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(54) **ELECTRIC CLEANER**

(57) An electric blower 51 is covered by a first electric blower cover 52, and the first electric blower cover 52 is covered by a second electric blower cover 53 to insulate driving noise of the electric blower 51. An exhaust air from the electric blower 51 is exhausted from the exhaust ports 49 after passing through the first electric blower cover 52, the second electric blower cover 53, and the exhaust air passage chamber 35. Wind noise that becomes loud particularly due to concentrated passage of a large volume of air through a narrow and short air passage is absorbed by securing an exhaust air passage length and accordingly, noise reduction performance is improved.

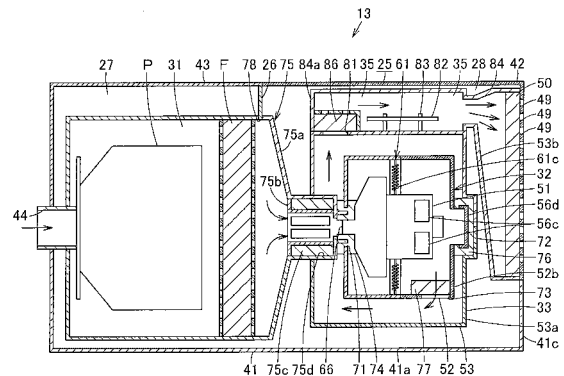


FIG. 1

**Description**

## TECHNICAL FIELD

**[0001]** The present invention relates to an electric vacuum cleaner including an electric blower housed in a main body case.

## BACKGROUND ART

**[0002]** Conventionally, this type of electric vacuum cleaner includes a cleaner main body including a hollow main body case and a substantially cylindrical electric blower housed in this main body case. Inside the main body case, a main body dust collecting chamber and an electric blower chamber housing an electric blower are partitioned in the front-rear direction by a partition. In the partition, a communication hole that makes communication between the main body dust collecting chamber and the electric blower chamber is opened. The main body dust collecting chamber communicates with the outside of the main body case via a suction port formed in the main body case. The electric blower chamber communicates with the outside of the main body case via an exhaust port formed in the main body case. Further, the electric blower is configured so that a fan cover covering a centrifugal fan to be driven to rotate by an electric motor part is integrally attached to a motor case housing the electric motor part. The periphery of the fan cover on the suction side, that is, the front end side of the electric blower and the end portion on the rear end side of the motor case that is the exhaust side of the electric blower are respectively fixed to the electric blower chamber of the main body case via vibration isolating members, and in this fixed state, the suction side of the electric blower communicates with the rear portion of the communication hole of the partition (for example, refer to Patent Document 1).

## CITATION LIST

## Patent Literature

**[0003]**

PTL 1: Japanese Patent Publication No. 2745700 (pp. 2-3, Fig. 2)

## SUMMARY OF INVENTION

## Technical Problem

**[0004]** The electric blower causes operation noise when the centrifugal fan cuts wind. Therefore, with the above-described configuration, the operation noise caused by driving of the electric blower easily leaks to the outside, and this creates a problem that noise reduction is not easy.

**[0005]** In addition, it is not easy to secure a sufficient length of an exhaust air passage through which exhaust air from the electric blower is exhausted from the main body case to the outside, and a large volume of air passes through the exhaust air passage at one time, so that wind noise is caused in this exhaust air passage, and this also creates a problem that noise reduction is not easy.

**[0006]** The present invention was made in view of these circumstances, and an object thereof is to provide an electric vacuum cleaner with improved noise reduction performance.

## Solution to Problem

**[0007]** An electric vacuum cleaner of the present invention includes a first electric blower cover that has a first cover exhaust port and covers an electric blower, a second electric blower cover that has a second cover exhaust port, covers at least a part of the first electric blower cover, and supports this first electric blower cover, and a case body in which an enclosed space for making communication between the second cover exhaust port of the second electric blower cover and the exhaust port of the main body case is partitioned.

## Advantageous Effect of Invention

**[0008]** According to the present invention, operation noise caused by driving of the electric blower is insulated by covering at least a part of the first electric blower cover covering the electric blower by the second electric blower cover, and by exhausting exhaust air from the electric blower from the exhaust port after passing through the first electric blower cover, the second electric blower cover, and the enclosed space, a length of an exhaust air passage is secured and wind noise caused by a large volume of air is absorbed, whereby improving the noise reduction performance.

## BRIEF DESCRIPTION OF DRAWINGS

**[0009]**

Fig. 1 is an explanatory view schematically showing an internal structure of an electric vacuum cleaner according to an embodiment of the present invention.

Fig. 2 is a longitudinal sectional view showing an essential portion of the same electric vacuum cleaner.

Fig. 3 is a perspective view of the same electric vacuum cleaner.

## DESCRIPTION OF EMBODIMENTS

**[0010]** Hereinafter, a configuration of an embodiment of the present invention will be described with reference to Fig. 1 to Fig. 3.

**[0011]** In Fig. 3, the reference numeral 11 denotes a so-called canister-type electric vacuum cleaner, and this electric vacuum cleaner 11 includes a tube part 12 and a cleaner main body 13 to which the tube part 12 is removably connected.

**[0012]** The tube part 12 includes a connection tube part 15 to be connected to the cleaner main body 13, a flexible hose body 16 communicating with the tip end side of the connection tube part 15, a hand operation part 17 provided on the tip end side of this hose body 16, an extension tube 18 removably connected to the tip end side of the hand operation part 17, and a floor brush 19 as a suction port body removably connected to the tip end side of the extension tube 18.

**[0013]** On the hand operation part 17, a grip part 21 projects to the hose body 16 side, and on this grip part 21, a plurality of set buttons 22 for operations are provided.

**[0014]** The cleaner main body 13 includes, as shown in Fig. 1 and Fig. 2, a hollow main body case 25, and inside this main body case 25, a partition 26 is formed in a substantially intermediate region in the front-rear direction, a front chamber 27 is partitioned forward of this partition 26, and a rear chamber 28 is partitioned rearward of the partition 26. Inside the front chamber 27, a main body dust collecting chamber 31 is partitioned, and inside the rear chamber 28, an electric blower chamber 33 housing an electric blower part 32, a cord reel chamber not shown housing a cord reel around which a power cord not shown for supplying electric power to the electric blower part 32, etc., is wound, and an exhaust air passage chamber 35 as an enclosed space, are partitioned, respectively. Specifically, the main body case 25 has a multiple structure in which the main body dust collecting chamber 31 is partitioned in the front chamber 27, and the electric blower chamber 33, the cord reel chamber, and the exhaust air passage chamber 35 are partitioned in the rear chamber 28.

**[0015]** The main body case 25 is made of, for example, a synthetic resin, etc., and includes a lower case 41 whose upper side is opened, an upper case 42 covering the rear chamber 28 that is an upper rear portion of the lower case 41, and a lid body 43 that is axially supported turnably in the up-down direction on the upper case 42 or the lower case 41, covers the front chamber 27, and makes the main body dust collecting chamber 31 openable and closable. In the front portion of the main body case 25, a main body suction port 44 as a suction port is opened.

**[0016]** The lower case 41 is formed into a box shape whose upper side is opened, having a bottom surface 41a opposed to the lower portion of the electric blower part 32, side surfaces 41b (only one side surface is shown) opposed to the side portions of the electric blower part 32, respectively, and a rear surface 41c opposed to the rear portion of the electric blower part 32. On the side surfaces 41b of the lower case 41, traveling wheels 46 that enable the cleaner main body 13 to travel on a floor

surface as a surface to be cleaned are axially supported rotatably, respectively.

**[0017]** On the upper portion of the upper case 42, a handle part 48 for carrying the cleaner main body 13 is formed across the left-right direction. In the rear portion of the upper case 42, a plurality of exhaust ports 49 communicating with the electric blower chamber 33 are opened toward the rear upper side, and to the exhaust ports 49, an exhaust port filter 50 is attached.

**[0018]** The lid body 43 is axially supported at its rear portion on the upper case 42 or the lower case 41 so as to become turnable in the up-down direction, and is configured so as to open the main body dust collecting chamber 31 in an upward turned state and close the main body dust collecting chamber 31 in a downward turned state.

**[0019]** The main body suction port 44 makes communication between the main body dust collecting chamber 31 and the outside of the main body case 25. To this main body suction port 44, a connection tube part 15 (Fig. 3) is communicatively connected in a removable manner.

**[0020]** The main body dust collecting chamber 31 is a portion in which dust suctioned together with air via the tube part 12 (Fig. 3) is trapped by driving of the electric blower part 32, and a dust collecting bag P, for example, such as a paper pack is attachable to the inside of the main body dust collecting chamber, and a dust collecting chamber filter F is attached to the upstream side of the partition 26 on the downstream side of the dust collecting bag P.

**[0021]** The electric blower part 32 includes an electric blower 51, a first electric blower cover 52 covering this electric blower 51, and a second electric blower cover 53 covering this first electric blower cover 52.

**[0022]** The electric blower 51 is configured so that a fan cover 58 covering a centrifugal fan 57 to be driven to rotate by an electric motor part 55 is joined integrally to a motor case 56 housing the electric motor part 55. The electric blower 51 is disposed so that the electric motor part 55 (motor case 56) side comes to the rear side and the centrifugal fan 57 (fan cover 58) side comes to the front side and the front side is slightly inclined downward with respect to the horizontal direction.

**[0023]** The electric motor part 55 can rotate a rotary shaft 55a in a predetermined direction by generating a rotating magnetic pole in a rotor not shown formed integrally with a rotary shaft 55a and a commutator not shown, and generating a fixed magnetic pole in a tubular stator not shown positioned around this rotor.

**[0024]** The motor case 56 includes a case main body 56a formed into a substantially bottomed cylindrical shape constituting the outer frame of the electric motor part 55, and an attaching plate part 56b to which the opening side of the case main body 56a is attached across the radial direction. In the case main body 56a, a plurality of blower exhaust ports 56c are opened. At the center portion of the rear end portion of the case main body 56a, a substantially cylindrical motor head part 56d is formed to project rearward. Further, the outer periphery

of the case main body 56a is elastically suspended and supported on the first electric blower cover 52 via a suspending means 61.

**[0025]** The motor head part 56d houses such as a bearing not shown and a thrust spring elastically supporting this bearing. The rotary shaft 55a is axially supported rotatably by the bearing and a bearing housed in the attaching plate part 56b of the motor case 56.

**[0026]** The suspending means 61 includes coaxially a ring-shaped inner support portion 61a to be fixed to the periphery of the case main body 56a and a ring-shaped outer support portion 61b to be fixed to the first electric blower cover 52 side, and between these support portions 61a and 61b, a plurality of coil springs 61c as energizing means are disposed. Specifically, the coil springs 61c are disposed radially with respect to the electric blower 51. In addition, the coil springs 61c are preferably disposed at substantially even intervals in the circumferential direction. The suspending means 61 is disposed so as to suspend the gravity center position of the electric blower 51 or a position near the gravity center on the first electric blower cover 52.

**[0027]** The centrifugal fan 57 blows out air suctioned from the center portion to the outer peripheral side, and is joined to one end portion of the rotary shaft 55a and positioned outside the motor case 56, here, the front side of the motor case. Around this centrifugal fan 57, a rectifierplate 64 for leading the air blown out from the centrifugal fan 57 to the outer peripheral side into the case main body 56a while rectifying the air is disposed. The centerportion of this rectifier plate 64 is fixed to the attaching plate part 56b of the motor case 56.

**[0028]** The fan cover 58 covers the centrifugal fan 57 and the rectifier plate 64 and is fixed to the front side of the case main body 56a of the motor case 56. This fan cover 58 is formed into a substantially covered cylindrical shape having a circular suction port 66 opened in the center portion.

**[0029]** The first electric blower cover 52 is formed into a substantially cylindrical shape from, for example, a synthetic resin, etc. This first electric blower cover 52 has a circular first cover suction port 71 opened in a front end portion as one end portion, and a substantially cylindrical head housing 72 is formed to project rearward integrally on the rear end portion as the other end portion for housing the motor head part 56d of the electric blower 51. Further, in the lower portion of this first electric blower cover 52, a first cover exhaust port 73 is opened so as to be opposed to the blower exhaust ports 56c of the electric blower 51. This first electric blower cover 52 is divided in the front-rear direction by, for example, a substantially cylindrical front cover portion 52a as one first cover portion and a substantially cylindrical rear cover portion 52b as the other first cover portion. The first cover suctionport 71 side that is the front end side of the first electric blower cover 52 is joined to a suction side silencer 75 on the main body case 25 side via an upstream side seal member 74 as a substantially ring-shaped first seal

member that is a vibration isolating member as an elastic member, and the head housing 72 side that is the rear end side of the first electric blower cover is supported on the second electric blower cover 53 on the main body case 25 side via a downstream side seal member 76 that is a second seal member as an elastic member. Therefore, the lower portion of the first electric blower cover 52 is spaced in a floating state from the lower portion of the second electric blower cover 53.

**[0030]** The first cover exhaust port 73 is formed, for example, between the respective lower end portions of the front cover portion 52a and the rear cover portion 52b, and positioned on the rear side of the first electric blower cover 52. To this first cover exhaust port 73, a cover filter 77 is attached.

**[0031]** The upstream side seal member 74 is made of, for example, an elastic material (flexible material) such as rubber or elastomer. The front end side of this upstream side seal member 74 is joined airtightly to the rear end side that is the exhaust side of the suction side silencer 75, and the intermediate position in the front-rear direction is engaged with the inner edge of the first cover suction port 71 of the first electric blower cover 52, and the rear end side is attached to the front surface of the fan cover 58 from the peripheral edge portion of the suction port 66 of the fan cover 58 of the electric blower 51. Therefore, the suction side silencer 75 is connected airtightly to the suction port 66 of the electric blower 51 via the upstream side seal member 74.

**[0032]** This suction side silencer 75 is a so-called expansion silencer, and absorbs operation noise caused according to driving of the electric blower 51 (hereinafter, simply referred to as driving noise of the electric blower 51) or wind noise caused by air suctioned by driving of the electric blower 51, and prevents it from being transmitted to the floor brush 19 (Fig. 3) side. This suction side silencer 75 includes a funnel form inducer portion 75a as a silencer main body whose front end portion is attached to the partition 26 and whose diameter is gradually made smaller rearward (toward the downstream side), a partition body 75b attached inside the inducer portion 75a, and an acoustic absorption material 75c disposed between these inducer portion 75a and partition body 75b.

**[0033]** The inducer portion 75a is a portion for rectifying air that passed through the main body dust collecting chamber 31 to the downstream side, and is connected airtightly to the rear side that is the downstream side of a communication hole 78 opened in the partition 26 and communicating with the main body dust collecting chamber 31. Therefore, the suction port 66 of the electric blower 51 communicates with the main body dust collecting chamber 31 and the main body suction port 44 via the suction side silencer 75 and the communication hole 78. On the rear side of the inducer portion 75a, an expansion portion 75e that partitions an expansion space 75d as a silencing space between the inducer portion and the partition body 75b is formed in a stepped manner. This expansion portion 75e is formed into a cylindrical shape

whose diameter is substantially constant from the front side to the rear side.

**[0034]** The partition body 75b is formed to be substantially cylindrical, and attached to and fixed to the inducer portion 75a by, for example, screws, etc. Further, on the front end portion of this partition body 75b, a flange portion 75f covering the front side of the expansion portion 75e is formed integrally in a flange shape. In the periphery of this partition body 75b, a plurality of communication openings 75g that make communication between the inside and the outside of the partition body 75b are formed.

**[0035]** The flange portion 75f continues to the portion on the side more forward (upstream) than the expansion portion 75e of the inducer portion 75a and forms a rectifying surface that rectifies air.

**[0036]** The acoustic absorption material 75c has breathability, and is disposed so as to fill the entire expansion space 75d.

**[0037]** The expansion space 75d is a space for silencing by lowering the pressure by expanding air that passes through the suction side silencer 75.

**[0038]** The material of the acoustic absorption material 75c and the size, etc., of the expansion space 75d are arbitrarily set corresponding to frequencies that are desired to be absorbed of driving noise of the electric blower 51 and wind noise caused by a flow of air suctioned by driving of the electric blower 51, etc.

**[0039]** On the other hand, the downstream side seal member 76 is made of an elastic material (flexible material), for example, rubber or elastomer, etc. This downstream side seal member 76 is attached to surround the periphery of the head housing 72.

**[0040]** The second electric blower cover 53 is made of, for example, a synthetic resin, etc., and is divided in the up-down direction into, for example, a lower cover portion 53a as one second cover portion and an upper cover portion 53b as the other second cover portion. This second electric blower cover 53 partitions the electric blower chamber 33 inside the rear chamber 28.

**[0041]** The lower cover portion 53a is formed into a box shape which is long in the left-right width direction and whose upper side is opened, and, for example, both sides of the lower cover portion are fixed to the lower case 41 by fixation members such as screws. Therefore, the lower portion of this lower cover portion 53a is spaced in a floating state from the bottom surface 41a of the lower case 41. One side portion of this lower cover portion 53a is a wall section that partitions the electric blower chamber 33 and the cord reel chamber, and in this one side portion, a hole portion not shown that makes communication between the electric blower chamber 33 and the cord reel chamber is formed, and to this hole portion, a filter not shown is attached. Further, the lower surface of the lower cover portion 53a is opposed to the first cover exhaust port 73 of the first electric blower cover 52. The front end portion of this lower cover portion 53a fits airtightly to the periphery of the suction side silencer 75,

and the rear end portion is fixed to the inner side of the rear surface 41c of the lower case 41. On the upper portion of the rear end of the lower cover portion 53a, the lower portion of the above-mentioned downstream side seal member 76 attached to the first electric blower cover 52 is placed.

**[0042]** The upper cover portion 53b is formed to be long in the left-right width direction, and for example, both end sides, etc., thereof are fixed to the lower cover portion 53a by fixation members and cover the entire upper side of the lower cover portion 53a so that the upper cover portion covers the entirety of the first electric blower cover 52. In a flat front portion of the upper cover portion 53b, a plurality of second cover exhaust ports 81 that make communication between the electric blower chamber 33 and the exhaust air passage chamber 35 are opened in the left-right width direction. Further, on the upper portion of this upper cover portion 53b, an attaching portion 83 for attaching a main body control part 82 as a control means for controlling driving of the electric blower 51 is formed to project upward. To the upper side of the upper cover portion 53b, a case body 84 for partitioning the exhaust air passage chamber 35 between the case body and the upper cover portion 53b is attached. This upper cover portion 53b is spaced from the upper portion of the first electric blower cover 52. Further, the rear end of the upper cover portion 53b curves downward so as to be along the outer shape of the first electric blower cover 52, and the lower portion of this rear end is pressure-welded to the upper portion of the above-mentioned downstream side seal member 76 attached to the first electric blower cover 52. Therefore, the rear side of the first electric blower cover 52 is elastically sandwiched and fixed from above and below by the rear end of the upper cover portion 53b and the rear end of the lower cover portion 53a via the downstream side seal member 76.

**[0043]** The second cover exhaust ports 81 are positioned above the suction side silencer 75, and opened along the up-down direction. On the upper portions of these second cover exhaust ports 81, that is, on the exhaust air passage chamber 35 sides that are the exhaust sides, exhaust side acoustic absorption materials 86 having breathability are disposed, and these exhaust side acoustic absorption materials 86 cover the entire second cover exhaust ports 81.

**[0044]** The material of the exhaust side acoustic absorption materials 86 is, for example, urethane foam, etc., and is arbitrarily set corresponding to frequencies that are desired to be absorbed of driving noise of the electric blower 51 and wind noise caused by a flow of air, etc., exhausted from the electric blower 51, etc.

**[0045]** The main body control part 82 controls the electric blower 51 by, for example, conduction angle control according to an operation on the set buttons 22 (Fig. 3), and is configured so that various components such as a microcomputer as a control means main body are mounted on a substrate, and is fixed to the attaching portion

83, for example, horizontally, that is, so as to be along an air passage direction inside the exhaust air passage chamber 35.

**[0046]** The case body 84 is formed to be long horizontally in the left-right width direction from, for example, synthetic resin, etc., and is opposed to the entire upper portion of the upper cover portion 53b. Therefore, the exhaust air passage chamber 35 is partitioned above the second electric blower cover 53. This case body 84 is fixed to the upper cover portion 53b via attaching members such as screws not shown. Further, the entire lower end of this case body 84 is in close contact with the upper portion of the upper cover portion 53b, and the upper portion of the case body is in close contact with the inner side of the upper case 42 of the main body case 25 and extends horizontally in the front-rear direction. On the front end of the case body 84, a wall-like front wall portion 84a is formed integrally along the up-down direction on the side forward of the second cover exhaust ports 81. The rear end of this case body 84 is in close contact with the upstream side of the exhaust ports 49. Therefore, between the upper cover portion 53b (second electric blower cover 53) and the case body 84, the exhaust air passage chamber 35 is formed as a space that is enclosed from the second cover exhaust ports 81 to the exhaust ports 49, expands in the left-right width direction, and extends in the front-rear direction. In other words, the exhaust air passage chamber 35 is formed at a position between the second cover exhaust ports 81 and the exhaust ports 49 as an expansion silencing space, that is, a chamber without any other hole portions or clearances, etc., through which air leaks. Specifically, the exhaust air passage chamber 35 is formed so that the air passage sectional area becomes larger than the opening area of the second cover exhaust ports 81.

**[0047]** The cord reel chamber communicates with the outside of the main body case 25 via a cord leading out port not shown opened in the rear portion of the upper case 42. The cord leading out port is formed to have a size capable of leading out the tip end side of a power cord. The cord reel chamber, the power cord, and the cord reel are not essential components. Specifically, the electric vacuum cleaner 11 maybe configured so that electric power is supplied to the electric blower part 32 and the main body control part 82, etc., by a battery such as a secondary battery installed inside the cleaner main body 13 (main body case 25).

**[0048]** Next, operation and effect of the above-described embodiment will be described.

**[0049]** When cleaning, in a state where electric power supply to the electric blower 51 is possible, an operator grips the grip part 21 shown in Fig. 3 and operates the set buttons 22, and accordingly, the main body control part 82 drives the electric blower 51. Specifically, by rotating the centrifugal fan 57 by the electric motor part 55 of the electric blower 51, a negative pressure is generated. This negative pressure is applied to the main body dust collecting chamber 31, the main body suction port

44, and the tube part 12 via the suction side silencer 75 to suction dust together with air from the tip end side of the floor brush 19. In addition, vibration caused by rotation of the centrifugal fan 57 of the electric blower 51 is absorbed by expansion and contraction of the coil springs 61c and prevented from being transmitted to the first electric blower cover 52, and driving noise of the electric blower 51 is silenced by the suction side silencer 75.

**[0050]** The operator places the floor brush 19 shown in Fig. 3 on the floor surface, grips the grip part 21, and makes the floor brush 19 travel forward and backward, and accordingly, cleaning is performed by suctioning dust on the floor from the floor brush 19.

**[0051]** The suctioned air becomes suctioning wind and is suctioned into the main body dust collecting chamber 31 together with dust via the extension tube 18, the hose body 16, and the connection tube part 15, and the dust is trapped in the dust collecting bag P in the main body dust collecting chamber 31. Then, suctioning wind from which the dust was trapped passes through the dust collecting chamber filter F, and is then suctioned into the suction side silencer 75 from the communication hole 78 and rectified along the inducer portion 75a and the flange portion 75f of this suction side silencer 75. Further, by expansion of the suctioning wind from the communication openings 75g into the expansion space 75d, wind noise is absorbed, and further absorbed by the acoustic absorption material 75c filled in the expansion space 75d.

**[0052]** Thereafter, the suctioning wind passes through the inside of the upstream side seal member 74 from the suction side silencer 75 and is suctioned into the suction port 66 of the electric blower 51 via the first cover suction port 71, and suctioned from the center portion of the centrifugal fan 57 and blown out to the outer peripheral side, and suctioned into the case main body 56a of the motor case 56 while being rectified by the rectifier plate 64 and becomes exhaust air, cools the electric motor part 55 when passing through the inside of the case main body 56a, and is blown out from the blower exhaust ports 56c.

**[0053]** Then, after this exhaust air is rectified inside the first electric blower cover 52 and then exhausted from the first cover exhaust port 73 into the electric blower chamber 33 on the lower side while passing through the cover filter 77 and blown to the lower surface of the lower cover portion 53a of the second electric blower cover 53, passes through the front side of the first electric blower cover 52 from the lower cover portion 53a via the periphery of the suction side silencer 75, and is exhausted into the exhaust air passage chamber 35 on the upper side from the second cover exhaust ports 81.

**[0054]** At this time, wind noise caused by the exhaust air and driving noise of the electric blower 51 included in the exhaust air are absorbed by passage of the exhaust air through a long air passage and expansion of the exhaust air in the exhaust air passage chamber 35 in such a manner that the exhaust air is exhausted from the first cover exhaust port 73 to the inside of the second electric blower cover 53 and further exhausted from the second

cover exhaust ports 81 into the exhaust air passage chamber 35, and by passage through the exhaust side acoustic absorption materials 86 disposed in the second cover exhaust ports 81.

**[0055]** Thereafter, the exhaust air passes rearward through the inside of the exhaust air passage chamber 35 while cooling the main body control part 82, and is exhausted to the outside of the main body case 25 from the exhaust ports 49 while passing through the exhaust port filter 50.

**[0056]** After cleaning is finished, the operator appropriately operates the set buttons 22 to stop driving of the electric blower 51.

**[0057]** As described above, according to the embodiment described above, the first electric blower cover 52 covering the electric blower 51 is covered by the second electric blower cover 53 to insulate driving noise of the electric blower 51, and wind noise that becomes loud particularly due to concentrated passage of a large volume of air through a narrow and short air passage is absorbed by securing an exhaust air passage length in such a manner that the exhaust air from the electric blower 51 is exhausted from the exhaust ports 49 after passing through the first electric blower cover 52, the second electric blower cover 53, and the exhaust air passage chamber 35, and accordingly, noise reduction performance is improved.

**[0058]** By using the exhaust air passage chamber 35 as an expansion silencing space, driving noise or wind noise of the electric blower 51 included in the exhaust air that flowed from the electric blower chamber 33 to the exhaust air passage chamber 35 is absorbed by expansion of the exhaust air in the exhaust air passage chamber 35, so that the noise reduction performance can be further improved.

**[0059]** Further, by disposing the exhaust side acoustic absorption materials 86 on the exhaust sides of the second cover exhaust ports 81, driving noise or wind noise, etc., of the electric blower 51 can be absorbed by the exhaust side acoustic absorption materials 86, and the noise reduction performance can be further improved.

**[0060]** By joining the suction side silencer 75 to the first cover suction port 71 of the first electric blower cover 52 via the upstream side seal member 74, the electric blower 51 can be supported together with the first electric blower cover 52 at a position close to the shaft center of the electric blower 51 via the suction side silencer 75, so that the influence of vibration caused by driving of the electric blower 51 can be suppressed to a minimum.

**[0061]** In addition, by disposing the acoustic absorption material 75c inside the expansion space 75d of the suction side silencer 75, the acoustic absorption effect of the suction side silencer 75 can be further increased, so that the noise reduction performance can be further improved.

**[0062]** Noise on the suction side of the electric blower 51 can be absorbed by the suction side silencer 75, so that noise emitted from the tip end side of the floor brush

19 via the main body dust collecting chamber 31, the main body suction port 44, and the tube part 12 can be further suppressed, and the noise reduction performance can be further improved.

**[0063]** The first cover exhaust port 73 is disposed on the rear side of the first electric blower cover 52, the second cover exhaust ports 81 are disposed on the front side of the second electric blower cover 53, that is, at positions distant from the first cover exhaust port 73, and the exhaust ports 49 are disposed on the rear side of the main body case 25, that is, at positions distant from the second cover exhaust ports 81, and accordingly, the length of the exhaust air passage through which the exhaust air from the electric blower 51 passes is lengthened by repeatedly folding back in the front-rear direction as shown by the arrows in Fig. 2, so that the noise reduction performance can be further improved.

**[0064]** Further, the periphery of the electric blower 51 is elastically suspended on the first electric blower cover 52 by the suspending means 61, and the front side and the rear side that are both end portions in the axial direction of the first electric blower cover 52 are elastically supported via the seal members 74 and 76, respectively, and accordingly, transmission of vibration caused by driving of the electric blower 51 to the second electric blower cover 53 or the outside of the main body case 25 can be suppressed, and the noise reduction performance can be further improved.

**[0065]** The lower portion of the first electric blower cover 52 is spaced from the lower portion of the second electric blower cover 53, and the lower portion of the second electric blower cover 53 is spaced from the bottom surface 41a of the lower case 41 of the main body case 25, so that the vibration caused by driving of the electric blower 51 is hardly transmitted to the main body case 25, and noise caused by this vibration can be suppressed, so that the noise reduction performance can be further improved.

**[0066]** Moreover, the main body case 25 is formed to have a multiple structure such as by partitioning the main body dust collecting chamber 31 inside the front chamber 27 and partitioning the electric blower chamber 33 inside the rear chamber 28, so that driving noise of the electric blower 51 and vibration caused by driving, etc., are hardly transmitted to the outside of the main body case 25, and the noise reduction performance can be further improved.

**[0067]** By disposing the main body control part 82 inside the exhaust air passage chamber 35, the main body control part 82 can be efficiently cooled by the exhaust air passing through the exhaust air passage chamber 35.

**[0068]** In addition, in the embodiment described above, a part of the exhaust air passage chamber 35 maybe used as an expansion silencing space.

**[0069]** The second electric blower cover 53 may be arranged to cover a part of the first electric blower cover 52.

**[0070]** Further, the details of the electric vacuum clean-

er 11 are not limited to the configuration described above, and the present invention is applicable, for example, not only to the canister-type electric vacuum cleaner 11 but also to an arbitrary electric vacuum cleaner, such as an upright-type electric vacuum cleaner having a floor brush 19 connected to the lower portion of a vertically long cleaner main body 13, or a handy-type electric vacuum cleaner, etc.

#### REFERENCE SIGNS LIST

#### [0071]

11	Electric vacuum cleaner	
25	Main body case	
35	Exhaust air passage chamber as enclosed space	
44	Main body suction port as suction port	
49	Exhaust port	
51	Electric blower	
52	First electric blower cover	20
53	Second electric blower cover	
61	Suspending means	
71	First cover suction port	
73	First cover exhaust port	
74	Upstream side seal member that is vibration isolating member as elastic member	25
75	Suction side silencer	
75c	Acoustic absorption material	
75d	Expansion space as silencing space	
76	Downstream side seal member as elastic member	30
81	Second cover exhaust port	
84	Case body	
86	Exhaust side acoustic absorption material	35

#### Claims

##### 1. An electric vacuum cleaner comprising:

a main body case having a suction port and an exhaust port;  
 an electric blower disposed inside the main body case so that a suction side thereof communicates with the suction port;  
 a first electric blower cover that has a first cover exhaust port and covers the electric blower;  
 a second electric blower cover that has a second cover exhaust port, covers at least a part of the first electric blower cover, and supports the first electric blower cover; and  
 a case body in which an enclosed space for making communication between the second cover exhaust port of the second electric blower cover and the exhaust port of the main body case is partitioned.

##### 2. The electric vacuum cleaner according to Claim 1,

wherein  
 at least a part of the enclosed space is an expansion silencing space.

##### 3. The electric vacuum cleaner according to Claim 2, comprising:

an exhaust side acoustic absorption material disposed on the exhaust side of the second cover exhaust port.

##### 4. The electric vacuum cleaner according to any one of Claims 1 to 3, wherein the first electric blower cover has a first cover suction port communicating with the suction side of the electric blower, and the electric vacuum cleaner comprising:

a vibration isolating member attached to the first cover suction port; and  
 a suction side silencer that includes an expansion silencing space inside, and is joined to the first electric blower cover via the vibration isolating member.

##### 5. The electric vacuum cleaner according to Claim 4, wherein the suction side silencer includes an acoustic absorption material disposed inside the silencing space.

##### 6. The electric vacuum cleaner according to any one of Claims 1 to 5, wherein the first cover exhaust port is disposed on the rear side of the first electric blower cover, the second cover exhaust port is disposed on the front side of the second electric blower cover, and the exhaust port is disposed on the rear side of the main body case.

##### 7. The electric vacuum cleaner according to any one of Claims 1 to 6, comprising:

a suspending means that elastically suspends the periphery of the electric blower on the first electric blower cover; and  
 elastic members that elastically support both end portions in the axial direction of the first electric blower cover on the main body case side.

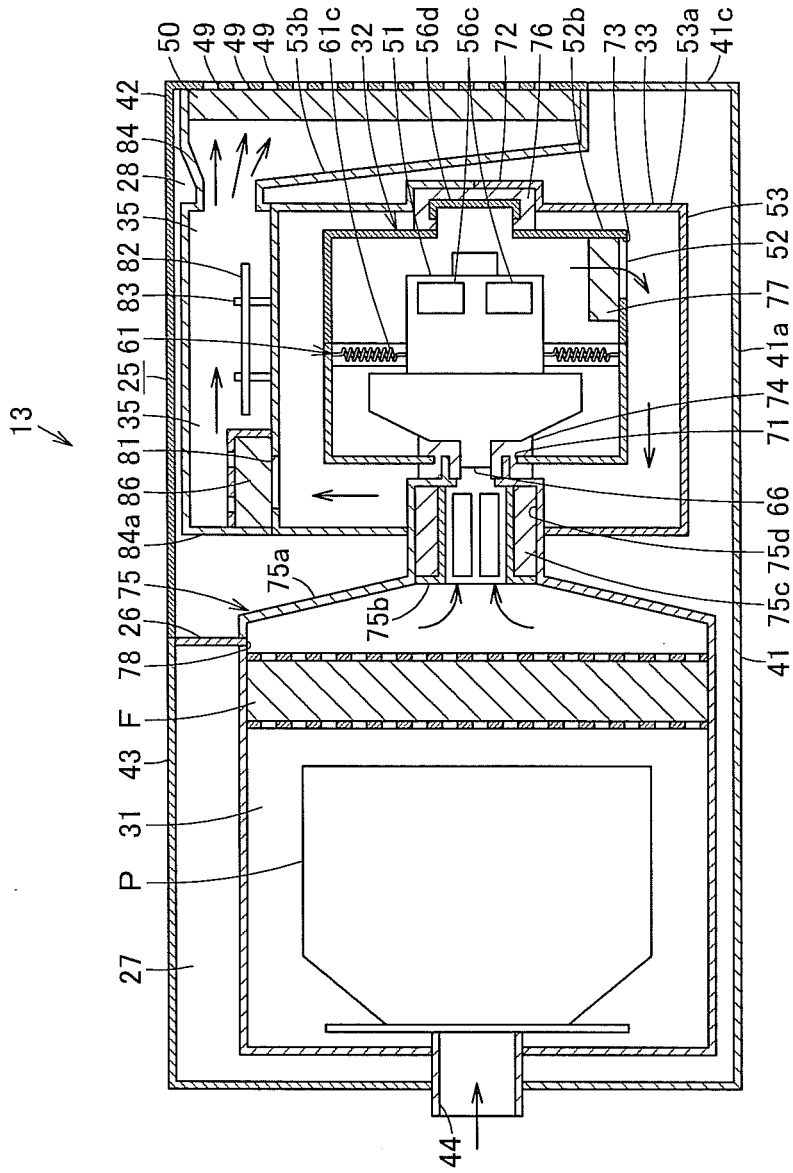


FIG. 1

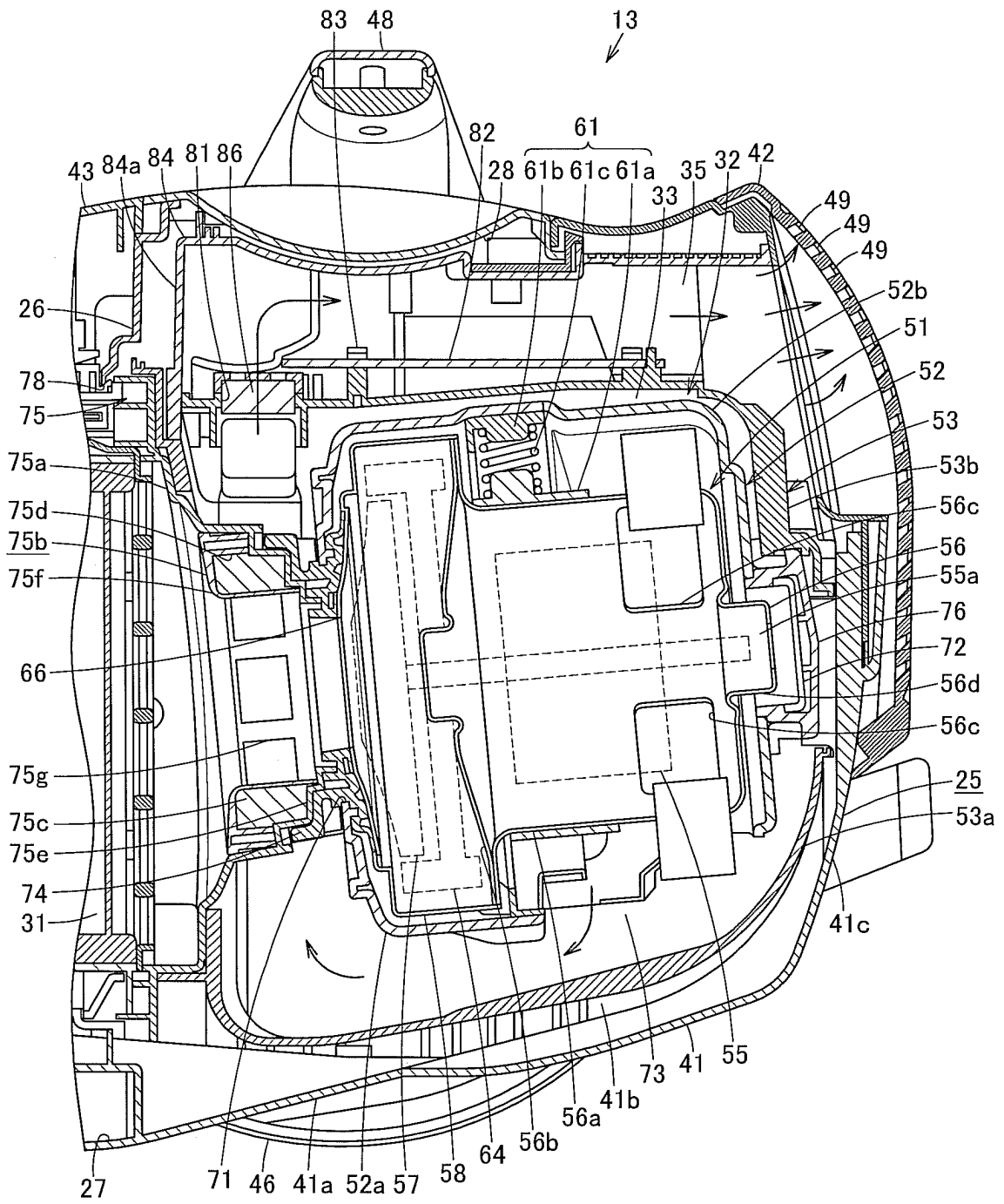


FIG. 2

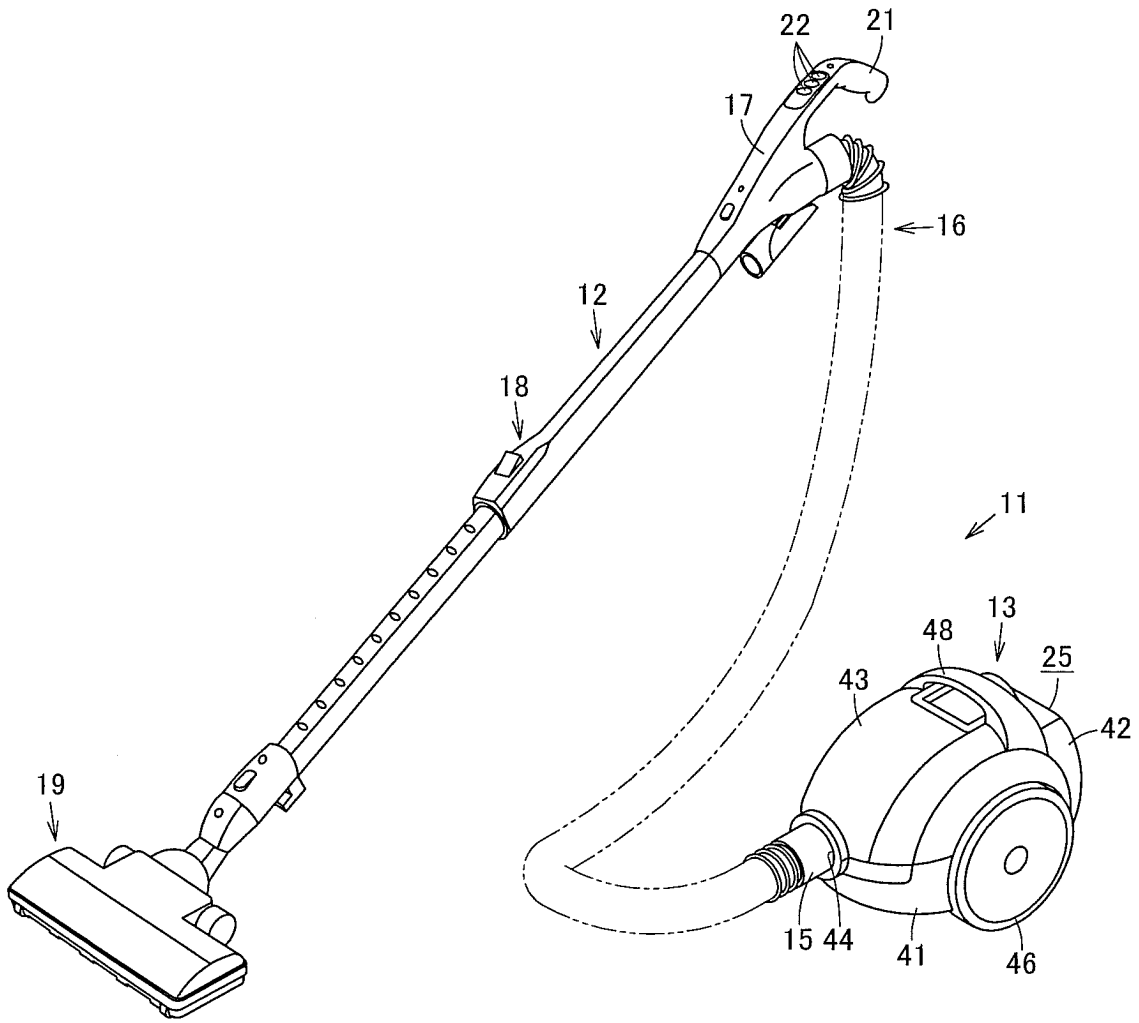


FIG. 3

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2009/070113

A. CLASSIFICATION OF SUBJECT MATTER A47L9/00 (2006.01) i		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) A47L9/00, A47L9/22		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2010 Kokai Jitsuyo Shinan Koho 1971-2010 Toroku Jitsuyo Shinan Koho 1994-2010		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) WPI		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	JP 48-64759 A (Matsushita Electric Industrial Co., Ltd.), 07 September 1973 (07.09.1973), entire text; all drawings (Family: none)	1-3, 6, 7 4, 5
Y A	JP 60-103929 A (Matsushita Electric Industrial Co., Ltd.), 08 June 1985 (08.06.1985), page 1, lower left column, line 10 to lower right column, line 18; fig. 1, 2 (Family: none)	1-3, 6, 7 4, 5
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C.		<input type="checkbox"/> See patent family annex.
* Special categories of cited documents:		
"A"	document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O"	document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
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Date of the actual completion of the international search 03 February, 2010 (03.02.10)	Date of mailing of the international search report 16 February, 2010 (16.02.10)	
Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer	
Facsimile No.	Telephone No.	

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2009/070113

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	JP 4-343816 A (Matsushita Electric Industrial Co., Ltd.), 30 November 1992 (30.11.1992), paragraphs [0002] to [0004], [0009] to [0010]; all drawings (Family: none)	3, 6, 7 4, 5
Y A	WO 2009/066648 A1 (Toshiba Corp.), 28 May 2009 (28.05.2009), entire text; all drawings & JP 2009-125248 A & JP 2009-131315 A	7 4, 5

**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

- JP 2745700 B [0003]