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(71) Applicant: **LG Electronics Inc.**
07336 SEOUL (KR)

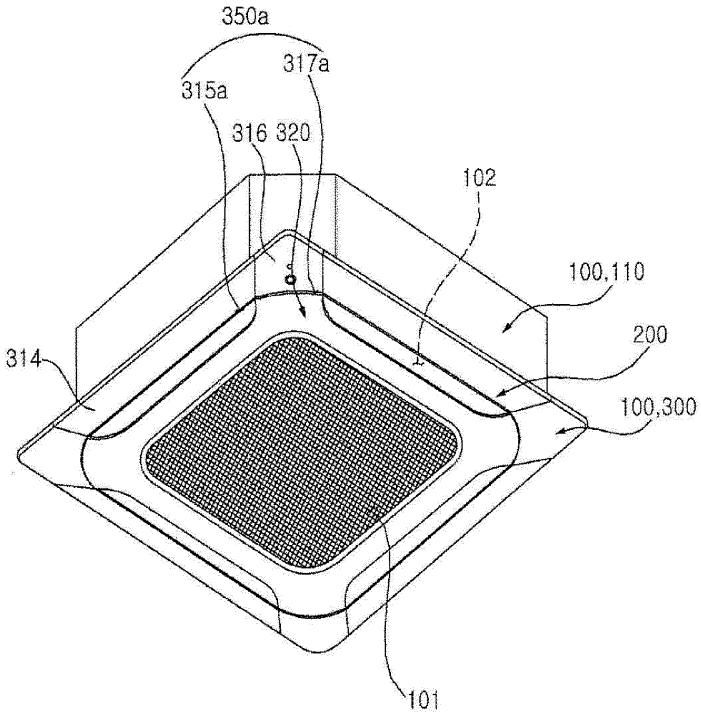
(72) Inventor: **KIM, Hyoungjune**
Seoul 08592 (KR)

(74) Representative: **Vossius & Partner**
Patentanwälte Rechtsanwälte mbB
Siebertstrasse 3
81675 München (DE)

(54) **CEILING-TYPE INDOOR UNIT OF AIR CONDITIONER**

(57) In the present disclosure, an intake grille is supported at four points through four wires, two wires disposed on one side are fixed to a first drum and two wires disposed on the other side are fixed to a second drum, whereby two pairs of wires may be simultaneously wound or unwound through two drum motors operating the first drum and the second drum, respectively.

Fig. 1



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Description

[Technical Field]

[0001] The present disclosure relates to a ceiling-type indoor unit of an air-conditioner, and more particularly, to a ceiling-type indoor unit in which an intake grille is automatically lowered and lifted.

[Background Art]

[0002] In general, air-conditioners include a compressor, a condenser, an evaporator, and an expander and supply cold air or warm air to a building or a room using an air conditioning cycle.

[0003] Air-conditioners are structurally classified as a separation type in which a compressor is disposed outdoors and an integrated type in which a compressor is integrally manufactured.

[0004] In the separation type air-conditioner, an indoor heat exchanger is installed in an indoor unit and an outdoor heat exchanger and a compressor are installed in an outdoor unit and the two devices separated from each other are connected with a refrigerant pipe.

[0005] In the integrated type air-conditioner, an indoor heat exchanger, an outdoor heat exchanger, and a compressor installed in one case. Integrated type air-conditioners include a window type air-conditioner installed directly by hanging a device on a window and a duct type air-conditioner installed outside a room by connecting an intake duct and a discharge duct.

[0006] The separation type air-conditioners are generally classified depending on an installation form of the indoor unit.

[0007] An air-conditioner whose indoor unit is installed vertically in an indoor space is called a stand-type air-conditioner, an air-conditioner whose indoor unit is installed on a wall in a room is called a wall-mounted air-conditioner, and an air-conditioner whose indoor unit installed on a ceiling in a room is called a ceiling-type indoor unit.

[0008] In the case of the ceiling-type indoor unit, the intake grille is arranged to face a floor. A filter for filtering foreign matter in the indoor air may be disposed on the intake grille and may be separated for cleaning. A user needs to periodically remove the intake grille from the case to clean the filter.

[0009] An intake grille disposed in the ceiling-type indoor unit of the related art has a structure that is open, while rotating to one side. In the case of the ceiling-type indoor unit of the related art, since the intake grille is disposed on the ceiling of the room, the user has to climb on a structure such as a chair to separate the intake grille.

[Related Art document]

[Patent document]

[0010]

Korean Patent Laid-open No. 10-2008-0110109 A
Korean Patent Registration No. 10-0679838 B1

[Disclosure]

[Technical Problem]

[0011] The present disclosure provides a ceiling-type indoor unit of an air-conditioner in which an entire intake grille is lifted or lowered by simultaneously winding or unwinding two pairs of wires.

[0012] Furthermore, the present disclosure provides a ceiling-type indoor unit of an air-conditioner having a structure capable of simultaneously unwinding or winding four wires using two motors.

[0013] Furthermore, the present disclosure provides a ceiling-type indoor unit of an air-conditioner in which an intake grille is prevented from falling when lifted or lowered.

[0014] Furthermore, the present disclosure provides a ceiling-type indoor unit of an air-conditioner shaking is minimized when an intake grille is lifted or lowered.

[0015] Furthermore, the present disclosure provides a ceiling-type indoor unit of an air-conditioner in which shaking is minimized when an intake grille is lifted or lowered.

[0016] Furthermore, the present disclosure provides a ceiling-type indoor unit of an air-conditioner in which separation of foreign matter attached to a filter is minimized when the intake grille is lifted or lowered.

[0017] Technical objects to be achieved by the present disclosure are not limited to the aforementioned technical objects, and other technical objects not described above may be evidently understood by a person having ordinary skill

in the art to which the present disclosure pertains from the following description.

[Technical Solution]

[0018] In the present disclosure, an intake grille may be simultaneously lifted or lowered using two motors, while the intake grille is supported at four points through four wires.

[0019] In the present disclosure, since two wires are disposed symmetrically in each drum, shaking of the intake grille may be minimized when the intake grille is lifted or lowered.

[0020] In the present disclosure, since four wires support four places near the corners of the intake grille, shaking in the process of lifting or lowering the intake grille may be minimized.

[0021] In the present disclosure, since one motor controls a pair of wires arranged on one side of the intake grille, a height variation on one side of the intake grille may be minimized.

[0022] In the present disclosure, since four wires are supported by each guider disposed in the case, shaking in the process of lifting or lowering the intake grille may be minimized.

[0023] In the present disclosure, since four wires support four places near the corners of the intake grille, even if one wire is damaged, the other three wires may support the intake grille, thereby preventing the intake grille from falling.

[0024] In the present disclosure, since four wires are supported by the respective guiders disposed in the case, shaking of the intake grille is suppressed and separation of foreign matter attached to the filter from the intake grille during the lowering process is minimized.

[0025] In an aspect, a ceiling-type indoor unit of an air-conditioner includes: a case installed on an interior ceiling in a suspended manner and having an inlet and an outlet provided downward; an intake grille disposed to be separable from the case, covering the inlet of the case, and moved in an up-down direction from the case; a 1-1 wire disposed on one side with respect to the intake grille and having a lower end fixed to the intake grille; a 1-2 wire disposed on one side with respect to the intake grille and having a lower end fixed to the intake grille; a 2-1 wire disposed on the other side with respect to the intake grille and having a lower end fixed to the intake grille; a 2-2 wire disposed on the other side with respect to the intake grille and having a lower end fixed to the intake grille; a first unit disposed in the case, coupled to each of upper ends of the 1-1 wire and the 1-2 wire, and lifting or lowering one side of the intake grille by simultaneously winding or unwinding the 1-1 wire and the 1-2 wire; a second unit disposed in the case, coupled to each of upper ends of the 2-1 wire and the 2-2 wire, and lifting or lowering the other side of the intake grille by simultaneously winding or unwinding the 2-1 wire and the 2-2 wire, wherein the first unit includes: a first drum fixed to each of the upper end of the 1-1 wire and the upper end of the 1-2 wire; and a first drum motor rotating the first drum, the 1-1 wire is disposed in one direction with respect to the first drum and the 1-2 wire is disposed in a direction opposite to the 1-1 wire, the second unit includes: a second drum fixed to each of the upper end of the 2-1 wire and the upper end of the 2-2 wire; and a second drum motor rotating the second drum, the 2-1 wire is disposed in one direction with respect to the second drum and the 2-2 wire is disposed in a direction opposite to the 2-1 wire.

[0026] The first unit and the second unit may be disposed to face each other based on the center O of the intake grille.

[0027] The first drum may include: a first zone formed on the outer circumferential surface of the first drum, allowing the upper end of the 1-1 wire to be fixed thereto, and allowing the 1-1 wire to be wound therearound; and a second zone formed on the outer circumferential surface of the first drum, allowing the upper end of the 1-2 wire to be fixed thereto, and allowing the 1-2 wire to be wound therearound, and the second drum may include: a first zone formed on the outer circumferential surface of the second drum, allowing the upper end of the 2-1 wire to be fixed thereto, and allowing the 2-1 wire to be wound therearound; and a second zone formed on the outer circumferential surface of the second drum, allowing the upper end of the 2-2 wire to be fixed thereto, and allowing the 2-2 wire to be wound therearound.

[0028] The first drum may further include: a first partition partitioning the first zone and the second zone, wherein the first partition protrudes from the outer circumferential surface of each drum, and the second drum may further include: a second partition partitioning the first zone and the second zone, wherein the second partition protrudes from the outer circumferential surface of each drum.

[0029] The first partition may protrude in a radial direction of the first drum, may be formed along a circumferential direction of the first drum, and may be perpendicular to a motor shaft of the first drum motor, and the second partition may protrude in a radial direction of the second drum, may be formed along a circumferential direction of the second drum, and may be perpendicular to a motor shaft of the second drum motor.

[0030] The first zone and the second zone of the first drum may be arranged in parallel, and the first zone and the second zone of the second drum may be arranged in parallel.

[0031] The first drum may form an axial center rotated by the first drum motor, the second drum may form an axial center rotated by the second drum motor, and the axial center of the first drum and the axial center of the second drum may be arranged in a line.

[0032] The upper end of the 1-1 wire fixed to the first zone and the upper end of the 1-2 wire fixed to the second zone may be symmetrical with respect to the axial center of the first drum.

[0033] The upper end of the 2-1 wire fixed to the first zone and the upper end of the 2-2 wire fixed to the second zone may be symmetrical with respect to the axial center of the second drum.

[0034] The first unit may further include: a first unit case in which the first drum and the first drum motor are installed, the first unit case may be fixed to inside of the case, and the second unit may further include a second unit case in which the second drum and the second drum motor are installed, the second unit case may be fixed inside of the case, the first unit case may include a first hole through which the 1-1 wire passes; and a second hole through which the 1-2 wire passes; and the second unit case may include a first hole through which the 2-1 wire passes; and a second hole through which the 2-2 wire passes, and an interval between the first hole and the second hole of the first unit case may be equal to an interval between the first hole and the second hole of the second unit case.

[0035] The first hole and the second hole of the first unit case may be open downward, and the first hole and the second hole of the second unit case may be open downward.

[0036] The first hole and the second hole of the first unit case may be disposed on a sidewall of the first unit case, the first hole and the second hole of the first unit case may be disposed to face in mutually opposite directions, the first hole and the second hole of the second unit case may be disposed on a sidewall of the second unit case, and the first hole and the second hole of the second unit case may be disposed to face in mutually opposite directions.

[0037] The ceiling-type indoor unit may further include: a first wire guider disposed at the case, supporting the 1-1 wire, and located above the intake grille; a second wire guider disposed at the case, supporting the 1-2 wire, and located above the intake grille; a third wire guider disposed at the case, supporting the 2-1 wire, and located above the intake grille; and a fourth wire guider disposed at the case, supporting the 2-2 wire, and located above the intake grille, wherein the first hole of the first unit case may be disposed to face the first wire guider, the second hole of the first unit case may be disposed to face the second wire guider, the first hole of the second unit case may be disposed to face the third wire guider, and the second hole of the second unit case may be disposed to face the fourth wire guider.

[0038] The ceiling-type indoor unit may further include: a first rotation detecting device disposed at the first unit and detecting rotation of the first drum; and a second rotation detecting device disposed at the second unit and detecting rotation of the second drum, wherein the first rotation detecting device may include: a rotation detecting factor disposed at the first drum and rotating together when the first drum rotates; a sensor disposed to be spaced apart from the rotation detecting factor and detecting rotation of the rotation detecting factor; and a printed circuit board (PCB) on which the sensor is disposed, and the second rotation detecting device may include: a rotation detecting factor disposed at the second drum and rotating together when the second drum rotates; a sensor disposed to be spaced apart from the rotation detecting factor and detecting rotation of the rotation detecting factor; and a PCB on which the sensor is disposed.

[0039] Each sensor may be an infrared sensor, the rotation detecting factor may be a sawtooth protruding outward in a radial direction of the drum, and the sensor may detect an infrared signal controlled by the sawtooth.

[0040] The sensor may include a light emitting unit and a light receiving unit, the rotation detecting device may further include: a sensor installation portion in which the light emitting unit and the light receiving unit are installed; and a slot formed at the sensor mounting portion and formed to be concave to allow the rotation detecting factor to pass therethrough, wherein the light emitting unit and the light receiving unit may be arranged on mutually opposite sides based on the slot.

[0041] The first unit may further include: a 1-1 roller box disposed on one side with respect to the first drum, disposed to be penetrated by the 1-1 wire, and aligning a position of the 1-1 wire when the 1-1 wire is wound or unwound; a 1-2 roller box disposed on the other side with respect to the first drum, disposed to be penetrated by the 1-2 wire, and aligning a position of the 1-2 wire when the 1-2 wire is wound or unwound; and a first rotation amount detecting device detecting a rotation amount of the first drum, and the second unit may further include: a 2-1 roller box disposed on one side with respect to the second drum, disposed to be penetrated by the 2-1 wire, and aligning a position of the 2-1 wire when the 2-1 wire is wound or unwound; a 2-2 roller box disposed on the other side with respect to the second drum, disposed to be penetrated by the 2-2 wire, and aligning a position of the 2-2 wire when the 2-2 wire is wound or unwound; and a second rotation amount detecting device detecting a rotation amount of the second drum.

[0042] The first drum may include: a first drum body having a cylindrical shape and allowing upper ends of the 1-1 wire and the 1-2 wire to be fixed thereto; a first zone disposed on an outer circumferential surface of the first drum body and allowing the 1-1 wire to wind therearound; a second zone disposed on an outer circumferential surface of the first drum body and allowing the 1-2 wire to wind therearound; a partition protruding outward from the first drum body and partitioning the first zone and the second zone; a 1-1 barrier protruding outward from the first drum body and preventing the 1-1 wire from escaping to outside of the first zone; and a 1-2 barrier protruding outward from the first drum body and preventing the 1-2 wire from escaping to outside of the second zone, and the second drum may include: a second drum body having a cylindrical shape and allowing upper ends of the 2-1 wire and the 2-2 wire to be fixed thereto; a first zone disposed on an outer circumferential surface of the second drum body and allowing the 2-1 wire to wind therearound; a second zone disposed on an outer circumferential surface of the second drum body and allowing the 2-2 wire to wind therearound; a partition protruding outward from the second drum body and partitioning the first zone and the second zone; a 2-1 barrier protruding outward from the second drum body and preventing the 2-1 wire from escaping to outside of the first zone; and a 2-2 barrier protruding outward from the second drum body and preventing the 2-2 wire from

escaping to outside of the second zone.

[0043] The ceiling-type indoor unit may further includes: a first unit case disposed in the case and allowing the first drum, the first drum motor, the 1-1 roller box, and the 1-2 roller box to be installed therein; a second unit case disposed in the case and allowing the second drum, the second drum motor, the 2-1 roller box, and the 2-2 roller box to be installed therein; a first hole formed in the first unit case and penetrated by the 1-1 wire; a second hole formed in the first unit case and penetrated by the 1-2wire; a first hole formed in the second unit case and penetrated by the 2-1 wire; and a second hole formed in the second unit case and penetrated by the 2-2 wire, wherein the first hole and the second hole of the first unit case are disposed on a side wall of the first unit case, the first hole and the second hole of the first unit case are arranged to face in mutually opposite directions, the first hole and the second hole of the second unit case are disposed on a side wall of the second unit case, and the first hole and the second hole of the second unit case are arranged to face in mutually opposite directions.

[0044] The ceiling-type indoor unit may further include: a first wire guider disposed in the case, supporting the 1-1 wire, and located above the intake grille; a second wire guider disposed in the case, supporting the 1-2 wire, and located above the intake grille; a third wire guider disposed in the case, supporting the 2-1 wire, and located above the intake grille; and a fourth wire guider disposed in the case, supporting the 2-2 wire, and located above the intake grille, wherein the first hole of the first unit case is disposed to face the first wire guider, the second hole of the first unit case is disposed to face the second wire guider, the first hole of the second unit case is disposed to face the third wire guider, and the second hole of the second unit case is disposed to face the fourth wire guider.

[0045] The 1-1 roller box and the 1-2 roller box may be disposed symmetrically with respect to the motor shaft of the first drum motor, and the 2-1 roller box and the 2-2 roller box may be disposed symmetrically with respect to the motor shaft of the second drum motor.

[Advantageous Effects]

[0046] The ceiling-type indoor unit of an air-conditioner according to the embodiment of the present disclosure has one or more advantages as follows.

[0047] First, in the present disclosure, since two wires disposed on one side are fixed to the first drum and two wires disposed on the other side are fixed to the second drum, two pairs of wires may be simultaneously wound or unwound through two drum motors operating the first drum and the second drum, respectively.

[0048] Second, in the present disclosure, since the intake griller is supported at four points through four wires, the intake grille may be stably lifted or lowered.

[0049] Third, in the present disclosure, since the elevator is configured to simultaneously wind or unwind four wires and two motors are used, a material cost required for manufacturing may be reduced and controlling may be simplified.

[0050] Fourth, in the present disclosure, since the two wires are fixed to one drum, two wires may be simultaneously wound or unwound.

[0051] Fifth, in the present disclosure, since the intake grille is maintained in a state of being in close contact with the front body, while being supported by four wires, the intake grille may be lowered immediately when the elevator operates.

[0052] Sixth, in the present disclosure, although two wires are fixed to one drum, each wire is wound or unwound in each region of the drum, thereby uniformly controlling a length and speed of the wires.

[0053] Seventh, in the present disclosure, since the rotation amount detecting device for detecting a rotation amount and a rotation speed of the drum is disposed at each of the first unit and the second unit, two drum motors may be controlled in the same manner.

[0054] Eighth, in the present disclosure, since two wires are disposed symmetrically on each drum, shaking of the intake grille may be minimized when the intake grille is lifted or lowered.

[Description of Drawings]

[0055]

FIG. 1 is a perspective view of an indoor unit of an air-conditioner according to an embodiment of the present disclosure.

FIG. 2 is an exemplary view of an operation of FIG. 1.

FIG. 3 is a cross-sectional view of FIG. 1.

FIG. 4 is an exploded perspective view of a front panel of FIG. 1.

FIG. 5 is a plan view showing an arrangement of the front panel and an elevator of FIG. 1.

FIG. 6 is a bottom view of the front panel shown in FIG. 1.

FIG. 7 is a bottom perspective view of an elevator of FIG. 2.

FIG. 8 is a bottom view of the front panel and the elevator of FIG. 2.

FIG. 9 is a perspective view showing an internal structure of the elevator of FIG. 2.
FIG. 10 is a plan view of FIG. 9.
FIG. 11 is an exemplary view of an operation of an elevator according to a first embodiment of the present disclosure.
FIG. 12 is an exemplary view showing an installation structure of a wire according to the first embodiment of the present disclosure.
FIG. 13 is a plan view of an intake grille shown in FIG. 4.
FIG. 14 is an exploded perspective view of a wire guider shown in FIG. 2.
FIG. 15 is a view showing an exemplary operation of a ceiling-type indoor unit according to a second embodiment of the present disclosure.
FIG. 16 is a bottom perspective view of an elevator of FIG. 15.
FIG. 17 is a perspective view showing an internal structure of the elevator of FIG. 16.
FIG. 18 is a plan view of FIG. 17.
FIG. 19 is a view showing an exemplary operation of the elevator according to the second embodiment of the present disclosure.
FIG. 20 is an exemplary view showing an arrangement state of wires according to a third embodiment of the present disclosure.

[Mode for Disclosure]

[0056] Advantages and features of the present disclosure and implementation methods thereof will be clarified through following embodiments described with reference to the accompanying drawings. The present disclosure may, however, be embodied in different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the present disclosure to those skilled in the art. Further, the present disclosure is only defined by scopes of claims. Throughout the specification, the same reference numerals will be used to designate the same or like components.

[0057] Hereinafter, the present disclosure will be described in detail with reference to the accompanying drawings.

[0058] FIG. 1 is a perspective view of an indoor unit of an air-conditioner according to an embodiment of the present disclosure. FIG. 2 is an exemplary view of an operation of FIG. 1. FIG. 3 is a cross-sectional view of FIG. 1. FIG. 4 is an exploded perspective view of a front panel of FIG. 1. FIG. 5 is a plan view showing an arrangement of the front panel and an elevator of FIG. 1. FIG. 6 is a bottom view of the front panel shown in FIG. 1. FIG. 7 is a bottom perspective view of an elevator of FIG. 2. FIG. 8 is a bottom view of the front panel and the elevator of FIG. 2. FIG. 9 is a perspective view showing an internal structure of the elevator of FIG. 2. FIG. 10 is a plan view of FIG. 9. FIG. 11 is an exemplary view of an operation of an elevator according to a first embodiment of the present disclosure. FIG. 12 is an exemplary view showing an installation structure of a wire according to the first embodiment of the present disclosure. FIG. 13 is a plan view of an intake grille shown in FIG. 4. FIG. 14 is an exploded perspective view of a wire guider shown in FIG. 2.

<Configuration of Indoor Unit>

[0059] An indoor unit of an air-conditioner according to the present embodiment includes a case 100 including an inlet 101 and an outlet 102, an indoor heat exchanger 130 disposed in the case 100, and an indoor blower fan 140 disposed in the case 100 and causing air to flow to the inlet 101 and the outlet 102.

[0060] In the indoor unit, both the inlet 101 and the outlet 102 are formed on a bottom surface. The indoor unit intakes air from the bottom and then discharges air to the bottom.

[0061] Only part of the case 100 of the indoor unit is exposed to the outside of the case 100, and most of the case 100 is buried and hidden in the ceiling.

[0062] The case 100 further includes an intake grille 320 disposed to face a floor of a room, and an elevator 500 lifting or lowering the intake grille 320 in a vertical direction is disposed in the case 100.

[0063] When a user's operation signal is received, the elevator 500 may be operated, four wires 511, 512, 521, and 522 may be simultaneously unwound or wound by the operation of the elevator 500, and the intake grille 320 coupled to the wires 511, 512, 521, and 522 may be moved in the vertical direction.

[0064] A structure of the elevator 500 for lifting and lowering the intake grille 320 will be described later in detail.

<Configuration of Case>

[0065] In this embodiment, the case 100 includes a case housing 110 and a front panel 300. The case housing 100 is installed to hang on the ceiling of a room through a hanger (not shown) and a lower side thereof is open. The front panel 300 covers the open surface of the case housing 110, is disposed to face a floor of the room, is exposed to the room, and has the inlet 101 and the outlet 102.

[0066] The case 100 may be implemented in various ways depending on a production form, and the configuration of the case 100 does not limit the spirit of the present disclosure.

[0067] The inlet 101 and the outlet 102 are both disposed on the front panel 300. In this embodiment, only the front panel 300 is exposed to the outside and the case housing 110 is embedded and hidden in the ceiling. The front panel 300 is disposed below the case housing 110. The intake grille 320 is located inside the front panel 300. The intake grille 320 is located on the same horizontal line as the front panel 300 and is located lower than the case housing 110.

[0068] Both the inlet 101 and the outlet 102 are open downward. The inlet 101 and the outlet 102 are located lower than the indoor heat exchanger 130 and the indoor blower fan 140.

[0069] The inlet 101 is disposed at the center of the front panel 300, and the outlet 102 is disposed outside the inlet 101. The number of the inlet 101 or the number of the outlet 102 is irrelevant to the spirit of the present disclosure. In this embodiment, one inlet 101 is provided and a plurality of outlets 102 are disposed.

[0070] In the present embodiment, the inlet 101 has a square shape in a bottom view, and four outlets 102 are provided and spaced apart from each edge of the inlet 101 by a predetermined interval.

<Configuration of Indoor Heat Exchanger>

[0071] The indoor heat exchanger 130 is disposed between the inlet 101 and the outlet 102 and partitions the case 100 into an inner side and an outer side. The indoor heat exchanger 130 is disposed vertically in this embodiment.

[0072] An indoor blower fan 140 is located on an inner side of the indoor heat exchanger 130.

[0073] In a top or bottom view, the indoor heat exchanger may have an overall shape of "□", and some sections thereof may be separated.

[0074] The indoor heat exchanger 130 is disposed such that air discharged from the indoor blower fan 140 enters vertically.

[0075] A drain pan 132 is installed in the case 100, and the indoor heat exchanger 130 is mounted on the drain pan 132. Condensate water generated in the indoor heat exchanger 130 may flow to the drain pan 132 and be subsequently stored therein. A drain pump (not shown) for discharging collected condensate water to the outside is disposed in the drain pan 132.

[0076] The drain pan 132 may have an inclined surface having directionality to collect and store condensate water flowing from the indoor heat exchanger 130 to one side.

<Configuration of Indoor Blower Fan>

[0077] The indoor blower fan 140 is located in the case 100 and is disposed above the inlet 101. The indoor blower fan 140 is a centrifugal blower that intakes air to the center and discharges air in a circumferential direction.

[0078] The indoor blower fan 140 includes a bell mouse 142, a fan 144, and a fan motor 146.

[0079] The bell mouse 142 is disposed above the intake grille 320 and located below the fan 144. The bell mouse 142 guides air passing through the intake grille 320 to the fan 144.

[0080] The fan motor 146 rotates the fan 144. The fan motor 146 is fixed to the case housing 110. The fan motor 146 is disposed above the fan 144. At least a portion of the fan motor 146 is located higher than the fan 144.

[0081] A motor shaft of the fan motor 146 is disposed to face a lower side, and the fan 144 is coupled to the motor shaft.

[0082] The indoor heat exchanger 130 is located outside the edge of the fan 144. At least portions of the fan 144 and the indoor heat exchanger 130 are disposed on the same horizontal line. At least a portion of the bell mouse 142 is inserted into the fan 144. At least a portion of the bell mouse 142 overlaps the fan 144 in the up-down direction.

<Configuration of Flow Path>

[0083] The indoor heat exchanger 130 is disposed in the case housing 110 and partitions an inner space of the case housing 110 into an inner side and an outer side.

[0084] An inner space surrounded by the indoor heat exchanger 130 is defined as an intake flow path 103, and an outer space of the indoor heat exchanger 130 is defined as a discharge flow path 104.

[0085] The indoor blower fan 140 is disposed at the intake flow path 103. The discharge flow path 104 is between the outside of the indoor heat exchanger 130 and a side wall of the case housing 110.

[0086] In a top view or a bottom view, the intake flow path 103 is an inner side surrounded by "□" of the indoor heat exchanger, and the discharge flow path 104 is an outer side surrounded by "□" of the indoor heat exchanger.

[0087] The intake flow path 103 communicates with the inlet 101, and the discharge flow path 104 communicates with the outlet 103.

[0088] Air flows from a lower side to an upper side of the intake flow path 103 and flows from an upper side to a lower side of the discharge flow path 104. A flow direction of air is switched 180 degrees based on the indoor heat exchanger 130.

[0089] The inlet 101 and the outlet 102 are provided on the same plane of the front panel 300.

[0090] The inlet 101 and the outlet 102 are arranged to face in the same direction. In this embodiment, the inlet 101 and the outlet 102 are arranged to face the floor of the room.

[0091] When the front panel 300 is curved, the outlet 102 may be formed to have a slight side slope, but the outlet 102 connected to the discharge flow path 104 is provided to face downward.

[0092] A vane module 200 is disposed to control a direction of air discharged through the outlet 102.

[0093] When air flows from the intake flow path 103 to the discharge flow path 104, the air flows in a horizontal direction. The air flows from the center of the fan 144 to an outer side in a radial direction and passes through the indoor heat exchanger 130. Based on the indoor heat exchanger 130, air flows of the intake flow path 103 and the discharge flow path 104 are opposite to each other. That is, air flows from a lower side to an upper side in the intake flow path 103, and air flows from an upper side to a lower side in the discharge flow path 104.

<Configuration of Front Panel>

[0094] The front panel 300 includes a front body 310 coupled to the case housing 110, having the inlet 101 and the outlet 102, the intake grille 320 having a plurality of grille holes 321 and covering the inlet 101, a pre-filter 330 detachably assembled to the intake grille 320, and a vane module 200 installed at the front body 310 and controlling an air flow direction of the outlet 102.

[0095] The intake grille 320 is disposed separately from the front body 310. The intake grille 320 is in close contact with the front body 310, but a component for assembling or coupling the front body 310 and the intake grille 320 is not disposed.

[0096] The intake grille 320 is pulled by a wire to maintain a close contact with the front body 310 and may be lowered or lifted according to an operation of the elevator 500.

[0097] The intake grille 320 may be lifted or lowered in the up-down direction from the front body 310 by the elevator 500. The intake grille 320 covers the entire inlet 101.

[0098] The elevator 500 and the intake grille 320 are connected through four wires and the elevator 500 moves the intake grille 320 in the up-down direction by winding or unwinding the wires.

[0099] In this embodiment, the intake grille 320 has a plurality of grille holes 321 through a grid shape. The grille hole 321 and the inlet 101 are in communication.

[0100] The pre-filter 330 is disposed above the intake grille 320. The pre-filter 330 filters air intaken into the case 100. The pre-filter 330 is located above the grille hole 321 and filters air passing through the intake grille 320.

[0101] The outlet 102 is provided in the form of a long slit along the edge of the inlet 101. The vane module 200 is located on the outlet 102 and coupled to the front body 310.

[0102] In this embodiment, the vane module 200 may be separated to a lower side of the front body 310. That is, the vane module 200 is disposed irrespective of a coupling structure of the front body 310 and may be independently separated from the front body 310. A structure thereof will be described later in more detail.

<Configuration of Front Body>

[0103] The front body 310 is coupled to the lower side of the case housing 110 and is arranged toward a direction of the room. The front body 310 is installed on the ceiling of the room and exposed to the room.

[0104] The front body 310 is coupled to the case housing 110, and the case housing 110 supports a load of the front body 310. The front body 310 supports loads of the intake grille 320 and the pre-filter 330.

[0105] The front body 310 has a square shape in a top view. The front body 310 may have various forms.

[0106] An upper surface of the front body 310 is formed horizontally to be in close contact with the ceiling, and a lower surface thereof may have a slightly curved edge.

[0107] The inlet 101 is disposed at the center of the front body 310, and a plurality of outlets 102 are arranged outside the edge of the inlet 101.

[0108] In a top view, the inlet 101 may have a square shape, and the outlet 102 may have a rectangular shape. The outlet 102 may be formed in a slit shape in which a length is greater than a width.

[0109] The front body 310 includes a front frame 312, a side cover 314, and a corner cover 316.

[0110] The front frame 312 provides a load and rigidity of the front panel 300 and is fastened to the case housing 110. The inlet 101 and four outlets 102 are provided in the front frame 312.

[0111] In this embodiment, the front frame 312 includes a side frame 311 and a corner frame 313.

[0112] The corner frame 313 is disposed at each corner of the front panel 300. The side frame 311 is coupled with two corner frames 313. The side frame 311 includes an inner side frame 311a and an outer side frame 311b.

[0113] The inner side frame 311a is disposed between the inlet 101 and the outlet 102 and couples the two corner frames 313. The outer side frame 311b is disposed outside the outlet 102.

[0114] In this embodiment, four inner side frames 311a and four outer side frames 311b are provided.

[0115] The inlet 101 is located on an inner side of the four inner side frames 311a. The outlet 102 is surrounded by two corner frames 313, the inner side frames 311a, and the outer side frames 311b.

[0116] The side cover 314 and the corner cover 316 are coupled to a bottom surface of the front frame 312. The side cover 314 and the corner cover 316 are exposed to the user, and the front frame 312 is not visible to the user.

[0117] The side cover 314 is disposed at the edge of the front frame 312, and the corner cover 316 is disposed at the corner of the front frame 312.

[0118] The side cover 314 is formed of a synthetic resin material and is fastened and fixed to the front frame 312. Specifically, the side cover 314 is coupled to the side frame 311 and the corner cover 316 is coupled to the corner frame 313.

[0119] In this embodiment, four side covers 314 and four corner covers 316 are provided. The side covers 314 and the corner covers 316 are coupled to the front frame 312 and connected to one structure. In the front panel 300, four side covers 314 and four corner covers 316 form one edge.

[0120] The side cover 314 is disposed below the side frame 311, and the corner cover 316 is disposed below the corner frame 313.

[0121] The four side covers 314 and the four corner covers 316 are assembled to form a quadrangular rim. The four connected side covers 314 and the four connected corner covers 316 are defined as a front deco 350.

[0122] The front deco 350 forms a deco outer border 351 and a deco inner border 352.

[0123] In a top view or a bottom view, the deco outer border 351 has a square shape, and the deco inner border 352 is also formed in a square shape overall. However, the corner of the deco inner border has a predetermined curvature.

[0124] The intake grille 320 and four vane modules 200 are arranged on an inner side of the deco inner border 352. The intake grille 320 and four vane modules 200 are in contact with the deco inner border 352.

[0125] In this embodiment, four side covers 314 are arranged, and each side cover 314 is coupled to the front frame 312. An outer edge of the side cover 314 forms part of the deco outer border 351, and an inner edge thereof forms part of the deco inner border 352.

[0126] In particular, the inner edge of the side cover 314 forms an outer boundary of the outlet 102. The inner edge of the side cover 314 is defined as a side deco inner border 315.

[0127] In this embodiment, four corner covers 316 are arranged, and each corner cover 316 is coupled to the front frame 312. The outer edge of the corner cover 316 forms part of the deco outer border 351, and the inner edge thereof forms part of the deco inner border 352.

[0128] The inner edge of the corner cover 316 is defined as a corner deco inner border 317.

[0129] The corner deco inner border 317 may be disposed in contact with the intake grille 320. In this embodiment, the inner edge of the corner cover 316 is disposed to face the intake grille 320 and is spaced apart therefrom by a predetermined interval to form a gap 317a.

[0130] The side deco inner border 315 is also spaced apart from the vane module 200 by a predetermined interval to form a gap 315a and is disposed to face the outer edge of the vane module 200.

[0131] Therefore, the deco inner border 352 is spaced apart from the outer edge of the intake grille 320 and four vane modules 200 by a predetermined interval and form a continuous gap.

[0132] A continuous gap formed by four side deco inner border gaps 315a and four corner deco inner border gaps 317a is defined as a front deco gap 350a.

[0133] The front deco gap 350a is formed on an inner edge of the front deco 350. Specifically, the front deco gap 350a is formed by separating the outer edge of the intake grille 320 and the vane module 200 and the inner edge of the front deco 350.

[0134] When the vane module 200 is not operated (when the indoor unit is stopped), the front deco gap 350a makes the intake grille 320 and the vane module 200 appear as one structure.

<Configuration of Intake Grille>

[0135] The intake grille 320 is located below the front body 310. The intake grille 320 may be lowered downward while in close contact with the bottom surface of the front body 310.

[0136] The intake grille 320 includes a grille body 322, a plurality of grille holes 321 formed to penetrate the grille body 322 in the up-down direction, a wire fixing portion 329 provided at the grille body 322 and allowing the other end of the wire to be fixed thereto, and a filter coupling portion 331 to which the pre-filter 330 is detachably assembled.

[0137] The intake grille 320 includes a grille body 322 disposed below the inlet 101, communicating with the inlet 101 by a plurality of grille holes 321, having a square shape and a grille corner portion 327 extending diagonally from a corner of the grille body 322.

[0138] A bottom surface of the grille body 322 and a bottom surface of the vane 210 may form a continuous plane. In addition, the bottom surface of the grille body 322 and a bottom surface of the corner cover 316 may form a continuous

plane.

[0139] A plurality of grills 323 are arranged in a grid shape inside the grille body 322. The grid-shaped grille 323 forms a rectangular grille hole 321. A portion where the grille 323 and the grille hole 321 are formed is defined as an inlet portion.

[0140] The grille body 322 includes a grille 323 in which a plurality of grille holes 321 are formed and a grille body portion 324 disposed along the edge of the grille 323 and surrounding the grille 323. In the top view or the bottom view, the inlet portion is formed in a rectangular shape overall.

[0141] The pre-filter 330 is located above the inlet portion and covers the inlet portion.

[0142] Each corner of the inlet portion is disposed to face each corner of the front panel 300, and more specifically, to face the corner cover 316.

[0143] In the bottom view, the grille body 322 is formed in a rectangular shape.

[0144] An outer edge of the grille body portion 324 is disposed to face the outlet 102 or the front deco 350.

[0145] The outer edge of the grille body portion 324 includes a grille corner border 326 disposed to face the corner cover 316 and a grille side border 325 forming the outlet 102 and disposed to face the side cover 314.

[0146] The grille corner border 326 may have a curvature centering on the inside of the intake grille 320, and the grille side border 325 may have a curvature centering on the outside of the intake grille 320.

[0147] The grille body portion 324 further includes a grille corner portion 327 surrounded by the grille corner border 326 and two grille side borders 325. The grille corner portion 327 protrudes toward the corner cover 316 from the grille body portion 324.

[0148] The grille corner portion 327 is disposed at each corner of the grille body 322. The grille corner portion 327 extends toward each corner of the front panel 300.

[0149] In this embodiment, four grille corner portions 327 are disposed. For convenience of explanation, the four grille corner portions 327 are defined as a first grille corner portion 327-1, a second grille corner portion 327-2, a third grille corner portion 327-3, and a fourth grille corner portion 327-4.

[0150] The grille side border 325 is formed to be concave inward from the outside.

[0151] The outlet 102 is provided between the side cover 314 and the intake grille 320. More specifically, one outlet 102 is provided between the side deco inner border 315 of the side cover 314 and the grille side border 325 of the grille body 322. Each outlet 102 is provided between the side deco inner border 315 and the grille side border 325 disposed in four directions of the intake grille 320.

[0152] In this embodiment, the grille corner border 326 and the corner deco inner border 317 are arranged to face each other. A length of the grille corner border 326 and a length of the corner deco inner border 317 are equal. That is, a width of the corner cover 316 and a width of the grille corner portion 327 are equal. In addition, an inner width of the side cover 314 and a width of the grille side border 325 are equal.

[0153] The grille side border 325 is described in more detail as follows.

[0154] The grille side border 325 forms an inner boundary of the outlet 102. The side deco inner border 315 and the corner deco inner border 317 form an outer boundary of the outlet 102.

[0155] The grille side border 325 incudes a long linear section 325a extending in a longitudinal direction of the outlet 102 and formed as a straight line, a first curved section 325b connected to one side of the long linear section 325a and having a center of curvature formed on an outer side of the intake grille 320, a second curved section 325c connected to the other side of the long linear section 325a and having a center of curvature formed on an outer side of the intake grille 320, a first short linear section 325d connected to the first curved section 325b, and a second short linear section 325e connected to the second curved section 325c.

[0156] The outlet 102 is provided between the grille side border 325 and the side deco inner border 315, and the vane module 200 is disposed at each outlet 102.

[0157] An inner edge 210a of the vane 210 of the vane module 200 is disposed to face the grille side border 325, and an outer edge 210b of the vane 210 is disposed to face the side deco inner border 315.

[0158] Meanwhile, the wire fixing portion 329 to which the other end of the wire is fixed protrudes upward from the grille body portion 324. Four wire fixing portions 329 are arranged and correspond to the wires 511, 512, 521, and 522, respectively.

[0159] A wire fixing portion to which the other end of a 1-1 wire 511 is fixed is defined as a first wire fixing portion 329-1, a wire fixing portion to which the other end of the 1-2 wire 512 is fixed is defined as a second wire fixing portion 329-2, a wire fixing portion to which the other end of the 2-1 wire 521 is fixed is defined as a third wire fixing portion 329-3, and a wire fixing portion to which the other end of the wire 2-2 wire 522 is fixed is defined as a fourth wire fixing portion 329-4.

[0160] In the top view or the bottom view, the first wire fixing portion and the second wire fixing portion are symmetrical with reference to a direction of a motor shaft 541 of a first unit. In the top view or the bottom view, the third wire fixing portion and the fourth wire fixing portion are symmetrical with reference to a direction of the motor shaft 541 of a second unit.

[0161] An arrangement direction of the first wire fixing portion and the second wire fixing portion is parallel to that of the third wire fixing portion and the fourth wire fixing portion.

[0162] In this embodiment, the first wire fixing portion is located adjacent to the first grille corner portion 327-1, the second wire fixing portion is located adjacent to the second grille corner portion 327-2, and the third wire fixing portion is located adjacent to the third grille corner portion 327-3, and the fourth wire fixing portion is located adjacent to the fourth grille corner portion 327-4.

[0163] The wire fixing portion 329 is disposed outside the pre-filter 330 and disposed at the grille body 322. Each wire fixing portion protrudes upward from an upper surface of the grille body 322.

[0164] The filter coupling portion 331 is configured to fix the pre-filter 330. Since the pre-filter 330 needs to be periodically cleaned, the pre-filter 330 is detachably assembled to the filter coupling portion 331.

[0165] In this embodiment, the filter coupling portion 331 is a structure surrounding the edge of the pre-filter 330. The filter coupling portion 331 may be disposed outside the grille 323 and may be disposed along the inlet 101 or the edge of the inlet portion.

[0166] The filter coupling portion 331 protrudes upward from the upper surface of the grille body portion 324, and an interval in which the pre-filter 330 may be accommodated is formed between the filter coupling portion 331 and the upper surface of the grille body portion 324.

<Configuration of Pre-filter>

[0167] The pre-filter 330 is disposed above the intake grille 320. The pre-filter 330 filters foreign matter having a large volume from air intaken through the inlet 101.

[0168] The pre-filter 330 is disposed above the grille 323 and covers the entire inlet portion.

[0169] The pre-filter 330 is detachably assembled to the intake grille 320 and lowered together when the intake grille 320 is lowered.

<Configuration of Elevator>

[0170] The elevator 500 may lift or lower the intake grille 320 by winding or unwinding four wires 511, 512, 521, and 522 at the same time. The user may operate the elevator 500 by inputting an operation signal to a controller.

[0171] The elevator 500 is controlled by the controller. The elevator 500 supports the intake grille 320 at four points. The elevator 500 supports the intake grille 320 through four wires 511, 512, 521, and 522 and lifts or lowers the intake grille 320 by winding or unwinding the wires.

[0172] The elevator 500 is operated to wind or unwind four wires 511, 512, 521, and 522 simultaneously, through which the intake grille 320 may be lifted or lowered in a horizontal state.

[0173] The elevator 500 includes a first unit 510 and a second unit 520.

[0174] The first unit 510 may wind or unwind a pair of wires simultaneously, and the second unit 520 may also wind or unwind a pair of wires.

[0175] A pair of wires connected to the first unit 510 is defined as a 1-1 wire 511 and a 1-2 wire 512, and a pair of wires connected to the second unit 520 is defined as a 2-1 wire 521 and a 2-2 wire 522.

[0176] The first unit 510 may simultaneously wind or unwind the 1-1 wire 511 and the 1-2 wire 512. The second unit 520 may simultaneously wind or unwind the 2-1 wire 521 and the 2-2 wire 522.

[0177] One end (upper end) of the 1-1 wire 511 and one end (upper end) of the 1-2 wire 512 are coupled to the first unit 510, the other end (lower end) of the 1-1 wire 511 and the other end (lower end) of the 1-2 wire 512 are fixed to each wire fixing portion 329 disposed on one side of the intake grille 320.

[0178] One end (upper end) of the 2-1 wire 521 and one end (upper end) of the 2-2 wire 522 are coupled to the second unit 520, and the other end (lower end) of the 2-1 wire 521 and the other end (lower end) of the 2-2 wire 522 are fixed to each wire fixing portion 329 disposed on other side of the intake grille.

[0179] When the 1-1 wire 511 and the 1-2 wire 512 are arranged on the left, the 2-1 wire 521 and the 2-2 wire 522 are arranged on the right. Alternatively, when the 1-1 wire 511 and the 1-2 wire 512 are arranged on a front side, the 2-1 wire 521 and the 2-2 wire 522 are arranged on a rear side.

[0180] Referring to FIG. 5, the 1-1 wire 511 and the 1-2 wire 512 are located on the left and are arranged in the front-rear direction, and the 2-1 wire 521 and the 2-2 wire 522 are located on the right and are arranged in the front-rear direction.

[0181] In the bottom view or the top view, the 1-1 wire 511 and the 1-2 wire 512 are arranged in a line, and the 2-1 wire 521 and the 2-2 wire 522 are also arranged in a line.

[0182] The 1-1 wire 511 and the 2-1 wire 521 are arranged in parallel, and the 1-2 wires 512 and the 2-2 wires 522 are arranged in parallel.

[0183] The first unit 510 and the second unit 520 are arranged symmetrically to each other. When the first unit 510 is disposed on the left of the case 100, the second unit 520 is disposed on the right of the case 100. Similarly, when the first unit 510 is disposed on the front side of the case 100, the second unit 520 is disposed on the rear side of the case 100.

[0184] In this embodiment, the first unit 510 is disposed on the left of the case 100, and the second unit 520 is disposed

on the right of the case 100.

[0185] The elevator 500 provides a structure that allows the intake grille 320 to be lifted or lowered in a horizontal state by simultaneously winding or unwinding four wires.

[0186] Since the configurations of the first unit 510 and the second unit 520 are the same, the structure of the first unit 510 will be described as an example.

<Configuration of First Unit>

[0187] The first unit 510 includes a drum 530 to which one end of the 1-1 wire 511 and one end of the 1-2 wire 512 are fixed, a drum motor that rotates the drum 530, a first roller box 550 disposed to be penetrated by the 1-1 wire 511 and aligning a position of the 1-1 wire 511 when the 1-1 wire 511 is wound or unwound, a second roller box 560 disposed to be penetrated by the 1-2 wire 512 and aligning a position of the 1-2 wire 512 when the 1-2 wire 512 is wound or unwound, and a rotation amount detecting device 600 detecting the amount of rotation of the drum 530.

[0188] Since the components of the first unit and the components of the second unit are the same, the same reference numerals are used. However, when it is necessary to distinguish between the components of the first unit and the components of the second unit, the components of the first unit are referred to as "first" and the components of the second unit are referred to as "second" . For example, when it is necessary to distinguish between the drum motor of the first unit from the drum motor of the second unit, the drum motor of the first unit is referred to as a "first drum motor" and the drum motor of the second unit is referred to as a "second drum motor". The same applies to the rest of the components.

[0189] The first unit 510 may be disposed at any one of the front body 310, the cabinet housing 110, and the bell mouse 142.

[0190] The drum 530, a drum motor 540, the first roller box 550, and the second roller box 560 configuring the first unit 510 may be disposed at any one of the front body 310, the cabinet housing 110, and the bell mouse 142.

[0191] In this embodiment, a unit case 590 forming an appearance of the first unit 510 is provided to facilitate replacement and repair. The drum 530, the drum motor 540, the first roller box 550, the second roller box 560, and the rotation amount detecting device 600 are disposed in the unit case 590.

[0192] The unit case 590 may be disposed at any one of the front body 310, the cabinet housing 110, and the bell mouse 142. In this embodiment, the unit case 590 is installed at the bell mouse 142. The unit case 590 is disposed above the intake grille 320.

[0193] When it is necessary to distinguish the unit case, the unit case disposed at the first unit is defined as a first unit case and the unit case disposed at the second unit is defined as a second unit case.

[0194] In addition, a plurality of roller boxes disposed in the first unit case are defined as a 1-1 roller boxes and a 1-2 roller box, and a plurality of roller boxes disposed in the second unit case are defined as a 2-1 roller box and a 2-2 roller box.

[0195] The 1-1 roller box is located in a 1-1 direction 511a with respect to the first drum, and the 1-2 roller box is located in a 1-2 direction 512a with respect to the first drum.

[0196] The direction of the 1-1 wire 511 disposed between the first drum and the 1-1 roller box is defined as the 1-1 direction 511a, and the direction of the 1-2 wires 512 disposed therebetween the first drum and the 1-2 roller box is defined as the 1-2th direction 512a.

[0197] In this embodiment, the 1-1 direction is disposed toward the first wire guider 701, which will be described later, and the 1-2 direction is disposed toward the second wire guider 702.

[0198] When the 1-1 direction is located on an upper side based on a rotation center of the drum, the 1-2 direction is located on a lower side. Conversely, when the 1-1 direction is located on the lower side based on the rotation center of the drum, the 1-2 direction is located on the upper side.

[0199] The 1-1 direction and the 1-2 direction form tangent lines with an outer surface of the drum, respectively.

[0200] That is, the 1-1 direction is tangential to the drum, and the 1-2 direction is also tangential to the outer surface of the drum.

[0201] Similarly, a direction of the 2-1 wire 521 disposed between the second drum and the 2-1 roller box is defined as a 2-1 direction, and a direction of the 2-2 wire 522 disposed between the second drum and the 2-2 roller box is defined as a 2-2 direction.

[0202] The 2-1 roller box is located in the 2-1 direction based on the second drum, and the 2-2 roller box is located in the 2-2 direction based on the second drum.

[0203] In this embodiment, the 2-1 direction is disposed toward a third wire guider 703, which will be described later, and the 2-2 direction is disposed toward a fourth wire guider 704.

[0204] In this embodiment, the 1-1 direction and the 1-2 direction are arranged to face in different directions, and when viewed from the side of the first unit, the 1-1 direction and the 1-2 direction intersect each other.

[0205] In the top view of the first unit, the 1-1 direction and the 1-2 direction may intersect each other or may be parallel to ach other depending on a position at which the 1-1 wire 511 and the 1-2 wire 512 are wound.

[0206] Similarly, the 2-1 direction and the 2-2 direction are arranged to face in different directions, and the 2-1 direction and the 2-2 direction intersect each other.

[0207] The 2-1 direction and the 2-2 direction form tangent lines with the outer surface of the drum, respectively.

[0208] That is, the 2-1 direction is arranged tangentially to the drum, and the 2-2 direction is also arranged tangentially to the outer surface of the drum.

<Configuration of Drum>

[0209] The drum 530 of the first unit 510 includes a drum body 535 formed in a cylindrical shape and allowing one end of the 1-1 wire 511 and the 1-2 wire 512 to be fixed thereto, a partition 533 disposed to protrude outward in a radial direction of the drum body 535 and partitioning a first zone 531 around which the 1-1 wire 511 is wound and a second zone 532 around which the 1-2 wire 512 is wound, a 1-1 barrier 534 disposed at the drum body 535 and preventing the 1-1 wire 511 wound in the first zone 531 from being released to an outside of the drum body 535, and a 1-2 barrier 536 disposed at the drum body 535 and preventing the 1-2 wire 512 wound in the second zone 532 from being released to an outside of the drum body 535.

[0210] The 1-1 wire 511 is wound around the first zone 531 and forms a tangent line with the outer surface of the first zone 531. The 1-2 wire 512 is wound around the second zone 532 and forms a tangent line with the outer surface of the second zone 532.

[0211] The 1-1 direction is disposed in a tangential direction with the outer surface of the first zone 531. The 1-2 direction is disposed in a tangential direction with the outer surface of the second zone 532.

[0212] The 1-1 direction is disposed to face an end roller 554 of the 1-1 roller box 550 to be described later, and the 1-2 direction is disposed to face an end roller 564 of the 1-2 roller box 560.

[0213] The 1-1 direction may be a tangential direction of the first zone 531 and the end roller 554. The 1-2 direction may be a tangential direction of the second zone 532 and the end roller 564.

[0214] The drum 530 of the second unit 520 includes a drum body 535 having a cylindrical shape and allowing each of one end of the 2-1 wire 521 and one end of the 2-2 wire 522 to be fixed thereto, a second partition 533 radially protruding outward from the drum body 535 and partitioning the first zone 531 around which the 2-1 wire is wound and the second zone 532 around which the 2-2 wire 522 is wound, a 2-1 barrier (not shown) disposed at the drum body 535 and preventing the 2-1 wire 521 wound at the first zone 531 from escaping to outside of the drum body 535, and a 2-2 barrier (not shown) disposed at the drum body 535 and preventing the 2-2 wire 512 wound at the second zone 532 from escaping to outside of the drum body 535.

[0215] The 2-1 wire 521 is wound around the first zone 531 and forms a tangent line with the outer surface of the first zone 531. The 2-2 wire 522 is wound around the second zone 532 and forms a tangent line with the outer surface of the second zone 532.

[0216] The 2-1 direction is disposed in a tangential direction with the outer surface of the first zone 531. The 2-2 direction is disposed in a tangential direction with the outer surface of the second zone 532.

[0217] The 2-1 direction is disposed to face the end roller 554 of the 2-1 roller box 550 to be described later, and the 2-2 direction is disposed to face the end roller 564 of the 2-2 roller box 560.

[0218] The 2-1 direction may be a tangential direction of the first zone 531 and the end roller 554. The 2-2 direction may be a tangential direction of the second zone 532 and the end roller 564.

[0219] The 2-1 barrier is the same component as the 1-1 barrier 534, the 2-2 barrier is the same component as the 1-2 barrier 536, and the second partition is the same component as the first partition.

[0220] The drum body 535 is formed in a cylindrical shape. Unlike the present embodiment, the drum body 535 may be formed in various shapes. A recess may be provided on an outer circumferential surface of the drum body 535 to facilitate alignment when the wire is wound. The recess may be provided in a spiral shape along the outer circumferential surface of the drum body 535.

[0221] The partition 533 is disposed in the middle of the drum body 535 with reference to the longitudinal direction. The partition 533 is formed to protrude radially outward of the drum body 535. In this embodiment, the partition 533 is formed in a ring shape, and the center of the partition 533 is disposed on the same axis as an axial center C of the drum body 535. The ring shape is disposed to protrude radially along an outer circumferential surface of the drum body 535.

[0222] Unlike the present embodiment, the partition 533 may be formed in an arc shape. A plurality of partitions 533 may be arranged separately along the outer circumferential surface of the drum body 535.

[0223] The axial center C of the drum body 535 and the 1-1 wire 511 or the 1-2 wire 512 intersect each other. The 1-1 wire 511 or the 1-2 wire 512 is wound in a spiral form based on the axial center C.

[0224] The partition 533 divides the outer circumferential surface of the drum body 535 into the first zone 531 and the second zone 532. The first zone 531 and the second zone 532 are arranged in the longitudinal direction of the drum. In this embodiment, the first zone 531 is located close to the drum motor 540, and the 1-1 barrier 534 forming the first zone 531 is located close to the drum motor 540.

[0225] The 1-1 wire 511 is located at the first zone 531 and is wound or unwound at the first zone 531. The 1-2 wire 512 is located at the second zone 532 and is wound or unwound at the second zone 532.

[0226] The partition 533 prevents the wire from being unwound outside the corresponding zone.

[0227] The 1-1 barrier 534 prevents the 1-1 wire 511 from escaping to outside of the first zone 531. The 1-2 barrier 536 prevents the 1-2 wire 512 from escaping to outside of the second zone 532.

[0228] The 1-1 barrier 534 is disposed to protrude radially outward of the drum body 535. The 1-2 barrier 536 is disposed to protrude radially outward of the drum body 535.

[0229] In this embodiment, the 1-1 barrier 534 and the 1-2 barrier 536 are formed in a ring shape along the outer circumferential surface of the drum body 535. The ring shapes of the 1-1 barrier 534 and the 1-2 barrier 536 are disposed to protrude radially along the outer circumferential surface of the drum body 535.

[0230] One end of the 1-1 wire 511 is fixed to the first zone 531, and one end of the 1-2 wire 512 is fixed to the second zone 532.

[0231] One end of the 1-1 wire 511 may be fixed to any one of the drum body 535, the partition 533, or the 1-1 barrier 534 forming the first zone 531.

[0232] In this embodiment, one end of the 1-1 wire 511 is fixed to the outer circumferential surface of the drum body 535 at the first zone 531. Also, in this embodiment, one end of the 1-2 wire 512 is fixed to the outer circumferential surface of the drum body 535 at the second zone 532.

[0233] The 1-1 wire 511 and the 1-2 wire 512 are wound around the outer circumferential surface of the drum body 535. Here, the 1-1 wire 511 and the 1-2 wire 512 are wound or unwound in the same direction. In this embodiment, when the drum 530 is rotated in a clockwise direction with respect to the axial center C of the drum body 535, the 1-1 wire 511 and the 1-2 wire 512 are wound. When the drum 530 is rotated in a counterclockwise direction with respect to the axial center C of the drum body 535, the 1-1 wire 511 and the 1-2 wire 512 are unwound.

[0234] In order to detect the amount of rotation of the drum 530, some components of the rotation amount detecting device 600 may be disposed at the drum 530. In order to detect the amount of rotation of the drum 530, a rotation detecting factor 601 is disposed. In this embodiment, the rotation detecting factor 601 is disposed at equal intervals with reference to a circumferential direction based on the axial center C of the drum 530. The rotation detecting factor 601 may be disposed on at least one of the 1-1 barrier 534 or the 1-2 barrier 536.

<Configuration of Drum Motor>

[0235] In the drum motor 540, a motor shaft 541 is assembled to the drum 530. The motor shaft 541 and the axial center C of the drum 530 are arranged in a line. In this embodiment, the drum motor 540 is a step motor.

[0236] Unlike the present embodiment, gears may be arranged to provide the drum 530 with a rotational force of the drum motor 540. Through the combination of the gears, the amount of rotation and a rotation speed of the drum 530 may be more precisely controlled.

[0237] The axial center C and an arrangement direction of the 1-1 wire 511 and the 1-2 wire 512 intersect. In this embodiment, the axial center C and the arrangement direction of the 1-1 wire 511 and the 1-2 wire 512 are perpendicular to each other.

[0238] In addition, one end of the 1-1 wire 511 and one end of the 1-2 wire 512 are symmetrical with respect to the axial center C.

[0239] To simultaneously wind or unwind the 1-1 wire 511 and the 1-2 wire 512, the 1-1 wire 511 is wound to an upper surface of the drum body 535 and the 1 -2 wire 512 is wound to a lower surface of the drum body 535.

<Configuration of Roller Box>

[0240] The first roller box 550 and the second roller box 560 are disposed in the unit case 590 of the first unit 510. The first roller box 550 and the second roller box 560 are also disposed in the unit case 590 of the second unit 520.

[0241] The first roller box 550 aligns the 1-1 wire 511 in order at the drum body 535 when the 1-1 wire 511 is wound or unwound at the first zone 531 of the drum 530.

[0242] When the 1-1 wire 511 is not wound while forming a uniform layer on the outer circumferential surface of the drum 530, a length difference may be formed from the 1-2 wire 512 by a thickness of the wire.

[0243] When the 1-1 wire 511 wound at the first zone 531 and the 1-2 wire 512 wound at the second zone 532 form a non-uniform layer, the intake grille 320 is inclined relative to a horizontal direction.

[0244] The second roller box 560 aligns the 1-2 wire 512 in order at the drum body 535 when the 1-2 wire 512 is wound or unwound at the second zone 532 of the drum 530.

[0245] In the top view, the first roller box 550 and the second roller box 560 are symmetrically arranged based on an intersection of the partition 533 and the axial center C.

[0246] Since the first roller box 550 and the second roller box 560 have the same configuration, the first roller box 550

will be described as an example.

[0247] The first roller box 550 includes a box 555 fixed to the unit case 590, a start roller 551 disposed in the box 555, coming into contact with the 1-1 wire 511, rotated by frictional contact when the 1-1 wire 511 moves, and disposed farthest from the drum 530, an end roller 554 disposed in the box 555, coming into contact with the 1-1 wire 511, rotated by frictional contact when the 1-1 wire 511 moves, and disposed closest to the drum 530, a second roller 552 disposed in the box 555, coming into contact with the 1-1 wire 511, rotated by frictional contact when the 1-1 wire 511 moves, disposed between the start roller 551 and the end roller 554, and disposed to be movable in a horizontal direction by tension of the 1-1 wire 511, and a third roller 553 disposed in the box 555, coming into contact with the 1-1 wire 511, rotated by frictional contact when the 1-1 wire 511 moves, disposed between the second roller 552 and the end roller 554, and disposed to be movable in a horizontal direction by tension of the 1-1 wire 511.

[0248] In this embodiment, the second roller 552 and the third roller 553 are defined as transfer rollers. In this embodiment, the second roller 552 and the third roller 553 are used as the transfer rollers, but, unlike the present embodiment, only one transfer roller may also be used.

[0249] With respect to the drum 530, the start roller 551 is disposed at the farthest position, the second roller 552 is disposed at the second farthest position, the third roller 553 is disposed at the third farthest position, and the end roller 554 is located to be closest to the drum 530.

[0250] The start roller 551, the second roller 552, the third roller 553, and the end roller 554 are assembled to the roller shafts 551a, 552a, 553a, and 554a, respectively, and may be rotated about the roller shaft 551a, 552a, 553a, and 554a, respectively. Each of the roller shafts 551a, 552a, 553a, and 554a is disposed in a horizontal direction.

[0251] The start roller 551 is rotatably assembled to the first roller shaft 551a, the second roller 552 is rotatably assembled to the second roller shaft 552a, the third roller 553 is rotatably assembled to the third roller shaft 553a, and the end roller 554 is rotatably assembled to the fourth roller shaft 554a. In this embodiment, the second roller shaft 552a and the third roller shaft 553a are transfer roller shafts.

[0252] At least one of the start roller 551, the second roller 552, the third roller 553, and the end roller 554 is rotated in place, and the other rollers may be rotated, while moving along a roller shaft.

[0253] In the present embodiment, the start roller 551 is a fixed roller not moved along the roller shaft. In the present embodiment, the start roller 551, in a state of being assembled to the roller shaft 551a, is rotated in place around a roller shaft 551a.

[0254] The second roller 552, the third roller 553, and the end roller 554 are movable rollers movable in the horizontal direction along each roller shaft. In this embodiment, the second roller 552, the third roller 553, and the end roller 554 are rotatable in a state of being assembled to each roller shaft 552a, 553a, and 554a. When a force (e.g., tension of wire) is applied to the second roller 552, the third roller 553, and the end roller 554, the second roller 552, the third roller 553, and the end roller 554 may be moved along the roller shafts 552a, 553a, and 554a, respectively. Each roller 552, 553, 554 may be moved relative to each other.

[0255] In this embodiment, the 1-1 wire 511 is in contact with a lower surface of the start roller 551 and is in contact with an upper surface of the end roller 554. Unlike this embodiment, contact surfaces of the 1-1 wire 511 and each roller may be changed.

[0256] In the present embodiment, since the 1-1 wire 511 surrounds the upper surface of the guider 750 and the 1-1 wire is changed in direction from the guider 750 downward in a vertical direction, preferably, the 1-1 wire 511 is disposed to surround a lower surface of the start roller 551.

[0257] In such a structure as in the present embodiment, the 1-1 wire 511 presses the guider 750 downward and presses the start roller 551 upward, and thus, it is effective to maintain tension of the 1-1 wire 750.

[0258] In this embodiment, each wire presses the guider and the start roller in different directions. Each wire is supported by the guider and the start roller in a staggered manner. Each wire is disposed diagonally with respect to the guider and start roller.

[0259] A part of the start roller 551 protrudes outside the box 555. The 1-1 wire 511 is preferably disposed horizontally or upwardly than a horizontal level toward the guider 750.

[0260] Referring to FIG. 12, when viewed from the side of the case, the 1-1 wire 511 facing the first wire guider 701 from the start roller 551 and the 1-2 wire 512 facing the second wider guider 702 from the start roller 561 are symmetrical based on the axial center C of the drum 530. In the top view, the 1-1 wire 511 facing the first wire guider 701 from the start roller 551 and the 1-2 wire 512 facing the second wire guider 702 from the start roller 561 512 are arranged in a line. This is possible because the start rollers 551 and 561 are fixed rollers.

[0261] The arrangement of the 2-1 wire 521 and the 2-2 wire 522 is the same as that of the 1-1 wire 511 and the 1-2 wire 512, and thus, a separate description thereof will be omitted.

[0262] The 1-1 wire 511 is aligned in line with the drum 530 by a relative movement of the second roller 552, the third roller 553, and the end roller 554.

[0263] A wire guard 551b is disposed to be spaced apart from the start roller 551 by a predetermined distance. The 1-1 wire 511 is disposed between the wire guard 551b and the start roller 551. The wire guard 551b prevents the wire

wound around the roller from being separated from the roller.

[0264] Wire guards 552b, 553b, and 554b are also disposed on the second roller 552, the third roller 553, and the end roller 554, respectively.

[0265] The start roller 551 located on the outermost side excludes movement in an axial direction, thereby preventing an axial movement of the wire. When the start roller 551 located outside is moved along the roller shaft 551a, a deviation may occur in the height of the intake grille 320 and the intake grille 320 may be shaken.

[0266] When the wire is wound or unwound, the start roller 551 is rotated in place in the box 555 and the second roller 552, the third roller 553, and the end roller 554 may be moved along the respective roller shafts.

[0267] The start roller 551, the second roller 552, the third roller 553, and the end roller 554 are arranged in a zigzag form in the up-down direction.

[0268] Based on the start roller 551, the second roller 552 is disposed above the start roller 551 and the third roller 553 is disposed below the start roller 551. The end roller 554 is disposed above the start roller 551 and the second roller 552, and is located below the third roller 553.

[0269] In particular, the second roller shaft 552a is located highest, the third roller shaft 553a is located lowest, and the first roller shaft 551a is located higher than the third roller shaft 553a and the fourth roller shaft 554a is located higher than the first roller shaft 551.

[0270] The fourth roller shaft 554a is located above the central axis C, and a wire connecting the drum body 535 is disposed to be inclined upward. Tension may be formed at the wire through a relative arrangement of the fourth roller shaft 554a and the central shaft C.

[0271] To reduce a horizontal width of the roller box 550, the start roller 551, the second roller 552, the third roller 553, and the end roller 554 are located to overlap each other in the up-down direction.

[0272] That is, a gap between the start roller 551 and the third roller 553 is formed smaller than a diameter of the second roller 552. In addition, an interval between the second roller 552 and the end roller 554 is smaller than a diameter of the third roller 553.

[0273] In this embodiment, the 1-1 wire 511 surrounds a lower outer circumferential surface of the start roller 551 and surrounds an upper outer circumferential surface of the end roller 554.

[0274] The 1-1 direction may be disposed to a tangential direction with respect to an outer surface of the first zone 531 and an outer surface of the end roller 554.

[0275] Meanwhile, the second roller box 560 includes a box 565 fixed to the unit case 590, a first roller 561 and a fourth roller 564 disposed in the box 565, coming into contact with the 1-2 wire 512, and rotated by frictional contact when the 1-2 wire 512 moves, and a second roller 562 and a third roller 563 disposed in the box 565, coming into contact with the 1-2 wire 512, rotated by frictional contact when the 1-2 wire 512 moves, and disposed to be relatively movable in an axial direction by tension of the 1-2 wire 512.

[0276] The first roller 561, the second roller 562, the third roller 563, and the fourth roller 564 are assembled to the roller shafts 561a, 562a, 563a, and 564a and may be rotated around the roller shafts 561a, 562a, 563a, and 564a, respectively.

[0277] The wire guards 561b, 562b, 563b, and 564b are disposed in the second roller box 560 and spaced apart by a predetermined interval from the first roller 561, the second roller 562, the third roller 563, and the fourth roller 564.

[0278] The first roller box 550 and the second roller box 560 are symmetrically disposed with respect to the drum 530. In particular, the first roller box 550 and the second roller box 560 are disposed to be bilaterally symmetrical based on the axial center C.

[0279] With respect to the axial center C, the first rollers 551 and 561 are disposed on the farthest side and the end rollers 554 and 564 are disposed on the closest side.

[0280] In this embodiment, the 1-2 direction may be disposed in a tangential direction with respect to an outer surface of the second zone 532 and an outer surface of the end roller 564.

[0281] In this embodiment, one end of the 1-1 wire 511 and one end of the 1-2 wire 512 are located on opposite sides based on the axial center of the drum 530. The 1-1 wire 511 and the 1-2 wire 512 are wound around or unwound from the drum body 535 in the same direction according to rotation of the drum 530.

[0282] The unit case 590 is formed in a box shape and includes a first hole 591 and a second hole 592 provided on the side thereof.

[0283] The first hole 591 is disposed on one side of the unit case 590, and the second hole 592 is disposed on the other side of the unit case 590. For example, when the first hole 591 is formed on the left side of the unit case 590, the second hole 592 is formed on the right side of the unit case 590.

[0284] The 1-1 wire 511 and the 1-2 wire 512 penetrate the unit case 590 in the horizontal direction.

[0285] The first hole 591 of the first unit case 590 is penetrated by the 1-1 wire 511. The first hole 591 of the first unit case 590 is disposed to face the first wire guider 701 described later.

[0286] The second hole 592 of the first unit case 590 is penetrated by the 1-2 wire 512. The second hole 592 of the first unit case 590 is disposed to face the second wire guider 702 to be described later.

[0287] The first hole 591 of the second unit case 590 is penetrated by the 2-1 wire 521. The first hole 591 of the first unit case 590 is disposed to face the third wire guider 701 described later.

[0288] The second hole 592 of the second unit case 590 is penetrated by the 2-2 wire 522. The second hole 592 of the second unit case 590 is disposed to face the fourth wire guider 702 to be described later.

<Configuration of Wire Guider>

[0289] A wire guider 700 is provided at the front body 310 to support the wire when the wire is wound or unwound by the elevator 500. Four wire guiders 700 are provided and correspond to the wires 511, 512, 521, and 522.

[0290] A wire guider corresponding to the 1-1 wire 511 is defined as a first wire guider 701, a wire guider corresponding to the 1-2 wire 512 is defined as a second wire guider 702, a wire guider corresponding to the 2-1 wire 521 is defined as a third wire guider 703, and a wire guider corresponding to the 2-2 wire 522 is defined as a fourth wire guider 704.

[0291] The first wire guider 701 and the second wire guider 702 are disposed to face each other with reference to a direction of the motor shaft 541 of the first drum motor. The third wire guider 703 and the fourth wire guider 704 are disposed to face each other with reference to a direction of the motor shaft 541 of the second drum motor.

[0292] The first wire guider 701, the second wire guider 702, the third wire guider 703, and the fourth wire guider 704 are all located at the same height.

[0293] In the top view or the bottom view, the first wire guider 701 and the second wire guider 702 are symmetrical based on a direction of the motor shaft 541 of the first unit. In the top view or the bottom view, the third wire guider 703 and the fourth wire guider 704 are symmetrical based on the direction of the motor shaft 541 of the second unit.

[0294] An arrangement direction of the first wire guider 701 and the second wire guider 702 and an arrangement direction of the third wire guider 703 and the fourth wire guider 704 are parallel.

[0295] In this embodiment, the first wire guider 701 is located adjacent to the first corner cover 316-1, the second wire guider 702 is located adjacent to the second corner cover 316-2 , the third wire guider 703 is located adjacent to the third corner cover 316-3, and the fourth wire guider 704 is located adjacent to the fourth corner cover 316-4.

[0296] In this embodiment, the wire guider 700 is disposed at the front body 310. The wire guider 700 protrudes from the front body 310 toward the elevator 500. Each wire guider 700 is disposed on an inner surface 310a of the front body 310. The wire guider 700 is located between the roller box 550 and the front body 310. The wire guider 700 protrudes horizontally from the front body 310 toward the roller box 550.

[0297] The wire guider 700 is located above the intake grille 320 and below the bell mouse 142.

[0298] The wire guider 700 includes a fixed block 710 disposed on the inner surface 310a of the front body 310 and protruding toward the roller box 550, an assembled block 720 assembled with the fixed block 710, and a guider 750 disposed at the assembled block 720, disposed to be rotatable in the assembled block 720, and supporting a wire.

[0299] In this embodiment, the wire guider 700 includes the fixed block 710 and the assembled block 720, but unlike the present embodiment, the wire guider 700 may include one integrated block. The one block may be integrally manufactured with the front body 310 or separately manufactured and then assembled to the front body 310. However, if the block is manufactured as one block and is integrated with the front body 310, it may be difficult to manufacture in the shape of an assembled block as in this embodiment through injection molding.

<Configuration of Guider>

[0300] The guider 750 supports the wire. The guider 750 may be rotated together with the wire when the wire is wound or unwound.

[0301] The guider 750 accommodates the wire and provides a structure to help the wire move. The guider 750 may be provided in various forms, but in this embodiment, the guider 750 is formed in a disk shape.

[0302] The guider 750 includes a guider body 752 having a rotation center in a horizontal direction, a guider recess 754 disposed on an outer surface of the guider body 752 and provided to be concave toward the rotation center, and allowing the wire to be inserted and supported therein, and a guide shaft 755 penetrating the rotation center of the guider body 752 and rotatably assembled to the assembled block 720.

[0303] In this embodiment, the guider body 752 is formed in a disk shape and is disposed to be erected in the up-down direction. The guider body 752 is rotated in a vertical direction, and the rotation center is formed in a horizontal direction. In a side view, an outer surface 752a of the guider body 752 is formed in a circular shape.

[0304] The guider recess 754 is formed concave toward the center of rotation from the outer surface of the guider body 752. The guider recess 754 is formed in a ring shape along the outer surface of the guider body 752.

[0305] The wire is inserted into the guider recess 754 and may form a friction force with the guider body 752 by frictional contact. The guider body 752 may be rotated by frictional contact between the wire and the guider body 752.

[0306] A guider shaft hole 753 penetrated by the guider shaft 755 is formed at the rotation center of the guider body 752. A formation direction of the guider shaft hole 753 and a formation direction of the guider recess 754 intersect.

[0307] In this embodiment, the guider shaft 755 and the guider body 752 are separately manufactured and then assembled. Unlike the present embodiment, the guider shaft 755 and the guider body 752 may be integrally manufactured.

<Configuration of Fixed Block>

[0308] In this embodiment, two fixed blocks 710 are provided. Unlike the present embodiment, one fixed block 710 may be manufactured. In this embodiment, the fixed block 710 is manufactured integrally with the front body 310. Unlike the present embodiment, the fixed block 710 may be separately manufactured and then assembled to the front body 310.

[0309] The fixed block 710 includes a first fixed block 711 and a second fixed block 712.

[0310] The first fixed block 711 and the second fixed block 712 are disposed in a horizontal direction and are laterally symmetrical. The first fixed block 711 and the second fixed block 712 are spaced apart from each other to form an insertion interval 713, and a guider 750 is located at the insertion interval 713.

[0311] A load applied to the guider 750 is supported through the first fixed block 711 and the second fixed block 712. Since the first fixed block 711 and the second fixed block 712 have the same shape, the first fixed block 711 will be described as an example.

[0312] The first fixed block 711 comprises a fixed block body 730, a fastening hole 735 penetrating the fixed block body 730 in the up-down direction, a first insertion portion 732 configuring the fixed block body 730, protruding toward the elevator 500, assembled to the assembled block 720, and mutually engaged with the assembled block 720 in the up-down direction, and a second insertion portion 732 configuring the fixed block body 730, protruding toward the elevator 500, assembled to the assembled block 720, and mutually engaged with the assembled block 720 in the up-down direction.

[0313] The first insertion portion 731 and the second insertion portion 732 are integrally formed. Upper surfaces of the first insertion portion 731 and the second insertion portion 732 form a continuous plane. Lower surfaces of the first insertion portion 731 and the second insertion portion 732 also form a continuous plane. That is, an upper surface 711a and a lower surface 711b of the first fixed block 711 are formed as a plane, are parallel to each other, and are disposed in the horizontal direction.

[0314] The first insertion portion 731 is disposed close to the insertion interval 713, and the second insertion portion 732 is disposed close to the insertion interval 713.

[0315] The first insertion portion 731 and the second insertion portion 732 protrude in the horizontal direction and form different protruding lengths. The first insertion portion 731 protrudes further toward the elevator 500 than the second insertion portion 732. That is, a protruding length of the first inserting portion 731 is formed to be longer than a protruding length of the second inserting portion 732.

[0316] In this embodiment, since the volume of the first insertion portion 731 is larger than the second insertion portion 732, the fastening hole 735 is formed at the first insertion portion 731.

[0317] The surface protruding from the first insertion portion 731 toward the assembled block 720 is formed as a curved surface 731a. The curved surface 731a is formed in an arrangement direction of the first insertion portion 731 and the second insertion portion 732.

[0318] In the first fixed block 711, an inner surface 711c forming the insertion interval 713 and an outer surface 711d away from the insertion interval 713 are formed parallel to each other. The inner surface 711c and the outer surface 711d are perpendicular to the upper surface 711a.

[0319] Upper surfaces 711a and 712a of the first fixed block 711 and the second fixed block 712 are disposed on the same plane, and lower surfaces 711b and 712b are also disposed on the same plane.

[0320] The insertion interval 713 is formed between the inner surfaces 711c and 712c of the first fixed block 711 and the second fixed block 712. The inner surfaces 711c and 712c of the first fixed block 711 and the second fixed block 712 are disposed parallel to each other with reference to the up-down direction. The outer surfaces 711d and 712d of the first fixed block 711 and the second fixed block 712 are disposed parallel to each other with reference to the up-down direction.

[0321] Fastening holes 735 of the first fixed block 711 and the second fixed block 712 are parallel to each other with reference to the up-down direction.

[0322] A space 739 is formed between the first fixed block 711 and the inner surface 310a of the front body 310. A space 739 is also formed between the second fixed block 712 and the inner surface 310a of the front body 310. Each space 739 is formed in the up-down direction and penetrates the first fixed block 711 and the second fixed block 712. Strength of the fixed block may be improved through the space. Through the space 739, deformation that may occur in the process of generating a fixed block may be suppressed.

[0323] Due to the space 739, a first insertion portion leg 736 connecting the first insertion portion 731 and the inner surface 310a is formed. Due to the space 739, a second insertion portion leg 737 connecting the second insertion portion 732 and the inner surface 310a is formed.

<Configuration of Assembled Block>

[0324] The assembled block 720 is a structure surrounding an outer surface of the fixed block 710. The fixed block 710 is inserted into the assembled block 720. The fixed block 710 and the assembled block 720 are assembled in a horizontal direction, and the fixed block 710 and the assembled block 720 form mutual engagement in the up-down direction.

[0325] The assembled block 720 includes an assembled block body 740 allowing the guider 750 to be rotatably assembled thereto and having a first block opening 721a and a second block opening 722a provided on one surface thereof, a first insertion space 721 provided in the assembled block body 740, provided to be concave to an inner side of the first block opening 721a, and allowing the first fixed block 711 to be inserted therein, a second insertion space 722 provided in the assembled block body 740, provided to be concave to an inner side of the second block opening 722a, and allowing the second fixed block 712 to be inserted therein, a guider installation space 742 provided outside the assembled block body 740, located between the first insertion space 721 and the second insertion space 722, and allowing the guider 750 to be inserted therein, guider axial recesses 744 and 746 provided outside the assembled block body 740 and supporting a rotational shaft of the guider 750, and a fastening hole 745 penetrating an inner side and an outer side of the assembled block body 740 and allowing a fastening member to be inserted therein.

[0326] In this embodiment, the first fixed block 711 is inserted into the first insertion space 721a, and the second fixed block 712 is inserted into the second insertion space 722a. The first insertion space 721a and the second insertion space 722a are open toward the inner surface 310a of the front body 310 and protrude toward the elevator 500.

[0327] Unlike the present embodiment, one insertion space instead of the first insertion space 721a and the second insertion space 722a may be formed. If one insertion space is formed, the first fixed block and the second fixed block may be inserted into one insertion space, and thus a gap may occur.

[0328] Since the wire guider 700 is a structure for supporting the wire, it is necessary to minimize a gap or shaking. If the guider 750 is shaken when supporting the wire, operation noise may not only occur and but also stronger shaking may occur in the intake grille 320 supported by the wire.

[0329] The first insertion space 721a and the second insertion space 722a are formed in the horizontal direction. The assembled block body 740 is open at only one side and is closed at the other side.

[0330] A guider installation space 742 and guide shaft recesses 744 and 746 are formed on an outer surface of the assembled block body 740.

[0331] The guider installation space 742 is formed in a horizontal direction and a front-rear width thereof is narrower than a vertical thickness thereof. The guider installation space 742 is formed by a first guider installation wall 742a, a second guider installation wall 742b, and a third guider installation wall 742c.

[0332] The first guider installation wall 742a and the third guider installation wall 742c are disposed to face each other, and the second guider installation wall 742b connects the first guider installation wall 742a and the third guider installation wall 742c. The second guider installation wall 742b intersects the first guider installation wall 742a and the third guider installation wall 742c and is perpendicular in this embodiment.

[0333] The first guider installation wall 742a and the third guider installation wall 742c are formed in parallel with each other, and the guider 750 is inserted between the first guider installation wall 742a and the third guider installation wall 742c. An interval between the first guider installation wall 742a and the third guider installation wall 742c is formed to be longer than a thickness of the guider 750.

[0334] An interval between the first guider installation wall 742a and the third guider installation wall 742c is formed to be narrower than the insertion interval 713 between the first fixed block 711 and the second fixed block 712.

[0335] A vertical length of the guider installation space 742 is formed to be smaller than a diameter of the guider 750, and the guider 750 protrudes upward and downward from the guider installation space 742.

[0336] The first guider installation wall 742a and the third guider installation wall 742c are formed flat in the up-down direction, but the second guider installation wall 742b is not.

[0337] An upper side of the second guider installation wall 742b may protrude toward the guider 750. In this embodiment, the upper side of the second guider installation wall 742b includes a separation preventing protrusion 743 that protrudes gently toward the guider 750.

[0338] The separation preventing protrusion 743 is configured to prevent the guider body 752 from being unintentionally separated from the assembled block 720. The separation preventing protrusion 743 is defined as a first separation preventing protrusion when to be designated distinguishably.

[0339] The first separation preventing protrusion 743 protrudes from the second guider installation wall 742b toward the guider 750. The first separation preventing protrusion 743 forms a predetermined curvature and is spaced apart from the outer surface 752a of the guider 750 by a predetermined interval.

[0340] An interval between the first separation preventing protrusion 743 and the outer surface 752a of the guider 750 is formed to be smaller than a diameter of the wire, through which the wire is prevented from being released from the wire recess 754 and separated to the outside of the guider 750. The wire installed at the guider recess 754 is located

between the second guider installation wall 742b and the wire recess 754.

[0341] At least a portion of the first separation preventing protrusion 743 may have a center of curvature disposed at a rotation center of the guider shaft 755. The first separation preventing protrusion 743 is located above the center of rotation of the guider shaft 755.

[0342] When the guider shaft 755 is inserted into the guide shaft recess 744 and 746, the outer surface 752a of the guider body 752 may interfere with the first separation preventing protrusion 743. When the guider shaft 755 is inserted into the guide shaft recesses 744 and 746, the guider body 752 is assembled with the separation preventing protrusion 743 in an interference fitting manner. After the guider shaft 755 is assembled, the outer surface 752a of the guider body 752 and the separation preventing protrusion 743 maintain in a state of being spaced apart from each other by a predetermined interval.

[0343] When an operator does not intentionally separate the guider 750 through such a structure, the guider shaft 755 is caught in the separation preventing protrusion 743 and is not separated.

[0344] Meanwhile, the guide shaft recesses 744 and 746 are disposed on both sides of the guider installation space 742, respectively. The first guide shaft recess 744 is disposed adjacent to the first guider installation wall 742a side and the second guide shaft recess 746 is disposed adjacent to the third guider installation wall 742c.

[0345] Formation directions of the first guide shaft recess 744 and the second guide shaft recess 746 are perpendicular to a formation direction of the guider installation space 742. The first guide shaft recess 744 and the second guide shaft recess 746 are symmetrical to the guider installation space 742.

[0346] The first guide shaft recess 744 and the second guide shaft recess 746 are concave downward on an upper surface of the assembled block body 740.

[0347] Since a shape of the second guide shaft recess 746 is symmetric to the first guide shaft recess 744, the first guide shaft recess 744 will be described as an example.

[0348] The guide shaft recesses 744 and 746 include a first axial wall 744a, a second axial wall 744b, and a third axial wall 744c.

[0349] The first axial wall 744a and the third axial wall 744c are formed parallel to each other. The guider shaft 755 of the guider 750 is inserted between the first axial wall 744a and the third axial wall 744c. An interval between the first axial wall 744a and the third axial wall 744c is formed to be wider than a diameter of the guider shaft 755. The guider shaft 755 may be rotated between the first axial wall 744a and the third axial wall 744c.

[0350] A separation preventing protrusion 747 for preventing separation of the guide shaft 755 is disposed. A configuration for preventing the guide shaft 755 from being separated from the guide shaft recesses 744 and 746 is defined as a second separation preventing protrusion.

[0351] In this embodiment, the second separation preventing protrusion 747 is disposed at two places. The second separation preventing protrusion 747 includes a 2-1 separation preventing protrusion 747a protruding from the first axial wall 744a toward the third axial wall 744c and a 2-2 separation preventing protrusions 747c protruding from the third axial wall 744c toward the first axial wall 744a.

[0352] Unlike the present embodiment, only one of the 2-1 separation preventing protrusion 747a and the 2-2 separation preventing protrusions 747c may be disposed.

[0353] An interval between the 2-1 separation preventing protrusion 747a and the 2-2 separation preventing protrusion 747c is formed smaller than a diameter of the guider shaft 755. The 2-1 separation preventing protrusion 747a and the 2-2 separation preventing protrusion 747c are located above the center of rotation of the guider shaft 755.

[0354] The 2-1 separation preventing protrusion 747a and the 2-2 separation preventing protrusion 747c surround an outer portion of the guider shaft 755. An arrangement direction of the 2-1 separation preventing protrusion 747a and the 2-2 separation preventing protrusion 747c intersects a longitudinal direction of the guider shaft 755.

[0355] The first separation preventing protrusion 743 and the second separation preventing protrusion 747 not only prevent the guider from being separated from the assembled block 720 but also suppress a vertical movement of the guider 750.

[0356] During the operation of the elevator 500, the first separation preventing protrusion 743 and the second separation preventing protrusion 747 limit shaking and movement of the guider 750, thereby minimizing operation noise that occurs during a rotation process of the guider 750.

[0357] Since the first separation preventing protrusion 743 and the second separation preventing protrusion 747 limit shaking and movement of the guider 750, shaking of the intake grille 320 in the operation process of the elevator 500 may also be minimized.

[0358] In this embodiment, the wire surrounds an upper side of the guider 750 and is turned to a lower side. Thus, since a load of the intake grille 320 is applied to the wire, the guider 750 is pressed downward. That is, since the guider 750 is pressed downward in an installation state or during operation, the guider does not escape from the guider installation space 742 and the guider axial recesses 744 and 746 if there is no intentional operation by the operator.

[0359] In this embodiment, in order to easily install the guider, the fixed block and the assembled block are manufactured distinguishably. Unlike the present embodiment, the installation structure of the guider may be provided on the fixed

block and the guider may be installed. For example, a guider installation space and a guider axial recess may be formed in the fixed block.

[0360] However, the formation of the guider installation space and the guider axial recess in the fixed block makes a structure of an injection mold complicated and is difficult to manufacture.

<Arrangement of Wire Fixing Portion>

[0361] The wire is turned to a lower side, while surrounding the guider 750, and fixed to the intake grille 320.

[0362] One end of the wire is fixed to the drum body 535 of the elevator 500 and the other end thereof is fixed to an upper surface of the intake grille 320.

[0363] The intake grille 320 includes a wire fixing portion 329 to which the other end of the wire is fixed. The wire fixing portion 329 is disposed at the grille body 322 of the intake grille 320. In particular, the wire fixing portion 329 is disposed in the grille body portion 324 in which the grille hole 321 is not formed in the grille body 322 and protrudes upward.

[0364] The wire fixing portion disposed below the first wire guider 701 is defined as a first wire fixing portion, the wire fixing portion disposed below the second wire guider 702 is defined as a second wire fixing portion, the wire fixing portion disposed below the third wire guider 703 is defined as a third wire fixing portion, and the wire fixing portion disposed below the fourth wire guider 701 is defined as a fourth wire fixing portion.

[0365] The wire extends vertically downward through the guider 750 and is fixed to the wire fixing portion 329. The guider 750 is located above the grille body portion 324.

[0366] The wire guider 700 according to the present embodiment is located above the intake grille 320 and is covered by the intake grille 320. In particular, since the wire guider 700 is located above the grille body portion 324, it is not exposed to the user.

[0367] The wire guider 700 is located closer to the inlet 101 than the vane module 200. The vane module 200 has a structure detachable from the front body 310 and prevents interference with the wire during a separation process of the vane module 200.

[0368] That is, the vane module 200 is located outside the four wires 511, 512, 521, and 522, and the operator may separate the vane module 200 in a state where the four wires 511, 512, 521, and 522 are installed.

[0369] In addition, in the case of repairing or replacing the elevator 500, the operator may separate four wires 511, 512, 521, and 522, regardless of the vane module 200, in a state where the intake grille 320 is lowered.

<Configuration of Rotation Amount Detecting Device>

[0370] The rotation amount detecting device 600 is for detecting the amount of rotation of the drum 530. The rotation amount detecting device 600 should detect a rotation amount to be more precise than a revolution per minute (RPM) of the drum 530.

[0371] In the present embodiment, the amount of rotation of the drum 530 must be precisely detected because the 1-1 wire 511 and the 1-2 wire 512 of the first unit 510 and the 2-1 wire 521 and the 2-2 wire 522 are to be simultaneously wound or unwound.

[0372] Since the rotation amount detecting devices 600 of the first unit 510 and the second unit 520 have the same configuration, the rotation amount detecting device 600 disposed in the first unit 510 will be described as an example.

[0373] The rotation amount detecting device 600 includes a rotation detecting factor 601 disposed at the drum 530 and rotated together when the drum 530 rotates, a sensor 602 disposed to be spaced apart from the rotation detecting factor 601 and detecting the amount of rotation of the rotation detecting factor 601, and a printed circuit board (PCB) where the sensor 602 is disposed.

[0374] The rotation detecting factor 601 is disposed at a position where the rotation detecting factor 601 is rotated together when the drum 530 is rotated. The rotation detecting factor 601 may be disposed on at least one of the 1-1 barrier 534 and the 1-2 barrier 536.

[0375] In the present embodiment, a plurality of the rotation detecting factors 601 are disposed, and the plurality of rotation detecting factors 601 are equally spaced with reference to a circumferential direction based on the axial center C of the drum 530.

[0376] In this embodiment, the rotation detecting factor 601 is disposed on the 1-1 barrier 534.

[0377] In the present embodiment, the rotation detecting factor 601 has a sawtooth shape. The rotation detecting factor 601 is disposed to protrude radially outward based on the axial center C of the drum 530.

[0378] The sensor 602 detects the rotation detecting factor 601. In this embodiment, the sensor 602 may be an infrared sensor or a photo sensor. The sensor 602 detects a signal generated by the rotation detecting factor 601 when the drum 530 rotates. For example, the sensor 602 generates infrared light and receives the generated infrared light. The controller may determine a rotation angle, the number of rotations, and a rotation speed of the drum 530 through a change in infrared rays blocked by the rotation detecting factor 601.

[0379] In order to effectively detect the rotation detecting factor 601, a sensor installation portion 604 is disposed to protrude from the PCB 603.

[0380] The PCB 603 is disposed parallel to the axial center C. The PCB 603 is installed on any one of the drum motor 540, the unit case 590, or a roller box.

[0381] In this embodiment, the PCB 603 is installed on the drum motor 540 and disposed parallel to the motor shaft of the drum motor 540.

[0382] The sensor installation portion 604 is disposed to protrude toward the drum 530 from the PCB 603. In this embodiment, the sensor installation portion 604 is disposed to be perpendicular to the PCB 603.

[0383] The sensor 602 is installed at the sensor installation portion 604. The sensor 602 includes a light emitting unit that generates an infrared signal and a light receiving unit that receives the infrared signal generated by the light emitting unit. Since an operation mechanism of the sensor 602 is a general technique to those skilled in the art, detailed description is omitted.

[0384] However, structures of the sensor installation portion 604 and the PCB 603 for effectively recognizing the rotation detecting factor 601 are characterized.

[0385] The sensor installation portion 604 is formed in a "ㄷ" shape in the top view.

[0386] The sensor installation portion 604 has a slot 605 allowing the rotation detecting factor 601 to pass therethrough. When the drum 530 rotates, the rotation detecting factor 601 passes through the slot 605, and the sensor 602 detects the rotation detecting factor 601 passing through the slot 605.

[0387] The slot 605 is perpendicular to the axial center of the drum 530. The slot 605 is located on a rotation plane of the rotation detecting factor 601.

[0388] In this embodiment, since the rotation detecting factor 601 is disposed on the 1-1 barrier 534, the slot 605 and at least a portion of the 1-1 barrier 534 are located on the same plane.

[0389] The slot 605 is disposed in parallel with the 1-2 barrier 536 and the partition 533.

[0390] The sensor installation portion 604 may be a structure in which only the sensor 602 is installed. Alternatively, the sensor installation portion 604 may be configured as a PCB capable of providing power to the sensor 602. Thus, the PCB 603 and the sensor installation portion 604 may be electrically connected.

[0391] Unlike the present embodiment, a permanent magnet is used as the rotation detecting factor and a Hall sensor for detecting the permanent magnet may be used as the sensor. When a permanent magnet is used as a rotation detecting factor, a plurality of permanent magnets may be arranged along the edge of the 1-1 barrier 534 in the circumferential direction.

[0392] Unlike the present embodiment, the rotation detecting factor 601 may be disposed at the 1-2 barrier 536 or the partition 533.

[0393] Since the second unit 520 is configured to be the same as the first unit 510, a detailed description is omitted.

<Arrangement of Vane Module and Intake Grille>

[0394] When the intake grille 320 is lowered, four vane modules 200 and the elevator 500 are exposed. Since each wire is maintained in an upwardly pulled state, the intake grille 320 is maintained in close contact with the front body 310.

[0395] When the intake grille 320 is moved downward, four vane modules 200 and the elevator 500 covered by the intake grille 320 are exposed.

[0396] In a state where the intake grille 320 is in close contact with the front body 310, only the vane 210 of the vane module 200 is exposed.

[0397] Then, each wire guider is located above the grille corner portion 327 configuring the intake grille 320.

[0398] The intake grille 320 includes a grille body 322 communicating with the inlet 101 by a plurality of grille holes 321 and having a quadrangular shape and a first grille corner portion 327-1, a second grille corner portion 327-2, a third grille corner portion 327-3, and a fourth grille corner portion 327-4 extending in a diagonal direction from each corner of the grille body 322.

[0399] The vane module 200 includes a first vane module 201 disposed outside each edge of the intake grille 320 and disposed between the first grille corner portion 327-1 and the second grille corner portion 327-2, a second vane module 202 disposed outside each edge of the intake grille 320 and disposed between the second grille corner portion 327-2 and the third grille corner portion 327-3, a third vane module 203 disposed outside each edge of the intake grille 320 and disposed between the third grille corner portion 327-3 and the fourth grille corner portion 327-4, and a fourth vane module 204 disposed outside each edge of the intake grille 320 and disposed between the fourth grille corner portion 327-4 and the first grille corner portion 327-1.

[0400] The vane module 200 disposed in a 12 o'clock direction is defined as the first vane module 201, the vane module 200 disposed in a 3 o'clock direction is defined as the second vane module 202, the vane module 200 disposed in a 6 o'clock direction is defined as the third vane module 203, and the vane module 200 disposed in a 9 o'clock direction

is defined as the fourth vane module 204.

[0401] The first vane module 201, the second vane module 202, the third vane module 203, and the fourth vane module 204 are arranged at 90° intervals based on the center C of the front panel 300.

[0402] The first vane module 201 and the third vane module 203 are arranged in parallel, and the second vane module 202 and the fourth vane module 204 are arranged in parallel.

[0403] Four side covers 314 are disposed on the front body 310. For convenience of description, the side cover 314 disposed outside the first vane module 201 is defined as a first side cover 314-1, the side cover 314 disposed outside the second vane module 202 is defined as a second side cover 314-2, the side cover 314 disposed outside the third vane module 203 is defined as a third side cover 314-3, and the side cover 314 disposed outside the fourth vane module 204 is defined as a fourth side cover 314-4.

[0404] Each side cover 314 is assembled to the edge of the front frame 312, located below the front frame 312, exposed to the outside, is disposed outside each vane module 202.

[0405] In addition, the corner cover 316 disposed between the first vane module 201 and the second vane module 202 is defined as a first corner cover 316-1. The corner cover 316 disposed between the second vane module 202 and the third vane module 203 is defined as a second corner cover 316-2. The corner cover 316 disposed between the third vane module 203 and the fourth vane module 204 is defined as a third corner cover 316-3. The corner cover 316 disposed between the fourth vane module 204 and the first vane module 201 is defined as a fourth corner cover 316-4.

[0406] The first corner cover 316-1 is assembled to the corner of the front frame 312, located below the front frame 312, located between the first side cover 314-1 and the second side covers 314-2, and exposed to the outside.

[0407] The second corner cover 316-2 is assembled to the corner of the front frame 312, located below the front frame 312, located between the second side cover 314-2 and the third side cover 314-3, and exposed to the outside.

[0408] The third corner cover 316-3 is assembled to the corner of the front frame 312, located below the front frame 312, located between the third side cover 314-1 and the fourth side cover 314-4, and exposed to the outside.

[0409] The fourth corner cover 316-4 is assembled to the corner of the front frame 312, located below the front frame 312, located between the fourth side cover 314-4 and the first side cover 314-1, and exposed to the outside.

[0410] The first corner cover 316-1 and the third corner cover 316-3 are arranged diagonally with respect to the center O of the front panel 300 and face each other. The second corner cover 316-2 and the fourth corner cover 316-4 are arranged diagonally with respect to the center O of the front panel 300 and face each other.

[0411] Virtual diagonal lines passing through the center of the front panel 300 are defined as P1 and P2. P1 is an virtual line connecting the first corner cover 316-1 and the third corner cover 316-3, and P2 is a virtual line connecting the second corner cover 316-2 and the fourth corner cover 316-4.

[0412] The intake panel 320 includes a first grille corner portion 327-1, a second grille corner portion 327-2, a third grille corner portion 327-3, and a fourth grille corner portion 327-4 extending toward the corner sides.

[0413] With respect to the grille corner portions, the first vane module 201 is disposed outside each edge of the intake grille 320 and disposed between the first grille corner portion 327-1 and the second grille corner portion 327-2.

[0414] The second vane module 202 is disposed outside each edge of the intake grille and disposed between the second grille corner portion 327-2 and the third grille corner portion 327-3.

[0415] The third vane module 203 is disposed outside each edge of the intake grille and disposed between the third grille corner portion 327-3 and the fourth grille corner portion 327-4.

[0416] The fourth vane module 204 is disposed outside each edge of the intake grille and disposed between the fourth grille corner portion 327-4 and the first grille corner portion 327-1.

[0417] The first grille corner portion 327-1 extends toward the first corner cover 316-1 and forms a continuous plane with an outer surface of the first corner cover 316-1.

[0418] The grille corner border 326 of the first grille corner portion 327-1 faces the corner deco inner border 317 of the first corner cover 316-1 and forms a corner deco inner border gap 317a.

[0419] The corner grille corner 326 of the remaining grille corner portion 327 and the corner deco inner border 317 of the corner cover 316 are also opposed to each other and form a corner deco inner border gap 317a.

[0420] The intake grille 320 includes four grille corner portions 327 that face the corner covers 316, respectively. The grille corner portions 327 are disposed to face the corner covers 316, respectively.

[0421] The grille corner portion 327 disposed to face the first corner cover 316-1 is defined as a first grille corner portion 327-1, the grille corner portion 327 disposed to face the second corner cover 316-2 is defined as a second grille corner portion 327-2, the grille corner portion 327 disposed to face the third corner cover 316-3 is defined as a third grille corner portion 327-3, and the grille corner portion 327 disposed to face the fourth corner cover 316-4 is defined as a fourth grille corner portion 327-4.

[0422] The grille side border 325 forming the edge of the grille corner portion 327 is disposed to face the corner deco inner border 317 forming an inner edge of the corner cover 316 and shapes of curves thereof correspond to each other.

[0423] Similarly, the grille corner border 326 forming the edge of the grille corner portion 327 is disposed to face the inner edge of the vane 210, and the shapes of the curves thereof correspond to each other.

[0424] Meanwhile, in this embodiment, in order to maintain a state in which the intake grille 320 is in close contact with the front body 310, a permanent magnet 318 and a magnetic force fixing portion 328 are provided.

[0425] Either the permanent magnet 318 or the magnetic force fixing portion 328 may be disposed on the front body 310, and the other of the magnetic force fixing portion 328 or the permanent magnet 318 may be disposed on an upper surface of each grille corner portion 327.

[0426] The permanent magnet 318 and the magnetic force fixing portion 328 are located above each grille corner portion 327 and are hidden by each grille corner portion 327. Since the permanent magnet 318 and the magnetic force fixing portion 328 are located outside each corner of the intake grille 320, a gap between the intake grille 320 and the front body 310 may be minimized.

[0427] If the intake grille 320 and the front body 310 are spaced apart from each other, a problem that an internal pressure of the intake flow path 103 is lowered arises.

[0428] In this embodiment, the permanent magnet 318 is disposed at the front body 310. Specifically, the permanent magnet is disposed at the corner frame 313.

[0429] The magnetic force fixing portion 328 is formed of a metal that interacts with the permanent magnet 318 to form an attractive force. The magnetic force fixing portion 328 is disposed on an upper surface of the intake grille 320. Specifically, the magnetic force fixing portion 328 is disposed on an upper surface of the grille corner portion 327.

[0430] When the intake grille 320 is moved upward and close to the permanent magnet 318, the permanent magnet 318 pulls the magnetic force fixing portion 328 to fix the intake grille 320. The magnetic force of the permanent magnet 318 is formed smaller than a self-load of the intake grille 320. Therefore, if the intake grille 320 is not pulled by the elevator 500, the combination of the permanent magnet 318 and the magnetic force fixing portion 328 is released.

[0431] In the top view or the bottom view, the permanent magnet 318 is disposed on the virtual diagonal lines P1 and P2. The permanent magnet 318 is located inside the corner cover 316.

[0432] In the top view or the bottom view, one of four permanent magnets 318 is disposed between a first module body 410 of the first vane module 201 and a second module body 420 of the fourth vane module 204. The other three permanent magnets are also disposed between the first module body 410 and the second module body 420 of each vane module.

[0433] The permanent magnet 318 and the magnetic force fixing portion 328 are located above each grille corner portion 327 and are hidden by each grille corner portions 327.

[0434] Hereinafter, an operation process when the intake grille is lifted or lowered according to an embodiment of the present disclosure will be described in detail.

<Installation State of Intake Grille>

[0435] The intake grille 320 may be lowered for filter cleaning or repairing the indoor unit. The intake grille 320 is supported by four wires 511, 512, 521, and 522, and a load of the intake grille 320 is applied by all four wires 511, 512, 521, and 522.

[0436] The intake grille 320 is maintained in close contact with the front body 310 by four wires 511, 512, 521, and 522. That is, a separate coupling structure for supporting the intake grille 320 and the front body 310 is not provided.

[0437] Therefore, the user does not need to stand on a structure such as a chair to disassemble the intake grille 320 and the front body 310 to separate the intake grille 320. That is, the intake panel 320 is lowered downward as soon as the four wires 511, 512, 521, and 522 are released by the operation of the elevator 500.

[0438] In addition, since the intake grille 320 is supported only by the wires 511, 512, 521, and 522, the wires 511, 512, 521, and 522 always form a tension. If the intake grille 320 is supported by another structure, some of the wires 511, 512, 521, and 522 may loosen and the elevator 500 may not precisely control the wires 511, 512, 521, and 522.

[0439] Since the wires 511, 512, 521, and 522 according to the present embodiment always supports the load of the intake grille 320, the entire length of the wires 511, 512, 521, and 522 loosened outside of the elevator 500 is always in a tight state.

[0440] The first wire fixing portion 329-1, the second wire fixing portion 329-2, the third wire fixing portion 329-3, and the fourth wire fixing portion 329-4 are located at the corners of the intake panels 320, respectively.

[0441] Since each of the four wire fixing portions is pulled upward by each wire so as to be in close contact with the front body 310, the edge of the intake grille 320 may be brought into close contact with the front body 310 and sagging of the intake grille 320 may be minimized.

[0442] Since wire guiders 701, 702, 703, and 704 are disposed for four wires 511, 512, 521, and 522, the wires 511, 512, 521, and 522 may be prevented from sagging.

[0443] A load applied to each of the wire 511, 512, 521, and 522 may be partially distributed to each of the wire guiders 701, 702, 703, and 704. In addition, since the wires 511, 512, 521, and 522 are moved only along the wire recess 754 disposed in the up-down direction, a horizontal movement of each of the wires 511, 512, 521, and 522 may be suppressed, whereby shaking of the intake grille 320 may be minimized.

<Lowering Process of Intake Grille>

[0444] When the user inputs an operation signal through a wireless remote controller or a wired remote controller with the intake grille 320 mounted on the cover panel 300, the controller determines the input operation signal and lowers the intake grille 320.

[0445] When the intake grille 320 is lowered, the user may adjust a descending length of the intake grille 320. In this embodiment, the intake grille 320 may be differentially lowered to 1 m, 2 m, 3 m, and 4.5 m.

[0446] The controller determines the input operation signal to operate the first unit 510 and the second unit 520 at the same time and determines rotation amounts of the drum motors 540 respectively disposed in the first unit 510 and the second unit 520.

[0447] When operating the drum motors 540 of the first unit 510 and the second unit 520 at the same time, revolutions per minute (RPMs) and rotation speeds of the drum motors 540 must be matched to prevent inclination of the intake grille 320. To this end, the drum motors 540 of the first unit 510 and the second unit 520 may be synchronized.

[0448] In this embodiment, when each drum motor 540 rotates each drum 530 in a first rotation direction (e.g., counterclockwise direction), the intake grille 320 is lowered. Conversely, when each drum motor 540 rotates each drum 530 in a second rotation direction (e.g., a clockwise direction) opposite to the first rotation direction, the intake grille 320 is lifted.

[0449] Also, when each drum motor 540 rotates each drum 530, the rotation amount detecting device 600 disposed at the first unit 510 and the second unit 520 detects at least one of the RPM or rotation speed of the drum 530.

[0450] The controller monitors data sensed by the rotation amount detecting device 600 and determines whether each drum 530 is rotated at the same speed.

[0451] If steps on both sides by the first unit 510 and the second unit 520 are not equal, correction may be performed on the number of counting of the rotation detecting factor 601 in a stop state to correct the step. In this embodiment, the counted number of the rotation detecting factor 601 is corrected up to three times and the elevator 500 is driven.

[0452] Also, the controller monitors the descending or elevating process of the intake grille 320 by the elevator 500 through the rotation amount detecting device 600.

[0453] When the rotation of any one of the drums 530 is stopped in the process of ascending or descending, each drum motor 540 is immediately stopped to prevent a possibility of tilting or falling of the intake grille 320.

[0454] By the operation of each drum motor 540, four wires 511, 512, 521, and 522 are simultaneously unwound from each drum 530. Each wire 511, 512, 521, and 522 passes through the end roller 554, the third roller 553, the second roller 552, and the start roller 551. Each wire 511, 512, 521, and 522 extending in the horizontal direction from each unit case 590 is changed in direction toward the ground from the guider 750 located in the horizontal direction of each unit case 590.

[0455] Each wire 511, 512, 521, and 522 may be moved downward in the up-down direction of the guider 750 while being supported on the upper surface of each guider 750. Through this process, the other ends of the wires 511, 512, 521, and 522 fixed to the wire fixing portion 329 of the intake grille 320 are simultaneously lowered downward.

[0456] Each wire fixing portion 329 is located below each guider 750, and each wire 511, 512, 521, and 522 extends in the up-down direction.

[0457] That is, since the wire fixing portion 329 is disposed below the guider 750 supporting the wire, shaking is minimized in the process of moving each wire 511, 512, 521, and 522 up and down. In addition, since the wires 511, 512, 521, and 522 are supported by four guiders 750, a load may be evenly distributed and the load applied to the rollers of the roller boxes may be minimized.

[0458] In addition, since the guider 750 and the roller box 550 are fixed structures, the wires are not shaken in a state of being supported by the guider 750 and the start roller 551.

[0459] Since the wire fixing portion 329 is a structure which may be shaken during the ascending or descending process of the intake grille 320 and the wire fixing portion 329 is disposed below the guider 750, a wire length between the guider 750 and the wire fixing portion 329 is minimized.

[0460] That is, since the guider 750 and the wire fixing portion 329 are arranged in the up-down direction, a length of the wire unwound in the descending process of the intake grille 320 is minimized. If the wires are arranged diagonally, it is necessary to unwind the wires longer than those in the up-down direction when the intake grille is lowered.

<Lifting Operation of Intake Grille>

[0461] In a state where the intake grille 320 is lowered, the controller may lift the intake grille 320 to its original position upon receiving the user's operation signal.

[0462] The controller rotates the drums 530 of the first unit 510 and the second unit 520 in a clockwise direction to return the intake grille 320 to the initial position.

[0463] The controller maintains the rotation amount and rotation speed of each drum 530 to be the same, thereby lifting the intake grille 320 in a horizontal state.

[0464] When the intake grille 320 is lifted, the wire fixing portion 329 is moved upward in a vertical direction and the ends of the wires are also moved upward from the lower side.

[0465] According to the rotation of the drums 530, the 1-1 wire 511 and the 1-2 wire 512 of the first unit and the 2-1 wire 521 and the 2-2 wire 522 of the second unit 520 are simultaneously wound around the drums 520, respectively.

[0466] When the drum 530 of the first unit 510 rotates, the 1-1 wire 511 and the 1-2 wire 512 are aligned and wound around a first zone 531 and a second zone 532 of the drum 530 in a horizontal direction.

[0467] The 1-1 wire 511 passes through the guider 750 in the vertical direction, turns in the horizontal direction, passes through the start roller 551, the second roller 552, the third roller 553, and the end roller 554, and is then wound on the outer circumferential surface of the drum body 535 of the first zone 531. After the 1-1 wire 511 is wound in a row on the outer circumferential surface of the drum body 535, the 1-1 wire is wound again on the 1-1 wire 511 wound in a row, while forming a layer.

[0468] The 1-2 wire 512 passes through the guider 750 in the vertical direction, turns in the horizontal direction, passes through the first roller 561, the second roller 562, the third roller 563, and the fourth roller 564, and is then wound on the outer circumferential surface of the drum body 535 of the second zone 532.

[0469] Meanwhile, the 2-1 wire 521 and the 2-2 wire 522 are wound on the second unit 520 which rotates simultaneously with the first unit 510 at the same rate as that of the first unit 510.

[0470] Like the first unit 510, when the drum 530 of the second unit 520 rotates, one end of the 2-1 wire 521 and one end of the 2-2 wire 522 are wound, while being aligned in the first zone 531 and the second zone 532 of the drum 530.

[0471] As in the present embodiment, the intake grille 320 includes the 1-1 wire 511, the 1-2 wire 512, the 2-1 wire 521, and the 2-2 wire 522.

[0472] In a state where the intake grille 320 is supported at four points, both sides of the intake grille 320 may be simultaneously lifted or lowered by synchronizing the rotation amount and the rotation speed of the drums 530 disposed at the first unit 510 and the second unit 520.

[0473] In the indoor unit according to the present embodiment, although the drum motor 540 disposed on the first unit 510 and the second unit 520, the controller may uniformly control the four wires through the rotation amount detecting device 600.

[0474] In addition, since the indoor unit according to the present embodiment provides the structure in which the 1-1 wire 511 and the 1-2 wire 512 are simultaneously wound or unwound by driving one drum 530, tilting of the intake grille 320 may be prevented.

[0475] FIG. 15 is a view showing an exemplary operation of a ceiling-type indoor unit according to a second embodiment of the present disclosure. FIG. 16 is a bottom perspective view of an elevator of FIG. 15. FIG. 17 is a perspective view showing an internal structure of the elevator of FIG. 16. FIG. 18 is a plan view of FIG. 17. FIG. 19 is a view showing an exemplary operation of the elevator according to the second embodiment of the present disclosure.

[0476] The ceiling-type indoor unit of an air-conditioner according to the present embodiment has a structure without the wire guider of the first embodiment. The 1-1 wire 511 and the 1-2 wire 512 of the first unit 1510 according to the present embodiment are directly fixed to the intake grille 320, and the 2-1 wire 521 and the 2-2 wire 522 of the second unit 1520 are also fixed directly to the intake grille 320.

[0477] Thus, a first hole 1591 and a second hole 1592 are formed on a lower surface of the first unit case 590, and a first hole 1591 and a second hole 1592 are formed on a lower surface of the second unit case 590.

[0478] The first hole 1591 and the second hole 1592 are symmetrical with respect to the axial center C of the drum 530. An interval between the axial center C and the first hole 1591 is equal to an interval between the axial center C and the second hole 1592. The first hole 1591 is located lower than the first roller box 550, and the second hole 1592 is located lower than the second roller box 560.

[0479] The 1-1 wire 511 extends downward through the first hole 1591 and is fixed to the first wire fixing portion 329-1 of the intake grille 320. The 1-2 wire 512 extends downward through the two hole 1592 and is fixed to the second wire fixing portion 329-2 of the intake grille 320.

[0480] The 2-1 wire 521 extends downward through the first hole 1591 and is fixed to the third wire fixing portion 329-3 of the intake grille 320. The 2-2 wire 522 extends downward through the second hole 1592 and is fixed to the fourth wire fixing portion 329-4 of the intake grille 320.

[0481] In the first embodiment, since the wire is supported by the wire guider, a load applied to the roller box 550 is small. However, when there is no wire guider as in the present embodiment, the entire load of the intake grille 320 is applied to the roller box 550.

[0482] The roller box 1550 according to the present embodiment has a structure similar to that of the first embodiment but provides a structure capable of supporting the load of the intake grille 320 more firmly. A first roller box 1550 includes a box 1555 fixed to the unit case 590, a start roller 1551 and an end roller 1554 disposed in the box 1555, disposed to be in contact with the 1-1 wire 511, and rotated by frictional contact when the 1-1 wire 511 moves, a second roller 1552 and a third roller 1553 disposed in the box 1555, disposed to be in contact with the 1-1 wire 511, rotated by frictional contact when the 1-1 wire 511 moves, and disposed to be relatively movable in an axial direction by tension of the 1-1

wire 511, and a roller elastic member 1556 elastically supporting one of the second roller 1552 and the third roller 1553.

[0483] The second roller 1552 and the third roller 1553 are disposed between the start roller 1551 and the end roller 1554. When the 1-1 wire 511 is unwound, the 1-1 wire 511 comes into contact with the end roller 1554, the third roller 1553, the second roller 1552, and the start roller 1551 in this order. Conversely, when the 1-1 wire 511 is wound, the 1-1 wire 511 comes into contact with the start roller 1551, the second roller 1552, the third roller 1553, and the end roller 1554 in this order. The start roller 1551 is disposed farthest from the drum 530, and the end roller 1554 is located closest to the drum 530.

[0484] The start roller 1551, the second roller 1552, the third roller 1553, and the end roller 1554 are assembled to the roller shafts 1551a, 1552a, 1553a, and 1554a, respectively, and may rotate about the roller shafts 1551a, 1552a, 1553a, and 1554a.

[0485] At least one of the start roller 1551, the second roller 1552, the third roller 1553, or the end roller 1554 is rotated in a fixed state, and the other rollers may be rotated, while moving along the roller shafts.

[0486] In this embodiment, the start roller 1551 is a fixed roller that is not moved along the roller shaft, and the second roller 1552, the third roller 1553, and the end roller 1554 are moving rollers movable along the roller shafts.

[0487] Since the wire passing through the start roller 1551 is coupled to the intake grille 320, shaking of the intake griller 320 may be suppressed by fixing the start roller 1551. In this embodiment, the start roller 1551 is rotated in place about the roller shaft 1551a, in a state of being coupled to the roller shaft 1551a.

[0488] In this embodiment, the second roller 1552, the third roller 1553, and the end roller 1554 are not only rotatable in a state of being coupled to the roller shafts 1552a, 1553a, 1554a, respectively, but also relatively movable along the roller shaft.

[0489] The 1-1 wire 511 is aligned in a line by the relative movement of the second roller 1552, the third roller 1553, and the end roller 1554, and is wound on the drum 530.

[0490] A wire guard 1551b is disposed at a predetermined distance from the start roller 1551. The 1-1 wire 511 is disposed between the wire guard 1551b and the start roller 1551. The wire guard 1551b prevents the wire wound on the start roller 1551 from escaping from the roller.

[0491] Wire guards 1552b, 1553b, and 1554b are also disposed on the second roller 1552, the third roller 1553, and the end roller 1554, respectively.

[0492] It is preferable that the roller that directly provides the 1-1 wire 511 to the intake grille 320 is fixed to the box 1555. If the roller providing the wire to the intake grille 320 is moved in the axial direction, the roller may be shaken in a lifting or lowering process.

[0493] Thus, in this embodiment, the start roller 1551 is a fixed roller, rotated in place in the box 1555, and the second roller 1552, the third roller 1553, and the end roller 1554 are moving rollers and may be moved along the roller shaft.

[0494] In this embodiment, the roller elastic member 1556 is a coil spring. The roller elastic member 1556 provides elastic force in the up-down direction. In this embodiment, the roller elastic member 1556 elastically supports the roller shaft 1553b of the third roller 1553.

[0495] The roller elastic member 1556 is preferably disposed on a roller disposed on an inner side among the plurality of rollers. The roller elastic member 1556 may be disposed on either the second roller 1552 or the third roller 1553. In this embodiment, the roller elastic member 1556 is disposed on the third roller 1553.

[0496] The roller elastic member 1556 provides elastic force toward the wire guard. In this embodiment, the roller elastic member 1556 presses the third roller 1553 upward through elastic force. The roller elastic member 1556 forms tension in the 1-1 wire 511 and maintains the 1-1 wire 511 in a tight state.

[0497] When the 1-1 wire 511 is wound in a first row on the outer circumferential surface of the drum body 535 and then wound in a second row, the roller elastic member 1556 is compressed by a thickness of the wire and the third roller 533 is moved downward by a stacked step of the wire.

[0498] A rail 1557 for guiding the roller shaft 1553a of the third roller 1553 to be movable in the up-down direction is provided in the box 1555 so that the third roller 1553 is movable in the up-down direction. The third roller 1553 may be moved in the up-down direction along the rail 1557.

[0499] In this embodiment, since four rollers are used, the roller elastic member 1556 is installed on the third roller, but if three rollers are used, the roller elastic member 1556 may be disposed on the second roller.

[0500] The start roller 1551, the second roller 1552, the third roller 1553, and the end roller 1554 are arranged in a zigzag form in the up-down direction.

[0501] One end of the 1-1 wire 1551 is fixed to the drum 530, and the other end thereof is fixed to the intake grille 320.

[0502] In this embodiment, the 1-1 wire 1551 extends downward, in a state of being supported on the upper outer circumferential surface of the start roller 1551, and is coupled to the intake grille 320. One end of the 1-1 wire 1551 is fixed to the drum 530, in a state of being supported on the lower outer circumferential surface of the end roller 443. The second roller box 1560 has the same configuration as the second roller box 560.

[0503] The second roller box 1560 includes a box 1565 fixed to the unit case 1590, a start roller 1561 and an end roller 1564 disposed in the box 1565, disposed to be in contact with the 1-2 wire 512, and rotated by frictional contact

when the 1-2 wire 512 moves, a second roller 1562 and a third roller 1563 disposed in the box 1565, disposed to be in contact with the 1-2 wire 512, rotated by frictional contact when the 1-2 wire 512 moves, and disposed to be relatively movable in the axial direction by tension of the 1-2 wire, and a roller elastic member 1566 elastically supporting at least one of the second roller 1562 and the third roller 1563. The third roller 1563 may be moved in the up-down direction along the rail 1567.

[0504] The start roller 1561, the second roller 1562, the third roller 1563, and the end roller 1564 are assembled to roller shafts 1561a, 1562a, 1563a, and 1564a, respectively, and rotated about the roller shafts 1561a, 1562a, 1563a, and 1564a.

[0505] Wire guards 1561b, 1562b, 1563b, and 1564b spaced apart from the start roller 1561, the second roller 1562, the third roller 1563, and the end roller 1564 by a predetermined interval are arranged in the second roller box 1560.

[0506] The first roller box 1550 and the second roller box 1560 are symmetrically arranged with respect to the drum 530. In particular, the first roller box 1550 and the second roller box 1560 are symmetrical in a transverse direction based on the axial center C.

[0507] The start rollers 1551 and 1561 are disposed on the farthest side based on the axial center C, and the end rollers 1554 and 1564 are disposed on the closest side.

[0508] Both the 1-1 wire 511 and the 1-2 wire 512 extend downward, in a state of being supported on the upper outer circumferential surface of the start rollers 1551 and 1561.

[0509] In this embodiment, one end 515 of the 1-1 wire 511 and one end 516 of the 1-2 wire 512 are located on the opposite sides based on the axial center of the drum 530. According to rotation of the drum 530, the 1-1 wire 511 and the 1-2 wire 512 are wound on or unwound from the drum body 535 in the same direction.

[0510] The unit case 590 is formed in a box shape and has a first hole 1591 and a second hole 1592 formed on a lower surface thereof. The first hole 1591 and the second hole 1592 are symmetrical with respect to the axial center C of the drum 530. A distance between the axial center C and the first hole 1591 is equal to a distance between the axial center C and the second hole 1592. The first hole 1591 is located lower than the first roller box 1550, and the second hole 1592 is located lower than the second roller box 1560.

[0511] A portion of the start rollers 1551 and 1561 is exposed to outside of the boxes 1555 and 1565. The first hole 1591 is disposed below the exposed start roller 1551. The second hole 1592 is disposed below the exposed start roller 1561. In the top view, the exposed start roller 1551 and the first hole 1591 overlap. Similarly, in the top view, the exposed start roller 1561 and the second hole 1592 overlap.

[0512] The other end (lower end) of the 1-1 wire 511 is coupled to the intake grille 320 through the first hole 1591. The other end (lower end) of the 1-1 wire 512 is coupled to the intake grille 320 through the second hole 1592.

[0513] The start roller 1551 of the first roller box 1550 is disposed above the first hole 1591. The start roller 1561 of the second roller box 1560 is disposed above the second hole 1592. The start rollers 1551 and 1561 are not moved and are rotated in place to suppress movement of the wires 511 and 512, thereby minimizing shaking of the intake grille 320.

[0514] In this embodiment, the 1-1 wires 511 and the 1-2 wires 512 are inclined with reference to the vertical direction. Similarly, the 2-1 wire 521 and the 2-2 wire 512 are also inclined with reference to the vertical direction.

[0515] The 1-1 wire 511 is disposed to be inclined to a front side with reference to the vertical direction, and the 1-2 wire 512 is disposed to be inclined to a rear side with reference to the vertical direction. The 2-1 wire 521 is disposed to be inclined to the front side with reference to the vertical direction, and the 2-2 wire 522 is disposed to be inclined to the rear side with reference to the vertical direction.

[0516] Thus, an interval between the first wire fixing portion 329-1 and the second wire fixing portion 329-2 is larger than an interval between the first hole 1591 and the second hole 1592 of the first roller box 1550.

[0517] In addition, an interval between the third wire fixing portion 329-3 and the fourth wire fixing portion 329-4 is larger than an interval between the first hole 1591 and the second hole 1592 of the second roller box 1560.

[0518] Through the arrangement of the holes and the other ends of the wires, the 1-1 wire 511 is disposed to be inclined to the front, the 1-2 wire 512 is disposed to be inclined to the rear, the 2-1 wire 521 is disposed to be inclined to the front, and the 2-2 wire 522 is disposed to be inclined to the rear.

[0519] When the wires are inclined, a length of the unit case may be shortened and an installation space of the unit case may be minimized.

[0520] In addition, when the wires are arranged to be inclined, the length of the wires extending to the intake grille 320 may be shortened.

[0521] In this embodiment, the 1-1 direction 511a' is disposed toward the end roller 1554 of the 1-1 roller box 1550, and the 1-2 direction 512a' is disposed toward the end roller 1564 of the 1-2 roller box 1560.

[0522] The 1-1 direction 511a' may be a tangential direction of the first zone 531 and the end roller 1554. The 1-2 direction 512a' may be a tangential direction of the second zone 532 and the end roller 1564.

[0523] In this embodiment, the 1-1 wire is disposed to surround the upper surface of the first zone 531 and the lower surface of the end roller 1554. The 1-2 wire is disposed to surround the lower surface of the second zone 532 and the lower surface of the end roller 1564.

[0524] The other components are the same as those of the first embodiment, and thus, a detailed description thereof will be omitted.

[0525] FIG. 20 is an exemplary view showing an arrangement state of wires according to a third embodiment of the present disclosure.

[0526] The ceiling-type indoor unit of an air-conditioner according to the present embodiment has a structure without a wire guider as in the second embodiment. The 1-1 wire 511 and the 1-2 wire 512 of the first unit 1510 according to the present embodiment are directly fixed to the intake grille 320, and the 2-1 wire 521 and the 2-2 wire 522 of the second unit 1520 are directly fixed to the intake grille 320.

[0527] Unlike the second embodiment, the wires are not disposed to be inclined but are disposed in a vertical direction.

[0528] In this embodiment, an interval between the first hole 1591 and the second hole 1592 of the first roller box 1550 and an interval between the first wire fixing portion 329-1 and the second wire fixing portion 329-2 are equal.

[0529] In addition, an interval between the first hole 1591 and the second hole 1592 of the second roller box 1560 and an interval between the third wire fixing portion 329-3 and the fourth wire fixing portion 329-4 are equal.

[0530] The other components are the same as those of the second embodiment, and thus, a detailed description thereof will be omitted.

[0531] The embodiments have been described with reference to the accompanying drawings but various modifications may be made without being limited thereto and it will be understood by those of skill in the art that various changes in form and details may be made without departing from the spirit and scope of the present disclosure as set forth in the following claims. Therefore, the embodiments described above are merely illustrative and should not be understood as a limitation of the present disclosure.

[Description of reference numeral]

[0532]

100:	case	101:	inlet
102:	outlet	103:	intake flow path
104:	discharge flow path	110:	case housing
120:	front panel	130:	indoor heat exchanger
140:	indoor blower fan	200:	vane module
300:	front module	310:	front body
320:	intake grille	321:	grille hole
322:	grille body	323:	grille
324:	grille body portion	329:	wire fixing portion
330:	pre-filter	500:	elevator
600:	rotation amount detecting device	700:	wire guider
701:	first wire guider	702:	second wire guider
703:	third wire guider	704:	fourth wire guider
710:	fixed block	720:	assembled block
730:	fixed block body	740:	assembled block body
750:	guider		

Claims

1. A ceiling-type indoor unit of an air-conditioner, the ceiling-type indoor unit comprising:

a case installed on an interior ceiling in a suspended manner and having an inlet and an outlet provided downward;
an intake grille disposed to be separable from the case, covering the inlet of the case, and moved in an up-down direction from the case;
a 1-1 wire disposed on one side with respect to the intake grille and having a lower end fixed to the intake grille;
a 1-2 wire disposed on one side with respect to the intake grille and having a lower end fixed to the intake grille; and
a first unit disposed in the case, coupled to each of upper ends of the 1-1 wire and the 1-2 wire, and lifting or lowering one side of the intake grille by simultaneously winding or unwinding the 1-1 wire and the 1-2 wire,
wherein the first unit comprises:

a first drum fixed to each of the upper end of the 1-1 wire and the upper end of the 1-2 wire; and
a first drum motor rotating the first drum,
wherein the 1-1 wire is wound around an outer circumferential surface of the first drum and disposed to face a 1-1 direction on the first drum, the 1-2 wire is wound around the outer circumferential surface of the first drum and disposed to face a 1-2 direction on the outer circumferential surface of the first drum, the 1-1 direction and the 1-2 direction face in mutually different directions, and the 1-1 direction and the 1-2 direction intersect each other.

2. The ceiling-type indoor unit of claim 1, wherein
the first drum comprises: a first zone formed on the outer circumferential surface of the first drum, allowing the upper end of the 1-1 wire to be fixed thereto, and allowing the 1-1 wire to be wound therearound; and a second zone formed on the outer circumferential surface of the first drum, allowing the upper end of the 1-2 wire to be fixed thereto, and allowing the 1-2 wire to be wound therearound,
wherein the 1-1 direction forms a tangent line with an outer circumferential surface of the first zone, and the 1-2 direction forms a tangent line with an outer circumferential surface of the second zone.

3. The ceiling-type indoor unit of claim 2, wherein
the first drum further comprises: a first partition partitioning the first zone and the second zone, wherein the first partition protrudes from the outer circumferential surface of each drum.

4. The ceiling-type indoor unit of claim 3, wherein
the first partition protrudes in a radial direction of the first drum, is formed along a circumferential direction of the first drum, and is perpendicular to a motor shaft of the first drum motor.

5. The ceiling-type indoor unit of claim 2, wherein
the first zone and the second zone of the first drum are arranged in parallel.

6. The ceiling-type indoor unit of claim 2, wherein
the 1-1 wire is supported on an upper surface of the first zone and the 1-2 wire is supported on a lower surface of the second zone, with respect to an axial center of the drum.

7. The ceiling-type indoor unit of claim 2, wherein
the 1-1 wire is supported on a lower surface of the first zone and the 1-2 wire is supported on an upper surface of the second zone, with respect to an axial center of the drum.

8. The ceiling-type indoor unit of claim 1, wherein
the first unit further comprises a first unit case allowing the first drum and the first drum motor to be installed therein and installed in the case, wherein the first unit case comprises: a first hole through which the 1-1 wire passes; and a second hole through which the 1-2 wire passes.

9. The ceiling-type indoor unit of claim 8, wherein
the first hole and the second hole of the first unit case are open downward.

10. The ceiling-type indoor unit of claim 8, wherein
the first hole and the second hole of the first unit case are disposed on a sidewall of the first unit case, and the first hole and the second hole of the first unit case are disposed to face in mutually opposite directions.

11. The ceiling-type indoor unit of claim 10, further comprising:

a first wire guider disposed at the case, supporting the 1-1 wire, and located above the intake grille; and
a second wire guider disposed at the case, supporting the 1-2 wire, and located above the intake grille,
wherein the first hole of the first unit case is disposed to face the first wire guider and the second hole of the first unit case is disposed to face the second wire guider.

12. The ceiling-type indoor unit of claim 1, further comprising:

a first rotation detecting device disposed at the first unit and detecting rotation of the first drum; and
a second rotation detecting device disposed at the second unit and detecting rotation of the second drum,

wherein the first rotation detecting device comprises: a rotation detecting factor disposed at the first drum and rotating together when the first drum rotates; a sensor disposed to be spaced apart from the rotation detecting factor and detecting rotation of the rotation detecting factor; and a printed circuit board (PCB) on which the sensor is disposed.

13. The ceiling-type indoor unit of claim 12, wherein
each sensor is an infrared sensor, the rotation detecting factor is a sawtooth protruding outward in a radial direction of the drum, and the sensor detects an infrared signal controlled by the sawtooth.

14. The ceiling-type indoor unit of claim 12, wherein
the sensor comprises a light emitting unit and a light receiving unit, and the rotation detecting device further comprises: a sensor installation portion in which the light emitting unit and the light receiving unit are installed; and a slot formed at the sensor mounting portion and formed to be concave to allow the rotation detecting factor to pass therethrough, wherein the light emitting unit and the light receiving unit are arranged on mutually opposite sides based on the slot.

15. The ceiling-type indoor unit of claim 1, wherein
the first unit comprises:

a unit case installed at the case;
a 1-1 roller box installed at the unit case, disposed in a 1-1 direction with respect to the first drum, penetrated by the 1-1 wire, and aligning a position of the 1-1 wire when the 1-1 wire is wound or unwound; and
a 1-2 roller box installed at the unit case, disposed in a 1-2 direction with respect to the first drum, penetrated by the 1-2 wire, and aligning a position of the 1-2 wire when the 1-2 wire is wound or unwound,
wherein
the 1-1 roller box comprises:

a start roller in contact with the 1-1 wire, rotated by frictional contact when the 1-1 wire moves, and disposed to be farthest from the drum;
an end roller in contact with the 1-1 wire, rotated by frictional contact when the 1-1 wire moves, and disposed to be closest to the drum; and
a transfer roller in contact with the 1-1 wire, rotated by frictional contact when the 1-1 wire moves, and disposed between the start roller and the end roller.

16. The ceiling-type indoor unit of claim 15, wherein
the 1-1 wire is disposed to be in contact with an upper surface of the end roller.

17. The ceiling-type indoor unit of claim 15, wherein
the 1-1 wire is disposed to be in contact with a lower surface of the end roller.

18. The ceiling-type indoor unit of claim 15, wherein
the transfer roller comprises:

a second roller in contact with the 1-1 wire, rotated by frictional contact when the 1-1 wire moves, and disposed between the start roller and the end roller; and
a third roller in contact with the 1-1 wire, rotated by frictional contact when the 1-1 wire moves, and disposed between the second roller and the end roller.

19. The ceiling-type indoor unit of claim 15, wherein
the start roller is rotatably assembled to a first roller shaft, the transfer roller is rotatably assembled to a transfer roller shaft, the end roller is rotatably assembled to a fourth roller shaft, and the start roller rotates in place on the first roller shaft.

20. The ceiling-type indoor unit of claim 15, wherein
the 1-1 direction is a tangential direction of the end roller and the first drum.

21. The ceiling-type indoor unit of claim 15, wherein
the 1-2 roller box comprises:

a start roller in contact with the 1-2 wire, rotated by frictional contact when the 1-2 wire moves, and disposed to be farthest from the drum;
an end roller in contact with the 1-2 wire, rotated by frictional contact when the 1-2 wire moves, and disposed to be closest to the drum; and
a transfer roller in contact with the 1-2 wire, rotated by frictional contact when the 1-2 wire moves, and disposed between the start roller and the end roller,
wherein the 1-2 direction is a tangential direction of the end roller and the first drum.

Fig. 1

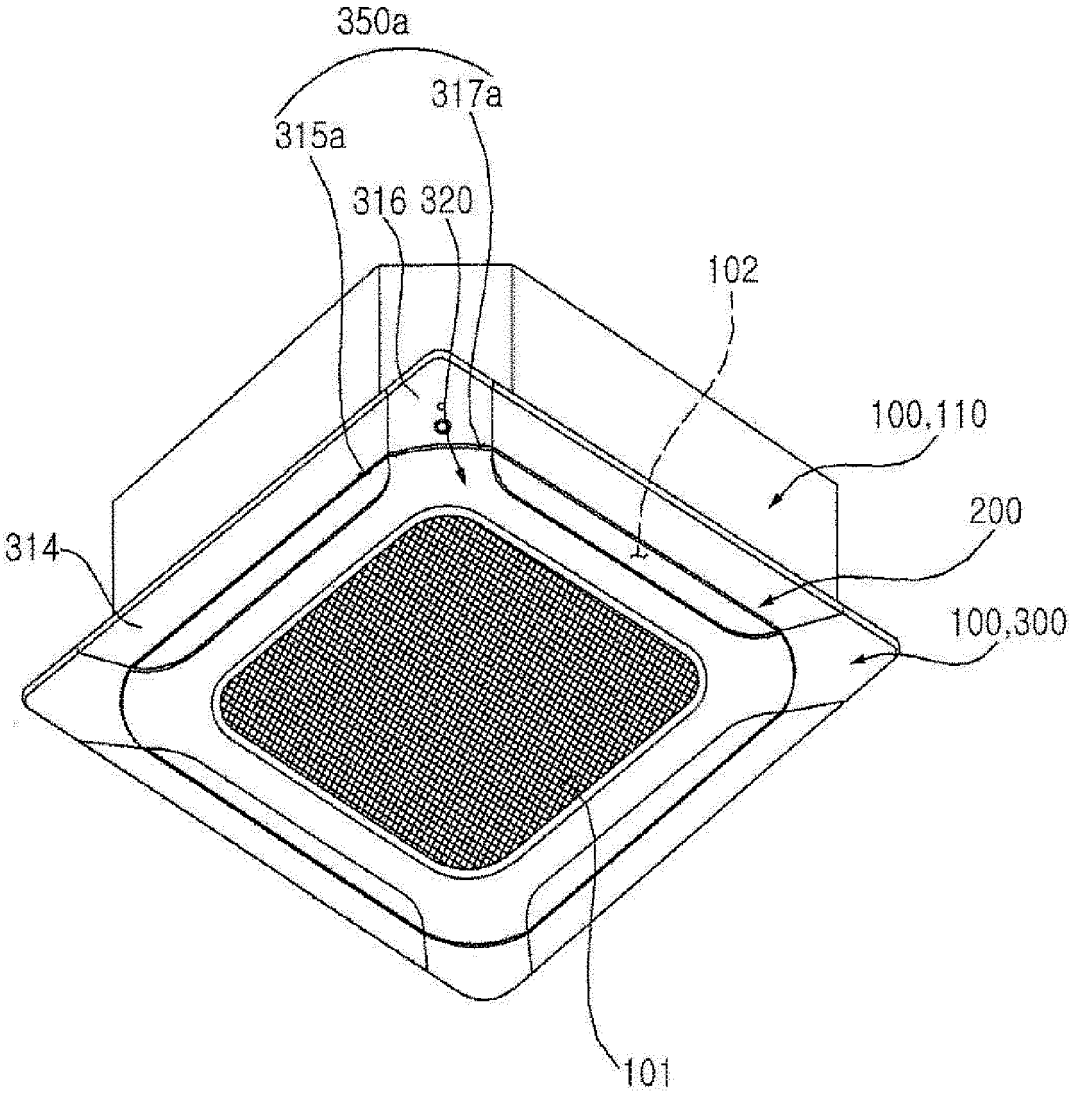

Fig. 2

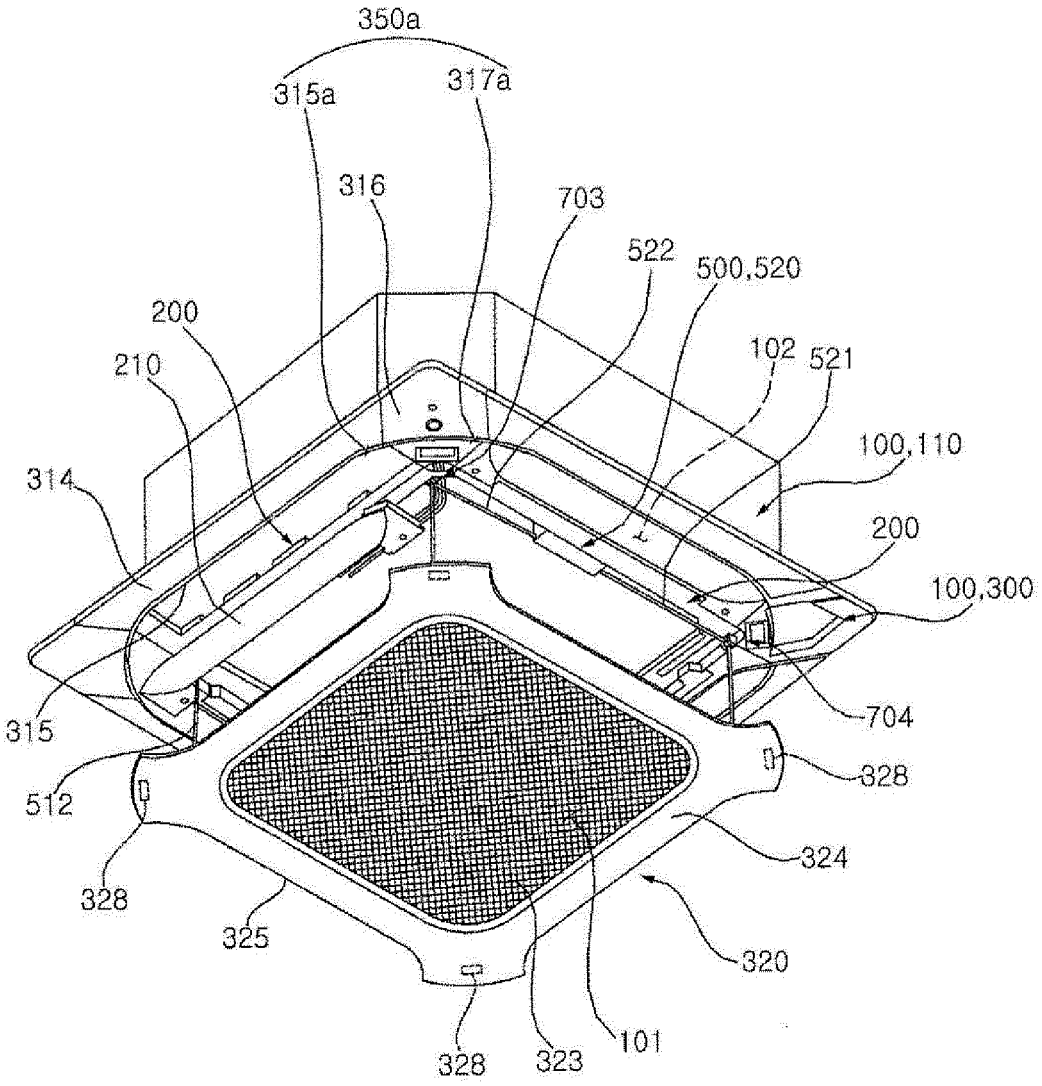
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Fig. 3

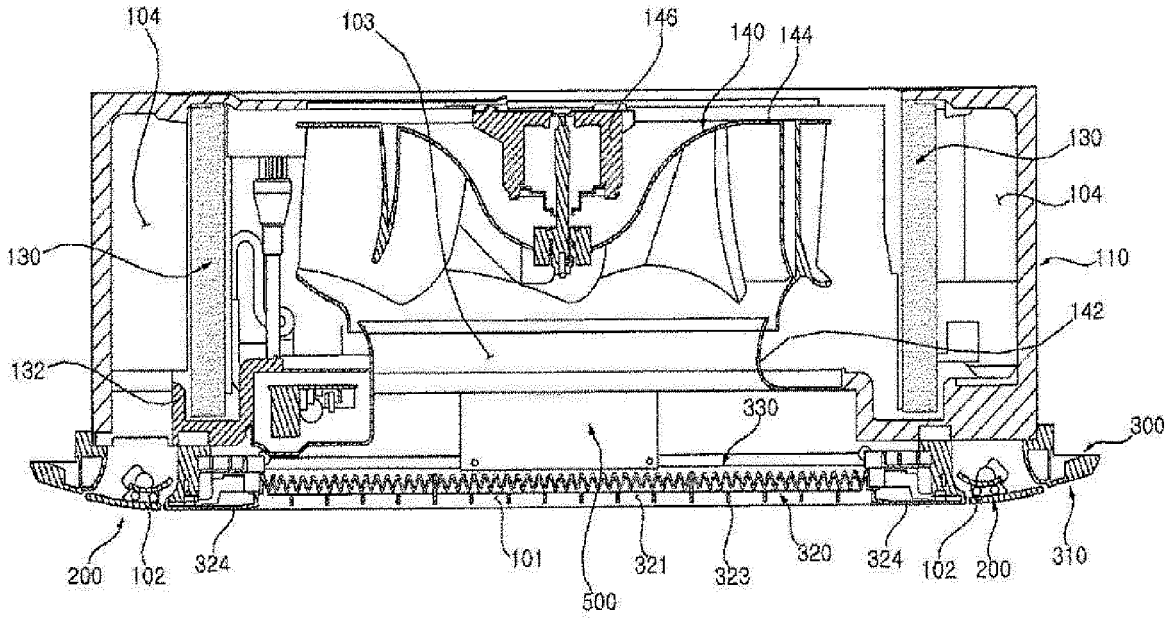
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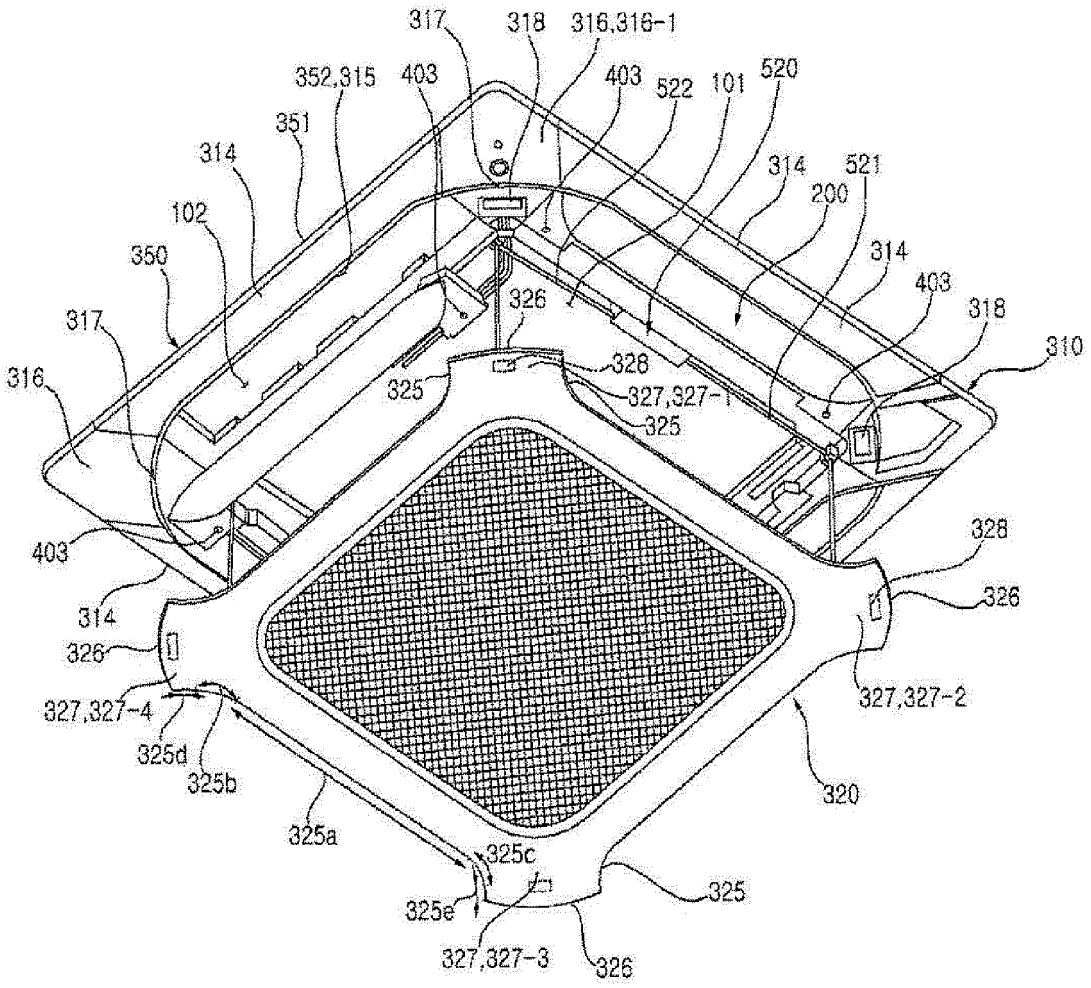
Fig. 4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325e
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326

Fig. 5

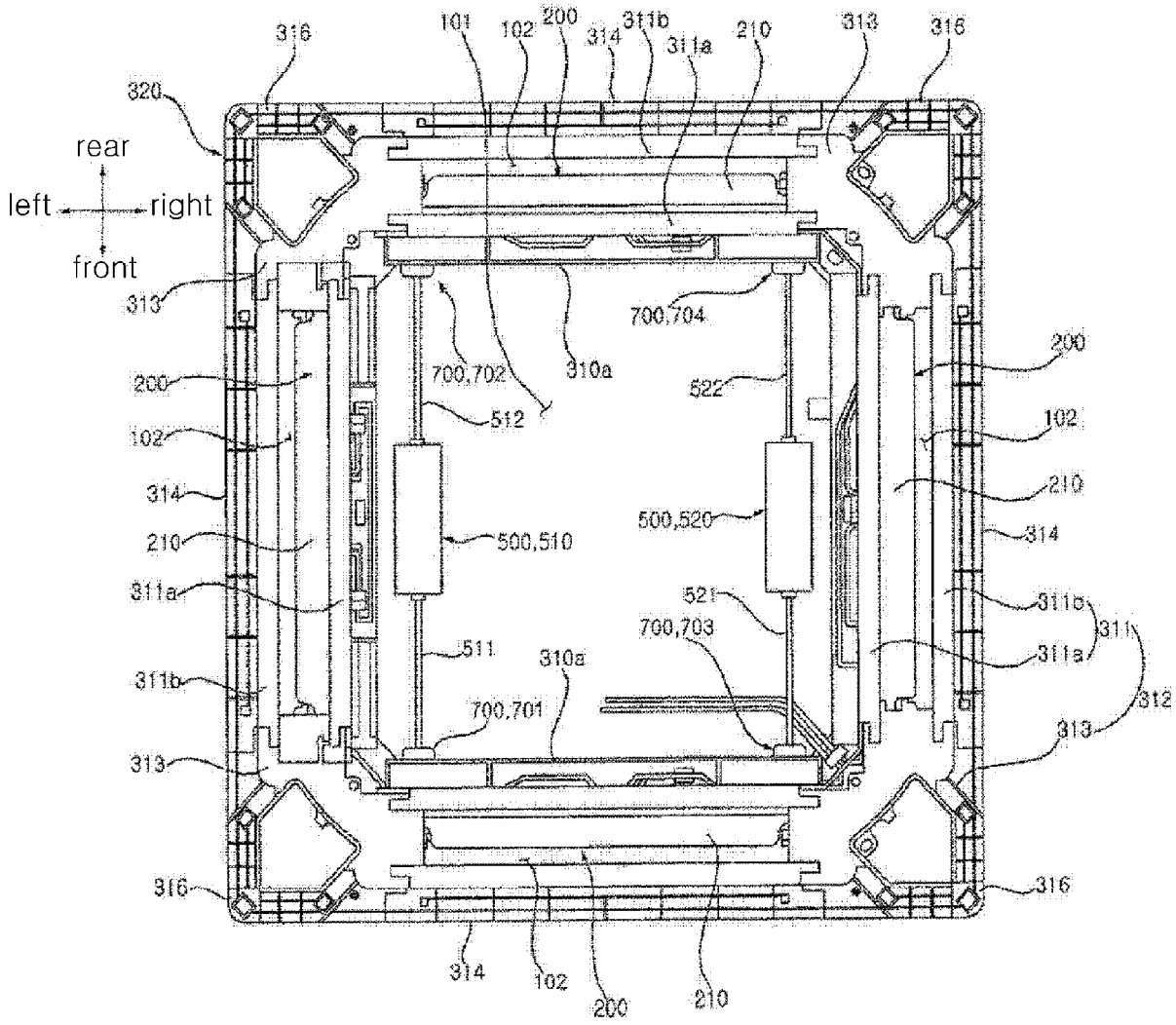
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Fig. 6

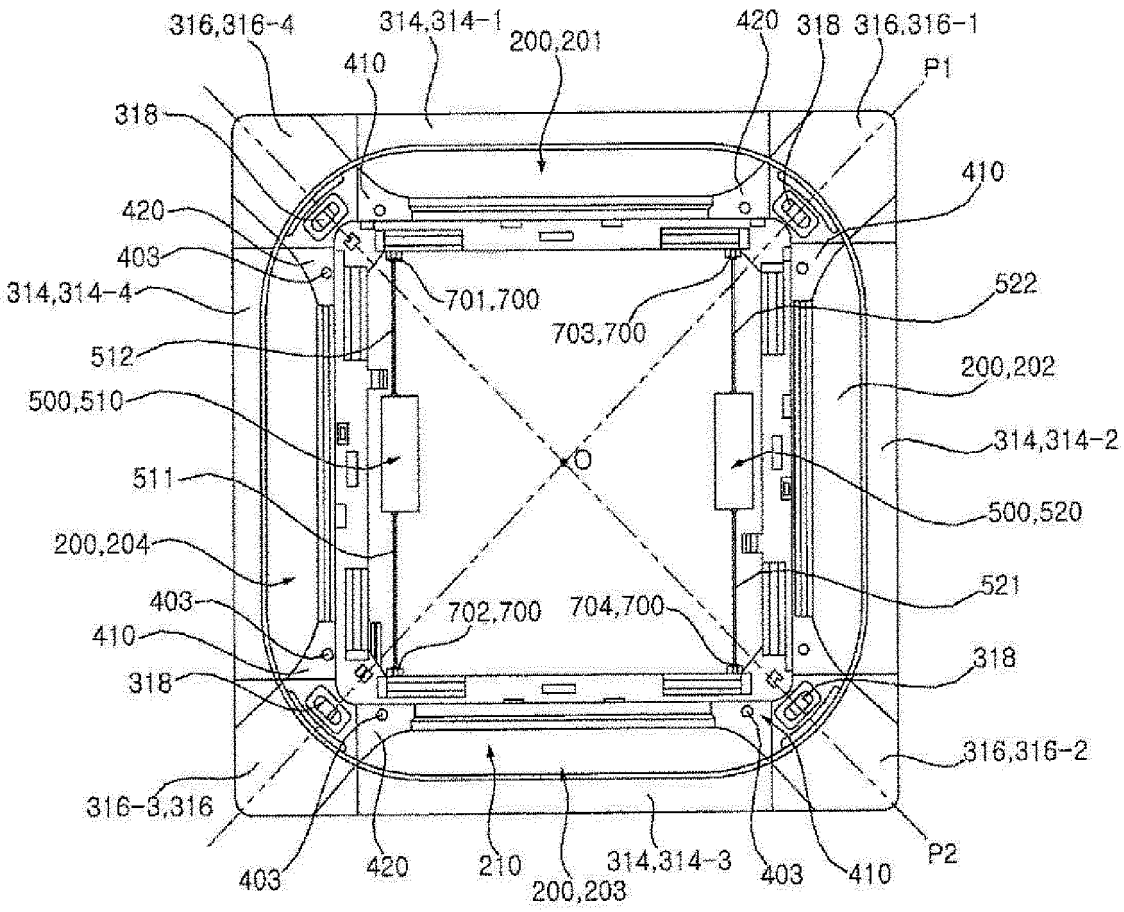
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Fig. 7

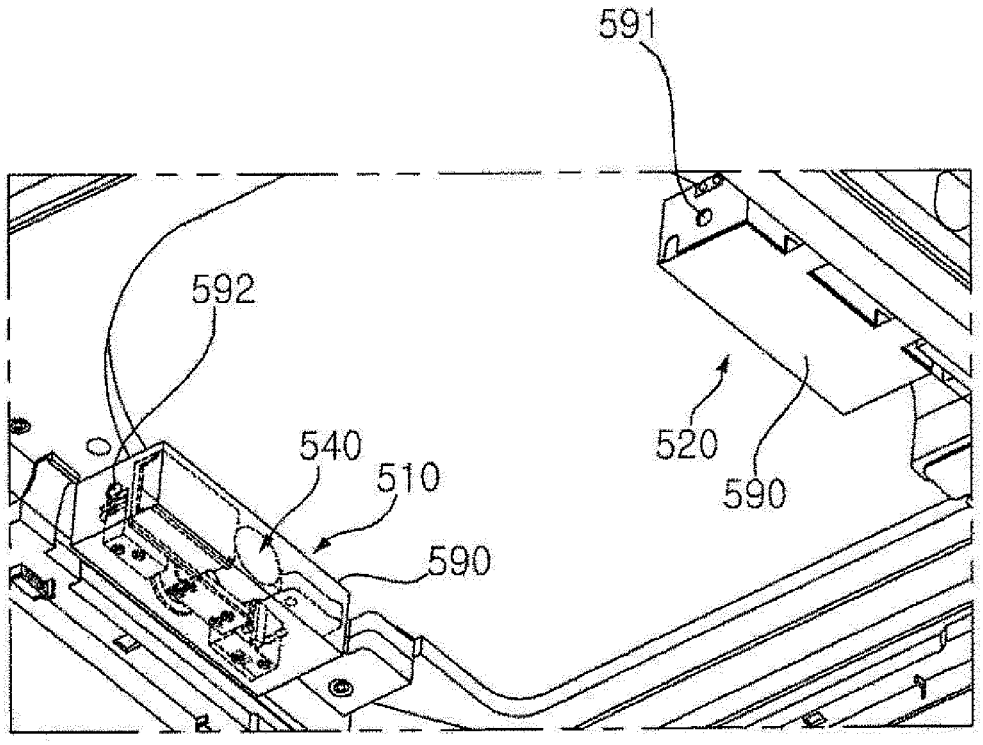


Fig. 8

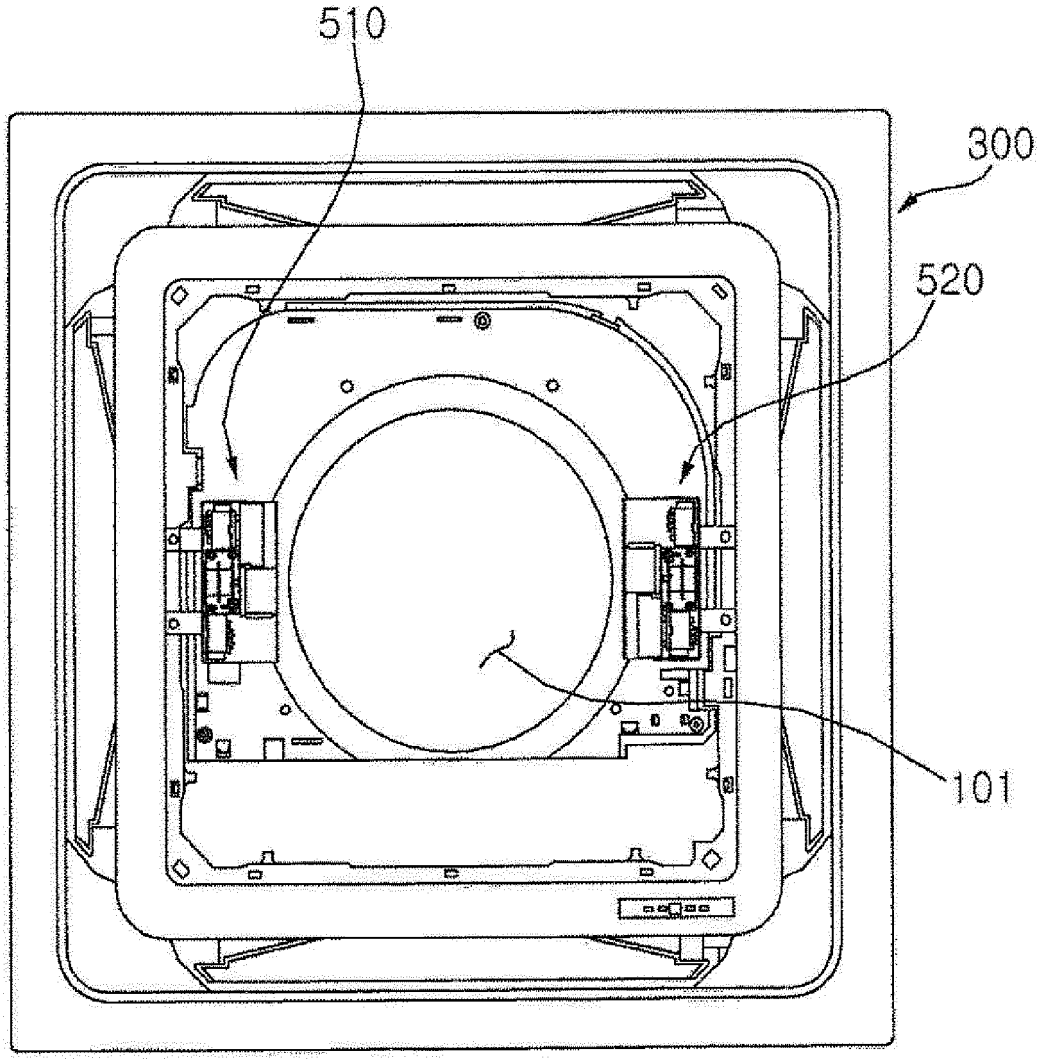
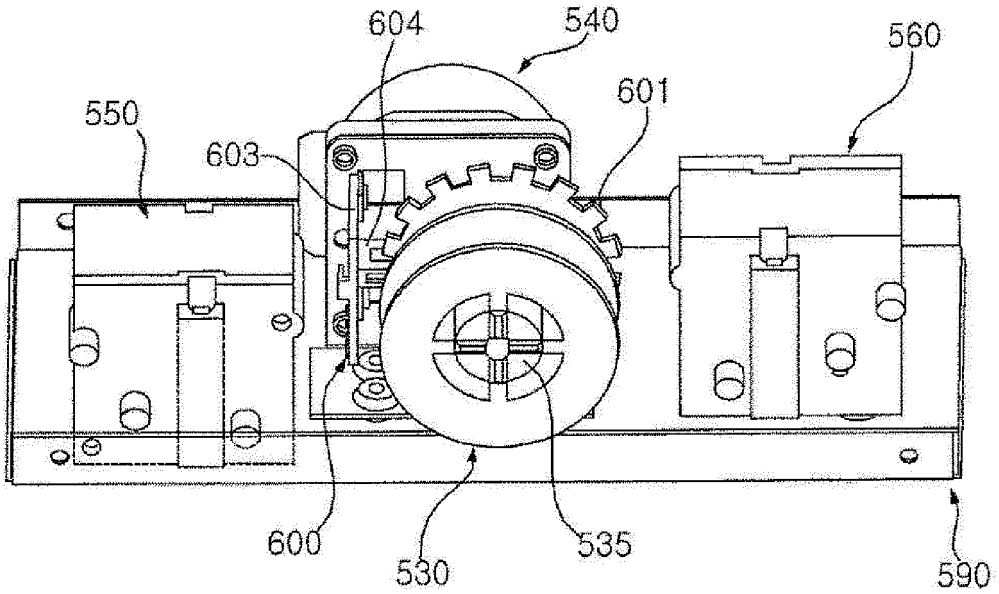


Fig. 9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530
535
590

Fig. 10

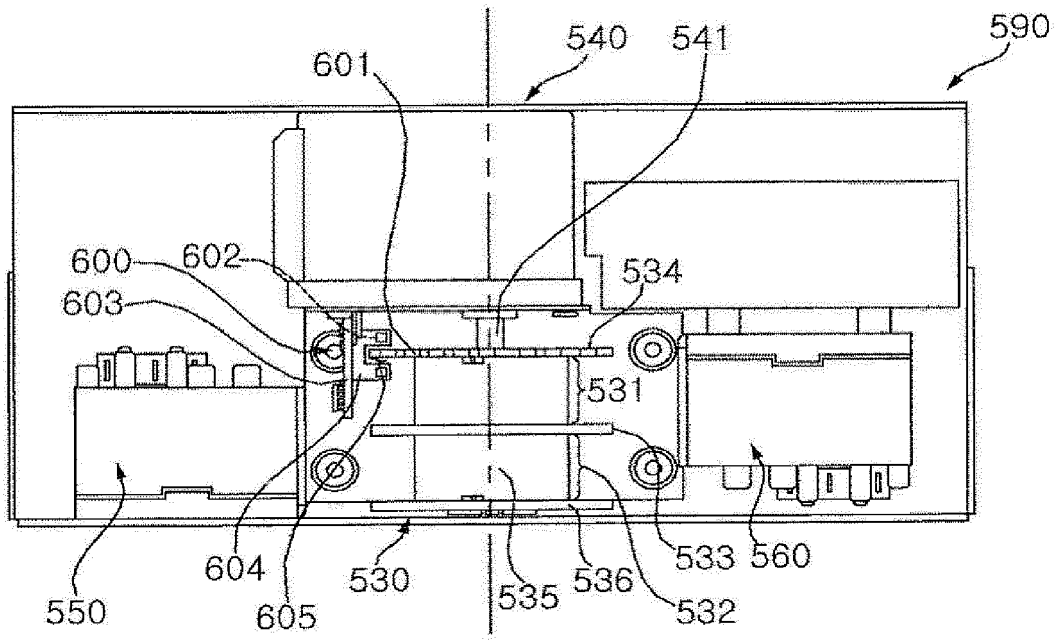
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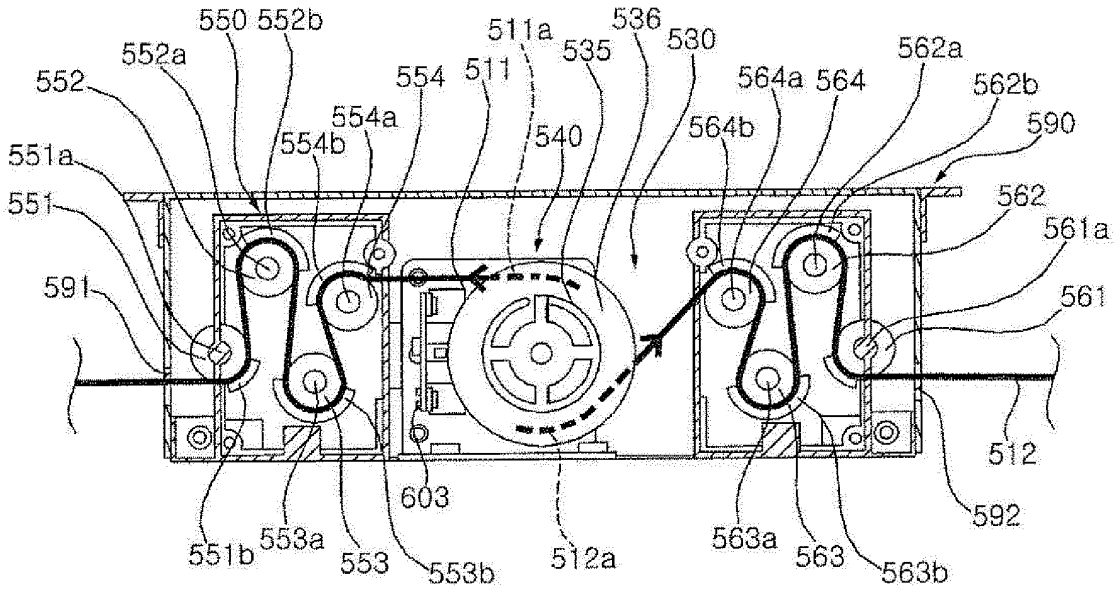
Fig. 11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553a
553
553b
512a
563a
563
563b

Fig. 12

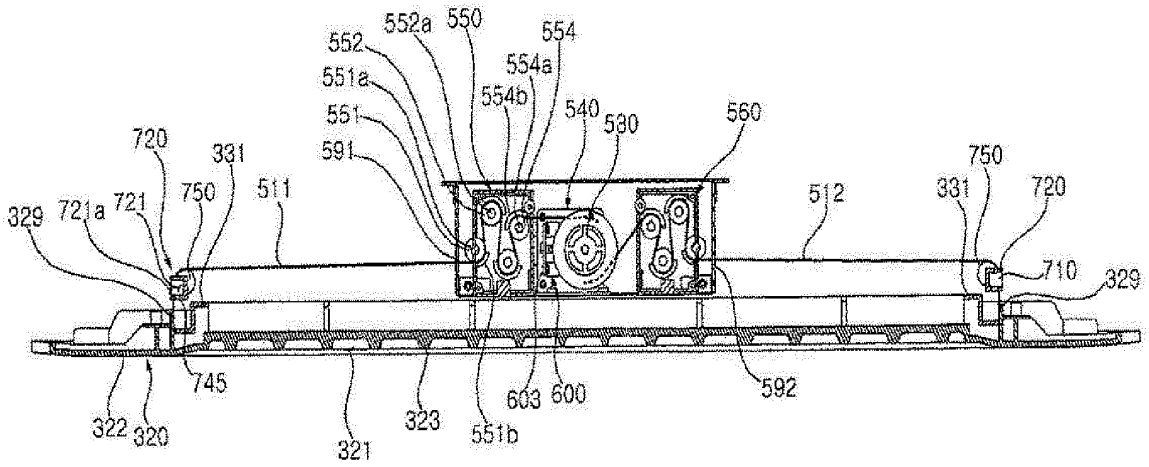
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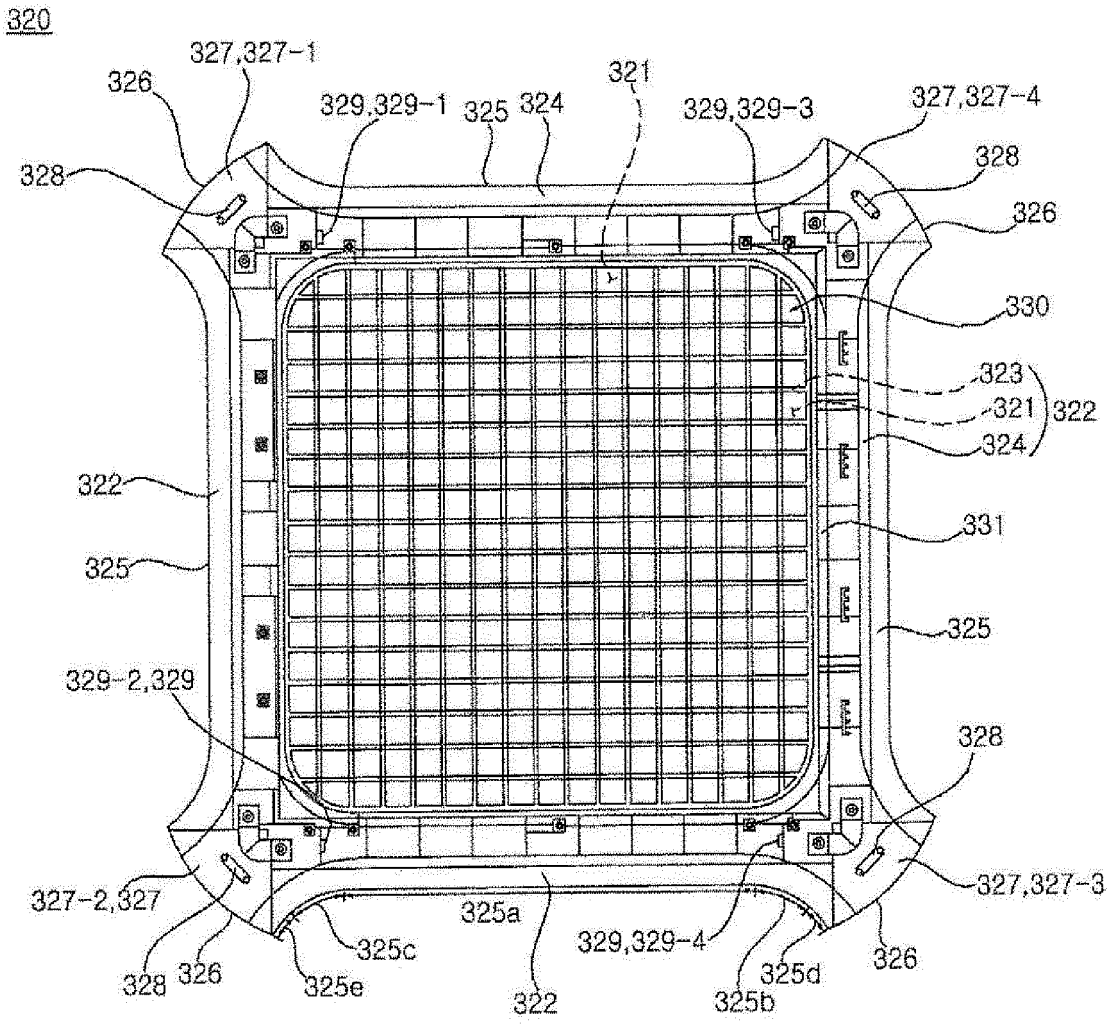
Fig. 13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325d
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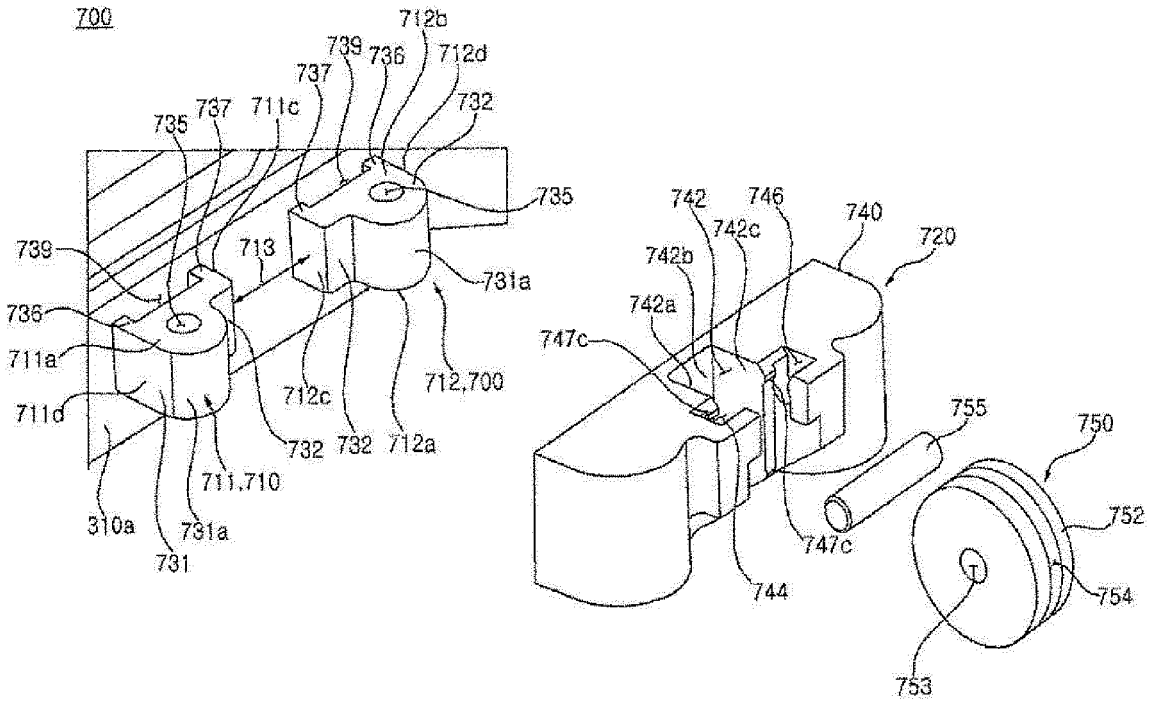
Fig. 14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712a
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Fig. 15

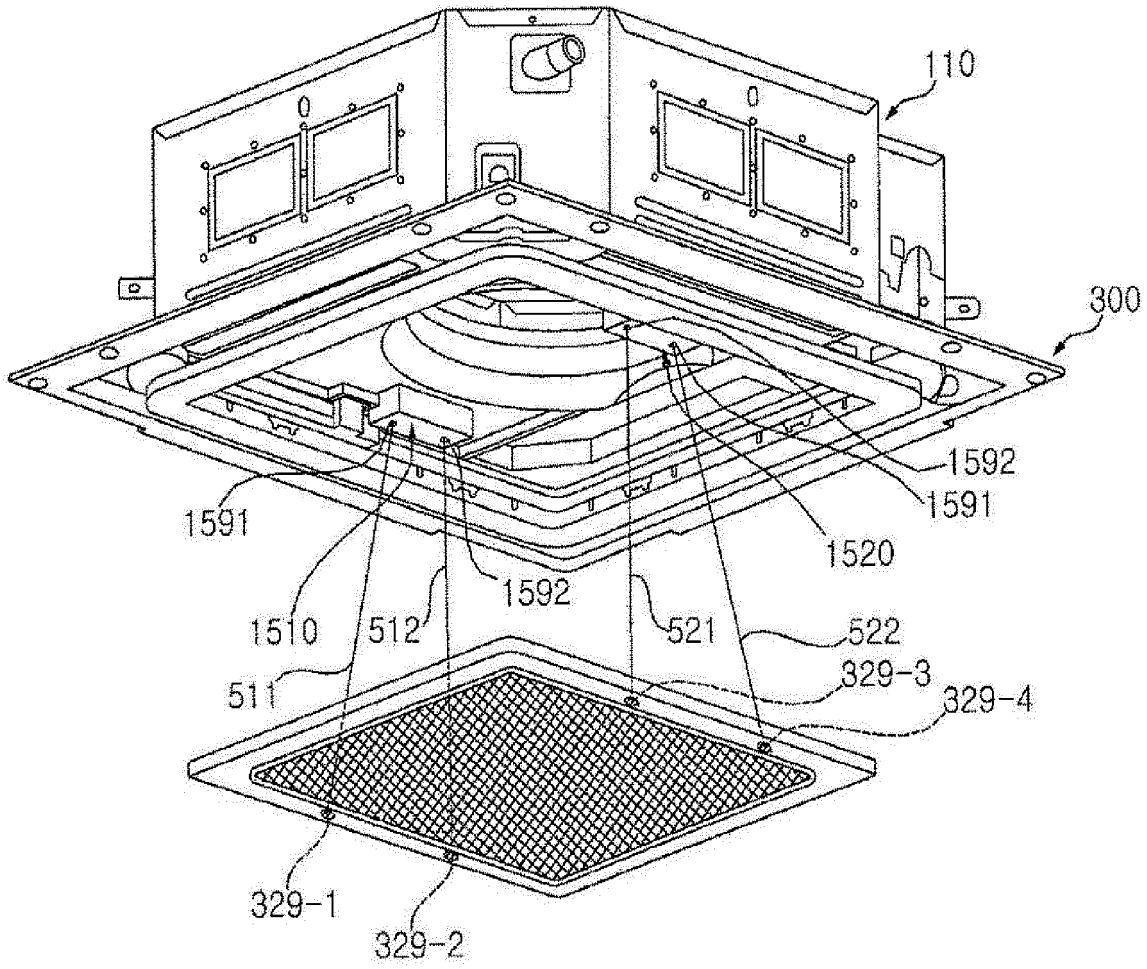
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Fig. 16

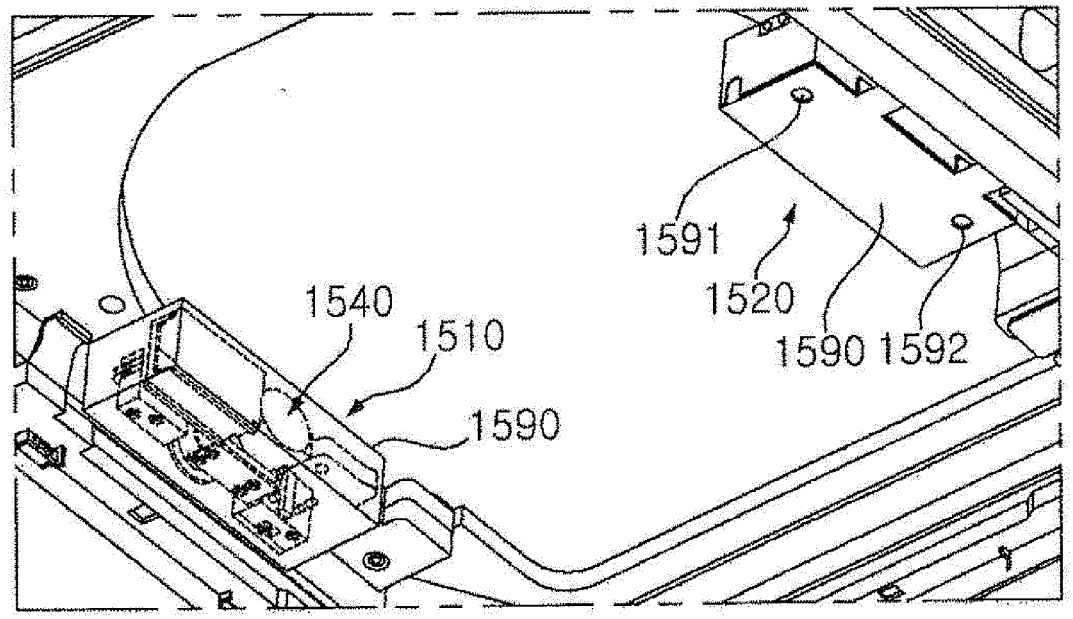
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Fig. 17

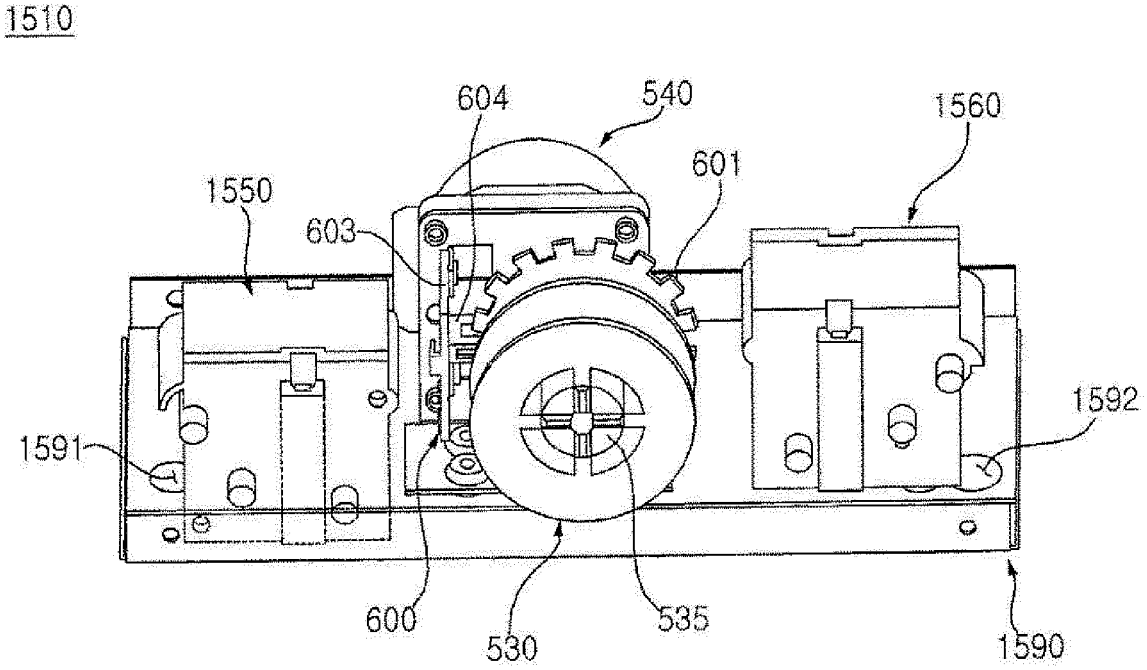
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Fig. 18

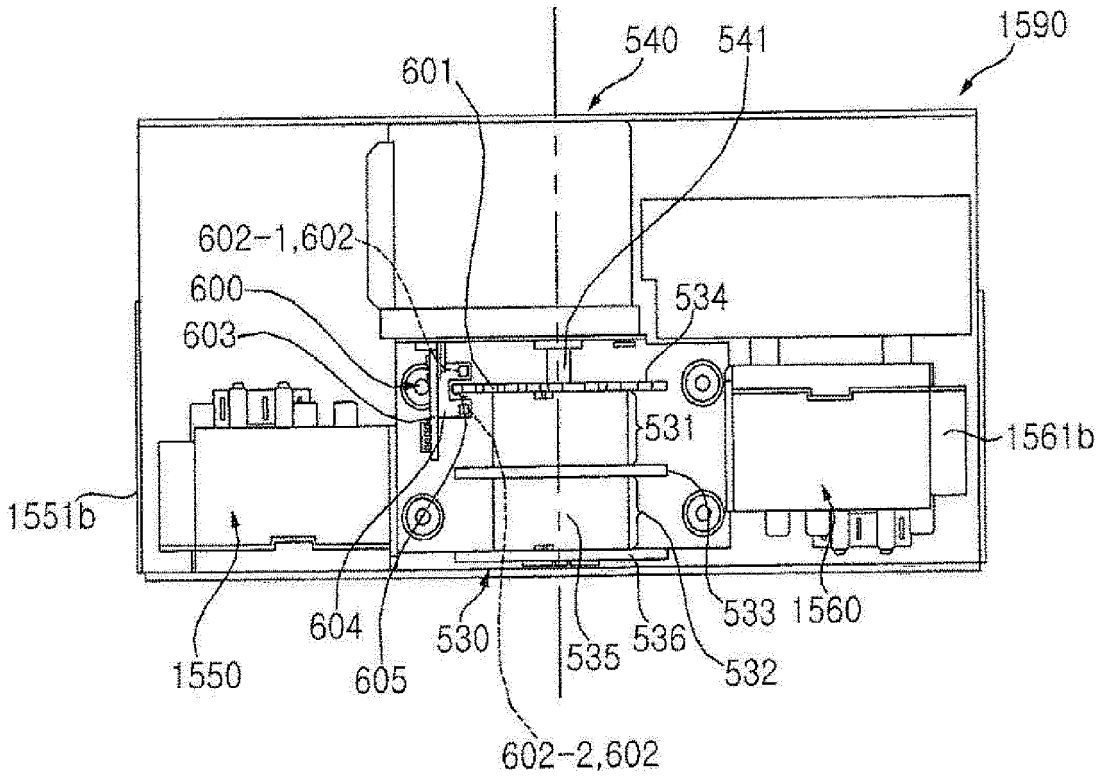
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Fig. 19

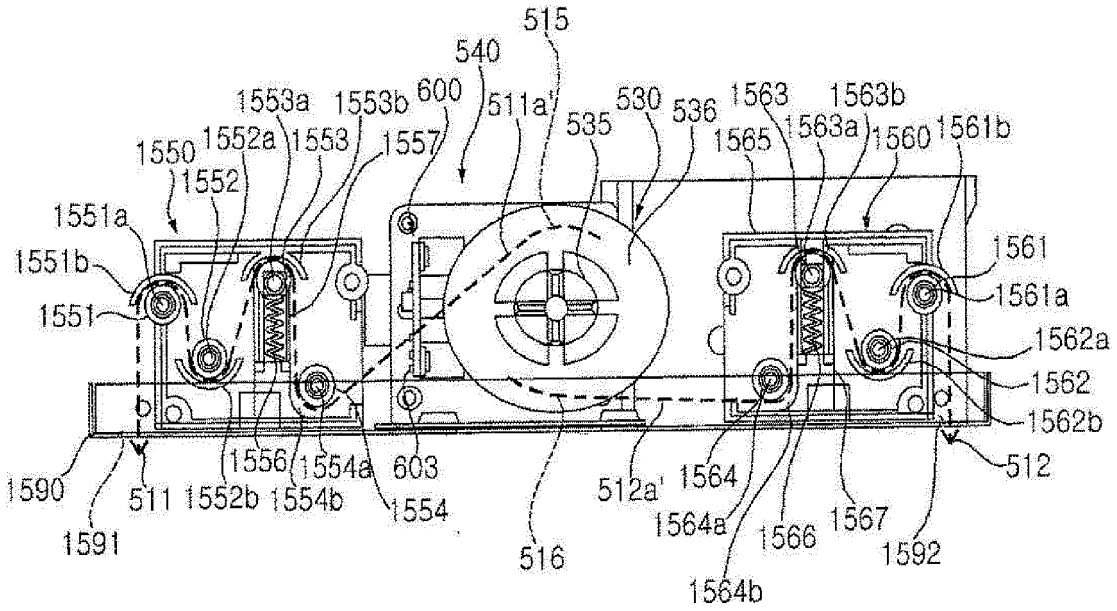
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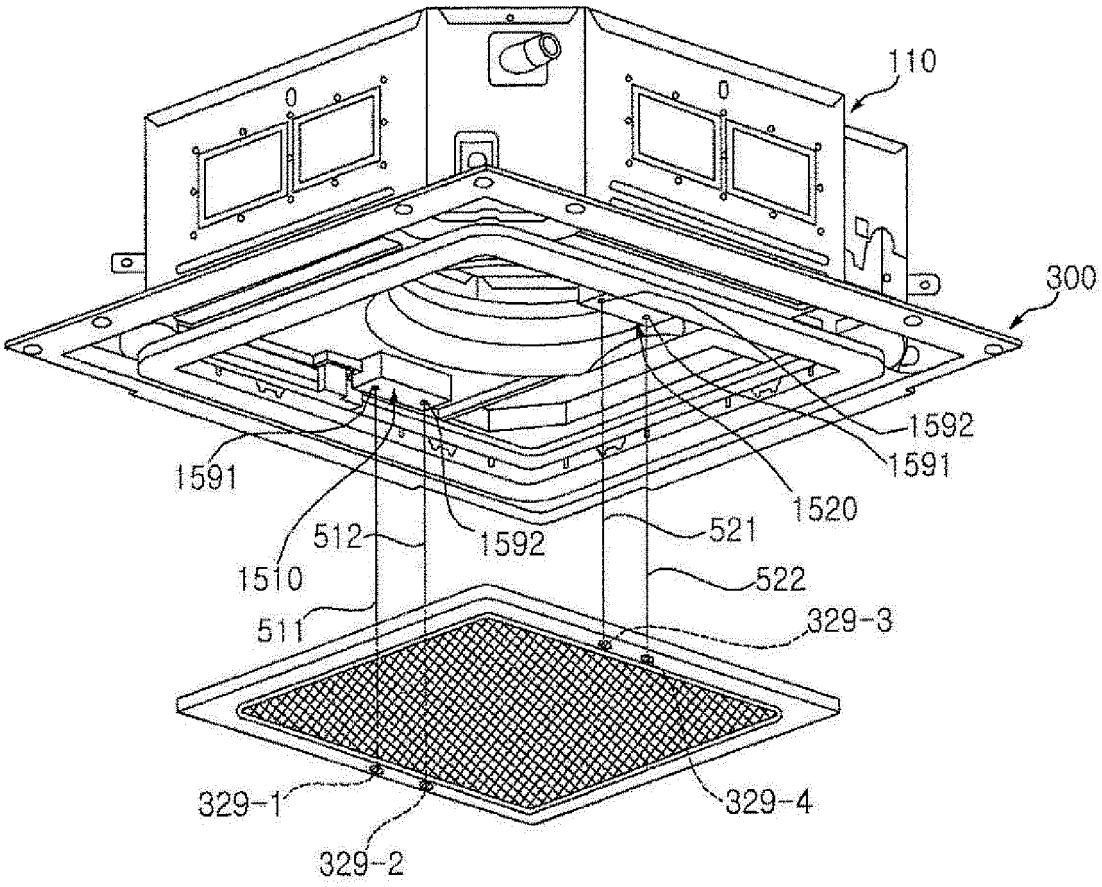
Fig. 20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329-2

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2018/016449

A. CLASSIFICATION OF SUBJECT MATTER

F24F 1/00(2011.01)i, F24F 13/10(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F24F 1/00; F24F 11/02; F24F 13/08; F24F 13/20; F24F 13/10

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean Utility models and applications for Utility models: IPC as above
Japanese Utility models and applications for Utility models: IPC as above

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

eKOMPASS (KIPO internal) & Keywords: ceiling, air conditioning, grill, wire, drum, sensor

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	KR 10-2010-0013472 A (SHIN, Jeong Hoon) 10 February 2010 See paragraphs [0021]-[0035]; and figures 1-6.	1-10,15-21
Y		11-14
Y	JP 11-002423 A (DAIKIN IND., LTD.) 06 January 1999 See paragraph [0038]; and figure 5.	11
Y	KR 10-0726584 B1 (SHIN, Jeong Hoon) 11 June 2007 See paragraph [0021]; and figures 3-5.	12-14
A	JP 2010-112643 A (PANASONIC CORP.) 20 May 2010 See paragraphs [0012]-[0026]; and figures 1-4.	1-21
A	JP 2001-153394 A (DAIKIN IND., LTD.) 08 June 2001 See paragraphs [0027]-[0093]; and figures 1-13.	1-21

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

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Date of the actual completion of the international search	Date of mailing of the international search report
16 APRIL 2019 (16.04.2019)	**17 APRIL 2019 (17.04.2019)**

Name and mailing address of the ISA/KR	Authorized officer
Korean Intellectual Property Office Government Complex Daejeon Building 4, 189, Cheongsa-ro, Seo-gu, Daejeon, 35208, Republic of Korea Facsimile No. +82-42-481-8578	Telephone No.

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2018/016449

Patent document cited in search report	Publication date	Patent family member	Publication date
KR 10-2010-0013472 A	10/02/2010	KR 10-2010-0013473 A	10/02/2010
		WO 2010-013957 A2	04/02/2010
		WO 2010-013957 A3	25/03/2010
JP 11-002423 A	06/01/1999	JP 3139415 B2	26/02/2001
KR 10-0726584 B1	11/06/2007	CN 101421176 A	29/04/2009
		CN 101421176 B	03/08/2011
		JP 2009-533300 A	17/09/2009
		KR 10-0780165 B1	27/11/2007
		KR 10-0780166 B1	27/11/2007
		KR 10-0787774 B1	24/12/2007
		KR 10-0840485 B1	20/06/2008
		KR 10-2007-0102773 A	22/10/2007
		KR 10-2007-0102774 A	22/10/2007
		KR 10-2007-0119973 A	21/12/2007
		US 2008-0217460 A1	11/09/2008
		WO 2007-120009 A1	25/10/2007
JP 2010-112643 A	20/05/2010	NONE	
JP 2001-153394 A	08/06/2001	JP 3332025 B2	07/10/2002

Form PCT/ISA/210 (patent family annex) (January 2015)

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Patent documents cited in the description

- KR 1020080110109 A **[0010]**
- KR 100679838 B1 **[0010]**