



(12) **EUROPEAN PATENT APPLICATION**  
published in accordance with Art. 153(4) EPC

(43) Date of publication:  
**21.08.2019 Bulletin 2019/34**

(51) Int Cl.:  
**F24F 13/20<sup>(2006.01)</sup> F24F 13/15<sup>(2006.01)</sup>**

(21) Application number: **18798858.9**

(86) International application number:  
**PCT/JP2018/015391**

(22) Date of filing: **12.04.2018**

(87) International publication number:  
**WO 2018/207544 (15.11.2018 Gazette 2018/46)**

(84) Designated Contracting States:  
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR**  
Designated Extension States:  
**BA ME**  
Designated Validation States:  
**KH MA MD TN**

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(30) Priority: **08.05.2017 JP 2017092342**

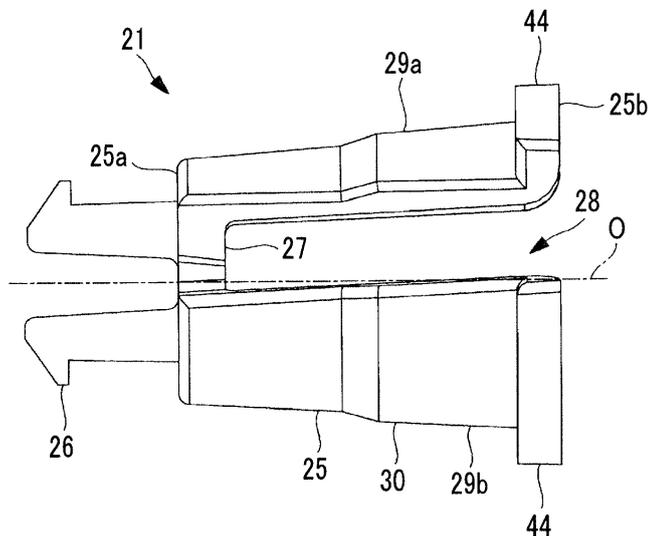
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(54) **INDOOR UNIT OF AIR CONDITIONER**

(57) This indoor unit of an air conditioner is provided with: a flap which changes the airflow direction; a housing-side bracket which supports the flap, which is positioned downward, with respect to the main body; and a connecting shaft (21) which is fixed to the flap and which is inserted into a shaft insertion hole formed in the housing-side bracket and rotates the flap in the shaft insertion

hole. The connecting shaft (21) has a lower claw part (29b) and an upper claw part (29a), and, when the claw parts are inserted into the shaft insertion hole, the outer periphery thereof contacts the inner periphery of the shaft insertion hole. The lower claw part (29b) has a higher rigidity than the upper floor part (29a).

**FIG. 6**



## Description

### Technical Field

**[0001]** The present invention relates to an indoor unit of an air conditioner including a flap that changes a wind direction.

### Background Art

**[0002]** A flap for changing a wind direction after air conditioning in an up-and-down direction is provided in an indoor unit of an air conditioner. In order to rotate the flap, a mechanism that rotatably supports the flap with respect to a main body portion of the indoor unit is provided.

**[0003]** In PTL 1, a flap is rotatably supported by a connecting member fixed to the flap being inserted into a main body attachment hole.

### Citation List

#### Patent Literature

**[0004]** [PTL 1] Japanese Unexamined Patent Application

**[0005]** Publication No. 2017-53508

### Summary of Invention

#### Technical Problem

**[0006]** By four elastically deforming pieces elastically deforming, the connecting member disclosed in PTL 1 supports the flap by keeping a contact state with respect to an inner circumferential surface of the main body attachment hole.

**[0007]** After the present inventor has repeated examination, it is determined that a deformation state of each of the four elastically deforming pieces changes according to a rotation angle by a load caused by the weight of the flap being exerted to the connecting member. That is, the load of the flap is applied to a lower side of the connecting member, an elastically deforming piece positioned on the lower side deforms the most. When the elastically deforming pieces change to which the load of the flap is exerted as the flap rotates, the deformation state of each of the elastically deforming pieces changes, and a possibility that the change becomes a cause of a strange noise and rattling arises.

**[0008]** In view of such circumstances, an object of the present invention is to provide an indoor unit of an air conditioner that can reduce a strange noise and rattling which occur when rotating a flap.

#### Solution to Problem

**[0009]** In order to solve the problem, an indoor unit of an air conditioner of the present invention adopts the fol-

lowing means.

**[0010]** That is, according to an aspect of the present invention, there is provided an indoor unit of an air conditioner including a flap that changes a wind direction, a supporting portion that supports the flap positioned on a lower side with respect to a main body portion, and a connecting member that is fixed to the flap, and is inserted into a through-hole formed in the supporting portion to rotate the flap in the through-hole. The connecting member has a lower claw portion and an upper claw portion that are inserted into the through-hole and each have an outer circumference coming into contact with an inner circumference of the through-hole. The lower claw portion has rigidity higher than the upper claw portion.

**[0011]** The supporting portion supports such that the flap on the lower side rotates via the connecting member. As the flap rotates, a wind direction where air blows from the indoor unit after air conditioning is changed.

**[0012]** The connecting member is fixed to the flap, and is inserted in the through-hole formed in the supporting portion. Accordingly, the flap is rotatably attached to the supporting portion.

**[0013]** The connecting member has the lower claw portion and the upper claw portion, and each of the lower claw portion and the upper claw portion is attached to be in contact with the inner circumference of the through-hole. While the lower claw portion receives a load caused by the weight of the flap positioned on the lower side, the upper claw portion does not receive the load caused by the weight of the flap. Thus, the rigidity of the lower claw portion is made higher than the upper claw portion such that a deformed amount of the lower claw portion receiving the load of the flap is made as small as possible. Accordingly, even when the flap rotates about the center of the through-hole with the connecting member, the lower claw portion receives the load of the flap. Thus, a strange noise and rattling caused by the deformation of the connecting member can be reduced.

**[0014]** In the indoor unit of an air conditioner according to the aspect of the present invention, a distance from a rotation center of the connecting portion to an outer circumferential surface of the upper claw portion is longer than a distance from the rotation center to the outer circumferential surface of the lower claw portion.

**[0015]** The distance from the rotation center of the connecting member to the outer circumferential surface of the upper claw portion is longer than the distance from the rotation center of the connecting portion to the outer circumferential surface of the lower claw portion. Accordingly, by actively deforming (bending) the upper claw portion instead of the lower claw portion, the connecting member can be suitably brought into contact with the inner circumferential surface of the through-hole of the supporting portion.

**[0016]** In the indoor unit of an air conditioner according to the aspect of the present invention, the outer circumferential surface of the lower claw portion is a substantially cylindrical surface formed over substantially 180°.

**[0017]** By making the outer circumferential surface of the lower claw portion a substantially cylindrical surface formed over substantially 180°, the lower claw portion can receive a load of the flap over a rotation range of substantially 180° insofar as a neutral position of the flap in the rotation range is set to the middle of the lower claw portion.

#### Advantageous Effects of Invention

**[0018]** Accordingly, since the lower claw portion having rigidity higher than the upper claw portion receives a load of the flap, a strange noise and rattling caused by the deformation of the connecting member can be reduced.

#### Brief Description of Drawings

##### **[0019]**

Fig. 1 is a perspective view illustrating an indoor unit of an air conditioner according to an embodiment of the present invention.

Fig. 2 is a sectional view taken along line II-II of Fig. 1.

Fig. 3 is a front view illustrating a state where a suction panel, which is on the front, of the indoor unit of Fig. 1 is removed.

Fig. 4 is a perspective view illustrating an attachment portion.

Fig. 5 is an exploded perspective view illustrating the attachment portion.

Fig. 6 is a side view illustrating a connecting shaft.

Fig. 7 is a front view illustrating the connecting shaft.

Fig. 8 is a longitudinal sectional view illustrating the connecting shaft inserted in a shaft connection hole.

Fig. 9 is a partially enlarged perspective view illustrating the connecting shaft inserted in the shaft connection hole.

#### Description of Embodiments

**[0020]** Hereinafter, an indoor unit 1 for an air conditioner of an embodiment of the present invention will be described in detail with reference to the drawings.

**[0021]** As illustrated in Figs. 1, 2, and 3, the indoor unit 1 for an air conditioner includes a housing 2 that has a rectangular parallelepiped shape which is long in a direction which becomes a horizontal direction at the time of mounting and an air conditioning unit (main body portion) 3 accommodated inside the housing 2. The indoor unit 1 is a device that sucks air A to adjust a temperature and humidity and then discharges the air A through an outlet 4, thereby performing indoor air conditioning. Flaps 8 that vertically change a blowing direction of the air A are provided in the indoor unit 1 of the embodiment.

**[0022]** In the embodiment, the direction which becomes the horizontal direction at the time of mounting will be referred to as a right-and-left direction, a direction that becomes an up-and-down direction at the time of

mounting will be simply referred to as an up-and-down direction, and a direction orthogonal to the right-and-left direction and the up-and-down direction will be referred to as a front-and-back direction. A side that becomes a near side at the time of mounting is the front of the front-and-back direction.

**[0023]** As illustrated in Fig. 2, the air conditioning unit 3 includes a heat exchanger 5, an air blowing fan 6 that is provided to be covered by the heat exchanger 5, a filter 7 provided in a suction port of the air A, the flaps 8 provided in the outlet 4 of the air A, and a control box 9 (refer to Fig. 3) that is provided on one end side of the right-and-left direction and controls air conditioning.

**[0024]** The housing 2 includes a front panel 10 that is disposed on the front side which becomes the near side at the time of mounting, an upper panel 11 that is integrally connected to the front panel 10 and is disposed on an upper side at the time of mounting, and a housing main body 12 that forms a space S, which accommodates the air conditioning unit 3 therein, with the front panel 10 and the upper panel 11.

**[0025]** The housing 2 has a suction panel 13 that covers the front panel 10 from the front.

**[0026]** The housing main body 12 has a pair of side panels 14 disposed in the right-and-left direction, a back panel 15 that is integrally connected to the pair of side panels 14 and opposes a mounting surface, and a bottom panel 16 that supports the pair of side panels 14 and the back panel 15 and is disposed on a lower side.

**[0027]** The housing main body 12 forms the space S that accommodates the air conditioning unit 3 surrounded by the pair of side panels 14, the back panel 15, and the bottom panel 16. In the housing main body 12, the space S is open to the front and the upper side. That is, a front opening portion OP1 that penetrates the housing 2 in the front-and-back direction and an upper opening portion OP2 that penetrates the housing in the up-and-down direction are formed in the housing main body 12.

**[0028]** The air A is introduced from the upper opening portion OP2 to the space S of the housing 2.

**[0029]** The front panel 10 has a grid shape, and is integrally provided with the housing main body 12 on the front side of the front opening portion OP1. The upper panel 11 has a grid shape, and is integrally provided with the housing main body 12 on an upper side of the upper opening portion OP2.

**[0030]** The suction panel 13 is disposed in front of the front panel 10 so as to cover the front opening portion OP1 and the front panel 10. The suction panel 13 can open and close the front opening portion OP1 by being detachable with respect to the housing main body 12.

**[0031]** The flaps 8 provided on the outlet 4 are wind direction adjusting plates that change a direction of the air A from the outlet 4 in the up-and-down direction. The indoor unit 1 includes two flaps 8. The two flaps 8 can be disposed to block the outlet 4. The two flaps 8 each can be rotated about an axis O so as to follow the flow of the air A discharged by the air blowing fan 6.

**[0032]** Next, an attachment structure of each of the flaps 8 will be described. Herein, out of the two flaps 8, an attachment structure of the flap 8 disposed on the back will be described. Since an attachment structure of the flap 8 disposed on the front, out of the two flaps 8, is the same as the attachment structure of the flap 8 disposed on the back, description thereof will be omitted.

**[0033]** As illustrated in Fig. 3, the flap 8 is connected to the housing 2 to be rotatable about the axis O extending in the right-and-left direction via a plurality of attachment portions 17 that are at intervals in the right-and-left direction. In addition, the flap 8 is rotation-driven about the axis O by a drive motor (not illustrated) provided on one end portion side of an axis O direction (right-and-left direction). For this reason, a pin 35 extending in the axis O direction is provided on one end portion of the flap 8, and the pin 35 is connected to the drive motor (not illustrated).

**[0034]** As illustrated in Figs. 4 and 5, the attachment portion 17 includes a flap side bracket 19 that is integrally provided with a flap main body 18 of the flap 8, a housing side bracket (supporting portion) 20 provided in the housing 2, and a connecting shaft (connecting member) 21 that connects the flap side bracket 19 to the housing side bracket 20. The reference sign 22 indicates a housing side bracket used in the flap disposed on the front.

**[0035]** The flap 8 includes the flap main body 18 that has a plate shape which is long in the right-and-left direction and the flap side bracket 19 provided on the flap main body 18 at a position corresponding to the attachment portion 17.

**[0036]** The flap side bracket 19 is integrally formed with one surface 18f of the flap main body 18 to extend from the surface 18f of the flap main body 18 in a direction orthogonal to the surface. The flap side bracket 19 has a plate shape, and has a main surface formed to be orthogonal to the axis O.

**[0037]** A shape of the flap side bracket 19 seen from the axis O direction is a triangular shape. A rectangular shaft engagement hole 23 (refer to Fig. 5) that penetrates the flap side bracket in the axis O direction is formed in the flap side bracket 19.

**[0038]** The housing side bracket 20 has a plate shape, and has a main surface orthogonal to the axis O direction which is formed such that the flow of the air A blown from the outlet 4 is not obstructed. A shaft insertion hole (through-hole) 24 that penetrates the housing side bracket in the axis O direction is formed in the housing side bracket 20. For example, the shaft insertion hole 24 has a circular shape.

**[0039]** In a state where one end 25a side of a shaft main body 25 of the connecting shaft 21 is inserted in the shaft insertion hole 24 formed in the housing side bracket 20, an engagement claw portion 26 is engaged with the shaft engagement hole 23 of the flap side bracket 19.

**[0040]** The shaft main body 25 has a cylindrical shape having a central axis, that is, the axis O as a center there-

of. As illustrated in Fig. 6, the shaft main body 25 has an insertion main body portion 27 having an outer diameter smaller than an inner diameter of the shaft insertion hole 24 and an increased diameter portion 30 having an outer diameter larger than the inner diameter of the shaft insertion hole 24.

**[0041]** The insertion main body portion 27 has a disk-like shape having a main surface formed to be orthogonal to the central axis (axis O) of the shaft main body 25 on the one end 25a side of the shaft main body 25. That is, the insertion main body portion 27 blocks the one end 25a of the increased diameter portion 30.

**[0042]** The increased diameter portion 30 has a cylindrical shape of which a diameter increases as going from the one end 25a side to the other end 25b side with the insertion main body portion 27 as a base portion. The increased diameter portion 30 has a flange portion 44, which protrudes radially outwards and is formed on the other end 25b of the shaft main body 25. The flange portion 44 has the largest outer diameter in the shaft main body 25. An outer diameter of the flange portion 44 is larger than the shaft insertion hole 24, and the flange portion retains the connecting shaft 21.

**[0043]** Two slits 28 are formed in a circumferential direction in the increased diameter portion 30. The slits 28 extend up to the insertion main body portion 27 from the other end 25b toward the one end 25a side of the shaft main body 25 in the central axis (axis O) direction of the shaft main body 25. Due to the slits 28, an upper claw portion 29a on the upper side and a lower claw portion 29b on the lower side are formed in the increased diameter portion 30.

**[0044]** The upper claw portion 29a and the lower claw portion 29b extend from the insertion main body portion 27 toward the other end 25b side. That is, each of the upper claw portion 29a and the lower claw portion 29b has a cantilever shape having the insertion main body portion 27 as a fixed end and a tip portion on the other end 25b side as a free end.

**[0045]** As illustrated in Fig. 7, the lower claw portion 29b has a semicircular arc outline formed over substantially 180° in a case of being seen from the front. An outer circumferential surface of the lower claw portion 29b (excluding the flange portion 44) has a tapered shape such that a diameter increases, and a curvature radius at any position in the axis direction substantially matches a curvature radius of the shaft insertion hole 24. Therefore, when the connecting shaft 21 is inserted in the shaft insertion hole 24 as in Fig. 8, the entire outer circumferential surface of the lower claw portion 29b is in contact with and coincides with an inner circumferential surface of the shaft insertion hole 24.

**[0046]** In a case where the lower claw portion 29b is fixed to the flap side bracket 19 as in Fig. 9 and the flap 8 is positioned at a neutral position in a rotation direction, a middle position of the lower claw portion 29b in the circumferential direction is set to be positioned on a vertical line VL passing through the axis O (refer to Fig. 7).

Accordingly, the lower claw portion 29b is in contact with an inner circumference of the shaft insertion hole 24 over an angle range of  $\pm 90^\circ$  from the middle position of the lower claw portion 29b.

**[0047]** The upper claw portion 29a has an arc outline formed over an angle range smaller than substantially  $180^\circ$  in a case of being seen from the front. An outer circumferential surface of the upper claw portion 29a (excluding the flange portion 44) has a tapered shape such that a diameter increases. In a case where the upper claw portion 29a and the lower claw portion 29b are seen from the front as in Fig. 7, a radius R1 of the upper claw portion 29a is larger than a radius R2 of the lower claw portion 29b ( $R1 > R2$ ). In addition, the lower claw portion 29b has rigidity higher than the upper claw portion 29a. Specifically, since an arc length of an appearance of the lower claw portion 29b is larger than an arc length of an appearance of the upper claw portion 29a, the rigidity of the lower claw portion 29b is higher. In addition, a thickness (radial thickness) of the lower claw portion 29b may be larger than a thickness of the upper claw portion 29a.

**[0048]** Therefore, when the connecting shaft 21 is inserted into the shaft insertion hole 24, the upper claw portion 29a deforms (bends) to an axis O side, and the lower claw portion 29b barely bends. Since the lower claw portion 29b barely deforms as described above, the entire outer circumferential surface of the lower claw portion 29b comes into contact with the inner circumferential surface of the shaft insertion hole 24. Even when the flap 8 rotates about the shaft insertion hole 24 and a load position changes due to the weight of the flap 8, the lower claw portion 29b barely deforms due to rigidity. Thus, a state where the entire outer circumferential surface of the lower claw portion 29b coincides with the inner circumferential surface of the shaft insertion hole 24 is maintained.

**[0049]** In the aforementioned indoor unit 1, the following operation effects can be achieved.

**[0050]** The lower claw portion 29b and the upper claw portion 29a of the connecting shaft 21 are inserted into the shaft insertion hole 24, and are attached such that the lower claw portion and the upper claw portion come into contact with the inner circumference of the shaft insertion hole 24. While the lower claw portion 29b receives a load caused by the weight of the flap 8 positioned on the lower side, the upper claw portion 29a does not receive the load caused by the weight of the flap 8. Thus, the rigidity of the lower claw portion 29b is made higher than the upper claw portion 29a such that a deformed amount of the lower claw portion 29b receiving the load of the flap 8 is made as small as possible. Accordingly, even when the flap 8 rotates about the axis O of the shaft insertion hole 24 with the connecting shaft 21, the lower claw portion 29b receives the load of the flap 8. Thus, a strange noise and rattling caused by the deformation of the claw portions 29a and 29b of the connecting shaft 21 can be reduced.

**[0051]** The radius R1 from the axis O, which is a rota-

tion center of the connecting shaft 21, to the outer circumferential surface of the upper claw portion 29a is larger than the radius R2 from the axis O, which is the rotation center of the connecting shaft 21, to the outer circumferential surface of the lower claw portion 29b. Accordingly, by actively deforming (bending) the upper claw portion 29a instead of the lower claw portion 29b, the connecting shaft can be suitably brought into contact with the inner circumferential surface of the shaft insertion hole 24 of the housing side bracket 20.

**[0052]** By making the outer circumferential surface of the lower claw portion 29b a substantially cylindrical surface formed over substantially  $180^\circ$ , a neutral position of the flap 8 in a rotation range is set to the middle of the lower claw portion 29b. Accordingly, a strange noise and rattling in the lower claw portion 29b can be reduced over the rotation range of substantially  $180^\circ$ , and the load of the flap 8 can be received.

## 20 Reference Signs List

### [0053]

1:	indoor unit
2:	housing
3:	air conditioning unit (main body portion)
4:	outlet
5:	heat exchanger
6:	air blowing fan
7:	filter
8:	flap
9:	control box
10:	front panel
11:	upper panel
12:	housing main body
13:	suction panel
14:	side panel
15:	back panel
16:	bottom panel
17:	attachment portion
18:	flap main body
18f:	surface
19:	flap side bracket
20:	housing side bracket (supporting portion)
21:	connecting shaft (connecting member)
23:	shaft engagement hole
24:	shaft insertion hole (through-hole)
25:	shaft main body
25a:	one end
25b:	the other end
26:	engagement claw portion
27:	insertion main body portion
28:	slit
29a:	upper claw portion
29b:	lower claw portion
30:	increased diameter portion
35:	pin
44:	flange portion

A: air  
 O: axis  
 OP1: front opening portion  
 OP2: upper opening portion  
 R1, R2: radius  
 S: space  
 VL: vertical line

claw portion and an upper claw portion that are inserted into the through-hole and each have an outer circumference coming into contact with an inner circumference of the through-hole, the lower claw portion has rigidity higher than the upper claw portion, and an outer circumferential surface of the lower claw portion is a substantially cylindrical surface formed over 180°.

#### Claims

#### 1. An indoor unit of an air conditioner, comprising:

a flap that changes a wind direction;  
 a supporting portion that supports the flap positioned on a lower side with respect to a main body portion; and  
 a connecting member that is fixed to the flap, and is inserted into a through-hole formed in the supporting portion to rotate the flap in the through-hole,  
 wherein the connecting member has a lower claw portion and an upper claw portion that are inserted into the through-hole and each have an outer circumference coming into contact with an inner circumference of the through-hole, and the lower claw portion has rigidity higher than the upper claw portion.

#### 2. The indoor unit of an air conditioner according to Claim 1, wherein a distance from a rotation center of the connecting member to an outer circumferential surface of the upper claw portion is longer than a distance from the rotation center to the outer circumferential surface of the lower claw portion.

#### 3. The indoor unit of an air conditioner according to Claim 1 or 2, wherein the outer circumferential surface of the lower claw portion is a substantially cylindrical surface formed over substantially 180°.

#### Amended claims under Art. 19.1 PCT

#### 1. (Amended) An indoor unit of an air conditioner, comprising:

a flap that changes a wind direction;  
 a supporting portion that supports the flap positioned on a lower side with respect to a main body portion; and  
 a connecting member that is fixed to the flap, and is inserted into a through-hole formed in the supporting portion to rotate the flap in the through-hole,  
 wherein the connecting member has a lower

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2. The indoor unit of an air conditioner according to Claim 1, wherein a distance from a rotation center of the connecting member to the outer circumferential surface of the upper claw portion is longer than a distance from the rotation center to the outer circumferential surface of the lower claw portion.

3. (Canceled)

FIG. 1

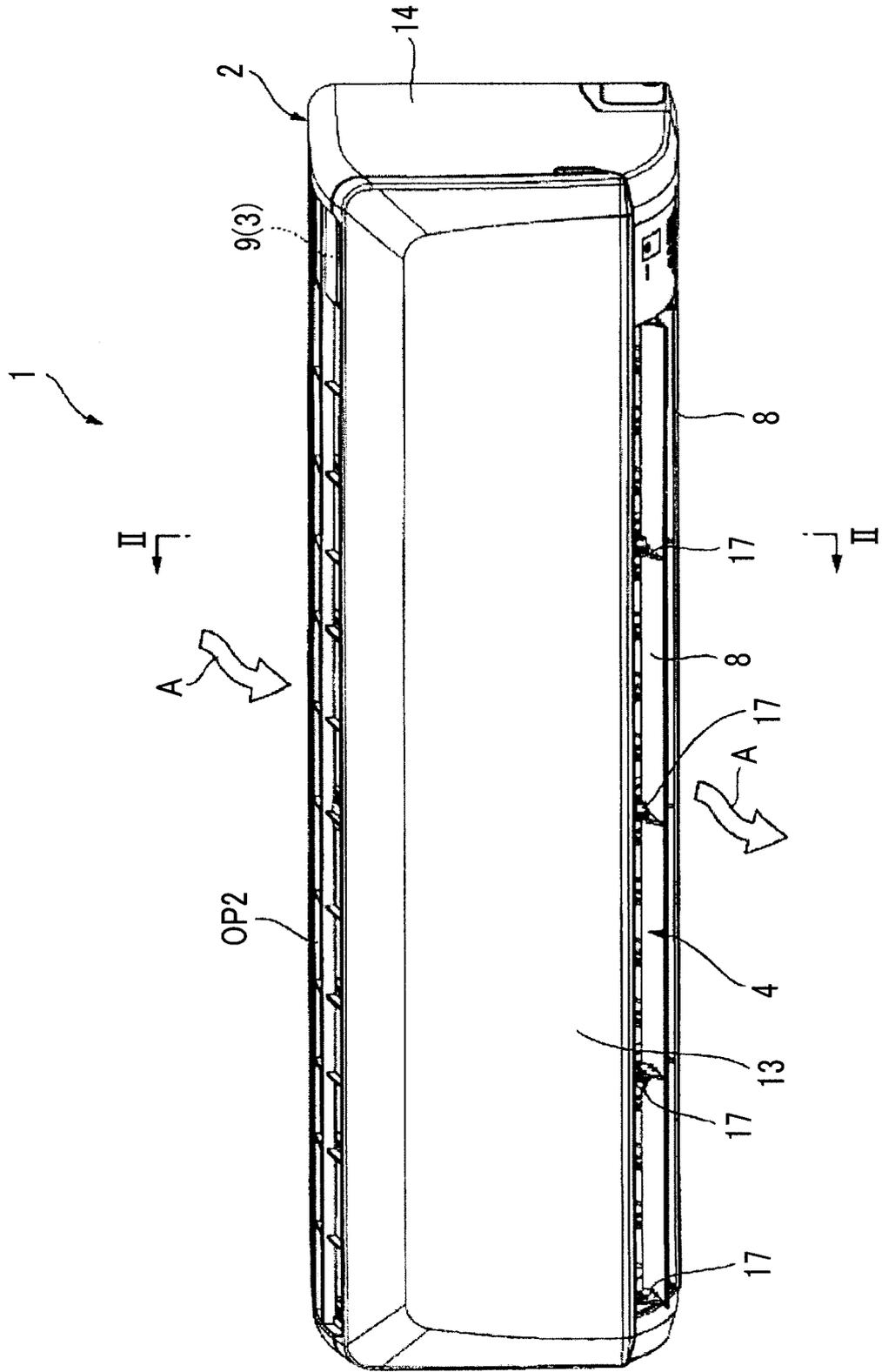




FIG. 3

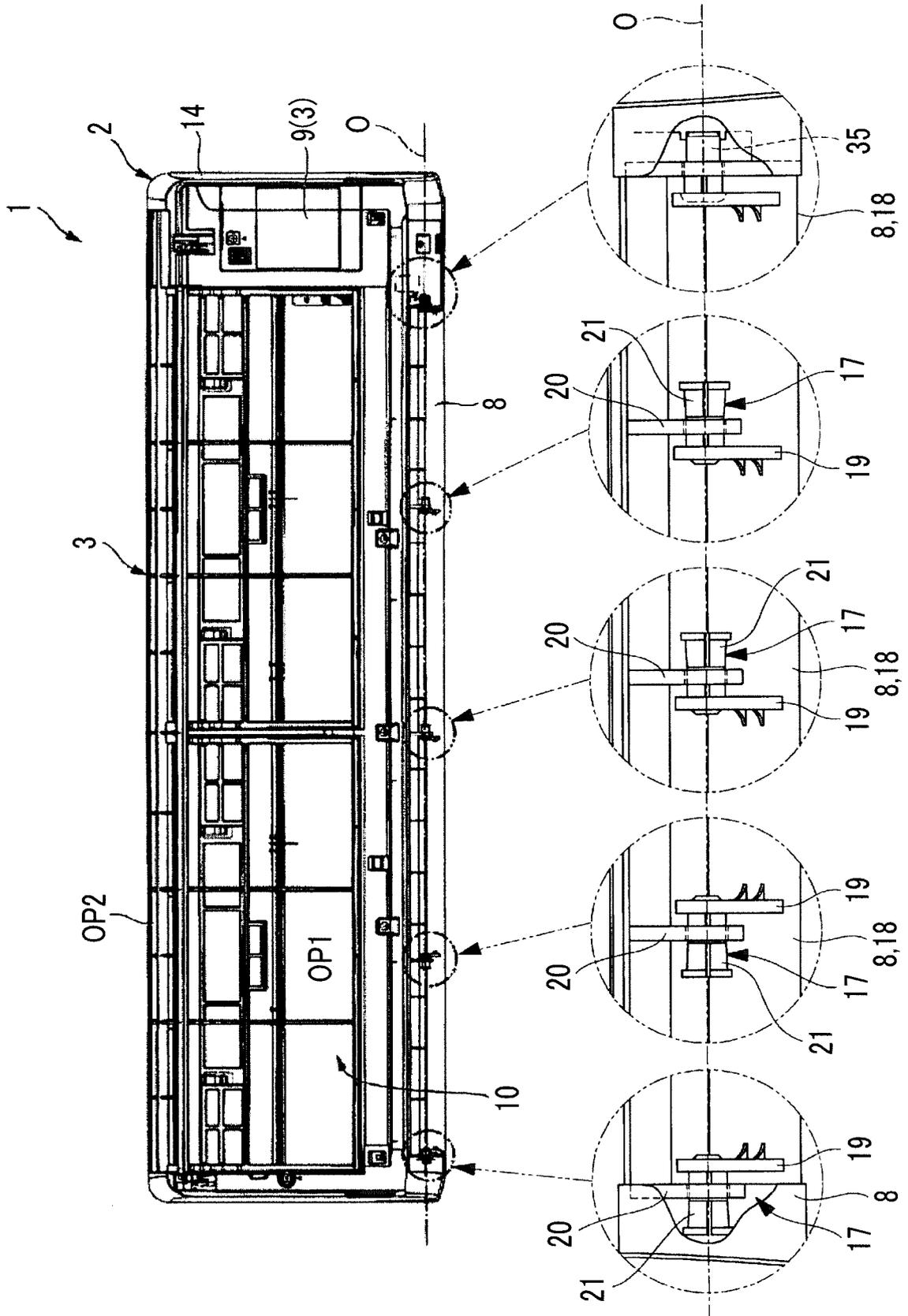


FIG. 4

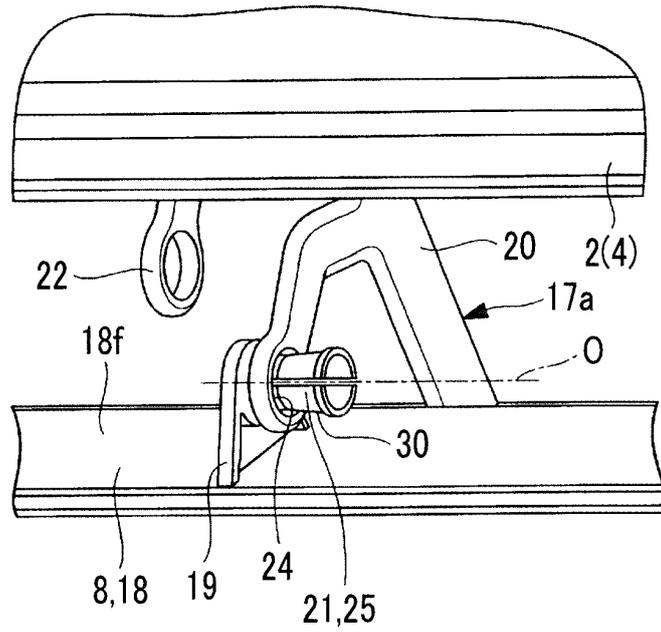


FIG. 5

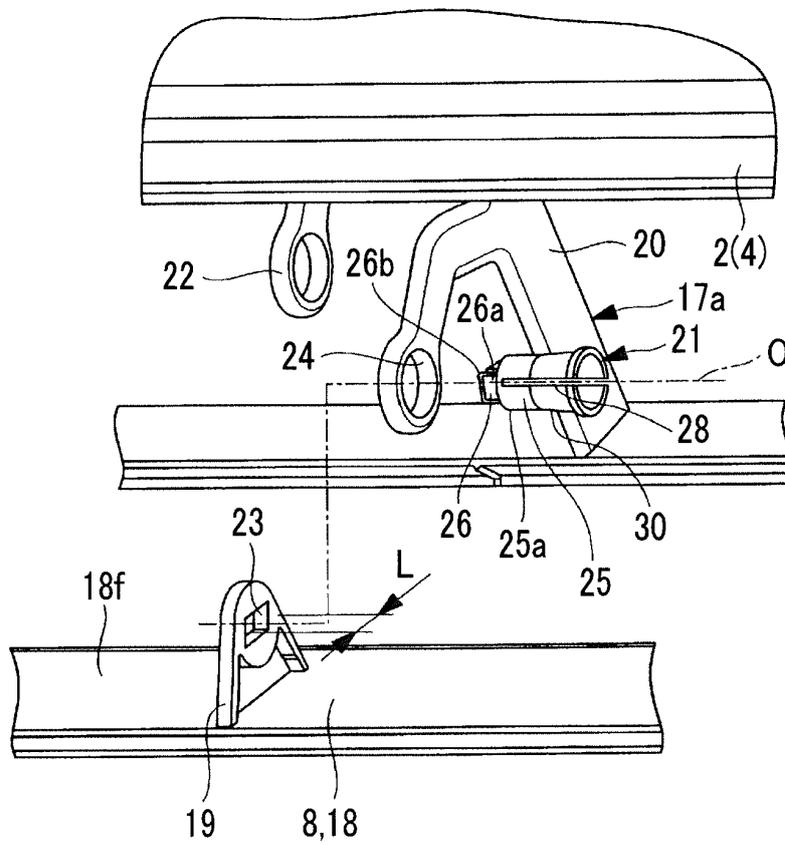


FIG. 6

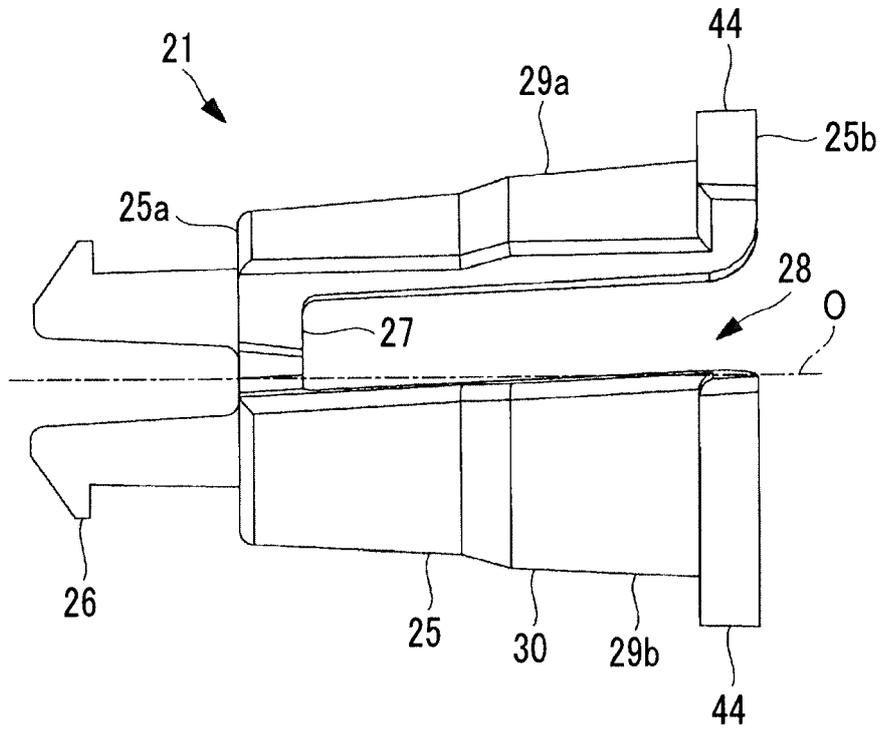


FIG. 7

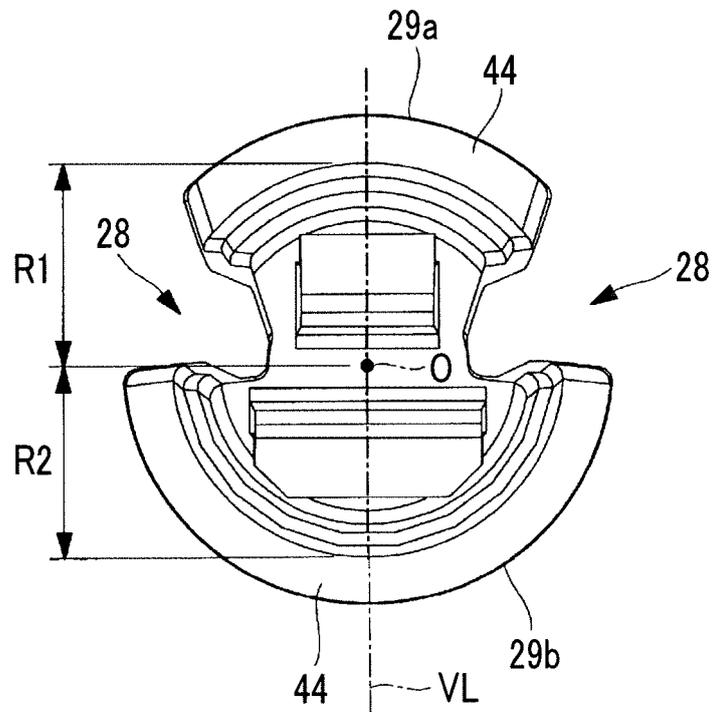


FIG. 8

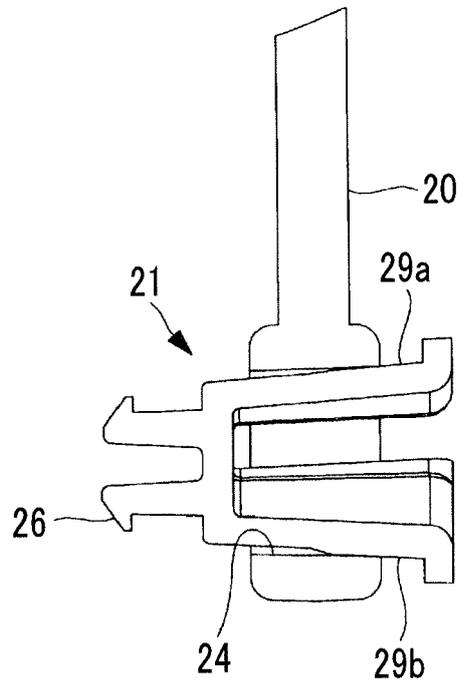
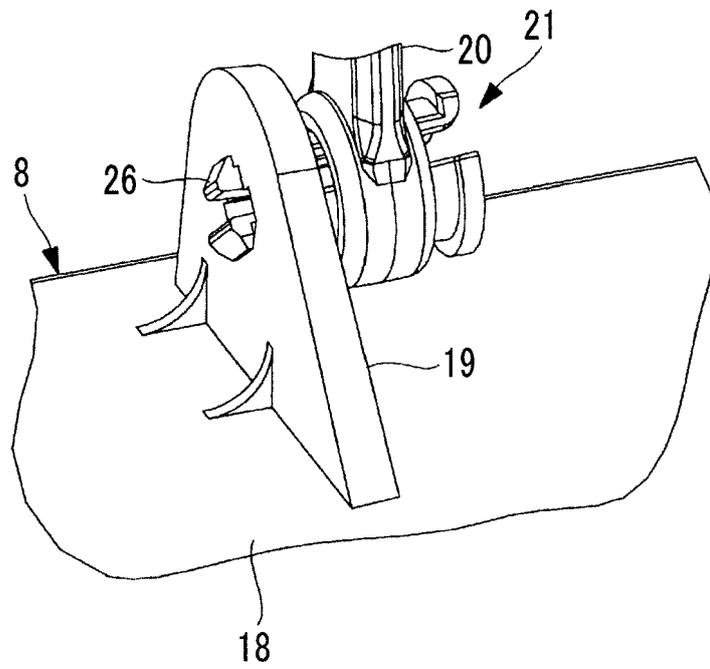


FIG. 9



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2018/015391

## A. CLASSIFICATION OF SUBJECT MATTER

Int.Cl. F24F13/20 (2006.01) i, F24F13/15 (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)

Int.Cl. F24F13/20, F24F13/14-13/15, F24F1/00

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

Published examined utility model applications of Japan	1922-1996
Published unexamined utility model applications of Japan	1971-2018
Registered utility model specifications of Japan	1996-2018
Published registered utility model applications of Japan	1994-2018

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

WPI

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2017-53524 A (MITSUBISHI HEAVY INDUSTRIES, LTD.) 16 March 2017, paragraphs [0013]-[0056], fig. 1-8	1-3
A	CN 203396058 U (HAIER GROUP CO., LTD.) 15 January 2014, entire text, all drawings	1-3
A	JP 2017-53508 A (MITSUBISHI HEAVY INDUSTRIES, LTD.) 16 March 2017, entire text, all drawings	1-3

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

\* Special categories of cited documents:

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"&amp;" document member of the same patent family

Date of the actual completion of the international search

22 May 2018 (22.05.2018)

Date of mailing of the international search report

05 June 2018 (05.06.2018)

 Name and mailing address of the ISA/  
 Japan Patent Office  
 3-4-3, Kasumigaseki, Chiyoda-ku,  
 Tokyo 100-8915, Japan

Authorized officer

Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)



**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

- JP 2017053508 A [0005]