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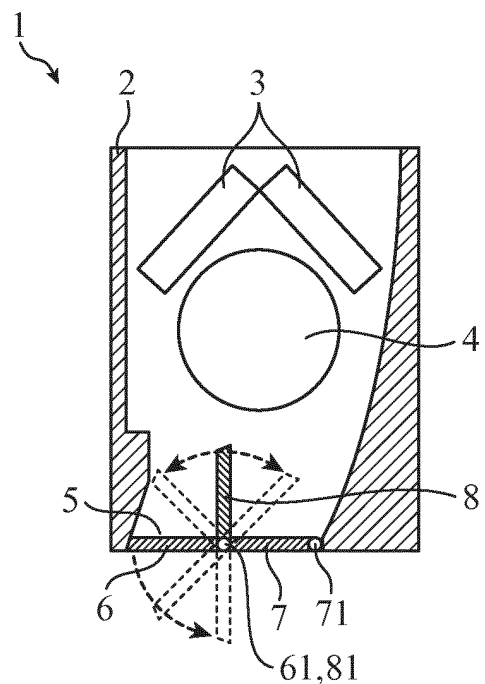
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(54) **AIR CONDITIONER**

(57) There is provided a front flap 6 having a rotary shaft 61 at a front side of an outlet 5 to be rotatable outwardly from a housing 2 about the rotary shaft 61; a rotary mechanism 62 that rotates the front flap 6; an auxiliary flap 8 coupled with the front flap 6 and disposed inside the housing 2, and having a rotary shaft 81 disposed on the same axial center as that of the rotary shaft 61 to be rotatable about the rotary shaft 81; and a rotary mechanism 82 that rotates the auxiliary flap 8.

FIG.1



Description

TECHNICAL FIELD

[0001] The present invention relates to air conditioners configured to perform airflow control by flaps disposed at an outlet.

BACKGROUND ART

[0002] Conventionally, flaps for performing airflow control are disposed at an outlet of an air conditioner. FIG. 8 is an exploded perspective view of a conventional air conditioner as viewed from the bottom surface side, and FIG. 9 is an enlarged view of a portion B depicted FIG. 8. In an air conditioner 101 depicted in FIG. 8, two flaps 103 and 104 are disposed at the front and back of an outlet 102 provided in the bottom surface. As depicted in FIG. 9, the flap 103 has rotary shafts 1031 and the flap 104 has rotary shafts 1041 at the respective two ends in a widthwise (longitudinal) direction (only the rotary shaft 1031 is depicted in FIG. 9). Then, the flap 103 is configured to be rotatable outwardly with a motor coupled directly or through a gear box to either one of the rotary shafts 1031 at the two ends, and the flap 104 is configured to be rotatable outwardly with a motor coupled directly or through a gear box to either one of the rotary shafts 1041 at the two ends.

CITATION LIST

PATENT DOCUMENT

[0003]

Patent Document 1: JP 08-061764 A
Patent Document 2: JP 2004-053196 A
Patent Document 3: JP 2007-120858 A
Patent Document 4: JP 2007-113806 A

SUMMARY OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0004] In this connection, the larger (longer) the surfaces of the flaps, the better in terms of blowing an airflow far. However, the weight thereof is heavier with the larger surfaces, and thus there is a problem such that a stronger torque is desired for the motor for performing rotational control of the flaps, which involves selection of an expensive motor. Further, in a case where larger flaps are adopted, the flaps take a larger area in the outer appearance, which causes a noticeable difference in shape between in operation and in stopping of the air conditioner, and thus there is also a problem such that the appearance is aesthetically impaired.

[0005] On the other hand, there is known a configuration in which an auxiliary flap is disposed at the back of

a flap disposed at the outlet (inside a housing of the air conditioner) (for example, see Patent Document 1). It becomes possible to rectify an airflow by this auxiliary flap. However, in the air conditioner disclosed in Patent Document 1, it is not contemplated to constitute a larger flap using the auxiliary flap, so that the airflow cannot be blown far.

[0006] In addition, there is also known a configuration in which a flap which is typically one is replaced with a plurality of flaps aligned in a row, and angles of the flaps are adjusted (for example, see Patent Document 2). It becomes possible that an airflow is gradually bent to thus suppress decrease in air volume, and vibration and noise by the above configuration. However, in the air conditioner disclosed in Patent Document 2, a surface area exposed outside the air conditioner is larger, which aesthetically impairs the appearance.

[0007] Further, there is also known a configuration in which right-hand flaps and left-hand flaps are arranged in a staggered manner, such that two alternately adjacent flaps integrate with each other to constitute one pseudo-arcuate flap (for example, see Patent Document 3 and 4). It becomes possible to deflect an airflow by the above configuration. However, in the air conditioner disclosed in Patent Document 3 and 4, deflected directions of the airflow are only two patterns of windward and leeward, and airflow control cannot be performed in various ways according to the use.

[0008] The present invention has been made to solve the foregoing problems, and an object of the invention is to provide an air conditioner capable of blowing an airflow far with a motor of a lower torque by using two flaps like one larger flap without aesthetically impairing the appearance, and capable of airflow control in a variety of ways.

MEANS FOR SOLVING THE PROBLEMS

[0009] An air conditioner according to the present invention includes: a second flap having a second rotary shaft at a front side of an outlet to be rotatable outwardly from a housing about the second rotary shaft; a second rotary mechanism that rotates the second flap; a third flap coupled with the second flap and disposed inside the housing, and having a third rotary shaft arranged on the same axial center as that of the second rotary shaft to be rotatable about the third rotary shaft; and a third rotary mechanism that rotates the third flap.

EFFECT OF THE INVENTION

[0010] According to the present invention, because of the above-described configuration, when the two flaps are used like one larger flap, an airflow is blown far with using a conventional lower-torque motor. In addition, when the third flap is housed inside the housing, increase of the area of the flaps occupied in the outer appearance can be prevented, and the shape does not change greatly between in operation and in stopping of the air condition-

er, so that the outer appearance is not aesthetically impaired. Moreover, it becomes possible to perform airflow control in various ways with the flaps using the above configuration.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011]

FIG. 1 is a cross-sectional view depicting a configuration of an air conditioner according to a first embodiment of the present invention.

FIG. 2 is a plan view depicting a coupling structure of a front flap and an auxiliary flap in the first embodiment of the invention.

FIG. 3 is an exploded perspective view depicting the configuration of the air conditioner according to the first embodiment of the invention as viewed from the bottom surface side.

FIG. 4 is an enlarged view of a portion A depicted in FIG. 3.

FIG. 5 is a cross-sectional view depicting an operational example (in a heating operation) of the air conditioner according to the first embodiment of the invention.

FIG. 6 is a cross-sectional view depicting an operational example (in a cooling operation) of the air conditioner according to the first embodiment of the invention.

FIG. 7 is a cross-sectional view depicting an operational example (in a heating operation with a larger air volume) of the air conditioner according to the first embodiment of the invention.

FIG. 8 is an exploded perspective view depicting a configuration of a conventional air conditioner as viewed from the bottom surface side.

FIG. 9 is an enlarged view of a portion B depicted in FIG. 8.

BEST MODE FOR CARRYING OUT THE INVENTION

[0012] Hereinafter, in order to describe the present invention in more detail, embodiments for carrying out the invention will be described with reference to the accompanying drawings.

First Embodiment

[0013] FIG. 1 is a cross-sectional view depicting a configuration of an air conditioner 1 according to a first embodiment of the present invention. In FIG. 1, the left side represents the front side of the air conditioner 1 and the right side represents the back side.

[0014] As depicted in FIG. 1, a housing 2 of the air conditioner 1 contains a heat exchanger 3 and a fan 4 for sending air that has been heat exchanged by the heat exchanger 3. Additionally, an outlet 5 that blows out air sent from the fan 4 to the outside is provided in the bottom

surface of the housing 2.

[0015] The outlet 5 is provided with a front flap (second flap) 6 and a rear flap (first flap) 7 for performing airflow control. The front flap 6 is disposed at the front side of the outlet 5, and a rotary shaft (second rotary shaft) 61 is provided at the rear end of the front flap. Then, the front flap 6 is configured to be rotatable by a rotary mechanism (second rotary mechanism) 62 to be described later about the rotary shaft 61 by about 90 degrees outwardly from the air conditioner 1. Also, the rear flap 7 is disposed at the back side of the outlet 5, and a rotary shaft (first rotary shaft) 71 is provided at the rear end of the rear flap. Then, the rear flap 7 is configured to be rotatable by a rotary mechanism (first rotary mechanism) (not shown) about the rotary shaft 71 by about 90 degrees outwardly from the air conditioner 1.

[0016] Further, an auxiliary flap (third flap) 8 is disposed inside the housing 2, and coupled with the front flap 6 and operates in cooperation with the front flap 6 to thus constitute one larger flap. A rotary shaft (third rotary shaft) 81 is disposed at the lower end of the auxiliary flap 8, such that the rotary shaft 81 is disposed on the same axial center as the rotary shaft 61 of the front flap 6. Then, the auxiliary flap 8 is configured to be rotatable by a rotary mechanism (third rotary mechanism) 82 to be described later about the rotary shaft 81 by about 45 degrees in each of the forward and backward directions.

[0017] Note that when the air conditioner 1 is stopped, the outlet 5 is in a state closed by the front flap 6 and the rear flap 7 (the state indicated with a solid line in FIG. 1). Therefore, the auxiliary flap 8 is not visible from the outside in this state, and the outer appearance looks the same as a conventional air conditioner 1.

[0018] Next, description is given of a coupling structure between the front flap 6 and the auxiliary flap 8 with reference to FIGS. 2 to 4. FIG. 2 depicts a state in which the front flap 6 and the auxiliary flap 8 are arranged on a flat surface. In FIG. 2, the rotary mechanisms 62 and 82 are not shown.

[0019] As depicted in FIG. 2, the front flap 6 is provided with a notch 63 into which the auxiliary flap 8 can be fit, and in which the rotary shaft 81 of the auxiliary flap 8 is disposed on the same axial center as that of its own rotary shaft 61. Additionally, insertion apertures 631 into which the rotary shaft 81 of the auxiliary flap 8 is insertable are prepared in the two side surfaces of the notch 63 portion.

[0020] Further, as depicted in FIGS. 3 and 4, the rotary mechanism 62 for rotating the front flap 6 about the rotary shaft 61 is disposed on the side at one end of the front flap 6 in its widthwise (longitudinal) direction and located at a position that is different from that on the axial center of the rotary shaft 61. The rotary mechanism 62 is constituted by including an arcuate rack portion 621, and a gear portion 622 that meshes with the rack portion 621. The gear portion 622 is fixedly positioned, and rotated in a predetermined direction by a motor (not shown) connected thereto to thus rotate the rack portion 621 in a predetermined direction. Note that the motor may be the

one having a torque required to rotate the front flap 6.

[0021] Meanwhile, as depicted in FIGS. 3 and 4, the rotary mechanism 82 for rotating the auxiliary flap 8 about the rotary shaft 81 is disposed on the side at one end of the auxiliary flap 8 in its widthwise (longitudinal) direction and located at a position that is different from that on the axial center of the rotary shaft 81. The rotary mechanism 82 is constituted by including an arcuate rack portion 821, and a gear portion 822 that meshes with the rack portion 821. The gear portion 822 is fixedly positioned, and rotated in a predetermined direction by a motor (not shown) connected thereto to thus rotate the rack portion 821 in a predetermined direction. Note that the motor may be the one having a torque required to rotate the auxiliary flap 8.

[0022] Moreover, as depicted in FIG. 2, the auxiliary flap 8 is provided with a notch 83 for housing the motor connected to the rotary mechanism 82. Depending on the configuration of the air conditioner 1, installed positions of the motors to be connected to the rotary mechanisms 62 and 82 overlap each other, which may hinder the housings. Therefore, providing the notch 83 in such a case can ensure a space for housing the motors. However, in a case where the installed positions of the motors do not overlap each other, the notch 83 is unnecessary.

[0023] Then, as depicted in FIG. 2, the rotary shaft 81 of the auxiliary flap 8 is inserted into the insertion apertures 631 of the front flap 6 configured as mentioned above, and the auxiliary flap 8 is fit into the notch 63 portion of the front flap 6. This allows the rotary shaft 61 of the front flap 6 and the rotary shaft 81 of the auxiliary flap 8 to be arranged on the same axis, thereby coupling the front flap 6 with the auxiliary flap 8. In addition, the front flap 6 is rotationally controlled by the rotary mechanism 62, and the auxiliary flap 8 is rotationally controlled by the rotary mechanism 82.

[0024] In this manner, the front flap 6 and the auxiliary flap 8 are rotationally controlled separately; however, the flaps have the rotary shafts 61 and 81 on the same axial center, which makes it possible to handle the flaps like one larger flap, and makes it possible to blow an airflow far. Further, since the auxiliary flap 8 is housed inside the housing 2, an area of the whole flaps occupied in the outer appearance is as large as that of the conventional air conditioner 1, and the appearance is not aesthetically impaired.

[0025] Next, description is given of an operation of the air conditioner 1 configured as mentioned above with reference to FIGS. 5 to 7. Note that arrows shown in FIGS. 5 to 7 indicate directions and intensities of the airflows.

[0026] In the conventional air conditioner, since a case performing a cooling operation is mainly taken into consideration, the flaps are configured to be formed in a downwardly arcuate shape. Therefore, in a case where a heating operation is performed, such airflow control as will blow a required airflow downward is difficult. Further, in order to blow the airflow far, larger (longer) flaps are required, but in a thin air conditioner, it is difficult to ensure

such larger flaps.

[0027] On the other hand, in the air conditioner 1 according to the present invention, the front flap 6 and the auxiliary flap 8 that is housed in the housing 2 are operated independently from and in cooperation with each other to provide a larger flap in a variety of shapes, which makes possible airflow control in various ways in cooling and heating operations.

[0028] When the heating operation is performed, for example, as depicted in FIG. 5, the rotary mechanisms 62 and 82 rotate the front flap 6 and the auxiliary flap 8 to constitute a linear flap turning to a vertical direction with the front flap 6 and the auxiliary flap 8. In addition, the rear flap 7 is rotated to turn to the vertical direction by the rotary mechanism (not shown). In this manner, it becomes possible to blow the airflow downward. Meanwhile, in a case where the airflow is not blown downward in the heating operation, the front flap 6 and the auxiliary flap 8 may be rotated to constitute a pseudo-arcuate flap turning downward with the front flap 6 and the auxiliary flap 8.

[0029] Further, when the cooling operation is performed, for example, as depicted in FIG. 6, the rotary mechanisms 62 and 82 rotates the front flap 6 and the auxiliary flap 8 to constitute the pseudo-arcuate flap turning downward with the front flap 6 and the auxiliary flap 8. In addition, the rear flap 7 is rotated to turn obliquely downward by the rotary mechanism (not shown). In this manner, it becomes possible to blow the airflow far.

[0030] Further, when the heating operation with a larger air volume is performed to heat a floor, for example, as depicted in FIG. 7, the rotary mechanism 82 rotates the auxiliary flap 8 to close a space between a wall surface of the outlet 5 and the front flap 6 (the front side of the outlet 5) with the auxiliary flap 8. In this manner, it becomes possible to reduce a blowout area of the airflow and increase a wind speed.

[0031] As described above, according to the first embodiment, it is configured to include: the front flap 6 that has the rotary shaft 61 at the front side of the outlet 5 to be rotatable outwardly from the housing 2 about the rotary shaft 61; and the auxiliary flap 8 coupled with the front flap 6 and disposed inside the housing 2, and having the rotary shaft 81 arranged on the same axial center as that of the rotary shaft 61 to be rotatable about the rotary shaft 81; thus, when the two flaps 6 and 8 are used like one larger flap, the airflow can be blown far with using a conventional lower-torque motor. In addition, when the auxiliary flap 8 is housed inside the housing 2, increase of the area of the whole flaps occupied in the outer appearance can be prevented, and the shape does not change greatly between in operation and in stopping of the air conditioner 1, so that the outer appearance is not aesthetically impaired. Moreover, it becomes possible to perform airflow control in various ways with the flaps 6 and 8 using the above configuration.

[0032] If the rotary mechanisms are intended to be directly connected to the rotary shaft 61 of the front flap 6

and to the rotary shaft 81 of the auxiliary flap 8, the structure becomes complicated because both the rotary shafts 61 and 81 are arranged on the same axial center. On the other hand, in the present invention, the rotary mechanisms 62 and 82 are arranged at positions that are different from those on the axial centers of the above-mentioned rotary shafts 61 and 81, respectively, and thus the structure can be simplified.

[0033] It is noted that FIG. 2 illustrates a case in which the front flap 6 is provided with the notch 63 to fit the auxiliary flap 8 in the front flap 6. On the other hand, the auxiliary flap 8 may be provided with a notch, such that the front flap 6 is fitted in the auxiliary flap 8 to arrange the rotary shafts 61 and 81 on the same axial center.

[0034] Incidentally, the rotary mechanisms 62 and 82 of the front flap 6 and the auxiliary flap 8 are not limited to the configuration depicted in Fig. 4, but shapes of the rack portions 621 and 821 and arranged places of the gear portions 622 and 822 may be appropriately changed according to the configuration of the air conditioner 1.

[0035] It is noted that the invention of the present application allows modification of any components of the embodiment, or omission of any components in the embodiment within the scope of the invention.

INDUSTRIAL APPLICABILITY

[0036] The air conditioner according to the present invention includes: the second flap having the second rotary shaft at the front side of the outlet to be rotatable outwardly from the housing about the second rotary shaft; and the third flap coupled with the second flap and disposed inside the housing, and having the third rotary shaft arranged on the same axial center as that of the second rotary shaft to be rotatable about the third rotary shaft; thus, when the two flaps are used like one larger flap, the airflow can be blown far with using the conventional lower-torque motor. Hence, it is suitably used for an air conditioner configured to perform airflow control by flaps disposed at an outlet.

DESCRIPTION OF REFERENCE NUMERALS and SIGNS

[0037]

1	Air conditioner
2	Housing
3	Heat exchanger
4	Fan
5	Outlet
6	Front flap (second flap)
7	Rear flap (first flap)
8	Auxiliary flap (third flap)
61	Rotary shaft (second rotary shaft)
62	Rotary mechanism (second rotary mechanism)
63	Notch
71	Rotary shaft (first rotary shaft)

81	Rotary shaft (third rotary shaft)
82	Rotary mechanism (third rotary mechanism)
83	Notch
621	Rack portion
622	Gear portion
631	Insertion aperture
821	Rack portion
822	Gear portion.

Claims

1. An air conditioner including an outlet provided in a bottom surface of a housing, a first flap having a first rotary shaft at a back side of the outlet to be rotatable outwardly from the housing about the first rotary shaft, and a first rotary mechanism that rotates the first flap, the air conditioner comprising:

a second flap having a second rotary shaft at a front side of the outlet to be rotatable outwardly from the housing about the second rotary shaft; a second rotary mechanism that rotates the second flap;

a third flap coupled with the second flap and disposed inside the housing, and having a third rotary shaft arranged on the same axial center as that of the second rotary shaft to be rotatable about the third rotary shaft; and

a third rotary mechanism that rotates the third flap.

2. The air conditioner according to claim 1, wherein one of the second flap or the third flap has a notch that allows the other flap to fit therein and arranges the second and third rotary shafts on the same axial center.

3. The air conditioner according to claim 1, wherein the second rotary mechanism is disposed at a position on the second flap that is different from that on the axial center of the second rotary shaft, and the third rotary mechanism is disposed at a position on the third flap that is different from that on the axial center of the third rotary shaft.

4. The air conditioner according to claim 1, wherein when a heating operation is performed, the second and third rotary mechanisms rotate the second and third flaps to constitute a linear flap turning toward a vertical direction or a pseudo-arcuate flap turning downward with the second and third flaps.

5. The air conditioner according to claim 1, wherein when a cooling operation is performed, the second and third rotary mechanisms rotate the second and third flaps to constitute a pseudo-arcuate flap turning downward with the second and third flaps.

6. The air conditioner according to claim 1, wherein when a heating operation with a larger air volume, the third rotary mechanism rotates the third flap to close a space between a wall surface of the outlet and the second flap with the third flap.

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FIG.1

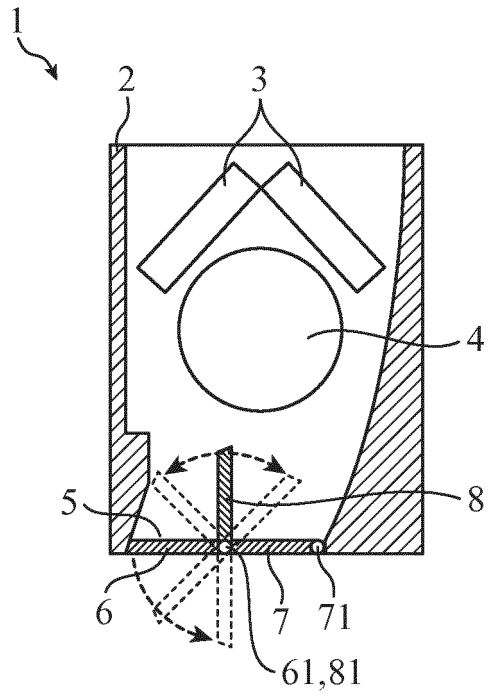


FIG.2

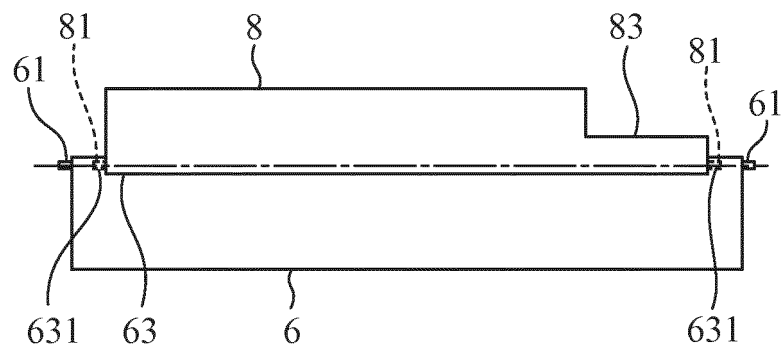


FIG.3

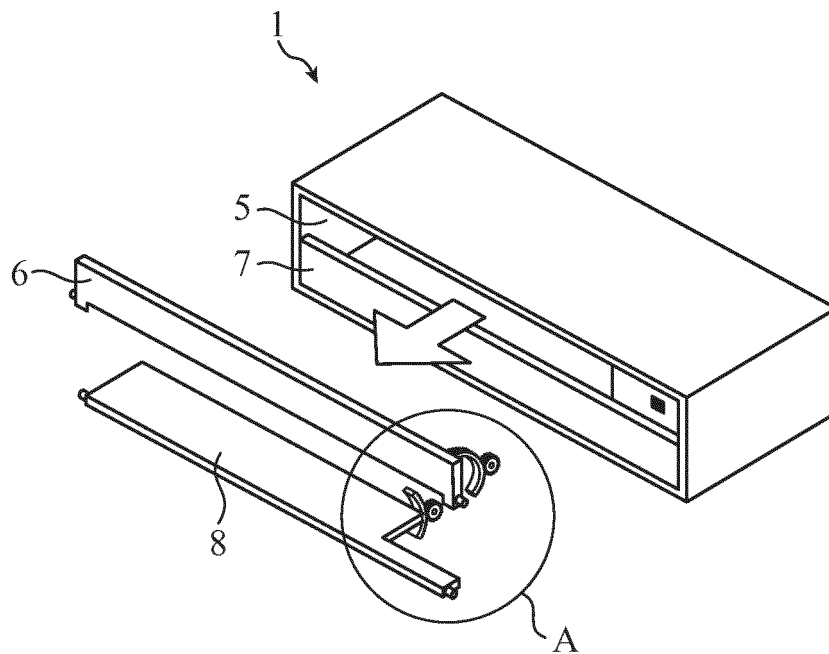


FIG.4

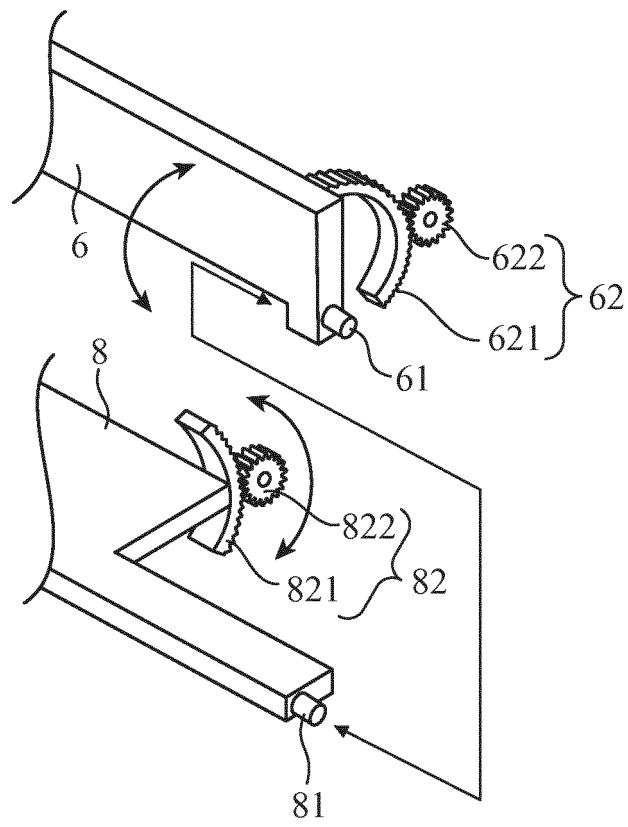


FIG.5

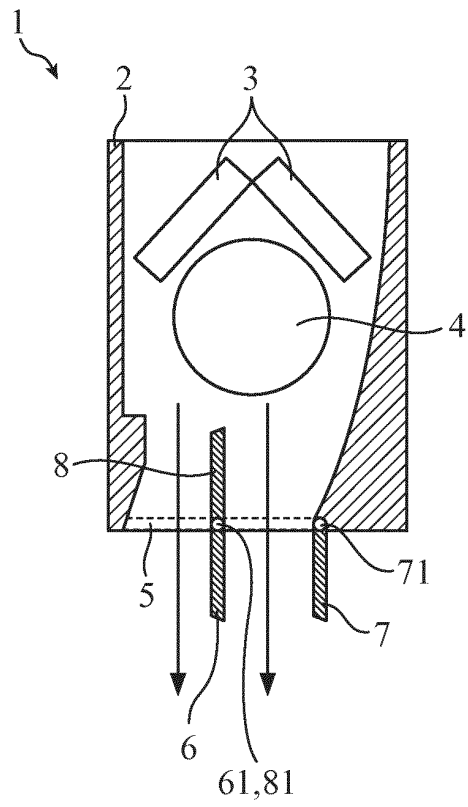


FIG.6

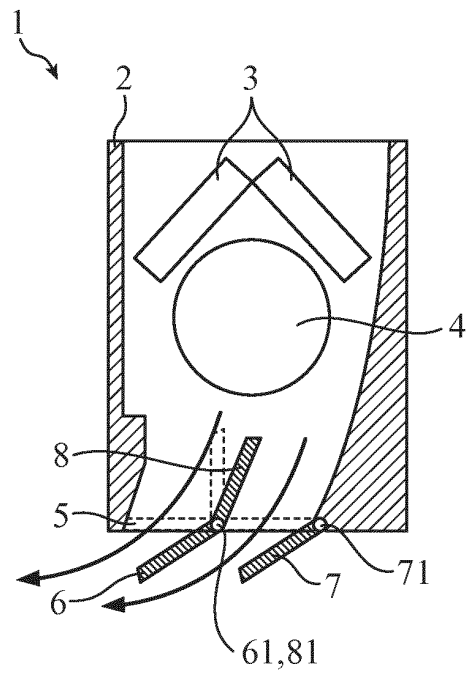


FIG.7

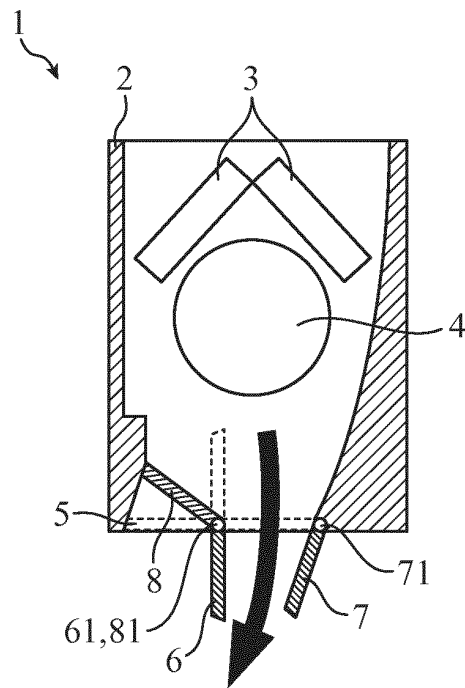


FIG.8

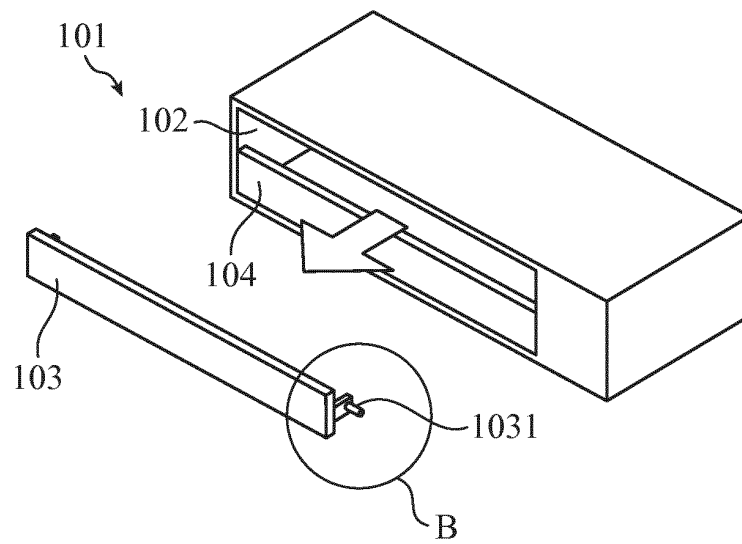
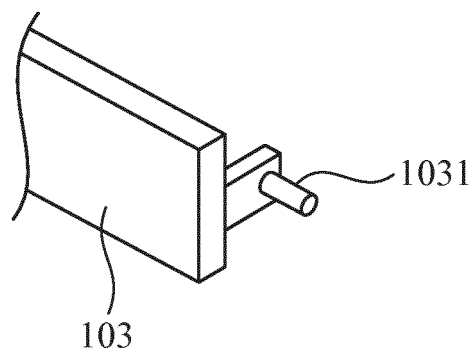


FIG.9



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2013/073820

A. CLASSIFICATION OF SUBJECT MATTER

F24F13/14(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)

F24F13/14

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 1996-2013

Kokai Jitsuyo Shinan Koho 1971-2013 Toroku Jitsuyo Shinan Koho 1994-2013

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 2004-308930 A (Sharp Corp.), 04 November 2004 (04.11.2004), paragraphs [0054] to [0065]; fig. 8 to 13 (Family: none)	1-6
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 86500/1987 (Laid-open No. 196041/1988) (Daikin Industries, Ltd.), 16 December 1988 (16.12.1988), page 7, line 5 to page 12, line 7; fig. 1 to 7 (Family: none)	1-6

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

* Special categories of cited documents:

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Date of the actual completion of the international search
25 November, 2013 (25.11.13)Date of mailing of the international search report
03 December, 2013 (03.12.13)Name and mailing address of the ISA/
Japanese Patent Office

Authorized officer

Facsimile No.

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2013/073820

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. 70416/1985 (Laid-open No. 186048/1986) (Toyota Motor Corp.), 20 November 1986 (20.11.1986), page 4, line 8 to page 7, line 15; fig. 1 to 5 (Family: none)	4-5

Form PCT/ISA/210 (continuation of second sheet) (July 2009)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 8061764 A [0003]
- JP 2004053196 A [0003]
- JP 2007120858 A [0003]
- JP 2007113806 A [0003]