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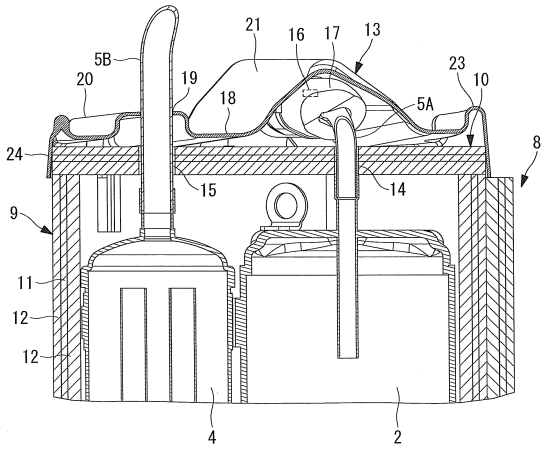
(54) COMPRESSOR SOUND-INSULATING STRUCTURE AND AIR CONDITIONER PROVIDED WITH COMPRESSOR HAVING THE SAME

(57) This sound-insulating structure is for covering the periphery of the compressor (2) and sound insulation of the compressor. A top-portion sound-insulating member (10) that is installed at a top portion of the compressor (2) is provided with a cover member (13) that covers a upper surface of the top-portion sound-insulating member (10), the cover member (13) has un upper surface (18) which is a surface that is inclined downward in a direction in which drain liquid is drained, and the inclined upper surface (18) is provided with a step portion (20) that is provided with a through-hole (19) through which an intake pipe (5B) passes and that is made higher than a surrounding area and a tunnel-like protrusion portion (21) that protrudes upward and in which a discharge pipe (5A) provided with a discharge temperature sensor (16) is disposed.

FIG. 3



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Description

{Technical Field}

[0001] The present invention relates to a compressor sound-insulating structure that achieves sound insulation by covering the periphery of a compressor by using a sound-insulating member, and relates to an air conditioner provided with a compressor having the same.

{Background Art}

[0002] When operated, compressors installed in air conditioners or the like generate rotational noise from a motor, mechanical noise from operation of a compression mechanism, vibrational noise due to pulsation of refrigerant, and so forth, and they act as noise sources. Because of this, a compressor is normally installed in a state in which the periphery of the compressor is covered with a sound-insulating member, thereby being sound insulated and soundproofed. Patent Literature 1 discloses an example of such a compressor sound-insulating structure.

[0003] The invention disclosed in Patent Literature 1 employs a soundproofing cover member that covers a top portion of a compressor and that has a stacked structure made of a sound-insulating material and a sound absorbing material. Also, the sound-insulating material has a cylindrical portion that is integrally formed therewith around a through-hole, through which a refrigerant pipe passes, and that extends in a direction of the pipe, and a slit portion through which the refrigerant pipe passes is provided so as to extend from an end of the sound-insulating material to the tip of the cylindrical portion of the through-hole, thus providing sound insulation against the noise from the compressor by using the cylindrical portion having a certain dimension in the height direction.

{Citation List}

{Patent Literature}

[0004] {PTL 1} Japanese Unexamined Patent Application, Publication No. 2012-122700

{Summary of Invention}

{Technical Problem}

[0005] However, the object of the invention disclosed in Patent Literature 1 is to enhance the sound-insulating function of the sound-insulating structure, and, in the case in which condensation drips onto the cover member that covers the top portion of the compressor, the invention does not have a function for preventing the condensation from entering the interior of the compressor through the cover member. Although a compressor is generally installed on a bottom surface of a machinery space, various devices, such as various refrigerant pipes and valves, is usually disposed in the upper space thereof, and, in the case in which elements, such as low-temperature pipes, an accumulator, or the like, is disposed in the upper space, condensation occurs on the surfaces thereof, and drips onto the cover member in the form of drain liquid.

[0006] Because the cylindrical portions is formed around the through-hole through which the refrigerant pipe passes, the drain liquid does not enter the interior of the compressor directly from the through-hole. However, there is a risk of the drain liquid entering the interior of the compressor from the slit portion that allows the refrigerant pipe to pass through the through-hole. In addition, in the case in which the cylindrical portion is not provided, there is a risk of the drain liquid entering the interior of the compressor directly from the through-hole, and, in this case, the drain liquid drips onto a main unit and terminals of the compressor, thus causing corrosion of and short circuiting in the compressor main unit.

[0007] In addition, a discharge pipe of the compressor is provided with a discharge temperature sensor. When this discharge temperature sensor is externally exposed, there is a risk of the drain liquid dripping onto the discharge temperature sensor, which causes malfunctioning and deterioration of the temperature-detection precision due to heat dissipation to the outside, and, because this causes deterioration of the controllability and control precision of various control functions based on detection values thereof, countermeasures against this are required.

[0008] The present invention is made in light of the above-described circumstances, and an object thereof is to provide a compressor sound-insulating structure with which, by appropriately handling drain liquid that drips onto a sound-insulating member covering a top portion of the compressor, it is possible to prevent the drain liquid from dripping onto a main unit and terminals of the compressor, a discharge temperature sensor, electrical wiring connected to the front side of the compressor, or the like, thus causing short circuiting, malfunctioning, corrosion, and so forth, and another object is to provide an air conditioner provided with a compressor having this sound-insulating structure.

{Solution to Problem}

[0009] In order to make an improvement in the above-described circumstances, a compressor sound-insulating structure and an air conditioner provided with a compressor using this sound-insulating structure according to the present invention employ the following solutions.

[0010] Specifically, a compressor sound-insulating structure according to a first aspect of the present invention is a compressor sound-insulating structure for sound insulation of a compressor by covering a periphery of the compressor by using a sound-insulating member, comprising: a top-portion sound-insulating member that is

mounted on an upper portion of the compressor; and a cover member that covers an upper surface of the top-portion sound-insulating member, wherein the cover member has an upper surface which is a surface that is inclined downward toward a position at which drain liquid is drained from the upper surface, and the inclined upper surface is provided with a step portion that is provided with a through-hole through which an intake pipe passes and that is made higher than a surrounding area, and a tunnel-like protrusion portion that protrudes upward and in which a discharge pipe provided with a discharge temperature sensor is disposed.

[0011] With the first aspect of the present invention, the top-portion sound-insulating member installed at the top portion of the compressor is provided with the cover member that covers the upper surface thereof, the cover member has the upper surface which is a surface that is inclined in the drain-liquid draining direction, and this inclined upper surface is provided with the step portion that is provided with the through-hole through which the intake pipe passes and that is made higher than the surrounding area, and the tunnel-like protrusion portion that protrudes upward and in which the discharge pipe provided with the discharge temperature sensor is disposed. Therefore, even if condensation occurs at the surfaces of pipes, devices, or the like disposed above the compressor and drips onto the compressor in the form of drain liquid, the cover member having the upper surface which is a surface that is inclined downward in the drain-liquid draining direction receives the drain liquid, and thus, it is possible to quickly drain the drain liquid along the inclined surface in a specific draining direction, such as towards the rear side of the compressor. In addition, because the through-hole for the intake pipe provided at the upper surface of the cover member is provided in the step portion that is made higher than the surrounding area, it is possible to prevent the drain liquid from entering the cover member from the through-hole and reaching the main unit of the compressor, and, in addition, the tunnel-like protrusion portion that protrudes upward and that is provided at the upper surface of the cover member covers the discharge pipe and the discharge temperature sensor disposed on the inner-surface side thereof, and thus, it is possible to shield the discharge pipe and the discharge temperature sensor from the outside air. Therefore, it is possible to prevent accumulation of drain liquid on the top-portion sound-insulating member, as well as short circuiting, malfunctioning, corrosion, or the like caused by drain liquid entering and dripping onto the main unit and the terminals of the compressor, the discharge temperature sensor, the electrical wiring connected to the front side of the compressor, or the like. In addition, because it is possible to suppress heat dissipation to the outside at a position closer to the compressor and to detect the discharge temperature by using the discharge temperature sensor, it is possible to increase the detection precision of the discharge temperature and to enhance the controllability based thereon.

[0012] In addition, with the compressor sound-insulating structure of the present invention, in a compressor sound-insulating structure of a second aspect of the present invention, the step portion extends from the periphery of the through-hole to an outer-circumferential edge portion of the cover member and a slit portion is provided between the outer-circumferential edge portion and the through-hole.

[0013] With the second aspect of the present invention, because the step portion extends from the periphery of the through-hole to the outer-circumferential edge portion of the cover member and because the slit portion is provided between this outer-circumferential edge portion and the through-hole, it is possible to make the intake pipe pass through the through-hole provided in the step portion via the slit portion extending to the outer-circumferential edge portion of the cover member, and, in addition, it is also possible to prevent drain liquid from entering the cover member from the slit portion. Therefore, it is possible to reliably prevent drain liquid from entering the main unit and the terminals of the compressor while ensuring ease of installation of the cover member.

[0014] In addition, in the compressor sound-insulating structure of a third aspect of the present invention, which can be configured with any one of the above-described compressor sound-insulating structures, the cover member is provided with a bank at an outer-circumferential edge portion of the upper surface thereof, and the outer-circumferential edge portion does not include the bank at a lower portion of the downward inclined surface from which drain liquid is drained.

[0015] With the third aspect of the present invention, because the bank is provided at the upper surface of the cover member at the outer-circumferential edge portion, excluding the lower portion of the downward inclined surface from which the drain liquid is drained, it is possible to guide the drain liquid that has dripped onto the upper surface of the cover member in a specific draining direction by means of the bank, which makes it possible to prevent the drain liquid from being drained from the outer-circumferential edge portion in directions other than the specific draining direction. Therefore, it is possible to always drain the drain liquid that has dripped onto the upper surface of the cover member in a specific direction, that is, towards a position close to a draining port on the rear side or the like of the compressor.

[0016] In addition, in the compressor sound-insulating structure of a fourth aspect of the present invention, which can be configured with any one of the above-described compressor sound-insulating structures, the cover member is provided with, at an outer-circumferential edge portion thereof, a downward-bent flange portion that engages with an edge of the top-portion sound-insulating member.

[0017] With the fourth aspect of the present invention, because the downward-bent flange portion that engages with the edge of the top-portion sound-insulating member is provided at the outer-circumferential edge portion of

the cover member, by installing the cover member by engaging the bent flange portion provided at the outer-circumferential edge portion of the cover member with the edge of the top-portion sound-insulating member, it is possible to install the cover member in a state in which the position thereof is set by being oriented in a predetermined direction with the rotation thereof prevented. Therefore, it is possible to reliably drain the drain liquid in the specific direction by always setting the inclination direction of the cover member to a certain direction.

[0018] In addition, in the compressor sound-insulating structure of a fifth aspect of the present invention, which can be configured with the above-described compressor sound-insulating structure, a part of the bent flange portion is provided with an engagement checking portion whose height is made higher than the other area of the flange portion.

[0019] With the fifth aspect of the present invention, because the engagement checking portion whose height is made higher than other portions is provided at a portion of the bent flange portion, the engagement checking portion comes into contact with the upper surface of the top-portion sound-insulating member and becomes unnaturally inclined when the bent flange portion provided at the outer-circumferential edge portion of the cover member is not correctly engaged with the edge of the top-portion sound-insulating member, and therefore, it is possible to easily and visually recognize an installation error of the cover member. Therefore, the cover member can accurately be assembled without an error in a state in which it is difficult to visually recognize the error in the housing interior.

[0020] In addition, in the compressor sound-insulating structure of a sixth aspect of the present invention, which can be configured with any one of the above-described compressor sound-insulating structures, the top-portion sound-insulating member is installed in a substantially horizontal manner on an upper portion of a body-portion sound-insulating member that covers an outer circumference of a body of the compressor, and the cover member is provided with an inwardly protruding portion that contacts with the upper surface of the horizontally-installed top-portion sound-insulating member and that causes the cover member to be inclined in a drain-liquid draining direction.

[0021] With the sixth aspect of the present invention, because the top-portion sound-insulating member is installed in a substantially horizontal manner on the top portion of the body-portion sound-insulating member that covers the outer circumference of the body portion of the compressor, and, because the cover member is provided with the inwardly protruding portion that is molded therein, that comes into contact with the upper surface of the horizontally-installed top-portion sound-insulating member, and that causes the cover member to be installed with an inclination in the drain-liquid draining direction, by installing the cover member in such a way that the inwardly protruding portion molded in the cover member is in contact with the upper surface of the horizontally-installed top-portion sound-insulating member, it is possible to install the cover member in such a way that the upper surface thereof is always inclined in the specific direction. Therefore, it is possible to facilitate inclined installation of the cover member and also to reliably ensure satisfactory drain-liquid draining function.

[0022] In addition, in the compressor sound-insulating structure of a seventh aspect of the present invention, which can be configured with any one of the above-described compressor sound-insulating structures, the top-portion sound-insulating member is installed in a substantially horizontal manner on a top portion of a body-portion sound-insulating member that covers an outer circumference of a body of the compressor, and the top-portion sound-insulating member is provided with a step portion that contacts with an inner surface of the cover member and that causes the cover member to be inclined in a drain-liquid draining direction.

[0023] With the seventh aspect of the present invention, because the top-portion sound-insulating member is installed in a substantially horizontal manner at the top portion of the body-portion sound-insulating member that covers the outer circumference of the body portion of the compressor, and, because the top-portion sound-insulating member is provided with the step portion that comes into contact with the inner surface of the cover member and that causes the cover member to be installed with an inclination in the drain-liquid draining direction, by installing the cover member in such a way that the inner surface thereof is in contact with the step portion provided at the upper surface of the horizontally-installed top-portion sound-insulating member, it is possible to install the cover member in such a way that the upper surface thereof is always inclined in the specific direction. Therefore, it is possible to facilitate inclined installation of the cover member and also to reliably ensure satisfactory drain-liquid draining function.

[0024] In addition, an air conditioner of an eighth aspect of the present invention is provided with a compressor that is sound insulated by using any one of the above-described compressor sound-insulating structures.

[0025] With the eighth aspect of the present invention, because a compressor sound insulated by using any one of the above-described compressor sound-insulating structures is installed, it is possible to prevent accumulation of drain liquid on the sound-insulating member that sound insulates the compressor by covering the outer circumferential portion of the compressor, as well as short circuiting, malfunctioning, corrosion, or the like caused by dripping of the drain liquid onto the main unit and the terminals of the compressor, the discharge temperature sensor, electrical wiring connected to the front side of the compressor, or the like, and it is also possible to detect the discharge temperature by using the discharge temperature sensor while suppressing heat dissipation to the outside at a position closer to the compressor. Therefore, it is possible to increase the detection

precision of the discharge temperature and to enhance the controllability based thereon. Therefore, it is possible to protect the compressor from the drain liquid generated around the compressor and to increase the reliability thereof, and it is also possible to enhance the controllability and the control precision of various control functions employing the discharge temperature sensor.

{Advantageous Effects of Invention}

[0026] With a compressor sound-insulating structure of the present invention, even if condensation occurs at surfaces of pipes, devices, or the like disposed above a compressor and drips onto the compressor in the form of drain liquid, a cover member having an upper surface which is a surface that is inclined downward in a drain-liquid draining direction receives the drain liquid, and thus, it is possible to quickly drain the drain liquid along the downward inclined surface in a specific draining direction, such as towards the rear side of the compressor. In addition, because the through-hole for the intake pipe provided at the upper surface of the cover member is provided in the step portion that is made higher than the surrounding area, it is possible to prevent the drain liquid from entering the cover member from the through-hole and reaching the main unit of the compressor main unit, and, in addition, the tunnel-like protrusion portion that protrudes upward and that is provided at the upper surface of the cover member covers the discharge pipe and the discharge temperature sensor disposed on the inner-surface side thereof, and thus, it is possible to shield the discharge pipe and the discharge temperature sensor from the outside air. Therefore, it is possible to prevent accumulation of drain liquid on the top-portion sound-insulating member, as well as short circuiting, malfunctioning, corrosion, or the like caused by drain liquid entering and dripping onto the main unit and the terminals of the compressor, the discharge temperature sensor, the electrical wiring connected to the front side of the compressor, or the like. In addition, because it is possible to suppress heat dissipation to the outside at a position closer to the compressor and to detect the discharge temperature by using the discharge temperature sensor, it is possible to increase the detection precision of the discharge temperature and to enhance the controllability based thereon.

[0027] With an air conditioner of the present invention, because it is possible to prevent accumulation of drain liquid on the sound-insulating member that sound insulates the compressor by covering the outer circumferential portion of the compressor, as well as short circuiting, malfunctioning, corrosion, or the like caused by dripping of the drain liquid onto the main unit and the terminals of the compressor, the discharge temperature sensor, electrical wiring connected to the front side of the compressor, or the like, and also, because it is possible to detect the discharge temperature by using the discharge temperature sensor while suppressing heat dissipation to the outside at a position closer to the compressor, it is possible to increase the detection precision of the discharge temperature and to enhance the controllability based thereon, and therefore, it is possible to protect the compressor from the drain liquid generated around the compressor and to increase the reliability thereof, and it is also possible to enhance the controllability and the control precision of various control functions employing the discharge temperature sensor.

{Brief Description of Drawings}

[0028]

{Fig. 1} Fig. 1 is a perspective view showing a state in which a front cover of an air-conditioner outdoor unit provided with a compressor according to a first embodiment of the present invention is removed.

{Fig. 2} Fig. 2 is a perspective view showing a state in which a cover member of a sound-insulating member that covers a top portion of the compressor is removed.

{Fig. 3} Fig. 3 is a cross-sectional view of a compressor sound-insulating structure according to the first embodiment of the present invention taken along A-A in Fig. 5.

{Fig. 4} Fig. 4 is a cross-sectional view of the compressor sound-insulating structure taken along B-B in Fig. 5.

{Fig. 5} Fig. 5 is a perspective view of the cover member of the sound-insulating member that covers the top portion of the compressor in the compressor sound-insulating structure, as viewed from the front side.

{Fig. 6} Fig. 6 is a perspective view of the cover member, as viewed from the rear side.

{Fig. 7} Fig. 7 is a perspective view of a cover member of a sound-insulating member that covers a top portion of a compressor according to a second embodiment of the present invention, as viewed from the front side.

{Description of Embodiments}

[0029] Embodiments according to the present invention will be described below with reference to the drawings.

{First Embodiment}

[0030] A first embodiment of the present invention will be described below using Figs. 1 to 6.

[0031] Fig. 1 is a perspective view showing a state in which a front cover of an air-conditioner outdoor unit provided with a compressor according to the first embodiment of the present invention is removed, Fig. 2 is a perspective view showing a state in which a cover member of a sound-insulating member that covers a top portion

of the compressor is removed, Fig. 3 is a cross-sectional view of a compressor sound-insulating structure taken along A-A in Fig. 5, and Fig. 4 shows a cross-sectional view taken along B-B in Fig. 5.

[0032] Air-conditioner outdoor devices, including a compressor 2, a four-way valve (not shown), an outdoor heat exchanger (not shown), a unit accumulator 3, and a compressor accumulator 4 (see Fig. 3), various refrigerant pipes 5 that connect them, an outdoor fan 6 that guides outdoor air to the outdoor heat exchanger, a control box 7, and so forth are disposed inside an air-conditioner outdoor unit 1. Among the outdoor devices, the outdoor heat exchanger and the outdoor fan 6 are disposed in the heat-exchanger-chamber in the outdoor unit 1, and the other devices are disposed in the machinery space.

[0033] The compressor 2 is installed on the bottom surface of the outdoor unit 1 through vibration isolation mounts and is also sound insulated and soundproofed by covering the periphery of the compressor 2 by using a sound-insulating member 8. The sound-insulating member 8 is provided with a body-portion sound-insulating member 9 that is mounted like a belly band around the outer circumference of bodies of the compressor 2 and the compressor accumulator 4, which are mounted as a single unit, and a top-portion sound-insulating member 10 that is installed in a substantially horizontal manner at an opening end of the top portion of the body-portion sound-insulating member 9 so as to cover the top portions of the compressor 2 and the compressor accumulator 4. Because the outer diameter of the top-portion sound-insulating member 10 is slightly greater on the compressor 2 side than the outer diameter thereof on the compressor-accumulator 4 side, the planar shape thereof is a deformed gourd shape.

[0034] As shown in Figs. 3 and 4, the body-portion sound-insulating member 9 and the top-portion sound-insulating member 10 both have a three-layer stacked structure in which a sound absorbing material 12, such as a felt material or the like, is attached on both sides of a cover material 11 made of an olefin sheet or the like, and provide sound insulation and soundproofing against noise from the compressor 2, such as rotational noise from a motor, mechanical noise from a compression mechanism, vibrational noise due to pulsation of refrigerant, or the like. In addition, a hat-shaped cover member 13 made of an olefin sheet or the like is mounted so as to be engaged with the upper surface of the top-portion sound-insulating member 10 so as to cover an upper surface of the top-portion sound-insulating member 10.

[0035] The top-portion sound-insulating member 10 is provided with through-holes 14 and 15 through which at least two of the refrigerant pipes, namely, a refrigerant discharge pipe 5A connected to the compressor 2 and a refrigerant intake pipe connected to the compressor 2 via the compressor accumulator 4, pass. In addition, at a position of the refrigerant discharge pipe 5A close to the compressor 2, a discharge temperature sensor 16, such as a thermistor or the like, is installed at a pipe surface thereof by being wrapped from outside with an insulating material 17 so that the temperature of the refrigerant discharged from the compressor 2 can be detected.

[0036] As shown in Figs. 3 to 6, the hat-shaped cover member 13 forms an inclined surface that is inclined downward on the rear side (back side) of the compressor 2 when an upper surface 18 thereof is placed above the upper surface of the top-portion sound-insulating member 10. When condensation occurs at surfaces of various pipes or devices disposed in the portion above the compressor 2 and when condensation therefrom drips onto the cover member 13 in the form of drain liquid, this inclined surface made of the upper surface 18 guides and drains the drain liquid along the downward inclined surface in a specific direction corresponding to the rear side (back side) of the compressor 2.

[0037] In addition, the upper surface 18 that is inclined downward to the rear side is provided with a step portion 20, which is provided with a through-hole 19 through which a refrigerant intake pipe 5B passes and which is higher than the surrounding area, and a tunnel-like protrusion portion 21 that protrudes upward and in which the refrigerant discharge pipe 5A, having the discharge temperature sensor 16 installed thereon, is disposed so as to extend in a horizontal direction.

[0038] The step portion 20 provided with the through-hole 19 extends from the periphery of the through-hole 19 to an outer-circumferential edge portion of the cover member 13, and a slit portion 22 that allows the refrigerant intake pipe 5B to pass therethrough is provided between the outer-circumferential edge portion and the through-hole 19, and the cover member 13 can be mounted so as to allow the refrigerant intake pipe 5B to pass through the through-hole 19 via the slit portion 22. On the other hand, the tunnel-like protrusion portion 21 that protrudes upward extends from the front side of the cover member 13 rearward to the outer-circumferential edge portion, and the refrigerant discharge pipe 5A on which the discharge temperature sensor 16 is installed can be provided so as to extend toward the rear side, in the space between the inner surface of the tunnel-like protrusion portion 21 and the upper surface of the top-portion sound-insulating member 10 so that the upper portion of the refrigerant discharge pipe 5A is covered.

[0039] In addition, as shown in Figs. 5 and 6, a bank 23 having a predetermined height is provided at the upper surface 18 of the cover member 13 on the front side of the outer-circumferential edge portion, excluding a lower portion of the downward inclined surface on the rear side from which the drain liquid is drained so that the drain liquid that has dripped onto the upper surface 18 can reliably be guided by the bank 23 in a specific draining direction on the rear side so as to prevent the drain liquid that has dripped onto the upper surface 18 of the cover member 13 from being drained from the front side of the compressor 2.

[0040] In addition, a bent flange portion 24 that is bent substantially vertically downward is provided over the entire circumference at the outer-circumferential edge portion of the cover member 13. As shown in Figs. 3 and 4, this bent flange portion 24 can engage with the edge of the top-portion sound-insulating member 10 whose planar shape is a deformed gourd shape. Furthermore, as shown in Fig. 6, an engagement checking portion 25 in which the flange height is made higher than the other portions of the flange portion is provided at a portion of the bent flange portion 24 at the rear side, and, with this engagement checking portion 25, it is possible to visually check the assembled state of the cover member 13 inside the unit, that is to say, the state of engagement of the bent flange portion 24 and the edge of the top-portion sound-insulating member 10.

[0041] In addition, the cover member 13 is provided with inwardly protruding portions 26 that are integrally molded at two locations at the front side with a distance therebetween and that cause the cover member 13 to always be installed with the upper surface 18 thereof inclined in the drain-liquid draining direction, by coming into contact with the upper surface of the top-portion sound-insulating member 10 that is installed in a substantially horizontal manner on the top portion of the body-portion sound-insulating member 9, which covers the outer circumference of the body portion of the compressor 2. As shown in Fig. 4, the cover member 13 is stably installed by coming into contact with the upper surface of the top-portion sound-insulating member 10 at the bottom surfaces of the inwardly protruding portions 26 at the two locations on the front side where the upper surface 18 is made higher, and by a portion of the bottom surface on the rear side where the upper surface 18 is made lower coming into contact with the outer-circumferential edge portion of the upper surface of the top-portion sound-insulating member 10.

[0042] This embodiment having the above-described configuration can achieve the following advantages.

[0043] Noise emitted to the surrounding area when the compressor 2 is operated, such as motor rotational noise, mechanical noise from a compression mechanism, vibrational noise due to pulsation of refrigerant or the like, is reduced due to sound insulation and sound absorption by the sound-insulating member 8 that covers the outer circumference of the compressor 2. On the other hand, depending on the operating conditions, condensation sometimes occurs at the surfaces of various refrigerant pipes and devices disposed in the upper portion of the machinery space in which the compressor 2 is installed, and, in some cases, drain liquid is formed therefrom and drips onto the cover member 13 that covers the upper surface of the top-portion sound-insulating member 10 installed at the top portion of the compressor 2.

[0044] Thus, the upper surface 18 of the cover member 13 that covers the upper surface of the top-portion sound-insulating member 10 is a surface that is inclined downward in the drain-liquid draining direction, and this inclined upper surface 18 is provided with the step portion 20, which is provided with the through-hole 19 through which the refrigerant intake pipe 5B passes and which is made higher than the surrounding area, and the tunnel-like protrusion portion 21, which protrudes upward and in which the refrigerant discharge pipe 5A provided with the discharge temperature sensor 16 is disposed.

[0045] Because of this, even if condensation occurs at the surfaces of pipes, devices, or the like disposed above the compressor 2 and drips onto the compressor 2 in the form of drain liquid, the cover member 13 having the upper surface 18 which is a surface that is inclined downward in the drain-liquid draining direction receives the drain liquid, and thus, it is possible to quickly drain the drain liquid along the inclined surface in a specific draining direction such as the rear side of the compressor 2.

[0046] In addition, because the through-hole 19 for the refrigerant intake pipe 5B provided at the upper surface of the cover member 13 is provided in the step portion 20 that is made higher than the surrounding area, it is possible to prevent the drain liquid from flowing toward the through-hole 19, entering the cover member 13 therefrom, and reaching the main unit and terminals of the compressor 2, and, in addition, the tunnel-like protrusion portion 21 that protrudes upward and that is provided at the upper surface 18 of the cover member 13 covers the refrigerant discharge pipe 5A and the discharge temperature sensor 16 disposed on the inner-surface side thereof, and thus, it is possible to shield the refrigerant discharge pipe 5A and the discharge temperature sensor 16 from outside air.

[0047] In this way, with this embodiment, it is possible to prevent accumulation of drain liquid on the top-portion sound-insulating member 10 that covers the top portion of the compressor 2, as well as short circuiting, malfunctioning, corrosion, or the like caused by drain liquid entering and dripping onto the main unit and the terminal of the compressor 2, the discharge temperature sensor 16, the electrical wiring connected to the front side of the compressor 2, or the like. In addition, because it is possible to suppress heat dissipation to the outside at a position closer to the compressor and to detect the discharge temperature by using the discharge temperature sensor, it is possible to increase the detection precision of the discharge temperature and to enhance the controllability based thereon.

[0048] In addition, because the above-described step portion 20 extends from the periphery of the through-hole 19 to the outer-circumferential edge portion of the cover member 13 and because the slit portion 22 is provided between this outer-circumferential edge portion and the through-hole 19, it is possible to make the refrigerant intake pipe 5B pass through the through-hole 19 provided in the step portion 20 via the slit portion 22 extending to the outer-circumferential edge portion of the cover member 13, and, in addition, it is also possible to prevent drain liquid from entering the cover member 13 from the slit portion 22. Therefore, it is possible to reliably prevent

drain liquid from entering the main unit and the terminals of the compressor 2 while ensuring ease of installation of the cover member 13.

[0049] In addition, because the bank 23 is provided at the upper surface 18 of the cover member 13 at the outer-circumferential edge portion, excluding the lower portion of the downward inclined surface from which the drain liquid is drained, it is possible to guide the drain liquid that has dripped onto the upper surface 18 of the cover member 13 in a specific draining direction, that is, towards the rear side of the compressor 2, by means of the bank 23, which makes it possible to prevent the drain liquid from being drained from the outer-circumferential edge portion in directions other than the specific draining direction, that is, towards the rear side of the compressor 2. Therefore, it is possible to always drain the drain liquid that has dripped onto the upper surface 18 of the cover member 13 in the specific direction, that is, towards a position close to a draining port on the rear side or the like of the compressor.

[0050] In addition, the downward-bent flange portion 24 that engages with the edge of the top-portion sound-insulating member 10 is provided at the outer-circumferential edge portion of the cover member 13. Because of this, by installing the cover member 13 by engaging the bent flange portion 24 provided at the outer-circumferential edge portion of the cover member 13 with the edge of the top-portion sound-insulating member 10, it is possible to install the cover member 13 in a state in which the position thereof is set by being oriented in a predetermined direction with the rotation thereof prevented, and, by doing so, it is possible to reliably drain the drain liquid in the specific direction by always setting the inclination direction of the cover member 13, which is provided around a single refrigerant intake pipe 5B, to a certain direction by preventing rotation thereof.

[0051] Furthermore, because the engagement checking portion 25 whose height is made higher than the other portions of the flange portion is provided at a portion of the bent flange portion 24, the engagement checking portion 25 comes into contact with the upper surface of the top-portion sound-insulating member 10 and becomes unnaturally inclined when the bent flange portion 24 provided at the outer-circumferential edge portion of the cover member 13 is not correctly engaged with the edge of the top-portion sound-insulating member 10. Therefore, it is possible to easily and visually recognize an installation error of the cover member 13, and, accordingly, the cover member 13 can accurately be assembled without any error in a state in which it is conventionally difficult to visually recognize the error in the housing interior.

[0052] In addition, in this embodiment, because the top-portion sound-insulating member 10 is installed in a nearly horizontal manner at the top portion of the body-portion sound-insulating member 9 that covers the outer circumference of the body portion of the compressor 2, and, because the cover member 13 is provided with, at two locations on the front side where the upper surface 18 is made higher, the integrally-molded inwardly protruding portions 26 that come into contact with the upper surface of the horizontally-installed top-portion sound-insulating member 10, and that cause the cover member 13 to be installed with an inclination in the drain-liquid draining direction, by installing the cover member 13 in such a way that the inwardly protruding portions 26 molded in the cover member 13 are in contact with the upper surface of the horizontally-installed top-portion sound-insulating member 10, it is possible to stably install the cover member 13 in such a way that the upper surface thereof is always inclined in the specific direction. Therefore, it is possible to facilitate inclined installation of the cover member 13 and also to reliably ensure satisfactory drain-liquid draining function.

[0053] In addition, by installing the compressor 2 that is sound insulated in the manner described above in an air conditioner, because it is possible to prevent accumulation of drain liquid on the sound-insulating member 8 that sound insulates the compressor 2 by covering the outer circumferential portion thereof, as well as short circuiting, malfunctioning, corrosion, or the like caused by dripping of drain liquid onto the main unit and the terminals of the compressor 2, the discharge temperature sensor 16, the electrical wiring connected to the front side of the compressor 2, or the like, and also, because it is possible to suppress heat dissipation to the outside at a position closer to the compressor 2 and to detect the discharge temperature by using the discharge temperature sensor 16, it is possible to increase the detection precision of the discharge temperature and to enhance the controllability based thereon. As a result, it is possible to protect the compressor 2 from the drain liquid generated around the compressor 2 and to increase the reliability thereof, and it is also possible to enhance the controllability and the control precision of various control functions using the discharge temperature sensor 16.

{Second Embodiment}

[0054] Next, a second embodiment of the present invention will be described using Fig. 7.

[0055] This embodiment differs from the above-described first embodiment in that a inwardly protruding portion 26 is not provided in a cover member 13A. Because other points are the same as those of the first embodiment, descriptions thereof will be omitted.

[0056] As shown in Fig. 7, with this embodiment, unlike the first embodiment, the inwardly protruding portions 26 are not molded in a cover member 13A. As an alternative to the inwardly protruding portion 26, a step portion (not shown) having a predetermined height is provided at a predetermined position of the upper surface of the top-portion sound-insulating member 10 in order to install the cover member 13 so that the upper surface 18 thereof is always inclined in the drain-liquid draining direction.

[0057] As described above, by providing, at the upper surface of the top-portion sound-insulating member 10,

the step portion that comes into contact with an inner surface of the cover member 13A and that causes the cover member 13A to be installed with an inclination in the drain-liquid draining direction, it is also possible to install the cover member 13A in such a way that the upper surface thereof is always inclined in the specific direction by installing the cover member 13A in such a way that the inner surface of the cover member 13A is in contact with the step portion provided at the upper surface of the horizontally-installed top-portion sound-insulating member 10. Therefore, it is possible to facilitate inclined installation of the cover member 13A and also to reliably ensure satisfactory drain-liquid draining function.

[0058] Note that, the present invention is not limited to the invention according to the above-described embodiments, and appropriate modifications are possible within a range that does not depart from the scope thereof. For example, in the embodiments described above, although an example in which the compressor 2 and the compressor accumulator 4, which is mounted to form a single unit therewith, are covered together by using the sound-insulating member 8 has been described, in the case in which the compressor accumulator 4 is separately installed, it is sufficient to cover only the compressor 2 with the sound-insulating member 8, and it is needless to say that the present invention encompasses a unit having such a configuration.

[0059] In addition, in the above-described embodiments, although an example in which the body-portion sound-insulating member 9 and the top-portion sound-insulating member 10 that constitute the sound-insulating member 8 both have a three-layer stacked structure in which a sound absorbing material 12, such as a felt material or the like, is attached on both sides of the cover material 11 made of an olefin sheet or the like has been described, the sound-insulating member 8 is not limited thereto, and any configuration can be employed so long as sound insulating and soundproofing functions are included.

{Reference Signs List}

[0060]

1 air-conditioner outdoor unit
2 compressor
5A refrigerant discharge pipe
5B refrigerant intake pipe
8 sound-insulating member
9 body-portion sound-insulating member
10 top-portion sound-insulating member
13 cover member
16 discharge temperature sensor
18 upper surface
19 through-hole
20 step portion
21 tunnel-like protrusion portion
22 slit portion
23 bank
24 bent flange portion
25 engagement checking portion
26 depressed portion

Claims

1. A compressor sound-insulating structure for sound insulation of a compressor (2) by covering a periphery of the compressor (2) by using a sound-insulating member (8), the compressor sound-insulating structure comprising:

   a top-portion sound-insulating member (10) that is mounted on an upper portion of the compressor (2); and
   a cover member (13; 13A) that covers an upper surface of the top-portion sound-insulating member (10), wherein
   the cover member (13; 13A) has an upper surface (18) which is a surface that is inclined downward toward a position at which drain liquid is drained from the upper surface (18), and
   the inclined upper surface (18) is provided with a step portion (20) that is provided with a through-hole (19) through which an intake pipe (58) passes and that is made higher than a surrounding area, and a tunnel-like protrusion portion (21) that protrudes upward and in which a discharge pipe (5A) provided with a discharge temperature sensor (16) is disposed.

2. The compressor sound-insulating structure according to Claim 1, wherein the step portion (20) extends from a periphery of the through-hole (19) to an outer-circumferential edge portion of the cover member (13; 13A) and a slit portion (22) is provided between the outer-circumferential edge portion and the through-hole (19).

3. The compressor sound-insulating structure according to Claim 1 or 2, wherein the cover member (13; 13A) is provided with a bank (23) at an outer-circumferential edge portion of the upper surface (18) thereof, and the outer-circumferential edge portion does not include the bank (23) at a lower portion of the downward inclined surface (18) from which drain liquid is drained.

4. The compressor sound-insulating structure according to any one of Claims 1 to 3, wherein the cover member (13; 13A) is provided with, at an outer-circumferential edge portion thereof, a downward-bent flange portion (24) that engages with an edge of the top-portion sound-insulating member (10).

5. The compressor sound-insulating structure accord-

ing to Claim 4, wherein a part of the bent flange portion (24) is provided with an engagement checking portion (25) whose height is made higher than the other area of the flange portion (24).

6. The compressor sound-insulating structure according to any one of Claims 1 to 5, wherein the top-portion sound-insulating member (10) is installed in a substantially horizontal manner on an upper portion of a body-portion sound-insulating member (9) that covers an outer circumference of a body of the compressor (2), and the cover member (13) is provided with an inwardly protruding portion (26) that contacts with the upper surface of the horizontally-installed top-portion sound-insulating member (10) and that causes the cover member (13) to be inclined in a drain-liquid draining direction.

7. The compressor sound-insulating structure according to any one of Claims 1 to 5, wherein the top-portion sound-insulating member (10) is installed in a substantially horizontal manner on a top portion of a body-portion sound-insulating member (9) that covers an outer circumference of a body of the compressor (2), and the top-portion sound-insulating member (10) is provided with a step portion that contacts with an inner surface of the cover member (13A) and that causes the cover member (13A) to be inclined in a drain-liquid draining direction.

8. An air conditioner comprising:

a compressor (2) that is sound insulated by using a compressor sound-insulating structure according to any one of Claims 1 to 7.

FIG. 1

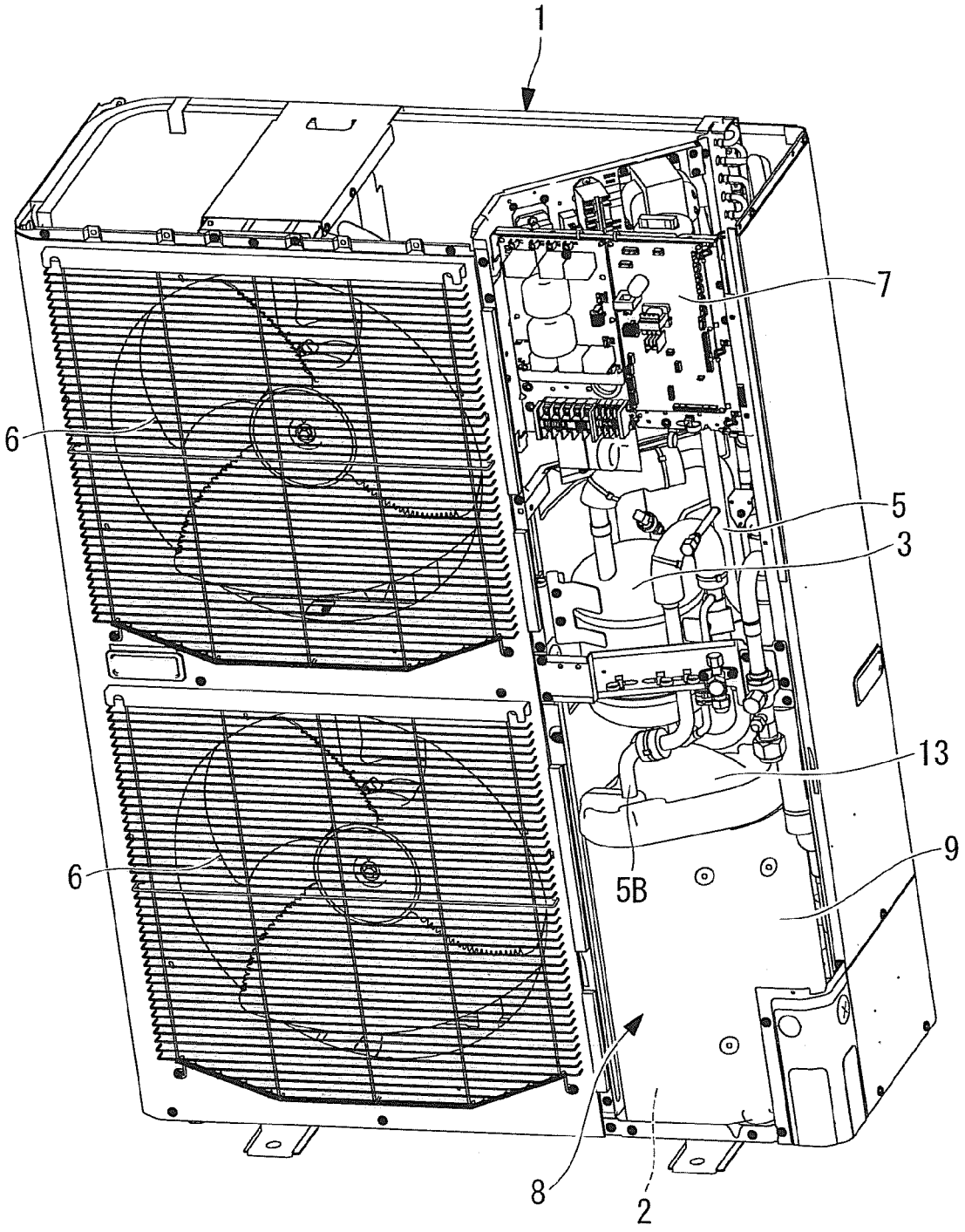


FIG. 2

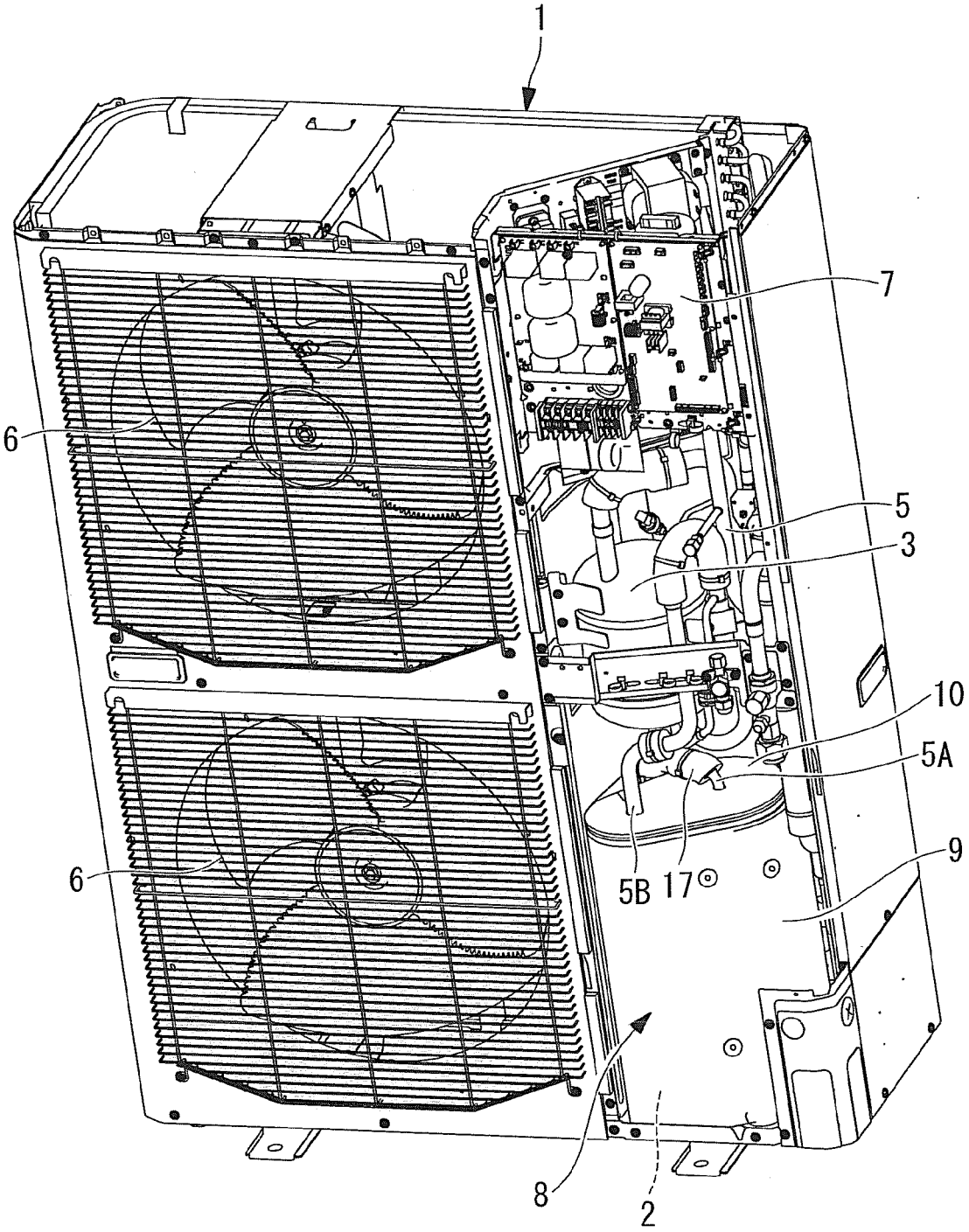


FIG. 3

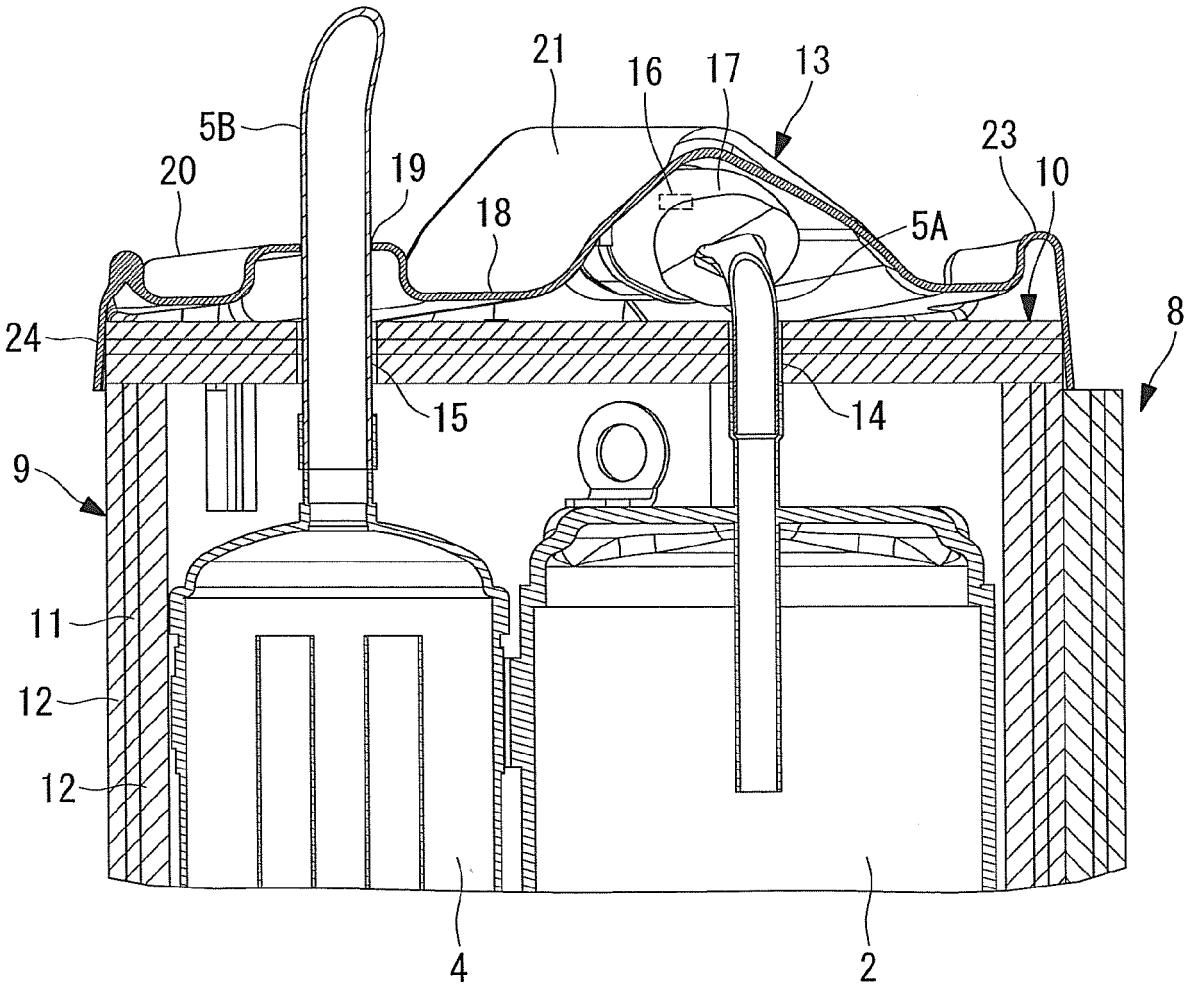


FIG. 4

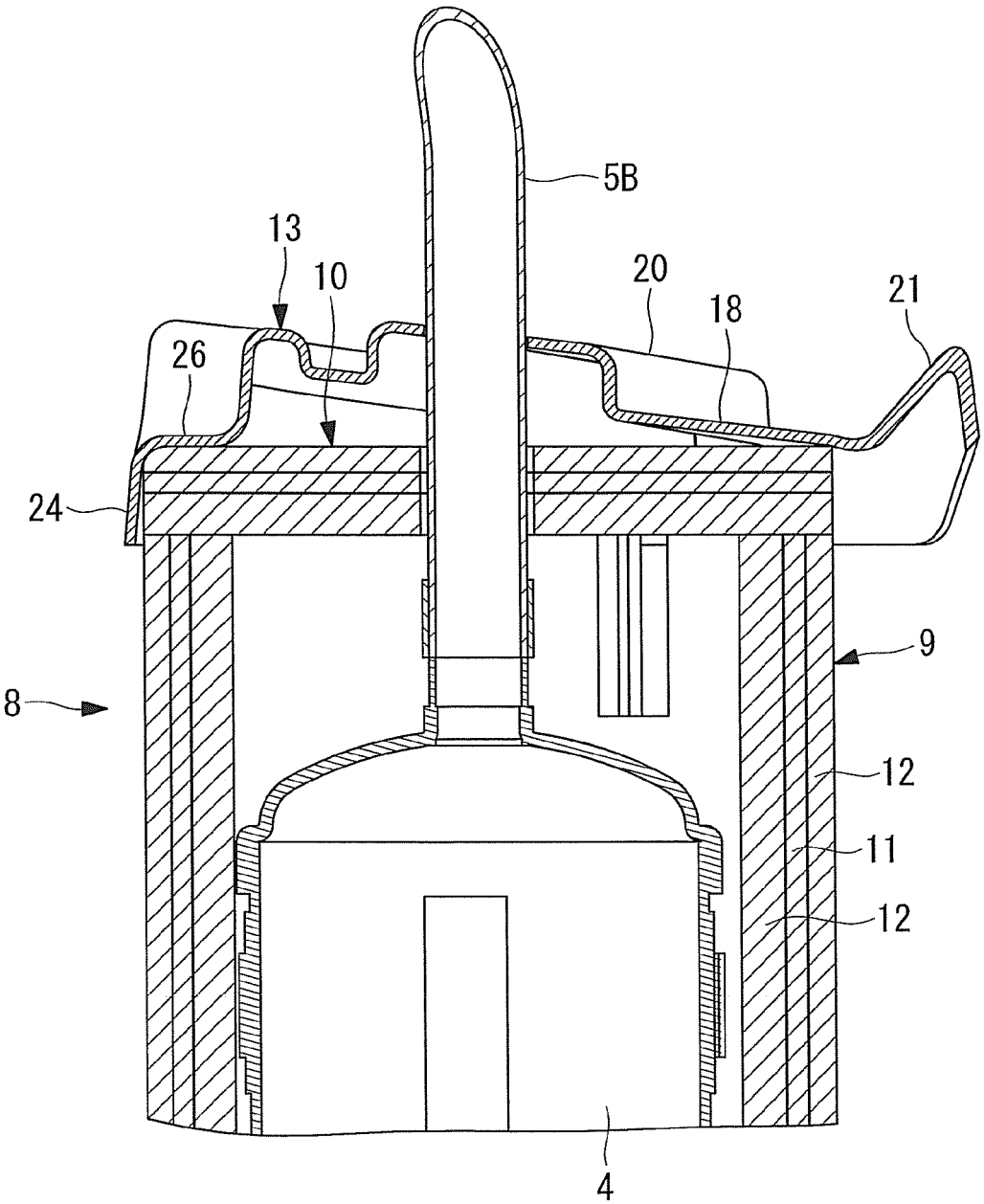


FIG. 5

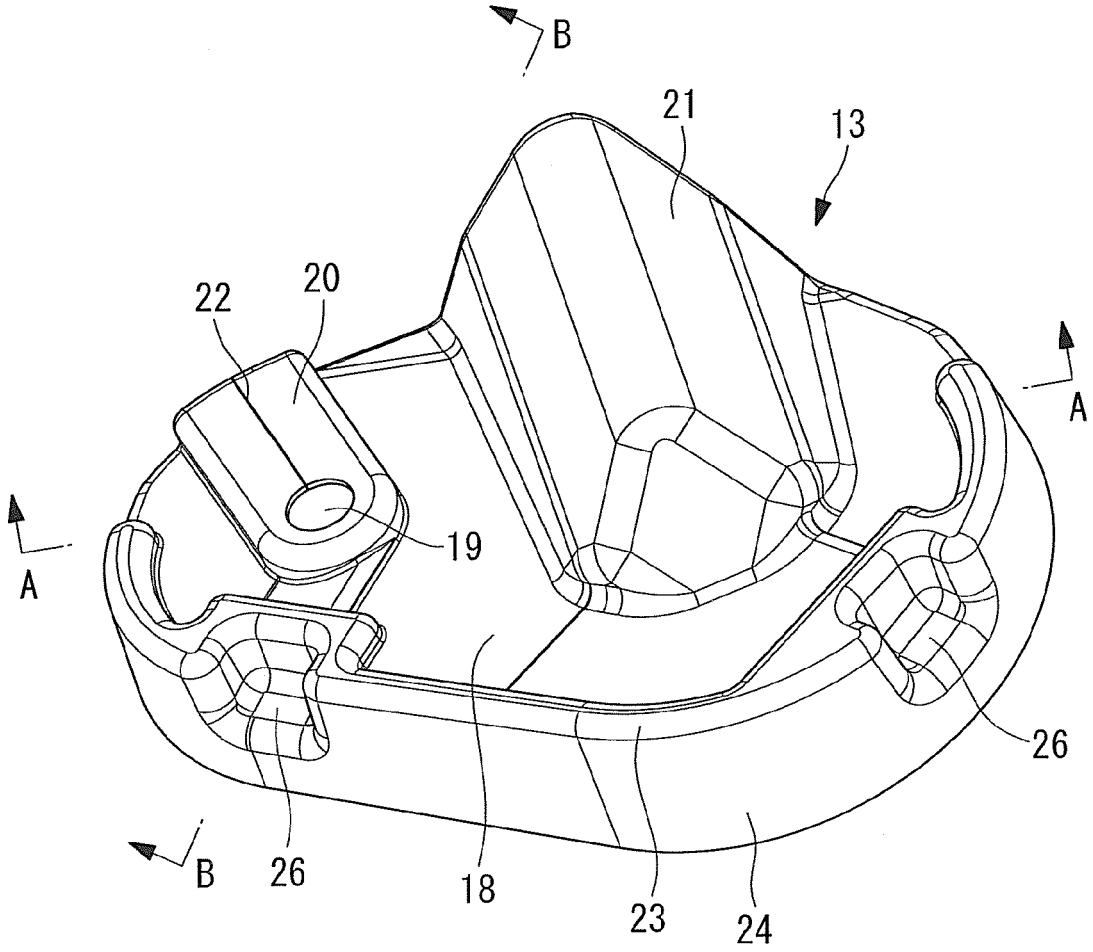


FIG. 6

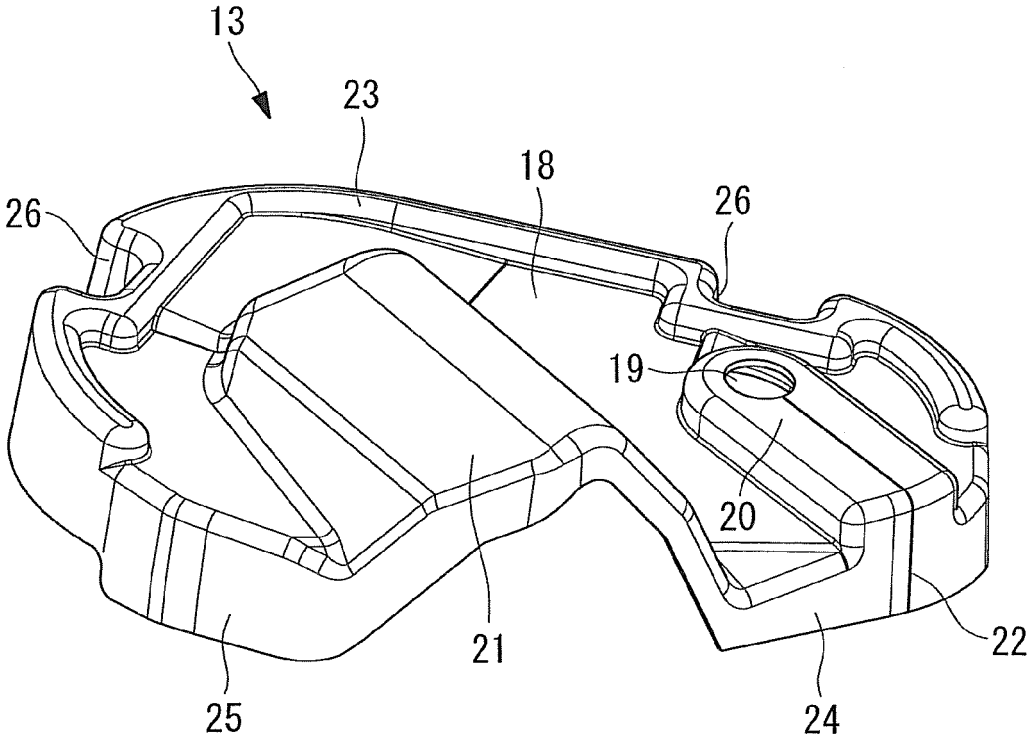
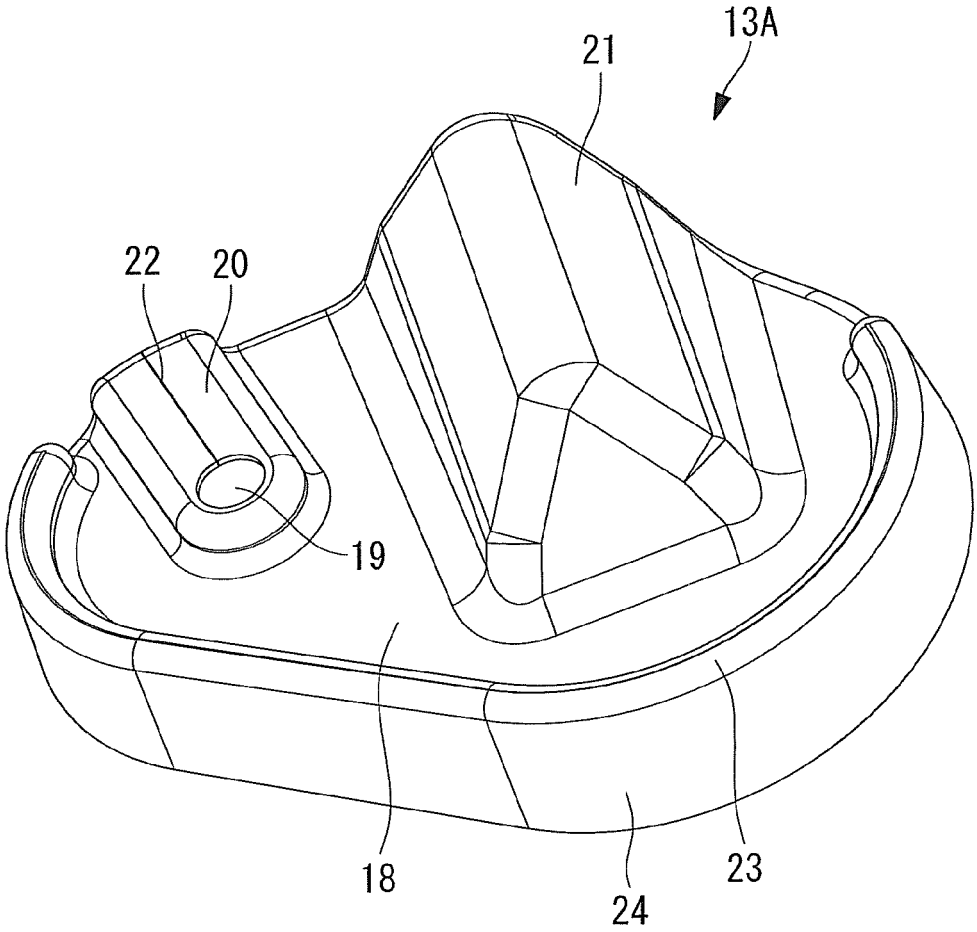


FIG. 7



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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