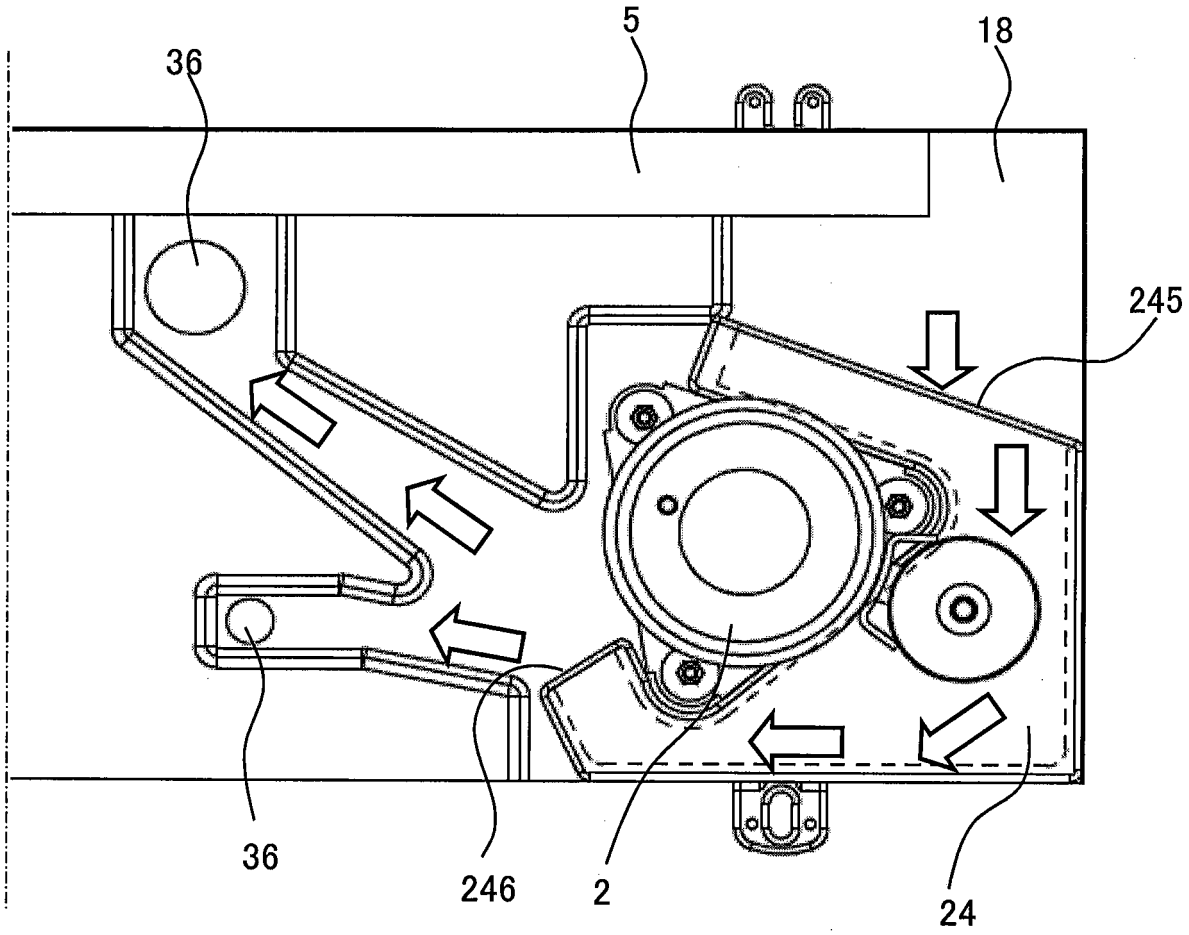

FIG. 9

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2018/001994

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl. F24F1/12(2011.01)i, F24F1/10(2011.01)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)
Int.Cl. F24F1/12, F24F1/10

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

Published examined utility model applications of Japan	1922-1996
Published unexamined utility model applications of Japan	1971-2018
Registered utility model specifications of Japan	1996-2018
Published registered utility model applications of Japan	1994-2018

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.
X A	JP 2011-94955 A (MITSUBISHI ELECTRIC CORPORATION) 12 May 2011, paragraphs [0027]-[0031], fig. 6, 7 (Family: none)	1-2 3-6
A	JP 7-19531 A (TOSHIBA CORPORATION) 20 January 1995, paragraphs [0019], [0020], fig. 1, 2 (Family: none)	1-6

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

* Special categories of cited documents:
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"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	Date of mailing of the international search report
13.04.2018	24.04.2018

Name and mailing address of the ISA/	Authorized officer
Japan Patent Office 3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan	Telephone No.

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

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2018/001994

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2013-88003 A (DAIKIN INDUSTRIES, LTD.) 13 May 2013, paragraph [0036], fig. 4 (Family: none)	1-6
A	JP 2005-241197 A (KIMURA KOHKI CO., LTD.) 08 September 2005, paragraphs [0008]-[0012], fig. 1-4 (Family: none)	1-6

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2013053827 A **[0004]**