(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 733 669 A1

(12) EUROPEAN PATENT APPLICATION

published in accordance with Art. 158(3) EPC

(43) Date of publication:
20.12.2006 Bulletin 2006/51

(21) Application number: **04807976.8**

(22) Date of filing: **28.12.2004**

(51) Int Cl.:
A47L 9/10 *(2006.01)* ***A47L 9/16*** *(2006.01)*

(86) International application number:
PCT/JP2004/019621

(87) International publication number:
WO 2005/099545 (27.10.2005 Gazette 2005/43)

(84) Designated Contracting States:
DE FR GB

(30) Priority: **07.04.2004 JP 2004113338**

(71) Applicant: **Toshiba TEC Kabushiki Kaisha**
Tokyo 141-8664 (JP)

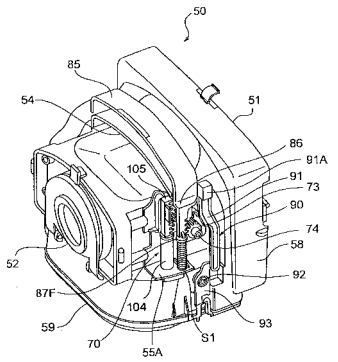
(72) Inventors:
- **Yokoyama, Hiroshi,**
  IP Division, Toshiba Tec K.K.
  Shinagawa-Ku,
  Tokyo 1418664 (JP)
- **Takemoto, Ritsuo,**
  IP DivisisiomToshiba Tec K.K.
  Shinagawa-ku,
  Tokyo 1418664 (JP)
- **Tanaka, Masatoshi,**
  IP Division, Toshiba Tec K.K.
  Shinagawa-ku,
  TOkyo 1418664 (JP)
- **Morishita, Atsushi,**
  IP Division, TOshiba Tec K.K.
  Shinagawa-ku,
  Tokyo 1418664 (JP)
- **Harada, Kenji,**
  IP Division, Toshiba Tec K.K.
  Shinagawa-ku,
  Tokyo 1418664 (JP)
- **Machida, Tatsuo,**
  IP Division, Toshiba Tec, K.K.
  Shinagawa-ku,
  Tokyo 1418664 (JP)
- **Suzuki, Hitoshi,**
  IP Division, Toshiba Tec, K.K.
  Shinagawa-ku,
  Tokyo 1418664 (JP)
- **Kojima, Kenji,**
  IP Division, Toshiba Tec K.K.
  Shinagawa-ku,
  Tokyo 1418664 (JP)
- **Tanaka, Ai,**
  IP Division, Toshiba Tec K.K.
  Shinagawa-ku,
  Tokyo 1418664 (JP)
- **Iizumi, Satoko,**
  IP Division, Toshiba Tec K.K.
  Shinagawa-ku,
  Tokyo 1418664 (JP)

(74) Representative: **Kramer - Barske - Schmidtchen**
Radeckestrasse 43
81245 München (DE)

(54) DUST COLLECTION VESSEL AND VACUUM CLEANER

(57) A dust collector, including a body having a dust-collecting chamber for storing dust, a gripping part provided outside the main body and gripped to carry the body, a compressing mechanism having a compressing member for compressing the dust stored in the dust-collecting chamber, and a lever for operating the compressing member by moving the lever toward the gripping part.

Fig. 5



EP 1 733 669 A1

Description

Technical Field

[0001] The present invention relates to a dust collector provided attachably and detachably in a main body of an electric vacuum cleaner, and an electric vacuum cleaner including the dust collector.

Background Art

[0002] Conventionally, there has been known a cyclon type-electric vacuum cleaner as described in FIG.10 (for reference, see JP 2001-104223A, paragraphs 38 and 45, FIG.2).

[0003] The electric vacuum cleaner includes a dust cup 1 in which an upper portion is opened, an electric blower 2 for generating a negative pressure in an inside of the dust cup 1, and so on. A suction opening 3 is provided in a peripheral wall 1A of the dust cup 1, the suction opening 3 communicates through a suction passage 5 with a suction unit 4 for sucking dust.

[0004] The dust sucked through the suction unit 4 is introduced in the dust cup 1 passing through the suction passage 5 and the suction opening 3 of the dust cup 1. Spiral flow is generated in the dust cup 1 to separate dust from air, and then only the air is sucked from the opened upper portion of the dust cup 1 to the electric blower 2 and discharged to the outside.

[0005] According to the electric vacuum cleaner, because the dust is collected in the dust cup 1, a paper pack-filter is not required.

[0006] However, in such an electric vacuum cleaner, because the dust and air are separated merely by the spiral flow generated in the dust cup 1, the dust collected in the dust cup 1 is not compressed almost, therefore the dust cup 1 is filled with the dust rapidly, hence there is a problem that an amount of the dust collected in the dust cup 1 is very less actually.

[0007] Therefore, there has been proposed an electric vacuum cleaner, which is provided with a compressing means for compressing dust collected in a dust-collecting part (for reference, see Japanese Patent Application No. 2003-097017).

[0008] However, in the technology, because a knob for operating the compressing means is provided on a lower position of a main body of the electric vacuum cleaner remote from a gripping tube part disposed on an upper portion of the main body in order to hold the main body of the electric vacuum cleaner, there is a case that while holding the main body with one hand, the compressing means must be operated by sliding the knob with another hand, therefore the compressing means is difficult to operate.

Disclosure of Invention

[0009] An object of the present invention is to provide a dust collector capable of compressing dust by a simple operation, and an electric vacuum cleaner for which the dust collector is used.

[0010] To achieve the above object, a dust collector in an aspect of the present invention comprises a body having a dust-collecting chamber for storing dust, a gripping part provided outside the main body and gripped to carry the body, a compressing mechanism including a compressing member for compressing the dust stored in the dust-collecting chamber, and a lever for operating the compressing member by moving the lever toward the gripping part.

[0011] The lever is disposed into a position capable of operating when the gripping part is gripped, and provided along an upper surface of the gripping part, in one embodiment.

[0012] The body includes a separating means disposed in an upstream side of the dust-collecting chamber and separating dust and air, a discharging opening for the dust provided in a bottom portion of the dust-collecting chamber, and a bottom lid disposed to allow the discharging opening to open and close and to discharge the dust by the compressing member when opening the bottom lid.

[0013] The body is disposed in a main body of an electric vacuum cleaner, and an operating means capable of operating the compressing member provided in the body of the dust collector is provided in the main body of the electric vacuum cleaner.

Brief Description of Drawings

[0014]

FIG.1 is a perspective view showing an outline of an electric vacuum cleaner according to the present invention.

FIG.2 is a partial sectional view showing a main body for the electric vacuum cleaner shown in FIG.1.

FIG.3 is a sectional view showing a portion of the main body for the electric vacuum cleaner in which a dust collector is mounted.

FIG.4 is a perspective view showing the dust collector.

FIG.5 is a perspective view showing the dust collector with a cover case removed.

FIG.6 is a perspective view showing a structure of a cooperative mechanism.

FIG.7 is a cross-sectional view of the dust collector.

FIG.8 is a perspective view showing a portion of the cooperative mechanism.

FIG.9 is an explanatory view showing a main portion of a dust collector in another embodiment.

FIG.10 is an explanatory view showing a structure of a conventional electric vacuum cleaner.

Best Mode for Carrying Out the Invention

[0015] A mode for carrying out an electric vacuum cleaner provided with a dust collector according to the present invention will be explained based on embodiments shown in the accompanying drawings below.

[0016] As shown in FIG.1, the electric vacuum cleaner 10 comprises a main body 11, a dust-collecting hose 12 having one end connected with the main body 11 and another end connected with an operation tube 13 at hand, an extension tube 14 connected with the operation tube 13 removably, and a suction unit 15 connected with a leading end of the extension tube 14 removably. One end of the dust-collecting hose 12 is connected with a connecting port 10A provided in the main body 11 removably.

[0017] The operation tube 13 includes an operation part 13A, which is provided with a plurality of operating switches 13B for operating the electric vacuum cleaner 10.

[0018] The suction unit 15 includes a suction chamber (not shown), which is provided with a suction port (not shown) formed on a bottom surface of the suction unit and sucking dust.

[0019] The main body 11 comprises a case 20, a dust collector 50 disposed removably in a collector-containing chamber 21 provided in the case 20, a lid 40 having a back portion connected pivotally with the case 20 by a hinge and a front side, which is openable and closable upward and downward, as shown in FIG.2.

[0020] The dust collector 50 includes a body 53, which has a suction port 52 provided at a front side (left side in FIG.5) of the body, and a filter-mounting part 58 provided at a back side of the body, as shown in FIGs.4 and 5. The filter-mounting part 58 has a back opening 51. The suction port 52 communicates through the connecting port 10A, the dust-collecting hose 12 and the extension tube 14 with the suction chamber of the suction unit 15. The filter-mounting part 58 is formed into a cylindrically shaped member having a rectangular shape in section, and, for example, a pleated filter unit P is mounted removably in the filter-mounting part 58.

[0021] The collector-containing chamber 21 is formed at a front side of the case 20, the upper opening 22 of the collector-containing chamber 21 is closed by the lid 40 constantly. An electric blower 23 is provided at a back side of the case 20, a suction opening 24 of the electric blower 23 communicates through a connecting air passage G with the back opening 51 of the dust collector 50.

[0022] The case 20 is provided with a plurality of exhausting holes 25, and back wheels are also provided with a plurality of exhausting holes 27. Air sucked through the suction opening 24 by the electric blower 23 and discharged through a discharging port (not shown) is emitted from the exhausting holes 25 and 27.

[0023] The body 53 comprises a dust-separating means 60 for separating air containing dust sucked through the suction port 52 into the dust and the air, a dust-collecting chamber 55 disposed beneath the dust-separating means and containing the dust separated by the dust-separating means 60, a guiding air passage 56 for guiding the dust separated by the dust-separating means 60 to the dust-collecting chamber 55, and a negative-pressure chamber 57 formed on the dust-collecting chamber 55 integrally and so on. Provided on a bottom portion of the dust-collecting chamber 55 are a discharging port 53D for discharging the dust, and a bottom lid 59 disposed at the discharging portion so that the discharging port can be opened and closed.

[0024] The dust-separating means 60 has a frame 61 provided with a plurality of openings 61A and a net filter F1 provided at each of the openings. A bugle-like air passage 62 is formed in an inner side of the frame surrounded by the net filters F1. The air passage 62 extends straightly in a forward and backward direction.

[0025] The frame 61 has a front opening 61a provided to face the suction port 52 and having a diameter larger than that of the suction port 52 and a back opening 61b having a generally same diameter to that of the suction port 52.

[0026] The guiding air passage 56 communicates with the back opening 61b of the frame 62 and an introducing opening 55d provided in a back portion of a ceiling wall 55A of the dust-collecting chamber 55.

[0027] The negative-pressure chamber 57 communicates with the back opening 51, and the dust-separating means 60 and the guiding air passage 56 are disposed in the negative-pressure chamber 57. An air passage 62 in the dust-separating means 60 communicates through each opening 61A of the frame 61 with the negative-pressure chamber 57.

[0028] An opening 55Ha is provided in a back wall 55H of the dust-collecting chamber, the dust-collecting chamber 55 communicates through the opening 55Ha with the negative-pressure chamber 57, and a filter F2 is provided at the opening 55Ha.

[0029] The dust collector 50 has a gripping part 54 provided on an upper portion of the main body 53. The gripping part 54 comprises a U character shaped band-like member fixed on opposed sides of the main body 53, as shown in FIGs.4 and 5. A person can carry the main body 53 by holding the gripping part 54 with hand.

[0030] A compressing mechanism for compressing the dust contained in dust-collecting chamber 55 in cooperation with gripping the gripping part 54 by hand is provided.

[0031] The compressing mechanism includes a lever 85 disposed in a position capable of operating when gripping the gripping part 54 and a compressing member 100 disposed in the dust-collecting chamber 55 so as to compress the dust in the dust-collecting chamber 55 through a cooperative mechanism 70 when operating the lever 65. The lever 85 comprises a generally U character shaped band-like member extending above the gripping part 54 and along the gripping part, and disposed bridging opposite sides of the body 53 of the dust collector.

[0032] The compressing member 100 is provided be-

low the ceiling wall 55A of the dust-collecting chamber 55 so as to move upward and downward, a dome-like guiding wall portion 101 disposed along an inner side of the guiding air passage 56 is formed integrally with the compressing member 100, as shown in FIG.6.

[0033] Moreover, the compressing member 100 is formed with an opening 102 facing the back opening 61b of the dust-separating means 60 and an opening 103 facing the introducing opening 55d of the dust-collecting chamber 55. To a back edge portion of the compressing member 100, a blade 110 sliding on a filter surface F2a at the upstream of the filter F2 is attached.

[0034] The cooperative mechanism 70 includes a gear means connected with the lever 85 and a rod means connected with the gear means, for example.

[0035] The rod means has upwardly and downwardly extending rods 104 and 104, which are attached detachably to opposite sides of the compressing member 100. The rods 104 and 104 are inserted in holes 55f and 55f provided in opposite ends of the ceiling wall 55A of the dust-collecting chamber 55 to enable the rods to move upward and downward, as shown in FIG.7.

[0036] The gear means includes racks 72 provided on legs 86 of the lever 85, sector gears 73 engaged with the racks 72, sector gears 75 mounted on shafts 74 of the gears 73, as shown in FIG.8, and upwardly and downwardly extending rack members 105 and 105 provided on upper ends of the rods 104 and 104 to engage with the sector gears 75.

[0037] Downwardly projecting shafts 87 and 87 are provided on lower portions of the legs 86 and 86 of the lever 85, flanges 87F and 87F are formed on upper portions of the shafts 87 and 87.

[0038] Springs S1 and S1 are attached to the shafts 87 and 87, as shown in FIG.5, upper portions of the springs S1 and S1 are engaged with the flanges 87F and 87F, and lower portions of the springs S1 and S1 are engaged with an upper surface of the ceiling wall 55A of the dust-collecting chamber 55. The lever 85 is biased by biasing forces of the springs S1 and S1, projections 85A and 85A provided on opposite ends of the lever 85 are abutted with lower surfaces of cover cases 71 and 71, and the lever 85 is limited so that the lever 85 is not moved beyond a predetermined amount.

[0039] Each sector gear 73 is mounted on each cover case 71 rotatably, a diameter of each sector gear 75 is set to be larger than that of each sector gear 73.

[0040] When the lever 85 is moved downwardly against the biasing forces of the springs S1 and S1, the gears 73 and 73 are rotated counterclockwise (in FIG.8), the gears 75 and 75 are rotated counterclockwise together with the rotation of the gears 73 and 73 integrally. The counterclockwise rotation of the gears 75 and 75 causes the racks 106 and 106 to move together with the rods 104 and 104 downwardly.

[0041] The rods 104 and 104 are moved downwardly an amount larger than that of the downward movement of the lever 85, because the diameter of each gear 75 is set to be larger than that of each gear 73.

[0042] The downward movement of the rods 104 and 104 causes the compressing member 100 to move downwardly.

[0043] In this way, when the lever 85 is moved downwardly, the compressing member 100 is moved by the cooperative mechanism 70 downwardly.

[0044] An opening and closing mechanism 90 for opening and closing the bottom lid 59 is provided, the opening and closing mechanism 90 comprises an upwardly and downwardly movable arm 91 disposed in the vicinity of the cooperative mechanism 70, a link member 93 for rotating about a shaft 92 according to the upward and downward movement of the arm 91, and so on, as shown in FIG.5.

[0045] The arm 91 is supported inside the cover case 71 to be movable upwardly and downwardly, and an operational part 91A on an upper portion of the arm 91 extends upwardly passing through a hole 71B provided in the cover case 71, as shown in FIG.4. The operational part 91A forms an operational part for opening and closing the bottom lid 59. The arm 91 is biased by a spring (not shown) upwardly.

[0046] The link member 93 is pivoted on the shaft 92 provided in the sidewall portion 55S, as shown in FIG.5. As shown in FIG.5, a hook 94 is provided on a lower portion of the link member 93, the hook 94 engages with an engaging part (not shown) provided on the bottom lid 59 so that the bottom lid 59 does not open.

[0047] When the arm 91 is moved downwardly against a biasing force of the spring by pressing the operational part 91A of the arm 91, the link member 93 is rotated clockwise and the hook 94 of the link member 93 disengages from the engaging part of the bottom lid 59 so that the bottom lid 59 opens.

[0048] The bottom lid 59 is opened by rotating it about an axis j1 at a left side in a direction shown at the arrow P1, as shown in FIG.4. In this way, when the operational part 91A of the arm 91 is pressed, the bottom lid 59 is opened through the opening and closing mechanism 90.

[0049] Meanwhile, the cooperative mechanism 70 and opening and closing mechanism 90 are covered by the cover case 71 for protecting them (see FIG.4).

[0050] The main body 11 of the electric vacuum cleaner is provided with an operating means capable of operating the gripping part 54 provided on the body 53 for the dust collector. The operating means has a hole 41 provided in the lid 40 and a button 42 inserted in the hole 41, for example. The button 42 is biased by a spring (not shown) upwardly, and disposed to close the hole 41 usually.

[0051] An upwardly and downwardly extending guiding cylinder 43 is provided beneath the hole 41 of the lid 40, a shaft 44 provided on a lower surface of the button 41 is inserted into a guiding hole 43A of the guiding cylinder 43 movably upwardly and downwardly so that the button 42 can be moved upwardly and downwardly.

[0052] In addition, a projection 45 is formed on the low-

er surface of the button 42, and the projection 45 abuts with the lever 85 as described hereinafter (see FIG.2).

[0053] When the button 42 is moved downwardly, the lever 85 is moved downwardly.

[Operation]

[0054] Next, an operation of the electric vacuum cleaner structured as described above is explained.

[0055] First, the dust collector 50 is disposed in the dust-collecting chamber 21 of the main body 11 of the electric vacuum cleaner, as shown in FIG.2, the dust-collecting hose 12 is connected with the connecting port 10A of the main body 11, as shown in FIG.1, and the suction unit 15 is connected through the extension tube 14 with the operation tube 13.

[0056] When the operating switches 13B of the operation part 13A on the operation tube 13 are operated, the electric blower 23 is driven. Driving the electric blower 23 causes air from the suction opening 24 of the electric blower 23 to suck, the suction of air operates at the back opening 51 of the dust collector 50 through the connecting air passage G, hence through the pleated filter unit P, the negative-pressure chamber 57 of the dust collector 50 becomes negative pressure.

[0057] The negative pressure operates in the air passage 62 of the dust-separating means 60 through the filter F2 at the dust-collecting chamber 55, the inside of the dust-collecting chamber 55, and the net filters F1 in the dust-separating means 60, and then the negative pressure operates over the dust-collecting hose 12, the extension tube 14 and the suction unit 15 through the suction port 52 of the dust collector 50 so as to suck air and dust through the suction unit 15.

[0058] The sucked air and dust are introduced to the suction port 52 of the dust collector 50 through the extension tube 14 and the dust-collecting hose 12. The dust and air sucked into the suction port 52 are sucked to the air passage 62 of the dust-separating means 60.

[0059] A portion of the air sucked into the air passage 62 is sucked into the negative chamber 57 of the dust collector 50 through the net filters F1 in the dust-separating means 60, further into the suction opening 24 of the electric blower 23 through the pleated filter unit P at the back opening 51 of the dust collector 50 and the connecting air passage G.

[0060] On the other hand, the dust sucked into the air passage 62 of the dust-separating means 60 passes through the air passage 62 straightly, because the dust has a mass larger than that of the air, guided by the guiding wall 101 of the compressing member 100, and introduced into the dust-collecting chamber 55. In other words, the dust is separated from the air by the dust-separating means 60, the separated dust is collected into the dust-collecting chamber 55.

[0061] Moreover, the air going within the air passage 62 straightly is guided by the guiding wall 101 of the compressing member 100 and introduced in the dust-collecting chamber 55. The air introduced into the dust-collecting chamber 55 is sucked into the negative chamber 57 of the dust collector 50 passing through the filter F2 at the back wall 55H of the dust-collecting chamber 55, further into the suction opening 24 of the electric blower 23 through the pleated filter unit P at the back opening 51 of the dust collector 50 and the connecting air passage G.

[0062] When the cleaning is completed, the driving of the electric blower 23 is stopped by operation of the switch 13B for stopping disposed on the operation part 13A. Then, the button 42 provided on the main body 11 is pressed downwardly. When the button 42 is pressed downwardly, the lever 85 is pressed down against the biasing forces of the springs S1 and S1.

[0063] When the lever 85 is pressed down, the compressing member 100 is moved by the cooperative mechanism 70 downwardly.

[0064] When the compressing member 100 is pressed downward, the blade 110 of the compressing member 100 slides on the filter surface F2a of the filter F2 to scrape off the dust adhering on the filter surface F2a. In addition, the dust stored in the dust-collecting chamber 55 is compressed by moving the compressing member 100 downwardly. Therefore, a great amount of dust can be contained in the dust-collecting chamber 55.

[0065] When separating the hand from the button, the lever 85 returns to an original position by the biasing forces of the springs S1 and S1, the compressing member 100 and the button 42 return to the original position as shown in FIG.2 in conjunction with the lever 85.

[0066] Next, a case throwing out the dust stored in the dust-collecting chamber 55 is as follows.

[0067] First, the dust collector 50 is taken out from the main body 11 by opening the lid 40. When the operation part 91A as shown in FIG.4 is then pressed, the bottom lid 59 is rotated about the axis Jl in a direction of arrow P1 by the opening and closing mechanism 90 and opened.

[0068] Next, when gripping the lever 85 together with the gripping part 54, the lever 85 is pressed downward toward the gripping part 54, by the press of the lever 85 down, the compressing member 100 is pressed downwardly to a position sufficient to discharge the dust by the cooperative mechanism 70. Thereby, the dust in the dust-collecting chamber 55 is pressed out from the bottom opening of the dust collector 50 downwardly, therefore throwing the dust out is easy.

[0069] Moreover, because the compressing member 100 can be removed from the rods 104 and 104, it is possible to sweep away dust or the like on the compressing member 100.

[0070] FIG.9 illustrates a portion of a dust collector 150 in another embodiment. The dust collector 150 is configured to rotate a compressing member 200 about a shaft 201 to a position shown by chained lines by the cooperative mechanism 70. The filter F2 is formed into an arc-shape, and the blade slides on a filter surface F2a of the filter F2 and the dust in the dust-collecting chamber 55

is pressed out by means of the compressing member 200, when the compressing member 200 is rotated. Meanwhile, in FIG.9, reference numeral 202 denotes an opening.

Industrial Applicability

[0071] In the above, although the embodiments in which the dust collector according to the present invention is applied to the electric vacuum cleaner have been described, the structure for the dust collector can be applied to another any device or instrument not only the electric vacuum cleaner.

Claims

1. A dust collector, comprising:

a body having a dust-collecting chamber for storing dust;
a gripping part provided outside the main body and gripped to carry the body;
a compressing mechanism including a compressing member for compressing the dust stored in the dust-collecting chamber; and
a lever for operating the compressing member by moving the lever toward the gripping part.

2. The dust collector according to claim 1, wherein the lever is disposed into a position capable of operating when the gripping part is gripped and provided along an upper surface of the gripping part.

3. The dust collector according to claim 1, wherein the body includes a separating means disposed in an upstream side of the dust-collecting chamber and separating dust and air, a discharging opening for the dust provided in a bottom portion of the dust-collecting chamber, and a bottom lid disposed to allow the discharging opening to open and close and to discharge the dust by the compressing member when opening the bottom lid.

4. The dust collector according to claim 1, wherein the body is disposed in a main body of an electric vacuum cleaner, and an operating means capable of operating the compressing member provided in the body of the dust collector is provided in the main body of the electric vacuum cleaner.

5. The dust collector according to claim 4, wherein the operating means comprises a button provided on an outer surface of the main body of the electric vacuum cleaner and in a position facing the lever.

6. An electric vacuum cleaner comprising the dust collector as recited in claim 1.

Fig. 1

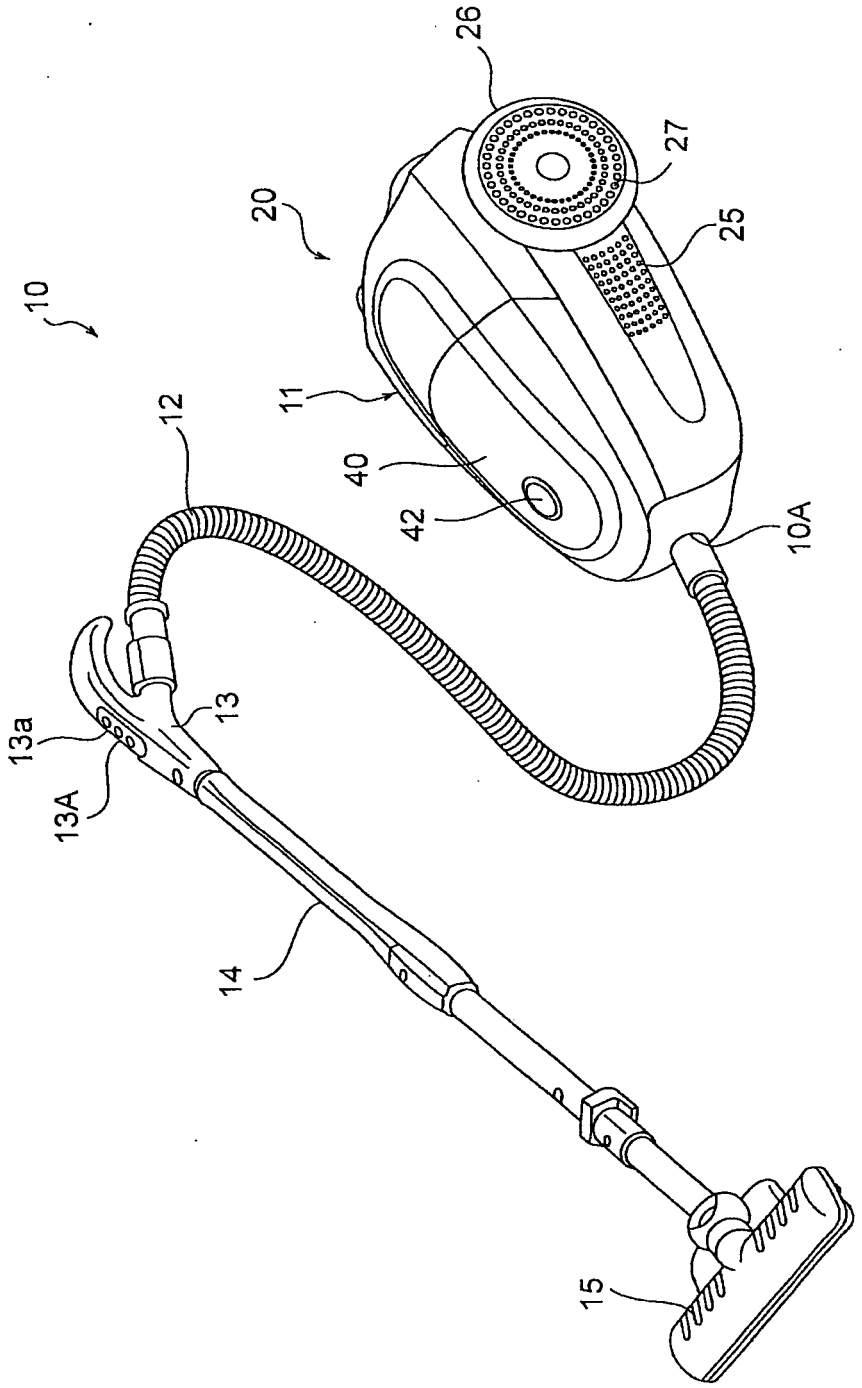


Fig. 2

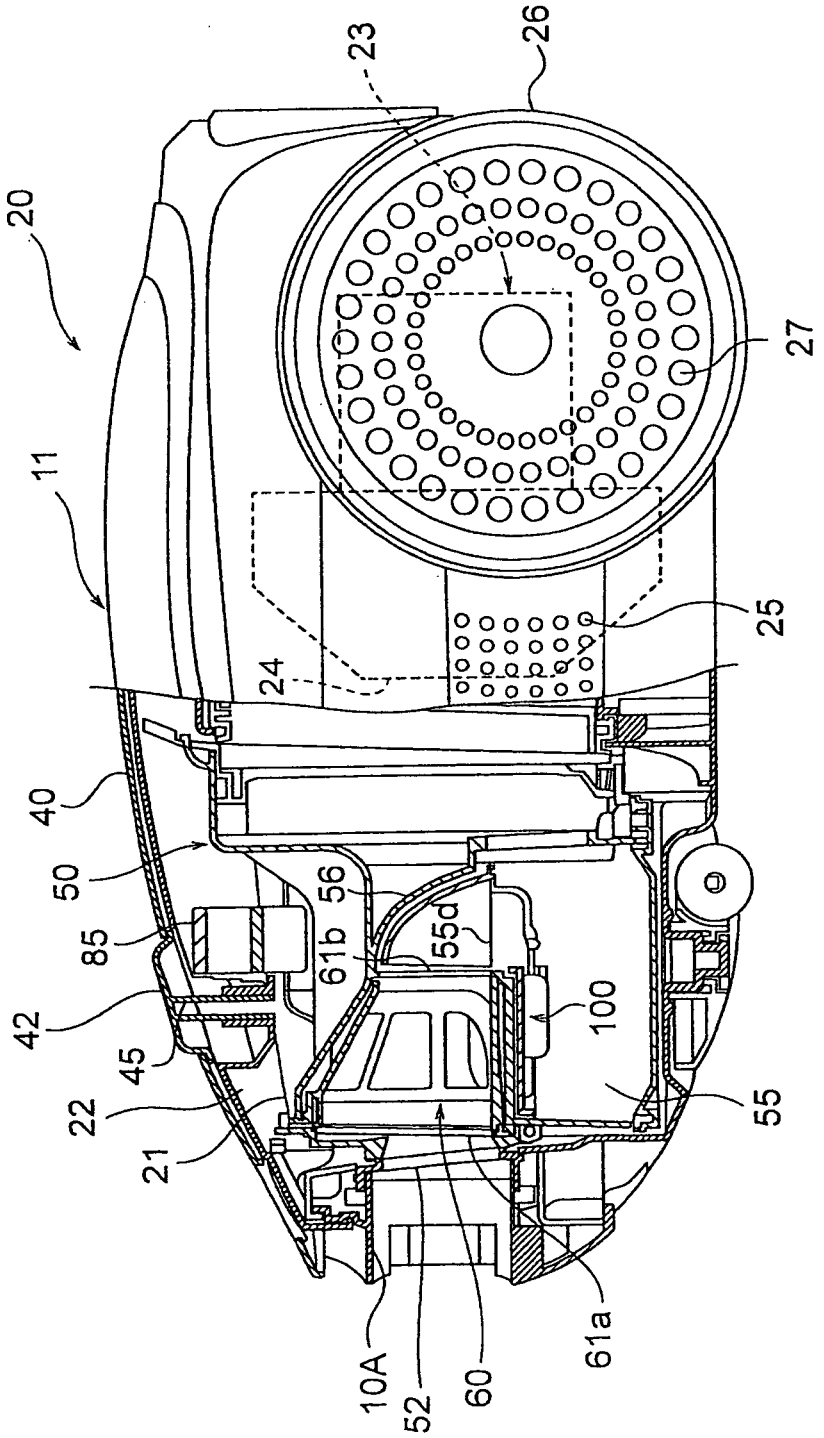

23
26
20
27
11
25
24
40
50
56
55d
85
61b
100
42
45
22
55
21
10A
52
60
61a

Fig. 3

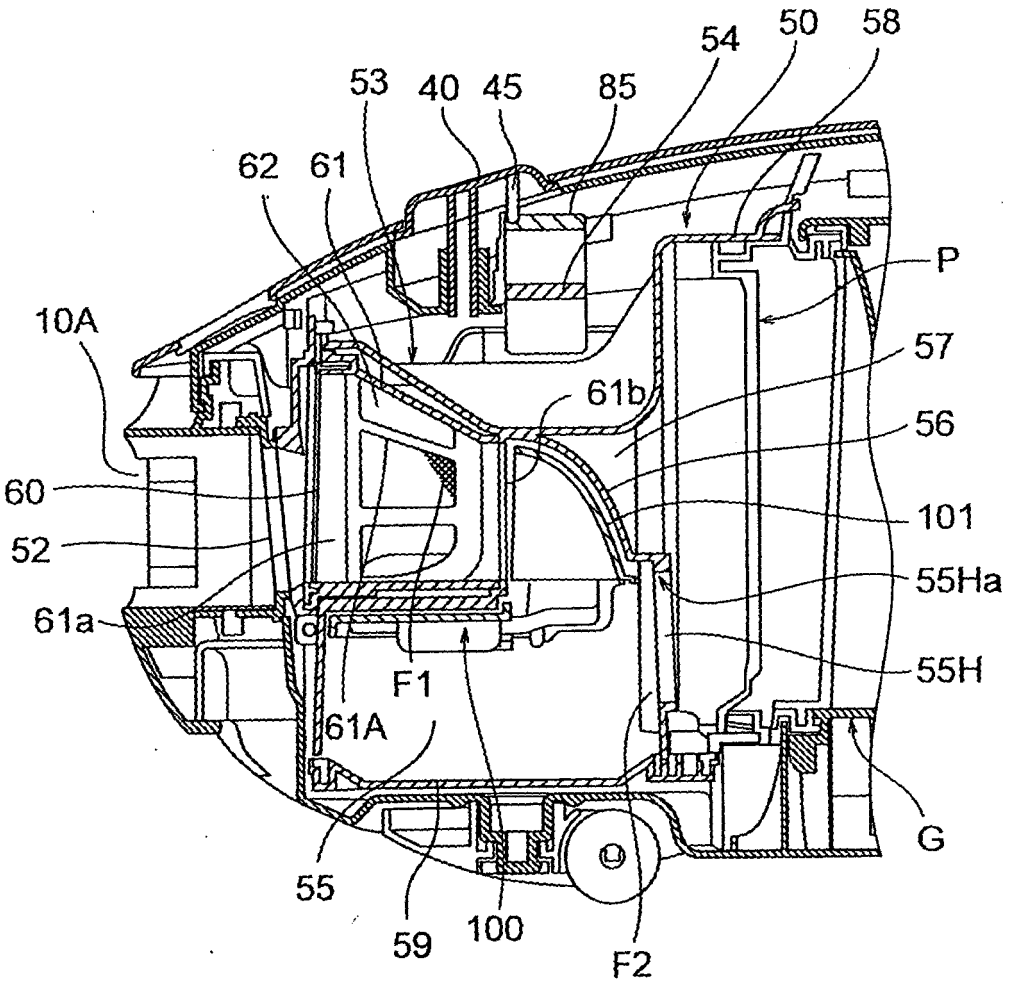

54
50
58
53
40
45
85
62
61
P
10A
57
61b
56
60
101
52
55Ha
61a
55H
F1
61A
G
55
59
100
F2

Fig. 4

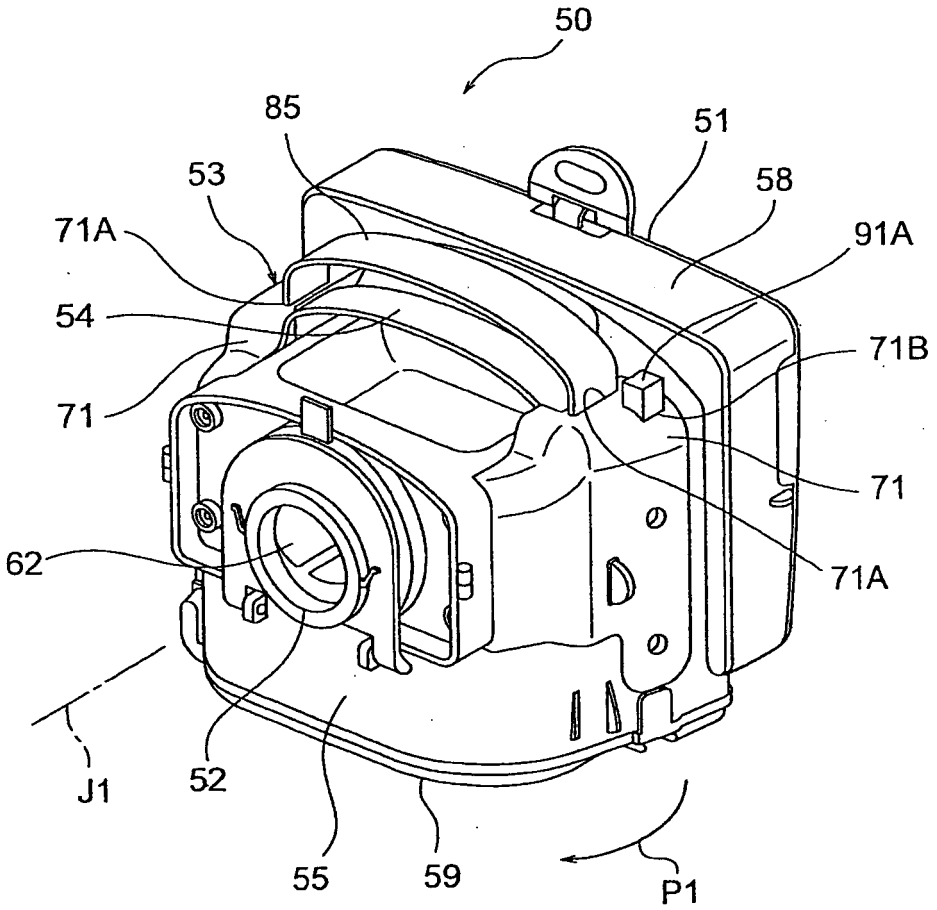


Fig. 5

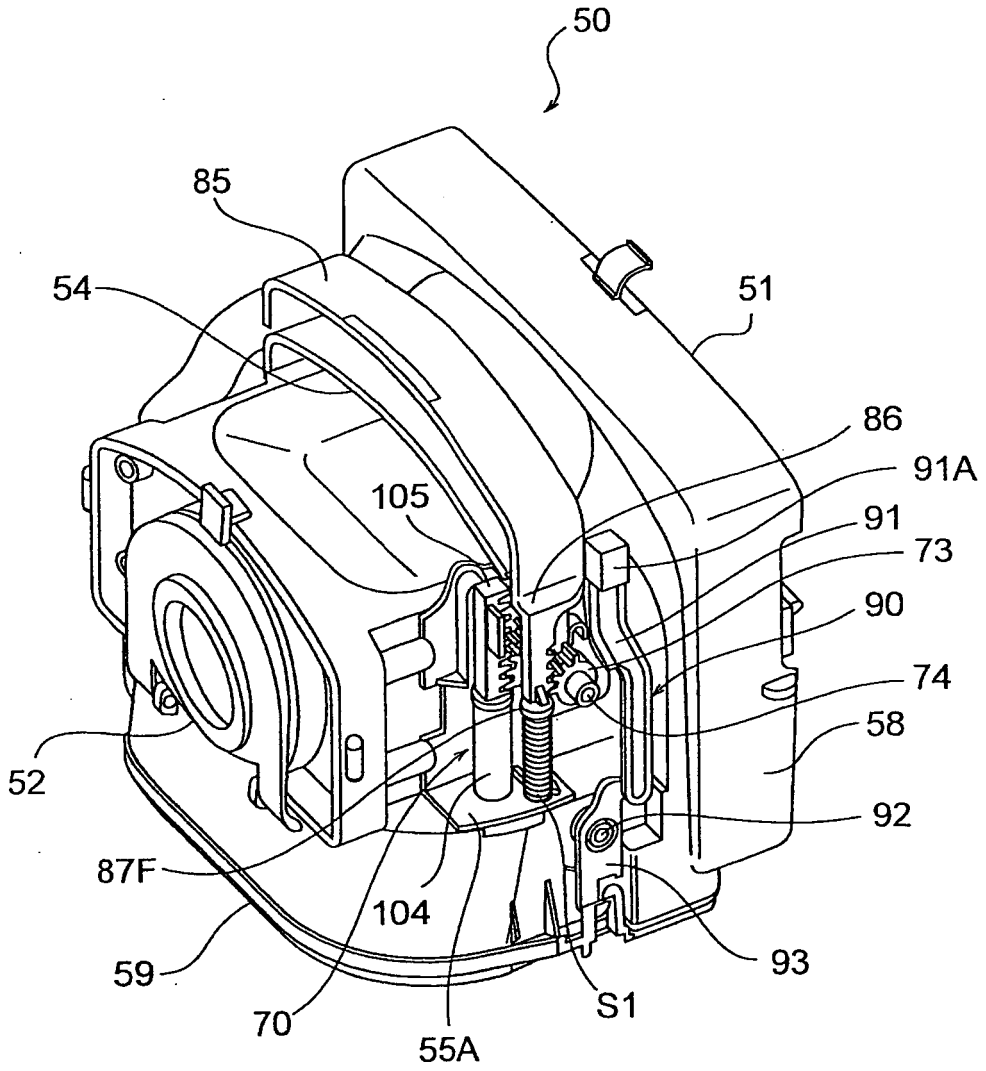


Fig. 6

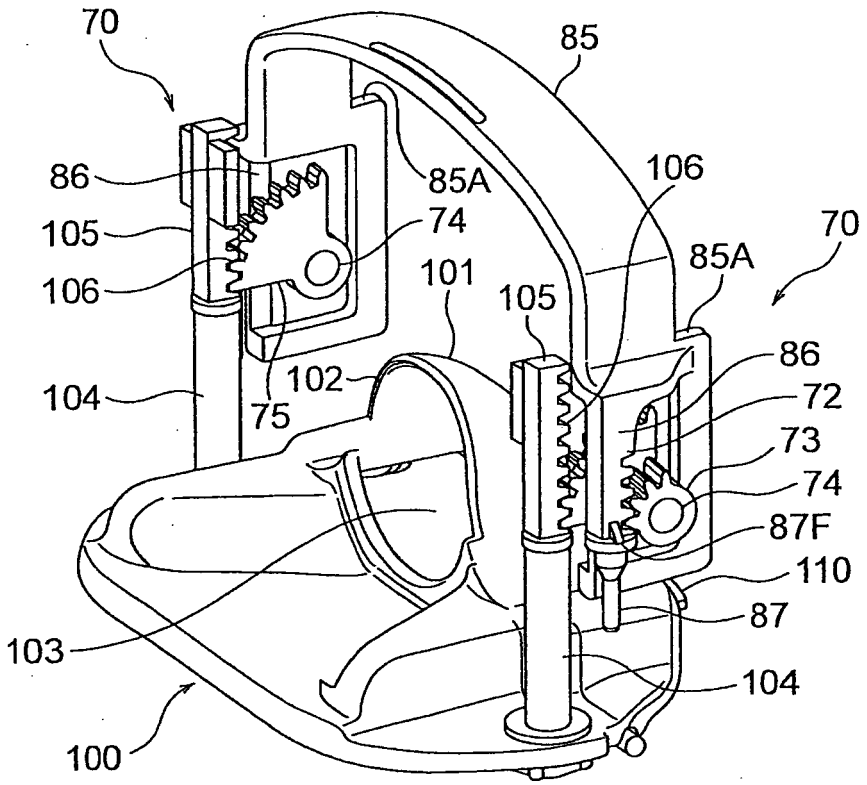

70
85
86
85A
106
105
74
70
106
85A
101
105
86
104
102
72
75
73
74
87F
110
87
103
104
100

Fig. 7

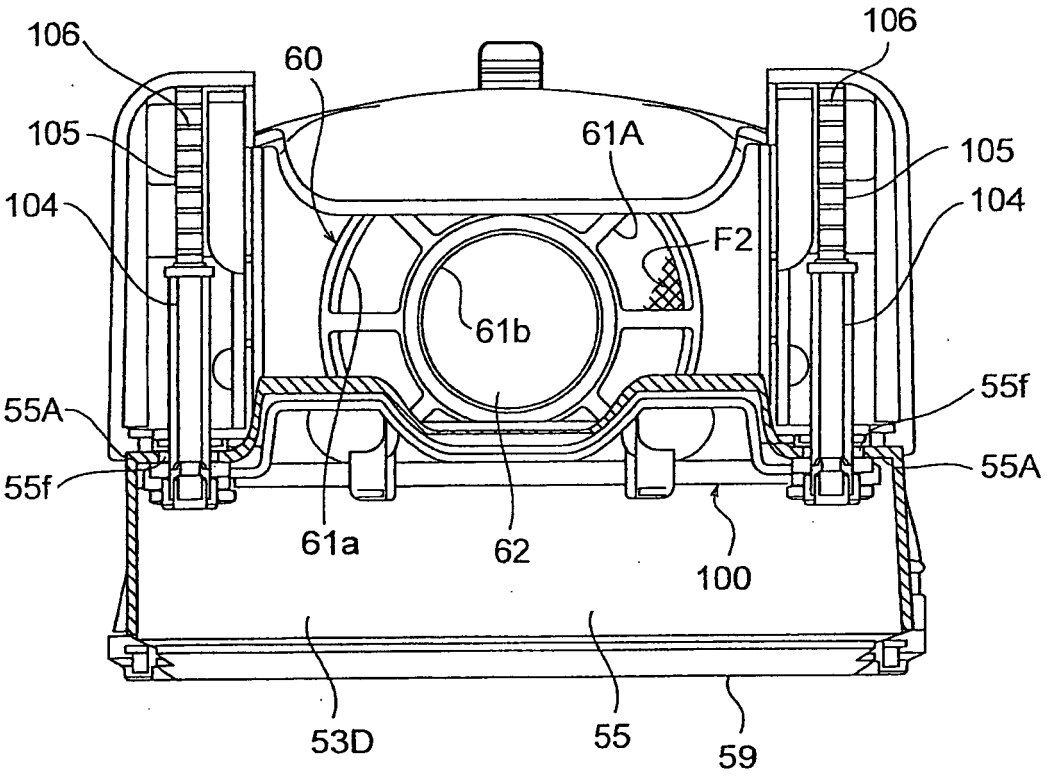

106
60
106
105
61A
105
104
F2
104
61b
55f
55A
55A
55f
61a
62
100
53D
55
59

Fig. 8

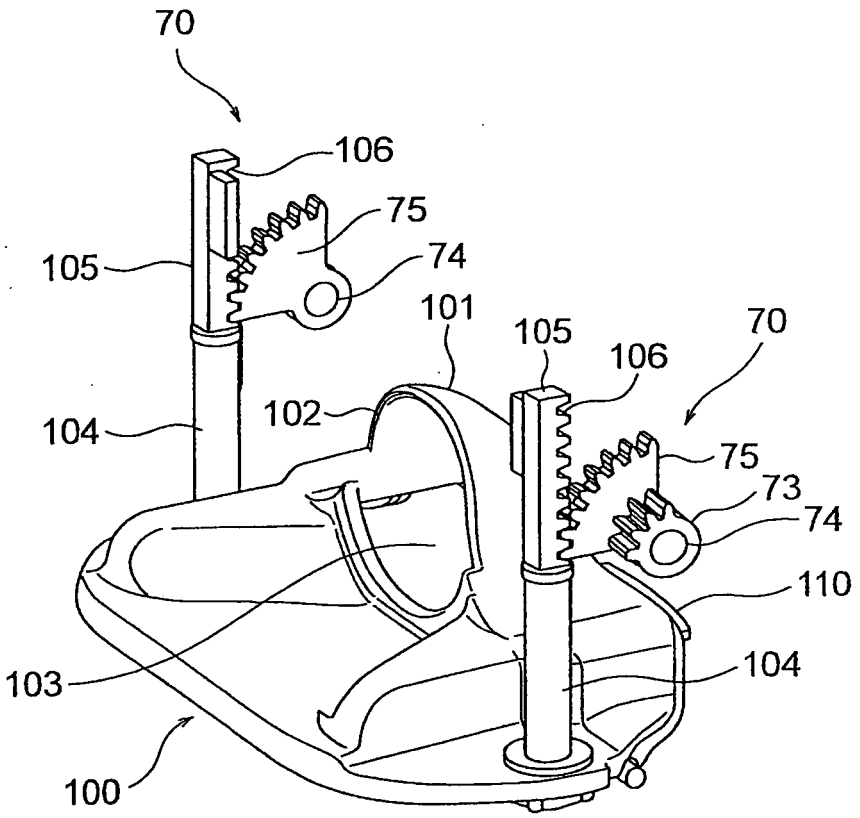


Fig. 9

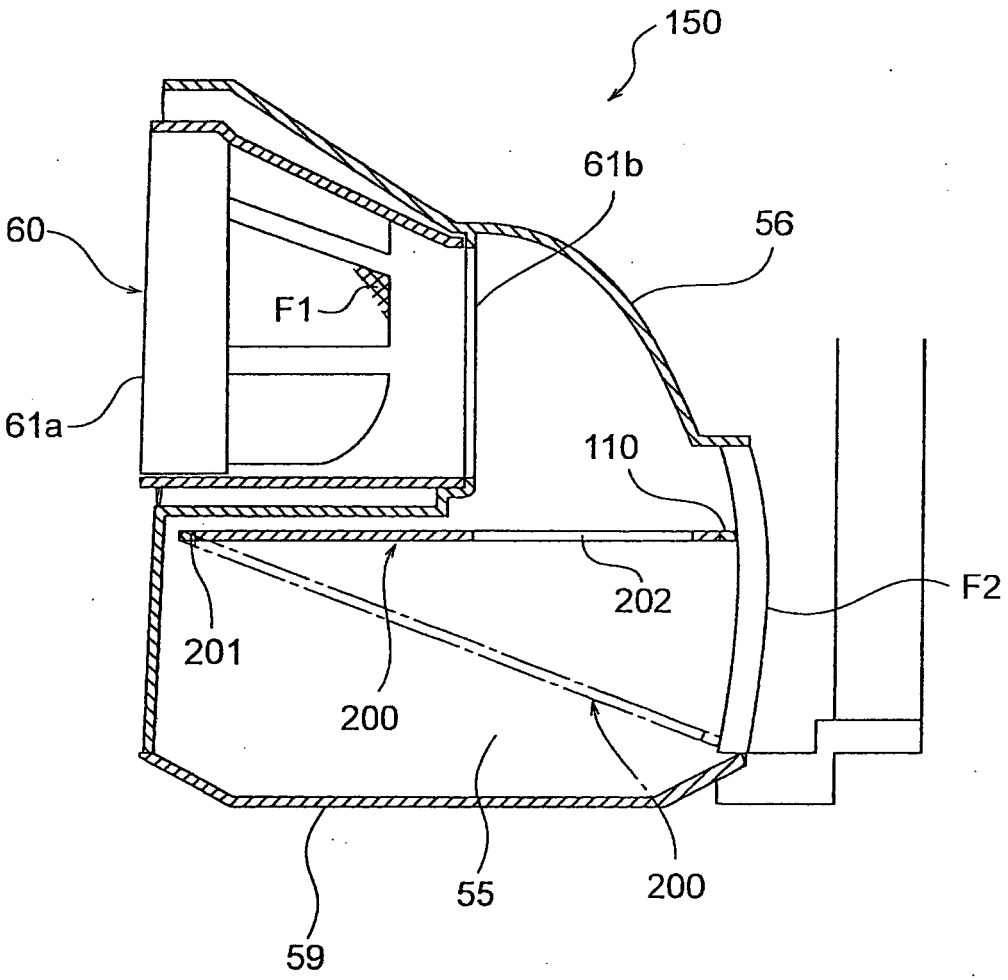
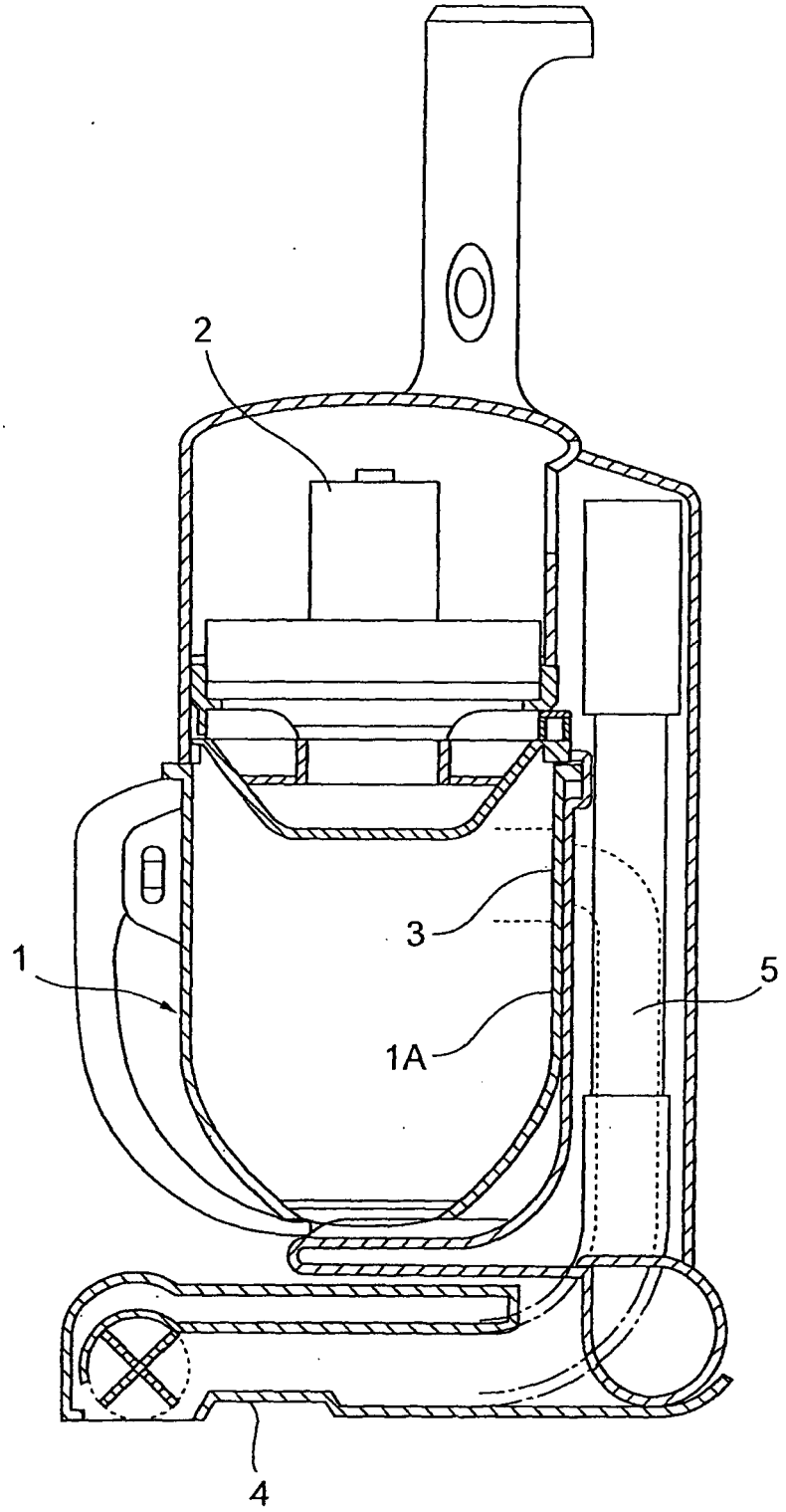


Fig. 10



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2 004/019621

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[7] A47L9/10, A47L9/16

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)
Int.Cl[7] A47L9/10, 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	Toroku Jitsuyo Shinan Koho	1994-2005
Kokai Jitsuyo Shinan Koho	1971-2005	Jitsuyo Shinan Toroku Koho	1996-2005

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 2003-190056 A (Matsushita Electric) Industrial Co., Ltd.), 08 July, 2003 (08.07.03), Full text; Figs. 1 to 13 (Family: none)	1-6
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 63525/1981(Laid-open No. 173650/1982) (Tokyo Shibaura Electric Co., Ltd.), 01 November, 1982 (01.11.82), Full text; Figs. 1 to 4 (Family: none)	1-6

☒ Further documents are listed in the continuation of Box C. ☐ 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
"E" earlier application or patent but published on or after the international filing date
"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)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"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
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"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
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
29 March, 2005 (29.03.05)	12 April, 2005 (12. 04.05)
Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer
Facsimile No.	Telephone No.

Form PCT/ISA/210 (second sheet) (January 2004)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2004/019621

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 57-136428 A (Tokyo Electric Co., Ltd.), 23 August, 1982 (23.08.82), Full text; Figs. 1 to 4 (Family: none)	3
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 130657/1979(Laid-open No. 48356/1981) (Matsushita Electric Industrial Co., Ltd.), 30 April, 1981 (30.04.81), Full text; Figs. 1 to 5 (Family: none)	4,5

Form PCT/ISA/210 (continuation of second sheet) (January 2004)

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 2001104223 A **[0002]**
- JP 2003097017 A **[0007]**