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(54) **AIR CONDITIONING INDOOR UNIT**

(57) There is provided an air conditioning indoor unit capable of reducing the input to a motor for driving a fan and further reducing electric power consumption. A grill 20 and a filter 21, which are provided at a suction opening 16 in the center of a decorative panel 19, are adapted to move up and down with respect to a case body 11 fixed to a ceiling. A louver 30 provided in an air discharge flow

path 18 is adapted to be able to retract to a position along the wall surface of the air discharge flow path 18. By lowering and separating the grill 20 and the filter 21 from the case body 11 and by setting the louver 30 at a retracted position, the pressure loss in the unit is reduced, and thereby the input to the motor for driving the fan of a blower 14 is reduced.

FIG. 2A

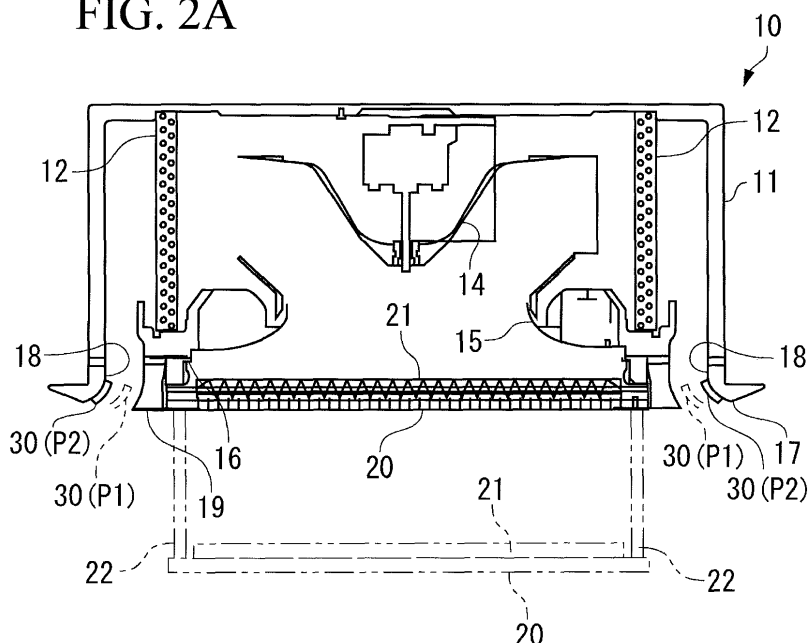
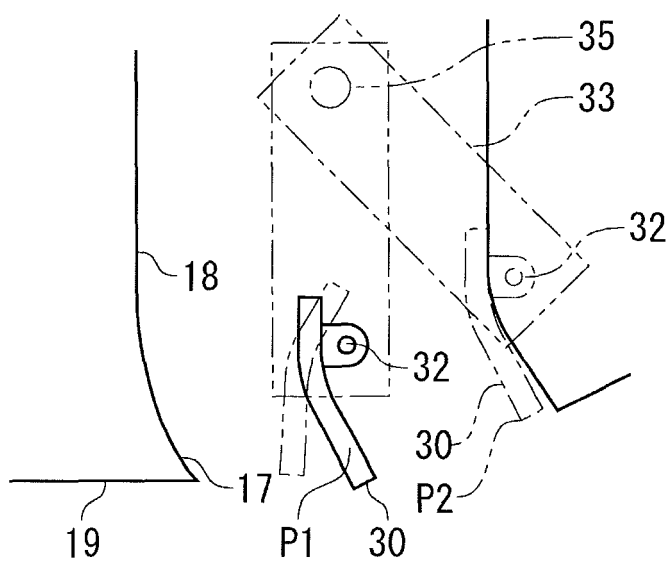


FIG. 2B



Description

Technical Field

[0001] The present invention relates to an air conditioning indoor unit for an air conditioner.

Background Art

[0002] In an air conditioning indoor unit for an air conditioner installed in a building room, room air is sucked into the air conditioning indoor unit through a filter by a fan, is cooled or heated in a heat exchanger, and then is blown off into the room through an air outlet opening.

[0003] For such an air conditioning indoor unit, reduction of electric power consumption has always been required, and to meet this requirement, various measures have been undertaken. As one of these measures, a technique has been disclosed in which the input (power) to a motor for driving a fan is reduced by reducing the in-unit pressure loss in the air conditioning indoor unit (for example, refer to Patent Documents 1 and 2).

Patent Document 1: Japanese Patent Laid-Open No. 2000-193264

Patent Document 2: Japanese Patent Laid-Open No. 10-196989

Disclosure of the Invention

Problems to be Solved by the Invention

[0004] As described above, lowering of electric power consumption has always been required, and a technique for reducing the input to the motor for driving the fan also has a room for further improvements.

[0005] The present invention has been made to solve the above-described technical problem, and accordingly an object thereof is to provide an air conditioning indoor unit capable of reducing the input to a motor for driving a fan and further lowering electric power consumption.

Means for Solving the Problems

[0006] The present inventors, who had carried out studies earnestly to achieve the above object, paid attention to an in-unit pressure loss in a suction flow path of air sucked into the air conditioning indoor unit and at an air outlet opening.

[0007] As a result, the present inventors found that a grill and a filter that are present in the suction flow path and a louver that is present at the air outlet opening exert an influence on the pressure loss in the unit.

[0008] Accordingly, the present invention provides an air conditioning indoor unit in which air in a room is sucked, the air is heated or cooled, and is blown off into the room, wherein the air conditioning indoor unit comprises a decorative panel provided with a suction opening

for sucking the air in the room and an air outlet opening for blowing off the heated or cooled air into the room; an indoor heat exchanger for heating or cooling the air in the room; a blower for sending the air in the room to the indoor heat exchanger; a case body for accommodating the indoor heat exchanger and the blower; and a pressure loss suppressing mechanism for suppressing the pressure loss of the air flow at the suction opening and/or the air outlet opening.

[0009] The pressure loss suppressing mechanism can comprise a grill having a passing part of the air sucked through the suction opening and a filter for removing foreign matters having a certain or larger size from the air sucked through the suction opening, at least the grill can be moved between a position at which the suction opening is covered and a position separating from the suction opening. If at least the grill is moved to a position separating from the suction opening, the grill can be prevented from increasing the pressure loss in the unit at the suction opening. To further reduce the pressure loss in the unit, not only the grill but also the filter is preferably moved to a position separating from the suction opening in the same way.

[0010] In the case where the filter is also moved, the grill and the filter can be integrally formed, or can be configured so as to be movable independently.

[0011] Also, the pressure loss suppressing mechanism can be configured so that a louver can be retracted to a position along the wall surface of an air discharge flow path continuous with the air outlet opening, the louver being located in the air discharge flow path to control the direction of wind blown off through the air outlet opening. Thereby, the louver can be prevented from increasing the pressure loss in the unit at the air outlet opening.

[0012] Thus, the pressure loss in the unit is reduced by moving at least the grill or by retracting the louver, whereby the input (power) to the motor for driving the fan of the blower can be reduced. An operation mode of the unit in which the grill and the louver are moved is referred to as a power-saving mode, and an operation mode of the unit in which the suction opening is covered with the grill and the fan and the louver is located in the air discharge flow path is referred as a normal mode. The changeover of the modes can be controlled by the operation of a control switch performed by the user or according to a preset control program or the like.

[0013] The present invention also provides an air conditioning indoor unit in which air in a room is sucked, the air is heated or cooled, and is blown off into the room, wherein the air conditioning indoor unit comprises a decorative panel provided with a suction opening for sucking the air in the room and an air outlet opening for blowing off the heated or cooled air into the room; an indoor heat exchanger for heating or cooling the air in the room; a blower for sending the air in the room to the indoor heat exchanger; a case body for accommodating the indoor heat exchanger and the blower; a grill which is provided so as to cover the suction opening and has a passing

part of the air sucked through the suction opening; a filter which is provided so as to cover the suction opening and which removes foreign matters having a certain or larger size from the air sucked through the suction opening; and a moving mechanism for moving the grill and the filter independently to positions separate from the suction opening.

[0014] The present invention further provides an air conditioning indoor unit in which air in a room is sucked, the air is heated or cooled, and is blown off into the room, wherein the air conditioning indoor unit comprises a decorative panel provided with a suction opening for sucking the air in the room and an air outlet opening for blowing off the heated or cooled air into the room; an indoor heat exchanger for heating or cooling the air in the room; a blower for sending the air in the room to the indoor heat exchanger; a case body for accommodating the indoor heat exchanger and the blower; a louver located in an air discharge flow path continuous with the air outlet opening to control the direction of wind blown off through the air outlet opening; and a louver retracting mechanism for retracting the louver from the interior of the air discharge flow path to a position along the wall surface of the air discharge flow path.

Advantages of the Invention

[0015] According to the present invention, the pressure loss in the unit is reduced by moving at least the grill or by retracting the louver, and thereby the input (power) to the motor for driving the fan of the blower can be reduced. Therefore, the electric power consumption can be lowered.

Brief Description of the Drawings

[0016]

FIG. 1 is a perspective view showing a configuration of a ceiling mounted air conditioner in accordance with an embodiment of the present invention; FIGS. 2A and 2B are views showing an air conditioning indoor unit, FIG. 2A being a sectional view, and FIG. 2B being a schematic view showing the movement of a louver; FIG. 3 is an exploded perspective view of a swaying mechanism for a louver; and FIG. 4 is a perspective view showing another example of a swaying mechanism for a louver.

Description of Symbols

[0017] 10 ... air conditioning indoor unit, 11 ... case body, 12 ... indoor heat exchanger, 14 ... blower, 16 ... suction opening, 17 ... air outlet opening, 18 ... air discharge flow path, 19 ... decorative panel, 20 ... grill, 21 ... filter, 22 ... rod, 30 ... louver, 31 ... swaying mechanism

Best Mode for Carrying Out the Invention

[0018] The present invention will now be described based on an embodiment shown in the accompanying drawings.

[0019] FIG. 1 is a perspective view showing a general configuration of an air conditioning indoor unit in accordance with the embodiment of the present invention.

[0020] As shown in FIG. 1, an air conditioning indoor unit 10 is connected to an air conditioning outdoor unit 1 by a refrigerant pipe 2 to form a ceiling mounted air conditioner.

[0021] The air conditioning outdoor unit 1 is installed on the outside of a room, and has a compressor for compressing a refrigerant, an outdoor heat exchanger 3 for heat-exchanging the refrigerant with air outside the room, and an outdoor fan 4.

[0022] On the other hand, the air conditioning indoor unit 10 is provided with an indoor heat exchanger 12, which heat-exchanges the refrigerant with air in the room, in a case body 11 embeddedly installed in a ceiling (not shown), so that the refrigerant circulates between the air conditioning outdoor unit 1 and the air conditioning indoor unit 10.

[0023] The air conditioning indoor unit 10 is further provided with a blower 14, a motor (not shown) for driving the blower 14, and a bell mouth 15 inside the case body 11.

[0024] Under the case body 11, a decorative panel 19 is provided. In the lower part of the decorative panel 19, a suction opening 16 for room air is formed in the central part, and air outlet openings 17 for blowing off air into the room are formed in the outer peripheral part.

[0025] When the ceiling mounted air conditioner is operated, the blower 14 is driven, and the room air is guided from the suction opening 16 to the bell mouth 15 and is sent into the indoor heat exchanger 12. Then, the air is cooled or heated in a process of flowing through the indoor heat exchanger 12, through which the refrigerant sent from the air conditioning outdoor unit 1 is caused to flow, and is blown off into the room through the air outlet openings 17 as conditioned air.

[0026] At the suction opening 16 in the center of the decorative panel 19, a grill 20 is provided so as to cover the suction opening 16. The grill 20 is formed with openings such as slits that allow the room air to pass through.

[0027] On the back surface side (the side facing to the interior of the case body 11) of the grill 20, a filter 21 is provided to remove dust and the like contained in the room air sucked through the openings of the grill 20. The filter 21 may be provided integrally with the grill 20, or may be configured so that it is held by a frame (not shown) and the frame holding the filter 21 is installed on the back surface side of the grill 20.

[0028] As shown in FIGS. 1 and 2A, the grill 20 and the filter 21 are provided so as to move up and down with respect to the case body 11 fixed to the ceiling as a pressure loss suppressing mechanism. Therefore, the grill 20

and the filter 21 are attached to the lower ends of a plurality of rods 22 elevatably held on the case body 11.

[0029] The rods 22 function as a moving mechanism for the grill 20 and the filter 21, and therefore can be moved up and down using a rack-and-pinion mechanism, a ball screw mechanism, or the like mechanism by motor drive. In this case, each of the rods 22 can also form a rack gear or a ball screw. Also, the rods 22 can be moved up and down by an air cylinder, an oil cylinder, or the like. Besides, the grill 20 and the filter 21 can be moved up and down by a link mechanism or the like, in place of the rods 22. The mechanism for moving the grill 20 and the filter 21 up and down is not limited to the above-described ones, and any other mechanism can be used as appropriate.

[0030] The elevating operation of the grill 20 and the filter 21 using the above-described mechanism is controlled automatically by a controller of the air conditioning indoor unit 10.

[0031] In the air conditioning indoor unit 10, the operation control is carried out by the controller in a plurality of modes including a mode in which air conditioning takes preference (a normal mode) and a mode in which power saving takes preference (a power-saving mode).

[0032] In the mode in which air conditioning takes preference, like the conventional indoor unit, the blower 14 is driven, and the room air is guided from the suction opening 16 to the bell mouth 15 and is sent into the indoor heat exchanger 12. Then, the air is cooled or heated in a process of flowing through the indoor heat exchanger 12, through which the refrigerant sent from the air conditioning outdoor unit 1 is caused to flow, and is blown off into the room through the air outlet openings 17 as conditioned air. At this time, the grill 20 and the filter 21 are located at positions at which the suction opening 16 of the case body 11 is closed as indicated by solid lines in FIG. 2A.

[0033] On the other hand, in the mode in which power saving takes preference, as indicated by two-dot chain lines in FIG. 2A, the grill 20 and the filter 21 are lowered beyond the suction opening 16, and a state in which a clearance is provided between the case body 11 and the grill 20 is formed. This clearance is provided with a dimension sufficient to prevent a pressure loss when the room air is sucked through the suction opening 16. Thereby, the pressure loss produced when the room air is sucked is reduced as compared with in the mode in which air conditioning takes preference. As a result, the input to the motor for driving the fan of the blower 14 can be reduced, so that electric power consumption can be lowered.

[0034] In this embodiment, the grill 20 and the filter 21 are lowered together. However, in the case where the grill 20 and the filter 21 are configured so as to be movable in the up and down direction independently, only the grill 20 can be lowered, or the lowering amounts (dimensions) of the grill 20 and the filter 21 can be made different.

[0035] In the above-described air conditioning indoor

unit 10, a louver 30 is provided at the air outlet opening 17 to control the direction of blown-off wind.

[0036] The louver 30 is operated, as a pressure loss suppressing mechanism, in the air outlet opening 17 by a swaying mechanism 31, described later. As shown in FIG. 2B, the swaying mechanism 31 moves the louver 30 between two positions of a wind direction control position P1 and a retraction position P2 in an air discharge flow path 18 formed in the case body 11 so as to be continuous with the air outlet opening 17. At the wind direction control position P1, the louver 30 is positioned in the air discharge flow path 18 to control the direction of blown-off wind, and at the retraction position P2, the louver 30 is retracted to a position along the wall surface of the air discharge flow path 18 so as not to obstruct the blown-off wind. Also, at the wind direction control position P1, the swaying mechanism 31 changes the angle of the louver 30 with respect to the wind blow-off direction in the air discharge flow path 18.

[0037] As shown in FIG. 3, the swaying mechanism 31 is configured so that a connecting shaft 35 is rotatably held on a pair of holders 36 fixed to the case body 11 (refer to FIG. 2A). At one end of the connecting shaft 35, an arm 42 is fixedly held via a key. To the other end of the connecting shaft 35, a gear 37b and a bearing 34b fixed to an L-shaped arm 33 are fixed via a key. At the distal end of the bearing 34b, a gear 34c is rotatably supported. A motor 34 is fixed to the upper part of the arm 33. To the rotating shaft of the motor 34, a gear 34a is fixed via a key. The gear 34a meshes with the gear 34c, and the gear 34c meshes with a gear 34d. This gear 34d is fixed to a shaft 43. The shaft 43 is insertedly and rotatably held by a bearing 40, which is fixed to the lower part of the arm 33.

[0038] At both ends of the louver 30, shafts 32a and 32b are provided integrally. The shaft 32a is insertedly fixed into a hole provided at one end of the shaft 43. The shaft 32b is insertedly fixed into a hole provided in a shaft 44. The shaft 44 is insertedly and rotatably held by the arm 42. Thereby, by the turning in the normal and reverse directions of the motor 34, the gears 34a, 34c and 34d are turned, whereby the louver 30 is swayed with the shafts 32a and 32b being supporting points.

[0039] A motor 37 is fixed to the case body 11 (refer to FIG. 2A), and a gear 37a is fixed to the rotating shaft of the motor 37. The gear 37a meshes with the gear 37b fixed to the connecting shaft 35, and the gears 37a and 37b are turned by the turning in the normal and reverse directions of the motor 37, whereby the arms 33 and 42 are swayed with the connecting shaft 35 being a supporting point.

[0040] The connecting shaft 35, the holders 36, and the motor 37 are fixed to the case body 11 (refer to FIG. 2A) at a position of not being exposed to the interior of the air discharge flow path 18. A set of two arms 33 penetrate holes formed in the air discharge flow path 18, and the louver 30 is exposed to the interior of the air discharge flow path 18.

[0041] In this swaying mechanism 31, the connecting shaft 35 is rotated by the operation of the motor 37, and thereby the arms 33 and 42 are swayed with the connecting shaft 35 being the center. Then, the louver 30 moves in the air discharge flow path 18 formed so as to be continuous with the air outlet opening 17 in the case body 11. Thereby, the louver 30 is moved between the two positions of the wind direction control position P1 in which the louver 30 is located in the air discharge flow path 18 to control the direction of blown-off wind and the retraction position P2 in which the louver 30 is located along the wall surface of the air discharge flow path 18 to retract so as not to obstruct the blown-off wind.

[0042] Also, in the case where the motor 34 is operated when the louver 30 is located at the wind direction control position P1, the shafts 32a and 32b are rotated via the gears 34a, 34c and 34d, and thereby the angle of the louver 30 is changed. Thereby, at the wind direction control position P1, the angle of the louver 30 with respect to the wind blow-off direction in the air discharge flow path 18 is changed.

[0043] For the air conditioning indoor unit 10, in the mode in which air conditioning takes preference (the normal mode), like the conventional indoor unit, the louver 30 is located at the wind direction control position P1, and the angle thereof is changed by the rotation in the normal and reverse directions of the motor 34 to control the direction in which wind is blown off through the air outlet opening 17.

[0044] On the other hand, in the mode in which power saving takes preference (the power-saving mode), the louver 30 is located at the retraction position P2 so that the louver 30 does not obstruct the flow of air in the air discharge flow path 18. Thereby, the pressure loss produced when the conditioned air passes through the air discharge flow path 18 and blows off through the air outlet opening 17 is reduced as compared with in the mode in which air conditioning takes preference. As a result, the input to the motor for driving the fan of the blower 14 can be reduced, whereby the electric power consumption can be lowered.

[0045] The configuration can be made such that the gears 34a, 34c, 34d, 37a, and 37b and the like are eliminated in the swaying mechanism 31, the louver 30 is made enable to be swayed by the motor 34 fixedly held by the arm 33 as shown in FIG. 4, and the connecting shaft 35 is rotationally driven directly by the motor 37 fixedly held by the arm 42.

[0046] In the above-described embodiment, a configuration of the air conditioning indoor unit 10 has been described. However, any configuration may be adopted except the portions relating to the essential part of the present invention.

[0047] As for the mechanism for moving the grill 20 and the filter 21 up and down, the louver 30, and the swaying mechanism 31 as well, any other configuration may be adopted as far as the desired function can be fulfilled.

[0048] Besides, the configurations described in the above-described embodiment can be selected or can be changed appropriately to other configurations without departing from the spirit and scope of the present invention.

Claims

1. An air conditioning indoor unit in which air in a room is sucked, the air is heated or cooled, and is blown off into the room, wherein the air conditioning indoor unit comprises:

a decorative panel provided with a suction opening for sucking the air in the room and an air outlet opening for blowing off the heated or cooled air into the room;
an indoor heat exchanger for heating or cooling the air in the room;
a blower for sending the air in the room to the indoor heat exchanger;
a case body for accommodating the indoor heat exchanger and the blower; and
a pressure loss suppressing mechanism for suppressing the pressure loss of the flow of the air at the suction opening and/or the air outlet opening.

2. The air conditioning indoor unit according to claim 1, wherein the pressure loss suppressing mechanism comprises a grill having a passing part of the air sucked through the suction opening and a filter for removing foreign matters having a certain or larger size from the air sucked through the suction opening, and at least the grill can be moved between a position at which the suction opening is covered and a position separating from the suction opening.

3. The air conditioning indoor unit according to claim 2, wherein the air conditioning indoor unit further comprises a controller for the pressure loss suppressing mechanism; and the controller carries out control to change over the operation mode from a normal mode in which the air conditioning indoor unit is operated in a state in which the suction opening is covered with the grill and the filter to a power-saving mode in which the air conditioning indoor unit is operated in a state in which the grill and the filter are moved to positions separate from the suction opening, and vice versa.

4. The air conditioning indoor unit according to claim 1, wherein the pressure loss suppressing mechanism is configured so that a louver can be retracted to a position along the wall surface of an air discharge flow path continuous with the air outlet opening, the louver being located in the air discharge flow path to

control the direction of wind blown off through the air outlet opening.

5. The air conditioning indoor unit according to claim 4, wherein
the air conditioning indoor unit further comprises a controller for the pressure loss suppressing mechanism; and
the controller carries out control to change over the operation mode from a normal mode in which the air conditioning indoor unit is operated in a state in which the louver is located in the air discharge flow path to a power-saving mode in which the air conditioning indoor unit is operated in a state in which the louver is retracted to a position along the wall surface of the air discharge flow path, and vice versa. 5 10
6. An air conditioning indoor unit in which air in a room is sucked, the air is heated or cooled, and is blown off into the room, wherein
the air conditioning indoor unit comprises: 15 20
 - a decorative panel provided with a suction opening for sucking the air in the room and an air outlet opening for blowing off the heated or cooled air into the room; 25
 - an indoor heat exchanger for heating or cooling the air in the room;
 - a blower for sending the air in the room to the indoor heat exchanger; 30
 - a case body for accommodating the indoor heat exchanger and the blower;
 - a grill which is provided so as to cover the suction opening and has a passing part of the air sucked through the suction opening; 35
 - a filter which is provided so as to cover the suction opening and which removes foreign matters having a certain or larger size from the air sucked through the suction opening; and
 - a moving mechanism for moving the grill and the filter independently to positions separate from the suction opening. 40
7. The air conditioning indoor unit according to claim 6, wherein
the air conditioning indoor unit further comprises: 45
 - a louver located in an air discharge flow path continuous with the air outlet opening to control the direction of wind blown off through the air outlet opening; and 50
 - a louver retracting mechanism for retracting the louver from the interior of the air discharge flow path to a position along the wall surface of the air discharge flow path. 55
8. The air conditioning indoor unit according to claim 6, wherein

the air conditioning indoor unit further comprises a controller for the moving mechanism; and
the controller carries out control to change over the operation mode from a mode in which the air conditioning indoor unit is operated in a state in which the suction opening is covered with the grill and the filter to a mode in which the air conditioning indoor unit is operated in a state in which the grill and the filter are moved to positions separate from the suction opening, and vice versa.

9. An air conditioning indoor unit in which air in a room is sucked, the air is heated or cooled, and is blown off into the room, wherein
the air conditioning indoor unit comprises:

- a decorative panel provided with a suction opening for sucking the air in the room and an air outlet opening for blowing off the heated or cooled air into the room;
- an indoor heat exchanger for heating or cooling the air in the room;
- a blower for sending the air in the room to the indoor heat exchanger;
- a case body for accommodating the indoor heat exchanger and the blower;
- a louver located in an air discharge flow path continuous with the air outlet opening to control the direction of wind blown off through the air outlet opening; and
- a louver retracting mechanism for retracting the louver from the interior of the air discharge flow path to a position along the wall surface of the air discharge flow path.

FIG. 1

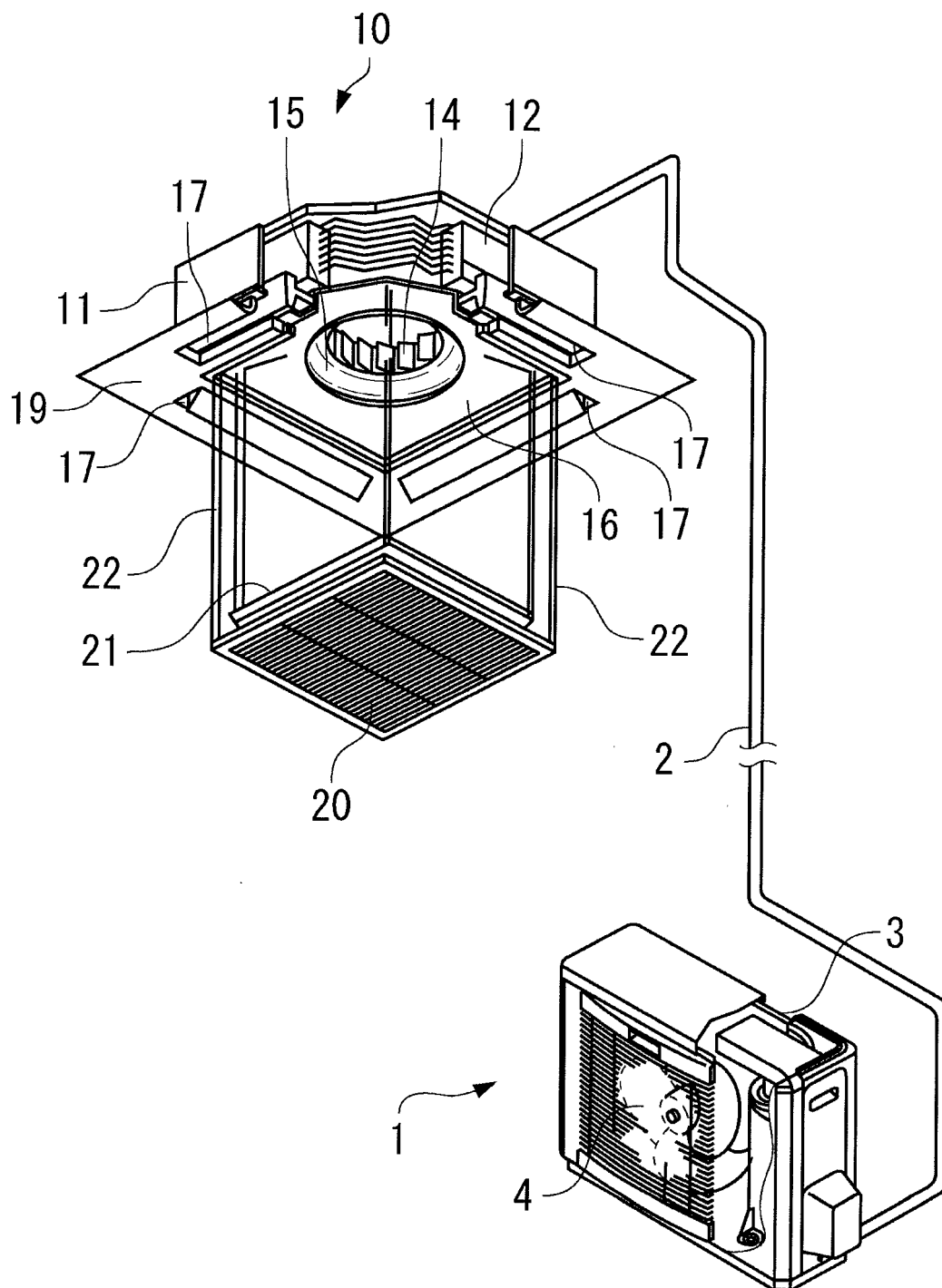


FIG. 2A

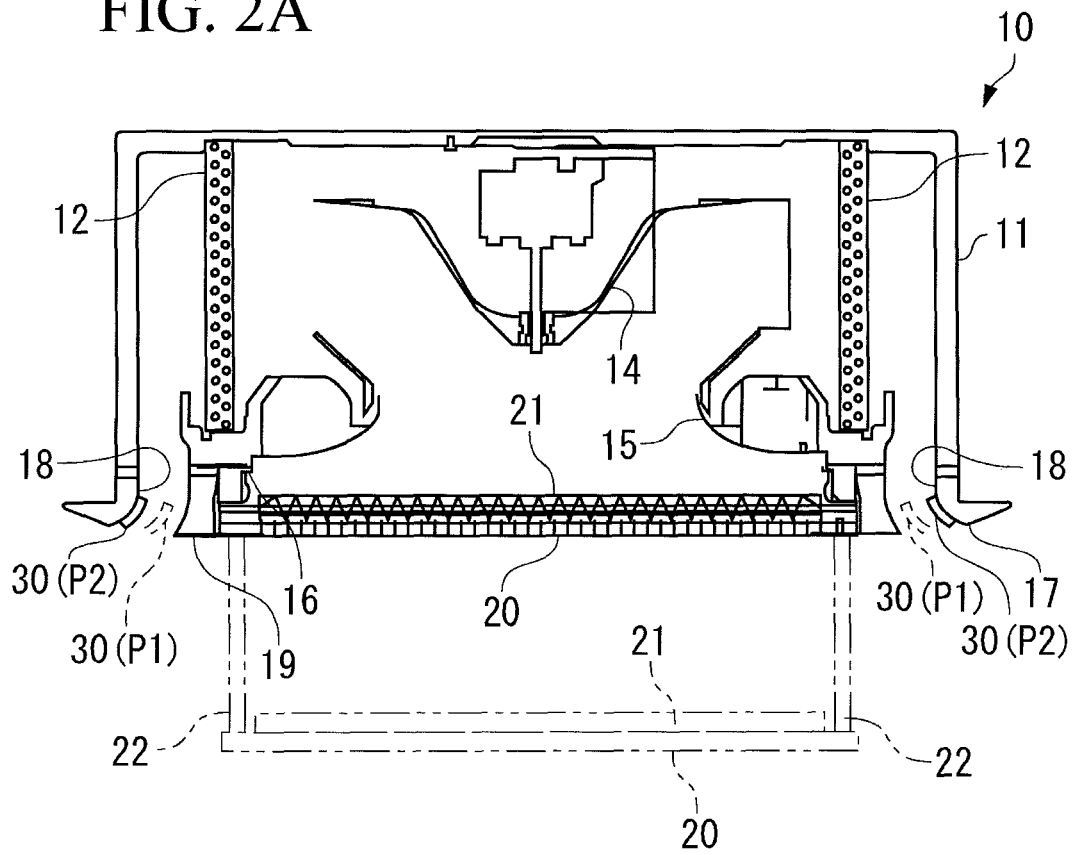
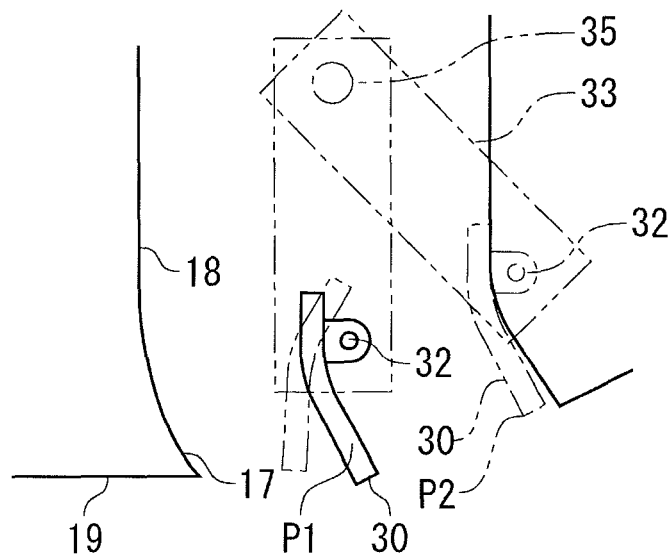


FIG. 2B



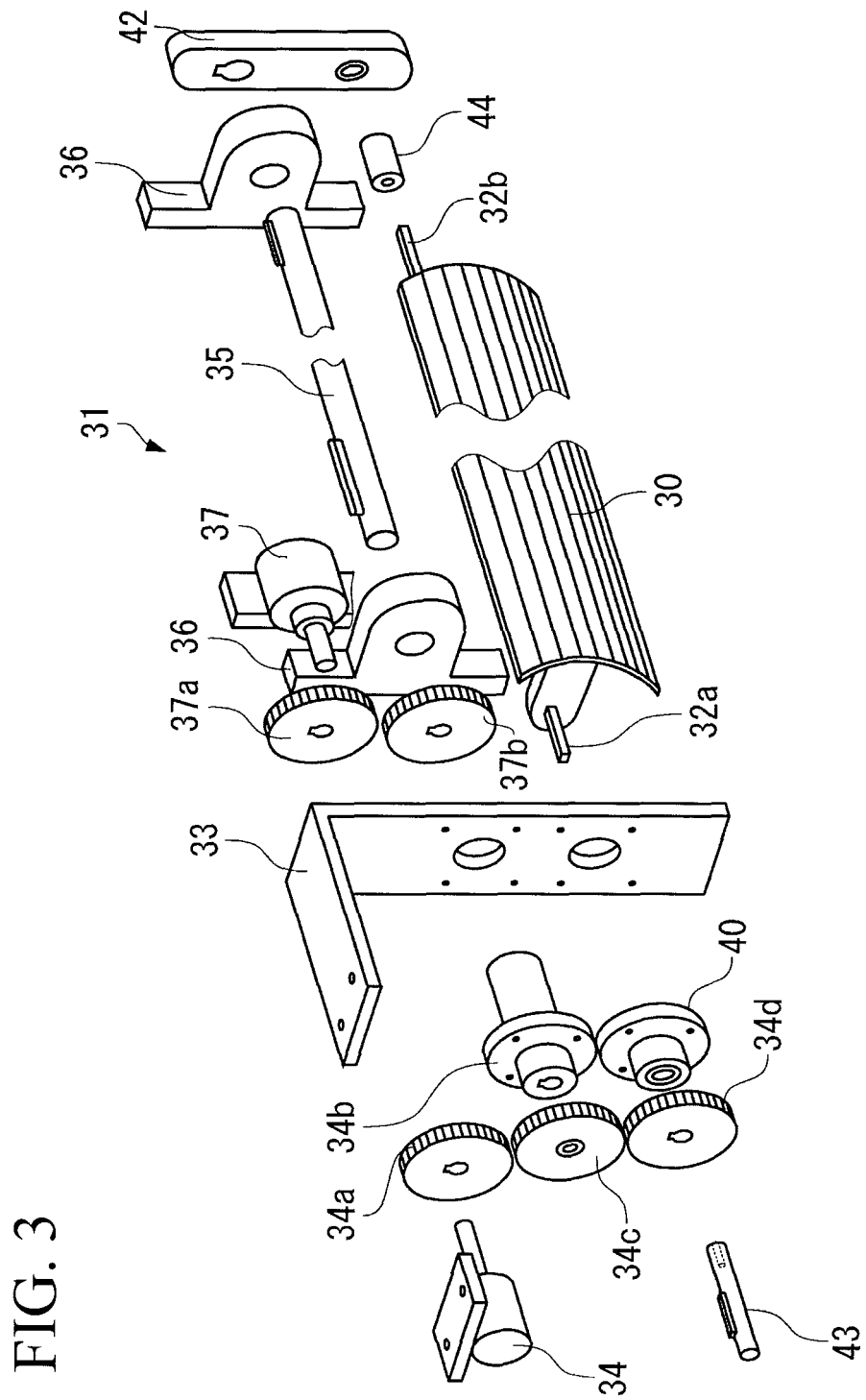
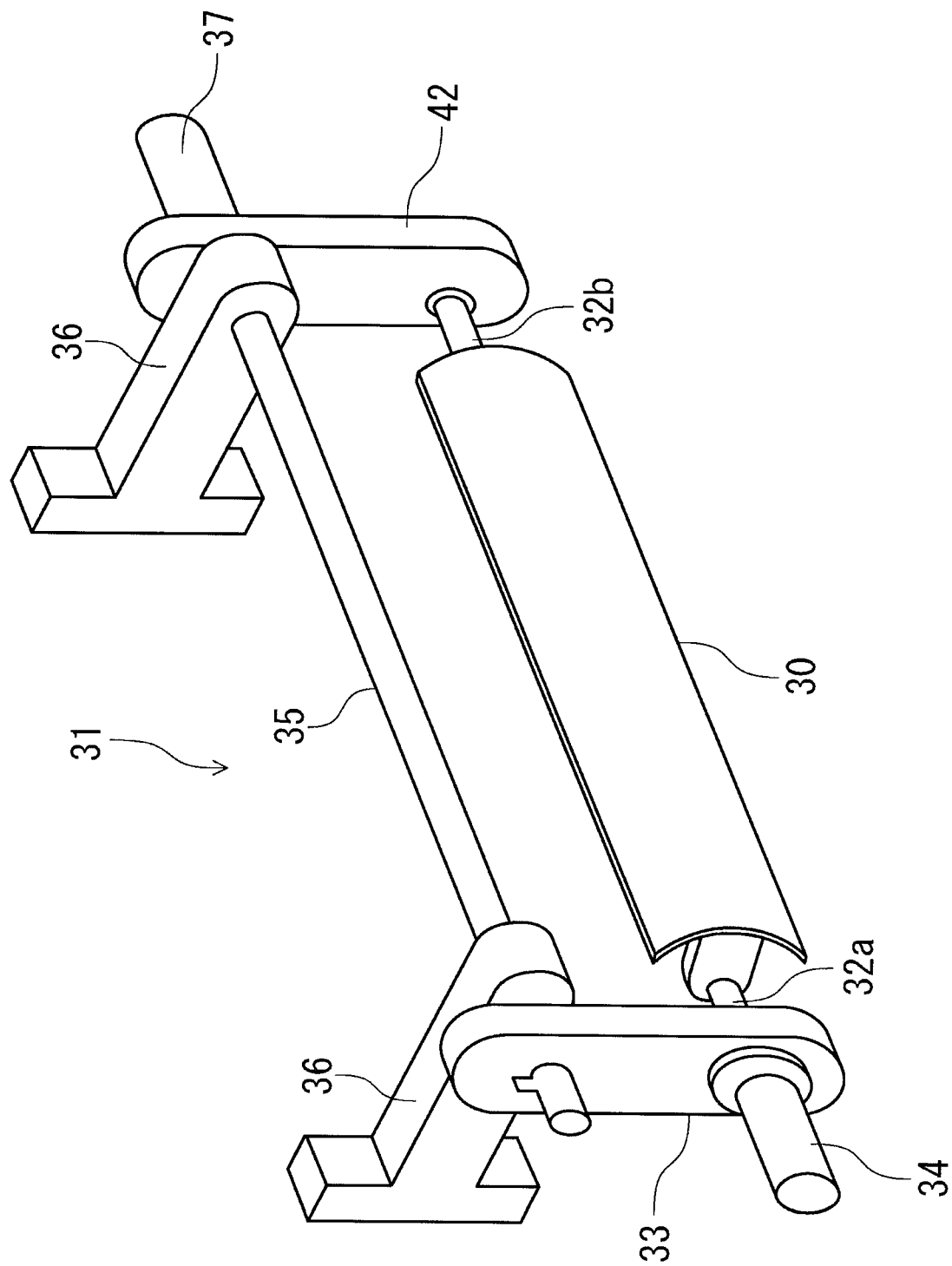


FIG. 4



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2009/000355

A. CLASSIFICATION OF SUBJECT MATTER

F24F13/20(2006.01) i, F24F13/28(2006.01) i

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)

F24F13/20, F24F13/28

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho	1922-1996	Jitsuyo Shinan Toroku Koho	1996-2009
Kokai Jitsuyo Shinan Koho	1971-2009	Toroku Jitsuyo Shinan Koho	1994-2009

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	JP 2000-111131 A (Daikin Industries, Ltd.), 18 April, 2000 (18.04.00), Full text; all drawings (Family: none)	1, 4, 5, 9 7, 8
Y	JP 2000-46366 A (Daikin Industries, Ltd.), 18 February, 2000 (18.02.00), Full text; all drawings (Family: none)	1-3, 6-8
Y	JP 2007-40689 A (Mitsubishi Heavy Industries, Ltd.), 15 February, 2007 (15.02.07), Full text; all drawings (Family: none)	1-3, 6-8

☐ 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 application or patent 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

10 April, 2009 (10.04.09)

Date of mailing of the international search report

21 April, 2009 (21.04.09)

Name and mailing address of the ISA/

Japanese Patent Office

Authorized officer

Facsimile No.

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2009/000355

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

The invention of claim 1 is described in document 1 cited in the international search report, and therefore, even if the inventions of all the claims have the same or corresponding "technical features," they are not "special technical features."

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☒ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest
the

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

Form PCT/ISA/210 (continuation of first sheet (2)) (April 2007)

REFERENCES CITED IN THE DESCRIPTION

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