(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 215 446 A1

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 158(3) EPC

(43) Date of publication:
19.06.2002 Bulletin 2002/25

(21) Application number: **00951933.1**

(22) Date of filing: **10.08.2000**

(51) Int Cl.[7]: **F24F 1/00**

(86) International application number:
PCT/JP00/05365

(87) International publication number:
WO 01/16531 (08.03.2001 Gazette 2001/10)

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE

(30) Priority: **31.08.1999 JP 24510099**

(71) Applicant: **Daikin Industries, Ltd.**
Osaka-shi, Osaka 530-8323 (JP)

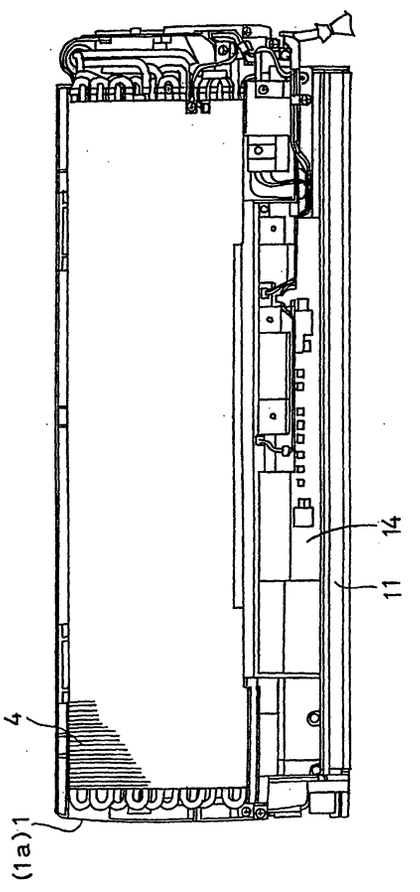
(72) Inventors:
- **KOREEDA, Kenji**
  Kusatsu-shi, Shiga 525-0058 (JP)
- **YAMASHITA, Tetsuya**
  Kusatsu-shi, Shiga 525-0044 (JP)
- **ITO, Mikio, Shiga-seisakusho of Daikin Ind., Ltd.**
  Kusatsu-shi, Shiga525-0044 (JP)
- **TERADA, Yuuichi**
  Kusatsu-shi, Shiga 525-0044 (JP)

(74) Representative: **HOFFMANN EITLE**
Patent- und Rechtsanwälte
Arabellastrasse 4
81925 München (DE)

(54) AIR CONDITIONER

(57) An air conditioner in which an electric/electronic parts unit (14) is disposed so that a longitudinal dimension thereof is not less than 1/3 of a longitudinal dimension of an indoor unit casing (1) or an air outlet (11). An indoor heat exchanger is thereby increased in size to increase the air conditioning efficiency of the air conditioner without increasing the size of an indoor unit casing body. Alternatively, the casing body can be formed compact without reducing the size of the indoor heat exchanger.

Fig. 1



EP 1 215 446 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to an air conditioner and particularly to an air conditioner in which the disposition space of an electric/electronic parts unit is improved.

BACKGROUND ART

[0002] Fig. 28 is a visualized front view showing an indoor unit of a conventional air conditioner. In a casing body 81, there is provided an indoor heat exchanger 82 having a front-side heat exchanger and a rear-side heat exchanger connected to each other in the shape of an inverted letter "V". A cylindrical cross flow fan 83 is disposed in a space surrounded with the inverted letter "V". The cross flow fan 83 is driven to rotate by a fan motor 85 disposed at the right-hand side of the indoor heat exchanger 82. By rotating the cross flow fan 83, indoor air is sucked into the indoor heat exchanger 82 from its front side. After heat exchange is carried out in the indoor heat exchanger 82, conditioned air is blown into a room from a lower part of the indoor heat exchanger 82.

[0003] An auxiliary piping 86 extends from the right-hand side of the indoor heat exchanger 82 in Fig. 28. The auxiliary piping 86 is composed of a liquid pipe and a gas pipe forming a refrigerant circuit between them and an outdoor unit (not shown). After the auxiliary piping 86 is pulled out from the indoor heat exchanger 82, the auxiliary piping 86 is disposed at the right-hand side of the indoor heat exchanger 82. Then, the auxiliary piping 86 is covered with a heat insulation to form a connection pipe 88. The connection pipe 88 is disposed at a rear part of the casing body 81 from the right-hand side thereof to the left-hand side thereof. An electric/electronic parts case 90 for accommodating electric/electronic component parts such as a microcomputer, a power amplifier for driving the motor, and the like is disposed at the right-hand side of the auxiliary piping 86 in such a manner that the electric/electronic parts case 90 does not interfere with an air path.

[0004] At the right-hand side of the indoor heat exchanger 82 of the indoor unit, the auxiliary piping 86 taken out from the indoor heat exchanger 82 is disposed. At the right-hand side of the auxiliary piping 86, the electric/electronic parts case 90 is disposed. That is, two spaces not directly contributing to heat exchange, namely, a space for disposing the auxiliary piping 86 and the space of the electric/electronic parts case 90 occupy the inside of the casing body 81. Thus the widthwise dimension of the indoor heat exchanger 82 cannot but be reduced by the volume of the two spaces. Needless to say, from the viewpoint of air-conditioning efficiency, it is desirable that the widthwise dimension of the indoor heat exchanger 82 is large. On the other hand, from the viewpoint of the limitation of the installing space and the maintenance of the installability, it is undesirable to make the widthwise dimension of the casing body 81 large. Therefore it has been desired that the air-conditioning efficiency is improved by reducing the space not directly contributing to the heat exchange in the casing body 81 as much as possible and making the widthwise dimension of the indoor heat exchanger 82 large without making the widthwise dimension of the casing body 81 large.

DISCLOSURE OF THE INVENTION

[0005] The present invention has been made to solve the problem of the conventional art. The object of the present invention is to provide an air conditioner which allows improving air-conditioning efficiency of the air conditioner by enlarging the dimension of a heat exchanger without enlarging a casing body or which allows making the casing body compact in size without reducing the dimension of the heat exchanger.

[0006] In order to accomplish the above object, in an air conditioner according to a first invention, an electric/electronic parts unit is disposed in such a manner that a dimension of the unit along a longitudinal direction of an indoor unit casing is not less than 1/3 of a dimension of the indoor unit casing in the longitudinal direction.

[0007] According to the air conditioner of the first invention, the electric/electronic parts unit, which is made elongate, can be disposed in various spaces appearing in cross sections perpendicular to the longitudinal direction of the indoor unit casing. That is, unlike the conventional art, there is no need for providing the indoor unit casing with a particular space for disposing the electric/electronic parts at the lateral sides of the indoor unit casing. Therefore it is possible to reduce the longitudinal dimension of the indoor unit and make the indoor unit compact. Conversely, supposing that the indoor unit of the present invention and the conventional indoor unit have the same size, the indoor unit of the present invention has a larger space for disposing a heat exchanger and a fan than the conventional indoor unit. Therefore, the indoor unit of the present invention has improved air-conditioning performance over the conventional indoor unit. It is preferable that the dimension of the electric/electronic parts unit along the longitudinal direction of the indoor unit casing is longer and is preferably not less than 1/2 and more preferably not less than 2/3 of the dimension of the indoor unit casing in its longitudinal direction.

[0008] In an air conditioner according to a second invention, an electric/electronic parts unit is disposed in such a manner that a dimension of the unit along a longitudinal direction of an indoor unit air outlet is not less than 1/3 of a dimension of the air outlet in the longitudinal direction.

[0009] In the air conditioner of the second invention as well, it is possible to obtain an advantage that the indoor unit is made compact or that the air-conditioning

performance is improved, as in the case of the first invention,. In this case as well, it is preferable that the dimension of the electric/electronic parts unit along the longitudinal direction of the air outlet is longer and is favorably not less than 1/2 and more favorably not less than 2/3 of the dimension of the air outlet of the indoor unit in its longitudinal direction.

[0010] In an air conditioner according to a third invention, an electric/electronic parts unit is disposed in such a manner that a dimension of the unit along an axial direction of an indoor unit fan is not less than 1/3 of a dimension of an indoor unit casing or an indoor air outlet in a longitudinal direction thereof.

[0011] In the air conditioner of the third invention, it is possible to obtain the advantage that the indoor unit is made compact or that the air-conditioning performance is improved, as in the case of the first invention. In the air conditioner of the third invention, the axial direction of the fan is coincident with the longitudinal direction of the indoor unit casing or the air outlet. Accordingly the first and second inventions involve a case where an air-feeding means other than the fan is used and a case where the axial direction of the fan is not coincident with the longitudinal direction of the indoor unit casing or the air outlet. In this case also, it is preferred that the dimension of the electric/electronic parts unit along the longitudinal direction of the indoor unit casing or the air outlet is longer and is preferably not less than 1/2 and more preferably not less than 2/3 of the longitudinal dimension of the indoor unit casing or the air outlet.

[0012] In an air conditioner according to a fourth invention, an electric/electronic parts unit is arranged in such a manner that a total dimension of the unit along a longitudinal direction of an indoor unit casing is not less than 1/3 of a dimension of the indoor unit casing in the longitudinal direction.

[0013] In an air conditioner according to a fifth invention, an electric/electronic parts unit is arranged in such a manner that a total dimension of the unit along a longitudinal direction of an indoor air outlet is not less than 1/3 of a dimension of the air outlet in the longitudinal direction.

[0014] In an air conditioner according to a sixth invention, an electric/electronic parts unit is arranged in such a manner that a total dimension of the unit along an axial direction of an indoor unit fan is not less than 1/3 of a dimension of an indoor unit casing or an indoor air outlet in a longitudinal direction thereof.

[0015] Each of the first through third inventions involves a case in which the electric/electronic parts unit is constructed as a single unit, a case in which the electric/electronic parts unit is composed of a plurality of units arranged almost linearly, and a case in which a plurality of the units are arranged not linearly but displaced from each other. In the case in which the electric/electronic parts unit is composed of a plurality of units, it is specified in the fourth through sixth inventions that the length of the electric/electronic parts unit is defined by the total value of the dimensions of the plurality of constituent units. Although not specified in the first through third inventions, in the case in which the electric/electronic parts unit is composed of a plurality of units, the dimension of the electric/electronic parts unit means the total value of the longitudinal dimensions of the constituent units. In the fourth through sixth inventions as well as in the case of the first through third inventions, it is possible to obtain the advantage that the indoor unit is made compact or that the air-conditioning performance is improved. Further by composing the electric/electronic parts unit of a plurality of the units, it is possible to improve the degree of freedom in selecting the mounting positions of the units and appropriately dispose them according to the kind of an air conditioner.

[0016] In the fourth through sixth inventions as well, it is preferable that the total value of the dimensions of the constituent units of the electric/electronic parts unit is longer and is thus preferably not less than 1/2 and more preferably not less than 2/3 of the dimension of the indoor unit casing or the air outlet in the longitudinal direction thereof.

[0017] In one embodiment of the air conditioner according to any one of the first through sixth inventions, the electric/electronic parts unit is disposed in an air path inside the indoor unit casing.

[0018] In this embodiment, in the cooling and warming operations, the electric/electronic parts unit is cooled with circulation air, and the reliability of the electric/electronic parts is improved.

[0019] In one embodiment of the air conditioner according to any one of the first through sixth invention, the electric/electronic parts unit is disposed outside an air path inside the indoor unit casing.

[0020] In the air conditioner of the embodiment, it is possible to prevent the electric/electronic parts unit from increasing a resistance to air flow directly. Therefore deterioration of the air-conditioning performance owing to the installation of the electric/electronic parts unit is suppressed.

[0021] In an air conditioner according to a seventh invention, an electric/electronic parts unit extends in such a manner that a dimension thereof along a longitudinal direction of an indoor unit casing, a longitudinal direction of an air outlet or an axial direction of a fan is not less than 1/3 of a dimension of the indoor unit casing or air outlet in the longitudinal direction thereof, and the electric/electronic parts unit is disposed in a region adjoining the air outlet and an air inlet.

[0022] Similarly to the first through third inventions, in the air conditioner of the seventh invention, due to the dimension of the electric/electronic parts unit, it is possible to obtain the advantage that the indoor unit is made compact or that the air-conditioning performance is improved. Further the region which adjoins the air outlet and the air inlet of the indoor unit is a region which forms a dead space to prevent the outlet side and the inlet side from being short-circuited or connected. By disposing

the electric/electronic parts unit in the region that forms a dead space, the spaces inside the indoor unit casing can be more effectively utilized. Consequently the indoor unit can be made more compact or the air-conditioning performance can be improved further.

[0023] In one embodiment of the air conditioner according to the seventh invention, the region adjoining the air outlet and the air inlet is located above the air outlet, and in the region, the electric/electronic parts unit is disposed at a position between a drain pan disposed below an indoor heat exchanger and a front panel of the indoor unit casing.

[0024] In the air conditioner of the embodiment, the drain pan is disposed below the heat exchanger in the region positioned above the air outlet of the indoor unit. In this case, the place between the drain pan and the front panel of the indoor unit casing forms a dead space without failure. By disposing the electric/electronic parts unit in this region, spaces inside the indoor unit casing can be more effectively utilized. Consequently the indoor unit can be made more compact or the air-conditioning performance can be improved further.

[0025] In an air conditioner according to an eighth invention, an electric/electronic parts unit extends in such a manner that a dimension thereof along a longitudinal direction of an indoor unit casing, a longitudinal direction of an air outlet or an axial direction of a fan is not less than 1/3 of a dimension of the indoor unit casing or air outlet in the longitudinal direction thereof, and the electric/electronic parts unit is disposed in a region disposed between a front panel and an indoor heat exchanger.

[0026] Similarly to the first through third inventions, in the air conditioner of the eighth invention, due to the dimension of the electric/electronic parts unit, it is possible to obtain the advantage that the indoor unit is reduced in size, i.e., made compact or that the air-conditioning performance is improved. Further in the eighth invention, the electric/electronic parts unit is disposed in a region located between the indoor heat exchanger and the front panel, i.e., the electric/electronic parts unit is disposed in an air path. In this case, however, because the sectional area of the electric/electronic parts unit is small, it is possible to suppress the increase of the resistance to air. Further at cooling and warming operation times, it is possible to cool the electric/electronic parts unit with circulation air and improve the reliability of the electric/electronic parts.

[0027] In an air conditioner according to a ninth invention, an electric/electronic parts unit extends in such a manner that a dimension thereof along a longitudinal direction of an indoor unit casing, a longitudinal direction of an air outlet or an axial direction of a fan is not less than 1/3 of a dimension of the indoor unit casing or air outlet in the longitudinal direction thereof, and the electric/electronic parts unit is disposed in a region positioned at a rear side of an indoor unit.

[0028] As in the case of the first through third inventions, in the air conditioner of the ninth invention as well, due to the dimensional feature of the electric/electronic parts unit, it is possible to obtain the advantage that the indoor unit is made compact or that the air-conditioning performance is improved. Further in the ninth invention, because the electric/electronic parts unit is disposed within the indoor unit casing in a region positioned at the rear side of the indoor unit which forms a dead space, spaces inside the indoor unit casing are effectively utilized. Consequently it is possible to make the indoor unit more compact or improve the air-conditioning performance further.

[0029] In one embodiment of the air conditioner according to the ninth invention, the electric/electronic parts unit is embedded in a rear-side scroll portion defining an air path inside the indoor unit casing.

[0030] In this embodiment, because the electric/electronic parts unit is embedded in the scroll portion which may be composed of, for example, a foamed material, spaces inside the indoor unit casing are more effectively utilized without increasing a resistance to air or draft inside the air path. Consequently the indoor unit can be made more compact and the air-conditioning performance can be improved further.

[0031] In an air conditioner according to a tenth invention, an electric/electronic parts unit extends in such a manner that a dimension thereof along a longitudinal direction of an indoor unit casing, a longitudinal direction of an air outlet or an axial direction of a fan is not less than 1/3 of a dimension of the indoor unit casing or air outlet in the longitudinal direction thereof, a heat exchanger inside the indoor unit casing has a front-side heat exchanger and a rear-side heat exchanger combined with each other in the shape of an inverted letter "V", and the electric/electronic parts unit is disposed at a junction position of the front-side and rear side heat exchangers so as to connect these heat exchangers.

[0032] As in the case of the first through third inventions, in the air conditioner of the tenth invention, due to the dimensional feature of the electric/electronic parts unit, it is possible to obtain the advantage that the indoor unit is made compact or that the air-conditioning performance is improved. In the tenth invention, the electric/electronic parts unit performs a function of sealing the junction portion of the front-side heat exchanger and the rear-side heat exchanger. By providing the electric/electronic parts unit with such an additional function, the use of a dedicated sealing material can be dispensed with and thus the manufacturing cost can be reduced. Further, providing the electric/electronic parts unit with the two functions reduces a necessary space accordingly. Therefore, this also contributes to the size reduction of the indoor unit or the improvement of the air-conditioning performance. When the electric/electronic parts unit is disposed so as to connect the front-side heat exchanger and the rear-side heat exchanger at the junction position thereof, a sealing member may be additionally provided. Even in this case as well, it is possible to obtain the advantage that the indoor unit is com-

pact or that the air-conditioning performance is improved.

[0033] In one embodiment of the air conditioner, a dimension of the electric/electronic parts unit in a height direction orthogonal to a longitudinal direction of the indoor unit casing is 1/3 or less of a whole length of the indoor unit casing in the height direction thereof. By constructing the air conditioner in this manner, it is possible to reduce the resistance to air flow to a higher extent and improve the degree of freedom in the disposition of the electric/electronic parts unit.

[0034] It is preferred that the electric/electronic parts unit is longer and preferably not less than 1/2 and more preferably not less than 2/3 of the longitudinal dimension of the indoor unit casing or the air outlet.

[0035] In an air conditioner according to an eleventh invention, a spare space is formed inside an indoor unit casing, the spare space extending in a longitudinal direction of the indoor unit casing, and an electric/electronic parts unit having an increased proportion of a dimension in the longitudinal direction is disposed along the spare space.

[0036] According to the air conditioner of the eleventh invention, a spare space extending inside the indoor unit casing in its longitudinal direction is utilized to receive the electric/electronic parts unit having the increased proportion of the longitudinal dimension. Thus, the electric/electronic parts unit can be disposed in various spaces in sections as viewed in a direction perpendicular to the longitudinal direction of the indoor unit casing. That is, unlike the conventional art, there is no need for providing the indoor unit casing with a lateral space intended to accommodate the electric/electronic parts unit. Therefore it is possible to reduce the longitudinal dimension of the indoor unit and make the indoor unit compact. Conversely, if the indoor unit of the present invention has the same size as the conventional indoor unit, it is possible to provide the indoor unit of the present invention with a larger space for disposing a heat exchanger and a fan. Therefore, it is possible to increase the air-conditioning performance of the indoor unit of the present invention over the conventional indoor unit. It is meant by the "increased proportion of a dimension in the longitudinal direction" herein that a dimension in the longitudinal direction is larger than dimensions in the other two directions orthogonal to the longitudinal direction. The value of the proportion does not matter, although it is preferred that the proportion of the longitudinal dimension of the electric/electronic parts unit is set larger than the proportion of the longitudinal dimension of the indoor unit casing.

[0037] In one embodiment of the air conditioner according to the eleventh invention, the electric/electronic parts unit is disposed in a region adjoining an air outlet and an air inlet of the indoor unit casing.

[0038] As in the case of the eleventh invention, according to the air conditioner of the embodiment, it is possible to obtain the advantage that the indoor unit is made compact or that the air-conditioning performance is improved. Further the region adjoining the air outlet and air inlet of the indoor unit should remain as a dead space to prevent the outlet side and the inlet side from being short-circuited or directly connected. By forming a spare space extending longitudinally in such a dead-space region and disposing the electric/electronic parts unit therein, spaces inside the indoor unit casing can be more effectively utilized. Consequently the indoor unit can be made compact or the air-conditioning performance can be improved.

[0039] In one embodiment of the air conditioner according to the eleventh invention, the region adjoining the air outlet and the air inlet is located above the air outlet, and in this region, the electric/electronic parts unit is disposed at a position between a drain pan disposed below an indoor heat exchanger and a front panel of the indoor unit casing.

[0040] When the drain pan is disposed in a region positioned above the air outlet of the indoor unit and below the indoor heat exchanger as in the air conditioner of the embodiment, a region between the drain pan and the front panel of the indoor unit casing does not fail to form a dead space. By forming a spare space extending longitudinally in the above region and disposing the electric/electronic parts unit therein, spaces inside the indoor unit casing can be more effectively utilized. Consequently the indoor unit can be made compact or the air-conditioning performance can be improved.

[0041] In one embodiment of the air conditioner according to the eleventh invention, the electric/electronic parts unit is disposed in a region positioned between a front panel of the indoor unit casing and an indoor heat exchanger.

[0042] Similarly to the eleventh invention, in the air conditioner of the embodiment, due to the dimensional feature of the electric/electronic parts unit, it is possible to obtain the advantage that the indoor unit is made compact or that the air-conditioning performance is improved. Further in this invention, the electric/electronic parts unit is disposed in a region between the indoor heat exchanger and the front panel, i.e., the electric/electronic parts unit is disposed in an air path. In this case, because the sectional area of the electric/electronic parts unit is reduced by increasing the proportion of the longitudinal dimension of the electric/electronic parts unit, it is possible to suppress the increase of the resistance to air flow. Further at cooling and warming operation times, it is possible to cool the electric/electronic parts unit with circulation air and improve the reliability of the electric/electronic parts.

[0043] In one embodiment of the air conditioner according to the eleventh invention, a heat exchanger inside the indoor unit casing has a front-side heat exchanger and a rear-side heat exchanger combined with each other in the shape of an inverted letter "V", and the electric/electronic parts unit is disposed at a junction position of the front-side and rear side heat exchangers so

as to connect these heat exchangers.

[0044] In this embodiment, due to the dimensional feature of the electric/electronic parts unit, it is possible to obtain the advantage that the indoor unit is made compact or that the air-conditioning performance is improved, as in the case of the eleventh invention. In this invention, the electric/electronic parts unit performs a function of sealing the junction portion of the front-side heat exchanger and the rear-side heat exchanger. By providing the electric/electronic parts unit with such an additional function, the use of a dedicated sealing material can be dispensed with and thus the manufacturing cost can be reduced. Further, providing the electric/electronic parts unit with the two functions reduces a necessary space accordingly. Therefore, this also contributes to the size reduction of the indoor unit or the improvement of the air-conditioning performance. When the electric/electronic parts unit is disposed so as to connect the front-side heat exchanger and the rear-side heat exchanger at the junction position thereof, a sealing member may be additionally provided. Even in this case as well, it is possible to obtain the advantage that the indoor unit is compact or that the air-conditioning performance is improved.

[0045] In one embodiment of the air conditioner according to the eleventh invention, the electric/electronic parts unit is disposed in a region behind a scroll portion defining a rear wall of an outlet path.

[0046] In this embodiment, due to the dimensional feature of the electric/electronic parts unit, it is possible to obtain the advantage that the indoor unit is made compact or that the air-conditioning performance is improved, as in the eleventh invention. In this invention, the electric/electronic parts unit is disposed within the indoor unit casing in the region behind the scroll portion which is also positioned at the rear side of the indoor unit. The space inside the indoor unit casing is effectively utilized in this manner. Consequently the indoor unit can be made compact or the air-conditioning performance can be improved.

[0047] In one embodiment of the air conditioner, the electric/electronic parts unit is embedded in the scroll portion.

[0048] In the air conditioner of the embodiment, because the electric/electronic parts unit is embedded in the scroll portion composed of, for example, a foamed material, the space inside the indoor unit casing is effectively utilized without causing an increase of the resistance to air flow inside an air path. Consequently the indoor unit can be made compact or the air-conditioning performance can be improved.

[0049] In an air conditioner according to a twelfth invention, a heat exchanger is disposed in an indoor unit casing, an air outlet is formed at a lower side of the indoor unit casing, and an air inlet is formed above the air outlet, and an electric/electronic parts unit is disposed at a position above the air outlet and between a drain pan disposed below the heat exchanger and a front panel of the indoor unit casing.

[0050] In the air conditioner of the twelfth invention, the position above the air outlet and between the drain pan disposed below the heat exchanger and the front panel of the indoor unit casing is a region which should be a dead space to prevent the outlet side and the inlet side from being short-circuited. By disposing the electric/electronic parts unit in such a dead-space region, spaces inside the indoor unit casing can be effectively utilized. Consequently the indoor unit can be made compact or the air-conditioning performance can be improved. In this case, the indoor unit casing, the air outlet, the air inlet, and the electric/electronic parts unit may have any configuration or shape. But by using the laterally elongated indoor unit casing, forming the air outlet and the air inlet such that they extend laterally, and disposing the laterally elongated electric/electronic parts unit along the air outlet, the effect of utilizing the spaces effectively can be displayed to a higher extent. Consequently the indoor unit can be made more compact or the air-conditioning performance can be improved further.

[0051] In an air conditioner according to a 13th invention, a heat exchanger inside an indoor unit casing of the air conditioner has a front-side heat exchanger and a rear-side heat exchanger combined with each other in the shape of an inverted letter "V", and an electric/electronic parts unit is disposed at a junction position of the front-side and rear side heat exchangers so as to connect these heat exchangers.

[0052] In the air conditioner of the thirteenth invention, In this invention, the electric/electronic parts unit performs a function of sealing the junction portion of the front-side heat exchanger and the rear-side heat exchanger. By providing the electric/electronic parts unit with such an additional function, the use of a dedicated sealing material can be dispensed with and thus the manufacturing cost can be reduced. Further, providing the electric/electronic parts unit with the two functions reduces a necessary space accordingly. Therefore, this also contributes to the size reduction of the indoor unit or the improvement of the air-conditioning performance. In the thirteenth invention, the above-described advantages are obtainable, irrespective of the configuration of the electric/electronic parts unit.

[0053] In an air conditioner according to a 14th invention, an electric/electronic parts unit is disposed at an inner rear position of an indoor unit casing or an outer rear position thereof.

[0054] In the air conditioner of the fourteenth invention, because the electric/electronic parts unit is disposed inside the indoor unit casing at the inner rear position or the outer rear position which each form a dead space, the space inside the indoor unit casing can be effectively utilized. Consequently it is possible to make the indoor unit compact and improve the air-conditioning performance. In the fourteenth invention, the electric/electronic parts unit may have any configuration or

shape. But preferably, the electric/electronic parts unit may be formed into the shape of a thin plate or a rod and may be square, rectangular or the like as desired. The electric/electronic parts unit may be constructed as a single unit or as a plurality of units.

[0055] In one embodiment of the air conditioner, the electric/electronic parts unit is provided with a shielding mechanism against scattered drain.

[0056] In the air conditioner of the embodiment, the drain in the drain pan is prevented from affecting the electric/electronic parts unit adversely. Thus the reliability of the electric/electronic parts unit can be improved. The electric/electronic parts unit is also prevented from being adversely affected by poured water for checking the drain discharge function in an installation work or a cleaning agent and cleaning water which are used to clean the indoor heat exchanger. Thus the reliability of the electric/electronic parts unit can be also improved in this respect. A mechanism for shielding the drain is only required to prevent a bad influence such as a drain-caused short circuit from occurring, but does not necessarily have to completely block the penetration of the drain. Thus the shielding mechanism includes even provision of a casing for the electric/electronic parts or a partitioning plate.

[0057] In one embodiment of the air conditioner, the electric/electronic parts unit is exposed to the outside when a front side of the indoor unit casing is opened.

[0058] In the air conditioner of the embodiment, just by opening the front side of the indoor unit casing, the electric/electronic parts unit, namely, the electric/electronic parts can be handled. Thus, a maintenance work is facilitated.

[0059] In one embodiment of the air conditioner, the electric/electronic parts unit is removable to the outside when a front side of the indoor unit casing is opened.

[0060] In the air conditioner of the embodiment, just opening the front side of the indoor unit casing allows the electric/electronic parts unit, namely, the electric/electronic parts to be removed. Thus, parts-replacing and maintenance works are facilitated.

[0061] In one embodiment of the air conditioner, the electric/electronic parts unit is provided with a light emission display means which is disposed at a position where the light emission display means is observable from outside through an observation window disposed at a front side of the indoor unit casing.

[0062] In the air conditioner of the embodiment, because the electric/electronic parts unit is provided integrally with the light emission display means, it is unnecessary to elongate wiring such as a lead wire for electrically connecting the electric/electronic parts unit and the light emission display means to each other. This, it is possible to reduce the length of the wiring than in the prior art to thereby reduce the cost. Also, it is possible to facilitate a maintenance work because the electric parts and the light emission display means are disposed close to each other. The light emission display means include an LED, a seven-segment LED, an LCD, and the like.

[0063] In one embodiment of the air conditioner, the electric/electronic parts unit is constructed as a single unit. By thus doing, it is easy to manufacture and handle the electric/electronic parts unit and possible to reduce its cost and improve its reliability. The electric/electronic parts unit may be composed of a plurality of units arranged almost linearly and side by side. More specifically, the electric/electronic parts unit is composed of a plurality of printed circuit boards, and the printed circuit boards are mounted on the same substrate and electrically connected to each other. In the case where the electric/electronic parts unit is constructed as described above, from the viewpoint of making the electric/electronic parts unit compact and facilitating handling thereof, it is preferable that the electric/electronic parts unit is formed pillar-shaped as a whole. In addition to the above construction, the electric/electronic parts unit may be constructed in the form of a plurality of units which are displaced from each other both in a longitudinal direction thereof and a direction intersecting with the longitudinal direction. By constructing the electric/electronic parts unit in this manner, it is possible to improve the degree of freedom in selecting the mounting position of the units and appropriately dispose them according to the kind of an air conditioner.

[0064] In one embodiment of the air conditioner, the electric/electronic parts unit has a longitudinal dimension almost equal to that of the indoor unit casing or the air outlet.

[0065] In the air conditioner of the embodiment, because the dimension of the electric/electronic parts unit is set to an electric/electronic parts unit-constructible maximum length or a length very close thereto, it is possible to set the sectional area of the electric/electronic parts unit to a minimum or close thereto and thus greatly improve the degree of freedom in the disposing position of the electric/electronic parts unit and greatly reduce the resistance to air flow. Thereby it is possible to make the indoor unit very compact or greatly improve the air-conditioning performance.

[0066] In one embodiment of the air conditioner, a heat exchanger inside the indoor unit casing is disposed in an almost entire area of the indoor unit casing or the air outlet.

[0067] In this embodiment, it is possible to increase the effective area of the heat exchanger inside the indoor unit casing to thus improve the air-conditioning performance. If the performance of the air conditioner of the present invention is maintained the same as that of the conventional air conditioner, then the indoor unit casing of the present invention is made smaller than the conventional indoor unit casing.

[0068] In one embodiment of the air conditioner, the electric/electronic parts unit is removable.

[0069] In the air conditioner of the embodiment, it is possible to improve assembling and maintenance per-

formance.

[0070] In one embodiment of the air conditioner, the electric/electronic parts unit is disposed so as to extend in a direction orthogonal to a direction in which plate fins of the heat exchanger extend.

[0071] In the air conditioner of the embodiment, even if there is turbulence in a circulation air flow owing to the disposition of the electric/electronic parts unit, the turbulence direction is parallel to the direction of the plate fins. Thus, it is possible to prevent the turbulence from increasing the resistance to air flow when the air passes through the plate fins. Consequently it is possible to prevent deterioration of the air-conditioning performance.

[0072] In one embodiment of the air conditioner, a longitudinal dimension of a fan mechanism including a fan and a fan motor is almost equal to a longitudinal dimension of a fan mechanism of the heat exchanger.

[0073] In the air conditioner of the embodiment, the fan and the indoor heat exchanger are allowed to display their capabilities to the maximum.

[0074] The indoor unit of the air conditioner is not limited to a wall mounted type, but includes a floor- standing type, a ceiling-mounted built-in type, and other mounting modes. Thus the "longitudinal direction" may mean a left-to-right direction, a vertical direction or a horizontal direction as viewed from a user.

BRIEF DESCRIPTION OF THE DRAWINGS

[0075]

Fig. 1 is a schematic front view showing a first embodiment of the air conditioner of the present invention;

Fig. 2 is a schematic front view, similar to Fig. 1, showing the first embodiment of the air conditioner of the present invention;

Fig. 3 is a schematic side view showing the first embodiment of the air conditioner of the present invention;

Fig. 4 is a sectional view showing the first embodiment of the air conditioner of the present invention;

Fig. 5 is an exploded perspective view showing the first embodiment of the air conditioner of the present invention;

Fig. 6 is an exploded perspective view showing an example of an electric/electronic parts unit that is used in the air conditioner;

Fig. 7 is a plan view showing the electric/electronic parts unit;

Fig. 8 is a block diagram showing a circuit construction of the electric/electronic parts unit;

Fig. 9 is a sectional view showing the construction of an light emission display portion and its neighborhood in the electric/electronic parts unit;

Fig. 10 is a block diagram showing a circuit construction of the electric/electronic parts unit;

Fig. 11 is a block diagram showing a modification of the circuit construction of the electric/electronic parts unit;

Fig. 12 is an illustration showing a disposition example of the electric/electronic parts unit of the air conditioner;

Fig. 13 is an illustration showing a modification of the disposition example of the electric/electronic parts unit of the air conditioner;

Fig. 14 is an illustration showing another modification of the disposition example of the electric/electronic parts unit of the air conditioner;

Fig. 15 is an illustration showing a disposition example of the electric/electronic parts unit of the air conditioner;

Fig. 16 is an illustration showing a disposition example of the electric/electronic parts unit composed of a plurality of units;

Fig. 17 is an illustration showing another disposition example of the electric/electronic parts unit composed of a plurality of units;

Fig. 18 is an illustration showing a disposition example of the electric/electronic parts unit of the air conditioner;

Fig. 19 is an illustration showing a disposition example of the electric/electronic parts unit of the air conditioner;

Fig. 20 is a sectional view showing an example of a disposition modification of the electric/electronic parts unit of the air conditioner;

Fig. 21 is a sectional view showing another disposition example of the electric/electronic parts unit of the air conditioner;

Fig. 22 is a sectional view showing still another disposition example of the electric/electronic parts unit of the air conditioner;

Fig. 23 is a sectional view showing another disposition example of the electric/electronic parts unit of the air conditioner;

Fig. 24 is a sectional view showing another example of the disposition of the electric/electronic parts unit of the air conditioner;

Fig. 25 is an illustration showing a disposition example of the electric/electronic parts unit of the air conditioner;

Fig. 26 is an illustration showing a disposition example of the electric/electronic parts unit of the air conditioner;

Fig. 27 is a sectional illustration showing a disposition example of the electric/electronic parts unit of the air conditioner; and

Fig. 28 is a schematic front view showing the conventional disposition of an electric/electronic parts unit of an air conditioner.

BEST MODE FOR CARRYING OUT THE INVENTION

[0076] Embodiments of the air conditioner of the present invention will be described in detail below with

reference to the drawings. Initially a first embodiment will be described below. The air conditioner has an outdoor unit and an indoor unit. The indoor unit of a wall mounted type will be described below.

(First Embodiment)

[0077] With reference to Figs. 3, 4, and 5, the internal construction of the indoor unit will be described below. As shown in Fig. 5, an indoor unit casing 1 of the indoor unit has a casing body 1a on which main constituent component parts such as an indoor heat exchanger 4, a cross flow fan 9, and an electric/electronic parts unit 14 are installed, a front grill 5 fit on a front of the casing body 1a, and a front panel 7 fit on a front of the front grill 5. As a whole, the indoor unit casing 1 is laterally longer than vertically, namely, its widthwise dimension is larger than its vertical dimension. Of these casing parts, the front panel 7 is removable by a user as desired, but the casing body 1a and the front grill 5 are not removable by the user. As shown in Figs. 3 and 4, inside the indoor unit casing 1, there is disposed the plate fin-type indoor heat exchanger 4 constructed of a front-side heat exchanger 2 and a rear-side heat exchanger 3 disposed in the shape of an inverted letter "V". As shown in Fig. 4, in the indoor unit casing 1, a ceiling air inlet 6 is formed in a ceiling of the front grill 5, and a front air inlet 8 is formed in the front panel 7. Of these ports, the ceiling air inlet 6 is formed by latticing the ceiling of the front grill 5, while the front air inlet 8 is formed by laterally extending an opening directed upward and located in a position a little higher than the center of the front panel 7. At the inner side of the inverted V-shaped indoor heat exchanger 4, the cross flow fan 9 is disposed. The cross flow fan 9 is a one called an axial fan, and disposed such that its axis extends along the longitudinal direction or the length of the indoor unit casing 1. A scroll portion 10 is formed in the rear of the cross flow fan 9 and smoothly continuous with an air outlet 11 open at a lower portion of the front side of the indoor unit casing 1.

[0078] An upper-side wall 12 of the air outlet 11 is formed integrally with a drain pan 13 disposed below the front-side heat exchanger 2. The electric/electronic parts unit 14 is disposed at a position above the air outlet 11 and forward of the drain pan 13, namely, at the position between the drain pan 13 and the front panel 7. A rear-side drain pan 15 is disposed below the rear-side heat exchanger.

[0079] The indoor unit itself and the indoor unit casing 1 are laterally elongate, as shown in Figs. 1 and 2. The front air inlet 8 and the air outlet 11 are formed in a manner that they extend along the longitudinal direction (lateral direction) of the indoor unit casing 1. The electric/electronic parts unit 14 is arranged in a position upward from the air outlet 11 and forward from the drain pan 13 such that the unit 14 extends laterally along the longitudinal direction of the indoor unit casing 1 as shown in Figs. 1 and 2.

[0080] The construction of the electric/electronic parts unit 14 will be described below with reference to Figs. 6, 7, and 8. In Fig. 6, reference numeral 20 denotes an electric/electronic parts case accommodating the electric/electronic parts unit 14, and 21 denotes a electric/electronic parts cover covering the electric/electronic parts unit 14. The electric/electronic parts unit 14 is disposed between the electric/electronic parts case 20 and the electric/electronic parts cover 21. As shown in Fig. 8, the electric/electronic parts unit 14 includes a terminal board 22, serving as an electric power input portion, connected to a commercial power supply (AC 100V or 200V), an AC circuit 23, a DC high-voltage circuit 24, a DC low-voltage circuit 25, a CPU control portion 26, and a light emission display portion 27. As shown in Figs. 6 and 7, the DC high-voltage circuit 24, the DC low-voltage circuit 25, and the light emission display portion 27 are mounted on a first printed wiring board 28, a second printed wiring board 29, and a display substrate 30 respectively. As shown in Figs . 6 and 7, the terminal board 22, the AC circuit 23, the DC high-voltage circuit 24, the DC low-voltage circuit 25, and the CPU control portion 26 are laid out to be in series along the longitudinal direction of the indoor unit casing 1 from the right-hand side to the left-hand side of the figures and installed in the electric/electronic parts case 20. The display substrate 30 is attached to the back of the electric/electronic parts cover 21. In this state, the electric/electronic parts cover 21 covers the electric/electronic parts case 20. To allow observation of an LED, a seven-segment LED, etc. (light emission display means) in the light emission display portion 27 from the outside, electric/electronic parts cover 21 is formed with the openings 31, 31 at the positions corresponding to the LEDs.

[0081] To make the electric/electronic parts unit 14 elongate in the lateral direction, the first printed wiring board 28, the second printed wiring board 29, and the display substrate 30 are formed as long as possible from side to side. The first printed wiring board 28 and the second printed wiring board 29 are connected to each other through a board-to-board connector 39 in a state in which a harness is not used (harnessless).

[0082] In the DC high-voltage circuit 24 mounted on the first printed wiring board 28, heat generation component parts such as an SW transformer 41, a rectifying diode 42, and a primary-side SW element 43 are used. As shown in Fig. 7, these electric component parts 41, 42, and 43 self-generating much heat are disposed at upper positions of the first printed wiring board 28 extending in a vertical direction of the figure to accelerate heat release of each of the electric component parts 41, 42, and 43 and prevent released heat from affecting other electric component parts adversely. The electric/electronic parts unit 14 is, as described above, accommodated in the electric/electronic parts case 20 and covered with the electric/electronic parts cover 21. A gap (portion shown with a reference numeral 45 in Fig. 7) serving as a heat release hole is formed between an

upper portion of the electric/electronic parts case 20 and an upper portion of the electric/electronic parts cover 21. The gap is open toward the front side to thereby accelerate the heat release of the electric component parts 41, 42, and 43 self-generating much heat. Further by opening the heat release hole toward the front side, penetration of drain is prevented and reliability of the component parts is maintained.

[0083] In the air conditioner, a DC PWM type indoor fan-driving motor for driving the cross flow fan 9 is disposed at the right-hand side in Fig. 1, and a flap control motor (stepping motor) for driving/controlling a horizontal flap is disposed at the left-hand side in Fig. 1. As shown in Fig. 8, the DC high-voltage circuit 24 supplies the indoor fan-driving motor 35 with an electric power, and the DC low-voltage circuit 25 supplies the flap control motor 36 with an electric power. That is, as shown in Figs. 6 and 7, the DC high-voltage circuit 24 is disposed at the right-hand side, and the DC low-voltage circuit 25 is disposed at the left-hand side of the DC high-voltage circuit 24. Similarly, the indoor fan-driving motor 35 serving as a high-voltage driven actuator is disposed at the right-hand side, and the flap control motor 36 serving as a low-voltage driven actuator is disposed at the left-hand side of the indoor fan-driving motor 35. Thereby the circuits 24 and 25 are disposed as close to the actuators 35 and 36 as possible respectively to reduce the length of a connection harness and facilitate wire connections and assembling works.

[0084] As shown in Fig. 8, the indoor unit is connected to an outdoor unit 37 through VVF lines 38. The VVF lines 38 include a pair of power supply AC lines and a transmission line for internal and external transmission. The VVF line 38 serving as the internal and external connection line is inserted into the terminal board 22 from the right-hand side in Figs. 6 and 7 and connected thereto. That is, the VVF line 38 is inserted into the terminal board 22 in the longitudinal direction of the indoor unit casing 1 and in the direction from the AC circuit 23 to the DC low-voltage circuit 25. By inserting the VVF line 38 into the terminal board 22 in this direction, it is possible to perform insertion and connection works of the VVF line 38, prevent the VVF line 38 from interfering with the circuits 23, 24, 25, and 26, facilitate the routing of the VVF line 38, and reduce noises.

[0085] As shown in Fig. 9, each of the openings 31, 31 of the electric/electronic parts cover 21 is so formed that a user can observe the openings 31, 31 from the outside through the observation window 32 of the front grill 5. As shown in Fig. 9, the front panel 7 does not cover the entire front grill 5 but a lower portion of the front grill 5 is exposed to the outside.

[0086] A characteristic point of the air conditioner is that as shown in Fig. 12, the electric/electronic parts unit 14 is disposed in such a manner that a dimension, a, thereof along the longitudinal direction of the indoor unit casing 1 is not less than 1/3 of a dimension, LA, of the indoor unit casing 1 in its longitudinal direction. The larger the length, a, of the electric/electronic parts unit 14 is, the better. Therefore, the length, a, of the electric/electronic parts unit 14 is preferably not less than 1/2 and more preferably not less than 2/3 of the longitudinal dimension, LA, of the indoor unit casing 1. It is most favorable that the dimension, a, of the electric/electronic parts unit 14 along the longitudinal direction of the indoor unit casing 1 is almost equal to the lateral dimension, LA, of the indoor unit casing 1 (see Fig. 18). By setting the length of the electric/electronic parts unit 14 to a maximum length or a length very close thereto, it is possible to set the sectional area of the electric/electronic parts unit 14 to be a minimum or close thereto and thus greatly improve the degree of freedom in the disposing position of the electric/electronic parts unit 14 and greatly reduce a resistance to air flow. As a result, it is possible to make the indoor unit very compact and greatly improve the air-conditioning performance.

[0087] According to the air conditioner, since the long and narrow electric/electronic parts unit 14 is disposed inside the indoor unit casing 1, unlike the conventional art, it is unnecessary to provide a dedicated space for disposing the electric/electronic parts unit 14 at the lateral side inside the indoor unit casing 1. Therefore, the length or dimension of the indoor unit in its longitudinal direction is allowed to be shorter. Thus the indoor unit is allowed to be compact. Conversely, if the indoor unit of the present invention has the same size as that of a conventional indoor unit, the space for disposing the indoor heat exchanger 4 and the cross flow fan 9 therein can be increased. Thus the air conditioner of the present invention has improved air-conditioning performance over the conventional air conditioner. Further the electric/electronic parts unit 14 is elongated and disposed symmetrically in the longitudinal direction of the indoor unit casing. Thus if the electric/electronic parts unit 14 acts as a resistance to air flow at the inlet side, the resistance to air flow is not unbalanced between the left-hand side and the right-hand side. Thus it is possible to prevent occurrence of a disadvantage such as condensation on a rotor. The portion upward from the air outlet 11 and forward from the drain pan 13 is required to be a dead space to prevent the outlet side and the inlet side from being short-circuited. Since the electric/electronic parts unit 14 is disposed in such a region, the space inside the indoor unit casing 1 can be more effectively utilized. Consequently the indoor unit can be made more compact and the air-conditioning performance can be improved further.

[0088] In the air conditioner, the electric/electronic parts unit 14 is accommodated inside the electric/electronic parts case 20 and covered with the electric/electronic parts cover 21. Accordingly it is possible to prevent the drain in the drain pan 13 from affecting the electric/electronic parts unit 14 adversely. Thus the reliability of the electric/electronic parts unit 14 is improved. The electric/electronic parts unit 14 is also prevented from being adversely affected by water poured to check the

drain discharge function during an installation work or a cleaning agent and cleaning water used to clean the indoor heat exchanger 4. Thus the reliability of the electric/electronic parts unit 14 can be also improved in this respect. A mechanism for shielding against the drain is required to prevent a bad influence, such as a drain-caused short circuit, from occurring but does not necessarily have to completely block penetration of the drain. Thus it is possible to omit the provision of one of the electric/electronic parts case 20 or the electric/electronic parts cover 21. Also, the mechanism for shielding against the drain includes only providing a partitioning plate. In the air conditioner, by removing the front panel 7, the front grill 5, and the electric/electronic parts cover 21, the electric/electronic parts unit 14 is exposed to the outside. In this state, because electric parts is accessible from the front side of the air conditioner to be inspected, replaced, and/or repaired, parts-replacing and maintenance works are facilitated.

[0089] In the air conditioner, the electric/electronic parts unit 14 is provided with an light emission display portion 27. The light emission display portion 27 is disposed at a position where it can be observed from the outside through the observation window 32 disposed at the front side of the indoor unit casing 1. Because the electric/electronic parts unit 14 is provided integrally with the light emission display portion 27, it is unnecessary to elongate wiring such as a lead wire for electrically connecting the electric/electronic parts unit 14 and the light emission display portion 27 to each other. This, it is possible to reduce the length of the wiring than in the prior art to thereby reduce the cost. Also, it is possible to facilitate a maintenance work because the electric parts and the light emission display portion 27 are disposed close to each other. Further the electric/electronic parts unit 14 is constructed as a pillar-shaped unit by accommodating the electric/electronic parts unit 14 in the electric/electronic parts case 20 and covering the electric/electronic parts unit 14 with the electric/electronic parts cover 21. Thus it is easy to manufacture and handle the electric/electronic parts unit 14 and possible to reduce the costs and improve its reliability.

[0090] Fig. 10 shows illustrates a disposed state of each circuit. As described above, the terminal board 22, the AC circuit 23, the DC high-voltage circuit 24, and the DC low-voltage circuit 25 are disposed along the longitudinal direction of the indoor unit casing 1. Fig. 11 shows a modification thereof. Fig. 11(a) shows a layout preferable for a product having an AC to DC conversion portion disposed outside the indoor unit. The DC high-voltage circuit 24 and the DC low-voltage circuit 25 are disposed along the longitudinal direction of the indoor unit casing 1. Fig. 11(b) shows a layout preferable for a product in which the voltage is dropped by a transformer or the like. The terminal board 22, the AC high-voltage circuit 23, an AC low-voltage circuit 23a, and the DC low-voltage circuit 25 are disposed along the longitudinal direction of the indoor unit casing 1.

(Modifications on Dimension of Electric/Electronic Parts Unit)

[0091] As shown in Fig. 13, the electric/electronic parts unit 14 may be disposed in such a manner that a dimension, a, thereof along the longitudinal direction of the air outlet 11 of the indoor unit is not less than 1/3 of a dimension, LB, of the air outlet 11 in its longitudinal direction. In this case, it is preferable that the dimension, a, of the electric/electronic parts unit 14 along the longitudinal direction of the air outlet 11 is longer. Therefore, the length, a, of the electric/electronic parts unit 14 is preferably not less than 1/2 and more preferably not less than 2/3 of the dimension, LB, of the air outlet 11 of the indoor unit in its longitudinal direction. It is most preferable that the dimension, a, of the electric/electronic parts unit 14 along the longitudinal direction of the air outlet 11 of the indoor unit is almost equal to the longitudinal dimension, LB, of air outlet 11 (see Fig. 18). By setting the dimension of the electric/electronic parts unit 14 to an electric/electronic parts unit-constructible maximum length or a length very close thereto, it is possible to allow the sectional area of the electric/electronic parts unit 14 to be a minimum or close thereto and thus greatly improve the degree of freedom in the disposing position of the electric/electronic parts unit 14 and greatly reduce a resistance to air flow. Thereby it is possible to make the indoor unit very compact and greatly improve the air-conditioning performance. As shown in Fig. 14, in the case where the axial direction of the cross flow fan 9 is coincident with the longitudinal direction of the air outlet 11 or the air outlet 11 of the indoor unit casing 1 or the longitudinal direction, the electric/electronic parts unit 14 may be disposed in such a manner that a dimension a thereof along the axial direction of the cross flow fan 9 of the electric/electronic parts unit 14 is not less than 1/3 of the dimension, LA, of the indoor unit casing 1 or the dimension, LB, of the air outlet 11 in the longitudinal direction thereof. In this case, the dimension, a, of the electric/electronic parts unit 14 along the axial direction of the cross flow fan 9 of the electric/electronic parts unit 14 is preferably made longer. Thus the dimension, a, of the electric/electronic parts unit 14 is preferably not less than 1/2 and more preferably not less than 2/3 of the longitudinal dimension, LA, of the indoor unit casing 1 or the longitudinal dimension, LB, of the air outlet 11.

(Modifications on Configuration of Electric/Electronic Parts Unit)

[0092] In the above air conditioner, to facilitate the production and handling of the electric/electronic parts unit 14 to thereby reduce the cost and improve the reliability, the electric/electronic parts unit 14 is formed as a pillar-shaped unit by accommodating the electric/electronic parts unit 14 in the electric/electronic parts case 20 and covering the electric/electronic parts unit 14 with the electric/electronic parts cover 21 (see Fig. 18). Al-

ternatively, as shown in Fig. 16, the electric/electronic parts unit 14 may be composed of a plurality of units 14a, 14b, and 14c arranged almost linearly and side by side. More specifically, the electric/electronic parts unit 14 is composed of a plurality of printed circuit boards, and the printed circuit boards are mounted on the same substrate and electrically connected to each other. When the electric/electronic parts unit 14 is constructed in this manner, from the viewpoint of making the electric/electronic parts unit 14 compact and facilitating handling thereof, it is preferable that the electric/electronic parts unit 14 is formed in the shape of a pillar as a whole. Further as shown in Fig. 17, the electric/electronic parts unit 14 may be composed of a plurality of units 14a, 14b, and 14c which are displaced from each other both in the longitudinal direction and in a direction (air flow direction) intersecting with the longitudinal direction. Constructing the electric/electronic parts unit 14 in this manner increases the degree of freedom in selecting the mounting positions of the units 14a, 14b, and 14c, whereby the units are disposed in appropriate positions according to the kind of an air conditioner.

[0093] In the case where the electric/electronic parts unit 14 is composed of a plurality of separate units, the electric/electronic parts unit 14 may be disposed such that a total value (a+b+c) of dimensions of the constituent units along the longitudinal direction of the indoor unit casing 1 is not less than 1/3 of the entire length, LA, of the indoor unit casing 1. Alternatively, the electric/electronic parts unit 14 may be disposed in such a manner that the total value (a+b+c) of dimensions of the constituent units along the longitudinal direction of the air outlet 11 of the indoor unit is not less than 1/3 of the entire length, LB, of the air outlet 11. Alternatively, the electric/electronic parts unit 14 may be disposed in such a manner that the total value (a+b+c) of dimensions of the constituent units along the axial direction of the cross flow fan 9 is not less than 1/3 of the entire length or longitudinal dimension, LA, of the indoor unit casing 1 or the entire length, LB, of the air outlet 11. That is, in the case where the electric/electronic parts unit 14 is composed of a plurality of units, defining the length of the electric/electronic parts unit 14 by the total value (a+b+c) of the dimensions of the constituent units makes it possible to obtain the advantages of compactness of the indoor unit and improvement of the air-conditioning performance. In this case, too, it is preferable that the total value (a+b+c) of the dimensions of the units of the electric/electronic parts unit 14 is set larger. Thus the total value (a+b+c) of the dimensions of the units is more preferably not less than 1/2 and most preferably not less than 2/3 of the longitudinal dimension, LA, of the indoor unit casing 1 or the longitudinal dimension, LB, of the air outlet 11.

[0094] Further, it is preferable that as shown in Fig. 19, a dimension, t, of the electric/electronic parts unit 14 in a height direction (vertical direction) orthogonal to the longitudinal direction of the indoor unit casing 1 is 1/3 or less of a whole length, T, of the indoor unit casing 1 in its height direction. Constructing the electric/electronic parts unit 14 in this manner allows to further reduce the resistance to air flow and improve the degree of freedom in the disposing manner of the electric/electronic parts unit 14.

(Modifications on Disposing Position of Electric/Electronic Parts Unit)

[0095] The electric/electronic parts unit 14 is located at the position upward from the air outlet 11 and forward from the drain pan 13. The disposing position of the electric/electronic parts unit 14 can be modified as described below. The above description on the modifications of the dimension and configuration of the electric/electronic parts unit 14 is also applicable to the modifications described below. In Fig. 20, the electric/electronic parts unit 14 is disposed in an air path 33 located between the front-side heat exchanger 2 and the front panel 7. In this case, because the sectional area of the electric/electronic parts unit 14 is also small as in the case of the above-described electric/electronic parts unit 14, it is possible to suppress the increase of the resistance to air flow. Further in the cooling and warming operations, it is possible to cool the electric/electronic parts unit 14 with the circulation air and improve the reliability of the electric/electronic parts. The electric/electronic parts unit 14 is long and narrow and disposed symmetrically in its longitudinal direction. Thus if the electric/electronic parts unit 14 makes resistance to air flow at the inlet side, the resistance to air flow will not be unbalanced between the left-hand side and the right-hand side. Thus it is possible to prevent occurrence of a disadvantage such as generation of condensation on a rotor.

[0096] Referring now to Figs. 21 and 22, the indoor heat exchanger 4 inside the indoor unit casing 1 is constructed by combining the front-side heat exchanger 2 and the rear-side heat exchanger 3 with each other in the shape of an inverted letter "V" as in the above-mentioned case. Further the electric/electronic parts unit 14 is disposed at an junction position of the front-side and rear side heat exchangers 2 and 3 so as to connect or join these heat exchangers 2 and 3. In the case of the electric/electronic parts unit 14 shown in Fig. 21, the longer side thereof in section is disposed along the air flow. In the case of the electric/electronic parts unit 14 shown in Fig. 22, the shorter side thereof in section is disposed along the air flow. In this modification, the electric/electronic parts unit 14 performs a function of sealing the junction portion of the front-side heat exchanger 2 and the rear-side heat exchanger 3, which dispenses with the use of a sealing material. Thus, the manufacturing cost can be reduced. By providing the electric/electronic parts unit 14 with two functions, a necessary space is reduced accordingly. This also makes it possible to make the indoor unit compact and improve the air-conditioning performance. Further in these cases, at

cooling and warming times, the electric/electronic parts unit 14 can be cooled with the circulation air and the reliability of the electric/electronic parts can be improved. In the case where the electric/electronic parts unit 14 is disposed at a junction position of the front-side and rear side heat exchangers 2 and 3 so as to connect these heat exchangers 2 and 3, the present invention can be implemented by separately providing a sealing member. In this case, too, it is possible to obtain the advantage that the indoor unit can be made compact and the air-conditioning performance can be improved.

[0097] In Fig. 23, the electric/electronic parts unit 14 is disposed in back of the rear-side heat exchanger 3 in the indoor unit casing 1. Because in the indoor unit casing 1, the electric/electronic parts unit 14 is disposed in the rear side region of the indoor unit which is a dead space, spaces inside the indoor unit casing 1 can be more effectively utilized. Consequently it is possible to make the indoor unit more compact or further improve the air-conditioning performance.

[0098] In Fig. 24, the electric/electronic parts unit 14 is disposed in a region behind the scroll portion 10 constructing a rear wall of an outlet passage. Because in the indoor unit casing 1, the electric/electronic parts unit 14 is disposed in the rear region behind the scroll portion 10, of the indoor unit, which is a dead space, the space inside the indoor unit casing 1 can be more effectively utilized. Consequently it is possible to make the indoor unit more compact or further improve the air-conditioning performance. In this case, the electric/electronic parts unit 14 is disposed outside the air circulation path in the indoor unit casing 1. Consequently it is possible to prevent the electric/electronic parts unit 14 from increasing a resistance to air flow directly. Therefore deterioration of the air-conditioning performance owing to the installation of the electric/electronic parts unit 14 is suppressed.

(Further Modifications on Dimension, Configuration, and Disposing Position of Electric/Electronic Parts Unit)

[0099] In each of the above examples, the longitudinal dimension of the electric/electronic parts unit 14 is specified in association with the longitudinal dimension of the indoor unit casing 1 or the air outlet 11. However the longitudinal dimension of the electric/electronic parts unit 14 is not limited to the above, but may be altered by considering the way of disposing the electric/electronic parts unit. For example, utilizing a spare space extending inside the indoor unit casing 1 in its longitudinal direction, an electric/electronic parts unit 14 having an increased proportion of a dimension in the longitudinal direction may be disposed along the spare space. By thus doing, the electric/electronic parts unit 14 can be disposed in various spaces in sections as viewed in a direction perpendicular to the longitudinal direction of the indoor unit casing 1. That is, unlike the conventional art, there is no need for providing the lateral side area of the indoor unit casing 1 with a particular space for disposing the electric/electronic parts. Therefore it is possible to reduce the dimension of the indoor unit in its longitudinal direction and make the indoor unit compact. Conversely, supposing that the indoor unit of the present invention and the conventional indoor unit have the same size, the indoor unit of the present invention has a larger space for disposing the heat exchanger 4 and the fan 9 than the conventional indoor unit. Therefore, the indoor unit of the present invention has improved air-conditioning performance over the conventional indoor unit. It is meant by the "increased proportion of a dimension in the longitudinal direction" that a dimension in the longitudinal direction is larger than dimensions in the other two directions orthogonal to the longitudinal direction. The value of the proportion does not matter. It is preferable that the proportion of the longitudinal dimension of the electric/electronic parts unit 14 is set larger than the proportion of the longitudinal dimension of the indoor unit casing 1.

[0100] When the present invention is implemented in the above-mentioned manners, it is preferable to dispose the electric/electronic parts unit 14 in a region which adjoins the air outlet 11 and the air inlet 8, at a position above the air outlet 11 and between the drain pan 13 and the front panel 7 (Fig. 4), in an air passage between the drain pan 13 and the front panel 7 (Fig. 20), in the junction of the front-side heat exchanger 2 and the rear-side heat exchanger 3 (Figs. 21, 22), in a position at the rear side of the indoor unit casing 1 (Fig. 23), or in a region behind the scroll portion 10 (Fig. 24). In the case where the electric/electronic parts unit 14 is composed of a plurality of separate constituent units 14a, 14b, and 14c, as shown in Figs. 16 and 17, which are spaced from each other, it is preferable to increase proportions of the longitudinal dimensions of each constituent unit 14a, 14b, and 14c and also the proportion of the total longitudinal dimension of the entire layout of the constituent units. In the case where as shown in Figs. 21 and 22, the electric/electronic parts unit 14 is disposed so as to combine the heat exchangers 2 and 3 at the junction position thereof, a sealing member may be additionally provided. The advantage of reduction of the indoor unit size or improvement of the air-conditioning performance can be obtained even in this case.

[0101] When much attention is paid to the disposing position of the electric/electronic parts unit 14, as described above, there is a case where it is unnecessary to increase the proportion of the longitudinal dimension of the electric/electronic parts unit 14. For example, the position above the air outlet 11 and between the drain pan 13 disposed below the heat exchanger 4 and the front panel 7 of the indoor unit casing 1 is a region which should be a dead space to prevent the outlet side and the inlet side from being short-circuited. By disposing the electric/electronic parts unit 14 in the region which should be a dead space, as shown in Fig. 4, spaces inside the indoor unit casing 1 can be more effectively uti-

lized. Consequently the indoor unit can be made more compact or the air-conditioning performance can be improved further. In this case, the indoor unit casing 1, the air outlet 11, the air inlet 8, and the electric/electronic parts unit 14 may have any configuration or shape. But by using the elongate indoor unit casing 1, forming the air outlet 11 and the air inlet 8 such that they extend laterally, and disposing the electric/electronic parts unit 14 along the air outlet 11, the effect of utilizing the space effectively can be displayed to a higher extent. Consequently the indoor unit can be made more compact or the air-conditioning performance can be improved further.

[0102] Further the electric/electronic parts unit 14 can be disposed such that the electric/electronic parts unit 14 performs an additional function of sealing the junction of the front-side heat exchanger 2 and the rear-side heat exchanger 3 (Figs. 21, 22). Thus the sealing material can be dispensed with and the manufacturing cost can be reduced. Further if the electric/electronic parts unit 14 has the two functions, a necessary space decreases accordingly. Thus in this respect, the indoor unit can be made compact or the air-conditioning performance can be improved.

[0103] Further, if the electric/electronic parts unit 14 is disposed at an inner rear region of the indoor unit which is indeed a dead space within the indoor unit casing 1 (Fig. 23), or at an outer rear position of the indoor unit casing 1 (Fig. 24), the spaces inside the indoor unit casing 1 can be more effectively utilized. Consequently the indoor unit can be made more compact or the air-conditioning performance can be improved further.

[0104] In the case where the electric/electronic parts unit 14 is disposed either at the rear position of the indoor unit casing 1, at which provision of the electric/electronic parts unit 14 would hardly affect the air flow, or outside the indoor unit casing 1, the dimension and configuration of the electric/electronic parts unit 14 are not limited to the described ones. For example, if the electric/electronic parts unit 14 is configured to have the shape of a thin plate, as shown in Figs. 25 and 26, the electric/electronic parts unit 14 can be disposed at an inner rear position of the indoor unit casing 1 or at an outer rear position of the indoor unit casing 1. In this case, the electric/electronic parts unit 14 can be shaped to be square, rectangular, rod-shaped, etc. as desired. Depending on a case, the electric/electronic parts unit 14 can be composed of a plurality of vertically elongate units, which are disposed separately from each other as shown in Fig. 26. In such an air conditioner, because the electric/electronic parts unit 14 is disposed either at a rear position, of the indoor unit, which is a dead space inside the indoor unit casing 1, or disposed at a rear position outside of the indoor unit casing 1, spaces inside the indoor unit casing 1 can be more effectively utilized. Consequently the indoor unit can be made more compact or the air-conditioning performance can be improved further.

[0105] In the case where the electric/electronic parts unit 14 is disposed at the rear side of the indoor unit casing 1, if the electric/electronic parts unit 14 is embedded in the scroll portion 10 composed of a foamed synthetic resinous material, as shown in Fig. 27, the spaces inside the indoor unit casing 1 can be more effectively utilized without increasing the resistance to air flow inside the air flow path. Consequently the indoor unit can be made more compact or the air-conditioning performance can be improved further.

(Other Modifications and Variants)

[0106] It is preferable that the indoor heat exchanger 4 inside the indoor unit casing 1 is disposed in almost all regions of the indoor unit casing 1 or of the air outlet 11. Constructing the indoor heat exchanger 4 in this manner makes it possible to increase the effective area of the heat exchanger 4 inside the indoor unit casing 1 and thereby improve the air-conditioning performance. If the performance of the air conditioner of the present invention is the same as that of the conventional air conditioner, the indoor unit casing 1 of the present invention can be made smaller than the conventional indoor unit casing. Regarding the "almost all regions", the size of the indoor heat exchanger 4 does not refer to the size of only a portion thereof having plate fins, but the size of the indoor heat exchanger 4 including not only the plate fins but also a U-shaped heat transfer pipe disposed at one side thereof and a flow-dividing pipe or shunt disposed at the opposite side. It is preferable to mount the electric/electronic parts unit 14 removably. In this case, it is possible to improve assembling and maintenance performance.

[0107] In the first embodiment, the electric/electronic parts unit 14 is disposed, with its disposing direction orthogonal to each plate fin of the indoor heat exchanger 4. According to this construction, even if a circulation air flow is turbulent owing to the disposition of the electric/electronic parts unit 14, the direction of the turbulence is parallel to the plate fin-disposing direction. Thus, turbulence would not increase a circulation resistance when the air flow passes the plate fins. Consequently it is possible to prevent deterioration of the air-conditioning performance. Further the electric/electronic parts unit 14 is disposed orthogonally to the plate fins, the internal construction is symmetrical and thus the manufacturing cost can be reduced. Further in the air conditioner, the longitudinal dimension of the fan mechanism, including the fan 9 and the fan motor is almost equal to the lateral dimension of a fan mechanism of the indoor heat exchanger 4. This construction allows the fan 9 and the indoor heat exchanger 4 to display their capabilities to the maximum. The dimension of the indoor heat exchanger 4 in its longitudinal direction, or the lateral dimension of the indoor heat exchanger 4 means a total dimension including not only the dimension of the portion having the plate fins but also the dimensions of por-

tions of the U-shaped heat transfer pipes disposed at both ends thereof.

[0108] The type of the indoor unit of the air conditioner is not limited to the wall-mounted type, but includes various types such as a floor-standing type, a ceiling-mounted built-in type, etc. Thus the longitudinal direction may be a left-to-right direction, a vertical direction or a horizontal direction, as viewed from a user. The expression of "laterally elongate" used herein means w/h>1, where h is a vertical length and w is a lateral length.

Claims

1. An air conditioner in which an electric/electronic parts unit (14) is disposed in such a manner that a dimension of the unit along a longitudinal direction of an indoor unit casing (1) is not less than 1/3 of a dimension of the indoor unit casing (1) in the longitudinal direction.

2. An air conditioner in which an electric/electronic parts unit (14) is disposed in such a manner that a dimension of the unit along a longitudinal direction of an indoor unit air outlet (11) is not less than 1/3 of a dimension of the air outlet (11) in the longitudinal direction.

3. An air conditioner in which an electric/electronic parts unit (14) is disposed in such a manner that a dimension of the unit along an axial direction of an indoor unit fan (9) is not less than 1/3 of a dimension of an indoor unit casing (1) or an indoor air outlet (11) in a longitudinal direction thereof.

4. An air conditioner in which an electric/electronic parts unit (14) is arranged in such a manner that a total dimension of the unit along a longitudinal direction of an indoor unit casing (1) is not less than 1/3 of a dimension of the indoor unit casing (1) in the longitudinal direction.

5. An air conditioner in which an electric/electronic parts unit (14) is arranged in such a manner that a total dimension of the unit along a longitudinal direction of an indoor air outlet (11) is not less than 1/3 of a dimension of the air outlet (11) in the longitudinal direction.

6. An air conditioner in which an electric/electronic parts unit (14) is arranged in such a manner that a total dimension of the unit along an axial direction of an indoor unit fan (9) is not less than 1/3 of a dimension of an indoor unit casing (1) or an indoor air outlet (11) in a longitudinal direction thereof.

7. An air conditioner according to any one of claims 1 through 6, wherein the electric/electronic parts unit (14) is disposed in an air path inside the indoor unit casing (1).

8. An air conditioner according to any one of claims 1 through 6, wherein the electric/electronic parts unit (14) is disposed outside an air path inside the indoor unit casing (1).

9. An air conditioner in which an electric/electronic parts unit (14) extends in such a manner that a dimension thereof along a longitudinal direction of an indoor unit casing (1), a longitudinal direction of an air outlet (11) or an axial direction of a fan (9) is not less than 1/3 of a dimension of the indoor unit casing (1) or air outlet (11) in the longitudinal direction thereof, and the electric/electronic parts unit (14) is disposed in a region adjoining the air outlet (11) and an air inlet (8).

10. An air conditioner according to claim 9, wherein the region adjoining the air outlet (11) and the air inlet (8) is located above the air outlet (11), and in the region, the electric/electronic parts unit (14) is disposed at a position between a drain pan (13) disposed below an indoor heat exchanger (4) and a front panel (7) of the indoor unit casing (1).

11. An air conditioner in which an electric/electronic parts unit (14) extends in such a manner that a dimension thereof along a longitudinal direction of an indoor unit casing (1), a longitudinal direction of an air outlet (11) or an axial direction of a fan (9) is not less than 1/3 of a dimension of the indoor unit casing (1) or air outlet (11) in the longitudinal direction thereof, and the electric/electronic parts unit (14) is disposed in a region disposed between a front panel (7) and an indoor heat exchanger (4).

12. An air conditioner in which an electric/electronic parts unit (14) extends in such a manner that a dimension thereof along a longitudinal direction of an indoor unit casing (1), a longitudinal direction of an air outlet (11) or an axial direction of a fan (9) is not less than 1/3 of a dimension of the indoor unit casing (1) or air outlet (11) in the longitudinal direction thereof, and the electric/electronic parts unit (14) is disposed in a region positioned at a rear side of an indoor unit.

13. An air conditioner according to claim 12, wherein the electric/electronic parts unit (14) is embedded in a rear-side scroll portion (10) defining an air path inside the indoor unit casing (1).

14. An air conditioner in which an electric/electronic parts unit (14) extends in such a manner that a dimension thereof along a longitudinal direction of an indoor unit casing (1), a longitudinal direction of an

air outlet (11) or an axial direction of a fan (9) is not less than 1/3 of a dimension of the indoor unit casing (1) or air outlet (11) in the longitudinal direction thereof, a heat exchanger (4) inside the indoor unit casing (1) has a front-side heat exchanger (2) and a rear-side heat exchanger (3) combined with each other in the shape of an inverted letter "V", and the electric/electronic parts unit (14) is disposed at a junction position of the front-side and rear side heat exchangers (2) and (3) so as to connect these heat exchangers (2) and (3).

15. An air conditioner according to any one of claims 1 through 14, wherein a dimension of the electric/electronic parts unit (14) in a height direction orthogonal to a longitudinal direction of the indoor unit casing (1) is 1/3 or less of a whole length of the indoor unit casing (1) in the height direction thereof.

16. An air conditioner in which a spare space is formed inside an indoor unit casing (1), the spare space extending in a longitudinal direction of the indoor unit casing, and an electric/electronic parts unit (14) having an increased proportion of a dimension in the longitudinal direction is disposed along the spare space.

17. An air conditioner according to claim 16, wherein the electric/electronic parts unit (14) is disposed in a region adjoining an air outlet (11) and an air inlet (8) of the indoor unit casing (1).

18. An air conditioner according to claim 17, wherein the region adjoining the air outlet (11) and the air inlet (8) is located above the air outlet (11), and in this region, the electric/electronic parts unit (14) is disposed at a position between a drain pan (13) disposed below a heat exchanger (4) and a front panel (7) of the indoor unit casing.

19. An air conditioner according to claim 16, wherein the electric/electronic parts unit (14) is disposed in a region positioned between a front panel (7) of the indoor unit casing (1) and an indoor heat exchanger (4).

20. An air conditioner according to claim 16, wherein a heat exchanger (4) inside the indoor unit casing (1) has a front-side heat exchanger (2) and a rear-side heat exchanger (3) combined with each other in the shape of an inverted letter "V", and the electric/electronic parts unit (14) is disposed at a junction position of the front-side and rear side heat exchangers (2) and (3) so as to connect these heat exchangers (2) and (3).

21. An air conditioner according to claim 16, wherein the electric/electronic parts unit (14) is disposed in a region behind a scroll portion (10) defining a rear wall of an outlet path.

22. An air conditioner according to claim 21, wherein the electric/electronic parts unit (14) is embedded in the scroll portion (10).

23. An air conditioner comprising:

a heat exchanger (4) disposed in an indoor unit casing (1);
an air outlet (11) formed at a lower side of the indoor unit casing (1), and an air inlet (8) formed above the air outlet (11); and
an electric/electronic parts unit (14) disposed at a position above the air outlet (11) and between a drain pan (13) disposed below the heat exchanger (4) and a front panel (7) of the indoor unit casing (1).

24. An air conditioner in which a heat exchanger (4) inside an indoor unit casing (1) of the air conditioner has a front-side heat exchanger (2) and a rear-side heat exchanger (3) combined with each other in the shape of an inverted letter "V", and an electric/electronic parts unit (14) is disposed at a junction position of the front-side and rear side heat exchangers (2) and (3) so as to connect these heat exchangers (2) and (3).

25. An air conditioner in which an electric/electronic parts unit (14) is disposed at an inner rear position of an indoor unit casing (1) or an outer rear position thereof.

26. An air conditioner according to any one of claims 10, 18, and 23, wherein the electric/electronic parts unit (14) is provided with a shielding mechanism against scattered drain.

27. An air conditioner according to any one of claims 10, 11, 18, 19, and 23, wherein the electric/electronic parts unit (14) is exposed to the outside when a front side of the indoor unit casing (1) is opened.

28. An air conditioner according to any one of claims 10, 11, 18, 19, and 23, wherein the electric/electronic parts unit (14) is removable to the outside when a front side of the indoor unit casing (1) is opened.

29. An air conditioner according to any one of claims 10, 11, 18, 19, and 23, wherein the electric/electronic parts unit (14) is provided with a light emission display means (27) which is disposed at a position where the light emission display means (27) is observable from outside through an observation window (32) disposed at a front side of the indoor unit casing (1).

30. An air conditioner according to any one of claims 1 through 3 and 7 through 29, wherein the electric/electronic parts unit (14) is constructed as a single unit.

31. An air conditioner according to any one of claims 1 through 29, wherein the electric/electronic parts unit (14) is constructed in the form of a plurality of units arranged almost linearly.

32. An air conditioner according to claim 31, wherein the units are mounted on the same substrate and connected to each other.

33. An air conditioner according to any one of claims 30 through 32, wherein the electric/electronic parts unit (14) is formed generally in the shape of a pillar.

34. An air conditioner according to any one of claims 1 through 29, wherein the electric/electronic parts unit (14) is constructed in the form of a plurality of units which are displaced from each other both in a longitudinal direction thereof and a direction intersecting with the longitudinal direction.

35. An air conditioner according to any one of claims 1 through 34, wherein the electric/electronic parts unit (14) has a longitudinal dimension almost equal to that of the indoor unit casing (1) or the air outlet (11).

36. An air conditioner according to any one of claims 1 through 35, wherein a heat exchanger (4) inside the indoor unit casing (1) is disposed in an almost entire area of the indoor unit casing (1) or the air outlet (11).

37. An air conditioner according to any one of claims 1 through 36, wherein the electric/electronic parts unit (14) is removable.

38. An air conditioner according to any one of claims 1 through 37, wherein the electric/electronic parts unit (14) is disposed so as to extend in a direction orthogonal to a direction in which plate fins of the heat exchanger (4) extend.

39. An air conditioner according to any one of claims 1 through 38, wherein a longitudinal dimension of a fan mechanism including a fan (9) and a fan motor is almost equal to a longitudinal dimension of a fan mechanism of the heat exchanger (4).

Fig. 1

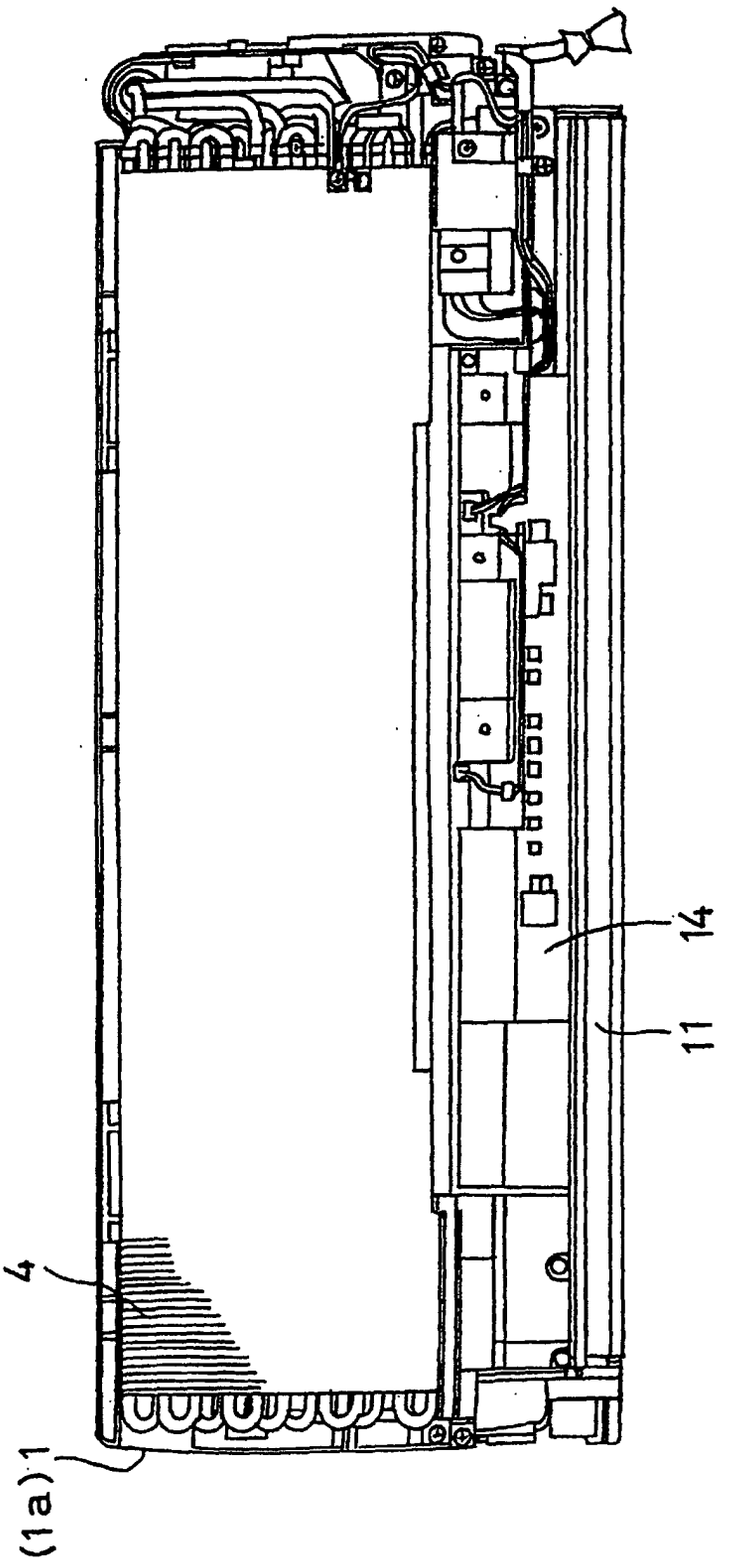


Fig. 2

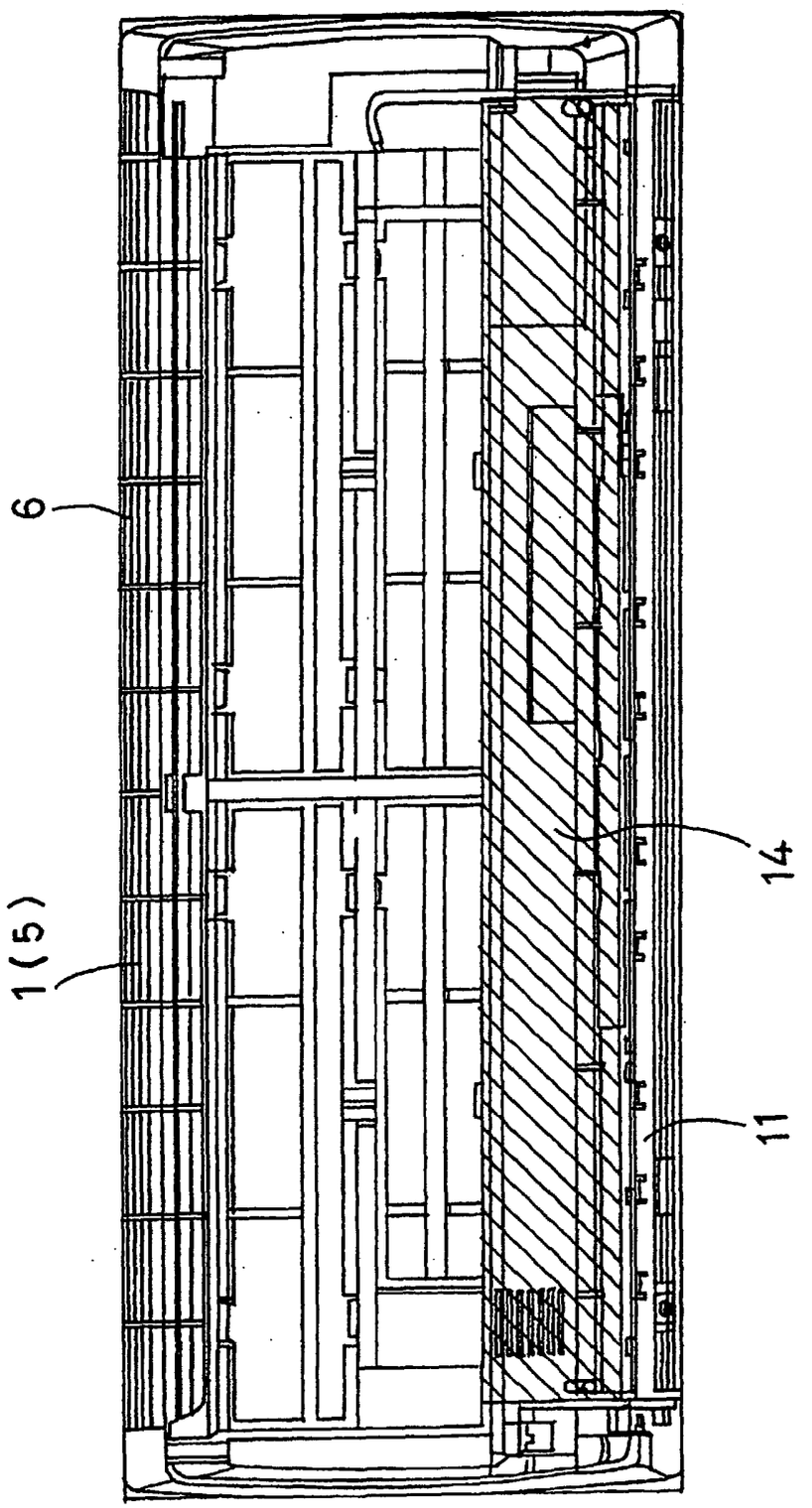


Fig. 3

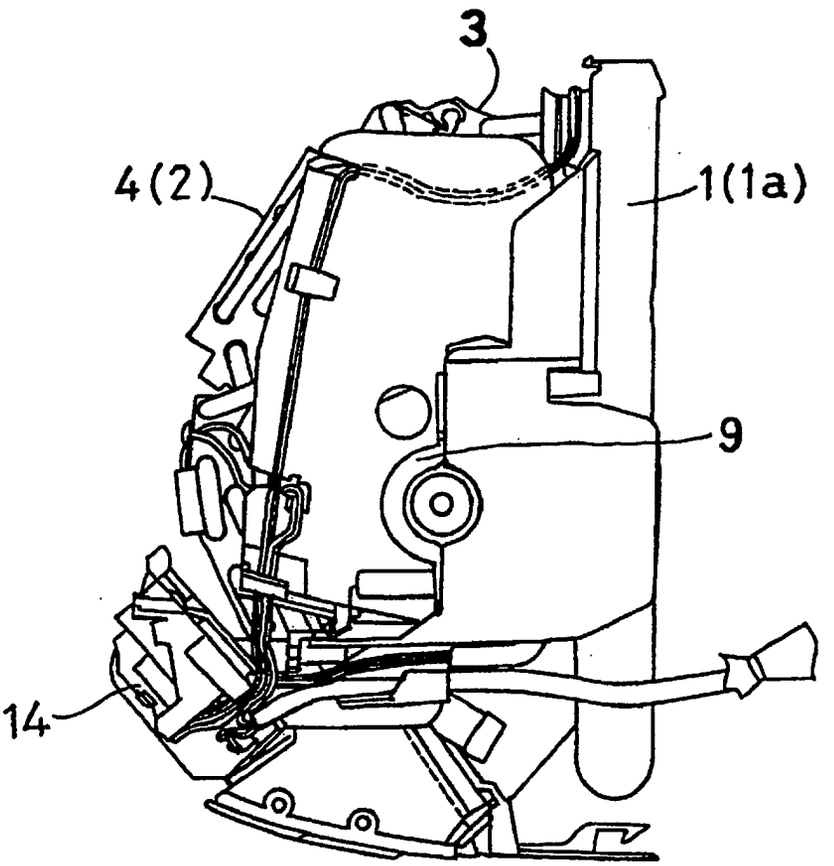


Fig. 4

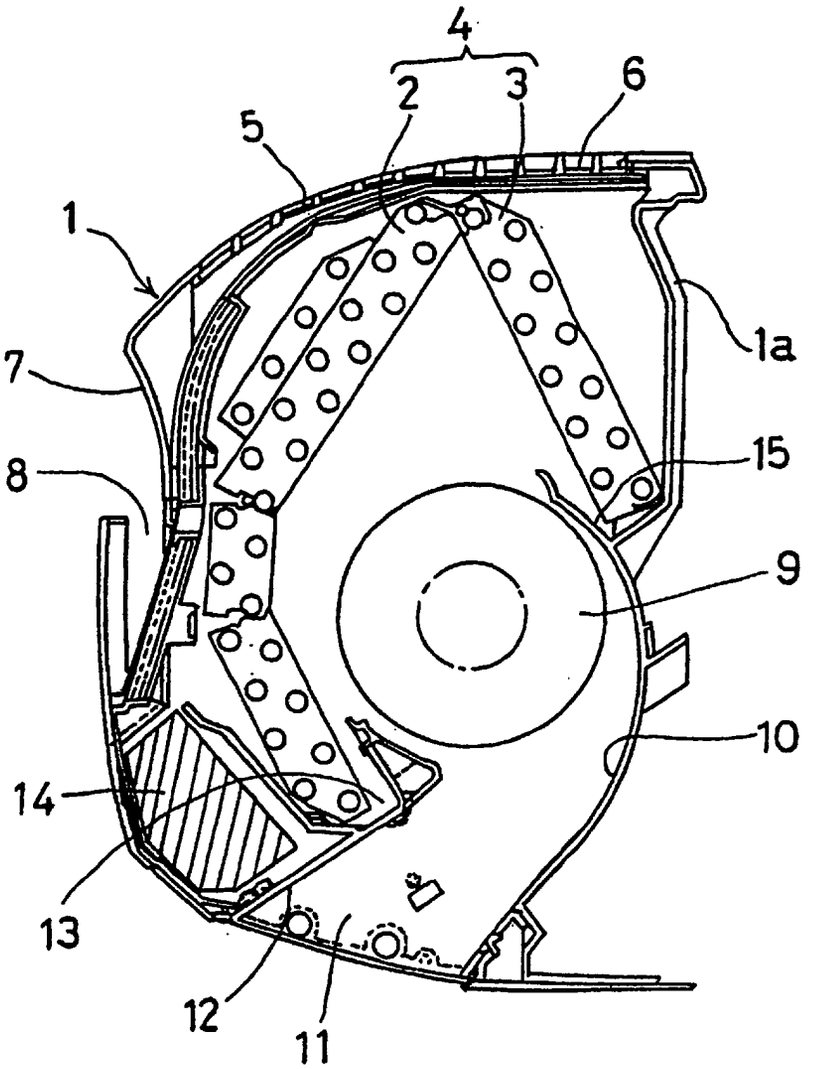


Fig. 5

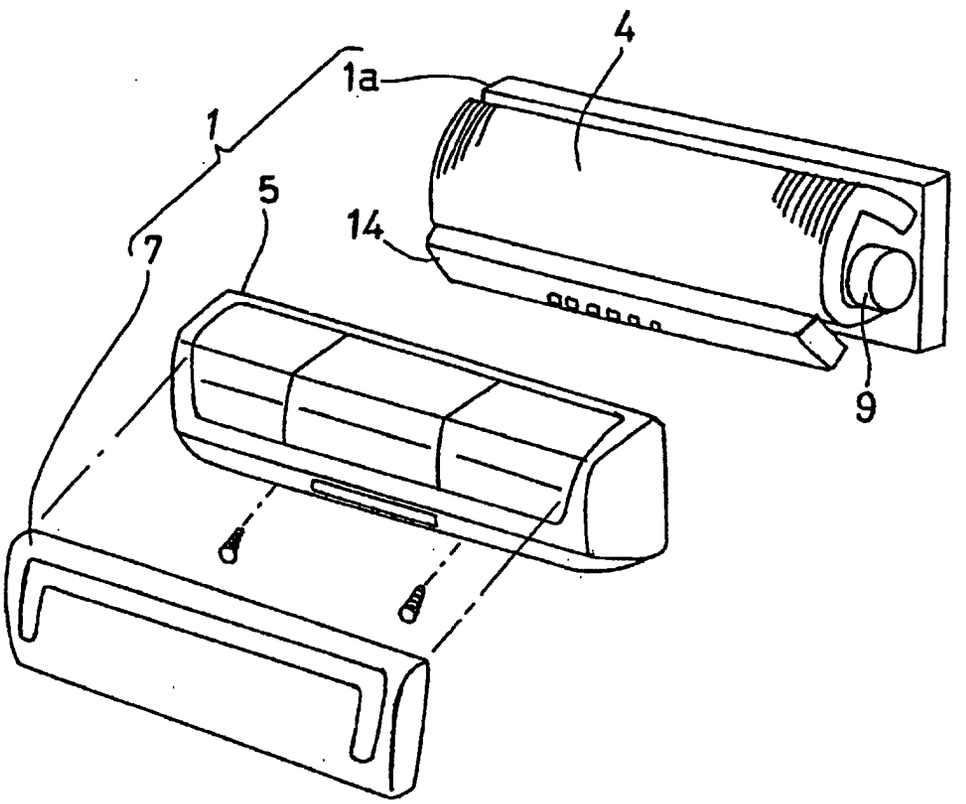


Fig. 6

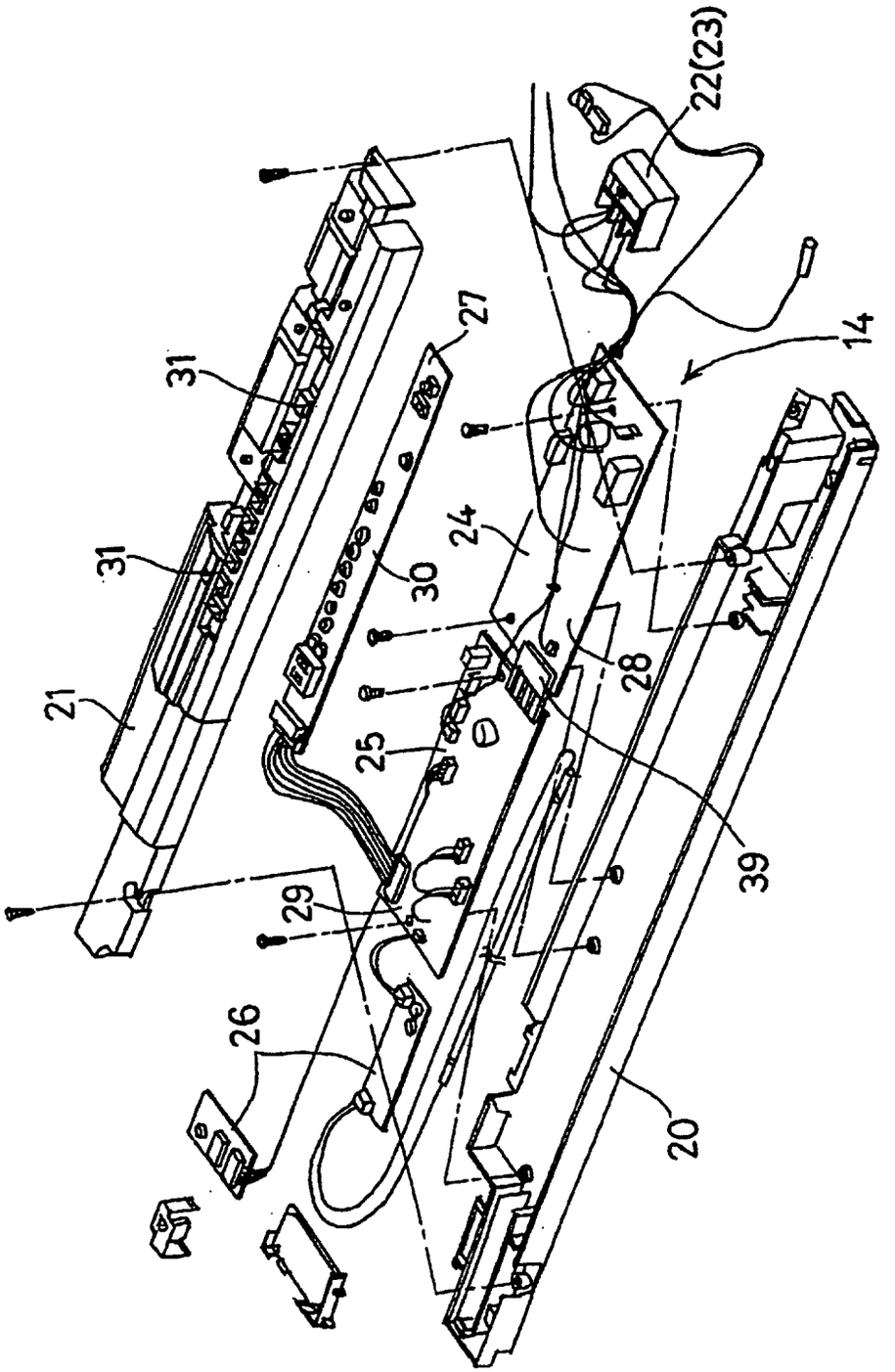


Fig. 7

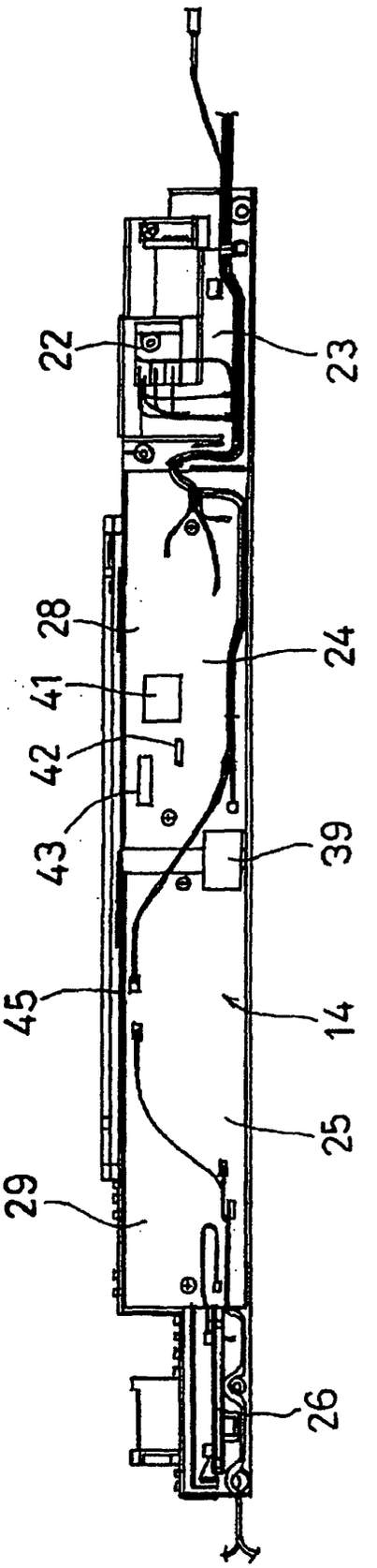


Fig.8

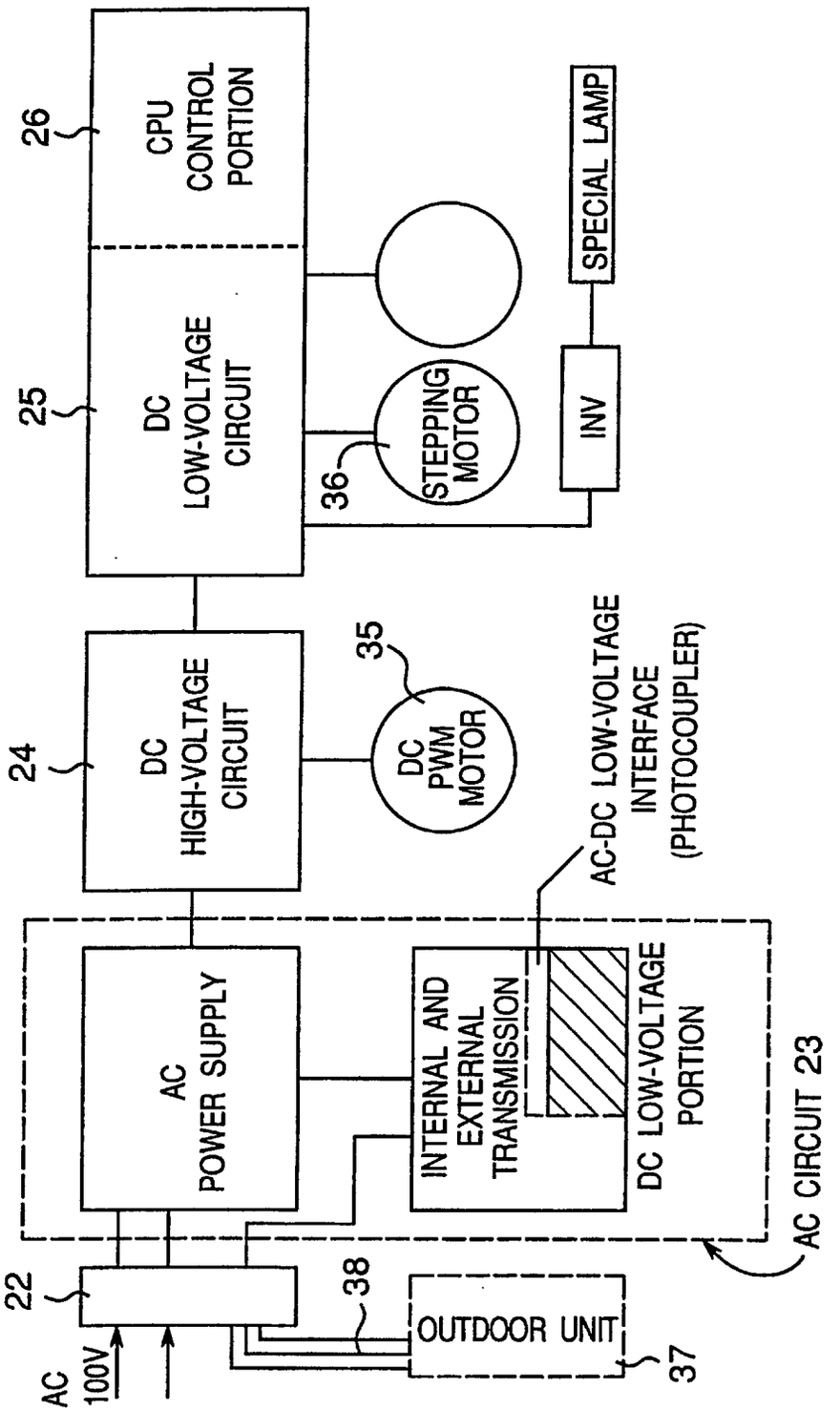

26
CPU CONTROL PORTION
25
DC LOW-VOLTAGE CIRCUIT
36
STEPPING MOTOR
SPECIAL LAMP
INV
24
DC HIGH-VOLTAGE CIRCUIT
35
DC PWM MOTOR
AC-DC LOW-VOLTAGE INTERFACE (PHOTOCOUPLER)
AC POWER SUPPLY
INTERNAL AND EXTERNAL TRANSMISSION
DC LOW-VOLTAGE PORTION
AC CIRCUIT 23
22
38
OUTDOOR UNIT
37
AC 100V

Fig.9

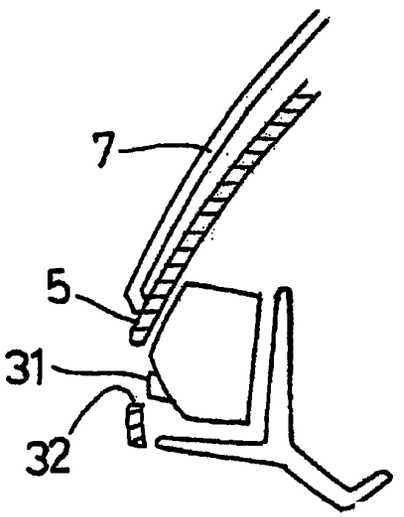

7
5
31
32

Fig.10

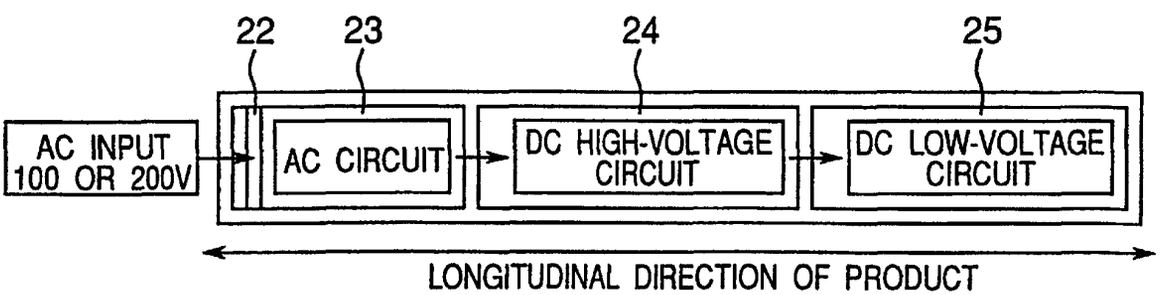

22
23
24
25
AC INPUT
100 OR 200V
AC CIRCUIT
DC HIGH-VOLTAGE CIRCUIT
DC LOW-VOLTAGE CIRCUIT
LONGITUDINAL DIRECTION OF PRODUCT

Fig.11

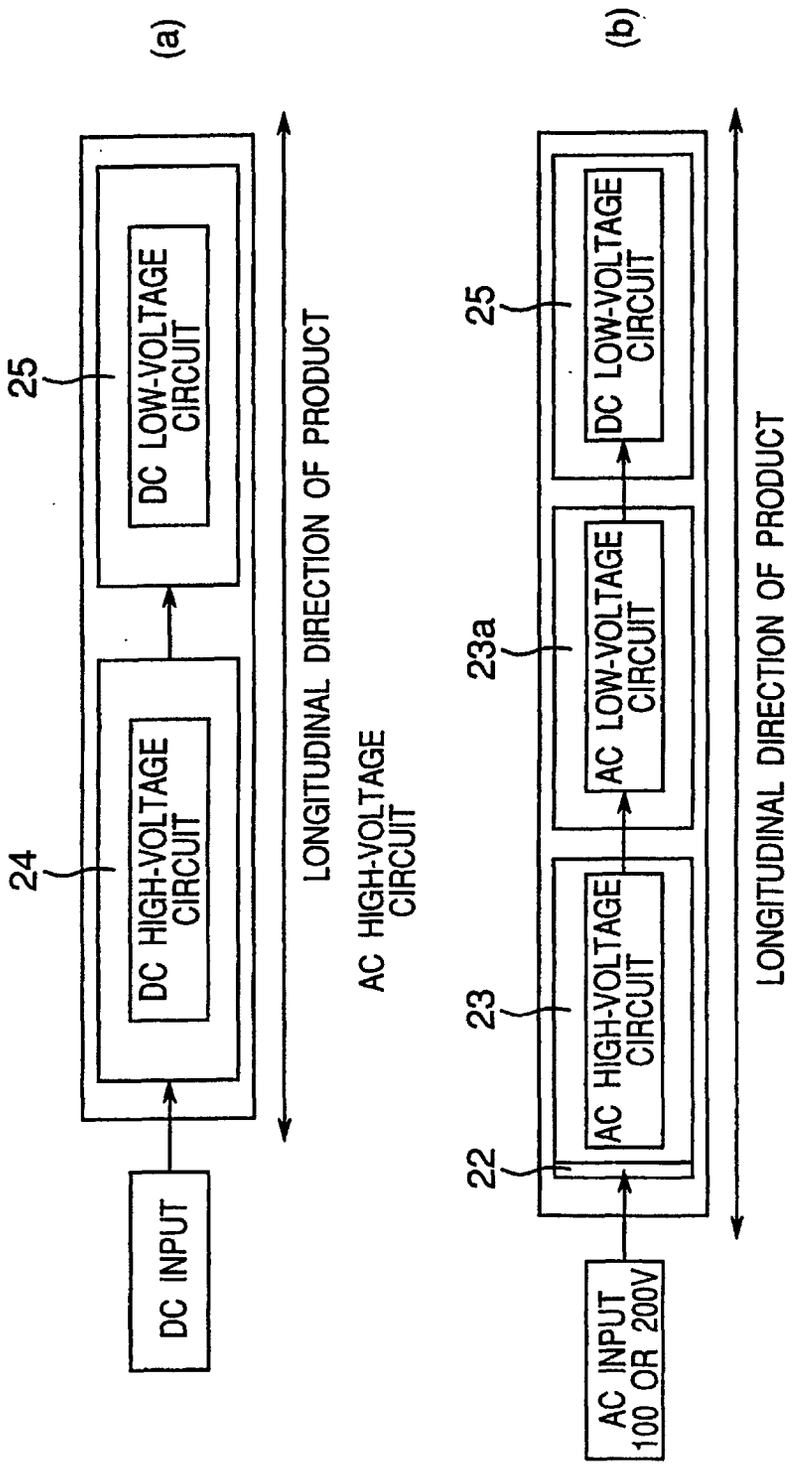

(a)
DC INPUT
24
DC HIGH-VOLTAGE CIRCUIT
25
DC LOW-VOLTAGE CIRCUIT
AC HIGH-VOLTAGE CIRCUIT
LONGITUDINAL DIRECTION OF PRODUCT
(b)
AC INPUT 100 OR 200V
22
23
AC HIGH-VOLTAGE CIRCUIT
23a
AC LOW-VOLTAGE CIRCUIT
25
DC LOW-VOLTAGE CIRCUIT
LONGITUDINAL DIRECTION OF PRODUCT

Fig. 12

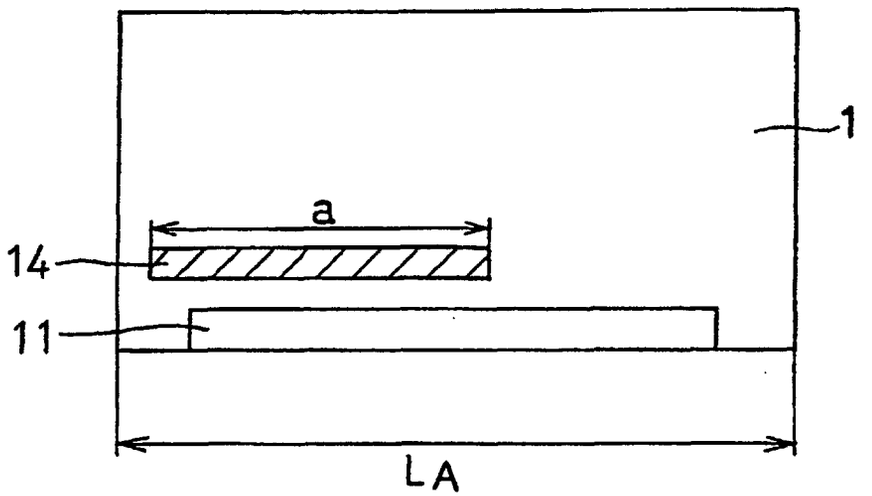


Fig. 13

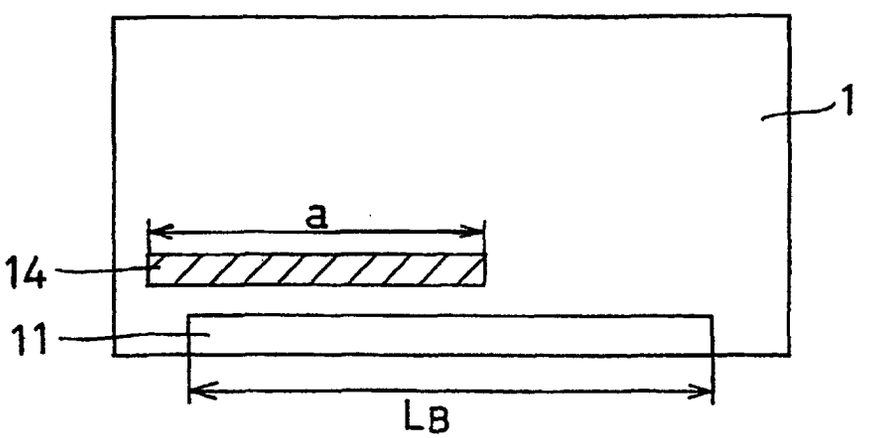


Fig. 14

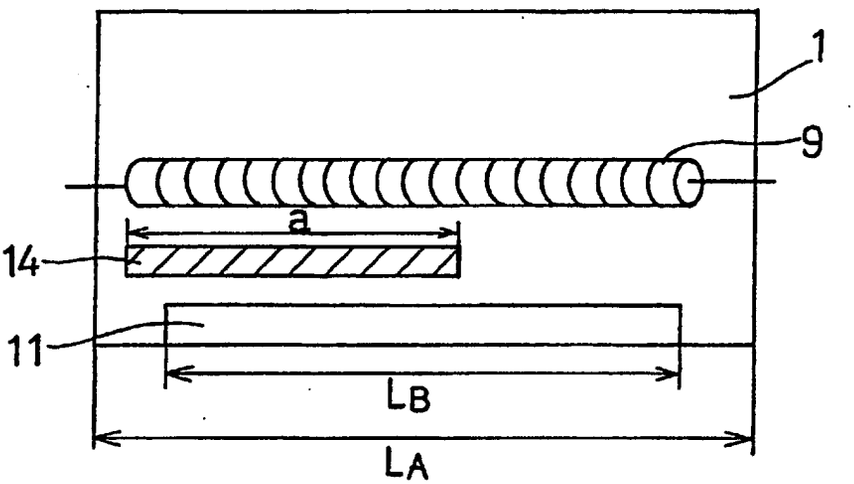


Fig. 15

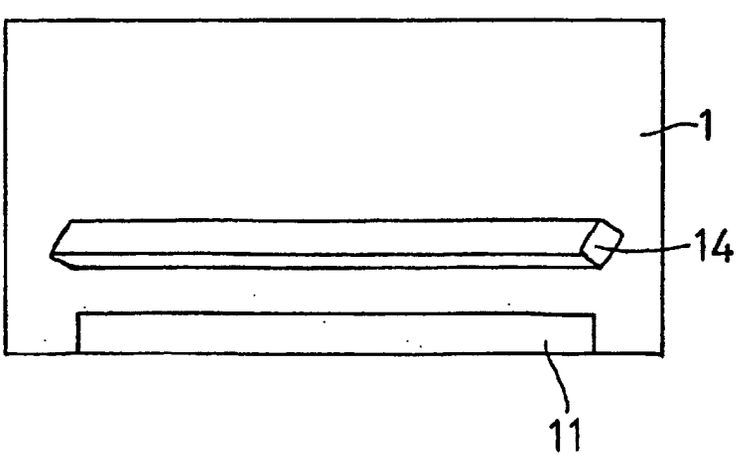


Fig. 16

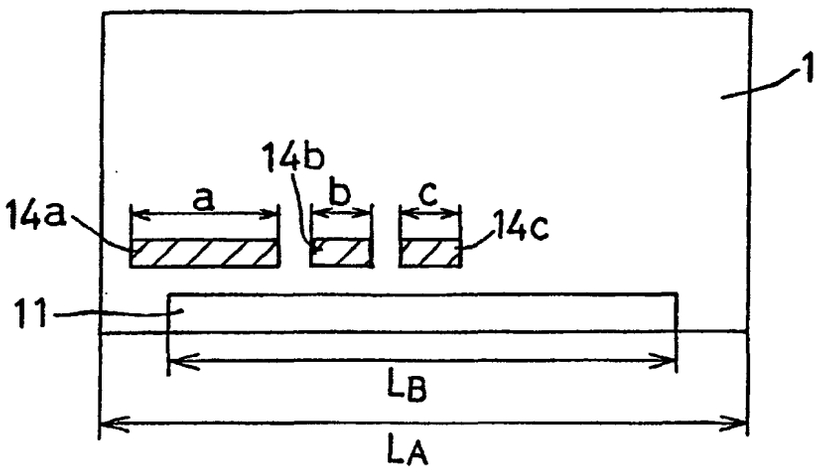


Fig. 17

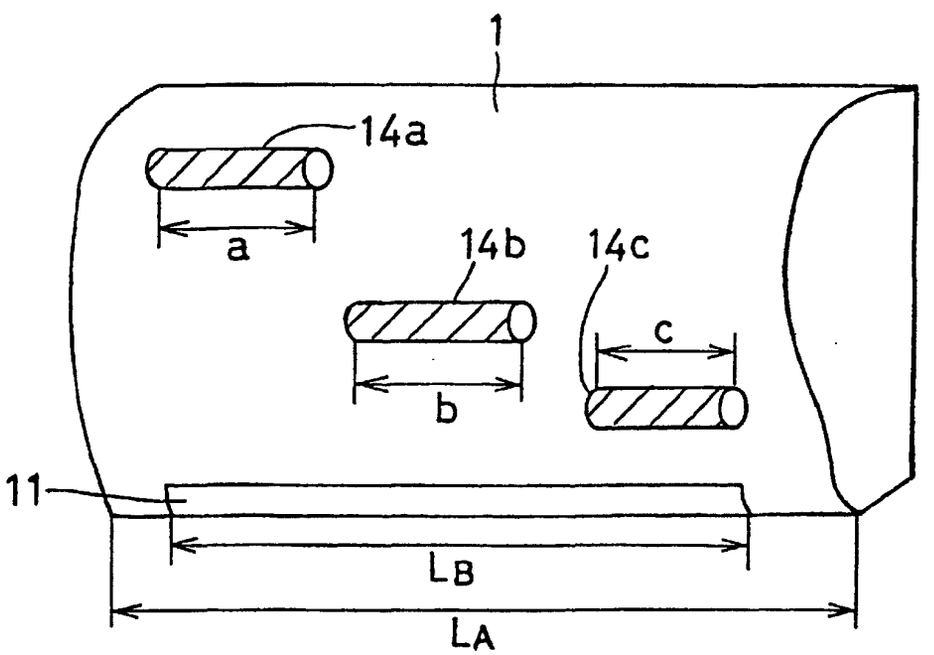


Fig. 18

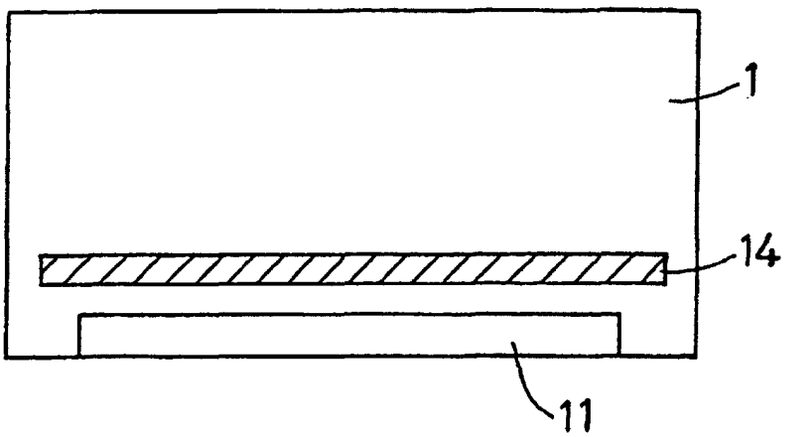


Fig. 19

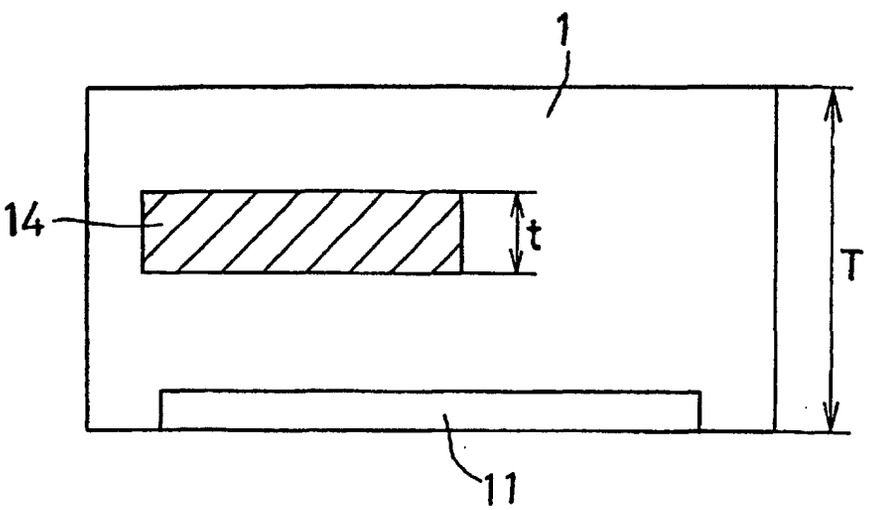


Fig. 20

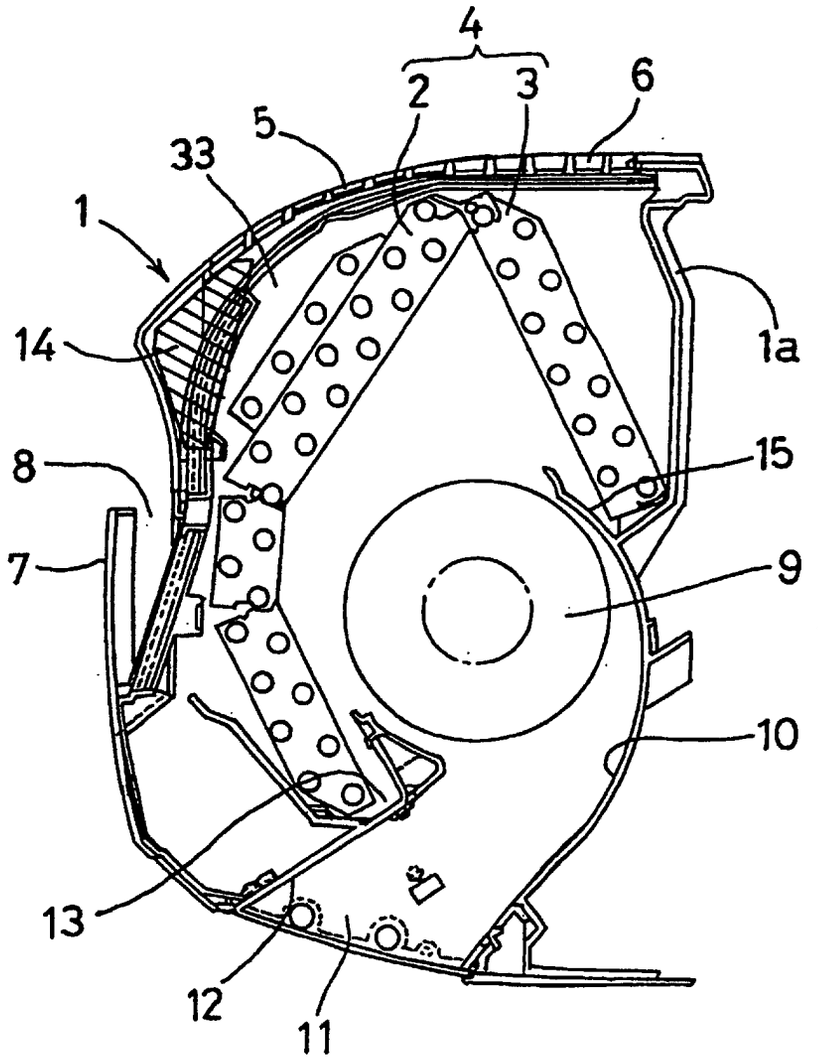


Fig. 21

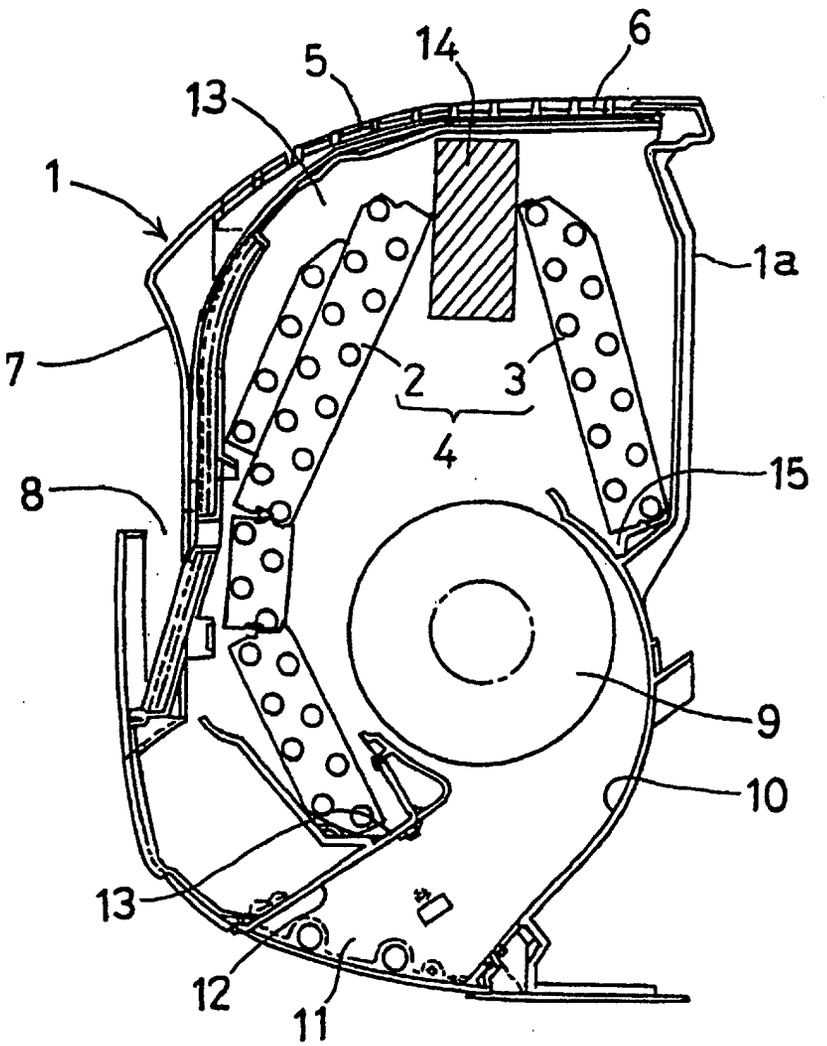


Fig. 22

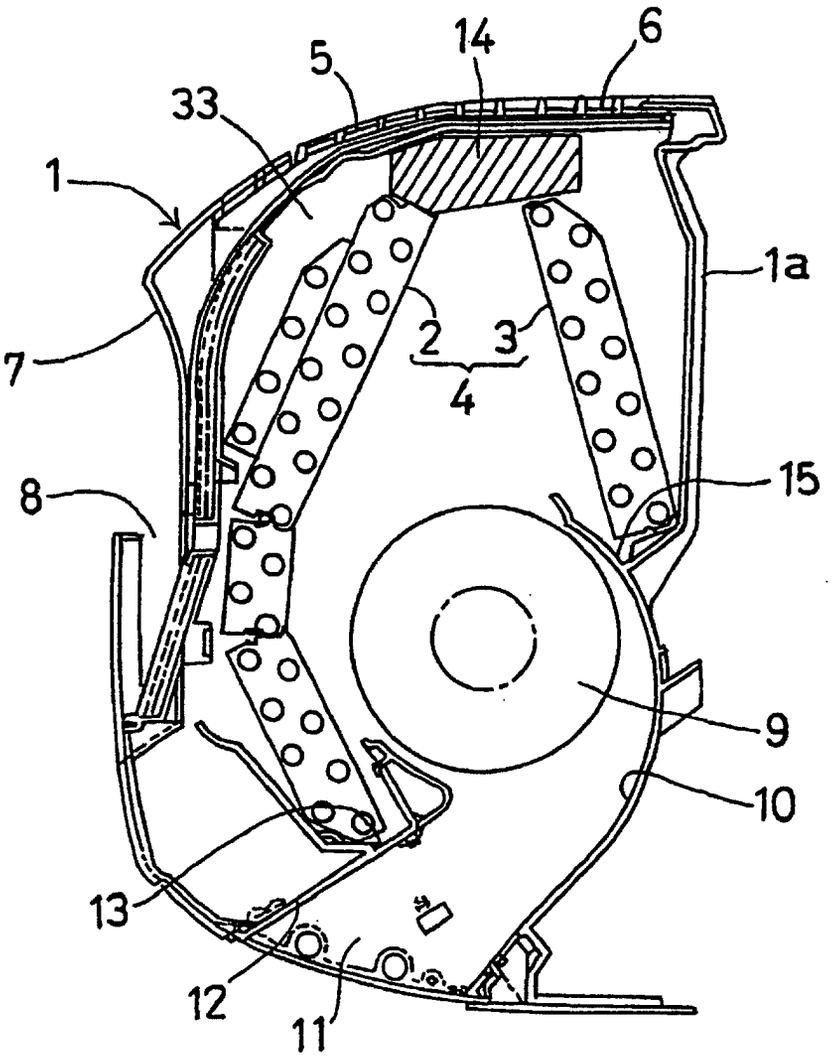


Fig. 23

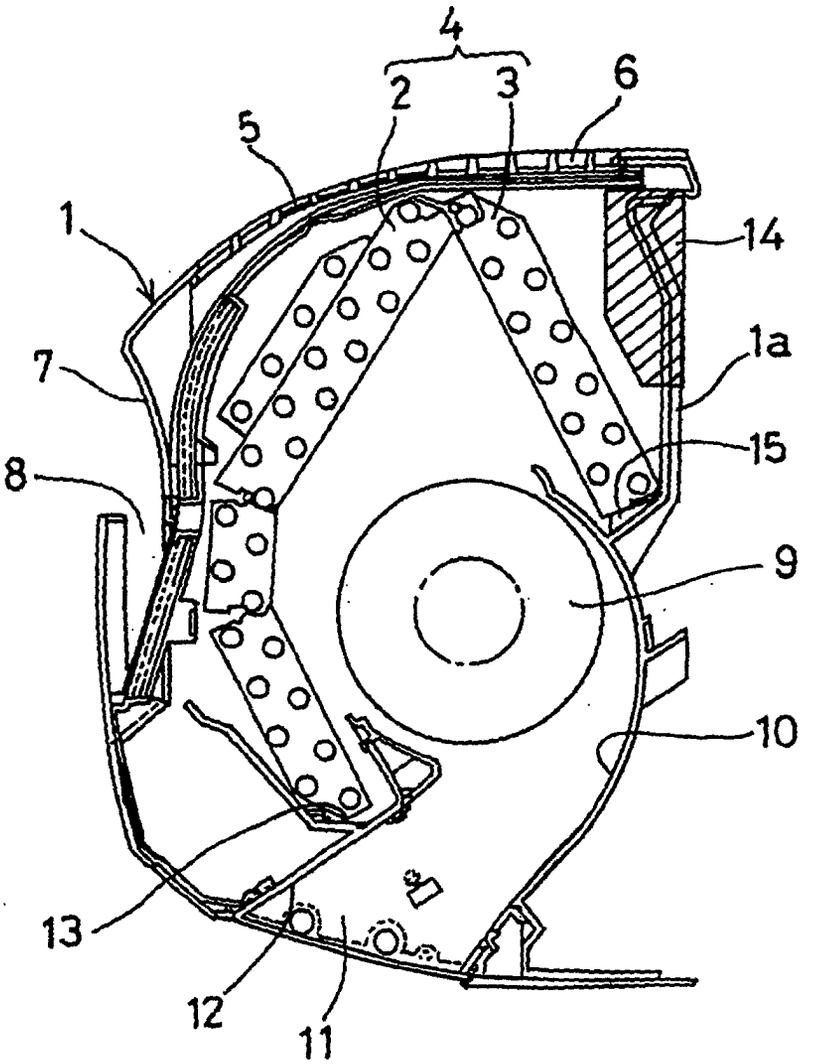


Fig. 24

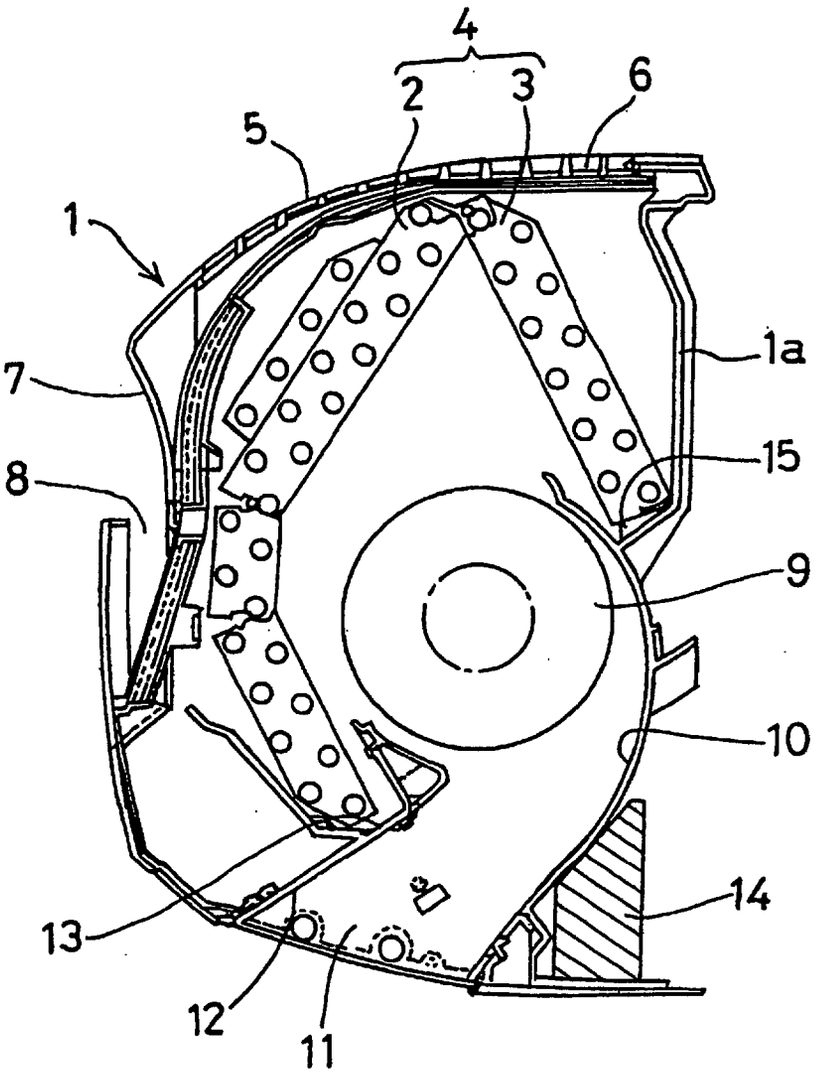


Fig. 25

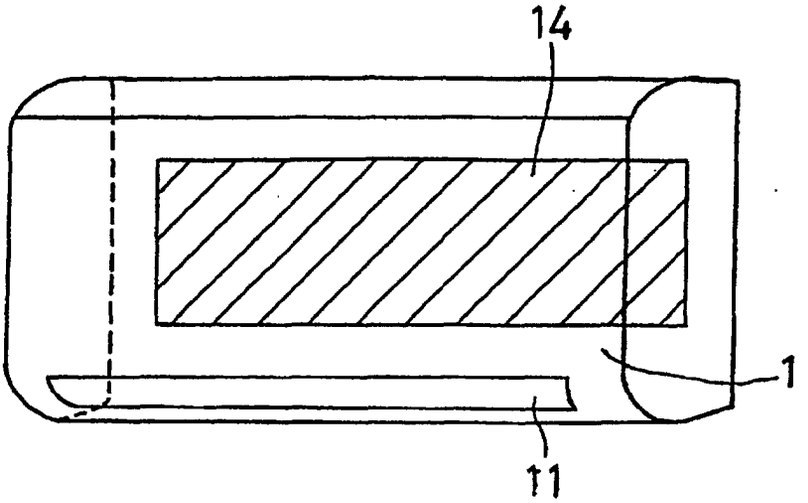


Fig. 26

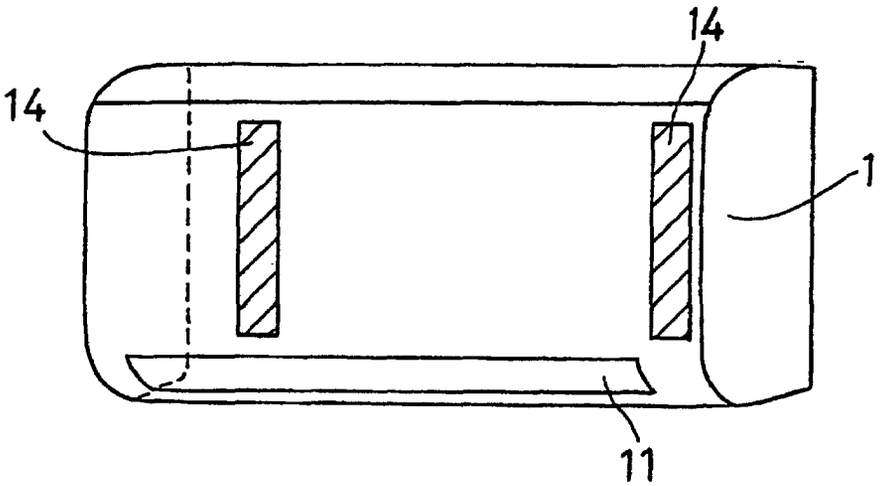


Fig. 27

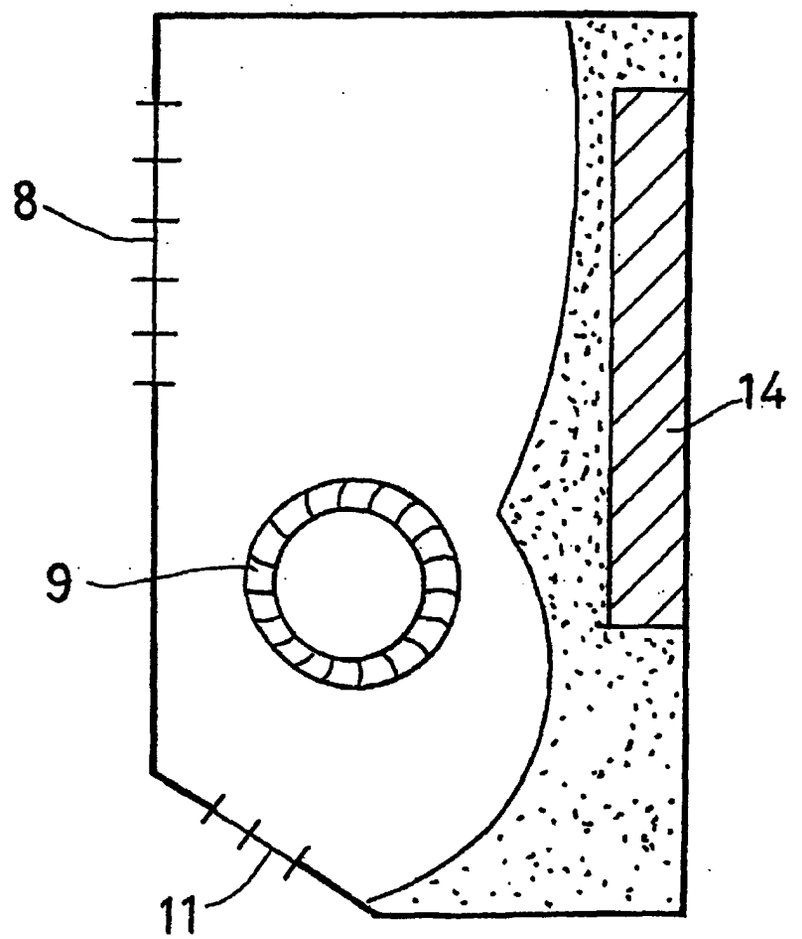
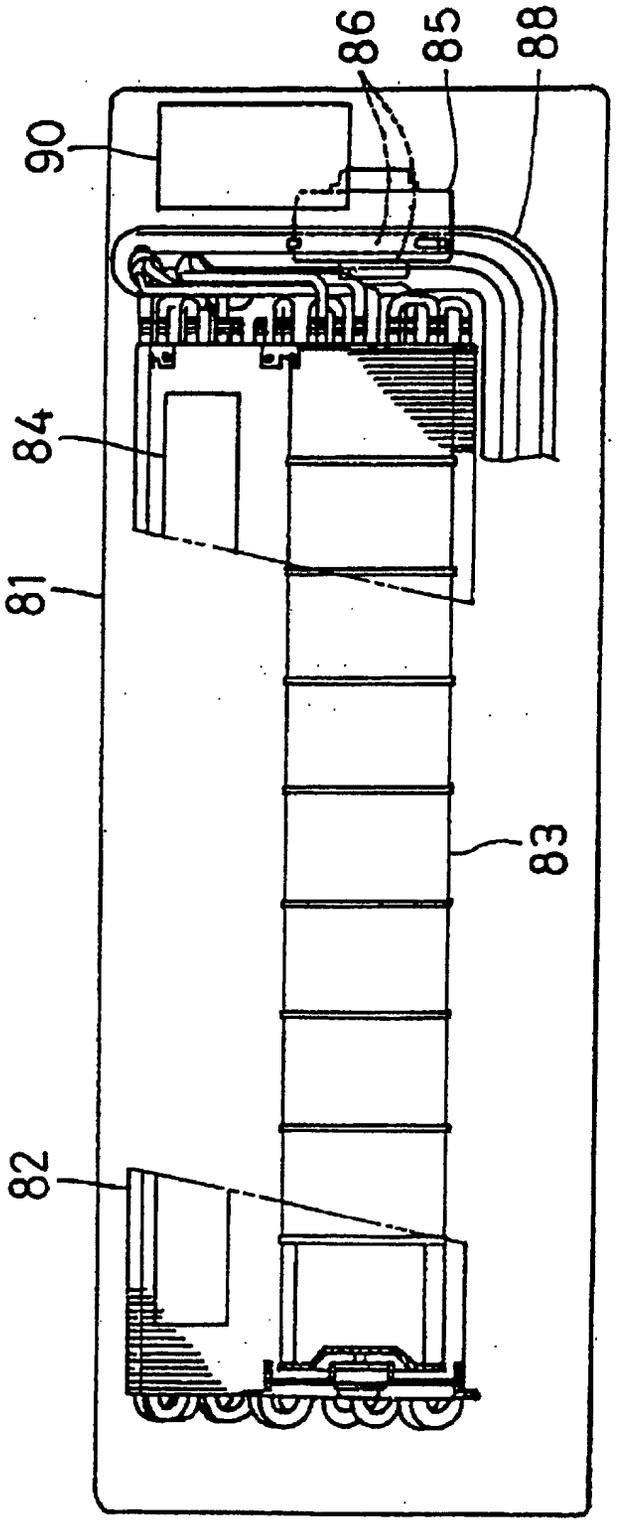


Fig. 28



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP00/05365

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[7] F24F1/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int.Cl[7] F24F1/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1926-1996 Toroku Jitsuyo Shinan Koho 1994-2000
Kokai Jitsuyo Shinan Koho 1971-2000 Jitsuyo Shinan Toroku Koho 1996-2000

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.
Y	JP, 10-197004, A (Daikin Industries, Ltd.), 31 July, 1998 (31.07.98) (Family: none)	1-9,15-17, 30-39
Y	JP, 8-135998, A (Hitachi, Ltd.), 31 May, 1996 (31.05.96) (Family: none)	7,16,19,21,22, 25,27,28,30, 37,38
Y	JP, 10-96530, A (Fujitsu General Limited), 14 April, 1998 (14.04.98) (Family: none)	27-29
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No.81138/1980 (Laid-open No.5633/1982) (Sanyo Electric Co., Ltd.), 12 January, 1982 (12.01.82) (Family: none)	1-8,15,16, 30-39
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No.77003/1984 (Laid-open No.188918/1985) (Kabushiki Kaisha General), 14 December, 1985 (14.12.85) (Family: none)	8-11,16-19,23, 26-28,30,37,38

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

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
01 November, 2000 (01.11.00)	14 November, 2000 (14.1.00)
Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer
Facsimile No.	Telephone No.

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP00/05365

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No.158863/1982 (Laid-open No.62416/1984) (Matsushita Refrig. Co., Ltd.), 24 April, 1984 (24.04.84) (Family: none)	7,12,16,17,21, 25,30,37

Form PCT/ISA/210 (continuation of second sheet) (July 1992)