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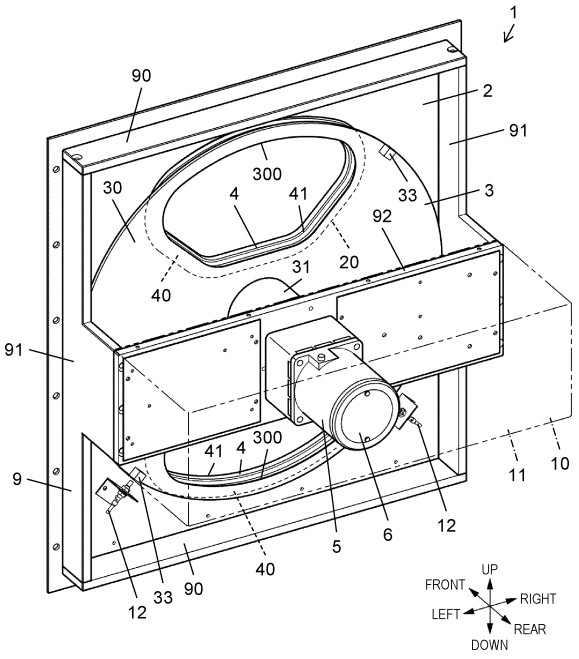
(54) SHUTTER DEVICE AND VENTILATION DEVICE

(57) Durability of a shutter device and a ventilation device is improved. Shutter device (1) includes window member (2) partially including vent (20), opening and closing member (3) that opens and closes vent (20), elastic body (4) located between window member (2) and opening and closing member 3, and moving mechanism (5) that moves opening and closing member (3) between a closed position where opening and closing member (3) closes vent (20) and open position where opening and closing member (3) opens vent (20). Moving mechanism (5) includes driving motor (6) that includes an output shaft connected to opening and closing member (3) and rotates opening and closing member (3), and an advancing and retracting mechanism that advances and retracts opening and closing member (3) with respect to window member (2). Moving mechanism (5) moves opening and closing member (3) in a manner that opening and closing member (3) at the closed position presses against a peripheral edge portion of vent (20) of window member (2) with elastic body (4) interposed between opening and closing member (3) and the peripheral edge portions to close vent (20). The ventilation device includes shutter device (1) and a blower that sends air to shutter device (1).

FIG. 1



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Description

TECHNICAL FIELD

[0001] The present disclosure relates to a shutter device and a ventilation device. Specifically, the present disclosure relates to a shutter device and a ventilation device that open and close a vent provided in a part of a window member with an opening and closing member.

BACKGROUND ART

[0002] PTL 1 describes an air supply damper device used for an opening for ventilation provided in a building.

[0003] In the air supply damper device, a drive motor rotates forward and backward to wind or unwind a wire to open and close a shutter so as to open and close an air passage.

Citation List

Patent Literature

[0004] PTL 1: Unexamined Japanese Patent Publication No. 2010-271037

SUMMARY OF THE INVENTION

[0005] In an air supply damper device that opens and closes a shutter with a wire like the air supply damper device described in PTL 1, since a load is repeatedly applied to a wire, the wire is likely to stretch, and there has been a problem in terms of durability.

[0006] In view of the above circumstances, an object of the present disclosure is to provide a shutter device and a ventilation device for which improvement in durability can be achieved.

[0007] A shutter device according to one aspect of the present disclosure includes a window member partially including a vent, an opening and closing member that opens and closes the vent, an elastic body located between the window member and the opening and closing member, and a moving mechanism. The moving mechanism moves the opening and closing member between a closed position where the opening and closing member closes the vent and an open position where the opening and closing member opens the vent. The moving mechanism includes a driving motor that includes an output shaft connected to the opening and closing member and rotates the opening and closing member, and an advancing and retracting mechanism that advances and retracts the opening and closing member with respect to the window member. The moving mechanism moves the opening and closing member in a manner that the opening and closing member at the closed position presses against a peripheral edge portion of the vent of the window member with the elastic body interposed between the opening and closing member and the peripheral edge portion to close the vent.

[0008] A ventilation device according to another aspect of the present disclosure includes the shutter device and a blower that sends air to the shutter device.

[0009] In the shutter device and the ventilation device according to the above aspect of the present disclosure, durability can be improved.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010]

Fig. 1 is a perspective view illustrating a shutter device according to an exemplary embodiment of the present disclosure.

Fig. 2 is another perspective view illustrating the shutter device of the exemplary embodiment of the present disclosure.

Fig. 3 is a perspective view schematically illustrating a ventilation device including the shutter device of the exemplary embodiment of the present disclosure.

Fig. 4A is a rear view illustrating a closed state of the shutter device of the exemplary embodiment of the present disclosure.

Fig. 4B is a rear view illustrating an open state of the shutter device of the exemplary embodiment of the present disclosure.

Fig. 5 is a plan view illustrating a closed state of the shutter device of the exemplary embodiment of the present disclosure.

Fig. 6 is a side view illustrating an open state of the shutter device of the exemplary embodiment of the present disclosure.

Fig. 7 is a perspective view illustrating a moving mechanism included in the shutter device of the exemplary embodiment of the present disclosure.

DESCRIPTION OF EMBODIMENT

(Exemplary embodiment)

[0011] Hereinafter, shutter device 1 and ventilation device 100 including shutter device 1 according to an exemplary embodiment of the present disclosure will be described below with reference to the drawings.

1. Outline

[0012] Fig. 1 is a perspective view illustrating shutter device 1 according to an exemplary embodiment of the present disclosure. Fig. 2 is another perspective view illustrating shutter device 1 according to the exemplary embodiment of the present disclosure.

[0013] Shutter device 1 of an exemplary embodiment illustrated in Figs. 1 and 2 includes window member 2 partially including vent 20, opening and closing member 3 that opens and closes vent 20, elastic body 4 located

between window member 2 and opening and closing member 3, and moving mechanism 5. Moving mechanism 5 moves opening and closing member 3 between a closed position where opening and closing member 3 closes vent 20 and an open position where opening and closing member 3 opens vent 20. Moving mechanism 5 includes output shaft 60 (see Fig. 5) connected to opening and closing member 3, and includes driving motor 6 that rotates opening and closing member 3 and advancing and retracting mechanism 7 (see Fig. 7) that advances and retracts opening and closing member 3 with respect to window member 2. Moving mechanism 5 moves opening and closing member 3 so that opening and closing member 3 at the closed position presses against a peripheral edge portion of vent 20 of window member 2 with elastic body 4 interposed between opening and closing member 3 and the peripheral edge portion to close vent 20.

[0014] Fig. 3 is a perspective view schematically illustrating ventilation device 100 including shutter device 1 according to the exemplary embodiment of the present disclosure. Ventilation device 100 of the exemplary embodiment illustrated in Fig. 3 includes shutter device 1 and blower 13 that sends air to shutter device 1.

[0015] In shutter device 1 and ventilation device 100 of the exemplary embodiment having the above configuration, movement of opening and closing member 3 between the open position and the closed position can be performed by driving motor 6 and advancing and retracting mechanism 7 in which output shaft 60 is connected to opening and closing member 3. In addition, in shutter device 1 and ventilation device 100 of the exemplary embodiment, opening and closing member 3 at the closed position can be pressed against a peripheral edge portion of vent 20 of window member 2 with elastic body 4 interposed between opening and closing member 3 and the peripheral edge portion by moving mechanism 5 to airtightly close vent 20. By the above, in shutter device 1 and ventilation device 100 of the exemplary embodiment, since a wire for moving opening and closing member 3 is unnecessary, durability can be improved, and airtightness can also be improved.

2. Details

[0016] Next, shutter device 1 and ventilation device 100 of the exemplary embodiment will be described in more detail with reference to the drawings. Shutter device 1 and ventilation device 100 are installed, for example, in an opening for ventilation provided in a building, and are used for ventilating indoor air. Ventilation device 100 includes shutter device 1 and blower 13 that sends air to shutter device 1.

2-1. Shutter device

[0017] As illustrated in Fig. 1, shutter device 1 includes window member 2 partially including vent 20, opening and closing member 3 that opens and closes vent 20, elastic body 4 located between window member 2 and opening and closing member 3, and moving mechanism 5. Moving mechanism 5 moves opening and closing member 3 between a closed position where opening and closing member 3 closes vent 20 and an open position where opening and closing member 3 opens vent 20.

[0018] Window member 2 and opening and closing member 3 face each other. Hereinafter, each configuration of shutter device 1 will be described in detail with the side where window member 2 is located with respect to opening and closing member 3 as the front side and the opposite side as the rear side.

[0019] As illustrated in Figs. 1 and 2, shutter device 1 further includes a mesh-like cover 8 attached to the front side of window member 2 so as to cover vent 20, and support frame 9 attached to the rear side of window member 2 to support opening and closing member 3 and moving mechanism 5. Shutter device 1 further includes case 10 that covers driving motor 6 included in moving mechanism 5, controller 11 that controls rotation of driving motor 6, and sensor 12 that detects a position in a rotation direction of opening and closing member 3.

2-1-1. Window member

[0020] In the present embodiment, window member 2 has a rectangular plate shape. Window member 2 has thickness in a front-rear direction. Two vents 20 penetrating in the front-rear direction are provided in a part of window member 2. In the present embodiment, two vents 20 are arranged point-symmetrically with respect to the center of window member 2 (portion corresponding to the rotation center of opening and closing member 3). Two vents 20 are arranged at intervals in a vertical direction. Two vents 20 are disposed in a portion facing opening and closing member 3 of window member 2. Two vents 20 are provided in the same shape.

2-1-2. Elastic body

[0021] Elastic body 4 is disposed between window member 2 and opening and closing member 3. Elastic body 4 is, for example, packing. In the present embodiment, shutter device 1 includes two elastic bodies 4 attached to two vents 20 of window member 2 on a one-to-one basis.

[0022] Fig. 5 is a plan view illustrating the closed state of shutter device 1 according to the exemplary embodiment of the present disclosure. Fig. 6 is a side view illustrating the open state of shutter device 1 of the exemplary embodiment of the present disclosure.

[0023] As illustrated in Figs. 1, 5, and 6, elastic body 4 includes annular main body 40 along a peripheral edge portion of vent 20 in a rear surface of window member 2, and annular attachment portion 41 integrated with main body 40 and attached to a hole edge of vent 20 of window member 2. Attachment portion 41 has a U-shaped cross

section orthogonal to a circumferential direction, and is fitted to a hole edge of vent 20 of window member 2 over the entire circumference. Main body 40 is integrated with a portion along a rear surface of window member 2 of attachment portion 41. Main body 40 has a circular cross-sectional shape orthogonal to the circumferential direction. Main body 40 of elastic body 4 is sandwiched between window member 2 and opening and closing member 3. Elastic body 4 is made from, for example, packing, but is not limited to packing, and may be any sealing member. Further, rubber can be considered as a material of the packing, but adhesive gel may be used other than rubber. Further, all elastic bodies 4 may have elasticity, but this is not necessarily required. For example, attachment portion 41 may have elasticity, and main body 40 does not need to have elasticity.

2-1-3. Cover

[0024] Cover 8 has a mesh shape and has air permeability. As illustrated in Figs. 2, 5, and 6, cover 8 has a rectangular plate shape. Cover 8 is provided to have size to cover two vents 20 of window member 2. Cover 8 is detachably attached to a front surface of window member 2 with a fixing tool such as a screw.

2-1-4. Support frame

[0025] As illustrated in Fig. 1, support frame 9 includes a pair of upper and lower first attachment portions 90 and a pair of left and right second attachment portions 91 attached to a rear surface of window member 2, and support portion 92 bridged between rear end portions of the pair of left and right second attachment portions 91. Each of the pair of upper and lower first attachment portions 90 has a rectangular plate shape. Each of the pair of left and right second attachment portions 91 has a T-shaped plate shape in side view. Support portion 92 has a rectangular plate shape. Moving mechanism 5 is fixed and supported by support portion 92. Support portion 92 is provided with a through hole through which output shaft 60 of driving motor 6 passes. Rectangular parallelepiped box-shaped case 10 whose front surface is opened is attached to support portion 92. Driving motor 6 of moving mechanism 5 and controller 11 that controls rotation of driving motor 6 are accommodated in case 10.

2-1-5. Opening and closing member

[0026] As illustrated in Fig. 1, opening and closing member 3 includes main body 30 that opens and closes vent 20 of window member 2, and rotating shaft 31 protruding rearward from a central portion of main body 30.

[0027] In the present embodiment, main body 30 has a disc shape. Vent 300 is provided in a part of main body 30. In the present embodiment, main body 30 includes two vents 300. Each of two vents 300 penetrates main body 30 in the front-rear direction. Two vents 300 are arranged at equal intervals around the center of main body 30 (that is, in the circumferential direction). Two vents 300 have the same shape. In the present embodiment, two vents 300 are substantially the same in shape and relative arrangement with respect to two vents 20 of window member 2.

[0028] Each of two vents 300 is located away from an outer peripheral edge of main body 30 toward the center side of main body 30. That is, two vents 300 do not have a notch shape extending from the outer peripheral edge of main body 30 toward the center side.

[0029] Fig. 7 is a perspective view illustrating moving mechanism 5 included in shutter device 1 according to the exemplary embodiment of the present disclosure. As illustrated in Fig. 7, rotating shaft 31 has a cylindrical shape. The center of rotating shaft 31 and the center of main body 30 are located in the same straight line. Rotating shaft 31 is fixed to main body 30 by a fixing tool such as a screw. Rotating shaft 31 is provided with contact 32 protruding in a direction intersecting a direction (that is, the front-rear direction) along a central axis of rotating shaft 31.

[0030] In the present embodiment, rotating shaft 31 is provided with a pair of contacts 32. The pair of contacts 32 protrude in directions opposite to each other. Each of the pair of contacts 32 protrudes in a direction orthogonal to a direction along a central axis of rotating shaft 31. Positions of the pair of contacts 32 in a direction along the central axis of rotating shaft 31 (that is, front-rear positions) are the same.

[0031] Each of the pair of contacts 32 has a columnar shape in the present embodiment. Each of the pair of contacts 32 is attached to rotating shaft 31 so as to be rotatable about its own central axis.

[0032] A pair of attachment grooves 310 are provided on a front surface of rotating shaft 31. Pin 711 of biasing portion 71 to be described later is inserted into the pair of attachment grooves 310.

[0033] Rotating shaft 31 is attached to tubular joint 61 fixed to output shaft 60 of driving motor 6. Joint 61 and biasing portion 71 are located inside rotating shaft 31.

[0034] Rotating shaft 31 is attached to joint 61 in a state of being slidable in a direction along the central axis of rotating shaft 31 (that is, the front-rear direction) and fixed in a rotation direction. By the above, rotating shaft 31 is connected to output shaft 60. When output shaft 60 rotates, rotating shaft 31 rotates integrally with output shaft 60.

[0035] When rotating shaft 31 is connected to output shaft 60 by joint 61, opening and closing member 3 is attached to support portion 92 by moving mechanism 5.

[0036] As illustrated in Fig. 1, two block-shaped detection portions 33 for detection by sensor 12 are attached to a rear surface of main body 30. The two detection portions 33 are attached to an outer periphery of main body 30. The two detection portions 33 are located on an imaginary straight line passing through the center of main

body 30, and are located to be shifted by 180 degrees in the circumferential direction of main body 30.

2-1-6. Moving mechanism

[0037] As illustrated in Fig. 7, moving mechanism 5 includes driving motor 6 and advancing and retracting mechanism 7. Driving motor 6 includes output shaft 60 (see Figs. 5 and 6) connected to opening and closing member 3, and rotates opening and closing member 3. Advancing and retracting mechanism 7 advances and retracts opening and closing member 3 with respect to window member 2.

[0038] In the present embodiment, driving motor 6 is a geared motor integrated with a speed reducer. Driving motor 6 is fixed to a rear surface of support portion 92 of support frame 9. Output shaft 60 of driving motor 6 passes through a through hole provided in support portion 92 and protrudes forward from support portion 92. Tubular joint 61 is fixed to a tip portion (front end portion) of output shaft 60. Joint 61 rotates integrally with output shaft 60.

[0039] Advancing and retracting mechanism 7 has cam 70 having a tubular shape and including guide surface 700 against which contact 32 abuts. In the present embodiment, advancing and retracting mechanism 7 further includes biasing portion 71 that biases rotating shaft 31 toward cam 70 side (that is, toward the rear side).

[0040] In the present embodiment, cam 70 includes cylindrical main body 701 and flange-shaped fixing portion 702 protruding from one end (rear end) of main body 701. A front end surface of cylindrical main body 701 is guide surface 700. Fixing portion 702 of cam 70 is fixed to support portion 92. That is, in the present embodiment, a position of cam 70 is fixed, and cam 70 itself does not rotate.

[0041] In the present embodiment, guide surface 700 has an annular shape when viewed from the front to the rear. A part of guide surface 700 includes protrusion 703 protruding to window member 2 side (that is, the front side). In the present embodiment, guide surface 700 includes a pair of protrusions 703. The pair of protrusions 703 are disposed in a manner corresponding to a pair of contacts 32. That is, the pair of protrusions 703 are located on an imaginary straight line passing through the center of annular guide surface 700. For this reason, a pair of contacts 32 simultaneously rides on the pair of protrusions 703.

[0042] The pair of protrusions 703 have the same shape. In the present embodiment, as illustrated in Figs. 6 and 7, protrusion 703 of guide surface 700 has a curved surface curved in an arc shape. Protrusion 703 has a vertex at an intermediate point in the circumferential direction. A gradient from one end in the circumferential direction to the vertex of protrusion 703 is the same as a gradient from another end in the circumferential direction to the vertex.

[0043] As illustrated in Fig. 7, in the present embodiment, biasing portion 71 is a spring mechanism having coil spring 710 and pin 711 connected to one end of coil spring 710. Coil spring 710 is accommodated inside tubular joint 61. Pin 711 is bridged between a pair of attachment grooves 310 of rotating shaft 31. Another end of coil spring 710 is connected to a part of joint 61. Rotating shaft 31 is biased toward cam 70 side (rear side) by coil spring 710. By the above, in the present embodiment, it is easy to maintain a state in which a pair of contacts 32 of rotating shaft 31 abut on guide surface 700. Further, by being biased toward cam 70 by coil spring 710, rotating shaft 31 is hardly detached from joint 61.

2-1-7. Controller

[0044] Controller 11 controls rotation of driving motor 6. In the present embodiment, controller 11 has a first control mode and a second control mode. In the first control mode, output shaft 60 is rotated in one direction to move opening and closing member 3 from the open position to the closed position. In the second control mode, output shaft 60 is moved from the open position to the closed position as opening and closing member 3 is rotated in a direction opposite to the one direction. Controller 11 alternately performs the first control mode and the second control mode.

[0045] Controller 11 includes, for example, a computer including a processor such as a central processing unit (CPU) and a memory. The computer includes a microcomputer. Controller 11 receives a control signal from an external management device or the like, and executes an appropriate program stored in the memory to control rotation of driving motor 6. Controller 11 is mounted on an electric panel mounted in case 10, for example.

[0046] Fig. 4A is a rear view illustrating the closed state of shutter device 1 according to the exemplary embodiment of the present disclosure. Fig. 4B is a rear view illustrating the open state of shutter device 1 according to the exemplary embodiment of the present disclosure. In the present embodiment, controller 11 performs control to rotate output shaft 60 of driving motor 6 by 90 degrees in one direction to move opening and closing member 3 from the open position illustrated in Fig. 4B to the closed position illustrated in Fig. 4A. Then, controller 11 performs control to further rotate output shaft 60 by 90 degrees in the one direction to move opening and closing member 3 from the closed position to the open position.

[0047] After performing movement from the open position to the closed position and movement from the closed position to the open position a plurality of times (for example, four times) in the first control mode, controller 11 performs movement from the open position to the closed position and movement from the closed position to the open position the same number of times as in the first control mode in the second control mode.

[0048] Note that controller 11 may perform control to rotate output shaft 60 by 90 degrees in one direction to

move opening and closing member 3 from the open position to the closed position, and then perform control to rotate output shaft 60 by 90 degrees in a direction opposite to the one direction to move opening and closing member 3 from the closed position to the open position.

2-1-8. Sensor

[0049] Sensor 12 detects a position in the rotation direction of opening and closing member 3. In the present embodiment, shutter device 1 includes a pair of sensors 12.

[0050] Each of the pair of sensors 12 is, for example, a proximity sensor. The pair of sensors 12 are attached to a portion outside opening and closing member 3 of a rear surface of window member 2.

[0051] In the present embodiment, as illustrated in Fig. 4B, when opening and closing member 3 is at the open position, one (left) sensor 12 detects detection portion 33, and another (right) sensor 12 does not detect detection portion 33. Further, as illustrated in Fig. 4A, when opening and closing member 3 is at the closed position, one (left) sensor 12 does not detect detection portion 33, and another (right) sensor 12 detects detection portion 33. From a detection result of the pair of sensors 12, it is possible to detect whether opening and closing member 3 is at the open position or the closed position.

2-1-9. Operation of shutter device

[0052] In shutter device 1 of the present embodiment described above, when output shaft 60 of driving motor 6 of moving mechanism 5 rotates, opening and closing member 3 rotates integrally, and a pair of contacts 32 protruding from rotating shaft 31 slides on guide surface 700.

[0053] When each of the pair of contacts 32 rides on a pair of protrusions 703, opening and closing member 3 moves (advances) toward window member 2 side. Further, when the pair of contacts 32 slide from above the pair of protrusions 703 to a portion other than the pair of protrusions 703 of guide surface 700, opening and closing member 3 moves (retracts) to the side opposite to window member 2 side. That is, in the present embodiment, opening and closing member 3 advances and retracts by using driving force of driving motor 6.

[0054] In shutter device 1 of the present embodiment, opening and closing member 3 moves between the closed position illustrated in Fig. 4A and the open position illustrated in Fig. 4B.

[0055] When opening and closing member 3 is located at the closed position illustrated in Fig. 4A, a pair of contacts 32 are located on a pair of protrusions 703. At this time, a portion between two vents 300 of main body 30 of opening and closing member 3 is pressed against a peripheral edge portions of two vents 20 of window member 2 with main body 40 of elastic body 4 interposed between opening and closing member 3 and the peripheral edge portions to close vents 20. Further, at this time, two vents 20 of window member 2 and two vents 300 of opening and closing member 3 are shifted in the rotation direction of opening and closing member 3 and do not overlap each other.

[0056] When opening and closing member 3 is located at the open position illustrated in Fig. 4B, a pair of contacts 32 are located on an intermediate portion between a pair of protrusions 703 of guide surface 700, and is disposed at a position retracted from when opening and closing member 3 is located at the closed position. At this time, main body 30 of opening and closing member 3 is located away from main body 40 of elastic body 4 (see Fig. 6). Further, at this time, two vents 20 of window member 2 and two vents 300 of opening and closing member 3 coincide with each other when viewed in the front-rear direction. That is, the center of vent 20 of window member 2 and the center of vent 300 of opening and closing member 3 are located side by side in the front-rear direction.

2-2. Ventilation device

[0057] As illustrated in Fig. 3, ventilation device 100 includes shutter device 1 described above and blower 13 that sends air to shutter device 1.

[0058] Blower 13 is, for example, a propeller fan, an axial fan, or the like that can rotate in both forward and reverse directions, and a conventionally known blower can be used.

[0059] For example, shutter device 1 is installed in an opening for ventilation of a building in a manner that that cover 8 faces the outdoor side. Then, blower 13 is installed on the indoor side of shutter device 1. Shutter device 1 and blower 13 are installed so as to be accommodated, for example, in an opening for ventilation of a building.

[0060] For example, in a case where humidity is high such as a rainy day, ventilation device 100 closes vent 20 by disposing opening and closing member 3 at the closed position in order to prevent moisture from entering a building. Then, in a case where humidity is low, opening and closing member 3 is disposed at the open position, and outside air is introduced into the building or air in the building is discharged to the outside of the building through vents 20, 300. At this time, by forming flow of air by blower 13, ventilation can be effectively performed, and outdoor air conditioning of a building can be performed.

3. Variation

[0061] Next, a variation of shutter device 1 and ventilation device 100 described above will be described. Variations below can be appropriately combined.

[0062] Opening and closing member 3 only needs to be configured to open and close vents 20 of window member 2, and is not limited to the structure illustrated in Fig. 1 and

the like. For example, vent 300 of opening and closing member 3 may be provided in a notch shape cut out from an outer peripheral edge of main body 30 toward the center.

[0063] Elastic body 4 only needs to be located between window member 2 and opening and closing member 3, and is not limited to the structure illustrated in Fig. 1 and the like. For example, elastic body 4 may be attached to a front surface of main body 30 of opening and closing member 3 instead of window member 2. In this case, elastic body 4 may be provided in an annular shape, or may be provided in a sheet shape that entirely covers a front surface of main body 30. Further, elastic body 4 may be attached to each of window member 2 and opening and closing member 3.

[0064] Further, moving mechanism 5 may be configured to move opening and closing member 3 in a manner that opening and closing member 3 at the closed position presses against a peripheral portion of vent 20 of window member 2 with elastic body 4 interposed opening and closing member 3 and the peripheral portions them to close vent 20. Moving mechanism 5 does not need to be configured to move opening and closing member 3 in a manner that opening and closing member 3 at the open position is located away from elastic body 4. That is, moving mechanism 5 may advance and retract opening and closing member 3 within a range in which a state in which opening and closing member 3 abuts on elastic body 4 is maintained.

[0065] Moving mechanism 5 only needs to be a mechanism that includes driving motor 6 that rotates opening and closing member 3 and advancing and retracting mechanism 7 that advances and retracts opening and closing member 3 and moves opening and closing member 3 between the open position and the closed position, and is not limited to the structure illustrated in Fig. 7 or the like.

[0066] For example, advancing and retracting mechanism 7 does not need to include cam 70, and may be a mechanism that advances and retracts opening and closing member 3 by a driving source different from driving motor 6.

[0067] Further, rotating shaft 31 only needs to include at least one contact 32, and does not need to include a pair of contacts 32.

[0068] Further, biasing portion 71 only needs to bias rotating shaft 31 toward cam 70 side, and is not limited to one having coil spring 710 and pin 711. Advancing and retracting mechanism 7 does not need to include biasing portion 71.

[0069] Further, controller 11 is not limited to one having the first control mode and the second control mode, and may have only one of them.

(Conclusion)

[0070] Like shutter device 1 of the exemplary embodiment and the variation of the exemplary embodiment described above, shutter device (1) of a first aspect of the present disclosure has a configuration below.

[0071] That is, shutter device (1) of a first aspect includes window member (2) partially including vent (20), opening and closing member (3) that opens and closes vent (20), elastic body (4) located between window member (2) and opening and closing member (3), and moving mechanism (5). Moving mechanism (5) moves opening and closing member (3) between a closed position where opening and closing member (3) closes vent (20) and an open position where opening and closing member (3) opens vent (20). Moving mechanism (5) includes driving motor (6) that includes output shaft (60) connected to opening and closing member (3) and rotates opening and closing member (3), and advancing and retracting mechanism (7) that advances and retracts opening and closing member (3) with respect to window member (2). Moving mechanism (5) moves opening and closing member (3) in a manner that opening and closing member (3) at the closed position presses against a peripheral edge portion of vent (20) of window member (2) with elastic body (4) interposed between opening and closing member 3 and the peripheral edge portions to close vent (20).

[0072] In shutter device (1) of the first aspect having the above configuration, movement of opening and closing member (3) between the open position and the closed position can be performed by driving motor (6) in which output shaft (60) is connected to opening and closing member (3) and advancing and retracting mechanism (7). In addition, in shutter device (1) of the first aspect, opening and closing member (3) at the closed position can be pressed against a peripheral edge portion of vent (20) of window member (2) with elastic body (4) interposed between opening and closing member (3) and the peripheral edge portion by moving mechanism (5) to airtightly close vent (20). By the above, in shutter device (1) of the first aspect, since a wire for moving opening and closing member (3) is unnecessary, durability can be improved, and airtightness can also be improved.

[0073] Further, like shutter device 1 of the exemplary embodiment and the variation of the exemplary embodiment described above, shutter device (1) of a second aspect additionally includes a configuration below in addition to the configuration of the first aspect.

[0074] That is, in shutter device (1) of the second aspect, moving mechanism (5) moves opening and closing member (3) in a manner that opening and closing member (3) at the open position is located away from elastic body (4).

[0075] According to shutter device (1) of the second aspect having the above configuration, when opening and closing member (3) is at the open position, no load is applied to elastic body (4), and it is possible to suppress wear of elastic body (4) between window member (2) and rotating opening and closing member (3).

[0076] Further, like shutter device 1 of the exemplary embodiment and the variation of the exemplary embodi-

ment described above, shutter device (1) of a third aspect additionally includes a configuration below in addition to the configuration of the first or second aspect.

[0077] That is, in shutter device (1) of the third aspect, opening and closing member (3) has rotating shaft (31) connected to output shaft (60) of driving motor (6). Rotating shaft (31) includes contact (32) protruding in a direction intersecting a direction along a central axis of rotating shaft (31). Advancing and retracting mechanism (7) includes a cam (70) having a tubular shape and including guide surface (700) against which contact (32) abuts. A part of guide surface (700) includes protrusion (703) protruding toward window member (2) side. When contact (32) rides on protrusion (703), opening and closing member (3) is disposed at the closed position.

[0078] According to shutter device (1) of the third aspect having the above configuration, when opening and closing member (3) is rotated by driving motor (6), contact (32) of opening and closing member (3) rides on protrusion (703) of guide surface (700) of cam (70), and opening and closing member (3) can be moved toward window member (2) side. For this reason, according to shutter device (1) of the third aspect, both rotation and advancing and retracting of opening and closing member (3) can be performed using driving force of driving motor (6).

[0079] Further, like shutter device 1 of the exemplary embodiment and the variation of the exemplary embodiment described above, shutter device (1) of a fourth aspect additionally includes a configuration below in addition to the configuration of the third aspect.

[0080] That is, in shutter device (1) of the fourth aspect, protrusion (703) of guide surface (700) has a curved surface curved in an arc shape.

[0081] According to shutter device (1) of the fourth aspect having the above configuration, opening and closing member (3) advances and retracts with respect to window member (2) while contact (32) of opening and closing member (3) abuts on arc-shaped protrusion (703). For this reason, according to shutter device (1) of the fourth aspect, frictional force applied to elastic body (4) can be gradually increased or decreased, and wear of elastic body (4) can be suppressed.

[0082] Further, like shutter device 1 of the exemplary embodiment and the variation of the exemplary embodiment described above, shutter device (1) of a fifth aspect additionally includes a configuration below in addition to the configuration of the third or fourth aspect.

[0083] That is, in shutter device (1) of the fifth aspect, rotating shaft (31) includes a pair of contacts (32), and the pair of contacts (32) protrude in directions opposite to each other. Guide surface (700) includes a pair of protrusions (703). When each of the pair of contacts (32) rides on the pair of protrusions (703), opening and closing member (3) is disposed at the closed position.

[0084] According to shutter device (1) of the fifth aspect having the above configuration, the pair of contacts (32) protruding in the opposite directions of rotating shaft (31) ride on the pair of protrusions (703) of guide surface (700), and rotating shaft (31) can be prevented from being inclined by being pressed by cam (70). For this reason, in shutter device (1) of the fifth aspect, it is possible to suppress generation of a bias in frictional force applied to elastic body (4), and it is easy to suppress wear of elastic body (4).

[0085] Further, like shutter device 1 of the exemplary embodiment and the variation of the exemplary embodiment described above, shutter device (1) of a sixth aspect additionally includes a configuration below in addition to the configuration of any one of the third to fifth aspects.

[0086] That is, in shutter device (1) of the sixth aspect, advancing and retracting mechanism (7) further includes biasing portion (71) that biases rotating shaft (31) toward cam (70) side.

[0087] According to shutter device (1) of the sixth aspect having the above configuration, rotating shaft (31) is biased toward cam (70) side by biasing portion (71). For this reason, in shutter device (1) of the sixth aspect, it is easy to maintain a state in which contact (32) of rotating shaft (31) abuts on guide surface (700) of cam (70), and advancing and retracting of opening and closing member (3) are easily stabilized.

[0088] Further, like shutter device 1 of the exemplary embodiment and the variation of the exemplary embodiment described above, shutter device (1) of a seventh aspect additionally includes a configuration below in addition to the configuration of any one of the first to sixth aspects.

[0089] That is, shutter device (1) of the seventh aspect further includes controller (11) that controls rotation of driving motor (6). Controller (11) has a first control mode and a second control mode. In the first control mode, opening and closing member (3) is moved from the open position to the closed position as output shaft (60) is rotated in one direction. In the second control mode, opening and closing member (3) is moved from the open position to the closed position as output shaft (60) is rotated in a direction opposite to the one direction. Controller (11) alternately performs the first control mode and the second control mode.

[0090] According to shutter device (1) of the seventh aspect having the above configuration, it is possible to prevent frictional force from being always applied to elastic body (4) from the same direction, and it is easy to suppress wear of elastic body (4).

[0091] Further, as in ventilation device 100 of the exemplary embodiment and the variation of the exemplary embodiment described above, ventilation device (100) of an eighth aspect includes shutter device (1) of any one of the first to seventh aspects and blower (13) that sends air to shutter device (1).

[0092] In ventilation device (100) of the eighth aspect having the above configuration, ventilation can be performed through vent (20) of window member (2) by driving blower (13) in a state where opening and closing member (3) of shutter device (1) is disposed at the open position. Here, in ventilation device (100) of the eighth

aspect, improvement in durability and airtightness of shutter device (1) can be achieved, and improvement in durability and airtightness of ventilation device (100) as a whole can also be achieved.

[0093] Although the present disclosure is described above based on the exemplary embodiment illustrated in the accompanying drawings, the present disclosure is not limited to the above exemplary embodiment, and an appropriate design change can be made within the intended scope of the present disclosure.

INDUSTRIAL APPLICABILITY

[0094] According to the shutter device and the ventilation device of the present disclosure, durability of the device itself is improved. Therefore, the shutter device and the ventilation device of the present disclosure are necessary in a room or a factory requiring ventilation, and are industrially useful.

REFERENCE MARKS IN THE DRAWINGS

[0095]

1: shutter device
2: window member
20, 300: vent
3: opening and closing member
31: rotating shaft
32: contact
4: elastic body
5: moving mechanism
6: driving motor
60: output shaft
7: advancing and retracting mechanism
70: cam
700: guide surface
703: protrusion
71: biasing portion
11: controller
13: blower
100: ventilation device

Claims

1. A shutter device comprising:

a window member partially including a vent;
an opening and closing member that opens and closes the vent;
an elastic body located between the window member and the opening and closing member; and
a moving mechanism that moves the opening and closing member between a closed position where the opening and closing member closes the vent and an open position where the opening and closing member opens the vent,
wherein the moving mechanism includes:

a driving motor that includes an output shaft connected to the opening and closing member and rotates the opening and closing member; and
an advancing and retracting mechanism that advances and retracts the opening and closing member with respect to the window member, and

the moving mechanism moves the opening and closing member in a manner that the opening and closing member at the closed position presses against a peripheral edge portion of the vent of the window member with the elastic body interposed between the opening and closing member and the peripheral edge portion to close the vent.

2. The shutter device according to Claim 1, wherein
the moving mechanism moves the opening and closing member in a manner that the opening and closing member at the open position is located away from the elastic body.

3. The shutter device according to Claim 1, wherein

the opening and closing member includes a rotating shaft connected to the output shaft of the driving motor,
the rotating shaft includes a contact protruding in a direction intersecting a direction along a central axis of the rotating shaft,
the advancing and retracting mechanism includes a cam having a tubular shape and including a guide surface against which the contact abuts,
a part of the guide surface includes a protrusion protruding toward the window member, and
the opening and closing member is disposed at the closed position by the contact riding on the protrusion.

4. The shutter device according to Claim 3, wherein
the protrusion of the guide surface has a curved surface curved in an arc shape.

5. The shutter device according to Claim 3, wherein

the rotating shaft includes a pair of the contacts each being the contact, and the pair of the contacts protrude in directions opposite to each other,
the guide surface includes a pair of the protrusions each being the protrusion, and
the opening and closing member is disposed at

the closed position by the pair of the contacts each riding on the pair of the protrusions.

6. The shutter device according to Claim 3, wherein the advancing and retracting mechanism further includes a biasing portion that biases the rotating shaft toward the cam.

7. The shutter device according to Claim 1, further comprising a controller that controls rotation of the driving motor, wherein

the controller has:

a first control mode of moving the opening and closing member from the open position to the closed position by rotating the output shaft in one direction; and
a second control mode of moving the opening and closing member from the open position to the closed position by rotating the output shaft in a direction opposite to the one direction, and

the controller alternately performs the first control mode and the second control mode.

8. A ventilation device comprising:

the shutter device according to Claim 1; and
a blower that sends air to the shutter device.

FIG. 1

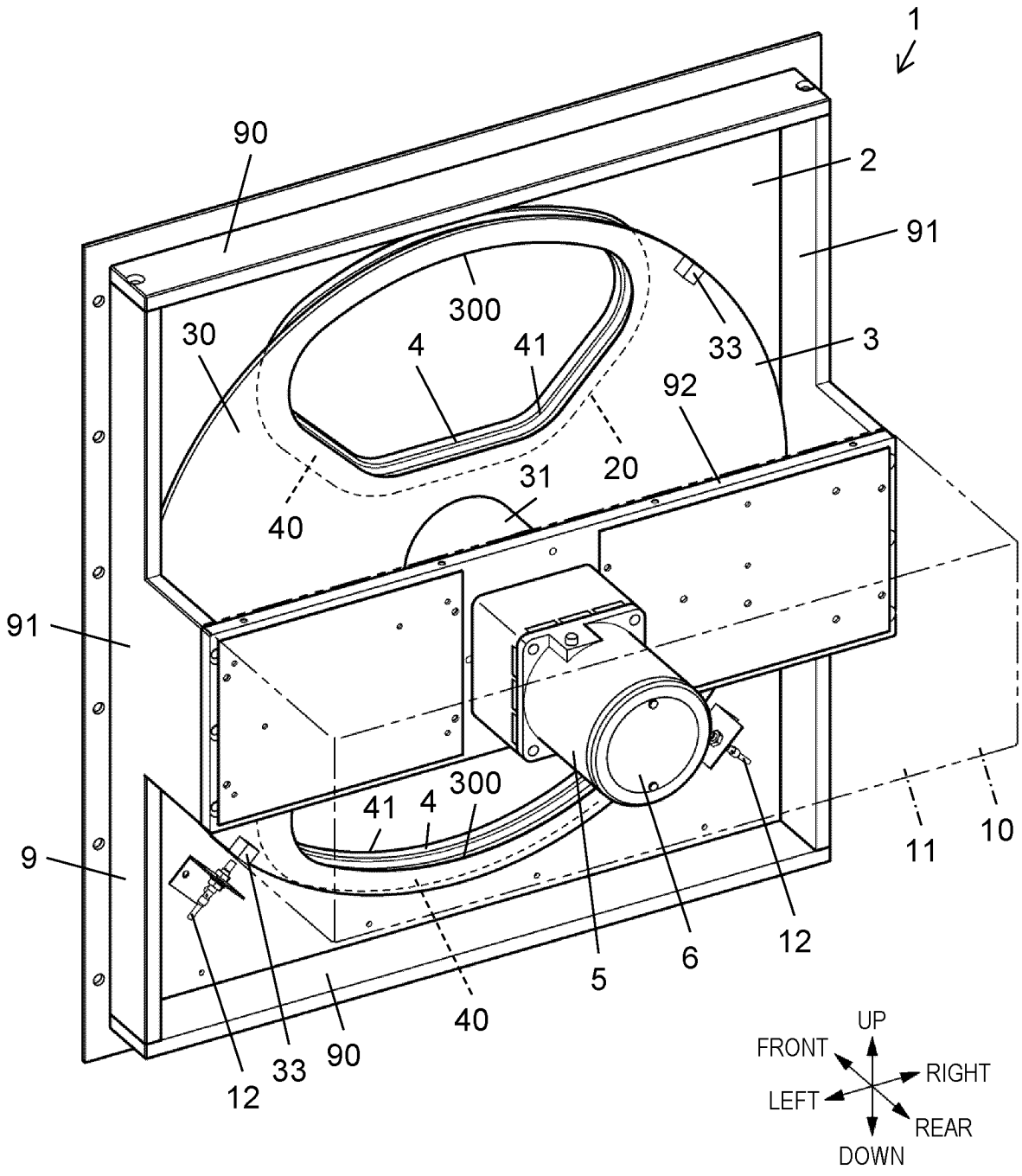
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FIG. 2

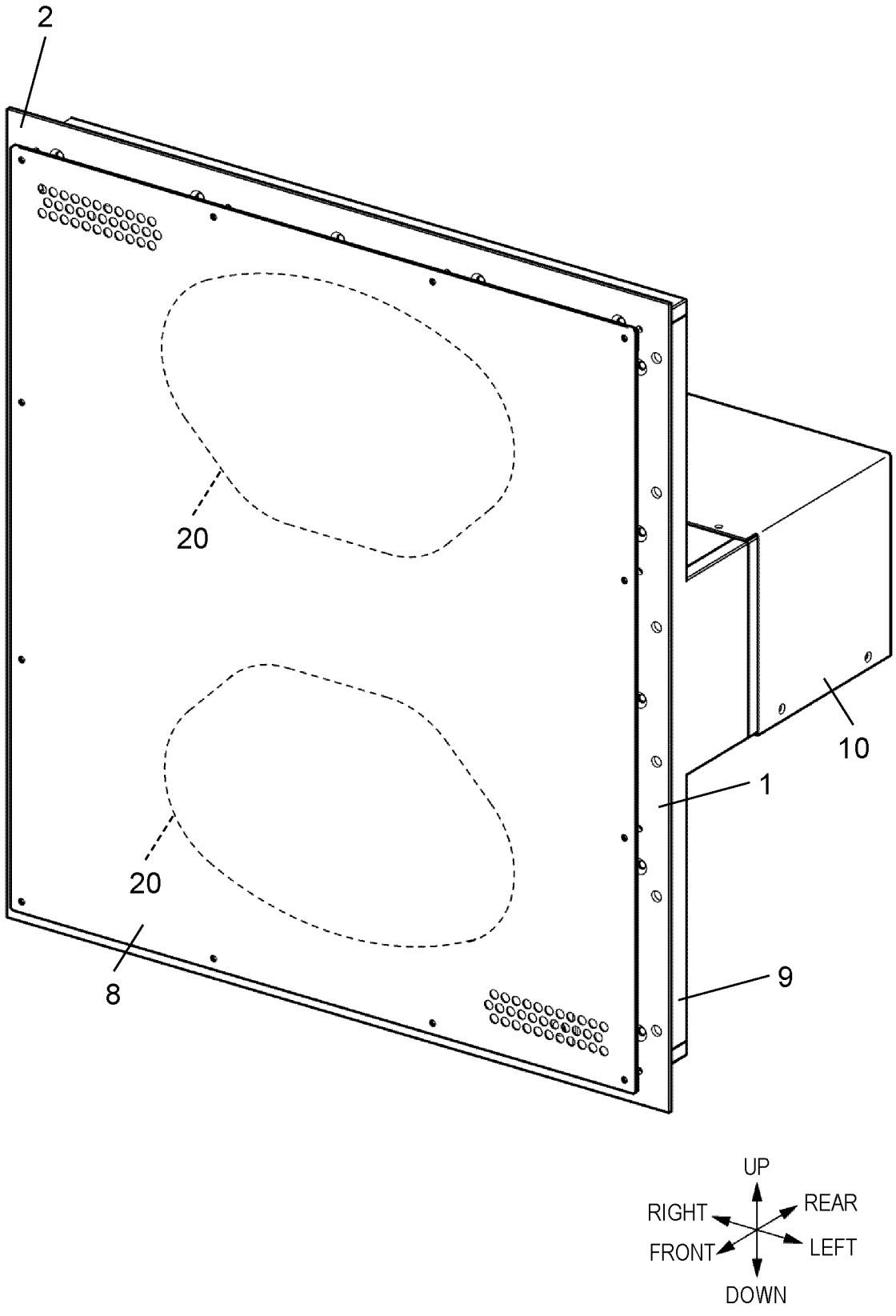

FIG. 3

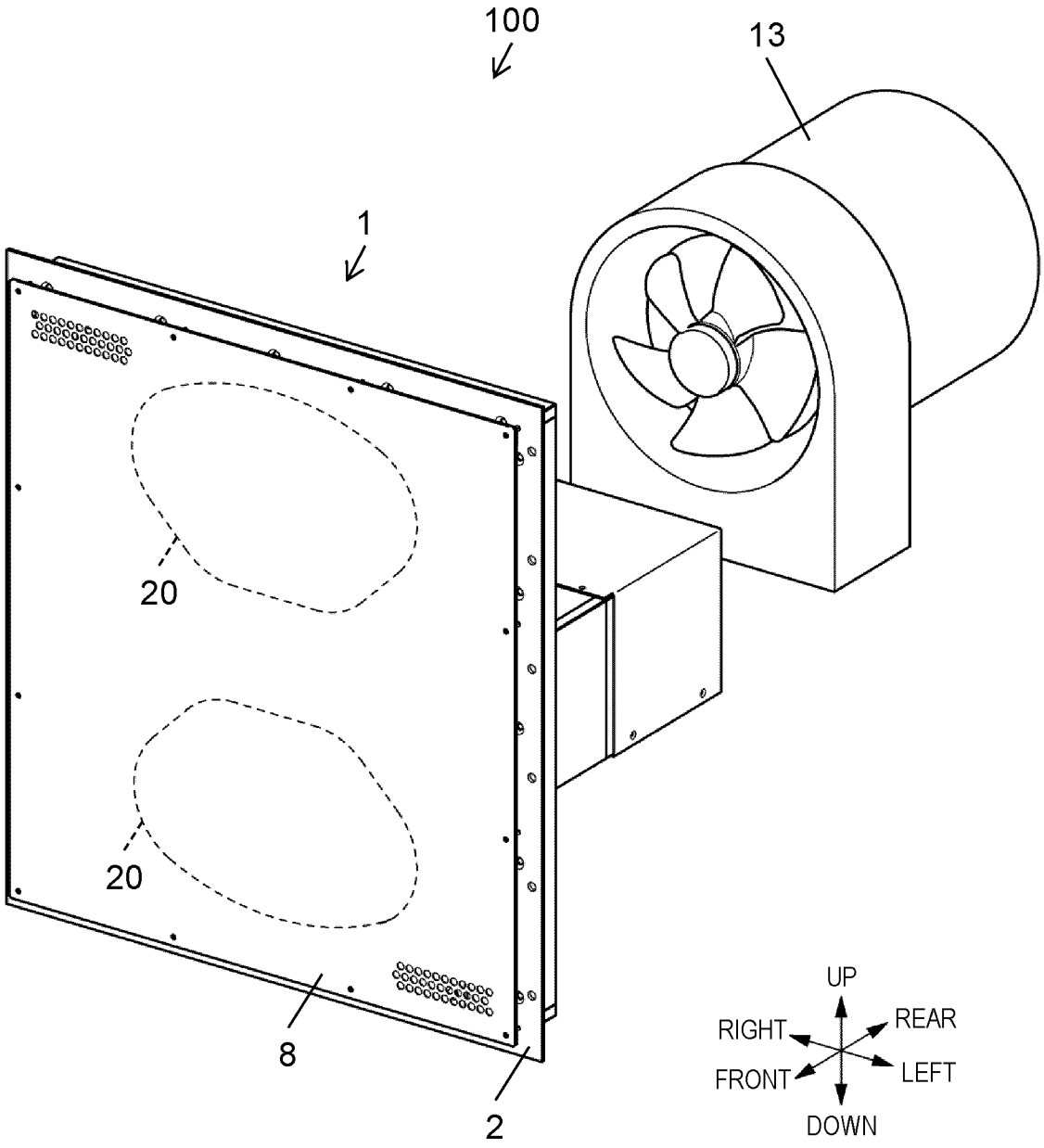

FIG. 4A

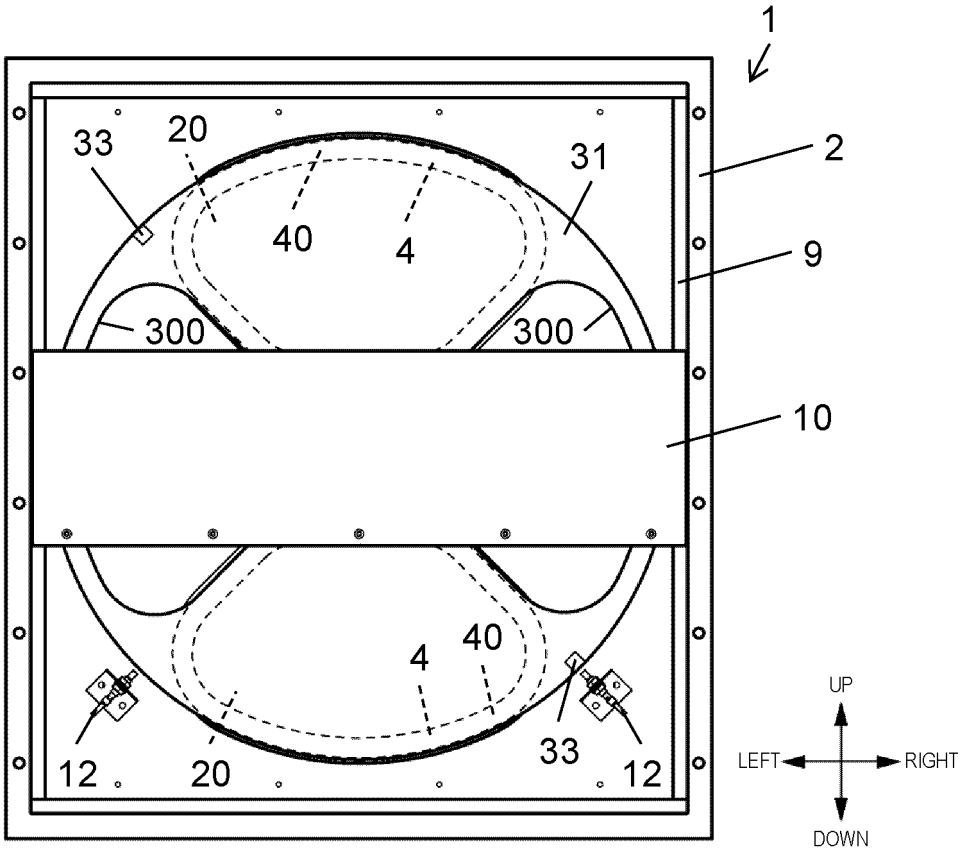
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FIG. 4B

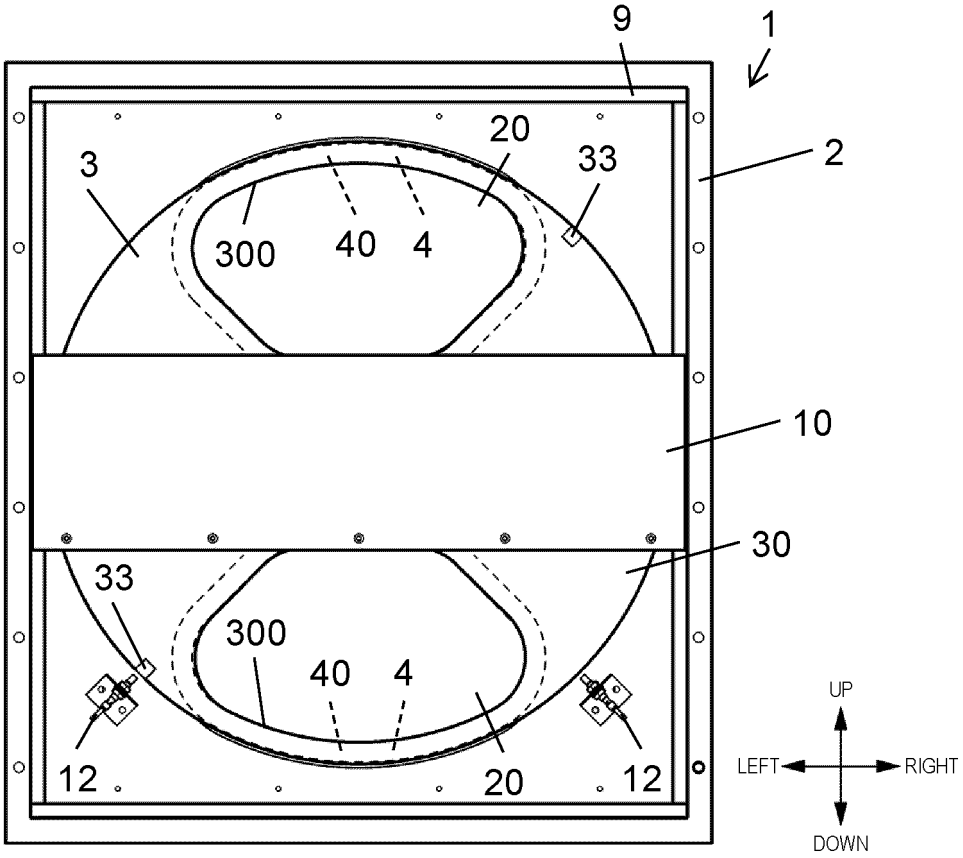
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FIG. 5

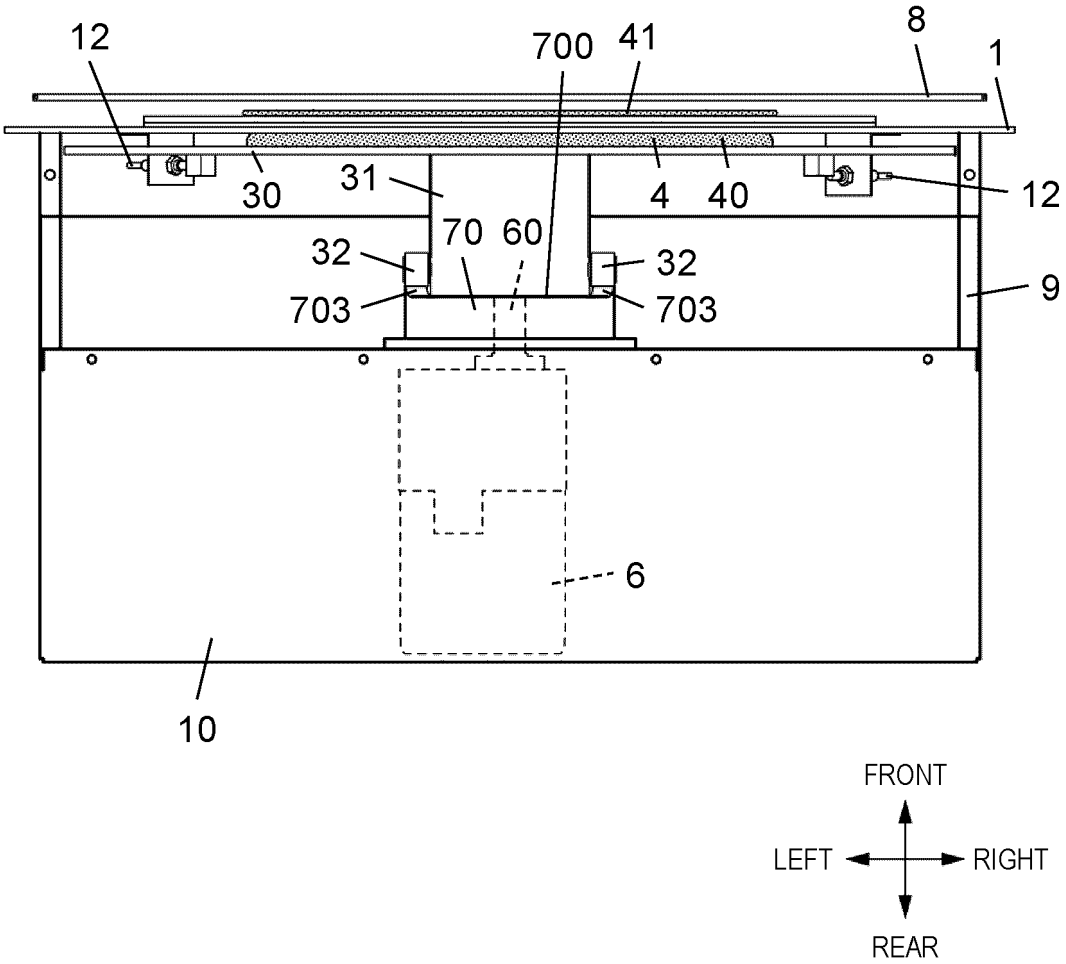
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FIG. 6

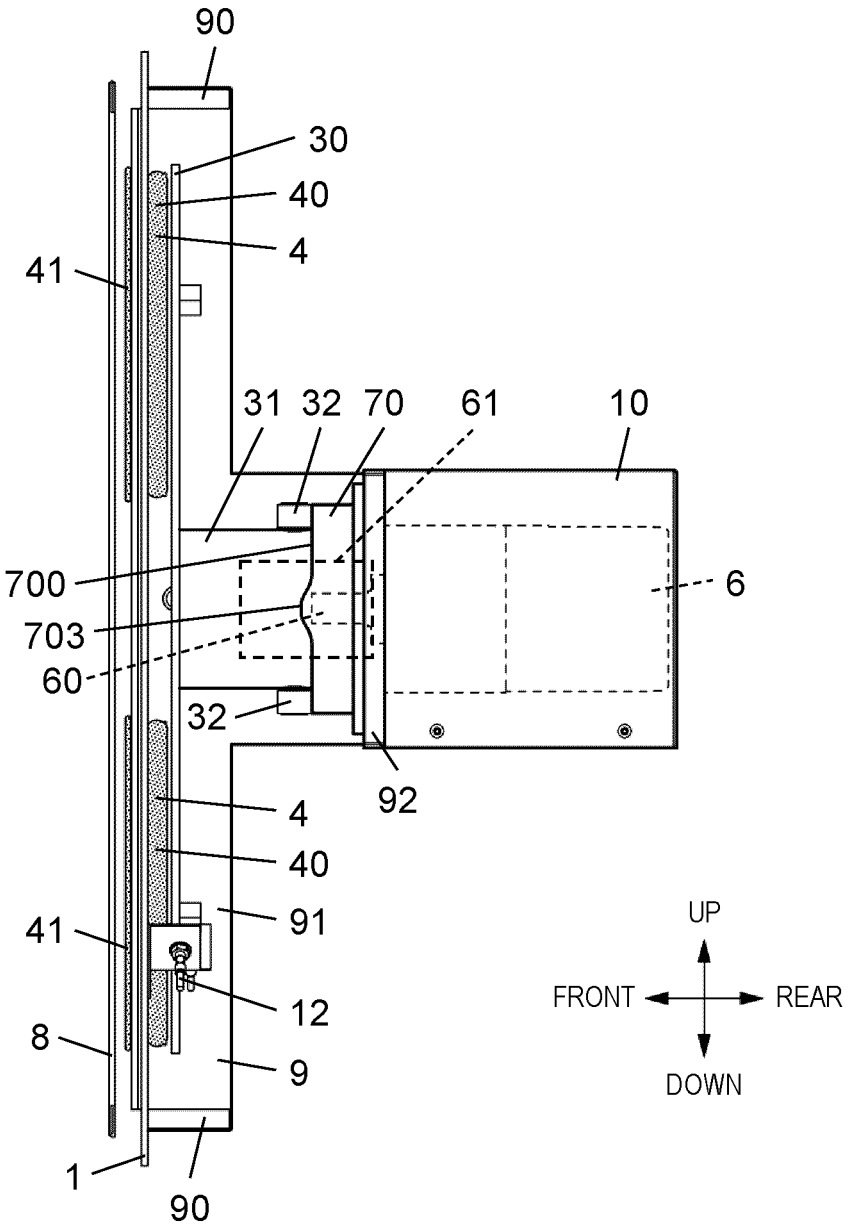
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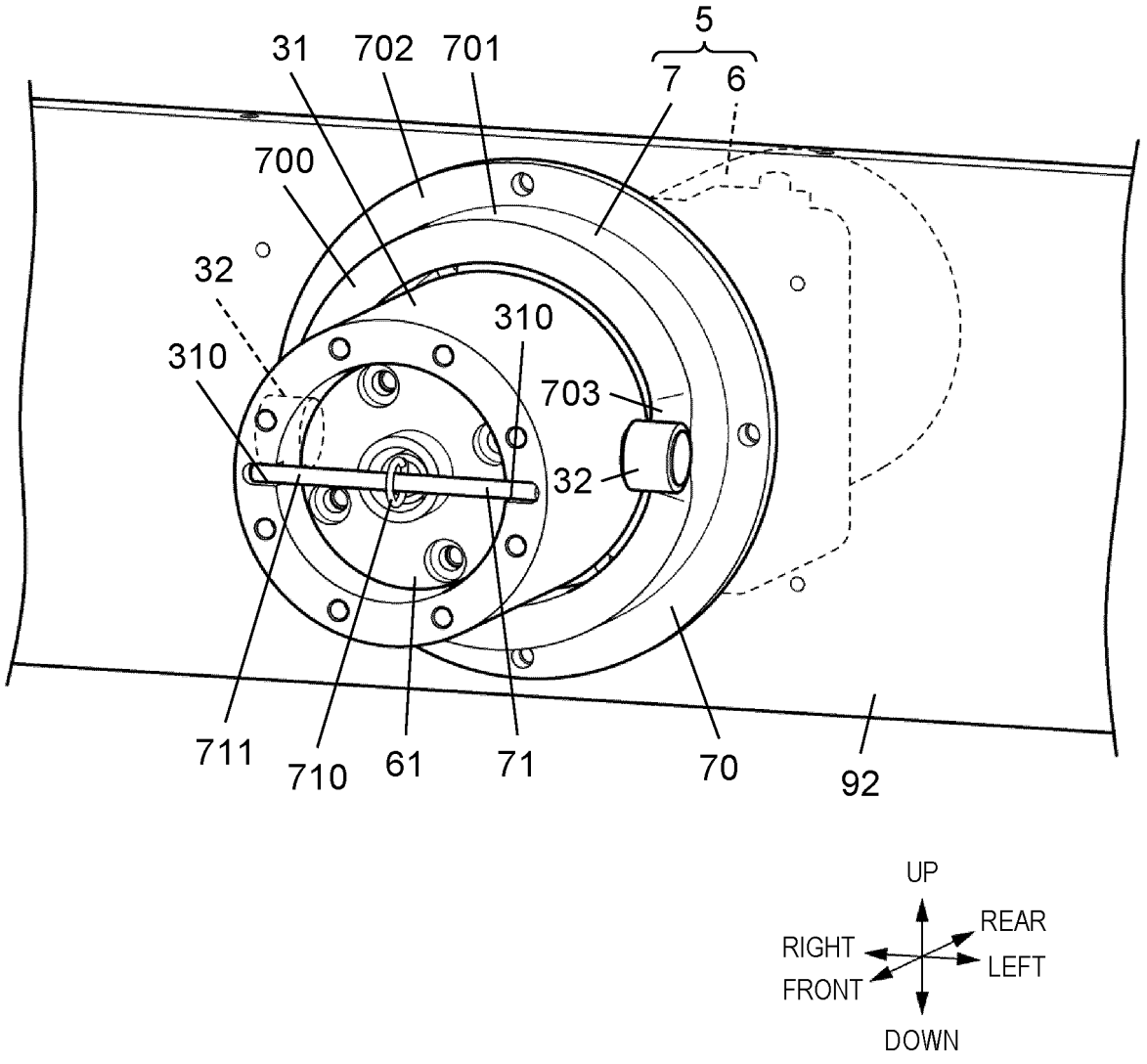
FIG. 7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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2023/013766

A. CLASSIFICATION OF SUBJECT MATTER

F24F 13/14(2006.01)i
FI: F24F13/14 H

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

Published examined utility model applications of Japan 1922-1996
Published unexamined utility model applications of Japan 1971-2023
Registered utility model specifications of Japan 1996-2023
Published registered utility model applications of Japan 1994-2023

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	JP 03-031676 A (MATSUSHITA REFRIG. CO., LTD.) 12 February 1991 (1991-02-12) page 2, upper right column, line 13 to page 3, lower left column, line 12, fig. 1-3	1-2, 7
Y		8
A		3-6
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 171882/1982 (Laid-open No. 075641/1984) (TOYOTA MOTOR CORP.) 22 May 1984 (1984-05-22), specification, page 2, line 3 to specification, page 4, line 15, fig. 1-5	8
A	JP 2019-027709 A (IBA SEKKEI JIMUSHO KK) 21 February 2019 (2019-02-21) entire text, all drawings	1-8
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 132133/1972 (Laid-open No. 087240/1974) (YODOGAWA STEEL WORKS, LTD.) 29 July 1974 (1974-07-29), entire text, all drawings	1-8
A	JP 46-021430 Y1 (MITSUBISHI HEAVY INDUSTRIES, LTD.) 23 July 1971 (1971-07-23) entire text, all drawings	1-8

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

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"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
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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
05 June 2023	**13 June 2023**
Name and mailing address of the ISA/JP **Japan Patent Office (ISA/JP)** **3-4-3 Kasumigaseki, Chiyoda-ku, Tokyo 100-8915** **Japan**	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2023/013766

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 119866/1985 (Laid-open No. 028797/1987) (NIPPON FRUEHAUF CO., LTD.) 21 February 1987 (1987-02-21), entire text, all drawings	1-8

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/JP2023/013766

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
JP 03-031676 A	12 February 1991	(Family: none)	
JP 59-075641 U1	22 May 1984	(Family: none)	
JP 2019-027709 A	21 February 2019	(Family: none)	
JP 49-087240 U1	29 July 1974	(Family: none)	
JP 46-021430 Y1	23 July 1971	(Family: none)	
JP 62-028797 U1	21 February 1987	(Family: none)	

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REFERENCES CITED IN THE DESCRIPTION

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- JP 2010271037 A **[0004]**