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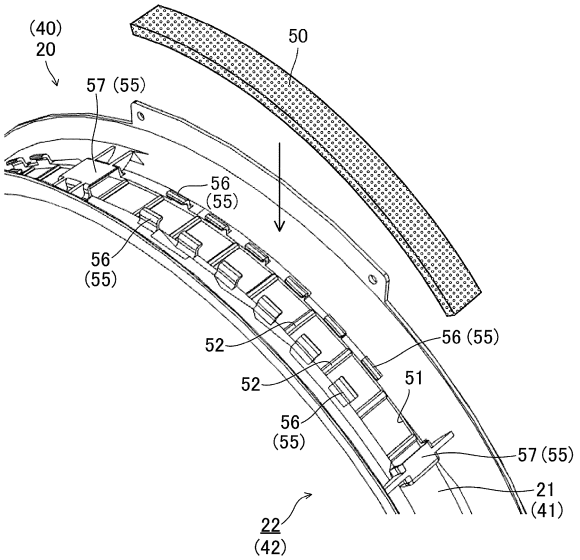
(54) BLOWER DEVICE, HEAT SOURCE-SIDE UNIT, USE-SIDE UNIT, AND METHOD FOR MANUFACTURING BLOWER DEVICE

(57) A first bell mouth (20) has a first peripheral wall portion (21) that forms a first air passage (22). The first peripheral wall portion (21) has an opening (51) penetrating in the thickness direction. A porous part (50) is positioned to cover the opening (51). The first peripheral wall portion (21) has the attachment portion (55) configured to attach the porous part (50).

FIG.5



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Description

TECHNICAL FIELD

[0001] The present disclosure relates to a blower, a heat-source-side unit, a utilization-side unit, and a method for manufacturing a blower.

BACKGROUND ART

[0002] Patent Document 1 discloses a fan motor including: a bell mouth (casing) having a cylindrical wind tunnel in a barrel; and a rotor fan provided in the wind tunnel and having a plurality of blades.

[0003] In the fan motor of Patent Document 1, a turbulence prevention member is provided near an air inlet of the barrel. The turbulence prevention member is made of a material through which air can flow, for example, a porous material having many pores.

CITATION LIST

PATENT DOCUMENTS

[0004] Patent Document 1: Japanese Unexamined Patent Publication No. 2007-218150

SUMMARY OF THE INVENTION

TECHNICAL PROBLEM

[0005] In a case of forming the bell mouth with a resin material, it is conceivable to form a porous part serving as the turbulence prevention member in the barrel of the bell mouth by insert molding.

[0006] However, an attempt to mold the porous part integrally with the bell mouth takes much time in molding the porous part, resulting in poor production efficiency.

[0007] It is an object of the present disclosure to improve the production efficiency of a blower provided with a bell mouth including a porous part.

SOLUTION TO THE PROBLEM

[0008] A first aspect of the present disclosure is directed to a blower including: a fan (16, 36); and a bell mouth (20, 40) having a peripheral wall portion (21, 41) forming an air passage (22, 42) through which air transferred by the fan (16, 36) passes, wherein the peripheral wall portion (21, 41) has an opening (51) penetrating in a thickness direction, the blower is provided with a porous part (50) positioned to cover the opening (51), and the peripheral wall portion (21, 41) includes an attachment portion (55) configured to attach the porous part (50).

[0009] According to the first aspect, since the porous part (50) is attached to the peripheral wall portion (21, 41) by the attachment portion (55), it is possible to improve the production efficiency as compared to the case where the porous part (50) is integrated with the bell mouth (20, 40).

[0010] A second aspect of the present disclosure is an embodiment of the blower of the first aspect. In the second aspect, the attachment portion (55) includes a claw (56) configured to fasten the porous part (50).

[0011] According to the second aspect, it is possible to attach the porous part (50) to the peripheral wall portion (21, 41) easily by simply making the porous part (50) fastened by the claws (56).

[0012] A third aspect of the present disclosure is an embodiment of the blower of the first or second aspect. In the third aspect, the porous part (50) extends along a circumferential direction of the peripheral wall portion (21, 41), and the attachment portion (55) includes a holder (57) configured to hold a circumferential end portion of the porous part (50).

[0013] According to the third aspect, it is possible to restrict unintentional displacement of the end portions of the porous part (50).

[0014] A fourth aspect of the present disclosure is an embodiment of the blower of any one of the first to third aspects. In the fourth aspect, the peripheral wall portion (21, 41) has a rib (52) extending across the opening (51).

[0015] According to the fourth aspect, the ribs (52) provided for the opening (51) can ensure the stiffness of the peripheral wall portion (21, 41) even if the opening area of the opening (51) is large.

[0016] A fifth aspect of the present disclosure is an embodiment of the blower of any one of the first to fourth aspects. In the fifth aspect, the attachment portion (55) is provided on an outer peripheral side of the peripheral wall portion (21, 41).

[0017] According to the fifth aspect, providing the attachment portion (55) on the outer peripheral side of the peripheral wall portion (21, 41) can reduce inhibition of the airflow on the inner peripheral side of the peripheral wall portion (21, 41).

[0018] A sixth aspect of the present disclosure is an embodiment of the blower of any one of the first to fifth aspects. In the sixth aspect, the porous part (50) is elastically deformable along a circumferential surface of the peripheral wall portion (21, 41).

[0019] According to the sixth aspect, by elastically deforming the porous part (50) along the circumferential surface of the peripheral wall portion (21, 41), it is possible to make the porous part (50) cover the opening (51) while being in tight contact with the peripheral wall portion (21, 41).

[0020] A seventh aspect of the present disclosure is an embodiment of the blower of any one of the first to sixth aspects. In the seventh aspect, a surface of the porous part (50) is subjected to water-repellent treatment.

[0021] According to the seventh aspect, since moisture is less likely to be deposited on the porous part (50), it is possible to reduce mold on the porous part (50).

[0022] An eighth aspect of the present disclosure is an embodiment of the blower of the seventh aspect. In the

eighth aspect, the porous part (50) has pores penetrating in the thickness direction of the peripheral wall portion (21, 41).

[0023] According to the eighth aspect, even the porous part (50) subjected to water-repellent treatment can release the pressure of the air flowing through the air passage (22, 42) to the outside of the peripheral wall portion (21, 41) via the pores of the porous part (50).

[0024] A ninth aspect of the present disclosure is directed to a heat-source-side unit including: the blower (15) of any one of the first to eighth aspects; a refrigerant circuit (1a) through which a refrigerant flows; and a heat exchanger (14) provided in the refrigerant circuit (1a) and configured to exchange heat between the refrigerant flowing through the refrigerant circuit (1a) and air transferred by the blower (15).

[0025] According to the ninth aspect, the heat-source-side unit including the blower (15), the refrigerant circuit (1a), and the heat exchanger (14) can be provided.

[0026] A tenth aspect of the present disclosure is directed to a utilization-side unit including: the blower (35) of any one of the first to eighth aspects; a refrigerant circuit (1a) through which a refrigerant flows; and a heat exchanger (34) provided in the refrigerant circuit (1a) and configured to exchange heat between the refrigerant flowing through the refrigerant circuit (1a) and air transferred by the blower (35).

[0027] According to the tenth aspect, the utilization-side unit including the blower (35), the refrigerant circuit (1a), and the heat exchanger (34) can be provided.

[0028] An eleventh aspect of the present disclosure is directed to a method for manufacturing a blower, the blower including: a fan (16, 36); and a bell mouth (20, 40) having a peripheral wall portion (21, 41) forming an air passage (22, 42) through which air transferred by the fan (16, 36) passes, the peripheral wall portion (21, 41) having an opening (51) penetrating in a thickness direction, the method comprising: positioning a porous part (50) to cover the opening (51); and attaching the porous part (50) to the peripheral wall portion (21, 41).

[0029] According to the eleventh aspect, the porous part (50) is attached to the peripheral wall portion (21, 41) by covering the opening (51) of the peripheral wall portion (21, 41) with the porous part (50). It is thus possible to improve the production efficiency as compared to the case where the porous part (50) is integrated with the bell mouth (20, 40).

BRIEF DESCRIPTION OF THE DRAWINGS

[0030]

FIG. 1 is a refrigerant circuit diagram showing a configuration of a refrigeration apparatus according to an embodiment.

FIG. 2 is a plan sectional view illustrating a configuration of a heat-source-side unit.

FIG. 3 is a side sectional view illustrating a configuration of a utilization-side unit.

FIG. 4 is a perspective view illustrating a configuration of a bell mouth.

FIG. 5 is a perspective view illustrating the state of the bell mouth before a porous part is attached to a peripheral wall portion.

DESCRIPTION OF EMBODIMENTS

[0031] <Air Conditioner>

[0032] As illustrated in FIG. 1, an air conditioner (1) has a refrigerant circuit (1a) filled with a refrigerant. The refrigerant circuit (1a) performs a vapor compression refrigeration cycle.

[0033] The air conditioner (1) controls the temperature of air in an indoor space. The air conditioner (1) performs a cooling operation and a heating operation. In the cooling operation, the air conditioner (1) cools the air in the indoor space. In the heating operation, the air conditioner (1) heats the air in the indoor space. The air conditioner (1) includes a heat-source-side unit (10) and a utilization-side unit (30).

[0034] The heat-source-side unit (10) is disposed in an outdoor space. The heat-source-side unit (10) includes a compressor (2), a decompression mechanism (3), a four-way switching valve (4), a first heat exchanger (14), and a first blower (15).

[0035] The utilization-side unit (30) is disposed in the indoor space. The utilization-side unit (30) includes a second heat exchanger (34) and a second blower (35).

<Heat-Source-Side Unit>

[0036] As illustrated in FIG. 2, the heat-source-side unit (10) includes an outdoor casing (11). The outdoor casing (11) is formed in a rectangular box shape.

[0037] The interior of the outdoor casing (11) is partitioned into a fan chamber (12) and a machine chamber (13). The first heat exchanger (14) and the first blower (15) are arranged in the fan chamber (12).

[0038] The first heat exchanger (14) exchanges heat between the refrigerant and outdoor air. The first heat exchanger (14) is, for example, a fin-and-tube heat exchanger.

[0039] The first blower (15) includes a first fan (16), a first fan motor (17), and a first bell mouth (20). The first fan (16) is, for example, a propeller fan. The first fan (16) is substantially coaxial with a first peripheral wall portion (21) of the first bell mouth (20). The first fan motor (17) drives the first fan (16) into rotation.

[0040] The first bell mouth (20) is provided on a sidewall on the front side (lower side in FIG. 2) of the outdoor casing (11). The first bell mouth (20) has the first peripheral wall portion (21). The first peripheral wall portion (21) is formed in a cylindrical shape. The first peripheral wall portion (21) forms a first air passage (22). The first peripheral wall portion (21) surrounds part of the outer periphery of the first fan (16).

[0041] The first fan (16) transfers outdoor air. The flow of air is indicated by the hollow arrows in FIG. 2. Outdoor air is sucked into the outdoor casing (11). The outdoor air exchanges heat with the refrigerant when passing through the first heat exchanger (14). The air that has undergone heat exchange is expelled to the outside of the outdoor casing (11) through the first air passage (22) of the first bell mouth (20).

[0042] The compressor (2), the decompression mechanism (3), and the four-way switching valve (4) are arranged in the machine chamber (13). Only the compressor (2) is illustrated in FIG. 2. The compressor (2) compresses the refrigerant. The compressor (2) is a rotary compressor of, for example, an oscillating piston type, a rolling piston type, or a scroll type.

[0043] As illustrated in FIG. 1, the decompression mechanism (3) is, for example, an expansion valve. The decompression mechanism (3) decompresses the refrigerant. The decompression mechanism (3) is an electronic or temperature-sensitive expansion valve.

[0044] The four-way switching valve (4) switches the direction of flow of the refrigerant in the refrigerant circuit (1a). The four-way switching valve (4) switches between a first state indicated by solid curves in FIG. 1 and a second state indicated by broken curves in FIG. 1. The four-way switching valve (4) in the first state makes a discharge side of the compressor (2) and a gas side of the first heat exchanger (14) communicate with each other, and makes a suction side of the compressor (2) and a gas side of the second heat exchanger (34) communicate with each other.

[0045] The four-way switching valve (4) in the second state makes the discharge side of the compressor (2) and the gas side of the second heat exchanger (34) communicate with each other, and makes the suction side of the compressor (2) and the gas side of the first heat exchanger (14) communicate with each other.

<Utilization-Side Unit>

[0046] As illustrated in FIG. 3, the utilization-side unit (30) is, for example, a ceiling-mounted indoor unit. The ceiling-mounted utilization-side unit (30) includes a ceiling-embedded utilization-side unit (30) embedded in the ceiling surface, and a ceiling-suspended utilization-side unit (30) suspended from an upper wall.

[0047] The utilization-side unit (30) includes an indoor casing (31). The indoor casing (31) includes a casing body (31a) and a panel (31b). The casing body (31a) is formed in a rectangular box shape. The casing body (31a) has a lower side that is open.

[0048] The panel (31b) is removably attached to the open side of the casing body (31a). The panel (31b) is provided with a suction grille (32) at the center.

[0049] Four side edge portions of the panel (31b) each have an outlet (33). A flap (39) is disposed in each of the outlets (33).

[0050] The second heat exchanger (34), the second blower (35), and a drain pan (38) are provided in the casing body (31a). The second blower (35) is disposed above the suction grille (32).

[0051] The second blower (35) includes a second fan (36), a second fan motor (37), and a second bell mouth (40). The second fan (36) is, for example, a centrifugal turbo fan. The second fan motor (37) drives the second fan (36) into rotation.

[0052] The second heat exchanger (34) is disposed so as to surround the second fan (36). The second heat exchanger (34) is, for example, a fin-and-tube heat exchanger. The drain pan (38) is disposed below the second heat exchanger (34).

[0053] The second bell mouth (40) is disposed between the suction grille (32) and the second fan (36). The second bell mouth (40) has a second peripheral wall portion (41). The second peripheral wall portion (41) is formed in a cylindrical shape. The second peripheral wall portion (41) forms a second air passage (42).

[0054] The second fan (36) transfers indoor air. The flow of air is indicated by the hollow arrows in FIG. 3. The indoor air is sucked into the indoor casing (31) through the suction grille (32) and the second bell mouth (40).

[0055] The indoor air that has passed through the second air passage (42) of the second bell mouth (40) is sucked into an inlet that is open downward at the center of the second fan (36) and is expelled from an outlet that is open radially outward of the second fan (36). The air expelled from the outlet of the second fan (36) exchanges heat with the refrigerant when passing through the second heat exchanger (34). The air that has undergone heat exchange is supplied to the indoor space through the outlets (33) of the indoor casing (31).

<Porous Part of Bell Mouth>

[0056] The air passing through the first air passage (22) of the first bell mouth (20) in the heat-source-side unit (10) causes separation of the air in the vicinity of the inner surface of the first peripheral wall portion (21), generating a vortex flow easily. The vortex flow generated disturbs the flow of the air passing through the first peripheral wall portion (21) significantly, resulting in generation of noise.

[0057] In the utilization-side unit (30), as well, the air passing through the second air passage (42) of the second bell mouth (40) in the utilization-side unit (30) causes separation of the air in the vicinity of the inner surface of the second peripheral wall portion (41), generating a vortex flow easily. The vortex flow generated disturbs the flow of the air passing through the second peripheral wall portion (41) significantly, resulting in generation of noise.

[0058] To solve such a problem, it is conceivable to provide a porous part (50) having a plurality of successive fine pores for each of the first peripheral wall portion (21) and the second peripheral wall portion (41), so that the pressure of the air flowing through the first air passage (22) and the second air passage (42) be released to the

outside of the first peripheral wall portion (21) and the second peripheral wall portion (41).

[0059] For example, in a case of forming the first bell mouth (20) and the second bell mouth (40) with a resin material, it is conceivable to form the porous part (50) in each of the first peripheral wall portion (21) of the first bell mouth (20) and the second peripheral wall portion (41) of the second bell mouth (40) by insert molding.

[0060] However, an attempt to mold the porous part (50) integrally with each of the first bell mouth (20) and the second bell mouth (40) takes much time in molding the porous part (50), resulting in poor production efficiency. In addition, the pores of the porous part (50) may be squeezed by the resin material, or bonding failures may occur. Thus, many man-hours are required to control molding conditions for the resin material.

[0061] In this embodiment, improvements are made in the production efficiency of the blower (35) having the first bell mouth (20) or the second bell mouth (40) including the porous part (50).

[0062] An embodiment in which the porous part (50) is attached to the first bell mouth (20) will be described below. An embodiment in which the porous part (50) is attached to the second bell mouth (40) is similar to the embodiment in which the porous part (50) is attached to the first bell mouth (20), and thus description thereof will be omitted.

[0063] The configuration similar to that of the first bell mouth (20) can be applied to the second bell mouth (40). Thus, in FIGS. 4 and 5, the reference characters of the second peripheral wall portion (41) and the second air passage (42) of the second bell mouth (40) are shown in parentheses together to correspond to the reference characters of the first peripheral wall portion (21) and the first air passage (22) of the first bell mouth (20).

[0064] As illustrated in FIGS. 4 and 5, the first bell mouth (20) has the first peripheral wall portion (21). The first peripheral wall portion (21) is formed in a cylindrical shape. The first peripheral wall portion (21) forms the first air passage (22).

[0065] An upstream end portion of the first peripheral wall portion (21) in the air flow direction has a tubular shape that is curved such that the inside diameter decreases from the upstream side toward the downstream side. A downstream end portion of the first peripheral wall portion (21) in the air flow direction has a tubular shape that is curved such that the inside diameter increases from the upstream side toward the downstream side.

[0066] The first peripheral wall portion (21) has an opening (51) penetrating in the thickness direction. The opening (51) is formed in the shape of a long hole extending along the circumferential direction. There are a plurality of openings (51) spaced apart from each other in the circumferential direction.

[0067] The porous part (50) extends along the circumferential direction of the first peripheral wall portion (21). The porous part (50) is elastically deformable along the circumferential surface of the first peripheral wall portion (21). The porous part (50) is made of, for example, melamine foam or a sponge material. The materials of the porous part (50) are mere examples and are not limited thereto. The porous part (50) is made of a porous material having many successive fine pores. The average diameter of the pores (air gaps) of the porous part (50) is, for example, in the range of 15 μm to 300 μm. The porosity of the porous part (50) (= the total volume of the air gaps / the entire volume of the porous part) is, for example, in the range of 35% to 90%.

[0068] The porous part (50) is positioned to cover the opening (51). The surface of the porous part (50) is subjected to water-repellent treatment. The pores of the porous part (50) penetrate in the thickness direction of the first peripheral wall portion (21). If the porous part (50) is used outdoors, the porous part (50) is preferably made of a weather-resistant material, or is subjected to weather resistance treatment.

[0069] Each of the openings (51) is provided with a plurality of ribs (52). The ribs (52) extend across the opening (51). The ribs (52) are spaced apart from one another in the circumferential direction.

[0070] The first peripheral wall portion (21) includes an attachment portion (55). The attachment portion (55) is integrated with the first peripheral wall portion (21). The attachment portion (55) is used to attach the porous part (50) to the first peripheral wall portion (21). The attachment portion (55) includes claws (56) and holders (57). The claws (56) and the holders (57) are provided on the outer peripheral side of the first peripheral wall portion (21).

[0071] The claws (56) fasten the porous part (50). The claws (56) are provided along the edge of the opening (51) and are paired so that the claws (56) in pairs are located at the upstream side and the downstream side in the air flow direction and face each other. The porous part (50) is retained between the claws (56) in pairs facing each other with the opening (51) interposed therebetween. Multiple sets of paired claws (56) are spaced apart from one another in the circumferential direction of the first peripheral wall portion (21).

[0072] The holders (57) are located at both circumferential ends of each opening (51). The pair of holders (57) are open on the side that faces a circumferential end portion of the porous part (50). The circumferential end portions of the porous part (50) are held in the openings of the paired holders (57).

[0073] In this embodiment, the porous part (50) is assumed to be attached to each of the first bell mouth (20) and the second bell mouth (40). However, the porous part (50) may be attached to at least one of the first bell mouth (20) or the second bell mouth (40).

<Method for Manufacturing Bell Mouth>

[0074] A procedure in which the porous part (50) is attached to the first bell mouth (20) will be described below. First, the porous part (50) is positioned to cover

the opening (51) of the first peripheral wall portion (21) of the first bell mouth (20). At this moment, the porous part (50) is elastically deformed along the circumferential surface of the first peripheral wall portion (21) and brought into tight contact with the first peripheral wall portion (21).

[0075] In positioning the porous part (50) to cover the opening (51), the porous part (50) may be pushed into a space between the pair of claws (56) from the outside of the first peripheral wall portion (21) in the radial direction, or porous part (50) may be inserted in the circumferential direction so as to pass between the pair of claws (56) from the outside of the first peripheral wall portion (21) in the circumferential direction.

[0076] In attaching the porous part (50) to the first peripheral wall portion (21), the circumferential end portions of the porous part (50) are held in the pair of holders (57) after the opening (51) is covered with the porous part (50). The circumferential end portions of the porous part (50) are attached to the pair of holders (57) in this manner. The porous part (50) is attached to the first peripheral wall portion (21) by being caught by the periphery of the opening (51) of the first peripheral wall portion (21), the pairs of claws (56), and the ribs (52).

[0077] It is thus possible to manufacture the first bell mouth (20) having the first peripheral wall portion (21) to which the porous part (50) is attached.

-Advantages of Embodiment-

[0078] According to this embodiment, the bell mouth (20, 40) has the peripheral wall portion (21, 41) that forms the air passage (22, 42). The peripheral wall portion (21, 41) has the opening (51) penetrating in the thickness direction. The porous part (50) is positioned to cover the opening (51). The peripheral wall portion (21, 41) has the attachment portion (55) configured to attach the porous part (50).

[0079] Since the porous part (50) is attached to the peripheral wall portion (21, 41) by the attachment portion (55), it is possible to improve the production efficiency as compared to the case where the porous part (50) is integrated with the bell mouth (20, 40).

[0080] According to this embodiment, the attachment portion (55) includes the claws (56) configured to fasten the porous part (50). It is thus possible to attach the porous part (50) to the peripheral wall portion (21, 41) easily by simply making the porous part (50) fastened by the claws (56). Further, it is easy to replace the porous part (50) that has been soiled.

[0081] According to this embodiment, the porous part (50) extends along the circumferential direction of the peripheral wall portion (21, 41), and the attachment portion (55) includes the holders (57) each configured to hold a circumferential end portion of the porous part (50). It is thus possible to restrict unintentional displacement of the end portions of the porous part (50).

[0082] According to this embodiment, the peripheral wall portion (21, 41) has the ribs (52) each extending across the opening (51). The ribs (52) provided for the opening (51) can ensure the stiffness of the peripheral wall portion (21, 41) even if the opening area of the opening (51) is large.

[0083] The ribs (52) can reduce protrusion of the porous part (50) from the opening (51) toward the inner surface of the peripheral wall portion (21, 41).

[0084] According to this embodiment, the attachment portion (55) is provided on the outer peripheral side of the peripheral wall portion (21, 41). Providing the attachment portion (55) on the outer peripheral side of the peripheral wall portion (21, 41) as described above can reduce inhibition of the airflow on the inner peripheral side of the peripheral wall portion (21, 41).

[0085] According to this embodiment, the porous part (50) is elastically deformable along the circumferential surface of the peripheral wall portion (21, 41). Thus, by elastically deforming the porous part (50) along the circumferential surface of the peripheral wall portion (21, 41), it is possible to make the porous part (50) cover the opening (51) while being in tight contact with the peripheral wall portion (21, 41).

[0086] According to this embodiment, the surface of the porous part (50) is subjected to water-repellent treatment. Since moisture is less likely to be deposited on the porous part (50), it is possible to reduce mold on the porous part (50).

[0087] According to this embodiment, the pores of the porous part (50) penetrate in the thickness direction of the peripheral wall portion (21, 41). Thus, even the porous part (50) subjected to water-repellent treatment can release the pressure of the air flowing through the air passage (22, 42) to the outside of the peripheral wall portion (21,41) via the pores of the porous part (50).

[0088] According to this embodiment, the heat-source-side unit (10) including the blower (15), the refrigerant circuit (1a), and the heat exchanger (14) can be provided.

[0089] According to this embodiment, the utilization-side unit (30) including the blower (35), the refrigerant circuit (1a), and the heat exchanger (34) can be provided.

[0090] According to this embodiment, the porous part (50) is attached to the peripheral wall portion (21, 41) by covering the opening (51) of the peripheral wall portion (21, 41) with the porous part (50). It is thus possible to improve the production efficiency as compared to the case where the porous part (50) is integrated with the bell mouth (20, 40).

<<Other Embodiments>>

[0091] The above-described embodiment may be modified as follows.

[0092] In this embodiment, the first bell mouth (20) is provided on the side wall of the outdoor casing (11) of the heat-source-side unit (10), so that the air transferred by the first fan (16) passes through the first bell mouth (20) and is expelled in the lateral direction of the outdoor

casing (11), but is not limited thereto.

[0093] For example, the first bell mouth (20) may be provided on the ceiling surface of the outdoor casing (11) of the heat-source-side unit (10), so that the air transferred by the first fan (16) passes through the first bell mouth (20) and is expelled in the upward direction of the outdoor casing (11). In this case, the porous part (50) is attached to the first peripheral wall portion (21) of the first bell mouth (20) that opens upward.

[0094] While the embodiment and variations have been described above, it will be understood that various changes in form and details can be made without departing from the spirit and scope of the claims. The elements of the embodiment, the variations thereof, and the other embodiments may be combined and replaced with each other. In addition, the expressions of "first," "second," "third," ... , in the specification and claims are used to distinguish the terms to which these expressions are given, and do not limit the number and order of the terms.

INDUSTRIAL APPLICABILITY

[0095] As can be seen from the foregoing description, the present disclosure is useful for a blower, a heat-source-side unit, a utilization-side unit, and a method for manufacturing a blower.

DESCRIPTION OF REFERENCE CHARACTERS

[0096]

1a	Refrigerant Circuit
10	Heat-Source-Side Unit
14	First Heat Exchanger
15	First Blower
16	First Fan
20	First Bell Mouth
21	First Peripheral Wall Portion
22	First Air Passage
30	Utilization-Side Unit
34	Second Heat Exchanger
35	Second Blower
36	Second Fan
40	Second Bell Mouth
41	Second Peripheral Wall Portion
42	Second Air Passage
50	Porous Part
51	Opening
52	Rib
55	Attachment Portion
56	Claw
57	Holder

Claims

1. A blower comprising:

a fan (16, 36); and a bell mouth (20, 40) having a peripheral wall portion (21, 41) forming an air passage (22, 42) through which air transferred by the fan (16, 36) passes, wherein
the peripheral wall portion (21, 41) has an opening (51) penetrating in a thickness direction,
the blower is provided with a porous part (50) positioned to cover the opening (51), and
the peripheral wall portion (21, 41) includes an attachment portion (55) configured to attach the porous part (50).

2. The blower of claim 1, wherein
the attachment portion (55) includes a claw (56) configured to fasten the porous part (50).

3. The blower of claim 1 or 2, wherein

the porous part (50) extends along a circumferential direction of the peripheral wall portion (21, 41), and
the attachment portion (55) includes a holder (57) configured to hold a circumferential end portion of the porous part (50).

4. The blower of any one of claims 1 to 3, wherein
the peripheral wall portion (21, 41) has a rib (52) extending across the opening (51).

5. The blower of any one of claims 1 to 4, wherein
the attachment portion (55) is provided on an outer peripheral side of the peripheral wall portion (21, 41).

6. The blower of any one of claims 1 to 5, wherein
the porous part (50) is elastically deformable along a circumferential surface of the peripheral wall portion (21, 41).

7. The blower of any one of claims 1 to 6, wherein
a surface of the porous part (50) is subjected to water-repellent treatment.

8. The blower of claim 7, wherein
the porous part (50) has pores penetrating in the thickness direction of the peripheral wall portion (21, 41).

9. A heat-source-side unit comprising:

the blower (15) of any one of claims 1 to 8;
a refrigerant circuit (1a) through which a refrigerant flows; and
a heat exchanger (14) provided in the refrigerant circuit (1a) and configured to exchange heat between the refrigerant flowing through the refrigerant circuit (1a) and air transferred by the blower (15).

10. A utilization-side unit comprising:

the blower (35) of any one of claims 1 to 8;
a refrigerant circuit (1a) through which a refrigerant flows; and
a heat exchanger (34) provided in the refrigerant circuit (1a) and configured to exchange heat between the refrigerant flowing through the refrigerant circuit (1a) and air transferred by the blower (35).

11. A method for manufacturing a blower, the blower including:

a fan (16, 36); and a bell mouth (20, 40) having a peripheral wall portion (21, 41) forming an air passage (22, 42) through which air transferred by the fan (16, 36) passes,
the peripheral wall portion (21, 41) having an opening (51) penetrating in a thickness direction, the method comprising:

positioning a porous part (50) to cover the opening (51); and
attaching the porous part (50) to the peripheral wall portion (21, 41).

FIG.1

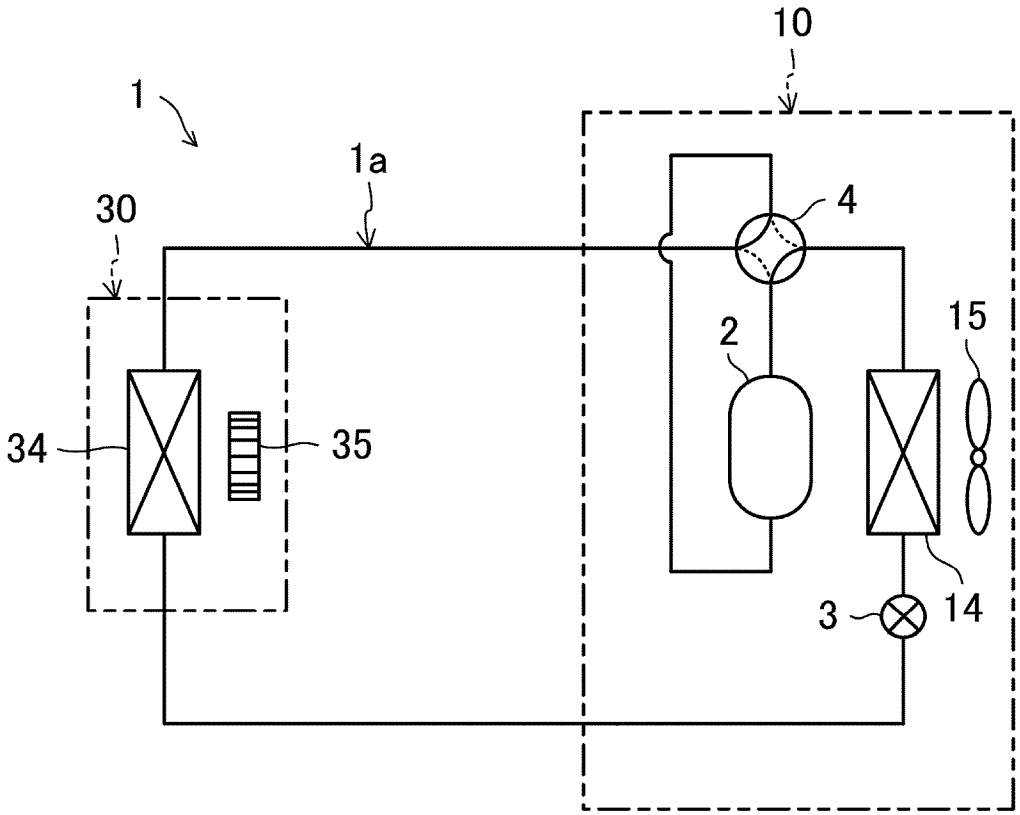


FIG.2

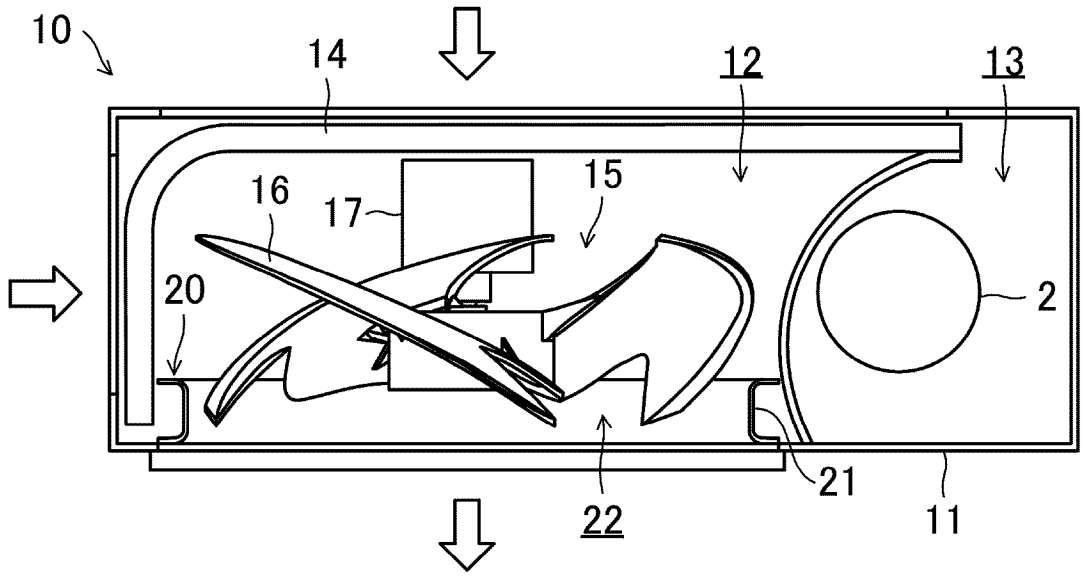


FIG.3

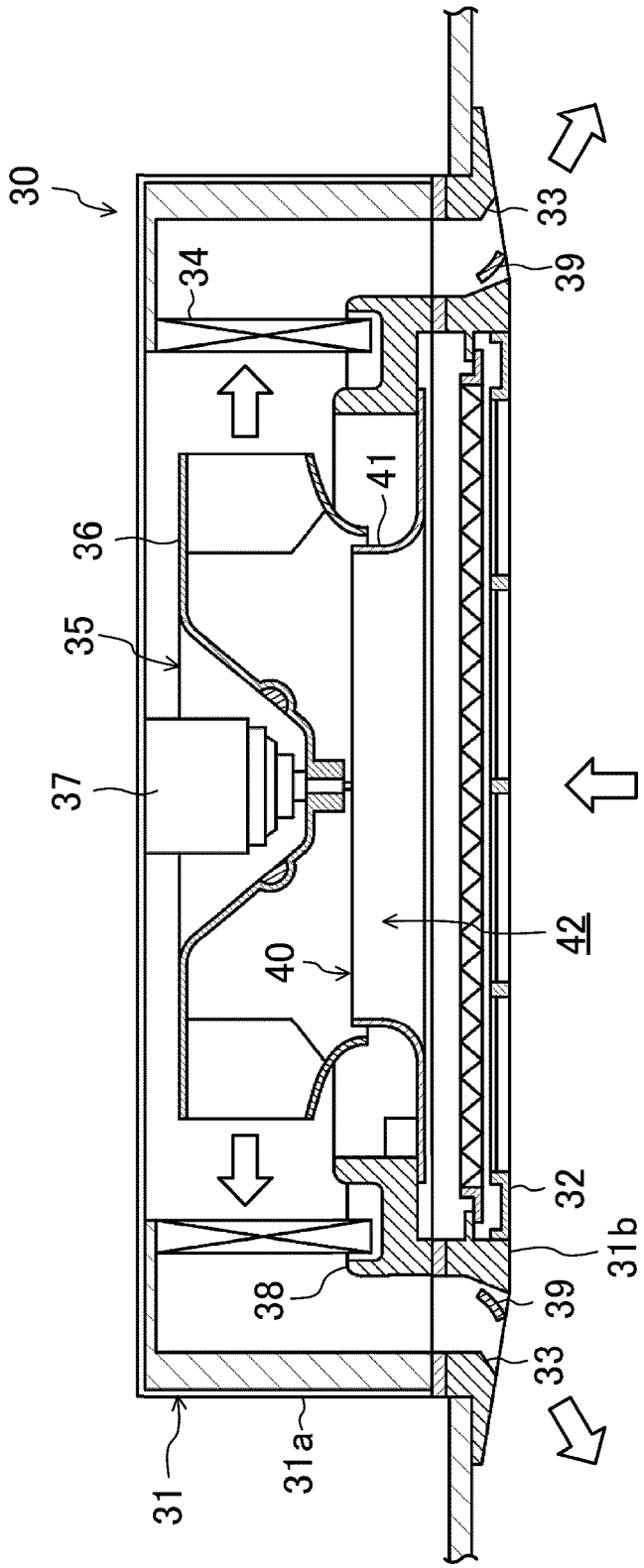
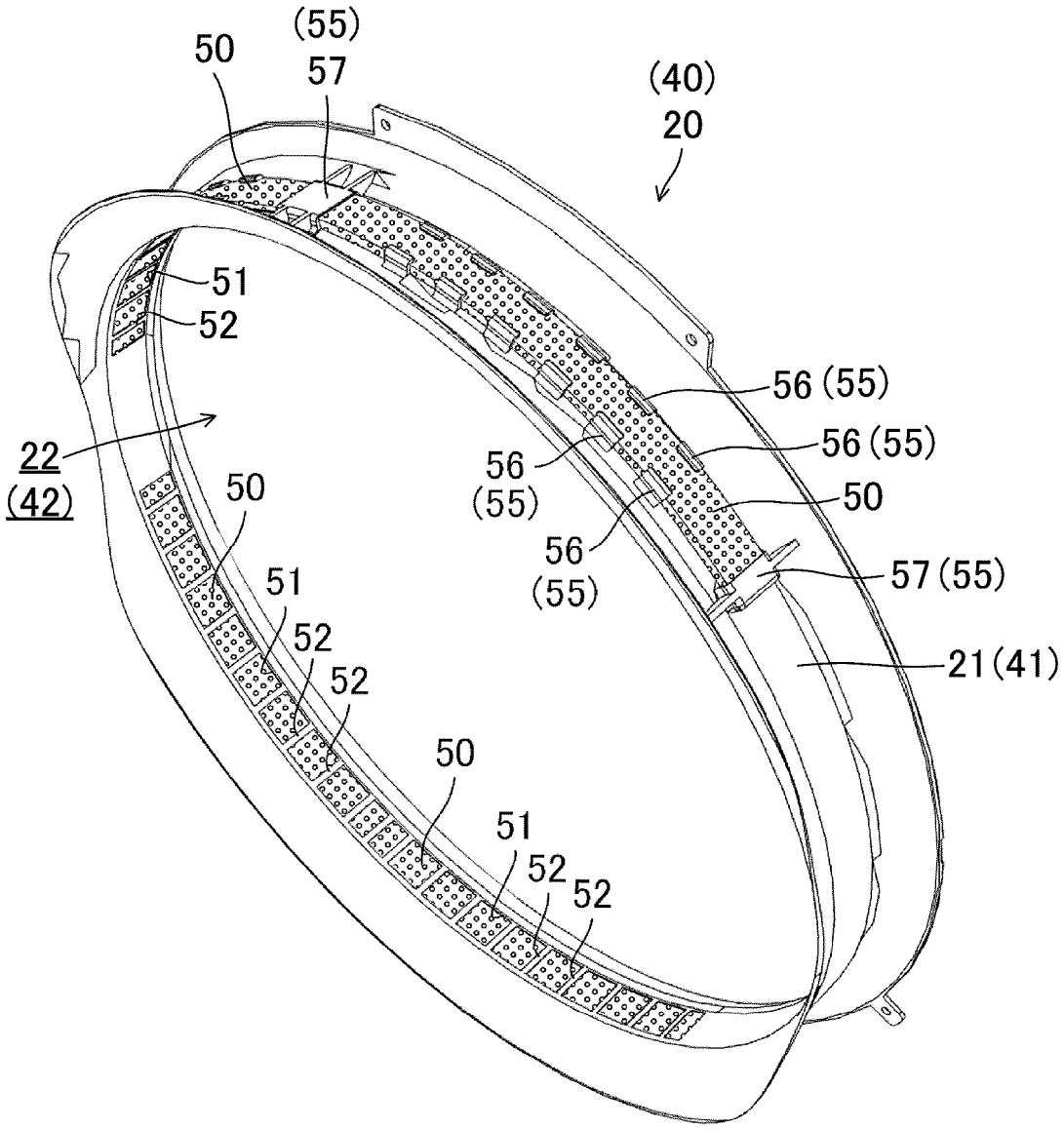


FIG.4


(55)
50
57
(40)
20
51
52
56 (55)
56 (55)
22
(42)
56
(55)
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56
(55)
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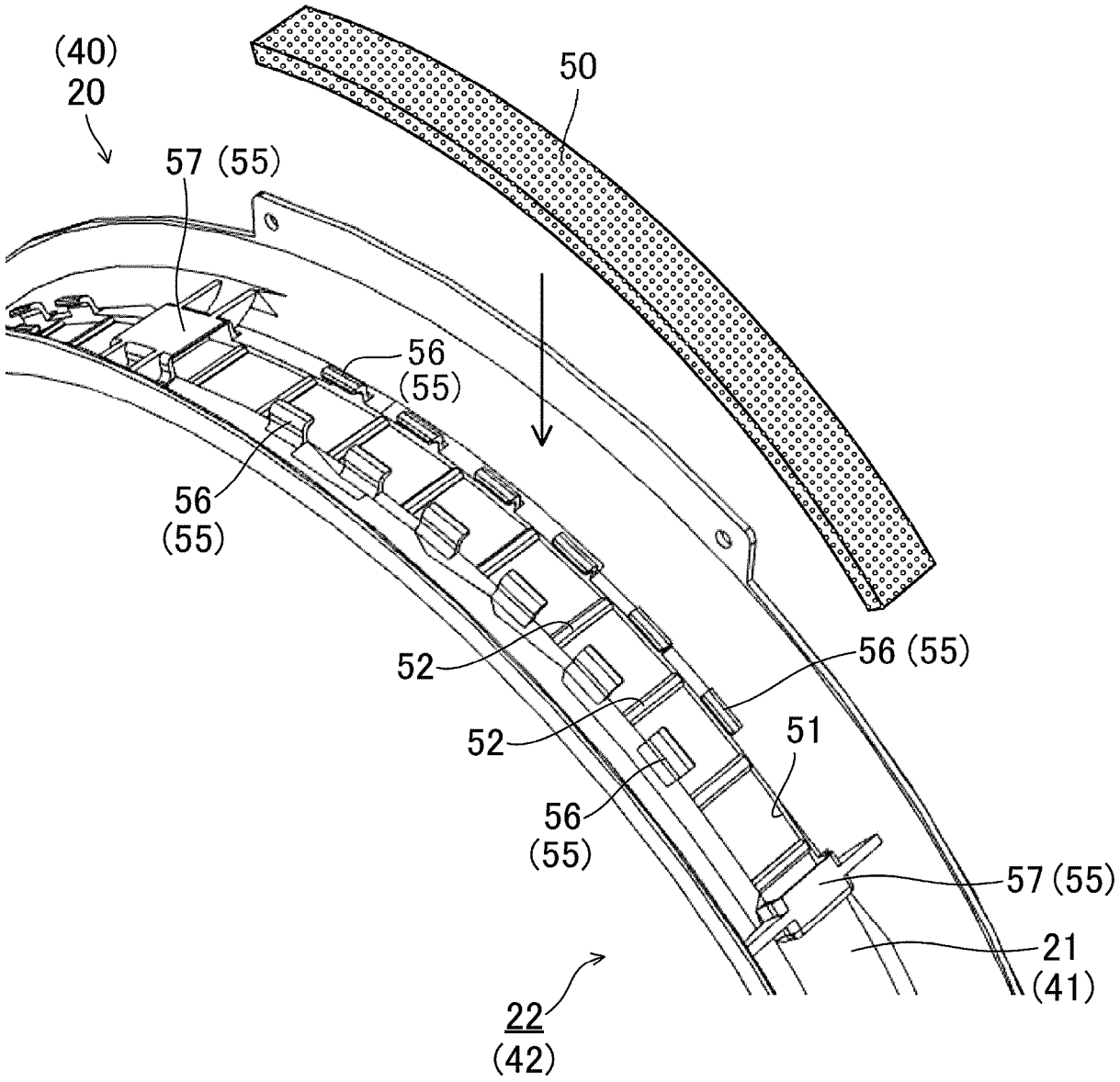
51
52
21 (41)
52
50
51
52
52

FIG.5



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2024/016646

A. CLASSIFICATION OF SUBJECT MATTER

F04D 29/54(2006.01)i; ***F04D 29/44***(2006.01)i; ***F04D 29/66***(2006.01)i
FI: F04D29/54 C; F04D29/44 P; F04D29/44 X; F04D29/54 G; F04D29/66 N

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)

F04D29/54; F04D29/44; F04D29/66

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 1971-2024
Registered utility model specifications of Japan 1996-2024
Published registered utility model applications of Japan 1994-2024

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	JP 2007-218150 A (SUMITOMO HEAVY INDUSTRIES, LTD.) 30 August 2007 (2007-08-30) paragraphs [0016]-[0029], fig. 3-4	1, 4-6, 11
Y		2-10
Y	CD-ROM of the specification and drawings annexed to the request of Japanese Utility Model Application No. 68593/1992 (Laid-open No. 25597/1994) (PACIFIC IND CO., LTD.) 08 April 1994 (1994-04-08), paragraphs [0003]-[0009], fig. 5-6	2-10

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

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
08 July 2024	**23 July 2024**
Name and mailing address of the ISA/JP **Japan Patent Office (ISA/JP)** **3-4-3 Kasumigaseki, Chiyoda-ku, Tokyo 100-8915** **Japan**	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/JP2024/016646

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
JP 2007-218150 A	30 August 2007	(Family: none)	
JP 6-25597 U1	08 April 1994	(Family: none)	

Form PCT/ISA/210 (patent family annex) (July 2022)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2007218150 A **[0004]**