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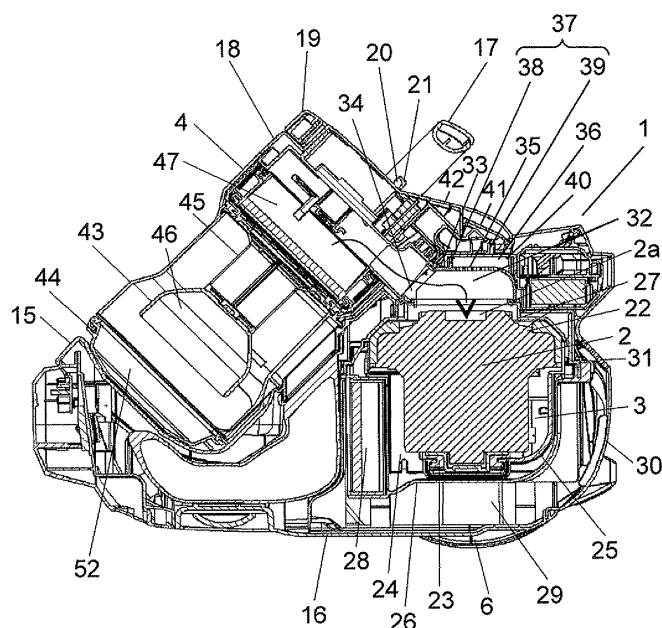
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(54) **ELECTRIC VACUUM CLEANER**

(57) An electric vacuum cleaner includes a blower that sucks air for generating suction wind, a dust collector for collecting dust sucked by the suction wind, a communicating section disposed between the blower and the

dust collector for forming an air duct through which the air flows from the dust collector to the blower. Multiple openings are formed in the communicating section and a space is formed adjacently to the communicating section.

FIG. 4



Description

Technical Field

[0001] The present invention relates to an electric vacuum cleaner. 5

Background Art

[0002] A conventional electric vacuum cleaner is formed of an electric blower generating a suction wind and a cyclone dust collector placed on an upstream side of the blower. An airflow containing dust flows into the cyclone dust collector, and this airflow circles within the dust collector for the dust to be centrifuged, so that the dust remains in the collector while the air is discharged outside the collector. 10

[0003] The cyclone dust collector is connected to the blower via an air duct. The air having undergone the centrifugal separation flows to the blower through this air duct (e.g. refer to Patent Literature 1.) In this conventional vacuum cleaner, a wind noise produced at an intake port of the blower travels through the air duct or on the inner wall of the air duct to the exterior of the vacuum cleaner. The conventional electric vacuum cleaner thus has a problem of producing a loud noise. 15

Related Art Literature

[0004] Patent Literature 1: Unexamined Japanese Patent Publication No. 2010 - 99183 20

Disclosure of Invention

[0005] An electric vacuum cleaner of the present invention comprises the following structural elements: 25

a blower that sucks air for generating suction wind;
a dust collector for collecting dust through the suction wind; and
a communicating section disposed between the blower and the dust collector and forming an air duct through which the air flows from the dust collector to the blower, and multiple openings being formed in the communicating section, and a space being formed adjacently to the communicating section. 30 40 45

[0006] The foregoing structure allows a wind noise produced at an intake port of the blower to travel through the multiple openings formed in the communicating section, and thereby resonating the air in the space. This mechanism results in an effect similar to that of a Helmholtz resonator, so that the wind noise of high frequency can be attenuated and lowered. 50 55

Brief Description of Drawings

[0007]

Fig. 1 is a perspective view of an electric vacuum cleaner in accordance with an embodiment of the present invention.

Fig. 2 is a sectional view cut along a center line of a cleaner body of the electric vacuum cleaner shown in Fig. 1.

Fig. 3 is a perspective view of the cleaner body without a dust collector.

Fig. 4 is a sectional view of the cleaner body focusing on a blower.

Fig. 5 is a perspective view of a blower unit of the electric vacuum cleaner.

Fig. 6 is a perspective exploded view of the blower unit of the electric vacuum cleaner.

Preferred Embodiment to Carry out Invention

[0008] An exemplary embodiment of the present invention is demonstrated hereinafter with reference to the accompanying drawings. Not to mention, the present invention is not limited to this embodiment.

Exemplary Embodiment

[0009]

Fig. 1 is a perspective view of an electric vacuum cleaner in accordance with the embodiment of the present invention. As shown in Fig. 1, cleaner body 1 includes blower chamber 3 and a cord winder (not shown) at a rear section and dust collector receptor 5 at a front section. Suction port 10 is provided to the front section of cleaner body 1, and connecting pipe 9 provided to a first end of hose 8 can be connected detachably to suction port 10. Leader pipe 12 having grip 11 is connected to a second end of hose 8. Extension pipe 13 is telescopic and detachable, and a first end thereof is connected detachably to leader pipe 12 and a second end thereof is connected detachably to sucking device 14 having an opening (not shown) for sucking dust.

Fig. 2 is a sectional view cut along a center line of cleaner body 1 of the electric vacuum cleaner. As shown in Fig. 2, cleaner body 1 includes a pair of movable wheels 6 on both sides at a lower part of the rear section, and movable caster 7 at a front bottom. Blower chamber 3 accommodates blower 2 therein for sucking air and generating a suction wind. Dust collector receptor 5 shown in Fig. 1 receives detachable dust collector 4 that collects and sorts the dust sucked by the suction wind.

Fig. 3 is a perspective view of the cleaner body without the dust collector. As Fig. 3 shows, cleaner body 1 is formed of upper housing 15 and lower housing 16, and both of housings 15 and 16 form an outer shell. On the upper part of cleaner body 1, handle 17 is provided to be used for carrying cleaner body 1. Fig. 4 is a sectional view of the cleaner body focusing

on the blower of the electric vacuum cleaner in accordance with the embodiment. Fig. 5 is a perspective view of a blower unit of the electric vacuum cleaner. Fig. 6 is a perspective exploded view of the blower unit of the electric vacuum cleaner. As Fig. 4 shows, handle 17 has recess 21 which mates with protrusion 20 formed on grip 19 mounted rotatably on upper lid 18 of dust collector 4. Dust collector 4 can be thus reliably and rigidly mounted to cleaner body 1.

[0010] Blower 2 is supported by front supporter 22 at the front and by rear supporter 23 at the rear. Both of supporters 22 and 23 are made of elastic material. The front of blower 2 is sandwiched by motor housing right 24 and motor housing left 25 for lowering the noises produced in blower 2.

[0011] As Fig. 5 shows, the front of blower 2 is surrounded by sound deadening box 26 and sound deadening lid 27. Sound deadening box 26 includes filter 28 for trapping fine dust contained in exhausted air from blower 2. The air passes through filter 28, which removes the fine dust, and then passes through discharge path 29 shown in Fig. 4 and formed at the lower section of sound deadening box 26. The air is then discharged outside cleaner body 1 via discharge port 31 formed at housing 30 that is a part of the rear outer shell of cleaner body 1.

[0012] As Fig. 4 shows, on the upstream side of blower 2, communicating section 33 is provided for forming air duct 32 through which the air flows from dust collector 4 to blower 2. In other words, air duct 32 is disposed between blower 2 and dust collector 4. Lattice-like communicating port 34 is formed as shown in Fig. 5 approximately in front of blower 2. This port 34 communicates with intake port 2a of blower 2. As Fig. 6 shows, multiple openings 35 are formed in communicating section 33 confronting intake port 2a. Openings 35 are ranged from a place confronting intake port 2a to a place in the vicinity of communicating port 34.

[0013] As Fig. 4 shows, space 36 communicating with air duct 32 is provided adjacently to communicating section 33. Space 36 is formed of communicating section 33 and space forming section 37.

[0014] Space forming section 37 is formed of space forming rib 38 and space forming face 39. Rib 38 is formed in communicating section 33 such that it surrounds the region in which openings 35 are provided. Space forming faces 38 confronts communicating section 33. On top of that, sealable member 40 is provided between space forming face 39 of upper housing 15 and space forming rib 38. Sealable member 40 prevents the suction wind from leaking. Space 36 is formed by layering the communicating section 33, sealable member 40, and upper housing 15 in this order. This structure allows assembling cleaner body 1 with ease, and preventing reliably the suction wind from leaking.

[0015] On top of that, above the space forming face 39, upper cover 41, which is a part of the outer shell of

cleaner body 1, and cap 42 are provided, so that multiple wall-like faces work as noise-blocking walls against the noise produced in cleaner body 1. As a result, the noise is further prevented from leaking through the outer shell.

[0016] Communicating section 33 includes multiple openings 35 ranged from the place confronting intake port 2a of blower 2 to a place in the vicinity of communicating port 34. This structure allows the wind noise produced at intake port 2a to travel to openings 35 via the shortest route, and the wind noise passes through openings 35, thereby resonating the air in space 36. Not only the wind noise produced at intake port 2a but also another wind noise produced at communicating port 34 passes through openings 35 formed in communicating section 33, whereby the air in space 36 is resonated. This mechanism produces an effect similar to that of the Helmholtz resonator, so that the wind noise of high frequency can be attenuated. The shape of each opening 35 can be round or polygon with the same effect maintained.

[0017] An outer shell of dust collector 4 is formed of dust box 43, upper lid 18, grip 19, and bottom lid 44. Upper lid 18 covers the top face of dust box 43, and grip 19 is provided to upper lid 18. Bottom lid 44 covers the underside of dust box 43.

[0018] As Fig. 2 shows, first stage filter 45 and extension part 46 under filter 45 are mounted inside dust box 43 by welding or engagement with a claw (not shown). Above the first stage filter 45, second stage filter 47, dust removing section 48, and motor 49 are provided. Dust removing section 48 drops the dust accumulated in second stage filter 47 by means of vibration, and motor 49 applies the vibration to dust removing section 48. The air containing dust is sucked from a suction port (not shown) of dust box 43 into cyclone space 50. A circling flow produced by the first stage filter 45 separates the air containing dust into the dust chiefly formed of dust balls and the air still containing fine dust. The dust chiefly formed of dust balls travels through dust collecting path 51 and is accumulated in dust accumulation space 52. The dust chiefly formed of dust balls is prevented from flying back to cyclone space 50 by a wall formed vertically above space 50. This wall is formed of extension part 46 and slant part 53, and increases an efficiency of dust collection. Extension part 46 is mounted to first stage filter 45, and slant part 53 is provided to dust box 43.

[0019] The fine dust contained in the air having passed through first stage filter 45 is filtered by second stage filter 47, and only the air free from the fine dust passes through second stage filter 47 and then this air passes through communicating port 34 shown in Fig. 4 before it is sucked by blower 2. The fine dust accumulated in second stage filter 47 is removed therefrom by the vibration applied to dust removing section 48, and passes through first stage filter 45 before it is accumulated in tube 54 disposed under filter 45.

[0020] In this embodiment, a cyclone dust collector is used as dust collector 4; however, a dust collector employing a sack, e.g. paper bag, also can lower the noise

in operation.

Industrial Applicability

[0021] The electric vacuum cleaner of the present invention lowers the noise in operation, so that it is useful for a household-use cleaner and a business-use cleaner.

Description of Reference Marks

1	cleaner body	10
2	blower	
2a	suction port	
3	blower chamber	
4	dust collector	
5	dust collector receptor	15
6	wheel	
7	caster	
8	hose	
9	connecting pipe	20
10	suction port	
11	grip	
12	leader pipe	
13	extension pipe	25
14	sucking device	
15	upper housing	
16	lower housing	
17	handle	
18	upper lid	30
19	grip	
20	protrusion	
21	recess	
22	front supporter	
23	rear supporter	35
24	motor housing right	
25	motor housing left	
26	sound deadening box	
27	sound deadening lid	40
28	filter	
29	discharge path	
30	housing	
31	discharge port	
32	air duct	45
33	communicating section	
34	communicating port	
35	opening	
36	space	50
37	space forming section	
38	space forming rib	
39	space forming face	
40	sealable member	
41	upper cover	55
42	cap	
43	dust box	

(continued)

44	bottom lid
45	first stage filter
46	extension part
47	second stage filter
48	dust removing section
49	motor
50	cyclone space
51	dust collecting path
52	dust accumulation space
53	slant part
54	tube

Claims

1. An electric vacuum cleaner comprising:

a blower that sucks air for generating suction wind;
a dust collector for collecting dust sucked by the suction wind; and
a communicating section disposed between the blower and the dust collector and forming an air duct through which the air flows from the dust collector to the blower,
wherein a plurality of openings is formed in the communicating section, and a space is formed adjacently to the communicating section.

2. The electric vacuum cleaner of claim 1, wherein the space is formed of the communicating section and a space-forming section that is formed of a space-forming rib formed in the communicating section for surrounding the plurality of openings and a space-forming face confronting the communicating section.

3. The electric vacuum cleaner of claim 1, wherein the openings confront an intake port of the blower.

4. The electric vacuum cleaner of claim 1, wherein the openings are formed in a vicinity of a communicating port that communicates with the air duct and the dust collector.

5. The electric vacuum cleaner of claim 2, wherein a sealable member is disposed between the space-forming rib and the space-forming face for preventing the suction wind from leaking.

FIG. 1

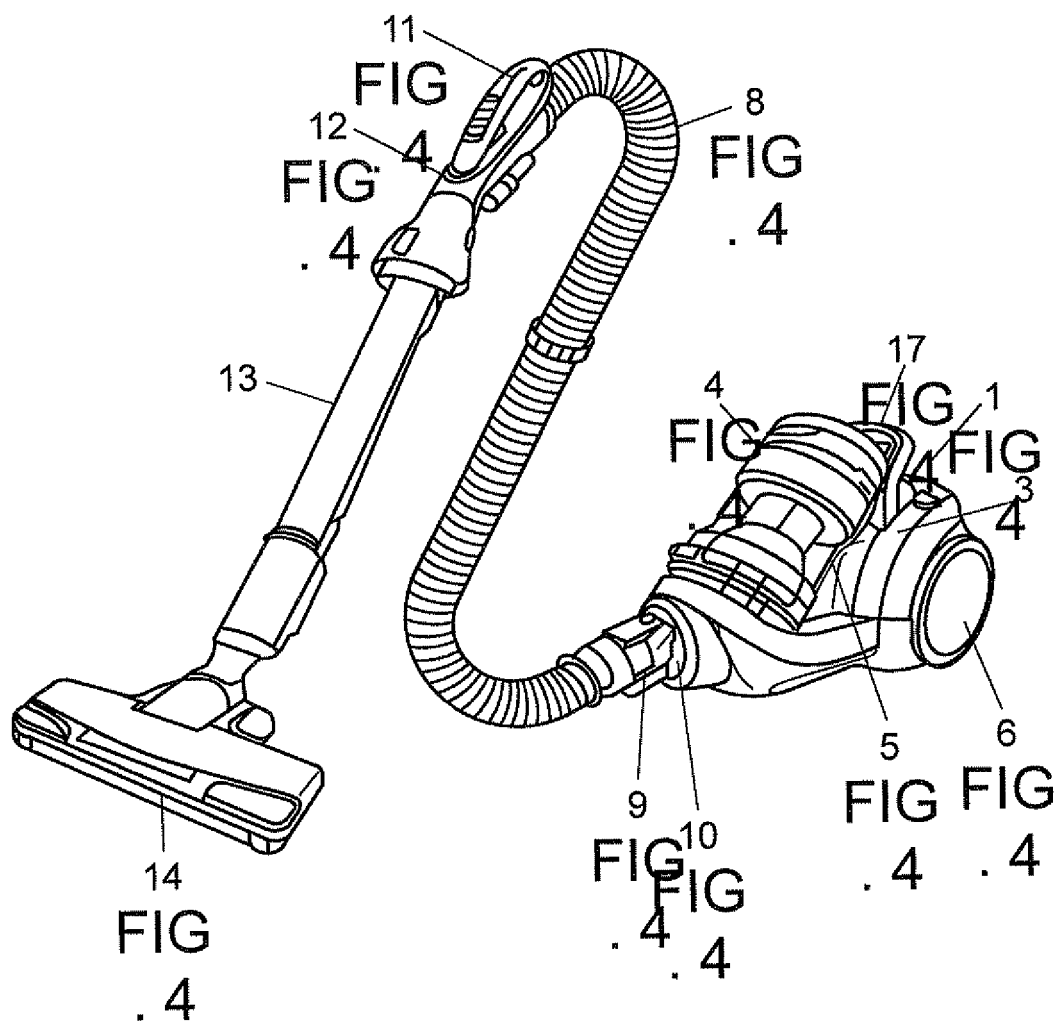


FIG. 2

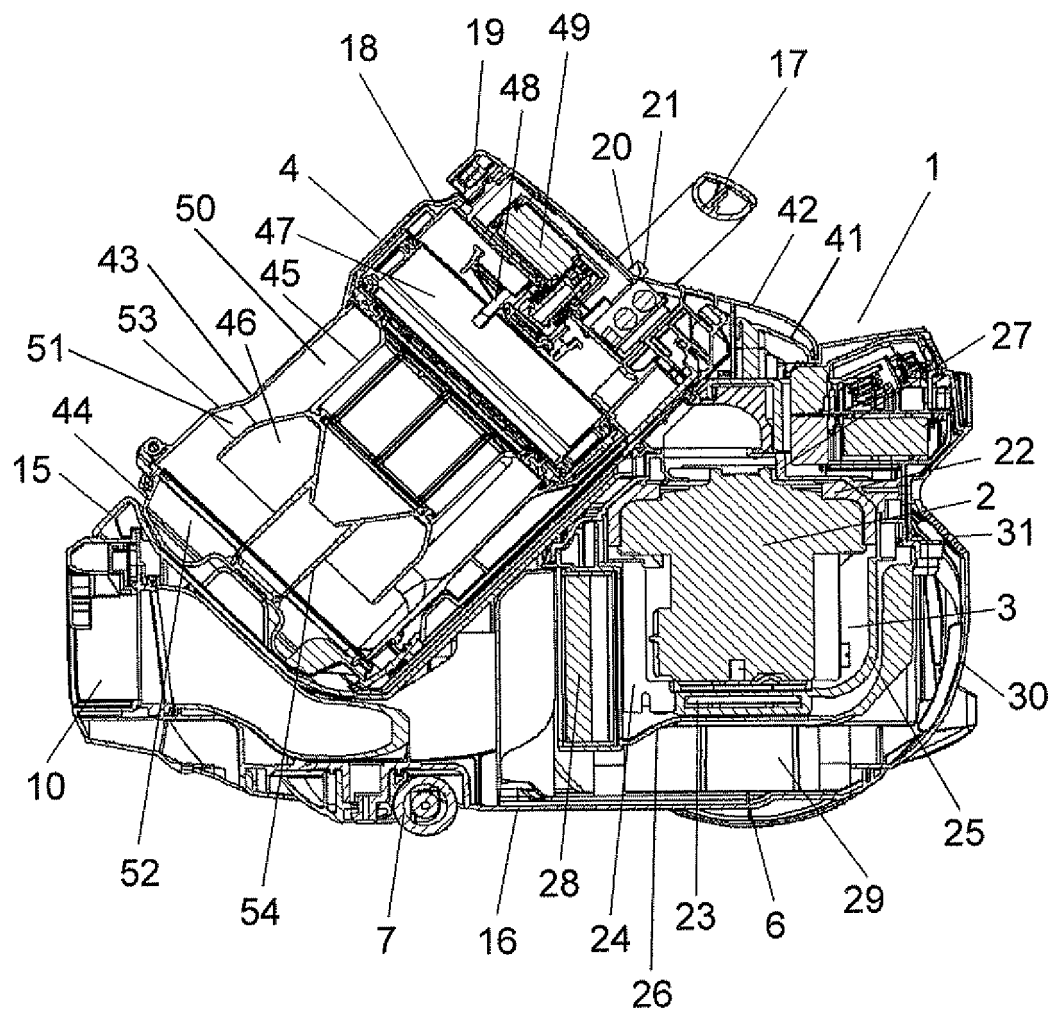


FIG. 3

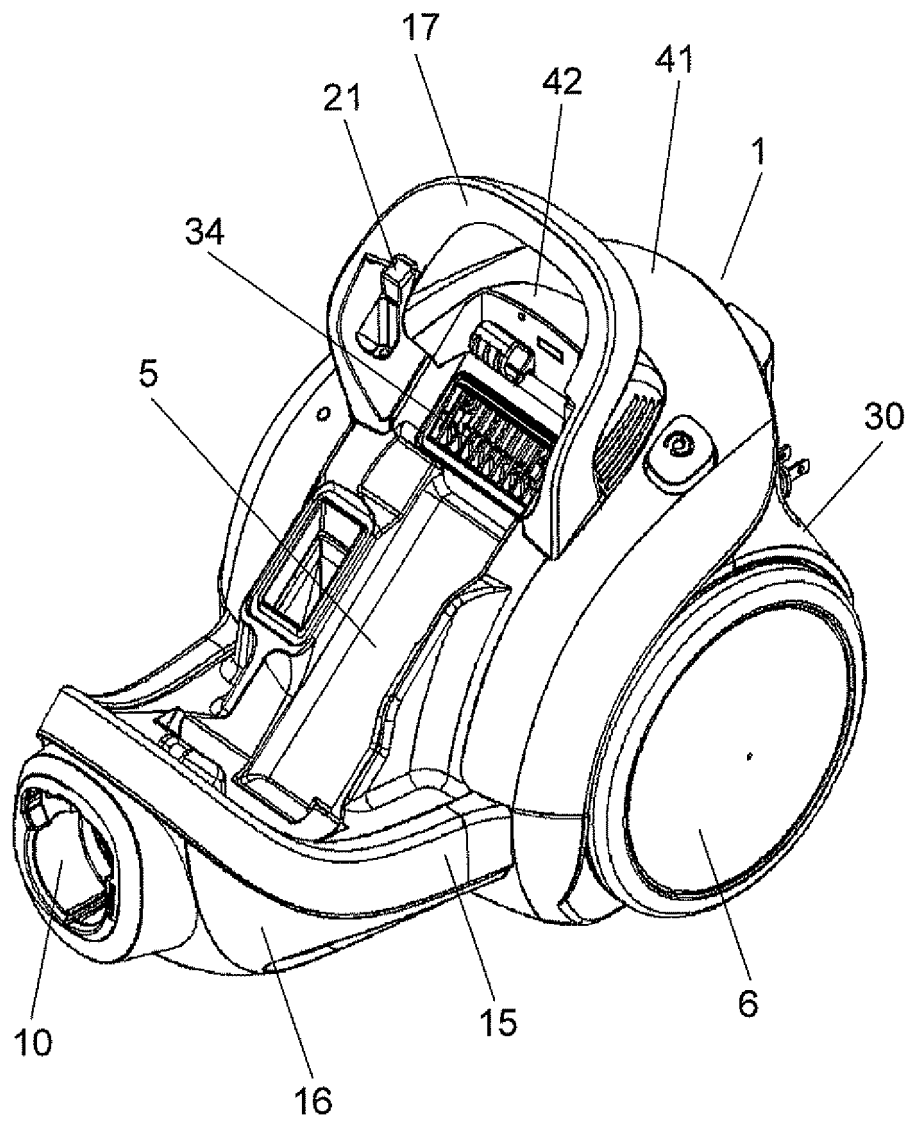


FIG. 4

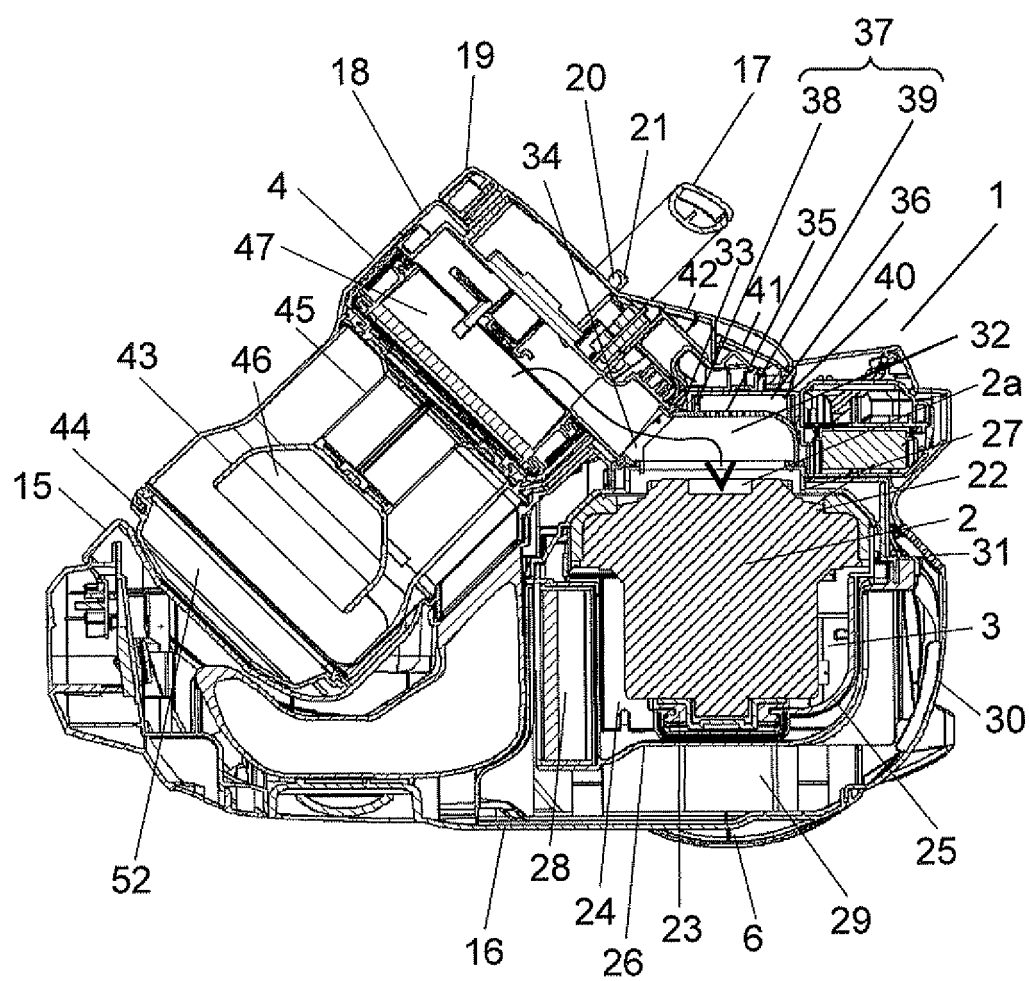


FIG. 5

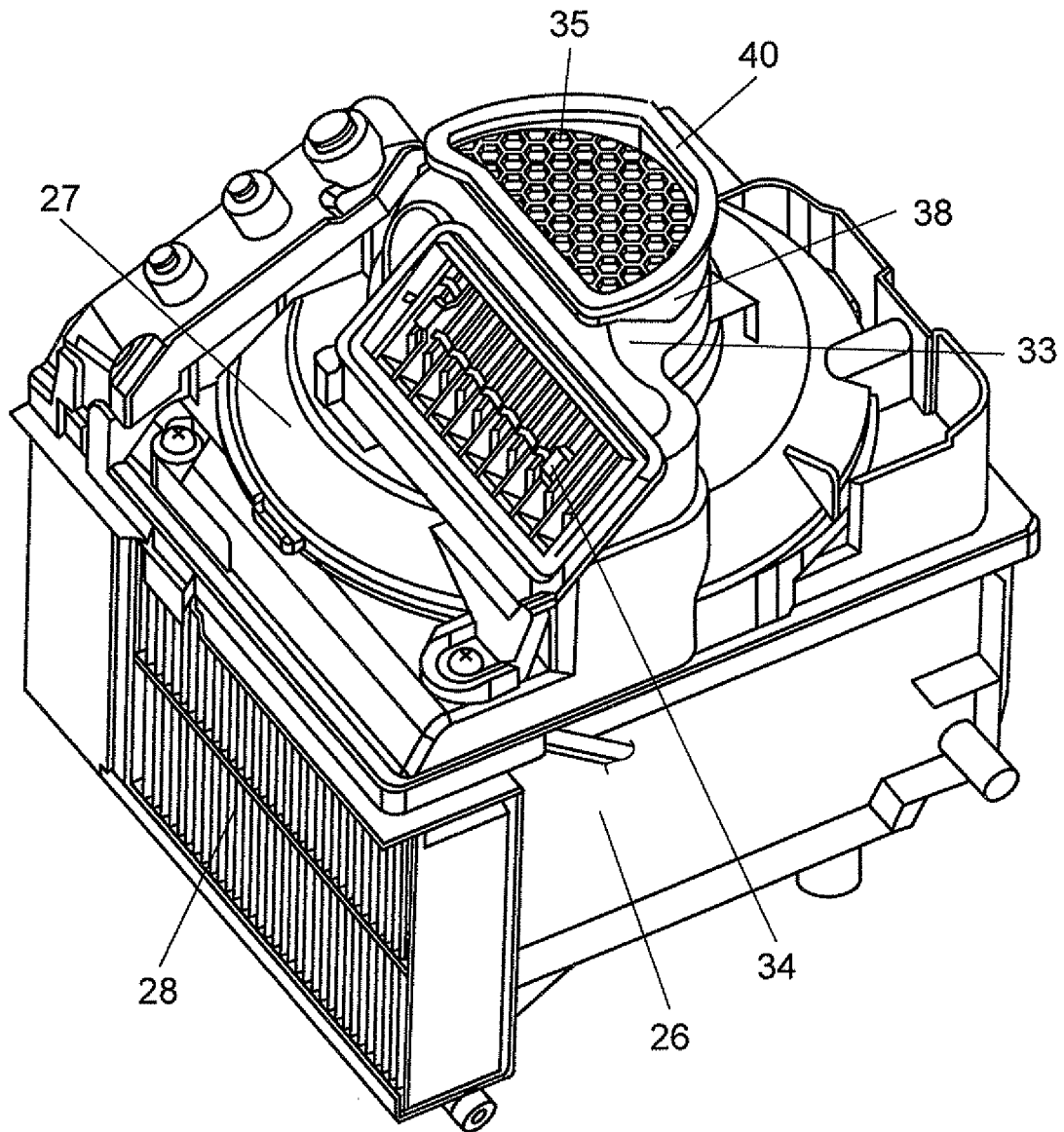
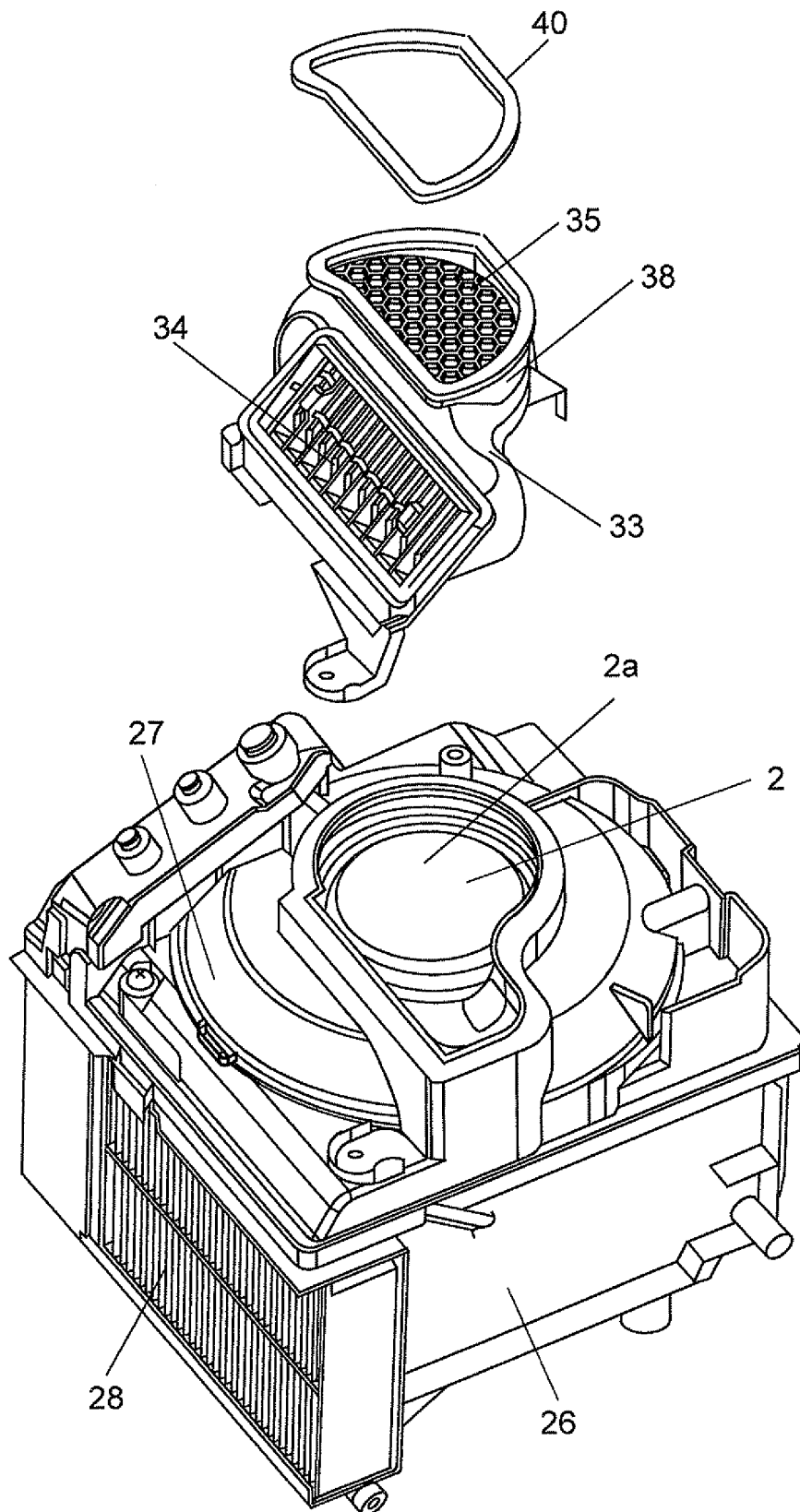


FIG. 6



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2011/004661

A. CLASSIFICATION OF SUBJECT MATTER

A47L9/00(2006.01) i, A47L9/16(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, A47L9/16

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 1996-2011

Kokai Jitsuyo Shinan Koho 1971-2011 Toroku Jitsuyo Shinan Koho 1994-2011

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2010-99183 A (Sharp Corp.), 06 May 2010 (06.05.2010), paragraphs [0034] to [0038]; fig. 1 to 3 (Family: none)	1-5
Y	JP 2009-219853 A (Mitsubishi Electric Corp.), 01 October 2009 (01.10.2009), paragraphs [0011] to [0013]; fig. 1 to 4 (Family: none)	1-5
Y	JP 5-220072 A (Toshiba Corp.), 31 August 1993 (31.08.1993), paragraphs [0002], [0010]; fig. 2, 8 (Family: none)	1-5

☒ Further documents are listed in the continuation of Box C.☐ See patent family annex.

* Special categories of cited documents:

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Date of the actual completion of the international search
21 November, 2011 (21.11.11)Date of mailing of the international search report
06 December, 2011 (06.12.11)Name and mailing address of the ISA/
Japanese Patent Office

Authorized officer

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2011/004661

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	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 42744/1979(Laid-open No. 143146/1980) (Matsushita Electric Industrial Co., Ltd.), 14 October 1980 (14.10.1980), specification, page 2, line 20 to page 4, line 3; fig. 1 (Family: none)	3 1, 2, 4, 5

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2010099183 A [0004]