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

(11) EP 1 621 125 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
01.02.2006 Bulletin 2006/05

(51) Int Cl.:
A47L 9/04 *(2006.01)* ***A47L 9/00*** *(2006.01)*

(21) Application number: **05254803.9**

(22) Date of filing: **01.08.2005**

(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 NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR MK YU

(30) Priority: **30.07.2004 KR 2004060413**

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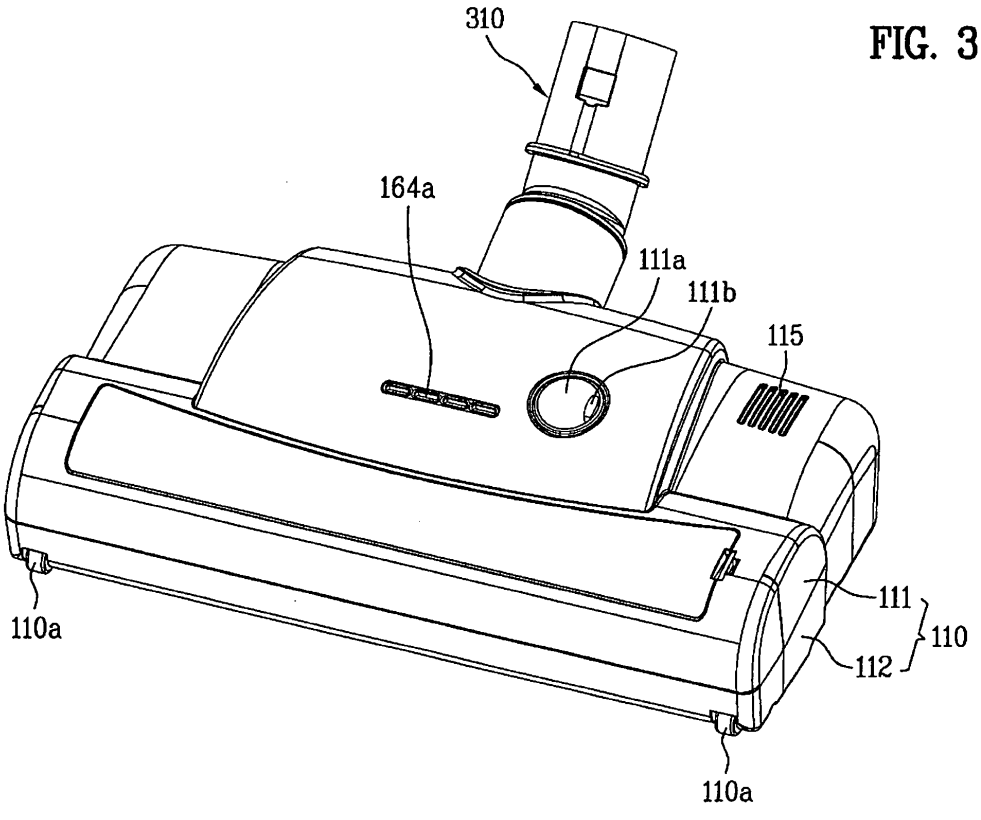
(54) Intake nozzle and vacuum cleaner having the same

(57) An intake nozzle (100) and vacuum cleaner having the same are disclosed, by which a rotational speed of an agitator is variable. The present invention includes a nozzle case (110), a first air intake port (120) provided to a bottom of the nozzle case to suck an air containing dust by an air intake force generated from driving an air intake device, an agitator (130) rotatably provided to the first air intake port (120) to agitate the dust on a floor, and a speed adjusting device varying a rotational speed of the agitator (130).

FIG. 3



EP 1 621 125 A2

Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a vacuum cleaner, and more particularly, to an intake nozzle and vacuum cleaner having the same. Although the present invention is suitable for a wide scope of applications, it is particularly suitable for adjusting a rotational speed of an agitator.

Discussion of the Related Art

[0002] Generally, a vacuum cleaner is an appliance for cleaning a carpet, a normal room floor and the like. In a vacuum cleaner, polluted air containing particles is sucked up by driving an air intake device provided within a cleaner body to generate an air-sucking force, the particles are separated from the polluted air for dust collecting, and the particle-removed air is then discharged to an outside of the cleaner.

[0003] The vacuum cleaner consists of a cleaner body (not shown in the drawing) provided with an air intake device (not shown in the drawing) including a motor and a blower and a dust collector (not shown in the drawing) collecting the particles separated from the polluted air, an intake nozzle 10 moving along a bottom to be cleaned to suck the polluted air along a bottom to be cleaned to suck the polluted air containing the particles, and a connecting pipe (not shown in the drawing) guiding the air sucked by the intake nozzle to the dust collector of the cleaner body.

[0004] Wheels are provided under both sides of the cleaner body to facilitate a motion of the cleaner body. And, the dust collector of the cleaner body includes a cyclon type dust-collecting box or a general filtering type dust-collecting bag.

[0005] And, the connecting pipe includes an extension pipe 5 having one end connected to the intake nozzle, a flexible connecting hose having one end connected to the other end of the extension pipe and the other end connected to the cleaner body, and a handle provided to the other end of the extension pipe.

[0006] An intake nozzle provided to a general vacuum cleaner according to a related art is explained with reference to FIG. 1 as follows.

[0007] Referring to FIG. 1, an intake nozzle 10 according to a related art includes a nozzle case having an upper case (not shown in the drawing) configuring an exterior and a lower case 11 to have an empty space therein and an air intake port 12 provided to a bottom of the nozzle case, i.e., a bottom of the lower case. turbine 14 provided within the nozzle case to rotate the agitator 13.

[0008] Rollers 15 are provided to both front sides of the lower case to smooth a motion of the intake nozzle 10.

[0009] And, rotational shafts (not shown in the drawing) supported by both ends of the air intake port 12 are projected from both ends of the agitator 13 to work as a rotation center of the agitator 13. And, a spiral brush 13a is provided to an outer circumference of the agitator 13 to facilitate particles to be separated from the floor.

[0010] Meanwhile, the rotational turbine 14 is configured to be rotated by the air introduced via the air intake port 12 to flow toward the extension pipe 5. And, the rotational turbine 14 is connected to the agitator by a belt 16. A driven pulley 17 and a driving pulley 18 are provided to the agitator 13 and a rotational shaft of the rotational turbine 14, respectively. And, the belt 16 is hung on the driven and driving pulleys 17 and 18. Hence, a rotational force of the rotational turbine 14 is transferred to the agitator 13.

[0011] An operation of the above-configured related art intake nozzle 10 is explained as follows.

[0012] First of all, once the air is introduced via the air intake port 12 by the driven air intake device, the introduced air flows toward the extension pipe 5 to rotate the rotational turbine 12.

[0013] The rotational force of the rotating rotational turbine 14 is transferred to the agitator 13 via the belt 16 to rotate the agitator 13. While the agitator 13 is being rotated, the brush 12a can separate particles from the floor.

[0014] The particles separated from the floor in the above-explained manner are introduced into the air intake port together with air to be guided to the dust-collector of the cleaner body via the extension pipe.

[0015] In doing so, the dust collector removes the particles from the polluted air having been introduced into the dust collector to discharge the particle-removed air to an outside of the cleaner body.

[0016] However, in the above-configured related art intake nozzle of the vacuum cleaner 10, since the agitator keeps rotating at a constant RPM regardless of a status of the floor to be cleaned, the demand for an intake nozzle of a vacuum cleaner having an agitator rotating at a variable rotational speed rises recently.

SUMMARY OF THE INVENTION

[0017] Accordingly, the present invention is directed to an intake nozzle and vacuum cleaner having the same that substantially obviate one or more problems due to limitations and disadvantages of the related art.

[0018] An object of the present invention is to provide an intake nozzle and vacuum cleaner having the same, by which a rotational speed of an agitator is variable.

[0019] Additional advantages, objects, and features of the invention will be set forth in part in the description which follows and in part will become apparent to those having ordinary skill in the art upon examination of the following or may be learned from practice of the invention. The objectives and other advantages of the invention may be realized and attained by the structure particularly pointed out in the written description and claims hereof as well as the appended drawings.

[0020] To achieve these objects and other advantages and in accordance with the purpose of the invention, as embodied and broadly described herein, an intake nozzle of a vacuum cleaner according to the present invention includes a nozzle case, a first air intake port provided to a bottom of the nozzle case to suck an air containing dust by an air intake force generated from driving an air intake device, an agitator rotatably provided to the first air intake port to agitate the dust on a floor, and a speed adjusting device varying a rotational speed of the agitator.

[0021] Preferably, the speed adjusting device raises the rotational speed of the agitator if the nozzle case is landed on the floor and wherein the speed adjusting device lowers the rotational speed of the agitator if the nozzle case is separated from on the floor.

[0022] Preferably, the speed adjusting device varies the rotational speed of the agitator according to a status of the floor on which the nozzle case is landed.

[0023] Preferably, the speed adjusting device includes a rotational turbine provided to an air passage formed within the nozzle case to rotate the agitator, the rotational turbine rotated by a flow of the air introduced via the first air intake port and an air flow adjusting device provided to the nozzle case to vary a rotational speed of the rotational turbine by adjusting a flux of the air introduced into the first air intake port.

[0024] More preferably, the air flow adjusting device includes a chamber provided to the air passage of the nozzle case, the chamber provided with a second air intake port through which the air introduced via the first air intake port passes and an external air supply port via which an external air introduced via one side of the nozzle case passes, the chamber accommodating the rotational turbine rotated by the air introduced via the second air intake port and a cut-off unit adjusting an opening degree of the external air supply port to adjust a flux of the air passing through the second air intake port.

[0025] More preferably, the cut-off unit includes a cut-off plate opening/closing the external air supply port and a lever unit connected to the cut-off plate to adjust the cut-off plate, the lever unit increasing a flux of the air sucked into the first air intake port in case of being pressed by the floor.

[0026] More preferably, the lever unit includes a first lever having one side connected to the cut-off plate and the other side rotatably connected to a rotational shaft provided within the nozzle case and a second lever having one side configured to apply a force to the first lever and the other side configured to be pressed by the floor by being projected beneath the nozzle case.

[0027] More preferably, the first lever is elastically supported by a first spring and the first spring returns the cut-off plate in a direction of opening the external air supply port.

[0028] More preferably, a prescribed position between both ends of the second lever is rotatably connected to a lower part of the nozzle case.

[0029] More preferably, a display window is provided to a topside of the nozzle case to check out the opening degree of the external air supply port.

[0030] More preferably, the second lever moves the cut-off plate connected to the first lever to a position in the vicinity of the external air supply port.

[0031] More preferably, the cut-off plate completely cuts off the external air supply port by an intake force within the chamber at a position in the vicinity of the external air supply port.

[0032] More preferably, the air flow adjusting device further includes an auxiliary air passage guiding the external air to an inside of the chamber to rotate the rotational turbine and a passage opening/closing portion selectively opening the auxiliary air passage to prevent the air passage form being blocked.

[0033] More preferably, the passage opening/closing portion includes an elastic member opened/closed by a difference between a pressure within the chamber and an atmospheric pressure outside the nozzle case.

[0034] There is also provided, a vacuum cleaner including a cleaner body provided with a dust collector collecting dust by separating dust and an intake nozzle communicating with the dust collector of the cleaner body, the intake nozzle moving along a floor to suck an air including the dust. And, the intake nozzle includes a nozzle case, a first air intake port provided to a bottom of the nozzle case to suck the air including the dust by an air intake force generated from driving an air intake device, an agitator rotatably provided to the first air intake port to agitate the dust on the floor, and a speed adjusting device varying a rotational speed of the agitator.

[0035] It is to be understood that both the foregoing general description and the following detailed description of the present invention are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0036] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this application, illustrate embodiment(s) of the invention and together with the description serve to explain the principle of the invention. In the drawings:

FIG. 1 is a perspective diagram of an intake nozzle of a vacuum cleaner according to a related art;

FIG. 2 is a perspective diagram of a vacuum cleaner having an intake nozzle according to the present invention;

FIG. 3 is a perspective diagram of an intake nozzle according to one embodiment of the present invention;

FIG. 5 is a bottom diagram of an intake nozzle according to the present invention;

FIG. 6 is a cross-sectional diagram of the intake nozzle in FIG. 4 along a cutting line in right-to-left direc-

tion centering on a lever part;

FIG. 7 is a cross-sectional diagram of the intake nozzle in FIG. 4 along a cutting line in front-to-rear direction; and

FIG. 8 is a perspective diagram of an intake nozzle of a vacuum cleaner according to the present invention, in which the intake nozzle shows a maximum sucking force;

DETAILED DESCRIPTION OF THE INVENTION

[0037] Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts.

[0038] First of all, vacuum cleaners are classified into a canister type vacuum cleaner and an upright type vacuum cleaner in general.

[0039] The canister type vacuum cleaner includes a cleaner body, an intake nozzle separated from the cleaner body, and a connecting pipe mutually connecting the cleaner body and the intake nozzle together.

[0040] And, the upright type vacuum cleaner includes an intake nozzle and a cleaner body joined to an upper part of the intake nozzle.

[0041] In the present embodiment, the canister type vacuum cleaner is described as a vacuum cleaner having an intake nozzle according to one embodiment of the present invention.

[0042] Referring to FIGs. 2 to 5, a vacuum cleaner having an intake nozzle according to one embodiment of the present invention includes an intake nozzle 100 moving along a floor to suck an air containing particles, a cleaner body 200, and a connecting pipe 300 mutually connecting the intake nozzle 100 and the cleaner body 200 together to guide a polluted air to the cleaner body 200.within the leaner body 200 provided are an air intake device (not shown in the drawing) generating an air intake force and an electric/electronic unit (not shown in the drawing) to control the vacuum cleaner.

[0043] The air intake device includes a motor and a fan. Wheels are rotatably provided to both sides of the cleaner body 200 to enable the cleaner body 200 to move on the floor smoothly, respectively. And, an exhaust portion 221 is provided to each of the wheels 220 to discharge an particle-removed air.

[0044] A dust collector 210 is detachably provided to a front side of the cleaner body 200 for the separation and storage of the particles such as dust and the like. And, a dust collector loading space is provided to the front side of the cleaner body 200 to accommodate the dust collector 210.

[0045] In this case, the particles such as dust and the like are introduced into the dust collector 210 to be collected by a cyclon system or a filtration system using a filter device.

[0046] Optionally, the dust collector 210 can collect dust using both of the cyclon system and the filtration system using the filter device.

[0047] The connecting pipe 300 includes a hard extension pipe 310 having one end connected to the intake nozzle 100, a flexible connecting hose 330 having one end connected to the other end of the extension pipe 310 and the other end connected to the cleaner body 200, and a handle 320 provided to a portion of the other end of the extension pipe 310.

[0048] A configuration of the intake nozzle 100 according to the present invention is explained with reference to FIGs. 3 to 8 as follows.

[0049] Referring to FIGs. 3 to 6, the intake nozzle 100 includes a nozzle case forming an exterior, a first air intake port 120 provided to a bottom o the nozzle case 110, an agitator 130 rotatably provided to the first air intake port 120 to separate particles from a floor, and a speed adjusting device adjusting a rotational speed of the agitator 130.

[0050] In this case, the nozzle case 110 includes an upper case 111 and a lower case 112 provided under the upper case 111. And, a prescribed space is provided within the nozzle case 110 to accommodate the speed adjusting device adjusting the rotational speed of the agitator 130 and the like.

[0051] And, moving wheels 110a are rotatably provided to both lower front sides and a lower rear part of the lower case 112, respectively to facilitate a movement of the intake nozzle 110.

[0052] The first air intake port 120 is formed long in right-to-left direction to perforate a front part of the lower case 112. Hence, by an air intake force generated from the driven air intake device, external air is introduced into the nozzle case 110 together with the particles on the floor via the first air intake port 120 and is then introduced into the extension pipe 310 via an air passage provided within the nozzle case 110.

[0053] The agitator 120 includes a cylindrical body 131, a rotational shaft (not shown in the drawing) projected from both ends of the body 131 in a lateral direction, and a dust agitating portion 132 agitating dust on the floor to be cleaned.

[0054] The rotational shaft is detachably assembled to both sides of the first air intake port 120 and is rotatably connected to a rotational shaft loading portion 133 fixed by the lower and upper cases 112 and 111.

[0055] In particular, the rotational shaft is rotatably inserted in an insertion recess (not shown in the drawing) provided to the rotational shaft loading portion 133.

[0056] The dust agitating portion 132 includes a plurality of 'V' type grooves formed on an outer circumference of the agitator body 131 in a length direction. Alternatively, the dust agitating portion 132 can include a groove formed on the outer circumference of the body 131 in a spiral direction, a brush provided to the outer circumference of the body 1331 in the spiral direction or the like.

[0057] Meanwhile, the speed adjusting device raises the rotational speed of the agitator 130 if the nozzle case 110 of the intake nozzle is landed on the floor or lowers the rotational speed of the agitator 130 if the nozzle case 110 is separated from the floor.

[0058] Alternatively, the speed adjusting device can be configured to vary the rotational speed of the agitator 130 according to a status of the floor on which the nozzle case 110 is landed. Namely, the rotational speed of the agitator 130 varies according to a degree of pressurization applied to a bottom of the nozzle case 110 by the floor.

[0059] For this, the speed adjusting device includes a rotating device rotated by a flow of air sucked via the first air intake port 120 to rotate the agitator and an air flow adjusting device varying a rotational speed of the rotating device by adjusting a flux of the air sucked via the first air intake port 120.

[0060] The rotating device includes a rotational turbine 140 provided within the nozzle case 110 to guide the air sucked via the first air intake port 120 to the extension pipe 310.

[0061] The rotational turbine 140 is rotated by a flow of the air introduced via the first air intake port 120, and a plurality of wings 141 are provided to a circumference of the rotational turbine 140.

[0062] In particular, the rotational turbine 140 is rotatably accommodated within a prescribed chamber 113 provided to the air passage within the nozzle case 110.

[0063] Hence, the chamber 113 is provided between the first air intake port 120 and the extension pipe 310 to be passed through by the air sucked via the first air intake port 120.

[0064] While passing through the chamber 113, the air introduced via the first air intake port 120 collides with the wings 141 of the rotational turbine 140 to rotate the rotational turbine 140.

[0065] In doing so, the rotational speed of the agitator 130 varies directly as the rotational speed of the rotational turbine. In the present embodiment, the rotational turbine 140 transfers a rotational force to the agitator 130 via a belt 142.

[0066] In particular, a turbine rotational shaft 143 extending in one direction to a predetermined length is provided to a center of the rotational turbine 140 and the belt 42 is wound on a driving pulley 144 provided to the turbine rotational shaft 143 and a driven pulley 134 provided to the rotational shaft of the agitator 130, whereby the rotational force of the rotational turbine is transferred to the agitator 130.

[0067] Preferably, rugged portions (not shown in the drawings) are provided to outer circumferential surfaces of the driving and driven pulleys 144 and 134 and an inside surface of the belt 142 to prevent the belt 142 from slipping. Preferably, a diameter of the driving pulley 144 is smaller than that of the driven pulley 134.

[0068] And, the turbine rotational shaft 143 is rotatably inserted in a packing portion 145 to be supported. In this case, the packing portion 145 is supported by a first support portion 114 provided to the lower case 112 and a second support portion (not shown in the drawings) provided to the upper case 111.

[0069] The air flow adjusting device, which is provided to the nozzle case 110, adjusts a flux of the air rotating the rotational turbine 140 to change the rotational speed of the agitator 130 according to whether the nozzle case 110 is landed on the floor and/or according to a status of the floor.

[0070] In this case, the status of the floor means a surface state of the floor to be cleaned such as a hard floor, which includes a wooden floor, a laminated floor or the like, and a soft floor including a carpet, a bedding sheet or the like.

[0071] Meanwhile, the air flow adjusting device includes a second air intake port 150 provided to a prescribed position of a wall of the chamber 113 wherein the air having introduced via the first air intake port 120 passes through the second air intake port 150 to rotate the rotational turbine 140 and a flux adjusting portion 160 adjusting a flux of the air passing through the second air intake port 150 to rotate the rotational turbine 140.

[0072] In the present embodiment, the second air intake port 150 is provided to a front side of the chamber 113. And, a front wall of the chamber 113 extends in right-to-left direction to partition an internal space of the nozzle case 110 into front and rear spaces.

[0073] Hence, the air having introduced via the first air intake port 120 is introduced into the chamber 113 via the second air intake port 150 to rotate the rotational turbine 140.

[0074] And, the flux adjusting portion 160 includes an external air supply port 161 provided to one side wall of the chamber 113 to allow the external air introduced via one side of the nozzle case 110 to pass through and a cut-off unit 162 adjusting an opening degree of the external air supply port 161 to adjust a flux of the air introduced into the second air intake port 150.

[0075] In particular, a lateral side of the chamber 113 is perforated to form the external air supply port 161. And, an external air intake port 115 is formed at one side of the nozzle case to communicate with the external air supply port 161.

[0076] In this case, the external air intake port 115 is preferably formed at a prescribed position of the nozzle case 110, and more preferably, at one side of a rear portion of the upper case 110 so that the external air introduced into the rear space of the nozzle case can be introduced into the chamber via the external air supply port 161.

[0077] In other words, the cut-off unit 162 adjusts a current speed and flux of the air that passes through the second air intake port 150.

[0078] And, the air introduced into the chamber 113 via the external air supply port 161 is guided not to affect the rotation of the rotational turbine.

[0079] Hence, if the opening degree of the external

supply port 161 is raised, the flux of the air introduced into the second air intake port 150 is reduced. If the opening degree of the external supply port 161 is lowered, the flux of the air introduced into the second air intake port 150 is increased.

[0080] Hence, if the flux and current speed of the air introduced into the second air intake port 150 per unit time are raised according to the lowered opening degree of the external air supply port 161, the rotational speeds of both of the rotational turbine 140 and the agitator 130 are raised.

[0081] For this, the cut-off unit 162 includes a cut-off plate 162a opening or closing the external air supply port 161 and a lever unit 163 connected to the cut-off plate 162a to adjust the opening degree of the external air supply port 161.

[0082] The lever unit 163 adjusts the cut-off plate 162a so that the flux of the air sucked into the first air intake port 120 can be increased in case of being pressurized by the floor.

[0083] In particular, according to whether the nozzle case 110 is landed on the floor and/or according to the status of the floor on which the nozzle case 110 is landed, by adjusting the flux of the air sucked via the external air supply port 161, the flux of the air introduced into the chamber via the second air intake port 150 is adjusted.

[0084] In this case, a lower end of the external air supply port 161 is preferably spaced apart from a lower end of a lateral side of the chamber 113, and more particularly, from an upper side of the lower case 112 with a predetermined height in-between. And, a lower end of the cut-off plate 162a is preferably spaced apart from the upper side of the lower case 112 with a predetermined height.

[0085] This is to prevent an operational failure from being caused by the particles such as dust piled up on the upper side of the lower case 112 when the cut-off plate 162a is moving.

[0086] And, the lever unit 163 includes a first lever 163a and a second lever 163b connected to the first lever 163a.

[0087] In the present embodiment, the lever unit 163 moves the cut-off plate 162a toward the external air supply port 161 so that a flux of the air passing through the external air supply port 161 is reduced if the nozzle case 110 of the intake nozzle 100 is landed on the floor.

[0088] On the contrary, the lever unit 163 is configured to make the cut-off plate 162 return in a direction getting far away from the external air supply port 161 to raise the flux of the air passing through the external air supply port 161 if the nozzle case 110 is separated from the floor.

[0089] Hence, once the nozzle case is landed on the floor, the rotational speed of the agitator 130 is increased. Once the nozzle case is separated from the floor, the rotational speed of the agitator 130 is reduced.

[0090] In particular, one end of the lever 163a is connected to the cut-off plate 162a and the other end of the lever 163a is rotatably connected to a first rotational shaft 112a projected upward from an inside of the nozzle case 110, and more particularly, from a rear inside of the lower case 112.

[0091] One side of the second lever 163b is configured to pressurize the first lever 163a. And, the other side of the second lever 163b, which is configured to be projected from a lower part of the nozzle case 110, can be pressurized by the floor.

[0092] In the present embodiment, if the second lever 163b is pressed by the floor in a manner that the nozzle case is landed on the floor, the second lever 163b turns the first lever 163a so that the cut-off plate 162a reduces the opening degree of the external air supply port 161.

[0093] Hence, to reduce the flux of the air introduced into the external air supply port 161 when the nozzle case 110 is landed on the floor, the second lever 163b moves the cut-off plate 162a connected to the first lever 163a toward the external air supply port 161.

[0094] Preferably, a prescribed part between both ends of the second lever 163b is rotatably connected to the lower case 112. More preferably, the prescribed part between both of the ends of the second lever 16b corresponds to a middle part of the second lever 163b.

[0095] Hence, if the other side of the second lever 163b projected from the lower side of the lower case 112 is pressed by the floor, the first lever 163a is turned by the second lever 163b so that the cut-off plate 162a is moved toward the external air supply port 161 to reduce the flux of the air introduced into the external air supply port 161.

[0096] For this, the second lever 163b is substantially bend to form a 'L' type bent portion 163c and is connected to the lower case 112 by a second rotational shaft 163d provided to the bent portion 163c to turn around the bent portion 163c.

[0097] Namely, one side of the second lever 163b is extended upward centering on the bent portion 163c and the other side of the second lever 163b is extended in a lateral direction centering on the bent portion 163c to be selectively pressurized by the floor to be cleaned. Thus, the second lever 163b is turned.

[0098] Moreover, a roller 163e is preferably provided to the other side of the second lever 163b to be brought into contact with the floor. Hence, a friction between the second lever 163b and the floor is minimized.

[0099] And, the lower case 112 is preferably provided with a perforated hole penetrated by one side of the second lever 163b in a vertical direction and an accommodating recess to accommodate the other side of the second lever 163b that is pressed by the floor.

[0100] Besides, the first lever 163a is elastically supported by a first spring 163f that returns the cut-off plate 162a in a direction of opening the external air supply port 161.

[0101] Namely, once the force pressing the other side of the second lever 163b is released, the first spring 163f applies a restoring force to the first lever 163a to return the cut-off plate 162a so that the flux of the air introduced via the external air supply port 161 can be increased.

[0102] In this case, the first spring 163f may include a

torsion spring provided to the first rotational shaft 112a.

[0103] Moreover, a second spring 163g is preferably provided to the lower case 112 to pressurize the second lever 163b so that the other side of the second lever 163b is projected from the lower side of the lower case 112.

[0104] In this case, the second spring 163g is accommodated in the accommodating recess accommodating the second lever 163b to pressurize a top of the other side of the second lever 163b.

[0105] A connecting hole 163h is provided to the first lever 163a for the connection between the first and second levers 163a and 163b. In this case, one side of the second lever 163b is fitted in the connecting hole 163h.

[0106] Meanwhile, while being pressed by a maximum force by the floor, the second lever 163b moves the cut-off plate 162a built in one body of the first lever 163a to a position in the vicinity of the external air supply port 161.

[0107] Once the cut-off plate 162a is moved to the position in the vicinity of the external air supply port 161, the cut-off plate 162a completely cuts off the external air supply port 161 by an intake force within the chamber 113.

[0108] For this, a thickness of one side of the second lever 163b is preferably smaller than a width of the connecting hole 163h.

[0109] Meanwhile, a display window 111a is provided to a topside of the nozzle case 110, i.e., a topside of the upper case 111 to check out the opening degree of the external air supply port 161.

[0110] In this case, the display window 11a is formed of a transparent material. And, a check piece 11b protruding in one body from the lever unit 163, and more particularly, from the first lever 163a is provided within the display window.

[0111] Hence, if the check piece 111b fully lies down toward the external air supply port 161, it is informed that the external air supply portion 161 is cut off.

[0112] Besides, the intake nozzle 100 according to the present invention is preferably configured to prevent an overload of the motor and the rotational speed reduction of the agitator 130 in cleaning the floor covered with a carpet or blanket.

[0113] Referring to FIG. 7, the nozzle case 110 is provided with an auxiliary air passage 164 guiding the external air into the chamber 113 selectively to rotate the rotational turbine 140 and a passage opening/closing portion 165 selectively opening/closing the auxiliary air passage 164.

[0114] In this case, the auxiliary air passage 164 includes an auxiliary air intake port 164a formed on a center of a topside of the upper case 111 and an auxiliary air supply port 164b provided over the second air intake port 150 to discharge the air to the rotational turbine 140 for the rotation of the rotational turbine 140.

[0115] In the present embodiment, the passage opening/closing portion 165 is opened/closed by a difference between an atmospheric pressure outside the nozzle case and an internal pressure within the chamber 113.

[0116] In particular, the passage opening/closing portion 165 may include an elastic member.

[0117] In this case, one side of the elastic member is preferably connected to a prescribed position of the auxiliary air passage 164, and more particularly, to an upper end of the auxiliary air supply port 164b and the other side of the elastic member is preferably supported by a rim of the auxiliary air supply port 164b to be bent toward an inside of the chamber 113.

[0118] In this case, as an elastic coefficient of the passage opening/closing portion 165 is lowered, the passage opening/closing portion 165 can be open more easily. If the elastic coefficient of the passage opening/closing portion 165 is raised higher, the passage opening/closing portion 165 can be opened in case of a high vacuum state within the chamber only.

[0119] Hence, the material of the passage opening/closing portion 165 needs to be appropriately selected according to performance of the moor, a cross-sectional area of the auxiliary air passage and the like.

[0120] By the above configuration of the vacuum cleaner, in cleaning a floor of covered with a carpet, the roller 163e of the second lever 163b is pressed by the carpet so that the external air supply port 161 is cut of by the cut-off plate 162a. If so, the intake force of the first air intake port 120 is raised and the rotational speed of the agitator 130 is increased.

[0121] Moreover, if the inside of the chamber 113 becomes in high vacuum state because of the first air intake port 120 blocked by the carpet, the passage opening/closing portion 165 is bent toward the inside of the chamber 113 to open the auxiliary air supply port 164b.

[0122] Hence, the external air is introduced into the chamber 113 to rotate the rotational turbine 140. And, the rotational force of the rotational turbine is transferred to the agitator 130 via the belt 142 to rotate the agitator 130. Particles on the carpet are then sucked into the first air intake port 120.

[0123] An operation of the vacuum chamber having the above-configured intake nozzle 100 according to the present invention is explained as follows.

[0124] First of all, once external power is applied to the vacuum chamber, the motor and fan provided within the cleaner body are rotated to generate the air intake force. And, external air can be introduced into the intake nozzle 100 by the air intake force.

[0125] In doing so, if the intake nozzle 100 lies in a state of being separated from the floor to be cleaned, the air introduced via the first air intake port 120 and the external air intake port 115 passes through the second air intake port 150 and the external air supply port 161, respectively so that the flux and current speed of the air introduced into the second air intake port 150 are lowered. Hence, the agitator 130 rotated by the rotational turbine 140 is rotated at a low rotational speed.

[0126] Subsequently, once the intake nozzle 100 is landed on the floor to be cleaned, the roller 163e of the second lever 163b is pressed by the floor to be turned

upward centering on the bent portion 163c of the second lever 163b.

[0127] As one side of the second lever extending upward centering on the bent portion 163c turns the first lever 163a toward the external air supply port 161, the cut-off plate 163 reduces the opening degree of the external air supply port 161. Hence, the flux and current speed of the air introduced from the first air intake port 120 to pass through the second air intake port 150 are increased.

[0128] Accordingly, both of the rotational speeds of the rotational turbine 140 and the agitator 130 are increased to enhance the performance of separating particles from the floor.

[0129] Thus, the polluted air introduced via the first air intake port 120 is passed through the chamber 113, is guided to the dust collector 210 of the cleaner body via the connecting pipe 300, and is then discharged outside via the blowing portion 221 of the wheel. In doing so, the particles of the polluted air are removed by the dust collector 210.

[0130] In this case, the rotational speed of the agitator 120 and the particle intake performance of the first air intake port 120 reach their maximum levels, respectively if the external air supply port 161 is completely cut off.

[0131] Meanwhile, in cleaning the carpet floor with the vacuum cleaner, if the external air supply port 161 is cut off by the cut-off plate 162a and if the first air intake port 120 is blocked by the carpet, the flux of the air introduced into the chamber 113 is reduced.

[0132] Once the flux of the air introduced into the chamber 113 is reduced, the rotational speed of the agitator 130 is lowered or the agitator stops rotating.

[0133] If an internal pressure of the chamber 113 becomes equal to or smaller than a prescribed pressure, the passage opening/closing portion 165 of the auxiliary air passage 164 is opened to guide the external air to the inside of the chamber 113. The air guided to the inside of the chamber 113 rotates the rotational turbine 140.

[0134] Hence, the rotational speed of the agitator 120 is raised to facilitate the suction of the particles on the carpet into the first air intake port 120 and to prevent the motor from being overloaded.

[0135] And, in case of separating the intake nozzle from the floor to clean another place, the external air supply port 161 is fully opened to reduce the flux and current speed of the air sucked into the second air intake port 150.

[0136] Hence, the rotational speed of the agitator 130 and the intake force and noise of the intake nozzle are reduced.

[0137] Accordingly, the present invention provides the following effects or advantages.

[0138] First of all, as the rotational speed of the agitator is variable, the present invention enhances the cleaning performance.

[0139] Secondly, if the intake nozzle is landed on the floor, the rotational speed of the agitator is increased. If the intake nozzle is separated from the floor, the rotational speed of the agitator is decreased. And, the rotational speed of the agitator is varied according to the status of the floor on which the intake nozzle is landed. Hence, the present invention enhances the performance of separating dust from the floor.

[0140] Thirdly, if the intake nozzle is separated from the floor to carry the vacuum cleaner, the agitator is rotated with low power at low speed. Hence, the present invention prevents a user's hand from being injured by the agitator.

[0141] Fourthly, if the intake nozzle is separated from the floor to change a spot to be cleaned, the flux and current speed of the air introduced into the first air intake port are lowered to reduce the intake noise of air.

[0142] Finally, if the intake nozzle is separated from the floor to carry the vacuum cleaner, the air intake force of the intake nozzle is reduced. Hence, when a user holds the intake nozzle to carry move to another place to be cleaned, the present invention prevents a user's clothes, a curtain and the like from being sucked into the intake nozzle.

[0143] It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the spirit or scope of the inventions. Thus, it is intended that the present invention covers the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

Claims

1. An intake nozzle of a vacuum cleaner, comprising:

   a nozzle case;
   a first air intake port provided to a bottom of the nozzle case to suck an air containing dust by an air intake force generated from driving an air intake device;
   an agitator rotatably provided to the first air intake port to agitate the dust on a floor; and
   a speed adjusting device varying a rotational speed of the agitator.

2. The intake nozzle of claim 1, wherein the speed adjusting device raises the rotational speed of the agitator if the nozzle case is landed on the floor and wherein the speed adjusting device lowers the rotational speed of the agitator if the nozzle case is separated from on the floor.

3. The intake nozzle of claim 1, wherein the speed adjusting device varies the rotational speed of the agitator according to a status of the floor on which the nozzle case is landed.

4. The intake nozzle of claim 1, the speed adjusting device comprising:

a rotational turbine provided to an air passage formed within the nozzle case to rotate the agitator, the rotational turbine rotated by a flow of the air introduced via the first air intake port; and
an air flow adjusting device provided to the nozzle case to vary a rotational speed of the rotational turbine by adjusting a flux of the air introduced into the first air intake port.

5. The intake nozzle of claim 4, the air flow adjusting device comprising:

a chamber provided to the air passage of the nozzle case, the chamber provided with a second air intake port through which the air introduced via the first air intake port passes and an external air supply port via which an external air introduced via one side of the nozzle case passes, the chamber accommodating the rotational turbine rotated by the air introduced via the second air intake port; and
a cut-off unit adjusting an opening degree of the external air supply port to adjust a flux of the air passing through the second air intake port.

6. The intake nozzle of claim 5, the cut-off unit comprising:

a cut-off plate opening/closing the external air supply port; and
a lever unit connected to the cut-off plate to adjust the cut-off plate, the lever unit increasing a flux of the air sucked into the first air intake port in case of being pressed by the floor.

7. The intake nozzle of claim 6, the lever unit comprising:

a first lever having one side connected to the cut-off plate and the other side rotatably connected to a rotational shaft provided within the nozzle case; and
a second lever having one side configured to apply a force to the first lever and the other side configured to be pressed by the floor by being projected beneath the nozzle case.

8. The intake nozzle of claim 7, wherein the first lever is elastically supported by a first spring and wherein the first spring returns the cut-off plate in a direction of opening the external air supply port.

9. The intake nozzle of claim 7, wherein a prescribed position between both ends of the second lever is rotatably connected to a lower part of the nozzle case.

10. The intake nozzle of claim 7, wherein a display window is provided to a topside of the nozzle case to check out the opening degree of the external air supply port.

11. The intake nozzle of claim 7, wherein the second lever moves the cut-off plate connected to the first lever to a position in the vicinity of the external air supply port.

12. The intake nozzle of claim 10, wherein the cut-off plate completely cuts off the external air supply port by an intake force within the chamber at a position in the vicinity of the external air supply port.

13. The intake nozzle of claim 5, the air flow adjusting device further comprising:

an auxiliary air passage guiding the external air to an inside of the chamber to rotate the rotational turbine; and
a passage opening/closing portion selectively opening the auxiliary air passage to prevent the air passage form being blocked.

14. The intake nozzle of claim 13, the passage opening/closing portion comprising an elastic member opened/closed by a difference between a pressure within the chamber and an atmospheric pressure outside the nozzle case.

15. A vacuum cleaner comprising:

a cleaner body provided with a dust collector collecting dust by separating dust; and
an intake nozzle communicating with the dust collector of the cleaner body, the intake nozzle moving along a floor to suck an air including the dust, the intake nozzle comprising:

a nozzle case;
a first air intake port provided to a bottom of the nozzle case to suck the air including the dust by an air intake force generated from driving an air intake device;
an agitator rotatably provided to the first air intake port to agitate the dust on the floor; and
a speed adjusting device varying a rotational speed of the agitator.

16. The vacuum cleaner of claim 15, the speed adjusting device comprising:

a rotational turbine provided to an air passage formed within the nozzle case to rotate the agitator, the rotational turbine rotated by a flow of the air introduced via the first air intake port; and
an air flow adjusting device provided to the noz-

zle case to vary a rotational speed of the rotational turbine by adjusting a flux of the air introduced into the first air intake port.

17. The vacuum cleaner of claim 16, the air flow adjusting device comprising:

a chamber provided to the air passage of the nozzle case, the chamber provided with a second air intake port through which the air introduced via the first air intake port passes and an external air supply port via which an external air introduced via one side of the nozzle case passes, the chamber accommodating the rotational turbine rotated by the air introduced via the second air intake port;
a cut-off unit adjusting an opening degree of the external air supply port to adjust a flux of the air passing through the second air intake port;
an auxiliary air passage guiding the external air to an inside of the chamber to rotate the rotational turbine; and
a passage opening/closing portion selectively opening the auxiliary air passage to prevent the air passage form being blocked.

18. The vacuum cleaner of claim 17, the cut-off unit comprising:

a cut-off plate opening/closing the external air supply port; and
a lever unit connected to the cut-off plate to adjust the cut-off plate, the lever unit increasing a flux of the air sucked into the first air intake port in case of being pressed by the floor.

19. The vacuum cleaner of claim 18, the lever unit comprising:

a first lever having one side connected to the cut-off plate and the other side rotatably connected to a rotational shaft provided within the nozzle case;
a second lever having one side configured to apply a force to the first lever and the other side configured to be pressed by the floor by being projected beneath the nozzle case; and
a first spring elastically supporting the first lever to return the cut-off plate in a direction of opening the external air supply port.

20. The vacuum cleaner of claim 19, wherein the second lever moves the cut-off plate connected to the first lever to a position in the vicinity of the external air supply port and wherein the cut-off plate completely cuts off the external air supply port by an intake force within the chamber at a position in the vicinity of the external air supply port.

FIG. 1
Related Art

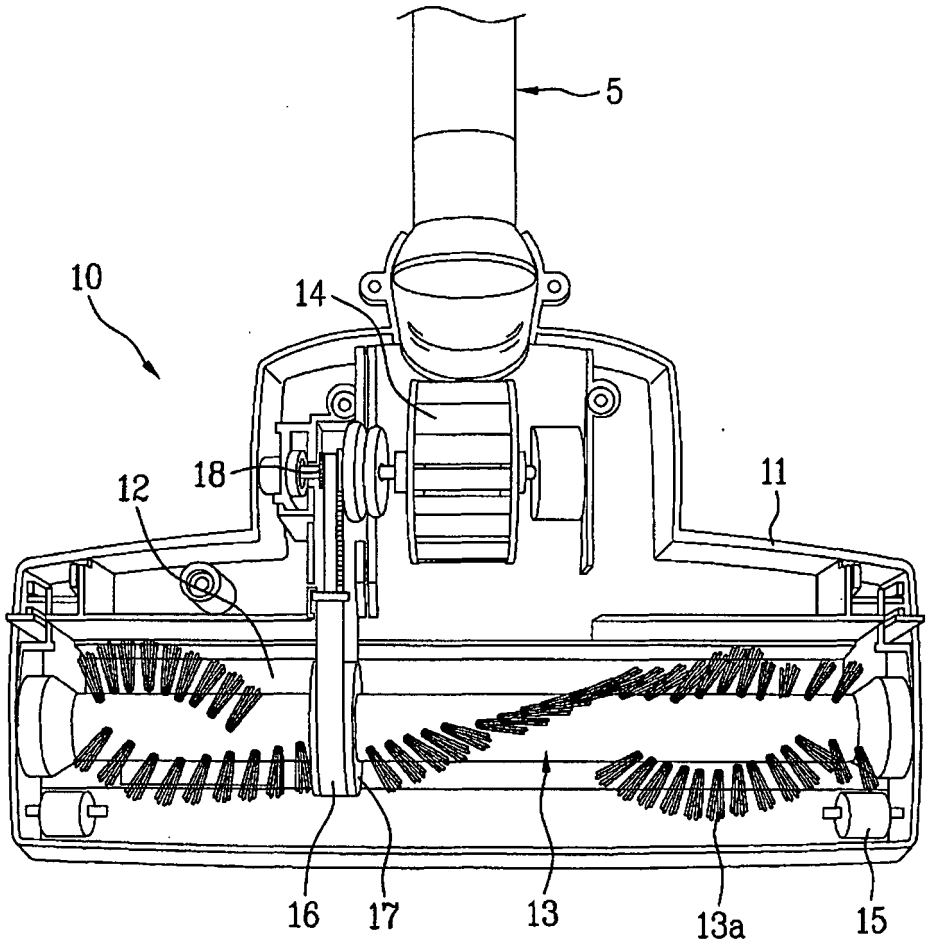


FIG. 2

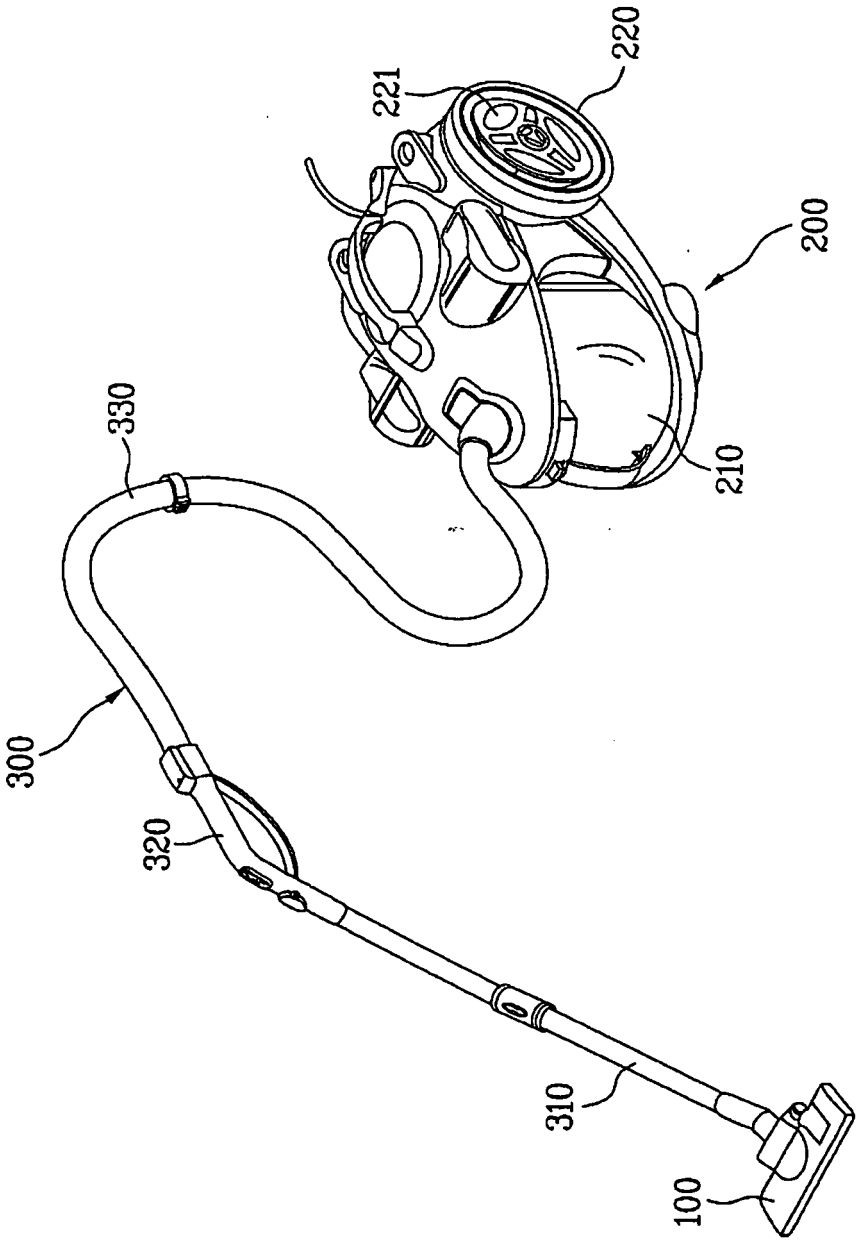


FIG. 3

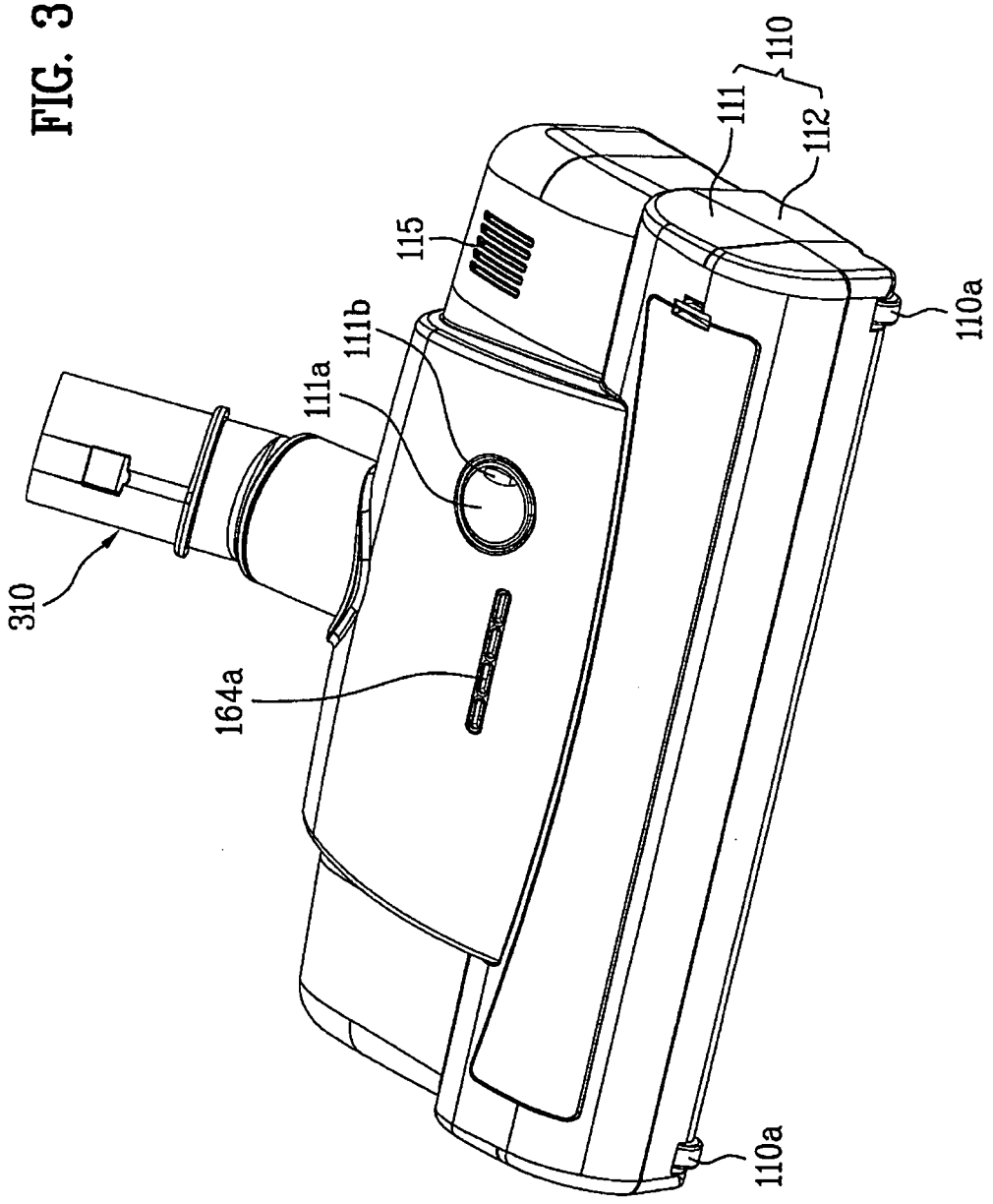


FIG. 4

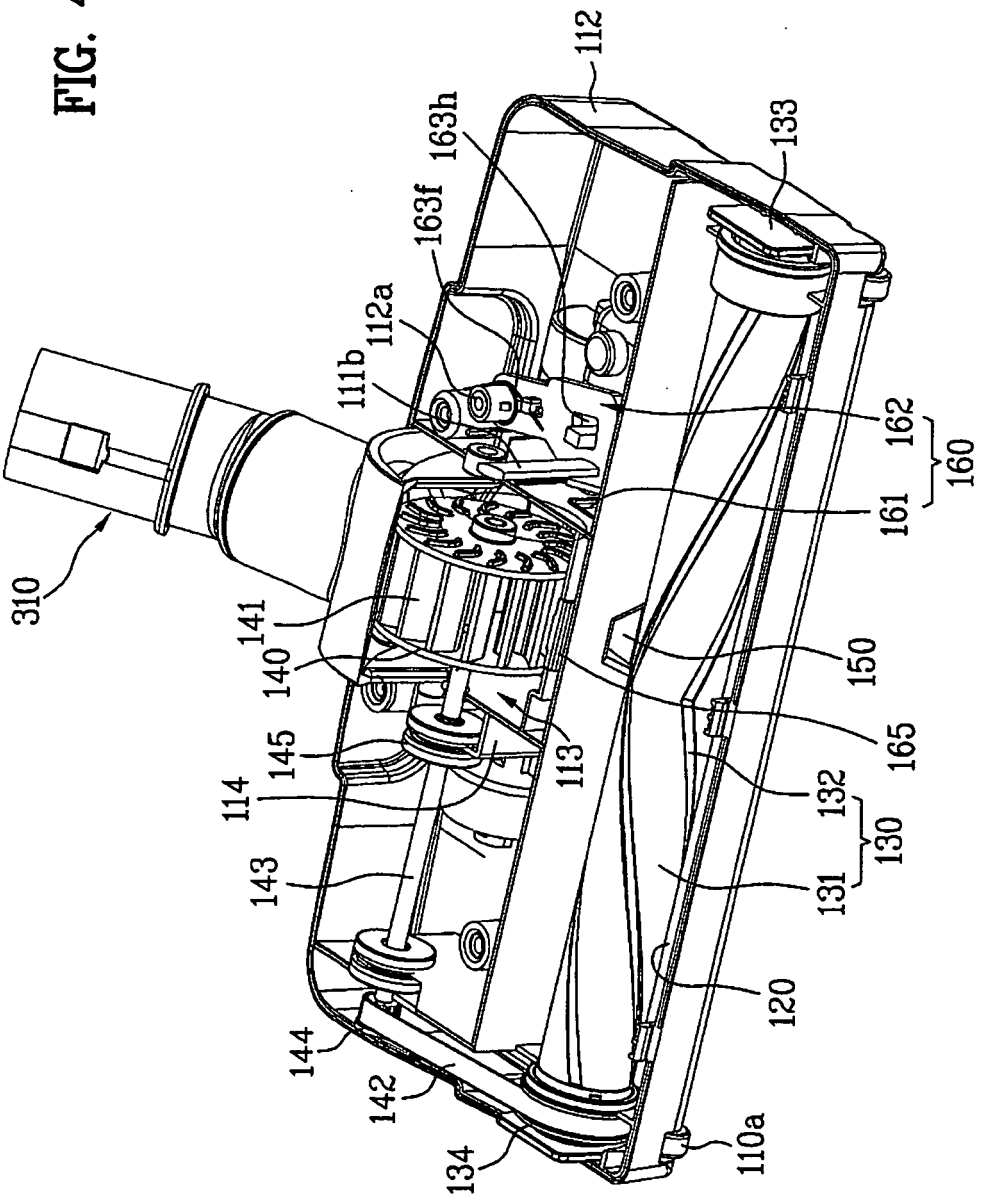

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FIG. 5

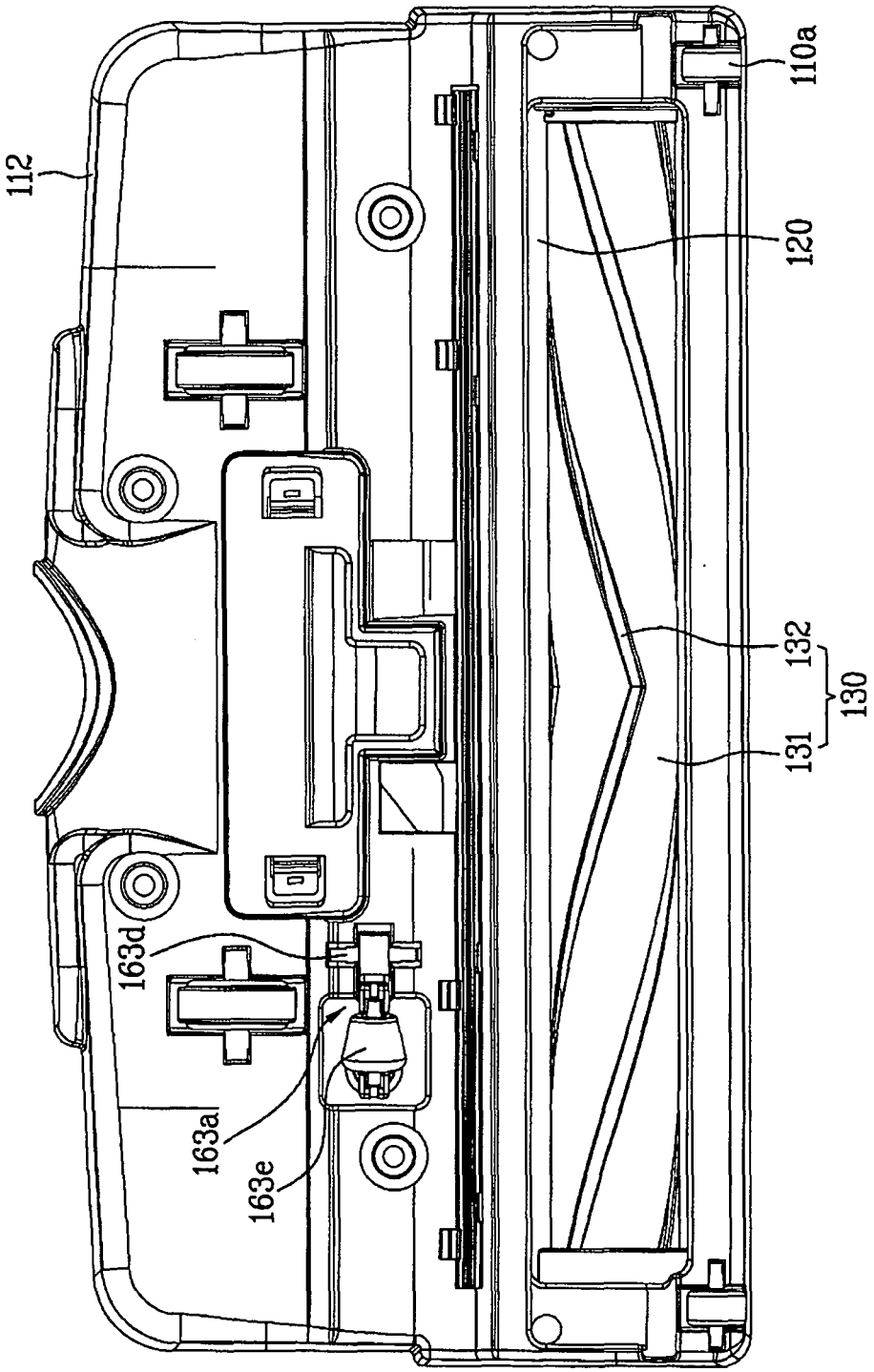

FIG. 6

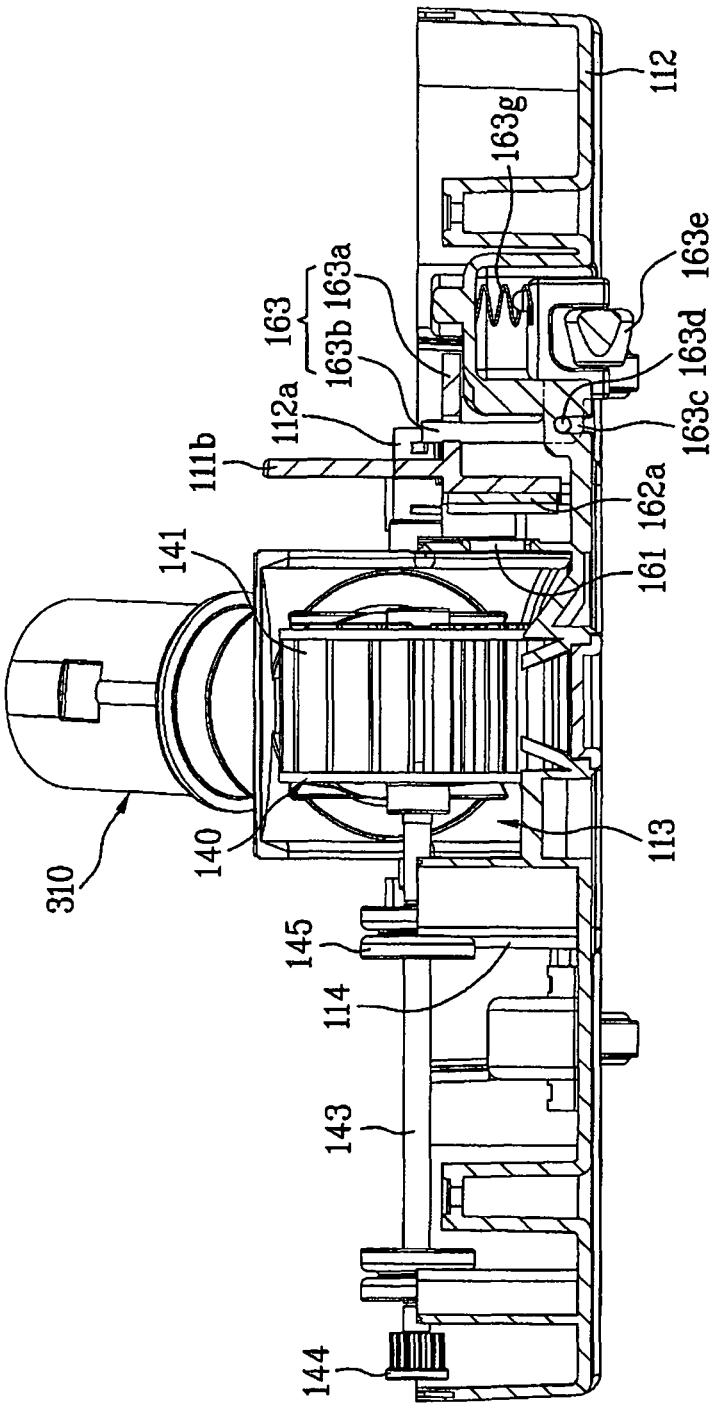
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FIG. 7

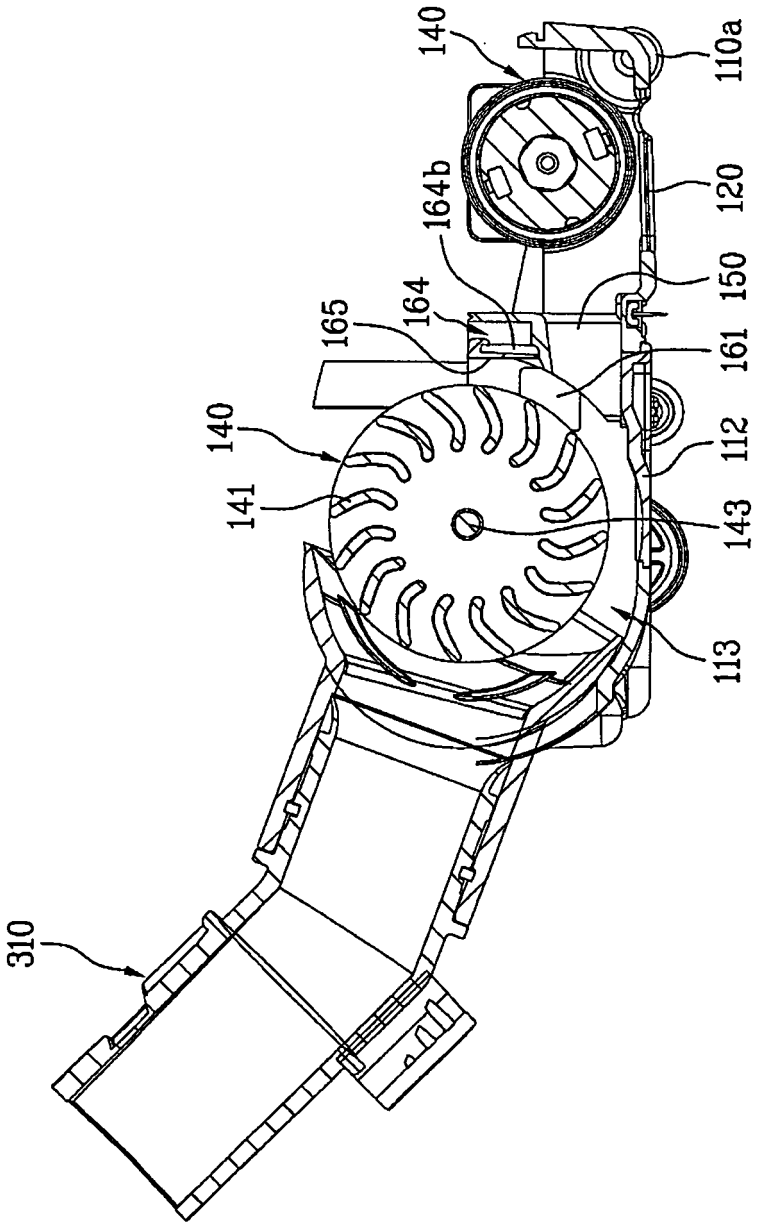

FIG. 8