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(54) **AIR SUCKING/BLOWING DEVICE AND ELECTRIC CLEANER PROVIDED WITH SAME**

LUFTANSAUG-/AUSBLASVORRICHTUNG UND ELEKTRISCHER REINIGER DAMIT

DISPOSITIF D'ASPIRATION/DE SOUFFLAGE D'AIR ET APPAREIL DE NETTOYAGE ÉLECTRIQUE ÉQUIPÉ DE CELUI-CI

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Description

Technical Field

[0001] The present invention relates to an air suction/injection device employed in a vacuum cleaner and a vacuum cleaner comprising such air suction/injection device, and particularly relates to an air suction/injection device, which is capable of injecting air by utilizing suction of air created by a vacuum cleaner and is also capable of switching between suction and an injection of air, and to a vacuum cleaner comprising the same.

Background Art

[0002] General vacuum cleaners involve a function for suctioning air to suction dusts together with air (hereinafter referred to as "vacuum function"), and in recent years, new configurations of vacuum cleaners involving a function for injecting air to blow dusts off (hereinafter referred to as "blower function") are proposed. When the vacuum cleaner comprises the blower function, it is possible to sweep dusts present in a location that is difficult to see by a user (a back side, a top surface and the like of an installed furniture) or in a high location viewed by a user (a top surface of the above-described furniture, a hood of a lighting device, a ceiling and the like).

[0003] A technology of utilizing exhaust air is conventionally known as a specific blower function. Even though the exhaust air is an airflow which has passed through a dust chamber of the vacuum cleaner, such exhaust air is provided as a clean airflow in the practical blower function. However, users tend to have images as insanitation, in view of utilizing the exhaust air. Further, when the blower function has a configuration of utilizing a suction hose or an extension tube or the like, it is suspected that minute amount of dusts adhered to the interior thereof are blown out, and therefore users also tend to have images as insanitation. Thus, blower functions, which do not utilize exhaust air, are recently proposed.

[0004] For example, Patent Literature 1 discloses an air suction/injection device comprising a suction fan actuated by a suction force, an injection fan generating an injection force, and a power transmission means which transmits the power of the above-described suction fan to the above-described injection fan. According to such configuration, the injection fan can be rotated by the suction force of the vacuum cleaner by only connecting the air suction/injection device to the suction hose. Hence, the blower function, which does not utilize exhaust air, can be additionally utilized, regardless of the type of the vacuum cleaner.

[0005] Further, Patent Literature 2 discloses a suction tool for a vacuum cleaner configured to comprise a pressure generator section, which is capable of forcing air into an injection nozzle provided in a suction port. Such a suction tool injects compressed air created in the pressure generator section such as an air pump and the like from the injection nozzle, so that dusts adhered to the surface to be cleaned or accumulated in a corner of a concave and convex section are blown out and then are suctioned. Hence, the blower function without utilizing the exhaust air can be achieved and the dusts blown out by the blower function can be rapidly suctioned, such that the dust collection with higher efficiency can be realized.

Patent Literature

[0006] Patent Literature 1: Japanese Laid-Open Patent Application Publication No. 2000-217746

Patent Literature 2: Japanese Laid-Open Patent Application Publication No. 2001-321305

Technical Problem

[0007] However, since the aforementioned conventional technology cannot provide easy switching of the timing between the injection and the suction of the air with a simple configuration, sufficient contribution of the blower function to the cleanup work of the vacuum cleaner cannot be achieved.

[0008] More specifically, the situations, in which the blower function can be preferably employed, include not only: the above-described situation (1) cleaning a location that is difficult to see by a user or a high location; or situation (2) sweeping dusts adhered to the surface to be cleaned or accumulated in a corner of a concave and convex section, but also situation (3) cleaning objects, on which there is a fear to cause a damage, an unwanted movement, a misoperation, or an erroneous suction when the suction port approaches thereto. However, since the switching between the blower function and the vacuum function is difficult in the conventional technology, such technology cannot sufficiently address the various situations as described above.

[0009] For instance, examples of the aforementioned situation (3) typically include: ornaments such as artificial flowers and the like, which may be possibly broken by applying the suction; wall-hanged picture frames or clocks, which may be inclined when they are directly touched for the cleanup; telephones, facsimile machines or keyboards of personal

computers, which may possibly be misoperated due to the approach of the suction port; or inside of drawers containing small articles, which may possibly be erroneously suctioned, and the like, and when the cleanup of these objects are conducted, the damage, the movement or the erroneous suction as described above may be possibly caused only by the use of the ordinary suction.

[0010] Here, while dusts can be blown out from the object through the pneumatic injection by employing the conventional blower function, such simple blowing out may possibly cause a broad scatter of the dusts. In particular, in the room with higher air tightness, the simple use of the blower function results in only dispersing the dusts, which eventually leads to broadening the area for removing dusts by suctioning. Further, since no particular disclosure related to configurations for switching between the ordinary vacuum function and the blower function is made in the related art, it is difficult to provide an easy switching between the vacuum function and the blower function in accordance with the various situations such as the above-described situations (1) to (3) with a simple configuration.

[0011] DE 299 07 437 U relates to a dust-removing device for surface dust. Dust is blown off by means of air flow and simultaneously the dust is sucked in.

SUMMARY OF THE INVENTION

[0012] It is an object of the present invention to provide an improved and useful air suction/injection device in which the above-mentioned problems are eliminated. In order to achieve the above-mentioned object, there is provided an air suction/injection device according to claim 1. Advantageous embodiments are defined by the dependent claims.

[0013] Advantageously, there is provided an air suction/injection device which connects to a front end of a suction hose included in a vacuum cleaner, the air suction/injection device comprising: a tube-like main body, one end of the main body serving as a rear end opening section connected to the front end of the suction hose and the other end thereof serving as a front end opening section, and an interior of the main body forming a main passage of air; an injection passage section having an injecting air inlet for introducing air from outside and an injection outlet for injecting the introduced air to the outside, an interior of the injection passage section forming a sub-passage from the injecting air inlet to the injection outlet; a power fan provided in the interior of the main body and being rotated by a suctioned airstream created in the main passage by means of suction of air through the suction hose; an injection fan provided in an interior of the injection passage section and rotates in conjunction with the power fan to create an injecting airstream from the injecting air inlet toward the injection outlet in the sub-passage; and an injection switching section for permitting or limiting injection of the injecting airstream from the injection outlet to the outside.

[0014] According to the above-described configuration, it achieves not only that the injecting airstream can be created in the sub-passage without employing a configuration that requires a specific power source, but also that the injection of the injecting airstream from the injection outlet can be permitted and blocked by the injection switching section. Hence, it achieves not only that the injecting airstream can be easily injected from the front end of the suction nozzle in the use of the vacuum cleaner without adopting complicated configurations, but also that switching between the suction (vacuum function) and the injection (blower function) of air can be easily achieved by substantially the action of the injection switching section. This results in that the switching between the blower function and the vacuum function in the vacuum cleaner can be easily achieved with a simple configuration, and in addition, the blower function can be effectively utilized in various conditions.

[0015] In the above-described air suction/injection device, the injection switching section may be a passage switching section for switching between connecting of and blocking of the sub-passage to the injection outlet.

[0016] Advantageously, the sub-passage, which leads to the injection outlet, is connected or blocked to achieve permission or blocking of the flow of the injecting airstream from the sub-passage to the front end opening section. This allows easy switching between the suction (vacuum function) and the injection (blower function) of air to further considerably improve the operability.

[0017] In the above-described air suction/injection device, the injection switching section may be a passage open-close section for opening or blocking the main passage or the sub-passage at a location upstream of the power fan or the injection fan, in a flow direction of the suctioned airstream.

[0018] According to the above-described configuration, the permission or the blocking of the flow of the injecting airstream from the sub-passage to the injection outlet is achieved by opening and closing the main passage or the sub-passage. This allows easy switching between the suction (vacuum function) and the injection (blower function) of air to further considerably improve the operability.

[0019] In the above-described air suction/injection device, it may further comprises a power fan housing section provided in the main passage in the main body, for housing the power fan therein, and the power fan housing section may include a inner suction inlet facing to the main passage and a suctioned air introduction inlet for introducing air from the outside.

[0020] Advantageously, air can be taken from the suctioned air introduction inlet to the power fan housing section while the power fan is protected with the power fan housing section, so that the reduction in the pressure due to the

main passage directly affects the interior of the power fan housing section to reduce the pressure therein, so that a large quantity of the suctioned airstream is created from the suction air inlet toward the inner suction inlet. This allows rotating the power fan at an elevated rate, so that the injecting airstream with higher flow velocity can be created by means of the injection fan.

[0021] In the above-described air suction/injection device, it may further comprise an air introduction cover member for closing at least a portion of a passage of air from the suctioned air introduction inlet to the main passage in openable and closable manner.

[0022] Advantageously, the air introduction cover member is opened only when the injecting airstream is created and the air introduction cover member is closed when the injecting airstream is not created, so that a fear for decreasing the flow velocity of the suctioned airstream can be avoided.

[0023] In the above-described air suction/injection device, the injection passage section may be provided in the main body so that the sub-passage in the injection passage section is joined to the main passage in the main body, and the front end opening section in the main body may serve as the injection outlet in the injection passage section, and the passage switching section may be provided in a section where the main passage is joined to the sub-passage and may be a valve member for changing its position so as to close one of the main passage and the sub-passage.

[0024] Advantageously, one of the main passage and the sub-passage is closed by switching the valve member to connect the aforementioned one of these passages to the front end opening section. Hence, when the main passage is closed, the sub-passage leads to the front end opening section so that the injecting airstream can be injected from the front end opening section, and when the sub-passage is closed, the suctioned airstream can be created in the main passage from the front end opening section toward the rear end opening section. Accordingly, the switching between the blower function and the vacuum function in the vacuum cleaner can be easily achieved with a simple configuration simply by the switching of the valve member.

[0025] In the above-described air suction/injection device, the injection passage section may be provided in the main body so that the sub-passage in the injection passage section reaches the front end opening section along the main passage inside of the main body, and the passage open-close section may be a valve member for blocking only the main passage.

[0026] According to the above-described configuration, the sub-passage directly leads to the front end opening section, so that the injecting airstream can be injected from the front end opening section without particularly switching the passage and the suctioned airstream can be created in the main passage by opening the valve member. Accordingly, the switching between the blower function and the vacuum function in the vacuum cleaner can be easily achieved with a simple configuration simply by the opening and closing the closing valve member.

[0027] In the above-described air suction/injection device, it may further comprise a lever member provided outside of the main body, the lever member being operative in response to a positional change of the valve member.

[0028] Advantageously, switching of the valve member provided inside of the main body can be achieved by operating the lever member provided outside of the main body. Hence, the switching between the blower function and the vacuum function in the vacuum cleaner can be easily achieved with a simple configuration.

[0029] In the above-described air suction/injection device, the front end opening section may be provided in the main body as a turnable opening section, which is a separate member turnable in a circumference direction thereof, an interior of the turnable opening section being provided with a through hole and a closed hole, the closed hole being adjacent to the through hole and having one open end that leads to the main body and the other closed end, and the injection passage section may be provided in the main body so that the main passage is adjacent to the sub-passage in an end leading to the turnable opening section of the main body, and the through hole of the turnable opening section may serve as the injection outlet in the injection passage section, and the turnable opening section may connect the closed hole to one of the main passage and the sub-passage, and the turnable opening section may be turned so as to connect the through hole to the other of the main passage and the sub-passage, so that it functions as the passage switching section.

[0030] Advantageously, the closed hole can be connected to the main passage or the sub-passage by turning the turnable opening section to close one of these passages, so that switching of the connection and the blocking of the sub-passage can be achieved. Hence, the switching between the blower function and the vacuum function in the vacuum cleaner can be easily achieved with a simple configuration.

[0031] In the above-described air suction/injection device, the injection passage section and the power fan housing section may be cylindrical housing for fan section such that the injection passage section and the power fan housing section are integrated together in a state in which the injection fan and the power fan are internally housed, respectively, and may be rotatably provided to the main body, the housing for fan section may be inserted in the main body in a location between the front end opening section and the rear end opening section along a direction for intersecting with the tube axis of the main body, and at least a portion of an outer circumference thereof may face to the main passage of the main body, the injecting air inlet may be provided in a location in a top surface of the housing for fan section and at the outside of the main body, and an injection outlet may be provided in a part of the outer circumference of the

housing for fan section to form the sub-passage between the injecting air inlet and the injection outlet, and the housing for fan section may function as the injection switching section, by turning the housing for fan section to change the position of the injection outlet.

[0032] Advantageously, the connection or the blocking of the sub-passage configured inside of the housing for fan section with the front end opening section can be achieved by turning the housing for fan section to change the position of the injection outlet. Hence, the creation and the stopping of the injecting airstream can be achieved simply by turning the housing for fan section, so that the switching between the blower function and the vacuum function in the vacuum cleaner can be easily achieved with a simple configuration.

[0033] In the above-described air suction/injection device, the injection passage section may be provided to be inserted in the main body so as to position the sub-passage along the main passage inside of the main body, and the suctioned air introduction inlet may be provided at a location facing to the outside of the main body in the suctioned airstream, and it may comprise a passage open-close section serving as the injection switching section for closing at least a part of the passage of air from the suctioned air introduction inlet to the main passage in openable and closable manner.

[0034] Advantageously, the main passage and the sub-passage are provided in the interior of the main body, and at least a portion of the passage of air from the suctioned air introduction inlet to the above-described main passage is closed by the passage open-close section in openable and closable manner. Hence, when the above-described passage is closed with the passage open-close section, no air is introduced into the sub-passage, so that only the suctioned airstream is created in the main passage. On the other hand, when the passage open-close section is opened, air is introduced into the sub-passage, so that the injecting airstream is substantially created. The injecting airstream can be formed or be stopped in this way by opening and closing the passage open-close section, so that switching between the blower function and the vacuum function in the vacuum cleaner can be easily achieved with a simple configuration.

[0035] In the above-described air suction/injection device, it may further comprise a suction nozzle detachably provided in the front end opening section.

[0036] Advantageously, the suction nozzle is detachable, so that the suction nozzle having appropriate configuration can be selectively employed according to the conditions of the cleanup, the objects of the cleanup or the locations of the cleanup.

[0037] In the above-described air suction/injection device, it may further comprise a liquid spray section including a liquid storage tank and a spray nozzle for spraying liquid stored in the liquid storage tank, and the liquid spray section may be detachably provided in the injection outlet.

[0038] Advantageously, the liquid spray section may be mounted to the front end opening section in the present embodiment, so that liquid can be sprayed by using the injecting airstream. Hence, the variation of the cleanup can be broadened.

[0039] In the above-described air suction/injection device, the front end opening section may be configured as a front end nozzle section at a front end side, the front end nozzle section having a shape in which a cross sectional area is gradually reduced toward the front end. This allows utilizing the air suction/injection device itself as the suction nozzle.

[0040] In the above-described air suction/injection device, an injection opening regulation member for adjusting the momentum of the injecting airstream may be provided inside of the front end nozzle section.

[0041] When the configuration functioning as both of the suction port and the injection outlet is employed according to the above-described configuration, if the injection opening regulation member is not actuated at the time of vacuum, the vacuum process can be conducted through an original dimensional area of the opening of the suction port, and if the injection opening regulation member is actuated at the time of blower, the dimensional area of the opening of the injection outlet (namely, suction port) can be reduced to achieve enhanced flow velocity of the injecting air stream.

[0042] Advantageously, a vacuum cleaner comprises one of the aforementioned air suction/injection devices, and a suction hose provided with the air suction/injection device. In vacuum cleaner, the air suction/injection device may be connected to the suction hose, and preferably, may be detachably connected to the suction hose.

[0043] The above-described objects, the other objects, the characteristic and the benefits of the present invention will become apparent from the following descriptions of the preferred embodiments taken in conjunction with the annexed drawings.

Advantageous Effects of the Invention

[0044] As described above, the present invention provides benefits for providing a technology, which is capable of easily switching between the vacuum function and the blower function of the vacuum cleaner with a simple configuration, and is also capable of effectively utilizing the blower function even in the various situations.

Brief Description of the Drawings

[0045]

[Fig. 1] Fig. 1 is a perspective view of an example of a vacuum cleaner comprising an air suction/injection device according to Embodiment 1 of the present invention.

[Fig. 2] Fig. 2 is a side view, illustrating an example of an air suction/injection device according to Embodiment 1 of the present invention.

[Fig. 3] Fig. 3 is a perspective view, illustrating an example of a condition of the air suction/injection device shown in Fig. 2 provided with a suction nozzle mounted thereon.

[Fig. 4] Fig. 4 is a side view of the air suction/injection device shown in Fig. 3, illustrating an example of a condition at the time of vacuum (in formation of suctioned airstream).

[Fig. 5] Fig. 5 is a cross-sectional view of the air suction/injection device shown in Fig. 4, illustrating an example of the internal configuration at the time of vacuum (in formation of suctioned airstream) viewed from the lateral side.

[Fig. 6] Fig. 6 is a side view, illustrating an example of the air suction/injection device shown in Fig. 3 in a condition of being mounted to a handy operation section (suction hose) equipped in the vacuum cleaner.

[Fig. 7] Fig. 7 is a side view of the air suction/injection device shown in Fig. 3, illustrating an example in a condition at the time of blower (in formation of injecting airstream).

[Fig. 8] Fig. 8 is a cross-sectional view of the air suction/injection device shown in Fig. 7, illustrating an example of the internal configuration at the time of blower (in formation of injecting airstream) viewed from the lateral side.

[Fig. 9] Fig. 9 is a partial cross-sectional view of the air suction/injection device shown in Fig. 8, illustrating an example of a condition in a suction chamber at the time of blower (in formation of injecting airstream) viewed from the lower side (direction of arrow-view line I in Fig. 8).

[Fig. 10] Fig. 10 is a perspective view of the air suction/injeetion device shown in Fig. 3, illustrating an example of a condition, in which a front end brush included in the suction nozzle is protruded.

[Fig. 11] Fig. 11 is a perspective view of the air suction/injection device shown in Fig. 2, illustrating an example of a condition, in which a suction nozzle having other structure is mounted thereto.

[Fig. 12] Fig. 12 is a side view, illustrating an example of an air suction/injection device according to Embodiment 2 of the present invention.

[Fig. 13] Fig. 13 is a cross-sectional view of the air suction/injection device shown in Fig. 12, illustrating an example of the internal configuration at the time of vacuum (in formation of suctioned airstream) viewed from the lateral side.

[Fig. 14] Fig. 14 is a side view of the air suction/injection device shown in Fig. 12, illustrating an example in a condition at the time of blower (in formation of injecting airstream).

[Fig. 15] Fig. 16 is a cross-sectional view of the air suction/injection device shown in Fig. 14, illustrating an example of the internal configuration at the time of blower (in formation of injecting airstream) viewed from the lateral side.

[Fig. 16] Fig. 16 is a side view, illustrating an example of the air suction/injection device shown in Fig. 11 in a condition of being mounted to a lower section of a handy operation section equipped in the vacuum cleaner.

[Fig. 17] Fig. 17 is a cross-sectional view of an air suction/injection device according to Embodiment 3 of the present invention, illustrating an example of the internal configuration at the time of vacuum (in formation of suctioned airstream) viewed from the lateral side.

[Fig. 18] Fig. 18 is a cross-sectional view of the air suction/injection device shown in Fig. 17, illustrating an example of the internal configuration at the time of blower (in formation of injecting airstream) viewed from the lateral side.

[Fig. 19] Fig. 19 is a perspective view, illustrating an example of an air suction/injection device according to Embodiment 4 of the present invention.

[Fig. 20] Fig. 20 is a side view, illustrating an example in a condition, in which a suction nozzle is mounted to the air suction/injection device shown in Fig. 19 and in a condition at the time of vacuum (in formation of suctioned airstream).

[Fig. 21] Fig. 21 is a cross-sectional view of the air suction/injection device shown in Fig. 20, illustrating an example of the internal configuration at the time of vacuum (in formation of suctioned airstream) viewed from the lateral side.

[Fig. 22] Fig. 22 is a side view of the air suction/injection device shown in Fig. 19, illustrating an example in a condition at the time of blower (in formation of injecting airstream).

[Fig. 23] Fig. 23 is a cross-sectional view of the air suction/injection device shown in Fig. 22, illustrating an example of the internal configuration at the time of blower (in formation of injecting airstream) viewed from the lateral side.

[Fig. 24] Fig. 24 is a perspective view of the air suction/injection device shown in Fig. 19, illustrating an example of a condition, in which a suction nozzle having other structure is mounted thereto.

[Fig. 25] Fig. 25 is a side view of an air suction/injection device according to Embodiment 5 of the present invention, illustrating an example of a condition, in which a liquid spray section is mounted thereto.

[Fig. 26] Fig. 26 is a cross-sectional view of the air suction/injection device shown in Fig. 25, illustrating an example in a condition at the time of blower (in formation of injecting airstream and thus in the spraying of liquid) viewed from the lateral side.

[Fig. 27] Fig. 27 is a cross-sectional view of an air suction/injection device according to Embodiment 6 of the present invention, illustrating an example of the internal configuration at the time of vacuum (in formation of suctioned airstream) viewed from the lateral side.

[Fig. 28] Fig. 28 is a cross-sectional view of the air suction/injection device shown in Fig. 27, illustrating an example of the internal configuration at the time of blower (in formation of injecting airstream) viewed from the lateral side.

[Fig. 29] Fig. 29 is a cross-sectional view of the air suction/injection device shown in Fig. 27, illustrating another example of the internal configuration at the time of blower (in formation of injecting airstream) viewed from the lateral side.

[Fig. 30] Fig. 30 is a partial cross-sectional view of an air suction/injection device according to Embodiment 7 of the present invention, illustrating an example of the internal configuration at the time of vacuum (in formation of suctioned airstream) viewed from the lateral side.

[Fig. 31] Fig. 31 is a partial cross-sectional view of the air suction/injection device shown in Fig. 30, illustrating an example of the internal configuration at the time of vacuum (in formation of suctioned airstream) viewed from the upper side (direction of arrow-view line II-II in Fig. 30).

[Fig. 32] Fig. 32 is a partial cross-sectional view of the air suction/injection device shown in Fig. 30, illustrating an example of the internal configuration at the time of vacuum (in formation of suctioned airstream) viewed from the upper side (direction of arrow-view line III-III in Fig. 30).

[Fig. 33]Fig. 33 is a partial cross-sectional view of the air suction/injection device shown in Fig. 30, illustrating an example of the internal configuration at the time of vacuum (in formation of suctioned airstream) viewed from the lower side.

[Fig. 34] Fig. 34 is a partial cross-sectional view of the air suction/injection device shown in Fig. 30, illustrating an example of the internal configuration at the time of blower (in formation of injecting airstream).

[Fig. 35] Fig. 35 is a partial cross-sectional view of the air suction/injection device shown in Fig. 34, illustrating an example of the internal configuration at the time of blower (in formation of injecting airstream) viewed from the upper side (direction of arrow-view line IV-IV in Fig. 34).

[Fig. 36] Fig. 36 is a partial cross-sectional view of the air suction/injection device shown in Fig. 34, illustrating an example of the internal configuration at the time of blower (in formation of injecting airstream) viewed from the upper side (direction of arrow-view line V-V in Fig. 34).

[Fig. 37] Fig. 37 is a partial cross-sectional view of the air suction/injection device shown in Fig. 34, illustrating an example of the internal configuration at the time of blower (in formation of injecting airstream) viewed from the lower side.

[Fig. 38] Fig. 38 is a perspective view, illustrating an example of an air suction/injection device according to Embodiment 8 of the present invention, including an example of the internal configuration thereof

[Fig. 39] Fig. 39 is a cross-sectional view of the air suction/injection device shown in Fig. 38, illustrating an example of the internal configuration at the time of vacuum (in formation of suctioned airstream) viewed from the upper side (direction of arrow-view line VII-VII in Fig. 40).

[Fig. 40] Fig. 40 is a cross-sectional view of the air suction/injection device shown in Fig. 38, illustrating an example of the internal configuration at the time of vacuum (in formation of suctioned airstream) viewed from the lateral side (direction of arrow-view line VI-VI in Fig. 39).

[Fig. 41] Fig. 41 is a partial cross-sectional view of the air suction/injection device shown in Fig. 38, illustrating an example of the internal configuration at the time of blower (in formation of injecting airstream) viewed from the lateral side (direction of arrow-view line VI-VI in Fig. 39).

[Fig. 42] Fig. 42 is a perspective view, illustrating a modified Embodiment based on the air suction/injection device shown in Fig. 38.

[Fig. 43] Fig. 43 is a cross-sectional view of the air suction/injection device shown in Fig. 42, illustrating an example of the internal configuration viewed from the upper side (direction of arrow-view line IX-IX in Fig. 44).

[Fig. 44] Fig. 44 is a partial cross-sectional view of the air suction/injection device shown in Fig. 42, illustrating an example of the internal configuration viewed from the lateral side (direction of arrow-view line VIII-VIII in Fig. 42).

Reference Citation Lists

[0046]

10A to 10G	air suction/injection device
27	liquid spray section
111 to 171	main body
111a, 141a	front end opening section

111b to 171b	rear end opening section
112 to 172	injection passage section
112a to 172a	injecting air inlet
113 to 143	lever member
113c, 123c, 143c	air introduction cover member
114a to 164a	injection fan
114b to 164b	power fan
114c to 164c	fan rotating shaft
115 to 175	suction chamber (power fan housing section)
115a to 175a	inner suction inlet (inner suction port)
115b, 125b, 145b, 175b	suctioned air introduction inlet
116, 126, 146	passage switching section (valve member)
121a, 131a, 161a, 171a	front end nozzle section (front end opening section)
121f	injection opening regulation plate (injection opening regulation member)
136	passage open-close section
151h	bearing section
152c	bearing section
155c	inner suction cover member
156	turnable opening section (passage switching section)
156a	through hole
156b	closed hole
165b	suctioned air introduction inner inlet
165c	suctioned air introduction outer inlet
167	housing for fan section (injection switching section, injection passage section, power fan housing section)
173	air introduction cover member (injection switching section, passage open-close section)
174	integrated-type fan section (injection fan, power fan)
175c	inner suction cover member (injection switching section, passage open-close section)
177	injection section (injection passage section, power fan housing section)
271	liquid storage tank

Description of Embodiments

[0047] Hereinafter, preferable Embodiments of the present invention will be described in reference to the annexed figures. In the following descriptions, the same reference numerals are assigned to identical or correspondent elements throughout the separate views, and the duplicated descriptions thereof are not presented.

(Embodiment 1)

[Illustrative Structure of the Vacuum Cleaner]

[0048] First of all, an example of a vacuum cleaner comprising an air suction/injection device according to Embodiment 1 of the present invention will be specifically described. As shown in Fig. 1, an air suction/injection device 10A according to the present Embodiment is provided to a typical canister type electric vacuum cleaner 20. More specifically, the canister type vacuum cleaner 20 (hereinafter referred simply to as vacuum cleaner 20) comprises a cleaner main body 21, a suction hose 22, a handy operating section 23, a suction extension tube 24, a suction port member 25, and a suction nozzle 26, and an air suction/injection device 10A.

[0049] The cleaner main body 21 comprises an electric blower 31, a dust collection chamber 32, a wheel 33, and a power cable 34, and one end of the suction hose 22 is detachably connected thereto through a connecting pipe 35. The other end of the suction hose 22 is provided with the handy operating section 23, and one end of the suction extension tube 24 is detachably connected to the front end section of the handy operating section 23. In addition, the suction port member 25 is detachably attached to the other end of the suction extension tube 24. The suction nozzle 26 and the air suction/injection device 10A are also detachably attached to the section under the handy operating section 23, and the suction nozzle 26 and the air suction/injection device 10A are attachable to a front end section of the handy operating section 23, in place of the suction extension tube 24.

[0050] The cleaner main body 21 is provided with the electric blower 31 and the dust collection chamber 32 inside thereof, in which a suction force is generated by an actuation of the electric blower 31 to create a suction force at the suction port of the suction port member 25 through the suction hose 22 and the suction extension tube 24. Further, the power cable 34 is drawably stored inside of the cleaner main body 21. Further, the cleaner main body 21 is configured to have a pair of wheels 33 provided in the both lateral sides for freely moving on the floor surface.

[0051] In the use of the vacuum cleaner 20, the user, at first, draws the power cable 34 from the cleaner main body 21, and a plug for power supply at the front end section is inserted in the power source plug port, and then the cleaner main body 21 is switched on by operating the handy operating section 23. This allows creating the suction force at the suction port of the suction port member 25 by the actuation of the electric blower 31, so that the dusts on the floor surface are suctioned to be collected in the dust collection chamber 32 through the suction extension tube 24, the suction hose 22 and the connecting pipe 35.

[0052] The user holds the handy operating section 23 and moves the location of the suction port member 25 on the floor surface to change a region of the floor surface to be cleaned. When it is intended to change the location to be cleaned, the cleaner main body 21 can travel on the floor surface by means of rotation of the wheels 33 by dragging the suction hose 22. In addition to above, the cleaner main body 21 is also provided with a handle, not shown here, which can be used to lift the cleaner main body 21 to be moved.

[0053] Meanwhile, when it is intended to clean a small region such as a corner of a room, a clearance between furniture and the like, instead of the cleanup of the floor surface, the suction extension tube 24 or the suction port member 25 is removed, and instead, the suction nozzle 26 is attached thereto to conduct the cleanup. In addition, when it is intended to carry out: (1) cleaning a location that is difficult to see by a user or a high location; (2) sweeping dusts adhered to the surface to be cleaned or accumulated in a corner of a concave and convex section; (3) cleaning objects, on which there is a fear to cause a damage, an unwanted movement, a misoperation, or an erroneous suction when the suction port approaches thereto, or the like, the blower function can be preferably employed, in addition to the cleaning by means of the ordinary suction force (cleaning by the vacuum function). Thus, the suction extension tube 24 or the suction port member 25 is removed, and instead, the air suction/injection device 10A is attached, and further, the suction nozzle 26 is attached to the front end section thereof to conduct the cleanup.

[0054] The specific configurations in the vacuum cleaner 20 as shown in Fig. 1, more specifically, the cleaner main body 21, the suction hose 22, the handy operating section 23, the suction extension tube 24, the suction port member 25 and the suction nozzle 26 and the like are not particularly limited to any specific elements, and various types of configurations, which are well known in the field of vacuum cleaner, may be preferably employed.

[Configuration of Air Suction/Injection Device]

[0055] Next, the specific configurations of the air suction/injection device 10A according to the present Embodiment

will be described in reference to Fig. 2 to Fig. 5.

[0056] As shown in the side view of Fig. 2, the air suction/injection device 10A according to the present Embodiment comprises a main body 111, an injection passage section 112, a lever member 113, and in addition, a fan section, a suction chamber and a passage switching section, which are not shown in Fig. 2. Further, as shown in the perspective view of Fig. 3 and the side view of Fig. 4, a suction nozzle 26A including a brush at the front end section can be attached to the air suction/injection device 10A.

[0057] The main body 111 has substantially tube-like form, and the inside thereof forms a main passage of air. The both ends of the main body 111 serve as a front end opening section 111a and a rear end opening section 111b, respectively, and the front end opening section 111a is configured as a substantially tetragonal opening section, which is capable of being attached with the suction nozzle 26A (or, other suction nozzle 26), and the rear end opening section 111b is configured as a cylindrical opening section, which is capable of being attached with the suction hose 22 (more specifically, handy operating section 23). The front end opening section 111a and the rear end opening section 111b are preferably formed to be tapered. This allows easily mounting and removing the suction nozzle 26A or the suction hose 22 at the outer circumference of the front end opening section 111a or the rear end opening section 111b.

[0058] The injection passage section 112, as shown in Fig. 2 or Fig. 4, is provided so as to be integrated with the main body 111 in the positional relation of being inclined to the tube axis direction of the main body 111. The interior of the injection passage section 112 serves as a sub-passage of air, and such a sub-passage is configured to lead to the front end opening section 111a. Further, the injection passage section 112 is provided with an injecting air inlet 112a.

[0059] The air suction/injection device 10A is mounted on the handy operating section 23 at the front end of the suction hose 22 basically in the attitude that the injection passage section 112 is positioned in the upper side. Accordingly, the side where the injection passage section 112 is positioned is referred to as "upper", and the opposite side is referred to as "lower" in the following descriptions. In addition, the side where the front end opening section 111a is positioned is referred to as "front end ," and the side where rear end opening section 111b is positioned is referred to as "rear end."

[0060] The section of the injection passage section 112 exposed upward from the main body 111 extends, as shown in Fig. 2 or Fig. 4, so as to be inclined to the tube axis direction of the main body 111, and the upper surface thereof is provided with a disc-shaped section as shown in Fig. 3, and the injecting air inlet 112a is formed under such a disc shape element. Such an injecting air inlet 112a is an opening to allow the air flow into the inside of the injection passage section 112, namely, the sub-passage.

[0061] In addition, the lower side of the main body 111, namely the position opposite to the injection passage section 112 across the main body 111, is provided with a plurality of suction force-regulation holes 111c along the outer circumference of the main body 111. The suction force-regulation holes 111c serve as taking external air in the main passage from locations other than the front end opening section 111a, in order to avoid creating excessive load to the vacuum cleaner with reduced flow of air below a certain flow velocity by the block of the main passage of the main body 111 due to the intake or the stick of dusts into the front end opening section 111a.

[0062] The lever member 113 is composed of a switching lever 113a, a lever support section 113b and an air introduction cover member 113c. As shown in Fig. 2 and Fig. 4, the lever support section 113b is positioned between the switching lever 113a and the air introduction cover member 113c, and such a lever support section 113b serves as a rotary shaft, which is rotatably supported in the condition of extending through the main body 111. In addition, as discussed later, the lever support section 113b is provided with a passage switching section mounted thereto, which allows switching of the passage switching section by operating the switching lever 113a.

[0063] The switching lever 113a is in a frame shape, which is positioned to cover the lower section of the main body 111 as shown in Fig. 3, and the air introduction cover member 113c is in a plate shape, which is capable of closing suctioned air introduction inlets that is provided in the side wall of the main body 111 (not shown in Figs. 2 to 4), in openable and closable manner. Since the switching lever 113a is biased toward the front end side by an elastic member such as a spring and the like as shown in Fig. 3, the air introduction cover member 113c is positioned basically in the side of the rear end. Since the lever member 113 is rotated around the lever support section 113b as discussed later, the air introduction cover member 113c is moved to side of the front end when the switching lever 113a is moved to the side of the rear end. In such occasion, the suctioned air introduction inlet (not shown in Figs. 2 to 4) closed by the air introduction cover member 113c is opened. In addition, since the switching lever 113a knocks a portion of the surface of the lower side of the main body 111 to be stopped by being moved fully to the side of the rear end, the air introduction cover member 113c is configured not to move to the front end side beyond necessity.

[0064] The suction nozzle 26A mounted to the front end opening section 111a of the main body 111 is composed of a nozzle body 261 and a front end brush 262 as shown in Fig. 3 or Fig. 4. The front end of the nozzle body 261 is provided with a suction port 261a for suctioning dusts as shown in Fig. 3. In addition, the front end brush 262 is folded under the nozzle body 261 in the structure shown in Fig. 3 or Fig. 4, and is capable of being protruded to be positioned in side of the front end of the suction port 261a, as discussed later.

[0065] The interior of the air suction/injection device 10A is provided with, as illustrated in the vertical cross-sectional view of Fig. 5, a main passage 101 composed of the interior of the main body 111, a sub-passage 102 composed of the

interior of the injection passage section 112, and the suction chamber 115 facing the main passage 101 in the lower section of the injection passage section 112. The injection passage section 112 and the suction chamber 115 abut each other, and are integrated into one piece, the inside of which is provided with a fan section 114. In other words, the injection passage section 112 and the suction chamber 115 serve as a housing for fan section, and the suction chamber 115 serve as a power fan housing section. In addition, a section of the suction chamber 115 facing the main passage 101 is provided with an inner suction inlet (inner suction port) 115a, and further, is also provided with a suctioned air introduction inlet 115b leading to the outside of the main body 111, as discussed later.

[0066] The fan section 114 is composed of an injection fan 114a positioned in the injection passage section 112, a power fan (a motive fan) 114b positioned in the suction chamber 115, and a fan rotating shaft 114c for rotatably supporting these fans. The injection fan 114a serves as creating injecting airstream that flows toward the front end opening section 111a in the sub-passage 102. The power fan 114b, which shares the fan rotating shaft 114c with the injection fan 114a, is configured of being rotated in conjunction with the injection fan 114a. Here, specific actions of the fan section 114 will be described together with the descriptions of formation of the injecting airstream as discussed later.

[0067] The main passage 101 and the sub-passage 102 are composed of the interiors of the main body 111 and of the injection passage section 112, respectively, as described above, and as shown in Fig. 5, the sub-passage 102 is joined to the main passage 101 in a position thereof in the side of the front end. While the main passage 101 (main body 111) extends in the substantially advancing direction viewed from the front end opening section 111a, the sub-passage 102 is branched on the way of the main passage 101 toward the direction forming acute angle to the main passage 101. Here, such a condition will be expressed in reference to the main body 111 and the injection passage section 112, instead of the expression in reference to the main passage 101 and the sub-passage 102, to present that the injection passage section 112 is provided in the main body 111, so that the sub-passage 102 inside of the injection passage section 112 is joined to the main passage 101 inside of the main body 111. In addition, it can be considered that the sub-passage 102 is joined to the main passage 101, such that the front end opening section 111a in the main body 111 also serves as an injection outlet in the injection passage section 112.

[0068] In addition, the section where the main passage 101 is joined to the sub-passage 102 is provided with a passage switching section 116. While the passage switching section 116 may be configured of switching the connection or the blocking of the sub-passage 102 at least over the front end opening section 111a, it is configured to conduct an alternative switching so that one of the main passage 101 and the sub-passage 102 is connected to the front end opening section 111a in the present Embodiment.

[0069] More specifically, the passage switching section 116 is a substantially plate-shaped valve member as shown in Fig. 5, and an end thereof is fixedly supported by the lever support section 113b. Accordingly, an operation of the switching lever 113a allows the passage switching section 116 flapping in the region of the joined section around the fulcrum of the lever support section 113b. Hence, the flapping angle of the passage switching section 116 can be freely changed by the operation of the switching lever 113a.

[0070] Here, it is assumed that the joined section in the main passage 101 is defined as "main body joined gate 111d" as represented by the region surrounded with dotted line in Fig. 5, and the joined section in the sub-passage 102 is defined as "injection joined gate 112b", such that the passage switching section 116 of the valve member changes the angle thereof (flaps) so as to shut one of the main passage 101 and the sub-passage 102 by the operation of the switching lever 113a. In addition to above, the configuration shown in Fig. 5 is in the condition, in which the passage switching section 116 closes the injection joined gate 112b.

[0071] In addition, in either of the main body joined gate 111d and the injection joined gate 112b, it is provided with stoppers 111e and 112c, which stop the movement of the passage switching section 116 at a predetermined position in order to avoid a situation where the flapping of the passage switching section 116 is beyond the position corresponding to the closed condition. These stoppers 111e and 112c are composed of protrusions in the inner wall of the main body 111 or the injection passage section 112, and while linear protrusions adapted to the shape of the passage switching section 116 are illustrated in the configuration shown in Fig. 5, it is not limited to such a configuration, and protrusions of other shapes may be also employed.

[0072] Specific configurations of the air suction/injection device 10A and the suction nozzle 26A according to the present Embodiment are not particularly limited, and the main body 111, the injection passage section 112, the lever member 113, the fan section 114, the suction chamber 115 and the passage switching section 116 and the like may also be configured of being produced by employing members, materials, shapes and the like, which are well known in the field of vacuum cleaners or in the general and broader fields of home electric appliances.

[Action of Air Suction/Injection Device]

[0073] Next, actions of the air suction/injection device 10A having the above-described configuration, in particular, details of the function for discharging injecting airstream from the suction port 261 a (blower function) and the switching between the blower function and the function for conducting ordinary suction (vacuum function) will be specifically

described in reference to Fig. 6 to Fig. 10, in addition to Fig. 5.

[0074] First of all, the air suction/injection device 10A may be directly mounted to the handy operating section 23 provided at the front end section of the suction hose 22 to be used, as shown in, for example,

[0075] Fig. 6. More specifically, the user, starting from the condition that the suction extension tube 24 and the suction port member 25 is mounted to the handy operating section 23 (see Fig. 1), removes the suction extension tube 24, and uses in the condition that the air suction/injection device 10A is instead mounted. In addition to above, the suction nozzle 26A is mounted to the air suction/injection device 10A (see Fig. 3 to Fig. 5), and the actions of the air suction/injection device 10A will be described on the basis of such a condition in the following descriptions.

[0076] Next, the ordinary vacuum function will be described. Since the air suction/injection device 10A is in steady state where the switching lever 113a is positioned in the side of the front end as shown in Fig. 5, the passage switching section 116 closes the injection joined gate 112b, and opens the main body joined gate 111 d in the joined section of the main passage 101 and the sub-passage 102. Once a suction force is generated by the actuation of the cleaner main body 21 (not shown in Fig. 5), such a suction force propagates to the main passage 101 and the suction nozzle 26A through the suction hose 22 (not shown in Fig. 5). Hence, as represented by thick line arrows in the diagram, external air is suctioned through the suction port 261a, and suctioned airstream is formed in the main passage 101 from the front end opening section 111a toward the rear end opening section 111 b.

[0077] In the next, switching to the blower function will be described. When the user conducts an operation of moving the switching lever 113a toward the side of the rear end as shown in Fig. 7, the air introduction cover member 113c moves to the side of the front end, so that the suctioned air introduction inlet 115b, which has been closed by the air introduction cover member 113c, is opened. Further, the passage switching section 116 moves from the position for closing the injection joined gate 112b to the position for closing the main body joined gate 111d in the joined site between the main passage 101 and sub-passage 102 as shown in Fig. 8. This allows opening the injection joined gate 112b, so that the sub-passage 102 communicates with the front end opening section 111a but the main passage 101 is blocked from the front end opening section 111a. A suction force created in vicinity of the rear end opening section 111b causes the suction of air in the interior of the suction chamber 115 through the inner suction inlet 115a, as illustrated by thick arrows in the diagram.

[0078] At this time, since the opened suctioned air introduction inlet 115b lead to the suction chamber 115 as shown in Fig. 9, which is a view from the direction of arrow I of alternate long and two short dashes line in Fig. 8, the interior of the suction chamber 115 also leads to external atmosphere. Hence, a suctioned airstream is formed through the suctioned air introduction inlet 115b and the suction chamber 115 toward the inner suction inlet 115a. Such a suctioned airstream flows from the rear end opening section 111b through the main passage 101 toward the suction hose 22 (not shown in Fig. 8 or Fig. 9). The interior of the suction chamber 115 is provided with the power fan 114b, and the power fan 114b rotates by the effect of the suctioned airstream. More specifically, if the pressure of the main passage 101 is reduced by the suctioned airstream created in the main passage 101, this also directly reduces the pressure inside of the suction chamber 115 to create a large quantity of suctioned airstream from the suctioned air introduction inlet 115b toward the inner suction inlet 115a. This allows the power fan 114b rotating in the interior of the suction chamber 115.

[0079] Further, since the power fan 114b shares the fan rotating shaft 114c with the injection fan 114a, the injection fan 114a also rotates in association with the rotation of the power fan 114b. Since the injection fan 114a is provided in the injection passage section 112, an injecting airstream is formed in the sub-passage 102, and the injecting airstream flows from the front end opening section 111a into the interior of the suction nozzle 26A, and eventually is injected from the suction port 261a, as illustrated in thick arrows of Fig. 8.

[0080] In addition to above, if the user cancel the condition where the switching lever 113a is moved to side of the rear end, the switching lever 113a moves from the side of the rear end to the side of the front end and returns to the original position. In response to such a situation, the air introduction cover member 113c closes the suctioned air introduction inlet 115b, and the passage switching section 116 moves from a position for opening the injection joined gate 112b to a position for opening the main body joined gate 111d. Hence, the sub-passage 102 is blocked from the front end opening section 111a and the main passage 101 leads to the front end opening section 111a, so that the rotations of the power fan 114b and the injection fan 114a are stopped, and the injecting airstream, which has been injected from the suction port 261a is also stopped. In addition, since the suctioned airstream is formed in the main passage 101, a suction force is created again in the suction port 261 a.

[0081] As described above, the present Embodiment allows discharging the injecting airstream from the front end opening section 111a simply by the operation of the switching lever 113a for switching the passage switching section 116. Hence, the injecting airstream can be easily discharged from the front end of the suction nozzle 26A, in the use of the vacuum cleaner 20 without a need for adopting complicated configurations. In addition, it can stop the blower function and to return to the vacuum function by simply returning the switching lever 113a to the original position, so that suitable switching between the vacuum function and the blower function can be achieved according to the operating condition of the vacuum cleaner 20, in addition to providing improved operability.

[0082] If the switching between the vacuum function and the blower function can be easily achieved, dusts accumulated

over the object to be cleaned, for example, are blown out by means of the blower function, and then the dusts, which are blown and whirled up, can be rapidly suctioned before being spread throughout the interior of the room by immediately returning to the vacuum function. Such a cleaning method can be preferably utilized in the cases of, for example: (1) cleaning a location that is difficult to see by a user or a high location; (2) sweeping dusts adhered to the surface to be cleaned or accumulated in a corner of a concave and convex section; (3) cleaning objects, on which there is a fear to cause a damage, an unwanted movement, a misoperation, or an erroneous suction when the suction port approaches thereto, or the like.

[0083] In addition, if the momentum of the injecting airstream is constant in the above-described cleanup (3), injecting airstream is squirted to cause a fear that the dusts scatters beyond necessity, according to the types of the object or the types of the dusts. Here, in the present Embodiment, the passage switching section 116 serving as the valve member is configured to change the angle by the operation of the switching lever 113a so as to open one of the main passage 101 and the sub-passage 102 and close the other. Hence, for example, the switching lever 113a can be held in the middle position without completely reaching to the side of the rear end to simultaneously create the injecting airstream and the suctioned airstream.

[0084] Accordingly, the operating condition of the switching lever 113a can be suitably adjusted to freely change the ratio of the injecting airstream and the suctioned airstream, such that the object can be struck with the preferable flow velocity of the injecting airstream. In addition, the operating condition of the switching lever 113a can be adjusted to achieve a fine adjustment of the flow velocity of the injecting airstream, so that a fine adjustment of the blower function can also be achieved.

[0085] Further, the injection fan 114a, which creates the injecting airstream, is rotated by the power fan 114b, and the power fan 114b is rotated by the suctioned airstream created in the main passage 101. Hence, since the injection fan 114a is rotated by the flow of air running through the main passage 101, it is not necessary to provide a source of actuation utilizing an electric power source. Hence, a simplified configuration of the air suction/injection device 10A can be adopted to avoid an increase in the cost.

[0086] In addition to above, the switching between the vacuum function and the blower function can also be suitably carried out as described above, even in the condition that the front end brush 262 of the suction nozzle 26A is projected so as to be positioned in the side of the front end of the suction port 261 a as shown in Fig. 10. More specifically, the switching lever 113a is moved to the side of the rear end to open the suctioned air introduction inlet 115b as shown in Fig. 10, so that air is taken in the suction chamber 115 through the suctioned air introduction inlet 115b to form the suctioned airstream with larger flow velocity from the suctioned air introduction inlet 115b toward the inner suction inlet 115a. This allows rotating the power fan 114b inside of the suction chamber 115 at an elevated rate, so that the injecting airstream with higher flow velocity can be created by means of the injection fan 114a.

[Modified Embodiment]

[0087] While the injection passage section 112 is provided so as to be integrated with the main body 111 in the present Embodiment, the present invention is not limited to such a specific configuration, and the injection passage section 112 may alternatively be provided as an absolutely separated element or separate configuration from the main body 111. More specifically, it is sufficient in the present invention to comprise an injection passage section, which has an air inlet and an injection outlet, and the interior of which forms a sub-passage, integrally with the tubular main body or separately from the tubular main body.

[0088] In addition, while the suction chamber 115 adjacent to the injection passage section 112 is provided in the present Embodiment, the present invention is not limited to such a specific configuration, and the suction chamber 115 may be omitted. While it is, of course, preferable to provide the suction chamber 115, since such a suction chamber involves the function for protecting the power fan 114b in the main passage 101 and the function for successfully creating the suctioned airstream toward the suctioned air introduction inlet 115b, the inside of suction chamber 115 (power fan 114b) and the inner suction inlet 115a, the suction chamber 115 may serve as, for example, 'power fan housing section', and therefore it may be configured to have a preferable shape to protect the power fan 114b, or it may be configured to have, for example, tubular shape to successfully create the suctioned airstream. Alternatively, in the case of providing no suction chamber 115, the power fan 114b may be provided at least inside of the main body 111, since it is sufficient to rotate the power fan 114b by means of the suctioned airstream created in the above-described main passage by the suction of air through the suction hose.

[0089] In addition, while the injection fan 114a and the power fan 114b included in the fan section 114 are configured to be in conjunction with the common fan rotating shaft 114c in the present Embodiment, the present invention is not limited to such a specific configuration, and for example, a known acceleration and deceleration mechanism may be interposed between the injection fan 114a and the power fan 114b. In particular, the rotating speed per unit time of the injection fan 114a can be increased by interposing the mechanism, which can achieve the acceleration, to allow creating faster injecting airstream.

[0090] In addition, while the present Embodiment employs the suction nozzle 26A having the front end brush 262 serving as the suction nozzle 26 to be mounted to the air suction/njection device 10A, the present invention is not limited to such a specific configuration, and various types of known suction nozzles may also be preferably employed. For example, as shown in Fig. 11, a suction nozzle 26B comprising relatively longer nozzle body 263 may also be employed. Such a suction nozzle 26B may preferably be employed for the cleanup of, for example, a high location or a clearance between furniture or the like. These suction nozzles 26A and 26B may be suitably chosen for the use as required. Further, when it is intended to clean specific objects, to which it is not preferable to be contacted with the dust-covered suction nozzle due to the ordinary cleanup, for example, a top of a desk, a telephone, a facsimile machine, a personal computer or the like, a dedicated suction nozzle may be previously prepared.

[0091] In addition, while the lever member 113 in the present Embodiment comprises the air introduction cover member 113c in addition to the switching lever 113a, the present invention is not limited to such a specific configuration, the air introduction cover member 113c may be omitted, and/or other configuration may be further provided. On the lever member 113, any known configuration may be adopted, provided that it is presented outside of the main body 111 and it is operative in response to a positional change of the passage switching section 116 (valve member).

[0092] In addition, while the air introduction cover member 113c is provided in the lever member 113 in the present Embodiment in order to close the suctioned air introduction inlet 115b, through which air is taken in the suction chamber 115, the present invention is not limited to such a specific configuration, and for example, it may provides, instead of the air introduction cover member 113c, a member for closing the injecting air inlet 112a, through which air is taken in the injection passage section 112.

[0093] In addition, while the front end opening section 111a is configured of a specific shape of substantially tetragonal to allow limiting the type of the attachment available to be mounted in the present Embodiment, it is not necessarily limited to such a specific configuration, and it may be configured of a tapered and substantially cylindrical shape, so that commercially available various types of attachments can be mounted, in addition to the suction nozzles 26A and 26B.

[0094] In addition, while the switching between the main passage 101 and the sub-passage 102 is achieved by means of the passage switching section 116 serving as the valve member in the present Embodiment, the present invention is not limited to such a specific configuration, and it may adopt at least a configuration (injection switching section) for permitting or limiting the injection of the injecting airstream to the outside from the injection outlet (the front end opening section 111a in the present Embodiment). Since the injecting airstream is created by rotating the fan section 114 with the suctioned airstream as described above, substantially no other than the injecting airstream is injected through the front end opening section 111a when the injecting airstream is created, without a need for completely blocking the connection between the main passage 101 and the front end opening section 111a. Hence, a known member or the like, which allows permission or blocking of the injecting airstream, may alternatively be provided in vicinity of the injection joined gate 112b instead of the passage switching section 116, so that an advantageous effect equivalent to that of the present Embodiment can also be obtained.

[0095] In addition, while the canister type vacuum cleaner 20 (see Fig. 1) is exemplified as the typical vacuum cleaner in the present Embodiment, the present invention is, of course, not limited to such a specific configuration, and other canister type cleaner having different configuration from that of the vacuum cleaner 20 may be employed, or an upright-type vacuum cleaner or a handy-type vacuum cleaner may be alternatively employed. Further, while the air suction/injection device 10A according to the present Embodiment is configured to be detachable to the suction hose 22 (handy operating section 23), it is not limited to such a configuration, and it may alternatively be configured to be integrated with a part of the main body of the suction device such as the suction hose 22 (handy operating section 23) and the like.

(Embodiment 2)

[0096] An air suction/injection device according to Embodiment 2 of the present invention has a configuration, which is basically equivalent to that of the air suction/injection device 10A according to the above-described Embodiment 1, except that the following features are considerably different: the front end opening section is in nozzle-like, instead of substantially tetragonal; it is provided with a member for reducing an injection area of the opening as discussed later at the time of blower to provide enhanced flow velocity of the injecting airstream; and a lever lock section for continuing the blower function is provided. The air suction/injection device according to the present Embodiment will be specifically described in reference to Fig. 12 to Fig. 16.

[Configuration of Air Suction/Injection Device]

[0097] First of all, a specific configuration of an air suction/injection device 10B according to the present Embodiment will be described in reference to Fig. 12 to Fig. 15. As shown in Fig. 12 and Fig. 13, the air suction/injection device 10B according to the present Embodiment comprises a main body 121, an injection passage section 122, a lever member 123, a fan section 124, a suction chamber 125 and a passage switching section 126, and in addition, a lever lock section

127.

[0098] The configuration of the main body 121 is similar to that of the main body 111 in the aforementioned Embodiment 1, and the interior thereof serves as a main passage 101, and the side of the front end thereof has a nozzle-like shape, in which the cross sectional area is decreased as approaching to the front end section, instead of substantially quadrangular prism shape. Such a nozzle-like front end section is referred to as a front end nozzle section 121 a. In addition to above, a rear end opening section 121b is similar to the rear end opening section 111b in the aforementioned Embodiment 1. In addition, a plurality of suction force-regulation holes 121 c are provided in the lower side of the main body 121.

[0099] The configuration of the injection passage section 122 is also similar to that of the injection passage section 112 in the aforementioned Embodiment 1, and the interior thereof serves as the sub-passage 102, and an injecting air inlet 122a is provided in the upper side. In addition to above, the injecting air inlet 122a is formed as an opening of substantially square shape, unlike the slit-like opening of the injecting air inlet 112a in the aforementioned Embodiment 1.

[0100] The configuration of the lever member 123 is also configured of a switching lever 123a, a lever support section 123b and an air introduction cover member 123c, similarly as in the lever member 113 in the aforementioned Embodiment 1. The switching lever 123a in the lever member 123 is also capable of moving toward the side of the front end and toward the side of the rear end, and the air suction/injection device 10B is further provided with the lever lock section 127, which is capable of holding the switching lever 123a in a state after it is moved to the side of the rear end. While the lever lock section 127 is composed of a known stopper member, as shown in Fig. 14 and Fig. 15, it may alternatively be composed of a known lock mechanism and the like.

[0101] As shown in Fig. 13, the interior of the main body 121 is provided with a suction chamber 125, which is adjacent to the lower side of the injection passage section 122 and faces to the main passage 101, and the interiors of the injection passage section 122 and the suction chamber 125 are provided with a fan section 124. In addition, a section of the suction chamber 125 facing to the main passage 101 is provided with an inner suction inlet 125a, and is also provided with a suctioned air introduction inlet 125b, which leads to the outside of the main body 121 and is capable of being opened and closed with the air introduction cover member 123c, as shown in Fig. 14 and Fig. 15.

[0102] The fan section 124 is also composed an injection fan 124a positioned in the injection passage section 122, a power fan 124b positioned in the suction chamber 125, and a fan rotating shaft 124c for rotatably supporting these fans, similarly as in the fan section 114 in the aforementioned Embodiment 1.

[0103] The main passage 101 and the sub-passage 102 are also configured that the sub-passage 102 is joined to the main passage 101 in a position thereof in the side of the front end, similarly as in the air suction/injection device 10A according to the aforementioned Embodiment 1. Then, the section where the main passage 101 is joined to the sub-passage 102 is provided with a passage switching section 126. Such a passage switching section 126 is configured of a substantially plate-shaped valve member, and is also configured to change an angle by means of the operation of the switching lever 123a, similarly as in the passage switching section 116 in the aforementioned Embodiment 1.

[0104] Here, since one of the main body joined gate 121d that is the joined section of the main passage 101 and the injection joined gate 122b that is the joined section of the sub-passage 102 are alternatively closed by means of the flapping of the passage switching section 126, the main passage 101 or the sub-passage 102 are configured of providing alternative switching of the connection to the front end nozzle section 121a by means of the passage switching section 126 (and the lever member 123). In addition to above, the main body joined gate 121d and the injection joined gate 122b are provided with stoppers for stopping the movement of the passage switching section 126 at a predetermined position, similarly as the air suction/injection device 10A according to the aforementioned Embodiment 1.

[0105] In addition, a plate-shaped injection opening regulation plate 121f is presented in the location of the inner surface of the front end nozzle section 121a located in the side of the front end and the lower side viewed from the main body joined gate 121d, as shown in Fig. 13 and Fig. 15. The rear end of such an injection opening regulation plate 121f is attached to the lower inner surface of the front end nozzle section 121a by a flapping shaft, and the front end is oriented toward a suction port 121 g of the front end nozzle section 121a. Then, the injection opening regulation plate 121f flaps as reference with the flapping shaft of the side of the rear end, so that a cross sectional area of the main passage 101 in the front end nozzle section 121a can be gradually reduced as the aperture is gradually closed.

[0106] In addition to above, while the suction port 121g serves as an opening section for suctioning air from the outside toward the inside, at the time of vacuum, it also serves as an another opening section for injecting air from the inside toward the outside, or in other words, "injection outlet", at the time of blower. Therefore, a cross sectional area of the main passage 101 in the front end nozzle section 121a will be referred to as an "area of the injection opening" in the following descriptions, for the purpose of indicating the meaning of an area of the opening of the injection outlet.

[0107] In addition, the rear end of the injection opening regulation plate 121f is configured to extend to the side of the rear end beyond the aforementioned flapping shaft, so as to be in contact with the front end of the passage switching section 126 when the passage switching section 126 closes the main body joined gate 121d. Hence, while the injection opening regulation plate 121f is contacted with the lower inner surface of the front end nozzle section 121a when the passage switching section 126 closes the injection joined gate 122b as shown in Fig. 13, the front end of the passage

switching section 126 is in contact with the rear end of the injection opening regulation plate 121f once the passage switching section 126 flaps to close the main body joined gate 121d, and then the side of the front end of the injection opening regulation plate 121f is moved toward the upper side by the principle of leverage so that the injection opening regulation plate 121f is inclined, as shown in Fig. 15. Such structural condition presents the condition, in which the injecting airstream proceeds toward the front end nozzle section 121a from the injection passage section 122 (the sub-passage 102). Hence, the area of the injection opening can be reduced by means of the injection opening regulation plate 121f when the injecting airstream is injected from the suction port 121g, thereby increasing the flow velocity of the injecting airstream.

[Action of the Air Suction/Injection Device]

[0108] Next, the action of the air suction/injection device 10B having the above-described structure will be specifically described in reference to Fig. 13 and Fig. 15. The following descriptions are also based on the condition, where the air suction/injection device 10B is directly mounted to the handy operating section 23 provided at the front end section of the suction hose 22 for the use (see Fig. 6 and the like), similarly as in the aforementioned Embodiment 1.

[0109] First of all, the ordinary vacuum function will be described. Since the air suction/injection device 10B is in steady state, in which the switching lever 123a is positioned in the side of the front end as shown in Fig. 13, the passage switching section 126 closes the injection joined gate 122b, and opens the main body joined gate 121d in the joined section between the main passage 101 and sub-passage 102. Then, the suction force of the vacuum cleaner 20 (not shown in Fig. 13) causes suctioning external air through the suction port 121g as illustrated by thick line arrows in the diagram to create a suctioned airstream in the main passage 101 from the front end nozzle section 121a toward the rear end opening section 121b.

[0110] Next, the switching to the blower function will be described. When the user conducts an operation of moving the switching lever 123a toward the side of the rear end as shown in Fig. 15 (and Fig. 14), the air introduction cover member 123c moves to the side of the front end, so that the suctioned air introduction inlet 125b, which has been closed by the air introduction cover member 123c, is opened. Further, the passage switching section 126 moves from the position for closing the injection joined gate 122b to the position for closing the main body joined gate 121d in the joined section between the main passage 101 and sub-passage 102. This allows opening the injection joined gate 122b, so that the sub-passage 102 is in communication with the front end nozzle section 121a but the main passage 101 is blocked from front end nozzle section 121a. The suction force created in vicinity of the rear end opening section 121b causes suction of air in the interior of the suction chamber 125 through the inner suction inlet 125a, as illustrated by thick arrows in the diagram.

[0111] At this time, since the opened suctioned air introduction inlet 125b leads to the suction chamber 125, the interior of the suction chamber 125 also leads to external air. Hence, a suctioned airstream is, although it is not shown here, created through the suctioned air introduction inlet 115b and the suction chamber 125 toward the inner suction inlet 115a (see Fig. 9). Such a suctioned airstream flows, as shown in Fig. 15, from the rear end opening section 121b through the main passage 101 toward the suction hose 22 (not shown in Fig.15). The power fan 124b provided in the interior of the suction chamber 125 rotates by the effect of the suctioned airstream, and the injection fan 124a rotates in conjunction with such a rotation. Hence, as illustrated in thick line arrows in Fig. 15, the injecting airstream is formed in the injection passage section 122, namely the sub-passage 102, and the injecting airstream flows to the interior of the front end nozzle section 121a, and eventually is injected from the suction port 121 g.

[0112] Further at this time, the passage switching section 126 flaps to close the main body joined gate 121d as described above, to achieve the condition, where the injection opening regulation plate 121f is inclined. Hence, since the area of the injection opening is reduced by means of the injection opening regulation plate 121f, the injecting airstream from the sub-passage 102 is injected through the suction port 121g in the condition of the increased flow velocity. In addition, since the switching lever 123a is locked in the condition to be positioned in the side of the rear end by the lever lock section 127 as shown in Fig. 15 (and Fig. 14), the injection of the injecting airstream is continued until such a locked condition is released. When the user releases the lock of the switching lever 123a by the lever lock section 127, the switching lever 123a moves from the side of the rear end to the side of the front end and returns to the original position.

[0113] In response to this situation, the air introduction cover member 123c closes the suctioned air introduction inlet 125b, and the passage switching section 126 moves from a position for opening the injection joined gate 122b to a position for opening the main body joined gate 121d, and further, the injection opening regulation plate 121f is returned from the inclined condition to the condition of being in contact with the lower inner surface of the front end nozzle section 121 a. Hence, the sub-passage 102 is blocked from the front end nozzle section 121a and the main passage 101 leads to the front end nozzle section 121a, so that the rotations of the power fan 124b and the injection fan 124a are stopped, and the injecting airstream, which has been injected from the suction port 261a, is also stopped. In addition, since a suctioned airstream is formed in the main passage 101, a suction force is created again in the suction port 261a.

[0114] Since the front end opening section forms the front end nozzle section 121a as described above in the present

Embodiment, the air suction/injection device 10B may be employed, in place of the general suction nozzle (for example, suction nozzles 26A, 26B or the like). Hence, for example, the air suction/injection device 10B may be detachably mounted to the lower side of the handy operating section 23 as shown in Fig. 16, instead of the suction nozzle, and the suction extension tube 24 (not shown in Fig. 16) may be removed from the handy operating section 23 and the air suction/injection device 10B may be attached, when the blower function is required.

[0115] In addition, since the lever lock section 127 is provided in the present Embodiment, the position of the switching lever 123a can be locked at the position of the blower function. Hence, the device can easily keep the blower function and also easily returns to the vacuum function by simply releasing the lock. Further, since the injection opening regulation plate 121f is provided in the interior of the front end nozzle section 121a, the air suction/injection device 10B can be employed as the general suction nozzle at the time of the vacuum, and also can be employed for enhancing the flow velocity of the injecting airstream from the suction port 121g to increase the momentum of the injecting airstream at the time of the blower, by reducing the area of the injection opening.

[0116] In addition to above, while the plate-shaped injection opening regulation plate 121f is used for the member for reducing the area of the injection opening (injection opening regulation member) in the present Embodiment, the present invention is not limited to such a specific configuration, and various types of known members may be employed, provided that the member is capable of reducing the area of the opening of the opening section serving as the "injection outlet" (the suction port 121g in the present Embodiment) in the blower. Further, the injection opening regulation member necessarily may have not only the function for increasing the flow velocity of the injecting airstream to enhance the momentum, but also the function for ,inversely, increasing the area of the injection opening to reduce the flow velocity to diminish the momentum. More specifically, members, which can adjust the momentum of the injecting airstream, may be employed for the injection opening regulation member.

[0117] Further, while the injection opening regulation plate 121f in the present Embodiment is configured to be inclined so as to reduce the area of the injection opening by achieving that the front end of the passage switching section 126 is in contact with the rear end of the injection opening regulation plate 121f, the present invention is not limited to such a specific configuration, and it may be alternatively configured to be in conjunction with the action of the lever member 123, or it may be alternatively configured to allow only the change of only an the inclination angle of the injection opening regulation plate 121f without being in conjunction with other members.

[0118] In addition, while no additional member is presented to the front end nozzle section 121a in the present Embodiment, a front end brush 262 or the like, for example, may be additionally included similarly as in the suction nozzles 26A and 26B in the aforementioned Embodiment 1. Further, an extension nozzle conformable to the shape of the front end nozzle section 121a may be attachable.

[0119] (Embodiment 3)

[0120] An air suction/injection device according to Embodiment 3 of the present invention has a configuration, which is basically equivalent to that of the air suction/injection device 10B according to the above-described Embodiment 2, in which the front end opening section of the main body is the front end nozzle section of the nozzle-like shape, except that the following features are considerably different: the interior of such a front end nozzle section is completely divided into the main passage and the sub-passage; and passage open-close section for opening and closing the main passage is provided as the injection switching section, instead of the above-described passage switching section. The air suction/injection device according to the present Embodiment will be specifically described in reference to Fig. 17 and Fig. 18.

[0121] **[Configuration of Air Suction/Injection Device]**

[0122] First of all, as shown in Fig. 17 and Fig. 18, the air suction/injection device 10C according to the present Embodiment comprises a main body 131, an injection passage section 132, a lever member 133, a fan section 134, a suction chamber 135 and a passage open-close section 136. Similarly as in the main body 121 in the aforementioned Embodiment 2, the main body 131 is configured that a front end nozzle section 131a and a rear end opening section 131b are formed at both ends, respectively, the lower sides of which are provided with a plurality of suction force-regulation holes 131c. In addition, the inside of the main body 131 is provided with a suction chamber 135, which comprises an inner suction inlet 135a and a suctioned air introduction inlet that is not shown here, and the fan section 134 is provided inside of the injection passage section 132 and the inside of the suction chamber 135.

[0123] The injection passage section 132 is provided with an injecting air inlet 132a, similarly as in the injection passage section 122 in the aforementioned Embodiment 2. In addition, the lever member 133 is composed of a switching lever 133a, a lever support section 133b and an air introduction cover member that is not shown, similarly as in the lever member 123 in the aforementioned Embodiment 2. In addition, the fan section 134 is composed of an injection fan 134a, a power fan 134b and a fan rotating shaft 134c, similarly as in the fan section 124 in the aforementioned Embodiment 2.

[0124] Here, each of the main passage 101 and the sub-passage 102 provided inside of the air suction/injection device 10C is completely separated from each other, unlike the air suction/injection device 10A according to the aforementioned Embodiment 1 or unlike the air suction/injection device 10B according to the aforementioned Embodiment 2. Thus, there is no section for joining these passages, and there is no opening equivalent to the injection joined gate 122b in the aforementioned Embodiment 2, and instead, an injection outlet 132b is provided in the front end of the front end nozzle

section 131a. On the other hand, an opening equivalent to the main body joined gate 121d in the aforementioned Embodiment 2 is provided as a main body open-close gate 131d.

[0125] Such a main body open-close gate 131d may be provided in the side of the rear end beyond the suction port 131g positioned in the front end of the front end nozzle section 131a, and further, a passage open-close section 136 having similar configuration of the passage switching section 126 in the aforementioned Embodiment 2 is provided in order to open and close the main body open-close gate 131d. Such passage open-close section 136 serves as switching between the creation of the suctioned airstream and the creation of the injecting airstream in the front end nozzle section 131 a by opening and blocking only the main passage 101.

[0126] **[Action of the Air Suction/Injection Device]**

[0127] Next, the action of the air suction/injection device 10C having the above-described structure will be specifically described. First of all, the ordinary vacuum function will be described that, since the air suction/injection device 10C is in steady state, which the switching lever 133a is positioned in the side of the front end as shown in Fig. 17, the passage open-close section 136 is in contact with the upper inner surface of the injection passage section 132 to open the main body open-close gate 131d. Then, the suction force of the vacuum cleaner 20 (not shown in Fig. 17) causes suctioning external air through the suction port 131g as illustrated by thick line arrows in the diagram to create a suctioned airstream in the main passage 101 from the front end nozzle section 131 a toward the rear end opening section 131 b.

[0128] Next, the switching to the blower function will be described. When the user conducts an operation of moving the switching lever 133a toward the side of the rear end as shown in Fig. 18, a suctioned air introduction inlet that is not shown is opened, and the passage open-close section 136 moves from the condition of being in contact with the inner surface of the injection passage section 132 to the position for closing the main body open-close gate 131d. This allows blocking the main passage 101 and the suction force in the main passage 101 causes suction of air in the interior of the suction chamber 135 through the inner suction inlet 135a.

[0129] As described above, since the suction chamber 135 leads to external air through a suctioned air introduction inlet that is not shown, a suctioned airstream is created toward the suctioned air introduction inlet, the suction chamber 135 and the inner suction inlet 135a. Therefore, the power fan 134b provided in the interior of the suction chamber 125 rotates by the effect of the suctioned airstream, and the injection fan 134a rotates in conjunction with such a rotation. This allows, as illustrated in thick line arrows in the diagram, that the injecting airstream is formed in the injection passage section 132, namely in the sub-passage 102, and the injecting airstream is injected only from the injection outlet 132b located at the front end of the front end nozzle section 131a and the front end of the injection passage section 132.

[0130] Then, if the user cancels the condition where the switching lever 133a is moved to the side of the rear end, the passage open-close section 136 opens the main body open-close gate 131d, and the suctioned air introduction inlet that is not shown is closed by the air introduction cover member that is not shown. Hence, the suctioned airstream, which was created toward the suctioned air introduction inlet, the suction chamber 135 and the inner suction inlet 135a, dissipates, and rotations of the power fan 134b and the injection fan 134a are stopped, and the injecting airstream injected through the injection outlet 132b is also stopped. In addition, since the suctioned airstream is formed in the main passage 101, a suction force is created again at the suction port 131g.

[0131] As described above, since the injection passage section 132 is directly connected to the front end nozzle section 131a in the present Embodiment, the injecting airstream can be discharged from the front end nozzle section 131a without particularly conducting a switching, and the suctioned airstream can be created in the main passage 101 by opening the main body open-close gate 131d with the passage open-close section 136. Accordingly, switching between the blower function and the vacuum function in the vacuum cleaner can be easily achieved with a simple configuration simply by the open and the close of the passage open-close section 136 serving as a shut-off valve member.

[0132] Here, the area of the opening in the suction port 131g and the injection outlet 132b is not particularly limited, and it may have a certain area ratio, which can effectively achieve the blower function and the vacuum function. An example is a configuration, in which the suction port 131g has an area of the opening that is equivalent to the opening area of the general suction nozzle, and an area of the opening of the injection outlet 132b is reduced. Since such a configuration allows easy suction of the dusts from the suction port 131 g at the time of vacuum, similar convenience as obtained by the use of the general suction nozzle can be obtained, and at the time of blower, the injecting airstream can be injected through the opening having smaller area so that the flow velocity of the injecting airstream can be enhanced.

[0133] In addition, the suctioned airstream and the injecting airstream flow through completely different passages (main passage 101 and sub-passage 102) in the present Embodiment, the fear for injecting the dusts, which have been stuck to the inner wall of the main passage 101 at the vacuum, from the sub-passage 102 at the time of blower, is completely avoided. Hence, further cleaner injecting airstream from the injection outlet 132b can be injected.

[0134] While the positions of the main body open-close gate 131d and the passage open-close section 136 are substantially equivalent to the position of the joined position of the main passage 101 with the sub-passage 102 since the basic configuration of the air suction/injection device 10C in the present Embodiment is similar to the basic configuration of the air suction/injection device 10B according to the aforementioned Embodiment 2, the present invention is

not limited to such a specific configuration, and it is needless to point out that the main body open-close gate 131d and the passage open-close section 136 can be disposed at any of the positions, provided that at least the pressure inside of the suction chamber 135 can be reduced by closing the main body open-close gate 131d.

(Embodiment 4)

[0135] An air suction/injection device according to Embodiment 4 of the present invention has a configuration, which is basically equivalent to that of the air suction/injection device 10A according to the above-described Embodiment 1, except that the following features are different: the front end opening section of the main body has a shape, which is suitable for being fitted with an attachment such as a suction nozzle and the like in the internal circumference thereof and not on the outer circumference thereof; and the front end opening section is cylindrical. The air suction/injection device according to the present Embodiment will be specifically described in reference to Fig. 19 to Fig. 24.

[Configuration of Air Suction/Injection Device]

[0136] First of all, a specific configuration of an air suction/injection device according to the present Embodiment will be described in reference to Fig. 19 to Fig. 23. The air suction/injection device 10D according to the present Embodiment comprises, similarly as in the air suction/injection device 10A according to the aforementioned Embodiment 1, a main body 141, an injection passage section 142, a lever member 143, a fan section 144, a suction chamber 145 and a passage switching section 146.

[0137] The configuration of the main body 141 is similar to that of the main body 111 in the aforementioned Embodiment 1, and the interior thereof serves as a main passage 101, and the front end opening section 141a located in the side of the front end has also substantially cylindrical shape. However, the front end opening section 141a is configured that an attachment such as a suction nozzle 26A and the like is fitted in the internal circumference of the front end opening section 141a, and not on the outer circumference, unlike the front end opening section 111a in the aforementioned Embodiment 1. Accordingly, as shown in Fig. 19, the outer shape of the front end opening section 141 a has a dimension larger than that of the outer shape of the main body 141. In addition to above, a rear end opening section 141b is similar to the rear end opening section 111b in the aforementioned Embodiment 1. In addition, a plurality of suction force regulation holes 141c are provided in the lower side of the main body 141.

[0138] Here, as shown in Fig. 19, the front end opening section 141a having relatively large diameter is configured to be supported from the side of the rear end by the injection passage section 142, which is provided to protrude toward the upside of the main body 141. More specifically, the section of the front end opening section 141a disposed in the side of the rear end and being hung out from the main body 141, is supported in an integrated form with the upper surface of the injection passage section 142. Since the front end opening section 141a is configured to be fitted with an attachment in the internal circumference as described above, even relatively heavier attachment can also be sufficiently supported without being dropped off. In addition to above, the suction nozzle 26C is attached to the front end opening section 141a in the present Embodiment, similarly as in the aforementioned Embodiment 1.

[0139] In addition, the interior of the main body 141 is provided with a suction chamber 145 having an inner suction inlet 145a and a suctioned air introduction inlet 145b, and the interiors of the injection passage section 142 and the suction chamber 145 are provided with a fan section 144.

[0140] An injecting air inlet 142a is provided in the injection passage section 142, similarly as in the injection passage section 112 in the aforementioned Embodiment 1. In addition, the lever member 143 is composed of a switching lever 143a, a lever support section 143b and an air introduction cover member 143c, similarly as in the lever member 113 in the aforementioned Embodiment 1. In addition, the fan section 144 is composed of an injection fan 144a, a power fan 144b and a fan rotating shaft 144c similarly as in the fan section 114 in the aforementioned Embodiment 1.

[0141] The configurations of the main passage 101 and the sub-passage 102 are also similar to that of the air suction/injection device 10A according to the aforementioned Embodiment 1, and a passage switching section 146 is provided in the section of joining these passages. Such a passage switching section 146 is also configured of a substantially plate-shaped valve member, similarly as in the passage switching section 116 in the aforementioned Embodiment 1, and the angle can be changed by means of the operation of the switching lever 143a to alternatively close one of the main body joined gate 141d that is the joined section of the main passage 101 and the injection joined gate 142b that is the joined section of the sub-passage 102. Hence, the main passage 101 or the sub-passage 102 are configured of providing the alternative switching of the connection to the front end opening section 141a by means of the passage switching section 146 (and the lever member 143).

[Action of Air Suction/Injection Device]

[0142] Next, the action of the air suction/injection device 10D having the above-described structure will be specifically

described. First of all, the ordinary vacuum function will be described that, since the air suction/injection device 10D is in steady state, in which the switching lever 143a is positioned in the side of the front end as shown in Fig. 20 and Fig. 21, the passage switching section 146 closes the injection joined gate 142b and opens the main body joined gate 141d in the joined section between the main passage 101 and sub-passage 102. Then, the suction force of the vacuum cleaner 20 (not shown in Fig. 20 and Fig. 21) causes suctioning external air through the suction port 261a of the suction nozzle 26C as illustrated by thick line arrows in the diagram to create a suctioned airstream from the front end opening section 141 a toward the rear end opening section 141 b in the main passage 101.

[0143] Next, the switching to the blower function will be described. When the user conducts an operation of moving the switching lever 143 a toward the side of the rear end as shown in Fig. 22 and Fig. 23, the air introduction cover member 143c is moved to the side of the front end to open the suctioned air introduction inlet 145b. Further, since the injection joined gate 142b is opened by the movement of the passage switching section 146 in the joined section between the main passage 101 and sub-passage 102, the sub-passage 102 leads to the front end opening section 141a, but the main passage 101 is blocked from the front end opening section 141a. Hence, the suction force created in vicinity of the rear end opening section 141 b causes suction of air in the interior of the suction chamber 145 through the inner suction inlet 145a, as illustrated by thick arrows in the diagram.

[0144] Since the interior of the suction chamber 145 leads to external air due to the opening of the suctioned air introduction inlet 145b at this time, the suctioned airstream is created toward the suctioned air introduction inlet 145b, the suction chamber 145, and the inner suction inlet 145a. Such s suctioned airstream flows, as shown in Fig. 14, through the main passage 101 from the rear end opening section 141b toward the suction hose 22 (not shown in Fig. 23). Then, the power fan 144b provided inside of the suction chamber 145 rotates by the effect of the suctioned airstream, and the injection fan 144a rotates in conjunction with such a rotation. Hence, as indicated by thick line arrows of Fig. 14, the injecting airstream is created in the injection passage section 142, namely the sub-passage 102, and the injecting airstream flows into the interior of the front end opening section 141a, and is eventually injected through the suction port 261 a of the suction nozzle 26C.

[0145] Then, if the user cancel the condition where the switching lever 133a is moved to the side of the rear end, the passage switching section 146 opens the main body joined gate 141 d, and the suctioned air introduction inlet 145b is closed by the air introduction cover member 143c. Hence, the suctioned airstream, which was created toward the suctioned air introduction inlet 145b, the suction chamber 145 and the inner suction inlet 145a, dissipates, and the rotations of the power fan 144b and the injection fan 144a are stopped, and the injection of the injecting airstream through the suction nozzle 26C is stopped. In addition, since the suctioned airstream is formed in the main passage 101, a suction force is created again at the suction nozzle 26C.

[0146] While the air suction/injection device 10D according to the present Embodiment has substantially similar configuration as that of the air suction/injection device 10A according to the aforementioned Embodiment 1 as described above, the front end opening section 141a has the configuration, in which an attachment is fitted in the internal circumference thereof and the outer shape is larger than that of the main body 141, as mentioned above. Further, as clearly illustrated in the perspective view of Fig. 19, the injection passage section 142 is formed to have a canopy-like shape of the entire upper surface, and leads to a portion of the front end opening section 141a. Such a configuration allows sufficiently supporting the fitted attachment not only with a light weight as the general suction nozzle 26C, but also with relatively heavier weight. Hence, a number of the available types of the attachments can be added, for the benefit of the user.

[0147] While the suction nozzle 26C comprising the front end brush 262 is employed for the attachment mounted to the air suction/injection device 10D in the present Embodiment, the present invention is not limited to such a specific configuration, and various types of known suction nozzles may also be preferably employed. For example, as shown in Fig. 24, a relatively longer suction nozzle 26D may be employed. Although such a suction nozzle 26D is sufficiently longer than the suction nozzle 26B exemplified in the aforementioned Embodiment 1 (see Fig. 10), and thus has heavier weight than the suction nozzle 26B, the use of the air suction/injection device 10D according to the present Embodiment allows holding such a heavier nozzle with stable attaching condition, presenting improved usability for the users.

(Embodiment 5)

[0148] An air suction/injection device according to Embodiment 5 of the present invention has a configuration, which is basically equivalent to that of the air suction/injection device 10D according to the above-described Embodiment 4, except that the following feature is different: an attachment mounted to the front end opening section 141 a is a liquid spray section, instead of the suction nozzle 26. The air suction/injection device according to the present Embodiment will be specifically described in reference to Fig. 25 and Fig. 26.

[Configuration of the Liquid Spray Section]

[0149] As shown in Fig. 25, an air suction/injection device according to the present Embodiment is fitted with a liquid spray section 27 as an attachment to a front end opening section 141a. The liquid spray section 27 comprises a liquid storage tank 271, a spray nozzle 272, a liquid suction tube 273 and a shielding plate 274.

[0150] The liquid storage tank 271 is capable of storing liquid such as a cleaning solution, a deodorant, a fragrance and the like, inside thereof. The spray nozzle 272 serves as spraying liquid stored inside of the liquid storage tank 271, and the shielding plate 274 is provided inside thereof. The liquid suction tube 273 connects the inside of the liquid storage tank 271 with the spray nozzle 272, and serves as introducing liquid from the liquid storage tank 271 to the spray nozzle 272.

[0151] The shielding plate 274 is fixed to an inner wall of the spray nozzle 272, so as to achieve an upright condition for shutting the interior of the spray nozzle 272 and a lying condition lying from the side of the rear end toward the side of the front end of the spray nozzle 272. While the position of providing the shielding plate 274 is not particularly limited, the position is at least beyond the position of connecting with the liquid suction tube 273 toward the side of the rear end. In addition to above, a spraying outlet 275 for spraying liquid is formed at the front end of the spray nozzle 272.

[0152] Specific configurations of the liquid storage tank 271, the spray nozzle 272, the liquid suction tube 273 and the shielding plate 274, which composes the liquid spray section 27, are not particularly limited, and known configurations in the field of spraying liquid may be preferably applied to any of these elements. In addition, the liquid spray section 27 may comprise other member or mechanism.

[Action of the Liquid Spray Section]

[0153] The actions of spraying liquid by employing the liquid spray section 27 of the above configuration will be described that the basic actions are similar to the actions of the injection of the injecting airstream. More specifically, when the user conducts an operation for moving a switching lever 143a toward the side of the rear end as shown in Fig. 25, an air introduction cover member 143c is moved to the side of the front end to open a suctioned air introduction inlet 145b. Further, in the joined section between the main passage 101 and sub-passage 102, the injection joined gate 142b is opened by the movement of the passage switching section 146, so that the sub-passage 102 leads to the front end opening section 141a but the main passage 101 is blocked by the front end opening section 141a.

[0154] Hence, the suction force created in vicinity of the rear end opening section 141b acts on the interior of the suction chamber 145, which leads to external air by the opened suctioned air introduction inlet 145b, through the inner suction inlet 145a. This allows creating the suctioned airstream toward the suction chamber 145 and the inner suction inlet 145a as illustrated by thick line arrows in Fig. 26. Then, the power fan 144b provided inside of the suction chamber 145 rotates, and the injection fan 144a rotates in conjunction with such a rotation. Hence, as illustrated by thick line arrows in Fig. 26, the injecting airstream is created in the injection passage section 142, namely in the sub-passage 102, and the injecting airstream flows into the interior of the front end opening section 141 a.

[0155] Since such an injecting airstream is introduced in the interior of the spray nozzle 272, the shielding plate 274 standing so as to shut the spray nozzle 272 falls down in the side of the front end by the injecting airstream to achieve the injection from the spraying outlet 275. Since the liquid suction tube 273 connects between the shielding plate 274 and the spraying outlet 275, the discharge of the injecting airstream allows liquid in the liquid storage tank 271 being introduced into the interior of the spray nozzle 272 through the liquid suction tube 273. Then, as illustrated by thick line arrows in Fig. 26, such a liquid is atomized by the injecting airstream to be injected from the spraying outlet 275.

[0156] Then, if the user cancels the condition where the switching lever 143a is moved to the side of the rear end, the passage switching section 146 opens the main body joined gate 141d, and the suctioned air introduction inlet 145b is closed by the air introduction cover member 143c. Then, the suctioned airstream, which actuates the power fan 144b and the injection fan 144a, dissipates, and the injecting airstream injected from spraying outlet 275 is stopped.

[0157] Here, since the spray nozzle 272 leads to the main passage 101 by the open of the main body joined gate 141d, suctioned airstream is created in the interior of the spray nozzle 272. Hence, the shielding plate 274 in the state of being fallen down, stands up by the suctioned airstream, resulting in shutting the spray nozzle 272. Accordingly, an unwanted situation, in which the liquid in the interior of the liquid storage tank 271 is carelessly flowed into the interior of the air suction/injection device 10D, is avoided. In addition to above, even if it is assumed that liquid is suctioned in mistake by any possibility, it is structurally inevitable to suction in the form of mist, and therefore this will not be harmful for the vacuum cleaner 20 at all.

[0158] As described above, the liquid spray section 27 is mounted to the front end opening section 141a in the present Embodiment, so that liquid can be sprayed by using the injecting airstream. Hence, when a cleaning solution is employed as liquid, the type of the dusts, which cannot be removed by the ordinary vacuum function or the above-described blower function (for example, dusts clogged onto the cleaning surface or the like) can be removed by spraying a mist of the cleaning solution. Alternatively, a deodorant or a fragrance can be employed as liquid to spray them throughout the

room. In such case, a deodorant, a fragrance or the like can be sprayed over the broader area and in one stroke, as compared with the commercially available pressurized-can type agent. This results in spreading the variation of the cleanup.

(Embodiment 6)

[0159] An air suction/injection device according to Embodiment 6 of the present invention has a configuration, which is basically equivalent to that of the air suction/injection devices 10A to 10D according to the above-described Embodiment 1 to 5, except that the device is also configured that a front end opening section of a main body is turnably structured to function as a passage switching section and no valve member is included. The air suction/injection device according to the present Embodiment will be specifically described in reference to Fig. 27 to Fig. 29.

[Configuration of Air Suction/Injection Device]

[0160] First of all, the air suction/injection device 10E according to the present Embodiment comprises a main body 151, an injection passage section 152, a fan section 154 and a suction chamber 155 as shown in Fig. 27 and Fig. 28, similarly as in the air suction/injection device 10A according to the aforementioned Embodiment 1.

[0161] The configuration of the main body 151 is similar to the main body 111 in the aforementioned Embodiment 1, and the interior thereof serves as the main passage 101, and the front end opening section 111 a is not provided in the side of the front end, but a turnable opening section 156 is provided instead. The turnable opening section 156 functions as a front end opening section and at the same time, as a passage switching section for the main body 151. The turnable opening section 156 is presented as a separate member in the main body 151 (injection passage section 152), which is rotatable in the circumference direction around the center of a turning shaft section 156d, and the inside of which is provided with a through hole 156a and a closed hole 156b that is adjacent to such a through hole 156a.

[0162] The through hole 156a leads to a suction port 156c to form a passage through which an airstream flows. On the other hand, the closed hole 156b is configured to open an end that leads to the main body 151, namely the side of the rear end, and to close the other end, namely the side of the front end. In addition, the main body 151 and an end of the injection passage section 152, which are in contact with the turnable opening section 156, are provided with a main connecting gate 151d and an injection connecting gate 152b, respectively. Accordingly, the injection passage section 152 is provided to the main body 151 so as to be adjacent to the main passage 101 and the sub-passage 102 at an end leading to the turnable opening section 156.

[0163] The turnable opening section 156 has, as shown in Fig. 27 and Fig. 28, a nozzle-like shape, in which the cross sectional area is decreased as approaching to the front end section in the present Embodiment, only the through hole 156a extends through from the front end to the rear end, and the closed hole 156b has an open end only in the side of the rear end. It is needless to point out that the configuration is not limited thereto, and alternative configuration for accommodating to mount an attachment such as the suction nozzle 26 and the like may be adopted. In addition to above, the rear end opening section 151b is similar to the rear end opening section 111b in the aforementioned Embodiment 1.

[0164] In addition, the interior of the main body 151 is provided with a suction chamber 155 having an inner suction inlet 155a, and the interiors of the injection passage section 152 and the suction chamber 155 are provided with a fan section 154. Here, while the configuration of the injection passage section 152 is basically similar to that of the injection passage section 112 in the aforementioned Embodiment 1, the injecting air inlet 152a is provided so as to face to an upper surface of the fan section 154 in the upper surface of the injection passage section 152, and is not provided in the upper side wall of the injection passage section 152, unlike the injecting air inlet 112a of the aforementioned Embodiment 1. In addition, the suction chamber 155 is provided with an inner suction cover member 155c for closing the inner suction inlet 155a in openable and closable manner. Here, the fan section 154 is composed of an injection fan 154a, a power fan 154b and a fan rotating shaft 154c, similarly as in the fan section 114 in the aforementioned Embodiment 1.

[Action of Air Suction/Injection Device]

[0165] Next, the action of the air suction/injection device 10E having the above-described structure will be specifically described. First of all, the ordinary vacuum function will be described that the through hole 156a of the turnable opening section 156 faces to the main connecting gate 151d and the closed hole 156b faces to the injection connecting gate 152b in the air suction/injection device 10E as shown in Fig. 27. More specifically, this means that the main passage 101 leads to the turnable opening section 156, and the sub-passage 102 is blocked from the turnable opening section 156. Hence, a suction force of the vacuum cleaner 20 (not shown in Fig. 27 and Fig. 28) allows suctioning external air through the suction port 156c of the turnable opening section 156 to create a suctioned airstream in the main passage 101 toward the rear end opening section 151 b as illustrated by thick line arrows in the diagram.

[0166] Next, the switching to the blower function will be described. When the user twists the turnable opening section 156 as shown in Fig. 28, the through hole 156a faces to the injection connecting gate 152b, and the closed hole 156b faces to the main connecting gate 151d. More specifically, this means that the sub-passage 102 leads to the turnable opening section 156, and the main passage 101 is blocked from the turnable opening section 156. Hence, a suction force created in vicinity of the rear end opening section 151b allows suctioning air from the inside of the suction chamber 155 through the inner suction inlet 155a as illustrated by thick line arrows in the diagram.

[0167] Here, while the inner suction inlet 155a included in the suction chamber 155 is closed by the inner suction cover member 155c, the inner suction cover member 155c is suctioned by the aforementioned suction force (suctioned airstream) to open the inner suction inlet 155a. This results in rotating the power fan 154b by suctioning the interior of the suction chamber 155 through the inner suction inlet 155a to rotate the injection fan 154a in conjunction with the injection fan 114a. Hence, as illustrated by thick line arrows in Fig. 28, an injecting airstream is created in the injection passage section 152, namely in the sub-passage 102, and the injecting airstream flows via the through hole 156a of the turnable opening section 156 and be eventually injected from the suction port 156c.

[0168] Then, the turnable opening section 156 is turned back to the previous position by the user to shut the sub-passage 102 by the closed hole 156b and allow the main passage 101 leading to through hole 156a, so that the rotations of the power fan 154b and the injection fan 154a are stopped, and the injecting airstream injected from the turnable opening section 156 is stopped. In addition, since the suctioned airstream is formed in the main passage 101, suction force is created again at the through hole 156a and the suction port 156c.

[0169] Since the injection passage section 152 is provided in a positional relation of being inclined at an acute angle over the tube axis direction of the main body 151 at this time as shown in Fig. 28, the lower surface of suction chamber 155 integrated with the injection passage section 152 is also inclined. Hence, the inner suction cover member 155c provided in the lower surface of the suction chamber 155 is to be closed by the flow of the suctioned airstream.

[0170] As described above, since the present Embodiment is configured that the turnable opening section 156 connects the closed hole 156b to one of the main passage 101 and the sub-passage 102 and connects the through hole 156a to the other passage, the section functions not only as the front end opening section but also as the passage switching section. Hence, switching between the connection and the shutoff of the sub-passage 102 can be achieved without employing a lever member. Hence, switching between the blower function and the vacuum function can be easily achieved with a simple configuration.

[0171] In addition, when the main passage 101 is connected to the turnable opening section 156 and thus no injecting airstream is created, the inner suction cover member 155c can be closed, and the sub-passage 102 is connected to the turnable opening section 156 so as to automatically open the inner suction cover member 155c. Hence, the rotation of the injection fan 154a can be effectively achieved by the air flow flowing through the main passage 101, and in addition, the power fan 154b can be protected without disturbing the rotation of the power fan 154b.

[0172] In addition to above, the inner suction cover member 155c may be omitted in the present Embodiment, and for example, it may be alternatively configured that the fan rotating shaft 154d serving as rotating shafts of the injection fan 154a and the power fan 154b extends through the inner suction inlet 155a protrudes from the injection passage section 152 to the inside of the main body 151, as shown in Fig. 29. In such a configuration, bearing sections 151h and 152c for supporting the fan rotating shaft 154d are provided in a section between the injection passage section 152 and the suction chamber 155 and the inner surface of the main body 151, respectively, (indicated by a circle surrounded with an alternate-long-and-short dash line in the diagram). By employing such a configuration, the fan section 154 is supported not only by the injection passage section 152 and the inside of the suction chamber 155 but also by the bearing sections 151h and 152c inside of the main body 151, so that the fan section 154 can be more stably supported.

(Embodiment 7)

[0173] An air suction/injection device according to Embodiment 7 of the present invention has a configuration, which is basically equivalent to that of the air suction/injection devices 10A to 10E according to the above-described Embodiment 1 to 6, except that the device is also configured to comprise an injection switching section, which can be achieved by constituting an injection passage section itself to be turnable, instead of employing a passage switching section serving as a valve member. The air suction/injection device according to the present Embodiment will be specifically described in reference to Fig. 30 to Fig. 37.

[Configuration of Air Suction/Injection Device]

[0174] First of all, the air suction/injection device 10F according to the present Embodiment comprises a main body 161, an injection passage section 162, a fan section 164 and a suction chamber 165 similarly as in the air suction/injection device 10A according to the aforementioned Embodiment 1 as shown in Fig. 30. Here, Fig. 30 is a cross-sectional view cut along the vertical direction (longitudinal direction) of the air suction/injection device 10F.

[0175] The configuration of the main body 161 is similar to that of the main body 111 in the aforementioned Embodiment 1, and the interior thereof serves as a main passage 101, and the side of the front end thereof is configured as a front end nozzle section 161a, similarly as in the main body 121 in the aforementioned Embodiment 2. A suction port 161g are provided at the front end of such a front end nozzle section 161a. In addition to above, a rear end opening section 161b is similar to the rear end opening section 111 b in the aforementioned Embodiment 1.

[0176] In addition, the injection passage section 162 is configured as a housing for fan section 167, which is integrated with a suction chamber 165, unlike the main bodies 111 to 141 in the aforementioned Embodiments 1 to 5. Such a housing for fan section 167 is configured to have a cylindrical shape, which houses the fan section 164 inside thereof, and the upper section constitutes an injection passage section 162 and the lower section constitutes a suction chamber 165. The housing for fan section 167 is turnably inserted in the main body 161 along a direction (transverse direction in Fig. 30) perpendicular to the tube axis of the main body 161 (longitudinal direction in Fig. 30). In addition to above, the direction for inserting the housing for fan section 167 is not limited to the perpendicular direction, and may be a direction having at least an intersect therewith.

[0177] Since the housing tor fan section 167 is inserted in the main body 161, the outer circumference thereof basically faces to the main passage 101. In addition, the inside of the main body 161 is provided with a support for housing section 161h, which is capable of turnably supporting the inserted housing for fan section 167. In addition, a plate-shaped passage open-close section 166, which is positioned along the radial direction of the housing for fan section 167, is provided under the housing for fan section 167. The specific configurations of the support for housing section 161h and the passage open-close section 166 will be discussed later.

[0178] The fan section 164 is composed of, similarly as in the fan section 114 in the aforementioned Embodiment 1, an injection fan 164a, a power fan 164b and a fan rotating shaft 164c, and is housed inside of the housing for fan section 167 as described above, and the injection fan 164a is located inside of the injection passage section 162 as shown in Fig. 31, and the power fan 164b is located inside of the suction chamber 165, as shown in Fig. 32. Here, Fig. 31 is a partial cross-sectional view of the housing for fan section 167, illustrating the inside of the injection passage section 162 viewed from the upper side, and corresponds to a cross-sectional view along line II-II in Fig. 30. Fig. 32 is also a partial cross-sectional view, illustrating the inside of the suction chamber 165 viewed from the upper side, and is a cross-sectional view along line III-III in Fig. 30. More specifically, Fig. 31 and Fig. 32 are cross-sectional views along the direction perpendicular to the vertical direction (i.e., transverse direction).

[0179] As shown in Fig. 31, the outer circumference of the injection passage section 162 in the housing for fan section 167 is provided with an injection connecting gate 162b by cutoff a portion thereof. Such an injection connecting gate 162b serves an injection outlet in an injection passage section 162. In addition, an injecting air inlet 162a is provided in the upper surface of the injection passage section 162 (namely, upper surface of the housing for fan section 167) in a position facing to the upper surface of the fan section 164 similarly as in the injecting air inlet 152a in the aforementioned Embodiment 6. Hence, the section between the injecting air inlet 162a and the injection connecting gate 162b forms the sub-passage 102. In addition, the lower surface of the suction chamber 165 faces to the main passage 101, and such location is provided with an inner suction inlet 165a similarly as in the inner suction inlet 115a in the aforementioned Embodiment 1.

[0180] In addition, as shown in Fig. 32, the above-described support for housing section 161h is located in the section of the housing for fan section 167 outside of the suction chamber 165. Such support for housing section 161h is configured of a wall-like shape, which curves along the outer circumference of the suction chamber 165, and a portion thereof is exposed to the outside of the main body 161. Further, a suctioned air introduction outer inlet 165c is provided in such an exposed section. On the other hand, the suction chamber 165 is in the condition of being fitted inside of the support for housing section 161h, a portion of the outer circumference of which is provided with a suctioned air introduction inner inlet 165b. Hence, if the suctioned air introduction inner inlet 165b provided in the suction chamber 165 coincides with the suctioned air introduction outer inlet 165c provided in the support for housing section 161 h by the turn of the housing for fan section 167, it serves as "suctioned air introduction inlet" similarly as in the suctioned air introduction inlet 115b in the aforementioned Embodiment 1.

[0181] The most part of the passage open-close section 166 provided under the housing for fan section 167 is located inside of the support for housing section 161h and a part thereof is located outside of the support for housing section 161h, as shown in Fig. 32 and Fig. 33. The passage open-close section 166 is in the positional relation, in which both ends thereof (one is inside of the support for housing section 161h and the other is in the outside of the support for housing section 161h) are coplanar, and a section between the both ends is curved so as to cover a half of the circumference of the inner suction inlet 165a.

[0182] In the condition shown in Fig. 31 to Fig. 33, namely at the time of vacuum the passage open-close section 166 is located along the extending direction of the main passage 101 (passage direction), and is configured to move toward the direction for intersecting with the main passage 101 (crossing direction) by turning the housing for fan section 167 to close the main passage 101, as discussed later. Here, Fig. 33 is a cross-sectional view of transverse direction, similarly as Fig. 31 and Fig. 32, and is a partial cross-sectional viewed from the bottom side, and is not a partial cross-sectional

view viewed from the top side.

[0183] In addition to above, it is satisfactory for the present Embodiment that at least a portion of the outer circumference of the housing for fan section 167 faces to the main passage 101, and therefore it is not necessary for whole of the housing for fan section 167 to be located inside of main body 161. In the present Embodiment, as shown in Fig. 31, approximately a three-fourths of the outer circumference is inserted in the main body 161, and approximately a quarter is exposed at the outside of the main body 161.

[Action of Air Suction/Injection Device]

[0184] Next, the action of the air suction/injection device 10F having the above-described structure will be specifically described. First of all, the ordinary vacuum function will be described that, in the air suction/injection device 10F as shown in Fig. 31, the injection connecting gate 162b provided in the injection passage section 162 (housing for fan section 167) does not face to the suction port 161g of the front end nozzle section 161a, but is in the condition that it faces to the inner side wall near the rear end to be blocked. More specifically, the sub-passage 102 equivalent to the inside of the injection passage section 162 is blocked from the front end nozzle section 161a.

[0185] At this time, there is no overlapped opening regions between the suctioned air introduction inner inlet 165b provided in the suction chamber 165 and the suctioned air introduction outer inlet 165c provided in the support for housing section 161h, as shown in Fig. 32. Since the suctioned air introduction inner inlet 165b, which is oriented toward the suction port 161g in Fig. 32, is in the condition of being covered with the support for housing section 161h, and in addition, the outer circumference surface of the suction chamber 165 is exposed over the suctioned air introduction outer inlet 165c, so that the suctioned air introduction outer inlet 165c is in the closed condition. In such a condition, no external air is supplied from the outside into the inside of the suction chamber 165.

[0186] Hence, external air is suctioned through the suction port 161g of the front end nozzle section 161a by a suction force of the vacuum cleaner 20 (not shown in Fig. 31 to 33) as illustrated by thick line arrows in Fig. 31 to Fig. 33 to create a suctioned airstream in the main passage 101 toward the rear end opening section 161b. On the contrary, no flow of air is created in the blocked sub-passage 102.

[0187] In the next, the switching to the blower function will be described. Fig. 34 to Fig. 37 are cross-sectional views correspond to Fig. 30 to Fig. 33, respectively, and while Fig. 34 to Fig. 37 illustrates the condition at the vacuum, Fig. 34 to Fig. 37 illustrates the condition at the blower.

[0188] As shown in Fig. 34 and Fig. 35, when user twists the housing for fan section 167, the injection connecting gate 162b of the injection passage section 162 faces to the suction port 161g of the front end nozzle section 161a. In response to this situation, the opening region of the suctioned air introduction inner inlet 165b provided in the suction chamber 165 and the opening region of the suctioned air introduction outer inlet 165c provided in the support for housing section 161h acquire an overlapped section as shown in Fig. 36, so that external air can be introduced into the inside of the suction chamber 165 as illustrated by thick line arrows in Fig. 36. This allows creating a suctioned airstream through the suctioned air introduction outer inlet 165c, the suctioned air introduction inner inlet 165b, and the suction chamber 165 and toward the inner suction inlet 165a (not shown in Fig. 35 and Fig. 36).

[0189] Further, as shown in Fig. 36 and Fig. 37, the plate-like passage open-close section 166 located along the passage direction changes its direction to the crossing direction by the turn of the housing for fan section 167 to close the main passage 101. This prevents the suctioned airstream from reaching to the front end nozzle section 161a, and makes such a stream acting only for rotating the power fan 164b inside of the suction chamber 165. Hence, the injection fan 164a also rotates in conjunction with the rotation of the power fan 164b, the injecting airstream is created in the sub-passage 102, and such an injecting airstream flows in the front end nozzle section 161a and is discharged from the suction port 161g, as illustrated by thick line arrows in Fig. 35.

[0190] Then, the user twists the housing for fan section 167 to return to the original location, the close of the main passage 101 by the passage open-close section 166 is cancelled to open the main passage 101 and to release the coincidence state of the suctioned air introduction inner inlet 165b with the suctioned air introduction outer inlet 165c, and the "suctioned air introduction inlet" is closed and simultaneously the injection connecting gate 162b is also closed so that the rotations of the power fan 164b and the injection fan 164a are stopped and the injecting airstream discharged from the front end nozzle section 161 a is stopped. In addition, since the suctioned airstream is created in the main passage 101, sufficient suction force is regenerated in the suction port 161 g.

[0191] As described above, since it is configured to achieve the closing and the opening of the "suctioned air introduction inlet" and the opening and the closing of the main passage 101 by turning the housing for fan section 167 in the present Embodiment, such a housing for fan section 167 functions as an injection switching section. Hence, the switching between the blower function and the vacuum function in the vacuum cleaner can be easily achieved by simply turning the housing for fan section 167.

[0192] While the housing for fan section 167 is configured to function as the injection switching section by turning the housing for fan section 167 to direct the injection connection gate 162b (injection outlet) toward the front end nozzle

section 161a or toward the rear end opening section 161b in the present Embodiment, the present invention is, of course, not limited to such a specific configuration, and it is satisfactory to be configured to function as an injection switching section by changing at least the position of the injection connection gate 162b (injection outlet). In addition, while the passage open-close section 166 serving as closing the main passage 101 functions as the supporting injection switching section, the passage open-close section 166 may not to be necessarily provided depending on some specific configuration of the air suction/injection device 10F.

(Embodiment 8)

[0193] A configuration of an air suction/injection device according to Embodiment 8 of the present invention is different from that of the air suction/injection devices 10A to 10F according to the aforementioned Embodiments 1 to 7 in terms of some of the constituting elements, in which the sub-passage is positioned along the main passage in the interior of the main body so that the air introduction cover member functions as the injection switching section. The air suction/injection device according to the present Embodiment will be specifically described in reference to Fig. 38 to Fig. 44.

[Configuration of Air Suction/Injection Device]

[0194] First of all, the air suction/injection device 10G according to the present Embodiment is composed of a main body 171 and an injecting section 177 as shown in Fig. 38. The configuration of the main body 171 is similar to the main bodies 111 to 161 of the aforementioned Embodiments 1 to 7, and the interior thereof serves as a main passage 101, as shown in Fig. 39. In addition, similarly as in the aforementioned Embodiment 2, 3 or 7, the front end section thereof is configured of a front end nozzle section 171a. The front end of such a front end nozzle section 171a is provided with a suction port 171g. In addition to the above, a rear end opening section 171 b is also similar to the rear end opening sections 111b to 161b of the aforementioned Embodiments 1 to 7.

[0195] The injecting section 177 is composed of an injection passage section 172 and a suction chamber 175, and an integrated-type fan section 174 provided inside thereof. The injection passage section 172 and the suction chamber 175 are substantially integrated, and the interior thereof is provided with the integrated-type fan section 174. In addition, such an injecting section 177 is inserted in the main body 171 so that the sub-passage 102 is positioned along the main passage 101.

[0196] The injection passage section 172 in the injecting section 177 is basically similar to the injection passage sections 112 to 152 in the aforementioned Embodiments 1 to 6, and the interior thereof constitutes the sub-passage 102, except that the injection passage section 172 includes an inner injection nozzle 172c. Such an inner injection nozzle 172c extends from the main body of the injection passage section 172 provided with the integrated-type fan section 174 to the suction port 171 g of the front end nozzle section 171a, and the front end thereof is provided with the injection outlet 172b. In the present Embodiment, the location of the injection outlet 172b is presented to be closer to the side of the rear end beyond the suction port 171 g.

[0197] The main body of the injection passage section 172 (section except the inner injection nozzle 172c) is substantially integrated with the suction chamber 175 as shown in Fig. 39, similarly as in the housing for fan section 167 in the aforementioned Embodiment 6. The insides of these integrated sections are provided with a rotatable integrated-type fan section 174, which also serves as a partition. The integrated-type fan section 174 is composed of an injection fan wing 174a, a power fan wing 174b, and a fan rotating section 174c. The fan rotating section 174c is in the form of a disc-shape, and the circumference thereof is rotatably supported with inner walls of the injection passage section 172 and the suction chamber 175 through the fan support member 177a. Then, a surface of the fan rotating section 174c in the side of the injection passage section 172 (side of the sub-passage 102) is provided with a plurality of injection fan wings 174a, and a surface in the opposite side (side of the suction chamber 175) is provided with a plurality of power fan wings 174b.

[0198] In addition, an inner suction inlet 175a is presented at a location in the suction chamber 175 facing to the main passage 101, similarly as in the aforementioned respective Embodiments. Such a location also coincides with a location of the suction chamber 175 facing to the power fan wing 174b of the integrated-type fan section 174. In addition, the interior of the suction chamber 175 is communicated with the suctioned air introduction inlet 175b provided at the location facing to the outside of the main body 171, as shown in Fig. 40.

[0199] Hence, a creation of a suctioned airstream in the main passage 101 allows suction of air in the interior of the suction chamber 175 through the inner suction inlet 175a, so that external air is introduced through the suctioned air introduction inlet 175b into the suction chamber 175. This results in creating airflow in the direction from the suctioned air introduction inlet 175b toward the suction chamber 175, so that the integrated-type fan section 174 is rotated by striking the power fan wing 174b with such an airflow.

[0200] In addition, an injecting air inlet 172a is presented at a location in the injection passage section 172 facing to the outside of the main body 171. Such a location also coincides with a location of the main body of the injection passage

section 172 facing to the injection fan wing 174a of the integrated-type fan section 174. In addition, the sections starting from the injecting air inlet 172a through the main body of the injection passage section 172 and the inner injection nozzle 172c to the injection outlet 172b form the sub-passage 102.

[0201] The surface of the integrated-type fan section 174 in the opposing side to the surface provided with the power fan wing 174b is provided with the injection fan wing 174a, as described above. Hence, the rotation of the integrated-type fan section 174 by means of the suction of air in the interior of the suction chamber 175 allows air contained in the interior of the injection passage section 172 striking the injection fan wing 174a to create an injecting airstream in the sub-passage 102, which is then injected from the injection outlet 172b.

[0202] Here, as shown in Fig. 40, a location of the main passage 101 corresponding to the inner suction inlet 175a (shown with dotted line in the diagram.) is provided with an inner suction cover member 175c for closing such an inner suction inlet 175a in openable and closable manner (see also, Fig. 38 and Fig. 39). The inner suction cover member 175c is capable of allowing the introduction of external air into the interior of the suction chamber 175 and stopping the introduction by opening and closing thereof. Therefore, such an inner suction cover member 175c functions as a passage open-close section (switching cover member) for switching between the connection and the blocking of the sub-passage 102 for the front end nozzle section 171a.

[0203] Here, Fig. 39 and Fig. 40 are cross-sectional views of the air suction/injection device 10G shown in Fig. 38, and specifically, Fig. 39 is a cross-sectional view showing the interior of the air suction/injection device 10G from the upper side, and Fig. 40 is a cross-sectional view showing the interior of the main passage 101 of the air suction/injection device 10G from the lateral side. In addition, Fig. 40 is a cross-sectional view of Fig. 39 along line VI-VI, and Fig. 39 is a cross-sectional view of Fig. 40 along line VII-VII.

[Action of Air Suction/Injection Device]

[0204] Next, the action of the air suction/injection device 10G having the above-described structure will be specifically described. First of all, the ordinary vacuum function will be described that the inner suction cover member 175c closes the inner suction inlet 175a in the air suction/injection device 10G as shown in Fig. 38 and Fig. 40, and therefore no air is introduced from the outside into the interior of the suction chamber 175 through the suctioned air introduction inlet 175b. Here, once external air is suctioned through the suction port 171g of the front end nozzle section 171a as illustrated by thick line arrows in the diagrams by a suction force of the vacuum cleaner 20 (not shown in Fig. 38 to Fig. 40), a suctioned airstream is created in the main passage 101 toward the rear end opening section 171b in the main body 171. In addition to above, since the integrated-type fan section 174 is not rotated in this state, no injecting airstream is generated, and thus the interior of the inner injection nozzle 172c is in none-airstream state.

[0205] In the next, switching to the blower function will be described. When the user moves the inner suction cover member 175c from the closing state to open the inner suction inlet 175a as shown in Fig. 41, external air is introduced through the suctioned air introduction inlet 175b. Hence, once the suctioned airstream is created in the main passage 101 of the main body 171 by the suction force of the vacuum cleaner 20 (not shown in Fig. 41), the integrated-type fan section 174 is rotated in the interior of the injecting section 177 to create the injecting airstream in the interior of the injection passage section 172, namely in the sub-passage 102, and then is injected from the injection outlet 172b. Since no passage open-close section for closing the main passage 101 is provided in the air suction/injection device 10G unlike in Embodiment 3 or Embodiment 7, a smaller suctioned airstream is created in the suction port 171g of the front end nozzle section 171a in such a state.

[0206] After that, when the user closes the inner suction cover member 175c, no external air is introduced into the suction chamber 175, so that the rotation of the integrated-type fan section 174 is stopped, and the injecting airstream injected from the front end nozzle section 171a is also stopped. In addition, since the suctioned airstream is created in the main passage 101, sufficient suction force is regenerated in the suction port 171 g.

[0207] As described above, the present Embodiment includes the passage open-close section (inner suction cover member 175c) serving as the injection switching section, which is capable of closing the inner suction inlet 175a in openable and closable manner. Hence, when the closing of the inner suction inlet 175a is maintained at the passage open-close section, no external air is introduced into the suction chamber 175 so that a suctioned airstream is created at the suction port 171g of the main passage 101, and on the other hand, once the passage open-close section is opened, external air is introduced to the sub-passage 102, so that an injecting airstream is created at the inner injection nozzle 172. The injecting airstream can be formed or be stopped in this way by opening and closing the passage open-close section, so that switching between the blower function and the vacuum function in the vacuum cleaner can be easily achieved with a simple configuration.

[0208] In addition, as described above, a slight suctioned airstream is created even at the time of blower. Hence, even if the dusts are whirled up by the blower stream injected from the injection outlet 172b, the air suction/injection device 10G allows suctioning and collecting the dusts from the suction port 171g without switching from the vacuum to the blower.

[Modified Embodiment]

[0209] While the inner suction cover member 175c for closing such an inner suction inlet 175a in openable and closable manner is employed for the passage open-close section in the present Embodiment, the present invention is not limited to such a specific configuration, and a member, which is capable of closing at least a portion of the passage of air from the suctioned air introduction inlet 175b to the main passage 101 (inner suction inlet 175a) in openable and closable manner, may alternatively be employed. Another exemplary implementation for the passage open-close section may include, for example, an air suction/injection device 10H having an air introduction cover member 173 shown in Fig. 42 to Fig. 44.

[0210] As shown in Fig. 42, the basic configuration of the air suction/injection device 10H is almost similar to the configuration of the above-described air suction/injection device 10G, except that the inner suction cover member 175c for closing the inner suction inlet 175a is not provided, and instead, the air introduction cover member 173 is provided, as shown in Fig. 43 and Fig. 44. The air introduction cover member 173 serves as closing the suctioned air introduction inlet 175b, similarly as one of the air introduction cover members 113c, 123c and 143c in the aforementioned Embodiment 1, 2 and 4, respectively, and is configured as a cover member, which is capable of sliding along the longitudinal direction of the air suction/injection device 10H in the present modified Embodiment.

[0211] By employing such a configuration, as shown in Fig. 42 to Fig. 44, the air introduction cover member 173 is opened to introduce external air to the interior of the suction chamber 175 which rotates the integrated-type fan section 174, so that the injecting airstream is injected from the injection outlet 172b of the inner injection nozzle 172c (sub-passage 102). On the other hand, when the air introduction cover member 173 is closed, external air is not introduced to the interior of the suction chamber 175 and hence the rotation of the integrated-type fan section 174 is not occurred, and thus, no injecting airstream is created and a suctioned airstream is generated in the main passage 101 from the suction port 171 g.

[0212] As described above, the use of the air suction/injection device 10H, which is configured to include the air introduction cover member 173 in place of the inner suction cover member 175c, can also achieve an easy switching between the vacuum function and the blower function with a simple constitution similarly as in the above-described the air suction/injection device 10G

[0213] Here, Fig. 43 and Fig. 44 are cross-sectional views of the air suction/injection device 10H shown in Fig. 42, and specifically, Fig. 43 is a cross-sectional view showing the interior of the air suction/injection device 10H from the upper side, and Fig. 44 is a cross-sectional view of showing interior of the main passage 101 of the air suction/injection device 10H from the lateral side. In addition, Fig. 44 is a cross-sectional view of Fig. 39 along line VIII-VIII, and Fig. 43 is a cross-sectional view of Fig. 40 along line IX-IX. Here, arrows indicating the airflow is not shown in Fig. 42 to Fig. 44, since the configuration of the air suction/injection device 10H is substantially similar to the configuration of the air suction/injection device 10G and the creations of the injecting airstream and the suctioned airstream therebetween are also similar.

[0214] While the above-described configuration of the modified Embodiment is to close the suctioned air introduction inlet 175b and the aforementioned configuration of the present Embodiment is to close the inner suction inlet 175a, the specific configuration of the passage open-close section is not limited to the configuration of closing an upstream side or a downstream side of the passage for external air in openable and closable manner, and alternative configurations for permitting and blocking the flow of external air to the interior of suction chamber 175 may be also employed, or the passage open-close section 166 having the configuration described in the aforementioned Embodiment 7 may be alternatively employed, in place of the switching cover member. More specifically, any type of known configurations may be adopted for the passage open-close section in the present Embodiment, provided that the configuration is to close at least a portion of the passage of air from the suctioned air introduction inlet 175b to the main passage 101 (inner suction inlet 175a) in openable and closable manner as described above.

[0215] Those of ordinary skills in the art will recognize that the present invention is not limited to the descriptions of the aforementioned Embodiments, and various types of modifications may be made thereto without departing from the spirit and scope of the present invention as set forth in the following claims, and further, implementations obtained by suitably combining technical aspects disclosed in different Embodiments or a plurality of modified Embodiments are included in the spirit and scope of the present invention. For example, modified Embodiment exemplified in the aforementioned Embodiment 1 is applicable to the other Embodiments 1 to 8, and on the other hand, available combination of at least two or more of the configurations disclosed in the aforementioned Embodiments 1 to 8 may be included in the spirit and scope of the present invention.

[0216] In addition, many improvements and other Embodiments of the present invention are apparent for those having ordinary skills in the art based on the above-described descriptions. Therefore, the above-described description should be construed as illustrations only, and to be presented for the purpose of teaching the best mode for conducting the present invention by a person having ordinary skills in the art. Therefore, details of the structures and/or functions may be substantially modified without departing from the spirit and scope of the present invention.

Industrial Applicability

[0217] The present invention can preferably be employed in the fields of various types of vacuum cleaners, regardless of household use or business use, or regardless of canister type or upright type, if it is intended to utilize the blower function and the vacuum function.

Claims

1. An air suction/injection device which connects to a front end of a suction hose (22) included in a vacuum cleaner(20), the air suction/injection device (10A;10B; 10C; 10D; 10E; 10F; 10G; 10H) comprising:

a tube-like main body (111; 121; 141; 151; 161; 171), one end of said main body (111; 121; 131; 141; 151; 161; 171) serving as a rear end opening section (111b; 121b; 141b; 151b; 161b; 171b) connected to the front end of said suction hose (22) and the other end thereof serving as a front end opening section (111a; 141a), and an interior of said main body (111; 121; 131; 141; 151; 161; 171) forming a main passage (101) of air;
an injection passage section (112; 122; 132; 142; 152; 162; 172) having an injecting air inlet (112a; 122a; 132a; 142a; 152a; 162a; 172a) for introducing air from outside and an injection outlet for injecting the introduced air to the outside, an interior of said injection passage section forming a sub-passage (102) from said injecting air inlet (112a; 122a; 132a; 142a; 152a; 162a; 172a) to said injection outlet;
a power fan (114b; 124b; 134b; 144b; 154b; 164b) provided in the interior of said main body (111; 121; 131; 141; 151; 161; 171) and being rotated by a suctioned airstream created in said main passage (101) by means of suction of air through said suction hose (22); **characterized in that** the air suction injection device further comprises:

an injection fan (114a; 124a; 134a; 144a; 154a; 164a) provided in an interior of said injection passage section (112; 122; 132; 142; 152; 162; 172) and rotates in conjunction with said power fan (114b; 124b; 134b; 144b; 154b; 164b) to create an injecting airstream from said injecting air inlet (112a; 122a; 132a; 142a; 152a; 162a; 172a) toward said injection outlet in said sub-passage (102); and
an injection switching section for permitting or limiting injection of said injecting airstream from said injection outlet to the outside.

2. The air suction/injection device according to Claim 1, wherein said injection switching section is a passage switching section (116) for switching between connecting of and blocking of said sub-passage (102) to said injection outlet.

3. The air suction/injection device according to claim 1, wherein said injection switching section is a passage open-close section for opening or blocking said main passage (101) or said sub-passage (102) at a location upstream of said power fan (114b; 124b; 134b; 144b; 154b; 164b) or said injection fan (114a; 124a; 134a; 144a; 154a; 164a), in a flow direction of the suctioned airstream.

4. The air suction/injection device according to claim 1, further comprising a power fan housing section (115; 125; 135; 145; 155; 165) provided in said main passage (101) in said main body (111; 121; 131; 141; 151;161; 171), for housing said power fan (114b; 124b; 134b; 144b; 154b; 164b)therein,
wherein said power fan housing section (115; 125; 135; 145; 155; 165) includes an inner suction inlet (115a; 125a; 135a; 145a; 155a; 165a) facing to said main passage (101) and a suctioned air introduction inlet (115b; 125b; 135b; 145b; 155b; 165b) for introducing air from the outside.

5. The air suction/injection device according to claim 4, further comprising an air introduction cover member (113c; 123c; 143c) for closing at least a portion of a passage of air from said suctioned air introduction inlet (115b; 125b; 135b; 145b; 155b; 165b) to said main passage (101) in openable and closable manner.

6. The air suction/injection device according to claim 2,
wherein said injection passage section (112; 122; 132; 142; 152; 162; 172) is provided in the main body (111; 121; 131; 141; 151; 161; 171) so that the sub-passage (102) in said injection passage section (112; 122; 132; 142; 152; 162; 172) is joined to said main passage (101) in said main body (111; 121; 131; 141; 151; 161; 171), and said front end opening section (111a; 141 a) in said main body (111; 121; 131; 141; 151; 161; 171) serves as said injection outlet in said injection passage section (112; 122; 132; 142; 152; 162; 172), and
wherein said passage switching section (116) is provided in a section where said main passage (101) is joined to

said sub-passage (102) and is a valve member for changing its position so as to close one of said main passage (101) and said sub-passage (102).

7. The air suction/injection device according to claim 3,
wherein said injection passage section (112; 122; 132; 142; 152; 162; 172) is provided in said main body (111; 121; 131; 141; 151; 161; 171) so that the sub-passage (102) in said injection passage section (112; 122; 132; 142; 152; 162; 172) reaches said front end opening section (111a; 141a) along said main passage (101) inside of said main body (111; 121; 131; 141; 151; 161; 171), and
wherein said passage open-close section is a valve member for blocking only said main passage (101).

8. The air suction/injection device according to claim 6 or 7, further comprising a lever member (113; 123; 133; 143) provided outside of said main body (111; 121; 131; 141; 151; 161; 171), said lever member (113; 123; 133; 143) being operative in response to a positional change of said valve member.

9. The air suction/injection device according to claim 2,
wherein said front end opening section is provided in said main body (111; 121; 131; 141; 151; 161; 171) as a turnable opening section (156), which is a separate member turnable in a circumference direction thereof, an interior of said turnable opening section (156) being provided with a through hole (156a) and a closed hole (156b), said closed hole (156b) being adjacent to the through hole (156a) and having one open end that leads to said main body (151) and the other closed end,
wherein said injection passage section (112; 122; 132; 142; 152; 162; 172) is provided in the main body (111; 121; 131; 141; 151; 161; 171) so that said main passage (101) is adjacent to said sub-passage (102) in an end leading to said tumable opening section (156) of said main body (151), and the through hole (156a) of said turnable opening section (156) serves as said injection outlet in said injection passage section (112; 122; 132; 142; 152; 162; 172), and
wherein said turnable opening section (156) connects said closed hole (156b) to one of said main passage (101) and said sub-passage (102), and said turnable opening section (156) is turned so as to connect said through hole (156a) to the other of said main passage (101) and said sub-passage (102), so that it functions as said passage switching section.

10. The air suction/injection device according to claim 4,
wherein said injection passage section (112; 122; 132; 142; 152; 162; 172) and said power fan housing section are a cylindrical housing for fan section such that said injection passage section (112; 122; 132; 142; 152; 162; 172) and said power fan housing section are integrated together in a state in which the injection fan (114a; 124a; 134a; 144a; 154a; 164a) and the power fan (114b; 124b; 134b; 144b; 154b; 164b) are internally housed, respectively, and is rotatably provided to said main body (111; 121; 131; 141; 151; 161; 171),
wherein the housing for fan section is inserted in the main body (111; 121; 131; 141; 151; 161; 171), at a location between said front end opening section (111a; 141a) and said rear end opening section (111b; 121b; 141b; 151b; 161b; 171b) along a direction for intersecting with a tube axis of said main body (111; 121; 131; 141; 151; 161; 171), and at least a portion of an outer circumference thereof faces to said main passage (101) of said main body (111; 121; 131; 141; 151; 161; 171),
wherein said injecting air inlet (112a; 122a; 132a; 142a; 152a; 162a; 172a) is provided at a location in a top surface of said housing for fan section and at the outside of said main body (111; 121; 131; 141; 151; 161; 171) and an injection outlet is provided in a part of the outer circumference of said housing for fan section to form said sub-passage (102) between said injecting air inlet (112a; 122a; 132a; 142a; 152a; 162a; 172a) and said injection outlet, and
wherein said housing for fan section functions as said injection switching section, by turning said housing for fan section to change a position of said injection outlet.

11. The air suction/injection device according to claim 1,
wherein said injection passage section (112; 122; 132; 142; 152; 162; 172) is provided to be inserted in the main body (111; 121; 131; 141; 151; 161; 171) so as to position said sub-passage (102) along said main passage (110) inside of said main body (111; 121; 131; 141; 151; 161; 171),
and said suctioned air introduction inlet (115b; 125b; 145b; 175b) is provided at a location facing to the outside of said main body (111; 121; 131; 141; 151; 161; 171) in said suctioned airstream,
the air suction/injection device (10C; 10F; 10G) comprising a passage open-close section serving as said injection switching section for closing at least a part of the passage of air from said suctioned air introduction inlet (115b; 125b; 145b; 175b) to said main passage (101) in openable and closable manner.

12. The air suction/injection device according to claim 1, further comprising a suction nozzle (26A; 26B) detachably provided in said front end opening section (111a; 141a).

13. The air suction/injection device according to claim 1, further comprising a liquid spray section (27) including a liquid storage tank (271) and a spray nozzle (272) for spraying liquid stored in the liquid storage tank (271), wherein the liquid spray section (27) is detachably provided in said injection outlet.

14. The air suction/injection device according to claim 1, wherein said front end opening section (111a; 141 a) is a front end nozzle section at a front end side, the front end nozzle section having a shape in which a cross sectional area is gradually reduced toward the front end.

15. The air suction/injection device according to claim 14, wherein an injection opening regulation member (121f) for adjusting a momentum of the injecting airstream is provided inside of said front end nozzle section.

16. A vacuum cleaner, comprising the air suction/injection device as set forth in any one of claims 1 to 15, and a suction hose (22) provided with the air suction/injection device (10A; 10B; 10C; 10D; 10E; 10F; 10G; 10H).

17. The vacuum cleaner according to claim 16, wherein said air suction/injection device (10A; 10B; 10C; 10D; 10E; 10F; 10G; 10H) is detachably connected to said suction hose (22).

Patentansprüche

1. Luftsaug- / Einblasvorrichtung, welche sich mit einem vorderen Ende von einem Saugschlauch (22) verbindet, der in einem Staubsauger (20) enthalten ist,
wobei die Luftsaug- / Einblasvorrichtung (10A; 10B; 10C; 10D; 10E; 10F; 10G; 10H) aufweist:

einen rohrartigen bzw. kanalartigen Hauptkörper (111; 121; 141; 151; 161; 171), wobei ein Ende von dem Hauptkörper (111; 121; 131; 141; 151; 161; 171), das als ein hinterer Endöffnungsabschnitt (111b; 121b; 141b; 151b; 161b; 171b) dient, mit dem vorderen Ende von dem Saugschlauch (22) verbunden ist und wobei das andere Ende davon als ein vorderer Endöffnungsabschnitt (111a; 141 a) dient, und wobei ein Inneres bzw. ein Innenraum von dem Hauptkörper (111; 121; 131; 141; 151; 161; 171) eine Hauptpassage bzw. einen Hauptdurchgang (101) von Luft bildet;
einen Einblaspassagenabschnitt bzw. Einblasdurchgangsabschnitt (112; 122; 132; 142; 152; 162; 172), der einen Einblaslufteinlass (112a; 122a; 132a; 142a; 152a; 162a; 172a) zum Einführen von Luft von außerhalb und einen Einblasauslass zum Einblasen der eingeleiteten Luft zu der Außenseite bzw. nach außen hat, wobei ein Inneres bzw. ein Innenraum von dem Einblaspassagenabschnitt bzw. dem Einblasdurchgangsabschnitt eine Unterpassage bzw. einen Unterdurchgang (102) bildet, und zwar von dem Einblaslufteinlass (112a; 122a; 132a; 142a; 152a; 162a; 172a) zu dem Einblasauslass;
einen Leistungslüfter bzw. Leistungsgebläse (114b; 124b; 134b; 144b; 154b; 164b), der in dem Inneren bzw. Innenraum von dem Hauptkörper (111; 121; 131; 141; 151; 161; 171) zur Verfügung gestellt wird und durch einen angesaugten Luftstrom gedreht wird, der in der Hauptpassage bzw. dem Hauptdurchgang (101) erzeugt wird, und zwar mittels Ansaugen von Luft durch den Saugschlauch (22); **dadurch gekennzeichnet, dass** die Luftsaug- / Einblasvorrichtung ferner aufweist:

einen Einblaslüfter bzw. ein Einblasgebläse (114a; 124a; 134a; 144a; 154a; 164a), der bzw. das in einem Inneren bzw. Innenraum von dem Einblaspassagenabschnitt bzw. Einblasdurchgangsabschnitt (112; 122; 132; 142; 152; 162; 172) zur Verfügung gestellt wird und sich zusammen mit dem Leistungslüfter bzw. Leistungsgebläse (114b; 124b; 134b; 144b;
154b; 164b) dreht, um einen Einblasluftstrom von dem Einblaslufteinlass (112a; 122a; 132a; 142a; 152a; 162a; 172a) in Richtung des Einblasauslasses in der Unterpassage bzw. dem Unterdurchgang (102) zu erzeugen; und
einen Einblasumstellungs- bzw. Einblasschaltabschnitt zum Ermöglichen oder Limitieren des Einblasens von dem Einblasluftstrom von dem Einblasauslass zu der Außenseite bzw. nach außerhalb.

2. Luftsaug- / Einblasvorrichtung gemäß Anspruch 1, wobei der Einblasumstellungs- bzw. Einblasschaltabschnitt ein Passagenumstellungsabschnitt bzw. Passagenschaltabschnitt (116) zum Umstellen bzw. Schalten zwischen dem Verbinden von und dem Blockieren bzw. Sperren von der Unterpassage bzw. dem Unterdurchgang (102) mit dem

Einblasauslass ist.

3. Luftsaug- / Einblasvorrichtung gemäß Anspruch 1, wobei der Einblasumstellungs- bzw. Einblasschaltabschnitt ein Passagenöffnungs- / Schließabschnitt bzw. Durchgangsöffaungs- / Schließabschnitt zum Öffnen oder Blockieren bzw. Sperren der Hauptpassage bzw. des Hauptdurchgangs (101) der Unterpassage bzw. des Unterdurchgangs (102) ist, und zwar an einem Ort bzw. einer Stelle stromaufwärts gelegen von dem Leistungslüfter bzw. Leistungsgebläse (114b; 124b; 134b; 144b; 154b; 164b) oder dem Einblaslüfter bzw. Einblasgebläse (114a; 124a; 134a; 144a; 154a; 164a), und zwar in einer Strömungsrichtung von dem angesaugten Luftstrom.

4. Luftsaug- / Einblasvorrichtung gemäß Anspruch 1, ferner aufweisend einen Gehäuseabschnitt (115; 125; 135; 145; 155; 165) des Leistungslüfters bzw. Leistungsgebläses, der in der Hauptpassage bzw. dem Hauptdurchgang (101) in dem Hauptkörper (111; 121; 131; 141; 151; 161; 171) zur Verfügung gestellt wird, und zwar zum Unterbringen des Leistungslüfters bzw. Leistungsgebläses (114b; 124b; 134b; 144b; 154b; 164b) darin,
wobei der Gehäuseabschnitt (115; 125; 135; 145; 155; 165) des Leistungslüfters bzw. Leistungsgebläses einen inneren Saugeinlass (115a; 125a; 135a; 145a; 155a; 165a) enthält, der zu der Hauptpassage bzw. dem Hauptdurchgang (101) zugewandt ist und einen Einleitungseinlass (115b; 125b; 135b; 145b; 155b; 165b) für angesaugte Luft enthält, und zwar für das Einleiten von Luft von der Außenseite bzw. von außerhalb.

5. Luftsaug- / Einblasvorrichtung gemäß Anspruch 4, ferner aufweisend ein Lufteinleitungsabdeckungsglied (113c; 123c; 143c) zum Schließen wenigstens eines Abschnitts von einer Passage bzw. einem Durchgang von Luft von dem Einleitungseinlass (115b; 125b; 135b; 145b; 155b; 165b) für angesaugte Luft zu der Hauptpassage bzw. dem Hauptdurchgang (101) in öffnungsfähiger und schließbarer Weise.

6. Luftsaug- / Einblasvorrichtung gemäß Anspruch 2,
wobei der Einblaspassagenabschnitt bzw. Einblasdurchgangsabschnitt (112; 122; 132; 142; 152; 162; 172) in dem Hauptkörper (111; 121; 131; 141; 151; 161; 171) zur Verfügung gestellt wird, so dass die Unterpassage bzw. der Unterdurchgang (102) in dem Einblaspassagenabschnitt bzw. Einblasdurchgangsabschnitt (112; 122; 132; 142; 152; 162; 172) mit der Hauptpassage bzw. dem Hauptdurchgang (101) in dem Hauptkörper (111; 121; 131; 141; 151; 161; 171) verbunden ist, und wobei der vordere Endöffnungsabschnitt (111a; 141a) in dem Hauptkörper (111; 121; 131; 141; 151; 161; 171) als der Einblasauslass in dem Einblaspassagenabschnitt bzw. Einblasdurchgangsabschnitt (112; 122; 132; 142; 152; 162; 172) dient, und
wobei der Passagenumstellungsabschnitt bzw. Passagenschaltabschnitt (116) in einem Abschnitt zur Verfügung gestellt wird, wo die Hauptpassage bzw. der Hauptdurchgang (101) mit der Unterpassage bzw. dem Unterdurchgang (102) verbunden ist, und ein Ventilglied für das Ändern seiner Position ist, um eine von der Hauptpassage bzw. dem Hauptdurchgang (101) und der Unterpassage bzw. dem Unterdurchgang (102) zu schließen.

7. Luftsaug- / Einblasvorrichtung gemäß Anspruch 3,
wobei der Einblaspassagenabschnitt bzw. Einblasdurchgangsabschnitt (112; 122; 132; 142; 152; 162; 172) in dem Hauptkörper (111; 121; 131; 141; 151; 161; 171) zur Verfügung gestellt wird, so dass die Unterpassage bzw. der Unterdurchgang (102) in dem Einblaspassagenabschnitt bzw. Einblasdurchgangsabschnitt (112; 122; 132; 142; 152; 162; 172) den vorderen Endöffnungsabschnitt (111a; 141a) entlang der Hauptpassage bzw. des Hauptdurchgangs (101) innerhalb von dem Hauptkörper (111; 121; 131; 141; 151; 161; 171) erreicht, und
wobei der Passagenöffnungs- / Schließabschnitt bzw. Durchgangsöffnungs- / Schließabschnitt ein Ventilglied zum Blockieren bzw. Sperren nur der Hauptpassage bzw. des Hauptdurchgangs (101) ist.

8. Luftsaug- / Einblasvorrichtung gemäß Anspruch 6 oder 7, ferner aufweisend ein Hebelglied (113; 123; 133; 143), das außerhalb von dem Hauptkörper (111; 121; 131; 141; 151; 161; 171) zur Verfügung gestellt wird, wobei das Hebelglied (113; 123; 133; 143) als Reaktion auf eine Positionsänderung von dem Ventilglied wirksam wird.

9. Luftsaug- / Einblasvorrichtung gemäß Anspruch 2,
wobei der vordere Endöffnungsabschnitt in dem Hauptkörper (111; 121; 131; 141; 151; 161; 171) als ein drehbarer Öffnungsabschnitt (156) zur Verfügung gestellt wird, welcher ein separates Glied ist, das in einer Umfangsrichtung bzw. Peripherierichtung davon drehbar ist, wobei ein Inneres bzw. ein Innenraum von dem drehbaren Öffnungsabschnitt (156) mit einem Durchgangsloch (156a) und einem geschlossenen Loch (156b) zur Verfügung gestellt wird, wobei das geschlossene Loch (156b) angrenzend an das Durchgangsloch (156a) ist und ein offenes Ende hat, das zu dem Hauptkörper (151) und dem anderen geschlossenen Ende führt,
wobei der Einblaspassagenabschnitt bzw. Einblasdurchgangsabschnitt (112; 122; 132; 142; 152; 162; 172) in dem Hauptkörper (111; 121; 131; 141; 151; 161; 171) zur Verfügung gestellt wird, so dass die Hauptpassage bzw. der

Hauptdurchgang (101) angrenzend an die Unterpassage bzw. den Unterdurchgang (102) ist, und zwar in einem Ende, das zu dem drehbaren Öffnungsabschnitt (156) von dem Hauptkörper (151) führt, und wobei das Durchgangsloch (156a) von dem drehbaren Öffnungsabschnitt (156) als ein Einblasauslass in den Einblaspassagenabschnitt bzw. Einblasdurchgangsabschnitt (112; 122; 132; 142; 152; 162; 172) dient, und

wobei der drehbare Öffnungsabschnitt (156) das geschlossene Loch (156b) mit einer von der Hauptpassage bzw. Hauptdurchgang (101) und der Unterpassage bzw. Unterdurchgang (102) verbindet, und wobei der drehbare Öffnungsabschnitt (156) gedreht wird, um das Durchgangsloch (156a) mit der anderen von der Hauptpassage bzw. dem Hauptdurchgang (101) und der Unterpassage bzw. dem Unterdurchgang (102) zu verbinden, so dass er als der Passagenumstellungsabschnitt bzw. Passagenschaltabschnitt funktioniert.

10. Luftsaug- / Einblasvorrichtung gemäß Anspruch 4,
wobei der Einblaspassagenabschnitt bzw. Einblasdurchgangsabschnitt (112; 122; 132; 142; 152; 162; 172) und der Gehäuseabschnitt für den Leistungslüfter bzw. Leistungsgebläse ein zylindrisches Gehäuse für einen Lüfterabschnitt bzw. Gebläseabschnitt sind, so dass der Einblaspassagenabschnitt bzw. Einblasdurchgangsabschnitt (112; 122; 132; 142; 152; 162; 172) und der Gehäuseabschnitt für den Leistungslüfter bzw. Leistungsgebläse zusammen in einem Zustand integriert sind, in welchem der Einblaslüfter bzw. das Einblasgebläse (114a; 124a; 134a; 144a; 154a; 164a) und der Leistungslüfter bzw. Leistungsgebläse (114b; 124b; 134b; 144b; 154b; 164b) jeweils innen bzw. innerlich untergebracht sind, und drehbar an dem Hauptkörper (111; 121; 131; 141; 151; 161; 171) zur Verfügung gestellt werden, und
wobei das Gehäuse für den Lüfterabschnitt bzw. den Gebläseabschnitt in dem Hauptkörper (111; 121; 131; 141; 151; 161; 171) eingefügt ist, und zwar an einem Ort bzw.
einer Stelle zwischen dem vorderen Endöffnungsabschnitt (111a; 141a) und dem hinteren Endöffnungsabschnitt (111b; 121b; 141b; 151b; 161b; 171b) entlang einer Richtung zum Überschneiden mit einer Rohrachse bzw. Kanalachse von dem Hauptkörper (111; 121; 131; 141; 151; 161; 171) und wobei wenigstens ein Abschnitt von einem äußeren Umfang bzw. Peripherie davon zu der Hauptpassage bzw. dem Hauptdurchgang (101) von dem Hauptkörper (111; 121; 131; 141; 151; 161; 171) zugewandt ist,
wobei der Einblaslufteinlass (112a; 122a; 132a; 142a; 152a; 162a; 172a) an einem Ort bzw. einer Stelle in einer oberen Oberfläche von dem Gehäuse für den Lüfterabschnitt bzw.
den Gebläseabschnitt und an der Außenseite von dem Hauptkörper (111; 121; 131; 141; 151; 161; 171) zur Verfügung gestellt wird, und wobei ein Einblasauslass in einem Teil von dem äußeren Umfang bzw. Peripherie von dem Gehäuse für den Lüfterabschnitt bzw. Gebläseabschnitt zur Verfügung gestellt wird, um die Unterpassage bzw. den Unterdurchgang (102) zwischen dem Einblaslufteinlass (112a; 122a; 132a; 142a; 152a; 162a; 172a) und dem Einblasauslass zu bilden, und
wobei das Gehäuse für den Lüfterabschnitt bzw. den Gebläseabschnitt als der Einblasumstellungsabschnitt bzw. Einblasschaltabschnitt funktioniert, und zwar durch Drehen des Gehäuses für den Lüfterabschnitt bzw. Gebläseabschnitt, um eine Position von dem Einblasauslass zu ändern.

11. Luftsaug- / Einblasvorrichtung gemäß Anspruch 1,
wobei der Einblaspassagenabschnitt bzw. Einblasdurchgangsabschnitt (112; 122; 132; 142; 152; 162; 172) zur Verfügung gestellt wird, um in den Hauptkörper (111; 121; 131; 141; 151; 161; 171) eingefügt zu werden, um die Unterpassage bzw. den Unterdurchgang (102) entlang der Hauptpassage bzw. des Hauptdurchgangs (101) innerhalb von dem Hauptkörper (111; 121; 131; 141; 151; 161; 171) zu positionieren,
und wobei der Einleitungseinlass (115b; 125b; 145b; 175b) für angesaugte Luft an einem Ort bzw. einer Stelle zur Verfügung gestellt wird, der bzw. die der Außenseite von dem Hauptkörper (111; 121; 131; 141; 151; 161; 171) in dem angesaugten Luftstrom zugewandt ist,
wobei die Luftsaug- / Einblasvorrichtung (10C; 10F; 10G) einen Passagenöffnungs- / Schließabschnitt bzw. Durchgangsöffnungs- / Schließabschnitt aufweist, der als der Einblasumstellungsabschnitt bzw. Einblasschaltabschnitt dient, und zwar für das Schließen von wenigstens einem Teil von der Luftpassage bzw. dem Luftdurchgang von dem Einleitungseinlass (115b; 125b; 145b; 175b) für angesaugte Luft zu der Hauptpassage bzw. dem Hauptdurchgang (101) in einer öffnungsfähigen und schließbaren Weise.

12. Luftsaug- / Einblasvorrichtung gemäß Anspruch 1, ferner aufweisend eine Saugdüse (26A; 26B), die abnehmbar in dem vorderen Endöffnungsabschnitt (111a; 141a) zur Verfügung gestellt wird.

13. Luftsaug- / Einblasvorrichtung gemäß Anspruch 1, ferner aufweisend einen Flüssigkeitssprühabschnitt (27), der einen Flüssigkeitsspeichertank (271) und eine Sprühdüse (272) zum Sprühen von Flüssigkeit enthält, die in dem Flüssigkeitsspeichertank (271) gespeichert ist,
wobei der Flüssigkeitssprühabschnitt (27) abnehmbar in dem Einblasauslass zur Verfügung gestellt wird.

14. Luftsaug- / Einblasvorrichtung gemäß Anspruch 1, wobei der vordere Endöffnungsabschnitt (111a; 141a) ein vorderer Enddüsenabschnitt an einer vorderen Endseite ist, wobei der vordere Enddüsenabschnitt eine Form hat, in welcher eine Querschnittsfläche graduell in Richtung des vorderen Endes reduziert ist.

15. Luftsaug- / Einblasvorrichtung gemäß Anspruch 14, wobei ein Einblasöffnungsregulierungsglied (121f) zum Justieren bzw. Einstellen eines Moments bzw. Impulses von dem Einblasluftstrom innerhalb von dem vorderen Enddüsenabschnitt zur Verfügung gestellt wird.

16. Staubsauger, der die Luftsaug- / Einblasvorrichtung wie sie in irgendeinem der Ansprüche 1 bis 15 definiert ist und einen Saugschlauch (22) aufweist, der mit der Luftsaug- / Einblasvorrichtung (10A; 10B; 10C; 10D; 10E; 10G; 10H) zur Verfügung gestellt wird.

17. Staubsauger gemäß Anspruch 16, wobei die Luftsaug- / Einblasvorrichtung (10A; 10B; 10C; 10D; 10E; 10F; 10G; 10H) abnehmbar mit dem Saugschlauch (22) verbunden ist.

Revendications

1. Dispositif d'aspiration/d'injection d'air connecté à l'extrémité avant d'un tuyau d'aspiration (22) compris dans un aspirateur (20),
le dispositif d'aspiration/d'injection d'air (10A ; 10B ; 10C ; 10D ; 10E ; 10F ; 10G ; 10H) comportant:

un corps principal tubulaire (111 ; 121 ; 141 ; 151 ; 161 ; 171), l'une des extrémités dudit corps principal (111 ; 121 ; 131 ; 141 ; 151 ; 161 ; 171) servant de section d'ouverture arrière (111b; 121b; 141b; 151b; 161b; 171b) connectée à l'extrémité avant dudit tuyau d'aspiration (22) et l'autre extrémité servant de section d'ouverture avant (111a ; 141a), et l'intérieur dudit corps principal (111 ; 121 ; 131 ; 141 ; 151 ; 161 ; 171) formant un passage d'air principal (101) ;
une section de passage d'injection (112 ; 122 ; 132 ; 142 ; 152 ; 162 ; 172) comprenant une entrée d'injection d'air (112a ; 122a ; 132a ; 142a ; 152a ; 162a ; 172a) pour introduire de l'air depuis l'extérieur et une sortie d'injection pour injecter l'air introduit vers l'extérieur, l'intérieur de ladite section de passage d'injection formant un sous-passage (102) allant de ladite entrée d'injection d'air (112a ; 122a ; 132a ; 142a ; 152a ; 162a ; 172a) vers ladite sortie d'injection ;
un ventilateur (114b; 124b ; 134b ; 144b ; 154b ; 164b) disposé à l'intérieur dudit corps principal (111 ; 121 ; 131 ; 141 ; 151 ; 161 ; 171) et mis en rotation par un flux d'air aspiré formé dans ledit passage principal (101) au moyen d'une aspiration d'air à travers ledit tuyau d'aspiration (22) ; **caractérisé en ce que** le dispositif d'aspiration/injection d'air comporte en outre :

un ventilateur d'injection (114a ; 124a ; 134a ; 144a ; 154a ; 164a) disposé à l'intérieur de ladite section de passage d'injection (112 ; 122 ; 132 ; 142 ; 152 ; 162 ; 172) et tournant conjointement avec ledit ventilateur (114b ; 124b ; 134b ; 144b ; 154b ; 164b) afin de créer un flux d'air d'injection à partir de ladite entrée d'injection d'air (112a ; 122a ; 132a ; 142a ; 152a ; 162a ; 172a) vers ladite sortie d'injection dans ledit sous-passage (102) ; et
une section de commutation d'injection pour autoriser ou limiter l'injection dudit flux d'air d'injection de ladite sortie d'injection vers l'extérieur.

2. Dispositif d'aspiration/d'injection d'air selon la revendication 1, où ladite section de commutation d'injection est une section de commutation de passage (116) pour permuter entre une connexion et un blocage dudit sous-passage (102) vers ladite sortie d'injection.

3. Dispositif d'aspiration/d'injection d'air selon la revendication 1, où ladite section de commutation d'injection est une section d'ouverture/fermeture de passage pour ouvrir ou bloquer ledit passage principal (101) ou ledit sous-passage (102) en un lieu situé en amont dudit ventilateur (114b ; 124b ; 134b ; 144b ; 154b ; 164b) ou dudit ventilateur d'injection (114a ; 124a ; 134a ; 144a ; 154a ; 164a) dans une direction d'écoulement du flux d'air aspiré.

4. Dispositif d'aspiration/d'injection d'air selon la revendication 1, comportant en outre une section d'hébergement de ventilateur (115 ; 125 ; 135 ; 145 ; 155 ; 165) disposée dans ledit passage principal (101) dans ledit corps principal (111 ; 121 ; 131 ; 141 ; 151 ; 161 ; 171) pour y héberger ledit ventilateur (114b ; 124b ; 134b ; 144b ; 154b ; 164b), où la section d'hébergement de ventilateur (115 ; 125 ; 135 ; 145 ; 155 ; 165) comporte une entrée d'aspiration

interne (115a ; 125a ; 135a ; 145a ; 155a ; 165a) faisant face audit passage principal (101) et une entrée d'introduction d'air aspiré (115b ; 125b ; 135b ; 145b ; 155b ; 165b) pour introduire de l'air depuis l'extérieur.

5. Dispositif d'aspiration/d'injection d'air selon la revendication 4, comportant en outre un organe de couverture d'introduction d'air (113c ; 123 c ; 143 c) pour fermer au moins une partie d'un passage d'air allant de ladite entrée d'introduction d'air aspiré (115b ; 125b ; 135b ; 145b ; 155b ; 165b) vers ledit passage principal (101) de manière ouvrable et refermable.

6. Dispositif d'aspiration/d'injection d'air selon la revendication 2,
où ladite section de passage d'injection (112 ; 122 ; 132 ; 142 ; 152 ; 162 ; 172) est disposée dans le corps principal (111 ; 121 ; 131 ; 141 ; 151 ; 161 ; 171) de manière à ce que le sous-passage (102) dans ladite section de passage d'injection (112 ; 122 ; 132 ; 142 ; 152 ; 162 ; 172) est connectée audit passage principal (101) dans ledit corps principal (111 ; 121 ; 131 ; 141 ; 151 ; 161 ; 171), et ladite section d'ouverture avant (111a; 141a) dans ledit corps principal (111 ; 121 ; 131 ; 141 ; 151 ; 161 ; 171) sert en tant que ladite sortie d'injection dans ladite section de passage d'injection (112 ; 122 ; 132 ; 142 ; 152 ; 162 ; 172), et
où ladite section de commutation de passage (116) est disposée dans une section dans laquelle ledit passage principal (101) est connecté audit sous-passage (101) et est un organe de soupape changeant sa position afin de fermer ledit passage principal (101) ou ledit sous-passage (102).

7. Dispositif d'aspiration/d'injection d'air selon la revendication 3,
où ladite section de passage d'injection (112 ; 122 ; 132 ; 142 ; 152 ; 162 ; 172) est disposée dans ledit corps principal (111 ; 121 ; 131 ; 141 ; 151 ; 161 ; 171) de manière à ce que le sous-passage (102) dans ladite section de passage d'injection (112 ; 122 ; 132 ; 142 ; 152 ; 162 ; 172) atteint la section d'ouverture avant (111a ; 141a) le long dudit passage principal (101) à l'intérieur dudit corps principal (111 ; 121 ; 131 ; 141 ; 151 ; 161 ; 171), et
où ladite section d'ouverture/fermeture de passage est un organe de soupape pour bloquer seulement ledit passage principal (101).

8. Dispositif d'aspiration/d'injection d'air selon la revendication 6 ou 7, comportant en outre un organe de levier (113 ; 123 ; 133 ; 143) disposé à l'extérieur dudit corps principal (111 ; 121 ; 131 ; 141 ; 151 ; 161 ; 171), ledit organe de levier (113 ; 123 ; 133 ; 143) étant actionné en réponse à un changement de position de l'organe de valve.

9. Dispositif d'aspiration/d'injection d'air selon la revendication 2,
où ladite section d'ouverture avant est disposée dans ledit corps principal (111 ; 121 ; 131 ; 141 ; 151 ; 161 ; 171) en tant que section d'ouverture tournante (156) qui est un organe séparé tournant dans une direction circonférentielle, l'intérieur de ladite section d'ouverture tournante (156) étant équipée d'un trou débouchant (156a) et d'un trou fermé (156b), ledit trou fermé (156b) étant adjacent au trou débouchant (156a) et ayant une extrémité ouverte menant audit corps principal (151) et à l'autre extrémité fermée,
où ladite section de passage d'injection (112 ; 122 ; 132 ; 142 ; 152 ; 162 ; 172) est disposée dans le corps principal (111 ; 121 ; 131 ; 141 ; 151 ; 161 ; 171) de manière à ce que ledit passage principal (101) soit adjacent audit sous-passage (102) à une extrémité menant à ladite section d'ouverture tournante (156) dudit corps principal (151), et le trou débouchant (156a) de la section d'ouverture tournante (156) sert en tant que ladite sortie d'injection dans ladite section de passage d'injection (112 ; 122 ; 132 ; 142 ; 152 ; 162 ; 172), et
où ladite section d'ouverture tournante (156) relie ledit trou fermé (156b) à l'un parmi ledit passage principal (101) et ledit sous-passage (102), et ladite section d'ouverture tournante (156) est tournée de manière à relier ledit trou débouchant (156a) à l'autre parmi ledit passage principal (101) et ledit sous-passage (102), de manière à ce qu'il remplisse la fonction de section de commutation de passage.

10. Dispositif d'aspiration/d'injection d'air selon la revendication 4,
où ladite section de passage d'injection (112 ; 122 ; 132 ; 142 ; 152 ; 162 ; 172) et ladite section d'hébergement de ventilateur constituent une section d' hébergement de ventilateur cylindrique de manière à ce que la section de passage d'injection (112 ; 122 ; 132 ; 142 ; 152 ; 162 ; 172) et ladite section d'hébergement de ventilateur soient intégrés de manière à ce que le ventilateur d'injection (114a ; 124a; 134a; 144a ; 154a; 164a) et le ventilateur (114b ; 124b ; 134b ; 144b ; 154b ; 164b) y soient respectivement hébergés de manière interne et est disposée mobile en rotation sur le corps principal (111 ; 121 ; 131 ; 141; 151; 161; 171),
où la section d'hébergement de ventilateur est insérée dans le corps principal (111 ; 121 ; 131 ; 141 ; 151 ; 161 ; 171) en un lieu situé entre ladite section d'ouverture avant (111a ; 141a) et ladite section d'ouverture arrière (111b ; 121b ; 141b ; 151b ; 161b ; 171b) le long d'une direction d'intersection avec un axe de tube dudit corps principal (111 ; 121 ; 131 ; 141 ; 151 ; 161 ; 171) et au moins une partie de sa circonférence extérieure fait face au passage

principal (101) dudit corps principal (111 ; 121 ; 131 ; 141 ; 151 ; 161 ; 171),
où ladite entrée d'injection d'air (112a ; 122a ; 132a ; 142a ; 152a ; 162a ; 172a) est disposée en un lieu situé sur la surface supérieure de ladite section d'hébergement de ventilateur et à l'extérieur du corps principal (111 ; 121 ; 131 ; 141 ; 151 ; 161 ; 171) et une sortie d'injection est disposée dans une partie de la circonférence externe de ladite section d'hébergement de ventilateur pour former ledit sous-passage (102) entre ladite l'entrée d'injection d'air (112a ; 122a ; 132a ; 142a ; 152a ; 162a ; 172a) et ladite sortie d'injection, et
où ladite section d'hébergement de ventilateur remplit la fonction de ladite section de commutation d'injection par rotation de ladite section d'hébergement de ventilateur afin de changer la position de ladite sortie d'injection.

11. Dispositif d'aspiration/d'injection d'air selon la revendication 1,
où ladite section de passage d'injection (112 ; 122 ; 132 ; 142 ; 152 ; 162 ; 172) est insérée dans le corps principal (111 ; 121 ; 131 ; 141 ; 151 ; 161 ; 171) de manière à positionner ledit sous-passage (102) le long dudit passage principal (101) à l'intérieur dudit corps principal (111 ; 121 ; 131 ; 141 ; 151 ; 161 ; 171),
et ladite entrée d'introduction d'air aspiré (115b ; 125b ; 135b ; 145b ; 155b ; 165b) est disposée dans le flux d'air aspiré en un lieu faisant face à l'extérieur dudit corps principal (111 ; 121 ; 131 ; 141 ; 151 ; 161 ; 171),
le dispositif d'aspiration/d'injection d'air (10C ; 10F ; 10G) comprenant une section d'ouverture/fermeture de passage servant en tant que ladite section de commutation d'injection pour fermer au moins une partie du passage d'air entre ladite entrée d'introduction d'air aspiré (115b ; 125b ; 145b ; 175b) et ledit passage principal (101) de manière ouvrable et refermable.

12. Dispositif d'aspiration/d'injection d'air selon la revendication 1, comportant en outre une buse d'aspiration (26A ; 26B) disposée de manière détachable dans ladite section d'ouverture avant (111a ; 141 a).

13. Dispositif d'aspiration/d'injection d'air selon la revendication 1, comportant en outre une section de pulvérisation d'un liquide (27) comportant un réservoir de liquide (271) et une buse de pulvérisation (272) pour pulvériser le liquide stocké dans le réservoir de liquide (271),
où la section de pulvérisation de liquide (27) est disposée de manière détachable dans ladite sortie d'injection.

14. Dispositif d'aspiration/d'injection d'air selon la revendication 1, où la section d'ouverture avant (111a ; 141a) est une section de buse avant située du côté d'une extrémité avant, la section de buse avant ayant une forme telle que la superficie de sa section transversale diminue graduellement vers l'extrémité avant.

15. Dispositif d'aspiration/d'injection d'air selon la revendication 14, où un organe d'ajustement de l'ouverture d'injection (121f) pour ajuster la quantité de mouvement du flux d'air injecté est disposé à l'intérieur de ladite section de buse avant.

16. Aspirateur comportant le dispositif d'aspiration/d'injection d'air selon l'une quelconque des revendications 1 à 15 et un tuyau d'aspiration (22) équipé du dispositif d'aspiration/d'injection d'air (10A ; 10B ; 10C ; 10D ; 10E ; 10F ; 10G ; 10H).

17. Aspirateur selon la revendication 16, où ledit dispositif d'aspiration/d'injection d'air (10A ; 10B ; 10C ; 10D ; 10E ; 10F ; 10G ; 10H) est connecté de manière détachable audit tuyau d'aspiration (22).

Fig. 1

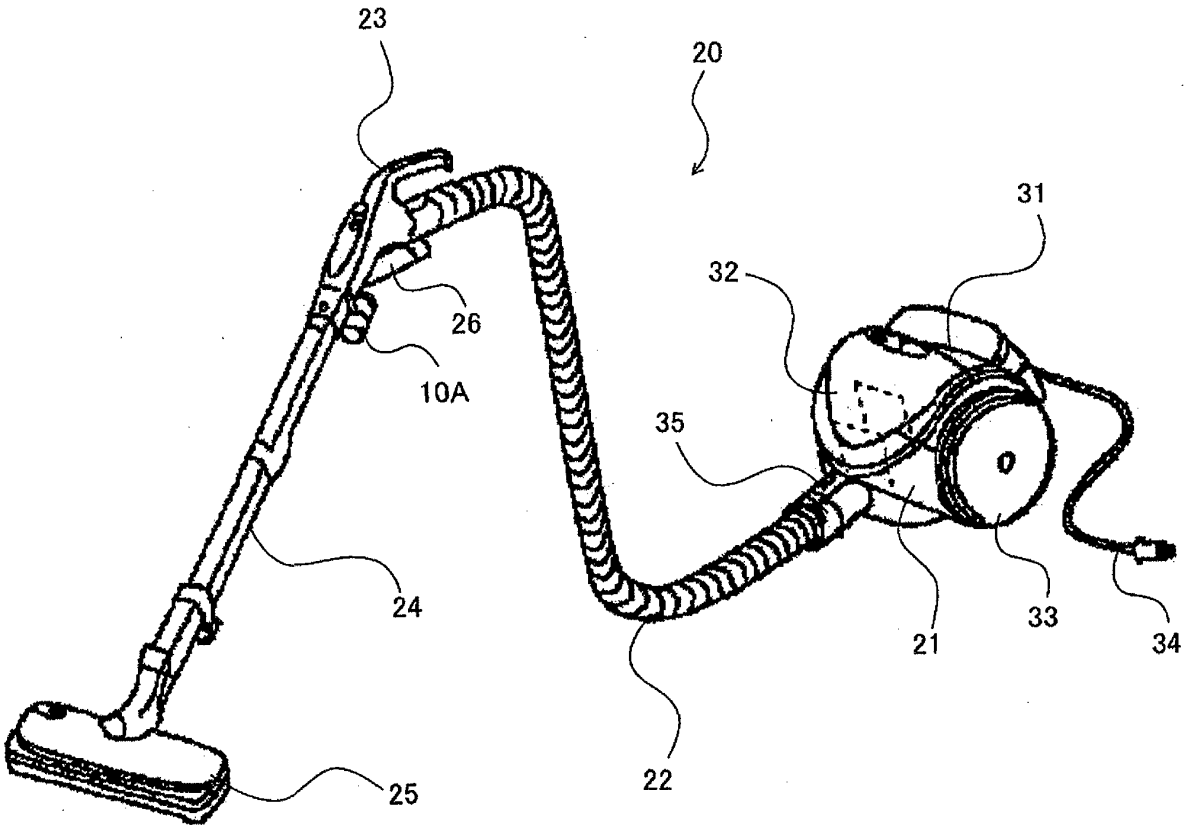


Fig. 2

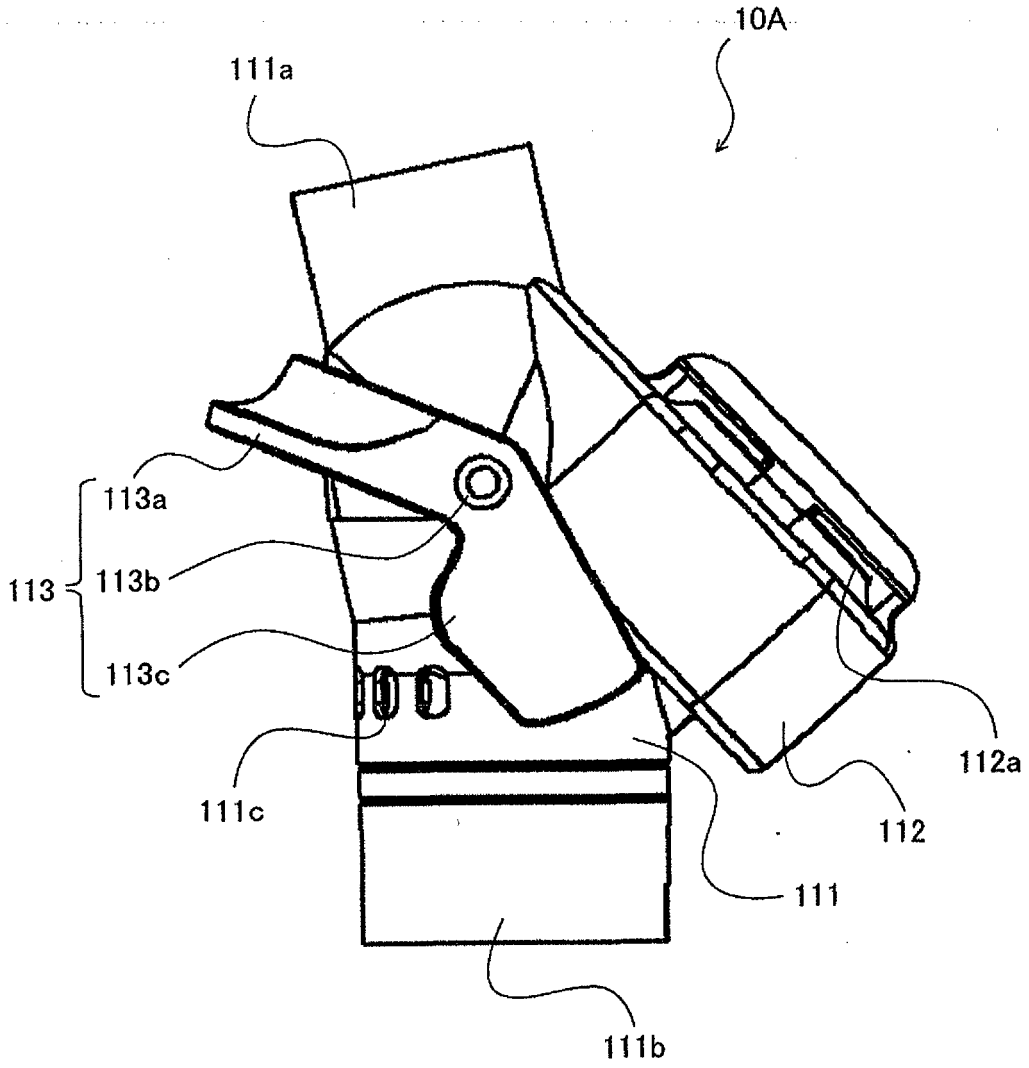


Fig. 3

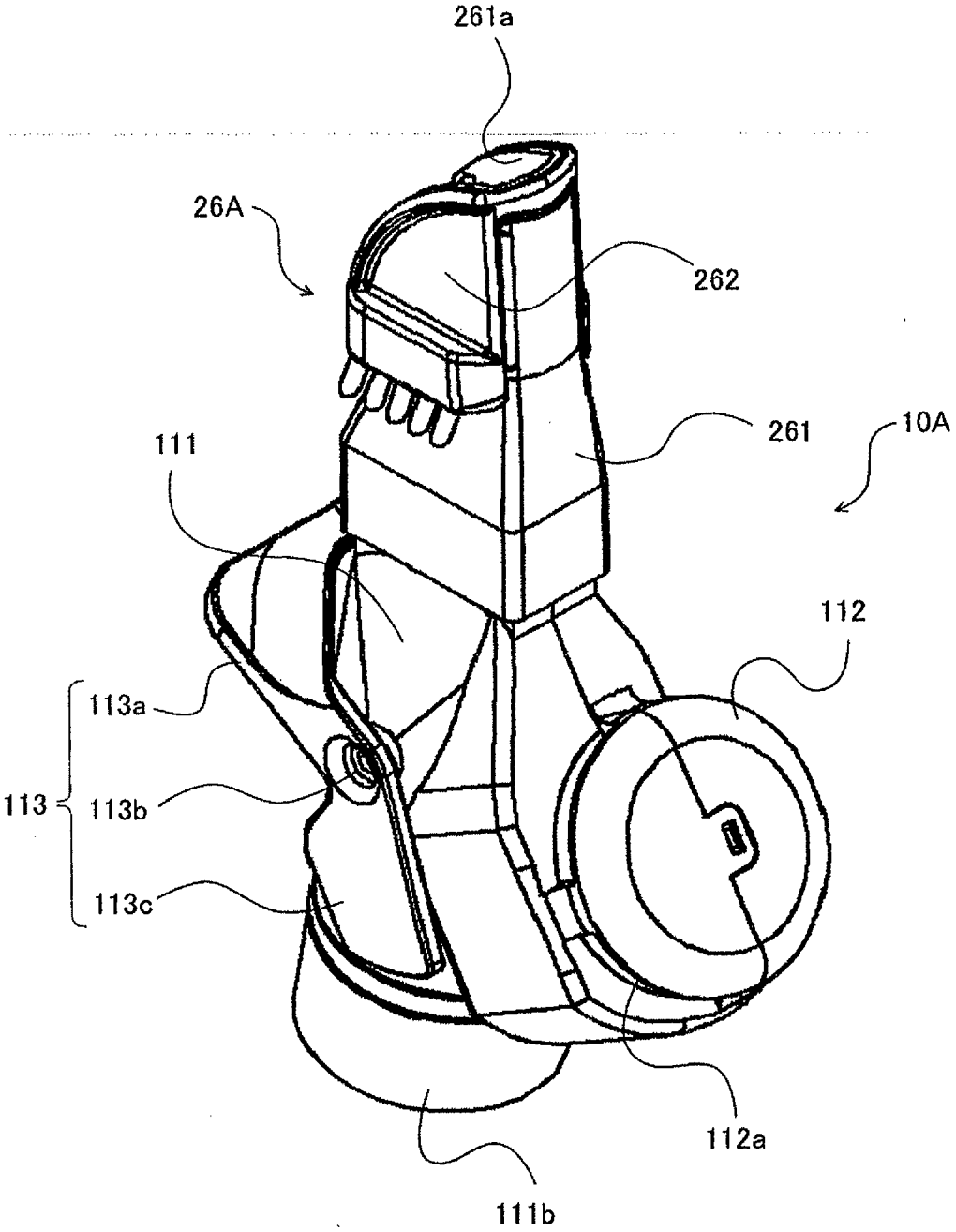


Fig. 4

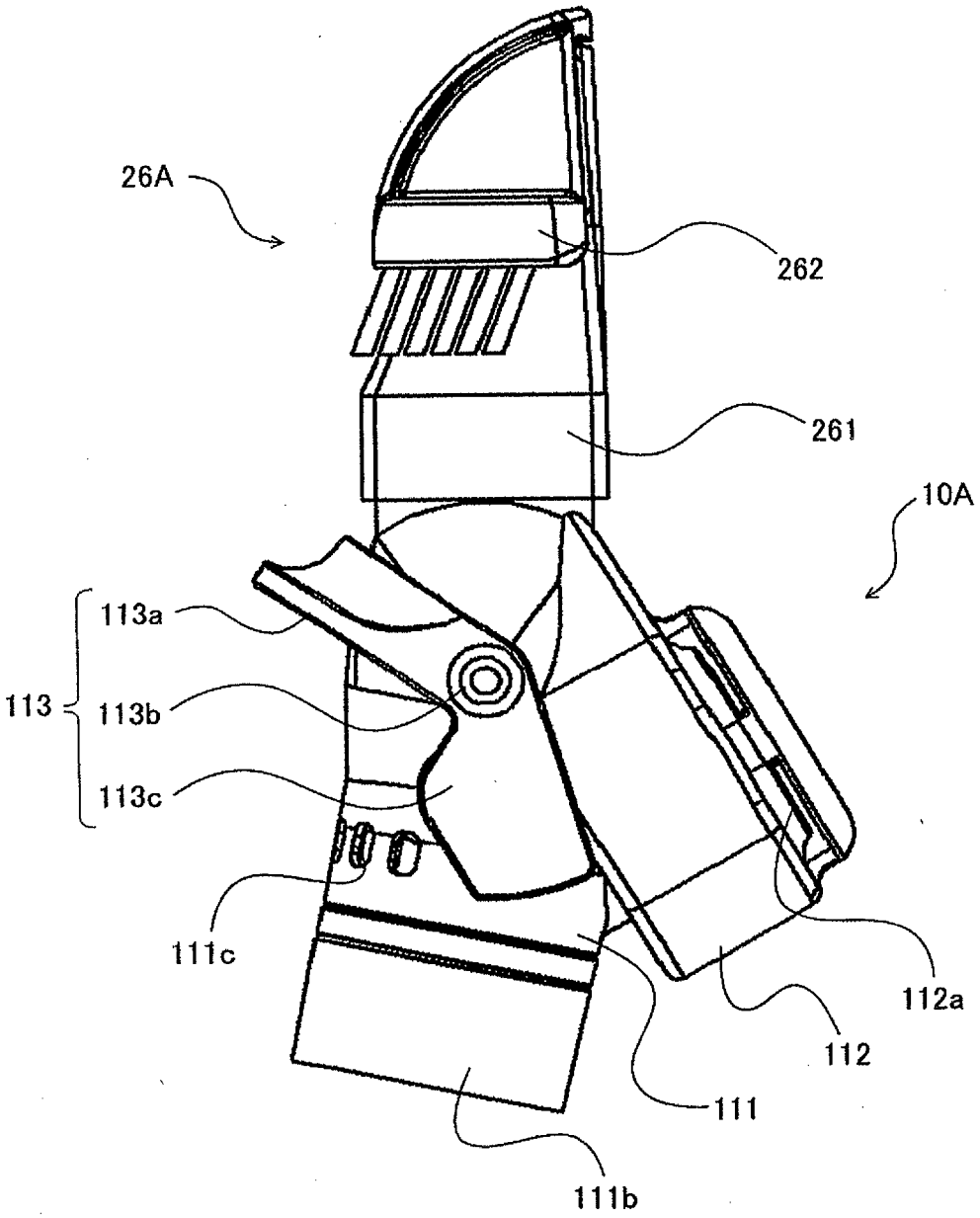


Fig. 5

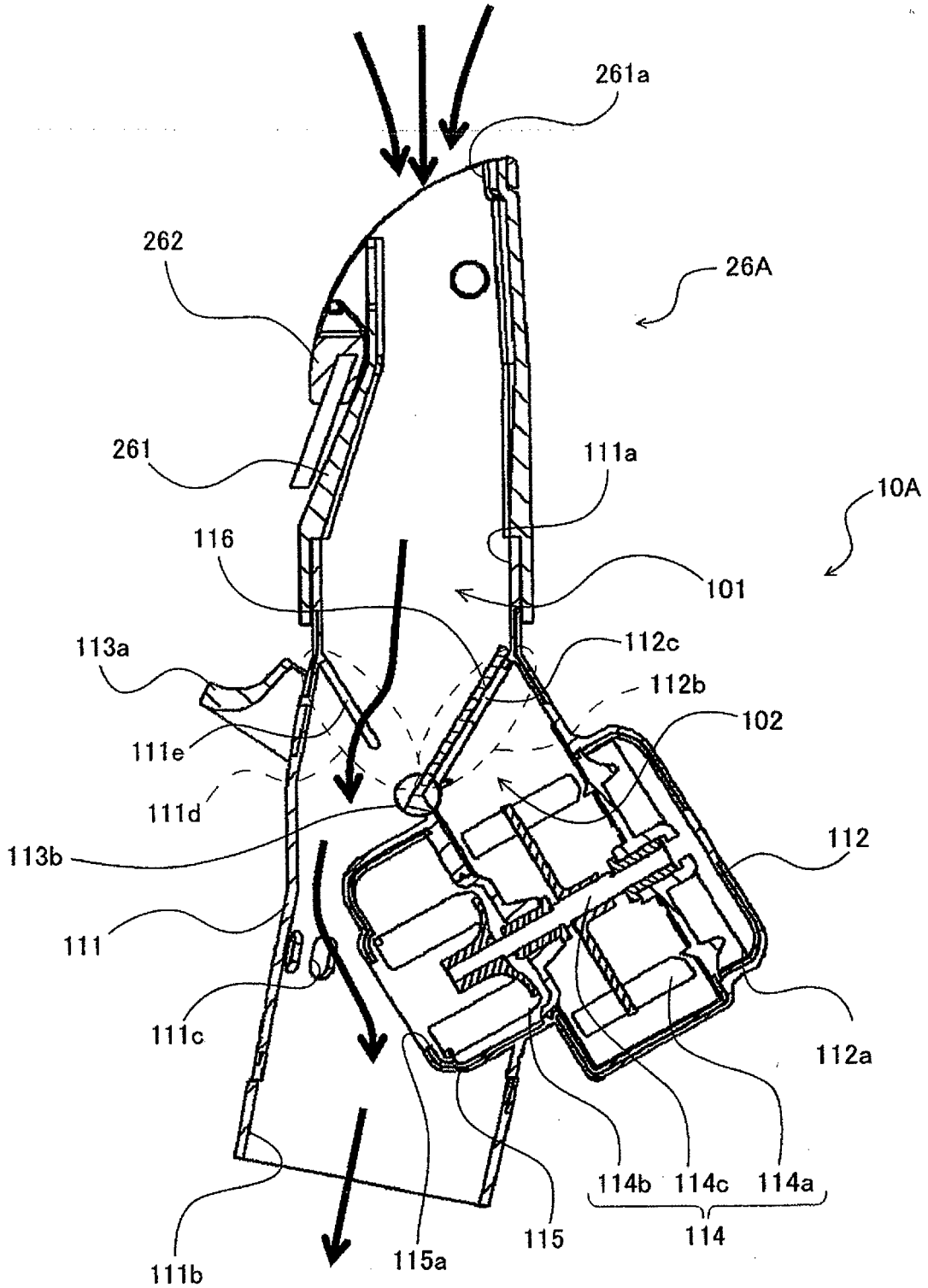

261a
262
26A
261
111a
10A
116
101
113a
112c
112b
102
111e
111d
113b
112
111
111c
112a
114b
114c
114a
114
115
111b
115a

Fig. 6

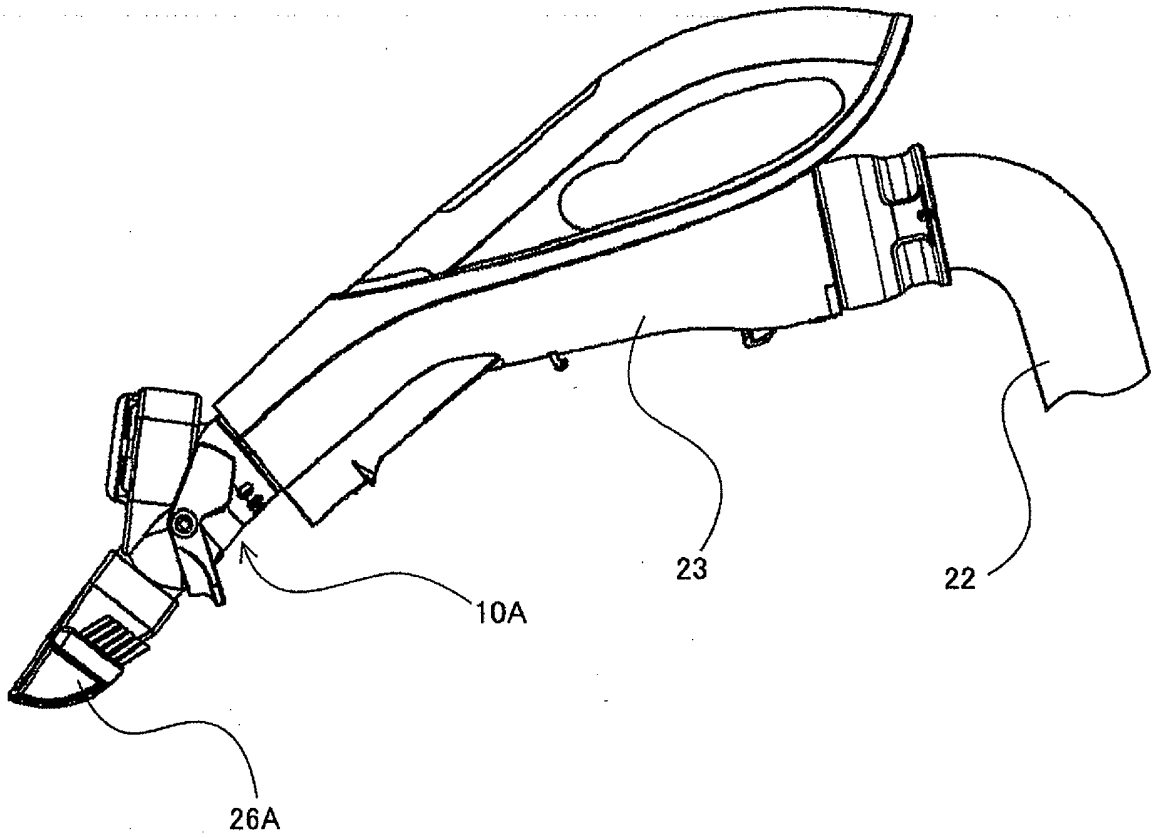


Fig. 7

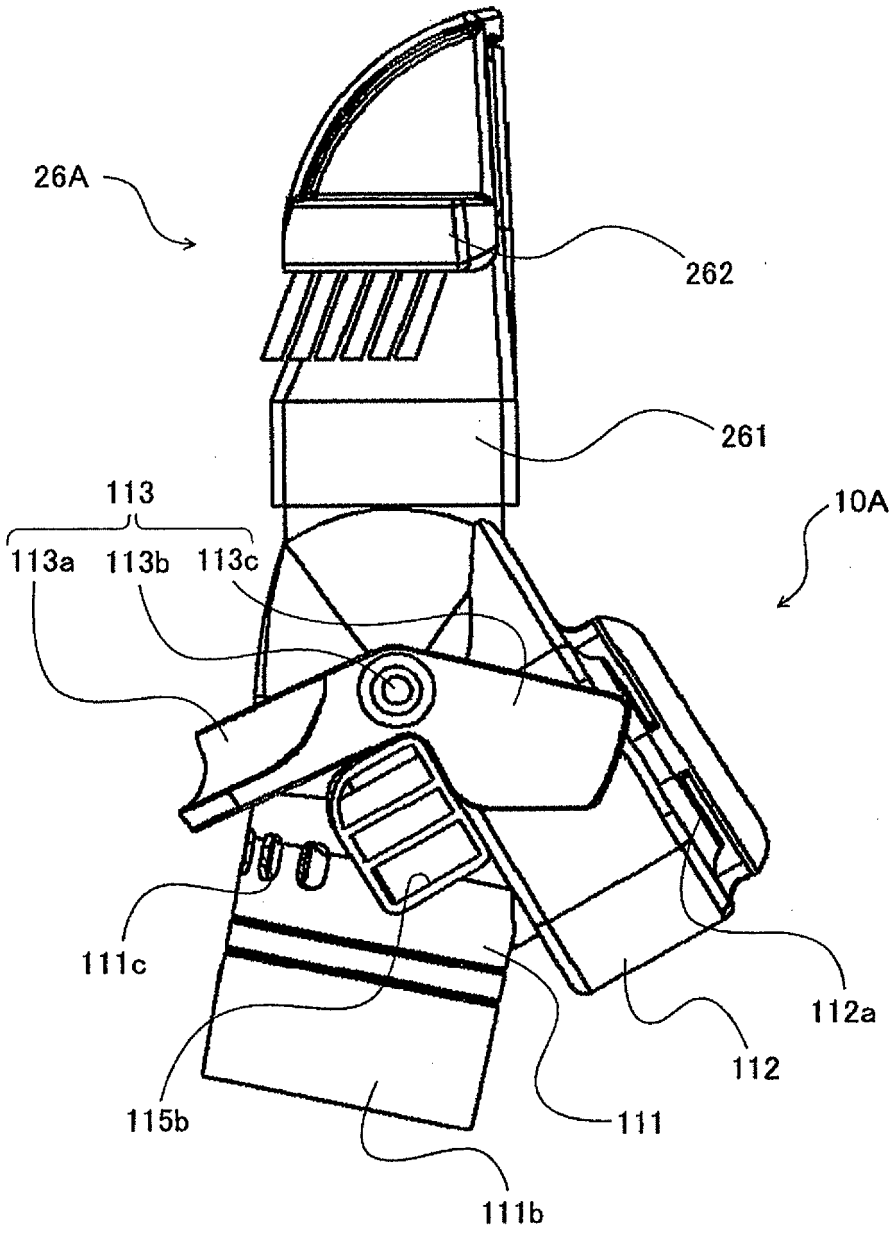


Fig. 8

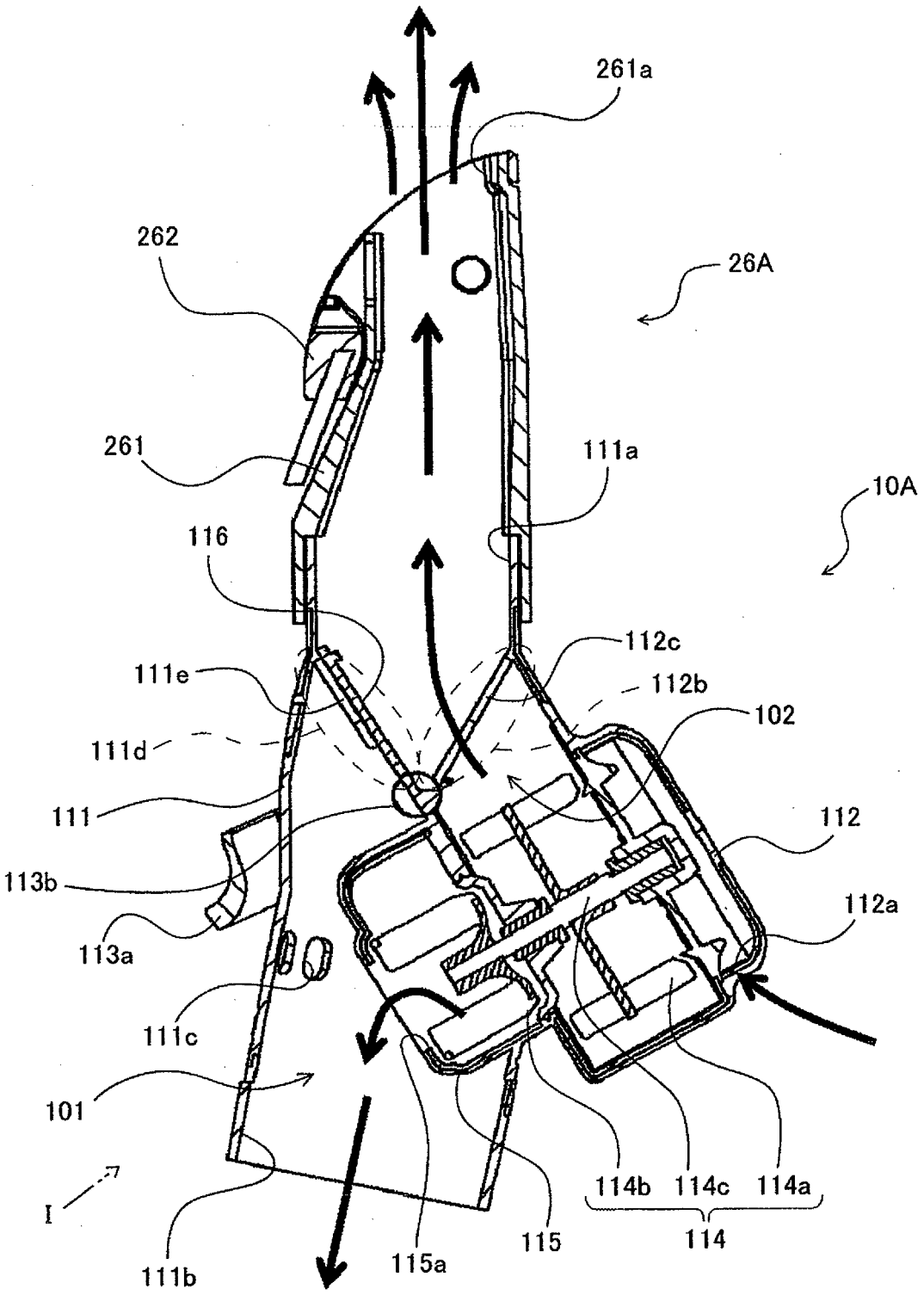

261a
262
26A
261
111a
10A
116
112c
111e
112b
102
111d
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112
113b
112a
113a
111c
101
I
114b
114c
114a
114
115
115a
111b

Fig. 9

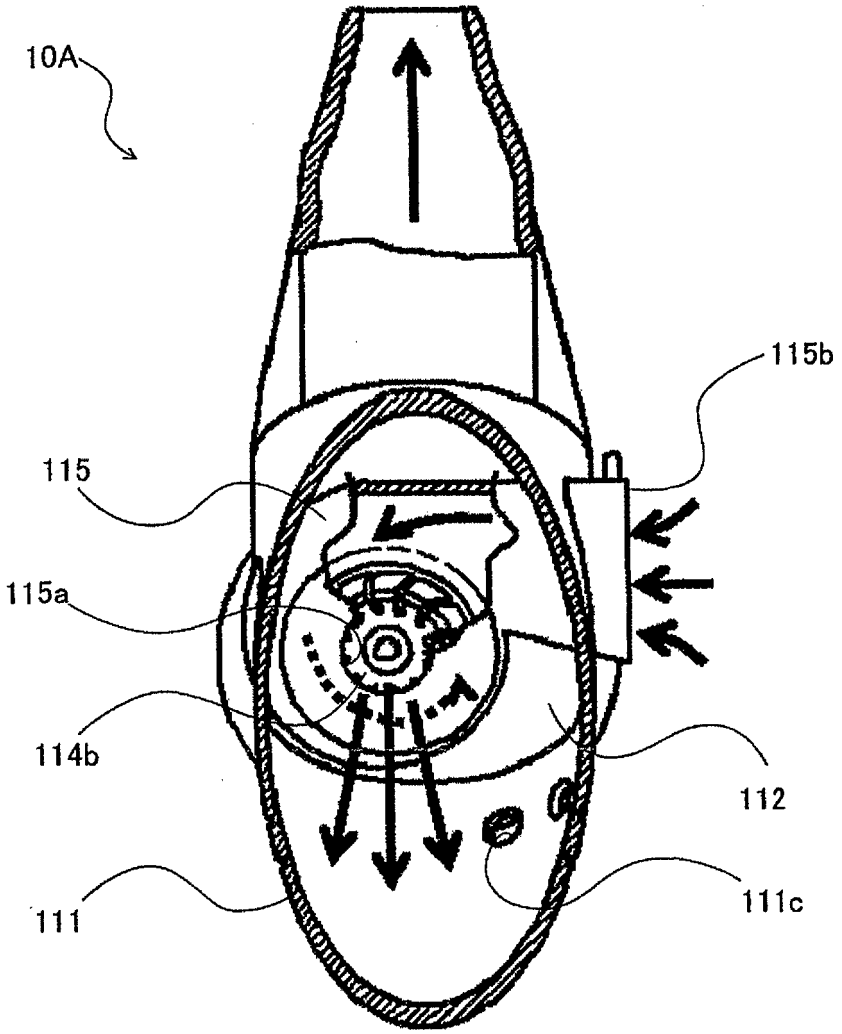


Fig. 10

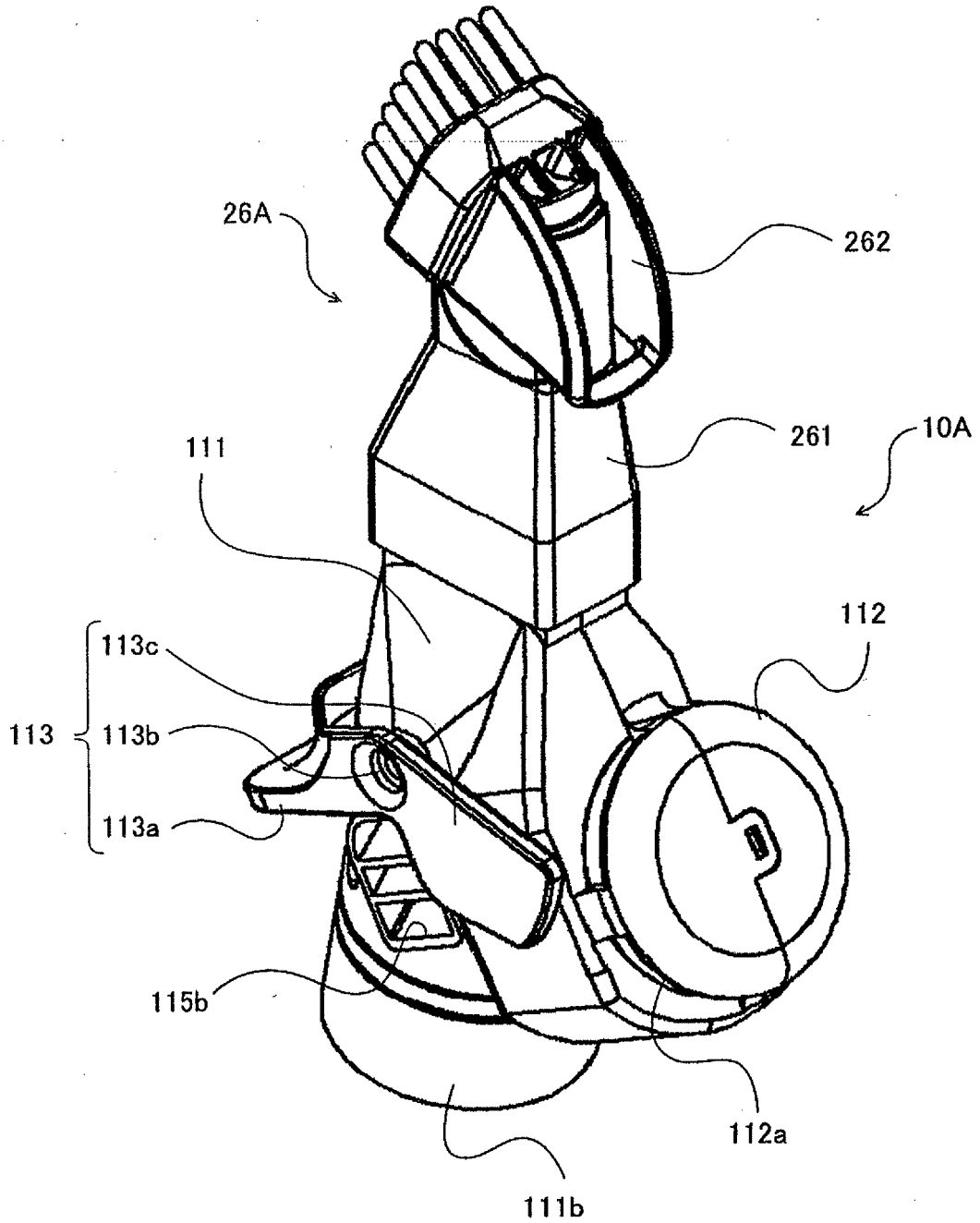


Fig. 11

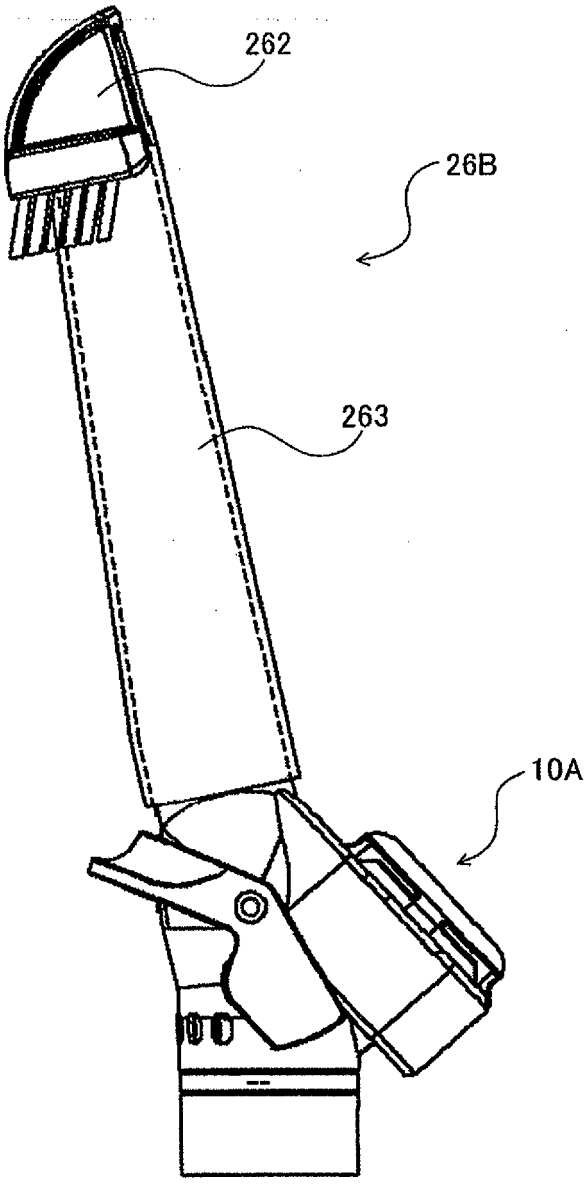


Fig. 12

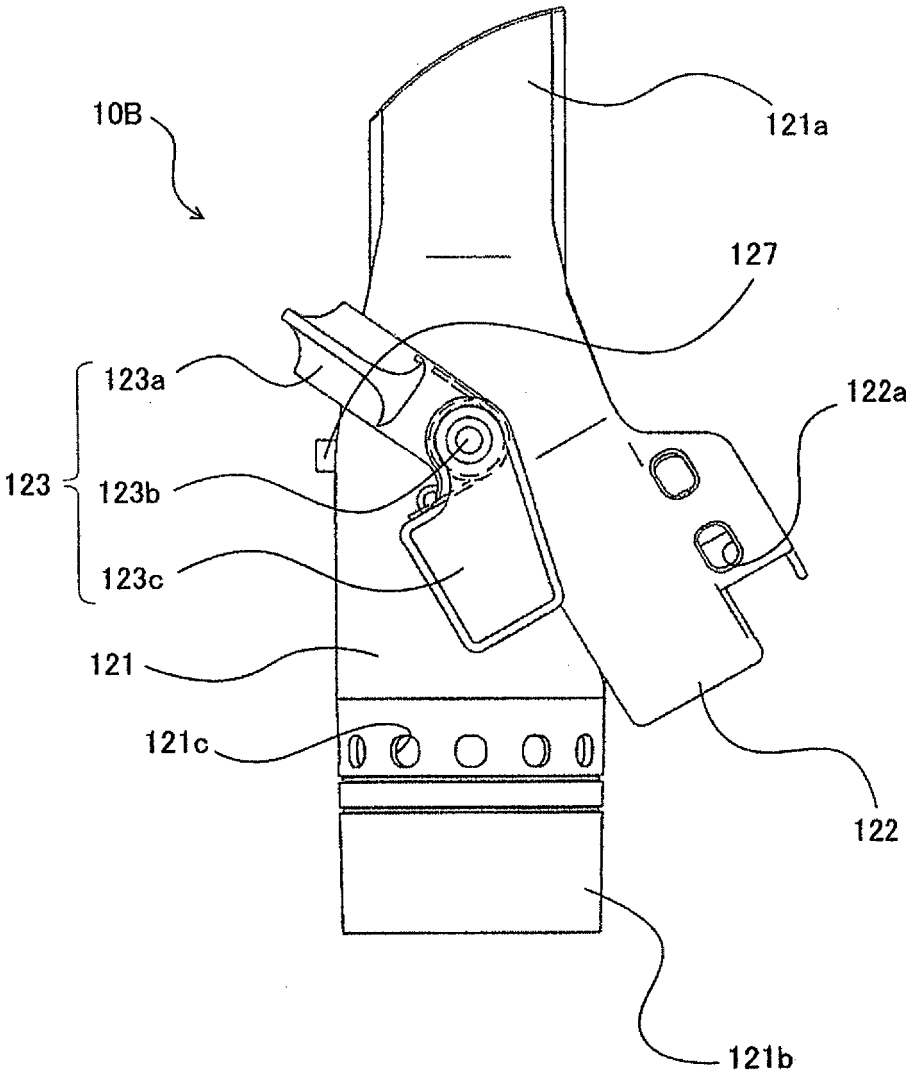


Fig. 13

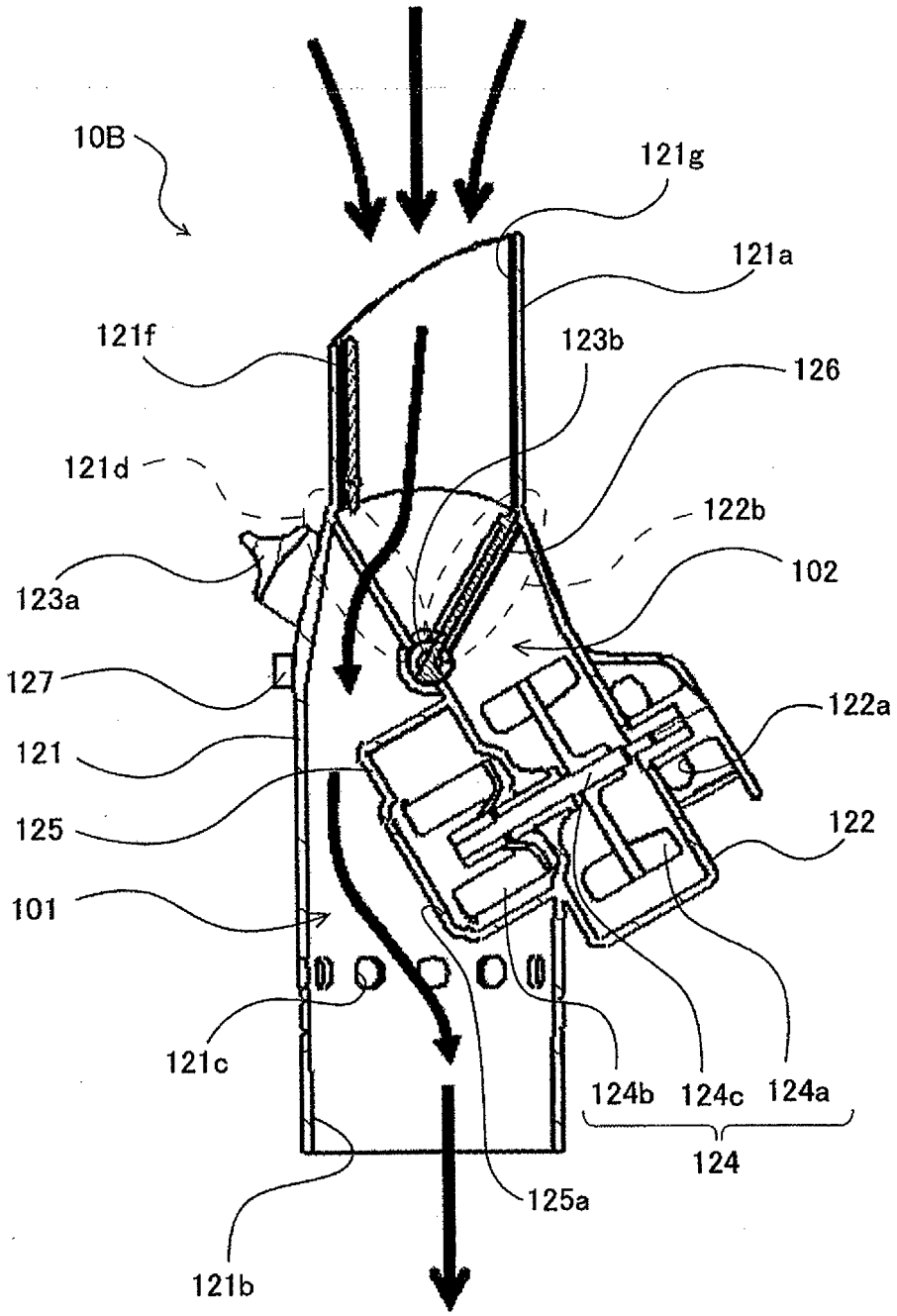

10B
121g
121a
121f
123b
126
121d
122b
123a
102
127
122a
121
125
122
101
121c
124b
124c
124a
124
125a
121b

Fig. 14

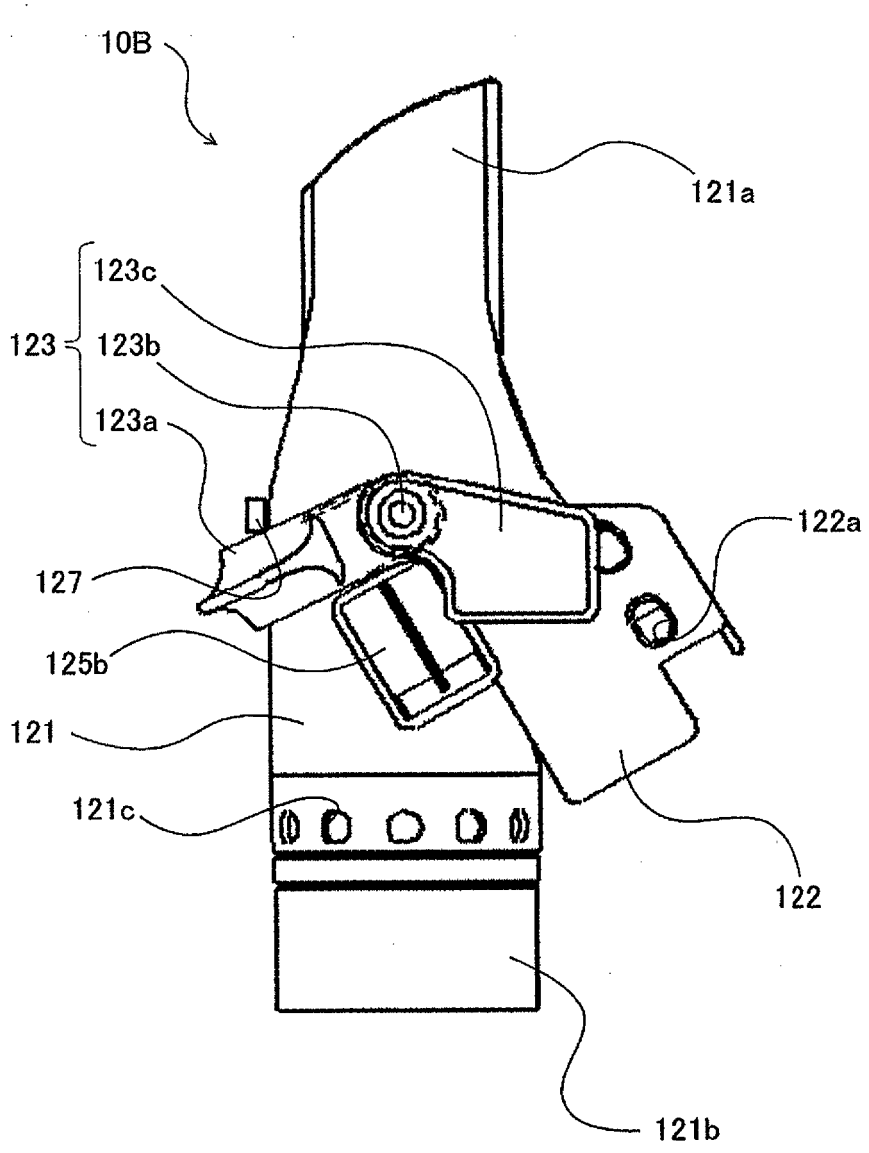


Fig. 15

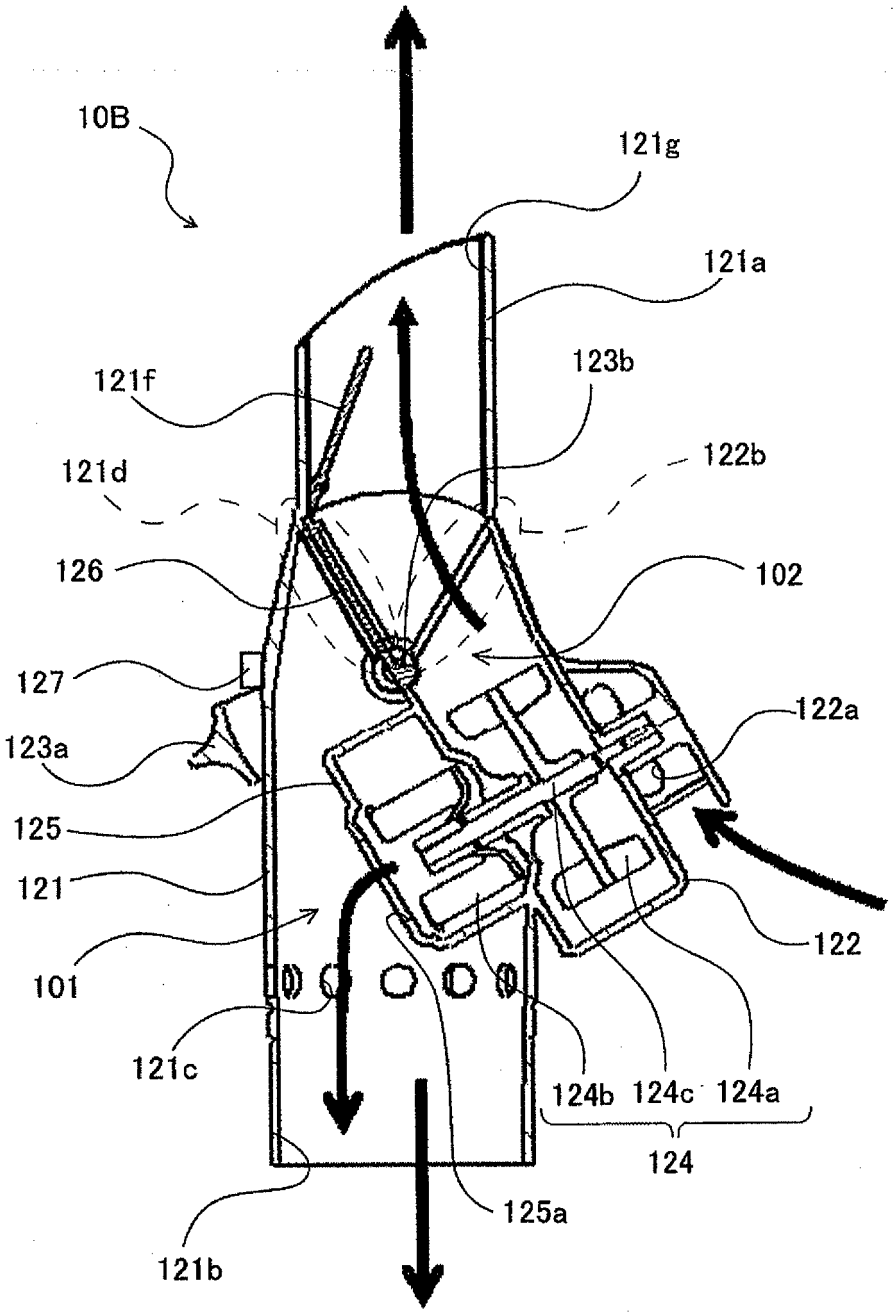

10B
121g
121a
123b
121f
122b
121d
126
102
127
122a
123a
125
121
122
101
121c
124b
124c
124a
124
125a
121b

Fig. 16

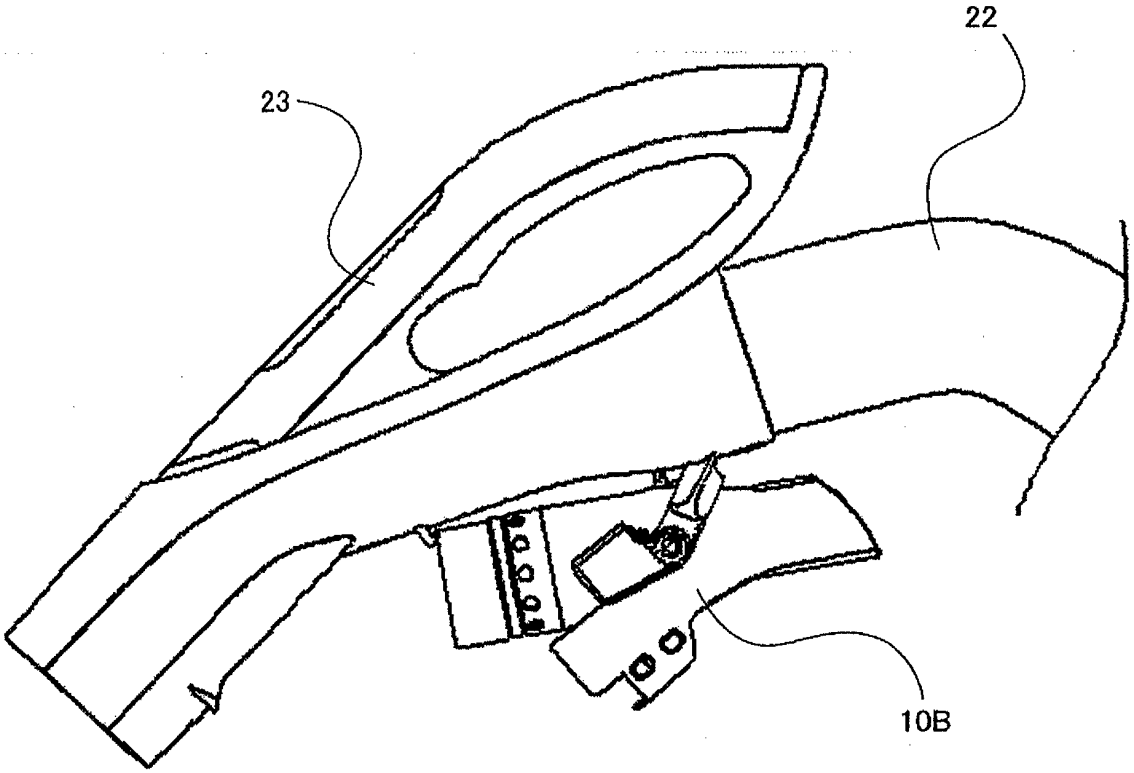


Fig. 17

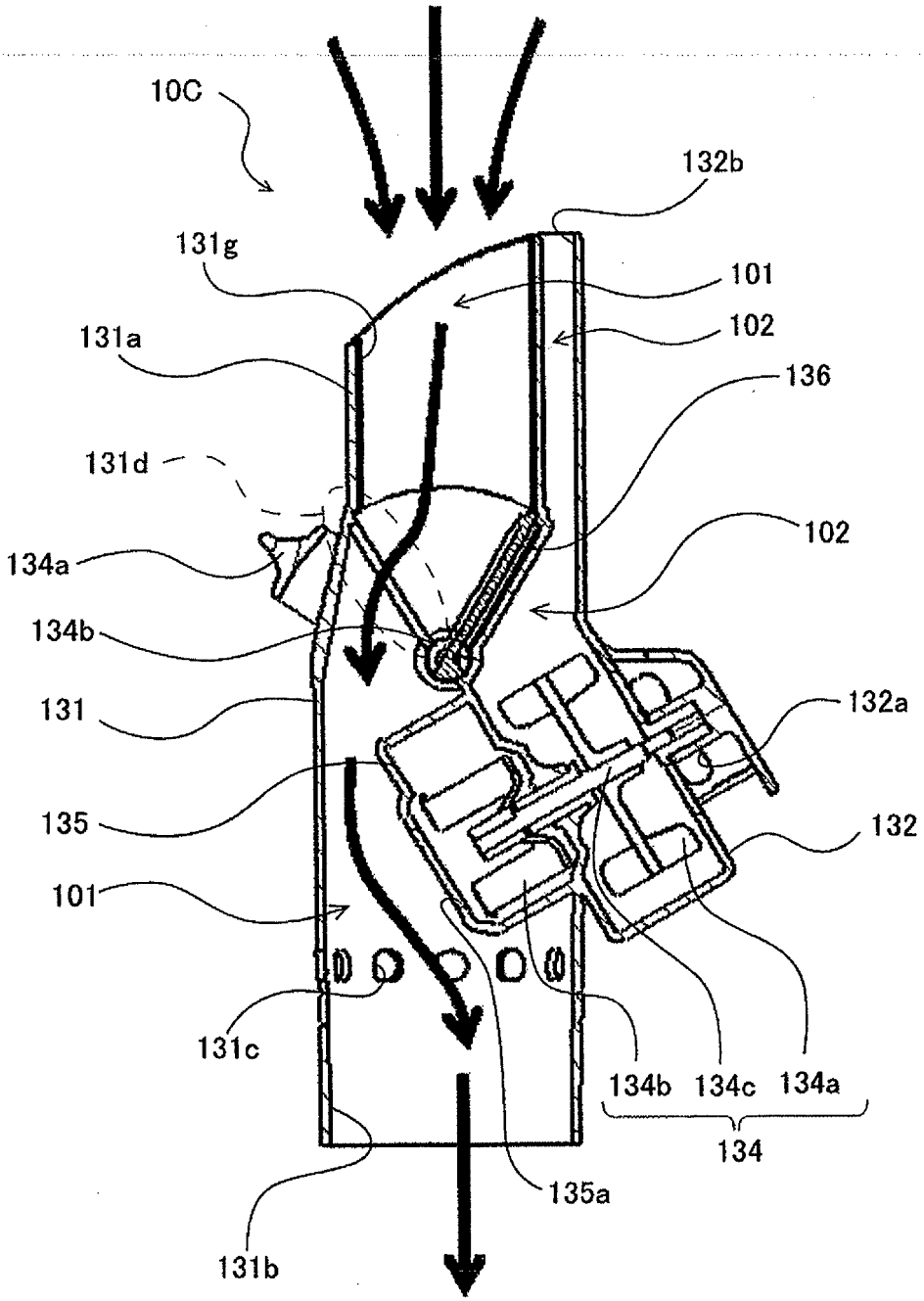

10C
132b
131g
101
131a
102
136
131d
102
134a
134b
131
132a
135
132
101
131c
134b
134c
134a
134
135a
131b

Fig. 18

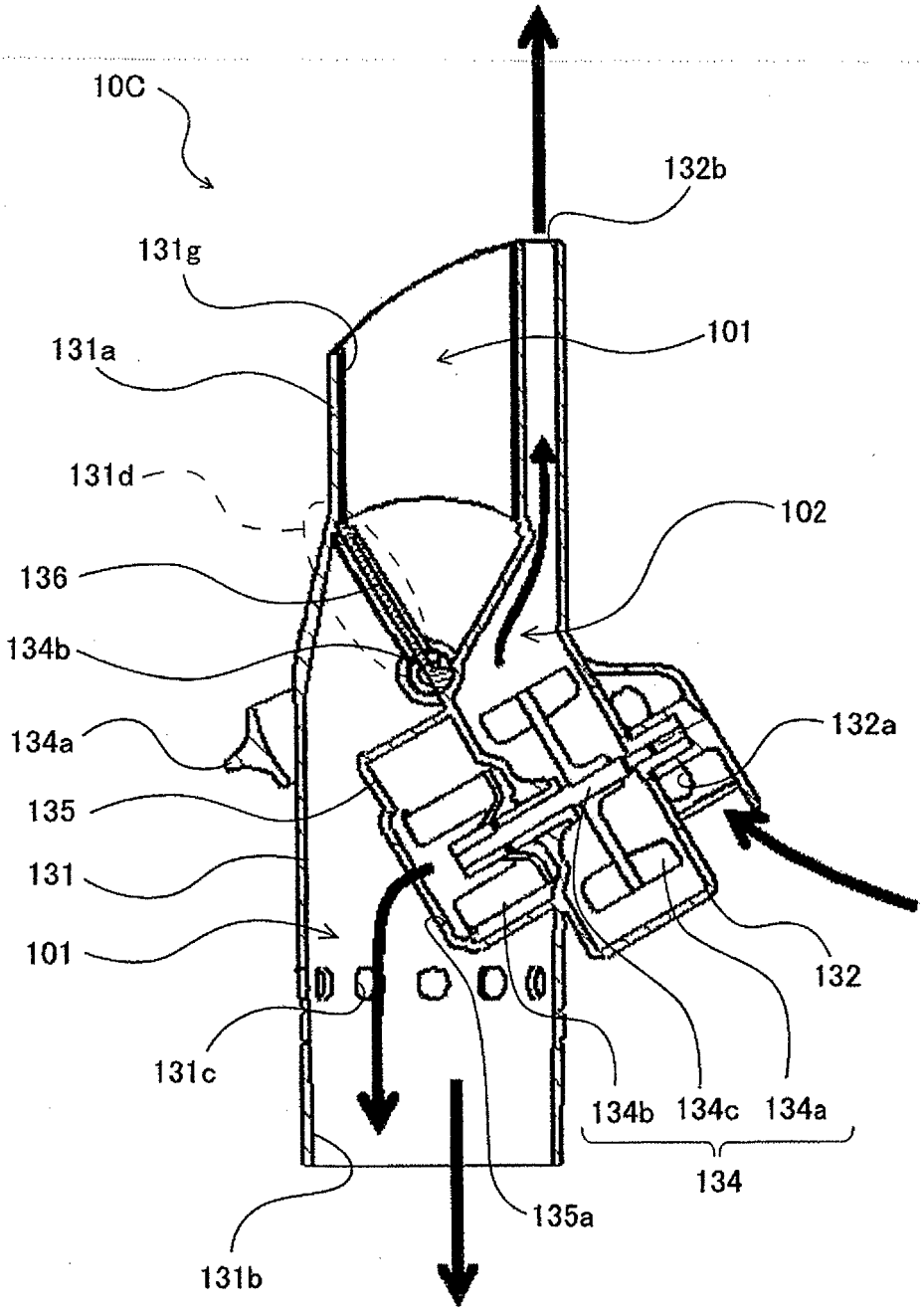

10C
132b
131g
101
131a
131d
102
136
134b
132a
134a
135
131
101
132
131c
134b
134c
134a
134
135a
131b

Fig. 19

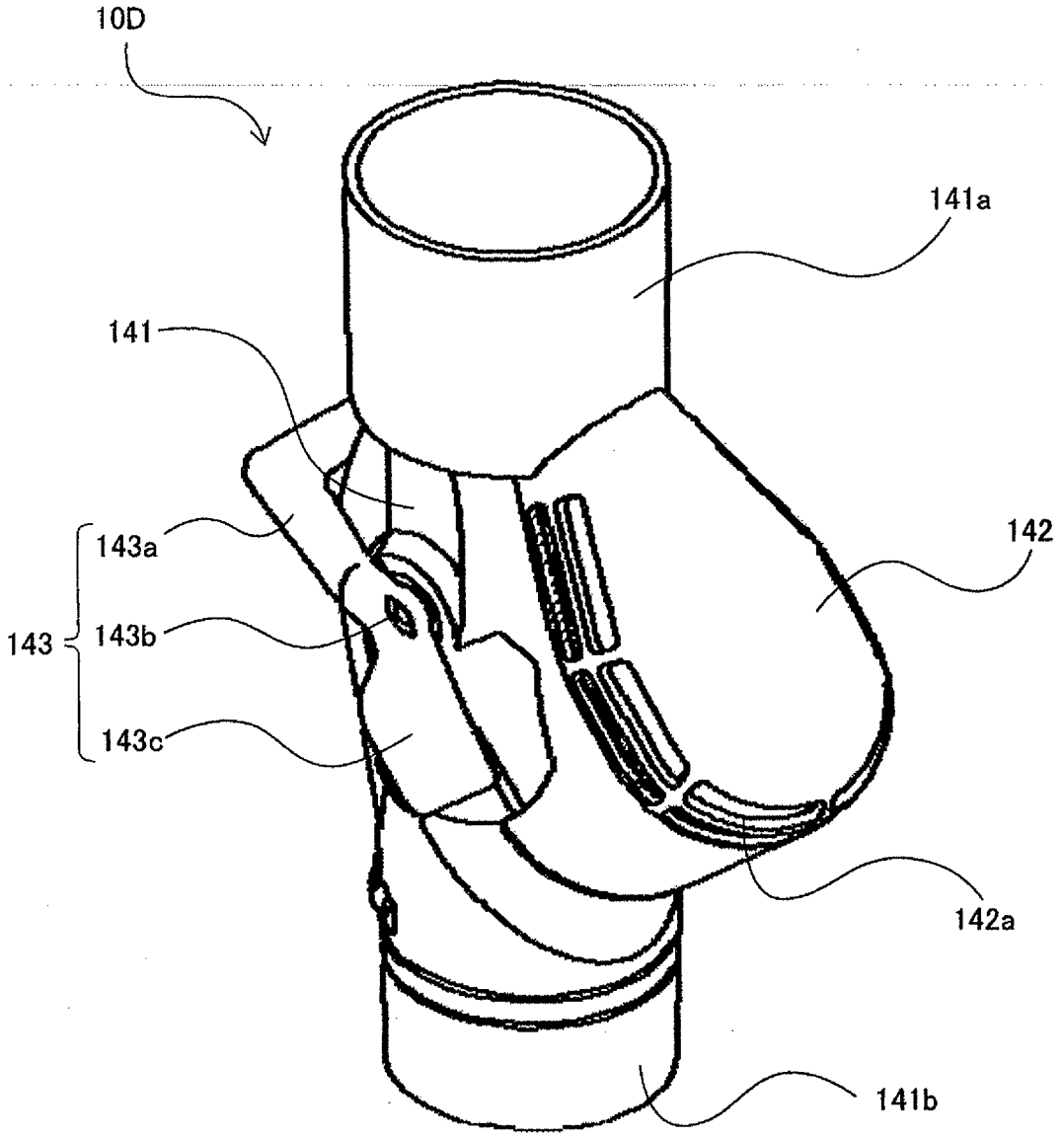


Fig. 20

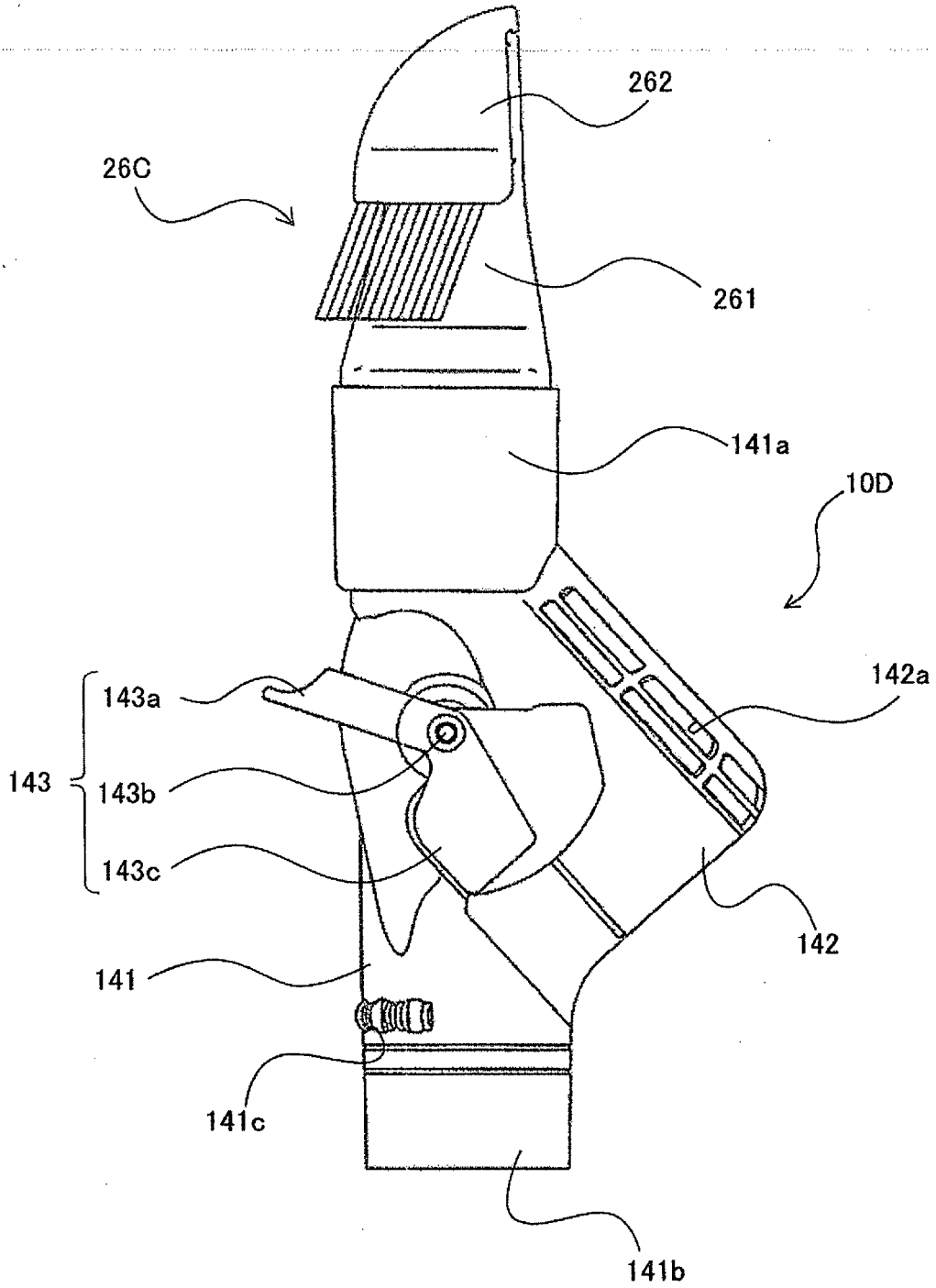


Fig. 21

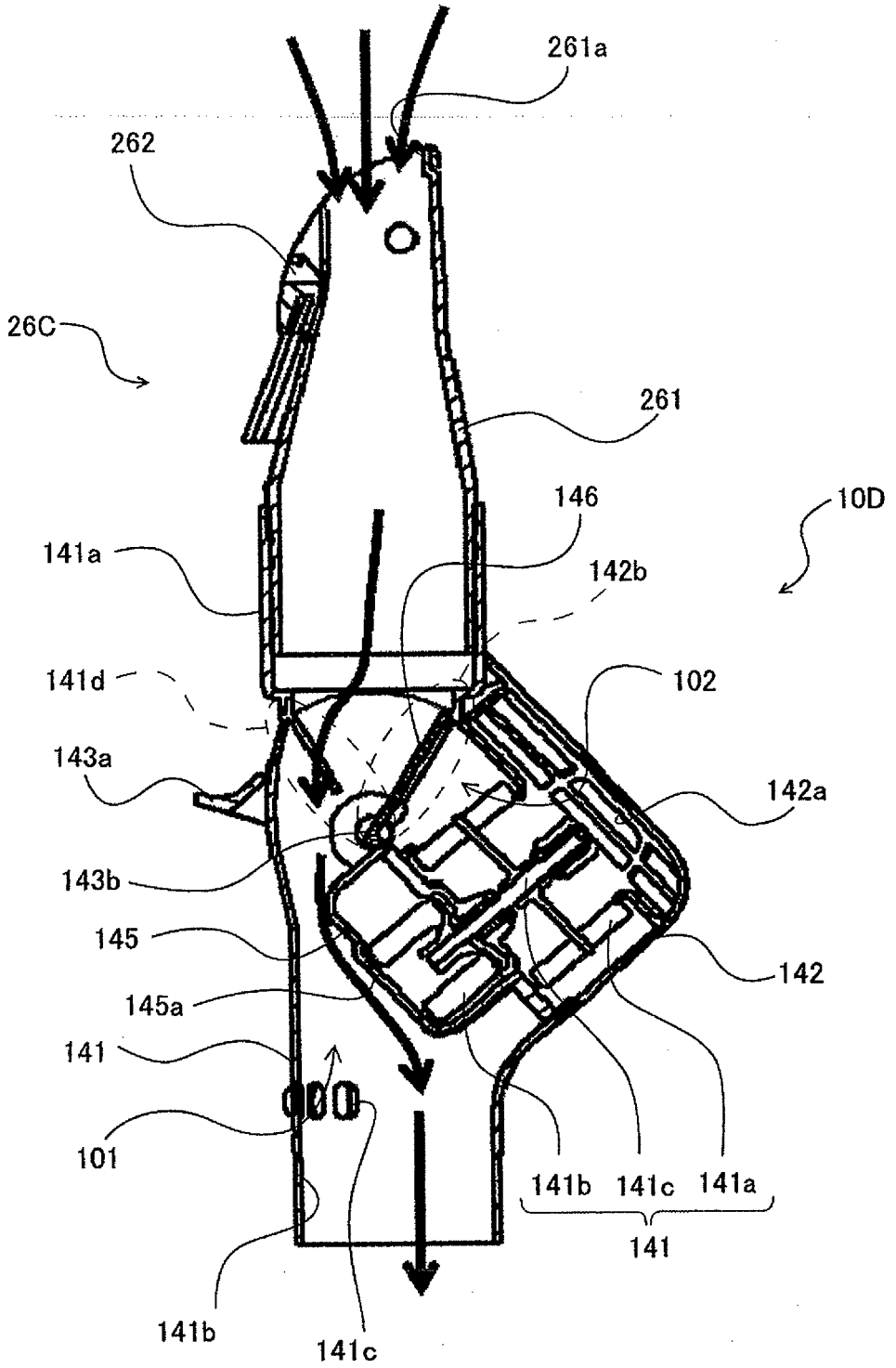

261a
262
26C
261
146
10D
141a
142b
141d
102
143a
142a
143b
145
142
145a
141
101
141b
141c
141a
141
141b
141c

Fig. 22

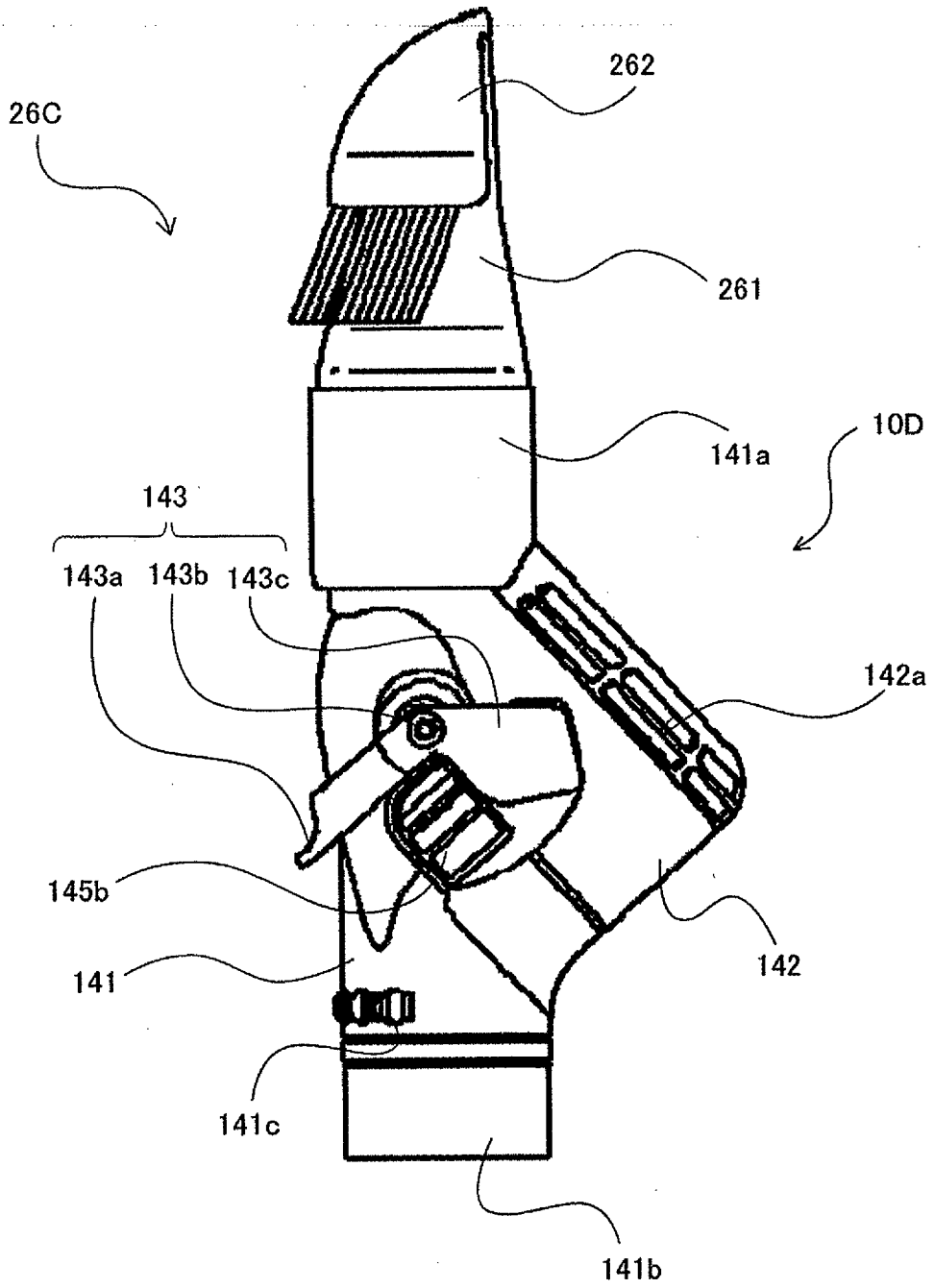

26C
262
261
141a
10D
143
143a
143b
143c
142a
145b
141
142
141c
141b

Fig. 23

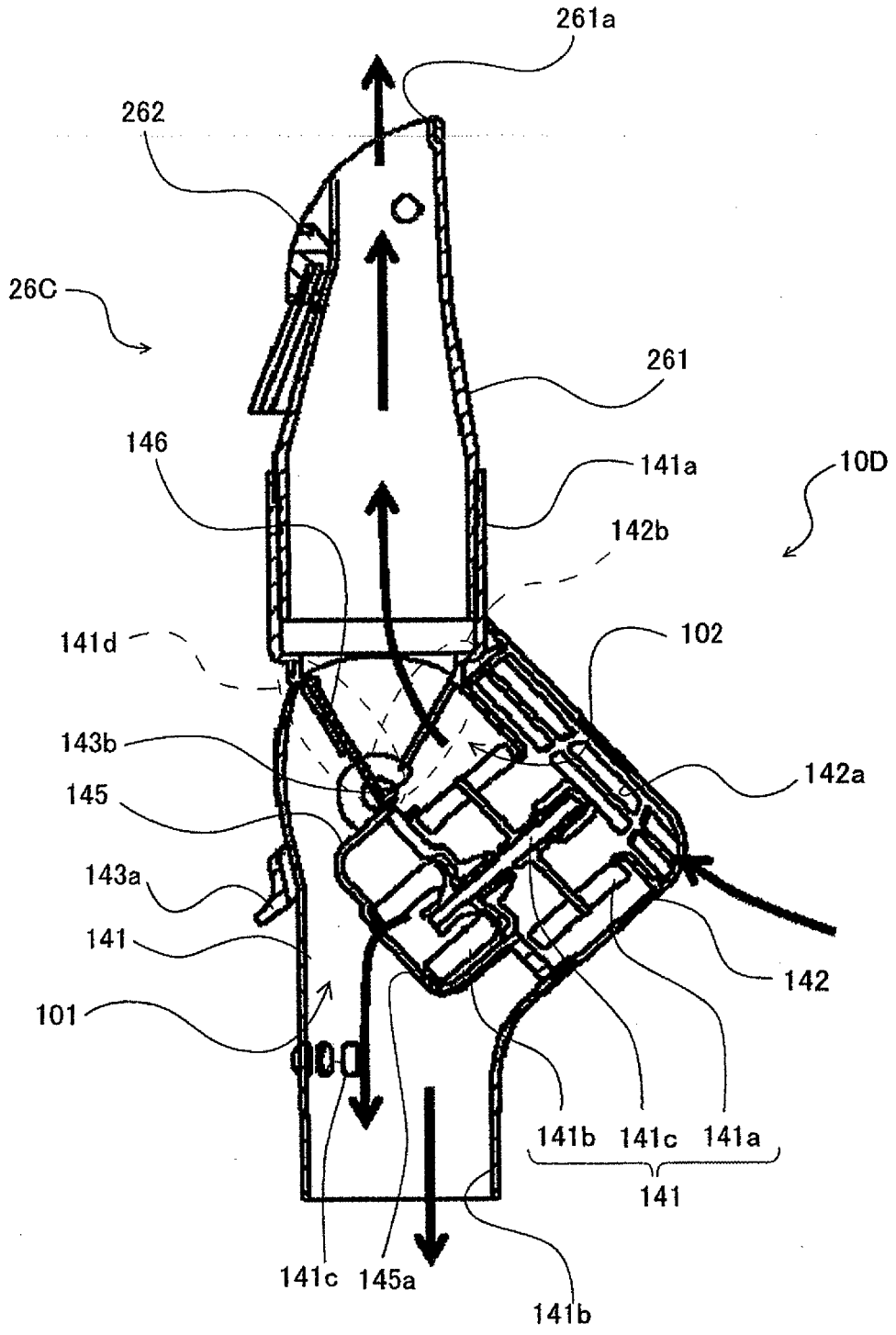

261a
262
26C
261
146
141a
10D
142b
141d
102
143b
142a
145
143a
141
142
101
141b
141c
141a
141
141c
145a
141b

Fig. 24

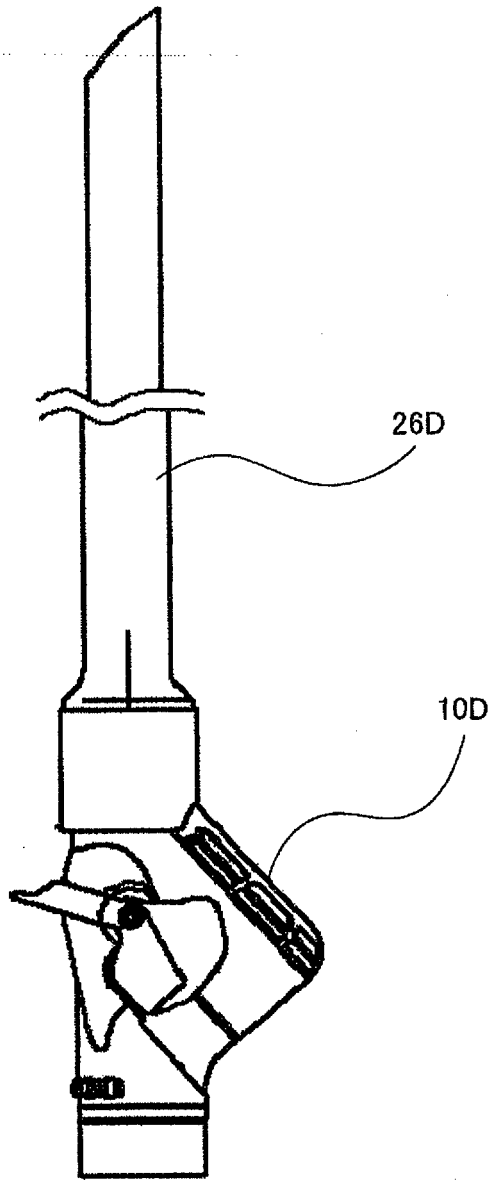


Fig. 25

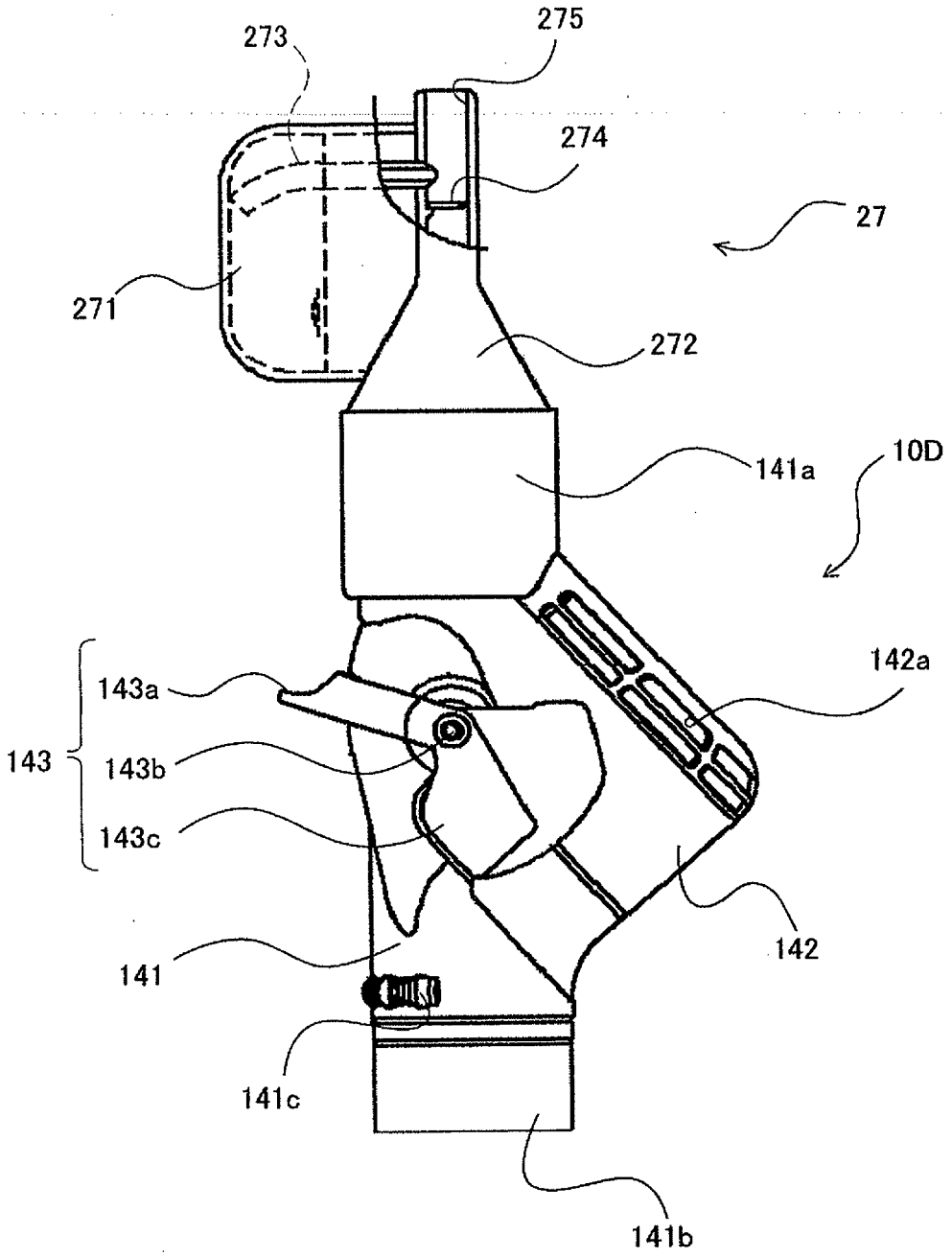

273
275
274
27
271
272
141a
10D
142a
143a
143
143b
143c
142
141
141c
141b

Fig. 26

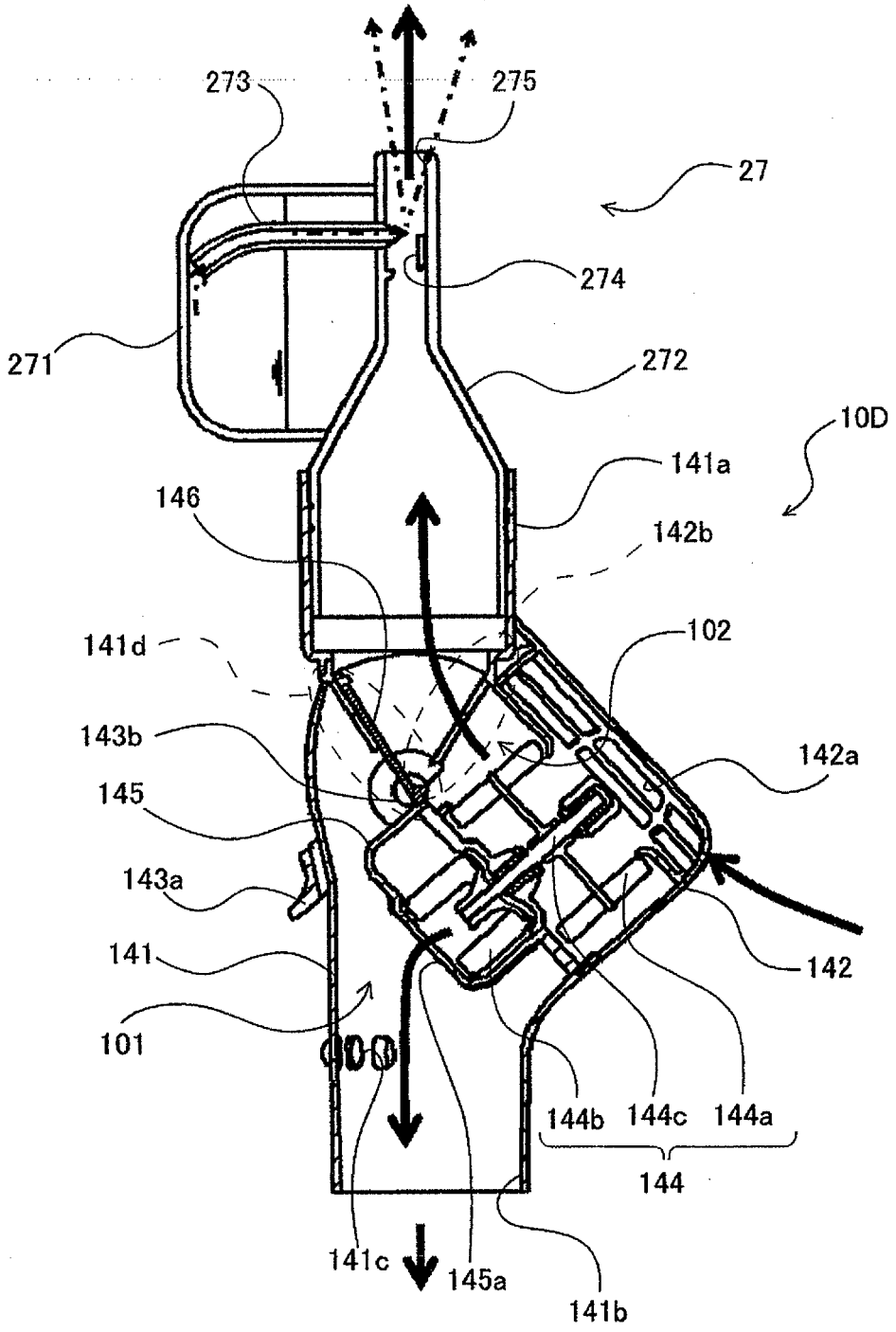

273
275
27
274
271
272
10D
141a
146
142b
102
141d
143b
142a
145
143a
142
141
101
144b
144c
144a
144
141c
145a
141b

Fig. 27

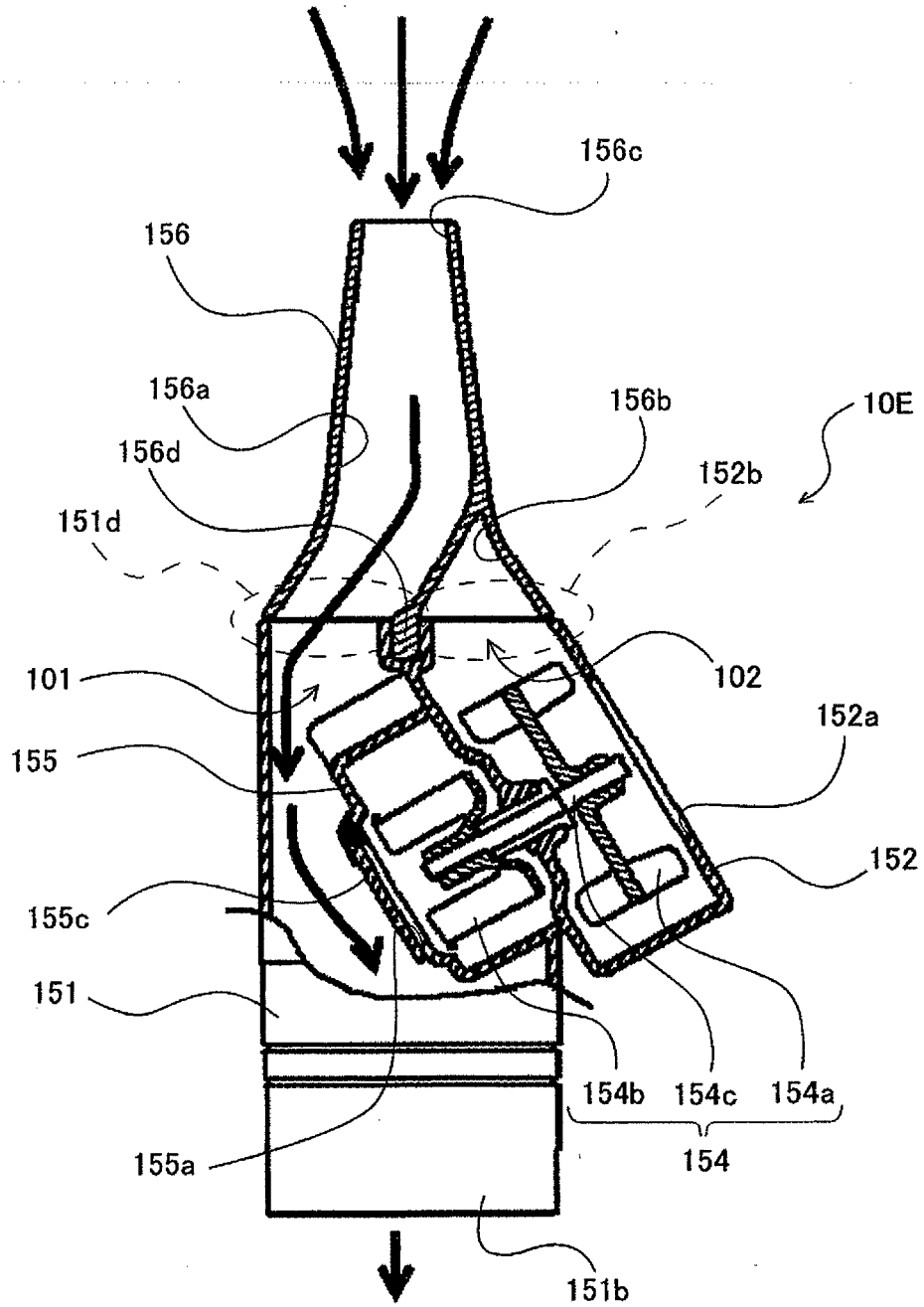

156c
156
156a
156b
10E
156d
152b
151d
101
102
152a
155
152
155c
151
154b
154c
154a
154
155a
151b

Fig. 28

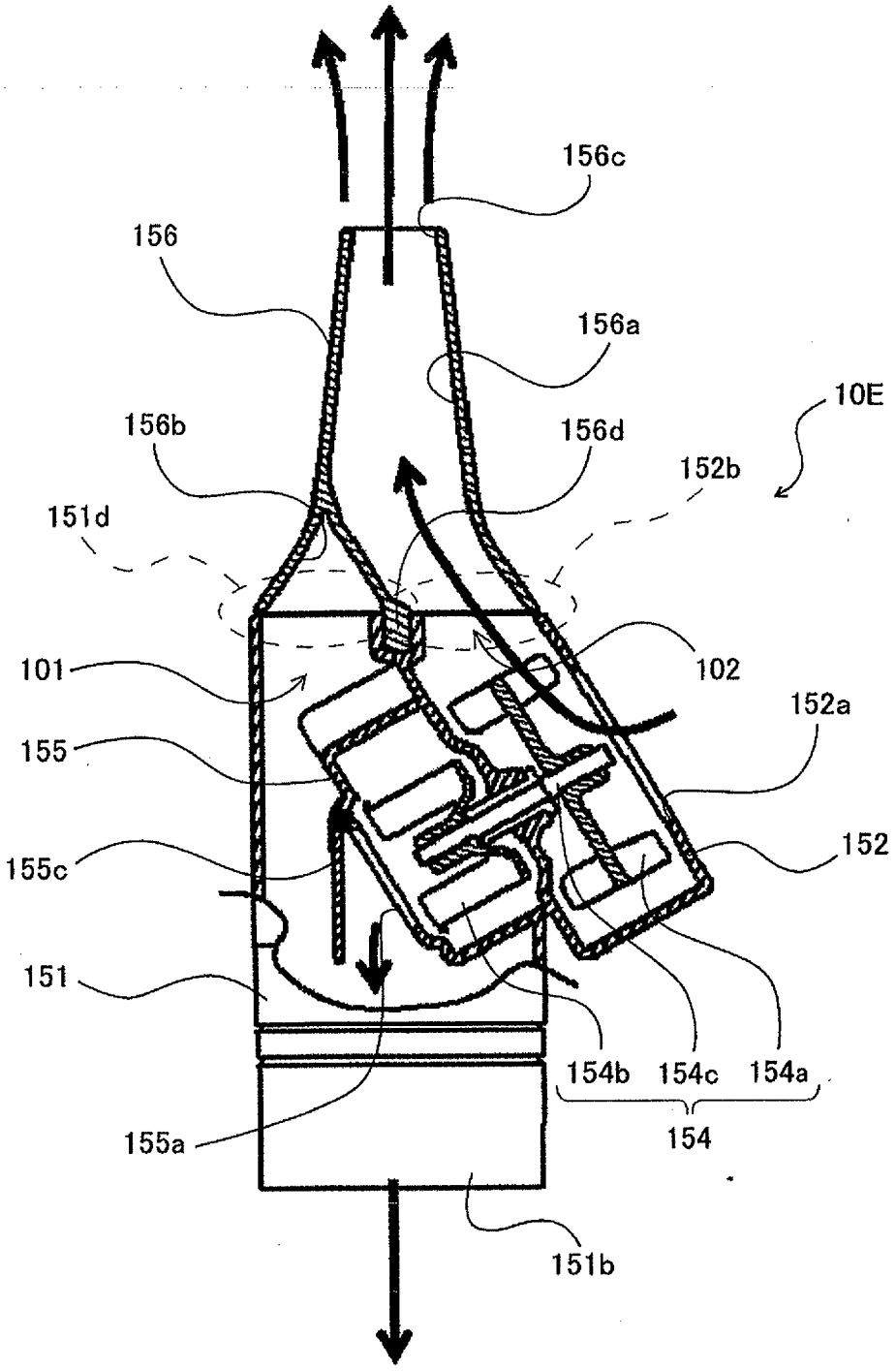

156c
156
156a
10E
156b
156d
152b
151d
101
102
152a
155
152
155c
151
154b
154c
154a
154
155a
151b

Fig. 29

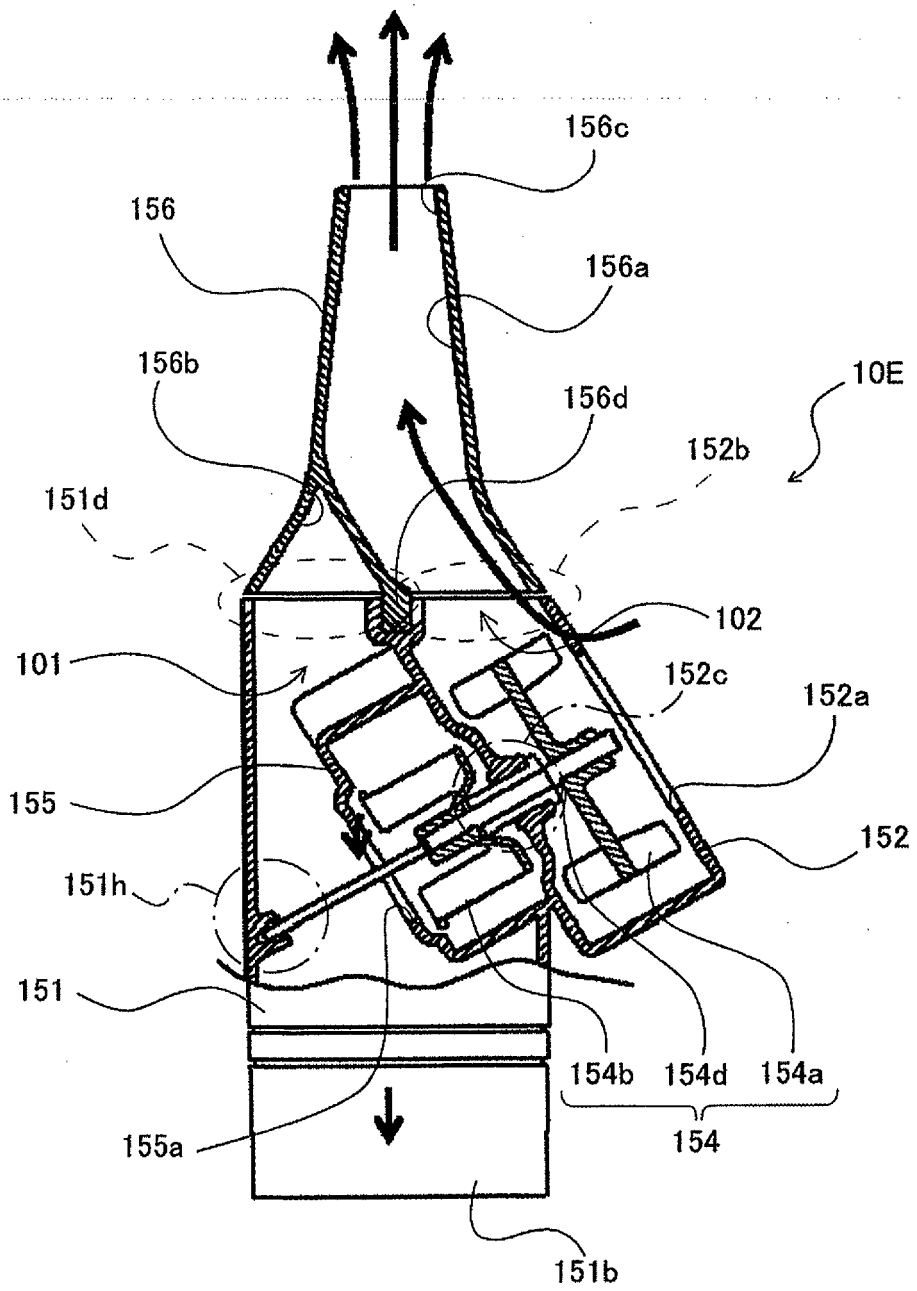

156c
156
156a
156b
156d
10E
152b
151d
102
101
152c
152a
155
152
151h
151
154b
154d
154a
154
155a
151b

Fig. 30

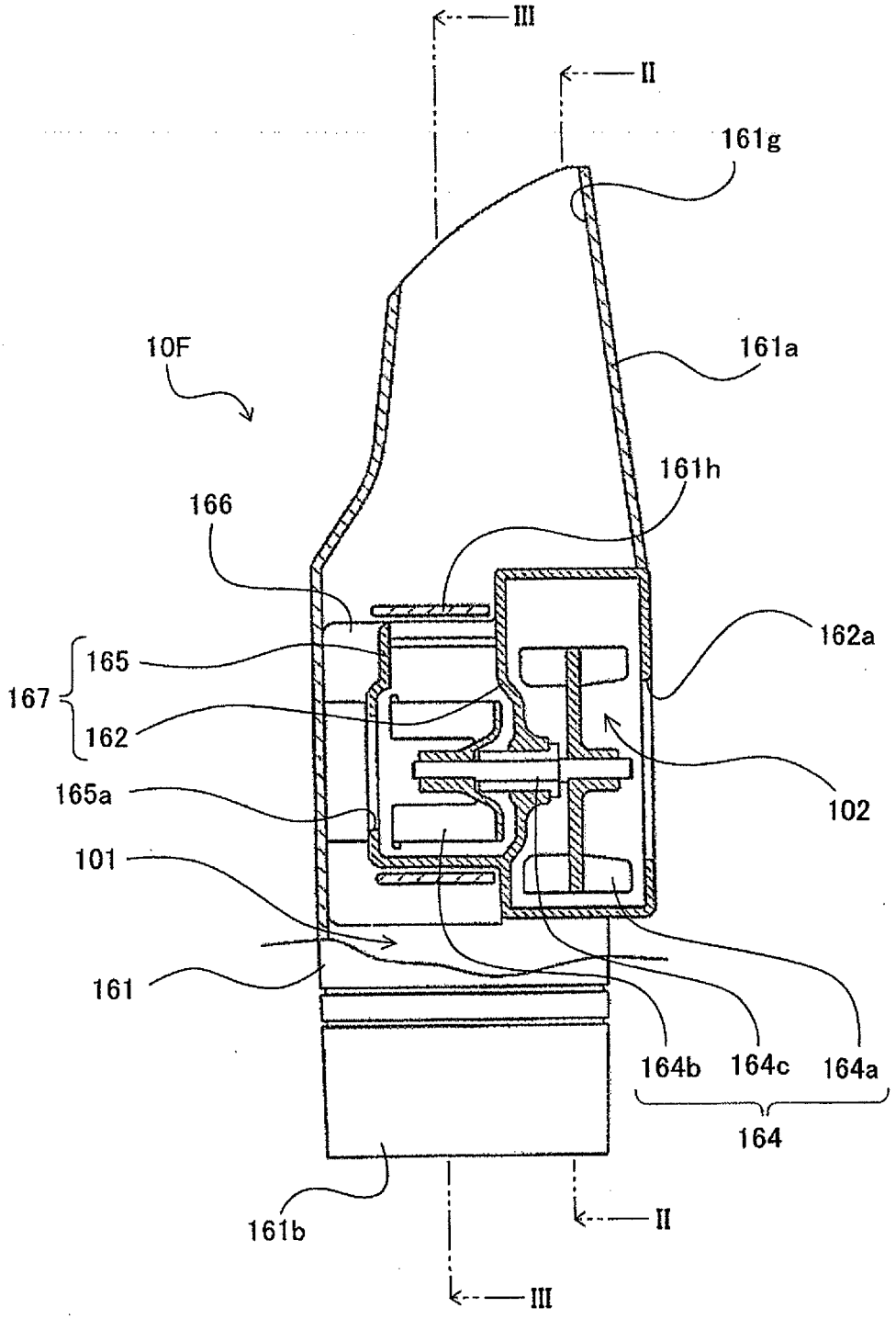

III
II
161g
10F
161a
161h
166
162a
165
167
162
102
165a
101
161
164b
164c
164a
164
161b
II
III

Fig. 31

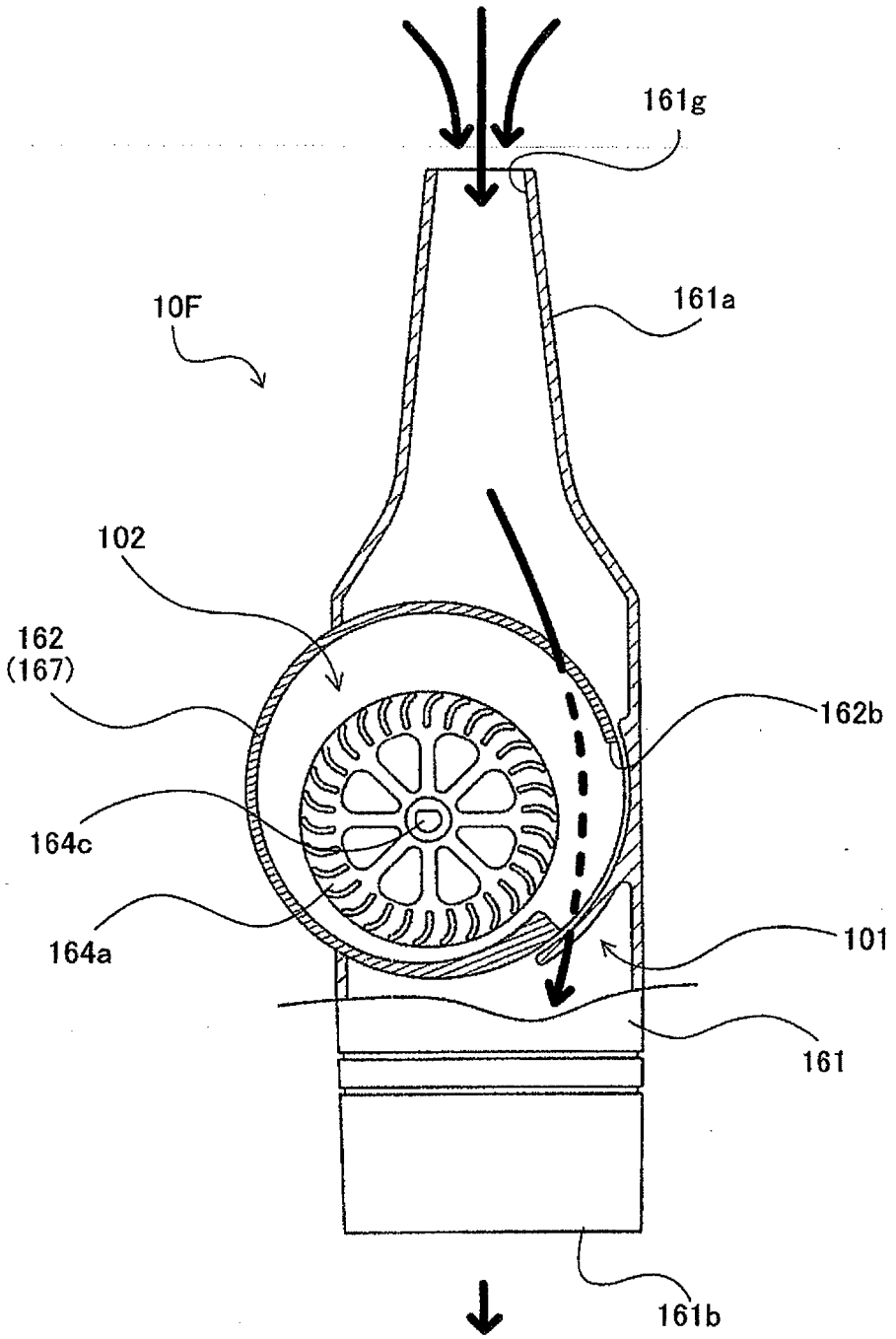


Fig. 32

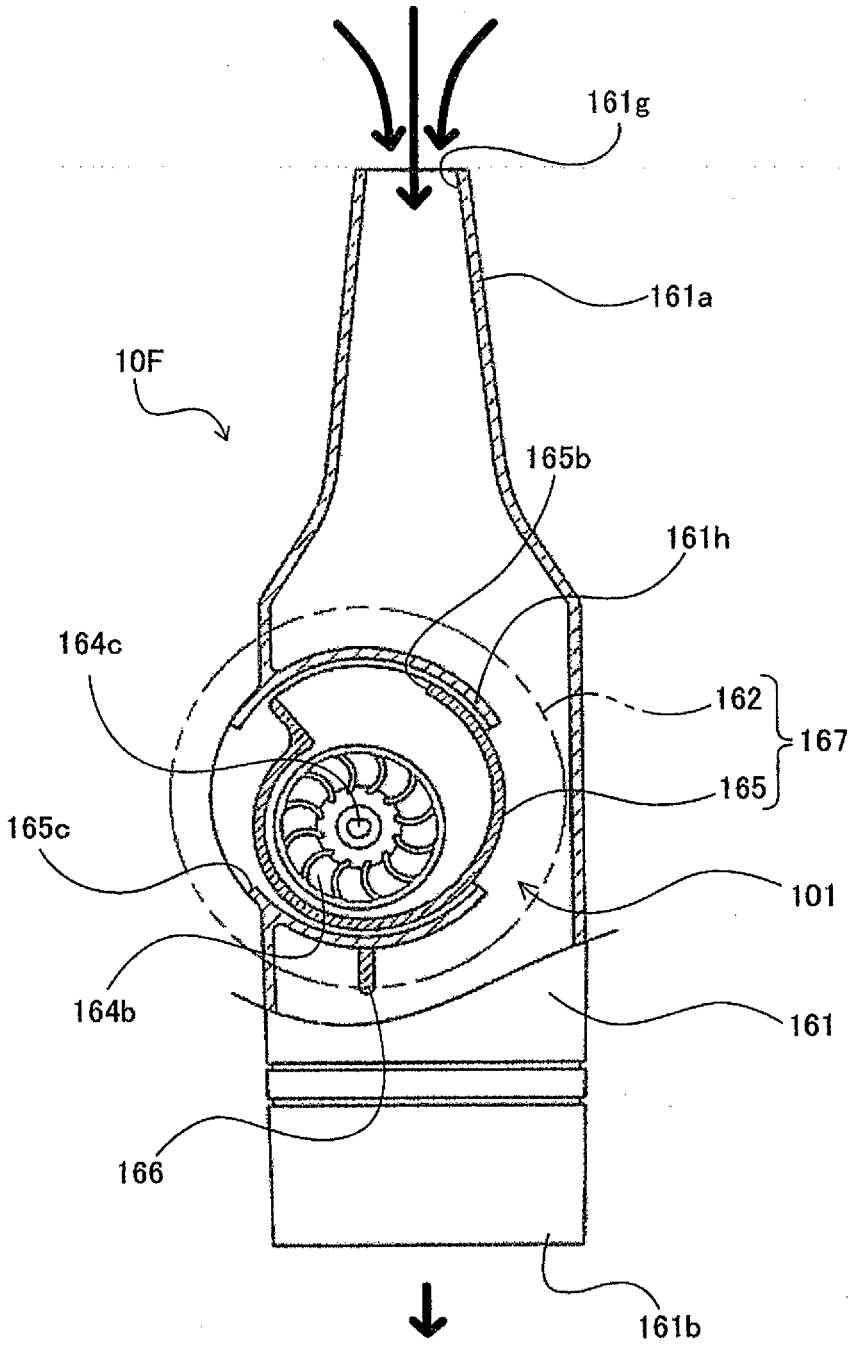

161g
161a
10F
165b
161h
164c
162
167
165
165c
101
164b
161
166
161b

Fig. 33

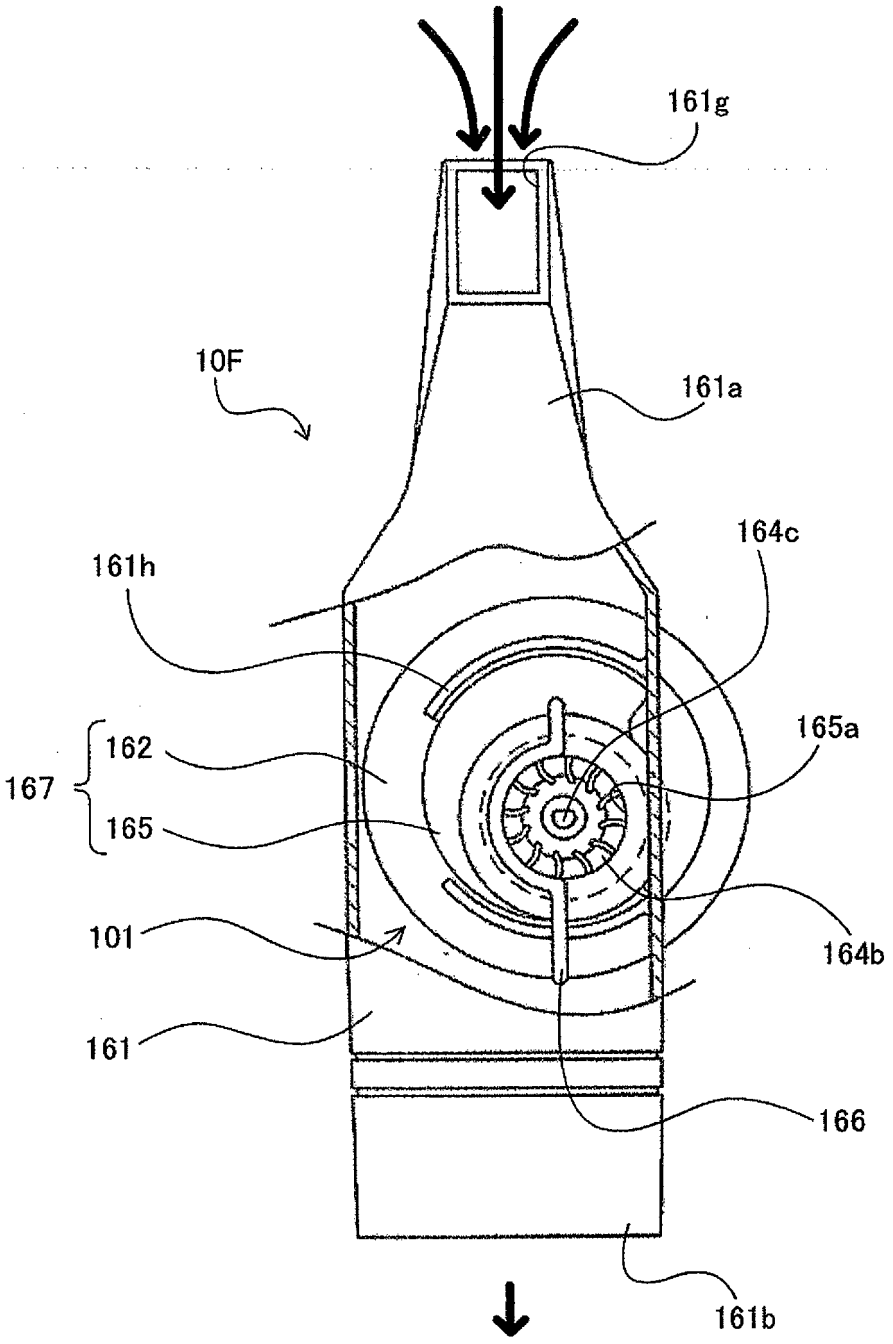


Fig. 34

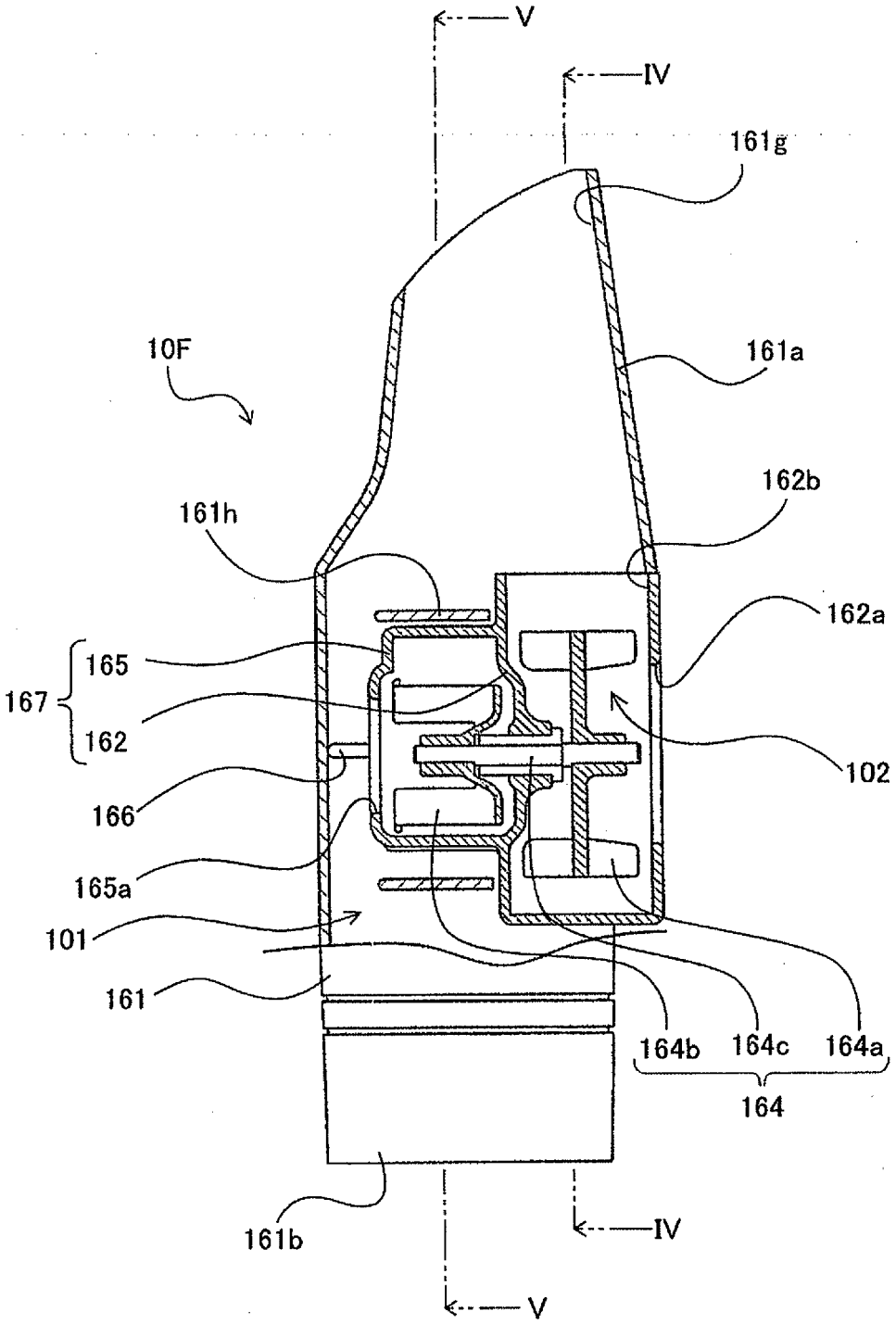

V
IV
161g
10F
161a
162b
161h
162a
165
167
162
102
166
165a
101
161
164b
164c
164a
164
161b
IV
V

Fig. 35

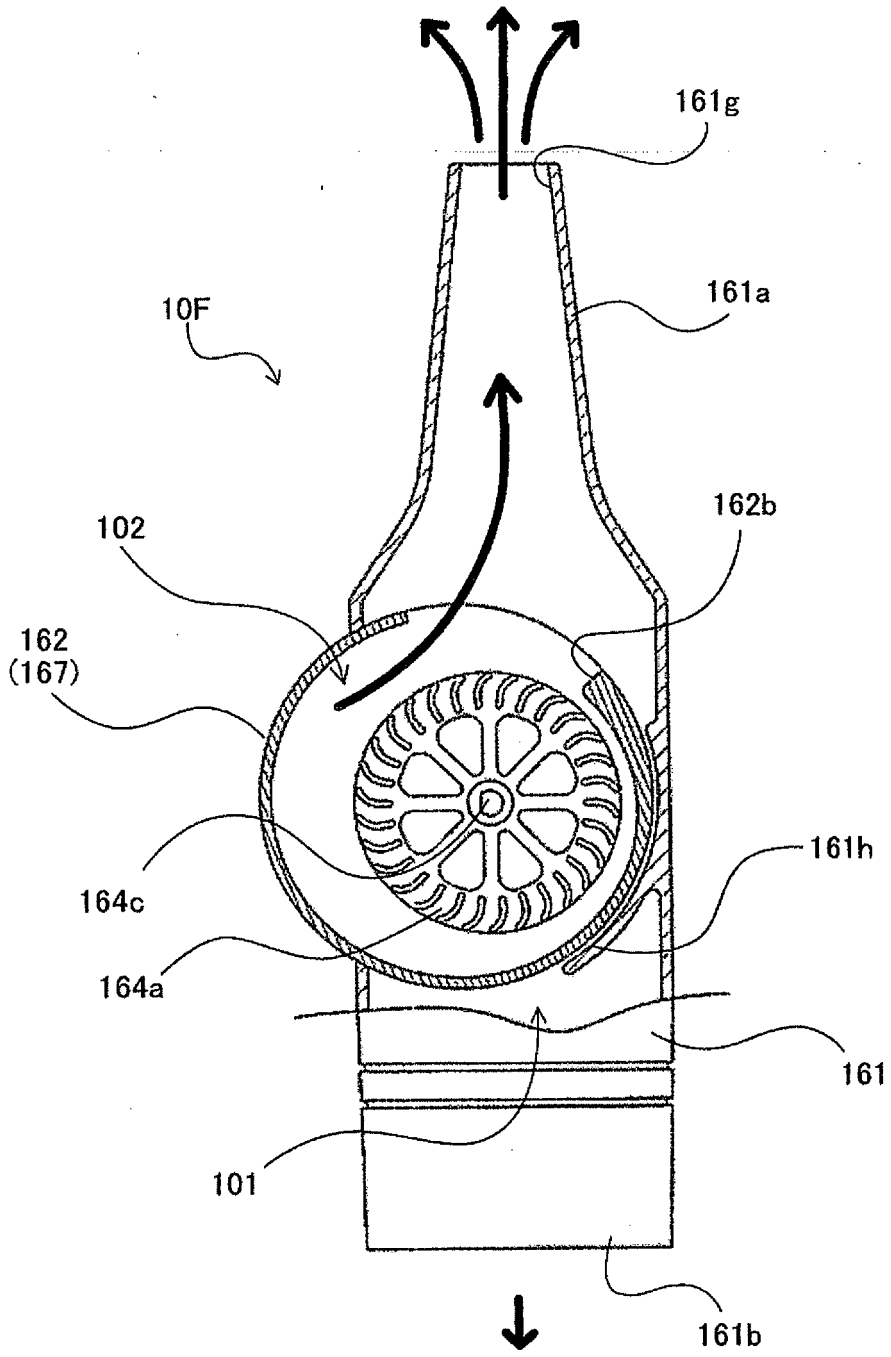


Fig. 36

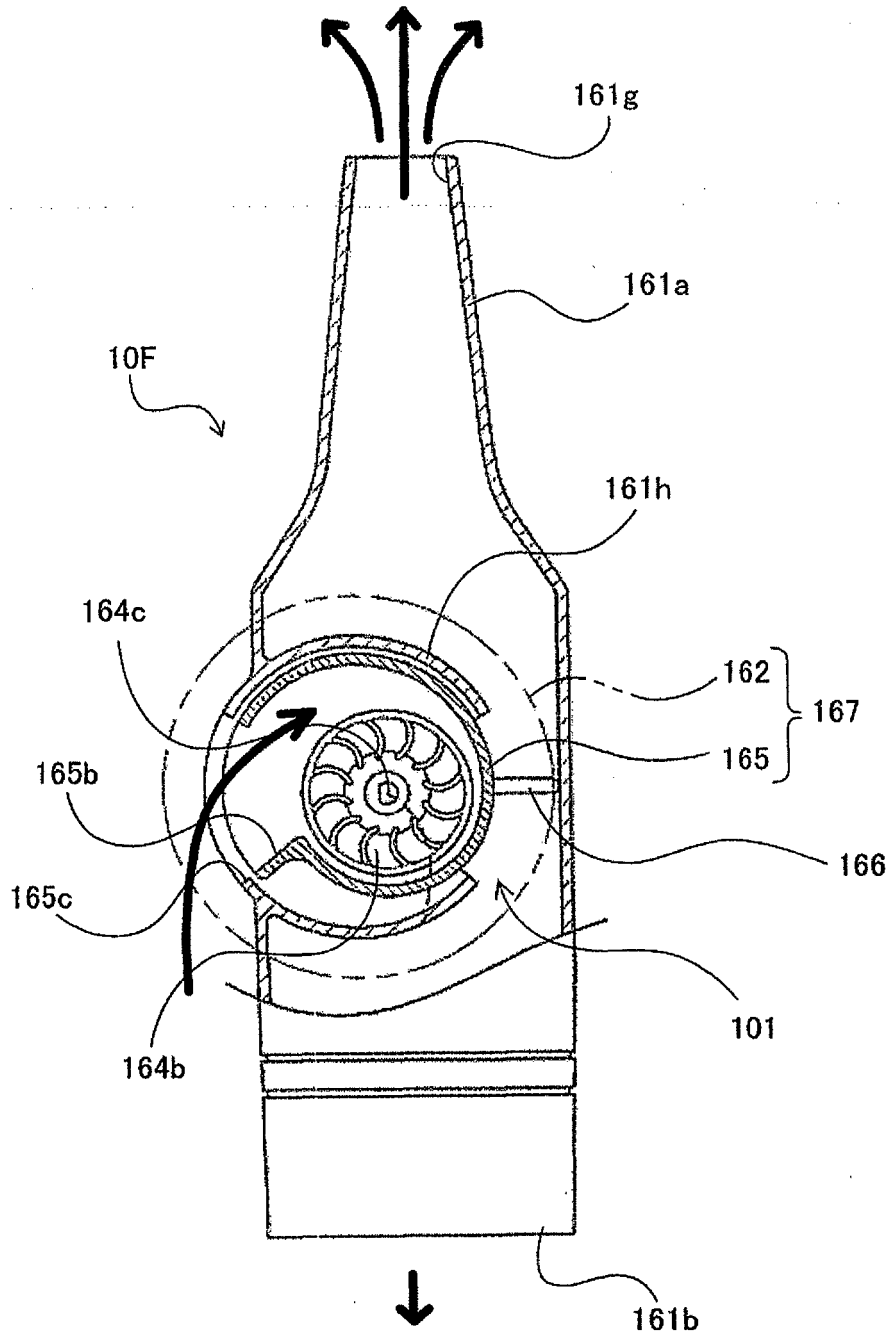

161g
161a
10F
161h
164c
162
167
165
165b
166
165c
101
164b
161b

Fig. 37

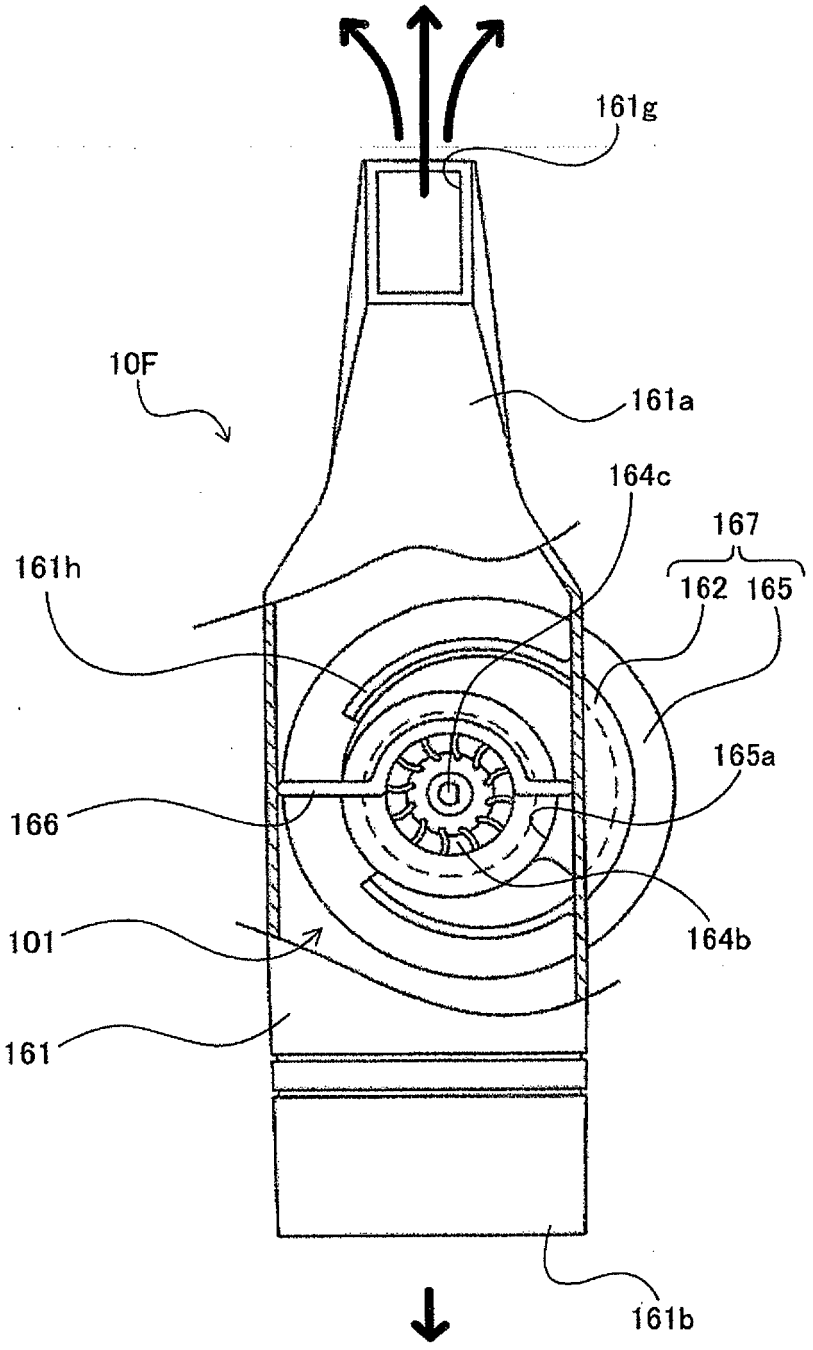


Fig. 38

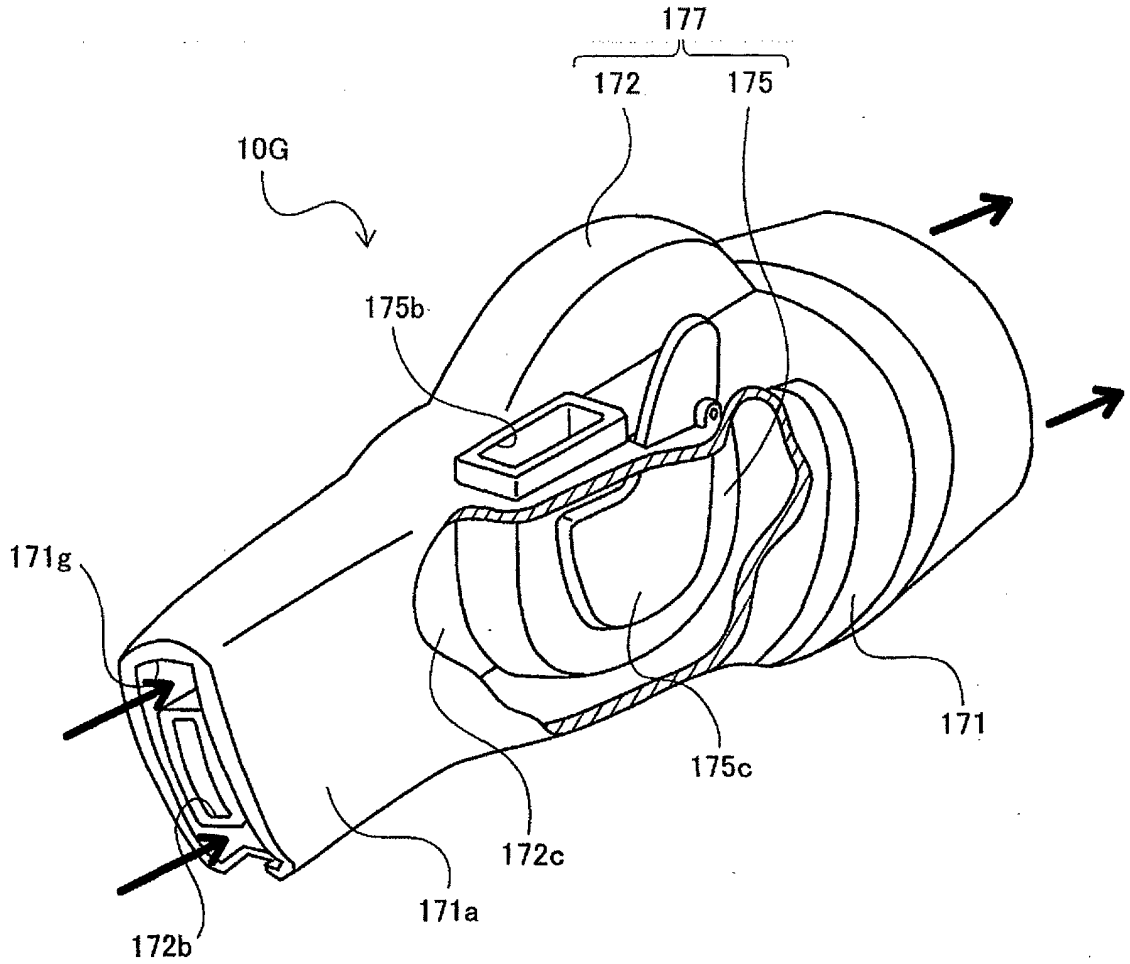


Fig. 39

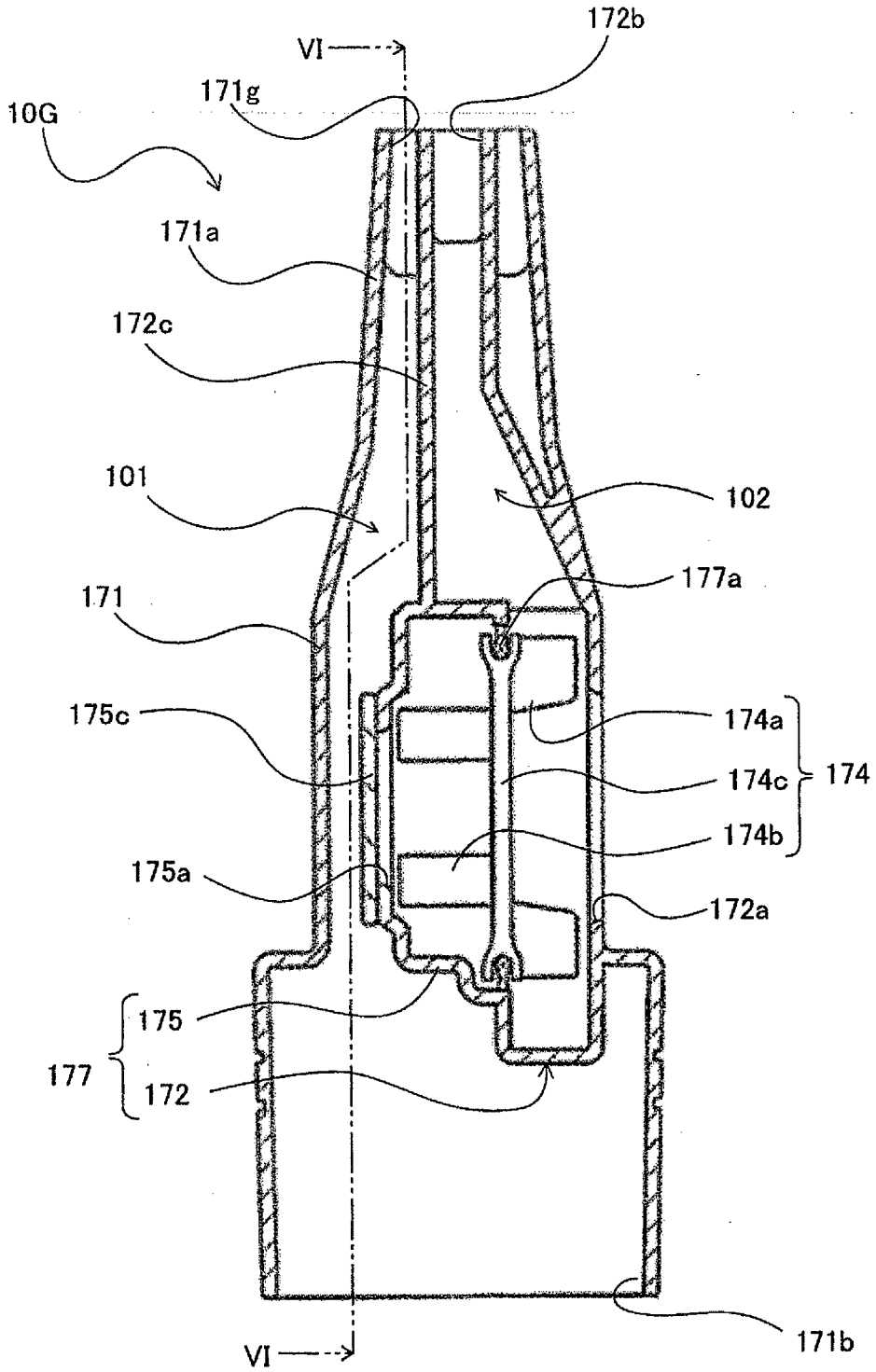

172b
VI
171g
10G
171a
172c
101
102
177a
171
175c
174a
174c
174
174b
175a
172a
175
177
172
171b
VI

Fig. 40

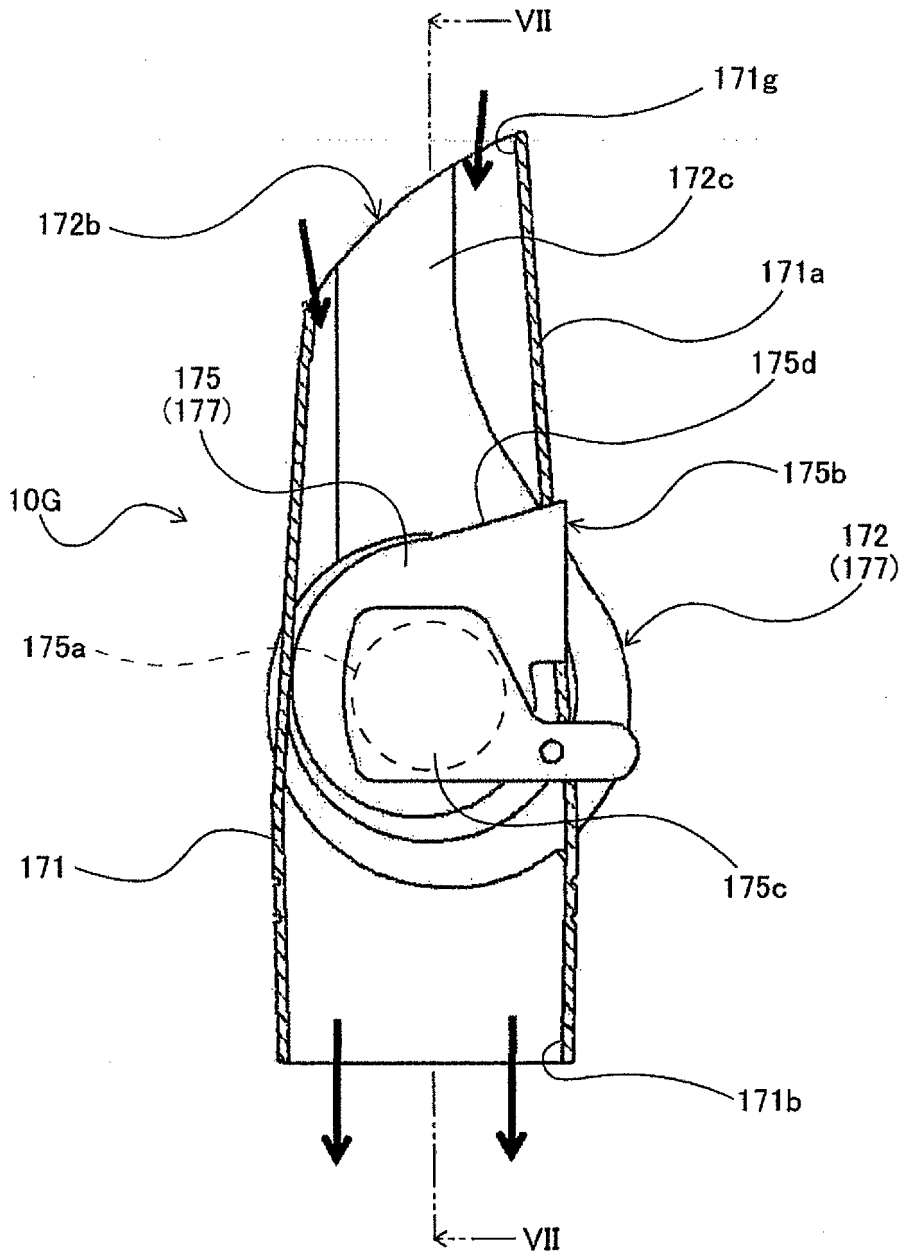

VII
171g
172c
172b
171a
175d
175
(177)
175b
10G
172
(177)
175a
171
175c
171b
VII

Fig. 41

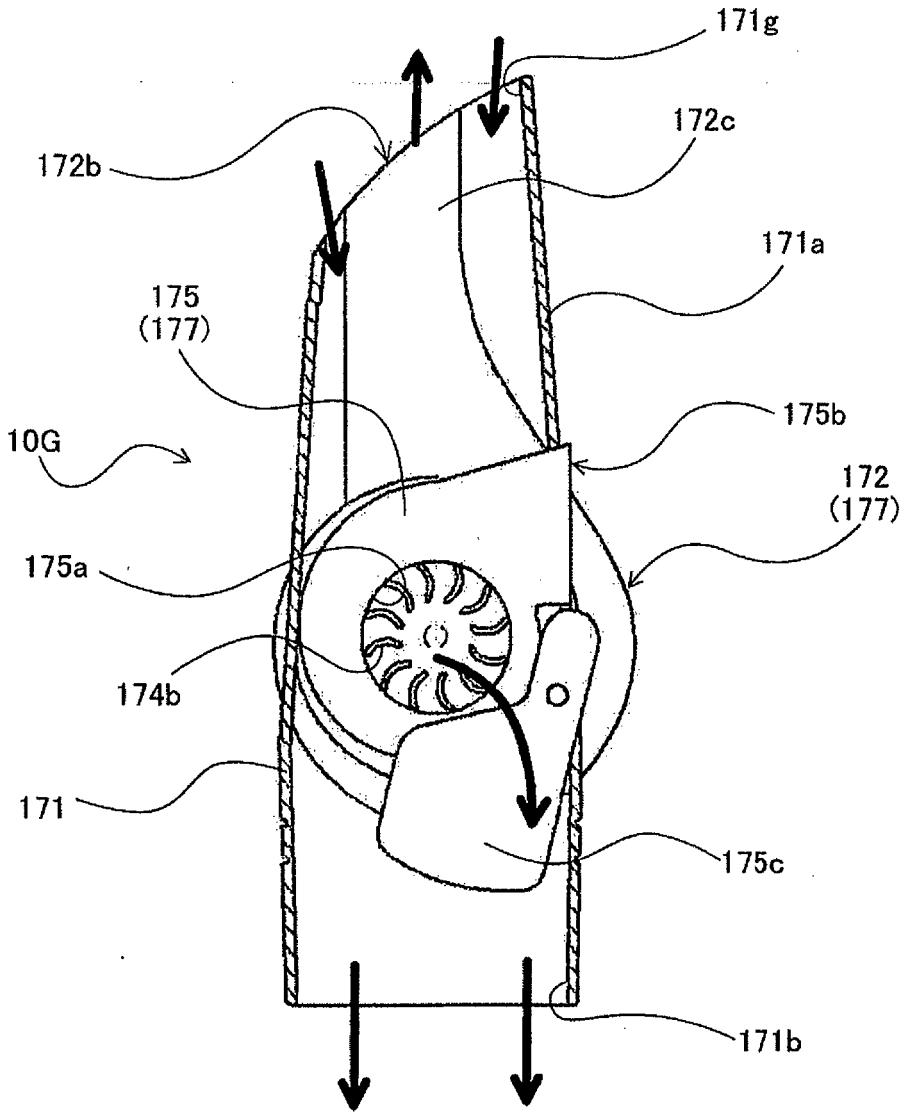

171g
172c
172b
171a
175
(177)
175b
10G
172
(177)
175a
174b
171
175c
171b

Fig. 42

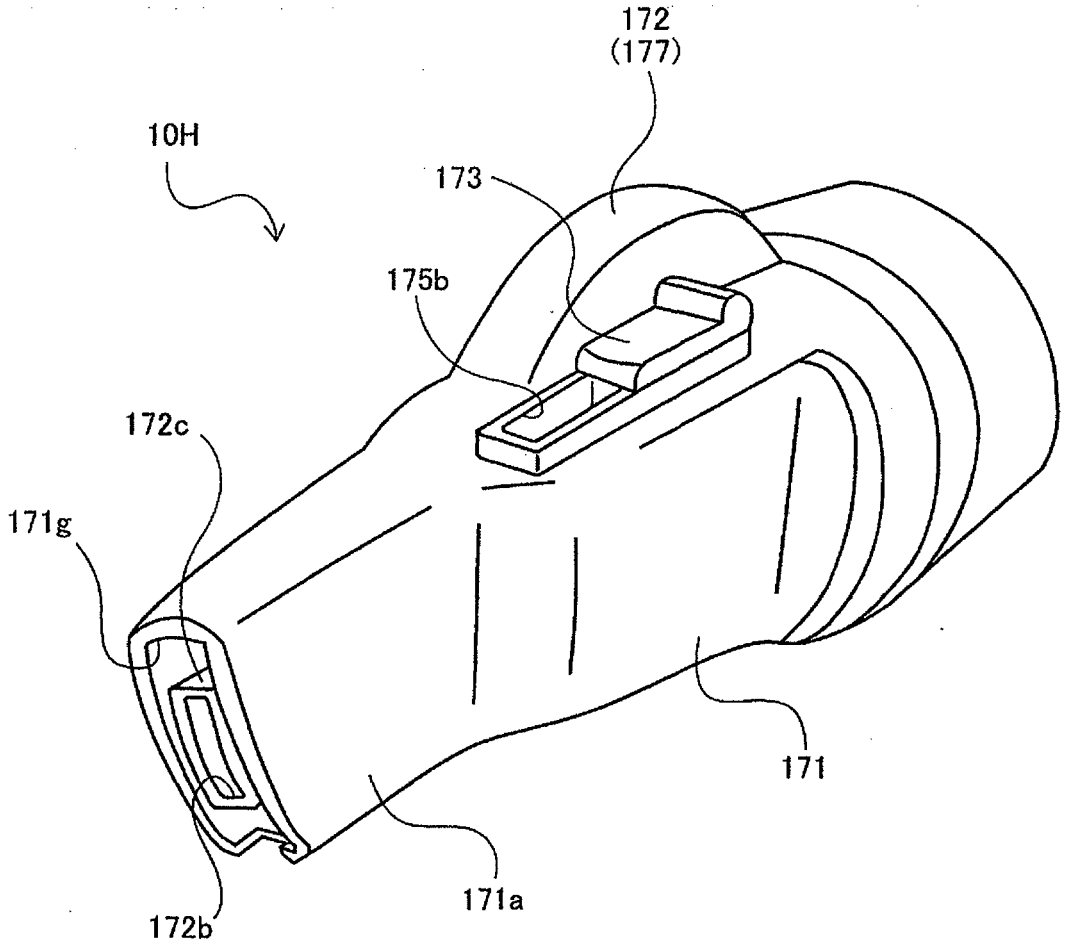


Fig. 43

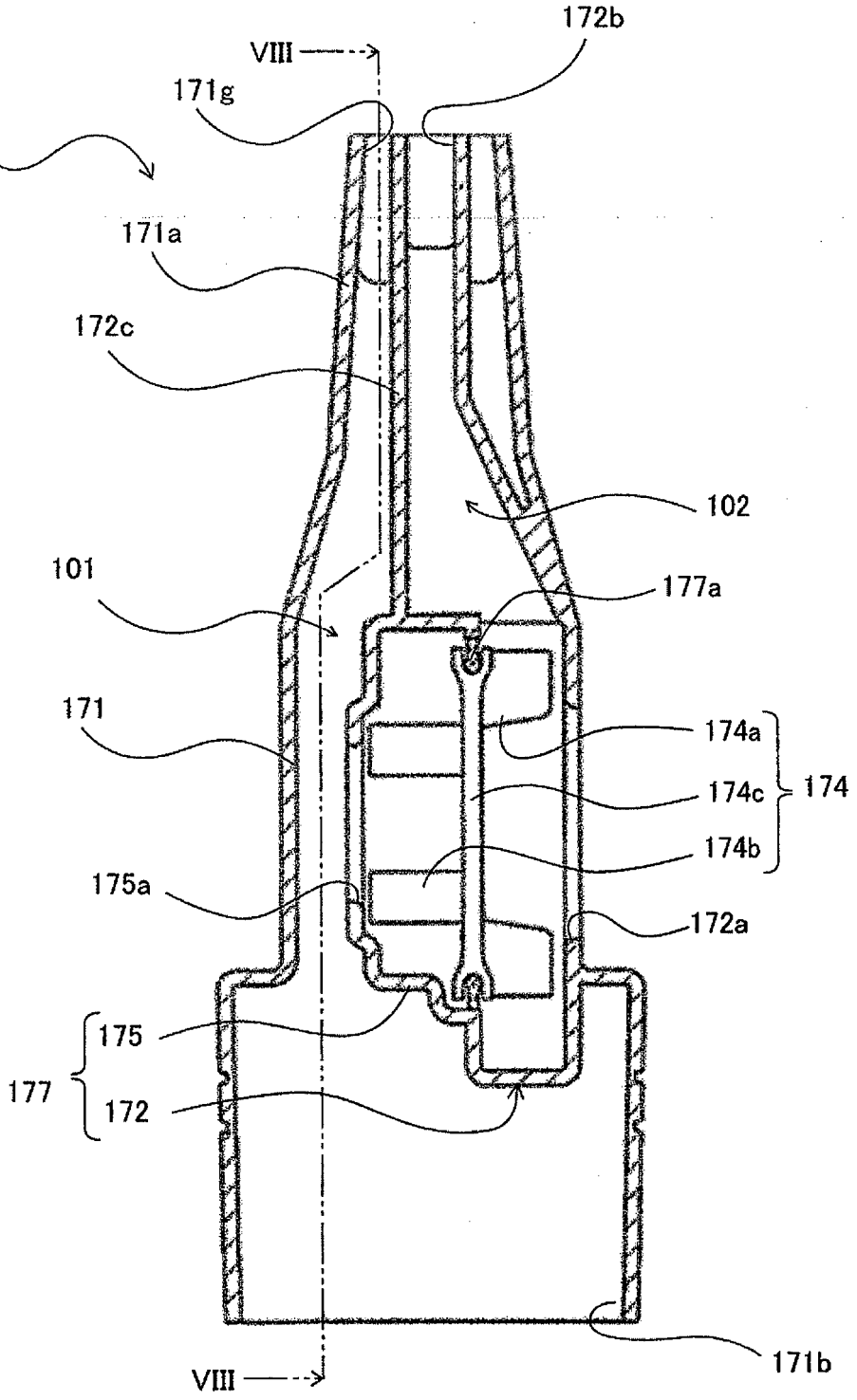
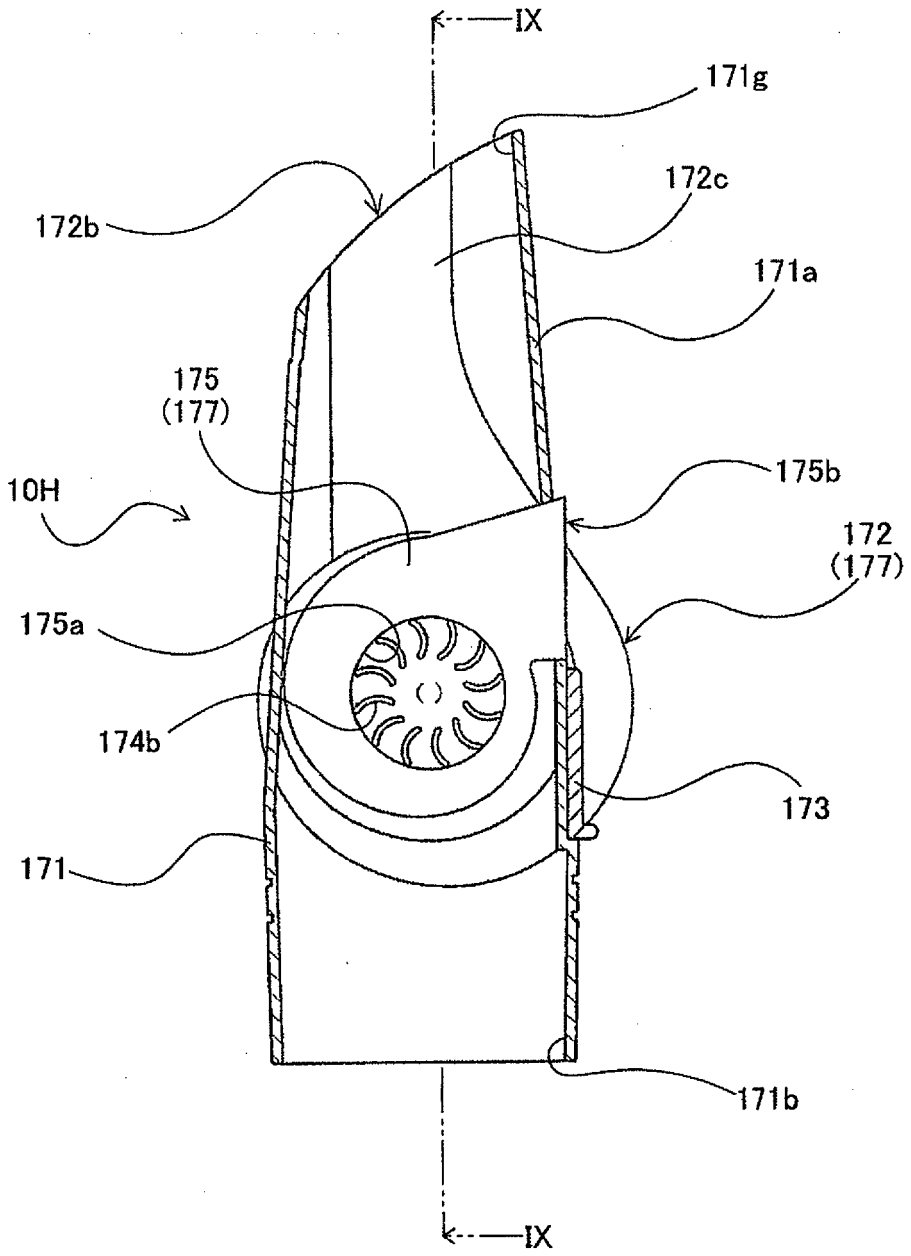

172b
VIII
10H
171g
171a
172c
102
101
177a
171
174a
174c
174
174b
175a
172a
175
177
172
171b
VIII

Fig. 44


IX
171g
172c
172b
171a
175
(177)
10H
175b
172
(177)
175a
174b
173
171
171b
IX

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2000217746 A **[0006]**
- JP 2001321305 A **[0006]**
- DE 29907437 U **[0011]**