(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 120 667 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
**26.06.2013 Bulletin 2013/26**

(21) Application number: **07834064.3**

(22) Date of filing: **15.11.2007**

(51) Int Cl.:
***A47L 9/19*** *(2006.01)* ***A47L 9/16*** *(2006.01)*

(86) International application number:
**PCT/KR2007/005758**

(87) International publication number:
**WO 2008/100005 (21.08.2008 Gazette 2008/34)**

(54) **VACUUM CLEANER**

STAUBSAUGER

ASPIRATEUR

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC MT NL PL PT RO SE SI SK TR**

(30) Priority: **15.02.2007 KR 20070015806**
**23.07.2007 KR 20070073222**

(43) Date of publication of application:
**25.11.2009 Bulletin 2009/48**

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## Description

### Technical Field

**[0001]** This document relates to a vacuum cleaner.

### Background Art

**[0002]** A vaccum cleaner according to the preamble of claim 1 is already known i.e. from US-A-20060123749.

**[0003]** Generally, a vacuum cleaner is an appliance, which sucks air containing particles by using a sucking force of a suction motor in a body thereof and filters off the particles in the body.

**[0004]** This vacuum cleaner includes an intake nozzle for sucking air containing particles, a cleaner body communicating with the intake nozzle, an extension pipe guiding the air sucked by the intake nozzle to the cleaner body, and a connecting pipe connecting the extension pipe with the cleaner body. And, an intake port is formed in a lower surface of the intake nozzle so that air containing particles of a floor to be cleaned.

**[0005]** Meanwhile, a suction motor, which generates a sucking force to suck air containing particles from the outside, is provided in the cleaner body. And, a dust collector for storing impurities separated from polluted air is detachably provided in the cleaner body.

**[0006]** Particularly, the dust collector includes a dust separator for separating impurities from the air sucked into the dust collector, and a dust container for storing the impurities separated by the dust separator.

**[0007]** And, if an operation of the vacuum cleaner is stopped while separating impurities from polluted air at the dust collector, the separated impurities are stored in the dust container at low density.

**[0008]** According to the related art dust collector, since the dust stored in the dust container has larger volume with respect to weight, there is an inconvenience that the dust of the dust container has to be frequently cleaned so as to maintain the dust collecting performance.

**[0009]** Therefore, in order to increase the convenience of using the cleaner, efforts have been continuously made to maximize capacity of dust stored in the dust collector as well as to enhance dust-collecting performance.

### Disclosure of Invention

### Technical Problem

**[0010]** The present invention is derived to resolve the above and other disadvantages of the prior art, and an object of the present invention is to provide a vacuum cleaner which increases dust-collecting capacity by compressing dust stored in the dust collector.

**[0011]** Also, another object of the present invention is to provide a vacuum cleaner which prevents a suction motor or a compression motor for compressing dust from operating when a dust collector is not mounted thereon.

### Technical Solution

**[0012]** To achieve these objects and other advantages and in accordance with the purpose of the invention, as embodied and broadly described herein, there is provided a vacuum cleaner, including: a cleaner body in which a suction motor is provided; a dust collector selectively attached to the cleaner body, in which a dust container is formed; a pressing element for pressing dust stored in the dust container; a compression motor for operating the pressing element; an installation sensor provided in a mounting element of the dust collector to detect whether the dust collector is correctly mounted; a signal display for displaying the mount of the dust collector; and a control unit for controlling the operation of the signal display.

**[0013]** In accordance with another aspect of the present invention, a vacuum cleaner includes a cleaner body in which a dust collector mounting element is formed; a dust collector detachably attached to the dust collector mounting element, in which a dust container is formed; a pressing element movably provided in the dust container to press dust stored in the dust container; a magnetic element which moves with the pressing element when the pressing element moves; a magnetic sensor for detecting a magnetism of the magnetic element; and a control unit for determining a storage amount of the dust stored in the dust container by using the magnetic information of the magnetic sensor.

**[0014]** In accordance with further another aspect of the present invention, a vacuum cleaner includes a cleaner body in which a dust collector mounting element is formed; a dust collector detachably attached to the dust collector mounting element, in which a dust container is formed; a pressing element provided in the dust container to press dust stored in the dust container; an installation sensor provided in the dust collector mounting element to detect whether the dust collector is correctly mounted; and a position sensor provided in the dust collector mounting element to detect a position of the pressing element.

### Advantageous Effects

**[0015]** According to the preferred embodiments of the present invention, since dust stored in the dust collector is compressed and volume of the dust is minimized, the capacity of dust stored in the dust collector is maximized.

**[0016]** Also, the user's inconvenience that he/she has to frequently empty the dust stored in the dust collector can be solved, as the dust-collecting capacity of the dust collector is miximized by a compressing operation of the dust.

**[0017]** Also, when dust of a predetermined amount is collected in the dust collector, a dust empty signal of the dust collector is displayed, and therefore it is possible for users to easily recognize the time to empty the dust con-

tainer.

**[0018]** Also, when the operation signal of the suction motor is input in a state that the dust collector is not mounted thereon, the unnecessary operation of the suction motor and the compression motor is prevented by informing this to the outside.

## Brief Description of the Drawings

**[0019]** Fig. 1 is a perspective view of a vacuum cleaner according to a first embodiment of the present invention.

**[0020]** Fig. 2 is a perspective view of a vacuum cleaner where a dust collector is separated therefrom.

**[0021]** Fig. 3 is a perspective view of a dust collector according to the first embodiment of the present invention.

**[0022]** Fig. 4 is a cross-sectional view taken along I-I' of Fig. 3.

**[0023]** Fig. 5 is a lower perspective view of the dust collector according to the first embodiment of the present invention.

**[0024]** Fig. 6 is a driven gear according to the first embodiment of the present invention.

**[0025]** Fig. 7 is a perspective view of a dust collector mounting element according to the first embodiment of the present invention.

**[0026]** Fig. 8 is a block diagram showing a control structure of the vacuum cleaner according to the first embodiment of the present invention.

**[0027]** Figs. 9 and 10 are views showing a position relationship between a magnetic element and a second magnetic sensor when a first pressing element is placed adjacent to one side of a second pressing element.

**[0028]** Figs. 11 and 12 are views showing a position relationship between the magnetic element and the second magnetic sensor when the first and second pressing elements are placed in a straight line.

**[0029]** Figs. 13 and 14 are views showing a position relationship between the magnetic element and the second magnetic sensor when the first pressing element is placed adjacent to the other side of the second pressing element.

**[0030]** Fig. 15 is a view for explaining a rotational operation of the first pressing element described in the Figs. 9 to 14.

**[0031]** Fig. 16 is a flow chart explaining a control method of the vacuum cleaner according to the first embodiment of the present invention.

**[0032]** Fig. 17 is a lower perspective view of a driven gear according to a second embodiment of the present invention.

**[0033]** Fig. 18 is a perspective view of a dust collector mounting element according to the second embodiment of the present invention.

**[0034]** Fig. 19 is a view showing a position relationship between the driven gear and the installation sensor according to the second embodiment of the present invention.

## Mode for the Invention

**[0035]** Hereinafter, the preferred embodiments of the present invention will be described in detail with reference to the accompanying drawings.

**[0036]** Figure 1 shows a perspective view of a vacuum cleaner according to a first embodiment of the present invention, Figure 2 shows a perspective view of a vacuum cleaner where a dust collector is separated therefrom, and Figure 3 shows a perspective view of a dust collector according to the first embodiment of the present invention.

**[0037]** Referring to Figs. 1 to 3, a vacuum cleaner 10 according to the present embodiment includes a cleaner body 100 in which a suction motor (not shown) for generating a sucking force is provided, and a dust separating device for separating dust from air sucked into the cleaner body 100.

**[0038]** Further, the vacuum cleaner further includes an intake nozzle which sucks air containing dust of the floor, and a connection means which connects the intake nozzle to the cleaner body 100, even though they are not illustrated.

**[0039]** In the present embodiment, basic configurations of the intake nozzle and the connection means are the same as those of the prior art, and therefore detailed description will be omitted.

**[0040]** Particularly, a body intake port 110, through which the air containing dust sucked by the intake nozzle, is formed at a bottom of a front surface of the cleaner body 100, and a body discharge port (not shown) for discharging air separated from dust to the outside is formed in one side of the cleaner body 100. And, a body handle 140, which allows for users to grab it, is formed on an upper part of the cleaner body 100.

**[0041]** Meanwhile, the dust separating device includes a dust collector 200 in which a primary cyclone unit (will be explained) for separating dust from air intoroduced therein is provided, and a secondary cyclone unit 300 which is provided in the cleaner body 100 to re-separate dust from the air initially separated by the primary cyclone unit.

**[0042]** Particularly, the dust collector 200 is detachably mounted on a dust collector mounting element 170 formed in a front of the cleaner body 100. An attachment/detachment lever 142 is provided in the handle 140 of the cleaner body 100, and an engagement end 256 engaging with the attachment/detachment lever 142 is formed in the dust collector 200.

**[0043]** Further, the dust collector 200 includes a primary cyclone unit forming a cyclonic flow, and a dust collecting body 210 in which a dust container for storing the dust separated from the primary cyclone unit is formed. And, the dust collector 200 is communicated with the cleaner body 100 and the secondary cyclone unit 300, as the dust collector 200 is attached to the cleaner body 100.

**[0044]** In the cleaner body 100, an air outlet 130 for

discharging air sucked into the cleaner body to the dust collector 200 is formed. And, in the dust collector 200, a first air inlet 218 for introducing air from the air outlet 130.

**[0045]** Further, a first air outlet 252, through which air separated from the dust at the primary cyclone unit is discharged, is formed in the dust collector 200, and a connecting channel 114, into which the air discharged through the first air outlet 252 is introduced, is formed in the cleaner body 100. And, the air introduced into the connecting channel 114 is introduced into the secondary cyclone unit 300.

**[0046]** Meanwhile, the secondary cyclone unit 300 includes a plurality of cyclones. And, the dust separated by the secondary cyclone unit 300 is stored in the dust collector 200. And, a dust inlet 254, into which the dust separated by the secondary cyclone unit 300 is introduced, is formed in the dust collecting body 210.

**[0047]** Meanwhile, a structure for reducing the volume of the dust stored in the dust collector 200 is provided in the dust collector 200.

**[0048]** Figure 4 shows a cross-sectional view taken along I-I' of Figure 3, Figure 5 shows a lower perspective view of the dust collector according to the first embodiment of the present invention, Figure 6 shows a driven gear according to the first embodiment of the present invention, and Figure 7 shows a perspective view of a dust collector mounting element according to the first embodiment of the present invention.

**[0049]** Referring to Fig. 4, the dust collector 200 according to the present embodiment includes a dust collecting body 210 defining an external appearance, a primary cyclone unit 230 provided in the dust collecting body 210 to separate dust from air, and a cover element 250 selectively opening or closing an upper part of the dust collecting body 210.

**[0050]** Particularly, a dust container in which the separated dust is stored is formed in the dust collecting body 210. And, the dust container includes a first dust container 214 in which the dust separated by the primary cyclone unit 230 is stored, and a second dust container 216 in which the dust separated by the secondary cyclone unit 300 is stored.

**[0051]** The dust collecting body 210 includes a first wall 211 defining the first dust container 214, and a second wall 212 defining the second dust container 216 in the relation with the first wall 211. That is, the second wall 212 is formed to surround a specific external part of the first wall 211. Therefore, the second dust container 216 is formed at the outside of the first dust container 214.

**[0052]** In the primary cyclone unit 230, a dust guide channel 232 which guides the dust separated from air to be easily discharged into the first dust container 214 is provided. An inlet 233 of the dust guide channel 232 is formed at a side of the primary cyclone unit 230, and an outlet 234 is formed at a bottom of the primary cyclone unit 230.

**[0053]** MEanwhile, the cover element 250 is detachably connected to the top of the dust collecting body 210, as described in the above. And, the cover element 250 opens or closes the first and second containers 214, 216 at the same time. And, the primary cyclone unit 230 is connected to the lower part of the cover element.

**[0054]** In the lower surface of the cover element 250, a discharge hole 251 through which the air separated from the dust at the primary cyclone unit 230 is passed is formed. And, a filter element 260, in which a plurality of perforated-holes 262 of a specific size are formed in a circumferential surface, is connected to a lower surface of the cover element 250.

**[0055]** Also, a channel 253, which guides the air of the primary cyclone unit 230 discharged from the discharge hole 251 to the first air outlet 252, is formed in the cover element 250. That is, the channel 253 serves as a passage connecting the discharge hole 251 with the first air outlet 252.

**[0056]** Meanwhile, a pair of pressing elements 270, 280, which increase the dust-collecting capacity by reducing the volume of dust stored in the first dust container 214, are provided in the dust collecting body 210.

**[0057]** Here, the pair of pressing elements 270, 280 reduce the volume of dust by compressing the dust due to the reciprocal action of the pressing elements, and therefore the dust-collecting capacity of the dust collector 200 is increased by increasing the density of the dust stored in the dust collecting body 210.

**[0058]** Hereinafter, for the convenience of explanation, one of the pair of pressing elements 270, 280 is referred to as a first pressing element 270, and the other is referred to as a second pressing element 280.

**[0059]** According to the present embodiment, at least one of the pair of pressing elements 270, 280 is movably provided in the dust collector 200 so that the dust is compressed between the pair of pressing elements 270, 280.

**[0060]** That is, if the first and second pressing elements 270, 280 are rotatably provided in the dust collector 200, a distance between one side of the first pressing element 270 and one side, which is opposing to the one side of the first pressing element 270, of second pressing element 280 is decreased as the first and second pressing elements 270, 280 are rotated to each other, and therefore the dust disposed between the pair of pressing elements 270, 280 is compressed.

**[0061]** However, according to the present embodiment, the first pressing element 270 is rotatably provided in the dust collecting body 210 and the second pressing element 280 is fixedly provided in the dust collecting body 210. Therefore, the first pressing element 270 is a rotating element, and the second pressing element 280 is a fixed element.

**[0062]** Particularly, the second pressing element 280 is preferably disposed between an inner circumferential surface of the dust collecting body 210 and an axial line of a rotational axis 272 which is center of rotation of the first pressing element 270. That is, the second pressing element 280 is provided on a surface connecting the axial line of the rotational axis 272 with the inner circumferen-

tial surface of the first dust container 214. Here, the second pressing element 280 fully or partially closes a space between the inner circumferential surface of the first dust container 214 and the axial line of the rotational axis 272, and therefore the second pressing element 280 and the first pressing element 270 compress dust when the dust is introduced by the first pressing element 270.

**[0063]** One end of the second pressing element 280 may be integrally formed in the inner circumferential surface of the dust collecting body 210, and the other end may be integrally formed in a fixed axis 282 which is provided in the same axis as the rotational axis 272 of the first pressing element 270.

**[0064]** Of course, only one end of the second pressing element 280 may be integrally formed in the inner circumferential surface of the dust collecting body 210, or only the other end may be integrally formed in a fixed axis 282. In other words, the second pressing element 280 may be fixed on at least one of the inner circumferential surface of the dust collecting body 210 and the fixed axis 282.

**[0065]** However, even if one end of the second pressing element 280 is not integrally formed in the inner circumferential surface of the dust collecting body 210, it is preferable that the one end of the second pressing element 280 is placed adjacent to the inner circumferential surface of the dust collecting body 210.

**[0066]** Further, even if the other end is not integrally formed in the fixed axis 282, it is preferable that the other end is placed adjacent to the fixed axis 282. This is to prevent the dust introduced by the first pressing element 270 from leaking through a gap between the second pressing element 280 and the inner circumferential surface of the dust collecting body 210.

**[0067]** The first and second pressing elements 270, 280 include a plate of retangular shape. And, the rotational axis 272 of the first pressing element 270 is positioned at the same axis as the axial line constituting the center of the dust collecting body 210.

**[0068]** Meanwhile, the fixed axis 282 is upwardly protruded from the lower surface of the dust collecting body 210, and a hollow hole 283 which passes in an axial direction for the connection of the rotational axis 272 is formed in the fixed axis 282. And, a specific part of the rotational axis 272 is inserted into the hollow hole 283 from the upper part of the fixed axis 282.

**[0069]** Particularly, a step 272c which is supported by the top of the fixed axis 282 is formed in the rotational axis 272. The rotational axis 272 is divided into an upper axis 272a to which the first pressing element 270 is connected, and a lower axis 272b to which a driven gear for rotating the first pressing element 270 is connected, with reference to the step 272c.

**[0070]** In addition to the configuration, the vacuum cleaner according to the present embodiment further includes a driving device which is selectively connected to the first pressing element 270 to rotate the first pressing element 270.

**[0071]** Hereinafter, a relation between the dust collector 200 and the driving device will be explained in detail with reference to Figs. 5 to 7.

**[0072]** Referring to Figs. 5 to 7, the driving device for rotating the first pressing element 270 includes a compression motor generating a driving force, and a power transmission 410, 420 transmitting the driving force of the compression motor to the first pressing element 270.

**[0073]** Particularly, the power transmission 410, 420 includes a driven gear 410 connecting to the rotational axis 272 of the first pressing element 270, and a driving gear 420 transmitting the power to the driven gear 410. And, the driving gear 420 is rotated by the compression motor as it is connected to the rotational axis of the compression motor.

**[0074]** Therefore, if the compression motor is rotated, the driving gear 420 connected with the compression motor is rotated, and therefore the driven gear 410 is rotated because the rotational force of the compression motor is transmitted to the driven gear 410 by the driving gear 420. And, the first pressing element 270 is rotated by the rotation of the driven gear 410.

**[0075]** Particularly, an axis 414 of the driven gear 410 is connected with the rotational axis 272 of the first pressing element 270 at the lower part of the dust collecting body 210. As described in the above, the driven gear 410 is exposed to the outside of the dust collecting body 210 as the driven gear 410 is connected to the lower part of the dust collecting body 210.

**[0076]** Meanwhile, the compression motor is provided below the dust collector mounting element 170, and the driving gear 420 is provided at the bottom of the dust collector mounting element 170 as it is connected to a rotational axis of the compression motor.

**[0077]** Further, some of the outer circumferential surface of the driving gear 420 is exposed to the bottom of the dust collector mounting element 170. And, an opening 173 for exposing some of the driving gear 420 to the dust collector mounting element 170 is formed in the dust collector mounting element 170.

**[0078]** As the driven gear 410 is exposed to the dust collector mounting element 170, if the dust collector 200 is mounted on the dust collector mounting element 170, then the driven gear 410 engages with the driving gear 420.

**[0079]** The compression motor is preferably capable of rotating in a forward and reverse direction. In other words, a motor capable of rotating in both directions may be used as a compression motor.

**[0080]** Accordingly, the first pressing element 270 is able to rotate in a forward and reverse direction, and the compressed dust is accumulated on both sides of the second pressing element 280 as the first pressing element 270 rotates in a forward and reverse direction. In order to allow the forward/reverse rotation of the compression motor, a synchronous motor may be used as the compression motor.

**[0081]** The synchronous motor is configured that the

forward/reverse rotation is enabled by the motor itself, if the force exerted on the motor is greater than a set value when the motor rotates in one direction, then the motor rotates in the other direction.

**[0082]** Here, the force exerted on the motor is a resisting force (torque) which is created as the first pressing element 270 presses the dust, the rotational direction of the motor is changed when the resisting force reaches the set value. The synchronous motor is generally known in the art, the detailed explanation will be omitted.

**[0083]** Further, it is preferable that the first pressing element 270 continuously presses the dust for a predetermined time even when the first pressing element 270 reaches a stationary point, where no more rotation is possible, as it compresses the dust due to the rotation. Here, the stationary point, where the first pressing element 270 cannot rotate any more, corresponds to the case that the resisting force reaches the set value.

**[0084]** Further, if the resisting force reaches the set value, then the power rotating the first pressing element, i.e. the power source applied to the compression motor is turned off for a predetermined time, and therefore the first pressing element 270 keep pressing the dust, and the first pressing element 270 is able to move by applying the power to the compression motor after the predetermined time elapses. Here, since the cut off time of the power applied to the compression motor is the time that the resisting force reaches the set value, if the compression motor is driven again, then the rotational direction of the compression motor is opposite to the rotational direction of the compression motor before the power cut off.

**[0085]** Also, in order to easily compress the dust, it is preferable that the compression motor continually rotates the first pressing element 270 in a forward and reverse direction at the same angular velocity.

**[0086]** Meanwhile, a guide rib 290 for guiding the installation of the dust collector 200 is formed in the lower part of the dust collecting body 210, and an insert groove 172 in which the guide rib 290 is inserted is formed in the dust collector mounting element 170.

**[0087]** The guide rib 290 is provided at the outside of the driven gear 410 in the shape of "C." Therefore, the guide rib 290 protects the driven gear 410 and prevents dust from moving into the driven gear 410.

**[0088]** The driven gear 410 is composed of a body 412, and a plurality of gear teeth 416 formed along the side surface of the body 412. And, a magnetic element 415 is provided in the body 412.

**[0089]** Particularly, the magnetic element 415 is extended from a center of the body 412 to an edge of the body in a radial direction.

**[0090]** Further, a plurality of magnetic sensors for detecting magnetism of the magnetic element 415 are provided on the inner side of the dust collector mounting element 170.

**[0091]** Particularly, the magnetic sensor includes a first magnetic sensor 440 for detecting the installation of the dust collector 200, and a second magnetic sensor 450 for detecting the state that the driven gear 410 rotates.

**[0092]** Further, the first magnetic sensor 440 is provided at the center of the insert groove 172 to detect magnetism of an A portion of the magnetic element 415. And, the second magnetic sensor 450 is placed apart from first magnetic sensor 440 and detects magnetism of a B portion of the magnetic element 415.

**[0093]** Here, it is preferable that the dust collector 200 is mounted on the dust collector mounting element 170 and is disposed vertically below the trajectory of the magnetic element 415 when the driven gear 410 is rotated, so that the second magnetic sensor 450 effectively detects magnetism generated from the magnetic element 415.

**[0094]** Therefore, the first magnetic sensor 440 always detects magnetism when the dust collector 200 is mounted on the dust collector mounting element 170.

**[0095]** However, the second magnetic sensor 450 detects magnetism only when the magnetic element 415 is disposed vertically above the second magnetic sensor 450 while the driven gear 410 is rotated, and therefore it is possible to check the rotational state of the driven gear 410.

**[0096]** Here, one magnetic element is provided in the driven gear according to the present embodiment, however it is also possible that a first magnetic element is provided at the center of the driven gear and a second magnetic element is provided at a position spaced apart from the first magnetic element. In this case, the first magnetic sensor 440 detects magnetism of the first magnetic element, and the second magnetic sensor 450 detects magnetism of the second magnetic element.

**[0097]** Figure 8 is a block diagram showing a control structure of the vacuum cleaner according to the first embodiment of the present invention.

**[0098]** Referring to Fig. 8, the vacuum cleaner according to the present embodiment includes a control unit 510, an operation signal input unit 520 for selecting the suction power (for example, high, middle and low modes) of dust, a signal display 530 for displaying the empty signal of the dust stored in the dust collector 200 and the dust collector uninstallation signal, a suction motor driver 540 for operating a suction motor according to the operation mode input from the operation signal input unit 520, and a compression motor driver 560 for operating a compression motor 570 which is used to compress dust stored in the dust collector 200.

**[0099]** Also, the vacuum cleaner includes a driving gear 420 driven by the compression motor 570, a driven gear 410 rotated by engaging with the driving gear 420, a magnetic element 415 provided in the driven gear 410, a first magnetic sensor 440 and a second magnetic sensor 450.

**[0100]** Particularly, if the dust collector 200 is not mounted on the dust collector mounting element 170, then magnetism of the magnetic element 415 is not detected by the first magnetic sensor 440. Therefore, if the

operation signal is input from the operation signal input unit 520 while the dust collector 200 is not mounted on the dust collector mounting element 170, then the dust collector uninstallation signal is displayed.

**[0101]** Further, the control unit 510 determines the amount of dust stored in the dust collector 200 with reference to the rotational state of the driven gear 410, which is detected by the second magnetic sensor 450. And, if the control unit 510 determines that the amount of dust is greater than a specific value, then the dust empty signal is displayed at the signal display 530.

**[0102]** Here, since the driven gear 410 and the first pressing element 270 is connected, to find out the rotational state of the driven gear 410 is to check the rotation position of the the first pressing element 270.

**[0103]** Therefore, the first magnetic sensor 440 may be preferred to as a "dust collector sensor" because it detects the mounting of the dust collector 200, and the second magnetic sensor 450 may be referred to as a "position sensor" because it detects the position of the first pressing element 270.

**[0104]** Here, the signal displayed at the signal display 530 may be a sound signal, a visual signal or a vibration directly transmitted to users. And, a speaker, a LED, a vibration motor and the like may be used as the signal display 530.

**[0105]** Further, the signal displayed at the signal display 530 may be differently set for the dust empty signal and the dust collector uninstallation signal.

**[0106]** Figures 9 and 10 show a position relationship between a magnetic element and a second magnetic sensor when a first pressing element is placed adjacent to one side of a second pressing element, Figures 11 and 12 show a position relationship between the magnetic element and the second magnetic sensor when the first and second pressing elements are placed in a straight line, and Figures 13 and 14 show a position relationship between the magnetic element and the second magnetic sensor when the first pressing element is placed adjacent to the other side of the second pressing element.

**[0107]** As shown in Figs. 9 to 14, according to the present embodiment, when the first and second pressing elements are placed in a straight line as the first pressing element 270 is rotated at 180 degree, the magnetic element 415 is positioned vertically above the second magnetic sensor 450, and thus the second magnetic sensor 450 detects magnetism of the magnetic element 415.

**[0108]** Here, the position of the first pressing element 270, where the second magnetic sensor 450 detects magnetism of the magnetic element 415, is referred to as a "reference position."

**[0109]** Further, while the first pressing element 270 presses dust accumulated in the dust collector 200 as it rotates in a counter-clockwise direction, the magnetic element 415 is spaced apart from the second magnetic sensor 450, and therefore magnetism is not detected by the second magnetic sensor 450.

**[0110]** Further, if the first pressing element 270, which rotates in a counter-clockwise direction, is not rotated any more, then the first pressing element 270 starts to rotate in a clockwise direction. Therefore, the first pressing element 270 presses dust accumulated in the dust collector 200, as it rotates to the right of the second pressing element 280 as shwon in Fig. 13 by passing through the reference point shwon in Fig. 11.

**[0111]** Further, if the first pressing element 270, which rotates in a clockwise direction, is not rotated any more, then the first pressing element 270 starts to rotate in a counter-clockwise direction and therefore the first pressing element 270 presses dust accumulated in the dust collector 200 by repeating the above-mentioned process.

**[0112]** Figure 15 explains a rotational operation of the first pressing element described in the Figures 9 to 14.

**[0113]** Referring to Fig. 15, the time TD1 which is required for the first pressing element 270 to return to the reference position from the reference position by rotating in a clockwise direction, and the time TD2 which is required for the first pressing element 270 to return to the reference position from the reference position by rotating in a counter-clockwise direction are displayed therein. For explanation, the time TD1 is referred to as a first turnaround, and the time TD2 is referred to as a second turnaround. Generally, since dust is evenly accumulated in the dust collector 200, the time TD1 and the time TD2 are almost same.

**[0114]** Meanwhile, as the amount of dust compressed by the first pressing element 270 increases, the time TD 1 and the time TD2 are getting short. According to the present embodiment, one of the time TD1 and the time TD2 reaches a specific reference time, it is determined that dust is sufficiently accumulated in the dust collector 200, and therefore the dust empty signal is displayed.

**[0115]** Hereinafter, an operation of the vacuum cleaner and a compression process of dust according to the present embodiment will be explained.

**[0116]** Figure 16 is a flow chart explaining a control method of the vacuum cleaner according to the first embodiment of the present invention.

**[0117]** Referring to Fig. 16, it is determined whether the suction motor operation signal is input through the operation signal input unit 520 in a state that the vacuum cleaner is deactivated (S10).

**[0118]** And, when he suction motor operation signal is input, it is determined whether the dust collector 200 is mounted or not (S 11).

**[0119]** If magnetism of the magnetic element 415 is not detected by the first magnetic sensor 440, the signal which the dust collector is not mounted is displayed at the signal display 530 (S 12).

**[0120]** As described in the above, in case that the suction motor operation signal is input while the dust collector 200 is mounted, the unnecesary operation of the suction motor and the compression motor can be prevented by informing this state to the outside.

**[0121]** However, if it is determined that the dust collec-

tor 200 is mounted because magnetism of the magnetic element 415 is detected by the first magnetic sensor 440, then the control unit 510 activates the suction motor driver 540 so that the suction motor 550 is activated according to the suction power selected by users (S13).

**[0122]** And, if the suction motor 550 is activated, then dust is introduced through the suction nozzle by the suction force of the suction motor 550. The air sucked through the suction nozzle is introduced into the cleaner body 100 via the body body suction 110, and the introduced air is introduced into the dust collector 200 via a predetermined channel.

**[0123]** Further, the air ntroduced into the dust collector 200 is discharged to the cleaner body 100 after being filtered. And the separated dust is stored in the first dust container 214.

**[0124]** While dust is stored in the first dust container 214 as it is separated from the air, the pair of pressing element 270, 280 press the dust stored in the first dust container 214.

**[0125]** That is, the control unit 510 activates the compression motor 570 in order to compress the dust stored in the dust collector 200 (S 14).

**[0126]** Here, according to the present embodiment, the compression motor 570 is driven aftr activating the suction motor 550, however it is also possible to activate the suction motor 550 and the compression motor 570 at the same time as another embodiment of the present invention.

**[0127]** If the compression motor 570 is activated, the driving gear 420 connected with the rotation axis of the compression motor 570 is rotated. And, if the driving gear 420 is rotated, the driven gear 410 is rotated. And, if the driven gear 410 is rotated, the sudt in compressed as the first pressing element 270 connected with the driven gear 410 is rotated to the second pressing element 280.

**[0128]** Here, the control unit 510 initially finds out whether the first pressing element 270 is positioned at the reference position (S15). According to the present embodiment, since the first and second turnarounds are measured with reference to the reference position, it is necessary to find out whether the first pressing element 270 is positioned at the reference position for the first movement.

**[0129]** The reference position of the first pressing element 270 is checked when magnetism of the magnetic element 415 is initially detected by the second magnetic sensor 450 in case of the first movement of the compression motor 570.

**[0130]** Therefore, the control unit 510 measures the turnarounds of the first pressing element 270 with reference to the time that the second magnetic sensor 450 initially detects magnetism.

**[0131]** Further, the first and second turnarounds TD1, TD2 are measured from the time when the first pressing element 270 moves to the reference positionby rotating the first pressing element 270 in a clockwise or counter-clockwise direction (S16).

**[0132]** Here, as the amount of dust compressed by the first and second pressing elements in the dust collector 200 is increased, the rotation turnaround time period of the driven gear 410 is reduced.

**[0133]** The control unit 510 determines the first and second turnarounds TD 1 and TD2 of the first pressing element 270 by using the second magnetic sensor 450, and therefore it determines that the first and second turnarounds TD 1 and TD2 reach the specific reference time (S 17). Here, the specific reference time is set in the control unit 510 itself by a designer, this is a ground which determines dust in the dust collector 200 is accumulated at a specific amount and more. The reference time is obtained by repeating experiment, and it has different values according to the capacity of the vacuum cleaner.

**[0134]** According to the present embodiment, when one of the time TD 1 and the time TD2 reaches the reference time, the amount of dust is determined to reach the specific amount, however it is also possible that the amount of dust is determined to reach the specific amount only when both of the time TD1 and the time TD2 reach the reference time.

**[0135]** Resulting from the step (S 17), if any one of the time TD 1 and the time TD2 is longer than the reference time, then the process returns to the step (S16) and accomplishes the previous process. However, if the time TD1 or the time TD2 reaches the reference time, the dust empty signal of the dust collector 200 is displayed at the signal display 530 (S 18).

**[0136]** After that, the control unit 510 turns off the suction motor 550 to prevent dust from introducing therein (S 19). Here, the suction motor 550 is forcibly stopped, since the suction efficiency is reduced and the suction motor 550 is overloaded when the suction operation is continously practiced while the amount of dust accumulated in the dust collector 200 exceeds the specific amount.

**[0137]** Further, the control unit 510 turns off the compression motor 570 (S20).

**[0138]** According to the present embodiment, the unnecessary operation of the suction motor and the compression motor is prevented by informing the uninstallation signal of the dust collector 200, and the convenience of the users is increased because the dust empty time is known to the users.

**[0139]** Figure 17 shows a lower perspective view of a driven gear according to a second embodiment of the present invention, Figure 18 shows a perspective view of a dust collector mounting element according to the second embodiment of the present invention, and Figure 19 shows a position relationship between the driven gear and the installation sensor according to the second embodiment of the present invention.

**[0140]** The present embodiment is the same as the first embodiment, except for difference in the structure of detecting the installation of the dust collector. Therefore, detailed description of the same configuration as the first embodiment will be omitted, and the character-

istic configuration of the present embodiment will be described.

**[0141]** Referring to Figs. 17 to 19, the installation of the dust collector according to the present embodiment is detected by a microswitch 640 provided in the dust collector mounting element 170, and the rotation position of a driven gear 610 is detected by a magnetic sensor 630 provided in the dust collector mounting element 170. That is, the microswitch 640 is a dust collector sensor for detecting the installation of the dust collector, and the magnetic sensor 630 is a position sensor for detecting the position of the driven gear 610.

**[0142]** Particularly, the driven gear 610 is composed of a body 612, and a plurality of gear teeth 314 formed along the side surface of the body 612. And, a pressing element 616 is formed in the bottom of the body 612. The pressing element 616 is formed along the bottom edge of the body 612 and is downwardly protruded from the body 612. And, a magnetic element 620 is provided in the body 612.

**[0143]** Meanwhile, the microswitch 640 is provided in the cleaner body 100. And, a terminal 650 connected with the microswitch 640 is exposed to the outside of the dust collector mounting element 170. And, the pressing element 616 presses the terminal 650 when the dust collector is mounted on the dust collector mounting element 170. And, if the terminal 650 is pressed, the terminal 650 pushes a contact 642 of the microswitch. As described in the above, if the contact is pressed by the terminal 650, te installation of the dust collector is detected.

**[0144]** Further, the magnetic sensor 620 for detacting magnetism of the magnetic element 620 is provided in the dust collector mounting element 170. The terminal 650 and the magnetic sensor 620 are disposed vertically below the trajectory of the pressing element when the driven gear 410 is rotated.

**[0145]** The magnetic detection of the magnetic sensor 620 is the same as that of the second magnetic sensor according to the first embodiment. Therefore, detailed description will be omitted.

**[0146]** According to the embodiments, the installation of the dust collector is detected by the magnetic sensor or the microswitch, however it is alsopossible to detect the installation of the dust collector by using an infrared sensor or a sonar sensor of the dust collector mounting element.

## Industrial Applicability

**[0147]** According to the vacuum cleaner of the present invention, the dust-collecting capacity of the dust collector can be maximized, since dust stored in the dust collector is pressed by the pressing element. Accordingly, the industrial applicability of the present invention is very high.

**[0148] It Follows a List of Embodiments:**

[1] A vacuum cleaner, comprising:

a cleaner body in which a suction motor is provided;
a dust collector selectively attached to the cleaner body, in which a dust container is formed;
a pressing element for pressing dust stored in the dust container;
a compression motor for driving the pressing element;
an installation sensor provided in a dust collector mounting element to detect whether the dust collector is mounted;
a signal display for displaying the installation of the dust collector; and
a control unit for controlling the operation of the signal display depending on the installation of the dust collector.

[2] The vacuum cleaner according to embodiment 1, wherein the installation sensor is disposed below the dust collector when the dust collector is mounted on the dust collector mounting element.

[3] The vacuum cleaner according to embodiment 1, further comprising:

a power transmission which transmits the power of the compression motor to the pressing element,
wherein the power transmission includes a driving gear connected to the compression motor and a driven gear connected to the pressing element.

[4] The vacuum cleaner according to embodiment 3, wherein the driven gear includes a magnetic element, and the installation sensor detects magnetism of the magnetic element.

[5] The vacuum cleaner according to embodiment 1, wherein the installation sensor includes a terminal which is pressed when mounting the dust collector, and a microswitch connected to the terminal.

[6] The vacuum cleaner according to embodiment 1, wherein the dust collector uninstallation signal is displayed at the signal display when the suction motor is activated in a state that the dust collector is not installed therein.

[7] The vacuum cleaner according to embodiment 1, further comprising:

a position sensor for detecting the position of the pressing element,
wherein the control unit determines the amount of dust in the dust container with reference to the position information detected by the position sensor.

[8] The vacuum cleaner according to embodiment 7, further comprising:

a power transmission transmitting the power of the suction motor to the pressing element, wherein the power transmission includes a driving gear connected to the compression motor, and a driven gear connected to the pressing element.

[9] The vacuum cleaner according to embodiment 8, wherein the driven gear is provided with a magnetic element, and the position sensor detects magnetism of the magnetic element.
[10] The vacuum cleaner according to embodiment 7, wherein dust empty signal is displayed to an outside when the amount of dust stored in the dust container is greater than a reference amount.
[11] A vacuum cleaner, comprising:

a cleaner body in which a dust collector mounting element is formed;
a dust collector detachably attached to the dust collector mounting element, in which a dust container is formed;
a pressing element movably provided in the dust container to press dust stored in the dust container;
a magnetic element which moves with the pressing element when the pressing element moves;
a magnetic sensor for detecting a magnetism of the magnetic element; and
a control unit for determining a storage amount of the dust stored in the dust container by using the magnetic information of the magnetic sensor.

[12] The vacuum cleaner according to embodiment 11, further comprising:

a power transmission transmitting the driving force from an outside to the pressing element, wherein the magnetic element is provided in the power transmission, and the magnetic sensor is provided in the dust collector mounting element.

[13] The vacuum cleaner according to embodiment 12, wherein the power transmission is a gear, and the magnetic sensor is disposed within the range of an imaginary circle the way that the magnetic element develops while the gear rotates.
[14] The vacuum cleaner according to embodiment 11, wherein determining the amount of dust is accomplished by,
checking whether the pressing element is disposed at the reference position, and measuring the turnaround time of the pressing element that takes the pressing element to return to the reference position by being rotated in a counter-clockwise or clockwise direction, after the pressing element is rotated from the reference position in a clockwise or counter-clockwise direction.
[15] The vacuum cleaner according to embodiment 14, wherein the reference position is a state that the magnetic sensor detects magnetism of the magnetic element.
[16] The vacuum cleaner according to embodiment 14, further comprising:

a signal display which displays dust empty signal when the determined amount of dust is greater than the reference amount.

[17] A vacuum cleaner, comprising:

a cleaner body in which a dust collector mounting element is formed;
a dust collector detachably attached to the dust collector mounting element, in which a dust container is formed;
a pressing element provided in the dust container to press dust stored in the dust container;
an installation sensor provided in the dust collector mounting element to detect whether the dust collector is correctly mounted; and
a position sensor provided in the dust collector mounting element to detect a position of the pressing element.

[18] The vacuum cleaner according to embodiment 17, further comprising:

a compression motor for generating power; and
a power transmission for transmitting the power of the compression motor to the pressing element.

[19] The vacuum cleaner according to embodiment 18, wherein a magnetic element is provided in the power transmission, and the installation sensor and the position sensor detect magnetism of the magnetic element.
[20] The vacuum cleaner according to embodiment 19, further comprising:

a control unit for determining the amount of dust stored in the dust collector by using the position information of the pressing element detected by the position sensor.

## Claims

**1.** A vacuum cleaner, comprising: a cleaner body (100) in which a suction motor is provided; a dust collector (200) selectively attached to the cleaner body (100), in which a dust container (214, 216) is formed; wherein the vacuum cleaner further comprises:

a pressing element (270) for pressing dust stored in the dust container (214);
**characterized in that** the vaccum cleaner further comprises :

a compression motor (430) for driving the pressing element (270);
an installation sensor (440) provided in a dust collector mounting element (170) to detect whether the dust collector (200) is mounted;
a signal display (530) for displaying the installation of the dust collector (200); and
a control unit (510) for controlling the operation of the signal display depending on the installation of the dust collector (530).

**2.** The vacuum cleaner according to claim 1, wherein the installation sensor (440) is disposed below the dust collector (200) when the dust collector (200) is mounted on the dust collector mounting element (170).

**3.** The vacuum cleaner according to claim 1, further comprising:

a power transmission which transmits the power of the compression motor (430) to the pressing element,
wherein the power transmission includes a driving gear (420) connected to the compression motor (430) and a driven gear (410) connected to the pressing element (270).

**4.** The vacuum cleaner according to claim 3, wherein the driven gear (410) includes a magnetic element (415), and the installation sensor (440) detects magnetism of the magnetic element (415).

**5.** The vacuum cleaner according to claim 4, wherein the installation sensor (440) is a hall sensor.

**6.** The vacuum cleaner according to claim 1, wherein the installation sensor (440) includes a terminal (650) which is pressed when mounting the dust collector (200), and a microswitch (640) connected to the terminal (650).

**7.** The vacuum cleaner according to claim 1, wherein the dust collector uninstallation signal is displayed at the signal display (530) when the suction motor is activated in a state that the dust collector (200) is not installed therein.

**8.** The vacuum cleaner according to claim 1, further comprising:

a position sensor (450) for detecting the position of the pressing element (270), wherein the control unit (510) determines the amount of dust in the dust container (214) with reference to the position information detected by the position sensor (450).

**9.** The vacuum cleaner according to claim 8, further comprising:

a power transmission transmitting the power of the compression motor to the pressing element (270),
wherein the power transmission includes a driving gear (420) connected to the compression motor (430), and a driven gear (410) connected to the pressing element (270).

**10.** The vacuum cleaner according to claim 9, wherein the driven gear (410) is provided with a magnetic element (415), and the position sensor (450) detects magnetism of the magnetic element (415).

**11.** The vacuum cleaner according to claim 10, wherein the position sensor (450) is disposed within the range of an imaginary circle the way that the magnetic element (415) develops while the driven gear (410) rotates.

**12.** The vacuum cleaner according to claim 11, wherein determining the amount of dust is accomplished by, checking whether the pressing element (270) is disposed at the reference position, and measuring the turnaround time of the pressing element (270) that takes the pressing element (270) to return to the reference position by being rotated in a counter-clockwise or clockwise direction, after the pressing element (270) is rotated from the reference position in a clockwise or counter-clockwise direction.

**13.** The vacuum cleaner according to claim 12, wherein the reference position is a state that the position sensor (450) detects magnetism of the magnetic element (415).

**14.** The vacuum cleaner according to claim 8, wherein dust empty signal is displayed to an outside when the amount of dust stored in the dust container (200) is greater than a reference amount.

**Patentansprüche**

**1.** Staubsauger, der umfasst: einen Staubsaugerkörper (100), in dem ein Saugmotor vorgesehen ist; einen Staubsammler (200), der wahlweise an dem Staubsaugerkörper (100) befestigt ist und in dem ein Staubbehälter (214, 216) ausgebildet ist; wobei der Staubsauger ferner umfasst:

ein Presselement (270) zum Pressen von Staub, der in dem Staubbehälter (214) gespeichert ist;
**dadurch gekennzeichnet, dass** der Staubsauger ferner umfasst:

einen Kompressionsmotor (430) zum Antreiben des Presselements (270);
einen Installationssensor (440), der in einem Staubsammlerbefestigungselement (170) vorgesehen ist, um zu detektieren, ob der Staubsammler (200) befestigt ist;
eine Signalanzeigevorrichtung (530) zum Anzeigen der Installation des Staubsammlers (200); und
eine Steuereinheit (510) zum Steuern des Betriebs der Signalanzeigevorrichtung abhängig von der Installation des Staubsammlers (530)

**2.** Staubsauger nach Anspruch 1, wobei der Installationssensor (440) unterhalb des Staubsammlers (200) angeordnet ist, wenn der Staubsammler (200) auf dem Staubsammlerbefestigungselement (170) angebracht ist.

**3.** Staubsauger nach Anspruch 1, der ferner umfasst:

eine Kraftübertragung, die die Kraft des Kompressionsmotors (430) an das Presselement überträgt,
wobei die Kraftübertragung ein Antriebsrad (420), das mit dem Kompressionsmotor (430) verbunden ist, und ein angetriebenes Rad (410), das mit den Presselement (270) verbunden ist, enthält.

**4.** Staubsauger nach Anspruch 3, wobei das angetriebene Rad (410) ein magnetisches Element (415) enthält und der Installationssensor (440) den Magnetismus des magnetischen Elements (415) detektiert.

**5.** Staubsauger nach Anspruch 4, wobei der Installationssensor (440) ein Hall-Sensor ist.

**6.** Staubsauger nach Anspruch 1, wobei der Installationssensor (440) einen Anschluss (650), der gedrückt wird, wenn der Staubsammler (200) befestigt wird, und einen Mikroschalter (640), der mit dem Anschluss (650) verbunden ist, enthält.

**7.** Staubsauger nach Anspruch 1, wobei das Deinstallationssignal des Staubsammlers an der Signalanzeigevorrichtung (530) angezeigt wird, wenn der Saugmotor in einem Zustand aktiviert wird, in dem der Staubsammler (200) nicht darin installiert ist.

**8.** Staubsauger nach Anspruch 1, der ferner umfasst:

einen Positionssensor (450) zum Detektieren der Position des Presselements (270), wobei die Steuereinheit (510) die Staubmenge in dem Staubbehälter (214) mit Bezug auf die Positionsinformationen, die von dem Positionssensor (450) detektiert werden, bestimmt.

**9.** Staubsauger nach Anspruch 8, der ferner umfasst:

eine Kraftübertragung, die die Kraft des Kompressionsmotors an das Presselement (270) überträgt,
wobei die Kraftübertragung ein Antriebsrad (420), das mit dem Kompressionsmotor (430) verbunden ist, und ein angetriebenes Rad (410), das mit den Presselement (270) verbunden ist, enthält.

**10.** Staubsauger nach Anspruch 9, wobei das angetriebene Rad (410) mit einem magnetischen Element (415) versehen ist und der Positionssensor (450) den Magnetismus des magnetischen Elements (415) detektiert.

**11.** Staubsauger nach Anspruch 10, wobei der Positionssensor (450) innerhalb des Bereichs eines imaginären Kreises derart angeordnet ist, dass sich das magnetische Element (415) entwickelt, während sich das angetriebene Rad (410) dreht.

**12.** Staubsauger nach Anspruch 11, wobei das Bestimmen der Staubmenge erreicht wird durch:

Prüfen, ob das Presselement (270) an der Referenzposition angeordnet ist, und Messen der Umlaufzeit des Presselements (270), die das Presselement benötigt, um zu der Referenzposition zurückzukehren, indem es in einem Gegenuhrzeigersinn oder Uhrzeigersinn gedreht wird, nachdem das Presselement (270) von der Referenzposition im Uhrzeigersinn oder Gegenuhrzeigersinn gedreht wird.

**13.** Staubsauger nach Anspruch 12, wobei die Referenzposition ein Zustand ist, in dem der Positionssensor (450) Magnetismus des magnetischen Elements (415) detektiert.

**14.** Staubsauger nach Anspruch 8, wobei ein Staub-entleeren-Signal nach außen angezeigt wird, wenn die Staubmenge, die in dem Staubbehälter (200) gespeichert ist, größer als eine Referenzmenge ist.

**Revendications**

1. Aspirateur, comprenant : un corps d'aspirateur (100) dans lequel est prévu un moteur à succion ; un collecteur de poussière (200) sélectivement attaché au corps d'aspirateur (100), dans lequel est formé un conteneur à poussière (214, 216) ; dans lequel l'aspirateur comprend encore :

   un élément presseur (270) pour presser la poussière stockée dans le conteneur à poussière (214) ;
   **caractérisé en ce que** l'aspirateur comprend encore :

   un moteur de compression (430) pour entraîner l'élément presseur (270) ;
   un capteur d'installation (440) prévu dans un élément de montage de collecteur de poussière (170) pour détecter si le collecteur de poussière (200) est monté ;
   un afficheur de signal (530) pour afficher l'installation du collecteur de poussière (200) ; et
   une unité de commande (510) pour commander le fonctionnement de l'afficheur de signal en dépendance de l'installation du collecteur de poussière (530).

2. Aspirateur selon la revendication 1, dans lequel le capteur d'installation (440) est disposé au-dessous du collecteur de poussière (200) quand le collecteur de poussière (200) est monté sur l'élément de montage de collecteur de poussière (170).

3. Aspirateur selon la revendication 1, comprenant en outre :

   une transmission de puissance qui transmet la puissance du moteur de compression (430) à l'élément presseur,
   dans lequel la transmission de puissance inclut un engrenage d'entraînement (420) connecté au moteur de compression (430) et un engrenage mené (410) connecté à l'élément presseur (270).

4. Aspirateur selon la revendication 3, dans lequel l'engrenage mené (410) inclut un élément magnétique (415), et le capteur d'installation (440) détecte le magnétisme de l'élément magnétique (415).

5. Aspirateur selon la revendication 4, dans lequel le capteur d'installation (440) est un capteur de Hall.

6. Aspirateur selon la revendication 1, dans lequel le capteur d'installation (440) inclut une borne (650) qui est pressée lorsqu'on monte le collecteur de poussière (200), et un microcommutateur (640) connecté à la borne (650).

7. Aspirateur selon la revendication 1, dans lequel un signal d'absence d'installation de collecteur de poussière est affiché sur l'afficheur de signal (530) quand le moteur de succion est activé dans un état dans lequel le collecteur de poussière (200) n'est pas installé à l'intérieur.

8. Aspirateur selon la revendication 1, comprenant en outre :

   un capteur de position (450) pour détecter la position de l'élément presseur (270), dans lequel l'unité de commande (510) détermine la quantité de poussière dans le conteneur à poussière (214) par référence à l'information de position détectée par le capteur de position (450).

9. Aspirateur selon la revendication 8, comprenant en outre :

   une transmission de puissance qui transmet la puissance du moteur de compression à l'élément presseur (270),
   dans lequel la transmission de puissance inclut un engrenage d'entraînement (420) connecté au moteur de compression (430), et un engrenage mené (410) connecté à l'élément presseur (270).

10. Aspirateur selon la revendication 9, dans lequel l'engrenage mené (410) est pourvu d'un élément magnétique (415), et le capteur de position (450) détecte le magnétisme de l'élément magnétique (415).

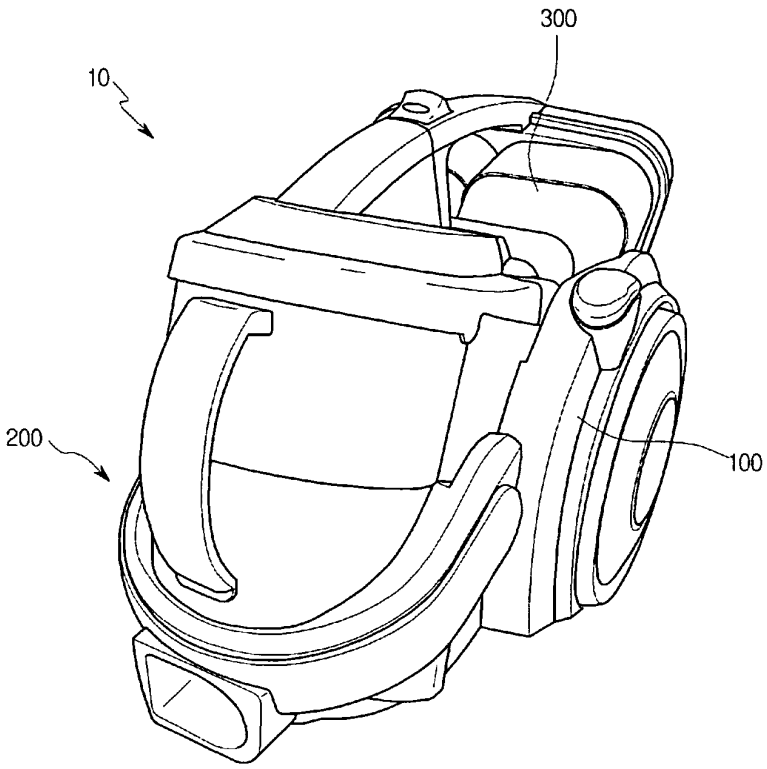
11. Aspirateur selon la revendication 10, dans lequel le capteur de position (450) est disposé dans l'étendue d'un cercle imaginaire sur le chemin que l'élément magnétique (415) développe lorsque l'engrenage mené (410) est en rotation.

12. Aspirateur selon la revendication 11, dans lequel la détermination de la quantité de poussière est accomplie
    en vérifiant si l'élément presseur (270) est disposé à la position de référence, et
    en mesurant le temps de déplacement de l'élément presseur (270) que l'élément presseur (270) prend pour retourner à la position de référence en étant mis en rotation dans le sens inverse aux aiguilles d'une montre ou dans le sens des aiguilles d'une montre, après que l'élément presseur (270) a été tourné depuis la position de référence dans le sens des aiguilles d'une montre ou dans le sens inverse aux aiguilles d'une montre.

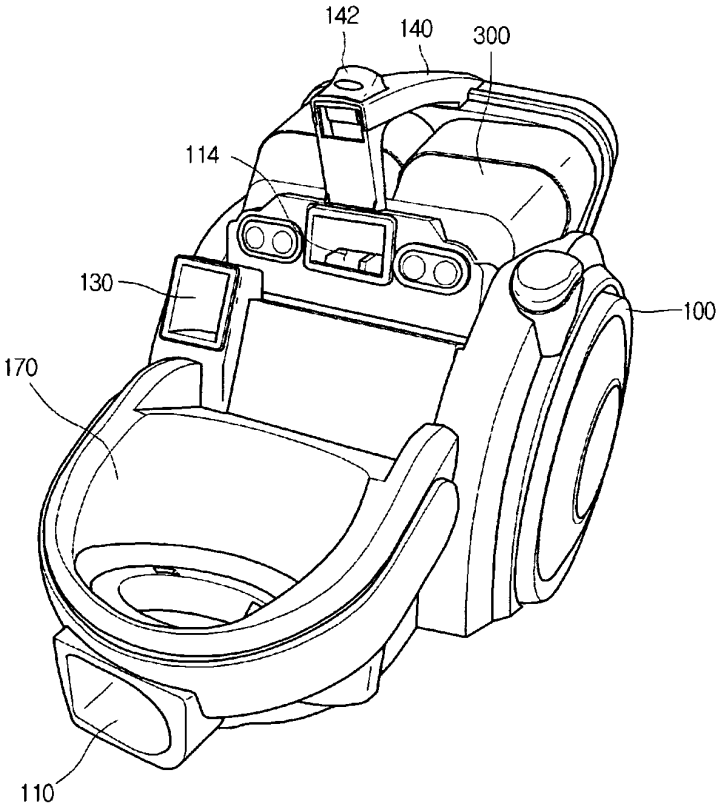
**13.** Aspirateur selon la revendication 12, dans lequel la position de référence est un état dans lequel le capteur de position (450) détecte le magnétisme de l'élément magnétique (415).

**14.** Aspirateur selon la revendication 8, dans lequel un signal de vidage de poussière est affiché à l'extérieur quand la quantité de poussière stockée dans le conteneur à poussière (200) est supérieure à une quantité de référence.

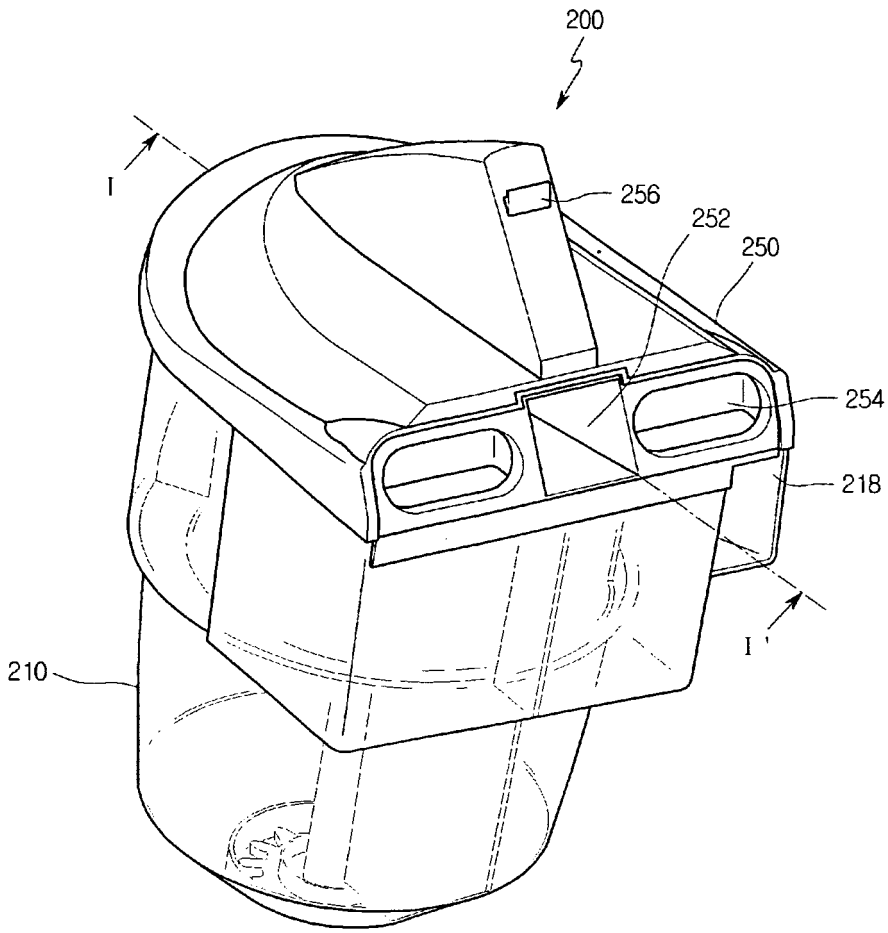
[Fig. 1]



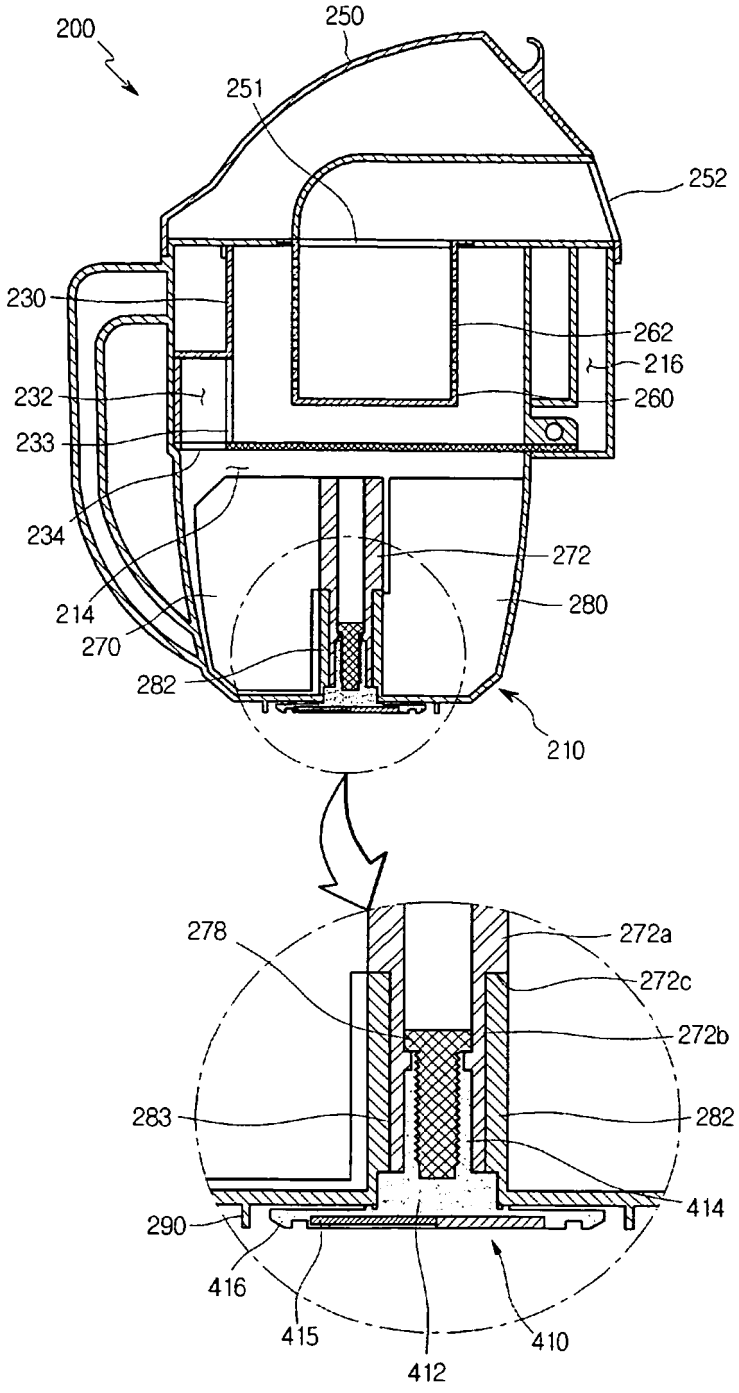

[Fig. 2]



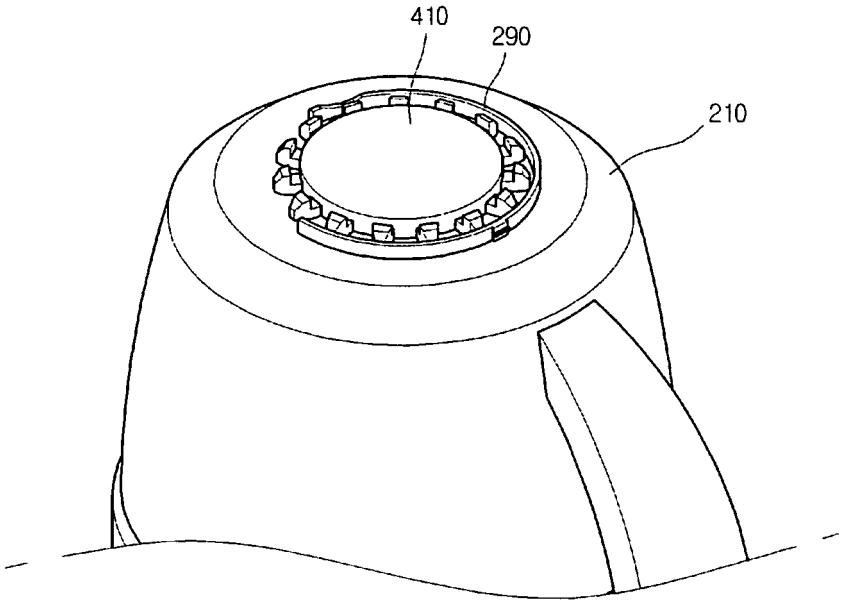
[Fig. 3]



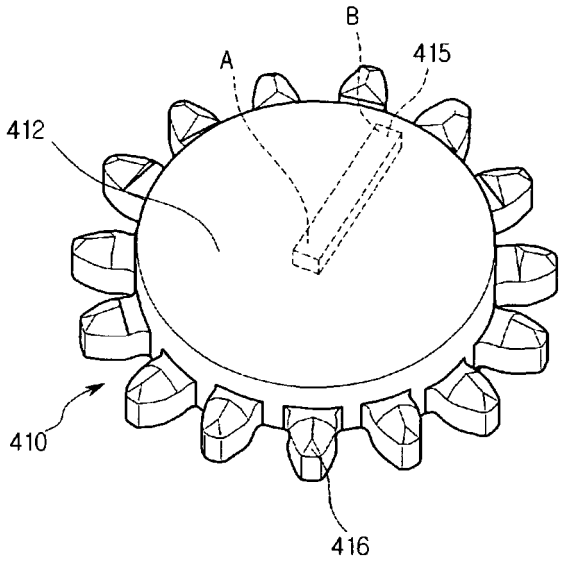
[Fig. 4]


200
250
251
252
230
262
216
232
260
233
234
272
214
280
270
282
210
278
272a
272c
272b
283
282
414
290
416
415
412
410

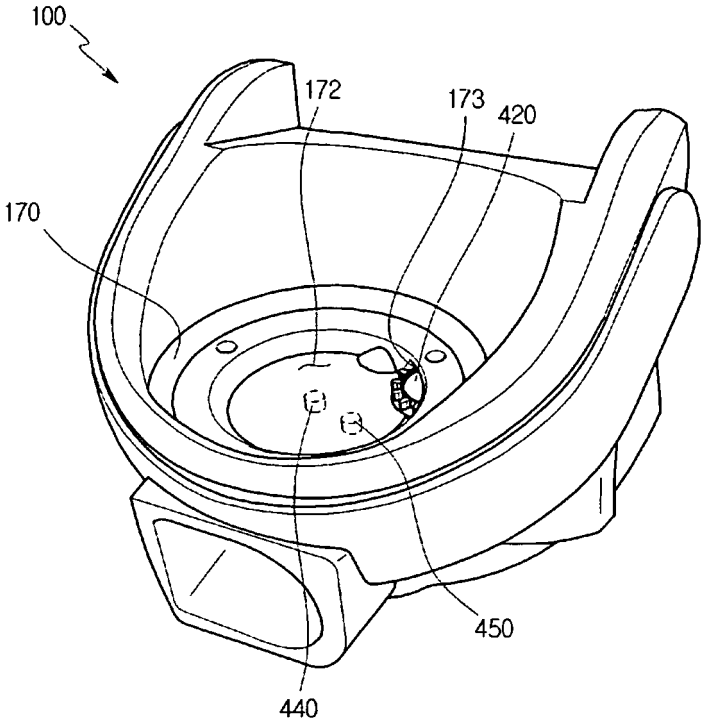
[Fig. 5]



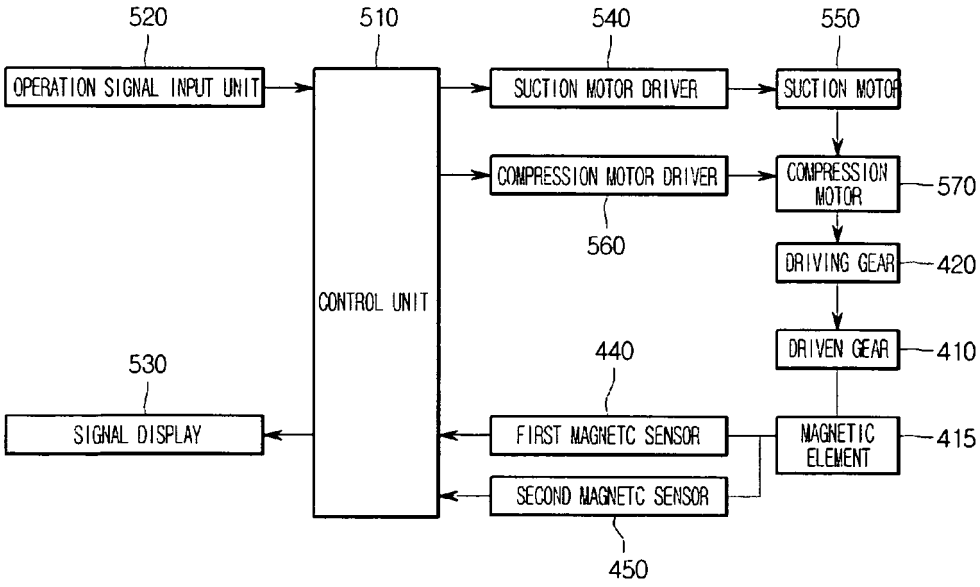

[Fig. 6]



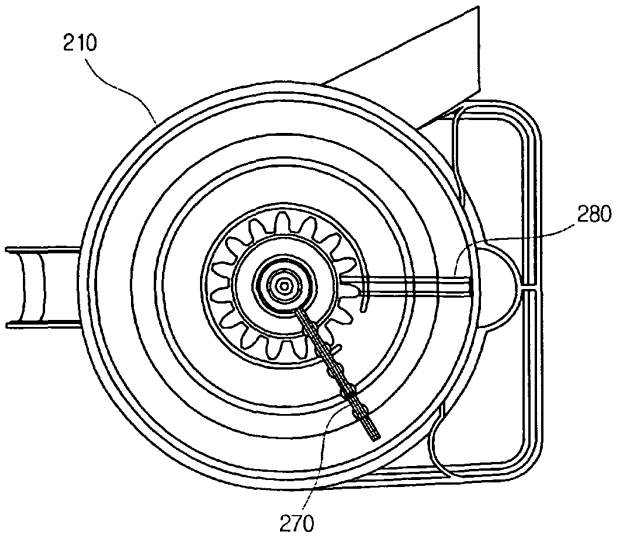
[Fig. 7]


100
172
173
420
170
450
440

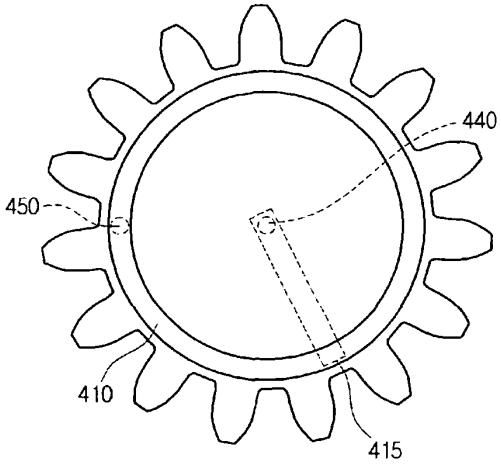
[Fig. 8]


520
510
540
550
OPERATION SIGNAL INPUT UNIT
SUCTION MOTOR DRIVER
SUCTION MOTOR
COMPRESSION MOTOR DRIVER
COMPRESSION MOTOR
570
560
DRIVING GEAR
420
CONTROL UNIT
DRIVEN GEAR
410
440
530
SIGNAL DISPLAY
FIRST MAGNETC SENSOR
MAGNETIC ELEMENT
415
SECOND MAGNETC SENSOR
450

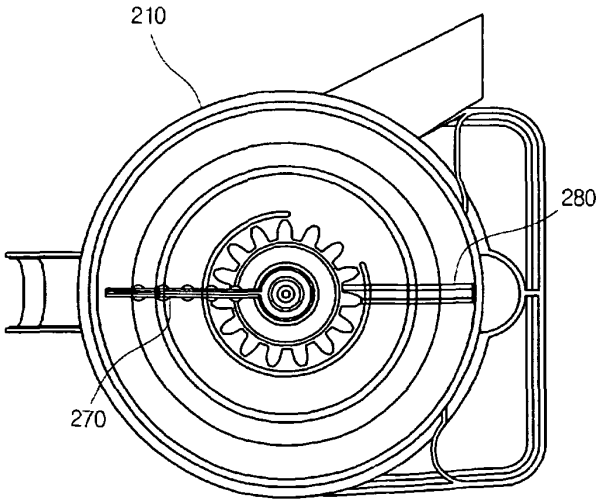
[Fig. 9]



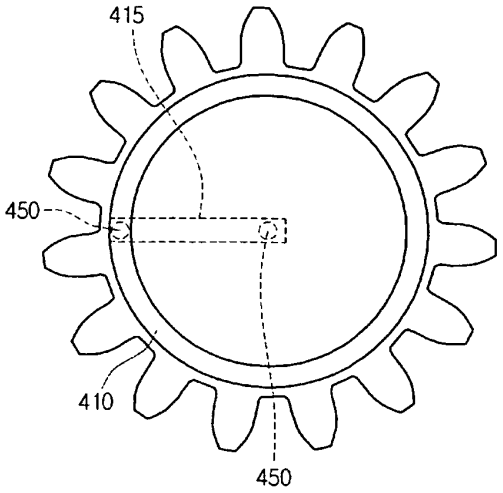

[Fig. 10]



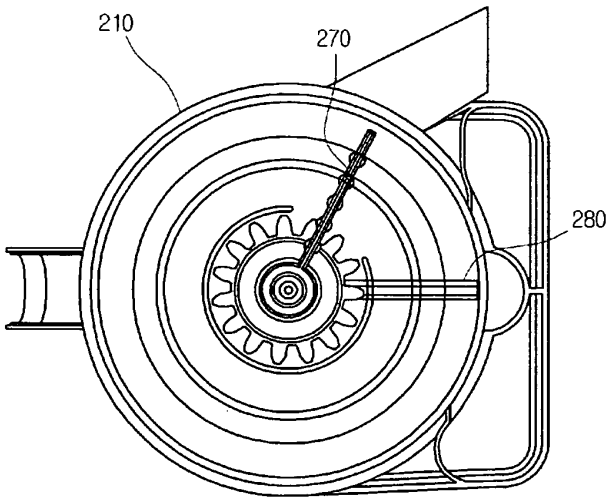

[Fig. 11]



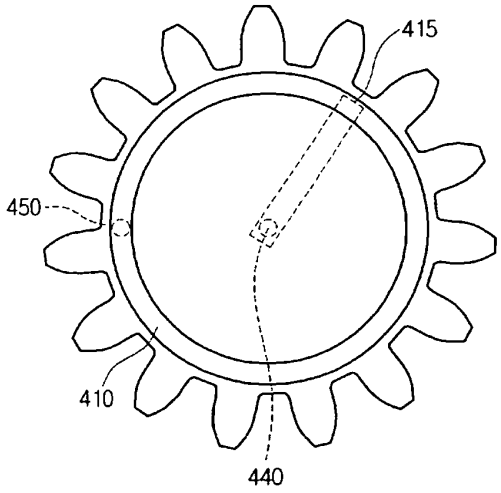
[Fig. 12]



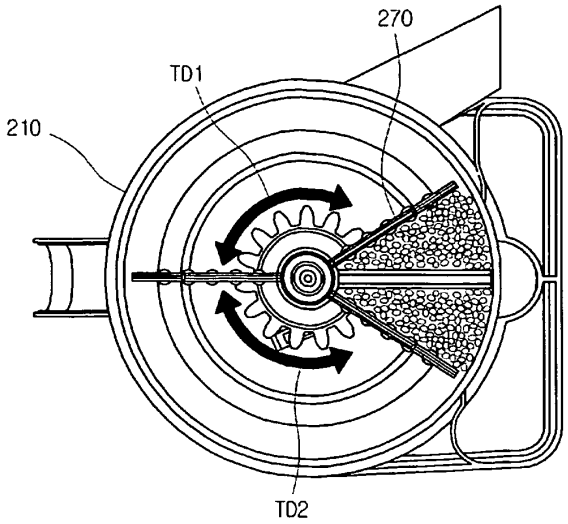

[Fig. 13]



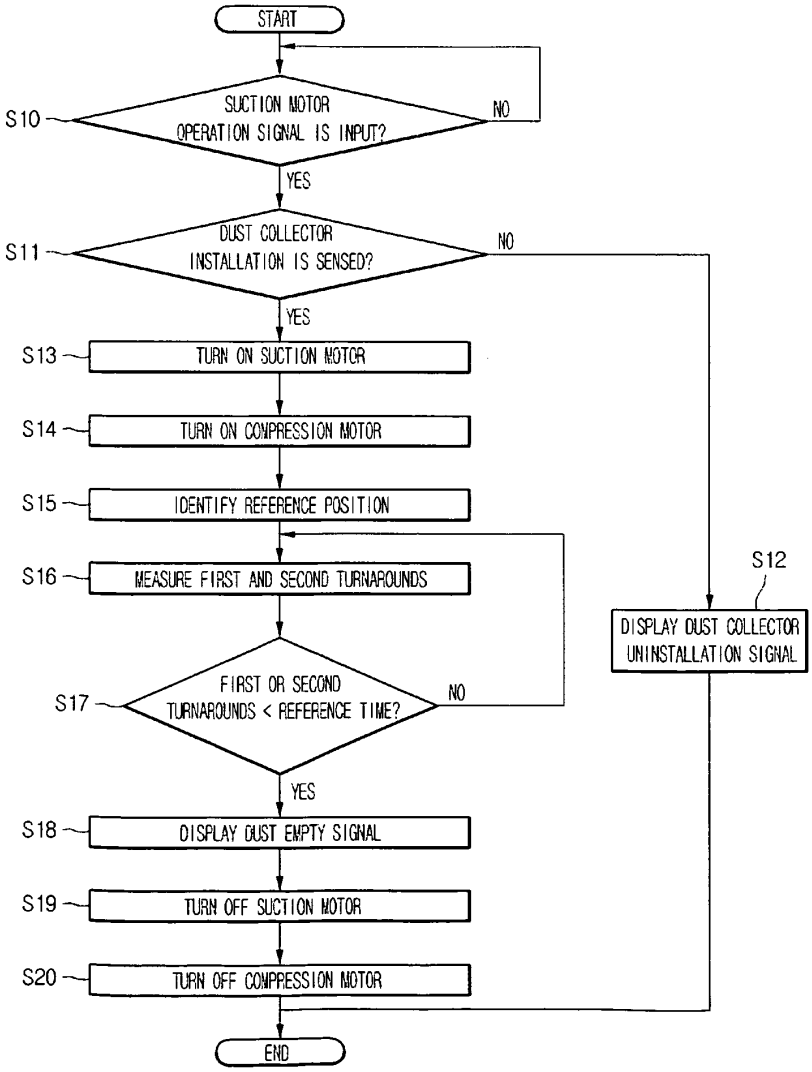

[Fig. 14]



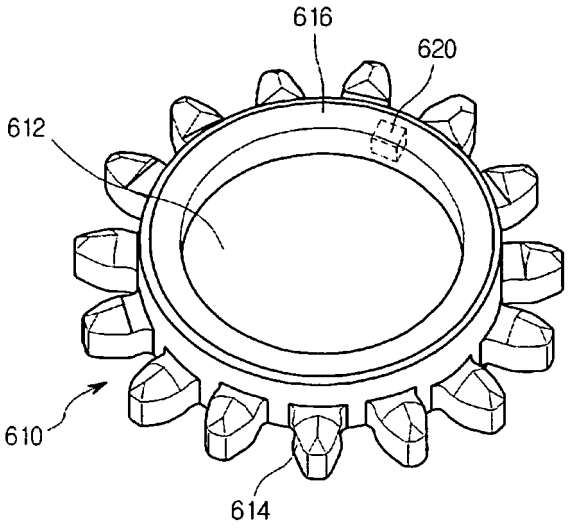
[Fig. 15]


270
TD1
210
TD2

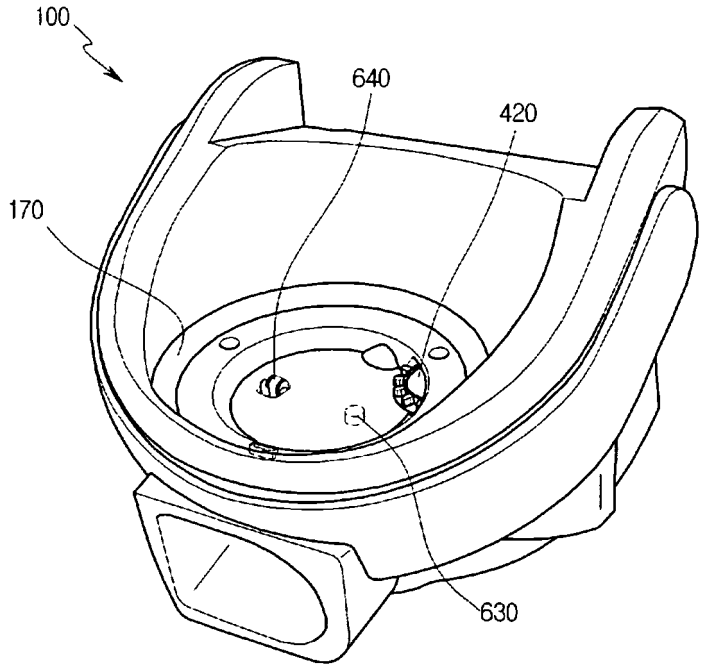
[Fig. 16]


START
S10
SUCTION MOTOR OPERATION SIGNAL IS INPUT?
NO
YES
S11
DUST COLLECTOR INSTALLATION IS SENSED?
NO
YES
S13
TURN ON SUCTION MOTOR
S14
TURN ON COMPRESSION MOTOR
S15
IDENTIFY REFERENCE POSITION
S16
MEASURE FIRST AND SECOND TURNAROUNDS
S17
FIRST OR SECOND TURNAROUNDS < REFERENCE TIME?
NO
YES
S18
DISPLAY DUST EMPTY SIGNAL
S19
TURN OFF SUCTION MOTOR
S20
TURN OFF COMPRESSION MOTOR
END
S12
DISPLAY DUST COLLECTOR UNINSTALLATION SIGNAL

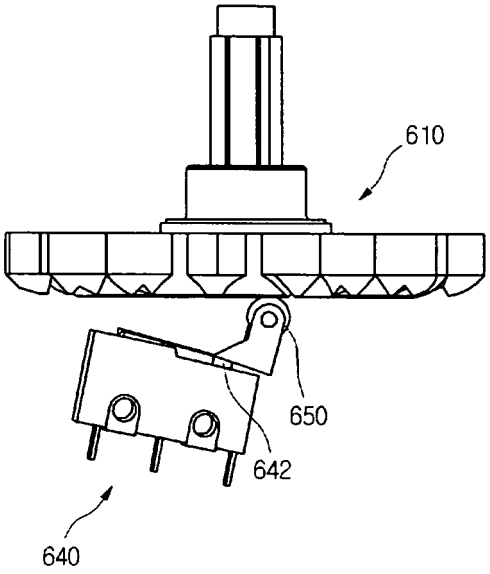
[Fig. 17]




[Fig. 18]



[Fig. 19]



## REFERENCES CITED IN THE DESCRIPTION

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### Patent documents cited in the description


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