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(54) CYCLONE SEPARATOR AND HANDHELD VACUUM CLEANER

ZYKLONABSCHEIDER UND HANDSTAUBSAUGER

SÉPARATEUR À CYCLONE ET ASPIRATEUR PORTATIF

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EP 3 609 379 B1

Description

TECHNICAL FIELD

[0001] This disclosure relates to a filtration assembly for a vacuum cleaner. More particularly, this disclosure relates to a concentric filtration assembly for a handheld vacuum cleaner.

Introduction

[0002] Among various home appliances, hand-held vacuum cleaners have gained popularity in the market place due to their compact, lightweight and portable designs. However, these attractive features often dictate a product design with a limited amount of space for the placement of the parts and components inside the cleaner unit. Consequently, the selection and placement of these parts and components are often resulted as a compromised.

[0003] Because of the compact, lightweight and portable design requirements, a limited amount of space for the appropriate separation and filtration components can have a direct impact on the efficiency, performance and reliability of the cleaner unit. In particular, degradation of cleaner performance is readily observable where large amount of dust or dirt contaminants are captured by the pre-filter of the suction fan blocking the passage of airflow to it or where the pre-filter is damaged. In a worse situation, the dust and contamination of the suction fan or the area housing the electrical components can result in the malfunction of the cleaner unit. These situations can be avoided if proper care is to be taken in the maintenance of the cleaner.

[0004] In a typical hand-held vacuum cleaner, one or more filters, e.g., a foam type pre-filter is provided to the suction fan to screen out fine dusts or particulates entrained in the airstream flowing from the dust separation compartment before it passes to the suction fan and areas when electrical components are held.

[0005] Often, however, due to space limitation, the placement of the pre-filter is located where it is only accessible by opening the dust cup or by disassembling it from the cleaner unit. As often in both cases, the user can be exposed dust and contaminates released from the dust bin. As a result, users' experience of annoyance and inconvenience detracts from the care and maintenance of the pre-filter to the suction fan, one of the most critical components of the vacuum cleaner. Prior art document D1 (US 2013/160232 A1) discloses a vacuum cleaner, which comprises a cyclonic separating apparatus including a dirty air inlet, a main body connected to the cyclonic separating apparatus and a motor and fan unit for generating an airflow through the cyclonic separating apparatus from the dirty air inlet to a clean air outlet, wherein the cyclonic separating apparatus includes at least a first cyclonic cleaning stage and an elongate filter arranged fluidly downstream from the first cyclonic cleaning stage, the elongate filter being housed in a duct at least partially surrounded by the first cleaning stage, and wherein the filter comprises an inlet portion and a filter portion defining a generally tubular filter chamber, the inlet portion including one or more radially facing inlets to permit air to flow into the inlet portion in a radial direction from where the air flows from the inlet portion to the filter chamber in an axial direction (see ABSTRACT of D1).

SUMMARY

[0006] The present invention provides a handheld vacuum cleaner according to the independent claims. The dependent claims show further examples of a suchlike handheld vacuum cleaner. According to the present invention, a handheld vacuum cleaner 1 is provided which comprises a housing 2 having exterior walls 3 forming an enclosure 4. A suction fan compartment 6 containing a suction fan and a cyclone separator 8 are provided within the enclosure 4 and separated by a partition wall 12 having an opening 14 between the cyclone separator and the suction fan compartment 6. A suction inlet 20 is formed on the wall of the housing enclosure adapted for the introduction of airflow or suction air 15 into the cyclone separator. At the partition wall opening 14 between the cyclone separator 8 and the suction fan compartment 6, a strainer or mesh assembly 10 is provided where airflow from the cyclone separator 8 is filtered and passed to the suction fan compartment 6. The strainer 10 includes a frame 101 forming an open enclosure and defining an interior passageway 104. A mesh cover or screen 102 is formed on the strainer frame 101. Suction air 15 flows through the strainer 10 and passes the passageway 104 through the partition wall opening 14 and to the suction fan compartment 6. To achieve air tightness, a resilient means such as a rubber seal 103 seated between the periphery of the base cover 85 around the access opening 851 and the lower portion of the strainer 10.

[0007] The cyclone separator 8 comprises an upper dust separation or cyclonic separation chamber 81 and a lower dust collection section or dust cup 82. Dust cup 82 has a base cover 85 pivotally attached to wall 3 to facilitate the removal of dust accumulated in the dust cup 8. The base cover 85 has an access opening 851. A filter media assembly 9 passes through the access opening 851 and is removably received in the passageway 104 of the strainer 10 to provide separation of particulates or fine dusts after suction air from the cyclonic separation chamber passes through the strainer.

[0008] To achieve air tightness and secured placement of the filter media assembly 9, sealing means 852 is seated between the periphery of access opening 851 and filter media assembly 9. The sealing means 852 may be constructed of a resilient material such as rubber (e.g., a rubber ring/o-ring) or the like. The sealing means 852 has a first sealing ring portion 8521 disposed on the exterior side of the base cover 85 around opening 851 and

a second sealing ring portion 8522 in the interior side of the base cover 85 at the opening. The sealing means 852 is fitted within a channel 853 disposed at the lower end portion of the filter media assembly 9 in engagement with the edge of the access opening 851.

[0009] The filter media assembly 9 comprises a filter holder 91 consisting of an open frame 92 and filter media 94 disposed outside the holder. The filter media assembly 9 is removably fitted in the passageway 104 of strainer 10 and is sealingly secured by the sealing means 852 (e.g., a seal) at the cover access opening 851.

[0010] In one embodiment of the present invention, the strainer 10 and filter media assembly 9 are substantially cylindrical in shape with the filter media assembly 9 retrievably received within the passageway 104 of the strainer 10. In this embodiment, the strainer 10 and filter media assembly 9 can be coaxially aligned or arranged axially parallel to the cyclonic axis of the airflow within the cyclone separator 8. Optionally, the suction fan 61 can be axially aligned with the filter media assembly 9.

[0011] In another embodiment of the present invention, the filter media assembly 9 and the strainer 10 extend from the dust collection chamber cover 85 toward the partition wall opening 14 and inlet to the suction fan compartment 6.

[0012] In summary, the present invention provides a handheld vacuum cleaner wherein air filtration of airflow prior to its entry to the suction fan compartment is provided by a filter media assembly that is directly retrievable from outside the vacuum cleaner housing and without the need for opening the dust cup or removing it from the cleaner body thereby ensuring the performance of the vacuum motor fan and adding to the user's convenience.

[0013] The present invention is described in further details below in conjunction with the accompanying drawings and embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The details of embodiments of the present disclosure, both as to their structure and operation, may be gleaned in part by study of the accompanying drawings, in which like reference numerals refer to like parts, and in which:

Fig. 1 is a partial cross-sectional view of the handheld vacuum cleaner;
Fig. 2 is a perspective view of an embodiment of a handheld vacuum cleaner of Fig. 1;
Fig. 3 is an enlarged view of element A of Fig. 1;
Fig. 4 is a perspective view of an embodiment of the filter media assembly of the handheld vacuum cleaner of Fig. 1;
Fig. 5 is an exploded view of the handheld vacuum cleaner of Fig. 1; and
Fig. 6 is a schematic cross sectional view of the handheld vacuum taken along the line 6 - 6 of Fig. 1.

DETAILED DESCRIPTION

[0015] **Fig. 1** is a perspective view of an embodiment of a handheld vacuum cleaner. **Fig. 2** is a perspective view of an embodiment of a handheld vacuum cleaner of Fig. 1. A handheld vacuum cleaner 1 can have a main body or housing 2 and dust collection accessories (such as wand and brushes, not shown in the figures) connected thereto. The housing 2 can have walls 3 forming an enclosure 4. The enclosure 4 or housing can be divided into multiple (e.g., two) sections by a partition wall 12 running laterally across the handheld vacuum 1. On one side of the partition wall 12 (e.g., an upper side or end) is a suction fan compartment 6 that can hose a motorized vacuum or suction fan 61 and associated electronical components. The suction fan 61 can provide air suction to the vacuum cleaner 1. On the other side (e.g., a lower end or side) of the partition wall 12 is cyclone separator 8 where dusts and other contaminants in the suction airflow are extracted and collected. The upper portion of the cyclone separator 8 is adapted as a cyclonic separation chamber 81. On its lower portion, the cyclone separator 8 provides a dust cup 82 for the collection of dusts and other contaminates separated from the suction airflow.

[0016] The dust cup 82 has a base cover 85 pivotally attached to lower portion of wall 3 and forming its base to facilitate the removal of dust accumulated in the dust separator/collection chamber or dust cup 8. The base cover 85 can be opened via a hinge assembly 87 and is held in the closed position by a latch assembly 86. The base cover 85 has an access opening 851.

[0017] The vacuum cleaner can be powered by a power storage means 7 contained in the handle base 24 as part of the housing enclosure 4, as shown in Figures 1 and 2. The power storage means 7 can be, for example, a rechargeable battery packs for operating the suction fan 61, its motor, and other parts and accessories of the vacuum cleaner that require power, for example, motorized power brush and lights (not shown). Optionally, an alternative current (AC) source (not shown) may be provided as electric power.

[0018] A suction inlet 20 is provided on the cleaner wall 3 to receive the dust collection pipe 11. Suction inlet 20 is adapted for the introduction of airflow or suction air 15 into the cyclone separator 8 in a cyclonic fashion. The airflow from suction inlet 20 is directed along the inside wall of the cyclonic separation chamber 81 to create a cyclonic flow such that dust, dirt particulates and other contaminates will be separated from the airstream as a result of centrifugal force.

[0019] Partition wall 12 has an opening 14. After suction air is centrifuged in the cyclone separator 8, it passes to the suction fan compartment 6 and is exhausted by the suction fan 61 out of the handheld vacuum cleaner 1 through slotted openings 22 on the head cover 21 of the vacuum cleaner body 2. The partition wall opening 14 is positioned about the region where the cyclonic axis

of the airflow is located in the cyclone separator. Optionally, the suction fan 61 is axially aligned with the direction of the flow path passing through the partition wall opening 14 between the cyclone separator and the suction fan compartment. In some embodiments, the partition wall opening 14 can also be concentric with the filter media assembly 9 and a strainer 10.

[0020] At the partition wall opening 14, the strainer 10 is provided for the airflow or suction air 15 to pass from the cyclone separator 8 to the suction fan compartment 6. Strainer 10 extends from the partition wall 12 toward the base cover 85. The strainer 10 includes an open frame 101 forming an enclosure and defining an interior passageway 104. In the cyclonic separation chamber 81, the strainer frame 101 is adapted to be open for the suction air to pass through. A mesh or screen 102 is provided on the open frame 101 for screening of finer dust, dirt or particulates from the airflow passing from the cyclonic separation chamber 81. The mesh 102 can be formed as part of the open frame 101. Alternatively, the mesh 102 can be provided as a separate cover mounted on the open frame 101. The strainer 10, strainer frame 101 and the mesh 102 can be constructed with nylon or metal braided mesh, or by metal etching mesh, and the likes, as known in the art.

[0021] To further reduce the undesirable carry-over of finer dusts or dirt into the suction fan compartment, a filter media assembly 9 is retrievably positioned in the strainer passageway 104. **Fig. 3** is an enlarged view of element A of Fig. 1. **Fig. 4** is a perspective view of an embodiment of the filter media assembly of the handheld vacuum cleaner of Fig. 1.

[0022] Referring to Fig. 3 and Fig. 4, the filter media assembly 9 comprises a filter holder 91 having an open or slotted wall 92 and defining an internal pathway 95 (Fig. 6) for the suction air 15 passing from the cyclonic separation chamber 81 to the suction fan compartment 6. At the lower end portion of the filter media assembly 9, a plug 96 is provided to isolate the internal pathway 95 of filter media assembly from the outside of the vacuum cleaner. The plug can be constructed of a resilient material such as rubber. To facilitate installation and removal of the filter media assembly 9, a knob or pull means 97 can be formed as part of the plug 96.

[0023] A filter media 94 disposed outside the holder 91. In one embodiment of the present invention, a sponge material is used as the filter media. While various materials for the construction of the filter media 94 are known in the art, the choice of the filter media materials, compositions and filtering characteristics are made to achieve the desired dust and contamination removal from the airflow before it enters the suction fan compartment 6 from the dust cup 8.

[0024] As shown in Fig, 1, filter media assembly 9 and strainer 10 are elongated extending from the partition wall 12 to the cyclone separator base cover 86. In the embodiment shown in Figure 1, filter media assembly 9 and strainer 10 are substantially cylindrical in shape with the filter media assembly 9 retrievably received within the passageway 104 of the strainer 10. In such configuration, filter media assembly 9 and strainer 10 are coaxially aligned with or arranged axially parallel to the cyclonic axis 100 of the suction air 15 within the cyclonic separation chamber 81. In some embodiments, the cyclonic axis 100 can be the axis about which the cyclonic flow of the handheld vacuum 1 rotates. Thus, the cyclonic axis can be coincident with a central axis 99 of the filter media assembly 9. In Fig. 6, the cyclonic axis 100 is marked with an "x." The filter media assembly 9 is thus positioned at the cyclonic center of the cyclone separator 8.

[0025] In other embodiments, the filter media assembly 9 and strainer 10 are configured in conical or truncated conical shapes wherein the filter media assembly 9 is nested within the strainer 10 (not shown). As a further option, the suction fan is axially aligned with the filter media assembly 9.

[0026] As referenced above, the cyclone separator 8 has a base cover 85 pivotally attached to base of wall 3 to facilitate the removal of dust accumulated in the dust cup 82. The base cover 85 has an access opening 851. As shown in Fig. 1, filter media assembly 9 and strainer 10 extend from the access opening 851 of the base cover 85 to the partition wall opening 14 of the inlet to the suction fan compartment 6. Filter media assembly 9 can be placed in the strainer passageway 104 and removed from it through base cover access opening 851.

[0027] To achieve air tightness and secured placement of the filter media assembly 9, sealing means 852 can be seated between the periphery of access opening 851 and filter media assembly 9. The sealing means 852 may be constructed of a resilient material such as rubber or the likes. The sealing means 852 can have a first sealing ring portion 8521 disposed on the exterior of the base cover 85 around opening 851 and a second sealing ring portion 8522 in the interior side of the base cover at the opening. The sealing means 852 is fitted within a channel 853 disposed at the lower end portion of the filter media assembly 9 in engagement with the edge of the access opening 851.

[0028] In a similar fashion, the filter media assembly 9 can be provided with similar sealing means at its upper portion to sealingly secure it around or adjacent to the opening 14 of the wall partition 12. In some embodiments, rubber o-rings or other similar sealing mechanisms can be implemented on either end of the filter media assembly 9.

[0029] To improve the cyclonic separation effect and to reduce remixing of containments with the airstream before it passes to the strainer 10, an open shelf 811 is provided in the cyclonic separation chamber 81. Open-shelf 811 has a side wall partially surrounding strainer 10. The open-shelf 811 can have a cylindrical or tubular body closed at one end with a base tray 812. The open-shell 811 can further have a portion of the cylindrical side wall removed, forming an opening (see Fig. 6). As suction

air 15 enters suction inlet 20, the airstream is directed along the interior wall surface of the cyclonic separation chamber 81 whereby a cyclonic flow is developed. The cyclonic flow creates an inertial particle separator, forcing heavier particulates to the outside of the flow (e.g., against the separation chamber 81 wall) that ultimately fall to the dust cup 82 and lower portion of the cyclone separator 8. The lighter dust particles may remain in the suction air flow (e.g., suction air 15) and flow into the open shelf 811 toward the strainer 10. As heavier particulates are separated from airflow, open shelf 811 helps reduce the remixing of dust particles with the airstream before it enters the strainer 10. The base tray 812 can block flow from the dust cup 8, reducing the reentrainment of dust or dirt in the airflow before it is passed the suction fan compartment 7. Thus, the open shelf 811 can have a generally cylindrical shape, with a portion of a wall (shown with the dashed lines in Fig. 6) missing.

[0030] In operation, when the vacuum or suction fan 61 is energized, suction air 15 (Fig. 6) is introduced into the vacuum cleaner enclosure 4 via the suction inlet 20 along the inside wall surface of the cyclone separator 81. The cyclonic flow pattern causes the dust particles carried in the suction airstream to be centrifugally separated from the airflow and collected in the lower portion of the cyclone separator in the dust collection chamber or dust cup 82.

[0031] The centrifugalized airflow 15 can be then passed through the filter mesh or screen 102 of strainer 10 where residual dusts or particulate matters are screened before it enters the interior passageway 104 of strainer 10. Within the passageway 104, the filter media assembly 9 is positioned to provide further filtration of the airflow to minimize the intrusion of even finer dust and particulates into the suction fan compartment.

[0032] As described above, the filter media assembly 9 enables the user to position or remove it from the cyclone separator 8 for maintenance without the need for opening the dust cup by way of the base cover 85 (or removing the cyclone separator or dust cup as in the case where the cyclone separator and dust cup may each be adapted to be disassembled from the vacuum cleaner housing). Accordingly, the ease of access to the filter media assembly provides convenience to the users in its maintenance or replacement and reduces the occasion of dust being released out of the dust cup 8 and user annoyance when the base cover of the dust cup is opened or is removed from the vacuum cleaner (as in the case where the cyclone separator as a whole or dust cup is formed as a separable component of the cleaner). As a result, the present invention effectively promotes care in the maintenance of the vacuum cleaner and helps improve the performance of the vacuum motor-fan system when compared with other handheld vacuum cleaners in the market.

[0033] **Fig. 5** is an exploded view of the handheld vacuum cleaner of Fig. 1. As shown, the handheld vacuum cleaner 1 can be formed with the filter media assembly 9 coaxially received within strainer 10. The strainer 10 can further be coaxially received within the cyclonic separation chamber 81, which is then contained within the dust cup 8. The exploded view shown is intended to illustrate the interaction of the components of the handheld vacuum cleaner 1 and the relative flow of the suction air 15 as it flows through the system.

[0034] **Fig. 6** is a schematic cross section of the handheld vacuum cleaner of Fig. 1, taken along the line 6 - 6. As shown, the suction air 15 can enter the suction inlet 20. The suction air 15 can be forced into a cyclonic flow by the inner wall of the cyclone separator 8. The open shelf 811 of the cyclonic separation chamber 81 can allow the suction air 15 to flow toward the strainer 10. As shown in Fig. 1 and Fig. 2, the suction fan compartment 6 is disposed atop the cyclone separator 8. Thus as shown in Fig. 6, the airflow is directed out of the airpath on the inner portion of the filter media assembly 9 and into the suction fan 61.

[0035] As the suction air 15 exits the handheld vacuum cleaner 1, an area of low pressure is formed within the filter media assembly 9, drawing the suction air 15 through the filter media 94 and the strainer 10. The shape of the cyclonic separation chamber 81, and more particularly the open shelf 811, creates an space through which the suction 15 flows, imparting a cyclonic rotation on the suction air 15 as it enters the cyclone separator 8 and flows through the dust separation chamber 81. The open shelf 811 is shown in cross section with a portion of the outer cylindrical wall missing. The open portion of the substantially cylindrical body is shown as a dashed line. The base tray 812 forms the bottom of the open shelf 811.

[0036] An exemplary benefit of embodiments of the handheld vacuum cleaner 1 is the concentric arrangement of the filter media assembly 9 and the strainer 10 with respect to the suction fan. This arrangement can allow the filter media assembly 9 to provide additional filtration to the suction air 15 exiting the system through the suction fan. Furthermore, the user replaceable nature of the filter media assembly 9 allows the user to remove the innermost filtration elements without opening the base cover 85 and removing other filter components.

[0037] As compared with the prior art handheld vacuum cleaner in which a pre-filter is provided to the suction fan, the filter media assembly can be installed and withdrawn directly from the outside the dust cup for maintenance without exposing the user from the dust and other contaminants in the dust collection chamber or bin.

Claims

1. A handheld vacuum cleaner, comprising:

a housing (2) having an exterior side wall and a base forming an enclosure (4);
a suction fan compartment (6) and a cyclone separator (8) within the enclosure separated by

a partition wall (12) with an opening between the suction fan compartment (6) and the cyclone separator (8), the cyclone separator (8) having a cyclonic separation chamber (81) and a dust cup (82);

a suction inlet (20) formed on the exterior wall of the housing enclosure adapted for the introduction of airflow into the cyclone separator (8) in a cyclonic fashion and defining a cyclonic axis passing through the partition wall opening (14);

an access opening (851) formed on the base of the enclosure in substantial alignment with the cyclonic axis;

a filter media assembly (9) removably disposed in the cyclone separator (8) between the partition wall opening (14) and the base access opening (851) to provide filtration of the airflow prior to its entry into the suction fan compartment (6); and

a strainer (10), wherein the filter media assembly (9) passes through the access opening (851) and is removably received in a passageway (104) of the strainer (10).

2. The handheld vacuum cleaner according to claim 1, wherein the filter media assembly (9) is located substantially at the cyclonic center of the airflow in the cyclonic separation chamber (81).

3. The handheld vacuum cleaner according to claim 1, wherein the base includes a cover pivotally attached to the enclosure wall and forming a part thereof.

4. The handheld vacuum cleaner according to claim 1, wherein the filter media assembly (9) comprises a filter holder (91) having an open wall defining an internal airstream pathway between the cyclone separator (8) and the suction fan compartment (6), and a filter media disposed outside the holder.

5. The handheld vacuum cleaner according to claim 3, wherein the filter media assembly (9) extends from the base cover to the partition wall opening (14) in the cyclone separator (8).

6. The handheld vacuum cleaner according to claim 1, wherein the strainer (10) is disposed in the dust cup, the strainer (10) having an open support frame with an internal passageway for the filter media assembly (9) retrievably disposed therein.

7. The handheld vacuum cleaner according to claim 6, wherein the strainer (10) further comprises a mesh cover formed on the support frame for the screening of airflow passing from the cyclonic separator to the suction fan compartment (6).

8. The handheld vacuum cleaner according to claim 6, wherein the filter media assembly (9) and the strainer (10) are cylindrical in shape and arranged substantially axially parallel to the cyclonic axis of the airflow within the cyclone separator (8).

9. The handheld vacuum cleaner according to claim 8, wherein the filter media assembly (9) and the strainer (10) are substantially axially parallel to the cyclonic axis of the airflow within the cyclone separator (8).

10. The handheld vacuum cleaner according to claim 1, further comprising an open shelf (811) within the cyclonic separation chamber (81), the open shelf (811) having a side wall and a base tray (821) for directing the airflow toward the inside wall of the cyclone separator (8) and reduce reentrainment of contaminated airflow before it is passed through the cyclone separator (8) to the suction fan compartment (6).

11. The handheld vacuum cleaner according to claim 1, wherein the base comprises a base cover (85), and the vacuum cleaner further comprises resilient sealing means for securing the filter media assembly (9) within the cyclone separator (8) at the partition wall (12) and the base cover (85).

12. The handheld vacuum cleaner according to claim 11, wherein the sealing means (852) comprises a sealing ring having a first seal ring portion and a second ring portion interposed between the filter media assembly (9) and mounted on the inner and outer sides of the base cover (85).

13. The handheld vacuum cleaner according to claim 1, wherein:

the cyclonic separation chamber (81) and the dust collection chamber are formed within the enclosure, the cyclonic separation chamber (81) defines a cyclonic axis (100);

the cyclone comprises an exit opening formed on the wall of the enclosure (4);

and

a filter media assembly (9) in the cyclone separator (8) between the access opening (851) of the base cover (85) and exit opening to provide filtration of the airflow passing from the suction inlet (20) to the exit opening wherein the filter media assembly (9) is removably placed in the cyclone separator (8) by way of the base access opening;

a suction fan assembly is provided above the dust cup;

a suction inlet (20) is provided on the cleaner wall (3) to receive the dust collection pipe (11);

a power storage means (7) is contained in the handle base (24) as part of the housing enclosure (4);

a handle is provided behind the housing (2);
a partition wall (12) running laterally across the handheld vacuum (1), and on the upper side of the partition wall (12) is a suction fan compartment (6);
at the partition wall opening (14), a strainer (10) is provided for the airflow or suction air (15) to pass from the cyclone separator (8) to the suction fan compartment (6), whereby strainer (10) extends from the partition wall (12) toward the base cover (85), and the strainer (10) includes an open frame (101) forming an enclosure and defining an interior passageway (104), and a mesh or screen (102) is provided on the open frame (101);
a filter media assembly (9) is retrievably positioned in the strainer passageway (104);
the filter media assembly (9) comprises a filter holder (91) having an open or slotted wall (92) and defining an internal pathway (95) for the suction air (15) passing from the cyclonic separation chamber (81) to the suction fan compartment (6);
a filter media (94) disposed outside the holder (91).

Patentansprüche

1. Ein tragbarer Staubsauger, bestehend aus:

ein Gehäuse (2) mit einer äußeren Seitenwand und einem Grundteil, die eine Umhüllung (4) bilden;
ein Sauggebläseabteil (6) und einen Zyklonabscheider (8) innerhalb der Umhüllung, die durch eine Trennwand (12) mit einer Öffnung zwischen dem Sauggebläseabteil (6) und dem Zyklonabscheider (8) getrennt sind, wobei der Zyklonabscheider (8) eine Zyklonabscheidekammer (81) und einen Staubbecher (82) aufweist;
einen Saugeinlass (20), der an der Außenwand des Gehäusekörpers angebracht ist, um den Luftstrom zyklonartig in den Zyklonabscheider (8) einzuleiten, wobei er eine Zyklonachse bildet, die durch die Trennwandöffnung (14) verläuft;
eine Zugangsöffnung (851), die an der Basis des Gehäuses gebildet ist und im Grunde mit der Zyklonachse ausgerichtet ist;
eine Filtermedienanordnung (9), die herausnehmbar in dem Zyklonabscheider (8) zwischen der Trennwandöffnung (14) und der Bodenzugangsöffnung (851) angeordnet ist, um die Filterung des Luftstroms vor seinem Eintritt in das Sauggebläseabteil (6) bereitzustellen; und
ein Sieb (10), wobei die Filtermedienanordnung (9) durch die Zugangsöffnung (851) hindurchgeht und herausnehmbar in dem Durchgang (104) des Siebs (10) angeordnet ist.

2. Der tragbare Staubsauger nach Anspruch 1, wobei die Filtermedienanordnung (9) im Wesentlichen in der Zyklonmitte des Luftstroms in der Zyklonabscheidekammer (81) angeordnet ist.

3. Der tragbare Staubsauger nach Anspruch 1, wobei die Basis eine Abdeckung umfasst, die schwenkbar an der Gehäusewand befestigt ist und einen Teil davon bildet.

4. Der tragbare Staubsauger nach Anspruch 1, wobei die Filtermedienanordnung (9) einen Filterhalter (91) mit der offenen Wand, die den internen Luftstromweg zwischen dem Zyklonabscheider (8) und dem Sauggebläseabteil (6) begrenzt, und ein außerhalb des Halters angeordnetes Filtermedium umfasst.

5. Der tragbare Staubsauger nach Anspruch 3, wobei sich die Filtermedienanordnung (9) von der Basisabdeckung bis zu der Trennwandöffnung (14) im Zyklonabscheider (8) erstreckt.

6. Der tragbare Staubsauger nach Anspruch 1, bei dem das Sieb (10) im Staubbecher angeordnet ist, wobei das Sieb (10) einen offenen Tragrahmen mit dem inneren Durchgang für die Filtermedienanordnung (9) umfasst, die darin herausnehmbar angeordnet ist.

7. Der tragbare Staubsauger nach Anspruch 6, wobei das Sieb (10) außerdem eine auf dem Tragrahmen ausgebildete Gitterabdeckung zur Abschirmung des vom Zyklonabscheider zum Sauggebläsefach (6) strömenden Luftstroms umfasst.

8. Handstaubsauger nach Anspruch 6, wobei die Filtermedienanordnung (9) und das Sieb (10) zylindrisch geformt und im Wesentlichen axial parallel zur Zyklonachse des Luftstroms innerhalb des Zyklonabscheiders (8) angeordnet sind.

9. Der tragbare Staubsauger nach Anspruch 8, wobei die Filtermedienanordnung (9) und das Sieb (10) im Wesentlichen axial parallel zur Zyklonachse des Luftstroms innerhalb des Zyklonabscheiders (8) angeordnet sind.

10. Der tragbare Staubsauger nach Anspruch 1 umfasst ferner ein offenes Fach (811) innerhalb der Zyklonabscheidekammer (81), wobei das offene Fach (811) eine Seitenwand und eine Bodenschale (821) umfasst, um den Luftstrom in Richtung der Innenwand des Zyklonabscheiders (8) zu lenken und die erneute Mitnahme des verunreinigten Luftstroms zu verringern, bevor er durch den Zyklonabscheider (8)

zum Sauggebläsefach (6) geleitet wird.

11. Der tragbare Staubsauger nach Anspruch 1, wobei die Basis eine Basisabdeckung (85) umfasst, und der Staubsauger ferner elastische Dichtungsmittel umfasst, um die Filtermedienanordnung (9) innerhalb des Zyklonabscheiders (8) an der Trennwand (12) und der Basisabdeckung (85) zu sichern.

12. Der tragbare Staubsauger nach Anspruch 11, wobei das Dichtungsmittel (852) einen Dichtungsring mit dem ersten Dichtungsringteil und dem zweiten Ringteil umfasst, der zwischen der Filtermedienanordnung (9) eingesetzt und an der Innen- und Außenseite der Basisabdeckung (85) angebracht ist.

13. Der tragbare Staubsauger nach Anspruch 1, wobei:

die Zyklonabscheidekammer (81) und die Staubsammelkammer innerhalb des Gehäuses vorgesehen sind, wobei die Zyklonabscheidekammer (81) eine Zyklonachse (100) bildet;
der Zyklon umfasst eine Austrittsöffnung, die an der Wand des Gehäuses (4) vorgesehen ist;
und
die Filtermedienanordnung (9) in dem Zyklonabscheider (8) zwischen der Zugangsöffnung (851) der Basisabdeckung (85) und der Ausgangsöffnung, um die Filtration des Luftstroms zu gewährleisten, der von dem Saugeinlass (20) zu der Ausgangsöffnung strömt, wobei die Filtermedienanordnung (9) durch die Basiszugangsöffnung herausnehmbar in dem Zyklonabscheider (8) angeordnet ist; eine Sauggebläseanordnung ist über dem Staubbecher vorgesehen;
der Saugeinlass (20) ist an der Wand des Staubsaugers (3) vorgesehen, um das Staubsammelrohr (11) darin zu integrieren; der Energiespeicher (7) ist im Handgriffsockel (24) als Teil des Gehäuses (4) eingebaut;
der Handgriff ist hinter dem Gehäuse (2) vorgesehen;
die Trennwand (12), die seitlich quer über den tragbaren Staubsauger (1) und auf der Oberseite der Trennwand (12) ein Sauggebläsefach (6), angeordnet ist;
an der Trennwandöffnung (14) ist das Sieb (10) vorgesehen, damit der Luftstrom oder die Ansaugluft (15) von dem Zyklonabscheider (8) zu dem Sauggebläseabteil (6) strömen kann, wobei sich das Sieb (10) von der Trennwand (12) zu der Bodenabdeckung (85) erstreckt und das Sieb (10) einen offenen Rahmen (101) umfasst, der eine Umhüllung bildet und den inneren Durchgang (104) bildet, und das Gitter oder das Sieb (102) ist an dem offenen Rahmen (101) vorgesehen;
die Filtermedienanordnung (9) ist in dem Siebdurchgang (104) abnehmbar angebracht;
die Filtermedienanordnung (9) enthält den Filterhalter (91), der eine offene oder geschlitzte Wand (92) umfasst und den internen Durchgang (95) für die Ansaugluft (15) bildet, die von der Zyklonabscheidekammer (81) zum Sauggebläsefach (6) strömt;
außerhalb des Halters (91) ist das Filtermedium (94) angeordnet.

Revendications

1. Aspirateur à main, comprenant :

un boîtier (2) ayant une cloison latérale et une base formant une enceinte (4) ;
un compartiment du ventilateur d'aspiration (6) et un séparateur à cyclone (8) à l'intérieur de l'enceinte séparé par une cloison de séparation (12) avec une ouverture entre le compartiment du ventilateur d'aspiration (6) et le séparateur à cyclone (8), le séparateur à cyclone (8) ayant une chambre de séparation cyclonique (81) et un bac à poussière (82) ;
une entrée d'aspiration (20) formée sur la cloison extérieure de l'enceinte du boîtier, adaptée pour l'introduction d'un flux d'air dans le séparateur à cyclone (8) de manière cyclonique et définissant un axe cyclonique passant à travers l'ouverture de cloison de séparation (14) ;
une ouverture d'accès (851) formée sur la base de l'enceinte, sensiblement alignée avec l'axe cyclonique ;
un ensemble de médias filtrants (9) disposé de manière amovible dans le séparateur à cyclone (8) entre l'ouverture de cloison de séparation (14) et l'ouverture d'accès à la base (851) pour assurer la filtration du flux d'air avant son entrée dans le compartiment du ventilateur d'aspiration (6) ; et
une crépine (10), dans lequel l'ensemble de médias filtrants (9) passe à travers l'ouverture d'accès (851) et est reçu de manière amovible dans un passage (104) de la crépine (10).

2. L'aspirateur à main selon la revendication 1, dans lequel l'ensemble de médias filtrants (9) est situé sensiblement au centre cyclonique du flux d'air dans la chambre de séparation cyclonique (81).

3. L'aspirateur à main selon la revendication 1, dans lequel la base comprend un cache fixé de manière pivotante à la cloison de l'enceinte et formant une partie de celle-ci.

4. L'aspirateur à main selon la revendication 1, dans

lequel l'ensemble de médias filtrants (9) comprend un support pour le filtre (91) ayant une cloison ouverte définissant un chemin de flux d'air interne entre le séparateur à cyclone (8) et le compartiment du ventilateur d'aspiration (6), et un milieu filtrant disposé à l'extérieur du support.

5. L'aspirateur à main selon la revendication 3, dans lequel l'ensemble de médias filtrants (9) s'étend depuis le cache de base jusqu'à l'ouverture de cloison de séparation (14) dans le séparateur à cyclone (8).

6. L'aspirateur à main selon la revendication 1, dans lequel la crépine (10) est disposée dans le bac à poussière, la crépine (10) ayant un cadre de support ouvert avec un passage interne pour l'ensemble de médias filtrants (9) disposé de manière réversible à l'intérieur.

7. L'aspirateur à main selon la revendication 6, dans lequel le crépine (10) comprend en outre un cache en maille formé sur le cadre de support pour filtrer le flux d'air passant du séparateur cyclonique au compartiment du ventilateur d'aspiration (6).

8. L'aspirateur à main selon la revendication 6, dans lequel l'ensemble de médias filtrants (9) et la crépine (10) sont de forme cylindrique et disposés sensiblement axialement parallèlement à l'axe cyclonique du flux d'air à l'intérieur du séparateur à cyclone (8).

9. L'aspirateur à main selon la revendication 8, dans lequel l'ensemble de médias filtrants (9) et la crépine (10) sont sensiblement axialement parallèles à l'axe cyclonique du flux d'air à l'intérieur du séparateur à cyclone (8).

10. L'aspirateur à main selon la revendication 1, comprenant en outre une étagère ouverte (811) à l'intérieur de la chambre de séparation cyclonique (81), l'étagère ouverte (811) ayant une cloison latérale et un plateau de base (821) pour diriger le flux d'air vers la cloison latérale du séparateur à cyclone (8) et pour réduire le réentraînement du flux d'air contaminé avant que celui-ci ne soit dirigé à travers le séparateur à cyclone (8) vers le compartiment du ventilateur d'aspiration (6).

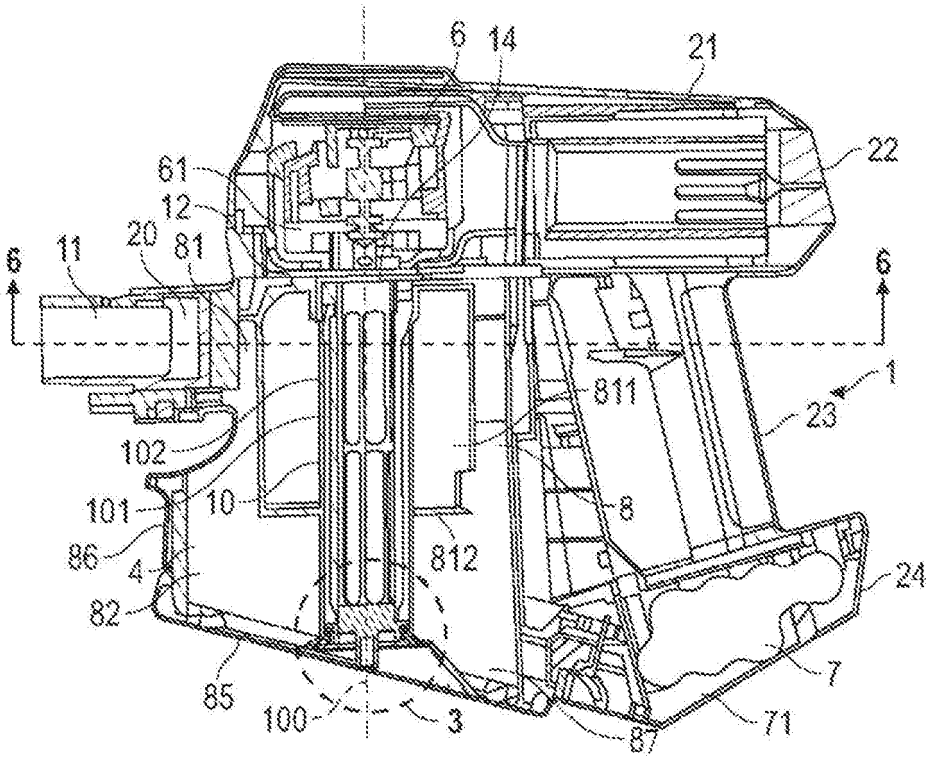
11. L'aspirateur à main selon la revendication 1, dans lequel la base comprend un cache de base (85), et l'aspirateur comprend en outre des moyens d'étanchéité élastiques pour fixer l'ensemble de médias filtrants (9) à l'intérieur du séparateur à cyclone (8) au niveau de la cloison de séparation (12) et du cache de base (85).

12. L'aspirateur à main selon la revendication 11, dans lequel les moyens d'étanchéité (852) comprennent une bague d'étanchéité ayant une première partie d'anneau d'étanchéité et une seconde partie d'anneau interposée entre l'ensemble de médias filtrants (9) et montée sur les côtés intérieur et extérieur du cache de base (85).

13. L'aspirateur à main selon la revendication 1, dans lequel :

la chambre de séparation cyclonique (81) et la chambre de collecte de poussière sont formées à l'intérieur de l'enceinte, la chambre de séparation cyclonique (81) définit un axe cyclonique (100),
le cyclone comprend une ouverture de sortie formée sur la cloison de l'enceinte (4) ;
et
un ensemble de médias filtrants (9) dans le séparateur à cyclone (8) entre l'ouverture d'accès (851) du cache de base (85) et l'ouverture de sortie pour assurer la filtration du flux d'air passant de l'entrée d'aspiration (20) à l'ouverture de sortie, dans lequel l'ensemble de médias filtrants (9) est placé de manière amovible dans le séparateur à cyclone (8) au moyen de l'ouverture d'accès à la base ;
un ensemble ventilateur d'aspiration est disposé au-dessus du bac à poussière ;
une entrée d'aspiration (20) est disposée sur la paroi du nettoyeur (3) pour recevoir le tuyau de collecte de poussière (11) ;
des moyens de stockage d'énergie (7) sont contenus dans la base de poignée (24) en tant que partie de l'enceinte du boîtier (4) ;
une poignée est disposée derrière le boîtier (2) ;
une cloison de séparation (12) s'étendant latéralement à travers l'aspirateur à main (1), et sur la face supérieure de la cloison de séparation (12) se trouve un compartiment du ventilateur d'aspiration (6) ;
au niveau de l'ouverture de la cloison de séparation (14), une crépine (10) est prévue pour que le flux d'air ou l'air aspiré (15) passe du séparateur à cyclone (8) au compartiment du ventilateur d'aspiration (6), la crépine (10) s'étendant depuis la cloison de séparation (12) vers le cache de base (85), et la crépine (10) comprend un cadre ouvert (101) formant un enceinte et définissant un passage intérieur (104), et une maille ou grillage (102) est prévu sur le cadre ouvert (101) ;
un ensemble de médias filtrants (9) est positionné de manière réversible dans le passage de crépine (104) ;
l'ensemble de médias filtrants (9) comprend un support pour le filtre (91) ayant une paroi ouverte ou fendue (92) et définissant un passage interne (95) pour l'air d'aspiration (15) passant de la

chambre de séparation cyclonique (81) au compartiment du ventilateur d'aspiration (6) ;
un milieu filtrant (94) disposé à l'extérieur du support (91).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12
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71

Fig. 1

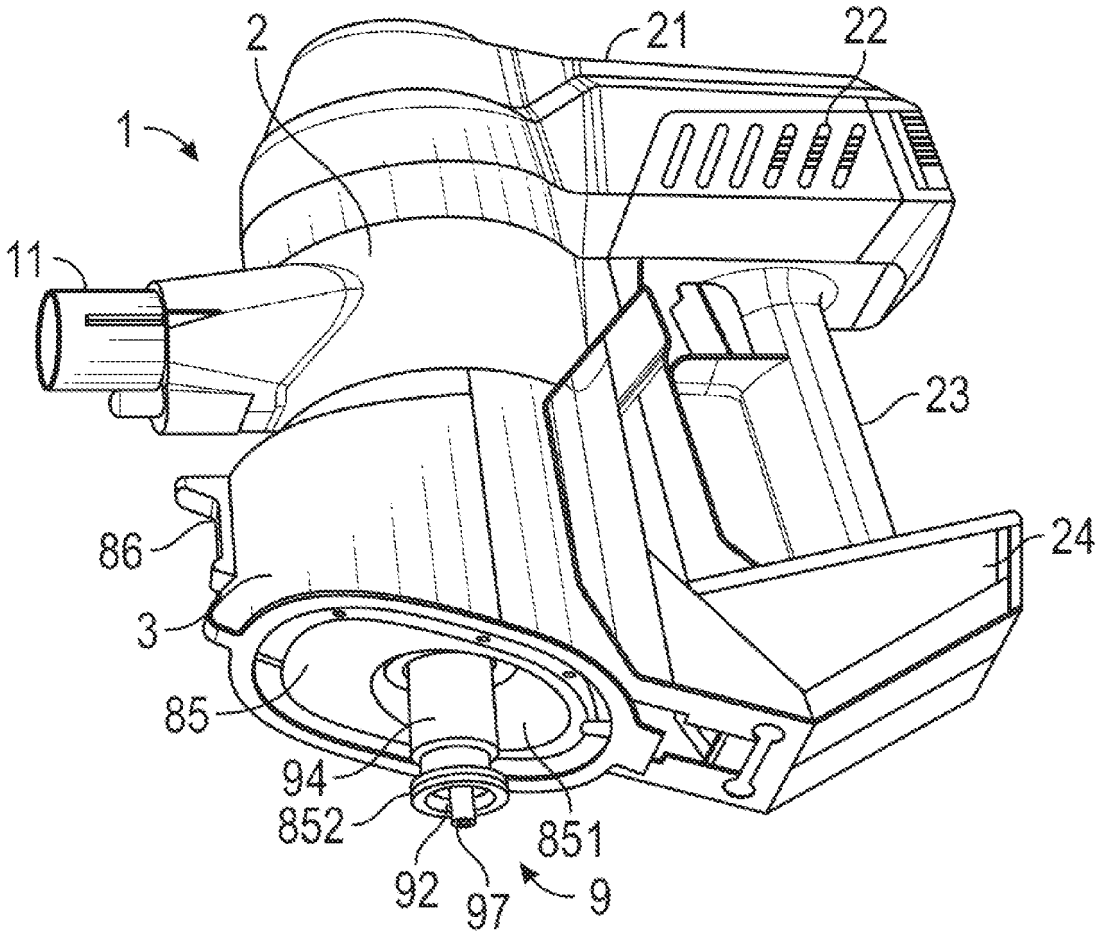

Fig. 2

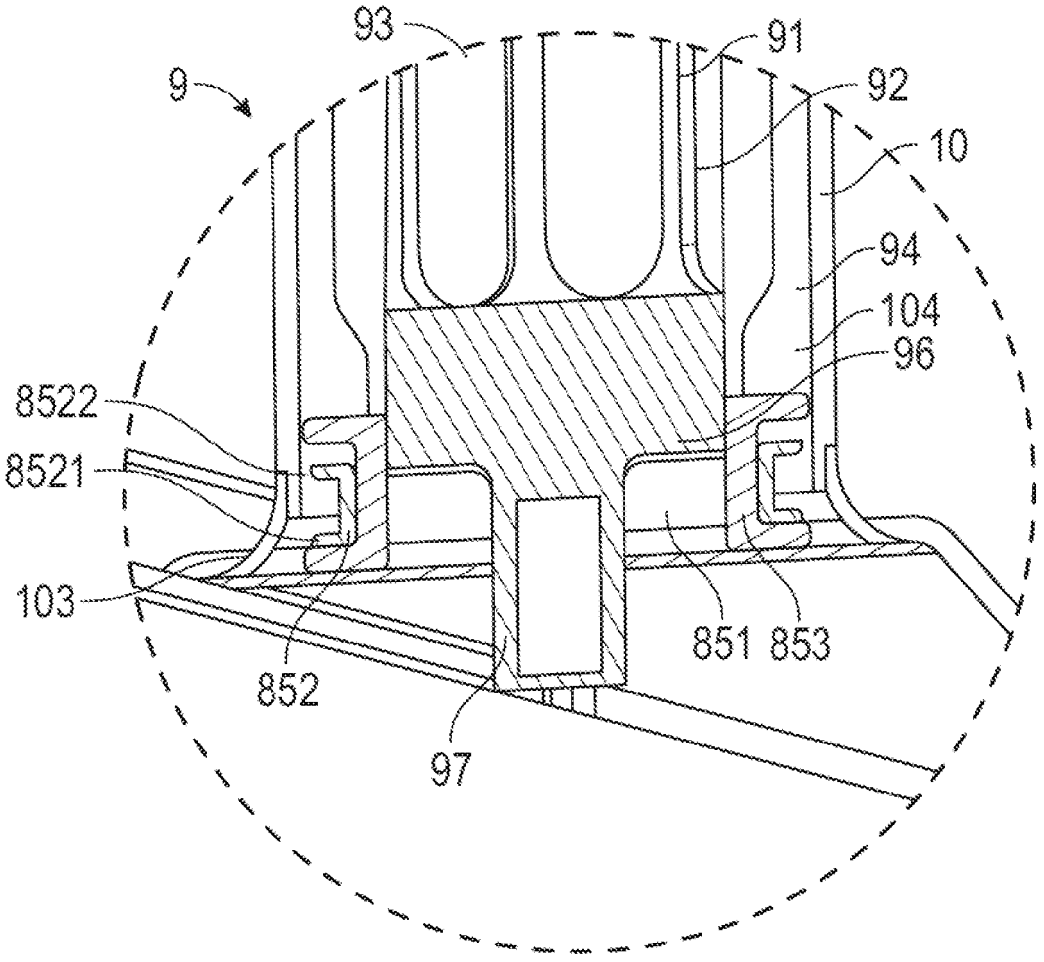

Fig. 3

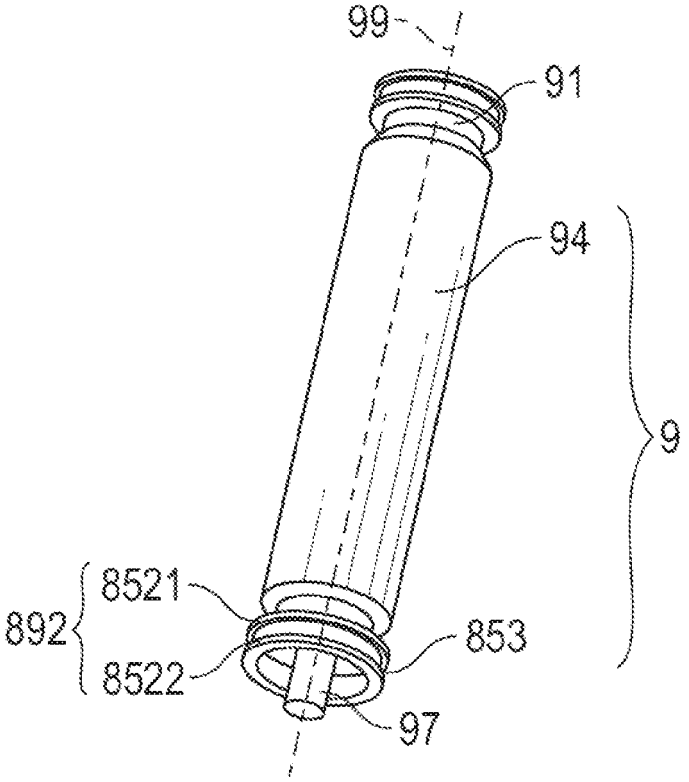

Fig. 4

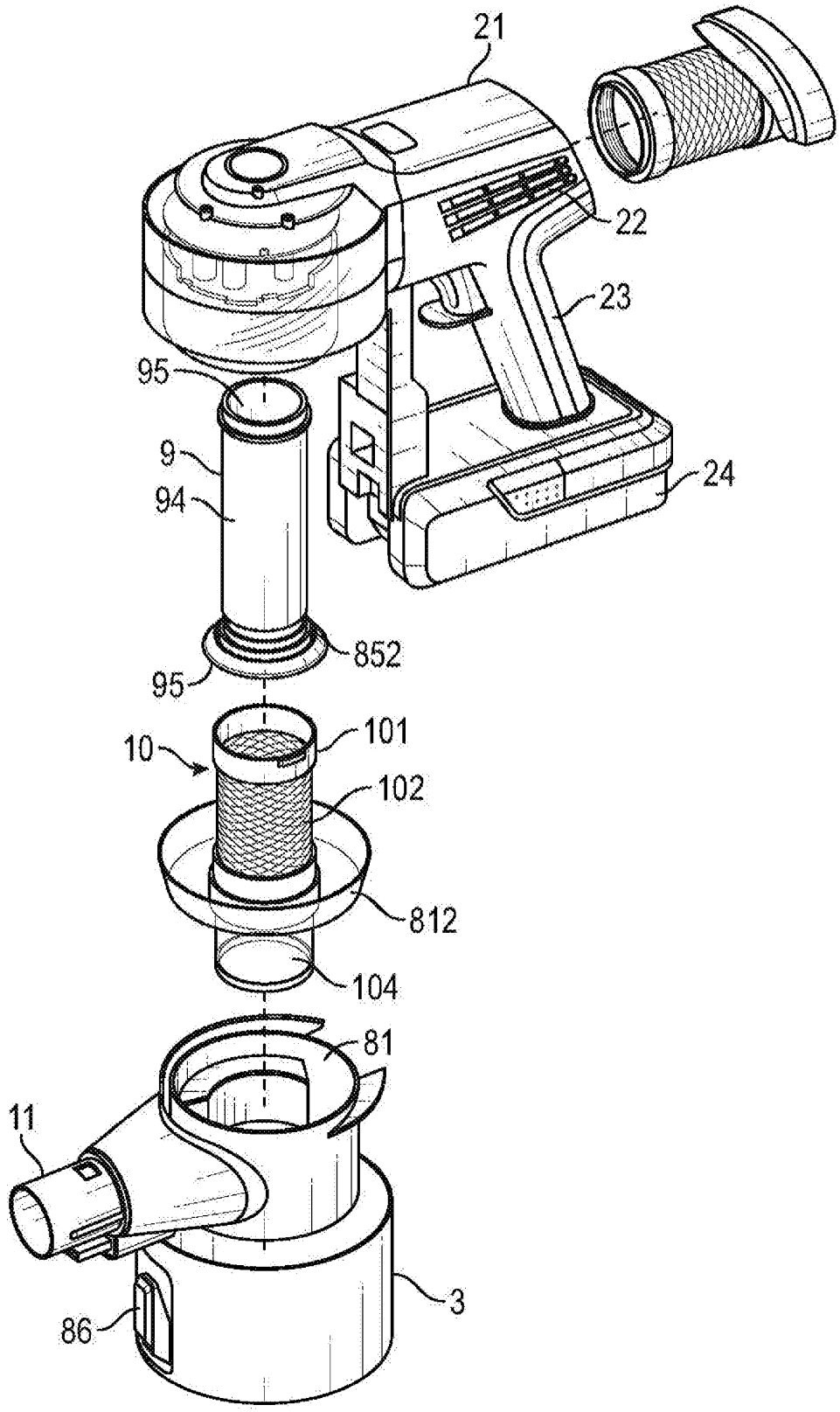

FIG. 5

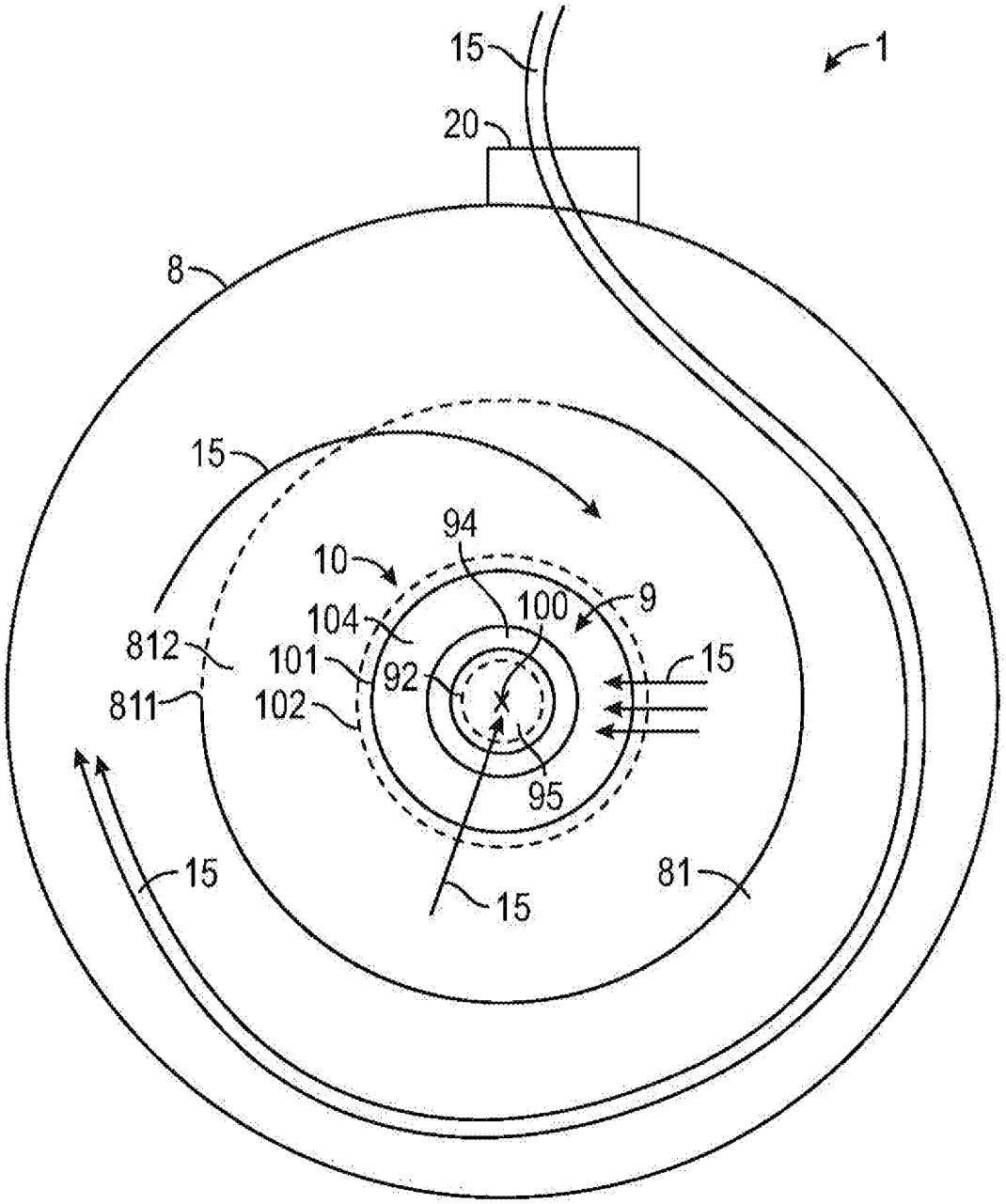

FIG. 6

REFERENCES CITED IN THE DESCRIPTION

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