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(54) **VACUUM CLEANER**

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(52) **U.S. Cl.** **15/352**

(57) **ABSTRACT**

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A vacuum cleaner is provided that includes a cleaner body incorporating a suction motor, an inlet hose, and an outlet hose; a suction brush; a cyclone unit for separating dirt from air, the cyclone unit discharging the air after the dirt is separated; a dirt collection bin for collecting the separated dirt, the dirt collection bin being removably arranged below the cyclone unit; an engagement unit for allowing the dirt collection bin to be removably fitted in the cleaner body, the engagement unit having at least one engagement projection and at least one engagement groove; and a guide unit for guiding the engagement projection to be correctly engaged in the engagement groove.

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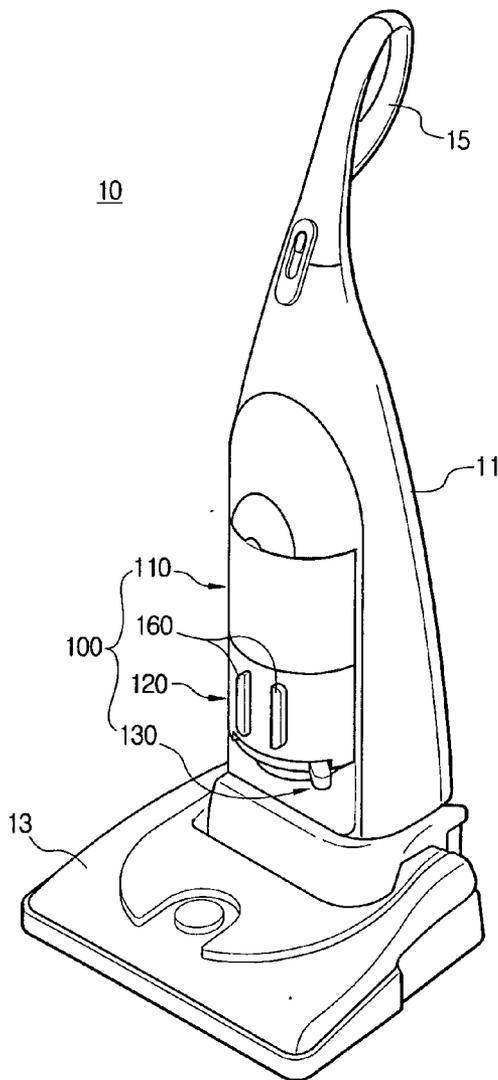


FIG. 1

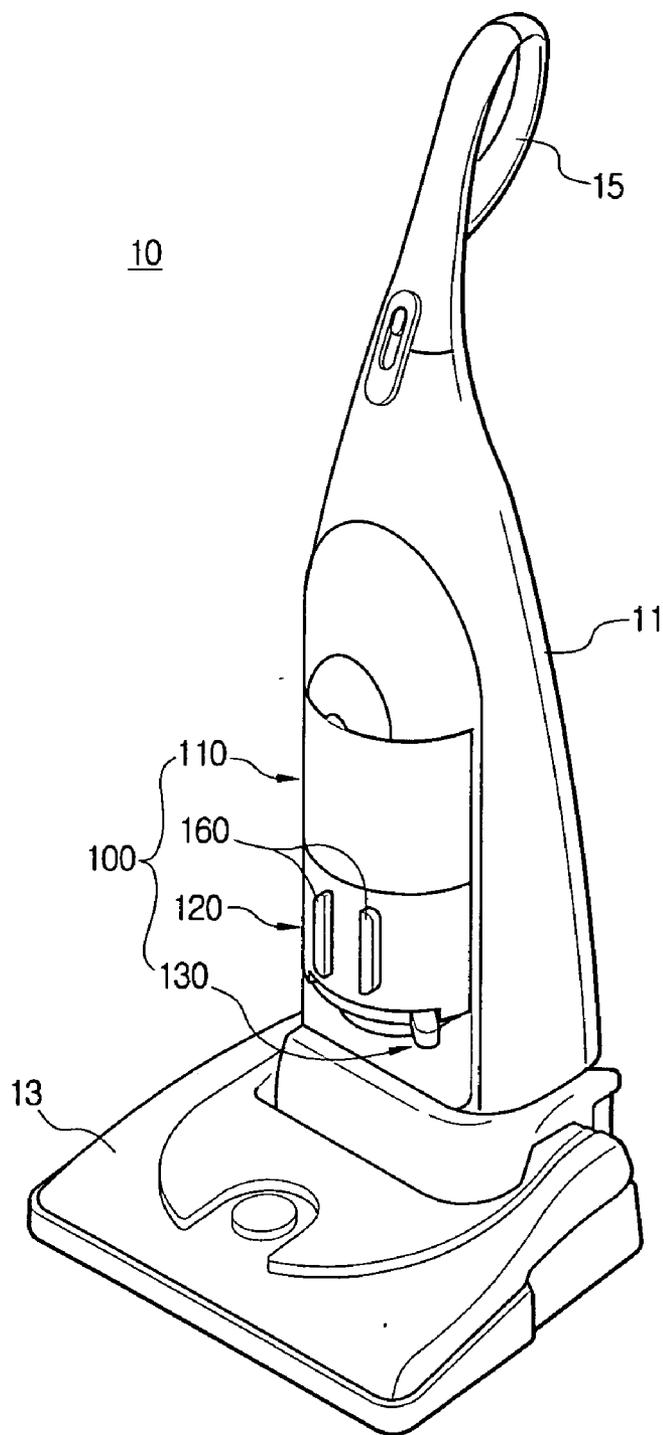


FIG. 2

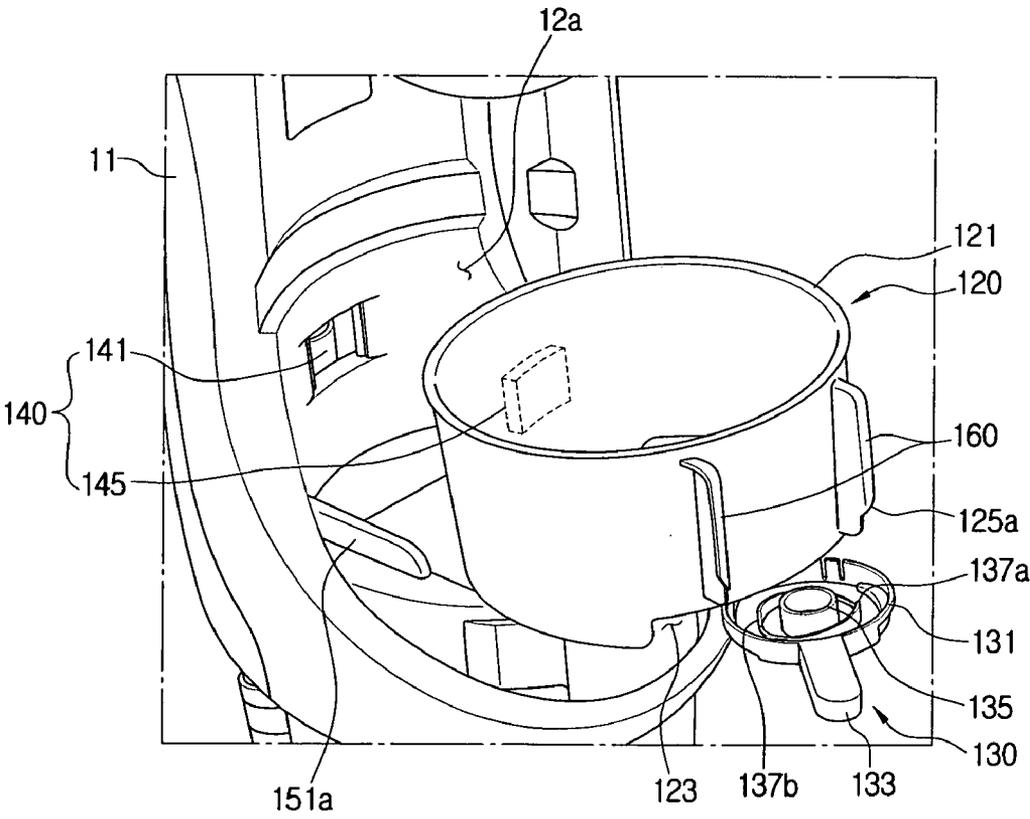


FIG. 3A

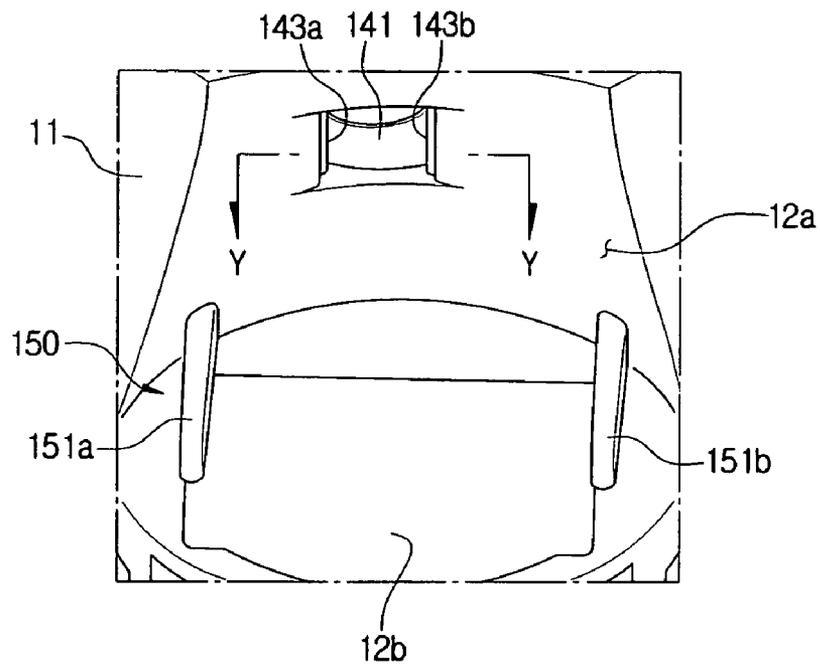


FIG. 3B

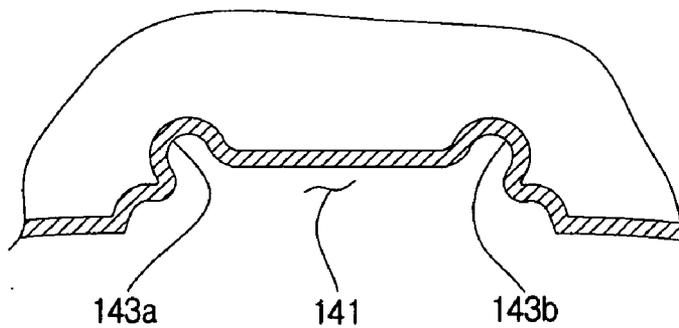


FIG. 4

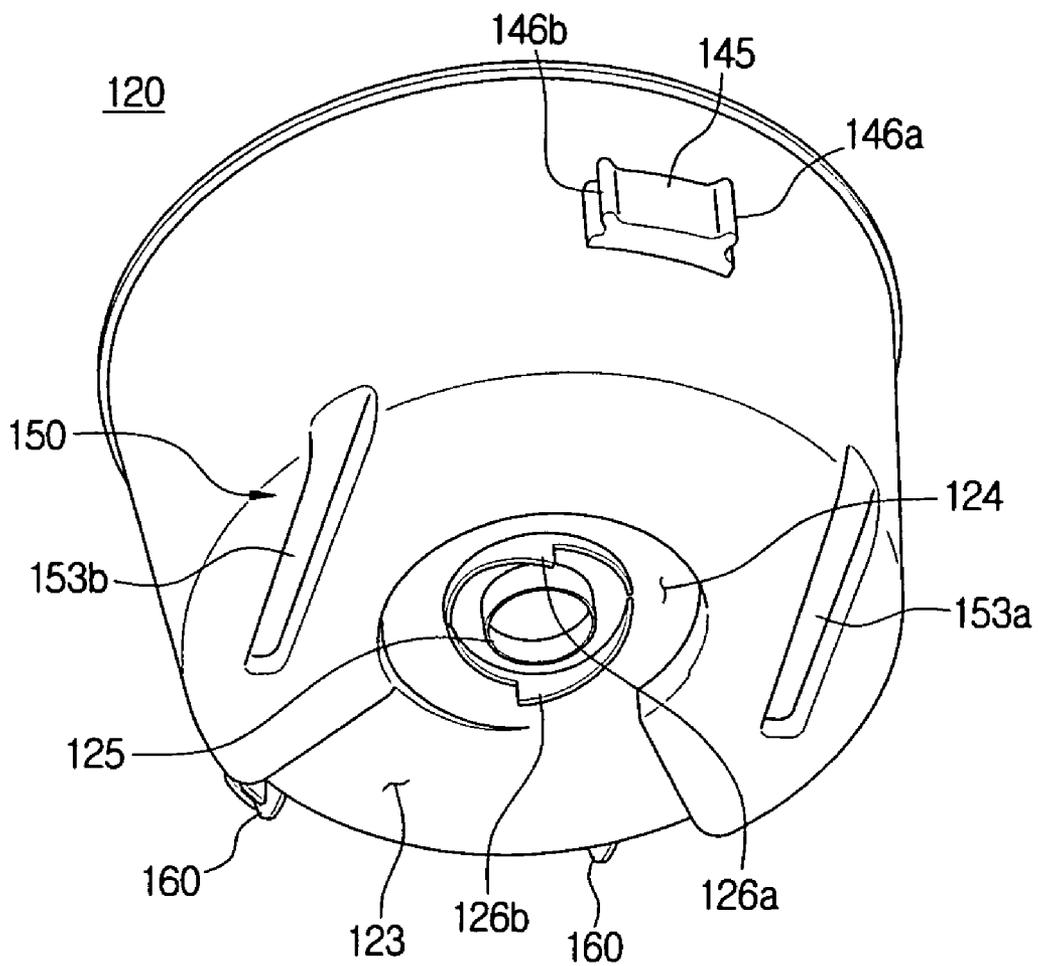


FIG. 5

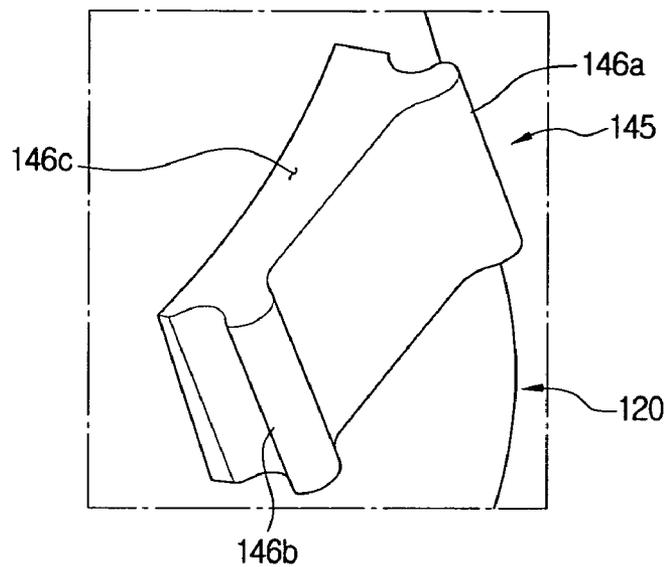


FIG. 6

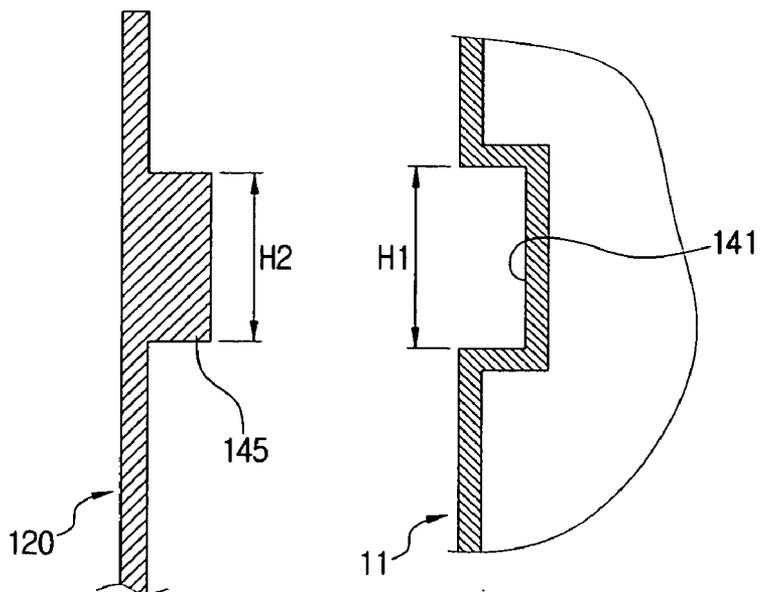


FIG. 7A

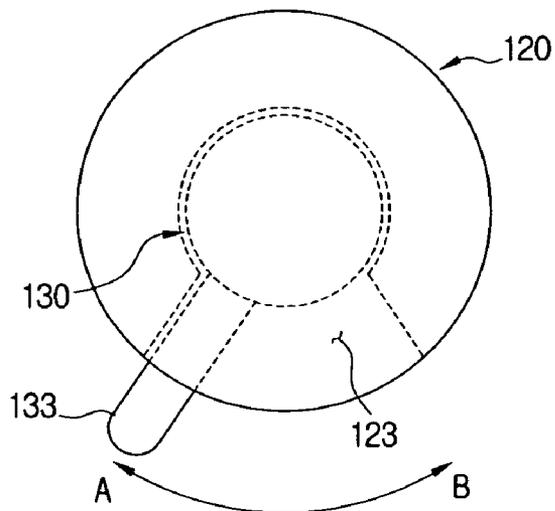


FIG. 7B

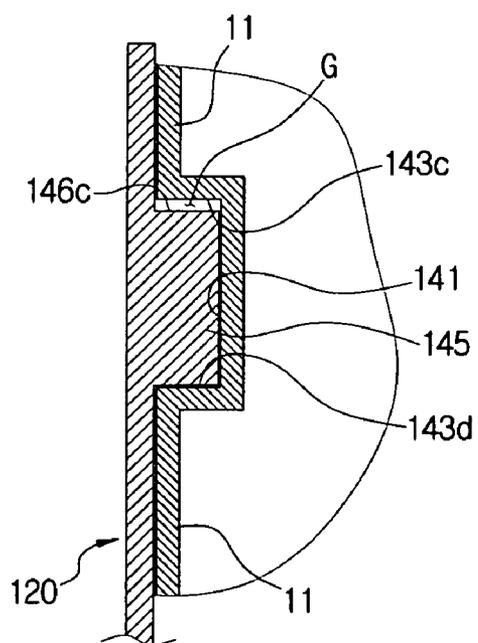


FIG. 8A

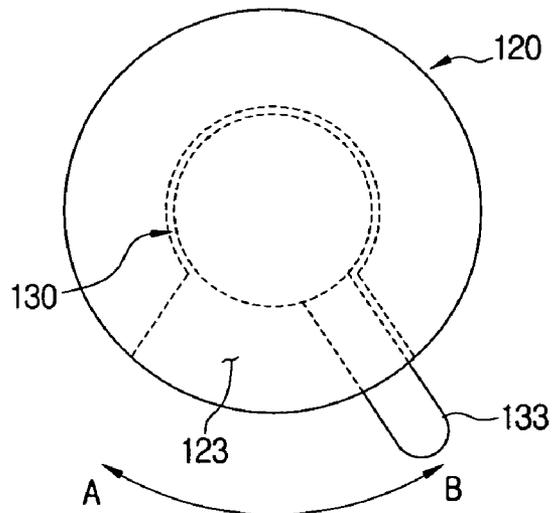
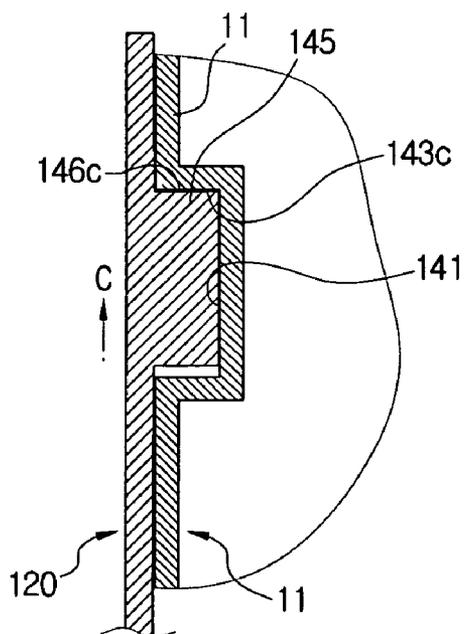


FIG. 8B



VACUUM CLEANER

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of Korean Patent Application No. 10-2006-021173 filed on Mar. 7, 2006, in the Korean Intellectual Property Office, the entire disclosure of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present disclosure relates to a vacuum cleaner for cleaning a surface, and in particular to a vacuum cleaner having a construction, which allows a dirt collection bin to be removably mounted on a cleaner body.

[0004] 2. Description of the Related Art

[0005] In general, a vacuum cleaner comprises a cleaner body, which incorporates a suction motor, an inlet hose, and an outlet hose, and a suction brush for drawing dirt from a surface to be cleaned. In addition, the vacuum cleaner includes a dust collection unit therein that includes a cyclone unit and a dirt collection bin. The cyclone unit separates dirt from air introduced through the suction brush and then discharges purified air, and the dirt collection bin collects the dirt separated from the air.

[0006] In particular, the dirt collection bin is removably mounted on the cleaner body, wherein a construction for mounting such a dirt collection bin is disclosed in Korean Patent Registration No. 478518. The dirt collection bin disclosed in the Patent Registration is stably fixed to the cleaner body by a locking unit provided on the front face of the cleaner body.

[0007] However, there was a problem in that the locking unit has a complicated construction and slight troubles frequently occur from the components of the locking unit, in particular, a spring if the locking unit is used numerous times.

[0008] Furthermore, the operation for removing the dirt collection bin from the cleaner body is performed in two steps of: constantly pressing a locking button, and then pulling the dirt collection bin away from the cleaner body in the state in which the locking button is pressed. Therefore, there is a difficulty in using the dirt collection bin.

SUMMARY OF THE INVENTION

[0009] Accordingly, the present disclosure has been made to solve the above-mentioned problems occurring in the prior art, and an aspect of the present disclosure is to provide a vacuum cleaner including a cleaner body and a dirt collection bin, wherein the dirt collection bin can be stably mounted on or removed from the cleaner body through a simple construction.

[0010] Another aspect of the present disclosure is to provide a vacuum cleaner including a cleaner body and a dirt collection bin, wherein the dirt collection bin can be vertically lifted or lowered with a horizontal posture when it is lifted/lowered from a fixed condition in the cleaner body by a lever unit.

[0011] In order to achieve the above-mentioned aspects, there is provided a vacuum cleaner comprising: a cleaner body incorporating a suction motor, an inlet hose, and an outlet hose; a suction brush for suctioning dirt from a surface to be cleaned; a cyclone unit for separating dirt from air

introduced through the suction brush and discharging purified air; a dirt collection bin for collecting the separated dirt from the cyclone unit, the dirt collection bin being removably arranged below the cyclone unit; an engagement unit for allowing the dirt collection bin to be removably fitted in a bin reception recess provided in the cleaner body, the engagement unit comprising at least one engagement projection and at least one engagement groove; and a guide unit for guiding the engagement projection to be correctly engaged in the engagement groove when the dirt collection bin is received in the bin reception recess, which is formed in the cleaner body, wherein the engagement unit restrains the dirt collection bin from moving forward and backward in relation to the cleaner body and the guide unit stably restrains the dirt collection bin from rotating left and right, thereby stably fixing the dirt collection bin in the cleaner body.

[0012] The engagement groove may be formed in the bin reception recess, and the engagement projection may be snapped in the engagement groove when the dirt collection bin is fitted in the dirt collection bin. In that event, the engagement projection and the engagement groove may be mated with each other at one or both side portions of each of them where they confront with each other.

[0013] It is preferable that the engagement projection has protrusions vertically formed along the opposite side edges on the front face thereof, and the engagement groove has depressions, which are engaged with the protrusions, respectively, the protrusions being press-fitted in the depressions for the purpose of solid engagement.

[0014] The guide unit may comprise: at least one guide groove formed on the outer bottom surface of the dirt collection bin; and at least one guide projection formed on a seating surface in the cleaner body in such a manner as to be correspondingly inserted into the at least one guide groove, the outer bottom surface of the dirt collection bin being seated on the seating surface.

[0015] The vacuum cleaner may further comprise a lever unit interposed between the outer bottom surface of the dirt collection bin and a seating surface in the cleaner body, on which the dirt collection bin is seated, wherein the lever unit is capable of rotating so as to render the dirt collection bin to be lifted so that the dirt collection bin is compressively engaged with the outer bottom surface of the cyclone unit.

[0016] It is preferable that the height of the engagement projection, H2, is smaller than the height of the engagement groove, H1, so that a vertical gap is formed when the engagement projection and the engagement groove are engaged with each other, whereby the dirt collection bin can be lifted with a horizontal posture when the lever unit is rotated.

[0017] The dirt collection bin may further comprise one or more gripping means for use in pulling out the dirt collection bin from the bin reception recess, the gripping means being provided on a surface of the dirt collection bin exposed to the outside in a state in which the dirt collection bin is received in the bin reception recess in the cleaner body.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] The above aspects and features of the present disclosure will be more apparent from the description for certain exemplary embodiments of the present disclosure taken with reference to the accompanying drawings, in which:

[0019] FIG. 1 is a perspective view showing a vacuum cleaner according to an exemplary embodiment of the present disclosure;

[0020] FIG. 2 shows a bin reception recess in a vacuum cleaner, a dirt collection bin mounted on the bin reception recess, and a lever unit;

[0021] FIG. 3A is a front view of the bin reception recess shown in FIG. 2

[0022] FIG. 3B is a cross-sectional view taken along line Y-Y of FIG. 3A;

[0023] FIG. 4 is a perspective view of the dirt collection bin shown in FIG. 2;

[0024] FIG. 5 is an enlarged perspective of an engagement projection;

[0025] FIG. 6 is partial cross-sectional views of an engagement unit, the components of which are formed in the dirt collection bin and the bin reception recess, respectively;

[0026] FIGS. 7A and 7B show the condition before the dirt collection bin is compressively engaged with the cyclone unit; and

[0027] FIGS. 8A and 8B show the condition after the dirt collection bin is compressively engaged with the cyclone unit.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0028] Exemplary embodiments of the present disclosure will be described in detail with reference to the annexed drawings. In the drawings, the same elements are denoted by the same reference numerals throughout the drawings. In the following description, detailed descriptions of known functions and configurations incorporated herein have been omitted for conciseness and clarity.

[0029] Hereinbelow, the preferred embodiments of the present disclosure are described in detail with reference to accompanying drawings. In the following description, a detailed description of known functions and configurations incorporated herein will be omitted when it may make the subject matter of the present disclosure rather unclear.

[0030] FIG. 1 is a perspective view of a vacuum cleaner according to an exemplary embodiment of the present disclosure.

[0031] The vacuum cleaner 10 according to the present embodiment comprises a cleaner body 11, a suction brush 13, and a dust collection unit 100.

[0032] The cleaner body 11 has a suction motor (not shown) as a vacuum source, an inlet hose and an outlet hose (not shown), one end of each of the inlet hose and the outlet hose is detachably connected with the dust collection unit 100, wherein the above-mentioned components are provided within the cleaner body 11. In addition, a handle 15 is provided on the top of the cleaner body 11, so that a user can easily move the vacuum cleaner on a surface to be cleaned.

[0033] The suction brush 13 is hinged to the bottom end of the cleaner body 11 at the rear end thereof, and suctions dirt from a surface to be cleaned through an inlet port (not shown) formed through the bottom of the suction brush 13.

[0034] The dust collection unit 100 comprises a cyclone unit 110, a dirt collection bin 120, a lever unit 130, an engagement unit 140 (see FIG. 2), a guide unit 150 (see FIGS. 3A and 4), and a gripping means 160.

[0035] The cyclone unit 110 separates dirt from air suctioned from a surface to be cleaned through the suction brush 13 and guided to the inside of the cyclone unit 110 through

the inlet hose (not shown). In addition, the cyclone unit 110 discharges air purified in this manner to the inlet hose (not shown). Such a cyclone unit 110 is removably arranged in the bin reception recess 12a (see FIG. 2) by fixing means (not shown).

[0036] The dirt collection bin 120 is arranged to communicate with the bottom end of the cyclone unit 110 so that the dirt separated from air by the cyclone unit 110 can drop, due to gravity and can be collected in the dirt collection bin 120. The dirt collection bin 120 has a central recess 124 which is inwardly depressed at the center of the bottom surface of the dust collection bin 120, a first cylindrical projection 125 formed at the center of the central recess 124, and a pair of first inclined projections 126a and 126b spaced from and surrounding the first cylindrical projection 125. In addition, the dirt collection bin 124 also has a limit groove 123 (see FIG. 4) for limiting the rotating angle of the handle 133 (see FIG. 2) of the lever unit 130, the limit groove 123 being formed aside of the central recess 124.

[0037] As shown in FIG. 2, the lever unit 130 comprises a rotary part 131, a handle 133, a second cylindrical projection 135, and a pair of second inclined projections 137a and 137b. The rotary part 131 is rotatably inserted into the central recess 124 of the dirt collection bin 120. The handle 133 is formed on a side portion of the rotary part 131 and has a predetermined length so that a user can grip the handle 133. The second cylindrical projection 135 is formed at the center of the rotary part 131 and has a diameter smaller than that of the first cylindrical projection 125, so that the second cylindrical projection 135 is rotatably inserted into the first cylindrical projection 125. The second inclined projections 137a and 137b (see FIG. 2) are formed to be spaced from and surround the second cylindrical projection 135, so that the second inclined projections 137a and 137b (see FIG. 2) come into slidable contact with the outer circumference of the second cylindrical projection 135 while confronting with the first inclined projections 126a and 126b (see FIG. 4). With such a lever unit 130, when gripping and rotating the handle 133 in one direction or the other direction by a predetermined angle, the second inclined projections 137a and 137b, which rotate together with the lever unit 130, come into slidable contact with the first inclined projections 126a and 126b, thereby lifting or lowering the dirt collection bin 120 by a height corresponding to the rotated angle of the handle 133. In this manner, the lever unit 130 serves to lift the dirt collection bin 120 so that the dirt collection bin 120 is compressed against the outer bottom surface of the cyclone unit 110, and due to this action of the lever unit 130, air-tight sealing is maintained between the cyclone unit 110 and the dirt collection bin 120. As a result, the suction force within the dust collection unit 100 is prevented from being reduced, and the leakage of air or dirt from the dust collection unit is blocked, whereby it is possible to prevent either the bin reception recess 12a in the cleaner body 11 or the surrounding of the vacuum cleaner 10 from being polluted by dirt leaking from the dust collection unit 100.

[0038] The engagement unit 140 comprises an engagement groove 141 (see FIG. 2) formed in the bin reception recess 12a of the cleaner body 11, and an engagement projection 145 snapped in the engagement groove 141 (see FIG. 4). In this case, the engagement projection 145 is preferably formed of a synthetic resin so that it can be resiliently engaged in the engagement groove 141. In addition, the engagement groove 141 and the engagement 145

are mated with each other at the both sides of each of them where they are in contact with each other. That is, as shown in FIG. 3B, the engagement groove 141 has depressions 143a and 143b vertically formed at the opposite side walls thereof and the engagement projection 145 has protrusions 146a and 146b formed at opposite side edges on the front face thereof, so that the protrusions 146a and 146b are inserted into the depressions 143a and 143b, respectively, when the engagement projection 145 is snapped in the engagement groove 141, wherein the protrusions 146a and 146b are vertically formed to correspond with the depressions 143a and 143b, respectively. In addition, the protrusions 146a and 146b are formed to be somewhat larger than the depressions 143a and 143b in volume, so that the former is press-fitted into the latter, whereby solid engagement can be achieved. Furthermore, the engagement projection 145 has a height less than that of the engagement groove 141, so that when the engagement projection 145 is snapped into the engagement groove 141, a gap (G) is formed between the top wall 143c of the engagement groove 141 and the top surface 146c of the engagement projection 145, as shown in FIG. 7B, thereby assuring that upon being lifted by rotary part 131, the dirt collection bin 120 is engaged with the outer bottom surface of the cyclone unit 110 at the top end thereof while maintaining an airtight condition. More specifically, as shown in FIG. 6, the height of the engagement groove 141, H1, is larger than the height of the engagement projection 145, H2 (i.e., $H1 > H2$), wherein the gap G is provided in order that when the dirt collection bin 120 is lifted from a state in which it is fixed in the bin reception recess 12a by the engagement unit 140, the dirt collection bin 120 can be lifted with a horizontal posture without being inclined toward the fixed side in such a manner as to be engaged with the outer bottom surface of the cyclone unit 110 while maintaining the airtight condition. As a result, the dirt collection bin 120 is stably and smoothly lifted and lowered while being retained within the bin reception recess 12a by the rotation of the lever unit 130.

[0039] The guide unit 150 comprises a pair of guide grooves 153a and 153b (see FIG. 4) formed longitudinally parallel to each other on the outer bottom surface of the dirt collection bin 120, and a pair of guide projection 151a and 151b formed on the seating surface 12b (see FIG. 3A), on which the outer bottom surface of the dirt collection bin 120 is seated, in such a manner that the guide projections 151a and 151b are correspondingly inserted into the guide grooves 153a and 153b. Such a guide unit 150 serves to guide the dust collection unit 100 in such a manner that when the dust collection unit 100 is inserted into the bin reception recess 12a of the cleaner body 11, the engagement projection 145 is correctly engaged in the engagement groove 141, whereby a user can easily make the engagement groove 141 and the engagement projection 145 engaged with each other. Meanwhile, according to an exemplary embodiment of the present disclosure, the leftward and rightward rotation of the dirt collection bin 120 is restrained through the guide unit 150, and the forward and backward movement of the dirt collection bin 120 is restrained through the engagement unit 140, as a result of which the dirt collection bin 120 can be three-dimensionally fixed at a side portion and the bottom side thereof.

[0040] The gripping means 160 is provided on a side portion of the dirt collection bin 120 exposed to the outside in a state in which the dirt collection bin 120 is received in

the bin reception recess 12a in the cleaner body 11, so that a user can easily and conveniently pull out the dirt collection bin 120 from the bin reception recess 12a to the outside using one or more fingers.

[0041] Now, description is made in relation to how to mount the dirt collection bin configured according to the exemplary embodiment of the present disclosure as described above.

[0042] When a user mounts the dirt collection bin 120 below the cyclone unit 110 fixed in the bin reception recess 12a in the cleaner body 11, the user grips the gripping means 160 of the dirt collection bin 160 (see FIG. 2) and then pushes the dirt collection bin 120 into a space below the cyclone unit 110 in the cleaner body 11 in such a manner that the guide grooves 153a and 153b (see FIG. 4) formed on the bottom of the dirt collection bin 120 are engaged with the guide projections 151a and 151b (see FIG. 3A) formed on the seating surface 12b (see FIG. 3A) in the cleaner body 11.

[0043] The user pushes the dirt collection bin 120 into the space until the engagement projection 145 is snapped in the engagement groove 141 so that the predetermined gap G is provided between the engagement projection 145 and the engagement groove 141 as shown in FIG. 7B. From this state, the handle 133 of the lever unit 130 is rotated to a point B as shown in FIG. 8A from the initial position (point A) thereof.

[0044] As a result, the dirt collection bin 120 is lifted toward the outer bottom surface of the cyclone unit 110 by the first and second inclined projections 126a and 126b; 137a and 137b which are in slidable contact with each other between the dirt collection bin 120 and the lever unit 110. At this time, the engagement projection 145 is vertically lifted in the engagement groove 141 together with the dirt collection bin 120, so that the top surface 146c of the engagement projection 145 comes into contact with the top wall 143c of the engagement groove 141. Therefore, the dirt collection bin 120 is lifted while maintaining its horizontal posture, so that the dirt collection bin 120 is safely received in the space below the cyclone unit 110 in a compressed state against the outer bottom surface of the latter, whereby the top end of the dirt collection bin 120 is evenly in contact with the outer bottom surface of the cyclone unit 110 in general, whereby the airtight condition can be maintained between the cyclone unit 110 and the dirt collection bin 120.

[0045] At this time, in order to prevent the dirt collection bin 120 from being released from the bin collection part 12a in the cleaner body when the guide projections 151a and 151b are disengaged from the guide grooves 153a and 153b after the dirt collection groove 120 is lifted, it is desired that the height of the guide projections 151a and 151b and the depth of the guide grooves 153a and 153b are larger than the maximum height for allowing the dirt collection bin 120 to be lifted.

[0046] When the dirt collection bin 120 is separated from the bin reception recess 12a in order to remove the dirt collected in the dirt collection bin 120, the handle 133 of the lever unit 130 is rotated from the point B (see FIG. 8B) to the point A (see FIG. 7A). As such, the dirt collection bin 120 will be lowered in the reversed sequence as compared with the procedure of mounting the dirt collection bin 120. In this state, if the gripping means 160 is gripped and pulled in the direction opposite to that for mounting the dirt collection bin 120, i.e., to the outside of the cleaner body 11, the snapped engagement between the engagement groove

141 and the engagement projection **145** is released so that the dirt collection bin **120** can be easily pulled out from the cleaner body **11**.

[0047] According to the present disclosure as described above, there is an advantage in that the dirt collection bin can be simply and stably snapped in the bin collection part in the cleaner body through a simple engagement unit. In addition, convenience in use can be enhanced because the dirt collection bin can be simply separated from the bin-reception recess in the cleaner body by drawing the dirt collection means from the cleaner body in a predetermined direction for pulling out the dirt collection bin.

[0048] Moreover, when the dirt collection bin is lifted through the lever unit, the dirt collection bin is lifted while maintaining the horizontal posture thereof through the engagement unit and the guide unit, so that the top end of the dirt collection bin generally comes into contact with the outer bottom surface of the cyclone unit in an evenly compressed state, whereby the airtight state can be maintained between the cyclone unit and the dirt collection bin.

[0049] Although representative embodiments of the present disclosure have been shown and described in order to exemplify the principle of the present disclosure, the present disclosure is not limited to the specific embodiments. It will be understood that various modifications and changes can be made by one skilled in the art without departing from the spirit and scope of the disclosure as defined by the appended claims. Therefore, it shall be considered that such modifications, changes and equivalents thereof are all included within the scope of the present disclosure.

What is claimed is:

1. A vacuum cleaner comprising:
 - a cleaner body;
 - a suction brush for suctioning dirt from a surface to be cleaned;
 - a cyclone unit for separating dirt from air introduced through the suction brush, the cyclone unit discharging purified air;
 - a dirt collection bin for collecting the separated dirt from the cyclone unit, the dirt collection bin being removably arranged below the cyclone unit;
 - an engagement unit for allowing the dirt collection bin to be removably fitted in a bin reception recess provided in the cleaner body, the engagement unit comprising at least one engagement projection and at least one engagement groove; and
 - a guide unit for guiding the engagement projection to be correctly engaged in the engagement groove when the dirt collection bin is received in the bin reception recess,
 - wherein the engagement unit restrains the dirt collection bin from moving forward and backward in relation to the cleaner body, and the guide unit stably restrains the dirt collection bin from rotating left and right, thereby stably fixing the dirt collection bin in the cleaner body.
2. The vacuum cleaner as claimed in claim 1, wherein the engagement groove is formed in the bin reception recess, and the engagement projection is formed on the dirt collection bin, the engagement projection being snapped in the engagement groove when the dirt collection bin is fitted in the bin reception recess.
3. The vacuum cleaner as claimed in claim 2, wherein the engagement projection and the engagement groove are

mated with each other at one or both side portions of each of them where they confront with each other.

4. The vacuum cleaner as claimed in claim 2, wherein the engagement projection has protrusions vertically formed along the opposite side edges on the front face thereof, and the engagement groove has depressions, which are engaged with the protrusions, respectively, the protrusions being press-fitted in the depressions.

5. The vacuum cleaner as claimed in claim 1, wherein the guide unit comprises:

- at least one guide groove formed on the outer bottom surface of the dirt collection bin; and

- at least one guide projection formed on a seating surface in the cleaner body in such a manner as to be correspondingly inserted into the at least one guide groove, the outer bottom surface of the dirt collection bin being seated on the seating surface.

6. The vacuum cleaner as claimed in claim 1, wherein the dirt collection bin further comprises one or more gripping means for use in pulling out the dirt collection bin from the bin reception recess, the gripping means being provided on a side portion of the dirt collection bin exposed to the outside in a state in which the dirt collection bin is received in the bin reception recess in the cleaner body.

7. The vacuum cleaner as claimed in claim 1, further comprising a lever unit interposed between the outer bottom surface of the dirt collection bin and a seating surface in the cleaner body, on which the dirt collection bin is seated, wherein the lever unit is capable of rotating so as to lift the dirt collection bin and compressively engage the dirt collection bin with the outer bottom surface of the cyclone unit.

8. The vacuum cleaner as claimed in claim 7, wherein the engagement projection has a height that is smaller than a height, H1, of the engagement groove so that a vertical gap is formed when the engagement projection and the engagement groove are engaged with each other, whereby the dirt collection bin can be lifted with a horizontal posture when the lever unit is rotated.

9. A vacuum cleaner comprising:

- a cleaner body having a cyclone unit and a bin reception recess below the cyclone unit;

- a dirt collection bin for collecting dirt separated by the cyclone unit;

- an engagement unit for removably securing the dirt collection bin in the bin reception recess, the engagement unit comprising an engagement projection and an engagement groove; and

- a guide unit for guiding the engagement projection into engagement with the engagement groove when removably securing the dirt collection bin in the bin reception recess,

- wherein, when the dirt collection bin is removably secured in the bin reception recess, the engagement unit restrains the dirt collection bin from moving forward and backward in relation to the cleaner body and the guide unit restrains the dirt collection bin from rotating in relation to the cleaner body.

10. The vacuum cleaner as claimed in claim 9, further comprising a lever unit between the dirt collection bin and the cleaner body, the lever unit being capable of rotating so as to lift the dirt collection bin and compressively engage the dirt collection bin with an outer bottom surface of the cyclone unit.

11. The vacuum cleaner as claimed in claim **10**, wherein the engagement groove is formed in the bin reception recess and the engagement projection is formed on the dirt collection bin, the engagement projection being snapped in the engagement groove when the dirt collection bin is removably secured in the bin reception recess.

12. The vacuum cleaner as claimed in claim **11**, wherein the engagement projection has a height that is smaller than a height of the engagement groove so that a vertical gap is formed when the engagement projection and the engagement groove are engaged with each other, whereby the dirt collection bin can be lifted with a horizontal posture when the lever unit is rotated.

13. The vacuum cleaner as claimed in claim **9**, wherein the guide unit comprises:

at least one guide groove formed on an outer bottom surface of the dirt collection bin; and

at least one guide projection formed on the cleaner body in such a manner as to be correspondingly inserted into the at least one guide groove when removably securing the dirt collection bin in the bin reception recess.

14. The vacuum cleaner as claimed in claim **9**, wherein the dirt collection bin further comprises one or more gripping devices.

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