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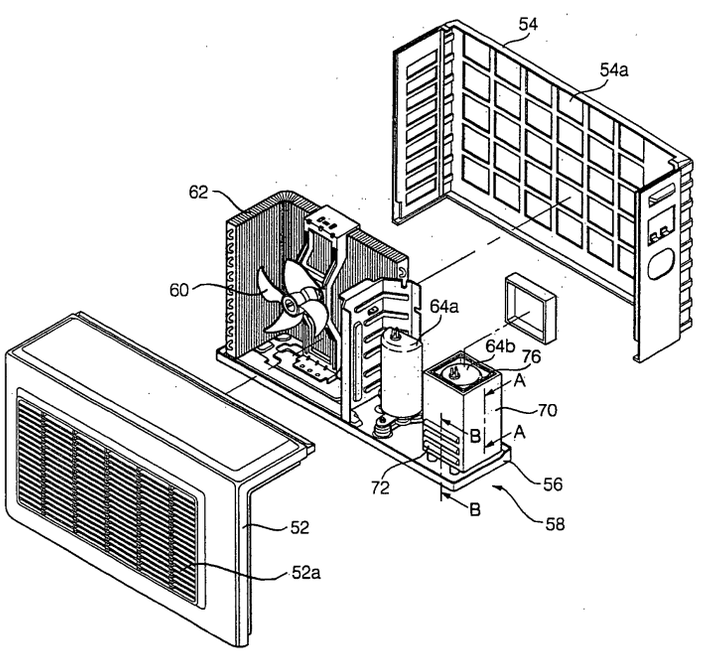
(54) Noise reduction structure of outdoor unit of large-sized air conditioner

(57) Disclosed is a noise reduction structure of an outdoor unit of a large-sized air conditioner provided with a constant-speed converter and an inverter converter for compressing a refrigerant so as to circulate the refrigerant through a refrigerating cycle to variably change air-cooling capacity of the air conditioner. Particularly, an anti-noise barrier provided with protrusions surrounds the inverter compressor, thereby preventing noise generated from the inverter compressor from being transmitted to the outside.

Fig. 2



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Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to an outdoor unit of a large-sized air conditioner provided with a constant-speed compressor and an inverter compressor installed therein, and more particularly to a noise reduction structure of the outdoor unit for the large-sized air conditioner in order to prevent noise generated from the inverter compressor from being transmitted to the outside.

Description of the Related Art

[0002] Generally, a large-sized air conditioner is an apparatus for maintaining a comfortable temperature, humidity, and the like of an indoor space. The large-sized air conditioner comprises an indoor unit and an outdoor unit. The indoor unit is arranged inside the room, and includes an indoor blower and an evaporator. The outdoor unit is arranged outside the room, and includes an outdoor blower, a condenser and a compressor.

[0003] Fig. 1 is an exploded perspective view of an outdoor unit of a conventional large-sized air conditioner.

[0004] As shown in Fig. 1, the outdoor unit of the conventional large-sized air conditioner comprises a case 8, an outdoor blast fan 10, a condenser 12, and a compression section 14. The case 8 comprises a front panel 2 provided with a heat discharging outlet 2a formed thereon, a back panel 4 provided with a heat absorbing inlet 4a formed thereon, and a base pan 6. The front and back panels 2 and 4 are arranged on the upper surface of the base pan 6. The outdoor blast fan 10 is installed inside the front panel 2 and serves to forcibly blow outdoor air. The condenser 12 is installed inside the back panel 4 and serves to exchange heat between the outdoor air forcibly-blown by the outdoor blast fan 10 and a refrigerant. The compression section 14 is arranged near the condenser 12 and serves to compress the refrigerant so as to control air-cooling capacity of the air conditioner, thereby circulating the refrigerant through a refrigerating cycle consisting of compression, condensation, expansion, and evaporation.

[0005] Herein, the compression section 14 includes a constant-speed compressor 14a driven at constant speed, and an inverter compressor 14b driven at variable speed. Therefore, the compression section 14 changes its rotational speed according to the change of an input frequency and then controls flow rate of the refrigerant circulated through the refrigerant cycle, thereby variably changing the air-cooling capacity of the air conditioner.

[0006] More particularly, the rotational speed of the inverter compressor 14b is variably changed according to the air-cooling capacity change and then continuously driven, while the air conditioner operates. Only when a higher air-cooling capacity of the air conditioner is required, the constant-speed compressor 14a is driven.

[0007] Herein, as the input frequency is higher, the inverter compressor 14b is rotated with a higher speed, thereby increasing the quantity of inflow and outflow of the refrigerant, and effectively controlling the air-cooling capacity of the air conditioner.

[0008] A reference number 16 represents a motor mount fixedly installed on the condenser 12 so as to fix a motor for rotating the outdoor blast fan 10, and a reference number 18 represents a partition wall formed within the case 8, for dividing a space where the constant-speed and inverter compressors 14a and 14b are installed from a space where the condenser 12 is installed.

[0009] Hereinafter, operation of the outdoor unit of the conventional air conditioner is described.

[0010] Power is applied, and a signal requiring a comparatively low air-cooling capacity is inputted to the inverter compressor 14b. Then, the inverter compressor 14b is driven at low speed, thereby decreasing the flow rate of the refrigerant circulated through the refrigerating cycle.

[0011] However, when a signal requiring a higher air-cooling capacity is inputted to the inverter compressor 14b, the inverter compressor 14b is driven at a higher speed, thereby increasing the flow rate of the refrigerant circulated through the refrigerating cycle.

[0012] Further, when a signal requiring a much higher air-cooling capacity is inputted to the inverter compressor 14b, the inverter compressor 14b is overloaded. Then, the constant-speed compressor 14a as well as the inverter compressor 14a is driven, thereby further increasing the flow rate of the refrigerant circulated through the refrigerating cycle.

[0013] However, in the aforementioned outdoor unit of the conventional large-sized air conditioner, the rotational speed of the inverter compressor 14b is variably changed according to the change of the input frequency, thereby generating noise due to the pulsation of pressure of the refrigerant and the structural vibration of the inverter compressor 64b.

[0014] The inverter compressor 14b installed on the outdoor unit of the conventional large-sized air conditioner is not installed on a separate space in the manner of another inverter compressor installed on a refrigerator, but is installed on the space divided by the partition wall within the case 8. Therefore, the noise generated due to the driving of the inverter compressor 14b is easily transmitted to the outside.

SUMMARY OF THE INVENTION

[0015] Therefore, the present invention has been made in view of the above problems, and it is an object

of the present invention to provide a noise reduction structure of an outdoor unit of a large-sized air conditioner so as to prevent noise generated by an inverter compressor installed on the outdoor unit of the air conditioner from being transmitted to the outside via a case of the outdoor unit.

[0016] In accordance with the present invention, the above and other objects can be accomplished by the provision of a noise reduction structure of an outdoor unit of a large-sized air conditioner comprising a compressor for compressing a refrigerant so as to circulate the refrigerant through a refrigerating cycle, wherein an anti-noise barrier provided with protrusions formed thereon surrounds the compressor so as to prevent noise generated from the compressor from being transmitted to the outside.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] The above and other objects, features and other advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

Fig. 1 is an exploded perspective view of an outdoor unit of a conventional large-sized air conditioner;
Fig. 2 is an exploded perspective view of a noise reduction structure of an outdoor unit of a large-sized air conditioner in accordance with an embodiment of the present invention;
Fig. 3 is a cross-sectional view taken along the line A-A of Fig. 2;
Fig. 4 is a cross-sectional view taken along the line B-B of Fig. 2;
Fig. 5 is an exploded perspective view of a noise reduction structure of an outdoor unit of a large-sized air conditioner in accordance with another embodiment of the present invention; and
Fig. 6 is a cross-sectional view taken along the line C-C of Fig. 5.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0018] Now, preferred embodiments of the present invention will be described in detail with reference to the annexed drawings.

[0019] Fig. 2 is an exploded perspective view of a noise reduction structure of an outdoor unit of a large-sized air conditioner in accordance with an embodiment of the present invention. Fig. 3 is a cross-sectional view taken along the line A-A of Fig. 2, and Fig. 4 is a cross-sectional view taken along the line B-B of Fig. 2. Fig. 5 is an exploded perspective view of a noise reduction structure of an outdoor unit of a large-sized air conditioner in accordance with another embodiment of the present invention. Fig. 6 is a cross-sectional view taken along the line C-C of Fig. 5.

[0020] As shown in Figs. 2 and 5, the noise reduction structure of the outdoor unit of the large-sized air conditioner of the present invention comprises a case 58, an outdoor blast fan 60, a condenser 62, a constant-speed compressor 64a, an inverter compressor 64b, and an anti-noise barrier 70. The case 58 comprises a front panel 52 provided with a heat discharging outlet 52a formed thereon, a back panel 54 provided with a heat absorbing inlet 54a formed thereon, and a base pan 56. The front and back panels 52 and 54 are arranged on the upper surface of the base pan 56. The outdoor blast fan 60 is installed inside the front panel 52 and serves to forcibly blow outdoor air. The condenser 62 is installed inside the back panel 54 and serves to exchange heat between the outdoor air forcibly blown by the outdoor blast fan 60 and a refrigerant. The constant-speed compressor 64a and the inverter compressor 64b are arranged near the condenser 62. The constant-speed compressor 64a is driven at constant speed and the inverter compressor 64b is driven at variable speed so as to compress the refrigerant and to control the flow rate of the refrigerant circulated through the refrigerating cycle according to the air-cooling capacity change. The anti-noise barrier 70 surrounds the inverter compressor 64b and is provided with a plurality of protrusions 72 or 74, thereby preventing noise generated from the inverter compressor 64b from being transmitted to the outside.

[0021] The noise reduction structure of the outdoor unit of the large-sized air conditioner of the present invention further comprises a sound absorbing and insulating material (not shown) surrounding the constant-speed compressor 64a. The sound absorbing and insulating material is formed by stacking a sound-absorbing material (not shown) made of porous material such as non-woven fabric or foam aerosol, and a sound-insulating material (not shown) made of rubber or metal.

[0022] Herein, the inverter compressor 64b changes its rotational speed depending on the air-cooling capacity and then is continuously driven while the air conditioner operates. Herein, only when a higher air-cooling capacity is required, the constant-speed inverter 64a as well as the inverter compressor 64b is driven.

[0023] Particularly, the rotational speed of the inverter compressor 64b is variably changed according to an input frequency, thereby generating comparatively much noise due to the pulsation of pressure of the refrigerant and the structural vibration of the inverter compressor 64b. As a result of experiments, noise generation characteristics of the inverter compressor 64b are determined. Thus, the protrusions 72 or 74 are formed on one outer side surface of the anti-noise barrier 70 at a position where the noise is most strongly generated.

[0024] Herein, since the noise generated from the inverter compressor 64b surrounded with the anti-noise barrier 70 is transmitted in the form of sound waves, the noise is not vertically incident on the anti-noise barrier

70 but is reflected into the inside of the anti-noise barrier 70 by the protrusions 72 and 74 formed on the outer side surface of the anti-noise barrier 70.

[0025] In order to enhance an anti-noise effect, a sound absorbing and insulating material 76 for absorbing the noise generated from the inverter compressor 64b is formed on the inner wall of the anti-noise barrier 70. Herein, the sound absorbing and insulating material 76 is formed on the whole inner wall of the anti-noise barrier 70 except for the area of the protrusions 72 and 74.

[0026] As shown in Fig. 3, the sound absorbing and insulating material 76 includes a sound-absorbing material 76a and a sound-insulating material 76b. The sound-absorbing material 76a is made of a porous material such as felt, fabric, or foam aerosol in which an air volume is very large relative to its total volume. The sound-insulating material 76b is made of rubber or metal and stacked on the sound-absorbing material 76a.

[0027] Specifically, as shown in Fig. 4, each of the protrusions 72 formed on one outer side surface of the anti-noise barrier 70 is horizontally extended and has a semicircular cross section. The protrusions 72 formed on the anti-noise barrier 70 are parallelly spaced from each other by a designated distance (h).

[0028] Alternatively, as shown in Fig. 6, each of other protrusions 74 formed on one outer side surface of the anti-noise barrier 70 is horizontally extended and has an arc-shaped cross section. Of course, the protrusions 74 formed on the anti-noise barrier 70 are parallelly spaced from each other by a designated distance (h).

[0029] Further, a ventilation hole 74a is formed on the bottom of the protrusions 74 of Fig. 6, thereby emitting heat generated from the inverter compressor 64b to the outside.

[0030] Alternatively, when the heat generated from the inverter compressor 64b is excessive, the top surface of the anti-noise barrier 70 is opened and the outdoor blast fan 60 is installed on the upper surface of the inverter compressor 64b, thereby effectively emitting the heat generated from the inverter compressor 64b to the outside.

[0031] Hereinafter, operation of the noise reduction structure of the outdoor unit of the large-sized air conditioner of the present invention is described.

[0032] When power is applied, the inverter compressor 64b is driven. Since the rotational speed of the inverter compressor 64b is variably changed according to the air-cooling capacity change, the inverter compressor 64b controls the flow rate of the refrigerant circulated through the refrigerating cycle. As a result, noise is generated from the inverter compressor 64b.

[0033] Herein, the noise generated from the inverter compressor 64b is partially absorbed or reduced by the sound absorbing and insulating material 76, and cut off from the outside by the anti-noise barrier 70 surrounding the inverter compressor 64b.

[0034] Further, since the noise generated from the inverter compressor 64b is not vertically incident on the anti-noise barrier 70 but is obliquely incident on the anti-noise barrier 70 by the protrusions 72 and 74, the noise is then reflected into the inside of the anti-noise barrier 70, thereby not being transmitted to the outside.

[0035] The heat generated from the inverter compressor 64b is emitted to the outside via the ventilation holes 74a formed on the protrusions 74 of the anti-noise barrier 70.

[0036] As apparent from the above description, the present invention provides a noise reduction structure of an outdoor unit of a large-sized air conditioner, in which an anti-noise barrier provided with protrusions formed thereon surrounds an inverter compressor, thereby preventing noise generated from the inverter compressor from being transmitted to the outside. Therefore, the noise generated from the inverter compressor is reflected into the inside of the anti-noise barrier by the protrusions, thereby reducing noise pollution and increasing performance of the air conditioner product.

[0037] Although the preferred embodiments of the present invention have been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

Claims

1. A noise reduction structure of an outdoor unit of a large-sized air conditioner comprising a compressor for compressing a refrigerant so as to circulate the refrigerant through a refrigerating cycle,

   wherein an anti-noise barrier provided with protrusions formed thereon surrounds the compressor so as to prevent noise generated from the compressor from being transmitted to the outside.

2. The noise reduction structure of an outdoor unit of a large-sized air conditioner as set forth in claim 1, wherein the compressor is an inverter compressor for variably changing its driving speed, installed near a constant-speed compressor so that air-cooling capacity of the air conditioner is variably changeable.

3. The noise reduction structure of an outdoor unit of a large-sized air conditioner as set forth in claim 1, wherein a sound absorbing and insulating material is formed on an inner wall of the anti-noise barrier except for an area provided with the protrusions.

4. The noise reduction structure of an outdoor unit of a large-sized air conditioner as set forth in claim 3, wherein the sound absorbing and insulating material is formed by stacking a sound-absorbing mate-

rial and a sound-insulating material.

5. The noise reduction structure of an outdoor unit of a large-sized air conditioner as set forth in claim 4, wherein the sound-absorbing material is made of porous material.

6. The noise reduction structure of an outdoor unit of a large-sized air conditioner as set forth in claim 4, wherein the sound-insulating material is made of rubber.

7. The noise reduction structure of an outdoor unit of a large-sized air conditioner as set forth in claim 1, wherein the anti-noise barrier is made of metal.

8. The noise reduction structure of an outdoor unit of a large-sized air conditioner as set forth in claim 1, wherein the protrusions are formed on one outer side surface of the anti-noise barrier at a position where the noise is most strongly generated.

9. The noise reduction structure of an outdoor unit of a large-sized air conditioner as set forth in claim 8, wherein the protrusions formed on one outer side surface of the anti-noise barrier are parallelly spaced from each other by a designated distance and have semi-circular cross sections.

10. The noise reduction structure of an outdoor unit of a large-sized air conditioner as set forth in claim 8, wherein the protrusions formed on one outer side surface of the anti-noise barrier are parallelly spaced from each other by a designated distance and have arc-shaped cross sections.

11. The noise reduction structure of an outdoor unit of a large-sized air conditioner as set forth in claim 10, wherein a ventilation hole for emitting heat generated from the compressor to the outside is formed on the bottom of each of the protrusions.

FIG. 1

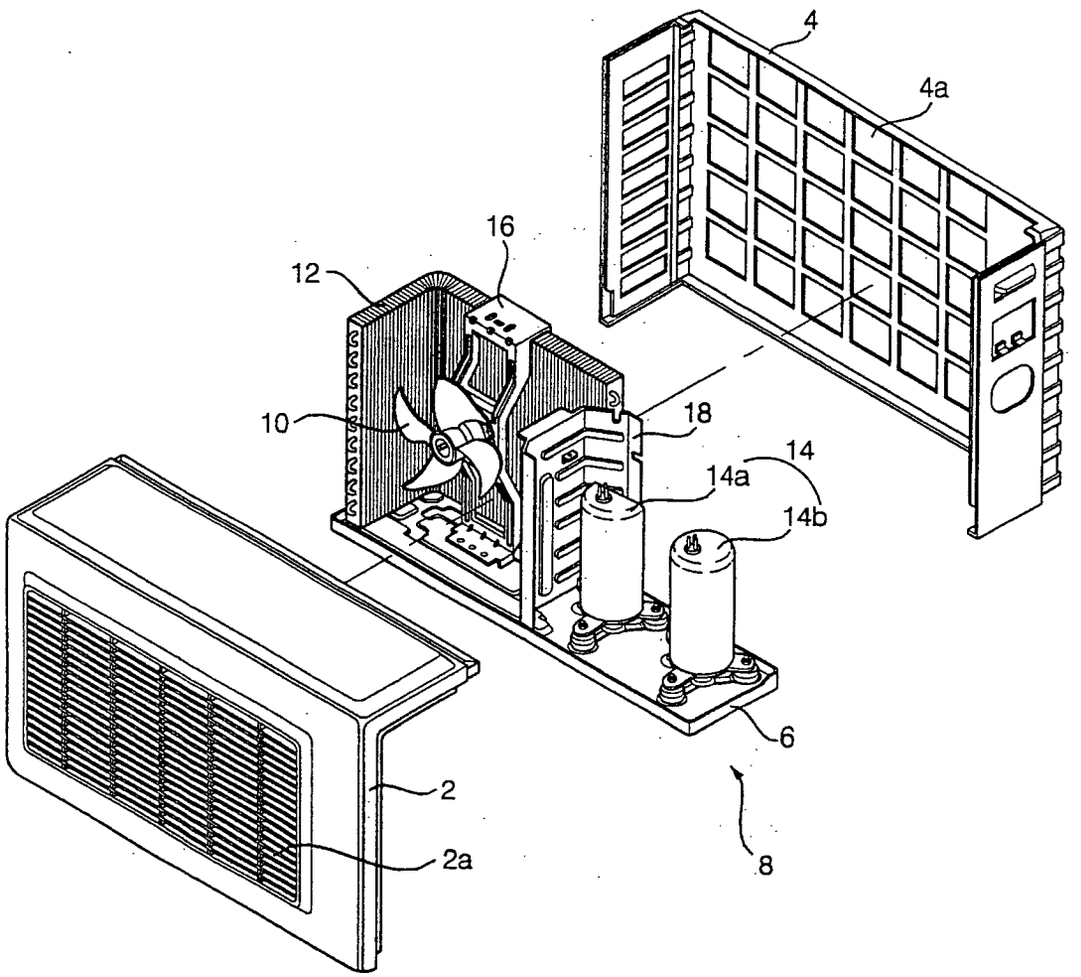

Fig. 2

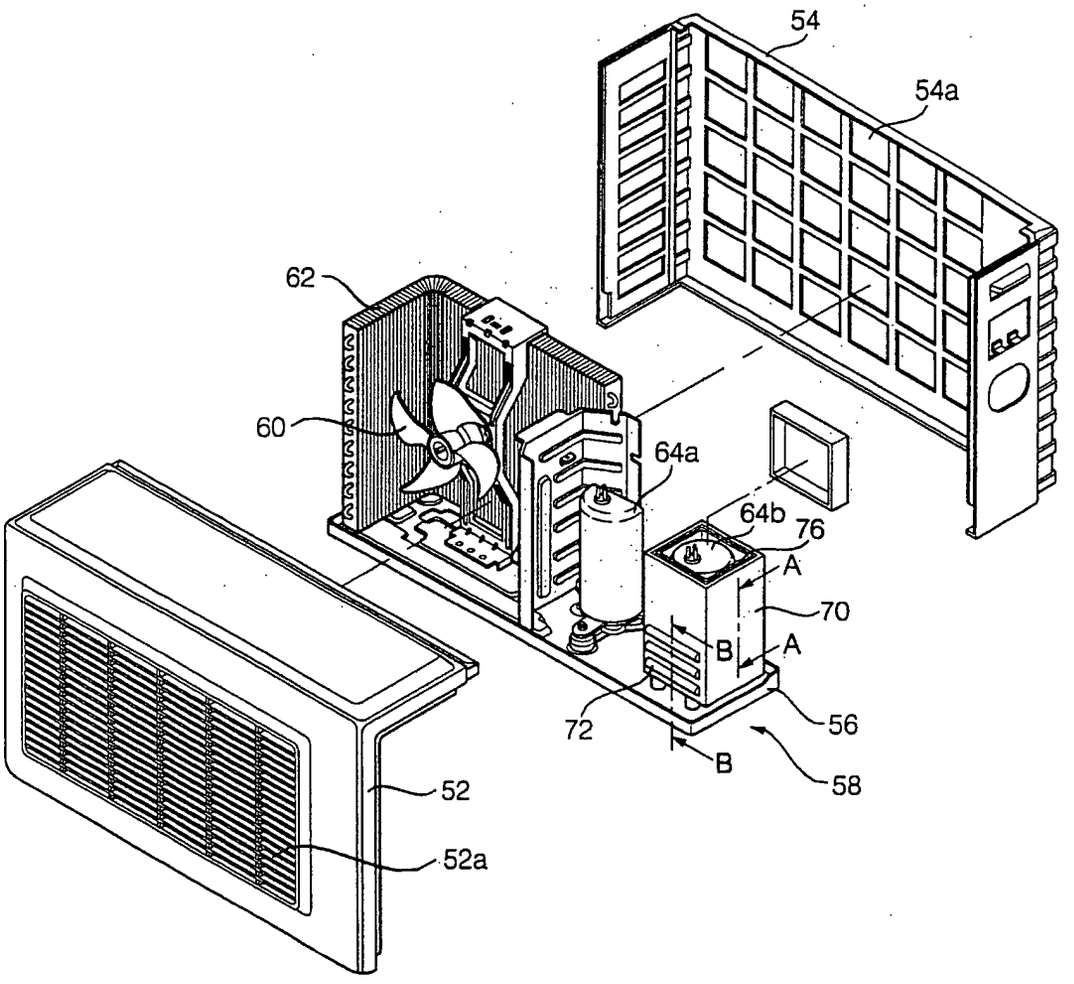

Fig. 3

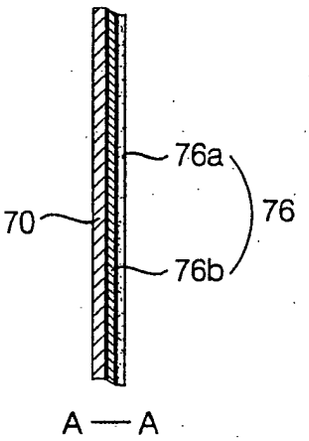

Fig. 4

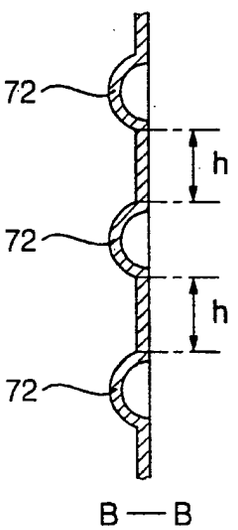

Fig. 5

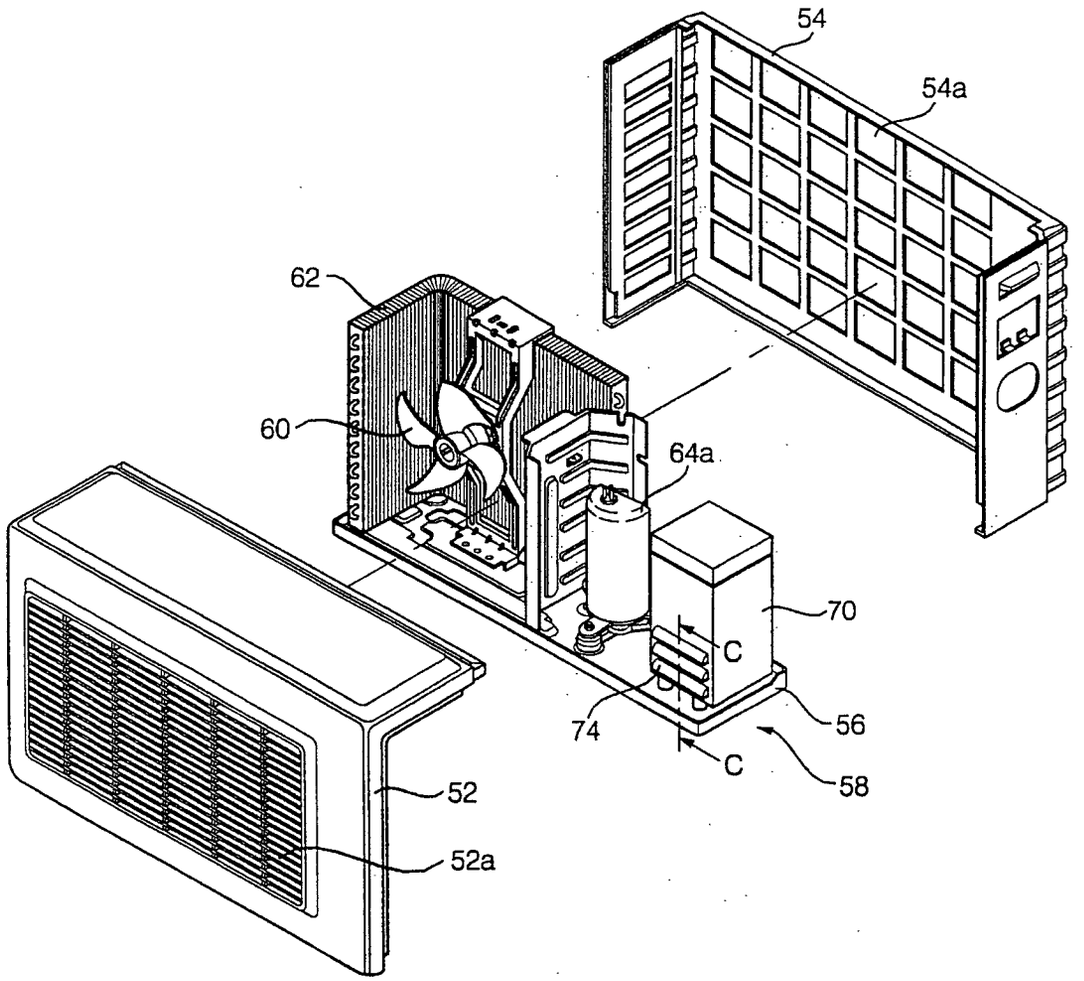

Fig. 6