US 20150354840A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2015/0354840 A1**

(43) **Pub. Date: Dec. 10, 2015**

YAMAUCHI et al.

(54) **OUTDOOR UNIT FOR AIR-CONDITIONING APPARATUS**

(71) Applicant: **Mitsubishi Electric Corporation**, Tokyo (JP)

(72) Inventors: **Hidetaka YAMAUCHI**, Tokyo (JP); **Kazuho ITO**, Tokyo (JP)

(21) Appl. No.: **14/685,743**

(22) Filed: **Apr. 14, 2015**

(30) **Foreign Application Priority Data**

Jun. 6, 2014 (JP) 2014-118074

Publication Classification

(51) **Int. Cl.**

F24F 5/00 (2006.01)

F24F 7/007 (2006.01)

(52) **U.S. Cl.**

CPC ***F24F 5/0007*** (2013.01); ***F24F 7/007*** (2013.01)

(57) **ABSTRACT**

The outdoor unit for an air-conditioning apparatus includes: a heat exchanger covering the opening of the rear surface of the housing from an inside of the housing; a fan motor support member having a part of the fan motor support member above the air-sending device being locked onto an upper end side of the heat exchanger and a part of the fan motor support member below the air-sending device being fixed onto a bottom panel of the housing; an inverted U-shaped locking plate formed on an upper side of the fan motor support member, the inverted U-shaped locking plate having a downward groove; and a size adjustment section to be fitted into the downward groove of the inverted U-shaped locking plate in accordance with a height and a thickness of the heat exchanger so that the heat exchanger is fitted into the downward groove of the inverted U-shaped locking plate through intermediation of the size adjustment section.

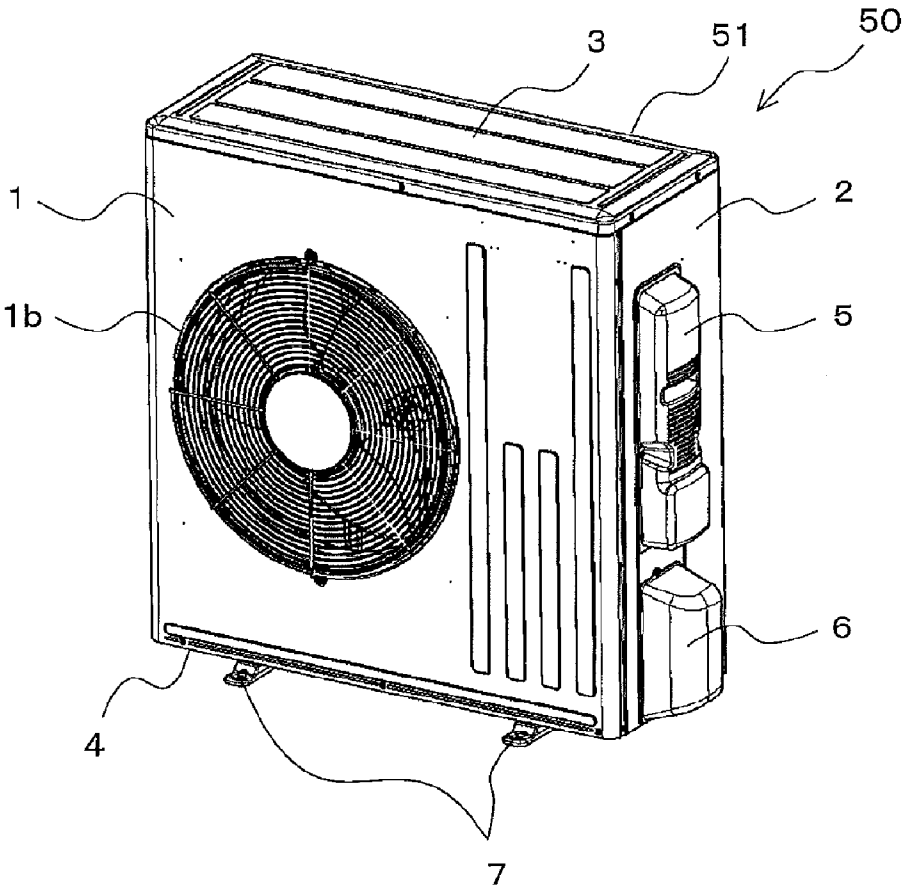


FIG. 1

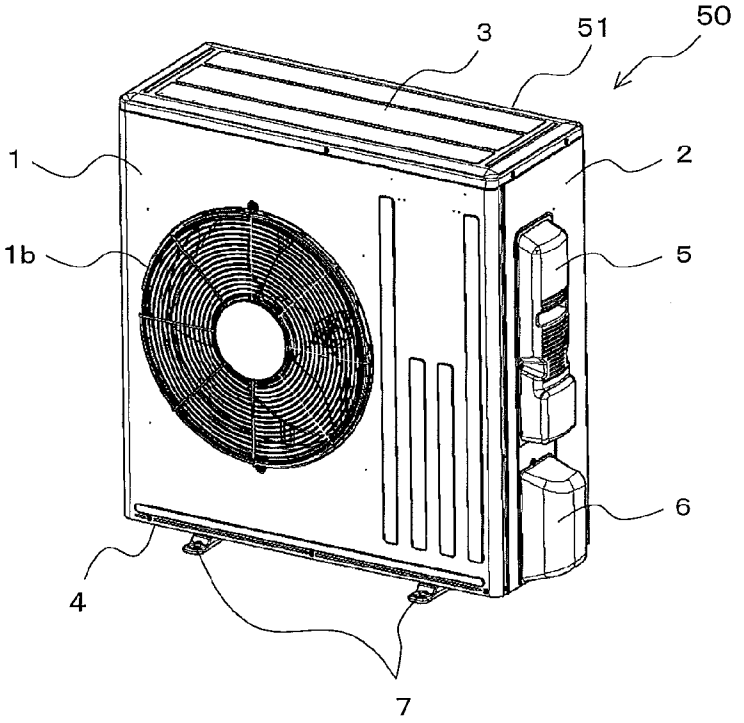


FIG. 2

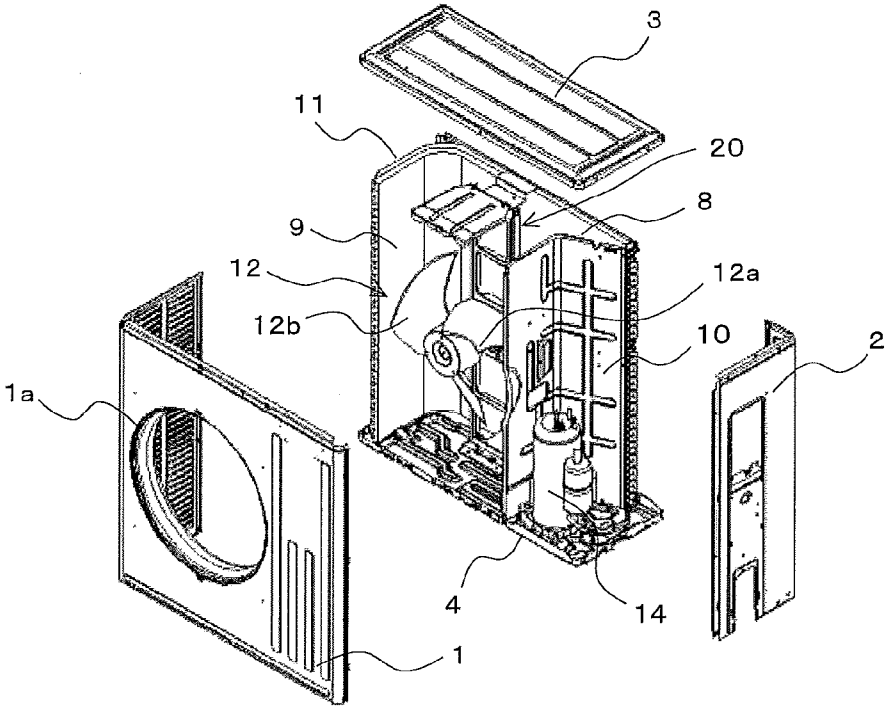


FIG. 3

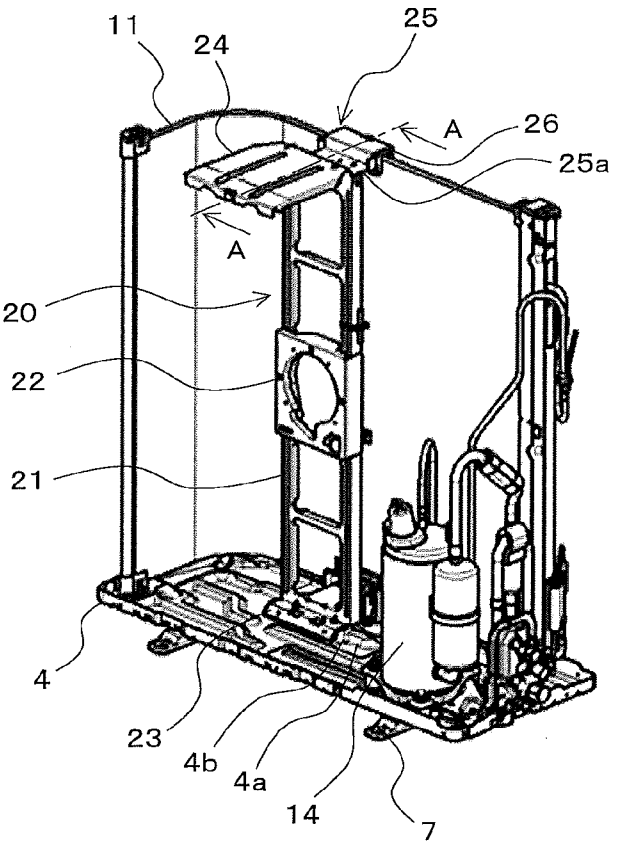


FIG. 4

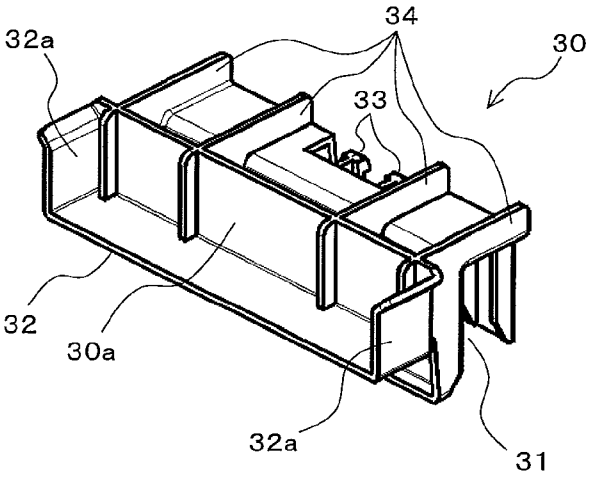


FIG. 5

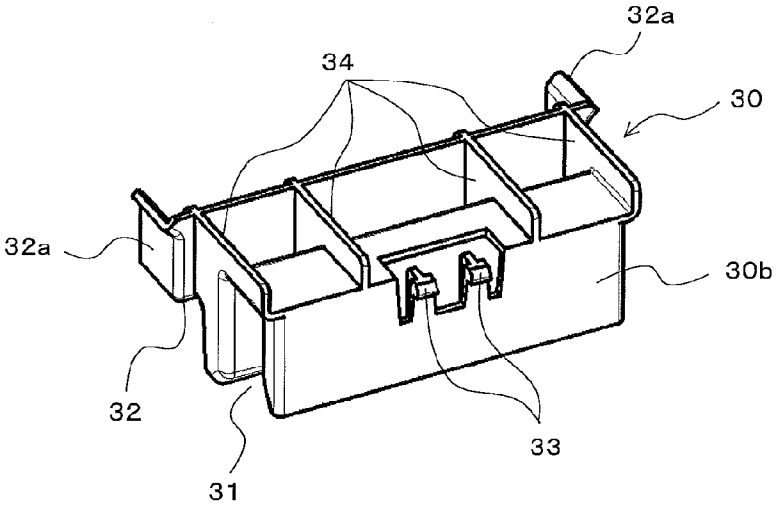


FIG. 6

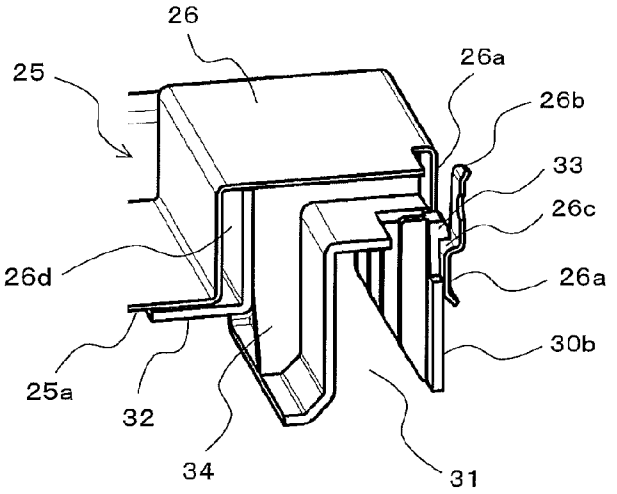


FIG. 7

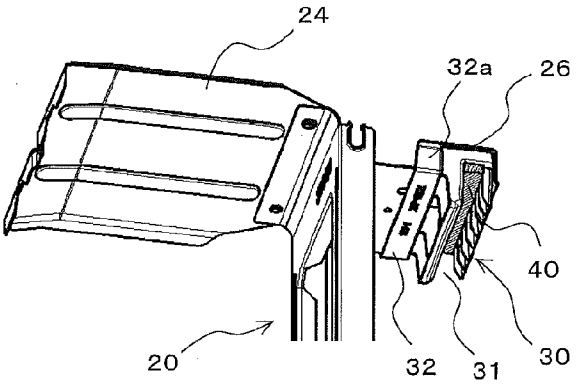


FIG. 8

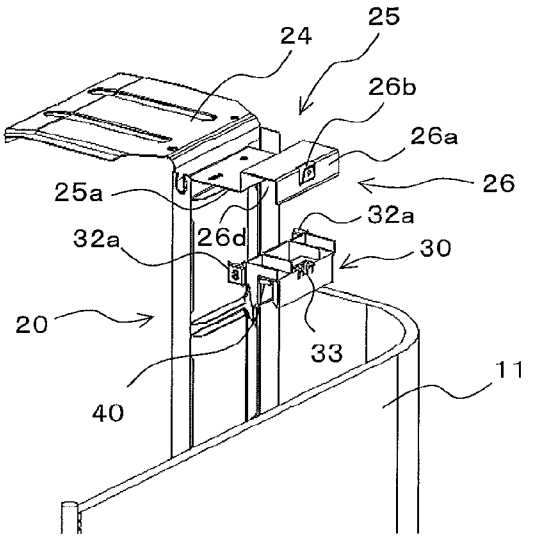

24
25
26b
26a
26
25a
32a
26d
32a
30
20
33
11
40

FIG. 9

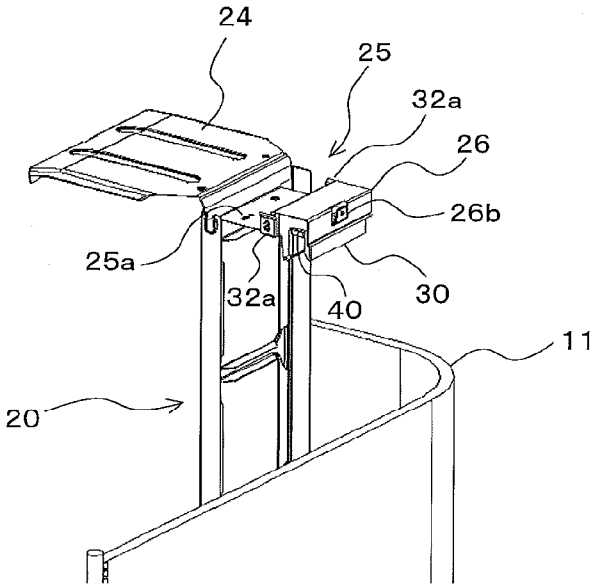

24
25
32a
26
26b
25a
32a
40
30
11
20

FIG. 10

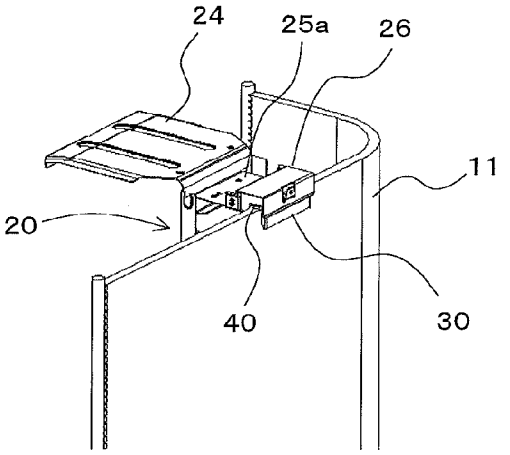
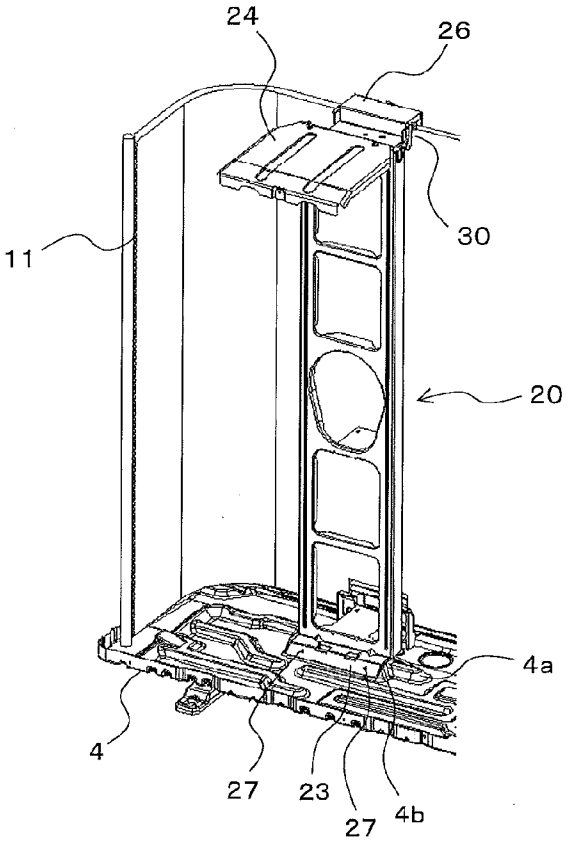


FIG. 11



OUTDOOR UNIT FOR AIR-CONDITIONING APPARATUS

TECHNICAL FIELD

[0001] The present invention relates to an outdoor unit for an air-conditioning apparatus, including a motor support member for fixing a motor of an air-sending device.

BACKGROUND ART

[0002] As a related-art outdoor unit for an air-conditioning apparatus, there is an outdoor unit including a motor support member having a locking section with a downward groove in which an upper end portion of a heat exchanger is to be fitted and locked (see, for example, Patent Literature 1).

CITATION LIST

Patent Literature

[0003] Patent Literature 1: Japanese Unexamined Patent Application Publication No. 2006-177620 (Abstract, FIG. 2)

SUMMARY OF INVENTION

Technical Problem

[0004] In the related-art outdoor unit, a plurality of motor support members are required depending on the height and thickness of the heat exchanger, thereby being necessary to prepare the same number of molds for forming the respective motor support members. As a result, the manufacturing cost is increased. Further, the number of components is also increased, thereby causing a problem in that the management of inventory and distribution is cumbersome.

[0005] The present invention has been made to solve the problem described above, and it is therefore an object of the present invention to provide an outdoor unit for an air-conditioning apparatus, which is compatible with a plurality of types of heat exchangers by mounting another component on the structure of a motor support member so as to share the motor support member among the plurality of types of heat exchangers.

Solution to Problem

[0006] According to Embodiment of the present invention, there is provided an outdoor unit for an air-conditioning apparatus, including: a housing having an opening formed in a rear surface thereof and an air outlet formed in a front surface thereof; a heat exchanger covering the opening of the rear surface of the housing from an inside of the housing; a fan motor support member having an air-sending device fixed to a center portion thereof, a part of the fan motor support member above the air-sending device being locked onto an upper end side of the heat exchanger and a part of the fan motor support member below the air-sending device being fixed onto a bottom panel of the housing; a locking section formed on an upper side of the fan motor support member, the locking section having a downward groove; and a size adjustment section to be fitted into the downward groove of the locking section in accordance with a height and a thickness of the heat exchanger so that the heat exchanger is fitted into the downward groove of the locking section through intermediation of the size adjustment section.

Advantageous Effects of Invention

[0007] According to Embodiment of the present invention, when the fan motor support member is to be locked in accordance with the height and thickness of the heat exchanger, the size adjustment section is fitted into the groove of the locking section of the fan motor support member, to thereby lock the fan motor support member onto the upper end portion of the heat exchanger. In this manner, the use of the size adjustment section alone allows the use of the fan motor support member without changing the structure thereof. Therefore, the increase in number of components can be minimized, thereby facilitating the management of inventory and distribution. As a result, materials can be saved.

BRIEF DESCRIPTION OF DRAWINGS

[0008] FIG. **1** is a perspective view of an outer appearance of an outdoor unit for an air-conditioning apparatus according to Embodiment of the present invention.

[0009] FIG. **2** is an exploded perspective view of the outdoor unit illustrated in

[0010] FIG. **1**.

[0011] FIG. **3** is a perspective view of the outdoor unit in a state in which a housing, an air-sending device, and a separator are removed in FIG. **2**.

[0012] FIG. **4** is a perspective view of a size adjustment section to be used for a fan motor support member of FIG. **2** as seen from the front side obliquely.

[0013] FIG. **5** is a perspective view of the size adjustment section of FIG. **4** as seen from the rear side obliquely.

[0014] FIG. **6** is an enlarged sectional view of an upper part of the fan motor support member of FIG. **3** as seen in the arrow A-A direction.

[0015] FIG. **7** is a perspective view of an upper end portion side of the fan motor support member of FIG. **3** as seen from the bottom side obliquely.

[0016] FIG. **8** is a perspective view of a state before the size adjustment section is mounted on an inverted U-shaped locking plate of the fan motor support member.

[0017] FIG. **9** is a perspective view of a state after the size adjustment section and a cushioning member are mounted on the inverted U-shaped locking plate of the fan motor support member.

[0018] FIG. **10** is a perspective view of a state in which the inverted U-shaped locking plate of the fan motor support member is locked onto a heat exchanger through intermediation of the size adjustment section and the cushioning member.

[0019] FIG. **11** is a perspective view of a state in which the fan motor support member locked onto the heat exchanger is fixed to a bottom panel of the housing.

DESCRIPTION OF EMBODIMENT

[0020] Now, an outdoor unit for an air-conditioning apparatus according to Embodiment of the present invention is described in detail with reference to the drawings. Note that, the present invention is not limited to Embodiment described below.

[0021] FIG. **1** is a perspective view of an outer appearance of the outdoor unit for an air-conditioning apparatus according to Embodiment of the present invention. FIG. **2** is an exploded perspective view of the outdoor unit illustrated in FIG. **1**.

[0022] In FIGS. **1** and **2**, an outdoor unit **50** according to Embodiment includes a housing **51** formed of an L-shaped front panel **1**, a side panel **2**, a top panel **3**, and a bottom panel **4**. In the front panel **1**, an air outlet **1***a* is formed into a circular shape, and is covered with a fan guard **1***b*. On the side panel **2**, a service cover **5** and a valve cover **6** are mounted in a freely removable manner. On a lower surface of the bottom panel **4**, foot sections **7** are mounted so as to fix the outdoor unit **50** onto an installation surface. The inside of the outdoor unit **50** is partitioned by a dogleg-shaped separator **8** into an air-sending device chamber **9** and a machine chamber **10**.

[0023] An L-shaped heat exchanger **11** and an air-sending device **12** arranged in front of the heat exchanger **11** are housed in the air-sending device chamber **9**. In Embodiment, for example, a corrugated-fin heat exchanger including flat pipes, corrugated fins, and header pipes is employed as the heat exchanger **11**. The air-sending device **12** includes a fan motor **12***a* fixed to a fan motor support member **20** described later, and a propeller fan **12***b*.

[0024] When the propeller fan **12***b* is rotated through drive of the fan motor **12***a*, air (outdoor air) is sucked through the rotation of the propeller fan **12***b* to pass through the heat exchanger **11** and flow into the outdoor unit **50**. Then, the air is caused to pass through the propeller fan **12***b*, and is blown outside from the air outlet **1***a* of the front panel **1** through the fan guard **1***b*. Thus, during, for example, cooling operation, refrigerant inside the heat exchanger **11** is cooled by the air, and the air caused to pass through the heat exchanger **11** is heated into warm air through the heat exchange between the air and the refrigerant.

[0025] A compressor **14** mounted on the bottom panel **4**, a four-way valve, an expansion valve, a pipe connection section for connecting, to those components, a refrigerant pipe connected to an indoor unit, an electrical component for controlling the drive of the compressor **14** and the air-sending device **12**, and the like are housed in the machine chamber **10**.

[0026] Next, the structure of the above-mentioned fan motor support member **20** is described with reference to FIGS. **3** to **6**.

[0027] FIG. **3** is a perspective view of the outdoor unit in a state in which the housing, the air-sending device, and the separator are removed in FIG. **2**. FIG. **4** is a perspective view of a size adjustment section to be used for the fan motor support member of FIG. **2** as seen from the front side obliquely. FIG. **5** is a perspective view of the size adjustment section of FIG. **4** as seen from the rear side obliquely. FIG. **6** is an enlarged sectional view of an upper part of the fan motor support member of FIG. **3** as seen in the arrow A-A direction. FIG. **7** is a perspective view of an upper end portion side of the fan motor support member of FIG. **3** as seen from the bottom side obliquely.

[0028] The fan motor support member **20** is mounted in front of the heat exchanger **11**. The fan motor support member **20** includes a ladder-shaped support column section **21**, a holding section **22** for the air-sending device **12**, which is arranged at a center portion of the support column section **21**, support column fixing sections **23** each arranged at a lower end portion of the support column section **21**, a plate-shaped top panel support section **24** extending horizontally from an upper end portion of the support column section **21** toward the air-sending device **12** side, and a lock and support section **25** extending horizontally from the upper end portion of the support column section **21** toward an opposite side to the top panel support section **24**.

[0029] The support column fixing sections **23** are arranged at the front and rear of the support column section **21**, and are fixed onto a convex drawing portion **4***a* formed on the bottom panel **4** by fastening screws **27** obliquely through burring portions **4***b* formed on the bottom panel **4** (see FIG. **11**). As illustrated in FIGS. **3** and **6**, the lock and support section **25** includes a support plate **25***a* extending horizontally from the upper end portion of the support column section **21**, and an inverted U-shaped locking plate **26** (locking section) formed at a distal end of the support plate **25***a* with a downward groove **26***d*. As illustrated in FIG. **6**, on one side surface **26***a* forming the groove **26***d* of the inverted U-shaped locking plate **26**, a stepped portion **26***c* having a flat surface is formed by bending a cut-and-raised piece **26***b* upward at a right angle. The cut-and-raised piece **26***b* is formed by cutting and raising a part of the center of the side surface **26***a* outward.

[0030] The height of the above-mentioned fan motor support member **20** is set in accordance with the height of, for example, a fin-and-tube heat exchanger. Further, the width of the groove **26***d* of the inverted U-shaped locking plate **26** is set to a dimension equal to or larger than the thickness of the fin-and-tube heat exchanger. That is, an upper end portion of the fin-and-tube heat exchanger is fitted into the groove **26***d* of the inverted U-shaped locking plate **26**, thereby enabling to lock the fan motor support member **20** onto the fin-and-tube heat exchanger.

[0031] A size adjustment section **30** is fitted into the groove **26***d* of the inverted U-shaped locking plate **26** of the lock and support section **25**. The size adjustment section **30** is provided so that the fan motor support member **20** for the fin-and-tube heat exchanger may also be used for the corrugated-fin heat exchanger, which is a different type of heat exchanger. Comparing the corrugated-fin heat exchanger and the fin-and-tube heat exchanger at equal capacity (performance), the corrugated-fin heat exchanger is smaller in height and thickness than the fin-and-tube heat exchanger. When the fan motor support member **20** is to be locked onto such a small-size corrugated-fin heat exchanger, the size adjustment section **30** is fitted into the groove **26***d* of the inverted U-shaped locking plate **26**, thereby enabling to lock the fan motor support member **20** onto the corrugated-fin heat exchanger.

[0032] The size adjustment section **30** is made of a resin material and, as illustrated in FIGS. **4** and **5**, formed into a rectangular parallelepiped shape having a horizontally-oriented outer appearance with a downward groove **31** formed at a lower part of the size adjustment section **30**. A U-shaped regulation piece **32**, which is elongated in a longitudinal direction of the size adjustment section **30**, is formed on a front surface **30***a* of the size adjustment section **30** on the support column section **21** side. When the size adjustment section **30** is fitted into the groove **26***d* of the inverted U-shaped locking plate **26** of the fan motor support member **20**, the support plate **25***a* of the fan motor support member **20** is fitted into the U-shaped regulation piece **32**.

[0033] When the support plate **25***a* of the fan motor support member **20** is fitted into the U-shaped regulation piece **32**, lateral movement of the size adjustment section **30** is regulated by side pieces **32***a* formed at both ends of the U-shaped regulation piece **32**. Two hook portions **33** protruding rearward are formed at the center of an upper part of a rear surface **30***b* of the size adjustment section **30** on an opposite side to the U-shaped regulation piece **32**. When the size adjustment section **30** is fitted into the groove **26***d* of the inverted U-shaped locking plate **26**, the two hook portions **33** are

caught on the stepped portion **26***c* having a flat surface, which is formed on the side surface **26***a* of the inverted U-shaped locking plate **26**, to thereby temporarily fix the size adjustment section **30**.

[0034] Further, at an upper part of the size adjustment section **30**, a plurality of protruding pieces **34** are arranged in the longitudinal direction of the size adjustment section **30**. Vertical movement of the size adjustment section **30** fitted into the groove **26***d* of the inverted U-shaped locking plate **26** is regulated by the protruding pieces **34** and the two hook portions **33**. That is, the size adjustment section **30** is prevented from dropping off the inverted U-shaped locking plate **26**. As illustrated in FIG. **7**, a cushioning member **40** is fitted into the groove **31** of the size adjustment section **30**. The cushioning member **40** is provided so as to mitigate vibrations during conveyance and operation of the outdoor unit **50**.

[0035] Next, referring to FIGS. **8** to **11**, description is given of a procedure of mounting the fan motor support member **20** in a case where the heat exchanger **11** mounted inside the outdoor unit **50** is the corrugated-fin heat exchanger.

[0036] FIG. **8** is a perspective view of a state before the size adjustment section is mounted on the inverted U-shaped locking plate of the fan motor support member. FIG. **9** is a perspective view of a state after the size adjustment section and the cushioning member are mounted on the inverted U-shaped locking plate of the fan motor support member. FIG. **10** is a perspective view of a state in which the inverted U-shaped locking plate of the fan motor support member is locked onto the heat exchanger through intermediation of the size adjustment section and the cushioning member. FIG. **11** is a perspective view of a state in which the fan motor support member locked onto the heat exchanger is fixed to the bottom panel of the housing.

[0037] First, the cushioning member **40** is fitted into the groove **31** of the size adjustment section **30**. Under a state in which the groove **31** into which the cushioning member **40** is fitted is oriented downward (see FIG. **8**), the size adjustment section **30** is then inserted from the bottom into the groove **26***d* of the inverted U-shaped locking plate **26** of the fan motor support member **20** (see FIG. **9**). At this time, the two hook portions **33** are fitted into the groove **26***d* of the inverted U-shaped locking plate **26** along with the insertion of the size adjustment section **30**. When the two hook portions **33** reach the stepped portion **26***c* formed on the inverted U-shaped locking plate **26**, the two hook portions **33** project toward the stepped portion **26***c* side due to an elastic force so that the two hook portions **33** are caught on the stepped portion **26***c*.

[0038] At this time, the protruding pieces **34** of the size adjustment section **30** are brought into contact with an upper surface of the inverted U-shaped locking plate **26** on an inner side thereof, and the support plate **25***a* of the fan motor support member **20** is fitted into the U-shaped regulation piece **32** of the size adjustment section **30**, to thereby fix the size adjustment section **30**. In this case, the lateral movement of the size adjustment section **30** is regulated by the side pieces **32***a* formed on both sides of the U-shaped regulation piece **32**.

[0039] The fan motor support member **20** is locked onto an upper end portion of the heat exchanger **11** (corrugated-fin heat exchanger) through intermediation of the size adjustment section **30** fixed to the inverted U-shaped locking plate **26** (see FIG. **10**). In this case, the upper end portion of the heat exchanger **11** is fitted into the groove **31** of the size adjustment section **30**. After that, as described above, the support column fixing sections **23** of the fan motor support member **20** are fixed onto the convex drawing portion **4***a* formed on the bottom panel **4** by fastening the screws **27** through the burring portions **4***b* formed on the bottom panel **4** (see FIG. **11**).

[0040] Incidentally, in a case where only the inverted U-shaped locking plate **26** is used without using the size adjustment section **30** and made of a sheet metal material, screw holes need to be formed so as to fix the inverted U-shaped locking plate **26** to the support plate **25***a*, with the result that the current shape of the mold for the fan motor support member **20** needs to be modified. Also in a case where only the inverted U-shaped locking plate **26** is used without using the size adjustment section **30** and made of a resin material, the mold for the fan motor support member **20** needs to be modified. Further, the coupling portion between the sheet metal material and the resin material may be damaged due to stress concentration caused by the vibrations applied during the conveyance and operation of the outdoor unit **50**. In this respect, Embodiment provides such structure that the size adjustment section **30** made of a resin material is held by fitting into the inverted U-shaped locking plate **26** of the fan motor support member **20** without modifying the existing mold for the fan motor support member **20**. Therefore, the range of fitting between the size adjustment section **30** and the fan motor support member **20** is wider, thereby enabling to disperse the stress to be applied to the size adjustment section **30** made of a resin material.

[0041] Further, in the outdoor unit **50** in which the fin-and-tube heat exchanger that is larger in height and thickness is mounted as the heat exchanger **11** arranged perpendicularly to the bottom panel **4**, there is no need to use the size adjustment section **30**, and hence only a minimum necessary gap is formed between the fin-and-tube heat exchanger and the top panel **3**. On the other hand, in a case where the corrugated-fin heat exchanger is mounted with use of the size adjustment section **30** in this Embodiment, the corrugated-fin heat exchanger has such specifications that the corrugated-fin heat exchanger is smaller in height and thickness than the fin-and-tube heat exchanger and a gap is therefore formed between the corrugated-fin heat exchanger and the top panel **3** under a state in which the fan motor support member **20** having the size adjustment section **30** mounted thereon is locked onto the corrugated-fin heat exchanger. However, the above-mentioned specifications do not raise any problem from the viewpoint of performance and structural strength of the outdoor unit **50**. Thus, there is no need to insert a spacer or the like between the corrugated-fin heat exchanger and the top panel **3** so as to fill the gap generated due to the height difference caused by the difference in specifications between the corrugated-fin heat exchanger and the fin-and-tube heat exchanger.

[0042] As described above, according to Embodiment of the present invention, in the case where the fan motor support member **20** compatible with the fin-and-tube heat exchanger is used for the corrugated-fin heat exchanger that is smaller in height and thickness than the fin-and-tube heat exchanger, the size adjustment section **30** only needs to be fitted into the groove **26***d* of the inverted U-shaped locking plate **26** formed on the fan motor support member **20**, thereby enabling to lock the fan motor support member **20** onto the corrugated-fin heat exchanger. In this manner, even for the different types of heat exchangers, the use of the size adjustment section **30** alone allows the use of the fan motor support member without changing the structure thereof. Therefore, the increase in

number of components can be minimized, thereby facilitating the management of inventory and distribution. As a result, materials can be saved.

REFERENCE SIGNS LIST

[0043] **1** front panel **1***a* air outlet **1***b* fan guard **2** side panel **3** top panel **4** bottom panel **4***a* drawing portion **4***b* burring portion **5** service cover **6** valve cover **7** foot section **8** separator **9** air-sending device chamber **10** machine chamber **11** heat exchanger **12** air-sending device **12***a* fan motor **12***b* propeller fan **14** compressor **20** fan motor support member **21** support column section **22** holding section **23** support column fixing section **24** top panel support section **25** lock and support section **25***a* support plate **26** inverted U-shaped locking plate **26***a* one side surface **26***b* cut-and-raised piece **26***c* stepped portion **26***d* groove **27** screw **30** size adjustment section **30***a* front surface **30***b* rear surface **31** groove **32** U-shaped regulation piece **32***a* side piece **33** hook portion **34** protruding piece **40** cushioning member **50** outdoor unit **51** housing

1. An outdoor unit for an air-conditioning apparatus, comprising:

a housing having an opening formed in a rear surface thereof and an air outlet formed in a front surface thereof;

a heat exchanger covering the opening of the rear surface of the housing from an inside of the housing;

a fan motor support member having an air-sending device fixed to a center portion thereof, a part of the fan motor support member above the air-sending device being locked onto an upper end side of the heat exchanger and a part of the fan motor support member below the air-sending device being fixed onto a bottom panel of the housing;

a locking section formed on an upper side of the fan motor support member, the locking section having a downward groove; and

a size adjustment section to be fitted into the downward groove of the locking section in accordance with a height and a thickness of the heat exchanger so that the heat exchanger is fitted into the downward groove of the locking section through intermediation of the size adjustment section.

2. The outdoor unit for an air-conditioning apparatus of claim **1**, wherein the size adjustment section has a downward groove, in which an upper end portion of the heat exchanger is to be fitted.

3. The outdoor unit for an air-conditioning apparatus of claim **1**, further comprising:

a stepped portion having a flat surface, which is formed on one side surface forming the downward groove of the locking section, the stepped portion being formed by cutting and raising a part of the one side surface; and

a hook portion formed on a surface of the size adjustment section on the stepped portion side, the hook portion being configured to be locked onto the stepped portion when the size adjustment section is fitted into the downward groove of the locking section.

4. The outdoor unit for an air-conditioning apparatus of claim **3**, further comprising a U-shaped regulation piece formed on a surface of the size adjustment section on an opposite side to the surface on the stepped portion side, the U-shaped regulation piece being configured to regulate lateral movement of the size adjustment section when the size adjustment section is fitted into the downward groove of the locking section.

5. The outdoor unit for an air-conditioning apparatus of claim **2**, further comprising a cushioning member fitted into the downward groove of the size adjustment section so as to absorb vibrations.

* * * * *