

DESCRIPTION

Title of Invention: AIR PURIFIER

Technical Field

[0001]

The present invention relates to an air purifier including a cleaning device for cleaning a filter.

Background Art

[0002]

PTL 1 discloses an air purifier in the related art. The air purifier has a casing that opens a suction port and an air outlet. An air pathway connecting the suction port and the air outlet is provided in the casing, and a blower is disposed in the air pathway. A pre-filter (filter) is disposed facing the suction port.

[0003]

In the air purifier configured as described above, when an operation is started, the blower is driven and air in a living room is sucked from the suction port. The air sucked from the suction port is delivered from the air outlet after dust is collected by the pre-filter. As a result, the air in the living room can be cleaned.

[0004]

In recent years, there has been an increasing demand for an air purifier provided with a cleaning device for cleaning a pre-filter. PTL 2 discloses a cleaning device

that cleans a filter disposed facing an air inlet of a projector. The cleaning device is provided with a supply roll, a winding roll, a brush body, a supply roll motor, a winding roll motor, a brush body motor, and a dust collecting box.

[0005]

A filter of a sheet shape is wound on the supply roll. The winding roll rotates by driving of a winding roll motor, and winds up the filter drawn out from the supply roll. The brush body forms brush bristles radially on a shaft body, and rotates by driving of a brush body motor during rotation of the winding roll, so that the brush bristles rub the filter to remove the dust. The dust collecting box collects the dust removed from the filter by the brush body. The supply roll is rotationally driven by a supply roll motor, and rewinds the filter wound on the winding roll. As a result, the dust on the filter is removed and the filter is cleaned.

[0006]

The cleaning device of PTL 2 has a detection switch. The detection switch is disposed in the vicinity of the winding roll and detects whether or not the filter wound on the winding roll has reached a predetermined outer diameter. When it is detected by the detection switch that the filter wound on the winding roll has reached the predetermined

outer diameter, the supply roll motor is driven. As a result, the filter wound on the winding roll is rewound to the supply roll.

Citation List

Patent Literature

[0007]

PTL 1: Japanese Unexamined Patent Application
Publication No. 2009-66466 (page 8, page 9, Fig. 1)

PTL 2: Japanese Patent No. 5627066 (page 6, page 7, Fig. 1, Fig. 4)

Summary of Invention

Technical Problem

[0008]

However, according to the cleaning device of PTL 2, since the filter is in the form of a sheet, the outer diameter varies in response to the winding amount of the filter wound on the winding roll. Therefore, there is a problem that the detection switch cannot accurately detect the end of winding of the winding roll, and the cleaning of the filter is insufficient.

[0009]

An object of the present invention is to provide an air purifier capable of sufficiently cleaning a filter.

Solution to Problem

[0010]

The present invention provides an air purifier including a casing opening a suction port and an air outlet, an air pathway connecting the suction port and the air outlet to each other, a blower disposed in the air pathway, a filter disposed to face the suction port, and a cleaning device cleaning the filter, in which the cleaning device includes a supply roll on which the filter of a sheet shape is wound, a winding roll that winds up the filter, a drive motor that rotationally drives the winding roll, an biasing portion that biases a rotation shaft of the supply roll in a direction opposite to a winding direction when winding up the winding roll, a brush body that slides on the filter when the winding roll rotates, and a rotation amount detection unit that detects a rotation amount of the drive motor, it is determined that the drive motor is stepped out based on a detection result of the rotation amount detection unit, and the drive motor is reversed when stepped out.

[0011]

According to the present invention, in the air purifier having the above configuration, it is preferable that the rotation amount detection unit includes a photo interrupter and a slit disk that rotates in conjunction with the drive motor, and when winding up the filter by the winding roll, in a case where the rotation amount detection unit does not detect a pulse outputted by rotation of the slit disk for a

predetermined time, it is determined that the drive motor is stepped out.

[0012]

According to the present invention, in the air purifier having the above configuration, it is preferable that in a case where a rotation amount, which is detected by the rotation amount detection unit when the drive motor is stepped out, is out of a predetermined range, error notification is performed.

[0013]

According to the present invention, in the air purifier having the above configuration, it is preferable that the air purifier includes an attachment or detachment sensor that detects attachment or detachment of the supply roll, and when driving the cleaning device for the first time after the supply roll is attached or detached, the rotation amount of the drive motor when the drive motor is reversed is made smaller than the rotation amount of the drive motor when the drive motor is stepped out.

[0014]

According to the present invention, in the air purifier having the above configuration, it is preferable that in a case where the cleaning device stops and restarts during driving, the rotation amount detected by the rotation amount detection unit is reset to start winding of the filter by

the winding roll, in a case where the rotation amount detected by the rotation amount detection unit at an end of winding of the filter by the drive motor is greater than a predetermined rotation amount, the drive motor is reversed only by the detected rotation amount, and in a case where the rotation amount is smaller than the predetermined rotation amount, the drive motor is reversed only by the predetermined rotation amount.

Advantageous Effects of Invention

[0015]

According to the present invention, it is determined that the drive motor is stepped out based on the detection result of the rotation amount detection unit, and the drive motor is reversed when stepped out. As a result, it is possible to accurately detect the end of winding of the winding roll. Therefore, the filter can be sufficiently cleaned.

Brief Description of Drawings

[0016]

[Fig. 1] Fig. 1 is a front view illustrating an air purifier according to a first embodiment of the present invention.

[Fig. 2] Fig. 2 is a side cross-sectional view illustrating the air purifier according to the first embodiment of the present invention.

[Fig. 3] Fig. 3 is an exploded perspective view illustrating a cleaning device of the air purifier according to the first embodiment of the present invention.

[Fig. 4] Fig. 4 is a plan view illustrating a pre-filter of the air purifier according to the first embodiment of the present invention.

[Fig. 5] Fig. 5 is a side cross-sectional view of a supply roll of the cleaning device of the air purifier according to the first embodiment of the present invention.

[Fig. 6] Fig. 6 is a perspective view illustrating a winding roll, a dust collecting portion, and an inside of a gear unit of the cleaning device of the air purifier according to the first embodiment of the present invention.

[Fig. 7] Fig. 7 is an enlarged perspective view of the inside of the gear unit of the cleaning device of the air purifier according to the first embodiment of the present invention.

[Fig. 8] Fig. 8 is a perspective view illustrating a rotation amount detection unit of the air purifier according to the first embodiment of the present invention.

[Fig. 9] Fig. 9 is an exploded perspective view of a biasing portion of the cleaning device of the air purifier according to the first embodiment of the present invention.

[Fig. 10] Fig. 10 is a flowchart illustrating an operation of the cleaning device of the air purifier

according to the first embodiment of the present invention.

[Fig. 11] Fig. 11 is a side view of a support member of a cover portion of an air purifier according to a second embodiment of the present invention before a supply roll is mounted.

[Fig. 12] Fig. 12 is a side view of the support member of the cover portion of the air purifier according to the second embodiment of the present invention after the supply roll is mounted.

[Fig. 13] Fig. 13 is a side view of a support member of a cover portion of an air purifier according to a third embodiment of the present invention before a supply roll is mounted.

[Fig. 14] Fig. 14 is a side view of the support member of the cover portion of the air purifier according to the third embodiment of the present invention after the supply roll is mounted.

[Fig. 15] Fig. 15 is a plan view of a pre-filter of an air purifier according to a fourth embodiment of the present invention.

[Fig. 16] Fig. 16 is a perspective view of a pressing member of an air purifier according to a fifth embodiment of the present invention.

Description of Embodiments

[0017]

<First Embodiment>

Embodiments of the present invention will be described below with reference to the drawings. Figs. 1 and 2 illustrate a front view and a side cross-sectional view of an air purifier according to a first embodiment. Arrow S indicates the flow of air. An air purifier 1 has a casing 2 which opens a suction port 3 and air outlets 4 and 5, and is installed on a floor or the like in a living room. The casing 2 has a main body portion 20 and a cover portion 21. The cover portion 21 is detachably disposed to a rear surface of the main body portion 20, and opens the suction port 3. The main body portion 20 opens the air outlets 4 and 5 to a front upper portion and an upper surface, respectively.

[0018]

Airflow direction plates 14 and 15 for varying the airflow direction are provided at the air outlets 4 and 5, respectively. The airflow direction plate 14 is formed of a flat plate and is supported so as to be rotatable in the vertical direction by a rotation shaft portion (not illustrated) provided on the airflow direction plate 14. On the lower surface of the airflow direction plate 14, a plurality of vertical louvers 14a are vertically disposed side by side in the left-right direction. The vertical louvers 14a at both side end portions are inclined outward

in the left-right direction as going forward.

[0019]

The airflow direction plate 15 is formed of a flat plate and is supported so as to be rotatable in the vertical direction by a rotation shaft portion 15b provided at the front portion of the airflow direction plate 15. On the lower surface of the airflow direction plate 15, a plurality of vertical louvers 15a are vertically disposed side by side in the left-right direction. The vertical louvers 15a at both side end portions are inclined outward in the left-right direction as going rearward.

[0020]

The airflow direction plates 14 and 15 close the air outlets 4 and 5, respectively, when the operation of the air purifier 1 is stopped, and open the air outlets 4 and 5 during operation.

[0021]

In the casing 2, an air pathway 8 connecting the suction port 3 and the air outlets 4 and 5 is provided. In the air pathway 8, a pre-filter 6 (filter), a deodorizing filter 7, a dust collecting filter 9, a humidifying portion 200, a blower 10, an ion generator 11, and a damper 12 are provided in order from the suction port 3 toward the air outlets 4 and 5 (from the upstream to the downstream of the airflow).

[0022]

The air pathway 8 has a first branch pathway 8a and a second branch pathway 8b which branch at the downstream of the ion generator 11. The first branch pathway 8a and the second branch pathway 8b communicate with the air outlets 4 and 5, respectively. A cross-sectional area of the air flow path of the first branch pathway 8a is smaller than a cross-sectional area of the air flow path of the second branch pathway 8b.

[0023]

The damper 12 is formed of a thin plate shape and is supported so as to be rotatable in the vertical direction by the rotation shaft portion 12a. The damper 12 can rotate in a direction to open (counterclockwise direction in Fig. 2) from the closed position (refer to Fig. 2) of the first branch pathway 8a. The damper 12 varies the air volume balance of the first branch pathway 8a and the second branch pathway 8b.

[0024]

The blower 10 is formed by a centrifugal fan such as a sirocco fan driven by the motor 10a, and sucks in the axial direction and exhausts in the circumferential direction.

[0025]

The pre-filter 6 is formed of a mesh of a sheet shape of polypropylene or the like, and is disposed on the cover

portion 21 so as to face the suction port 3. Large dust in the intake air can be collected by the pre-filter 6.

[0026]

The deodorizing filter 7 is formed in a honeycomb shape, and can absorb odorous components in the air to deodorize air.

[0027]

The dust collecting filter 9 is formed of a HEPA filter, and a frame material (not illustrated) is welded by hot melting so as to cover a filter material (not illustrated). Fine dust in the air and fine particles such as PM 2.5 with a particle diameter smaller than a predetermined particle diameter (for example, 3 μm) can be collected by the dust collecting filter 9.

[0028]

The humidifying portion 200 immerses the lower portion of a humidifying filter 202 in the water in a tray 201, and humidifies the air passing through the humidifying filter 202. As a result, humidified air is delivered from the air outlets 4 and 5.

[0029]

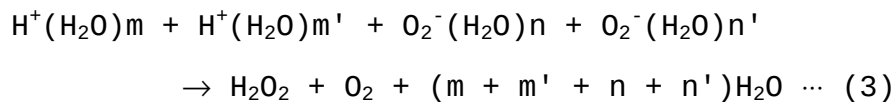
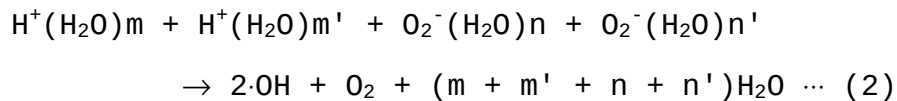
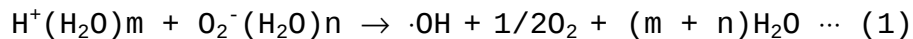
The ion generator 11 has an ion generation surface 11a for generating ions by application of a high voltage and the ion generation surface 11a faces into the air pathway 8. A voltage formed of an AC waveform or an impulse waveform is

applied to the ion generation surface 11a. In a case where positive voltage is applied to the ion generation surface 11a, positive ions mainly formed of $H^+(H_2O)_m$ are generated. In a case of negative voltage, negative ions mainly formed of $O_2^-(H_2O)_n$ are generated. Here, m and n are integers. $H^+(H_2O)_m$ and $O_2^-(H_2O)_n$ aggregate on the surface of airborne bacteria and odorous components in the air and surround these.

[0030]

As illustrated in the formulas (1) to (3), $[·OH]$ (hydroxyl radical) or H_2O_2 (hydrogen peroxide) which is active species is agglutinated on the surface of microorganisms and the like by collision, to destroy floating bacteria and the like. Here, m' and n' are integers. Therefore, positive ions and negative ions are generated and delivered from the air outlets 4 and 5, so that sterilization and odor removal in the living room can be performed.

[0031]



[0032]

An operation unit 19 is provided on the front upper surface of the main body portion 20. The operation unit 19 has a plurality of buttons (not illustrated), and performs operation setting of the air purifier 1 by a user operation. By operating each button, it is possible to change the air volume of the air sent out from the air outlets 4 and 5, change the air blowing direction, or the like.

[0033]

A display unit 17 is provided on the front upper portion of the main body portion 20. The display unit 17 is disposed on the right side of the air outlet 4, and is configured to include, for example, a liquid crystal panel.

[0034]

A cleaning device 30 for cleaning the pre-filter 6 is provided on the cover portion 21. Fig. 3 is an exploded perspective view illustrating the cleaning device 30. The cleaning device 30 includes a supply roll 40, a winding roll 50, a gear unit 60, a biasing portion 70, a brush body 80, a dust collecting portion 90, and a drive motor 100 (refer to Fig. 2).

[0035]

The supply roll 40 and the winding roll 50 are disposed on the upper and lower portions of the cover portion 21, respectively, and hold both ends of the pre-filter 6. The pre-filter 6 is wound around the supply roll 40 when the

cleaning device 30 is stopped, and is sent out from the supply roll 40 and wound up by the winding roll 50 when the cleaning device 30 is driven.

[0036]

The supply roll 40 has a shaft 41 extending in the left-right direction, and caps 48 are fitted to both end portions of the shaft 41. The caps 48 are rotatably supported by support members 49 disposed at the upper end portion of the inner surface of the cover portion 21. As a result, the supply roll 40 is disposed so as to be rotatable with a rotation shaft extending in the left-right direction. One end (right end) of the supply roll 40 is connected to the biasing portion 70 via the cap 48.

[0037]

An attachment or detachment sensor (not illustrated) for detecting attachment or detachment of the support member 49 of the supply roll 40 is provided. The attachment or detachment sensor is configured to include, for example, Hall element (not illustrated) and a magnet (not illustrated). The magnet is mounted on the supply roll 40. The Hall element is disposed at a position facing the magnet of the supply roll 40 on the rear surface of the main body portion 20.

[0038]

The winding roll 50 has a shaft 51 extending in the

left-right direction, and caps 58 are fitted to both end portions of the shaft 51. The left and right caps 58 are rotatably supported by support members 59 and gear units 60 disposed at the lower end portion of the inner surface of the cover portion 21, respectively. As a result, the winding roll 50 is disposed so as to be rotatable with a rotation shaft extending in the left-right direction.

[0039]

Fig. 4 is a plan view illustrating the pre-filter 6. The pre-filter 6 has bar members 6a extending in the left-right direction at both end portions in the winding direction W and held by the supply roll 40 and the winding roll 50. The pre-filter 6 has a ventilation portion 6b disposed so as to face the suction port 3 when the cleaning device 30 is stopped, and a storage portion 6c delivered from the supply roll 40 when the cleaning device 30 is driven.

[0040]

On the storage portion 6c, a design 6g which is visible from the suction port 3 is provided distinguished from the ventilation portion 6b. In the present embodiment, a red character is used as the design 6g "under cleaning". The design 6g is not particularly limited, and for example, a stripe pattern or the like having a color different from that of the ventilation portion 6b may be used.

[0041]

Fig. 5 is a side cross-sectional view of the supply roll 40. Since the configuration of the winding roll 50 is the same as that of the supply roll 40, the supply roll 40 will be described as a representative. The shaft 41 forming a shaft portion of the supply roll 40 has a core member 41a and a sleeve 41d.

[0042]

The core member 41a is formed of an extruded metal such as aluminum having a C-shaped cross section and has a groove portion 41b extending in the axial direction on the circumferential surface. An inner wall surface 41c facing the groove portion 41b is inclined and the circumferential width of the groove portion 41b is wider on the outer circumferential side than that on the inner circumferential side. The inner wall surface 41c of the groove portion 41b supports the circumferential surface of the bar member 6a of the pre-filter 6.

[0043]

The sleeve 41d is formed of a resin molded product having a C-shaped cross section and having an opening portion 41e extending in the axial direction, and is fitted over the core member 41a. The pre-filter 6 supporting the bar member 6a on the groove portion 41b is inserted into the opening portion 41e. The width of the opening portion 41e

of the sleeve 41d is smaller than the diameter of the bar member 6a, and the bar member 6a supported by the core member 41a is locked. At this time, both end portions of the sleeve 41d in the circumferential direction press the bar member 6a by elasticity, and the bar member 6a is elastically held by the groove portion 41b of the core member 41a and the sleeve 41d.

[0044]

When a force is applied in a direction to widen the opening portion 41e of the sleeve 41d (left-right direction in Fig. 5), the sleeve 41d is elastically deformed. The bar member 6a of the pre-filter 6 can be attached to or detached from the shaft 41 via the widened opening portion 41e. Similarly, the bar member 6a at the lower end portion of the pre-filter 6 can be attached to or detached from the shaft 51. As a result, it is possible to easily remove the pre-filter 6 from the cleaning device 30 to replace the pre-filter 6 or the like.

[0045]

In Fig. 3, the brush body 80 is disposed in the dust collecting portion 90 detachably attached to the cover portion 21. The brush body 80 has a shaft 81 which is supported at both end portions in the axial direction in the dust collecting portion 90 and rotates when the cleaning device 30 is driven as described later to remove the dust on

the pre-filter 6. A spur gear 68 is provided at one end (right end) of the shaft 81, and a brush bristle bundle 82 is spirally implanted at a predetermined interval on the circumferential surface of the shaft 81.

[0046]

The dust collecting portion 90 has a lid portion 91, a container 92, and a comb portion 93, and is detachably disposed to the cover portion 21. The container 92 is formed of a transparent resin, and the upper surface is opened to support the brush body 80 at both side portions. The lid portion 91 opens an opening portion 91a which opens to the left and right ends, and covers the upper surface of the container 92. The brush bristle bundle 82 of the brush body 80 is exposed to the outside through the opening portion 91a. The comb portion 93 is formed to extend in the left-right direction, and is disposed in the container 92 with the tooth tip directed upward. The brush bristle bundle 82 of the rotating brush body 80 abuts on the tooth tip of the comb portion 93. Dust adhering to the brush bristle bundle 82 by the comb portion 93 is removed from the brush bristle bundle 82.

[0047]

The dust removed from the pre-filter 6 by the brush body 80 and the dust removed from the brush body 80 by the comb portion 93 are stored in the container 92. At this

time, since the container 92 is formed of the transparent resin, the user can easily grasp the amount of dust in the container 92.

[0048]

The drive motor 100 (refer to Fig. 2) is disposed in the main body portion 20 of the casing 2, and the rotation shaft (not illustrated) of the drive motor 100 protrudes rearward from the rear surface of the main body portion 20. A stepping motor is used as the drive motor 100.

[0049]

A pressing member 22 is disposed in front of the pre-filter 6 with a predetermined clearance. The pressing member 22 is detachably attached to the cover portion 21. The pressing member 22 has a rectangular frame 22a formed of a synthetic resin such as ABS. In the frame 22a, a rib 22b extending in the vertical direction and a plurality (three in this embodiment) of ribs 22c extending in the left-right direction and disposed in parallel in the vertical direction are provided. As a result, the pressing member 22 has windows of a plurality of stages and a plurality of rows. The pre-filter 6 can be stably disposed along the suction port 3 by the pressing member 22 and slack of the pre-filter 6 due to the suction airflow can be prevented.

[0050]

The magnet 23 is provided at the central portion of the

right end portion of the frame 22a of the pressing member 22. A Hall element (not illustrated) is provided at a position facing the magnet 23 of the main body portion 20. The air purifier 1 can determine whether or not the cover portion 21 is mounted on the main body portion 20 by a Hall element. The air purifier 1 prohibits the operation of the blower 10 in a case where it is determined that the cover portion 21 is not mounted on the main body portion 20. As a result, the air blowing operation of the air purifier 1 in a state where the cover portion 21 is not mounted on the main body portion 20 is avoided. In a case where the cover portion 21 is detached from the main body portion 20 during driving of the cleaning device 30, the driving of the cleaning device 30 is stopped.

[0051]

The gear unit 60 and the biasing portion 70 are disposed at one end portion (right end portion) of the cover portion 21. Therefore, a space SP is formed on the inner surface of the cover portion 21 between the gear unit 60 and the biasing portion 70. In the space SP, a tape-shaped member 300 describing information on the instruction of handling the air purifier 1 is affixed. The information includes information on a method of removing the pre-filter 6 from the cleaning device 30 and information on a method of operating a handle 73 of the biasing portion 70 described

later.

[0052]

As a result, when the user removes the cover portion 21 from the main body portion 20, the user visually recognizes the above information, and can easily recognize the method of removing the pre-filter 6 from the cleaning device 30 and the method of operating the handle 73 of the biasing portion 70. Therefore, the convenience of the air purifier 1 can be improved.

[0053]

Fig. 6 is a perspective view illustrating the winding roll 50, the dust collecting portion 90, and the inside of the gear unit 60 of the cleaning device 30. Fig. 7 is an enlarged perspective view of the inside of the gear unit 60. The gear unit 60 has a bevel gear 61 (first cross shaft gear), a bevel gear 62 (second cross shaft gear), a spur gear 63 (first parallel shaft gear), a spur gear 64 (second parallel shaft gear), an internal gear 65, a spur gear 66, and a spur gear 67 in a housing 60a (refer to Fig. 3). The housing 60a is screwed to the cover portion 21 (refer to Fig. 3).

[0054]

The bevel gear 61 is disposed in a front-rear direction in the axial direction, and has a fitting hole 61a fitted in the rotation shaft (not illustrated) of the drive motor 100

(refer to Fig. 2) on the shaft. The bevel gear 62 is disposed in the left-right direction in the axial direction and meshes with the bevel gear 61. The spur gear 63 is integrally formed concentrically with the bevel gear 62.

[0055]

A shaft portion 63a of the spur gear 63 has a fitting hole (not illustrated) into which a protrusion portion 58a (refer to Fig. 3) of the cap 58 is fitted. As a result, the spur gear 63 and the bevel gear 62 are connected to the winding roll 50.

[0056]

The spur gear 64 is disposed below the spur gear 63 and meshes with the spur gear 63. The internal gear 65 is provided integrally with the spur gear 64. The spur gear 66 meshes with the internal gear 65. The spur gear 67 is integrally formed concentrically with the spur gear 66. The spur gear 68 provided at one end of the brush body 80 meshes with the spur gear 67.

[0057]

When the drive motor 100 is driven, the winding roll 50 rotates via the bevel gear 61 and the bevel gear 62. The brush body 80 rotates via the spur gear 64, the internal gear 65, the spur gear 66, the spur gear 67, and the spur gear 68 by the rotation of the spur gear 63 integrated with the bevel gear 62. The spur gear 63 integrated with the

bevel gear 62 and the spur gear 64 connected to the brush body 80 mesh with each other, so that the brush body 80 disposed in parallel with the winding roll 50 can be easily rotated.

[0058]

At this time, since the internal gear 65 integrated with the spur gear 64 is provided, the spur gear 68 on the rotation shaft of the brush body 80 can be disposed between the rotation shaft of the spur gear 63 (shaft portion 63a) and the rotation shaft of the spur gear 64. As a result, the brush body 80 sliding on the pre-filter 6 on the winding roll 50 can easily be disposed close to the winding roll 50.

[0059]

The bevel gears 61 and 62 may be cross shaft gears. Each spur gear may be a parallel shaft gear, and a helical gear or the like may be used.

[0060]

A rotation amount detection unit 110 is provided in the main body portion 20 of the air purifier 1. Fig. 8 is a perspective view of the rotation amount detection unit 110 as viewed from the rear side of the air purifier 1. The rotation amount detection unit 110 has a photo interrupter 111 and a slit disk 112.

[0061]

The photo interrupter 111 has a light emitting portion

111a for emitting light and a light receiving portion 111b for receiving light emitted from the light emitting portion 111a. A plurality of slits 112a are provided in the slit disk 112 at predetermined intervals in the circumferential direction. The slit disk 112 is provided concentrically with the spur gear 115 and rotates integrally with the spur gear 115. The slit disk 112 is disposed so that the slit 112a passes between the light emitting portion 111a and the light receiving portion 111b during rotation. The spur gear 115 meshes with the spur gear 116, and a rotation shaft portion of the spur gear 116 is fixed to a rotation shaft portion of the drive motor 100. The spur gear 116 rotates integrally with the drive motor 100.

[0062]

When the drive motor 100 rotates, the spur gears 115, 116 and the slit disk 112 rotate. At this time, the photo interrupter 111 detects ON or OFF of light passing through the slit 112a. As a result, the rotation amount detection unit 110 detects the number of pulses (rotation amount) outputted by rotation of the slit disk 112. In a case where the photo interrupter 111 does not detect the pulse for a predetermined time (for example, 6 seconds), the control unit (not illustrated) of the air purifier 1 determines that the drive motor 100 is stepped out.

[0063]

Fig. 9 is an exploded perspective view of the biasing portion 70 of the cleaning device 30. The biasing portion 70 has a rotating body 71 (first rotating body) and a rotating body 72 (second rotating body) housed in housings 78 and 79 screwed with each other. A clamping portion 71a protrudes from one end surface in the axial direction of the rotating body 71 and a groove portion 71b is provided on the other end surface. A locking portion 48a provided on the cap 48 is fitted into the groove portion 71b. As a result, the rotating body 71 locks the shaft portion of the supply roll 40, and the supply roll 40 is connected to the biasing portion 70.

[0064]

The rotating body 72 houses a spiral spring 75 inside the rotating body 71 side. One end (inner end) of the spiral spring 75 is clamped by the clamping portion 71a of the rotating body 71, and the other end (outer end) is mounted on the inner circumferential surface of the rotating body 72. When the rotating body 71 rotates in the clockwise direction with respect to the rotating body 72 as viewed from the right side (viewed from direction of arrow A), biasing force of the spiral spring 75 increases. That is, when the rotating body 72 rotates in the clockwise direction with respect to the rotating body 71 as viewed from the direction of the arrow A, the biasing force of the spiral

spring 75 decreases.

[0065]

A plurality of claws 72a are provided at predetermined intervals on the outer circumferential surface on the outer side (right side) of the rotating body 72 in the axial direction. A stopper 77 is pivotally supported in the housing 78, and the stopper 77 is biased by a torsion coil spring 77a in a direction to press the rotating body 72. As a result, the rotating body 72 is restricted from rotating in the clockwise direction, which reduces the biasing force of the spiral spring 75 as viewed from the direction of the arrow A by the engagement between the stopper 77 and the claw 72a.

[0066]

An opening portion 78a is opened in the right side surface of the housing 78, and a cylindrical handle 73 is disposed so as to cover the opening portion 78a. A flange portion 73a having a larger diameter than that of the opening portion 78a is disposed in the housing 78. The handle 73 and the flange portion 73a are screwed to the outer wall of the housing 78 with a predetermined clearance in the axial direction via the opening portion 78a. As a result, the handle 73 is rotatably mounted on the housing 78.

[0067]

In the housing 78, a connecting member 74 is disposed

on the inner side (left side) in the axial direction of the flange portion 73a. A compression spring 76 is disposed between the rotating body 72 and the connecting member 74, and the connecting member 74 is biased outward in the axial direction (right side). A plurality of cutout portions 74c are formed at predetermined intervals on the circumferential surface of the connecting member 74. A plurality of radially extending ribs 72c to be engaged with the cutout portion 74c are formed at the axially outer end portion of the rotating body 72. As a result, the connecting member 74 rotates integrally with the rotating body 72.

[0068]

The connecting member 74 is formed to have a larger diameter than these of the flange portion 73a and the opening portion 78a. A plurality of inclined portions 74a and a plurality of ribs 74b are provided at predetermined intervals on the axially outer (right side) surface of the connecting member 74. The inclined portion 74a is gradually formed to be high in a counterclockwise direction when viewed from the direction of the arrow A. The rib 74b radially extends adjacent to a top portion of the inclined portion 74a and is formed higher than the top portion.

[0069]

A plurality of radially extending ribs 73b which engage with the rib 74b are provided on the axially inner surface

(left side surface) of the flange portion 73a. On an inner wall surface of the housing 78, a protrusion (not illustrated) to be engaged with the rib 74b is provided.

[0070]

When the handle 73 is rotated in the clockwise direction when viewed from the direction of the arrow A, the rib 74b engages with the rib 73b and engages with the protrusion of the housing 78. As a result, the rotation of the handle 73 is restricted.

[0071]

On the other hand, when the handle 73 is rotated in the counterclockwise direction when viewed from the direction of the arrow A, the rib 73b slides on the inclined portion 74a. Therefore, the connecting member 74 moves inward in the axial direction against the biasing force of the compression spring 76, and the rib 74b separates from the protrusion portion of the housing 78 in the axial direction. As a result, the handle 73 can be rotated, and the rib 74b is engaged with the rib 73b, so that the rotating body 72 rotates in the direction of increasing the biasing force of the spiral spring 75. That is, the rotating body 72 is rotated by the handle 73.

[0072]

In the air purifier 1 having the above configuration, when the operation is started by operating the operation

unit 19, it is determined whether or not the cover portion 21 is mounted on the main body portion 20. When it is determined that the cover portion 21 is mounted on the main body portion 20, the blower 10 and the ion generator 11 are driven. As a result, the air in the living room is sucked from the suction port 3 and flows through the air pathway 8. At this time, large dust is collected in the air by the pre-filter 6. Air is deodorized by the deodorizing filter 7, and fine dust in the air and fine particles such as PM 2.5 are collected by the dust collecting filter 9.

[0073]

Ions generated by the ion generator 11 are contained in the air. Air containing ions is blown into the living room from one or both of the air outlets 4 and 5. As a result, the air blowing operation of the air purifier 1 is performed, and the air in the living room is cleaned.

[0074]

Fig. 10 is a flowchart illustrating an operation of the cleaning device 30. At a predetermined time, the cleaning device 30 is driven and the cleaning operation by the cleaning device 30 is started. The cleaning operation is started, for example, in a case where the cumulative operation time within a predetermined period of time of the air purifier 1 exceeds a predetermined time. When the cleaning device 30 is driven, the blower 10 is stopped.

[0075]

When the cleaning device 30 is driven, a flag F is substituted for a variable Y in Step #11. 0 is substituted for the flag F in a case where the previous cleaning operation of the cleaning device 30 is normally ended, and 1 is substituted for the flag F in a case where the cleaning device 30 is stopped during operation. In Step #12, 1 is substituted for the flag F.

[0076]

In Step #13, the drive motor 100 rotates, and the bevel gear 61 (refer to Figs. 6 and 7) rotates in the counterclockwise direction when viewed from the front. The bevel gear 62 and the spur gear 63 rotate in the clockwise direction as viewed from the right side surface (viewed from direction of arrow A). As a result, the winding roll 50 rotates in the clockwise direction when viewed from the right side surface, and the pre-filter 6 is drawn out from the supply roll 40 and wound up.

[0077]

The spur gear 64, the internal gear 65, the spur gear 66, and the spur gear 67 rotate in the counterclockwise direction as viewed from the right side surface, and the spur gear 68 rotates in the clockwise direction as viewed from the right side surface. As a result, the brush body 80 rotates in the clockwise direction as viewed from the right

side surface. At this time, the brush bristle bundle 82 of the brush body 80 slides on the pre-filter 6 on the winding roll 50. As a result, the dust on the pre-filter 6 is removed, and the dust is collected in the container 92.

[0078]

At this time, the rotation direction of the winding roll 50 and the rotation direction of the brush body 80 are the same direction as each other. Therefore, the brush bristle bundle 82 of the brush body 80 slides on the pre-filter 6 from the direction opposite to a traveling direction of the pre-filter 6. Therefore, the brush body 80 can reliably remove the dust on the pre-filter 6.

[0079]

A circumferential speed of the brush body 80 is preferably greater than a circumferential speed of the winding roll 50. As a result, the contact length in the circumferential direction of the brush bristle bundle 82 on the pre-filter 6 is made longer than the contacting period of the brush bristle bundle 82 and the brush bristle bundle 82 can be brought into contact with the pre-filter 6 without a clearance.

[0080]

The brush bristle bundle 82 on the rotation shaft 81 is combed by the comb portion 93, and the dust attached to the brush bristle bundle 82 falls into the container 92.

[0081]

When the pre-filter 6 is wound on the winding roll 50, the rotating body 71 (refer to Fig. 8) of the biasing portion 70 connected to the supply roll 40 rotates in the clockwise direction (viewed from direction of arrow A) as viewed from the right side. As a result, the spiral spring 75 is wound, and the biasing force of the spiral spring 75 is increased.

[0082]

At this time, the design 6g (refer to Fig. 4) on the storage portion 6c of the pre-filter 6 moves downward and is viewed through the suction port 3. As a result, the user can easily recognize that the cleaning device 30 is being driven. Therefore, it is possible to prevent the user from erroneously recognizing that the blower 10 is stopped due to a failure. The blower 10 may be operated at a low speed when the cleaning device 30 is driven.

[0083]

At this time, the movement speed of the pre-filter 6 is preferably approximately 4 mm/sec. As a result, the torque of the drive motor 100 can be suppressed, and the dust on the pre-filter 6 can be reliably removed by the brush body 80.

[0084]

In Step #14, it is determined whether or not the

cleaning device 30 is stopped during driving. For example, in a case where the power of the air purifier 1 is turned off by operation of the operation unit 19, in a case where a power failure occurs, or in a case where the cover portion 21 is detached from the main body portion 20, the cleaning device 30 stops during driving. When the power supply is turned off or when the cleaning device 30 is stopped due to attachment or detachment of the cover portion 21, an error notification is performed in Step #31, and the process proceeds to Step #26. In a case where the cleaning device 30 is not stopped, the process proceeds to Step #15.

[0085]

In Step #15, it is determined whether or not the drive motor 100 is stepped out. In a case where the drive motor 100 is stepped out, the process proceeds to Step #16. In a case where the drive motor 100 is not stepped out, the process returns to Step #14, and Steps #14 and #15 are repeated. At this time, the rotation detection unit 110 counts the slits 112a and detects the rotation amount N1 of the drive motor 100.

[0086]

In Step #16, it is determined whether the variable Y is 1 or not. In a case where the variable Y is 1, this indicates that it is an operation at the time of restarting after the cleaning device 30 of the previous operation is

stopped during driving, and the process proceeds to Step #19. In a case where the cleaning device 30 stops and restarts during driving, the rotation amount detected by the rotation amount detection unit 110 is reset, and winding of the pre-filter 6 by the winding roll 50 is started. In a case where the variable Y is 0, this indicates that the cleaning device 30 of the previous operation is normally ended, and the process proceeds to Step #17.

[0087]

In Step #17, it is determined whether or not the rotation amount N1 detected by the rotation detection unit 110 is within a predetermined range (for example, $66 \text{ times} < N1 < 96 \text{ times}$) when the drive motor 100 is stepped out. In a case where the rotation amount N1 is within the predetermined range, the process proceeds to Step #18, and in a case where the rotation amount N1 is out of the predetermined range, the process proceeds to Step #31. In the case where the rotation amount N1 is within the predetermined range, the winding of the pre-filter 6 by the winding roll 50 is ended when the drive motor 100 is stepped out.

[0088]

In a case where the rotation amount N1 is smaller than the lower limit value (66 times) of the predetermined range, for example, the winding of the pre-filter 6 by the winding

roll 50 stops halfway. In a case where the rotation amount N1 is greater than the upper limit value (96 times) of the predetermined range, for example, the winding of the pre-filter 6 by the winding roll 50 is not ended.

[0089]

In Step 31, characters and the like indicating errors are displayed by the display unit 17. As a result, an error notification is performed, and the user can easily recognize that the cleaning of the pre-filter 6 by the cleaning device 30 does not ended. The user performs predetermined measures based on the error notification. After Step #31, the process proceeds to Step #26.

[0090]

In Step #18, it is determined whether or not it is the first cleaning operation after the supply roll 40 is attached to or detached from the cover portion 21. In a case of the first cleaning operation, the process proceeds to Step #22, and in a case where it is not the first cleaning operation, the process proceeds to Step #21. In Step #21, a rotation amount N2 necessary for rewinding the pre-filter 6 to the supply roll 40 of the drive motor 100 is set to the rotation amount N1. In Step #22, the rotation amount N2 is set to a rotation amount smaller than the rotation amount N1 by a predetermined amount α ($N1 - \alpha$, for example, 79 times).

[0091]

In Step #19, it is determined whether or not the rotation amount N1 detected by the rotation amount detection unit 110 when the drive motor 100 is stepped out is greater than a predetermined upper limit rotation amount Nh (for example, 81 times). In a case where the rotation amount N1 is greater than the upper limit rotation amount Nh, the process proceeds to Step #21, and in a case where the rotation amount N1 is not greater than the upper limit rotation amount Nh, the process proceeds to Step #20.

[0092]

In Step #20, the rotation amount N2 is set to the upper limit rotation amount Nh. After Step #20, Step #21 and Step #22, the process proceeds to Step #23.

[0093]

In Step #23, the drive motor 100 is reversed. As a result, the bevel gear 61 rotates in a direction opposite to that at the time of winding (clockwise direction in the present embodiment). At this time, the winding roll 50 and the brush body 80 rotate in the counterclockwise direction when viewed from the right side surface.

[0094]

When the winding of the pre-filter 6 by the winding roll 50 is ended, the biasing force of the spiral spring 75 is larger than that before winding. Therefore, when the

drive motor 100 is reversed, the rotating body 71 rotates in the counterclockwise direction as viewed from the right side surface by the restoring force of the spiral spring 75. As a result, the pre-filter 6 is wound around the supply roll 40.

[0095]

In Step #24, the process stands by until the rotation amount detected by the rotation amount detection unit 110 reaches the rotation amount N2. In Step #25, 0 is substituted for the flag F. In Step #26, the rotation of the drive motor 100 is stopped. As described above, the cleaning operation by the cleaning device 30 is ended.

[0096]

After the cleaning operation is ended by the cleaning device 30, the user can remove the dust collecting portion 90 from the cover portion 21 and discard the dust collected in the container 92.

[0097]

At the time of replacement of the pre-filter 6, the supply roll 40 having one end of the pre-filter 6 mounted thereon is mounted on the cover portion 21. The lower end of the pre-filter 6 is mounted on the winding roll 50.

[0098]

At this time, slack may occur in the pre-filter 6 between the supply roll 40 and the winding roll 50. In this

case, when the user rotates the handle 73 of the biasing portion 70 in the counterclockwise direction as viewed from the right side surface (viewed from direction of arrow A), the rotating bodies 71 and 72 rotate in the counterclockwise direction as viewed from the right side surface. As a result, the pre-filter 6 is wound around the supply roll 40, and the slack of the pre-filter 6 can be eliminated. Therefore, when the blower 10 is driven, the air sucked from the suction port 3 can reliably pass through the pre-filter 6.

[0099]

According to the present embodiment, it is determined that the drive motor 100 is stepped out based on the detection result of the rotation amount detection unit 110, and the drive motor 100 is reversed when stepped out. As a result, it is possible to accurately detect the end of winding of the winding roll. Therefore, it is possible to sufficiently clean the pre-filter 6 (filter).

[0100]

The rotation amount detection unit 110 has the photo interrupter 111 and the slit disk 112 that rotates in conjunction with the drive motor 100. In a case where the rotation amount detection unit 110 does not detect the pulse outputted by the rotation of the slit disk 112 for a predetermined time at the time of winding the pre-filter 6

(filter) by the winding roll 50, it is determined that the drive motor 100 is stepped out. As a result, it is possible to easily realize the step-out determination of the drive motor 100.

[0101]

In a case where the rotation amount detected by the rotation amount detection unit 110 when the drive motor 100 is stepped out is out of the predetermined range, error notification is performed. As a result, the user can easily recognize that the cleaning of the pre-filter 6 by the cleaning device 30 does not ended.

[0102]

When driving the cleaning device 30 for the first time after the supply roll 40 is attached or detached, the rotation amount of the drive motor 100 at the time of reversing is made smaller than the rotation amount of the drive motor 100 when the drive motor 100 is stepped out. As a result, the slack of the pre-filter 6 after the cleaning operation of the cleaning device 30 is reduced, and air containing dust can reliably pass through the pre-filter 6.

[0103]

In a case where the cleaning device 30 stops and restarts during driving, the rotation amount detected by the rotation amount detection unit 110 is reset, and winding of the pre-filter 6 by the winding roll 50 is started. In a

case where the rotation amount N1 detected by the rotation amount detection unit 110 at the end of winding of the pre-filter 6 by the drive motor 100 is greater than the predetermined upper limit rotation amount Nh, the drive motor 100 is reversed only by the detected rotation amount N1, and in a case where the rotation amount N1 is smaller than the upper limit rotation amount Nh, the drive motor 100 is reversed only by the upper limit rotation amount Nh. As a result, even in a case where the cleaning operation is ended after restarting the driving of the cleaning device 30, the pre-filter 6 can reliably be rewound on the supply roll 40.

[0104]

The brush body 80 is connected to the drive motor 100 for rotationally driving the winding roll 50, rotates when the winding roll 50 rotates, and slides on the pre-filter 6 (filter) on the winding roll 50. As a result, it is unnecessary to separately provide a brush body motor in the related art for rotating the brush body 80 in addition to the drive motor 100. Therefore, the manufacturing cost of the air purifier 1 can be reduced.

[0105]

The direction of rotation of the winding roll 50 and the direction of rotation of the brush body 80 are the same direction as each other. As a result, the brush body 80

slides on the pre-filter 6 from the direction opposite to the traveling direction of the pre-filter 6. Therefore, the brush body 80 can reliably remove the dust on the pre-filter 6.

[0106]

The circumferential speed of the brush body 80 is preferably greater than the circumferential speed of the winding roll 50. As a result, the contact length in the circumferential direction of the brush bristle bundle 82 on the pre-filter 6 is made longer than the contacting period of the brush bristle bundle 82 and the brush bristle bundle 82 can be brought into contact with the pre-filter 6 without a clearance. Therefore, the dust on the pre-filter 6 can be more reliably removed.

[0107]

The drive motor 100 is disposed in the main body portion 20 of the casing 2 and the supply roll 40 and the winding roll 50 are disposed in the cover portion 21. As a result, the cover portion 21 can be removed from the main body portion 20, and the pre-filter 6 can be replaced easily. Although the air purifier 1 is provided with the cleaning device 30, clogging of the pre-filter 6 may occur depending on the installation location of the air purifier 1 (for example, place where there are many oil stain such as kitchen). Even in this case, the pre-filter 6 can be easily

detached and carefully cleaned.

[0108]

The bevel gear 61 (first cross shaft gear) having a fitting hole 61a fitted to the rotation shaft of the drive motor 100, the bevel gear 62 (second cross shaft gear) meshing with the bevel gear 61, the spur gear 63 (first parallel shaft gear) rotating integrally with the bevel gear 62 and connected to the winding roll 50, and the spur gear 64 (second parallel shaft gear) meshing with the spur gear 63 and connected to the brush body 80 are provided. As a result, it is possible to easily realize the rotation of the winding roll 50 and the brush body 80 by one drive motor 100.

[0109]

Since the spur gear 63 connected to the winding roll 50 is disposed closer to the drive motor 100 than the spur gear 64 connected to the brush body 80, attenuation of the driving force transmitted to the winding roll 50 can be suppressed. As a result, the winding roll 50 biased by the biasing portion 70 via the pre-filter 6 can reliably be rotationally driven by the drive motor 100 against the biasing force.

[0110]

The internal gear 65 provided integrally with the spur gear 64 and the spur gear 66 (third parallel shaft gear) meshed with the internal gear 65 are provided between the

brush body 80 and the spur gear 64, and the rotation shaft of the brush body 80 is disposed between the rotation shaft of the spur gear 63 and the rotation shaft of the spur gear 64. As a result, the brush body 80 sliding on the pre-filter 6 on the winding roll 50 can easily be disposed close to the winding roll 50.

[0111]

The pre-filter 6 has the ventilation portion 6b disposed so as to face the suction port 3 when the cleaning device 30 is stopped and the storage portion 6c delivered from the supply roll 40 when the cleaning device 30 is driven. On the storage portion 6c, the design 6g which is visible from the suction port 3 is provided distinguished from the ventilation portion 6b. As a result, the movement of the pre-filter 6 is easily visually recognized, and the user can easily recognize the cleaning of the pre-filter 6 by the cleaning device 30.

[0112]

When the cleaning device 30 is driven, the blower 10 is stopped. As a result, it is possible to prevent the dust immediately after being removed from the pre-filter 6 from being sucked into the downstream side of the pre-filter 6. It is possible to prevent the user from erroneously recognizing that the blower 10 is stopped due to a failure due to the design 6g.

[0113]

The biasing portion 70 of the cleaning device 30 has the spiral spring 75 that biases the rotation shaft of the supply roll 40 in the direction opposite to the winding direction when winding the pre-filter 6 of the winding roll 50. As a result, when the drive motor 100 is reversed after winding of the winding roll 50 is ended, the pre-filter 6 is wound around the supply roll 40 by the restoring force of the spiral spring 75. Therefore, it is unnecessary to separately provide a motor for rotating the supply roll 40 in the direction opposite to the winding direction W of the winding roll 50 from the drive motor 100. As a result, the manufacturing cost of the air purifier 1 can be further reduced. Since the spiral spring 75 is used, it is possible to wind the pre-filter 6 around the winding roll 50 at a long distance while biasing the pre-filter 6. As a result, the degree of freedom in designing the size of the pre-filter 6 can be enhanced.

[0114]

The biasing portion 70 has the rotating body 71 (first rotating body) to which the shaft portion of the supply roll 40 is locked and on which one end of the spiral spring 75 is mounted, the rotating body 72 (second rotating body) on which the other end of the spiral spring 75 is mounted and whose rotation in a direction to reduce the biasing force of

the spiral spring 75 is restricted, and the handle 73 rotating the rotating body 72. As a result, when the supply roll 40 is mounted on the cover portion 21 and the handle 73 is operated, the pre-filter 6 is wound in a direction opposite to the winding direction W. Therefore, the slack of the pre-filter 6 can be reduced, and air containing dust can reliably pass through the pre-filter 6.

[0115]

The biasing portion 70 is provided with the connecting member 74 which is disposed between the handle 73 and the rotating body 72 and restricts the rotation of the handle 73 in the direction to reduce the biasing force of the spiral spring 75, and the connecting member 74 rotates integrally with the rotating body 72. As a result, it is possible to reliably prevent the rotation of the rotating body 72 in the direction to reduce the biasing force of the spiral spring 75.

[0116]

The shaft 41 of the supply roll 40 has the core member 41a having the groove portion 41b and the sleeve 41d formed of an elastic body having the C-shaped cross section fitted over the core member 41a, and elastically clamps the bar member 6a of the pre-filter 6 by the sleeve 41d and the groove portion 41b. As a result, when the opening portion 41e of the sleeve 41d is expanded, the bar member 6a can be

easily removed from the shaft 41. It is possible to prevent the bar member 6a from falling off the shaft 41 by the sleeve 41d. This is similar to the winding roll 50.

[0117]

The core member 41a of the supply roll 40 is formed of a metal, and the sleeve 41d is formed of a resin molded product. This is similar to the winding roll 50. As a result, it is possible to easily attach or detach the bar member 6a to and from the shafts 41 and 51 while sufficiently securing the strength of the shafts 41 and 51.

[0118]

<Second Embodiment>

Next, a second embodiment of the present invention will be described. Fig. 11 is a side view of a support member of a cover portion of an air purifier according to the present embodiment. For convenience of description, the same reference numerals are assigned to the same parts as those of the first embodiment illustrated in Figs. 1 to 10. In the present embodiment, the configuration of a support member 49 of a cover portion 21 is different from that of the first embodiment. The other parts are the same as those in the first embodiment.

[0119]

On the front end portion of the support member 49 (refer to Fig. 3) on the right side of the supply roll 40 of

the cover portion 21, a rotating plate 400 formed of resin rotating in the vertical direction is disposed. A shaft portion 401 of the rotating plate 400 is disposed to be biased rearward from the center in the front-rear direction of the rotating plate 400. As a result, as illustrated in Fig. 11, in a case where the supply roll 40 is not mounted on the support member 49, a front end portion of the rotating plate 400 protrudes forward from the support member 49. Therefore, when attaching the cover portion 21 to the main body portion 20 in a state where the supply roll 40 is not mounted on the cover portion 21, the front end portion of the rotating plate 400 interferes with the main body portion 20. Therefore, it is possible to easily prevent forgetting to attach the supply roll 40 to the cover portion 21.

[0120]

On the other hand, as illustrated in Fig. 12, when the supply roll 40 is mounted on the support member 49, the supply roll 40 collides with the rear end portion of the rotating plate 400, and the rotating plate 400 rotates upward. As a result, the front end portion of the rotating plate 400 is retracted rearward, and interference between the rotating plate 400 and the main body portion 20 is prevented when the cover portion 21 is mounted on the main body portion 20.

[0121]

Also in this embodiment, the same effect as in the first embodiment can be obtained.

[0122]

<Third Embodiment>

Next, a third embodiment of the present invention will be described. Fig. 13 is a side view of a support member of a cover portion of an air purifier according to the present embodiment. For convenience of description, the same reference numerals are assigned to the same parts as those of the first embodiment illustrated in Figs. 1 to 10. In the present embodiment, the configuration of a support member 49 of a cover portion 21 is different from that of the first embodiment. The other parts are the same as those in the first embodiment.

[0123]

The support member 49 has a fixed portion 49a and a moving portion 49b. A spring 49c is provided at a rear end portion of the moving portion 49b, and one end of the spring 49c is mounted on a front surface of the cover portion 21. At this time, in a state where the spring 49c is extended, the front end portion of the moving portion 49b is configured to protrude forward from the fixed portion 49a. As a result, as illustrated in Fig. 13, in a case where the supply roll 40 is not mounted on the support member 49, the

front end portion of the moving portion 49b protrudes forward from the fixed portion 49a. Therefore, when attaching the cover portion 21 to the main body portion 20 in a state where the supply roll 40 is not mounted on the cover portion 21, the front end portion of the moving portion 49b interferes with the main body portion 20. Therefore, it is possible to easily prevent forgetting to attach the supply roll 40 to the cover portion 21.

[0124]

On the other hand, as illustrated in Fig. 14, when the supply roll 40 is mounted on the support member 49, the supply roll 40 abutting on the fixed portion 49a moves the moving portion 49b rearward. As a result, the front end portion of the moving portion 49b is retracted rearward, and interference between the moving portion 49b and the main body portion 20 is prevented when the cover portion 21 is mounted on the main body portion 20.

[0125]

Also in this embodiment, the same effect as in the first embodiment can be obtained.

[0126]

In the second embodiment and the third embodiment, a photo interrupter (not illustrated) may be provided instead of the magnet 23 and the Hall element of the first embodiment. The photo interrupter has a light emitting

portion and a light receiving portion facing each other. In a case where it is detected by the light receiving portion that the light traveling from the light emitting portion to the light receiving portion is shielded by the rotating plate 400 of the second embodiment protruding forward from the support member 49 or the moving portion 49b of the third embodiment, and driving of the blower 10 is prohibited. As a result, it is possible to prevent the air blowing operation of the air purifier 1 in a state where the cover portion 21 is not mounted on the main body portion 20.

[0127]

<Fourth Embodiment>

Next, a fourth embodiment of the present invention will be described. Fig. 15 is a plan view of a pre-filter of an air purifier according to the present embodiment. For convenience of description, the same reference numerals are assigned to the same parts as those of the first embodiment illustrated in Figs. 1 to 10. In the present embodiment, the configuration of a pre-filter 6 is different from that of the first embodiment. The other parts are the same as those in the first embodiment.

[0128]

The pre-filter 6 of a sheet shape is formed with a first region A1 to a fourth region A4 arranged side by side in the winding direction W. The first region A1 is a region

where the density of the mesh is low, the second region A2 is a region where the density of the mesh is high, the third region A3 is a region where activated carbon is attached to the mesh, and the fourth region A4 is a region where an aromatic is attached to the mesh.

[0129]

The air purifier 1 has a dust sensor (not illustrated) and an odor sensor (not illustrated). The dust sensor detects the concentration of dust in the air in the living room. The odor sensor detects the concentration of odorous components in the air in the living room.

[0130]

In the air purifier 1 having the above configuration, for example, in a case where it is determined that the dust concentration in the air is low according to the detection result of the dust sensor, the drive motor 100 is driven to rotate the winding roll 50, and the first region A1 is disposed facing the suction port 3. As a result, the air blowing efficiency of the air purifier 1 can be improved. For example, in a case where it is determined that the dust concentration in the air is high according to the detection result of the dust sensor, the drive motor 100 is driven to rotate the winding roll 50, and the second region A2 is disposed facing the suction port 3. It is possible to determine the region facing the suction port 3 based on the

length of the first region A1 to the fourth region A4 in the winding direction W and the rotation amount of the drive motor 100.

[0131]

In a case where it is determined that the concentration of the odorous component in the air is high according the detection result of the odor sensor, the drive motor 100 is driven to rotate the winding roll 50, and the third region A3 or the fourth region A4 is disposed facing the suction port 3.

[0132]

As described above, since the region of the pre-filter 6 suitable for the state of the air in the living room is disposed facing the suction port 3, usability of the air purifier 1 can be improved.

[0133]

Also in this embodiment, the same effect as in the first embodiment can be obtained. The pre-filter 6 is formed with the first region A1 to the fourth region A4 arranged side by side in the winding direction W. As a result, since the region of the pre-filter 6 suitable for the state of the air in the living room is disposed facing the suction port 3, the usability of the air purifier 1 can be improved.

[0134]

The user may operate the operation unit 19 to select the first region A1 to the fourth region A4.

[0135]

<Fifth Embodiment>

Next, a fifth embodiment of the present invention will be described. Fig. 16 is a perspective view of a pressing member of a pre-filter of an air purifier according to the present embodiment. For convenience of description, the same reference numerals are assigned to the same parts as those of the first embodiment illustrated in Figs. 1 to 10. In the present embodiment, the configuration of a pressing member 22 is different from that of the first embodiment. The other parts are the same as those in the first embodiment.

[0136]

The pressing member 22 of the embodiment has only the rib 22b extending in the winding direction W of the pre-filter 6 (vertical direction in the embodiment) and has no rib extending in a direction orthogonal to the winding direction W (left-right direction in the embodiment). As a result, it is possible to prevent the dust from falling due to the rib extending in the direction orthogonal to the winding direction W sliding on the pre-filter 6.

[0137]

Also in this embodiment, the same effect as in the

first embodiment can be obtained.

[0138]

In the first to fifth embodiments, the supply roll 40 and the winding roll 50 are disposed in the cover portion 21, and instead of this configuration, these may be disposed in the main body portion 20.

[0139]

In the cleaning operation of the air purifier 1 of the first to the fifth embodiments, the winding speed of the winding roll 50 and the rewinding speed to the supply roll 40 may be the same as or different from each other. For example, when the winding speed of the winding roll 50 is made smaller than the rewinding speed to the supply roll 40, it is possible to shorten the cleaning operation time by increasing the rewinding speed while removing the dust on the pre-filter 6.

Industrial Applicability

[0140]

The present invention can be applied to the air purifier provided with the cleaning device for cleaning a filter.

Reference Signs List

[0141]

- 1 air purifier
- 2 casing

3 suction port
4, 5 air outlet
6 pre-filter (filter)
6a bar member
6b ventilation portion
6c storage portion
6g design
7 deodorizing filter
8 air pathway
8a first branch pathway
8b second branch pathway
9 dust collecting filter
10 blower
11 ion generator
12 damper
14, 15 airflow direction plate
17 display unit
20 main body portion
21 cover portion
22 pressing member
23 magnet
30 cleaning device
40 supply roll
41 shaft
41a core member

41d sleeve
50 winding roll
60 gear unit
61 bevel gear (first cross shaft gear)
62 bevel gear (second cross shaft gear)
63 spur gear (first parallel shaft gear)
64 spur gear (second parallel shaft gear)
65 internal gear
66 spur gear (third parallel shaft gear)
70 biasing portion
71 rotating body (first rotating body)
71a clamping portion
72 rotating body (second rotating body)
72a claw
73 handle
74 connecting member
75 spring
76 compression spring
77 stopper
77a torsion coil spring
78, 79 housing
80 brush body
81 shaft
82 brush bristle bundle
90 dust collecting portion

91 lid portion
91a opening portion
92 container
93 comb portion
100 drive motor
110 rotation amount detection unit
111 photo interrupter
112 slit disk
200 humidifying portion
201 tray
202 humidifying filter
300 tape-shaped member
400 rotating plate
401 shaft portion
SP space

CLAIMS

[Claim 1]

An air purifier comprising:

- a casing opening a suction port and an air outlet;
- an air pathway connecting the suction port and the air outlet to each other;
- a blower disposed in the air pathway;
- a filter disposed to face the suction port; and
- a cleaning device cleaning the filter,

wherein the cleaning device includes

- a supply roll on which the filter of a sheet shape is wound,
- a winding roll that winds up the filter,
- a drive motor that rotationally drives the winding roll,
- an biasing portion that biases a rotation shaft of the supply roll in a direction opposite to a winding direction when winding up the winding roll,
- a brush body that slides on the filter when the winding roll rotates, and
- a rotation amount detection unit that detects a rotation amount of the drive motor, and

it is determined that the drive motor is stepped out based on a detection result of the rotation amount detection unit, and the drive motor is reversed when stepped out.

[Claim 2]

The air purifier according to Claim 1,
wherein the rotation amount detection unit includes a photo interrupter and a slit disk that rotates in conjunction with the drive motor, and
when winding up the filter by the winding roll, in a case where the rotation amount detection unit does not detect a pulse outputted by rotation of the slit disk for a predetermined time, it is determined that the drive motor is stepped out.

[Claim 3]

The air purifier according to Claim 1 or 2,
wherein in a case where a rotation amount, which is detected by the rotation amount detection unit when the drive motor is stepped out, is out of a predetermined range, error notification is performed.

[Claim 4]

The air purifier according to any one of Claims 1 to 3, further comprising:
an attachment or detachment sensor that detects attachment or detachment of the supply roll,
wherein when driving the cleaning device for the first

time after the supply roll is attached or detached, the rotation amount of the drive motor when the drive motor is reversed is made smaller than the rotation amount of the drive motor when the drive motor is stepped out.

[Claim 5]

The air purifier according to any one of Claims 1 to 4, wherein in a case where the cleaning device stops during driving and restarts, the rotation amount detected by the rotation amount detection unit is reset to start winding of the filter by the winding roll,

in a case where the rotation amount detected by the rotation amount detection unit at an end of winding of the filter by the drive motor is greater than a predetermined rotation amount, the drive motor is reversed only by the detected rotation amount, and in a case where the rotation amount is smaller than the predetermined rotation amount, the drive motor is reversed only by the predetermined rotation amount.