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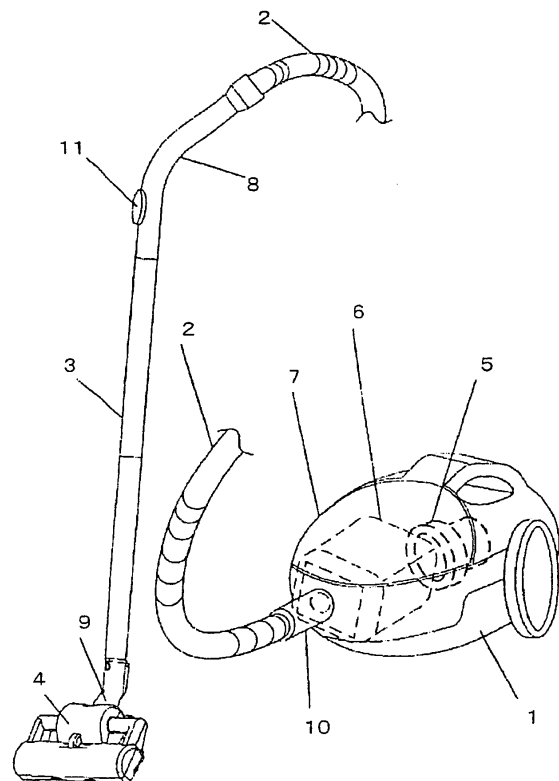
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(54) **Vacuum cleaner suction unit and electric vacuum cleaner equipped with same**

(57) A vacuum cleaner suction unit (14) includes an outer case (12-13); and an opening portion (14a,14b) passed through in a vertical direction, the opening portion formed by the outer case. Further, a direction of a longer side in the opening portions corresponds to a direction of a width of the suction unit. The vacuum cleaner suction unit further includes a guard member (91) made of a flexible material provided at an inner periphery of the opening portion. In addition, a vacuum cleaner suction unit includes an outer case; an opening portion formed by the outer case; and a recess portion provided at the opening portion by forming a closed surface (91) at the opening portion.

FIG. 1



Description

[0001] The present invention is related to an electric vacuum cleaner; and, more particularly, to an electric vacuum cleaner equipped with a suction unit having a construction that facilitates miniaturization of component case.

[0002] In a conventional suction unit having an electric vacuum cleaner equipped therewith, as shown in Figs. 15 and 16, an airflow controlling lever 17 for controlling the strength of suction air stream is provided at the middle of the upper surface of the suction unit, and is configured to slidably move right to left or vise-versa by having an axle portion 15 connected therewith and inserted in a slot 16, the slot 16 being provided at an upper member 13. Reference numeral 18 is a protective rail, which is for guarding the upper member 13 from scratches and the like that may be formed when the airflow controlling lever 17 is operated on the upper member 13 in a sliding manner. The protective rail 18 is formed in a recessed form so as to forcibly be in contact with the lower surface of the airflow controlling lever 17.

[0003] Further, a rotatable arm 9, which is rotatably supported by a snap-in connection of a lower member 12 and the upper member 13, is provided at the rear end of the suction unit. The rotatable arm 9 is formed with a link portion and is provided at substantially the middle portion of said rear end of the suction unit, where the link portion is linked with an extension pipe (not shown). A first suction port 19 for suctioning dust is provided at the front end of the lower surface of the suction unit.

[0004] Further, a second suction port 20 is provided at the rear end of the lower surface of the suction unit, which is not intended for a suction purpose. Further, a wall-shaped member 62, which is formed of a brush, is disposed around the second suction port 20 while facing the first suction port 19. In addition, a roller 32, which maintains a specific distance between a target cleaning surface and the suction unit for the purpose of a smooth operation, is installed at the right to left and front to back ends of the lower surface of the suction unit. In order to define a suction unit, a plurality of functional components is required to be installed. Particularly, with respect to an outer case of the suction unit, while the functional components are to be covered by the outer case, the conventional construction thereof is defined by an entirely closed surface, which covers regions that do not even accommodate the functional components. Consequently, since the suction unit 4 has been scaled up due to being added with additional functional components in recent years, it has been difficult to develop miniaturized products (for example, see Patent Reference 1).

[0005] [Patent Reference 1] Japanese Laid-open Publication No. H7-116095

[0006] However, in the conventional construction, each time additional functional components are added for the purpose of enhancing product functionality, the space for accommodating the components is enlarged.

Further, due to portliness caused by the outer case covering the whole surface, the miniaturization of suction unit is difficult to achieve. Further, since the suction unit includes the vacuum cleaner main body that is configured while only considering the link portion thereof, there is a problem of storing the suction unit at a state in which the suction unit is not being used and detached from the main body.

[0007] The object of the present invention is to provide a vacuum cleaner suction unit and an electric vacuum cleaner which employs the suction unit having an improved storage feature when it is detached.

[0008] In order to achieve the above object, a suction unit that is equipped to an electric vacuum cleaner of the present invention is configured to integrate a space portion, which does not accommodate functional components for the suction unit, into an opening portion formed by an outer case, the suction unit being for suctioning dusts and wastes on a target cleaning surface.

[0009] Accordingly, regions that do not accommodate any functional components can be omitted, and reduction in surface area of the suction unit in contact with a target cleaning surface is made possible. Therefore, the usability of the suction unit can be improved by miniaturization of the suction unit and reduction in operational resistance against the target cleaning surface. Further, the opening portion formed by the outer case allows the suction unit to be insertably hung by, for example, a hook. Therefore, when storing the suction unit after separating from the electric vacuum cleaner, a hanging storing by using, for example, a hook provided at home is possible, thereby allowing various storing methods.

[0010] The suction unit being equipped with the electrical vacuum cleaner of the present invention facilitates miniaturization and enables storing with the use of, for example, a hook and the like.

[0011] In accordance with a first aspect of the present invention, a space portion is integrated into an opening portion formed by an outer case, where the suction unit being used for suctioning dusts on a target cleaning surface. Accordingly, the regions that do not accommodate any functional components can be omitted. Further, reduction in surface area of the suction unit in contact with a target cleaning surface is made possible. Therefore, the usability of the suction unit may be improved by miniaturization of the suction unit and reduction in operational resistance against the target cleaning surface. Further, the opening portion formed by the outer case may allow the suction unit to be insertably hung by, for example, a hook. Therefore, when storing the suction unit after being detached from the electric vacuum cleaner, a hanging storing by using, for example, a hook provided at home is made possible to be used for storing, thereby allowing various storing methods.

[0012] In accordance with a second aspect of the present invention, a direction of a longer side in the opening portion corresponds to a direction of a width of the suction unit. Accordingly, a contact area in a target clean-

ing surface with respect to the direction of which the suction unit is being moved may be advantageously decreased, thereby reducing operational resistance. Therefore the usability of the suction unit is improved.

[0013] In accordance with a third aspect of the present invention, a guard member made of a flexible material is provided at an inner periphery of the opening portion. Therefore, when storing the suction unit in a hanging manner by using, for example, a hook inserted therein, scratches due to any shocks being observed by the suction unit are effectively prevented.

[0014] In accordance with a fourth aspect of the present invention, there is provided an outer case; an opening formed by the outer case; and a recess portion provided at the opening portion by forming a closed surface at the opening portion in the suction unit. Accordingly, in addition to a reduction in weight and size of the suction unit due to elimination of the regions, not accommodating functional components for the suction unit and being provided at the upper outer case of the suction unit, the closed surface and the recess portion serve as reinforcing walls for the opening portion. Therefore, the suction power of the suction unit is improved

[0015] In accordance with a fifth aspect of the present invention, there is provided a suction port; and a first through hole, which is in communication with the suction port, is disposed at one end of the recess portion in the suction unit. Accordingly, rough and large dusts that cannot be sucked by the suction unit due to the space limitation between the front bottom portion of the suction unit and the target cleaning surface are allowed to be put in by using the extra through hole, thereby improving the usability of the suction unit.

[0016] In accordance with a sixth aspect of the present invention, there is provided a first cover part capable of being freely opened and closed is provided at the first through hole. Accordingly, the degree of vacuum level within the suction port is prevented from being decreased, which in turn, enhances the suction performance at a suction port.

[0017] In accordance with a seventh aspect of the present invention, there is provided a dust inner suction path provided at a middle of the suction unit; and a second through hole, which is in communication with the dust inner suction path at a middle of the suction unit, is provided at one end of the recess portion. Accordingly, since the additional through hole is formed at where the degree of vacuum level is high, more powerful suctioning can be obtained when compared to a case where a gap is provided between the target cleaning surface and the suction port to have a communication between them.

[0018] In accordance with an eighth aspect of the present invention, there is provided a second cover part capable of being freely opened and closed is provided at the second through hole. Accordingly, in addition to an effect obtained from the seventh aspect of the present invention, the degree of vacuum level within the suction port is prevented from being decreased, thereby enhanc-

ing the suction performance at the suction port.

[0019] In accordance with a ninth aspect of the present invention, there is provided a rotating brush; a driving unit for driving the rotating brush; and a transmitting unit for transmitting a driving force from the driving unit to the rotating brush, wherein the transmitting unit is disposed in the outer case. In installing the rotating brush within the suction unit, the above configuration allows to transmit the driving force by using the outer case of the suction unit. Therefore, it is possible to miniaturize the suction unit.

[0020] In accordance with a tenth aspect of the present invention, there is provided an electric vacuum cleaner that includes the vacuum cleaner suction unit of the above aspects, the vacuum cleaner suction unit having an electric blow thereon. In addition to being able to miniaturize the suction unit, the suction unit can be stored in various storage methods, thereby improving the usability thereof. Further, in accordance with the tenth aspect of the present invention, the electric vacuum cleaner is capable of cleaning even rough and large dusts that cannot be sucked through the front side of the suction unit.

[0021] The above and other objects and features of the present invention will become apparent from the following description of embodiments, given in conjunction with the accompanying drawings, in which:

Fig. 1 is a schematic view of an electric vacuum cleaner equipped with a vacuum cleaner suction unit in accordance with a first embodiment of the present invention;

Fig. 2 is a schematic view of the vacuum cleaner suction unit in accordance with the first embodiment of the present invention;

Fig. 3 is a schematic view, illustrating the bottom of the vacuum cleaner suction unit in accordance with the first embodiment of the present invention;

Fig. 4 is a mid-cross sectional view of the vacuum cleaner suction unit in accordance with the first embodiment of the present invention;

Fig. 5 is a top view showing the upper portion of the outer surface of the vacuum cleaner suction unit in accordance with the first embodiment of the present invention;

Fig. 6 is an A-A cut view of the vacuum cleaner suction unit shown in Fig. 5;

Fig. 7 is a mid-cross sectional view of the vacuum cleaner suction unit shown in Fig. 6;

Fig. 8 is a schematic view of the vacuum cleaner suction unit at a storage state in accordance with the first embodiment of the present invention;

Fig. 9A is a top view of a vacuum cleaner suction unit in accordance with a second embodiment of the present invention, and Fig. 9B is a schematic view of the vacuum cleaner suction unit in accordance with the second embodiment of the present invention;

Fig. 10 is a B-B cut view of the vacuum cleaner suc-

tion unit shown in Fig. 9A;

Fig. 11 is a top view of a vacuum cleaner suction unit in accordance with a third embodiment of the present invention;

Fig. 12A is a D-D cut view of the vacuum cleaner suction unit shown in Fig. 10 when closed, and Fig. 12B is a D-D cut view of the vacuum cleaner suction unit shown in Fig. 10 when opened;

Fig. 13A is a top view of a vacuum cleaner suction unit in accordance with a fourth embodiment of the present invention, and Fig. 13B is a E-E cut view of the vacuum cleaner suction unit in accordance with the fourth embodiment of the present invention;

Fig. 14 is a side cross sectional view of the vacuum cleaner suction unit in accordance with the fourth embodiment of the present invention;

Fig. 15 is a upper schematic view of a conventional vacuum cleaner suction unit; and

Fig. 16 is a lower schematic view of the conventional vacuum cleaner suction unit.

[0022] Hereinafter, embodiments of the present invention will be described with reference to the accompanying drawings. Further, the present invention is not limited by the embodiments.

(Embodiment 1)

[0023] Fig. 1 shows a schematic view of an electric vacuum cleaner having a suction unit equipped therewith in accordance with a first embodiment of the present invention. In Fig. 1, the electric vacuum cleaner includes an electric vacuum cleaner main body 1 having a hose 2, an extension pipe 3 and a suction unit 4 connected therewith. In the electric vacuum cleaner main body 1, an electric blower 5 for generating suction air stream is installed. At its front end, a dust container 6 for storing dust collected by the suction air stream is detachably provided. The dirt container 6 is accommodated within the electric vacuum cleaner main body 1 by a dirt container lid 7 that is configured to be freely open therearound.

[0024] Provided at one end of the hose 2 is a connection pipe 10 that allows a connection between the dust container 6 and the hose 2, whereas a handle 8 having a control switch 11 for controlling the electric blower 5 of the electric vacuum cleaner main body 1 is provided at the other end thereof. The handle 8 is detachably connected at one end of the extension pipe 3 having dusts being passed therethrough, whereas the suction unit 4 is connected at the other end thereof by a rotatable arm 9 having a connection portion thereat.

[0025] Next, outer case construction of the suction unit 4 is discussed with reference to Figs. 2 and 3.

[0026] As shown in Fig. 2, an outer case is defined by a lower member 12 having a variety of functional components disposed therein and an upper member 13 that covers the functional components. In particular, through

openings 14a and 14b are provided at the right and left two opening locations in the lower and upper members 12 and 13 in the suction unit 4, which exclude regions that do not include the functional components. Further, the through openings 14a and 14b vertically pass through the lower and upper members 12 and 13.

[0027] Next, a summarized construction of outer case components which are incidental to the outer case of the suction unit 4 is discussed. Also shown in Figs. 2 and 3, an airflow controlling lever 17 for controlling the strength of suction air stream is, similar to its prior art invention, provided at the middle of the upper surface of the suction unit 4, and is configured to slidably move right to left or vise-versa by having an axle portion 15 connected therewith and inserted in a slot 16, the slot 16 being provided at the upper member 13. Reference numeral 18 is a protective rail, which is for guarding the upper member 13 from scratches and the like, which may be formed while the airflow controlling lever 17 is operated on the upper member 13 in a sliding manner. The protective rail 18 is formed in a recessed form so as to forcibly be in contact with the lower surface of the airflow controlling lever 17.

[0028] Further, a rotatable arm 9, which is rotatably supported by a snap-in connection of the lower and the upper member 12 and 13, is provided at the rear end of the suction unit 4. The rotatable arm 9 is formed with a link portion 54 and is provided at substantially the middle portion of the rear end of the suction unit 4. The first suction port 19 for suctioning dust is provided at the front end of the lower surface of the suction unit. Further, the second suction port 20 is provided at the rear end of the lower surface of the suction unit 4, which is not intended for a suction purpose. Further, a wall-shaped member 62, which is formed of a brush, is disposed around the second suction port 20 while facing the first suction port 19. In addition, a roller 32 which is for maintaining a specific distance from a target cleaning surface and is intended for the purpose of a smooth operation, is installed at the right to left and front to back ends of the lower surface of the suction unit 4.

[0029] Next, a detailed construction of functional components for the suction unit 4 is discussed with reference to Figs. 4 to 7.

[0030] At the front end of the lower member 12 of the suction unit 4, the first suction port 19 having a specific opening dimension in a length-wise direction is formed while facing a target cleaning surface 80 with an opening dimension that is close to the width of the suction unit 4. Reference numeral 22 is a rotating brush having a flexible member 23 rooted therein, which is formed on an axle body having a bar shape. The rotating brush 22 is a component for picking up accumulated dusts on the target cleaning surface. In the construction of the rotating brush 22, rotation bearings 24a and 24b are provided at two ends of the rotating brush 22. Further, at one end of the rotating brush 22, a gear 26 is provided to link a driving belt 25 that transmits driving means from a driving unit provided at an inner side of the suction unit 4.

[0031] Moreover, the rotating brush 22 is disposed at the upper surface of the first suction port 19 and the inner side of the suction unit 4. At a guide member 27 disposed on the inner wall of the suction unit 4, the rotation bearing 24b provided at one end of the rotating brush 22 is inserted to support the rotating brush 22. In the likely manner, a guide member 28 (Fig. 3) is provided while forming an inner wall 29 of the first suction port 19 by partitioning a portion of the lower member 12, where the guide member 28 is configured to accommodate the rotation bearing 24a of the rotating brush 22, the rotation bearing 24a being provided at the other end of the rotating brush 22. Further, the rotating brush 22 is detachably installed on the suction unit 4 while maintaining a closed state by a holder component 28b that allows a tight fixation with a vis 28a.

[0032] Further, as shown in Figs. 2 to 5, a space portion including the first suction port 19 and the rotating brush 22 is defined as a rotating brush chamber 34, where a dust suction inlet 42 is disposed at the lower end of a partition wall body 43 that is a separate detachable component, while dividers of a partition 41 installed and elongated from the lower and the upper member 12 and 13, is further provided thereat. Moreover, the rotating brush chamber 34 is located so that it faces the lower end of the airflow controlling lever 17 disposed at the upper end of the suction unit 4. In particular, the partition 41 of the dividers and the partition wall body 43 are fixedly engaged by forming a counter-lock mechanism that encircles therearound, thereby allowing a vertical insertion of the partition 41 and the partition wall body 43 jointly in the suction unit 4 in an air-tight manner.

[0033] Further, the upper portion of the partition wall body 43 is configured with a U-shaped groove 44 while facing the slot 16 provided at the upper member 13 of the suction unit 4. At the bottom surface of the U-shaped groove 44, a leakage opening 45, which communicates with the dust suction inlet 42 provided at the lower end of the partition wall body 43, is formed and in communication with the outside via the slot 16. As for the installation step for the airflow controlling lever 17 provided at the slot 16, the airflow controlling lever 17 is constructed by, first, slidably moving the upper surface of the suction unit 4, and vertically inserting the slot portion of the axle portion 47 extended to the lower end of the handle 46 which functions as an operational body for a user; then, inserting the airflow controlling lever 17 into the U-shaped groove 44 of the partition wall body 43.

[0034] One end of the axle portion 47 is adapted to press against a supporting component 49, which forms a closed surface for the leakage opening 45 provided at the bottom surface of the U-shaped groove 44 of the partition wall body 43 and serves the role of release-prevention means. In accordance with the above configuration, by manipulating the handle 46 of the airflow controlling lever 17, the opening of the leakage opening 45 is made to be closed by being slid thereon and it is possible to control the leakage size of the opening. From this, as the

degree of vacuum level within the rotating brush chamber 34 can be controlled, the suctioning force of the suction unit 4 for the target cleaning surface 80 can be controlled as well.

[0035] Reference numeral 35 is provided at the rear end of the rotating brush chamber 34 as shown in Figs. 4 to 7, and defined as a turbine chamber formed on a suctioning path of the electric vacuum cleaner main body 1. Similar to the rotating brush chamber 34, the turbine chamber 34 is a space portion partitioned with walls 31 and 33, the walls 31 and 33 including the counter-lock mechanism extended from the lower and upper member 12 and 13. The turbine chamber 35 is further configured to function as one of the suctioning path. Further, the turbine chamber 35 includes an air turbine 30 that mostly serves as a driving unit for the rotating brush 22 and the rotatable arm 9 including a link portion 54 that is for connecting the extension pipe 3. Hereinafter, constructions relating to functional means installed at the turbine chamber 35 will be discussed.

[0036] The air turbine 30 formed in a cylindrical shape includes a plurality of blades 36 that extends in a lengthwise direction of the suction unit 4 and forms side walls 37 at its two end portions. The air turbine 30 further includes an axle shaft 38 that protrudes to one side and passes through the middle of the side walls 37. In addition, bearing components 39 for reducing friction caused by rotation, a driving belt 25 for transmitting the rotation by the air turbine 20 to the rotating brush 22, and a bevel gear 40 for securing the driving belt 25 and reducing the rotation thereof are included. As for the bearing components 39, a lubricated metal bearing 39a provided at each end thereof is formed in a substantially cylindrical shape having a grease insertion slot provided at its middle portion, and is configured to allow rotation of the axle shaft 38 by having the axle shaft 38 passed therethrough. In addition, at one end of the axle shaft 38, the bevel gear 40 having a small radius is fixedly secured within the axle shaft 38 so as to disallow slippage therewithin, and it is also configured to be in synchronization with the rotation of the air turbine 30.

[0037] As for the shape of the outer case around the bevel gear 40, the driving belt 25 for transmitting rotation thereof to one end of the axle shaft 38 is disposed while being protruded from the air turbine 30 to a side direction and to one end of the suction unit 4. Therefore, the outer case that covers the above functional components is formed in a configuration that is protruded toward one end of the suction unit 4.

[0038] As for the protruded configuration of the above, minimum clearances are given for the functional means while avoiding any interference, and upper and lower components such as the turbine chamber 35 and the rotating brush chamber 34 are fixedly engaged together with each other by two lower and upper outer cases, each of the outer cases being extended from the lower and the upper member 12 and 13. In particular, as for the outer cases covering the axle shaft 38 protruded from

one front end of the rotating brush 22 for the suction unit 4 and from the middle of the turbine chamber 35 disposed at the rear end thereof, a configuration of a substantially square shape takes the functional means (the rotating brush 22, the turbine chamber 35, the bearing components 39 and the driving belt 25) as its four corners. Further, a through opening 14a having a penetrated opening shape that does not incorporate the outer case is formed at the middle portion of the outer cases.

[0039] Further, on the opposite side of the through opening 14a, when the middle of the turbine chamber 35 is considered as a middle portion, an outer case having a through opening 14b is disposed in a like manner. This outer case does not dispose any functional means to the outside thereof and prevents tilting of the suction unit 4 caused by a weight unbalance of the left and the right when lifting the suction unit 4 (i.e., when it is maintained in the air). Further, the through openings 14a and 14b, as shown in Fig. 8, allow the suction unit 4 to be hung by a mounting hook A or the like at home.

[0040] The rotatable arm 9 is formed with the link portion 54 that enables detachable installation of the extension pipe 3 at a suction controllable portion 53 having rotation shafts 51 and 52 provided at two ends thereof along the entire width of the turbine chamber 35, the extension pipe 3 functioning as a connecting unit for the electric vacuum cleaner main body 1 and the suction controllable portion 53 being formed in a substantially cylindrical shape. Further, the rotatable arm 9 is configured to freely rotate by the shaft supported configuration having the walls 31 and 33 of the lower and upper member 12 and 13 for support.

[0041] Further, the air turbine 30 is disposed inside of the suction controllable portion 53. The axle shaft 38 is protruded toward one side from the air turbine 30, and the air turbine 30 is configured to continuously rotate by having each bearing component 39 passed through within the axle shaft 52 of the rotatable arm 9. Further, the rotatable arm 9 is allowed to pivot upwardly and downwardly by determining the pivoting point from the connection of the link portion 54 within a restricted range 55 of the upper member 13 for the suction unit 4.

[0042] A second suction port 20, which passes through the lower member 12 of the suction unit 4 and is in a grid patterned shape, is provided at the inner lower surface of the turbine chamber 35. The second suction port 20 is closed while the suction unit 4 is slid on the target cleaning surface 80, and when lifting the suction unit 4, the second suction port 20 is made to be opened while suctioning ambient air. Since the second suction port 20 is disposed while not facing the air turbine 30, the suctioned ambient air is made to flow along a path 81 without having to pass through the air turbine 30. Therefore, the second suction port 20 serves to reduce pressure only for a path air stream 82 that passes through the dust suction inlet 42 and the air turbine 30.

[0043] That is, since the driving force of the air turbine 30, which acts as a rotation means for the rotating brush

22, is decreased by the above pressure reduction by the second suction port 20, the number of rotation by the rotating brush 22 is similarly reduced in effect, the rotating brush 22 being exposed when the suction unit 4 is lifted.

This reduction in the number of rotation of the rotating brush 22 serves to reduce dangerousness in operation.

[0044] Further, a wall-shaped member 62, which is rotated with a flexible brush, is disposed around the second suction port 20 facing the target cleaning surface 80 and at the outer case of the lower member 12 forming the second suction port 20. The wall-shaped member 62 serves to fill a closing inadequacy caused by a gap distance 63 having a height of about that of the roller 32 at a state in which the suction unit 4 is in contact with the target cleaning surface 80 made of, for example, hard floor material or the like. In the state when the suction unit 4 is in contact with the target cleaning surface 80, the dust collecting performance of the suction unit 4 is depended on the level of closeness between the target cleaning surface 80 and the bottom of the suction unit 4, for example, between the target cleaning surface 80 and the roller. That is, as the level of closeness of the target cleaning surface 80 is enhanced, the degree of vacuum is also increased. Therefore, improvement on the level of closeness is desired.

(Embodiment 2)

[0045] Next, configuration of a suction unit in accordance with a second embodiment of the present invention is discussed with reference to Figs. 9 and 10. As shown in Fig. 9, it is generally in line with the configuration of the first embodiment of the present invention. In accordance with the second embodiment of the present invention, a guard unit 91 formed of a flexible material is provided at the inner sides of the outer cases for the through openings 14a and 14b provided at the left and the right sides of the turbine 35 from the middle of the suction unit 4, the through openings 14a and 14b being formed while passing through the lower and the upper member 12 and 13.

[0046] As for the detail description of the configuration, as shown in Fig. 10, the outer cases of the lower and upper member 12 and 13, which are formed by being connected to the rotating brush 34 of the front end from the side of the suction unit 4 while being protruded from the side surface of the turbine chamber 35, are inserted into an upper and a lower groove 92 and 93 of the guard unit 91 having a substantially H shaped cross section. In specific, the insertion covers the entire circumstance of the inner sides of the outer cases for the through openings 14a and 14b having through openings. As for the effectiveness of the configuration, as discussed in the first embodiment of the present invention, a mounting hook may be used for hanging the suction unit 4, and due to the inclusion of the flexible guard unit 91, for example, between an engaging portion of the hook and the through openings 14a and 14b, the suction unit 4 is pre-

vented from being scratched.

(Embodiment 3)

[0047] Next, configuration of a suction unit in accordance with a third embodiment of the present invention is discussed with reference to Figs. 11 and 12. It is in general in line with the configuration of the first embodiment of the present invention, and only different portions are discussed hereinafter. At the inner sides of the outer cases for the through openings 14a and 14b provided at the left and the right side of the turbine 35 from the middle of the suction unit 4, the through openings 14a and 14b being formed, while passing through the lower and the upper member 12 and 13, a closed surface 101 and recess portions 102 and 103, is formed at the upper end of the outer cases for the suction unit 4. Further, a cover component 104, which can be freely opened and closed, and a through hole 107 are attached to the wall surface of the recess portion 102 of the upper end of the outer case for the rotating brush chamber 34. The cover component 104, as shown in Fig. 12, faces the inner wall of the rotating brush chamber 34 and is formed with a curved plate having a handle portion 105.

[0048] Further, the cover component 104 is attached by being slidably inserted due to a supporting rib 106 provided at the inner wall of the outer case for the rotating brush chamber 34. When using the suction unit 4 in a typical manner, the suction unit 4 is normally closed and opened only by the operation of the user when desired. As for the effectiveness of the configuration in the third embodiment of the present invention, since the closed surface 101 serves as reinforcing walls for the through openings 14a and 14b, the suction power of the suction unit 4 is improved, and the recess portion 102 prevents suctioning from the front end of the suction unit 4.

[0049] Further, since the recess portion 102 acts as a part that allows direct contact temporarily with any rough and large dusts or wastes picked by the user, the user can have an access to the suction path by opening the cover component 104. Therefore, it is not necessary to perform additional suction process operation, such as separation of the suction unit 4 from the extension pipe 108 (Fig. 1), thereby improving the usability for the user. Further, since the cover compartment 104 is opened only when desired, the rotating brush chamber 34 is prevented from being deteriorated in its degree of vacuum level, thereby preventing deterioration of dust collecting performance thereof.

(Embodiment 4)

[0050] Next, configuration of a suction unit in accordance with a fourth embodiment of the present invention is discussed with reference to Figs. 13 and 14. It is in general in line with the configuration of the third embodiment of the present invention, and only different portions are discussed hereinafter.

[0051] A through hole 115 and a cover component 110 that can be freely opened and closed are attached to the wall surface of the recess portion 102 of the upper end of the outer case for the turbine chamber 35. The cover component 110, as shown in Fig. 13B, faces the inner wall of the turbine chamber 35 and is formed with a curved plate having a handle portion 111.

[0052] Further, the cover component 110 is attached by being slidably inserted due to a supporting rib 112 provided at the inner wall of the outer case for the turbine chamber 35. When using the suction unit 4 in a typical manner, the suction unit 4 is normally closed and opened only by the operation of the user when desired. As for the effectiveness of the configuration in the fourth embodiment of the present invention, it is in most similar to the third embodiment of the present invention. However, since an additional inserting portion is formed at where the degree of vacuum level is high, more powerful suctioning can be obtained when compared to a case having communication with one location of suction port.

[0053] In this manner, an electric vacuum cleaner and a vacuum cleaner suction unit in accordance with the present invention, based on miniaturization, can solve a storage issue and enable to deal with rough and large dusts or wastes, thereby improving applicability for user.

[0054] While the invention has been shown and described with respect to the embodiments, it will be understood by those skilled in the art that various changes and modification may be made without departing from the scope of the invention as defined in the following claims.

Claims

1. A vacuum cleaner suction unit, comprising:

an outer case; and
an opening portion passed through in a vertical direction, the opening portion formed by the outer case.

2. The vacuum cleaner suction unit of claim 1, wherein a direction of a longer side in the opening portions corresponds to a direction of a width of the suction unit.

3. The vacuum cleaner suction unit of claim 1 or 2, further comprising:

a guard member made of a flexible material is provided at an inner periphery of the opening portion.

4. A vacuum cleaner suction unit, comprising:

an outer case;
an opening portion formed by the outer case;

and
a recess portion provided at the opening portion
by forming a closed surface at the opening portion.

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5. The vacuum cleaner suction unit of claim 4, further comprising:

a suction port; and
a first through hole, which is in communication with the suction port, disposed at one end of the recess portion.

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6. The vacuum cleaner suction unit of claim 5, further comprising:

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a first cover part, capable of being freely opened and closed, disposed at the first through hole.

7. The vacuum cleaner suction unit of claim 4, further comprising:

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a dust inner suction path provided at a middle of the suction unit; and
a second through hole, which is in communication with the dust inner suction path, provided at one end of the recess portion provided.

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8. The vacuum cleaner suction unit of claim 7, further comprising:

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a second cover part, capable of being freely opened and closed, disposed at the second through hole.

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9. The vacuum cleaner suction unit of any one of claims 1 to 8, wherein the suction unit includes:

a rotating brush;
a driving unit for driving the rotating brush; and
a transmitting unit for transmitting a driving force from the driving unit to the rotating brush, wherein the transmitting unit is disposed in the outer case.

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10. An electric vacuum cleaner comprising the vacuum cleaner suction unit of any one of claims 1 to 9.

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FIG. 1

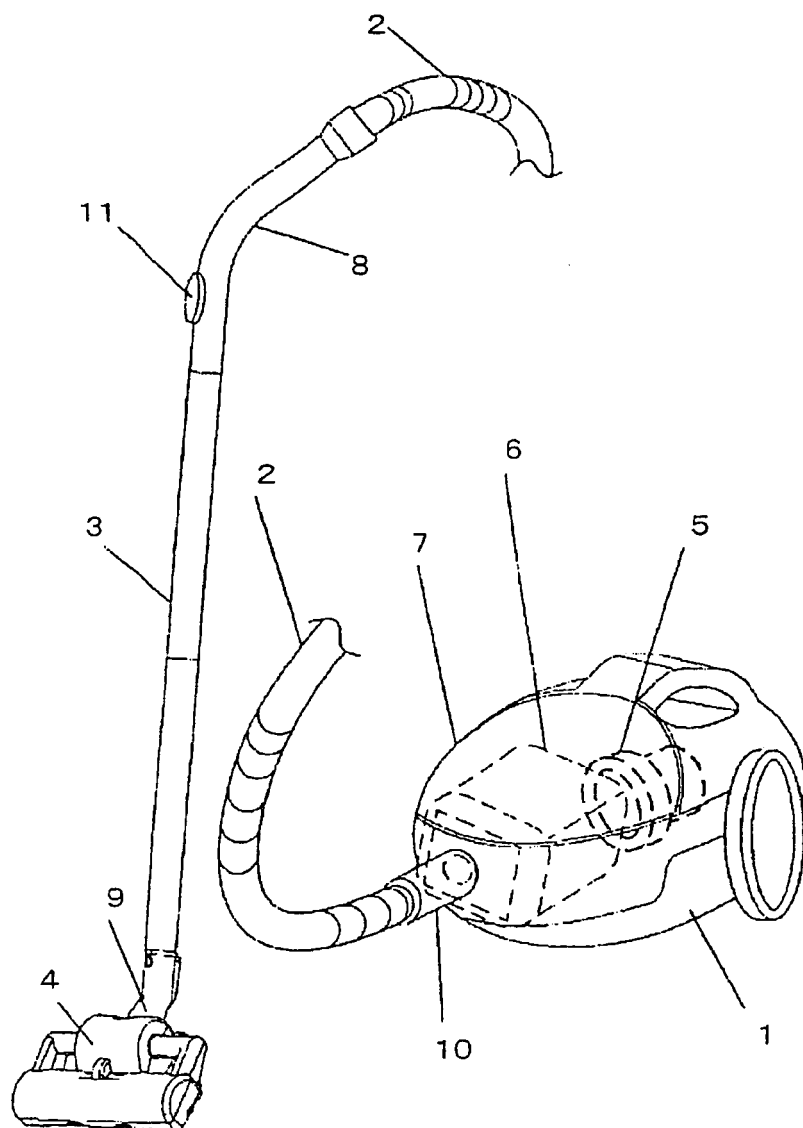


FIG.2

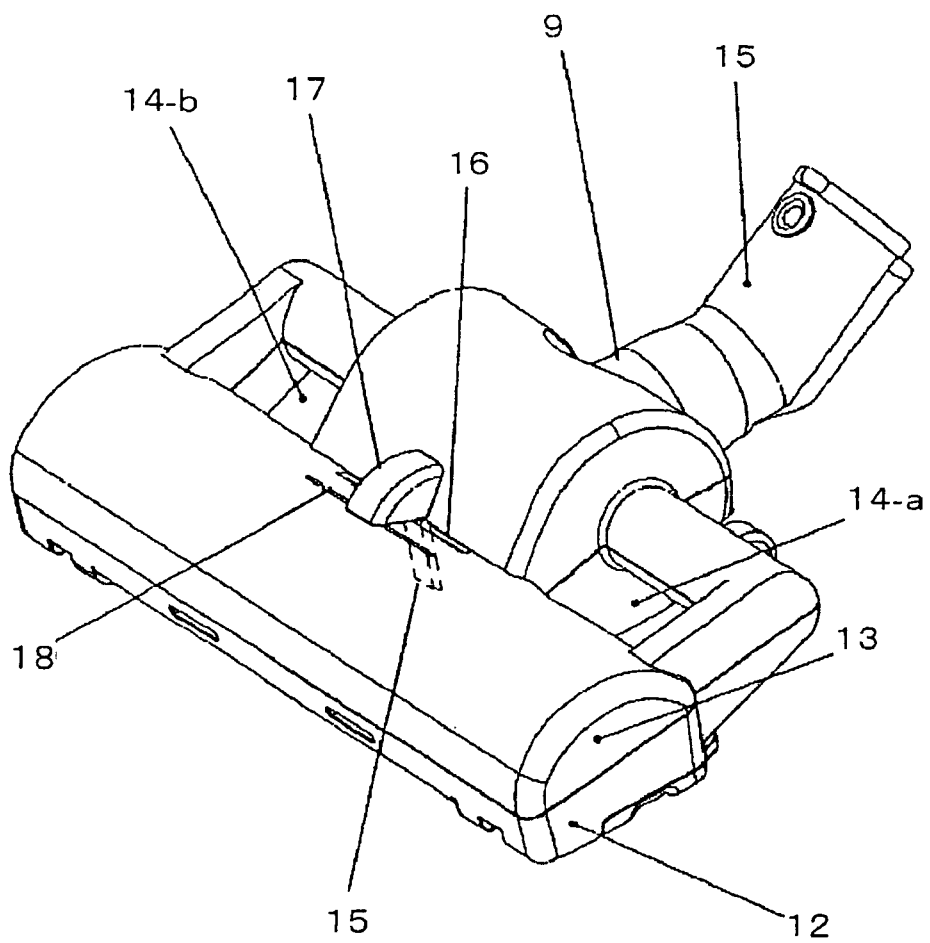


FIG. 3

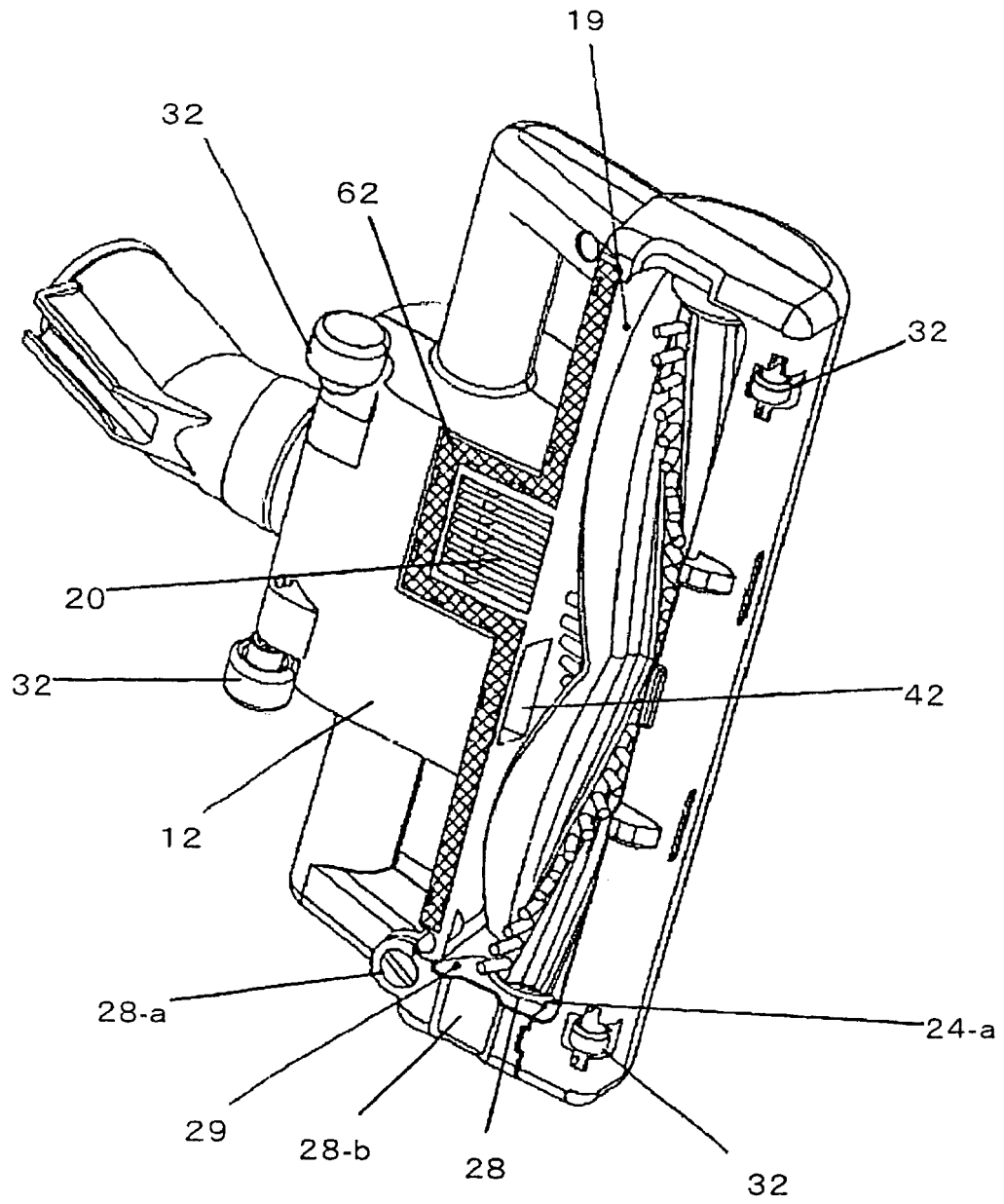


FIG. 4

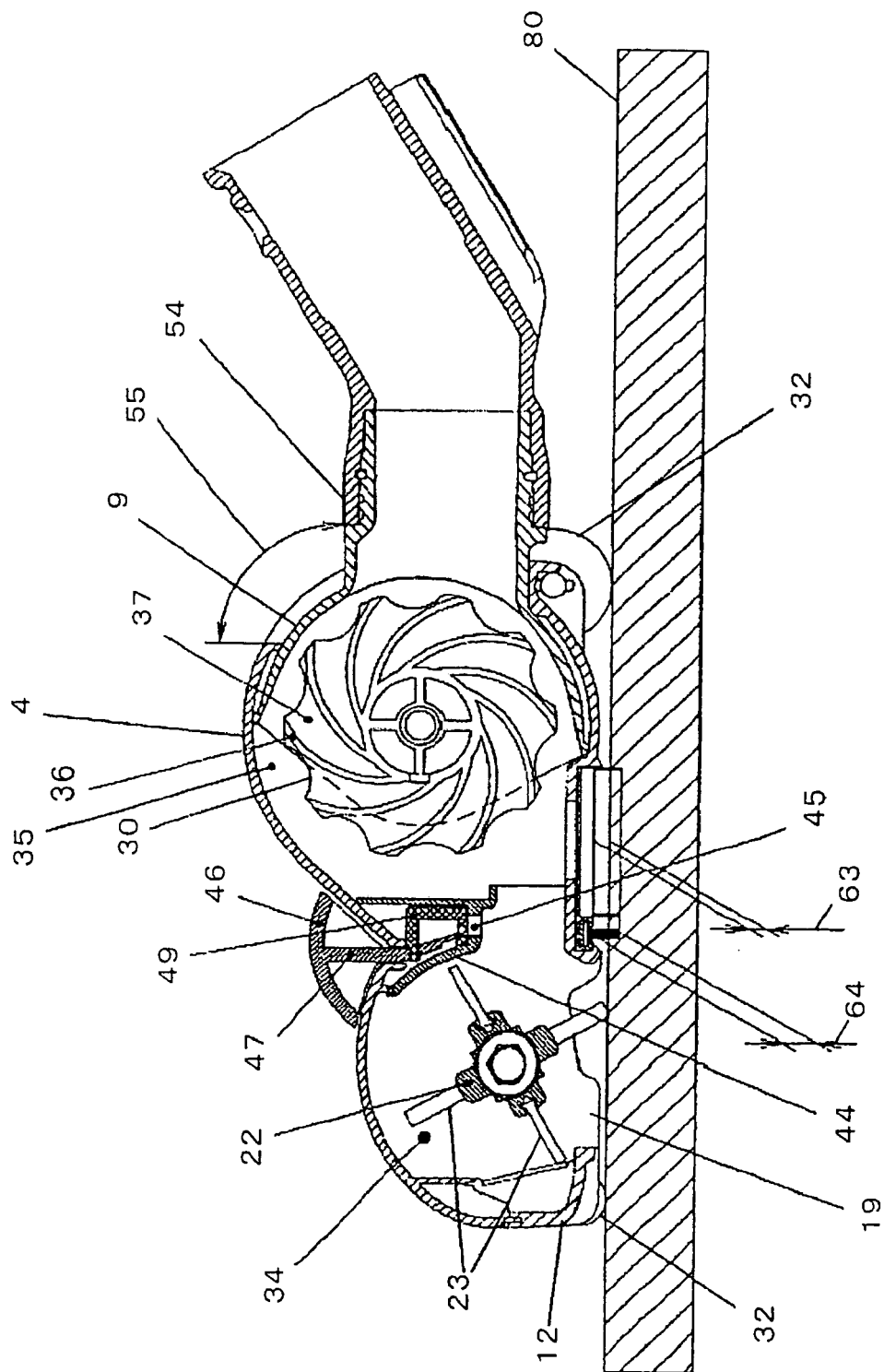


FIG.5

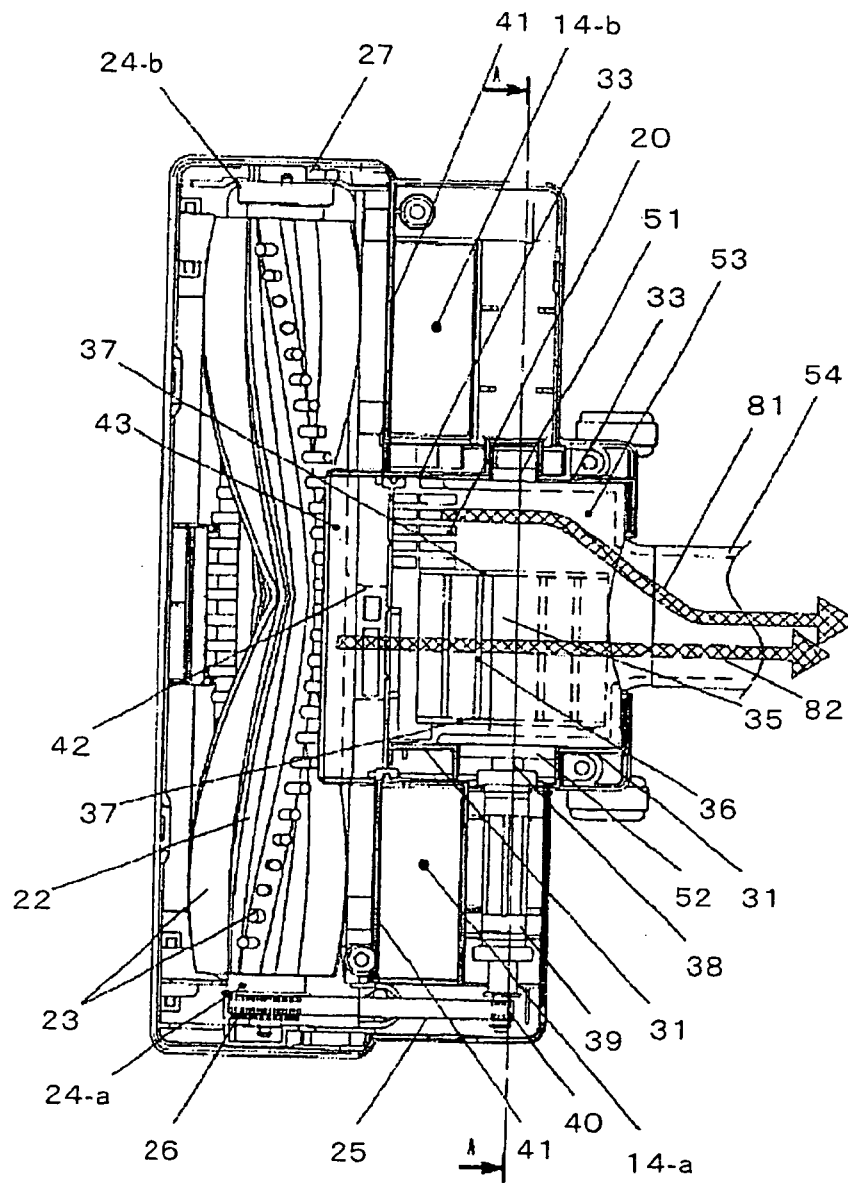


FIG. 6

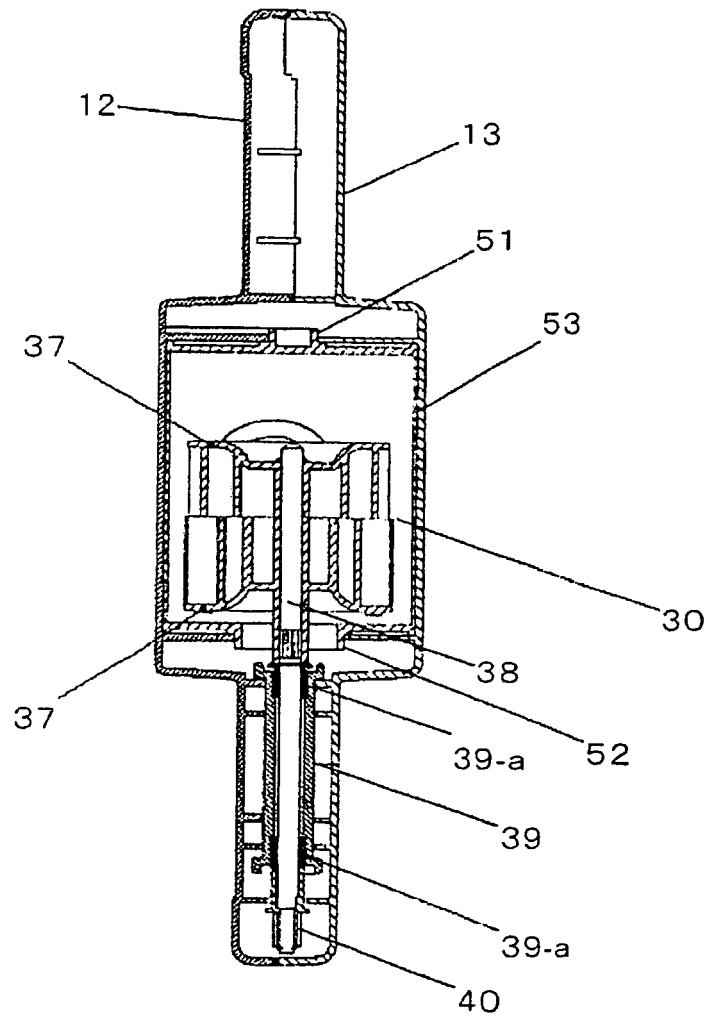


FIG. 7

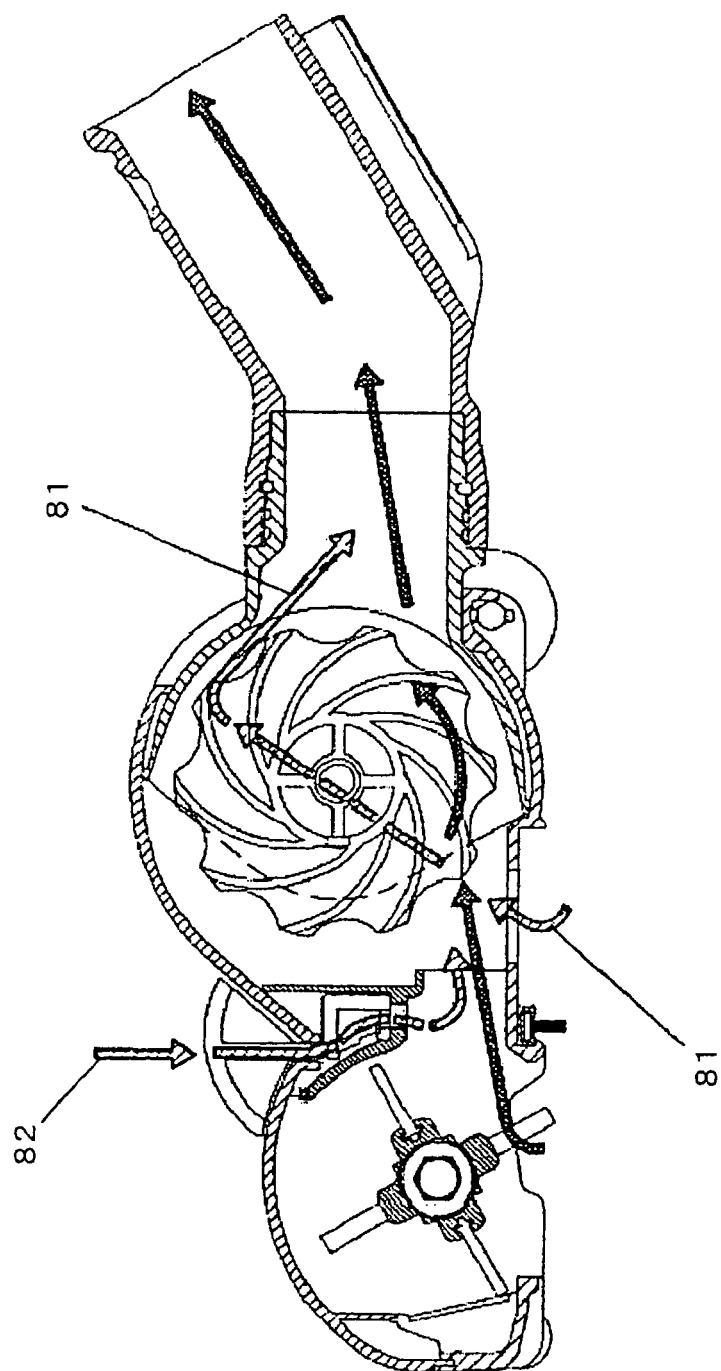


FIG. 8

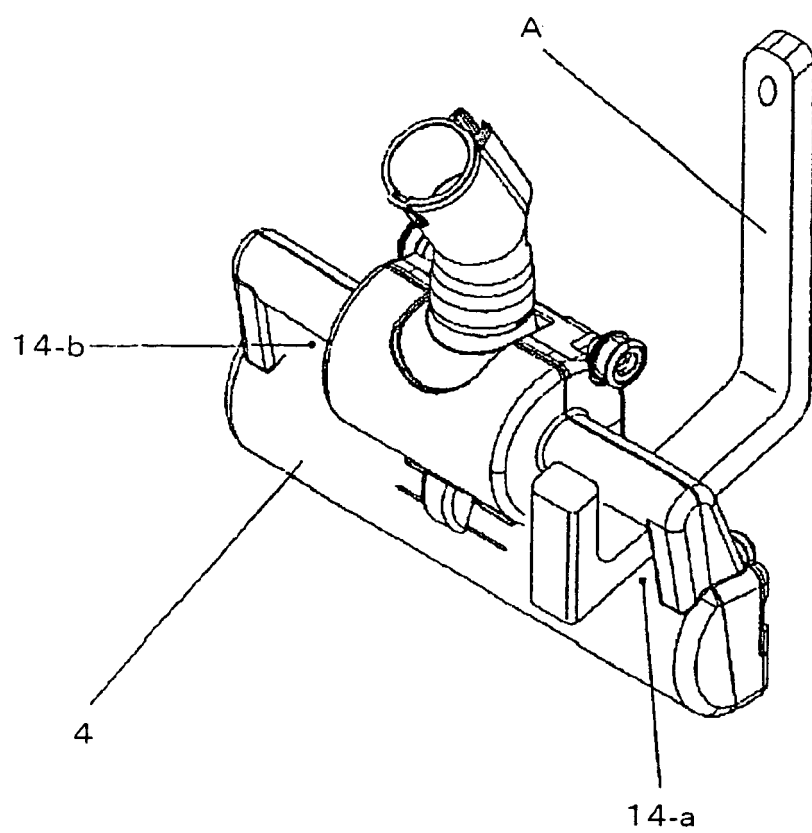


FIG. 9A

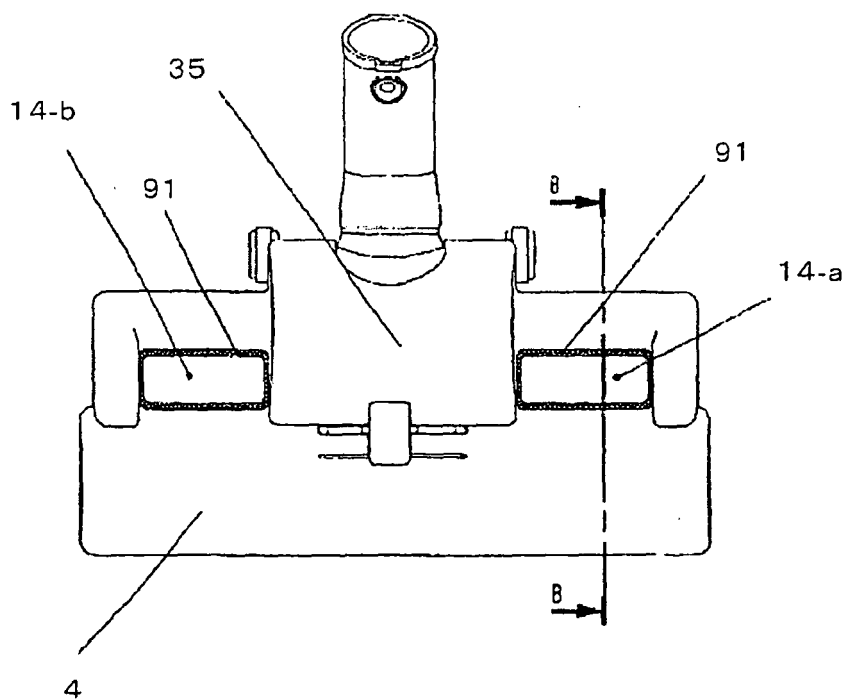


FIG. 9B

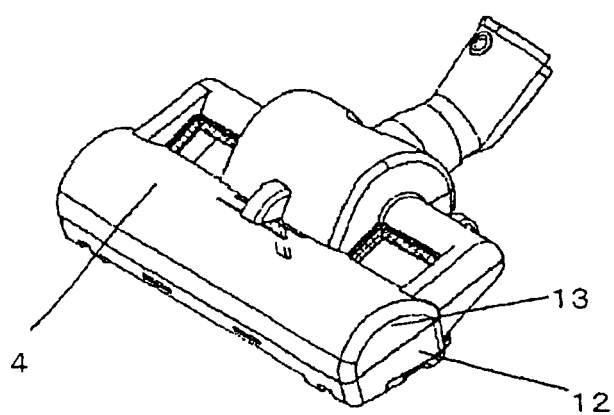


FIG. 10

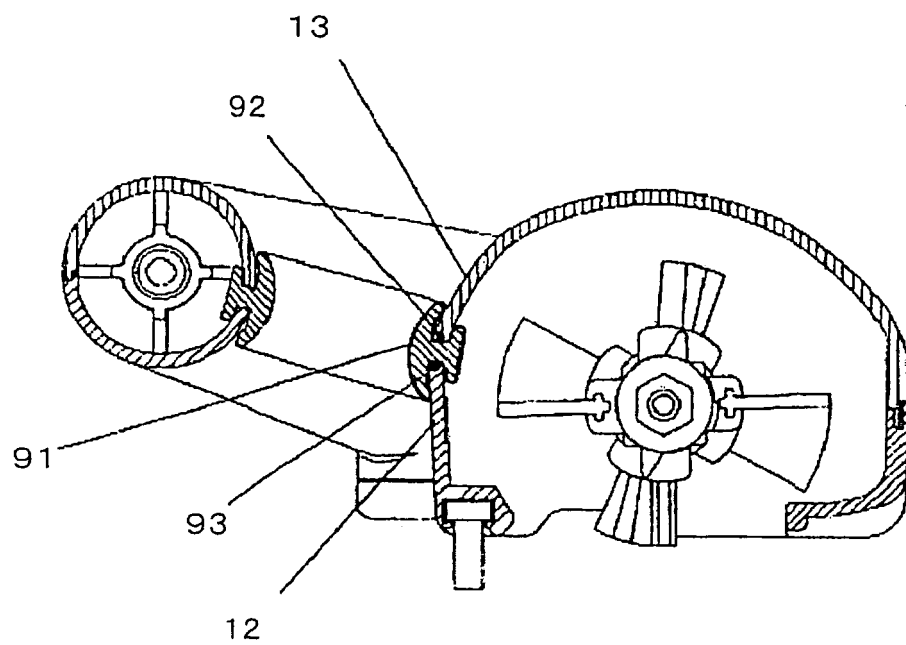


FIG. 11

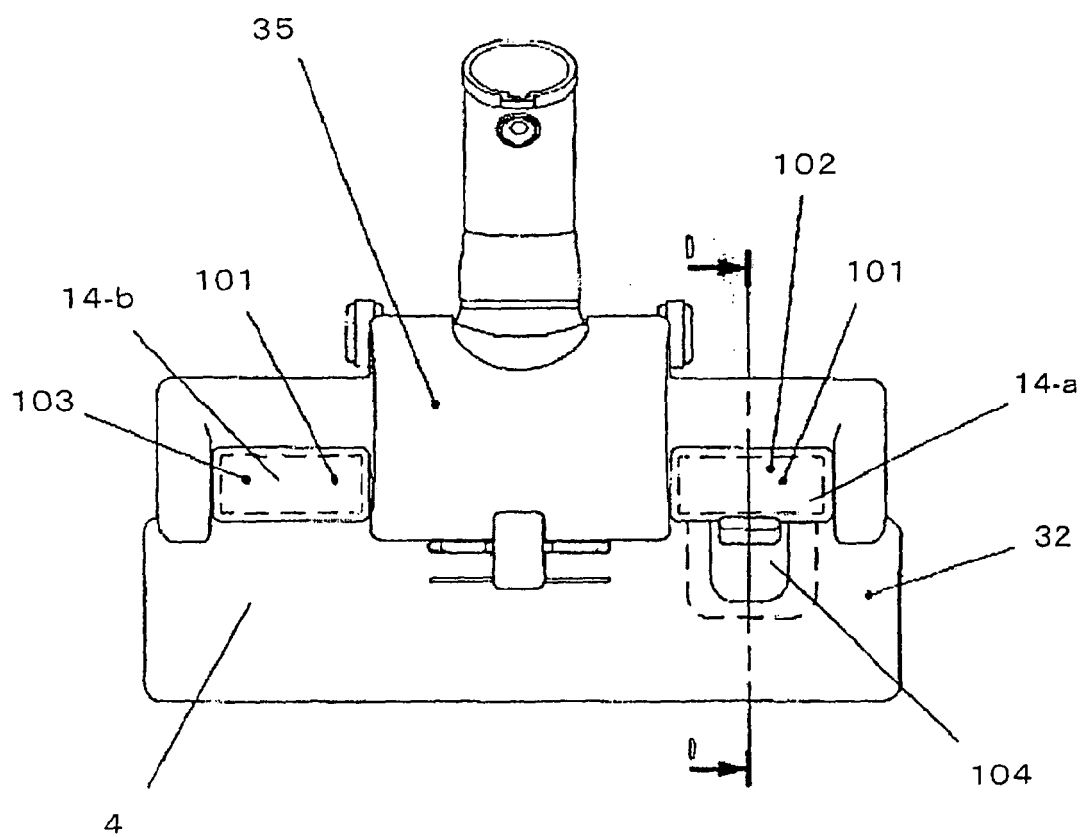


FIG. 12A

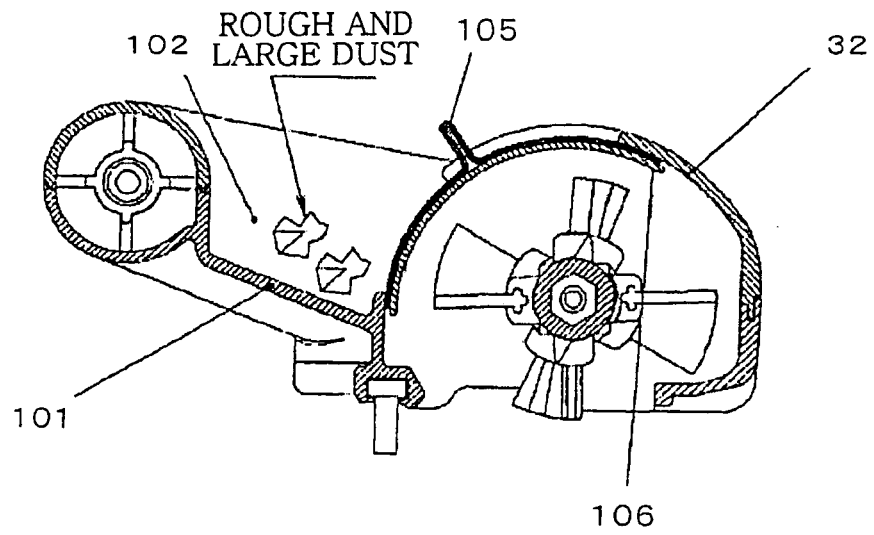


FIG. 12B

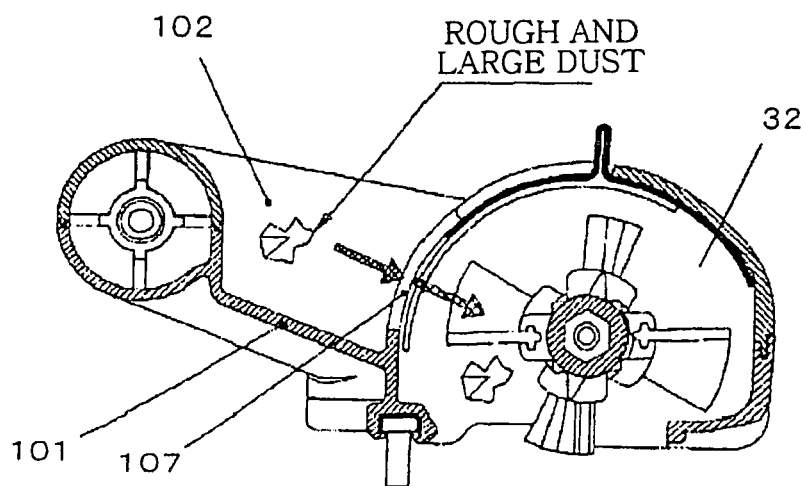


FIG. 13A

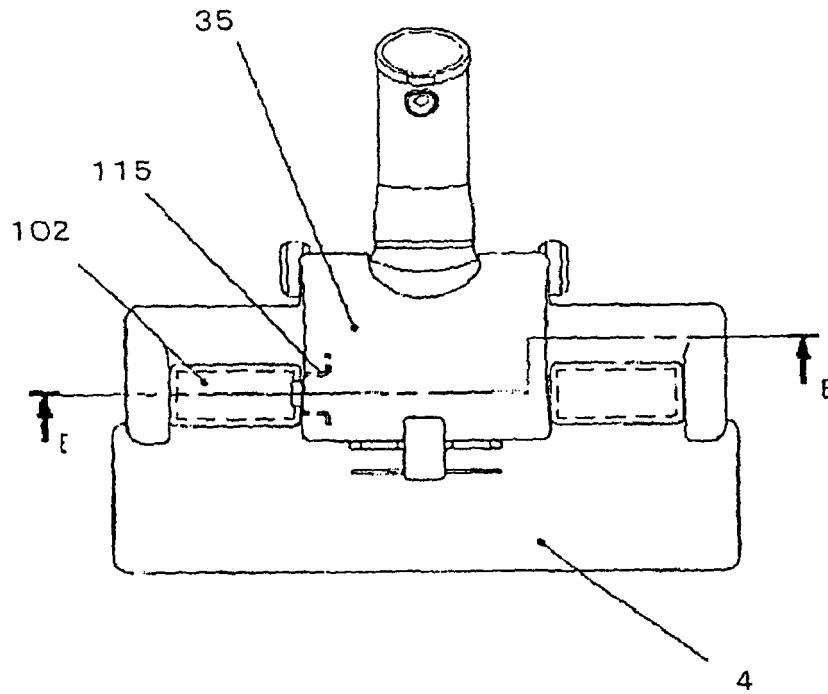


FIG. 13B

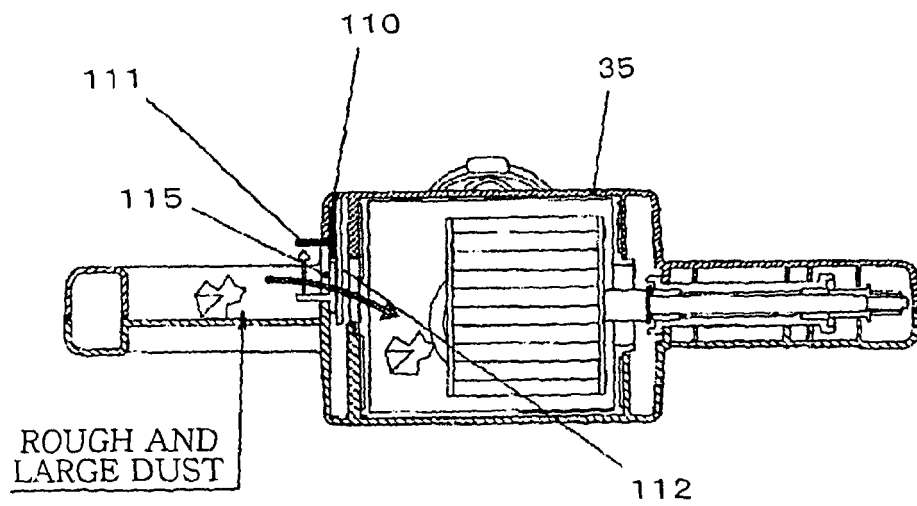


FIG. 14

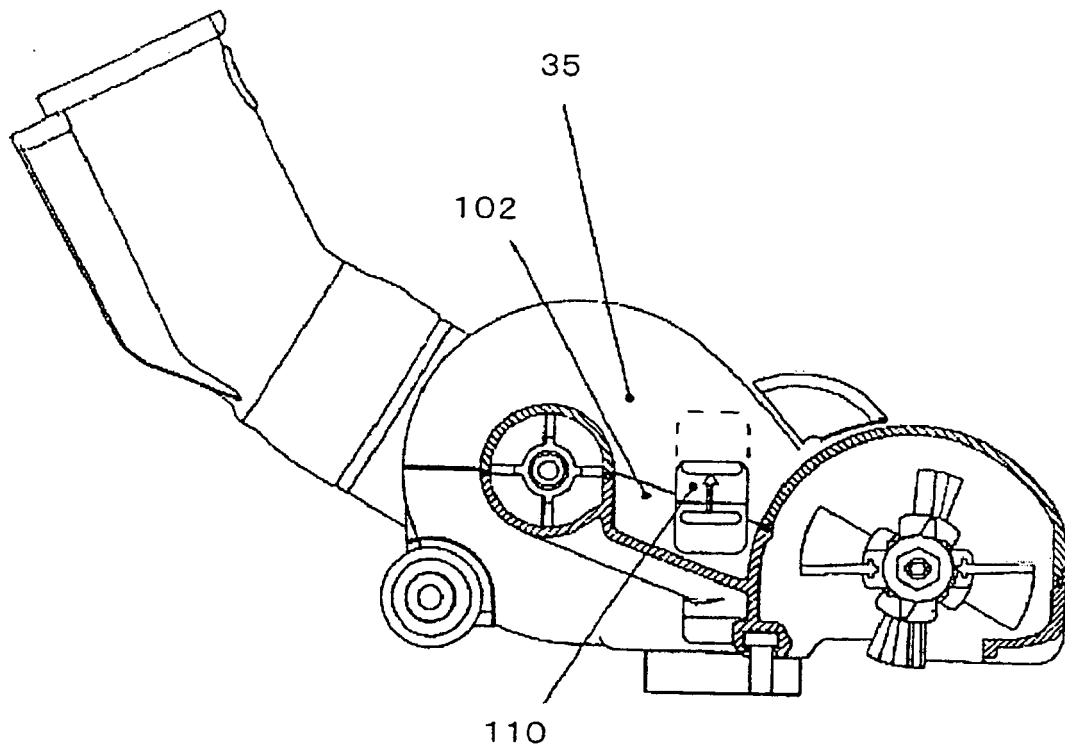


FIG. 15

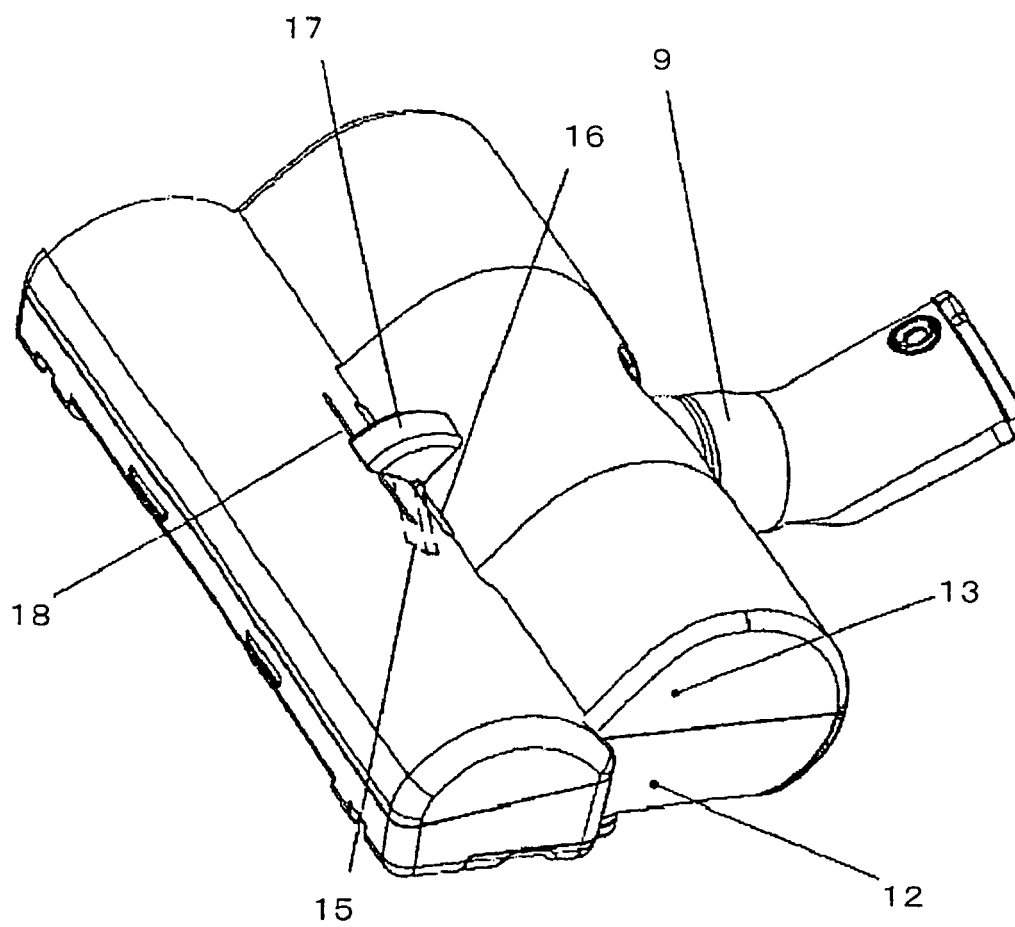
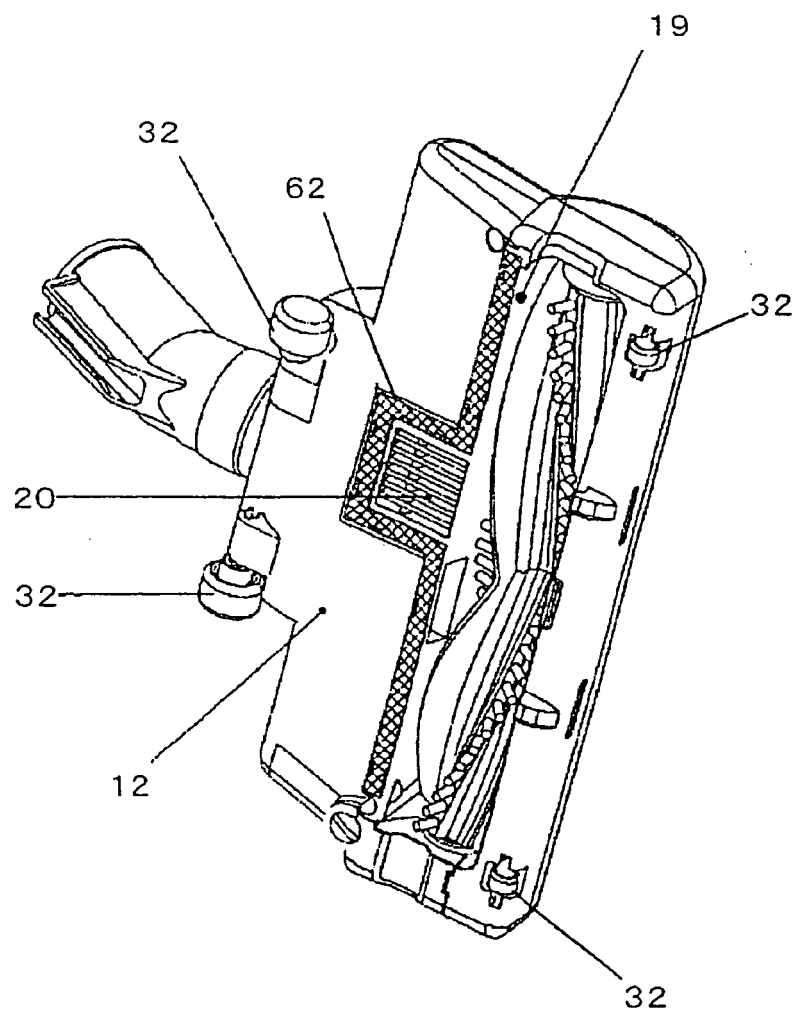


FIG. 16



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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