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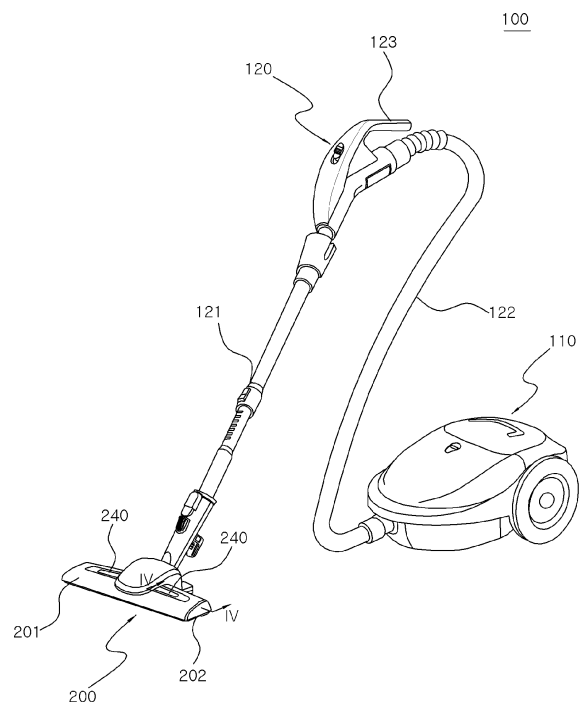
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(54) **Inlet means with multiple ports**

(57) An inlet means (200) with multiple suction ports and a vacuum cleaner (100) in which the inlet means is disposed are provided. The inlet means (200) includes an upper casing (201) having a secondary suction port (231) formed therein, a lower casing (202) engaged with the upper casing. The inlet means (200) further has a main suction port (203) formed therein and a shutter (240) formed in the upper casing; a secondary flow path (230) and an shutter flow path (210) are each formed between the upper casing and the lower casing, the shutter (240) opens the secondary suction port (230) and closes an upper end of the shutter flow path (210), when the vacuum at a lower area of the lower casing is increased. Accordingly, a constant contact force is maintained between the inlet means and the surface being cleaned.

FIG. 1



Description

[0001] The following description relates to a vacuum cleaner, and more particularly, to an inlet means for use in a vacuum cleaner, and a vacuum cleaner having the same.

[0002] Generally, vacuum cleaners such as upright cleaners, canister cleaners, or steam cleaners generate a vacuum within a cleaner body by driving a fan motor unit.

[0003] The vacuum generated within the vacuum cleaner body is applied as a suction force to draw in an external air stream along with suspended substances such as dust from a surface being cleaned, through an inlet means which may comprise a brush assembly or a nozzle. As the drawn-in air stream flows into a dust bag or centrifugal separator, the suspended substances are separated from the air stream and collected. The air stream, free of suspended substances, is then discharged out of the vacuum cleaner.

[0004] While a user performs a cleaning job using the above vacuum cleaner, a lower surface of the inlet means is brought into close contact with the surface being cleaned due to the suction force. If the suction between the inlet means and the surface being cleaned is greater than necessary, the movement of the inlet means over the surface being cleaned is impeded which affects cleaning efficiency. The problem may be worse for certain types of surfaces.

[0005] Many solutions have been suggested in an attempt to overcome the abovementioned problems. Examples of these are: Korean Patent No. 0621259 ('prior art document 1'), Korean Utility Model Publication No. 1999-0029151 ('prior art document 2'), Japan Patent Publication No. 2000-217753 ('prior art document 3'), Japan Utility Model Publication No. S62-184847 ('prior art document 4'), and Japan Patent Publication No. 2008-086549 ('prior art document 5').

[0006] Prior art documents 1 to 5 disclose inlet means such as a suction device, a suction brush, or the like, which has an integrated valve and a secondary flow path formed when the valve is open. The valve is opened when an internal vacuum pressure of the inlet means increases during operation of the vacuum cleaner, thereby letting in an air stream through the secondary flow path and thereby maintaining the force between the inlet means and the surface being cleaned.

[0007] However, in the abovementioned prior art documents, since the valve and the secondary flow path are integral with one another, if the secondary flow path is blocked by debris, the air stream does not pass efficiently through the secondary flow path.

[0008] This results in excessive suction between the surface being cleaned and the inlet means, so the user cannot continue cleaning.

[0009] The present invention has been made to overcome the above shortcomings and accordingly, it is an object of the present invention to provide an inlet means

with multiple suction ports in which secondary flow paths are opened and closed even when the secondary flow paths are blocked with debris, thereby ensuring that the suction between the inlet means and the surface being cleaned remains relatively constant.

[0010] A first aspect of the invention provides (200) for inlet means for a vacuum cleaner, comprising:

an upper casing (201) comprising a secondary suction port (231) formed therein;
a lower casing (202) engaged with the upper casing, and comprising a main suction port (203) formed therein;
a shutter (240) formed in the upper casing; and
a secondary flow path (230) and a shutter flow path (210) each formed between the upper casing and the lower casing, wherein
the shutter (240) opens the secondary suction port and closes an upper end of the shutter flow path when the vacuum at a lower area of the lower casing is increased.

[0011] The lower casing (202) may further comprise a guide hole (212) which places the lower area in fluid communication with the shutter flow path (210) of the inlet means.

[0012] The inlet means may further comprise an upper opening portion (211) which places the secondary flow path (230) in fluid communication with the shutter flow path (210).

[0013] At least two secondary flow paths (230) and at least two shutter flow paths (210) may be formed in the inlet means.

[0014] According to a further aspect the invention provides a vacuum cleaner (100) comprising:

a main body (110); and
an inlet means (200) in fluid connection with the main body, the inlet means comprising a main suction port (203) to draw in a foreign substance, wherein the inlet means (200) comprises,
a secondary flow path (230) opened and closed by a vacuum in a lower area of the inlet means to selectively admit an air stream from an upper portion of the inlet means,
a shutter flow path (210) to transmit the vacuum in the lower area of the inlet means to the secondary flow path to open and close the secondary flow path, and
a shutter (240) to open the secondary flow path and concurrently close the shutter flow path with the vacuum transmitted to the shutter flow path.

[0015] The vacuum cleaner may further comprise a guide hole (212) to place an upper opening portion (211) in fluid communication with the lower area of the inlet means, wherein the upper opening portion (211) may place the shutter flow path in fluid communication with

the secondary flow path.

[0016] A further aspect of the invention provides a nozzle attachment for a vacuum cleaner comprising:

- an operational facet for contacting a surface to be cleaned;
- an exit port through which an air stream exits the nozzle attachment in use;
- a first air passage connecting said operational facet and said exit port;
- a second passage connecting said first passage to an exterior of the nozzle attachment; and
- a valve for selectively allowing air to flow from said first passage to said second passage and there-through to the exterior of said nozzle attachment to thereby relieve a pressure in said first passage.

[0017] The valve may be activated by a pressure in said first passage.

[0018] The nozzle attachment may further comprise a biasing means, wherein a reduction in pressure in said first passage may act against said biasing means.

[0019] Other features and aspects will be apparent from the following detailed description, the drawings and the claims.

FIG. 1 is a perspective view of a vacuum cleaner having an inlet means according to an embodiment of the present invention;

FIG. 2 is a perspective view of the inlet means of FIG. 1;

FIG. 3 is a bottom view of the inlet means of FIG. 1;

FIG. 4 is a cross section view of the inlet means, cut along line IV-IV of the inlet means of FIG. 1 to illustrate the secondary flow path in a closed state; and

FIG. 5 is a cross-section of the inlet means, cut along line IV-IV of the inlet means of FIG. 1 to illustrate the secondary flow path in an open state.

[0020] Throughout the drawings and the detailed description, unless otherwise described, the same reference numerals will be understood to refer to the same elements, features, and structures. The relative size and depiction of these elements may be exaggerated for clarity, illustration, and convenience.

[0021] The following detailed description is provided to assist the reader in gaining a comprehensive understanding of the methods, apparatuses, and/or systems described herein. Accordingly, various changes, modifications, and equivalents of the systems, apparatuses, and/or methods described herein will be suggested to those of ordinary skill in the art. Also, descriptions of well-known functions and constructions may be omitted for increased clarity and conciseness.

[0022] FIG. 1 is a perspective view of a vacuum cleaner having an inlet means according to an embodiment of the present invention, and FIG. 2 is a perspective view of the inlet means of FIG. 1.

[0023] Referring to FIG. 1, a vacuum cleaner 100 includes a main body 110, inlet means 200, and an extension tube assembly 120 to connect the main body 110 and the inlet means 200.

[0024] The main body 110 houses therein a suspended substance collecting portion (not illustrated) such as a dust bag or a dust-collecting unit, a fan motor unit (not illustrated), and a filter unit (not illustrated). The interior of the main body 110 is similar to those generally known and therefore a detailed description thereof will not to be included.

[0025] The extension tube assembly 120 may include an extension tube 121, a handle 123, and a hose 122. The extension tube 121 may be applied as a telescopic tube or extensible tube which is variable in length, and connected to the inlet means 200.

[0026] The handle 123 may include a switch which controls the vacuum cleaner 100 by starting or stopping the vacuum cleaner 100, thereby enabling a user to move the inlet means 200 along the surface being cleaned using the handle 123 and clean the surface.

[0027] The hose 122 may connect the handle 123 to the main body 110, allowing an air stream from the inlet means 200 into the main body 110. The inlet means 200 may be connected to the extension tube 121, to draw in suspended substances off the surface being cleaned along with the air stream, using a suction force generated in the main body 110.

[0028] Referring to FIG. 2, the inlet means 200 includes shutters 240 opened by the internal vacuum pressure and which allow an air stream from an upper portion of the inlet means 200 thereinto; secondary flow paths 230 (see FIGS. 4 and 5) which are opened and closed by the shutters 240; and shutter flow paths 210 in fluid communication with the secondary flow paths 230 to transfer the vacuum pressure of a lower area 255 (see FIG. 4) of the inlet means 200 to the secondary flow paths 230. With the abovementioned structure, the inlet means 200 is capable of not only maintaining a constant suction between the inlet means 200 and the surface being cleaned, but also of drawing in dust floating in an upper portion of the inlet means 200.

[0029] The shutters 240 and secondary suction ports 231 which define upper open portions of the secondary flow paths 230, may be sized to facilitate smooth introduction of the dust or other suspended material from not only an upper portion, but also a lower portion, of the inlet means 200.

[0030] The inlet means 200 may draw in dust or other suspended material in the upper portion of the inlet means 200 and thereby provide an air purification function. By removing dust or other material suspended in the upper portion of the inlet means, the inlet means 200 reduces the amount of dust falling onto the surface being

cleaned, thereby increasing cleaning efficiency.

[0031] FIGS. 3 to 5 illustrate the detailed structure of the inlet means 200 with the aforementioned functions, in which FIG. 3 is a bottom view of the inlet means 200 of FIG. 1, FIG. 4 is a cross-section of the inlet means, cut along line IV-IV of the inlet means of FIG. 1 to illustrate the secondary flow path in a closed state, and FIG. 5 is a cross-section of the inlet means, cut along line IV-IV of the inlet means of FIG. 1 to illustrate the secondary flow path in an open state.

[0032] The structure of the inlet means 200 will be explained in greater detail below with reference to FIGS. 1 to 5.

[0033] The inlet means 200 includes an upper casing 201 and a lower casing 202. The upper casing 201 includes secondary suction ports 231 (see FIGS. 4 and 5) extending to both sides from an upper central portion where the extension pipe 121 is attached, and shutters 240 each moveably connected to secondary suction ports 231 (see FIGS. 4 and 5). One end of each shutter 240 close to the central portion of the upper casing 201 is pivotally connected to the upper casing 201 by a hinge 240a to open and close the secondary suction ports 231.

[0034] The shutters 240 are pivotally connected to the upper casing 201 via elastic members (not illustrated). Accordingly, if a vacuum pressure at a lower area of the inlet means 200 is decreased, the shutters 240 are returned to their original position by the recovery force of the elastic members to thereby close the secondary suction ports 231.

[0035] Referring to FIGS. 3 to 5, the lower casing 202 includes a main suction port 203 formed in the central portion and in fluid communication with the extension tube 121, guide holes 212 formed on both sides of the main suction port 203, and shutter flow paths 210 which connect secondary inlet means ports 232 of the secondary flow paths 230 and the guide hole 212 to interiors of the secondary flow paths 230.

[0036] The upper casing 201 and the lower casing 202 are connected to one another, defining spaces therebetween which serve as the secondary flow paths 230 and thereby constitute the inlet means 200.

[0037] If the shutters 240 are opened, the external air stream is introduced into the lower area 255 via the secondary suction ports 231, the secondary flow paths 230, and the secondary inlet means ports 232. Upper opening portions 211 of the shutter flow paths 210 connect the secondary flow paths 230 under the shutters 240 to the shutter flow paths 210.

[0038] Hereinbelow, the operation of the shutter flow paths 210, the shutters 240, and the secondary flow paths 230 maintaining a constant suction between the inlet means 200 and the surface being cleaned, and the operation whereby dust suspended in the upper portion of the inlet means 200 is drawn in during a cleaning operation of the vacuum cleaner 100 having the inlet means 200, will be explained in detail with reference to FIGS. 4 and 5.

[0039] The vacuum cleaner 100 is operated, generating a vacuum therein. The vacuum is applied as a suction force to the inlet means 200 so that the inlet means 200 draws in an external air stream along with dust from a surface being cleaned.

[0040] As the vacuum is formed within the vacuum cleaner 100, the user begins cleaning, moving the inlet means 200 along the surface being cleaned using the handle 123.

[0041] If the vacuum formed in a lower portion causes the inlet means 200 to be pulled toward the surface being cleaned and accordingly, the space between the lower surface of the inlet means 200 and the surface being cleaned rapidly decreases, the amount of air introduced into the main suction port 203 of the inlet means 200 is decreased, and the vacuum at the lower area 255 of the inlet means 200 rapidly increases. The increased vacuum is transmitted to the shutter flow paths 210 and the secondary flow paths 230 through the guide holes 212 and the secondary suction ports 232. The increased vacuum of the shutter flow paths 210 and the secondary flow paths 230 is applied as a force which causes the shutters 240 to pivot downward from the upper casing 201.

[0042] If the vacuum of the shutter flow paths 210 and the secondary flow paths 230 is increased to the extent where it exceeds the force of the elastic members (not illustrated) acting on the shutters 240 (see FIG. 5), the shutters 240 are pivoted towards the lower portion of the upper casing 201 to thereby open the secondary suction ports 231 and concurrently close the upper opening portions 211 of the shutter flow paths 210. If the shutters 240 close the upper opening portions 211 of the shutter flow paths 210, the vacuum at the lower area of the inlet means 200 is transmitted to the shutters 240 through the guide holes 212 and the shutter flow paths 210 and the air stream introduced into the secondary suction ports 231, the secondary flow paths 230, and the secondary inlet means ports 232 acts against the upper surfaces of the shutters 240. Accordingly, the shutters 240 keep the opening portions 211 in closed positions unless the vacuum decreases.

[0043] If the air from the upper portion of the inlet means 200 is continuously introduced into the lower area 255 of the inlet means 200 through the secondary suction ports 232 and the secondary flow paths 230, the vacuum at the lower area 255 of the inlet means 200 decreases, and the suction between the inlet means 200 and the surface being cleaned decreases. Accordingly, the user can clean even a soft surface such as a carpeted floor with ease.

[0044] Since foreign substances such as dust suspended in the upper portion of the inlet means 200 are introduced along with the air stream through the secondary flow paths 230, the air at the upper portion of the inlet means 200 is cleaned and purified. Accordingly, the amount of dust or other material returning to the surface being cleaned is decreased, which in turn improves cleaning efficiency of the surface being cleaned.

[0045] If the secondary suction ports 231, the secondary flow paths 230, or the secondary inlet means ports 232 are blocked due to dust or other material in the air stream introduced from the upper portion, the vacuum in the lower area 255 is transmitted to the shutters 240 through the guide holes 212. Accordingly, this helps ensure that the shutters 240 are kept open when the lower area 255 is under a relatively high vacuum. Blockage of the shutter flow paths 210 or the guide holes 212 is unlikely since the air stream from the upper portion is not introduced through the shutter flow paths 210 and the guide holes 212. Although some dust or other material suspended in the introduced air stream may be deposited on the secondary flow paths 230 or the like, it is unlikely that dust or other material would be deposited on the shutter flow paths 210. Accordingly, this helps ensure that the shutters 240 open the secondary suction ports 231 if the lower area 255 of the inlet means 200 has an increased vacuum during the cleaning operation of the vacuum cleaner 100. The suspended substances such as dust which may be deposited on the secondary flow paths 230 are usually removed by the drawn-in air stream.

[0046] According to an aspect of the present invention, the shutter flow paths 210 open and close the shutters 240 while the secondary flow paths 230, which are employed separately from the shutter flow paths 210, serve as passages through which an air stream from an upper portion of the inlet means 200 is introduced. Accordingly, this helps ensure that the shutters 240 are kept open and dust and other material, if deposited on the shutter flow paths 210, clean themselves.

[0047] As the air stream is constantly introduced from the upper portion of the inlet means 200 into the lower area 255 through the secondary flow paths 230, the vacuum of the lower area 255 of the inlet means 200 may decrease below the amount where this overcomes the recovery force of the elastic members supporting the shutters 240. In this case, the shutters 240 are returned to their original position by the recovery force of the elastic members, thereby closing the secondary suction ports 231.

[0048] That is, the shutters 240 open the secondary suction ports 231 if the vacuum of the lower area 255 of the inlet means 200 increases above a predetermined value and closes the secondary suction ports 231 if the vacuum of the lower area 255 decreases below a predetermined value.

[0049] Accordingly, the lower area 255 of the inlet means 200 is kept under a constant vacuum, and the suction between the inlet means 200 and the surface being cleaned is kept constant.

[0050] The suction between the inlet means 200 and the surface being cleaned can be adjusted by adjusting the modulus of elasticity of the elastic members.

[0051] As explained above, since the secondary flow paths 230 are opened and closed by the shutter flow paths 210, the secondary flow paths 230 are opened and

closed effectively even when the movement of air current is impeded in the secondary flow paths 230 due to blockage of the secondary flow paths 230 or other paths by deposited dust or other material.

[0052] Furthermore, since the secondary flow paths 230 are opened and closed effectively, a constant suction is maintained between the inlet means 200 and the surface being cleaned.

[0053] Furthermore, since dust and other material floating in the upper portion of the inlet means 200 are sucked into the secondary flow paths 230, air purification and cleaning efficiency are improved.

[0054] A number of embodiments have been described above. Nevertheless, it will be understood that various modifications may be made. For example, suitable results may be achieved if the described techniques are performed in a different order and/or if components in a described system, architecture, device or circuit are combined in a different manner and/or replaced or supplemented by other components or their equivalents. Accordingly, other implementations are within the scope of the following claims.

Claims

1. Inlet means (200) for a vacuum cleaner, comprising:

an upper casing (201) comprising a secondary suction port (231) formed therein;
a lower casing (202) engaged with the upper casing, and comprising a main suction port (203) formed therein;
a shutter (240) formed in the upper casing; and
a secondary flow path (230) and a shutter flow path (210) each formed between the upper casing and the lower casing, wherein
the shutter (240) opens the secondary suction port and closes an upper end of the shutter flow path when the vacuum at a lower area of the lower casing is increased.

2. An inlet means as claimed in claim 1, wherein the lower casing (202) further comprises a guide hole (212) which places the lower area in fluid communication with the shutter flow path (210) of the inlet means.

3. An inlet means as claimed in claim 2, further comprising an upper opening portion (211) which places the secondary flow path (230) in fluid communication with the shutter flow path (210).

4. An inlet means as claimed in any preceding claim, wherein at least two secondary flow paths (230) and at least two shutter flow paths (210) are formed in the inlet means.

5. A vacuum cleaner (100) comprising:

a main body (110); and
 an inlet means (200) in fluid connection with the
 main body, the inlet means comprising a main
 suction port (203) to draw in a foreign substance,
 wherein
 the inlet means (200) comprises,
 a secondary flow path (230) opened and closed
 by a vacuum in a lower area of the inlet means
 to selectively admit an air stream from an upper
 portion of the inlet means,
 a shutter flow path (210) to transmit the vacuum
 in the lower area of the inlet means to the sec-
 ondary flow path to open and close the second-
 ary flow path, and
 a shutter (240) to open the secondary flow path
 and concurrently close the shutter flow path with
 the vacuum transmitted to the shutter flow path.

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6. A vacuum cleaner as claimed in claim 5, further comprising a guide hole (212) to place an upper opening portion (211) in fluid communication with the lower area of the inlet means, wherein the upper opening portion (211) places the shutter flow path in fluid communication with the secondary flow path.

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7. A nozzle attachment for a vacuum cleaner comprising:

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an operational facet for contacting a surface to be cleaned;
 an exit port through which an air stream exits the nozzle attachment in use;
 a first air passage connecting said operational facet and said exit port;
 a second passage connecting said first passage to an exterior of the nozzle attachment; and
 a valve for selectively allowing air to flow from said first passage to said second passage and therethrough to the exterior of said nozzle attachment to thereby relieve a pressure in said first passage.

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8. A nozzle attachment as claimed in claim 7 wherein said valve is activated by a pressure in said first passage.

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9. A nozzle attachment as claimed in claim 8 further comprising a biasing means, wherein a reduction in pressure in said first passage acts against said biasing means.

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FIG. 1

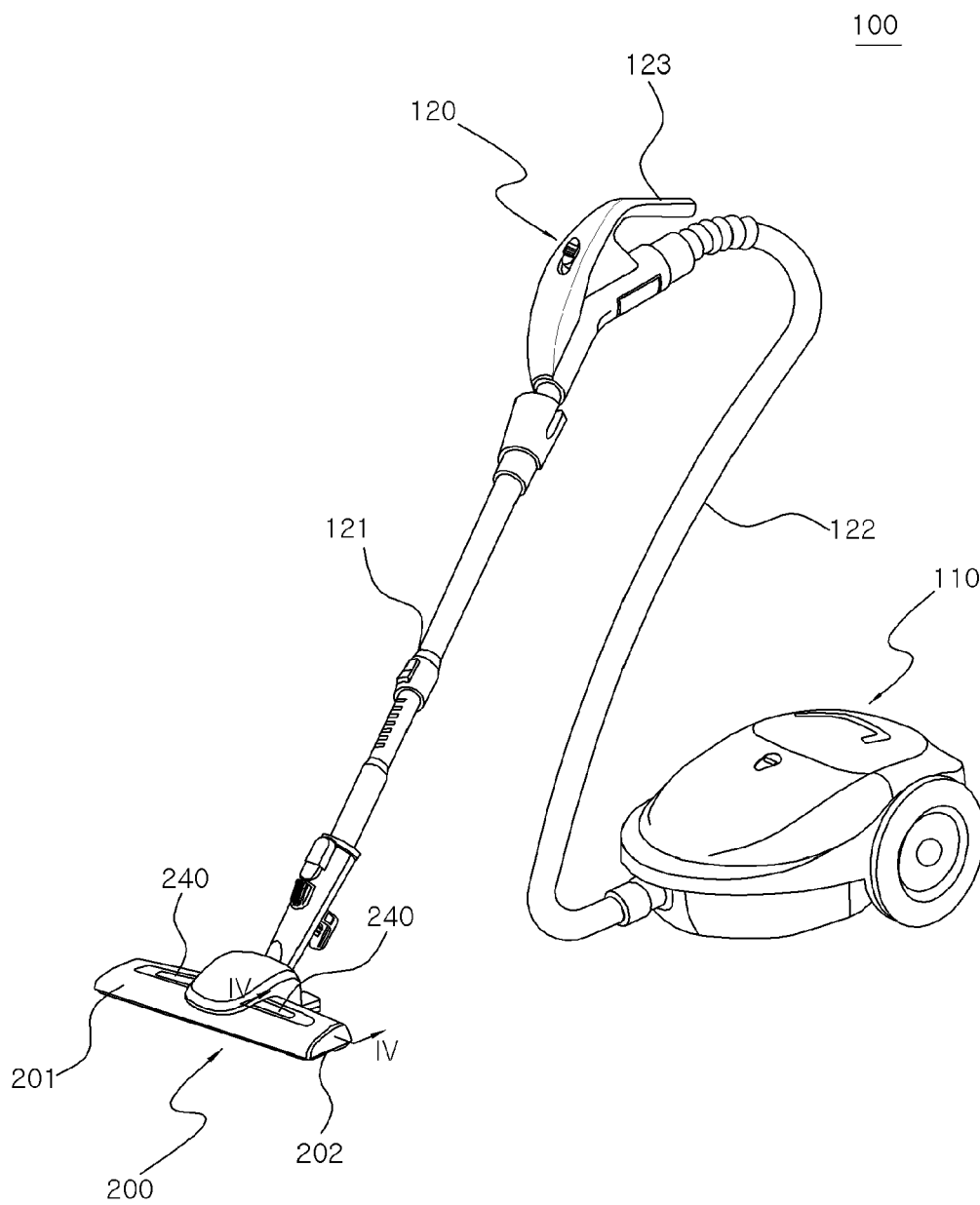


FIG. 2

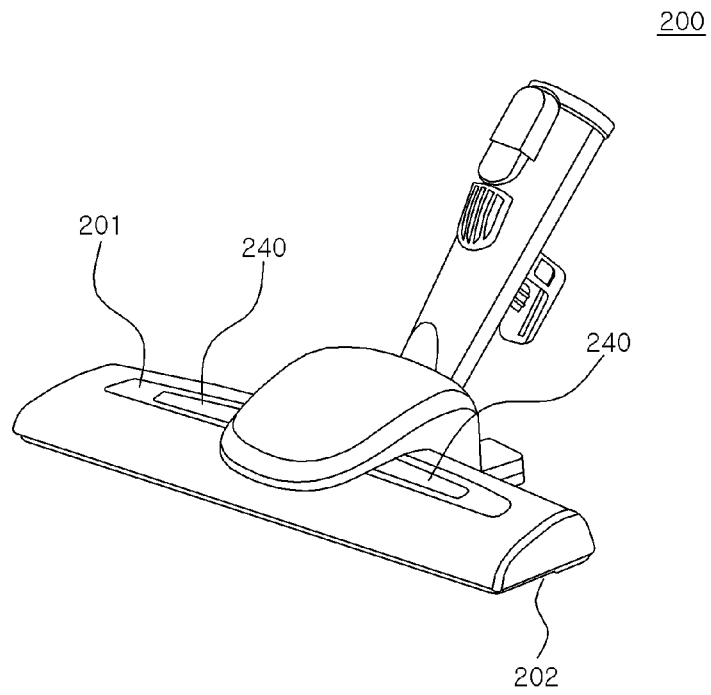


FIG. 3

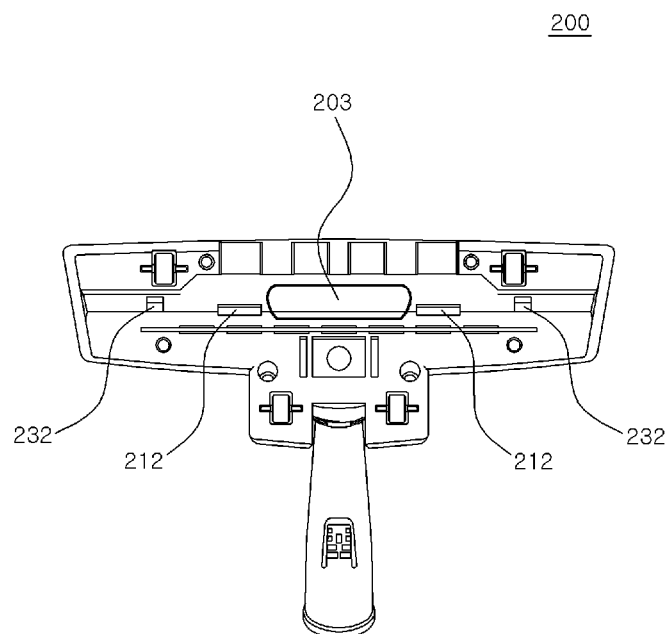


FIG. 4

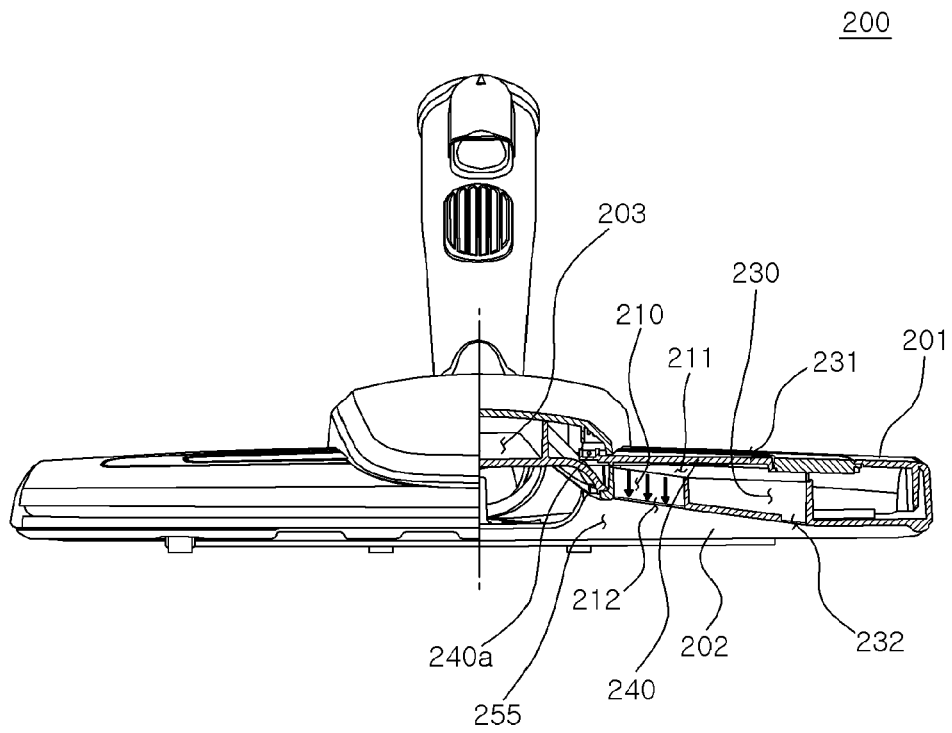
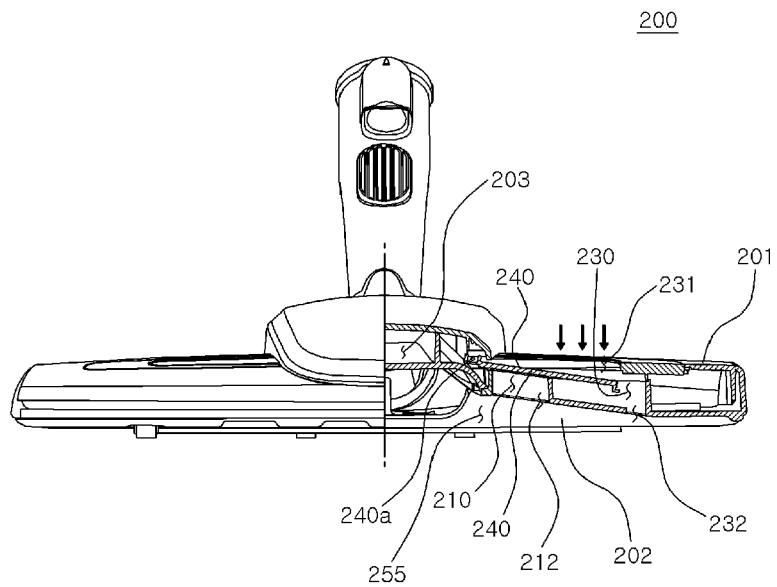


FIG. 5



REFERENCES CITED IN THE DESCRIPTION

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