(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
25 June 2015 (25.06.2015)

WIPO | PCT

(10) International Publication Number
WO 2015/090439 A1

(51) International Patent Classification:
A47L 9/14 (2006.01) *A47L 9/12* (2006.01)

(21) International Application Number:
PCT/EP2013/077661

(22) International Filing Date:
20 December 2013 (20.12.2013)

(25) Filing Language: English

(26) Publication Language: English

(71) Applicant: **AKTIEBOLAGET ELECTROLUX** [SE/SE]; S:t Göransgatan 143, S-10545 Stockholm (SE).

(72) Inventors: **WENNERSTRÖM, Magnus**; S:t Göransgatan, 143, S-105 45 Stockholm (SE). **ANDERSSON, Bänkt**; Kolartorps allé, 31, S-136 48 Handen (SE).

(74) Agent: **WRETBLAD, Eva**; S:t Göransgatan 143, S-105 45 Stockholm (SE).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

(54) Title: DUST CONTAINER

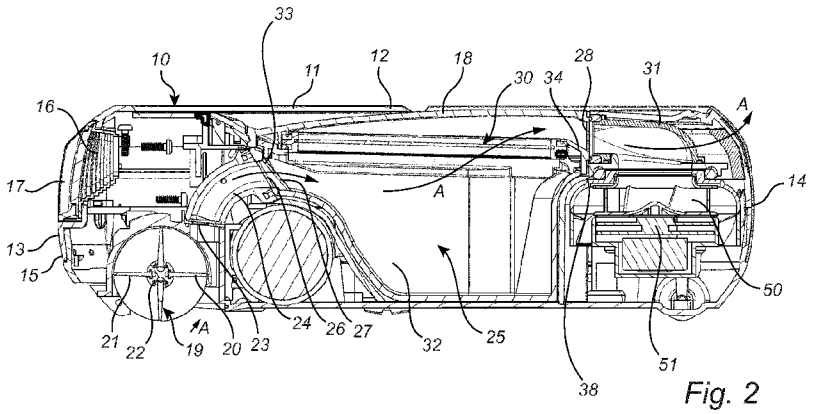

Fig. 2

(57) Abstract: The present invention relates to a dust container (25) for an autonomous cleaner (10), said dust container comprising: a container wall (31) enclosing a dust chamber (32); a first side (33); a second side (34); an inlet opening (27) to the dust chamber for dust particles and air arranged in the first side of the container; an outlet opening (28) from the dust chamber for air arranged in the second side of the dust container; and a filter (30) arranged in the dust container such that the flow of air through the dust container pass through the filter. The invention furthermore relates to an autonomous cleaner (10) comprising said dust container.

WO 2015/090439 A1

DUST CONTAINER

Field of the invention

The present invention relates to a dust container for an autonomous cleaner, and an autonomous cleaner comprising said dust container.

Background of the invention

In order to facilitate the work related to vacuum cleaning of floor areas in different types of building structures, autonomous vacuum cleaners have been available on the market for some time. These autonomous cleaners automatically move in different directions over the floor to clean the floor area without human involvement. The cleaner is either moving randomly or according to a predetermined pattern over the floor until a navigation system detects an obstacle or the cleaner hit some obstacle and turn. Consequently, the size and design of the cleaner is important factors to ensure that the cleaner is able to access as large area as possible of the floor since a cleaner with a limited height and width will be able to access areas under and around furniture, or in close corners more easily.

Autonomous cleaners have a cleaner body which comprises the different components of the cleaner, and wheels supporting the body to make it possible for the cleaner to move over the floor surface. In the cleaner body electrical motors are arranged together with at least two wheels for powering the cleaner. Particles such as dust, sand etc are collected from the floor surface by a brush roll and lead via a passage adjacent to the roll to a dust container arranged within the body. In order to further improve the cleaning result the roll could be combined with a fan powered by an electric motor to generate a flow of air through the passage to suck the particles into the passage and the dust container.

In order to make the cleaner work as intended, and ensure a good cleaning result, several components need to be arranged in the cleaner body. This is however contradictable to the desired small outer dimensions of the cleaner body to make it possible for the cleaner to access as large area as possible of the floor surface. The

design of each of the components, as well as the interior design of the cleaner is consequently extremely important to ensure the desired function of the different components, the desired limited size of the cleaner body and the possibility to clean as large areas as possible without requiring frequent emptying of the dust container.

There are a number of autonomous cleaners disclosed in the prior art. One example of a cleaner is illustrated in WO 2013/105431. The disclosed cleaner has a substantially circular cleaner body comprising the different components of the cleaner. As can be seen in the figures a number of different components are fitted within the cleaner body which in combination with the desired small outer size of the cleaner makes the room for the different components limited. The limited space within the cleaner body has some severe drawbacks on the disclosed cleaner. One of them is that the dust container has a very small volume. The small volume results in that the container must be emptied more frequently to ensure the desired cleaning result which is devastating since the container must be emptied manually. Furthermore the removal and fitting of the dust container in the cleaner body is complicated du to the complex design of the dust container and the surrounding structures in the cleaner body.

There is consequently a need for an improved dust container and an autonomous cleaner design that reduces the drawback described above.

Summary of the invention

The present invention, defined in the appended claims, relates to a dust container for an autonomous cleaner that to at least some extent fulfils the needs defined above, and an autonomous cleaner comprising said dust container.

The dust container according to the invention comprises:

a container wall enclosing a dust chamber;

a first side;

a second side;

an inlet opening to the dust chamber for dust particles and air arranged in the first side of the dust container;

an outlet opening from the dust chamber for air arranged in the second side of the container; and

a filter arranged in the dust container such that the flow of air through the dust container pass through the filter.

The dust container reduces the problems defined above since the inlet and outlet openings are separated from each other and arranged in different sides of the dust container which reduces the energy losses in the flow of air since the change in flow direction within the dust container is reduced. The reduction in energy losses in the flow of air through the container result in further advantages in the cleaner since related components in the cleaner could be adapted accordingly. For example the size of the fan, and the engine powering the fan could be reduced without reducing the capacity of the cleaner which makes it possible to increase the size of the dust container and extend the intervals between the required operations to empty the dust container.

In one embodiment of the dust container, the first and second side of the dust container are connected by side surfaces extending between the first and second side to enclose the dust chamber, and the dust container is divided in an upper and a lower section to be openable and facilitate the disposal of the dust collected in the dust container, and clean the interior of the dust container.

In one embodiment of the dust container, the upper section is forming a container lid.

In one embodiment of the dust container, the first and the second side of the dust container are arranged opposite to each such that the flow of air extends in a substantially straight direction through the container from the inlet in the first side to the outlet in the second side of the dust container. This embodiment reduces the energy losses further since the air will flow substantially straight through the dust container.

In one embodiment of the dust container, the inlet opening is arranged in the lower section of the dust container and the outlet opening is arranged in the upper section of the dust container. This embodiment is favourable since the inlet will be arranged close to the brush roll and the floor surface that is cleaned and the air will flow through the filter to the outlet with small changes in flow direction.

In one embodiment of the dust container, the inlet opening extends across substantially the entire first side of the dust container forming an elongated inlet to ensure uniform distribution in the air flow along the brush roll, and that dust and particles from the floor and brush roll are sucked into the dust container and achieve a satisfying cleaning result.

In one embodiment of the dust container, the upper and lower section are movably connected to each other and movable between a closed position and an open position, said dust container furthermore comprising releasable securing means maintaining the upper and lower section in the closed position. The movable connection between the upper and lower section facilitate regularly required emptying, cleaning and inspection of the filter and the dust container.

In one embodiment of the dust container, the filter is arranged in the upper section of the container between the outlet opening and an edge of the upper section that is facing an upper edge of the lower section. This embodiment makes it easy to empty the container since the lower section where dust particles are collected is accessible directly when the dust container is opened since the filter is arranged in the upper section.

In one embodiment of the dust container, the filter is arranged within a frame and covers the entire cross-section of the dust chamber between the inlet opening and the outlet opening. This embodiment provides a filter arrangement with several advantages. First, the filter area is maximized since the filter extends across the entire cross section of the container without limiting or affecting the flow of air more than necessary. The filter could also be replaced either by changing the entire frame or

only the filter material arranged within the frame. Furthermore, the frame makes it easy to fit the filter in the upper section.

In one embodiment of the dust container, the filter is fitted in the upper section of the dust container by at least one hinge and is movable between a secured position in the upper section, and an open position where the space inside the filter adjacent to the outlet opening within the upper section is accessible to make it possible to inspect that the outlet passage is not blocked and / or remove particles or dust trapped between the filter and the outlet opening.

In one embodiment of the dust container, the filter is removably fitted within the upper section of the dust container in order to make it possible to change the filter.

In one embodiment of the dust container, means for securing the dust container in the autonomous cleaner are fitted in the container wall on the outside surface of the wall. The securing means arranged on the dust container makes it easy to detach / attach the dust container to and from the autonomous cleaner to empty the dust container and / or inspect the interior of the cleaner.

In one embodiment of the dust container, the container wall comprises a top surface arranged on the upper section and intended to constitute an outside upper surface of the autonomous cleaner when correctly fitted in the cleaner. Letting the top surface constitute the outside upper surface of the autonomous cleaner eliminates material in the cleaner housing since not lid or covering structure is needed, and makes it easy to detach / attach the container in or from the cleaner body since the dust container is accessible from the outside of the cleaner.

The invention furthermore relates to an autonomous cleaner comprising the inventive dust container described above. The autonomous cleaner comprises:

a cleaner body with a forward end and an aft end;

a brush roll and means for rotating the brush roll arranged in the forward end of the cleaner body;

a fan arranged in the aft end of the cleaner body; and

a dust container comprising: a container wall enclosing a dust chamber; a first side intended to be arranged in a forward end of the cleaner body; a second side intended to be arranged in a aft end of the cleaner body; an inlet opening to the dust chamber for dust particles and air arranged in the first side of the dust container; an outlet opening from the dust chamber for air arranged in the second side of the dust container; and a filter;

wherein the dust container is arranged between the brush roll and the fan with the inlet opening facing the brush roll and the outlet opening facing the fan such that the flow of air generated by the fan, together with the collected particles and dust, enters the dust container via the first opening where the particles and dust are collected before the air continues through the filter and exits the container via the outlet opening.

The autonomous cleaner and dust container according to the invention provides a very efficient cleaner since the volume of the dust container could be increased considerably due to the improved design of the container and the cleaner.

In one embodiment of the autonomous cleaner the first and the second side of the dust container are arranged opposite to each such that the flow of air extend in a substantially straight direction through the container from the inlet in first side to the outlet in the second side of the container substantially parallel to a longitudinal axis of the autonomous cleaner. This embodiment provides a very efficient cleaner since the air flow is lead directly, and straight, from the brush roll into the dust container where dust and particles are collected before the air continues via the filter and outlet opening to fan in the aft end of the cleaner.

In one embodiment of the autonomous cleaner the dust container is divided in an upper and a lower section to be openable, and the inlet opening is arranged in the lower section adjacent to the brush roll and the outlet opening is arranged in the upper section of the dust container such that the air flow from the inlet opening slightly upwards through the filter and exists the container via the outlet opening. This design

of the dust container makes it possible to fit all the required components in the cleaner in a space saving way and increase the dust container volume in the cleaner body without compromising the function of the cleaner.

In one embodiment of the autonomous cleaner the inlet opening is elongated and extending across substantially the entire first side of the dust container, said inlet opening is arranged adjacent and parallel to the brush rolls in the forward end of the cleaner to ensure that as much particles as possible from the floor and the brush roll is sucked into the dust container.

In one embodiment of the autonomous cleaner the dust container comprises means for securing the dust container in the autonomous cleaner, said means are fitted in the container wall on the outside surface of the wall arranged to fit in corresponding means in the cleaner housing to ensure that the dust container is maintained in the intended position during use of the cleaner, and that the dust container is easy to detach when the dust container needs to be emptied.

In one embodiment of the autonomous cleaner the cleaner body is enclosed by a cleaner housing and the dust container wall comprises a top surface intended to constitute an outside upper surface of the cleaner housing when the dust container is correctly fitted in the cleaner body. This embodiment further improves the cleaner since the amount of material in cleaner housing is reduced and the space within the cleaner body is used to increase the dust container volume. Furthermore, the removal and fitting of the dust container in the cleaner body is facilitated since the container is accessible from the outside of the cleaner body.

In one embodiment of the autonomous cleaner, the upper top surface of the dust container constitutes a central area of the outside upper surface of the cleaner housing where it is easy to access and facilitate the removal and / or fitting of the container in the cleaner body

The different embodiment described above could of course be combined and modified in different ways without departing from the scope of the invention that will be described more in detail in the detailed description.

Brief description of the drawings

One embodiment of the dust container and an autonomous cleaner are illustrated in the appended figures.

Figure 1 discloses a perspective view of an autonomous cleaner.

Figure 2 discloses the flow of air through the autonomous cleaner in a cross sectional view through the longitudinal direction of the autonomous cleaner.

Figure 3 discloses a perspective view of an embodiment of the dust container in an opened state.

Detailed description

An autonomous cleaner 10 is illustrated in perspective in figure 1. The cleaner has a cleaner body 11 in which cleaner components are arranged. The cleaner body is enclosed by a cleaner housing 12 that surrounds the different components arranged within the cleaner body. The cleaner housing 12 is designed both to make room for the required components enclosed by the housing, and to give the cleaner the desired attractive appearance. The shape and colour could be modified in several different ways.

The illustrated cleaner 10 has a forward end 13 and an aft end 14, and a longitudinal axis L extending through the centre of the cleaner body. Two wheels powered by electrical engines support, and move, the autonomous cleaner on the floor surface. The cleaner housing 12 has and front side 15 that is slightly curved while the width of the cleaner is reduced towards the rounded aft end 14 resulting in a substantially triangular shape with rounded corners. The shape of the cleaner, with rounded corners, is important to ensure that the cleaner can access and turn in narrow passages or floor areas.

In the front side 15 of the cleaner 10, means 16 for navigation of the cleaner are arranged. Furthermore, the forward part of the cleaner housing is formed as a front section 17 structurally separated from the rest of the cleaner housing. The front section 17 is designed as a bumper with detecting means that indicate if the cleaner hit an obstacle. The means 16 for navigation, and the detection means are connected to a control unit arranged within the cleaner body. The control unit processes the information and controls the manoeuvring of the autonomous cleaner, and the different functions of the autonomous cleaner. Functions of relevance for this patent application will be described further down this description. The housing 12 furthermore comprises a substantially flat top side 18.

In figure 2 a cross sectional view through the longitudinal axis L of the cleaner 10 is illustrated. In the forward end of the cleaner body, an elongated brush roll 19 and means for rotating the brush roll are arranged. The brush roll has a substantially circular cross section and extends across substantially the entire wide forward end of the cleaner perpendicular to the longitudinal axis L to cover as wide floor area as possible when the cleaner is moving over the floor surface. The brush roll is provided with at least one brush 20 and / or elastic rib 21 that extend along the roll 22 either substantially straight along the brush roll, or helically around the brush roll. The brush roll in the forward end of the cleaner body is intended to lift and collect particles from the floor surface and transports them via a dust passage 24 to a dust container 25 arranged in the centre of the cleaner body 11.

The dust passage 24 has a width corresponding to the length of the brush roll and a forward opening 23 arranged adjacent to the brush roll such that the collected particles could enter the opening 23 easily. The passage 24 is slightly curved and ended by an aft opening 26 arranged in contact with a corresponding inlet opening 27 of the dust container 25 to lead the particles from the brush roll into the dust container 25. The dust container 25 is illustrated separately in figure 4 and will be described in detail further down this description.

In the aft end of the cleaner 10, a fan 50 and an electrical engine 51 for powering the fan are arranged to create a flow of air through the cleaner 10. The air is sucked into the forward opening 23 of the dust passage 24 and continues via the dust passage 24 to the dust container 25 to assist the brush roll by sucking dust and particles from the floor surface and the brush roll and lead the dust and particles to the dust container 25. The air continues via the dust chamber through a filter 30 arranged in the dust container 25 above the inlet opening to ensure that dust and particles remain in the dust container before the air continues to an outlet opening 28 in the aft end of the dust container 25 and exits the cleaner via an outlet passage 31 in the aft end 14 of the cleaner housing. The air flow through the cleaner 10 is illustrated in figure 2 by a number of small arrows A.

The dust container 25 according to the invention is illustrated in an open state in figure 3 to more clearly display the design and the different features of the dust container 25. The dust container comprises a container wall 31 formed of for example a plastic material. The container wall 31 encloses a dust chamber 32 for collected dust and particles formed in the centre of the dust container 25. The dust container 25 comprises a first side 33 arranged in the forward end of the container and intended to be arranged substantially parallel to the aft end of the dust passage 24 and the brush roll. In the illustrated embodiment the first side 33 is slightly angled to correspond to the aft end of the dust passage. However, modifications are possible as long as the aft end of the dust passage 24 and the first side 33 of the dust container 25 have corresponding shapes and fit together. In the first side the inlet opening 27 to the dust chamber 32 is formed. The inlet opening 27 is elongated to provide a large inlet area and facilitate the flow of air, particles and dust into the dust chamber.

The dust container 25 furthermore comprises a second side 34 arranged opposite to the first side 33 and substantially parallel to the first side. The second side 34 is arranged in the aft end of the dust container 25. The second side 34 is substantially flat and intended to be arranged substantially transverse to the longitudinal axis L of the cleaner 10. The outlet opening 28 is formed in the second side 34 of the container 25.

The first and second side of the container are connected by side surfaces 35 extending between the first and second side to enclose the dust chamber 32, and a substantially flat bottom surface 40. The side surfaces 35 have a slightly curved shape but could be modified in several ways as long as the dust container fits in the provided space within the cleaner body. The illustrated dust container has a shape corresponding to the shape of the cleaner body, i.e. a wide forward end and a narrower aft end. In order to facilitate the removal of dust and particles collected in the dust container, the dust container 25 is divided in an upper 36 and a lower section 37. The upper section 37 serves as a lid that is used to open and close the dust container. The upper and lower sections are turnably connected to each other by for example one or more hinges 38 arranged along one of the corresponding sides of the upper and lower section. The upper section of the container wall comprises a substantially flat top surface 41 facing upwards and intended to constitute an outside upper surface section of the cleaner housing when the dust container is correctly fitted in the cleaner. Letting the top side 41 of the dust container constitute a section of the cleaner housing saves space and simplifies the structure of the cleaner body and the cleaner housing. The saved space makes it possible to increase the volume of the dust container which is favourable since the time between required emptying of the dust container is increased.

The inlet opening 27 is arranged in the lower section 37 while the outlet opening is arranged in the upper section 36. The dust container 25 furthermore comprises releasable securing means 39 arranged on the upper and / or lower section to maintain the upper and lower section in the closed position. In the illustrated embodiment the securing means 39 are embodied as a resilient hook 42 arranged on the upper section and intended to grip a not illustrated recess in the lower section thereby securing the two sections together. The securing means are released by pressing the resilient hook 42 to disengage the recess. The resilient hook is accessible via an opening in the top side of the cleaner housing.

Within the dust container 25 the filter 30 i arranged. The filter 30 is arranged in the upper section 36 of the dust container and is intended to move together with the upper

section when the dust container is opened. The filter is arranged slightly angled in relation to a horizontal plane in the upper section between the inlet opening 27 and the outlet opening 28 such that the flow of air must pass through the filter 30. The filter 30 has a shape corresponding to the shape of the dust container in the intended filter position and extends across the entire cross section of the dust chamber to maximise the filter area. The filter could be made of any known filter material, soft or stiff, as long as the desired filter characteristics are achieved. However, the filter material is preferably washable and possible to reuse do reduce waste material.

The illustrated filter arrangement comprises a frame 43 surrounding a filter area 44 of filter material. The filter material of the filter area must be replaced or cleaned regularly and could be removed from the frame 43 without efforts. The frame 43 is designed to fit within the upper section of the dust container during use of the cleaner. The filter is arranged between the outlet opening and a surrounding edge 45 of the upper section that is facing the lower section. The filter frame is movably secured in the upper section 36 of the dust container by at least one hinge in order to be movable between a secured position within the upper section, i.e. the intended filter position during use of the autonomous cleaner, and an open position where the space inside the filter adjacent to the outlet opening is accessible to make it possible to replace the filter material within the frame or the entire filter alternatively clean the filter and the space within the upper section normally closed by the filter 30.

The dust container 25, or the cleaner body, furthermore comprises means for securing the dust container in the autonomous cleaner, not illustrated in the appended figures. The means for securing the dust container are fitted in the container wall on the outside surface of the container wall and / or in the cleaner body. The dust container is secured in the correct position within the cleaner body by the securing means but could be released by a release button 47 accessible from the outside of the cleaner housing. The release button 47 is positioned on the top side of the cleaner housing adjacent to the first side of the container in the forward end of the cleaner. The dust container is released by pressing the release button.

The embodiments described above could be combined and modified in different ways without departing from the scope of the invention that is defined by the appended claims.

Claims

1. Dust container (25) for an autonomous cleaner (10), said dust container comprising:

a container wall (31) enclosing a dust chamber (32);

a first side (33);

a second side (34);

an inlet opening (27) to the dust chamber (32) for dust particles and air arranged in the first side (33) of the dust container (25);

an outlet opening (28) from the dust chamber (32) for air arranged in the second side (34) of the dust container; and

a filter (30) arranged in the dust container such that the flow of air through the dust container (25) extends through the filter (30).

2. Dust container (25) according to claim 1, wherein the first side (33) and the second side (34) of the dust container (25) are connected by side surfaces (35) extending between the first side (33) and the second side (34) to enclose the dust chamber (32), and the dust container is divided in an upper section (36) and a lower section (37) to be openable.

3. The dust container (25) according to claim 2, wherein the upper section (36) is forming a container lid.

4. The dust container (25) according to anyone of the previous claims, wherein the first side (33) of the dust container (25) and the second side (34) of the dust container (25) are arranged opposite to each other such that the flow of air extends in a substantially straight direction through the dust container from the inlet opening (27) in the first side (33) to the outlet opening (28) in the second side (34) of the dust container.

5. The dust container (25) according to claim 3, wherein the inlet opening (27) is arranged in the lower section (37) of the dust container, and the outlet opening (28) is arranged in the upper section (36) of the dust container.

6. The dust container (25) according to anyone of the previous claims, wherein the inlet opening (27) extends across substantially the entire first side (33) of the dust container forming an elongated inlet opening.

7. The dust container (25) according to anyone of claim 2 or 3, wherein the upper section (36) and the lower section (37) are movably connected to each other and movable between a closed position and an open position, and said dust container comprises releasable securing means (39) maintaining the upper (37) and lower section (36) in the closed position.

8. The dust container (25) according to anyone of claim 2 or 3, wherein the filter (30) is arranged in the upper section (36) of the dust container (25) between the outlet opening (28) and an edge (45) of the upper section that is facing an upper edge (46) of the lower section (37).

9. The dust container (25) according to claim 8, wherein the filter (30) is arranged within a frame (43) and covers the entire cross-section of the dust chamber (32) between the inlet opening (27) and the outlet opening (28).

10. The dust container (25) according to claim 8 or 9, wherein the filter (30) is fitted in the upper section (36) of the dust container (25) by at least one hinge and is movable between a position secured in the upper section (36), and an open position where the space inside the filter (30) adjacent to the outlet opening (28) is accessible.

11. The dust container (25) according to claim 10, wherein the filter (30) is removably fitted within the upper section (36) of the dust container in order to make it possible to change the filter (30).

12. The dust container (25) according to anyone of the previous claims, wherein means for securing the dust container in the autonomous cleaner are fitted in the container wall on the outside surface of the wall.

13. The dust container (25) according to anyone of the previous claims, wherein the container wall comprises a top surface (41) arranged on the upper section (36) and intended to constitute an outside upper surface of the cleaner housing (12) when correctly fitted in the autonomous cleaner.

14. An autonomous cleaner (10) comprising:

a cleaner body (11) with a forward end (13) and an aft end (14);

a brush roll (19) and means for rotating the brush roll arranged in the forward end (13) of the cleaner body (11);

a fan (50) arranged in the aft end (14) of the cleaner body (11); and

a dust container (25) comprising: a container wall (31) enclosing a dust chamber (32); a first side (33) intended to be arranged in the forward end (13) of the cleaner body (11); a second side (34) intended to be arranged in the aft end (14) of the cleaner body (14); an inlet opening (27) to the dust chamber (32) for dust particles and air arranged in the first side (33) of the dust container (25) an outlet opening (28) from the dust chamber (32) for air arranged in the second side (34) of the dust container (25); and a filter (30);

wherein the dust container (25) is arranged between the brush roll (19) and the fan (50) with the inlet opening (27) facing the brush roll (19) and the outlet opening (28) facing the fan (50) such that the flow of air generated by the fan (50), together with collected particles and dust, enters the dust container (25) via the inlet opening (27) where the particles and dust are collected before the air continues through the filter (30) and exits the dust container (25) via the outlet opening (28).

15. The autonomous cleaner (10) according to claim 14, wherein the first (33) and the second side (34) of the dust container (25) are arranged opposite to each other such that the flow of air extend in a substantially straight direction

through the dust container (25) from the inlet opening (27) in the first side (33) to the outlet opening (28) in the second side (34) of the dust container (25) substantially parallel to a longitudinal axis (L) of the autonomous cleaner (10).

16. The autonomous cleaner (10) according to claim 14 or 15, wherein the dust container (25) is divided in an upper section (36) and a lower section (37) to be openable, and the inlet opening (27) is arranged in the lower section (37) adjacent to the brush roll (19) and the outlet opening (28) is arranged in the upper section (36) of the dust container (25) such that the air flow from the inlet opening (27) extend slightly upwards through the filter (30) and exists the dust container (25) via the outlet opening (28).

17. The autonomous cleaner (10) according to anyone of claims 14 to 16, wherein the inlet opening (27) is elongated and extending across substantially the entire first side (33) of the dust container (25), said inlet opening (27) is arranged adjacent and parallel to the brush roll (19) in the forward end (13) of the cleaner (10).

18. The autonomous cleaner (10) according to anyone of claims 14 to 17, wherein the dust container (25) comprises means for securing the dust container in the autonomous cleaner, said means are fitted in the container wall on the outside surface of the wall arranged to fit in corresponding means in the cleaner housing (12).

19. The autonomous cleaner (10) according to anyone of claims 14 to 18, wherein the cleaner body (11) is enclosed by a cleaner housing (12) and the dust container wall comprises a top surface (41) intended to constitute an outside upper surface of the cleaner housing (12) when the dust container (25) is correctly fitted in the cleaner body (11).

20. The autonomous cleaner according to claim 19, wherein the top surface (41) of the dust container (25) constitutes a central area of the outside upper surface of the cleaner housing (12).

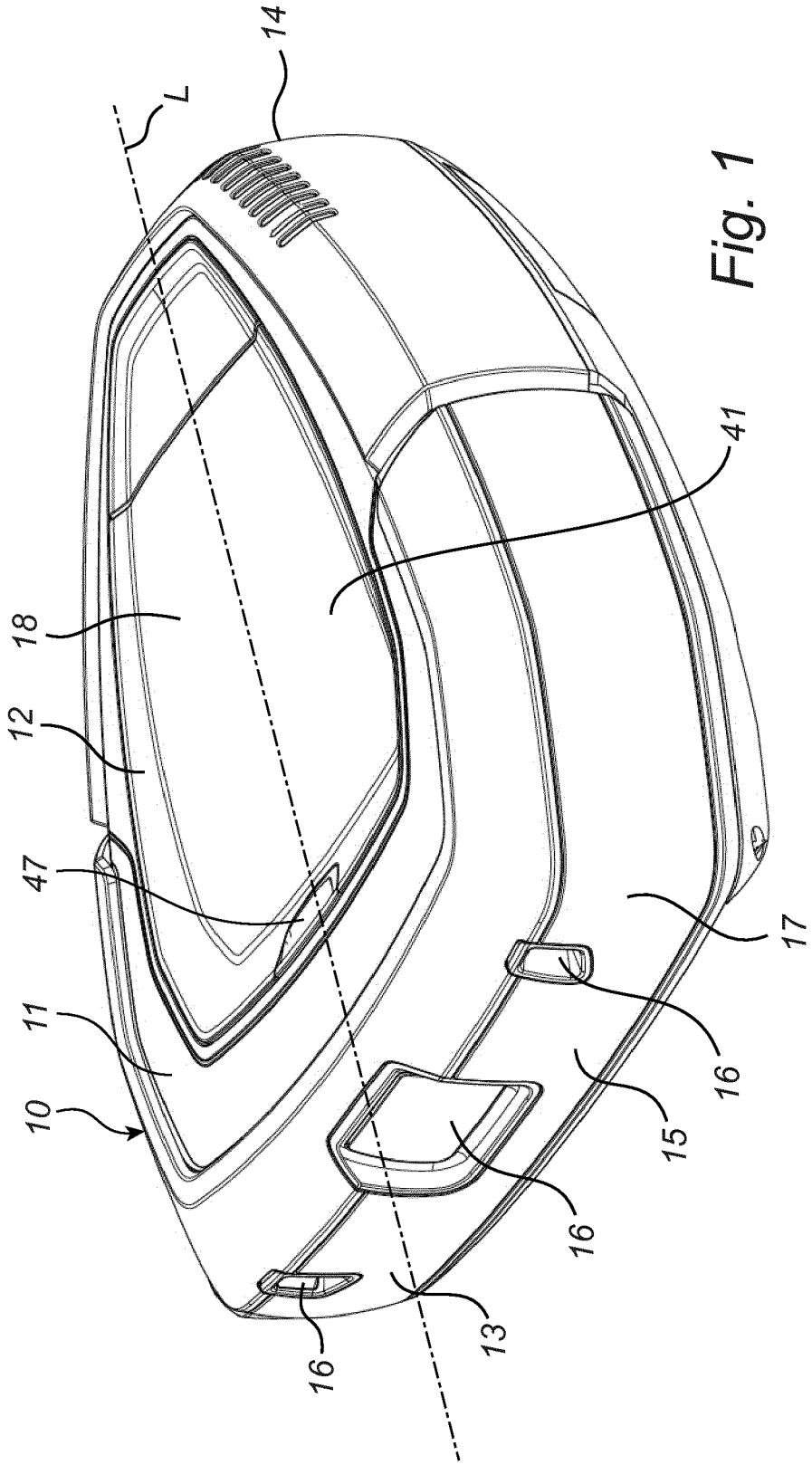

Fig. 1

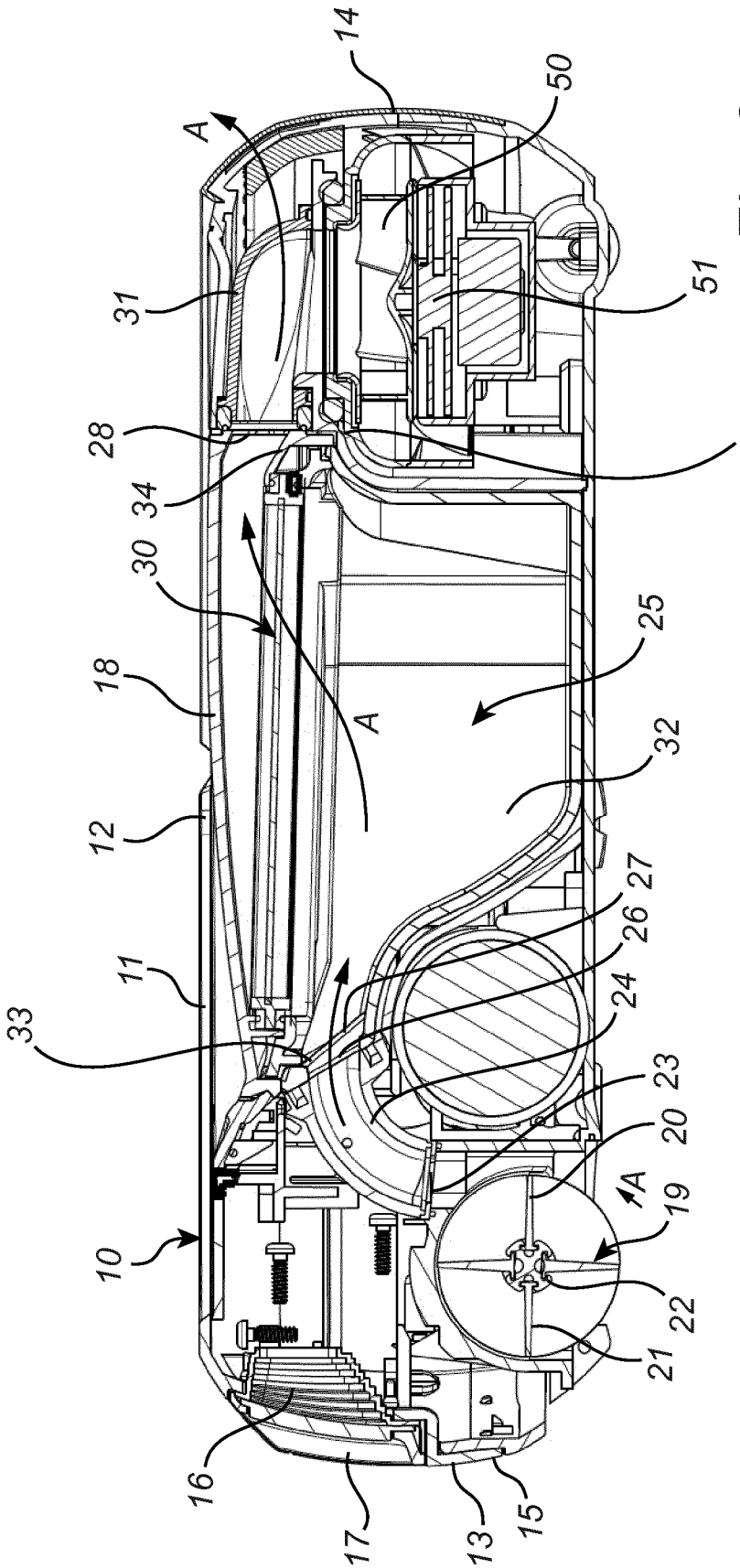
14
50
A
31
51
28
38
34
30
25
18
A
32
12
27
26
11
24
33
23
20
A
19
10
22
21
16
17
13
15

Fig. 2

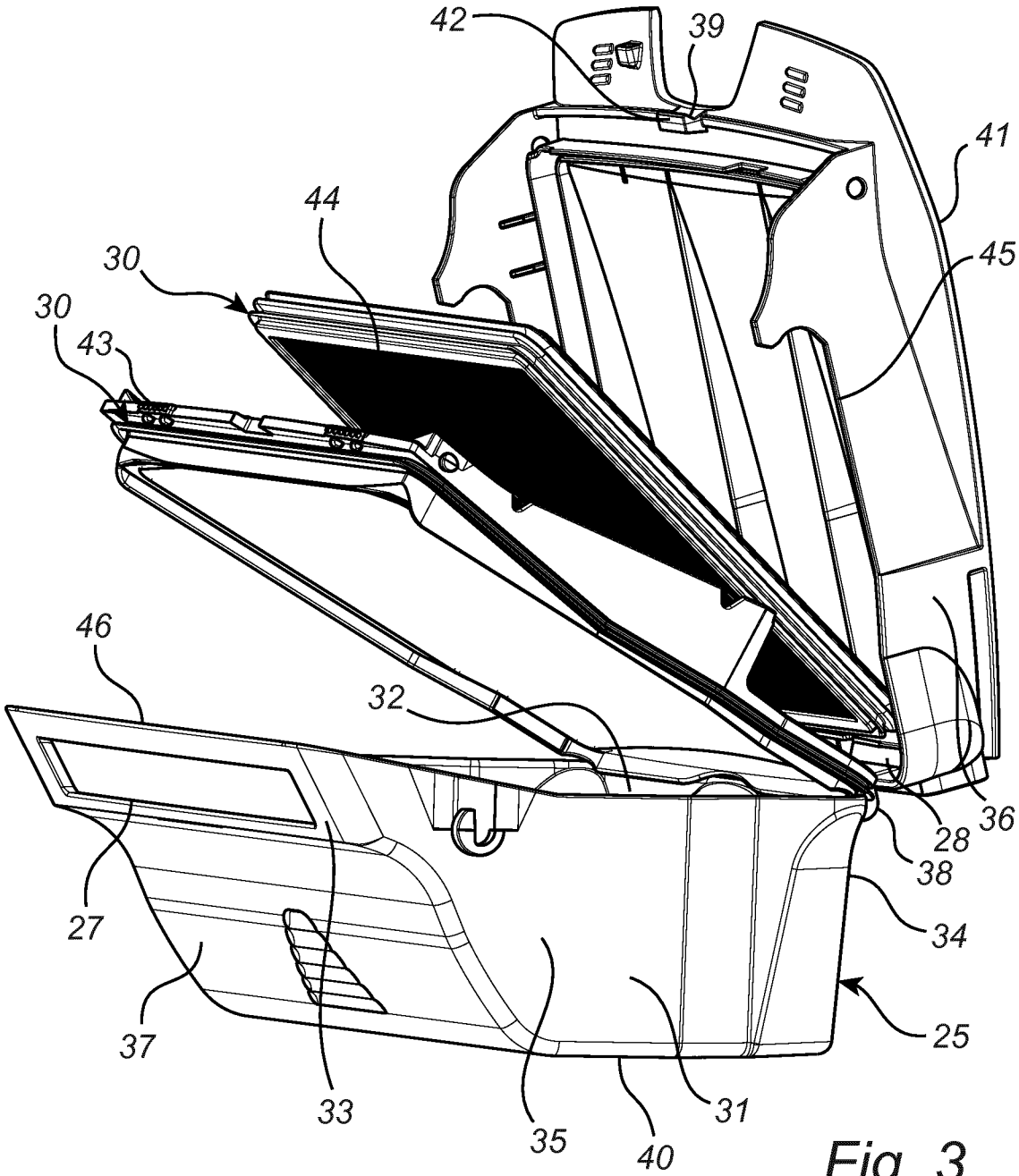

Fig. 3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP2013/077661

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☒ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2013/077661

A. CLASSIFICATION OF SUBJECT MATTER
INV. A47L9/14 A47L9/12
ADD.

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)
A47L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 2 417 894 A1 (LG ELECTRONICS INC [KR]) 15 February 2012 (2012-02-15) paragraph [0027] - paragraph [0099]; figures	1-4,6,7, 12,14, 15,17-20

X	WO 03/022120 A1 (ELECTROLUX AB [SE]; PETERSSON STEFAN [SE]; HJALMARSSON PAER [SE]; DANE) 20 March 2003 (2003-03-20)	1-4,12, 13
A	the whole document	14,19,20

X	KR 101 231 932 B1 (MONEUAL INC [KR]) 7 March 2013 (2013-03-07) abstract; figures	1-4,12, 14,15,18

A	WO 2013/105431 A1 (SHARP KK [JP]) 18 July 2013 (2013-07-18) cited in the application the whole document	1-20

☐ 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
25 September 2014	06/10/2014

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Masset, Markus

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2013/077661

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2417894 A1	15-02-2012	EP 2417894 A1	15-02-2012
		KR 20120055612 A	31-05-2012
		US 2012095597 A1	19-04-2012
		WO 2011004916 A1	13-01-2011
WO 03022120 A1	20-03-2003	SE 0103026 A	12-03-2003
		WO 03022120 A1	20-03-2003
KR 101231932 B1	07-03-2013	JP 2014517761 A	24-07-2014
		KR 101231932 B1	07-03-2013
		WO 2013162094 A1	31-10-2013
WO 2013105431 A1	18-07-2013	NONE	

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-13

   Dust container

   ---

2. claims: 14-20

   An autonomous cleaner
