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(54)

CYCLONE DUST ABSORPTION SYSTEM, CLEANING ROBOT, AND DUST ABSORPTION METHOD

- (57) Disclosed are a cyclone dust absorption system, a cleaning robot, and a dust absorption method. The dust absorption system includes a dust absorption opening (22), a dust collection box (1), a separator (2), and a negative pressure generator (3), where the separator is capable of forming a spiral airflow, using a centrifugal force to separate garbage from the airflow and collecting the garbage in the dust collection box, thereby being

capable of replacing a filter net assembly and reducing use costs. Further, an acceleration guide surface (25) is capable of accelerating flow of the spiral airflow, causing a larger centrifugal force to the garbage, and facilitating more thorough and faster separation of the garbage from a separation opening, thereby enhancing an effect of separating the garbage.

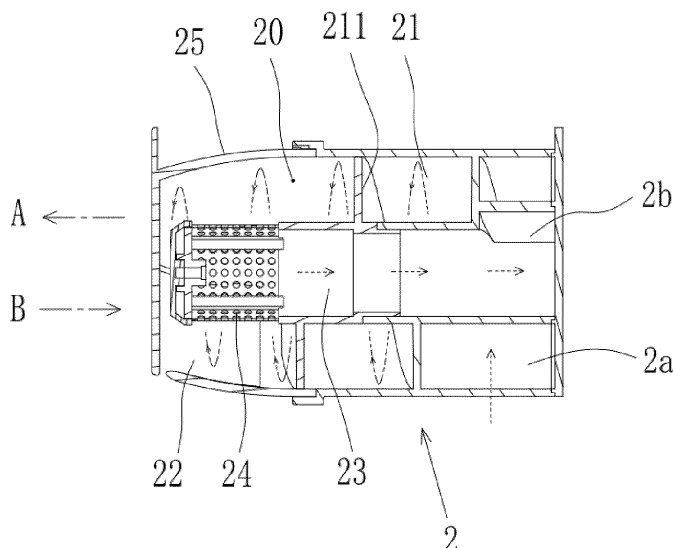


FIG. 5

Description

TECHNICAL FIELD

[0001] The present disclosure relates to the technical field of sweeping robots, and in particular to a cyclone dust absorption system, a cleaning robot, and a dust absorption method.

BACKGROUND

[0002] A sweeping robot includes a dust absorption system, the dust absorption system includes a dust absorption opening, a dust collection box, a filter net assembly and a fan, where the filter net assembly is arranged between the dust collection box and the fan to block garbage and ensure that the garbage remains in the dust collection box and does not flow to the fan. The filter net assembly is a consumable component. After a period of use, the garbage will accumulate on the filter net assembly, which will increase airflow resistance and affect suction of airflow. Therefore, the filter net assembly needs to be replaced regularly, thereby leading to higher use costs.

SUMMARY

[0003] An objective of the present disclosure is to provide a cyclone dust absorption system, a cleaning robot, and a dust absorption method. A separator is capable of forming a spiral airflow, using a centrifugal force to separate garbage from the airflow and collecting the garbage in a dust collection box, thereby being capable of replacing a filter net assembly and reducing use costs.

[0004] In order to achieve the above objective, the present disclosure adopts a technical solution as follows: a cyclone dust absorption system, including:

a separator, where the separator includes an inner cavity, a spiral air duct, a separation opening, an air inlet and an air outlet, where one end of the inner cavity is provided with the spiral air duct, the other end of the inner cavity is provided with the separation opening, a starting end of the spiral air duct is communicated with the air inlet, an ending end of the spiral air duct is communicated with the inner cavity, and the air outlet is communicated with the inner cavity;
a dust absorption opening, connected to the air inlet;
a dust collection box, connected to the separation opening; and
a negative pressure generator, connected to the air outlet.

[0005] In some embodiments, the separation opening is arranged on a peripheral wall of the other end portion of the inner cavity relative to the spiral air duct, and the

separation opening is elongated and extends circumferentially along the peripheral wall of the inner cavity.

[0006] In some embodiments, a spiral angle of the spiral air duct is equal to or greater than 45°, or the spiral angle of the spiral air duct is equal to or greater than 90°, or the spiral angle of the spiral air duct is equal to or greater than 180°; and the spiral angle of the spiral air duct is equal to or greater than 270°; or the spiral angle of the spiral air duct is equal to or greater than 360°.

[0007] In some embodiments, the separator further includes an acceleration guide surface, and the acceleration guide surface is arranged at the other end portion of the inner cavity relative to the spiral air duct; and the acceleration guide surface is arranged in a way of gradually extending inward in a direction away from the spiral air duct, the acceleration guide surface is arranged in a way of gradually extending inward in the form of an arc structure, or the acceleration guide surface is arranged in a way of gradually extending inward in the form of a diagonal structure.

[0008] In some embodiments, the separator further includes an air outlet pipe, where the air outlet pipe is arranged inside the inner cavity and the air outlet pipe is coaxially arranged with the inner cavity; the air outlet is arranged at an end portion of the inner cavity close to the spiral air duct; and

one end portion of the air outlet pipe is arranged close to the separation opening, a through hole is formed on a wall surface of the end portion of the air outlet pipe close to the separation opening, and the other end portion of the air outlet pipe is connected to the air outlet.

[0009] In some embodiments, the through hole is covered with a filter element.

[0010] A cleaning robot includes the dust absorption system.

[0011] A dust absorption method includes the following steps:

the negative pressure generator works to form a negative pressure airflow, and garbage, under the action of the negative pressure airflow, is sucked by the dust absorption opening and flows into the separator;

the spiral air duct of the separator causes the airflow to become a spiral airflow after spiral flow, and the spiral airflow then flows toward the separation opening in a direction A;

the garbage, under the action of a centrifugal force, is separated from the separation opening and then enters the dust collection box; and

the airflow that has separated the garbage flows into the air outlet pipe and moves towards the air outlet in a direction B, and ultimately flows to outside, where the direction A and the direction B are opposite.

[0012] In some embodiments, the acceleration guide surface helps to gradually decrease the spiral radius of the spiral airflow and accelerate flow of the spiral airflow,

and the spiral airflow flows toward the separation opening.

[0013] The present disclosure has the following beneficial effects: the separator is capable of forming a spiral airflow, using a centrifugal force to separate garbage from the airflow and collecting the garbage in a dust collection box, thereby being capable of replacing a filter net assembly and reducing use costs.

[0014] Further, an acceleration guide surface is capable of accelerating flow of the spiral airflow, causing a larger centrifugal force to the garbage, and facilitating more thorough and faster separation of the garbage from a separation opening, thereby enhancing an effect of separating the garbage.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015]

FIG. 1 is a structural diagram II of a dust absorption system according to Example 1 of the present disclosure.

FIG. 2 is a sectional view of a dust absorption system according to Example 1 of the present disclosure.

FIG. 3 is a structural diagram of a separator of a dust absorption system according to Example 1 of the present disclosure.

FIG. 4 is an exploded view of a separator of a dust absorption system according to Example 1 of the present disclosure.

FIG. 5 is a sectional view I of a separator of a dust absorption system according to Example 1 of the present disclosure.

FIG. 6 is a sectional view II of a separator of a dust absorption system according to Example 1 of the present disclosure.

FIG. 7 is a sectional view III of a separator of a dust absorption system according to Example 1 of the present disclosure.

FIG. 8 is a structural diagram of a dust absorption system according to Example 2 of the present disclosure.

FIG. 9 is a sectional view of a dust absorption system according to Example 2 of the present disclosure.

FIG. 10 is a structural diagram of a separator of a dust absorption system according to Example 2 of the present disclosure.

FIG. 11 is an exploded view of a separator of a dust absorption system according to Example 2 of the present disclosure.

FIG. 12 is a sectional view I of a separator of a dust absorption system according to Example 2 of the present disclosure.

FIG. 13 is a sectional view II of a separator of a dust absorption system according to Example 2 of the present disclosure.

FIG. 14 is a sectional view III of a separator of a dust absorption system according to Example 2 of the

present disclosure.

[0016] In the figures: 100-dust absorption system; 1-dust collection box; 2-separator; 2a-air inlet; 2b-air outlet; 20-inner cavity; 21-spiral air duct; 211-spiral blade; 22-separation opening; 23-air outlet pipe; 231-through hole; 24-filter element; 25-acceleration guide surface; 2c-first housing; 2d-second housing; 3-negative pressure generator; 4-dust absorption opening; 5-first tube; 6-second tube; 200-chassis; and 210-roller.

DETAILED DESCRIPTIONS OF THE EMBODIMENTS

[0017] The present disclosure will be further described in detail below with reference to the accompanying drawings.

Example 1

[0018] With reference to FIGs. 1 and 2, a cyclone dust absorption system 100 includes a dust absorption opening 4, a dust collection box 1, a separator 2, and a negative pressure generator 3;

the dust absorption opening 4 can be arranged on a chassis 200, and a roller 210 can be selectively arranged at a position of the dust absorption opening 4 as needed, that is, the roller 210 can be arranged at a corresponding position of the dust absorption opening 4, and alternatively, the roller 210 is not required to be arranged;

with reference to FIGs. 3-5, the separator 2 includes an inner cavity 20 and a spiral air duct 21, a starting end of the spiral air duct 21 is communicated with the dust absorption opening 4, and an ending end of the spiral air duct 21 is communicated with the inner cavity 20, where the starting end thereof indicates an upstream direction of airflow, and the ending end thereof indicates a downstream direction of airflow; the inner cavity 20 is provided with a separation opening 22, and the separation opening 22 is communicated with the dust collection box 1; the inner cavity 20 is communicated with the negative pressure generator 3, and the negative pressure generator 3 can be a negative pressure motor or fan capable of forming a negative pressure airflow; working principle: under the action of the negative pressure airflow, garbage is sucked into the dust absorption opening 4, an airflow becomes the spiral airflow through the spiral air duct 21 and flows towards the separation opening 22, the garbage, under the action of a centrifugal force, is separated from the separation opening 22 and then enters the dust collection box 1, and the airflow that has separated the garbage flows through the negative pressure generator 3 to outside.

[0019] Therefore, the separator 2 is capable of forming

the spiral airflow, using the centrifugal force to separate the garbage from the airflow and collecting the garbage in the dust collection box 1, thereby being capable of replacing a filter net assembly and reducing use costs due to no need of the filter net assembly.

[0020] With reference to FIGs. 3-5, the separator 2 can be barrel-shaped, cup-shaped, or cylindrical, and the inner cavity 20 is naturally barrel-shaped, cup-shaped, or cylindrical; the spiral air duct 21 can be arranged inside the inner cavity 20, e.g., the spiral air duct 21 is arranged at one end portion of the inner cavity 20 and the separation opening 22 is arranged at the other end portion of the inner cavity 20; and a spiral blade 211 of the spiral air duct 21 basically abuts against a peripheral wall of the inner cavity 20, such that a spiral radius of the spiral air duct 21 is basically the same as that of the inner cavity 20, airflow becomes smoother due to reduced airflow resistance, and easier manufacturing is achieved.

[0021] The spiral air duct 21 is used configured to guide spiral flow of the airflow, an angle of the spiral air duct 21 can be arranged to be 0-360° or be greater than 360°, e.g., 45°, 90°, 180°, 270° or around 360°, and as long as the spiral airflow can be formed, angular arrangement in any form is applicable.

[0022] The spiral air duct 21 includes the spiral blade 211, the spiral blade 211 is configured to form the spiral air duct 21 to guide the spiral flow of airflow, and a spiral angle of the spiral blade 211 is basically equal to that of the spiral air duct 21.

[0023] With reference to FIGs. 4 and 5, the separation opening 22 is arranged at an end portion of the inner cavity 20 away from the spiral air duct 21. The spiral airflow moves or flows in a direction A, the garbage ultimately accumulates at the end portion of the inner cavity 20, the separation opening 22 is arranged at the end portion to promote more thorough separation of the garbage, and the garbage is collected in the dust collection box 1.

[0024] The separation opening 22 can be arranged on the peripheral wall or end wall of the inner cavity 20 away from the spiral air duct 21. Preferably, the separation opening 22 can be arranged on the peripheral wall of the inner cavity 20 away from the spiral air duct 21, and the garbage, under the action of the centrifugal force, will spirally flow in a way of being attached to or along the peripheral wall of the inner cavity 20, such that arrangement of the separation opening 22 on the peripheral wall of the inner cavity 20 facilitates easier and faster separation of the garbage from the separation opening 22.

[0025] Further, the separation opening 22 is elongated and extends circumferentially along the peripheral wall of the inner cavity 20, and in a process of spiral or circular motion, the garbage can be separated from the airflow in a more thorough and effective manner due to availability of more time and space.

[0026] With reference to FIG. 5, the separator 2 further includes an acceleration guide surface 25, the acceleration guide surface 25 is arranged at the other end portion

of the inner cavity 20 relative to the spiral air duct 21, and the acceleration guide surface 25 can be part of the peripheral wall of the inner cavity 20; and

the acceleration guide surface 25 is arranged in a way of gradually extending inward in a direction away from the spiral air duct 21, which can be understood that: the acceleration guide surface 25 is arranged in a way of gradually extending toward a central axis of the inner cavity 20 in the direction away from the spiral air duct 21, such that an end portion space of the inner cavity 20 away from the spiral air duct 21 is gradually narrowed, which results in that a spiral radius of the spiral airflow gradually decreases, a velocity of the spiral airflow is gradually increased, and the centrifugal force applied to the garbage gradually increases, thereby achieving quicker separation of the garbage from the separation opening 22, including separation of lighter garbage from the separation opening 22 due to a sufficient centrifugal force, and enhancing the effect of separating the garbage.

[0027] In some embodiments, with reference to FIG. 5, the acceleration guide surface 25 is arranged in a way of gradually extending inward in the form of an arc structure; the arc structure can be arranged in a curvature gradient manner or a curvature fixed manner, and the acceleration guide surface 25 of the arc structure helps to gradually decrease the spiral radius of the spiral airflow, accelerate flow of the spiral airflow, and reduce resistance generated during the flow of the spiral airflow toward the separation opening 22.

[0028] In some embodiments, with reference to FIG. 6, the acceleration guide surface 25 can also be arranged in a way of gradually extending inward in the form of a diagonal structure. Of course, the acceleration guide surface 25 can also be of any other structure that helps to accelerate the airflow.

[0029] In some embodiments, with reference to FIG. 7, the acceleration guide surface 25 is not necessarily arranged for the separator 2, and the inner cavity 20 is cylindrical. Of course, arrangement of the acceleration guide surface 25 further facilitates thorough separation of the garbage.

[0030] With reference to FIG. 3, the separator 2 further includes an air inlet 2a, and the air inlet 2a is tangentially connected to the starting end of the spiral air duct 21, which helps to reduce airflow resistance and facilitate smoother airflow; and the air inlet 2a can be arranged at the end portion of the inner cavity 20 close to the spiral air duct 21, and the air inlet 2a can be connected to the dust absorption opening 4 through a first tube 5, or the air inlet 2a can be directly connected to the dust absorption opening 4.

[0031] With reference to FIGs. 4 and 5, the separator 2 further includes an air outlet pipe 23 and an air outlet 2b, where the air outlet pipe 23 is arranged inside the inner cavity 20 and the air outlet pipe 23 is coaxially arranged with the inner cavity 20; the air outlet 2b is arranged at the end portion of the inner cavity 20 close to the spiral air

duct 21; and

one end portion of the air outlet pipe 23 is arranged close to the separation opening 22, i.e., being arranged close to the separation opening 22 in a way of extending, a through hole 231 is formed on a peripheral wall or end wall of the end portion of the air outlet pipe 23 close to the separation opening 22, the other end portion of the air outlet pipe 23 is arranged close to the spiral air duct 21 in a way of extending, the other end portion of the air outlet pipe 23 is connected to the air outlet 2b, the air outlet 2b is connected to the negative pressure generator 3, and the air outlet 2b may be connected to the negative pressure generator 3 through a second tube 6. In this way, the airflow that has separated the garbage flows from the air outlet pipe 23 to the air outlet 2b and then flows to the outside through the negative pressure generator 3.

[0032] With reference to FIG. 5, the spiral airflow in the inner cavity 20 moves towards the separation opening 22 in the direction A, the airflow that has separated the garbage flows into the air outlet pipe 23 and moves towards the air outlet 2b in a direction B, and ultimately flows to the outside, where the direction A and the direction B are opposite. In this way, the garbage, under the action of the centrifugal force, will move towards the peripheral wall of the inner cavity 20, the airflow in a central area is almost free of garbage, and the airflow in the central area flows toward the air outlet pipe 23, thereby ensuring effective separation of the garbage into the dust collection box 1. Moreover, as the direction A and the direction B are opposite, movement of the garbage in the direction B is quite difficult due to inertia of the centrifugal force, which effectively promotes the spiral or circular motion of the garbage in the inner cavity 20, such that the garbage is ultimately separated into the dust collection box 1, and more thorough separation of the garbage is achieved.

[0033] Moreover, the air outlet pipe 23 and the inner cavity 20 are arranged coaxially, the other end portion of the air outlet pipe 23 is arranged close to the spiral air duct 21 in a way of extending, and the spiral air duct 21 can be arranged around the end portion of the air outlet pipe 23 to construct a more compact structure.

[0034] With reference to FIGs. 4 and 5, the through hole 231 is covered with a filter element 24. The airflow must pass through the filter element 24 to flow into the air outlet pipe 23, and the filter element 24 can be annular, sleeved or snap-fitted with the air outlet pipe 23, where a stainless steel filter net can be adopted. Centrifugal forces of the garbage differ due to varying particle sizes and weights, such that a small amount of garbage with lighter or smaller particles may be distributed in the central area of the airflow. To further reduce or prevent the garbage from flowing to the outside, the filter element 24 can be arranged to block the garbage and make the garbage remain in the inner cavity 20 for the continued spiral or circular motion.

[0035] There is almost no garbage or very little garbage in the central area of the spiral airflow, and the garbage

tends to move outward under the action of a centrifugal force, such that a relatively small amount of garbage is attached to the filter element 24, and the filter element 24 can be used for a long time without need of frequent replacement.

[0036] With reference to FIG. 4, the separator 2 can be composed of a first housing 2c, a second housing 2d, the air outlet pipe 23 and the like, where both the first housing 2c and the second housing 2d are generally barrel-shaped, cup-shaped, or cylindrical, an internal space formed by the first housing 2c and the second housing 2d constitutes the inner cavity 20, and the first housing 2c is provided with the air inlet 2a and the air outlet 2b, where the air inlet 2a can be arranged on a peripheral wall of the first housing 2c, and the air outlet 2b can be arranged on the peripheral or end wall of the first housing 2c; and the second housing 2d is provided with the separation opening 22 and the acceleration guide surface 25, where the acceleration guide surface 25 constitutes part of a peripheral wall of the second housing 2d, such that the second housing 2d gradually narrows or shrinks in a direction away from the first housing 2c. One end of the air outlet pipe 23 is provided with the spiral blade 211, and the other end of the air outlet pipe 23 is provided with the through hole 231.

[0037] The first housing 2c and the second housing 2d can be assembled by means of a rotary snap-fit structure or a fastener, and the first housing 2c and the air outlet pipe 23 can also be assembled by means of the rotary snap-fit structure, a plug-in structure, or the fastener.

[0038] The separator 2 is assembled inside the dust collection box 1, and the separator 2 can be assembled inside the dust collection box 1 by means of the snap-fit structure or the fastener.

Example 2

[0039] With reference to FIGs. 8-12, the dust absorption system 100 of Example 2 is basically the same as or similar to that of Example 1 in a structure and working principle, and differences therebetween mainly lie in that: the separator 2 is arranged outside the dust collection box 1, e.g., the separator 2 is arranged on an outer side of a top of the dust collection box 1.

[0040] With reference to FIGs. 8-11, the separator 2 in this example is essentially the same as or similar to the separator 2 in Example 1 in terms of structures, and differences therebetween mainly lie in that: positions of the air inlet 2a and the air outlet 2b are somewhat different, and sizes of the first housing 2c and the second housing 2d are also somewhat different.

[0041] In some embodiments, with reference to FIG. 12, the acceleration guide surface 25 of the separator 2 is arranged in a way of gradually extending inward in a direction away from the spiral air duct 21, and is arranged in a way of gradually extending inward in the form of the arc structure.

[0042] In some embodiments, with reference to FIG.

13, the acceleration guide surface 25 of the separator 2 is arranged in a way of gradually extending inward in a direction away from the spiral air duct 21, and is arranged in a way of gradually extending inward in the form of the diagonal structure.

[0043] In some embodiments, with reference to FIG. 14, the acceleration guide surface 25 is not necessarily arranged for the separator 2, and the inner cavity 20 is cylindrical. Of course, arrangement of the acceleration guide surface 25 further facilitates thorough separation of the garbage.

[0044] A connection method for and a positional relation between the separator 2 and the dust collection box 1 of the above dust absorption system 100 in two examples can be selected according to specific working conditions.

[0045] For example, Example 1 applies to a small cleaning robot with limitations in overall design space and garbage disposal, and the separator 2 is arranged inside the dust collection box 1.

[0046] Example 2 applies to a large cleaning robot with larger overall design space for disposal of a large amount of garbage, and the separator 2 is arranged outside the dust collection box 1.

Example 3

[0047] A cleaning robot includes the above dust absorption system 100. The chassis 200 of the cleaning robot is provided with the walking mechanism and the cleaning mechanism. The walking mechanism is provided with wheels to drive the cleaning robot to walk; and the cleaning mechanism is capable of cleaning a surface of an object to be cleaned including a floor.

Example 4

[0048] A dust absorption method, obtained based on the above dust absorption system 100, includes the following steps:

the negative pressure generator 3 works to form a negative pressure airflow, and garbage, under the action of the negative pressure airflow, is sucked by the dust absorption opening 4 and flows into the separator 2;

the spiral air duct 21 of the separator 2 causes the airflow to become a spiral airflow after spiral flow, and the spiral airflow in the inner cavity 20 then flows toward the separation opening 22 in the direction A; the garbage, under the action of a centrifugal force, is separated from the separation opening 22 and then enters the dust collection box 1; and

the airflow that has separated the garbage flows to outside.

[0049] Further, the airflow that has separated the garbage flows into the air outlet pipe 23 and moves towards the air outlet 2b in the direction B, and ultimately flows to

the outside through the negative pressure generator 3, where the direction A and the direction B are opposite.

[0050] Further, the acceleration guide surface 25 helps to gradually decrease the spiral radius of the spiral airflow and accelerate flow of the spiral airflow, and the spiral airflow flows toward the separation opening 22.

[0051] Therefore, the separator 2 is capable of forming the spiral airflow, using the centrifugal force to separate the garbage from the airflow and collecting the garbage in the dust collection box 1, thereby being capable of replacing a filter net assembly and reducing use costs due to no need of the filter net assembly. Further, the acceleration guide surface 25 is capable of accelerating flow of the spiral airflow, causing a larger centrifugal force to the garbage, and facilitating more thorough and faster separation of the garbage from the separation opening 22, thereby enhancing the effect of separating the garbage.

[0052] The above are merely some embodiments of the present disclosure. For those of ordinary skill in the art, they may also make several modifications and improvements on the premise of not deviating from the inventive concept of the present disclosure, and these modifications and improvements shall fall within the scope of protection of the present disclosure.

Claims

1. A cyclone dust absorption system, comprising:

a separator (2), wherein the separator (2) comprises an inner cavity (20), a spiral air duct (21), a separation opening (22), an air inlet (2a) and an air outlet (2b), wherein one end of the inner cavity (20) is provided with the spiral air duct (21), the other end of the inner cavity (20) is provided with the separation opening (22), a starting end of the spiral air duct (21) is communicated with the air inlet (2a), an ending end of the spiral air duct (21) is communicated with the inner cavity (20), and the air outlet (2b) is communicated with the inner cavity (20);
a dust absorption opening (4), being connected to the air inlet (2a);
a dust collection box (1), being connected to the separation opening (22); and
a negative pressure generator (3), being connected to the air outlet (2b).

2. The cyclone dust absorption system according to claim 1, wherein the separation opening (22) is arranged on a peripheral wall of the other end portion of the inner cavity (20) relative to the spiral air duct (21), and the separation opening (22) is elongated and extends circumferentially along the peripheral wall of the inner cavity (20).

3. The cyclone dust absorption system according to

claim 1, wherein a spiral angle of the spiral air duct (21) is equal to or greater than 45°.

4. The cyclone dust absorption system according to claim 1, wherein the separator (2) further comprises an acceleration guide surface (25), and the acceleration guide surface (25) is arranged at the other end portion of the inner cavity (20) relative to the spiral air duct (21); and the acceleration guide surface (25) is arranged in a way of gradually extending inward in a direction away from the spiral air duct (21).
5. The cyclone dust absorption system according to claim 4, wherein the acceleration guide surface (25) is arranged in a way of gradually extending inward in the form of an arc structure; or the acceleration guide surface (25) is arranged in a way of gradually extending inward in the form of a diagonal structure.
6. The cyclone dust absorption system according to claim 1, wherein the separator (2) further comprises an air outlet pipe (23), the air outlet pipe (23) is arranged inside the inner cavity (20) and the air outlet pipe (23) is coaxially arranged with the inner cavity (20); and the air outlet (2b) is arranged at an end portion of the inner cavity (20) close to the spiral air duct (21); and one end portion of the air outlet pipe (23) is arranged close to the separation opening (22), a through hole (231) is formed in the end portion of the air outlet pipe (23) close to the separation opening (22), and the other end portion of the air outlet pipe (23) is connected to the air outlet (2b).
7. The cyclone dust absorption system according to claim 6, wherein the through hole (231) is covered with a filter element (24).
8. A cleaning robot, comprising the dust absorption system (100) according to claim 1.
9. A dust absorption method, comprising the following steps:

the negative pressure generator (3) works to form a negative pressure airflow, and garbage, under the action of the negative pressure airflow, is sucked by the dust absorption opening (4) and flows into the separator (2);

the spiral air duct (21) of the separator (2) causes the airflow to become a spiral airflow after spiral flow, and the spiral airflow in the inner cavity (20) then flows toward the separation opening (22) in the direction A;

the garbage, under the action of a centrifugal force, is separated from the separation opening

(22) and then enters the dust collection box (1); and
the airflow that has separated the garbage flows into the air outlet pipe (23) and moves towards the air outlet (2b) in a direction (B), and ultimately flows to outside,
wherein the direction (A) and the direction (B) are opposite.

10. The dust absorption method according to claim 9, wherein the acceleration guide surface (25) helps to gradually decrease the spiral radius of the spiral airflow and accelerate flow of the spiral airflow, and the spiral airflow flows toward the separation opening (22).

Amended claims in accordance with Rule 137(2) EPC.

1. A cyclone dust absorption system, comprising:

a separator (2), wherein the separator (2) comprises an inner cavity (20), a spiral air duct (21), a separation opening (22), an air inlet (2a) and an air outlet (2b), wherein one end of the inner cavity (20) is provided with the spiral air duct (21), the other end of the inner cavity (20) is provided with the separation opening (22), a starting end of the spiral air duct (21) is communicated with the air inlet (2a), an ending end of the spiral air duct (21) is communicated with the inner cavity (20), and the air outlet (2b) is communicated with the inner cavity (20);

a dust absorption opening (4), being connected to the air inlet (2a);

a dust collection box (1), being connected to the separation opening (22); and

a negative pressure generator (3), being connected to the air outlet (2b);

wherein the spiral air duct (21) comprises a spiral blade (211) configured to form the spiral air duct (21) to form and guide a spiral airflow, and a spiral angle of the spiral blade (211) is equal to a spiral angle of the spiral air duct (21); wherein the separation opening (22) is arranged on a peripheral wall of the other end portion of the inner cavity (20) relative to the spiral air duct (21), and the separation opening (22) is elongated and extends circumferentially along the peripheral wall of the inner cavity (20);

characterized in that the separator (2) further comprises an acceleration guide surface (25), and the acceleration guide surface (25) is arranged at the other end portion of the inner cavity (20) relative to the spiral air duct (21); and the acceleration guide surface (25) is arranged in a way of gradually extending inward in a direction away from the spiral air duct (21), such

that the acceleration guide surface (25) is configured to gradually decrease a spiral radius of the spiral airflow to accelerate flow of the spiral airflow toward the separation opening (22).

2. The cyclone dust absorption system according to claim 1, wherein the spiral angle of the spiral air duct (21) is equal to or greater than 45°. 5
3. The cyclone dust absorption system according to claim 1, wherein the acceleration guide surface (25) is arranged in a way of gradually extending inward in the form of an arc structure; or the acceleration guide surface (25) is arranged in a way of gradually extending inward in the form of a diagonal structure. 10
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4. The cyclone dust absorption system according to claim 1, wherein the separator (2) further comprises an air outlet pipe (23), the air outlet pipe (23) is arranged inside the inner cavity (20) and the air outlet pipe (23) is coaxially arranged with the inner cavity (20); and the air outlet (2b) is arranged at an end portion of the inner cavity (20) close to the spiral air duct (21); and 20
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one end portion of the air outlet pipe (23) is arranged close to the separation opening (22), a through hole (231) is formed in the end portion of the air outlet pipe (23) close to the separation opening (22), and the other end portion of the air outlet pipe (23) is connected to the air outlet (2b). 30
5. The cyclone dust absorption system according to claim 4, wherein the through hole (231) is covered with a filter element (24). 35
6. A cleaning robot, comprising the dust absorption system (100) according to claim 1.
7. A dust absorption method of the cyclone dust absorption system according to claim 1, comprising the following steps: 40

the negative pressure generator (3) works to form a negative pressure airflow, and garbage, under the action of the negative pressure airflow, is sucked by the dust absorption opening (4) and flows into the separator (2); 45

the spiral air duct (21) of the separator (2) causes the airflow to become the spiral airflow after spiral flow, and the spiral airflow in the inner cavity (20) then flows toward the separation opening (22) in the direction A; 50

the garbage, under the action of a centrifugal force, is separated from the separation opening (22) and then enters the dust collection box (1); 55

and

the airflow that has separated the garbage flows

into the air outlet pipe (23) and moves towards the air outlet (2b) in a direction (B), and ultimately flows to outside,

wherein the direction (A) and the direction (B) are opposite;

wherein the acceleration guide surface (25) helps to gradually decrease the spiral radius of the spiral airflow and accelerate flow of the spiral airflow, and the spiral airflow flows toward the separation opening (22).

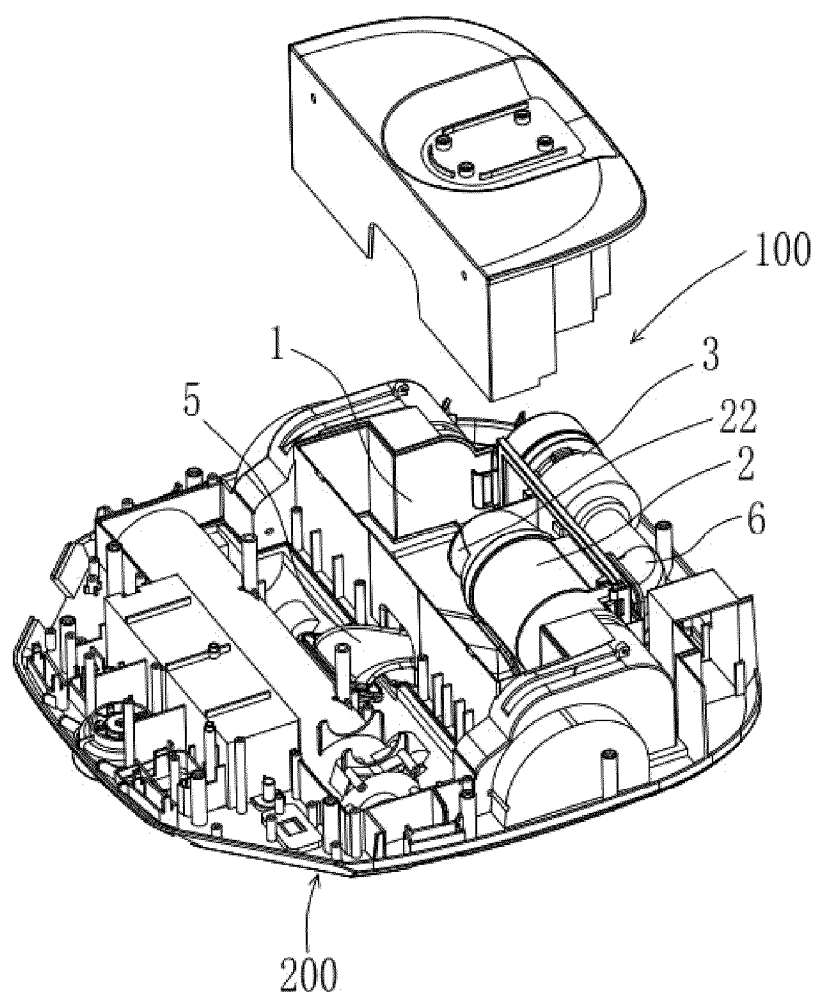


FIG. 1

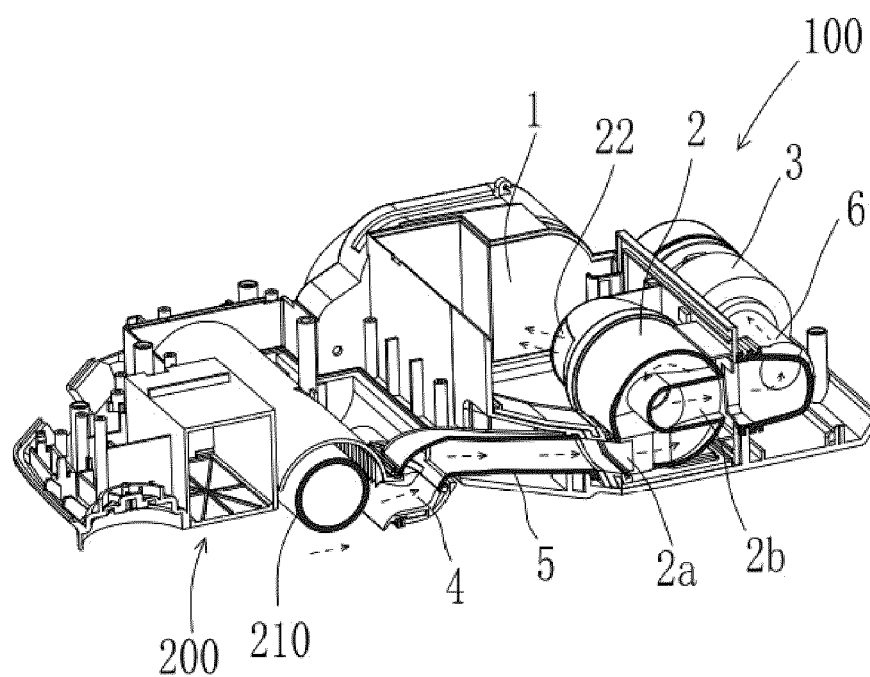


FIG. 2

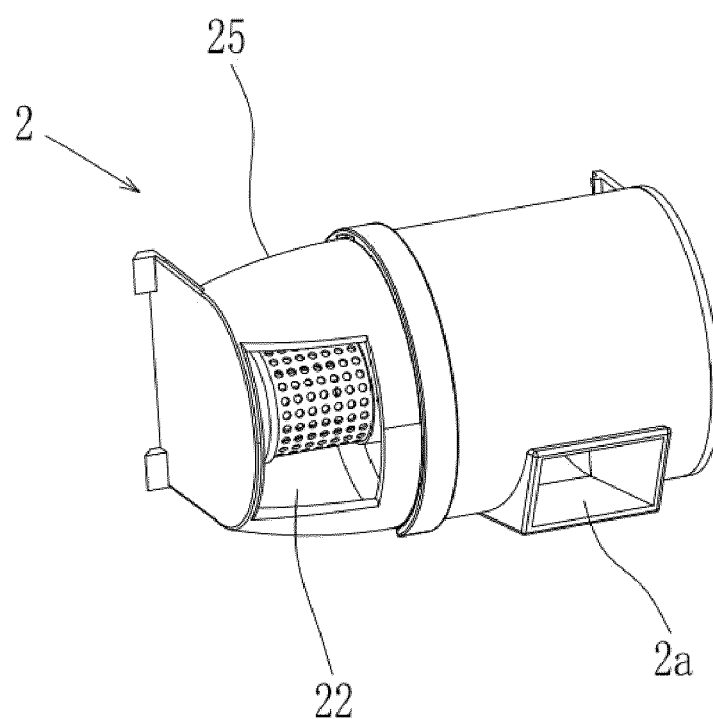


FIG. 3

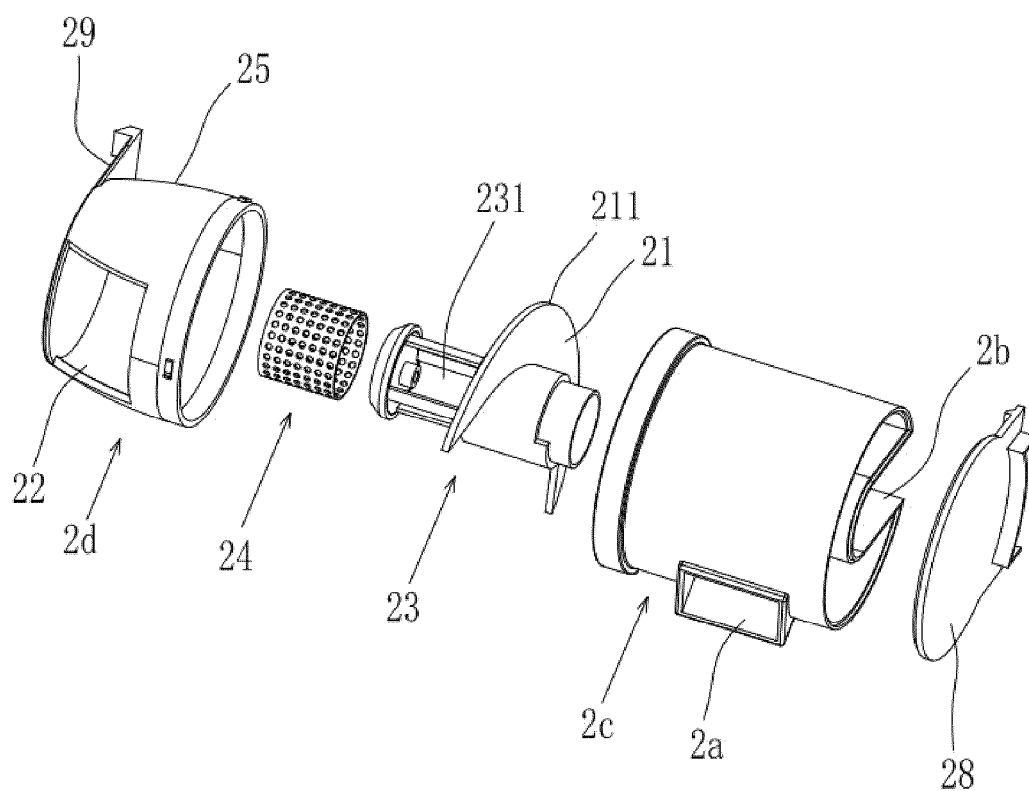


FIG. 4

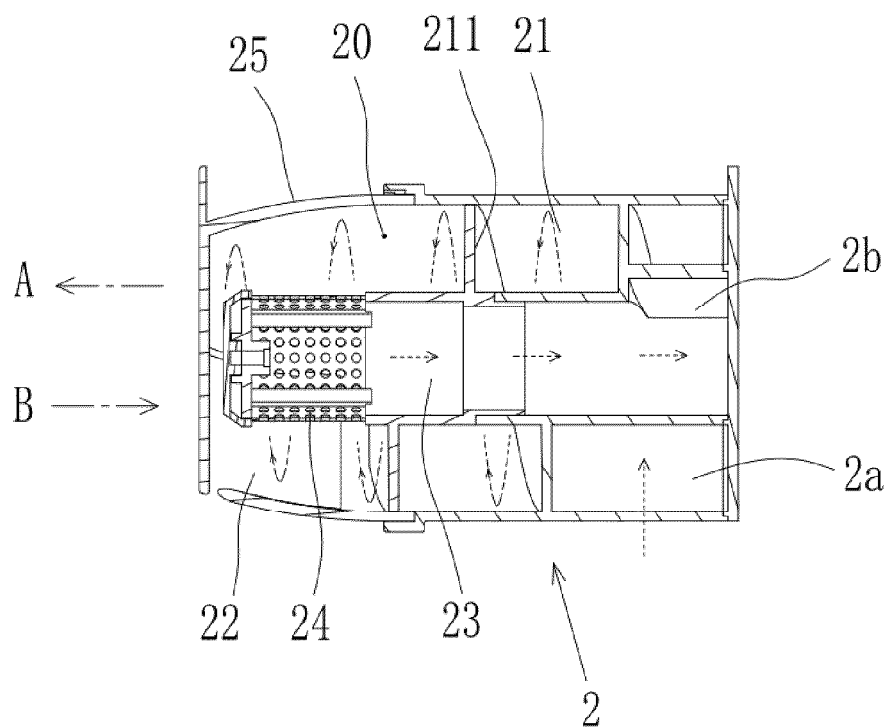


FIG. 5

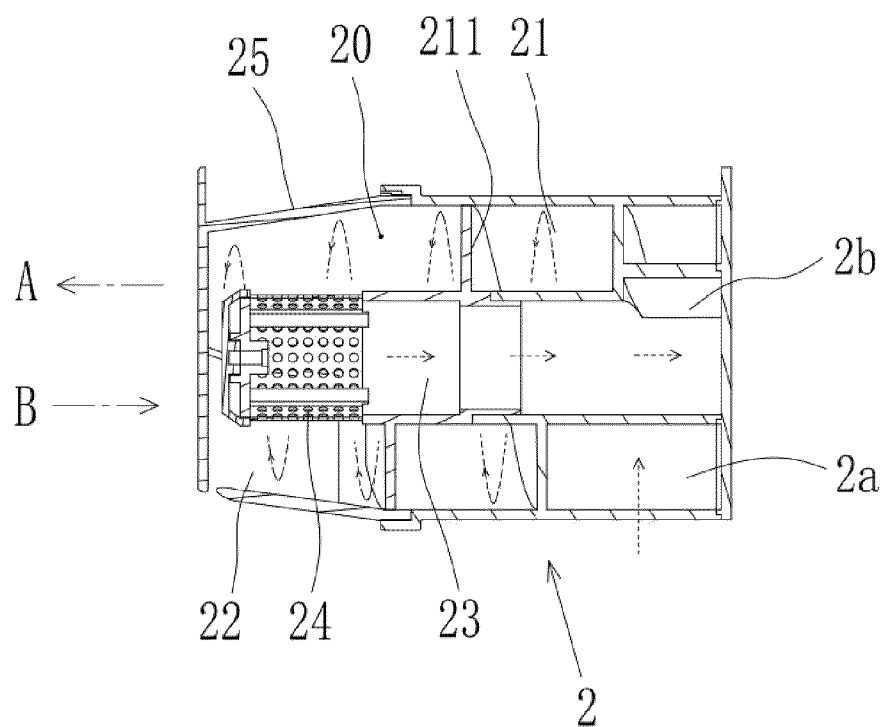


FIG. 6

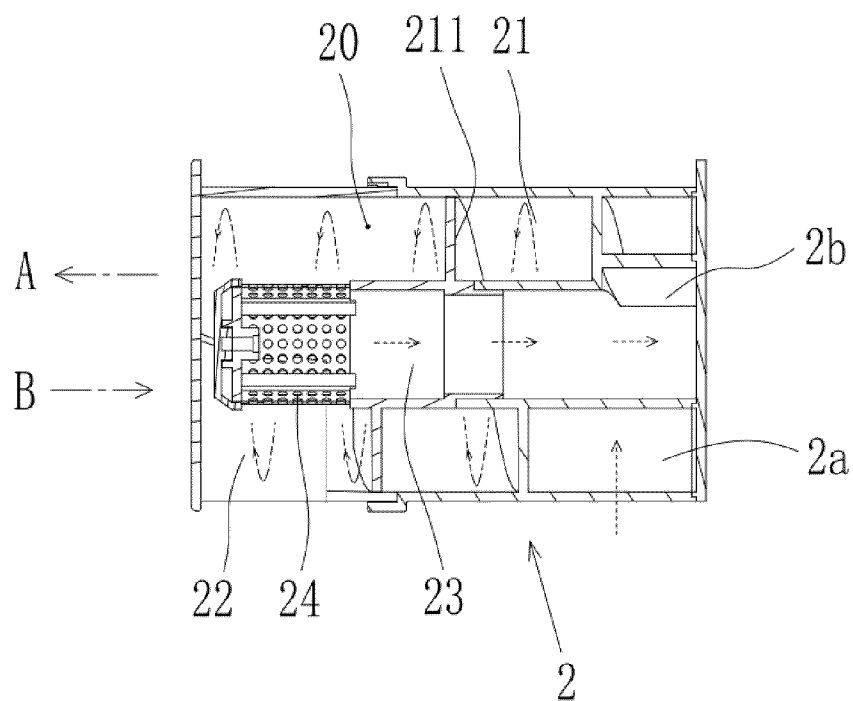


FIG. 7

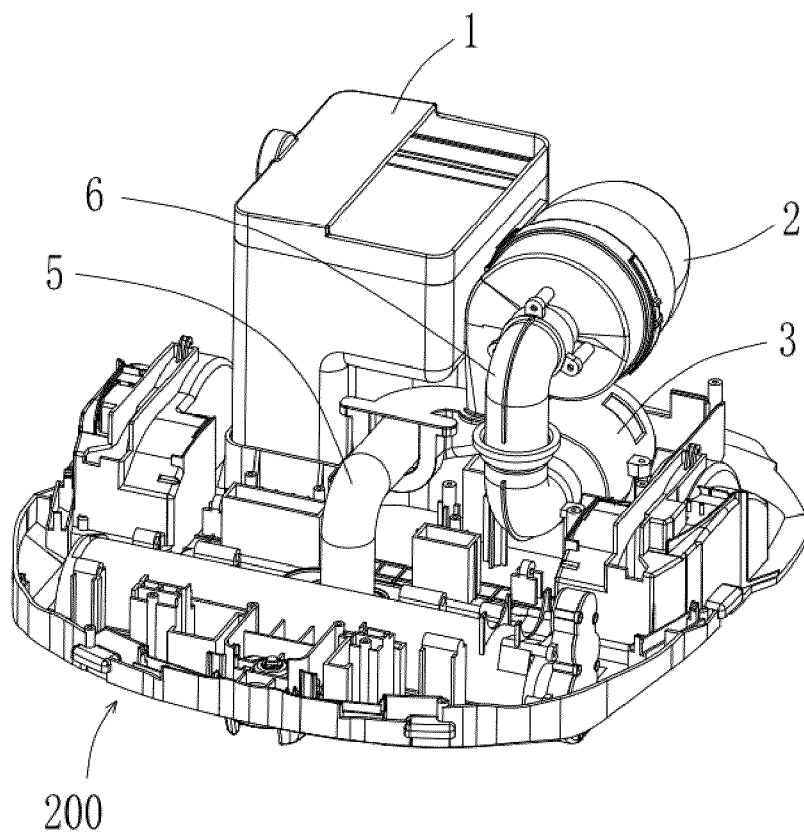


FIG. 8

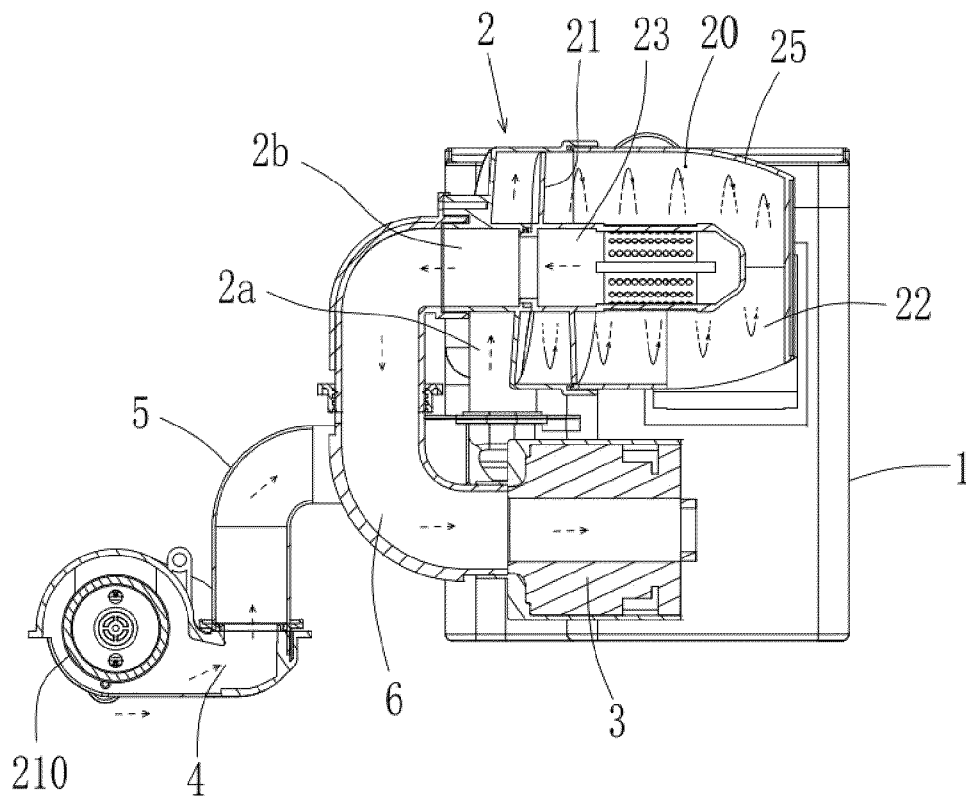


FIG. 9

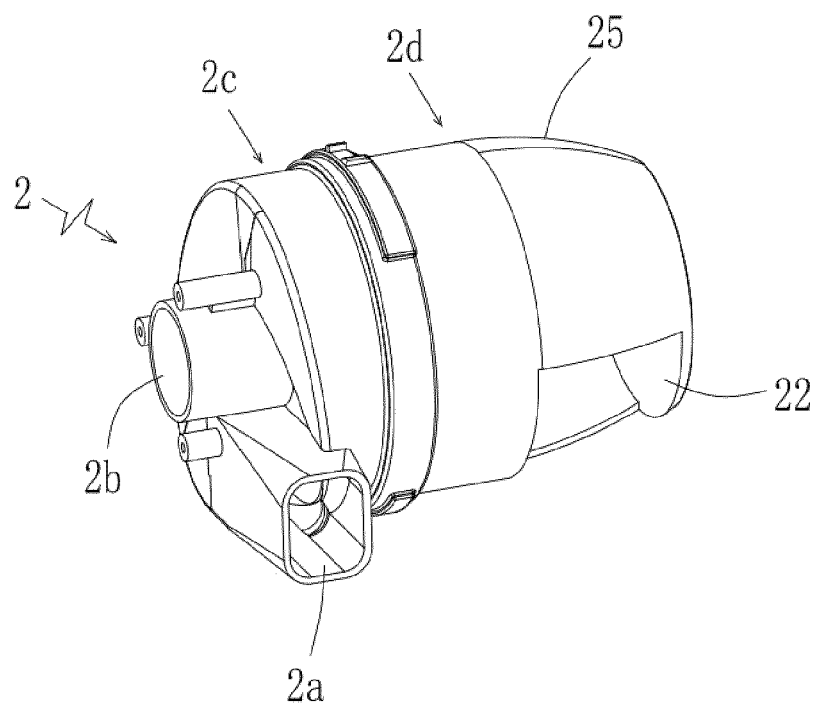


FIG. 10

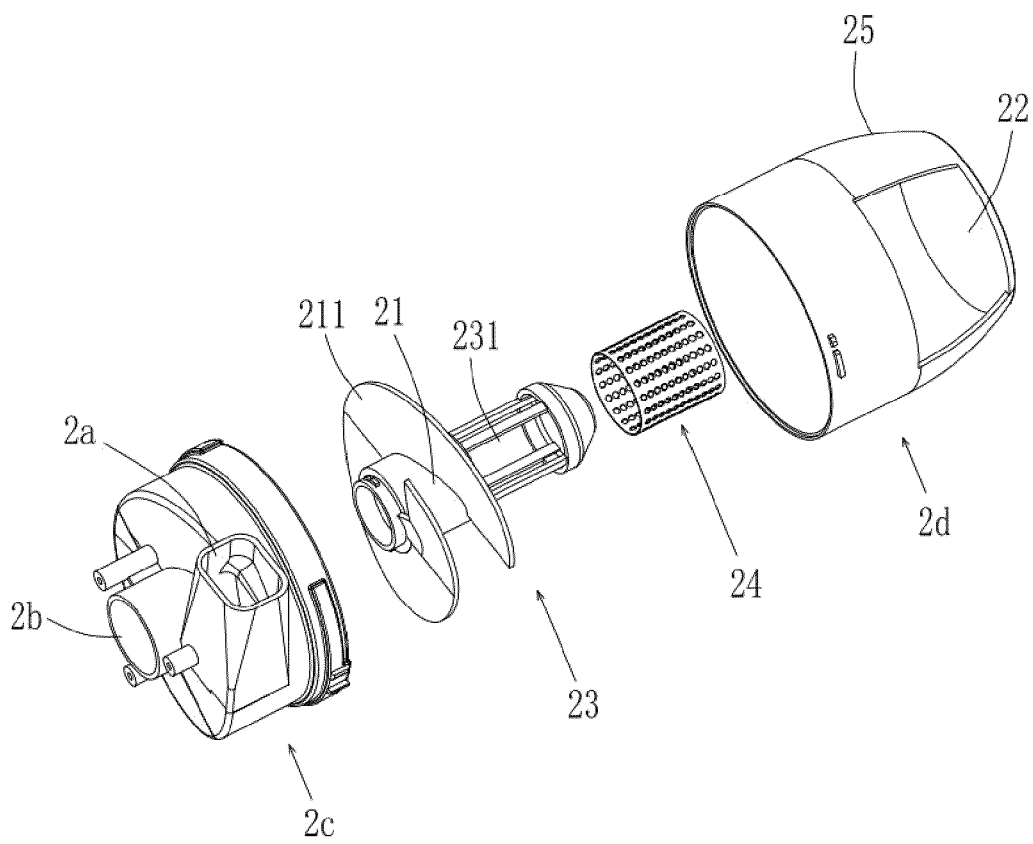


FIG. 11

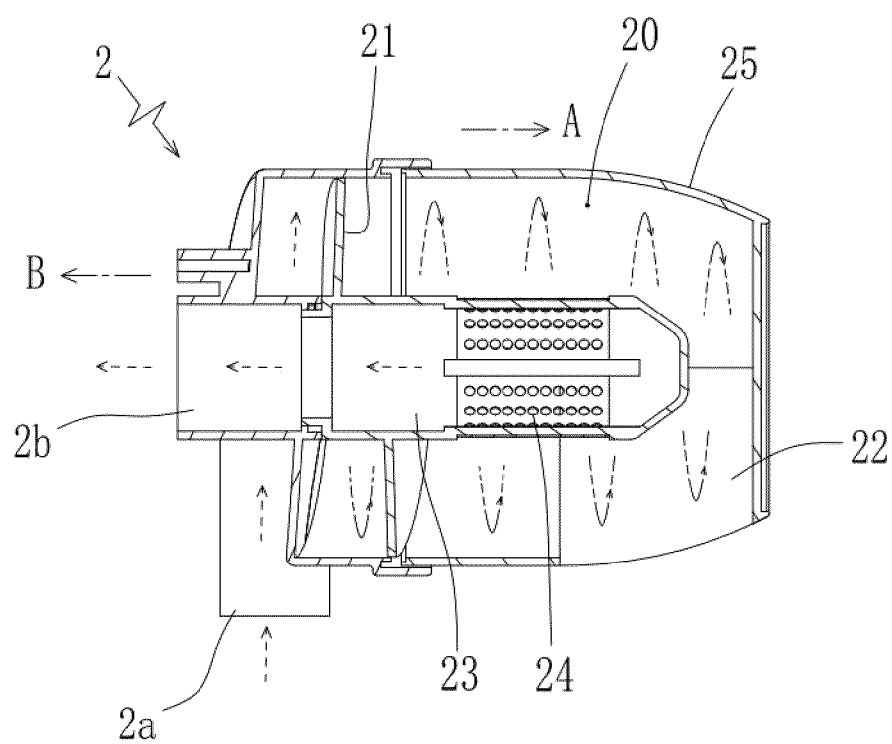


FIG. 12

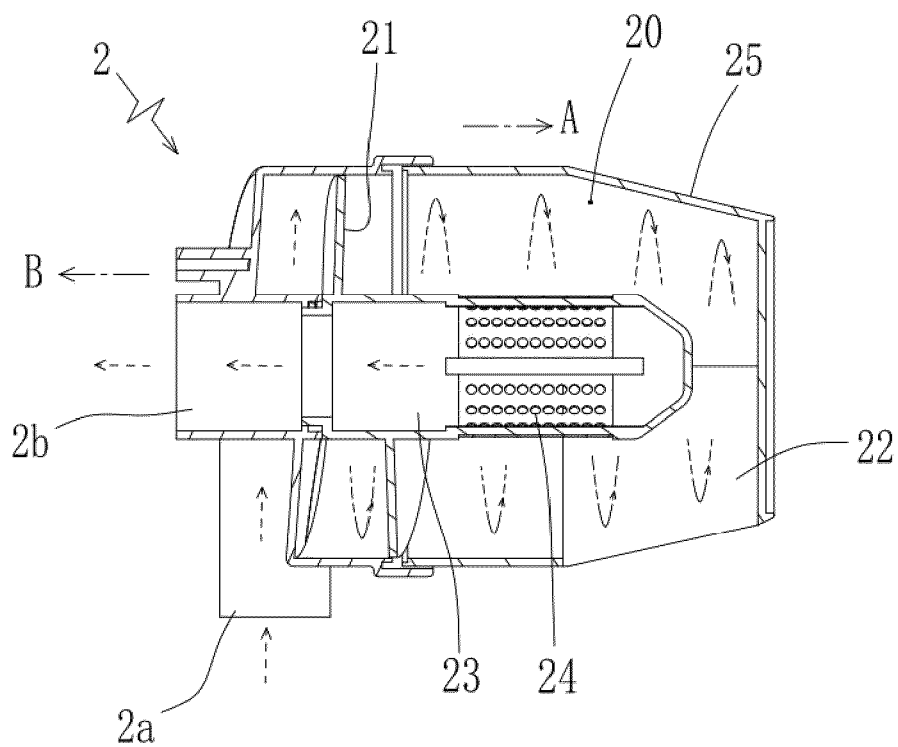


FIG. 13

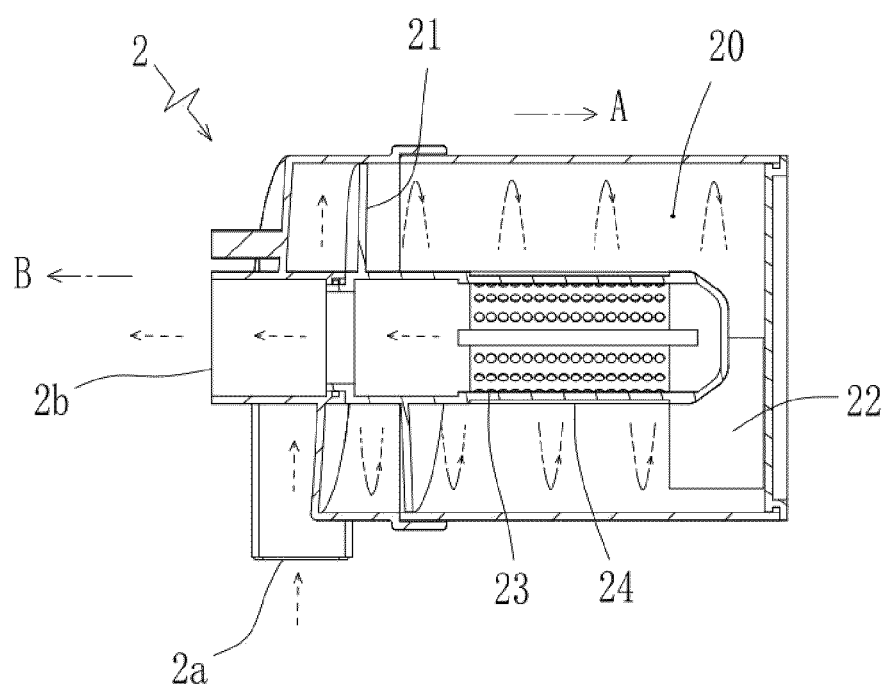


FIG. 14



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A	* paragraphs [0044] - [0060], [0095]; figures 1-10 *	9,10	
X	US 8 062 398 B2 (LUO MING [CN]; CHO WING-HEI [CN]; BISSELL HOMECARE INC [US]) 22 November 2011 (2011-11-22) * column 5, line 59 - column 6, line 12; figures 1-6 * * column 3, line 61 - column 4, line 24 *	1-10	
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 10 July 2025	Examiner Escudero, Raquel
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