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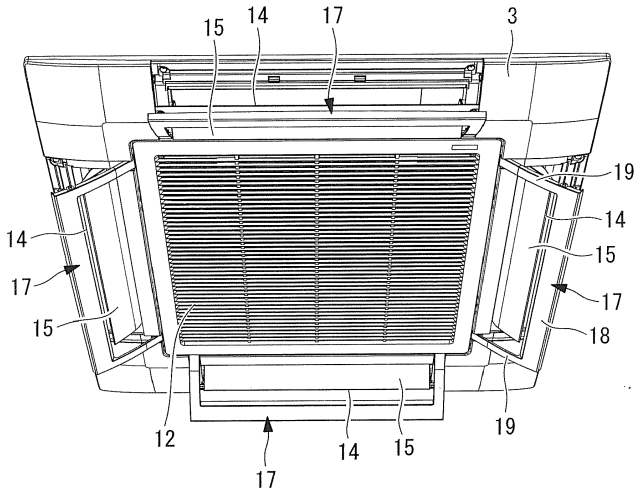
(54) AIR CONDITIONER

(57) Provided is an air conditioner with which the controllability of an air-flow direction by means of a dedicated louver and suppression of draft perception at the louver position can be achieved simultaneously and that includes an air wing that has a simple configuration, that operates smoothly, and that does not detract from the external design. The air conditioner includes an outlet (14) that is provided on a panel body (3) and also includes a louver (15) that is provided pivotally at the outlet (14). The air conditioner further includes an air wing (17) that is provided outside the outlet (14) of the panel body (3) and that is pivotable between a withdrawn position, at which the air wing (17) constitutes a common plane with the panel body (3), and a louver-direction position, at which the air wing (17) faces the air-conditioning air flow blown out from the outlet (14). The air conditioner also includes a pivot mechanism for pivoting the air wing (17) between the two positions.

FIG. 3



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Description

{Technical Field}

[0001] The present invention relates to an air conditioner having an air wing that is movable to a position facing an outlet so that draft perception caused by an air-conditioning air flow directly blowing onto someone can be avoided.

{Background Art}

[0002] An air conditioner that is installed at an indoor ceiling has a panel called a ceiling panel or a decorative panel under a unit body, an inlet for sucking indoor air is provided in a central region of a panel body, and multiple outlets for blowing out air-conditioning air flows are open in the downward direction around the inlet. In most cases, the multiple outlets are provided in one direction, two directions, or four directions around the inlet. Furthermore, air-flow direction louvers for adjusting the outlet directions of the air-conditioning air flows are pivotally provided via motors at the individual outlets to allow adjustment of the air-flow directions in arbitrary directions.

[0003] However, even though the outlet directions of the air-conditioning air flows are adjustable by means of the air-flow direction louvers provided at the outlets, as described above, depending on the louver angles, etc., there have been cases where a person under the outlets is directly blown by the air-conditioning air flows and perceives a draft. An example of a measure for avoiding draft perception in such cases is to additionally install on the panel body, as an optional part, a wing part (hereinafter referred to as an air wing) for interrupting an air-conditioning air flow at a position facing an outlet to change the air-flow direction.

[0004] According to Patent Literature 1, since an ordinary air-flow-direction control plate is too narrow to sufficiently suppress draft perception by a person under an outlet, a first arm one end of which is pivotally attached to a panel body, a second arm rotatably provided via a link member at the other end of the first arm, a wide air-flow-direction control louver fixed at the distal end of the second arm, and a stopper for regulating rotation with respect to the first arm are provided. Furthermore, pivoting is enabled between a position at which the wide air-flow-direction control louver and the first and second arms are elevated to close the outlet and withdrawn at the panel surface and a position at which the first and second arms are extended downward so that the air-flow-direction control louver faces the outlet to control the air-flow direction.

{Citation List}

{Patent Literature}

[0005] {PTL 1}
Japanese Unexamined Patent Application, Publication No. 2010-32062

{Summary of Invention}

{Technical Problem}

[0006] However, there have been problems in the case where the air wing is additionally installed as an option. For example, it is necessary to separately purchase the air wing. Moreover, once the air wing is installed on the panel body, since the air wing is fixed at a high position near the ceiling, it is not possible to readily change the direction thereof. Furthermore, since the installed air wing remains constantly hoisted (or oriented) downward from the surface of the panel body, the visual impression of the panel body and the ceiling is compromised.

[0007] As for the configuration according to Patent Literature 1, since priority is given to suppressing draft perception, it is difficult to allow both air-flow direction control for suppressing draft perception and air-flow direction control for rather enjoying draft perception, which does not allow arbitrary selection according to the user's preference. In addition, with the configuration according to Patent Literature 1, since the ends of the wide air-flow-direction control louver are moved upward and downward by means of a link mechanism, twisting easily occurs. Thus, there have been problems such as the difficulty of ensuring smooth operation over a long period.

[0008] The present invention has been made in view of the situation described above, and it is an object thereof to provide an air conditioner having an air wing that allows both air-flow direction control by means of a dedicated louver and suppression of draft perception at the louver position and that has a simple configuration such that smooth operation is ensured and the visual impression of the external design is maintained.

{Solution to Problem}

[0009] A first aspect of the present invention is an air conditioner including an outlet for an air-conditioning air flow, the outlet being provided on a panel body; a louver that is pivotally provided at the outlet in order to adjust an outlet direction of the air-conditioning air flow; an air wing that is provided outside the outlet on the panel body and that is pivotable between a withdrawn position, at which the air wing constitutes a common plane with the panel body, and a louver-direction position, at which the air wing faces the air-conditioning air flow blown out from the outlet; and a pivot mechanism for pivoting the air wing between the withdrawn position and the louver-direction position.

[0010] According to the first aspect of the present invention, the air wing that is pivotable between the withdrawn position, at which the air wing constitutes a common plane with the panel body, and the louver-direction position, at which the air wing faces the air-conditioning air flow blown out from the outlet, is provided outside the outlet that may be open in the downward direction from the panel body. The air wing is pivotable by the pivot mechanism selectively between the withdrawn position and the louver-direction position. In the case where the air-conditioning air flow blown out from the outlet directly blows on a person under the outlet, depending on the louver position, whereby the person perceives a draft, it is possible to alleviate draft perception by pivoting the air wing provided outside the outlet to the louver-direction position facing the air-conditioning air flow blown out from the outlet and interrupting and changing the air-conditioning air flow in the louver direction. In the case where the person does not perceive draft or rather feels like perceiving a draft, it is possible to pivot and withdraw the air wing to the withdrawn position so that the air wing constitutes a common plane with the panel body, whereby the air wing is withdrawn in such a manner as to be integrated with the panel body. Thus, it is possible to arbitrarily choose to use or not to use the air wing, which makes it possible to readily eliminate discomfort due to draft perception, thereby improving the feeling of air conditioning. When the air wing is not used, the air wing is withdrawn in such a manner as to be integrated with the panel body, so that the impression of the design can be maintained. Furthermore, it is possible to allow both air-flow direction control by means of a dedicated louver and suppression of draft perception at the louver position.

[0011] In the air conditioner according to the first aspect of the present invention, the air wing may have a wing portion that faces the air-conditioning air flow blown out in the louver direction to interrupt the air flow in the louver direction and may also have arm portions that are provided integrally on either end of the wing portion and whose proximal ends are pivotally supported on the panel body.

[0012] With this configuration, since the air wing has the wing portion that faces the air-conditioning air flow blown out in the louver direction to interrupt the air flow in the louver direction and also has the arm portions that are provided integrally on either end of the wing portion and whose proximal ends are pivotally supported on the panel body, it is possible to interrupt and change the air-conditioning air flow in the louver direction by pivoting the wing portion to the louver-direction position via the arm portions pivotally supported on the panel body so that the wing portion faces the air-conditioning air flow blown out from the outlet. This makes it possible to selectively alleviate or eliminate draft perception by pivoting the air wing to the louver-direction position as needed while maintaining the air-flow-direction control function of the louver provided at the outlet.

[0013] In the air conditioner according to the first aspect of the present invention, the wing portion may have a subwing that comes to a position along the wing portion when the air wing is pivoted to the withdrawn position and that stands at a position facing the air-conditioning air flow when the air wing is pivoted to the louver-direction position facing the air-conditioning air flow.

[0014] With this configuration, since the wing portion has a subwing that comes to a position along the wing portion when the air wing is pivoted to the withdrawn position and that stands at a position facing the air-conditioning air flow when the air wing is pivoted to the louver-direction position facing the air-conditioning air flow, irrespective of the pivot angle of the air wing itself, the subwing stands at the position facing the air-conditioning air flow when the wing portion is pivoted to the louver-direction position, so that the air-conditioning air flow is interrupted reliably. Furthermore, since the subwing comes to the position along the wing portion when the wing portion is pivoted to the withdrawn position, the subwing does not hinder withdrawal. Accordingly, it is possible to reliably attain the effect of reducing draft perception by means of the air wing.

[0015] In any one of the air conditioners described above, the panel body may be provided with multiple outlets of the type described above, and air wings of the type described above may be provided in association with the individual outlets.

[0016] With this configuration, since the multiple outlets are provided on the panel body and the air wings are provided in association with the individual outlets, it is possible to alleviate draft perception by individually causing the air wings to function with the air-conditioning air flows blown out from any of the multiple outlets provided, for example, in two directions or four directions. Accordingly, it is possible to selectively alleviate or eliminate draft perception irrespective of which one of the multiple outlets a person is under.

[0017] In the air conditioner described above, the air wings may be individually pivotable by pivot mechanisms of the type described above, the pivot mechanisms being provided independently of each other.

[0018] With this configuration, since the air wings are pivotable individually by the pivot mechanisms that are provided

independently of each other, even in the case where a person perceives a draft due to the air-conditioning air flow blown out from one of the outlets because the louver positions at the multiple outlets vary, it is possible to individually pivot the air wing provided in association with the relevant outlet to the predetermined louver-direction position by using the associated independent pivot mechanism. Thus, even with the air conditioner in which the louvers provided at the multiple outlets are individually pivotable, it is possible to alleviate or eliminate draft perception as needed by individually pivoting the air wings in association with the individual louver positions.

[0019] In any one of the air conditioners described above, the air wing may be configured to be pivotable to a position corresponding to the position of the louver via the pivot mechanism when an instruction to pivot to the louver-direction position facing the air-conditioning air flow is issued.

[0020] With this configuration, since the air wing is configured to be pivotable to a position corresponding to the position of the louver via the pivot mechanism when an instruction to pivot to the louver-direction position facing the air-conditioning air flow is issued, when alleviating draft perception by pivoting the air wing, it is possible to reliably pivot the air wing to a position corresponding to the pivot position of the louver, thereby placing the air wing at the position facing the air-conditioning air flow blown out in the louver direction. Accordingly, it is possible to reliably attain the effect of alleviating or eliminating draft perception by pivoting the air wing to the position corresponding to the louver position irrespective of the pivot position of the louver.

[0021] In any one of the air conditioners described above, the pivot mechanism may be a wire-based pivot mechanism including an actuator that is provided in the proximity of a pivot point at one end of the air wing on the panel body and that can be rotated forward and backward, a reel that is provided on an output shaft of the actuator, and a wire one end of which is connected to the reel so that it can be wound and unwound and the other end of which is connected to the proximity of a pivot point at the other end of the air wing via wire guides individually provided at a position on the panel body corresponding to one end of the air wing, a position at the one end of the air wing, a position at the other end of the air wing, and a position on the panel body corresponding to the other end of the air wing.

[0022] With this configuration, the pivot mechanism is a wire-based pivot mechanism including the actuator that is provided in the proximity of the pivot point at one end of the air wing and that can be rotated forward and backward, the reel provided on the output shaft of the actuator, and the wire one end of which is connected to the reel so that the wire can be wound and unwound and the other end of which is connected to the proximity of the pivot point at the other end of the air wing via the wire guides individually provided at predetermined positions. Thus, it is possible to pivot the air wing to the withdrawn position or the louver-direction position by rotating the actuator forward or backward to hoist the air wing upward or downward from the pivot point via the wire wound or unwound by the reel. Thus, it is possible to pivot the air wing, having a horizontally elongated shape along the outlet, smoothly to the withdrawn position or the louver-direction position by simultaneously hoisting the ends of the air wing upward or downward via the single wire. This serves to ensure the reliability of movement and to reduce the number of parts of the pivot mechanism, thereby simplifying the configuration and reducing costs.

[0023] In any one of the air conditioners described above, the pivot mechanism may be a gear-based pivot mechanism including a rotary shaft that extends in a lengthwise direction of the air wing and whose ends are pivotally supported individually on the panel body, an actuator that can be rotated forward and backward, and a gear mechanism that transmits the rotation of the actuator to the rotary shaft.

[0024] With this configuration, the pivot mechanism is a gear-based pivot mechanism including a rotary shaft that extends in a lengthwise direction of the air wing and whose ends are pivotally supported individually on the panel body, an actuator that can be rotated forward and backward, and a gear mechanism that transmits the rotation of the actuator to the rotary shaft. Thus, it is possible to simultaneously pivot the ends of the air wing to the withdrawn position or the louver-direction position via the single rotary shaft by rotating the actuator forward or backward to rotate the rotary shaft via the reduction gear mechanism. This makes it possible to simultaneously and smoothly pivot the ends of the air wing, having a horizontally elongated shape along the outlet, to the withdrawn position or the louver-direction position via the single rotary shaft. This serves to ensure the reliability of movement over a long period.

{Advantageous Effects of Invention}

[0025] According to the present invention, in the case where an air-conditioning air flow blown out from an outlet directly blows on someone under the outlet depending on a louver position, whereby the person perceives a draft, it is possible to alleviate draft perception by pivoting the air wing provided outside the outlet to the louver-direction position facing the air-conditioning air flow blown out from the outlet and interrupting and changing the air-conditioning air flow in the louver direction. In the case where the person does not perceive draft or rather feels like perceiving a draft, it is possible to pivot and withdraw the air wing to the withdrawn position so that the air wing constitutes a common plane with the panel body, whereby the air wing is withdrawn in such a manner as to be integrated with the panel body. Thus, it is possible to arbitrarily choose to use or not to use the air wing, which makes it possible to readily eliminate discomfort due to draft perception, thereby improving the feeling of air conditioning. When the air wing is not used, the air wing is

withdrawn in such a manner as to be integrated with the panel body, so that the impression of the design can be maintained. Furthermore, it is possible to allow both air-flow direction control by means of a dedicated louver and suppression of draft perception at the louver position.

{Brief Description of Drawings}

[0026]

{Fig. 1}
Fig. 1 is a partially cutaway, perspective view of an air conditioner according to a first embodiment of the present invention, as seen from below.
{Fig. 2}
Fig. 2 is a perspective view showing a state in which an air wing provided on a panel body of the air conditioner is placed at a withdrawn position.
{Fig. 3}
Fig. 3 is a perspective view showing a state in which the air wing provided on the panel body of the air conditioner is placed at a louver-direction position.
{Fig. 4}
Fig. 4 is a perspective view showing an actuator installation region of a wire-based pivot mechanism of the air wing in a state in which the air wing is placed at the withdrawn position, as viewed from the inner side.
{Fig. 5}
Fig. 5 is a perspective view showing the actuator installation region of the wire-based pivot mechanism of the air wing in a state in which the air wing is placed at the louver-direction position, as viewed from the inner side.
{Fig. 6}
Fig. 6 is a perspective view showing the placement and configuration of the wire-based pivot mechanism in a state in which the air wing is placed at the withdrawn position.
{Fig. 7}
Fig. 7 is a perspective view showing the wire-based pivot mechanism in a state in which the air wing is placed at the withdrawn position, as seen obliquely from below.
{Fig. 8}
Fig. 8 is a perspective view showing the wire-based pivot mechanism in a state in which the air wing is placed at the louver-direction position, as seen obliquely from below.
{Fig. 9}
Fig. 9 is a sectional view showing the positional relationship in a state where the air wing is placed at the withdrawn position and the louver is placed at a closed position.
{Fig. 10}
Fig. 10 is a sectional view showing the positional relationship in a state where the louver is placed at a horizontal outlet position and the air wing is placed at the louver-direction position.
{Fig. 11}
Fig. 11 is a sectional view showing the positional relationship in a state where the louver is placed at a downward outlet position and the air wing is placed at the louver-direction position.
{Fig. 12}
Fig. 12 is a perspective view showing an actuator installation region of a gear-based pivot mechanism according to a second embodiment of the present invention in a state in which an air wing is placed at a withdrawn position, as viewed from below.
{Fig. 13}
Fig. 13 is a perspective view of the actuator installation region of the gear-based pivot mechanism in a state in which the air wing is placed at a louver-direction position, as seen from below.
{Fig. 14}
Fig. 14 shows (A) a perspective view and (B) an enlarged perspective view of a subwing installation region, showing the placement and configuration of the gear-based pivot mechanism in a state in which the air wing is placed at the withdrawn position.
{Fig. 15}
Fig. 15 is a perspective view showing the placement and configuration of the gear-based pivot mechanism in a state where the air wing is placed at the louver-direction position.
{Fig. 16}
Fig. 16 is an exploded perspective view showing an actuator and a gear of the gear-based pivot mechanism.
{Fig. 17}

Fig. 17 is a perspective view showing a state in which the air wing is placed at the withdrawn position by the actuator of the gear-based pivot mechanism.

{Fig. 18}

Fig. 18 is a perspective view showing a state in which the air wing is placed at the louver-direction position by the actuator of the gear-based pivot mechanism.

{Description of Embodiments}

[0027] Embodiments of the present invention will be described below with reference to the drawings.

[First Embodiment]

[0028] Now, a first embodiment of the present invention will be described with reference to Figs. 1 to 11.

[0029] Fig. 1 shows a partially cutaway, perspective view of an air conditioner 1 according to this embodiment, as seen obliquely from below. Fig. 2 shows a perspective view of a state in which air wings provided on a panel body of the air conditioner 1 are placed at withdrawn positions. Fig. 3 shows a perspective view of a state in which the air wings are placed at louver-direction positions. As shown in Fig. 1, the air conditioner 1 here is a type of air conditioner that is installed on an indoor ceiling and that has outlets 14 directed in four directions of a panel body 3 provided at the bottom of a unit body 2.

[0030] The unit body 2 is a rectangular-parallelepiped box that is installed in a ceiling and whose bottom is open. The unit body 2 includes a turbofan 4 that is installed in a central region of the interior thereof, a heat exchanger 5 that is formed in a rectangular shape surrounding the turbofan 4, a drain pan 6 that is provided under the heat exchanger 5, an air outlet path 7 that is formed between the outer wall of the drain pan 6 and the inner circumferential surface of the unit body 2, a bell mouth 8 that is provided on the intake side of the turbofan 4, etc. The air conditioner 1 is connected to an outdoor unit via two refrigerant pipes 9, namely, a liquid pipe and a gas pipe, as well as an electrical wire 10.

[0031] The panel body 3 that is installed so as to cover the bottom of the unit body 2, which is also referred to as a ceiling panel or a decorative panel, is a substantially square panel and has an opening (inlet) 11 for sucking indoor air in a central region thereof. Furthermore, a sucking grill 12 is provided at the inlet 11. The sucking grill 12 is provided with an air filter (not shown) on the inner surface thereof. In order to allow changing or cleaning of the air filter, the sucking grill 12 is installed such that it can be moved vertically relative to the panel body 3, down to and up from the proximity of a floor in a room, by means of a wire 13, an elevating motor (not shown), etc. Alternatively, an air-filter automatic cleaning mechanism may be included in order to automatically clean the air filter.

[0032] Furthermore, the panel body 3 is provided with the outlets 14 individually directed in four directions corresponding to the four sides of the panel body 3 so as to surround the inlet 11 for taking in indoor air. Air that has been cooled or heated by the heat exchanger 5 is blown out indoors from the outlets 14 as air-conditioning air flows. The outlets 14 directed in four directions are individually provided with pivotable louvers 15 for adjusting the outlet directions of the air-conditioning air flows (air-flow directions). The louvers 15 are pivotable individually and independently via actuators (motors) 16 (see Fig. 12, etc.).

[0033] Furthermore, as shown in Figs. 2 and 3, the panel body 3 is provided with air wings 17 that are provided on the outer sides of the individual outlets 14. The air wings 17 are pivotable between withdrawn positions (the positions shown in Fig. 2), at which the air wings 17 constitute a common plane with the panel body 3, and louver-direction positions (the positions shown in Fig. 3), at which the air wings 17 face the air-conditioning air flows that are blown out from the outlets 14. The air wings 17 are plate-shaped parts that are projected to the louver-direction positions facing the outlets 14 to interrupt the air-conditioning air flows and change the air-flow directions. The air wings 17 serve to reduce or eliminate the perception of a draft by persons under the outlets 14, caused by direct blowing of the air-conditioning air flows from the outlets 14.

[0034] Each of the air wings 17 has a gate-like shape constituted of a wing portion 18 and arm portions 19. The wing portion 18 is projected to a position facing the air-conditioning air flow blown out from the associated outlet 14 in the louver direction to interrupt the air-conditioning air flow. The arm portions 19 are formed integrally at either end of the wing portion 18. The proximal ends of the arm portions 19 are supported pivotally with respect to the panel body 3 via support shafts 20 (see Fig. 6, etc.), which makes the arm portions 19 pivotable between the withdrawn position and the louver-direction position described earlier. The following describes the specific configuration of the air wings 17 with reference to Figs. 4 to 11.

[0035] The wing portion 18 and arm portions 19 of each of the air wings 17 constitute parts of the panel body 3. When the air wing 17 is pivoted to the withdrawn position shown in Fig. 2, the surfaces (lower faces) of the wing portion 18 and the arm portions 19 constitute a common plane with the surface (lower face) of the panel body 3. The wing portion 18 is a plastic, plate-shaped part having a certain width. The wing portion 18 has substantially the same length as the outlet 14, is disposed along the periphery of the outlet 14, and forms a part of the corresponding edge of the panel body

3. The arm portions 19 are formed integrally on either ends of the wing portion 18 and have a narrower width than the wing portion 18. The wing portion 18 and the arm portions 19 thus form a gate-like shape. Furthermore, ribs are formed integrally on the rear faces of the wing portion 18 and the arm portions 19 to ensure strength and rigidity of the individual portions.

[0036] Furthermore, support shafts 20 that support the air wing 17 pivotally with respect to the panel body 3 are formed integrally at the proximal ends of the arm portions 19. Furthermore, the wing portion 18 is provided with a subwing 21. The proximal end of the subwing 21 is supported pivotally at the inner edge of the wing portion 18. When the air wing 17 is pivoted to the withdrawn position, the outer edge of the subwing 21 comes to a withdrawn position (see Fig. 9) following the bottom face of the wing portion 18. When the air wing 17 is pivoted to the louver-direction position, the subwing 21 is pivoted to a position at which the outer edge thereof stands upward and interrupts the air-conditioning air flow (see Figs. 10 and 11).

[0037] The subwing 21 has support shafts 22 on either end thereof, and the support shafts 22 are supported pivotally at bearings 23 provided on the wing portion 18. Furthermore, in order to allow pivoting to the louver-direction position, a wire 29 is attached to the subwing 21 so that the subwing 21 can be hoisted downward or upward, as will be described later. Thus, when the air wing 17 is hoisted downward by its own weight, the outer edge of the subwing 21 stands upward from the wing portion 18, as described earlier. Alternatively, a coil spring 24 may be provided to pivotally urge the subwing 21 in such a direction that the subwing 21 stands, as in a second embodiment described later.

[0038] The air wing 17 is pivotable via a pivot mechanism 25 between the withdrawn position (the position shown in Fig. 2), at which the air wing 17 constitutes a common plane with the panel body 3, and the louver-direction position (the position shown in Fig. 3), at which the air wing 17 faces the air-conditioning air flow blown out from the outlet 14. The pivot mechanism 25 includes an actuator (motor) 27 that is fixed on the panel body 3 in the proximity of the pivot point of one of the arm portions 19 of the air wing 17, a reel 28 that is fixed to the output shaft of the actuator 27, and the wire 29 one end of which is connected to the reel 28 so that the wire 29 can be wound and unwound.

[0039] The other end of the wire 29 is connected to and fixed at the proximity of the pivot point of the arm portion 19 at the other end of the air wing 17 via multiple wire guides 30 to 34 individually installed at a position on the panel body 3 along the arm portion 19, a position on the panel body 3 corresponding to and immediately above one end of the wing portion 18, a position at one end of the subwing 21, a position at the other end of the subwing 21, a position on the panel body 3 corresponding to and immediately above the other end of the wing portion 18.

[0040] The pivot mechanism 25 is a wire-based pivot mechanism that unwinds and winds the wire 29 via the reel 28 that is rotated forward and backward by the actuator 27 to hoist downward or upward and pivot the outer edge of the air wing 17. The pivot mechanism 25 makes it possible to simultaneously and smoothly pivot both ends of the air wing 17 between the withdrawn position and the louver-direction position by unwinding and winding the single wire 29.

[0041] In order to independently and individually pivot the four air wings 17 provided in association with the outlets 14 directed in four directions, four pivot mechanisms 25 each configured as described above are provided in association with the individual air wings 17. In order to construct the four pivot mechanisms 25, two sets of actuators 27 and reels 28 are disposed facing each other at each of two diagonal positions among the four directions, and these are covered with a common lid member (not shown) so as to prevent entry of animals, insects, worms, or dust from the ceiling space.

[0042] Furthermore, when a user performs an ON operation via a remote controller to select and activate an air wing 17 in order to reduce or eliminate the perception of draft, the actuator 27 of the pivot mechanism 25 associated with the air wing 17 is rotated forward to rotate the reel 28 in such a direction that the wire 29 is unwound. Accordingly, the air wing 17 moves downward by its own weight and pivots to the louver-direction position facing the outlet direction of the air-conditioning air flow adjusted by the louver 15. That is, when activated by an ON operation via the remote controller, each of the pivot mechanisms 25 detects the pivot position of the actuator 16 (see Fig. 12, etc.) for pivoting the louver 15 and pivots the air wing 17 to the louver-direction position corresponding to that position.

[0043] Accordingly, for example, when the louver 15 is placed at a position at which the outlet direction is horizontal, as shown in Fig. 10, the air wing 17 is pivoted to the louver-direction position corresponding to that position, and the subwing 21 stands to interrupt and change the direction of the air-conditioning air flow to the louver direction, thereby reducing the perception of draft. As another example, when the louver 15 is placed at a position at which the outlet direction is downward, as shown in Fig. 11, the air wing 17 is pivoted to the louver-direction position corresponding to that position, and the subwing 21 stands to interrupt and change the direction of the air-conditioning air flow to the louver direction, thereby reducing or eliminating the perception of draft.

[0044] On the other hand, in the case where the user does not particularly perceive draft caused by the air-conditioning air flow or the user feels like experiencing the perception of draft, the user performs an OFF operation via the remote controller to backward rotate the actuator 27 of the pivot mechanism 25 to rotate the reel 28 in such a direction that the wire 29 is wound, thereby hoisting the air wing 17 upward. This makes it possible to pivot the air wing 17 to the withdrawn position, at which the air wing 17 constitutes a common plane with the surface of the panel body 3, as shown in Fig. 9.

[0045] According to this embodiment, with the configuration described above, the following operation and advantages are afforded.

[0046] During the operation of the air conditioner 1 configured as described above, by the rotation of the turbofan 4, indoor air is sucked into the unit body 2 from the inlet 11 of the panel body 3 via the sucking grill 12 and the bell mouth 8. Air that has been blown out in the centrifugal direction from the turbofan 4 in the unit body 2 undergoes heat exchange with the refrigerant while passing through the heat exchanger 5 disposed around the turbofan 4, whereby the air is cooled or heated to control the temperature thereof. Then, the air is passed through the air outlet path 7 and is blown out indoors from the outlets 14 provided in four directions of the panel body 3, whereby the air serves for indoor air conditioning.

[0047] The outlet directions of the air-conditioning air flows that are blown out indoors from the outlets 14 of the panel body 3 can be adjusted by using the louvers 15 provided at the outlets 14. Depending on the setting made by the user, it is possible to adjust the outlet directions by driving the actuators (motors) 16 (see Fig. 12) via the remote controller to change the louver angles to arbitrary directions. Since it is possible to individually and independently change the angles of the louvers 15 for the individual outlets 14 via the actuators 16 by using the remote controller, the user can arbitrarily set the angles to adjust the outlet directions.

[0048] It is generally considered that the desirable outlet direction of an air-conditioning air flow is a horizontal direction during cooling operation and a downward direction during heating operation. However, depending on the angles of the louvers 15 or the position of the user under the air conditioner 1, there are cases where the user feels uncomfortable due to the perception of draft caused by being directly blown by the air-conditioning air flows. It is possible to alleviate this perception of draft to a certain extent by changing the angles of the louvers 15. However, since this affects the overall feeling of air conditioning, it is difficult to fully eliminate the perception of draft just by changing the angles of the louvers 15.

[0049] In view of this problem, according to this embodiment, the air wings 17 are provided separately from the louvers 15. More specifically, the air wings 17 are provided on the outer sides of the outlets 14 having openings facing downward from the panel body 3. The air wings 17 can be pivoted by the pivot mechanisms 25 selectively between the withdrawn positions, at which the air wings 17 constitute a common plane with the panel body 3, and the louver-direction positions, at which the air wings 17 face the air-conditioning air flows blown out from the outlets 14. With this configuration, in the case where a user under the outlets 14 perceives a draft due to directly being blown by the air-conditioning air flows blown out from the outlets 14 depending on the louver positions, it is possible to alleviate the perception of draft by projecting the air wings 17 to the louver-direction positions facing the air-conditioning air flows blown out from the outlets 14 to interrupt and change the directions of the air-conditioning air flows in the louver directions.

[0050] In the case where the user does not perceive draft or the user rather feels like perceiving a draft, it is possible to pivot the air wings 17 to the withdrawn positions, whereby the air wings 17 are withdrawn in such a fashion that the air wings 17 constitute a common plane and are integrated with the panel body 3. Accordingly, it is possible to arbitrarily choose to use or not to use the air wings 17, thereby simply eliminating discomfort due to the perception of draft, which improves the feeling of air conditioning. Furthermore, when the air wings 17 are not used, the air wings 17 are withdrawn in such a fashion that the air wings 17 are integrated with the panel body 3, which serves to maintain the impression of the design. In addition, it is possible to simultaneously control the air-flow directions by means of the dedicated louvers and suppress the perception of draft at the louver positions.

[0051] Furthermore, each of the air wings 17 has the wing portion 18 and the arm portions 19. The wing portion 18 faces the air-conditioning air flow blown out in the louver direction to interrupt the air-conditioning air flow. The arm portions 19 are formed integrally at either end of the wing portion 18, with the proximal ends thereof pivotally supported on the panel body 3. With this configuration, it is possible to interrupt and change the direction of the air-conditioning air flow by pivoting the wing portion 18 via the arm portions 19 pivotally supported on the panel body 3 to project the wing portion 18 to a position facing the air-conditioning air flow blown out in the louver direction from the associated outlet 14. Accordingly, it is possible to selectively alleviate or eliminate the perception of draft by pivoting the air wing 17 to the louver-direction position as needed, while maintaining the function of controlling the air-flow direction by the louver 15 provided at the outlet 14.

[0052] Furthermore, the air wing 17 is provided with the subwing 21. The subwing 21 comes to a position along the wing portion 18 when the air wing 17 is pivoted to the withdrawn position. On the other hand, the subwing 21 stands at a position facing the air-conditioning air flow when the air wing 17 is pivoted to the louver-direction position facing the air-conditioning air flow. Thus, irrespective of the pivot angle of the air wing 17 itself, when the wing portion 18 is pivoted to the louver-direction position, the subwing 21 stands at a position facing the air-conditioning air flow to reliably interrupt the air-conditioning air flow. Furthermore, when the wing portion 18 is pivoted to the withdrawn position, the subwing 21 comes to a position along the wing portion 18, so that the subwing 21 does not hinder withdrawal of the air wing 17. Thus, it is possible to reliably ensure the effect of alleviating the perception of draft by the air wing 17.

[0053] Furthermore, in this embodiment, the outlets 14 are provided in four directions of the panel body 3, and the air wings 17 are provided in association with the individual outlets 14. With this configuration, it is possible to alleviate the perception of draft by individually causing the air wings 17 to function with the air-conditioning air flows blown out from any of the outlets 14 provided, for example, in one direction, two directions, or four directions. Accordingly, it is possible to selectively alleviate or eliminate the perception of draft irrespective of which one of the multiple outlets 14 the user is

under.

[0054] Furthermore, the air wings 17 are individually pivotable by the pivot mechanisms 25 that are provided independently. Thus, even in the case where the air-conditioning air flow blown out from one of the outlets 14 results in the perception of draft due to variations in the louver positions of the multiple outlets 14, it is possible to individually pivot the air wing 17 provided in association with that outlet 14 to the proper louver-direction position by means of the associated independent pivot mechanism 25. Accordingly, with the air conditioner 1, in which it is possible to individually pivot the louvers 15 provided at the multiple outlets 14, it is possible to alleviate or eliminate the perception of draft as needed by individually pivoting the air wings 17 associated with the individual louver positions.

[0055] Furthermore, the air wing 17 is pivotable to a position corresponding to the position of the louver 15 via the pivot mechanism 25 when a pivot instruction to the louver-direction position facing the air-conditioning air flow is issued. Thus, when the air wing 17 is pivoted to alleviate the perception of draft, it is possible to reliably pivot the air wing 17 to a position corresponding to the pivot position of the louver 15, thereby positioning the air wing 17 at a position facing the air-conditioning air flow blown out in the louver direction. Accordingly, it is possible to reliably alleviate or eliminate the perception of draft by pivoting the air wing 17 to a position corresponding to the louver position irrespective of the pivot position of the louver 15.

[0056] Furthermore, in this embodiment, the pivot mechanism 25 is a wire-based pivot mechanism that includes the actuator (motor) 27 that is provided in the proximity of the pivot point at one end of the air wing 17 and that can be rotated forward and backward, the reel 28 that is provided on the output shaft of the actuator 27, and the wire 29 one end of which is connected to the reel 28 so that the wire 29 can be wound and unwound and the other end of which is connected to the proximity of the pivot point at the other end of the air wing 17 via the multiple wire guides 30 to 34 individually installed at predetermined positions.

[0057] Thus, it is possible to pivot the air wing 17 to the withdrawn position or the louver-direction position by rotating the actuator 27 forward or backward to hoist the air wing 17 upward or downward from the pivot point via the wire 29 wound or unwound by the reel 28. Thus, it is possible to pivot the air wing 17, having a horizontally elongated shape along the outlet 14, smoothly to the withdrawn position or the louver-direction position by simultaneously hoisting the ends of the air wing 17 upward or downward via the single wire 29. This serves to ensure the reliability of movement and to reduce the number of parts of the pivot mechanism 25, thereby simplifying the configuration and reducing costs.

[Second Embodiment]

[0058] Next, a second embodiment of the present invention will be described with reference to Figs. 12 to 18.

[0059] This embodiment differs from the first embodiment described above in the configuration of a pivot mechanism 40 that pivots the air wing 17. This embodiment is otherwise the same as the first embodiment, so that descriptions of the commonalities will be omitted.

[0060] As shown in Figs. 12 and 13, the pivot mechanism 40 according to this embodiment is a gear-based pivot mechanism that includes an actuator (motor) 41, a rotary shaft 42, and a gear mechanism (reduction gear mechanism) 45. The actuator 41 can be rotated forward and backward and is disposed on the panel body 3 adjacent to the actuator (motor) 16 that pivots the louver 15 provided at the associated outlet 14. The rotary shaft 42 is pivotally supported on the panel body 3 via supports 43 close to the proximal ends of the arm portions 19 on either end of the air wing 17. Furthermore, the rotary shaft 42 is linked via link arms close to the proximal ends of the arm portions 19 on either end pivotally supported via the support shafts 20. The reduction gear mechanism 45 transmits the rotation of the actuator 41 to the rotary shaft 42.

[0061] Four gear-based pivot mechanisms 40 configured as described above are provided individually in association with the air wings 17 provided for the outlet 14. The four pivot mechanisms 40 make it possible to individually and independently pivot the air wings 17 selectively between the withdrawn positions and the louver-direction positions. Furthermore, in order to allow simultaneous pivoting of the arm portions 19 on either end of the air wing 17, the rotary shaft 42 extends in the lengthwise direction of the air wing 17 and pivotally supports either end of the air wing 17 with respect to the panel body 3, allowing simultaneous pivoting of the arm portions 19 on either end.

[0062] In this embodiment, as shown in Figs. 14 and 15, the subwing 21 provided on the wing portion 18 of each of the air wings 17 has the support shafts 22 on either end pivotally supported by the bearings 23 provided on the wing portion 18. Furthermore, the subwing 21 is installed so as to be constantly urged to pivot in a standing direction via coil springs 24 provided between the wing portion 18 and the subwing 21, for example, at three points along the lengthwise direction of the subwing 21.

[0063] As described above, also in this embodiment, the pivot mechanism 40 is a gear-based pivot mechanism constituted of the rotary shaft 42 that extends along the lengthwise direction of the air wing 17 and whose ends are pivotally supported individually on the panel body 3, the actuator 41 that can be rotated forward and backward, and the gear mechanism 45 that transmits the rotation of the actuator 41 to the rotary shaft 42 and this configuration, the actuator 41 is rotated forward or backward to rotate the rotary shaft 42 via the reduction gear mechanism 45. This makes it possible

to simultaneously pivot the arm portions 19 on either end of the air wing 17 via the single rotary shaft 42 to either the withdrawn position or the louver-direction position.

[0064] Also in this case, it is possible to simultaneously and smoothly pivot the ends of the air wing 17, having a horizontally elongated shape along the outlet 14, to the withdrawn position or the louver-direction position via the single rotary shaft 42. Accordingly, the same operation and advantages as those in the first embodiment are afforded, such as the reliability of movement over the long run.

[0065] The present invention is not limited to the embodiments described above, and modifications can be made as appropriate within the scope of the present invention. For example, although the above embodiments have been described in the context of examples of the air conditioner 1 in which the outlets 14 with the louvers 15 are provided in four directions of the panel body 3, and the air wings 17 are provided in association with the individual outlets 14, it is obviously possible to similarly apply the present invention to an air conditioner in which the outlets 14 are provided in two directions, etc.

[0066] Furthermore, since the air wings 17 are provided in the air outlet path and are cooled by cool air during cooling operation, the occurrence of condensation due to contact with indoor air is anticipated. Thus, insulators for preventing condensation may be attached as needed.

[0067] Furthermore, the actuators 16 for the louvers 15 and the actuators 27 and 41 for the air wings 17 may be implemented commonly so that the louvers 15 and the air wings 17 can be pivoted by common actuators via link mechanisms.

{Reference Signs List}

[0068]

1	Air conditioner
3	Panel body
14	Outlets
15	Louvers
17	Air wings
18	Wing portions
19	Arm portions
20	Support shafts
21	Subwings
22	Support shafts
23	Bearings
25, 40	Pivot mechanisms
27, 41	Actuators (motors)
28	Reel
29	Wire
30, 31, 32, 33, 34	Wire guides
42	Rotary shaft
44	Link arms
45	Gear mechanisms

Claims

1. An air conditioner comprising:

an outlet (14) for an air-conditioning air flow, the outlet being provided on a panel body (3);
a louver (15) that is pivotally provided at the outlet (14) in order to adjust an outlet direction of the air-conditioning air flow;
characterized by comprising an air wing (17) that is provided outside the outlet (14) on the panel body (3) and that is pivotable between a withdrawn position, at which the air wing (17) constitutes a common plane with the panel body (3), and a louver-direction position, at which the air wing (17) faces the air-conditioning air flow blown out from the outlet (14); and
a pivot mechanism (25, 40) for pivoting the air wing (17) between the withdrawn position and the louver-direction position.

2. An air conditioner according to claim 1, wherein the panel body (3) is provided with a plurality of the outlets (14),

and a plurality of the air wings (17) are provided in association with the outlets (14), respectively.

3. An air conditioner according to Claim 1 or Claim 2, wherein the air wing (17) includes a wing portion (18) that guides the air-conditioning air flow and a pair of arm portions (19) that extend from either end of the wing portion (18), the proximal ends of the arm portions (19) being supported pivotally with respect to the panel body (3), and each of the arm portions (19) is provided outside of the end portion of the louver (15) in a lengthwise direction of the louver (15).

4. An air conditioner according to any one of Claims 1 to 3, wherein the pivot mechanism (25, 40) is configured to pivot the air wing (17) to the louver-direction position corresponding to a pivot position of the louver (15) when an operation for pivoting the air wing (17) is performed by a user.

FIG. 1

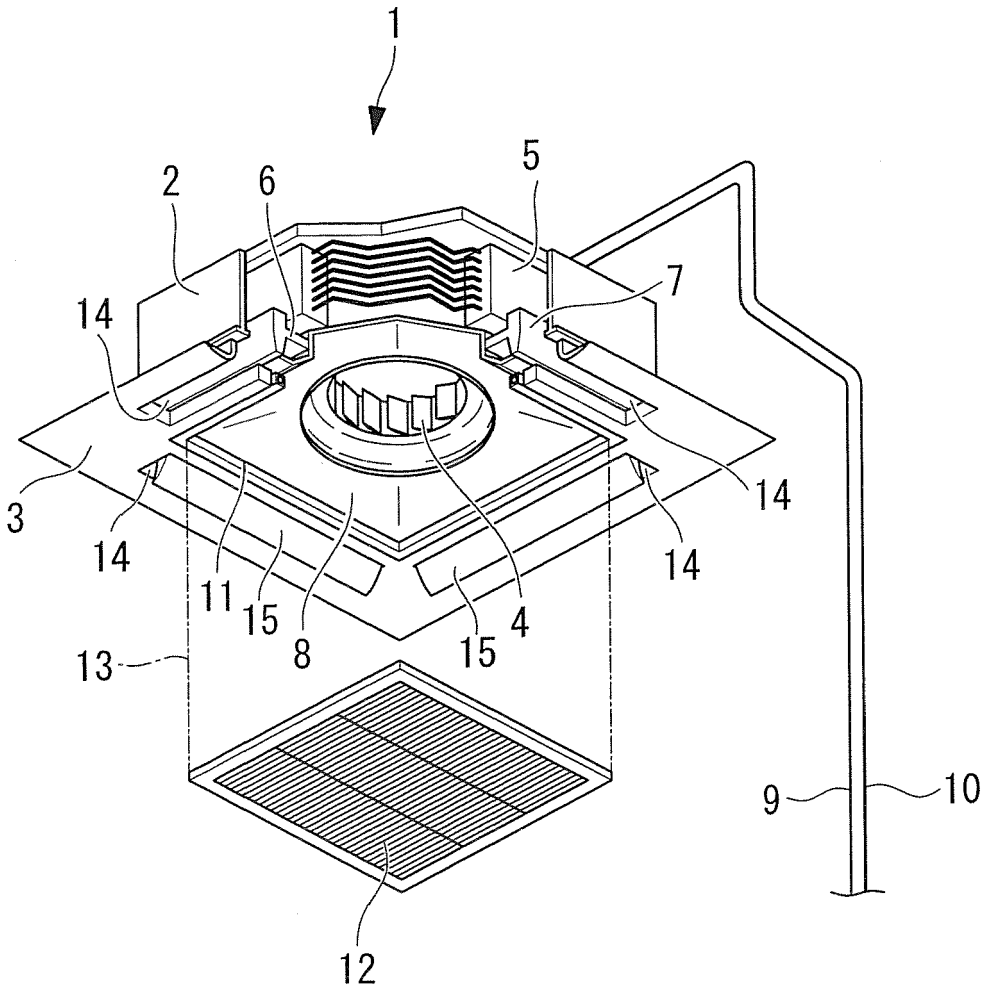


FIG. 2

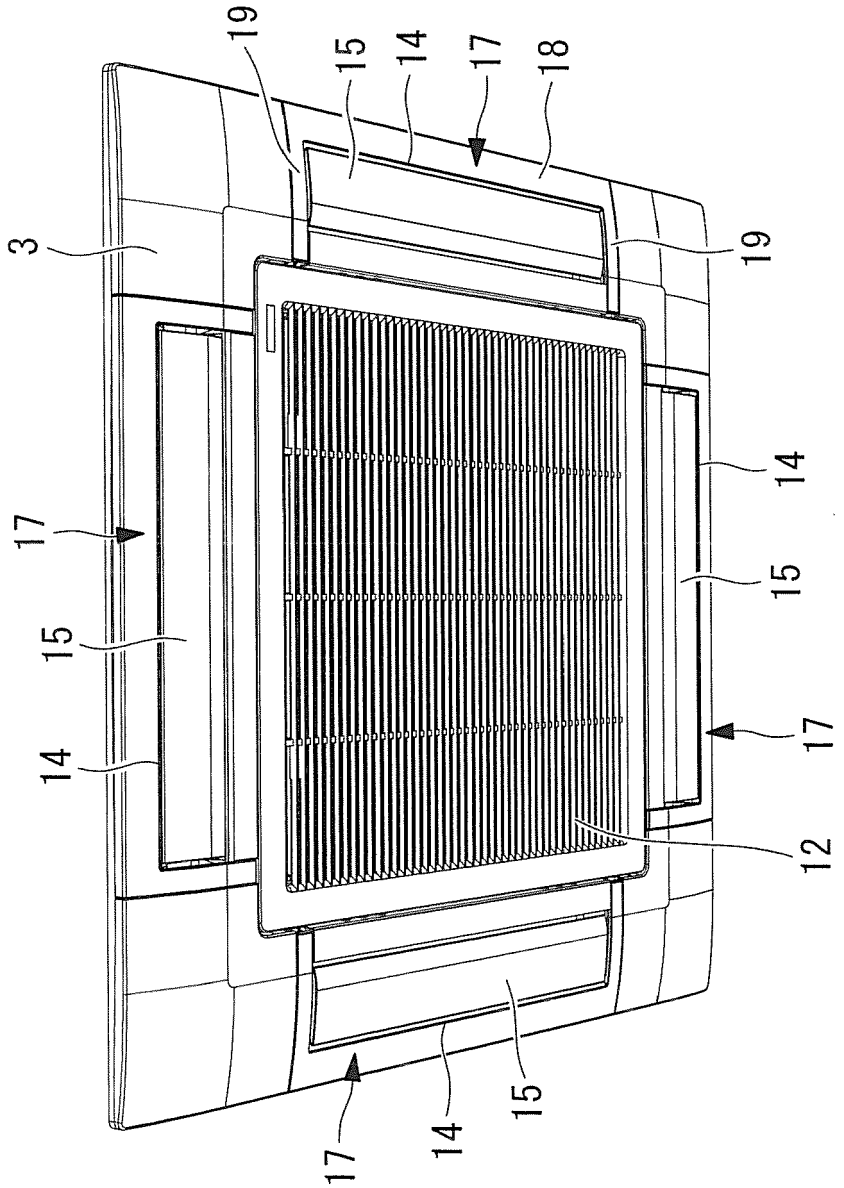


FIG. 3

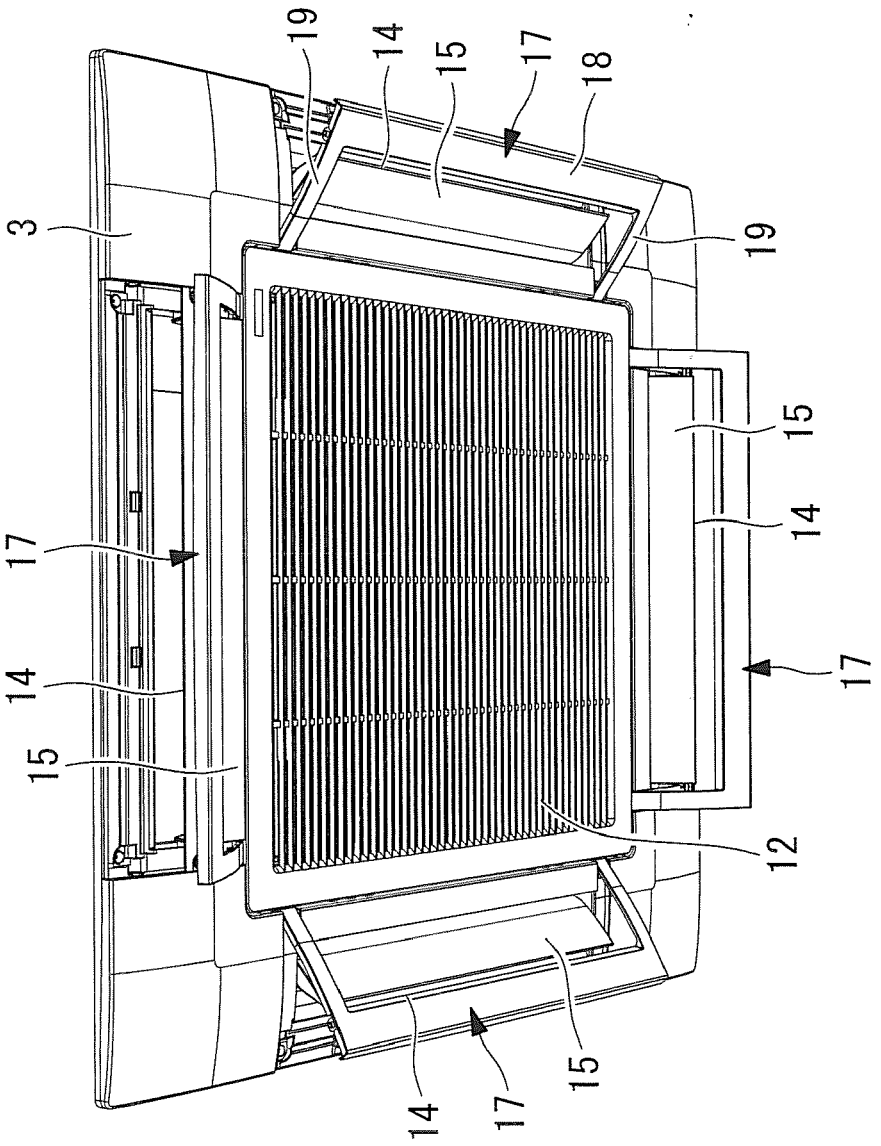
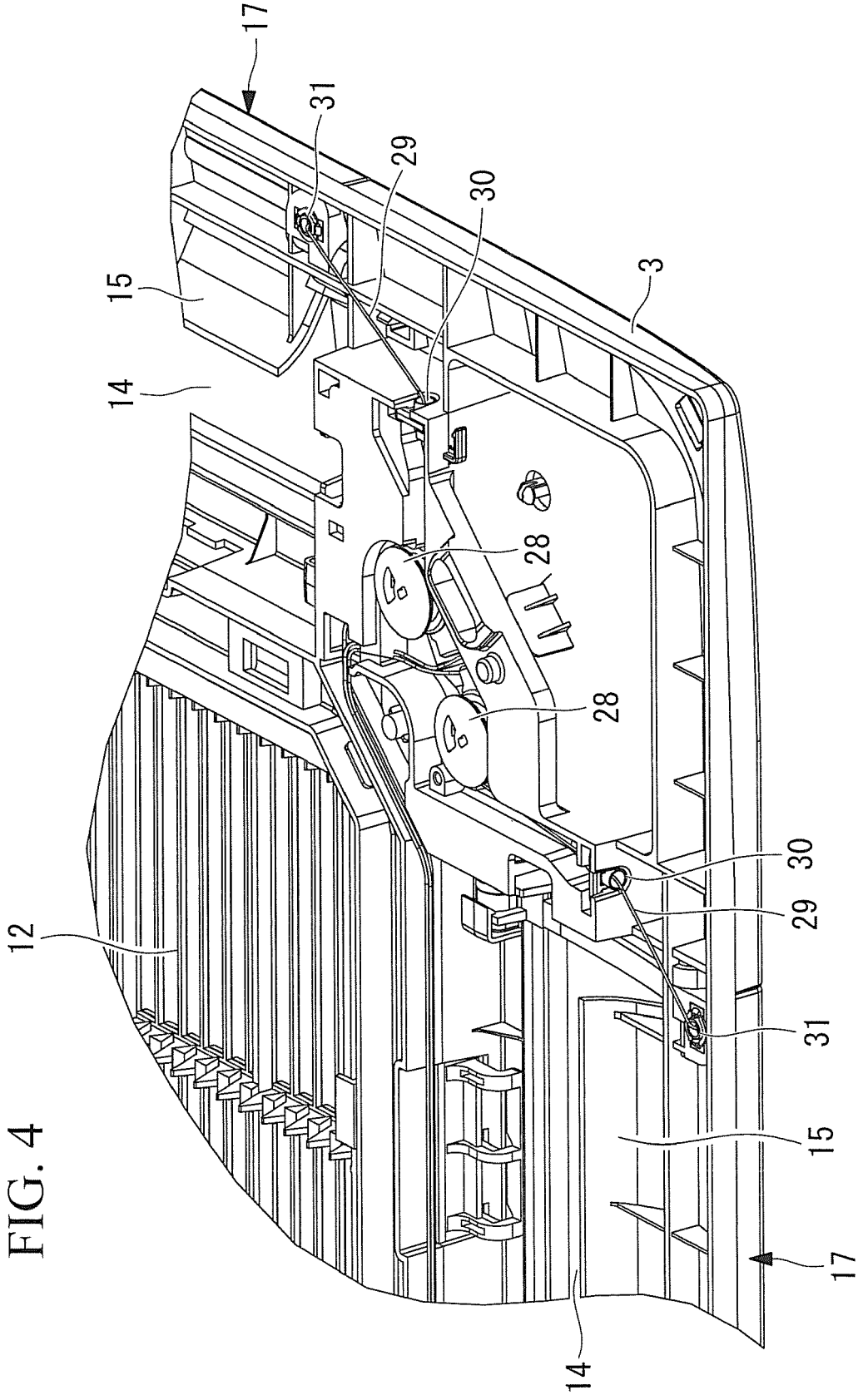


FIG. 4



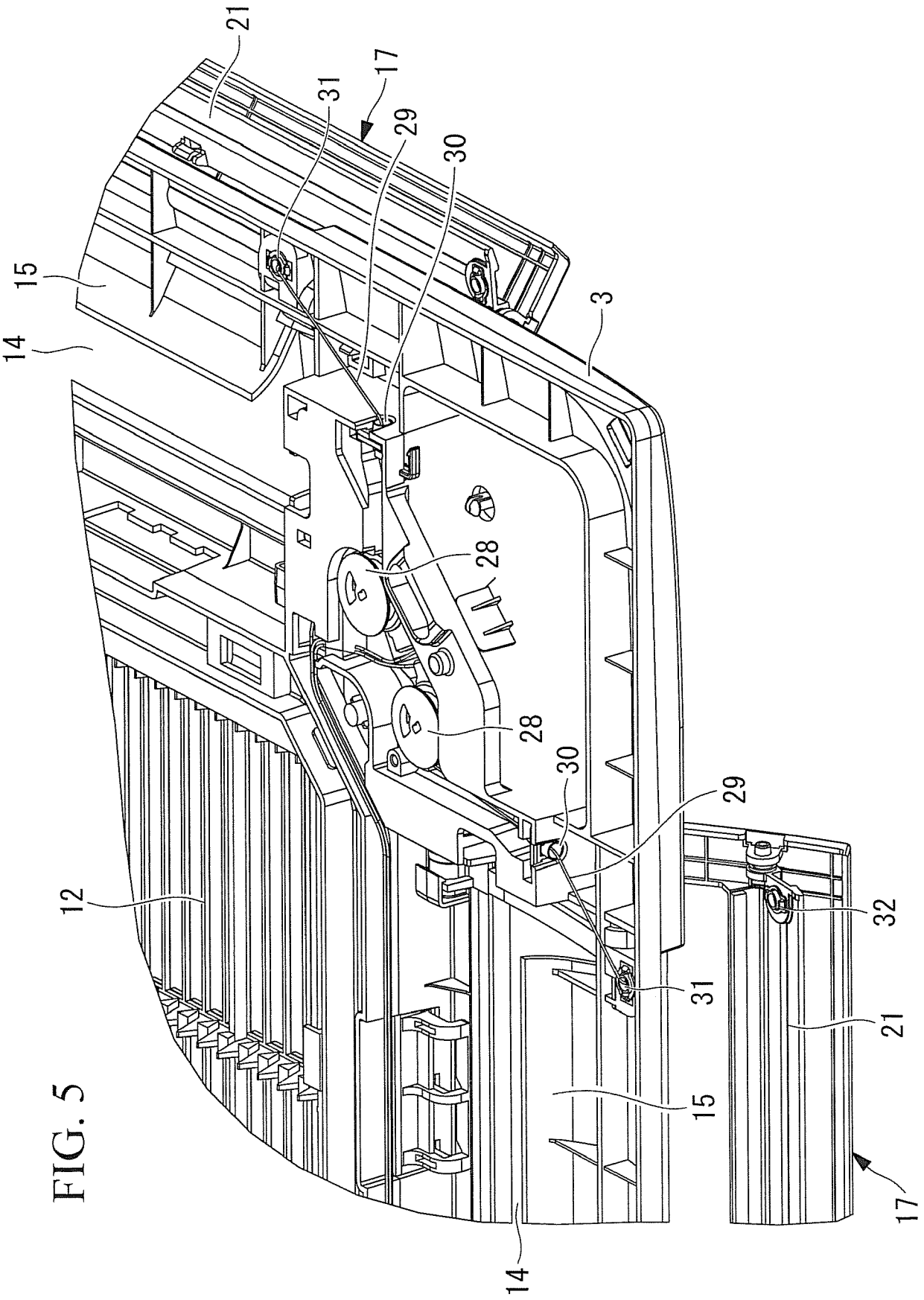


FIG. 5

FIG. 6

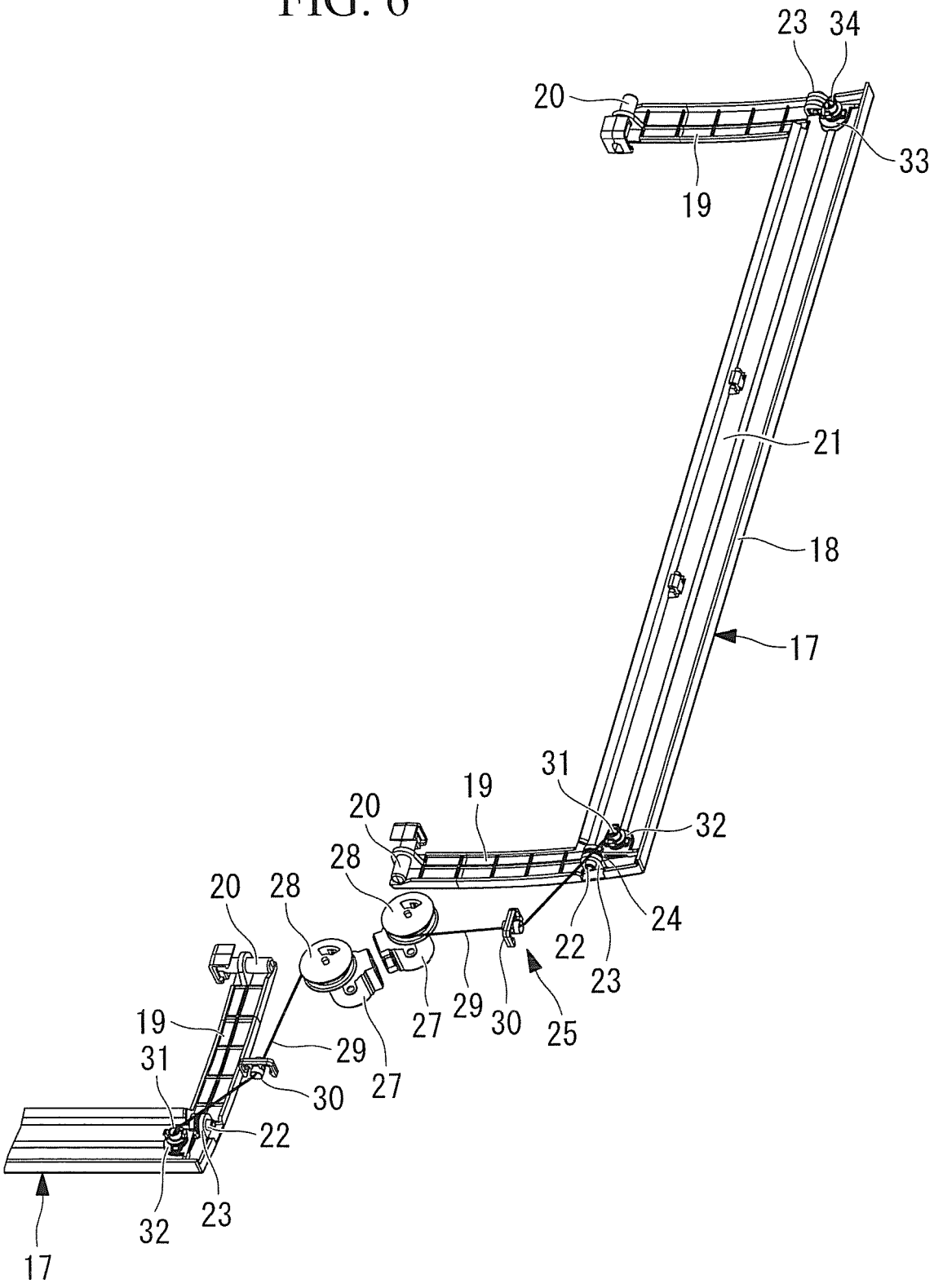

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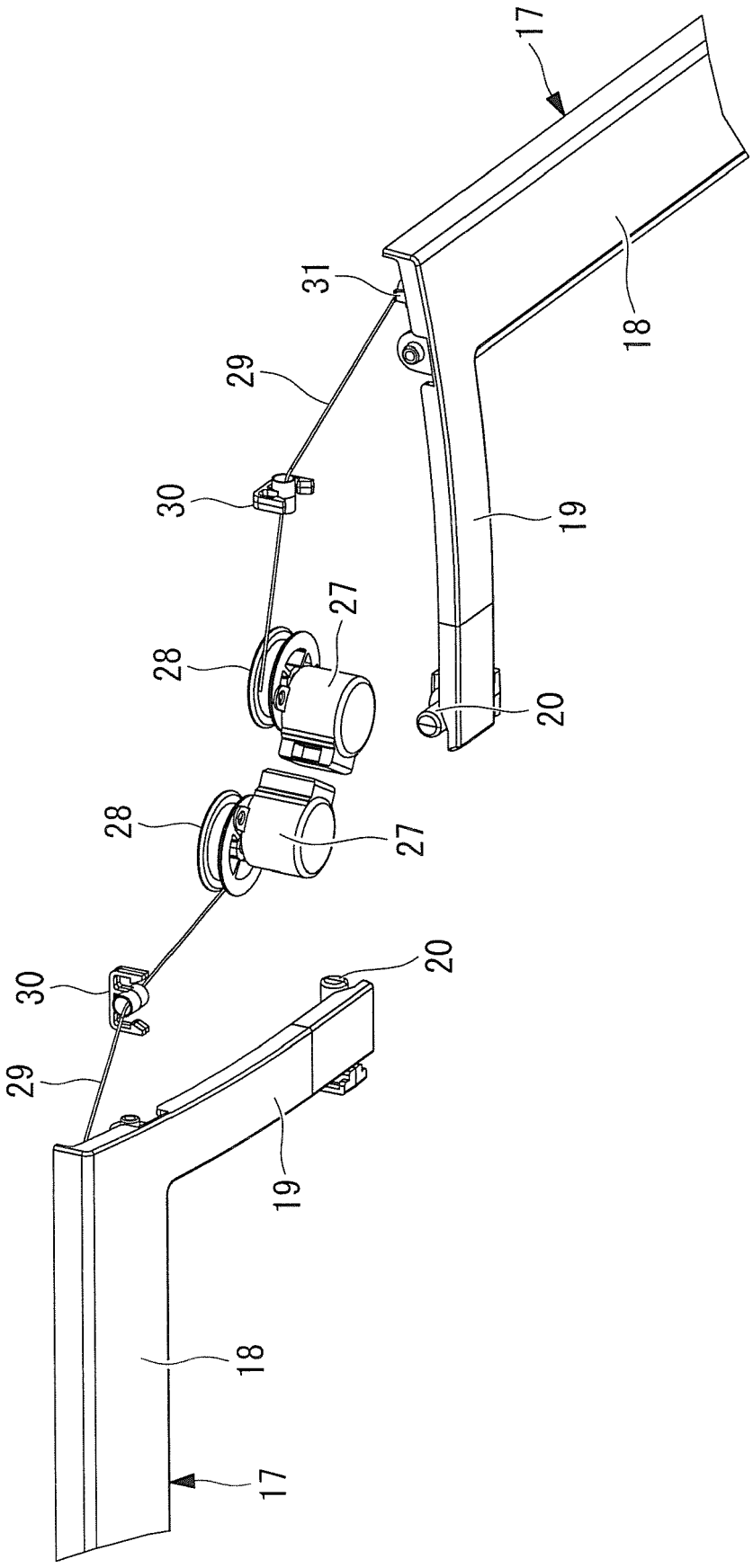
FIG. 7



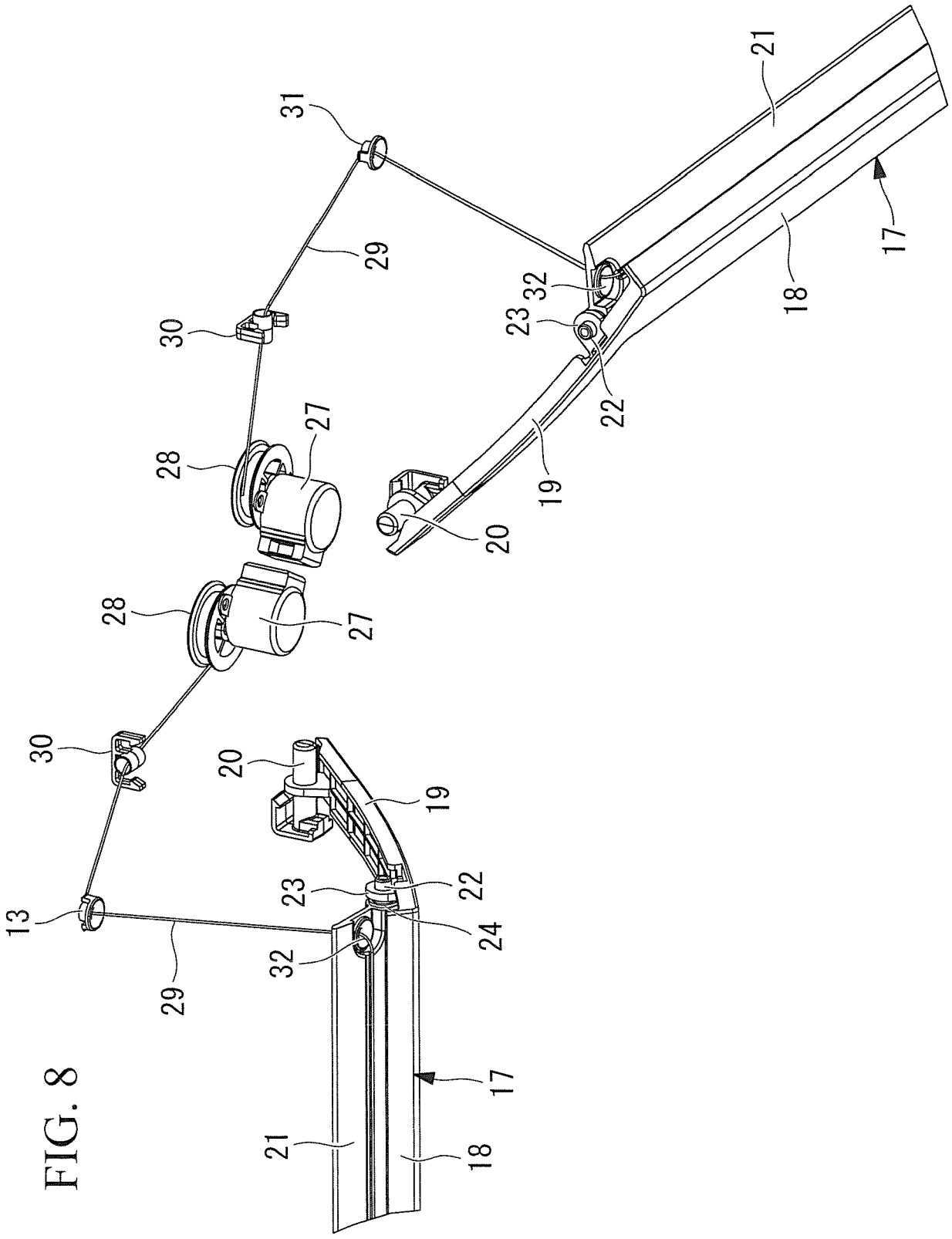

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FIG. 8

FIG. 9

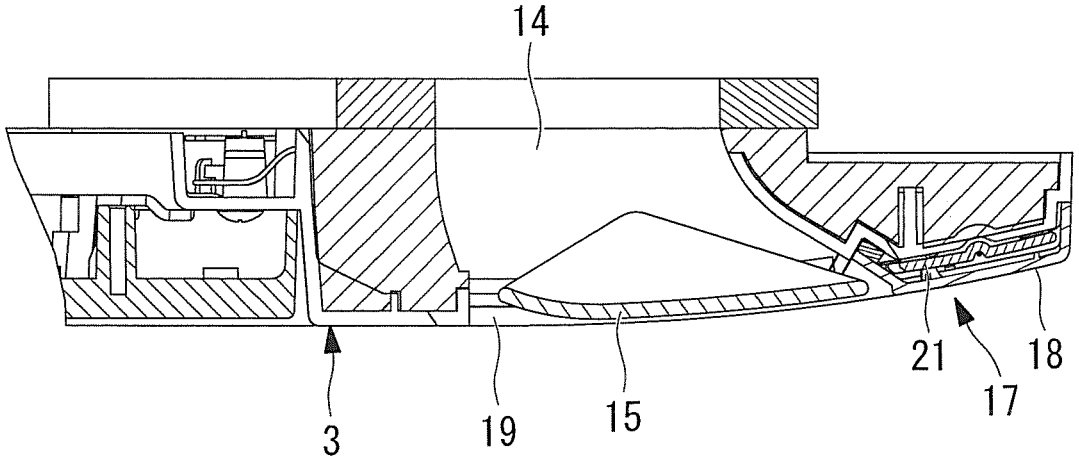


FIG. 10

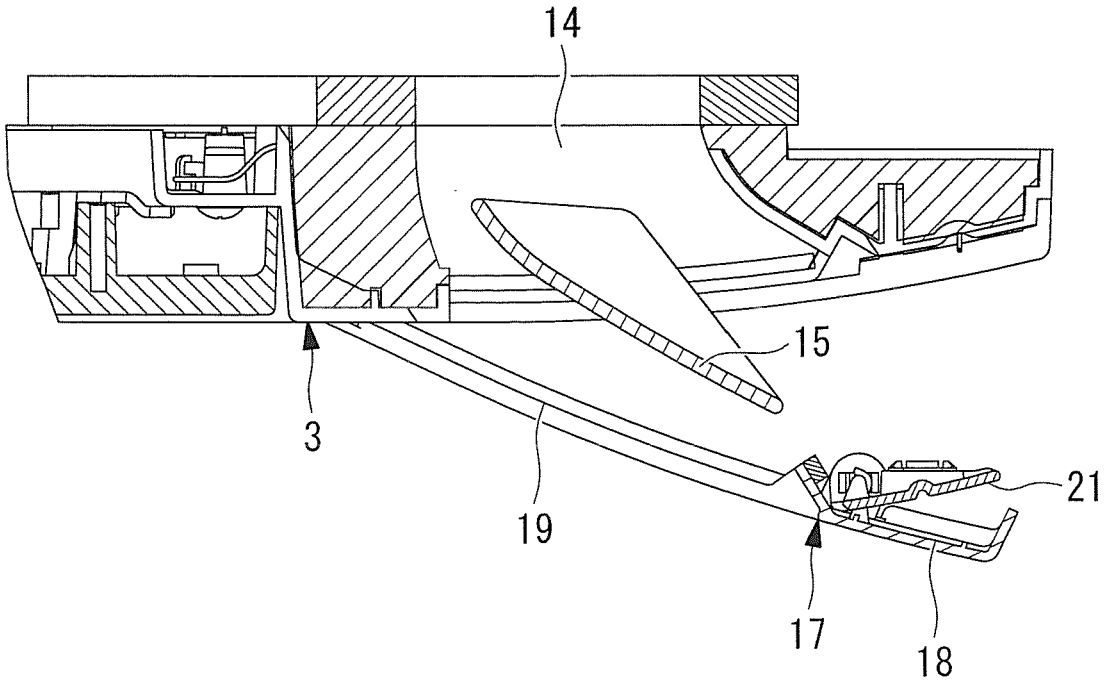


FIG. 11

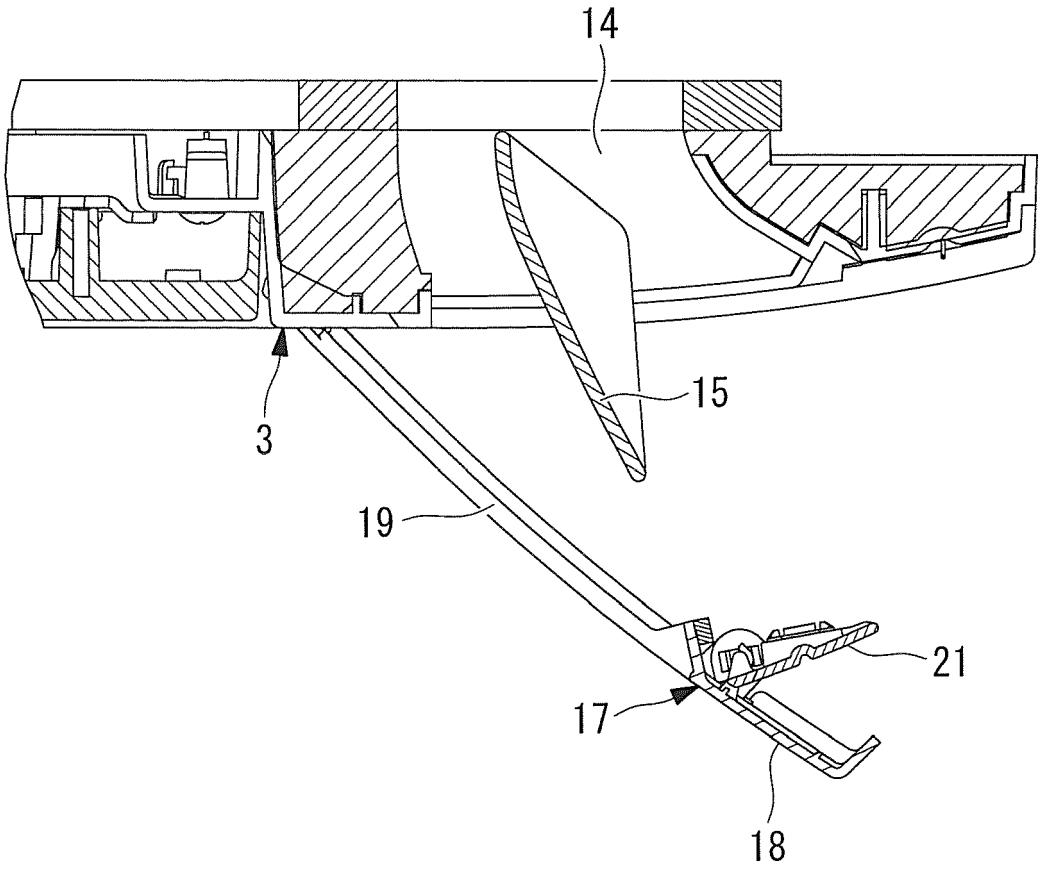


FIG. 12

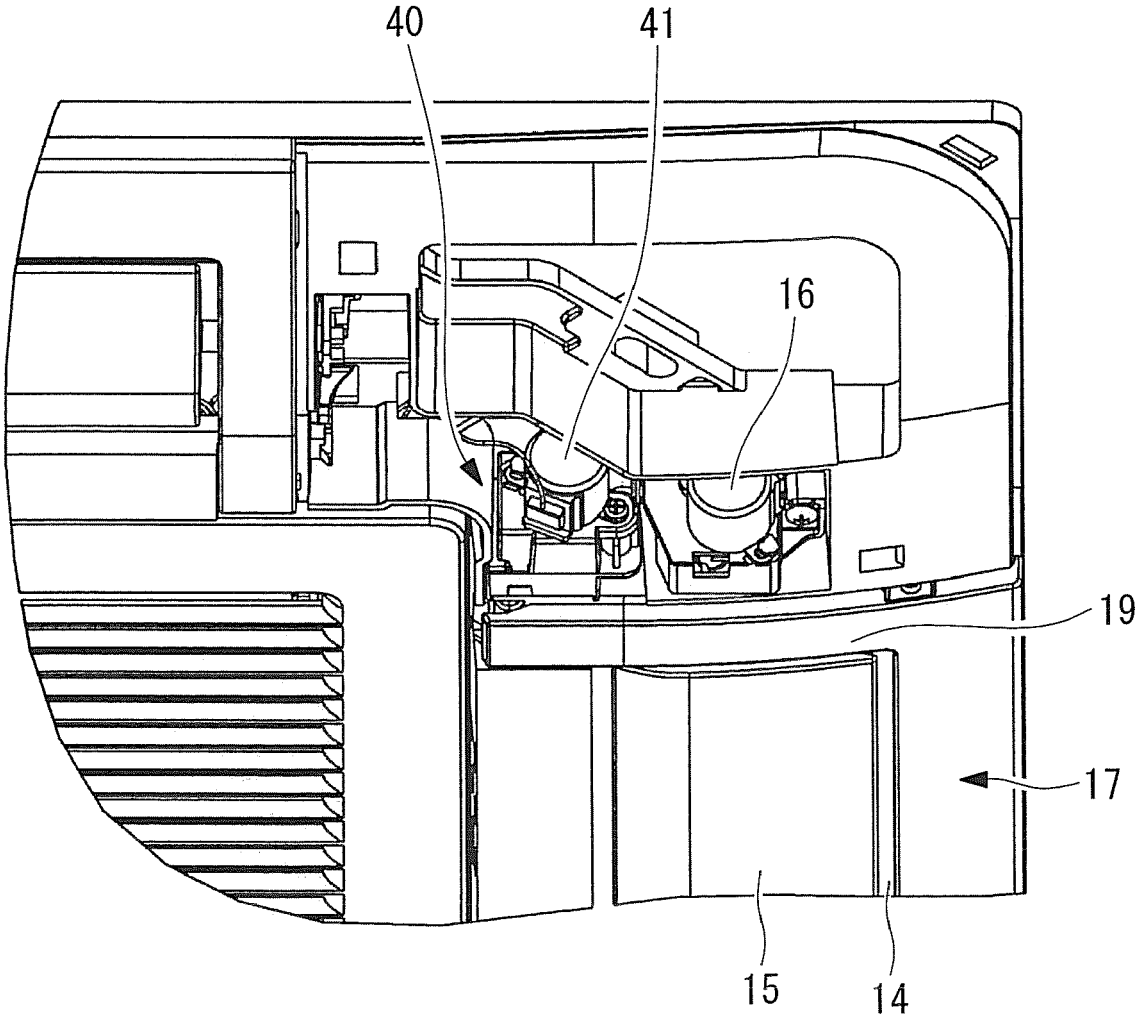


FIG. 13

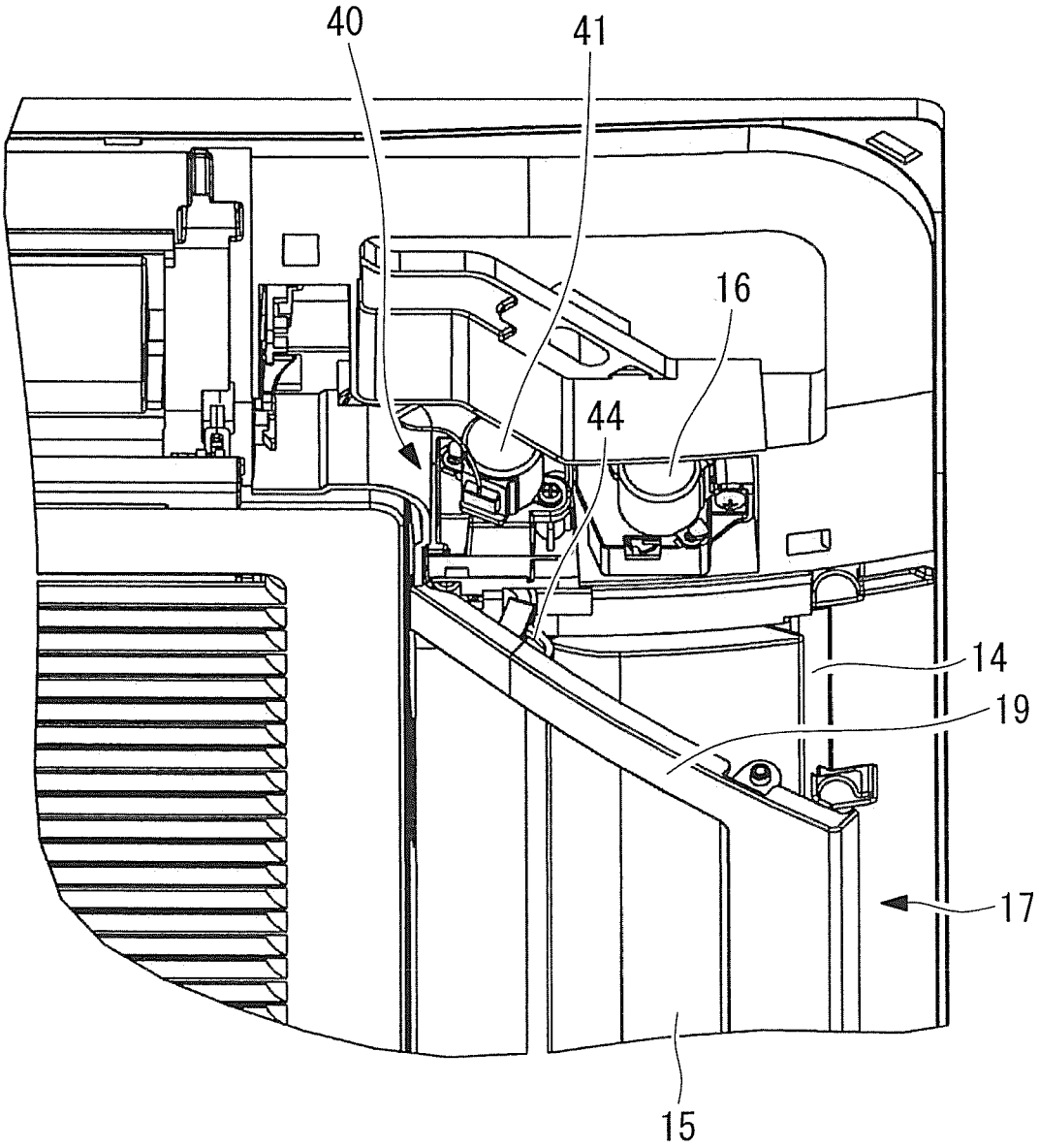


FIG. 14

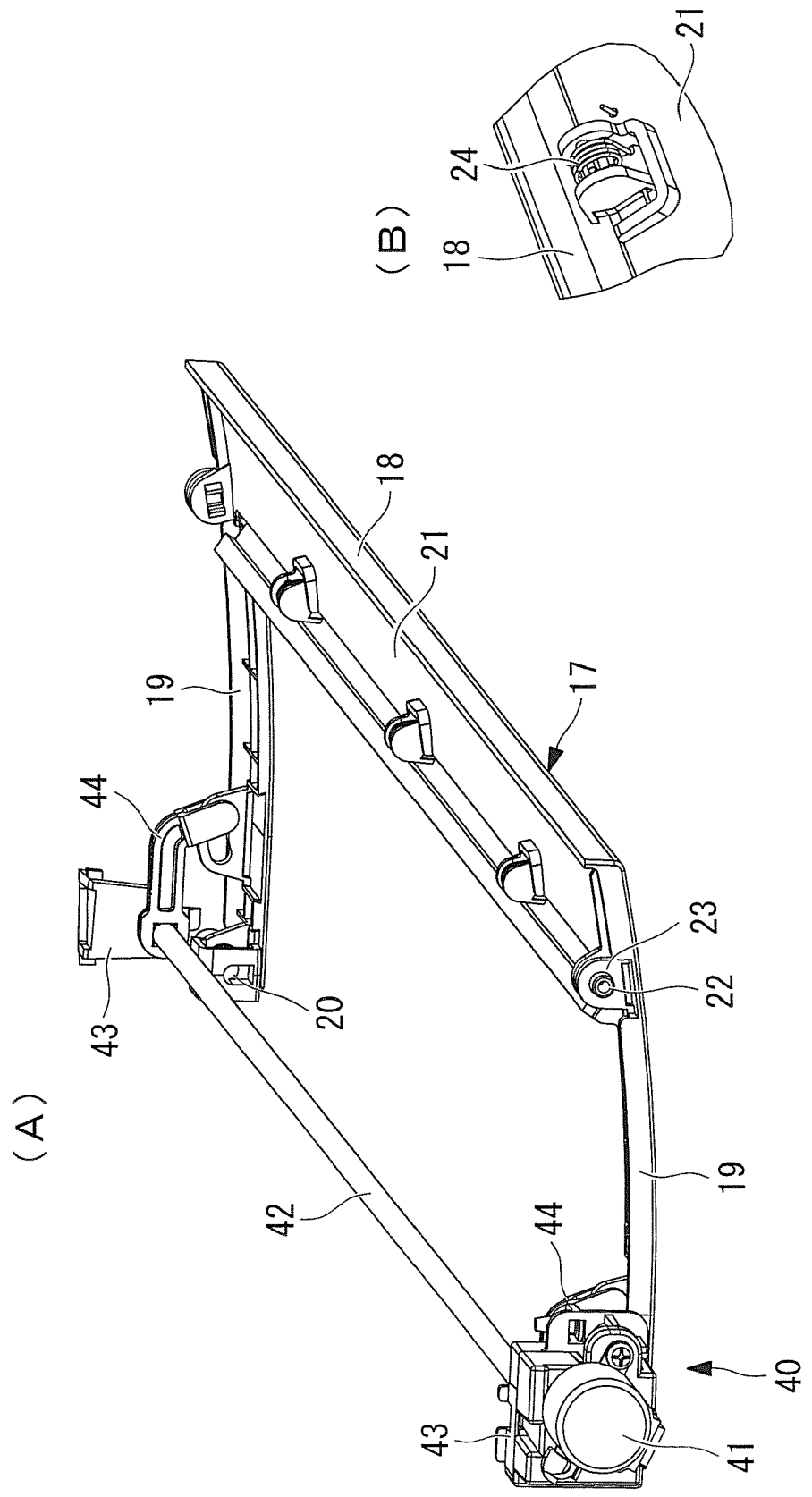


FIG. 15

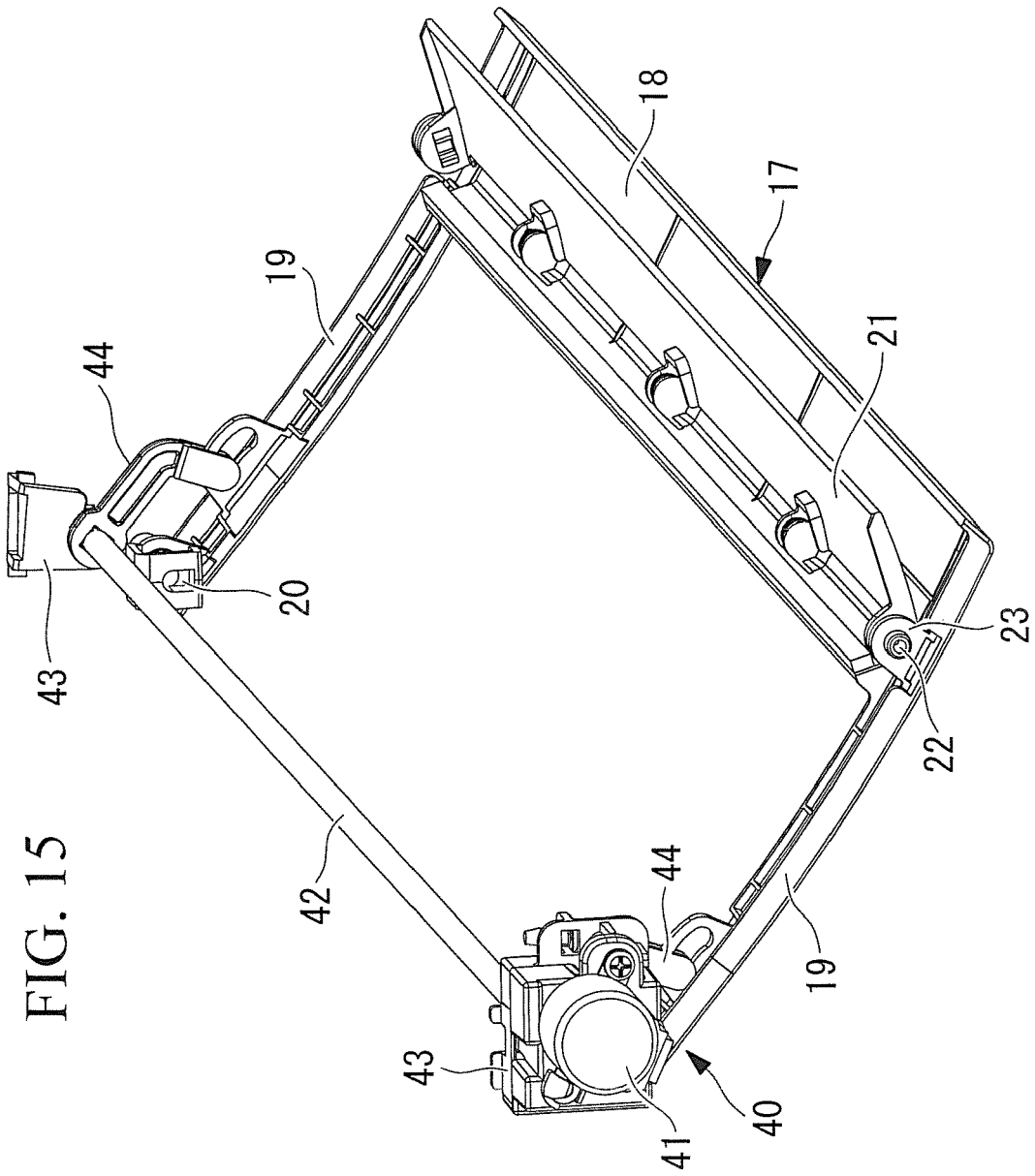


FIG. 16

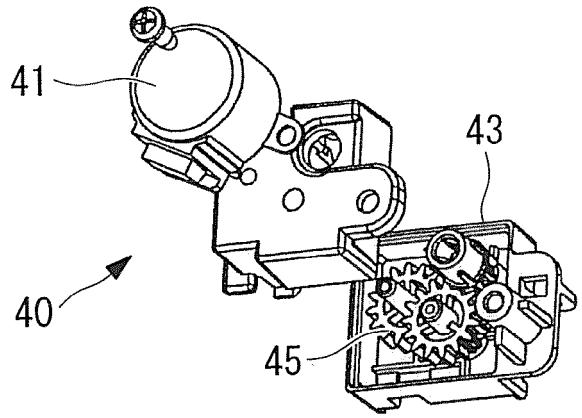


FIG. 17

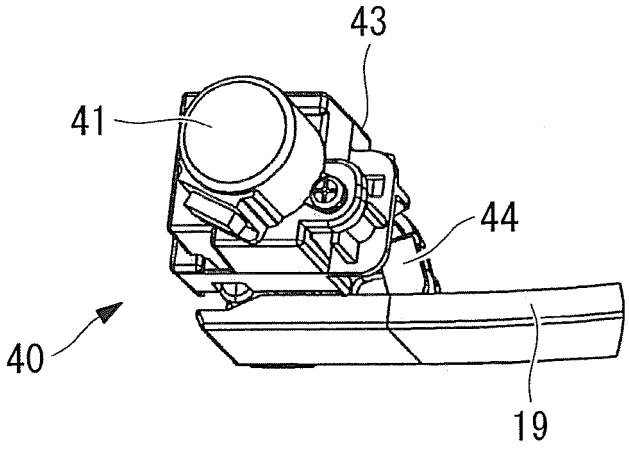
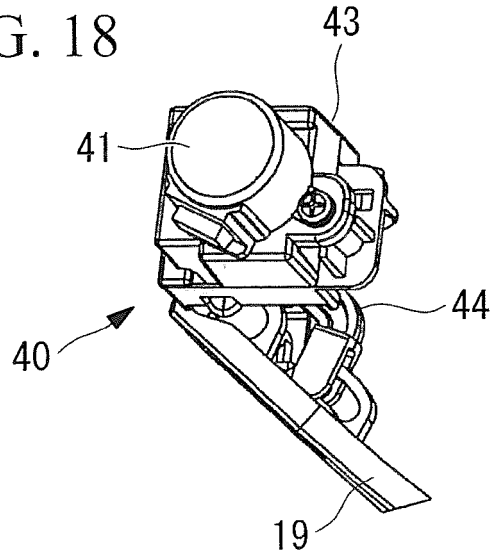


FIG. 18



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EUROPEAN SEARCH REPORT

Application Number
EP 19 18 2680

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 1 688 677 A1 (DAIKIN IND LTD [JP]) 9 August 2006 (2006-08-09) * claim 1; figure 1 *	1-4	INV. F24F1/00 F24F13/14
X	JP 2005 207733 A (DAIKIN IND LTD) 4 August 2005 (2005-08-04) * abstract; figures 1-4 *	1-4	
X	US 2014/086735 A1 (HUANG SZU-CHANG [TW]) 27 March 2014 (2014-03-27) * abstract; figure 1 *	1	
X	FR 2 708 088 A1 (SAMSUNG ELECTRONICS CO LTD [KR]) 27 January 1995 (1995-01-27) * figure 4 *	1	
A	WO 2014/068654 A1 (MITSUBISHI ELECTRIC CORP [JP]; KONO ATSUSHI [JP]; IKEDA TAKASHI [JP];) 8 May 2014 (2014-05-08) * abstract; figure 1 *	1-4	
			TECHNICAL FIELDS SEARCHED (IPC)
			F24F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	9 September 2019	Vuc, Arianda

CATEGORY OF CITED DOCUMENTS

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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09-09-2019

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1688677 A1	09-08-2006	AT 540273 T	15-01-2012
		CN 1771414 A	10-05-2006
		CN 101240916 A	13-08-2008
		EP 1688677 A1	09-08-2006
		EP 2336664 A1	22-06-2011
		ES 2376882 T3	20-03-2012
		ES 2674021 T3	26-06-2018
		JP 3700718 B2	28-09-2005
		JP 2005156043 A	16-06-2005
		TR 201808094 T4	23-07-2018
		US 2006213216 A1	28-09-2006
		US 2009013711 A1	15-01-2009
		WO 2005052464 A1	09-06-2005
JP 2005207733 A	04-08-2005	JP 3864978 B2	10-01-2007
		JP 2005207733 A	04-08-2005
US 2014086735 A1	27-03-2014	AU 2013200975 A1	10-04-2014
		CN 202832125 U	27-03-2013
		US 2014086735 A1	27-03-2014
FR 2708088 A1	27-01-1995	CN 1117569 A	28-02-1996
		DE 4424904 A1	26-01-1995
		FR 2708088 A1	27-01-1995
		JP 2807413 B2	08-10-1998
		JP H0755246 A	03-03-1995
		KR 950004320 U	17-02-1995
		US 5441451 A	15-08-1995
WO 2014068654 A1	08-05-2014	CN 104769368 A	08-07-2015
		CN 203595181 U	14-05-2014
		EP 2918936 A1	16-09-2015
		JP 6324316 B2	16-05-2018
		JP WO2014069301 A1	08-09-2016
		US 2015253032 A1	10-09-2015
		WO 2014068654 A1	08-05-2014
		WO 2014069301 A1	08-05-2014

EPO FORM P0459

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Patent documents cited in the description

- JP 2010032062 A **[0005]**