



(11) **EP 1 962 028 A1**

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

(43) Date of publication:
27.08.2008 Bulletin 2008/35

(51) Int Cl.:
F24F 1/00 (2006.01)

(21) Application number: **06833006.7**

(86) International application number:
PCT/JP2006/323156

(22) Date of filing: **21.11.2006**

(87) International publication number:
WO 2007/063737 (07.06.2007 Gazette 2007/23)

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI
SK TR**

(30) Priority: **30.11.2005 JP 2005345566**

(71) Applicant: **DAIKIN INDUSTRIES, LTD.**
Osaka-shi, Osaka 530-8323 (JP)

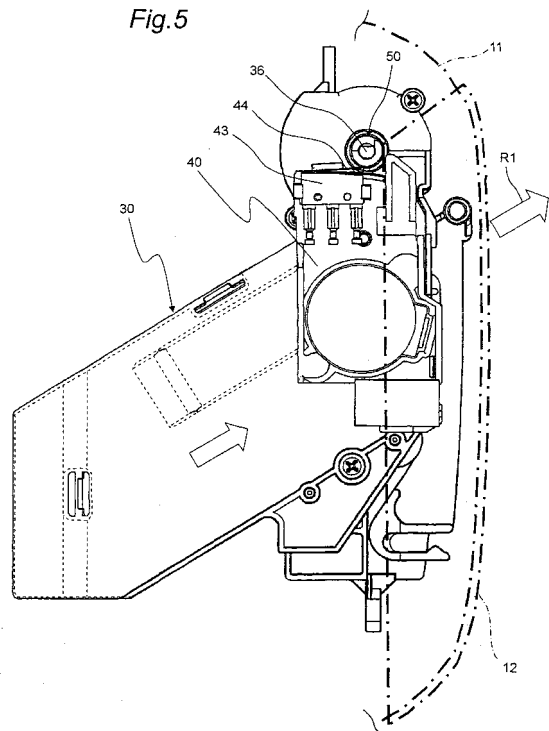
(72) Inventors:
• **TAKADA, Youhei**
Kusatsu-shi, Shiga 5250044 (JP)
• **AKAI, Tatsuhiko**
Kusatsu-shi, Shiga 5250044 (JP)

(74) Representative: **Spilgies, Jan-Hendrik et al**
Hoffmann Eitle
Patent- und Rechtsanwälte
Arabellastrasse 4
81925 München (DE)

(54) **INDOOR UNIT FOR AIR CONDITIONER**

(57) The indoor unit for air conditioners includes a bottom frame, a front panel 11 removably fitted on a front face side of the bottom frame, an opening/closing panel 12 for opening and closing an intake opening of the front panel 11, an opening/closing mechanism 30 placed on the front panel 11 and serving for opening and closing the opening/closing panel 12, and a driver part 40 placed on the bottom frame and serving for driving the opening/closing mechanism 30. The opening/closing detection part 43 placed on the bottom frame detects an opening/closing state of the opening/closing panel 12 based on a cam 50 which rotates along with rotation of a drive shaft 36 of the opening/closing mechanism 30 driven by the driver part 40.

Fig.5



EP 1 962 028 A1

Description

TECHNICAL FIELD

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

BACKGROUND ART

[0002] Conventionally, there has been provided an indoor unit for air conditioners including an opening/closing panel for opening and closing an opening of a front panel (see, e.g., JP 2005-106386 A). This air-conditioner indoor unit has a bottom frame on which a heat exchanger and a blower fan are mounted, and a front panel which is removably fitted so as to cover the front face side of the bottom frame. The air-conditioner indoor unit also includes a driver part placed on the bottom frame side, and an opening/closing mechanism placed on the front panel side, so that the opening/closing panel is moved by the opening/closing mechanism with driving force of the driver part.

[0003] In this air-conditioner indoor unit, since a microswitch for checking the opening and closing of the opening/closing panel needs to be placed on the front panel side, the microswitch on the front panel side and electrical parts on the bottom frame side are separated from each other in removal of the front panel, so that a junction harness for connecting the microswitch on the front panel side and the electrical parts on the bottom frame side to each other would be involved. As a result, there are problems that the indoor unit may become complex in structure, leading to degradation of its assemblability and maintainability, and that the junction harness may be damaged by the removal of the front panel, resulting in a lowered reliability of the indoor unit.

DISCLOSURE OF THE INVENTION

[0004] Accordingly, an object of the present invention is to provide an indoor unit for air conditioners which is enabled to detect an opening/closing state of the opening/closing panel with a simple construction without connecting the front panel and the bottom-frame side electrical parts to each other via a junction harness so that assemblability, maintainability and reliability of the indoor unit can be improved.

[0005] In order to achieve the above object, there is provided an indoor unit for air conditioners, comprising:

- a bottom frame;
- a front panel fitted on a front face side of the bottom frame so as to be removable or openable and closable;
- an opening/closing panel for opening and closing an intake opening of the front panel;
- an opening/closing mechanism which is placed on the front panel and which serves for opening and

closing the opening/closing panel;

a driver part which is placed on the bottom frame and which serves for driving the opening/closing mechanism; and

an opening/closing detection part which is placed on the bottom frame and which serves for detecting an opening/closing state of the opening/closing panel based on a motion of a movable part of the opening/closing mechanism (30) driven by the driver part.

[0006] With this construction, in the indoor unit in which the front panel is removably fitted on the front face side of the bottom frame, an opening/closing mechanism for opening and closing the opening/closing panel is placed on the front panel while the driver part for driving the opening/closing mechanism is placed on the bottom frame, and the opening/closing mechanism is driven by the driver part. Then, the movable part of the opening/closing mechanism driven by the driver part is moved, and based on the motion of the movable part, an opening/closing state of the opening/closing panel is detected by the opening/closing detection part placed on the bottom frame. Accordingly, since the opening/closing detection part for detecting the opening/closing state of the opening/closing panel is not provided on the front panel side, removal from the bottom frame or opening/closing of the front panel has no influence on electrical connections in electrical parts of the opening/closing detection part, the driver part or the like. That is, since the opening/closing detection part that is an electrical part is not provided on the front panel side, the need for a junction harness is eliminated. Therefore, the opening/closing state of the opening/closing panel can be detected with a simple construction, so that the assemblability, maintainability and reliability can be improved.

[0007] In one embodiment of the invention, the movable part of the opening/closing mechanism has a drive shaft which rotates with driving force of the driver part, and

the opening/closing detection part detects an opening/closing state of the opening/closing panel based on rotation of the drive shaft.

[0008] In this embodiment, since the opening/closing detection part detects the opening/closing state of the opening/closing panel based on rotation of the shaft of the movable part, the construction can be simplified by using, for example, a microswitch or the like.

[0009] In one embodiment of the invention, the movable part of the opening/closing mechanism has a cam which rotates along with rotation of the drive shaft, and the opening/closing detection part detects an opening/closing state of the opening/closing panel based on rotation of the cam of the opening/closing mechanism.

[0010] In this embodiment, the opening/closing detection part detects the opening/closing state of the opening/closing panel based on the cam that rotates along with rotation of the shaft of the movable part. Thus, the opening/closing state of the opening/closing panel can be de-

tected accurately and reliably.

[0011] In one embodiment of the invention, the opening/closing mechanism includes a first opening/closing mechanism part and a second opening/closing mechanism part which are provided near left-and-right side faces of the front panel, respectively, and which are coupled to each other by the drive shaft, and

as either one of the first and second opening/closing mechanism parts is driven by the driver part, the other of the first and second opening/closing mechanism parts is driven via the drive shaft that transmits driving force of the driver part.

[0012] In this embodiment, as either one of the first and second opening/closing mechanism parts placed near the left-and-right side faces of the front panel, respectively, is driven by the driver part, the other of the first and second opening/closing mechanism parts is driven via the shaft that transmits driving force of the driver part. Thus, with one driver part placed on one side, the opening/closing panel is opened or closed by the first and second opening/closing mechanism parts on the left and right of the front panel, by which opening/closing driving force is given to both left and right sides of the opening/closing panel, so that the opening/closing panel can be opened or closed smoothly and evenly.

[0013] As apparent from the above description, according to the air-conditioner indoor unit of the invention, the opening/closing state of the opening/closing panel can be detected with a simple construction, making it possible to achieve an air-conditioner indoor unit which can be improved in assemblability, maintainability and reliability.

[0014] Also, according to one embodiment, the opening/closing detection part detects an opening/closing state of the opening/closing panel based on rotation of the shaft of the movable part. Thus, the construction can be simplified by using, for example, a microswitch or the like.

[0015] Further, according to one embodiment, the opening/closing detection part detects a opening/closing state of the opening/closing panel based on the cam that rotates along with rotation of the shaft of the movable part. Thus, the opening/closing state of the opening/closing panel can be detected accurately and reliably.

[0016] Furthermore, according to one embodiment, either one of the first and second opening/closing mechanism parts placed near the left-and-right side faces of the front panel, respectively, is driven by the driver part, and the other of the first and second opening/closing mechanism parts is driven via the shaft that transmits driving force of the driver part, so that the opening/closing panel is opened or closed by the first and second opening/closing mechanism parts. Thus, opening/closing driving force is given to both left and right sides of the opening/closing panel, so that the opening/closing panel can be opened or closed smoothly and evenly.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017]

Fig. 1 is a perspective view of an air-conditioner indoor unit according to one embodiment of the present invention, showing an operation-halt state of the indoor unit;

Fig. 2 is a perspective view of the air-conditioner indoor unit, showing an operating state thereof;

Fig. 3 is a sectional view of the air-conditioner indoor unit with the opening/closing panel in a closed state;

Fig. 4 is a sectional view of the air-conditioner indoor unit with the opening/closing panel in an open state;

Fig. 5 is a side view of a first opening/closing mechanism and a driver part in the air-conditioner indoor unit;

Fig. 6 is a side view of the opening/closing mechanism;

Fig. 7 is a side view of the driver part;

Fig. 8 is an enlarged view of a main portion of the opening/closing mechanism and the driver part in the air-conditioner indoor unit with the opening/closing panel in a closed state;

Fig. 9 is an enlarged view of a main portion of the opening/closing mechanism and the driver part in the air-conditioner indoor unit with the opening/closing panel in an open state; and

Fig. 10 is a block diagram of the air-conditioner indoor unit.

DETAILED DESCRIPTION OF THE INVENTION

[0018] Hereinbelow, the indoor unit for air conditioners according to the present invention will be described in detail by way of embodiment thereof illustrated in the accompanying drawings.

[0019] Fig. 1 shows a perspective view of an air-conditioner indoor unit according to one embodiment of the invention. The air-conditioner indoor unit 1 is a wall-mounted type indoor unit to be fitted on a wall surface in a room.

[0020] The air-conditioner indoor unit 1, as shown in Fig. 1, includes a front panel 11 removably fitted on the front face side of a bottom frame 10 (shown in Fig. 3), and an opening/closing panel 12 for opening and closing an intake opening of the front panel 11, while a horizontal flap 13 is placed at a blowoff opening 20 provided on a lower side of the front panel 11. Shown in Fig. 1 is an operation halt state in which the intake opening (not shown) on the front face side of the front panel 11 is closed by the opening/closing panel 12 while the blowoff opening 20 is closed by the horizontal flap 13.

[0021] Next, Fig. 2 shows a perspective view of the air-conditioner indoor unit 1 in an operating state thereof. When the air-conditioner indoor unit 1 comes to an operating state as shown in Fig. 2, the opening/closing panel 12 slides frontward and diagonally upward and more-

over the horizontal flap 13 turns so that the blowoff opening 20 opens. Further, there opens a gap between an upper end side of the opening/closing panel 12 and the front face side of the front panel 11, by which a wind passage to an intake opening 11a (shown in Fig. 4) of the front panel 11 is formed.

[0022] Fig. 3 shows a sectional view of the air-conditioner indoor unit 1 with the opening/closing panel 12 in a closed state. As shown in Fig. 3, an indoor heat exchanger 21 having a dogleg-shaped cross section is placed within a body casing composed of the bottom frame 10 and the front panel 11 fitted on the front face side of the bottom frame 10, while a blower fan 22 is placed on the lower side of the indoor heat exchanger 21. The blower fan 22 is a cross flow fan which is positioned with its rotating shaft aligned horizontal.

[0023] Fig. 4 shows a sectional view of the air-conditioner indoor unit 1 with the opening/closing panel 12 in an open state. As shown in Fig. 4, the opening/closing panel 12 moves frontward and diagonally upward, while the horizontal flap 13 turns with the blowoff opening 20 opened. In this state, as the blower fan 22 is driven by a fan motor (not shown), indoor air is sucked in through the intake opening 11a from between the upper end side of the opening/closing panel 12 and the front face side of the front panel 11, while the air is sucked in from indoors via an intake opening (not shown) on the upper side of the front panel 11. Then, the sucked indoor air is passed through the indoor heat exchanger 21, where heat exchanged therewith, and thereafter passed through a blowoff passage 23 by the blower fan 22 so as to be blown out from the blowoff opening 20 into the room.

[0024] Fig. 5 shows a side view of a first opening/closing mechanism part 30 and a driver part 40 of the air-conditioner indoor unit 1. The first opening/closing mechanism part 30 for opening and closing the opening/closing panel 12 is placed inside and near the right side face of the front panel 11 as viewed from the front. Fig. 5 is a side view of the front panel 11 in its central to right-side part. Also, although not shown, a second opening/closing mechanism part (not shown) which is generally left-right symmetrical to the first opening/closing mechanism part 30 is mounted inside and near the left side face of the front panel 11 as viewed from the front. The first opening/closing mechanism part 30 and the second opening/closing mechanism part are coupled with each other via a drive shaft 36. As the first opening/closing mechanism part 30 is driven by the driver part 40, driving force of the driver part 40 is transmitted via the drive shaft 36, so that the second opening/closing mechanism part is driven. The first opening/closing mechanism part 30 and the second opening/closing mechanism part constitute an opening/closing mechanism.

[0025] Fig. 6 shows a side view of the first opening/closing mechanism part 30. The first opening/closing mechanism part 30 has an opening/closing mechanism casing 31, a panel support member 32 which is slidably housed in the opening/closing mechanism casing 31 and

which supports the opening/closing panel 12 (shown in Figs. 1 to 4) by the front face side, a gear case part 33 provided on the upper side of the opening/closing mechanism casing 31, a second gear 34 placed within the gear case part 33, and a third gear 35 to be engaged with the second gear 34. The drive shaft 36 is used as a rotating shaft for the second gear 34.

[0026] The third gear 35 is engaged with a rack (not shown) provided on the panel support member 32, and the panel support member 32 is slid by the second gear 34 and the third gear 35 being driven by the driver part 40. The direction of this slide of the panel support member 32 is a direction in which the opening/closing panel 12 moves frontward and diagonally upward (a direction of arrow R1 shown in Fig. 5).

[0027] Fig. 7 shows a side view of the driver part 40, and this driver part 40 is fitted to a support member 47 fixed to the bottom frame 10 (shown in Fig. 3). The driver part 40 has a driver part casing 41, a panel driving motor 42 fitted to the driver part casing 41, a detection switch 43 as an example of an opening/closing detection part mounted on the upper side of the driver part casing 41, and a first gear 46 to be driven by the panel driving motor 42. The first gear 46 of the driver part 40 and the second gear 34 of the first opening/closing mechanism part 30 are engaged with each other, so that driving force of the panel driving motor 42 is transmitted to the first opening/closing mechanism part 30 and the second opening/closing mechanism part. Also, the detection switch 43 is provided by using a microswitch, having a lever 44 which is movable by a hinge mechanism.

[0028] Further, a guide part 45 is provided on the upper side of the driver part casing 41. This guide part 45 serves to guide a cam 50 fixed to the drive shaft 36 shown in Fig. 5 when the front panel 11 is fitted to the bottom frame 10 shown in Fig. 3. That is, the cam 50 fixed to the drive shaft 36 first comes into contact with a tapered surface 45a of the guide part 45. Then, after the drive shaft 36 has been beyond the guide part 45, the cam 50 fixed to the drive shaft 36 comes into contact with the lever 44 of the detection switch 43, so that the front panel 11 is settled in a specified place.

[0029] As shown in Fig. 5, the lever 44 of the detection switch 43 comes into contact with the cam surface of the cam 50 fixed to the drive shaft 36, and the detection switch 43 is turned on and off in response to motions of the cam 50 caused by the rotation of the drive shaft 36.

[0030] Fig. 8 shows an enlarged view of a main portion of the first opening/closing mechanism part 30 and the driver part 40 in the air-conditioner indoor unit 1 with the opening/closing panel 12 (shown in Figs. 1 to 4) in a closed state. As shown in Fig. 8, the cam surface of the cam 50 fixed to the drive shaft 36 has an ON region 52 for turning ON the detection switch 43 by press-down of the lever 44 of the detection switch 43, and an OFF region 51 for turning OFF the detection switch 43. While the opening/closing panel 12 is a closed state, the OFF region 51 of the cam 50 is positioned on the lower side,

with the detection switch 43 OFF.

[0031] Meanwhile, Fig. 9 shows an enlarged view of a main portion of the first opening/closing mechanism part 30 and the driver part 40 in the air-conditioner indoor unit 1 with the opening/closing panel 12 (shown in Figs. 1 to 4) in an open state. While the opening/closing panel 12 is in the open state, the drive shaft 36 and the cam 50 rotate in a direction of arrow R2 as shown in Fig. 9, where the ON region 52 of the cam 50 moves downward, by which the ON region 52 of the cam 50 presses down the lever 44 of the detection switch 43, causing the detection switch 43 to be turned ON.

[0032] Fig. 10 shows a block diagram of the air-conditioner indoor unit 1. A control section 60 shown in Fig. 10, which is made up of a microcomputer, an input/output circuit and the like, controls operations of a fan motor 61, a flap motor 62, the panel driving motor 42 and the like according to commands from a remote controller (not shown) as well. Also, upon an opening/closing operation of the opening/closing panel 12, the control section 60 checks an opening/closing state of the opening/closing panel 12 according to a detection signal of the detection switch 43 mounted on the driver part 40 (shown in Figs. 5 and 7).

[0033] According to the air-conditioner indoor unit of the above construction, in the indoor unit in which the front panel 11 is removably fitted on the front face side of the bottom frame 10, the first opening/closing mechanism part 30 and the second opening/closing mechanism part for opening and closing the opening/closing panel 12 are placed on the front panel 11, while the driver part 40 for driving the first opening/closing mechanism part 30 and the second opening/closing mechanism part is placed on the bottom frame 10, so that the first opening/closing mechanism part 30 and the second opening/closing mechanism part are driven by the driver part 40. Then, the drive shaft 36 serving as a movable part to be driven by the driver part 40 is rotated, and based on the rotation of the drive shaft 36, an opening/closing state of the opening/closing panel 12 is detected by the detection switch 43 that is an opening/closing detection part placed on the bottom frame 10. Accordingly, since the opening/closing detection part for detecting the opening/closing state of the opening/closing panel 12 is not provided on the front panel 11 side, the need for connecting electrical parts on the front panel 11 side and on the bottom frame 10 side to each other via a junction harness is eliminated. Thus, the opening/closing state of the opening/closing panel 12 can be detected with a simple construction, so that the assemblability, maintainability and reliability can be improved.

[0034] Further, since the detection switch 43 detects an opening/closing state of the opening/closing panel 12 based on the rotation of the drive shaft 36, a microswitch may be used as the detection switch 43 as an opening/closing state detection part, so that the opening/closing state of the opening/closing panel 12 can be detected accurately and reliably.

[0035] Furthermore, since the detection switch 43 detects an opening/closing state of the opening/closing panel 12 based on the cam 50 that rotates along with rotation of the drive shaft 36, the opening/closing state of the opening/closing panel 12 can be detected accurately and reliably.

[0036] Moreover, the first opening/closing mechanism part 30 is driven by the driver part 40, and the second opening/closing mechanism part is driven via the drive shaft 36 that transmits driving force of the driver part 40, by which the opening/closing panel 12 is opened and closed by the first and second opening/closing mechanism parts 30 on the left and right of the front panel 11. Thus, opening/closing driving force is given to both left and right sides of the opening/closing panel 12, so that opening/closing operations of the opening/closing panel 12 can be fulfilled smoothly and evenly.

[0037] In the above-described embodiment, with a microswitch used for the detection switch 43 that serves as an opening/closing detection part, an opening/closing state of the opening/closing panel 12 is detected by detecting the rotation of the cam 50 provided on the drive shaft 36, which is a movable part. However, the opening/closing detection part and the movable part are not limited to these, and for example, an optical sensor may also be used as the opening/closing detection part placed on the bottom frame, so that motions of the movable part of the opening/closing mechanism placed on the front panel is detected.

[0038] In the above embodiment also, with a microswitch used for the detection switch 43 that serves as the opening/closing detection part, two states, open state and closed state, of the opening/closing panel 12 are detected by detecting rotation of the cam 50 provided on the drive shaft 36, which is a movable part. However, the present invention may also be applied to air-conditioner indoor units in which an opening/closing panel having one or more intermediate open states between a fully open state and a fully closed state of the opening/closing panel is opened and closed in multiple stages.

[0039] Furthermore, although the foregoing embodiment has been described on an air-conditioner indoor unit in which the front panel 11 is removably fitted on the front face side of the bottom frame 10, the invention may also be applied to air-conditioner indoor units in which the front panel is fitted on the front face side of the bottom frame so as to be freely openable and closable.

Claims

1. An indoor unit for air conditioners, comprising:

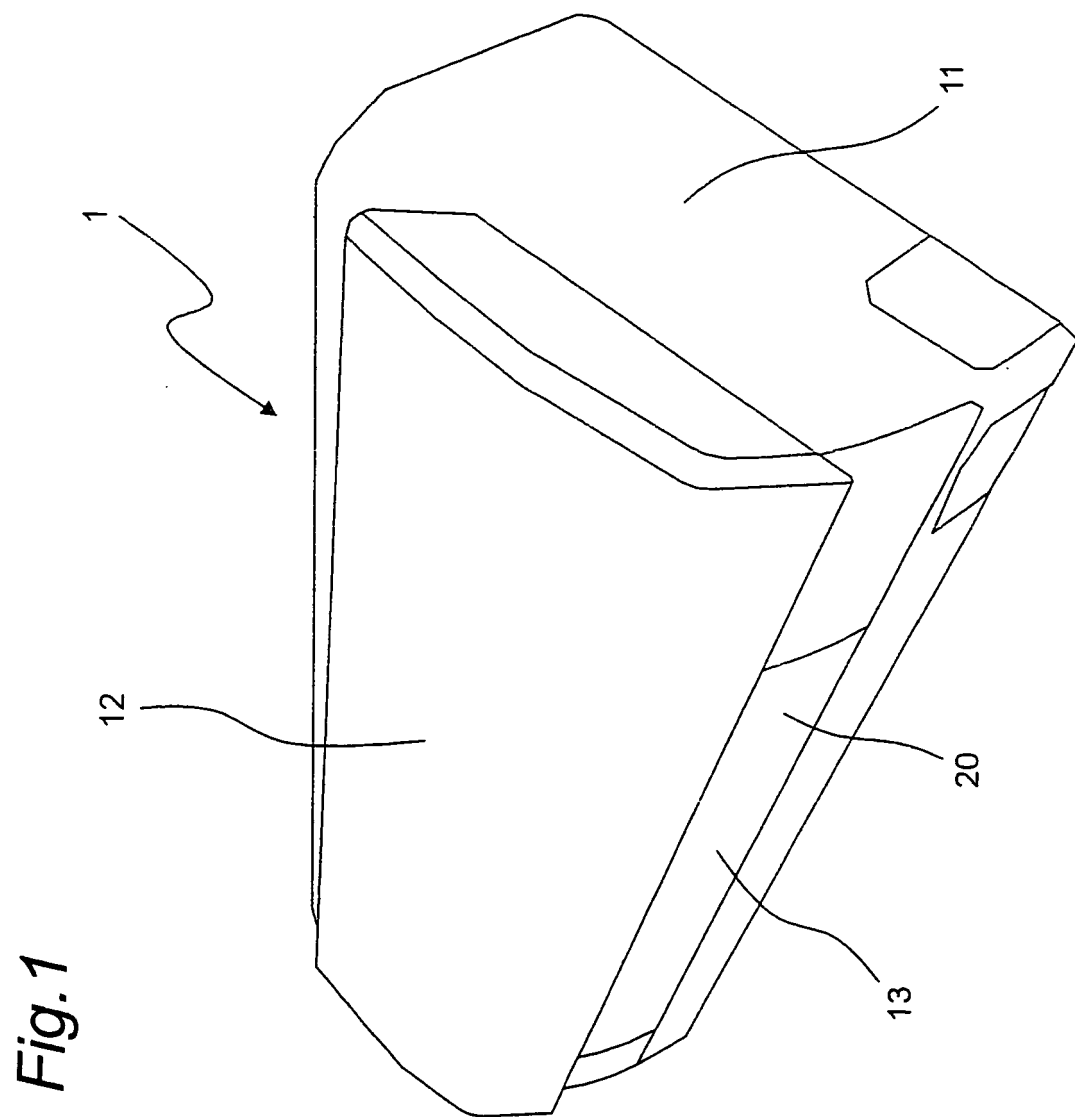
- a bottom frame (10);
- a front panel (11) fitted on a front face side of the bottom frame (10) so as to be removable or openable and closable;
- an opening/closing panel (12) for opening and

closing an intake opening of the front panel (11);
 an opening/closing mechanism (30) which is
 placed on the front panel (11) and which serves
 for opening and closing the opening/closing
 panel (12); 5
 a driver part (40) which is placed on the bottom
 frame (10) and which serves for driving the
 opening/closing mechanism (30); and
 an opening/closing detection part (43) which is
 placed on the bottom frame (10) and which 10
 serves for detecting an opening/closing state of
 the opening/closing panel (12) based on a mo-
 tion of a movable part of the opening/closing
 mechanism (30) driven by the driver part (40). 15

2. The indoor unit for air conditioners as claimed in
 Claim 1, wherein
 the movable part of the opening/closing mechanism
 (30) has a drive shaft (36) which rotates with driving
 force of the driver part (40), and 20
 the opening/closing detection part (43) detects an
 opening/closing state of the opening/closing panel
 (12) based on rotation of the drive shaft (36).
3. The indoor unit for air conditioners as claimed in 25
 Claim 2, wherein
 the movable part of the opening/closing mechanism
 (30) has a cam (50) which rotates along with rotation
 of the drive shaft (36), and
 the opening/closing detection part (43) detects an 30
 opening/closing state of the opening/closing panel
 (12) based on rotation of the cam (50) of the opening/
 closing mechanism (30).
4. The indoor unit for air conditioners as claimed in 35
 Claim 2, wherein
 the opening/closing mechanism (30) includes a first
 opening/closing mechanism part and a second
 opening/closing mechanism part which are provided
 near left-and-right side faces of the front panel (11), 40
 respectively, and which are coupled to each other
 by the drive shaft (36), and
 as either one of the first and second opening/closing
 mechanism parts is driven by the driver part (40),
 the other of the first and second opening/closing 45
 mechanism parts is driven via the drive shaft (36)
 that transmits driving force of the driver part (40).

50

55



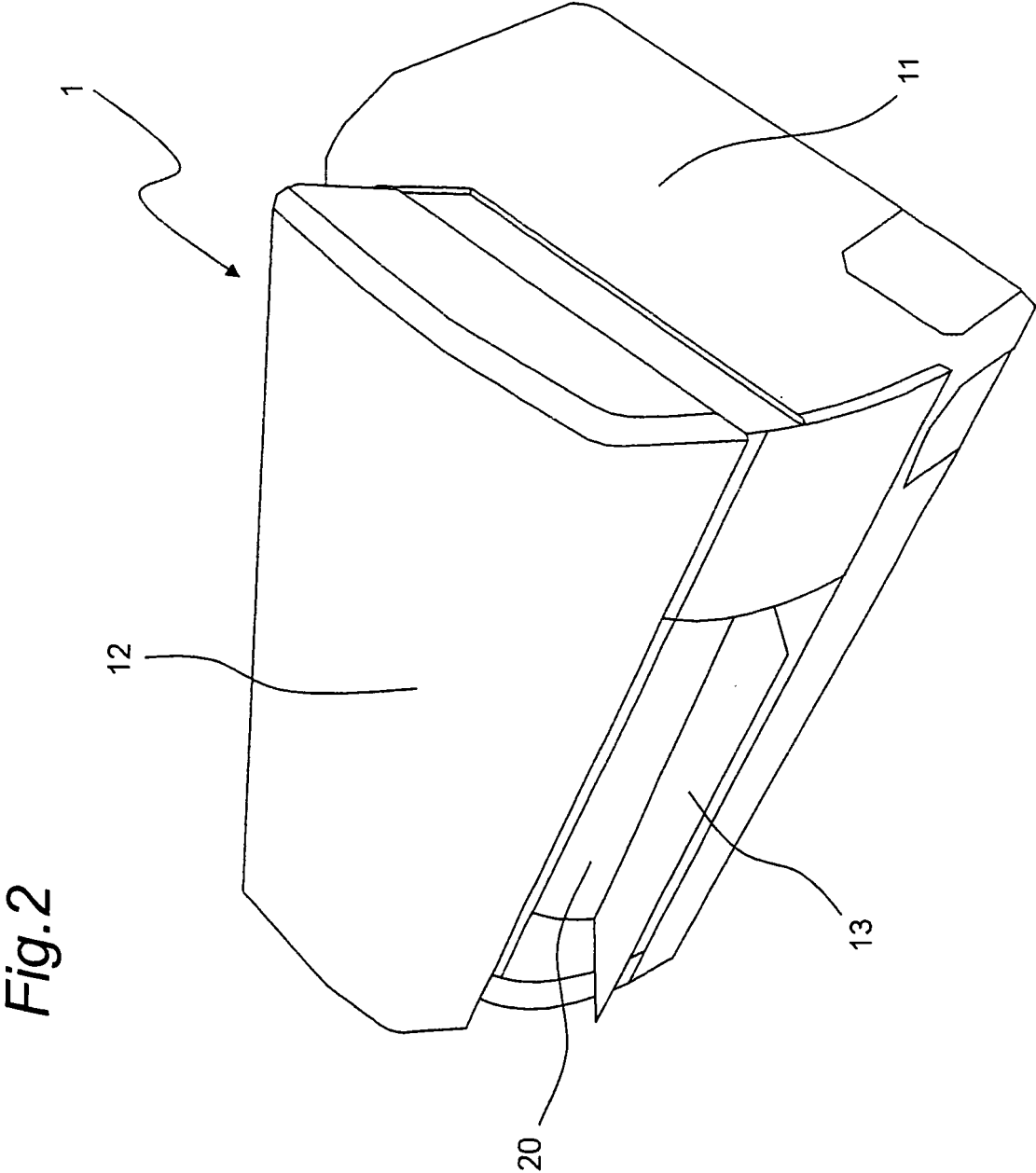


Fig.3

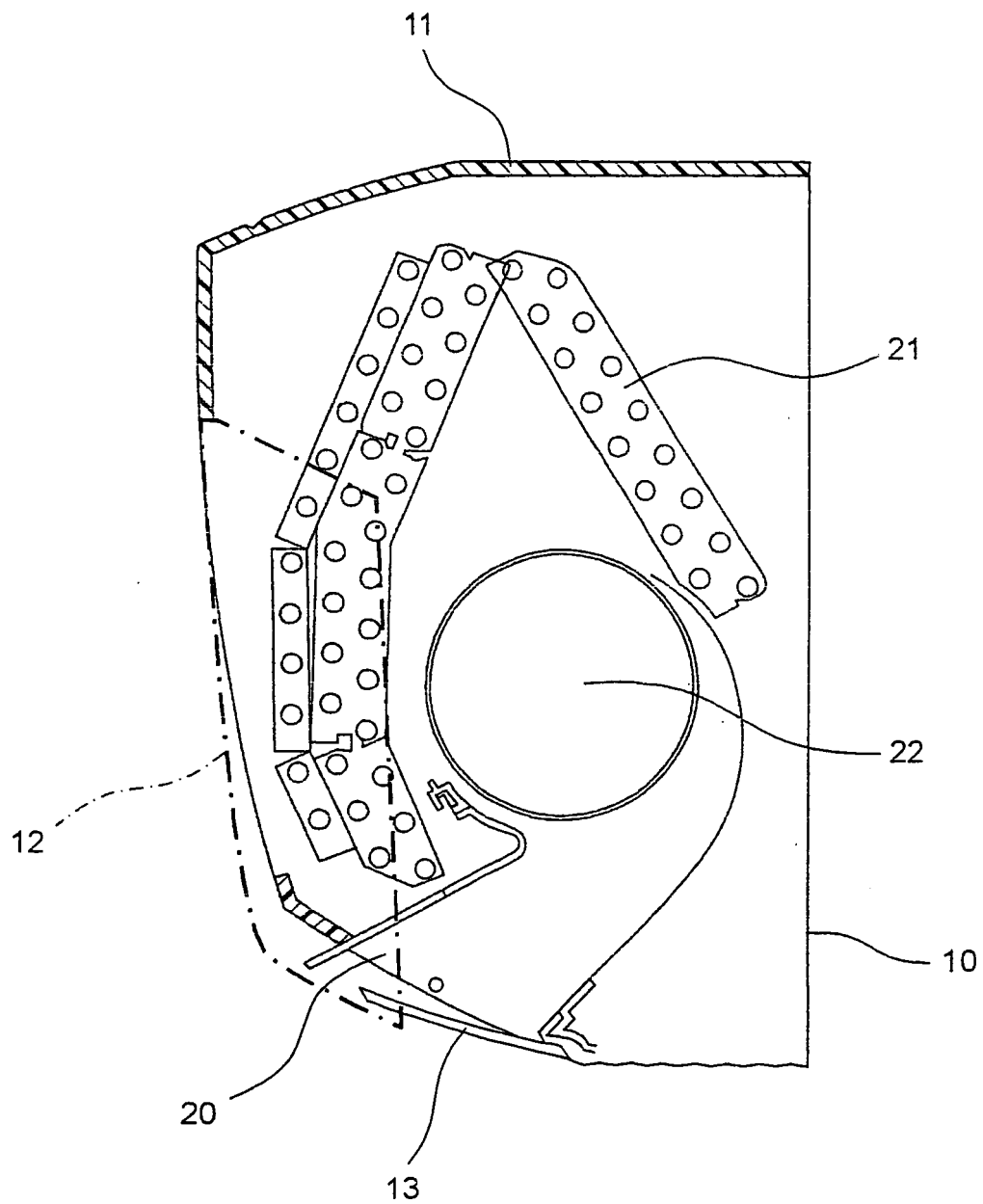


Fig.4

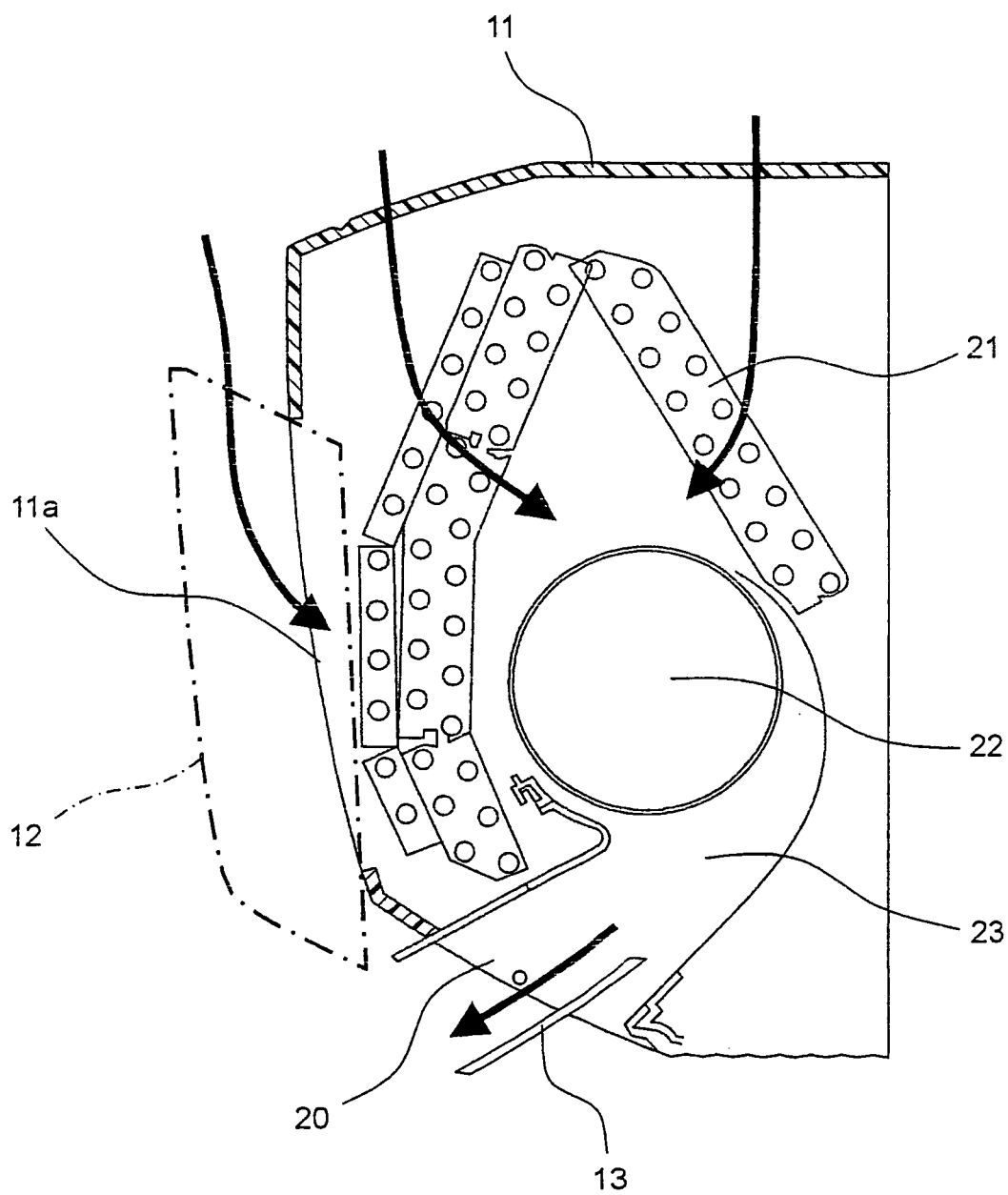


Fig.5

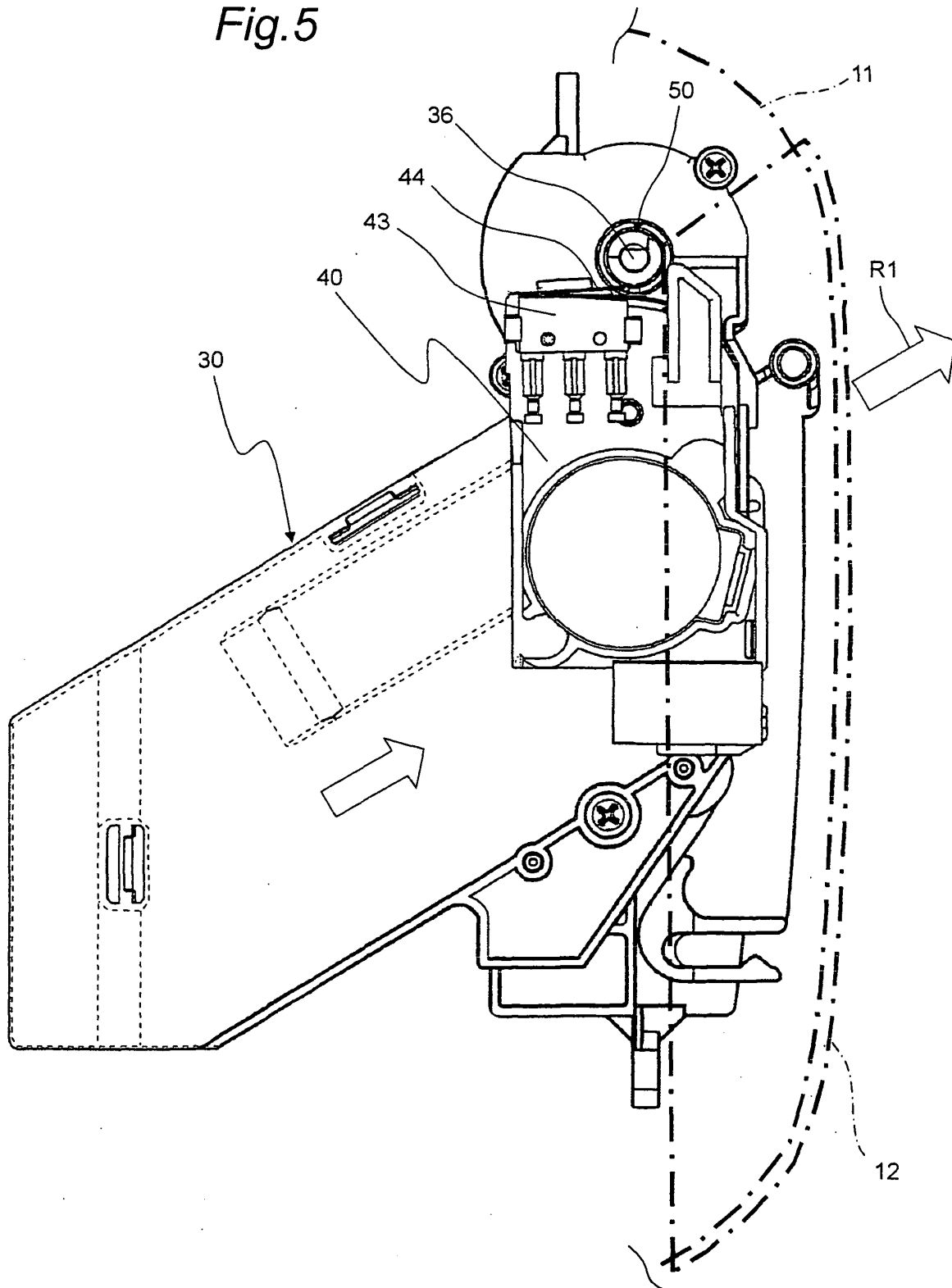


Fig.6

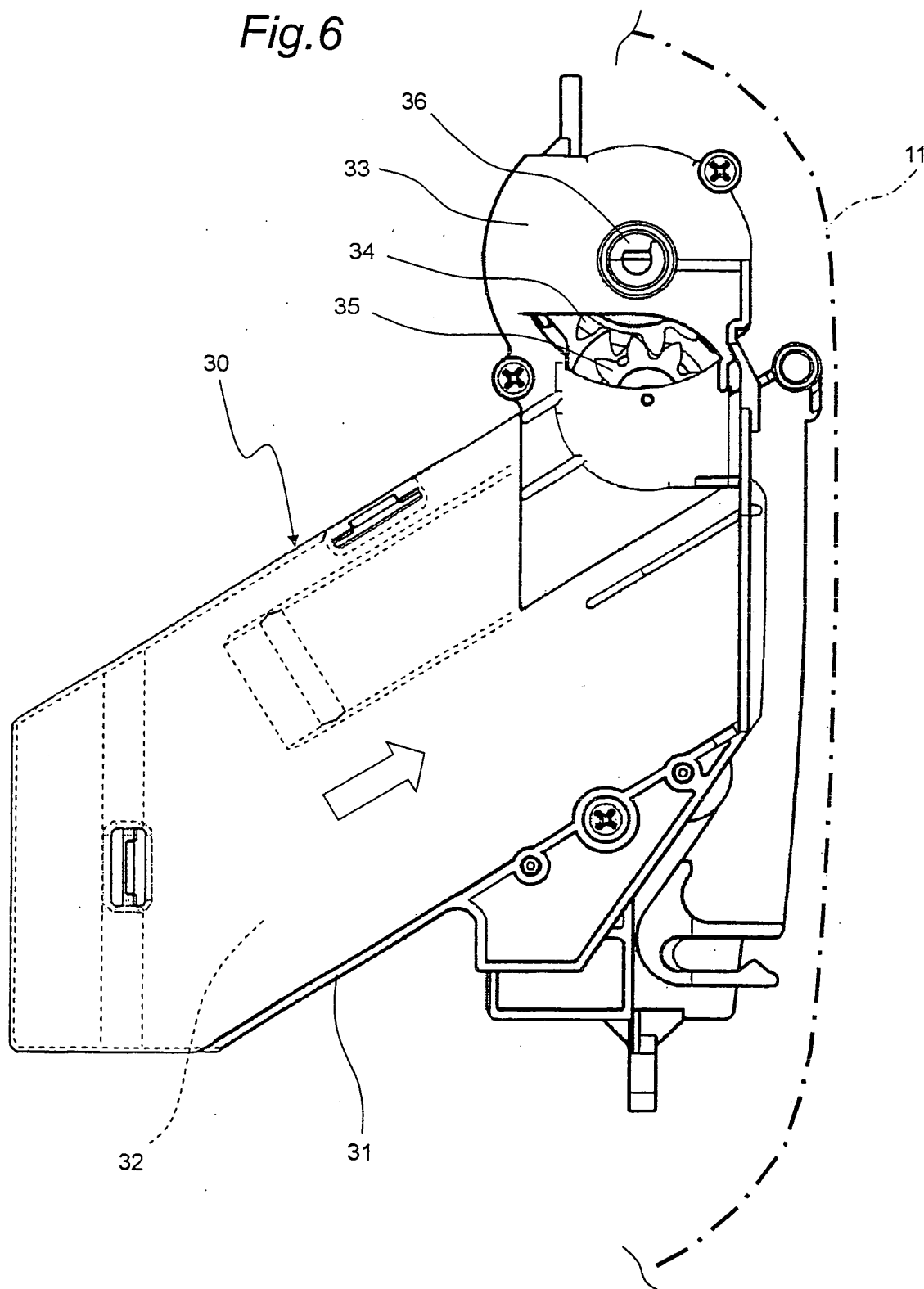


Fig. 7

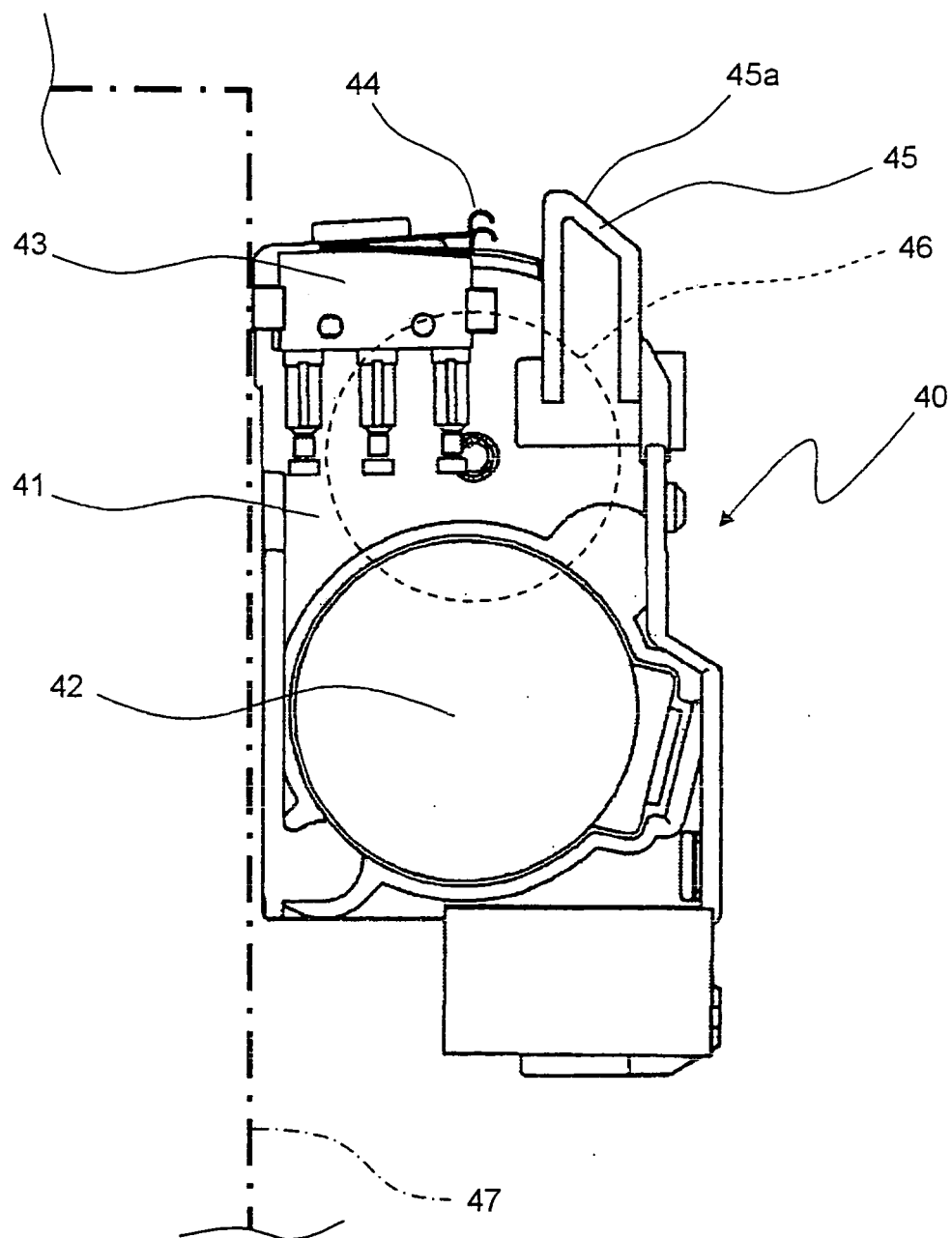


Fig.8

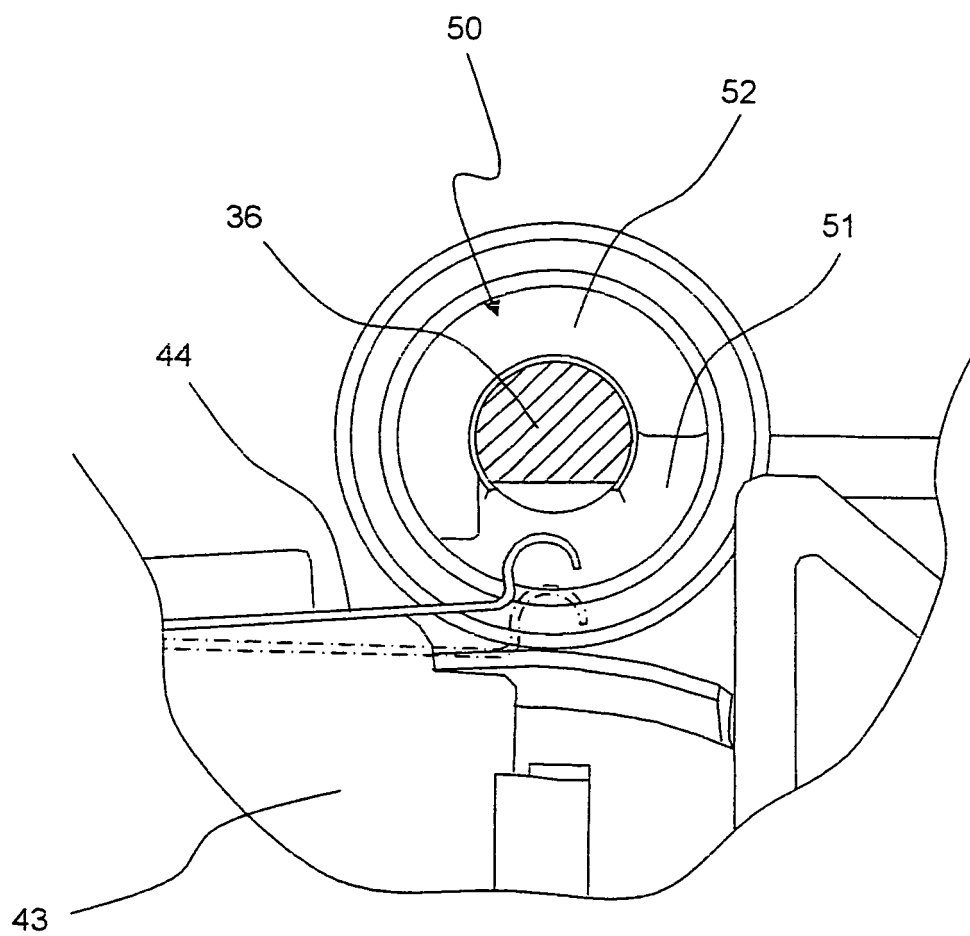


Fig.9

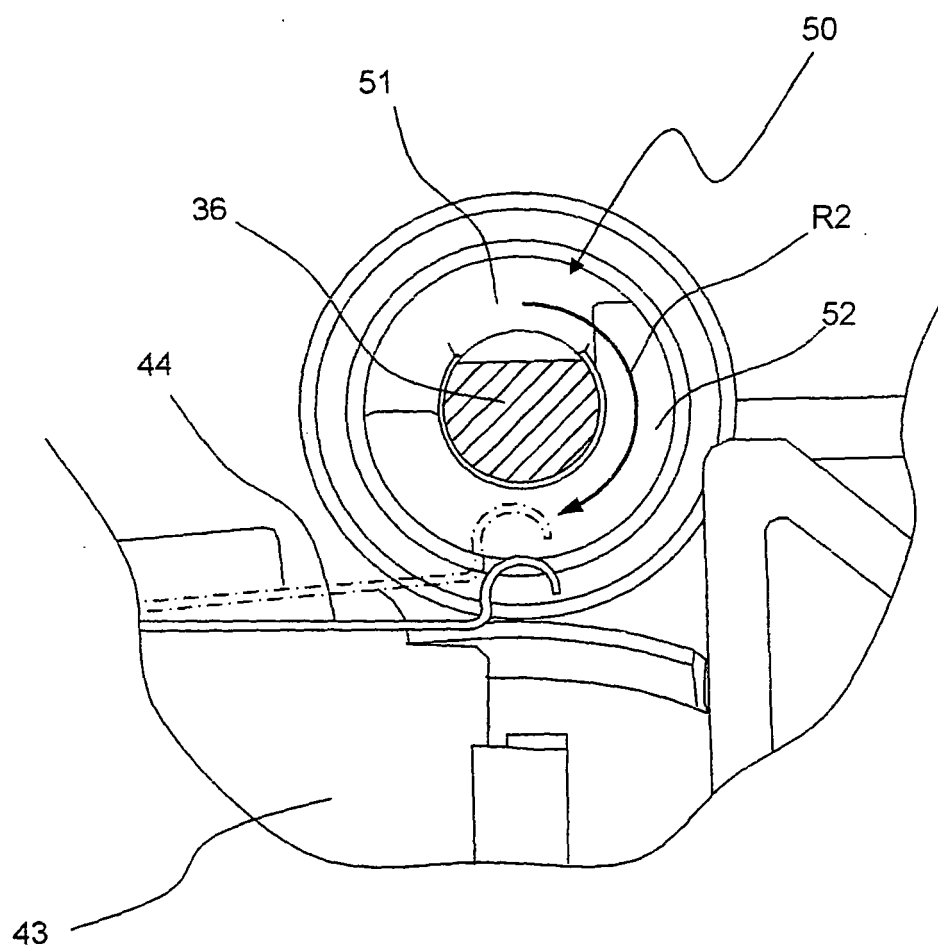
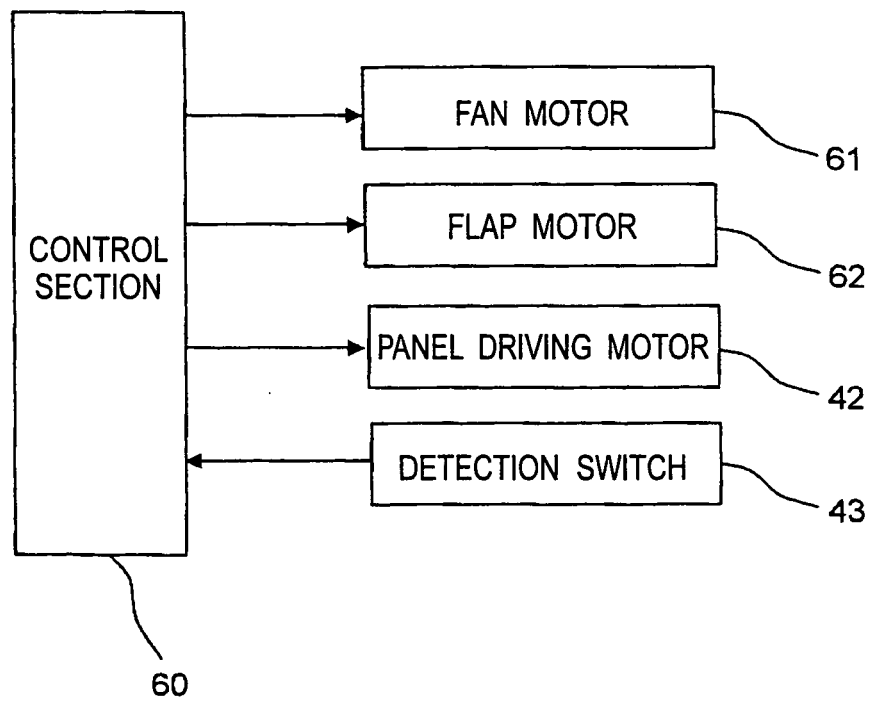


Fig. 10



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2006/323156

A. CLASSIFICATION OF SUBJECT MATTER

F24F1/00 (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)

F24F1/00

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 1996-2007

Kokai Jitsuyo Shinan Koho 1971-2007 Toroku Jitsuyo Shinan Koho 1994-2007

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 2005-106386 A (Daikin Industries, Ltd.), 21 April, 2005 (21.04.05), Par. Nos. [0033], [0048] to [0051]; Figs. 4, 7 (Family: none)	1-4
Y	JP 2001-49924 A (Aisin Seiki Co., Ltd.), 20 February, 2001 (20.02.01), Par. Nos. [0012], [0014], [0015]; Fig. 1 (Family: none)	1-4
Y	JP 2004-144318 A (Mitsubishi Electric Corp.), 20 May, 2004 (20.05.04), Par. No. [0016]; Fig. 1 (Family: none)	1-4

☐ 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
01 March, 2007 (01.03.07)Date of mailing of the international search report
13 March, 2007 (13.03.07)Name and mailing address of the ISA/
Japanese Patent Office

Authorized officer

Facsimile No.

Telephone No.

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 2005106386 A [0002]