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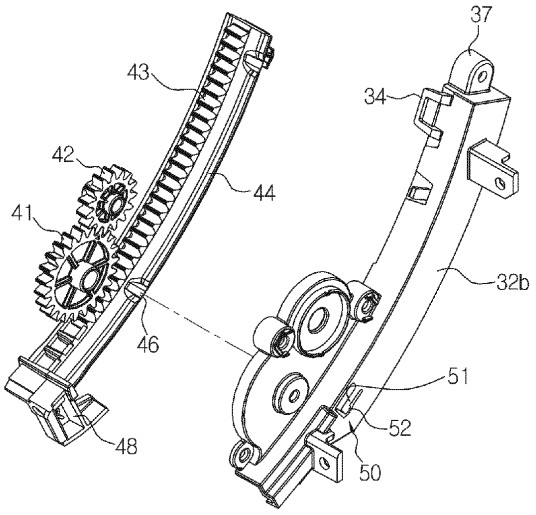
(54) AIR CONDITIONER

(57) Disclosed are provided an air conditioner having a door that can be smoothly moved by a friction member. The air conditioner includes a main body configured to form an outer appearance, an outlet provided in a lower portion of the main body, and configured to discharge air, a door disposed in a front portion of the main body, and configured to open or close the outlet, a driving device including a pinion configured to be rotatable, and a rack interlocked with the pinion and configured to be movable together with the door; and a friction member configured to press the rack when the rack moves so as to maintain a predetermined spacing between the rack and the pinion. The rack and the door can slide smoothly along a curved path through the friction member by a force of the motor.

[Fig. 6]



EP 3 064 852 A1

Description

Technical Field

[0001] The present invention relates to an air conditioner, and more particularly, to an air conditioner having a door that can be smoothly moved by a friction member.

Background Art

[0002] In general, an air conditioner is an apparatus to adjust temperature, humidity, air current, and distribution to optimal conditions at which humans are suitable to be active using a cooling cycle, while removing dust, etc. from the air. Main components constituting the cooling cycle include a compressor, a condenser, an evaporator, an expansion valve, and a blow fan.

[0003] The air conditioner can be classified into a split type air conditioner in which an indoor unit and an outdoor unit are separated and installed, and a window type air conditioner in which an indoor unit and an outdoor unit are installed together in a single cabinet. The indoor unit of the split type air conditioner includes a heat exchanger to heat-exchange air inhaled to the inside of the panel, and a blow fan to inhale indoor air to the inside of the panel and to again discharge the inhaled air to an indoor space. The indoor unit includes various types, such as a wall-mounted type, a stand type, etc.

[0004] In the wall-mounted type which is generally fixed at and mounted on the wall, an outlet is exposed to the outside. Lately, as interest in the designs of air conditioners is rising, an air conditioner having a door to open or close such an outlet is being developed in order to hide the outlet or to match the outlet with peripheral parts. In order to slidingly drive the door, a rack and a pinion gear are generally used. However, since the door is driven generally by linear motion or curvilinear motion (similar to linear motion), the outer appearance of the air conditioner looks large when the door opens.

[0005] Also, when the door moves curvilinearly through the rack and the pinion gear, the door cannot move smoothly due to a backlash between the rack and the pinion.

Disclosure

Technical Problem

[0006] An aspect of the present disclosure is to provide an air conditioner having a door curvilinearly and smoothly moving to open or close an outlet.

[0007] Another aspect of the present disclosure is to provide an air conditioner in which a friction member for applying a friction force to a rack is installed in a case, and the rack includes a groove for preventing plastic deformation.

Technical Solution

[0008] In accordance with an aspect of the present disclosure, there is provided an air conditioner includes a main body configured to form an outer appearance, an outlet provided in a lower portion of the main body, and configured to discharge air, a door disposed in a front portion of the main body, and configured to open or close the outlet, a driving device including a pinion configured to be rotatable, and a rack interlocked with the pinion and configured to be movable together with the door, and a friction member configured to press the rack when the rack moves so as to maintain a predetermined spacing between the rack and the pinion.

[0009] The driving device may include a case forming the outer appearance and fixed in the inside of the main body, wherein the pinion and the rack are located in the case.

[0010] The friction member may be disposed in the case, and protrudes toward the rack.

[0011] The friction member may be disposed between the rack and the pinion so as to press the rack to maintain the predetermined spacing between the rack and the pinion.

[0012] The friction member may include a pressing part contacting the rack, and a support part to elastically support the pressing part.

[0013] The case may include an opening at one end so that the rack is moveable to the outside through the opening, and one end of the rack exposed through the opening is connected to one end of the door.

[0014] The rack may include a saw-toothed unit interlocked with the pinion, and a rack rib provided in both sides of the saw-toothed unit and contacting the friction member.

[0015] The rack rib may include at least one groove in order to prevent the rack from being deformed by the friction member when the rack stops.

Advantageous Effects

[0016] The rack and the door can slide smoothly along a curved path through the friction member by a force of the motor.

[0017] Also, when the door does not operate, the rack may be prevented from plastic deformation through the groove formed therein.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018]

FIG. 1 shows an air conditioner according to an embodiment of the present disclosure.

FIGS. 2 and 3 show the rear part of the air conditioner according to an embodiment of the present disclosure

FIG. 4 is a side cross-sectional view of the air conditioner according to an embodiment of the present disclosure.

FIGS. 5 and 6 show the driving device of the air conditioner according to an embodiment of the present disclosure,

FIG. 7 shows a case of the driving device of the air conditioner according to an embodiment of the present disclosure.

FIG. 8 is a cross-sectional view of the driving unit of the air conditioner according to an embodiment of the present disclosure.

Best Mode

[0019] Hereinafter, embodiments of the present disclosure will be described in detail with reference to the accompanying drawings.

[0020] FIG. 1 shows an air conditioner 1 according to an embodiment of the present disclosure.

[0021] The air conditioner 1 may heat-exchange high-temperature air with low-temperature refrigerants using a cooling cycle composed of a compressor, a condenser, an expansion valve, and an evaporator, and then supply low-temperature air to an indoor space. Generally, the compressor and the condenser may be installed in an outdoor unit of the air conditioner 1, the expansion valve may be installed in any one of the outdoor unit and an indoor unit of the air conditioner 1, and the evaporator may be installed in the indoor unit of the air conditioner 1.

[0022] The indoor unit may be one of various types, such as a stand type standing on a floor to cool or heat a relatively wide indoor space, and a wall-mounted type mounted on a wall to cool or heat a relatively narrow indoor space.

[0023] The air conditioner 1, which is a wall-mounted type mounted on a wall, may include a main body having an inlet 3 and an outlet 5. The main body may include a rear panel fixed on the wall, a front panel 10 configured to surround internal components such as a heat exchanger 16 (see FIG. 4), a lower panel 12, and a pair of side panels 14.

[0024] The inlet 3 may be disposed in the upper portion of the front panel 10. The inlet 3 may always open, or may be opened by an operation of the air condition 1. In the inlet 3, a filter device for removing foreign materials from indoor air entering the inside of the air conditioner 1 may be installed.

[0025] The outlet 5 may be disposed in the lower portion of the front panel 10. The outlet 5 may be a passage through which air entered through the inlet 3 is discharged to the outside of the air conditioner 1 via the heat exchanger 16 (see FIG. 4). In the front portion of the outlet 5, a blade 7 (see FIG. 2) may be installed to adjust the direction of discharged air.

[0026] As described above, the air conditioner 1 according to the present disclosure may have a structure in which both of the inlet 3 and the outlet 5 are installed in the front panel 10. There may be no upper panel corresponding to the lower panel 12, and one side of the front panel 10 may contact the wall so that the front panel 10 convexly protrudes against the wall. The front panel 10 may include a first panel part in which the inlet 3 is located, and a second panel unit which is connected to the lower portion of the first panel part and in which the outlet 5 is located.

[0027] The first panel part and the second panel part of the front panel 10 may have curved shapes, and the front panel 10 may be most distant from the wall at the portion at which the first panel part is connected to the second panel part. One side of the first panel part may contact the wall, and the other side of the first panel part may be connected to the second panel part. One side of the second panel part may be connected to the first panel part, and the other side of the second panel part may be connected to the lower panel 12. The second panel part may be spaced from the wall such that the lower panel 12 can be positioned between the second panel part and the wall.

[0028] At both lateral sides of the front panel 10 and the lower panel 12, the pair of side panels 14 may be respectively connected to the front panel 10 and the lower panel 12, thereby forming the main body of the air conditioner 1. The front panel 10 and the pair of side panels 14 may be integrated into one unit. On the first panel part and the upper front portion of the second panel part, a cover 20 may be attached. The cover 20 may be fabricated by double injection molding to form the outer appearance of the air conditioner 1.

[0029] In the front portion of the second panel part, the door 100 may be provided to open or close the outlet 5. The door 100 may be connected to the lower portion of the cover 20 to cover the outlet 5 of the second panel part. In order for the air conditioner 1 to have a smooth surface, the cover 20 and the door 100 may have the same thickness. The door 100 may be fabricated by double injection molding to be disposed on the front panel 10, thus forming the outer appearance of the air conditioner 1.

[0030] When the air conditioner 1 does not operate, the door 100 may cover the outlet 5 to extend to the cover 20, thus forming the front surface of the air conditioner 1. Since the door 100 completely covers the outlet 5, the outlet 5 may be not exposed to the outside. Accordingly, in the air conditioner 1 mounted on the wall, the front surface formed by the cover 20 and the door 100 is exposed to the outside.

[0031] When the air conditioner 1 operates, the door 100 may slide toward the lower panel 12 to expose the outlet 5 to the outside. The door 100 may slide along a curved movement orbit to expose the outlet 5. The curved movement orbit may be curved with different curvatures so that the outer appearance of the air conditioner 1 looks

slim when the door 100 completely opens.

[0032] FIGS. 2 and 3 show the rear part of the air conditioner 1 according to an embodiment of the present disclosure, wherein FIG. 2 shows a case in which the door 100 is closed, and FIG. 3 shows a case in which the door 100 is opened. In FIG. 3, the lower panel 12 is not shown in order to show the rear part of the door 100.

[0033] The main body of the air conditioner 1 may be formed by integrating the front panel 10 including the outlet 5 and the side panels 14 into one unit. The lower panel 12 may be connected to the side panels 14 and the front panel 10, and the cover 20 and the door 100 may be located on the front surface of the front panel 10. In the outlet 5 formed in the front panel 10, the blade 7 may be disposed to change the direction of discharged air, and an installation member for installing the blade 7 may be attached on the front part of the front panel 10.

[0034] In order for the door 100 to slide, a driving device 200 for supplying power may be provided in the inside of the front panel 10. The driving devices 200 may be disposed at both edges of the inside of the front panel 10, adjacent to the side panels 14.

[0035] At each of corners at which the side panels 14, the front panel 10, and the lower panel 20 meet together, an external opening 30 may be provided so that the moving driving device 200 can slide together with the door 100 through the external opening 30 to be exposed to the outside. In order to form the external opening 30, both sides of the lower panel 12 may be dent toward the inside.

[0036] The driving device 200 may be coupled with one end of the door 100 to slide together with the door 100. The driving device 200 may move to the outside of the air conditioner 1 through the external opening 30 so as to cause the door 100 to slide. If the door 100 slides and moves to the lower panel 12, the blade 7 may be exposed to the outside. Purified air may be discharged to the indoor space through the outlet 5, and the blade 7 may rotate to change the direction of discharged air.

[0037] The door 100 may include side ribs 102 at its both ends, wherein the side ribs 102 protrude to contact the pair of side panels 14. The pair of side panels 14 may include respectively side guides 104 formed concavely along the movement orbit of the door 100 so that the door 100 can move stably. The side ribs 102 of the door 100 may include protrusions protruding toward the side panels 14 so that the side ribs 102 can be inserted into the side guides 104 of the side panels 14. The protrusions may be inserted into the side guides 104 and slide to prevent the door 100 from being separated by an external force.

[0038] In order to prevent the center portion of the door 10 from drooping down due to its own weight when the door 100 connected to the driving device 200 at the both ends slides, the door 100 may include at least one drooping prevention unit 107 on the inside surface. The drooping prevention unit 107 may have a T-shaped cross section, and extend on the inside surface of the door 100 in a direction in which the door 100 slides.

[0039] In the lower portion of the front panel 10, a guide bar 105 may be disposed which the drooping prevention unit 107 can be caught by and slide along. The guide bar 105 may be integrated with or separated from the installation member for installing the blade 7. The guide bar 105 may include at least one guide 106 by which the drooping prevention unit 107 can be caught, the at least one guide 106 corresponding to the drooping prevention unit 107. The guide 106 may be disposed in the center portion of the door 100, or two guides 106 may be provided, as shown in FIG. 3.

[0040] FIG. 4 is a side cross-sectional view of the air conditioner 1 according to an embodiment of the present disclosure.

[0041] In the inside of the air conditioner 1, the heat exchanger 16 may be provided to exchange heat with air entering from the indoor space to cool or heat the air. The heat exchanger 16 may function as an evaporator upon cooling, and as a condenser upon heating. A plurality of heat exchangers 16 may be arranged in the inside of the air conditioner 1 in order to effectively exchange heat with indoor air.

[0042] A crossflow fan 18 may be positioned in the inside of the air conditioner 1 together with the heat exchanger 16. The crossflow fan 18 may forcedly circulate indoor air to discharge the indoor air to the indoor space through the outlet 5. The crossflow fan 18 may include a plurality of blades arranged in a radial direction, and the plurality of blades may be connected to a driving motor to rotate at high speed.

[0043] In the inside of the air conditioner 1, a filter for removing dust included in inhaled air to purify the air, and a drain tray for draining condensed water generated on the surface of the heat exchanger 16 upon cooling may be disposed.

[0044] If the air conditioner 1 operates, the crossflow fan 18 may rotate at high speed by the driving motor, so that indoor air enters the inside of the air conditioner 1 through the inlet 3, and the air passes through the heat exchanger 16 to exchange heat. The air may be again discharged to the indoor space through the outlet 5. Through this process, the air conditioner 1 may circulate air to cool or heat the indoor space.

[0045] The driving device 200 to move the door 100 to open or close the outlet 5 may include a pinion 40 to rotate, and a rack 45 interlocked with the pinion 40 to move. The driving device 200 may include a case 32 configured to protect the pinion 40 and the rack 45 located therein. The case 32 may be fixed at both inside edges of the front panel 10.

[0046] The rack 45 may be in the shape of a saw-toothed, curved bar extending in the longitudinal direction. Accordingly, the rack 45 may move along a curved path according to rotation of the pinion 40.

[0047] In order for the rack 45 located in the inside of the case 32 to move and be exposed to the outside, the case 32 may include an internal opening 33 at one end. Hereinafter, for convenience of description, the internal

opening 33 will be simply referred to as an "opening" 33. One end of the rack 45 exposed through the opening 33 may be connected to one end of the door 100. That is, one end of the rack 45 may be coupled with one end of the door 100 with the lower portion of the front panel 100 in between.

[0048] If the air conditioner 1 operates, the pinion 40 may rotate, and the rack 45 interlocked with the pinion 40 may move. The rack 45 may pass through the opening 33 to escape from the case 32, and then pass through the external opening 30 provided in the main body to be exposed to the outside. The door 100 whose one end is connected to the rack 45 may slide when the rack 45 moves, to thus move below the lower panel 12.

[0049] The rack 45 and the door 100 may be coupled with each other at their one ends so that a space in which the lower portion of the front panel 10 can be positioned is formed between the rack 45 and the door 100. Accordingly, the lower portion of the front panel 10 may be formed in the shape of a flat plate in which neither an opening nor a coupling member for installing the rack 45 exist. Also, since the rack 45 and the door 100 are coupled with each other at their one sides, the curvature of the door 100 may be different from that of the rack 45.

[0050] On both inside corners of the door 100, a protrusion 47 protruding toward the inside of the air conditioner 1 may be disposed. The protrusion 47 may include a rib 49 extending toward the opening 33 of the case 32. The rack 45 may be coupled with the rib 49 in the longitudinal direction of the rack 45, and one end of the rack 45 may be inserted into and coupled with the protrusion 47. A screw may be inserted in such a way to penetrate the protrusion 47 and the end of the rack 45, thus fixing the protrusion 47 and the end of the rack 45. For stable coupling, the rack 45 may include a rack protrusion 48 protruding downward to be inserted into the door 100.

[0051] Since the door 100 and the rack 45 are coupled with each other at their one ends, the door 100 may be drooped at the other end not coupled with the rack 45 due to its own weight when the door 100 is completely separated from the front panel 10 to open. Accordingly, the rib 49 may be provided to be deeply inserted into the inside of the rack 45, thereby strengthening coupling between the rack 45 and the door 100 while moving the center of gravity toward the center area of the door 100, which prevents the door 100 from being drooped.

[0052] The door 100 may be disposed in such a way to slide adjacent to the lower panel 12 so that the volume of the air conditioner 1 looks slim when the door 100 opens completely. For this, the curvature of the door 100 may be greater than that of the rack 45. The door 100 may have the same curvature as that of the front panel 10 to be rested on the front surface of the front panel 10.

[0053] As the rack 45 moves, the door 100 may slide while changing its curvature gradually to the curvature of the rack 45. That is, the door 100 may slide along a movement orbit with a curvature changing from the curvature of the front panel 10 to the curvature of the rack 45.

[0054] FIG. 5 shows the driving device 200 of the air conditioner 1 according to an embodiment of the present disclosure, FIG. 6 shows the driving device 200 of the air conditioner 1 according to an embodiment of the present disclosure, and FIG. 7 shows a second case 32b of the driving device 200 of the air conditioner 1 according to an embodiment of the present disclosure. In FIGS. 5, 6, and 7, one of the driving devices 200 disposed at both inside edges of the front panel 10 is shown, for convenience of description.

[0055] The driving device 100 may include a motor 35 for supplying power, the pinion 40 having a rotating axis connected to the motor 35 to rotate, the rack 45 interlocked with the pinion 40 to move, and the case 32 surrounding these. As described above, the rack 45 may be coupled with the door 100 at one end to slide together with the door 100.

[0056] The case 32 may include a first case 32a and a second case 32b to form an internal space in which the rack 45 and the pinion 40 can be positioned. The case 32 may have a shape curved in the longitudinal direction in correspondence to the shape of the rack 45, and form a space in which the pinion 40 can be positioned at one side.

[0057] The first case 32a may be coupled with the second case 32b through at least one coupling member 34, 36, 37, and 38. As shown in FIG. 5, the first case 32a may be hook-joined with the second case 32b by the coupling members 34 and 36 corresponding to each other, or the first case 32a may be inserted into the second case 32b by the coupling members 37 and 38 corresponding to each other.

[0058] The rack 45 may include a saw-toothed unit 43 configured to be interlocked with the pinion 40, and rack ribs 44 provided in both sides of the saw-toothed unit 43. According to rotation of the motor 35, the pinion 40 may rotate, and the saw-toothed unit 43 interlocked with the pinion 40 may move accordingly. The pinion 40 may be configured as at least one gear to acquire a desired reduction gear ratio. In FIGS. 5 and 6, a first pinion 42 coupled with the motor 35, and a second pinion 41 contacting the first pinion 42 and interlocked with the saw-toothed unit 43 are shown.

[0059] In order for the rack 45 to be spaced by a predetermined distance from the pinion 40 when the motor 35 operates to move the rack 45, a friction member 50 may be provided. The friction member 50 may be disposed in the case 32, as shown in FIGS. 6 and 7. The friction member 50 may be disposed in at least one of the first case 32a and the second case 32b.

[0060] As shown in FIGS. 6 and 7, the friction member 50 may protrude toward the rack 45 from the second case 32b. The friction member 50 may be positioned between the rack 45 and the pinion 40 to press the rack 45 to maintain a spacing between the rack 45 and the pinion 40. The friction member 50 may include a pressing part 52 contacting the rack 45, and a support part 51 to elastically support the pressing part 52.

[0061] The friction member 50 may press the rack 45 while increasing a friction force with the rack 45 to thereby prevent the rack 45 from moving by the force of gravity. That is, the friction member 50 may press the rack 45 to maintain a spacing between the rack 45 and the pinion 40, and increase a friction force to prevent the rack 45 from slidingly moving. Accordingly, the rack 45 and the door 100 connected to the rack 45 can move smoothly by the force of the motor 35.

[0062] The pressing part 52 may contact the rack rib 44 to press the moving rack rib 44. In order to prevent the rack rib 44 from being deformed by the pressing part 52 when the rack 45 stops, the rack rib 44 may include at least one groove 46. As shown in FIG. 6, the rack rib 44 may include two grooves 46 at areas at which the pressing part 52 is located when the door 100 completely closes and opens.

[0063] As shown in FIG. 7, in the inside surface of the second case 32b, a guide 38 may be concavely formed along the movement path of the rack 45 so that the rack 45 can move stably. The guide 38 may extend from one end of the case 32b to the other end along the movement path of the rack 45, but in this case, contact friction between the rack 45 and the guide 38 may increase.

[0064] As the contact friction between the rack 45 and the guide 38 increases, more torque may be required to move the rack 45. Accordingly, in order to reduce such contact friction, the guide 38 may be formed in a smallest area as long as the rack 45 can move stably along the movement path. The guide 38 may be formed in both the first case 32a and the second case 32b.

[0065] FIG. 8 is a cross-sectional view of the driving unit 200 of the air conditioner 1 according to an embodiment of the present disclosure.

[0066] Although the guide 38 is formed in the smallest area, contact friction may still exist since a contact surface between the rack 45 and the guide 38 is wide. The rack rib 44 may be inserted into a contact surface positioned in the inner surface of the guide 38 and slidingly move.

[0067] The contact surface 33 may surround the upper and lower portions of the rack rib 44 so that the rack rib 44 cannot escape from the guide 38. However, the contact surface 33 contacting the rack rib 44 while surrounding the upper and lower portions of the rack rib 44 may increase contact friction.

[0068] Accordingly, the rack rib 44 may be inserted into the contact surface 33 with a gap in between, in order to reduce contact friction with the contact surface 33. That is, the rack rib 44 may be formed with a steeper slope than the contact surface 33 so that the rack rib 44 can be in line contact with the contact surface 33, not in surface contact with the contact surface 33. An empty space may be formed between the rack rib 44 and the contact surface 33 to thereby reduce contact friction.

[0069] It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the spirit or scope of the inventions. Thus, it is intended that the present invention covers the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

Claims

1. An air conditioner comprising:

   a main body configured to form an outer appearance;
   an outlet provided in a lower portion of the main body, and configured to discharge air;
   a door disposed in a front portion of the main body, and configured to open or close the outlet;
   a driving device including a pinion configured to be rotatable, and a rack interlocked with the pinion and configured to be movable together with the door; and
   a friction member configured to press the rack when the rack moves so as to maintain a predetermined spacing between the rack and the pinion.

2. The air conditioner according to claim 1, wherein the driving device comprises a case forming the outer appearance and fixed in the inside of the main body, wherein the pinion and the rack are located in the case.

3. The air conditioner according to claim 2, wherein the friction member is disposed in the case, and protrudes toward the rack.

4. The air conditioner according to claim 3, wherein the friction member is disposed between the rack and the pinion so as to press the rack to maintain the predetermined spacing between the rack and the pinion.

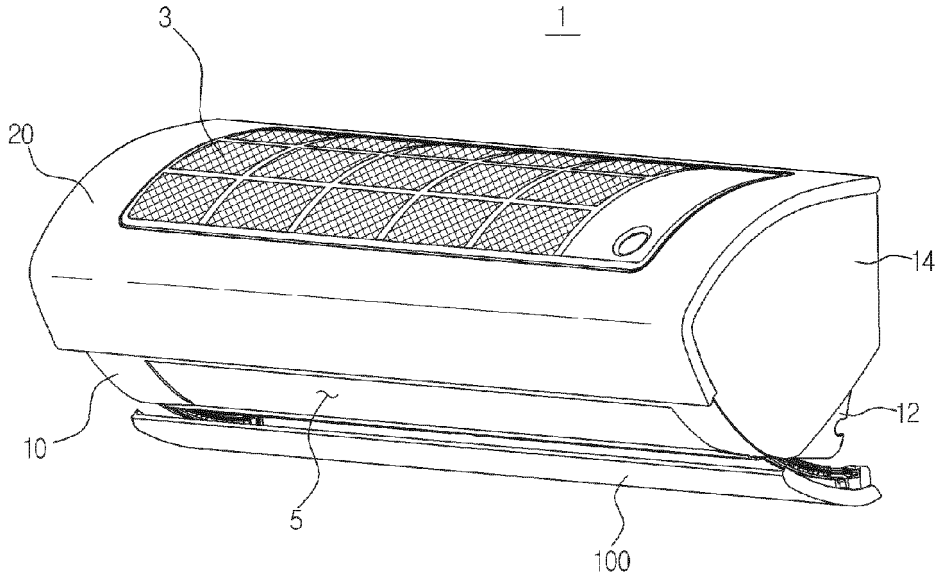
5. The air conditioner according to claim 3, wherein the friction member comprises a pressing part contacting the rack, and a support part to elastically support the pressing part.

6. The air conditioner according to claim 2, wherein the case comprises an opening at one end so that the rack is moveable to the outside through the opening, and
   one end of the rack exposed through the opening is connected to one end of the door.

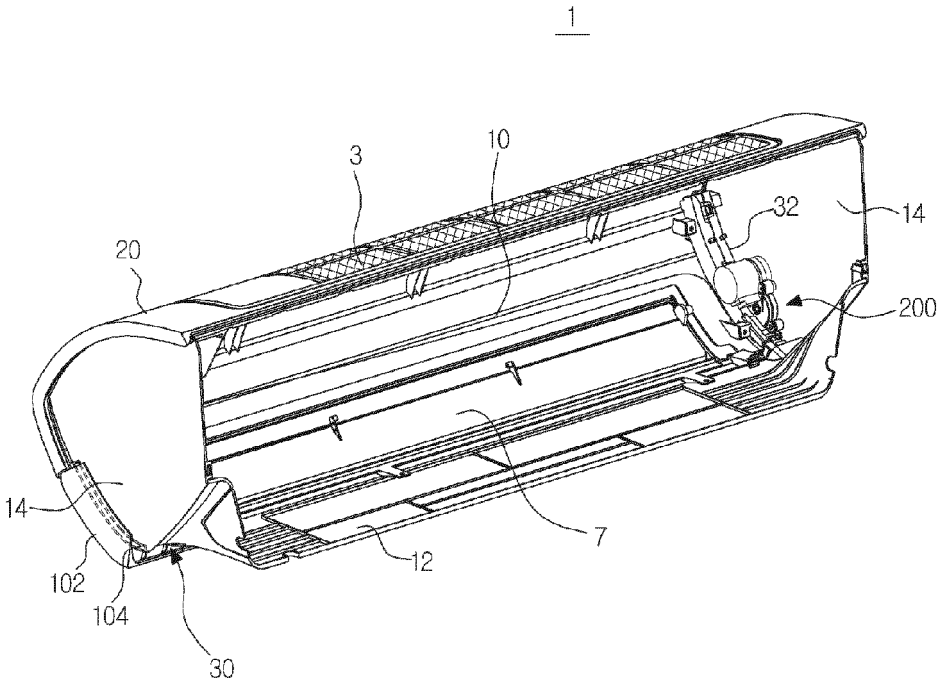
7. The air conditioner according to claim 1, wherein the rack comprises a saw-toothed unit interlocked with the pinion, and a rack rib provided in both sides of the saw-toothed unit and contacting the friction member.

8. The air conditioner according to claim 7, wherein the rack rib comprises at least one groove in order to prevent the rack from being deformed by the friction member when the rack stops.

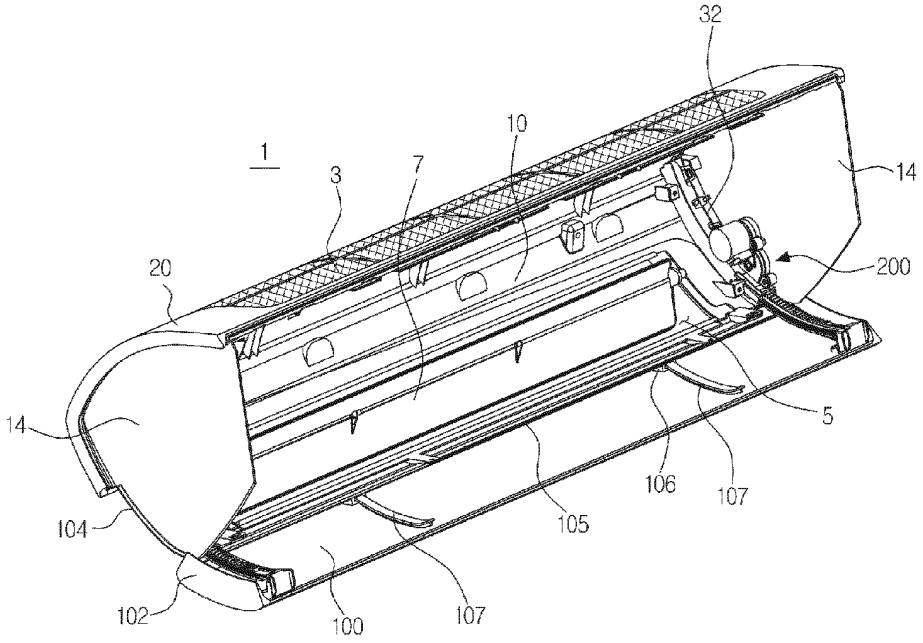
[Fig. 1]



[Fig. 2]



[Fig. 3]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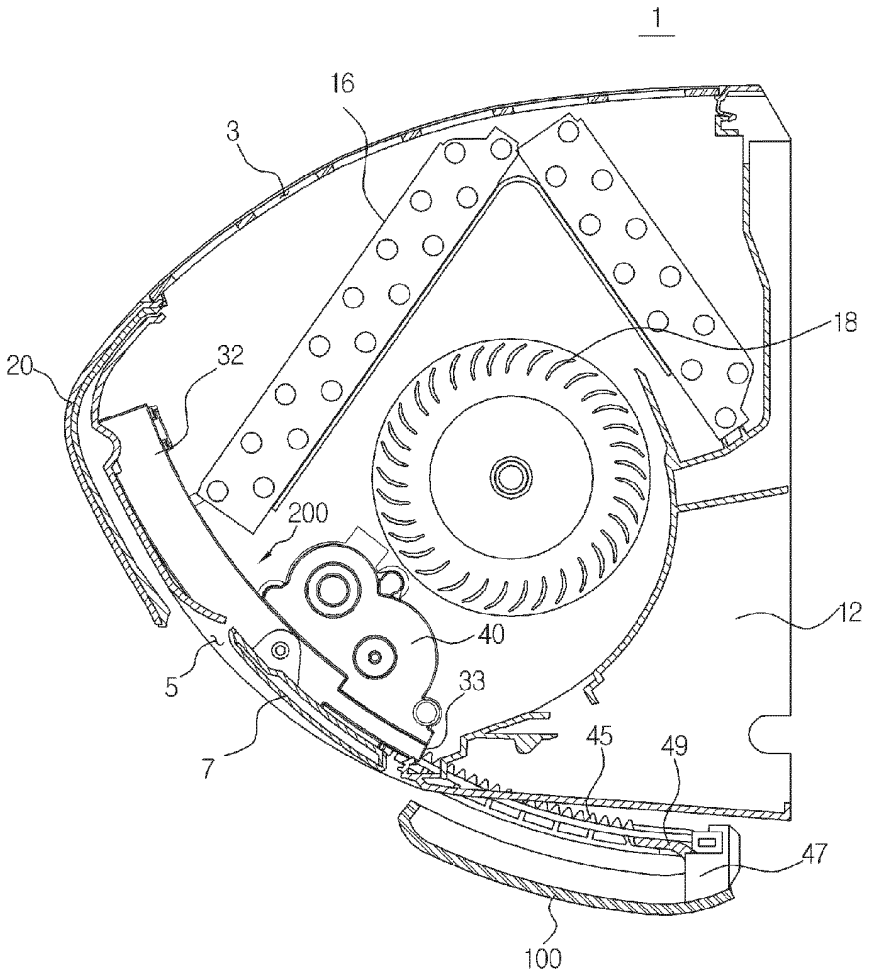
[Fig. 4]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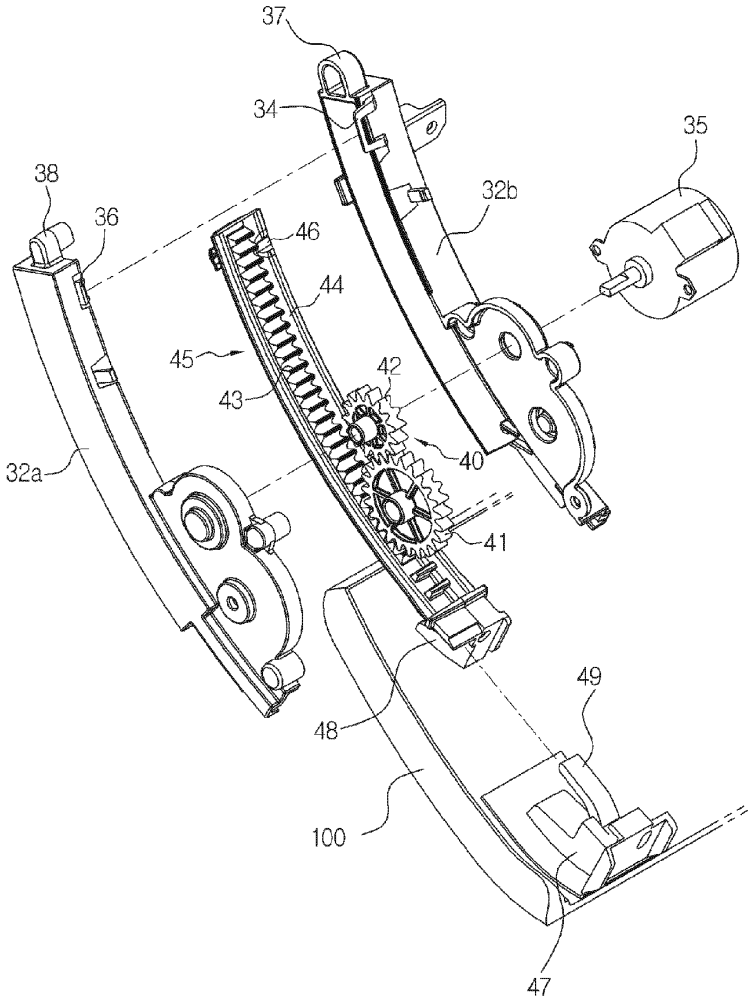
[Fig. 5]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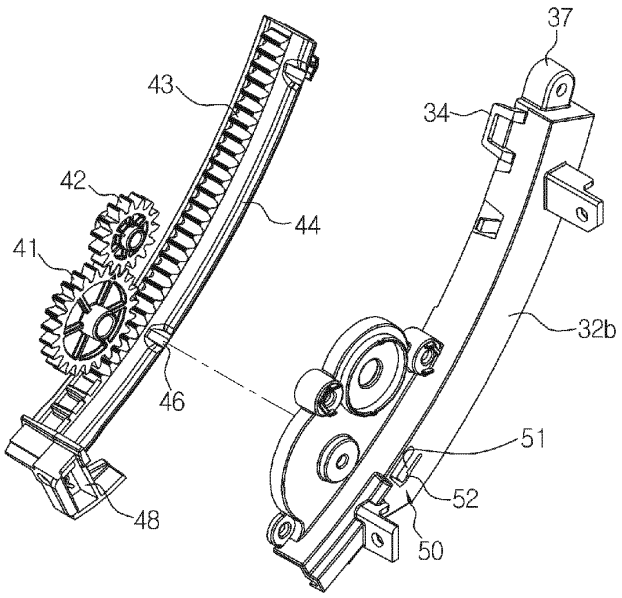
[Fig. 6]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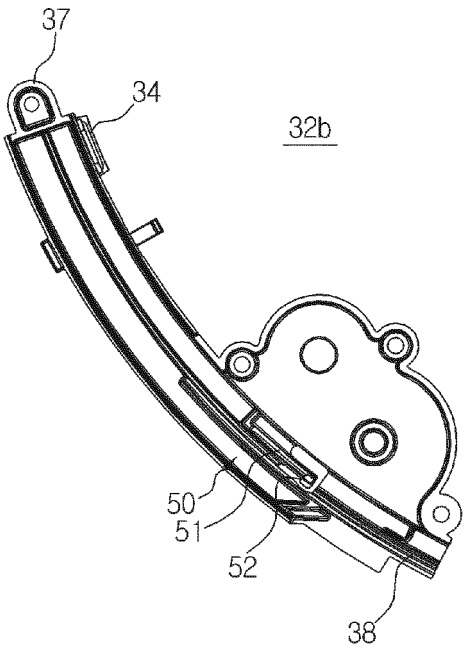
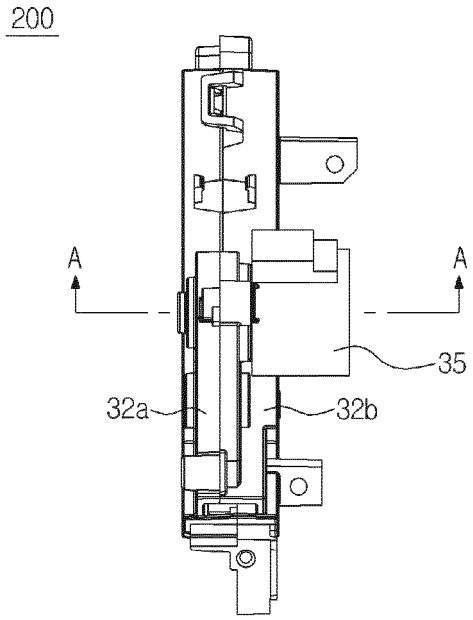
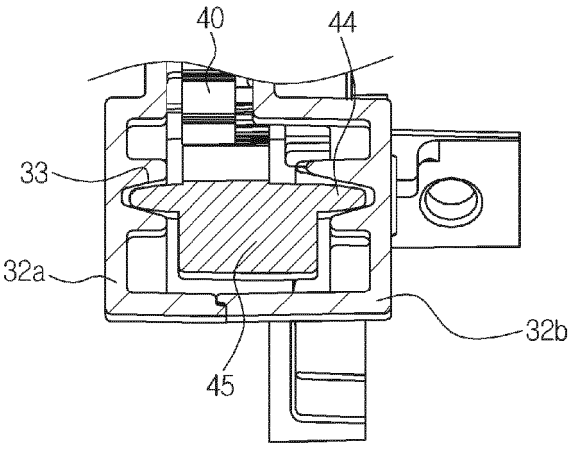
[Fig. 7]



[Fig. 8]





INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2015/001282

A. CLASSIFICATION OF SUBJECT MATTER

F24F 13/12(2006.01)i, F24F 1/00(2011.01)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 13/12; F24F 1/00; E06B 7/28; F24F 1/00; F24F 13/08

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: air conditioner, pinion, rack, friction member, pressing part, supporting unit

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	KR 10-0776595 B1 (SAMSUNG ELECTRONICS CO., LTD.) 15 November 2007 See paragraphs [0030]-[0042] and figures 1-4.	1-8
Y	EP 0238214 A2 (TRW CAM GEARS LTD.) 23 September 1987 See abstract, page 6, line 34 - page 8, line 1 and figure 1.	1-8
A	CN 202709402 U (ZHUHAI GREE ELECTRICAL APPLIANCES INC.) 30 January 2013 See paragraphs [0032]-[0036] and figures 1-3.	1-8
A	US 2011-0197512 A1 (NOMURA, Daisuke et al.) 18 August 2011 See paragraphs [0025]-[0027] and figure 1.	1-8
A	KR 20-0300032 Y1 (DAEWOO ELECTRONICS CO., LTD) 06 January 2003 See abstract, claim 1 and figures 1, 3.	1-8

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

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
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"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
14 MAY 2015 (14.05.2015)	**15 MAY 2015 (15.05.2015)**
Name and mailing address of the ISA/**KR** Korean Intellectual Property Office Government Complex-Daejeon, 189 Seonsa-ro, Daejeon 302-701, Republic of Korea Facsimile No. 82-42-472-7140	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2015/001282

Patent document cited in search report	Publication date	Patent family member	Publication date
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