(12) STANDARD PATENT (11) Application No. **AU 2004294882 B2**
(19) AUSTRALIAN PATENT OFFICE

(54) Title
Vacuum cleaner

(51) International Patent Classification(s)
A47L 9/16 (2006.01) ***A47L 9/20*** (2006.01)

(21) Application No: **2004294882** (22) Date of Filing: **2004.11.26**

(87) WIPO No: **WO05/053497**

(30) Priority Data

(31) Number	(32) Date	(33) Country
0401183-9	**2004.05.06**	**SE**
0303277-8	**2003.12.04**	**SE**

(43) Publication Date: **2005.06.16**
(44) Accepted Journal Date: **2010.12.09**

(71) Applicant(s)
Aktiebolaget Electrolux

(72) Inventor(s)
Mennborg, Lars;Miefalk, Hakan;Belin, Mathias;Gray, Anna-Karin;Trydegard, Anna-Karin;Holm, Henrik;Menrik, Linda;Jansson, Mattias;Lofnes, Finn

(74) Agent / Attorney
Davies Collison Cave, 1 Nicholson Street, Melbourne, VIC, 3000

(56) Related Art
WO85/02528 A1 (MARTTI OLLILA) 20 June 1985

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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
16 June 2005 (16.06.2005)

PCT

(10) International Publication Number
WO 2005/053497 A1

(51) International Patent Classification[7]: A47L 9/20, 9/16

(21) International Application Number:
PCT/SE2004/001756

(22) International Filing Date:
26 November 2004 (26.11.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
0303277-8 4 December 2003 (04.12.2003) SE
0401183-9 6 May 2004 (06.05.2004) SE

(71) Applicant *(for all designated States except US)*: **AKTIEBOLAGET ELECTROLUX** [SE/SE]; S-105 45 Stockholm (SE).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **MENRIK, Linda** [SE/SE]; Nyårsvägen 18, S-126 47 Hägersten (SE). **GRAY, Anna-Karin** [SE/SE]; Vindragarvägen 2, 4 tr., S-117 50 Stockholm (SE). **LOFNES, Finn** [SE/FR]; 21 Route de Chaumontal, F-60580 Coye la Forêt (FR). **MIEFALK, Håkan** [SE/SE]; Castorvägen 43, S-175 68 Järfälla (SE). **JANSSON, Mattias** [SE/DE]; Blumenstrasse 11, D-90402 Nürnberg (DE). **TRYDEGÅRD, Anna-Karin** [SE/SE]; Nortullsgatan 21, S-113 27 Stockholm (SE). **BELIN, Mathias** [SE/SE]; Diabasvägen 11, S-132 35 Saltsjö-Boo (SE). **HOLM, Henrik** [SE/SE]; Lästmakargatan 21, 11 tr., S-111 44 Stockholm (SE). **MENNBORG, Lars** [SE/SE]; Fältgatan 39, Sjögesta, S-590 48 Vikingstad (SE).

(74) Agent: **SCHMERER, SVEN, Erik**; AB ELECTROLUX, Group Intellectual Property, S-105 45 Stockholm (SE).

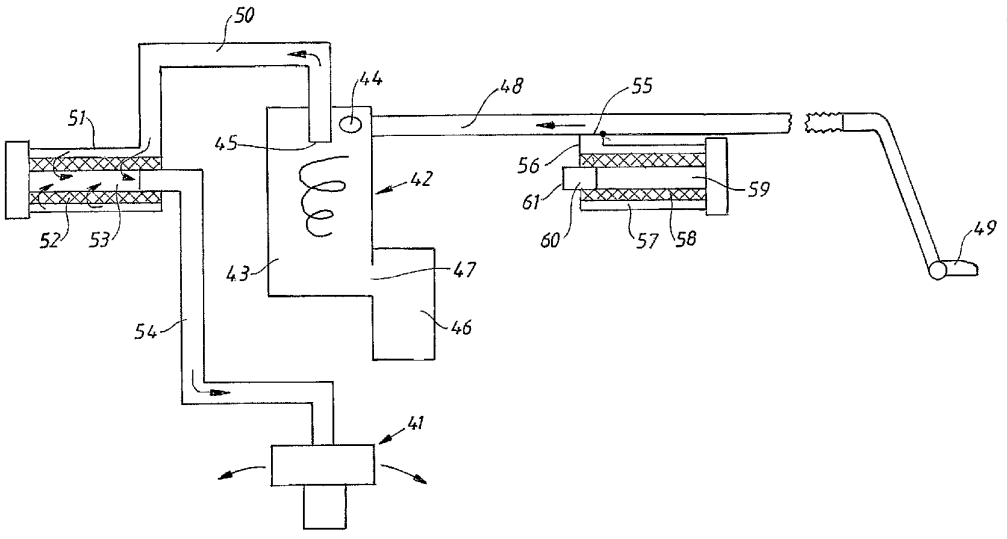
(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR,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

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*

[Continued on next page]

(54) Title: FILTER CLEANING SYSTEM FOR A VACUUM CLEANER



(57) Abstract: This invention relates to a vacuun cleaner comprising a body with a vacuum source (41). The vacuum cleaner is provided with at least two filter spaces (53, 59), a first filter holder for a first filter means (52) in an active cleaning position and a second holder for the same or a second filter means (58) in a passive non-cleaning position.

WO 2005/053497 A1

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

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Vacuum Cleaner

This invention relates to a vacuum cleaner comprising a body with a vacuum source.

Traditional vacuum cleaners usually belong to two different categories called canister cleaners and upright cleaners. The canister vacuum cleaner comprises a housing enclosing an electric fan unit that creates an airflow from a vacuum cleaner nozzle through a tube shaft and a hose and further through a separating system comprising a porous bag collecting the dust before the air reaches the fan and leaves the housing to the ambient air. The upright vacuum cleaner differs from the canister cleaner in that the tube shaft and the hose are eliminated and that the nozzle, that often is provided with a rotating brush, is pivotally connected to the vacuum cleaner housing. The housing encloses the fan unit and the air pervious dust bag and is provided with a handle to move the complete vacuum cleaner on the floor.

In order to further clean the air before the air leaves the vacuum cleaners mentioned above additional filters are arranged after the dust bag as seen in the air flow direction. These filters are usually placed such that they can easily be removed and be replaced by a new filter. As an alternative certain filters might be taken away in order to be cleaned by manual operations or by washing or rinsing the filter in water and/or cleaning agents.

There are also so called cyclone vacuum cleaners on the market, see for instance EP 00850060.1, that are provided with a different type of dust separation system. Instead of using an air pervious collecting bag the dust is separated by means of a vortex created in a circular cyclone chamber. The particles are by means of centrifugal action directed outwards from the centre of the vortex and are collected in a collecting container whereas the cleaned air is taken out from the center of the vortex . The clean air is then sucked to the vacuum source and flows out from the vacuum cleaner to the ambient air. Even if the main part of the dust particles that are present in the dust laden air are separated by the cyclone a minor part of the particles follow the clean airflow out of the cyclone. Consequently also for this type of vacuum cleaners there is a need for filters in the air passages after the cyclone chamber in order to get an efficient cleaning of the air flowing out from the vacuum cleaner.

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It is a disadvantage that the operator of all of the vacuum cleaners mentioned above has to remove the filter and replace it or clean it since replacement means that the consumer always has to keep an eye on the consumption of the filter and to buy new filters when necessary whereas cleaning means that the vacuum cleaner can not be used during the washing period and moreover demands for certain cumbersome activities from the operators side.

It has also been proposed, see WO 85/02528, to provide a vacuum cleaner with two electrical motors (Fig. 1-4) each having a filter that is placed in a common dust collecting chamber. In order to clean the filters the airflow through each filter is reversed by means of the other motor. The same publication also shows a vacuum cleaner arrangement (Fig. 5-6) that is provided with one motor and one main filter and an auxiliary filter the filters also being placed in a common dust collecting chamber. In order to clean the main filter the airflow is reversed and directed through the auxiliary filter. A clear disadvantage with the first arrangement is the need for two motors whereas there is no indication how to clean the auxiliary filter in the second arrangement.

According to the invention, there is provided a vacuum cleaner comprising a body with a vacuum source, wherein the vacuum cleaner body encloses a dust separation unit in which most of the particles are separated from an air flow through the vacuum cleaner, the vacuum cleaner being provided with at least two filter spaces, a first filter space for a first filter means in an active cleaning state and a second filter space for said filter means or a second filter means in a passive non-cleaning state.

In a preferred embodiment of the invention, the vacuum cleaner further comprises an inlet opening and an inlet channel for dust laden air, an outlet for clean air, a particle separator in which particles thus separated from the air flow through the cleaner are collected in a dust container, and a removable first filter arranged in a filter chamber downstream of the particle separator, and the vacuum cleaner is provided with a separate filter cleaning chamber in which the first filter can be inserted and cleaned by air flowing backwards through the filter. Preferably, the first filter is shaped as a turnable cartridge that is arranged on a support, said support preferably comprising a handle.

In a preferred embodiment of the invention, said support overbridges the distance between the filter chamber and the filter cleaning chamber and is provided with a second

filter. Preferably, the second filter is turnably arranged on the support and has mainly the same shape as the first filter.

Preferably, the vacuum cleaner is provided with filter cleaning indication means connected to an electric circuit in the vacuum cleaner. Preferably, said electric circuit includes a sensor arrangement for counting the number of turns or fractions of turns applied by the operator on the filter in the filter cleaning chamber. Preferably, the sensor arrangement comprises a permanent magnet.

In a preferred embodiment of the invention, the filter support is provided with a turnable cover or the like that is drivingly connected with the filter and with an annular element having projections engaging a slider. Preferably, the slider is under the influence of a spring. Preferably, the spring is integrated with slider.

Embodiments of the invention create an arrangement that eliminates the above drawbacks making it possible for the operator to change a filter quickly and to easily keep track of the filter condition, and that makes it possible to easily clean the filter without taking the vacuum cleaner out of operation or using cumbersome methods for cleaning the filter.

The present invention will now be described, by way of non-limiting example only, with reference to the accompanying drawings, in which:

Figs. 1-4 show a first vacuum cleaner, Figs. 5 and 6 show a second vacuum cleaner, and Figs. 7 and 8 show a third vacuum cleaner whereas Fig. 9 is a schematic drawing of a suitable filter rotating mechanism.

The vacuum cleaner shown in Fig 1 has a first filter in an active position whereas a second filter is in an inactive position during an ordinary cleaning operation. Fig. 2 shows the same view as Fig. 1 but with the first filter in an inactive position and the second filter in an active position. Fig. 3 shows the airflow through the vacuum cleaner when the first filter is cleaned whereas Fig. 4 shows the airflow when the second filter is cleaned. Fig. 5 shows a first filter in an active position during an ordinary vacuum cleaning operation at the same time as a

second filter is in an inactive stored position whereas Fig. 6 shows a filter being cleaned in the stored position. Fig. 7 is a schematic view of a third filter cleaning system whereas Fig. 8 is an exploded view of a vacuum cleaner that is provided with the last mentioned filter cleaning system.

Fig. 1 schematically shows a vacuum cleaner body 10 that encloses a single vacuum source such as fan unit 11 and a dust separation unit 12. The dust separation unit 12 is of the so called cyclone type and comprises a circular chamber 13 that is provided with a tangential inlet 14 for dust laden air and a central outlet 15 for clean air. Due to the airflow a vortex is created within the chamber 13 and the dust particles are separated from the airflow by means of the centrifugal forces and are thrown into a dust collecting container 16 via an opening 17.

The inlet 14 is via a channel 18 connected to an opening 19 in the vacuum cleaner body that in a conventional way can be connected to a vacuum cleaner nozzle 20 via a hose 21 and a tube shaft 22. The central cyclone outlet 15 is connected to a channel 23 via a valve 24 such that the airflow can be directed to a first or a second section 23a, 23b of the channel 23. The sections 23a and 23b are via valves 25 and 26 connected to a common channel 27 that by means of a further valve 28 is branched off from the channel 18.

Channel section 23a ends in a the central parts of a first tube shaped filter cartridge 29 that is provided with a grip 30 that is accessible from the outside of the vacuum cleaner. The cartridge 29 is inserted in a first filter space 31, shaped as a filter holder, provided at the vacuum cleaner body and can easily be removed from the space. The filter cartridge 29 is preferably made from a material that can be cleaned manually or by a washing operation.

Channel section 23b in a corresponding way ends in the central part of a second tube shaped filter cartridge 32 provided with a grip 33 accessible from the outside of the vacuum cleaner. This cartridge is inserted in a second filter space 34 and has the same design and filter material as the first mentioned cartridge 29.

The first as well as the second filter space 31, 34 offers a free space around each filter cartridge which are connected to a common channel 35 communicating with the fan unit 11. The channel comprises a first and a second section 35a and 35b each being provided with a valve 36 and 37 that can connect the section with the ambient air.

The arrangement operates in the following manner. During an ordinary cleaning operation, see Fig. 1, the valve 28 is in such a position that the opening to the branched

off channel 27 is closed. Dust laden air is taken in through the nozzle 20 and is distributed through the tube shaft 22, the hose 21 and the channel 18 to the cyclone chamber 13. The major part of the dust particles are separated in the cyclone chamber 13 and are distributed to the collecting container 16. The clean air with a minor part of smaller particles flows out through the outlet 15 at the centre of the cyclone chamber 13 and is by means of the valve 24 directed into the second section 23b and is by the valve 26 directed further into the central part of the second tubular filter cartridge 32. The air then flows through the filter material in the cartridge, in which the major part of the remaining particles are filtered out, before the air reaches the filter space outside the filter cartridge 32 from which the air flows further into the second section 35b of the channel 35 before entering into the fan unit 11. The air then escapes from the vacuum cleaner out to the ambient possibly via an exhaust filter (not shown) that might be of the Hepafilter type. During this procedure the valves 36 and 37 are in such positions that they keep the openings to the ambient air closed.

Assuming that the second filter cartridge 32 gets clogged the operator has the possibility to continue the vacuum cleaning operation, see Fig. 2, simply by changing the airflow direction from the second filter cartridge 32 to the first filter cartridge 29. This is effected by changing the positions of the valve 24 such that the clean air flows from the cyclone outlet 15 through the first section 23a of the channel 23 via the valve 25 into the central part of the filter cartridge 29 from which the air flows through the filter material and into the first section 35a of the channel before reaching the fan unit 11.

The operator also has the possibility to clean each filter cartridge in a simple manner by switching the airflow direction in the arrangement. Fig. 3 shows how the second filter cartridge 32 is cleaned. Ambient air is allowed to enter into the system by means of the valve 37. This air flows through a part of the channel section 35b into the filter space 34 outside the filter cartridge 32 and further through the filter material to the central part of the cartridge. Particles that have been clogged at the inside of the filter cartridge 32 are torn away and are taken up by the airflow and are by means of the valves 26 and 28 distributed through the branched off channel 27 and a part of the channel 18 into the cyclone chamber 13. In order to get sufficient cleaning of the filter there preferably are means, not shown, for concentrating the airflow through the filter to a smaller part of the total filter area such that the air velocity increases through this part. By gradually moving the airflow with respect to the filter surface, for instance by

rotating the filter manually or automatically, the complete filter area will be cleaned. From the clean air outlet 15 of the chamber 13 the air then flows through the first section 23a of the channel 23 into the interior of the first filter cartridge 29 and through the filter material before leaving the first filter space 31 via the first section 35a of the channel 35 to the fan unit 11. During this cleaning procedure the valve 25 keeps the opening between the first section 23a and the branched off channel 27 closed and the valve 36 keeps the opening between the first section 35a and the ambient air closed.

Fig.4 shows how the first filter cartridge 29 is cleaned in a corresponding way. The operator activates the various valves such that ambient air is now allowed to enter into the system by means of the valve 36. The air flows, in a similar way that has been described above, through the first filter cartridge 29 and the branched off channel 27 into a part of the channel 18 and further into the cyclone chamber 13. The clean airflow from the outlet 15 in the cyclone chamber 13 is then directed through the second section 23b of the channel 23 before entering into the interior of the second filter cartridge 32 where the major part of the remaining particles are separated. After flowing through the filter material the air is directed through the second section 35b of the channel 35 and further into the fan unit 11.

Thus, the arrangement described above makes it possible to continue a cleaning operation even if the efficiency decreases due to clogging in the filter by simply directing the airflow from the cyclone to another filter. The arrangement also makes it possible to clean the filters without taking them out of the vacuum cleaner simply by activating or deactivating the different valves such that the airflow is shifted in a suitable way. Since the filter cartridges are easy to remove from the vacuum cleaner body it is also easy for the operator to take away the cartridge and clean it more thoroughly in a washing operation if the cartridges are not fully cleaned in the suction operation described above.

The arrangement shown in Fig 5-6 comprises a single vacuum source such as a fan unit 41 and a dust separation unit 42 of the cyclone type having a circular chamber 43 with an inlet 44 for dust laden air and an outlet 45 for partially cleaned air. The separation unit is connected with a dust collecting container 46 via an opening 47 through which the dust particles are distributed into the container. The inlet 44 is in the same manner as described above via a channel 48 connected to a vacuum cleaner nozzle 49. The air outlet 45 of the cyclone is connected to a channel 50 that directs the cleaned air to a first filter space 51 for a first tube shaped filter cartridge 52 that is removably

inserted into said space. A central part 53 of the cartridge 52 communicates via a channel 54 with the fan unit 41 such that air is sucked from the central part 53 to the fan and then is directed to the ambient air.

The channel 48 is provided with a valve 55 that allows air to be taken in to the chamber through a branched off channel 56 at the same time as the airflow from the nozzle 49 is prevented from flowing to the inlet 44. The channel 56 is connected to a second filter space 57 of a second removable, tube shaped filter cartridge 58. The central part 59 of the cartridge 58 is connected to a tube 60 provided with an opening 61 through which air can be sucked into the filter cartridge.

The system according to Figs. 5 and 6 operate in the following manner. During normal vacuum cleaning work (see Fig. 5) dust laden air is sucked into the chamber 43 through the nozzle 49 and the channel 48. During this procedure the valve is in such a position that the connection to the channel 56 is closed. Consequently dirt particles are separated in the chamber 43 and are directed into the dust collecting container 46. The air which now has been partially cleaned is sucked through the outlet 45 and the channel 50 to the filter space 51 from which the air flows through the filter material of the cartridge 52 into the central part 53 of the cartridge. This means that the major part of the particles that have not been separated in the chamber 43 is deposited on the filter material when the air flows through the filter material and further into the channel 54 from which it leaves to the ambient air via the fan unit 41.

When the first cartridge 52 becomes clogged and provided that the second cartridge 58 has been cleaned the operator switches off the vacuum cleaner and exchanges the position of the two cartridges (see Fig. 6) such that it is possible to continue the work but this time with the clean cartridge 58 in the space 51 and the dirty cartridge 52 in the space 57.

If the operator finds it suitable to clean the cartridge 52 which is now in the filter space 57 he activates the valve 55 such that the connection between the channel 56 and the inlet opening 44 is opened at the same time as the connection to the nozzle 49 is closed. This means that ambient air is drawn through the opening 60 into the central part of the cartridge 52 and further through the filter material into the filter space 57. This means that the dust particles on the filter surfaces become free and are transported via the channel 48 to the chamber 43 together with the airflow. The major part of the dust particles are, as mentioned before, separated in the chamber 43 and collected in the container 46 whereas the clean air leaving through the outlet 45 enters the filter space

51 for the cartridge 58 where the air is filtered through the filter material before leaving the vacuum cleaner through the channel 54 and the fan unit 41. It should in this connection be mentioned that in order to get an efficient filter cleaning of the filter cartridge the airflow is concentrated to a small area of the filter surface when the air flows from the inner to the outer side of the filter cartridge.

According to a further embodiment of the invention it is also possible to use the filter cleaning system in a conventional cyclone vacuum cleaner that is provided with solely one active filter that is easily removable and that is placed in a filter space connected to the air cyclone and the fan unit. Such a vacuum cleaner can be provided with at least one additional non active filter space serving as a storage place for a passive filter which is easily accessible from the outside of the vacuum cleaner. When the active filter has been clogged during a vacuum cleaner operation the operator can easily remove the active filter from the active filter space and replace it with a cleaned filter that is taken out from the additional filter space. The operator can then finish the cleaning operation and also use the vacuum cleaner for additional cleaning operations before removing the clogged filter and wash or clean it manually. When the filter has been cleaned it is again inserted into the additional non active filter space in order to be used when the active filter has been clogged.

The vacuum cleaner according to Fig. 7 and Fig. 8 comprises an inlet opening 110 for dust laden air that in a conventional manner can be connected to a vacuum cleaner nozzle (not shown) via a hose 111. The inlet opening continues as an inlet channel 112 that ends in a mainly cylindrical cyclone chamber 113. The cyclone chamber 113 communicates via an opening 114 with a dust collecting container 115 and has a tube shaped outlet 116 arranged in the central part of the cyclone chamber. This outlet 116 communicates with an air passage 117 ending in a filter chamber 118 in which a first filter cartridge 119 is inserted. The filter cartridge preferably is provided with one or several folded filter layers arranged around a central channel 120 and having its outer periphery placed at some distance from the inner wall of the filter chamber 118. The upper portion of the filter cartridge is turnably and removably arranged at one end of a support structure 121 shaped as a handle.

The support structure 121 is provided with a turnable knob 122 that is connected to the filter cartridge 119 such that the filter cartridge follows the rotating motion of the knob 122 if it is turned manually. The rotating motion of the knob or the filter cartridge might of course also be achieved automatically by an electric motor or some other

means. The central channel 120 of the filter cartridge is at its lower part in communication with an air channel 123 connected to the air inlet of a vacuum source such as a motor/fan unit 124 whose outlet communicates with the ambient air.

The vacuum cleaner is also provided with a filter cleaning chamber 125 in which a second filter cartridge 126, preferably of the same type as the first filter cartridge, is inserted. The second filter cartridge 126 is in the same manner as the first filter cartridge 119 removably arranged at the other end of the support structure 121 and is also rotatably connected to a knob 127 secured to the support structure 121. The second filter cartridge has a central channel 128 that is connected to an air inlet 129 arranged at the bottom of the filter cleaning chamber 125 and tha communicates with the ambient air. The filter cleaner chamber is further provided with an outlet 130 that is shaped as an elongated narrow opening extending mainly parallel to the axis of the filter cartridge close to the outer periphery of the cartridge. The outlet 130 is via an air passage 131 and a valve 132 connected to the inlet channel 112 for dust laden air.

The vacuum cleaner is provided with an electric circuit that is connected to a pressure sensor 133 for sensing the pressure drop over the first filter cartridge 119 in order to indicate when the filter has been clogged. When this occurs a bulb or an acoustic signal is activated. There also is a sensor 134 arranged close to, or within, the filter cleaning chamber 125 for achieving a signal to the electric circuit when the filter in the filter cleaning chamber has been cleaned. This sensor is connected to a sensor system that includes a permanent magnet 135 arranged on the periphery of each knob 122, 127 and is connected such that the vacuum cleaner motor starts when the knob 122 is being turned and shuts off when a predetermined complete turns have been made by the operator.

The device operates and is used in the following manner. When the operator starts the vacuum cleaner dust laden air is sucked in through the hose111 and the inlet channel 112 to the cyclone chamber 113. Since the inlet flow is arranged to be tangentially to the mainly cylindrical cyclone chamber 113 a vortex is created and the particles are, due to centrifugal forces, thrown towards the periphery and out through the opening 114 into the dust container where they are collected. The cleaned airflows through the outlet 116 of the cyclone chamber 113 into the air passage 117 and continues into the filter chamber 118 before the air reaches the first filter cartridge 119. Smaller particles that have passed the cyclone chamber are now separated in the filter

material and the air then via the central channel 120 flows to the motor/fan unit 124 and is distributed to the ambient air.

When the first filter cartridge has been clogged this is indicated by the light bulb or the acoustic signal via the pressure sensor 133. The operator can now switch off the vacuum cleaner and open a cover at the front part of the vacuum cleaner that is connected to the valve 132 such that the valve closes the outer part of the inlet channel 112 and opens up the connection between the inner part of this channel and the air passage 131. The operator then lifts the support structure 121 to which the first and second cartridge 119, 126 are secured and turns it 180 °about a mainly vertical axis before putting the first filter cartridge 119 into the filter cleaning chamber 125 at the same time as the second filter cartridge 126 is inserted in the filter chamber 118.

The operator then manually turns the knob 122 thereby starting to rotate the filter cartridge 119 such that the permanent magnet 135 influences the sensor 134 and creates a signal starting the motor/fan unit 124. This means that fresh air is now sucked in from the ambient air through the air inlet 129 and into the central channel 120 of the cartridge 119. The air then flows through the part of the filter material facing the narrow outlet 130 with great velocity thereby releasing the dust particles that have been taken up previously and carrying them via the passage 131 and the inner part of the inlet channel 112 to the cyclone chamber 113. The major part of the particles are separated and collected in the dust container 115 whereas the cleaned air leaves through the outlet 116 and flows to the filter chamber 118 via the air passage 117.

The air is then sucked through the filter material and remaining particles are taken up by the second filter cartridge 126 before the air leaves to atmosphere via the air channel 123 and the motor/fan unit 124. When the operator has finished a predetermined number of complete turns of the knob 122 the motor/fan unit is stopped indicating that the filter has been cleaned. The operator now closes the cover which means that the valve 132 is moved back to its original position and the operator can again start the vacuum cleaner and continue his work. When the second filter cartridge 126 has been clogged the procedure described above will be repeated thereby switching the two filter cartridges 119, 126 back to their original positions.

As has been mentioned above the rotating motion of the filter cartridge might as well be realized by mechanical and/or electrical means and for instance be arranged such that the fan and the rotation starts automatically when the dirty filter has been inserted into the filter cleaning chamber.

A plan view of a preferable filter rotating mechanism is shown in Fig.9 Such a mechanism is arranged at each end of an elongated filter support structure 210 for two cylindrical filters (only one half is shown). Each end of the filter support structure comprises a mainly circular bottom plate 211 with an upwardly extending flange 212 on which a rotatable cup shaped cover 213 is arranged. The cover is provided with an annular element 214 having a number of several outwardly extending fins 215. During rotation of the cover 213 the fins will come into engagement with a slider 216 that is linearly movable in an opening 217 in the flange 212. The part of the slider 216 that is below the cover is provided with two resilient tongues 218 that rest against the flange 212 and consequently push the slider towards the rotation axis A of the cover 213. The part of the slider that is placed outside the opening 217 is arranged such that it can act against a micro switch 219 connected to the electrical system of the vacuum cleaner. A filter cartridge 220 is placed below the bottom plate 211 and is removably secured to the cover 213 such that it follows the rotation of the cover. The filter cartridge is mainly cylindrical and has a folded outer surface with the folding lines parallel to said axis A.

The rotating mechanism operates in the following manner. When a filter has been used and it is time to shift the clogged filter from the filter chamber to the cleaning chamber the support structure with the two filters are turned 180 ° and the filters are then inserted in their new positions. The operator starts to turn the cover 213 which means that the slider 216 is moved back and forth by the fins 215 and acts on the switch 219 thereby establishing electrical pulses that can be counted by the electric equipment within the vacuum cleaner. After a few pulses the fan is arranged to start. Simultaneously the folds of the filter are successively passing the elongated, narrow, outlet opening in the cleaning chamber such that air can be drawn from the inlet opening in the cleaning chamber through the lower central inlet opening of the filter cartridge, through the filter material and into said outlet opening. After a predetermined number of complete turns and the corresponding amount of pulses the motor of the fan is fan is shut off by the electric system.

In order to make the dust removal even more efficient it is possible to provide the walls of the cleaning chamber with ridges or similar elements such that dust is wiped off the folds when passing the ridges during the rotation of the filter.

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While various embodiments of the present invention have been described above, it should be understood that they have been presented by way of example only, and not by way of limitation. It will be apparent to a person skilled in the relevant art that various changes in form and detail can be made therein without departing from the spirit and scope of the invention. Thus, the present invention should not be limited by any of the above described exemplary embodiments.

Throughout this specification and the claims which follow, unless the context requires otherwise, the word "comprise", and variations such as "comprises" and "comprising", will be understood to imply the inclusion of a stated integer or step or group of integers or steps but not the exclusion of any other integer or step or group of integers or steps.

The reference in this specification to any prior publication (or information derived from it), or to any matter which is known, is not, and should not be taken as an acknowledgment or admission or any form of suggestion that that prior publication (or information derived from it) or known matter forms part of the common general knowledge in the field of endeavour to which this specification relates.

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THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A vacuum cleaner comprising a body with a vacuum source, wherein the vacuum cleaner body encloses a dust separation unit in which most of the particles are separated from an air flow through the vacuum cleaner, the vacuum cleaner being provided with at least two filter spaces, a first filter space for a first filter means in an active cleaning state and a second filter space for said filter means or a second filter means in a passive non-cleaning state.

2. A vacuum cleaner according to claim 1, wherein the body encloses a cyclone that is provided with an inlet for contaminated air, and an outlet for clean air, said clean air outlet via an air channel being in fluid communication with the ambient air.

3. A vacuum cleaner according to claim 2, wherein the first filter space is placed after the clean air outlet as seen in the airflow direction whereas the second filter space is placed before the cyclone inlet.

4. A vacuum cleaner according to claim 3, wherein at least one valve means is arranged to establish an airflow from the ambient air through the second filter space and to the cyclone inlet in order to clean the filter means inserted in the second filter space.

5. A vacuum cleaner according to claim 2, wherein the vacuum cleaner is provided with means for directing the clean airflow from the cyclone outlet either through the filter means in the first filter space or through the filter means in the second filter space.

6. A vacuum cleaner according to any of claims 1, 2 and 5, wherein the vacuum cleaner is provided with means for directing a back flow of air through at least one of the filter means in the filter spaces for cleaning the filter.

7. A vacuum cleaner according to claim 6, wherein the back flow through one of the filter means is directed to the cyclone and further through the other filter means.

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8. A vacuum cleaner according to any of claims 2 to 8, wherein said vacuum source is placed after the cyclone as seen in the airflow direction and the active filter means is placed between said cyclone and the vacuum source.

9. A vacuum cleaner according to any of the preceding claims, wherein the filter means constitutes a tube shaped cartridge.

10. A vacuum cleaner according to claim 1, further including an inlet opening and an inlet channel for dust laden air, an outlet for clean air, a dust container in which particles which are separated from the air flow through the cleaner are collected, and a removable first filter arranged in a filter chamber downstream of the particle separator, wherein the vacuum cleaner is provided with a separate filter cleaning chamber in which the first filter can be inserted and cleaned by air flowing backwards through the filter.

11. A vacuum cleaner according to claim 10, wherein said filter cleaning chamber is provided with an inlet for clean air that communicates with the ambient air and an outlet that via a passage can be connected to the inlet channel for dust laden air.

12. A vacuum cleaner according to claim 11, wherein a valve is provided between the outlet of the filter cleaning chamber and the dust laden air inlet channel.

13. A vacuum cleaner according to claim 12, wherein the valve is arranged to close the flow through the inlet opening and simultaneously open the passage between the outlet of the filter cleaning chamber and the inlet channel.

14. A vacuum cleaner according to claim 11, wherein the inlet or the outlet of the filter cleaning chamber is arranged such that the backflow through the filter in the filter cleaning chamber is concentrated to a minor part of the filter area and wherein the filter is arranged to be moved with respect to the inlet such that the major part of the filter area is successively cleaned.

15. A vacuum cleaner according to any of claims 10 to 14, wherein said first filter is shaped as a turnable cartridge that is arranged on a support.

16. A vacuum cleaner according to claim 15, wherein the outlet of the filter cleaning chamber is shaped as a slot arranged close to the outer periphery of the cartridge and extending mainly parallel to the axis of the cartridge.

17. A vacuum cleaner according to claim 15 or claim 16, wherein said support overbridges the distance between the filter chamber and the filter cleaning chamber and is provided with a second filter.

18. A vacuum cleaner according to any of claims 10 to 17, the vacuum cleaner being provided with filter cleaning indication means connected to an electric circuit in the vacuum cleaner.

19. A vacuum cleaner according to any of claims 15 to 18, wherein the filter cleaning chamber is provided with associating electrical and/or mechanical drive means for rotating the filter cartridge.

20. A vacuum cleaner according to any of claims 10 to 19, wherein the particle separator is a cyclone separator.

21. A vacuum cleaner according to claim 19 or 20, wherein the filter support is provided with a turnable cover or the like that is drivingly connected with the filter and with an annular element having projections engaging a slider acting on a switch providing pulses to the electric circuit.

22. A vacuum cleaner substantially as hereinbefore described with reference to the drawings and/or Examples.

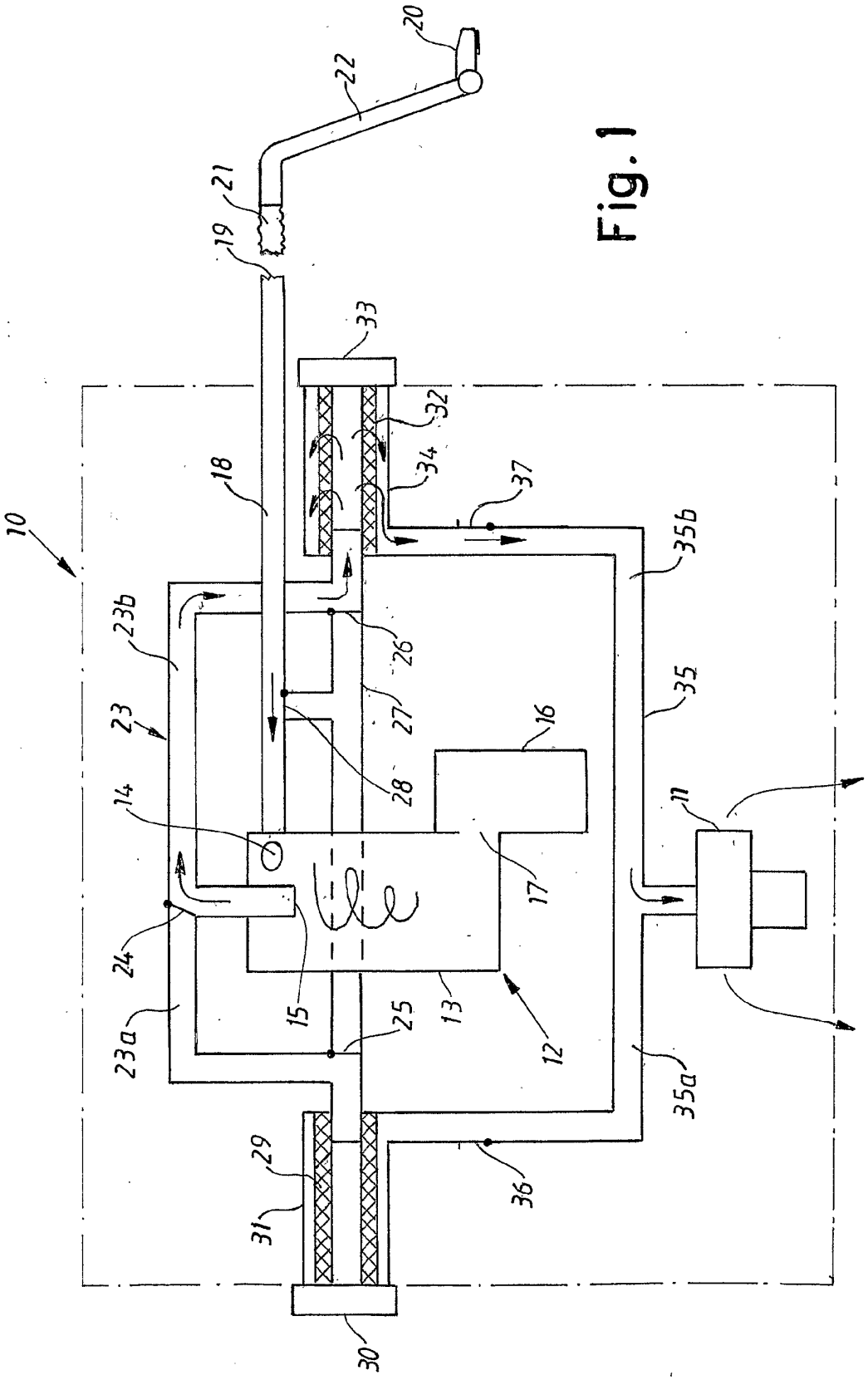
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Fig. 1

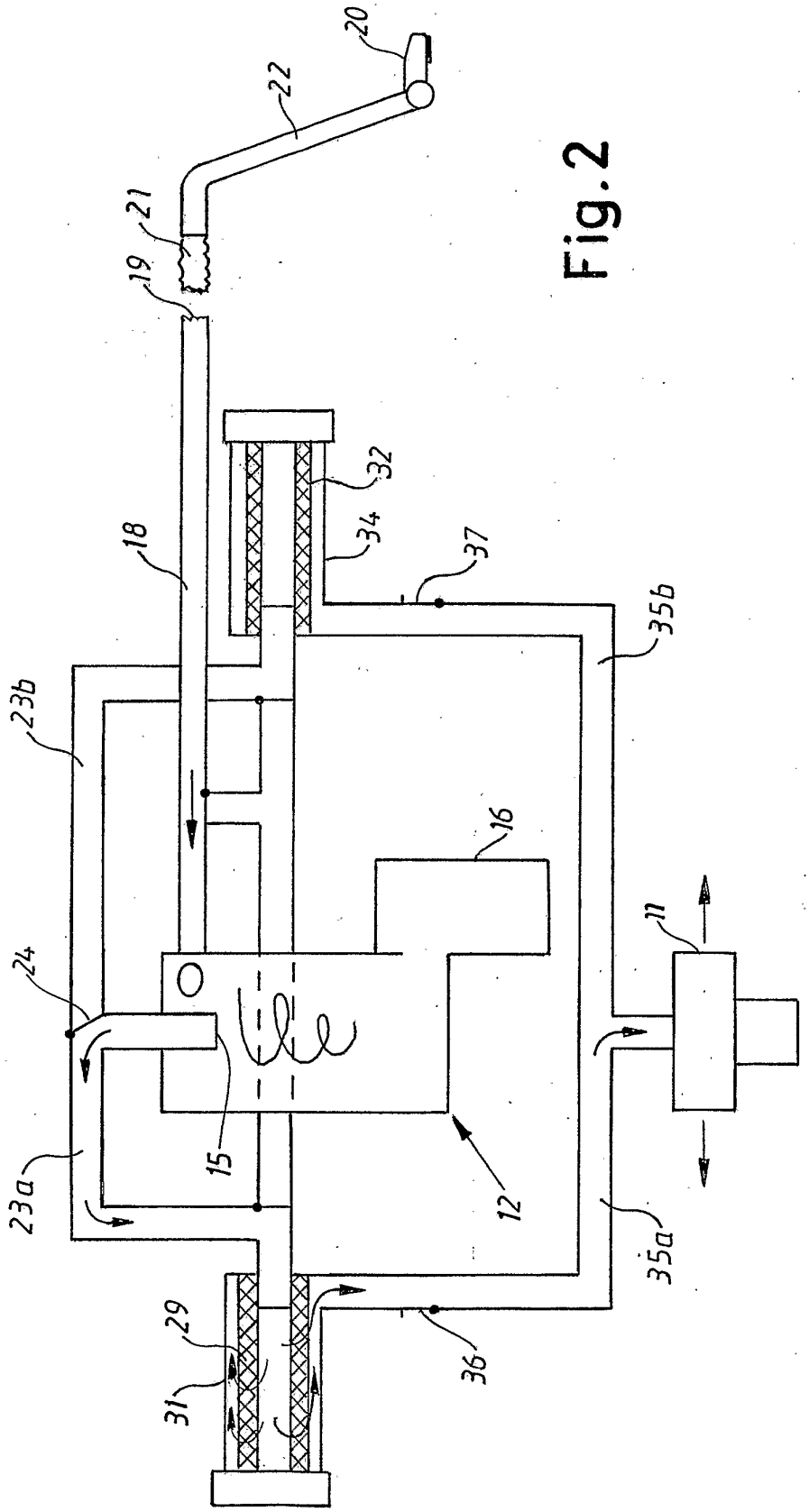

Fig.2

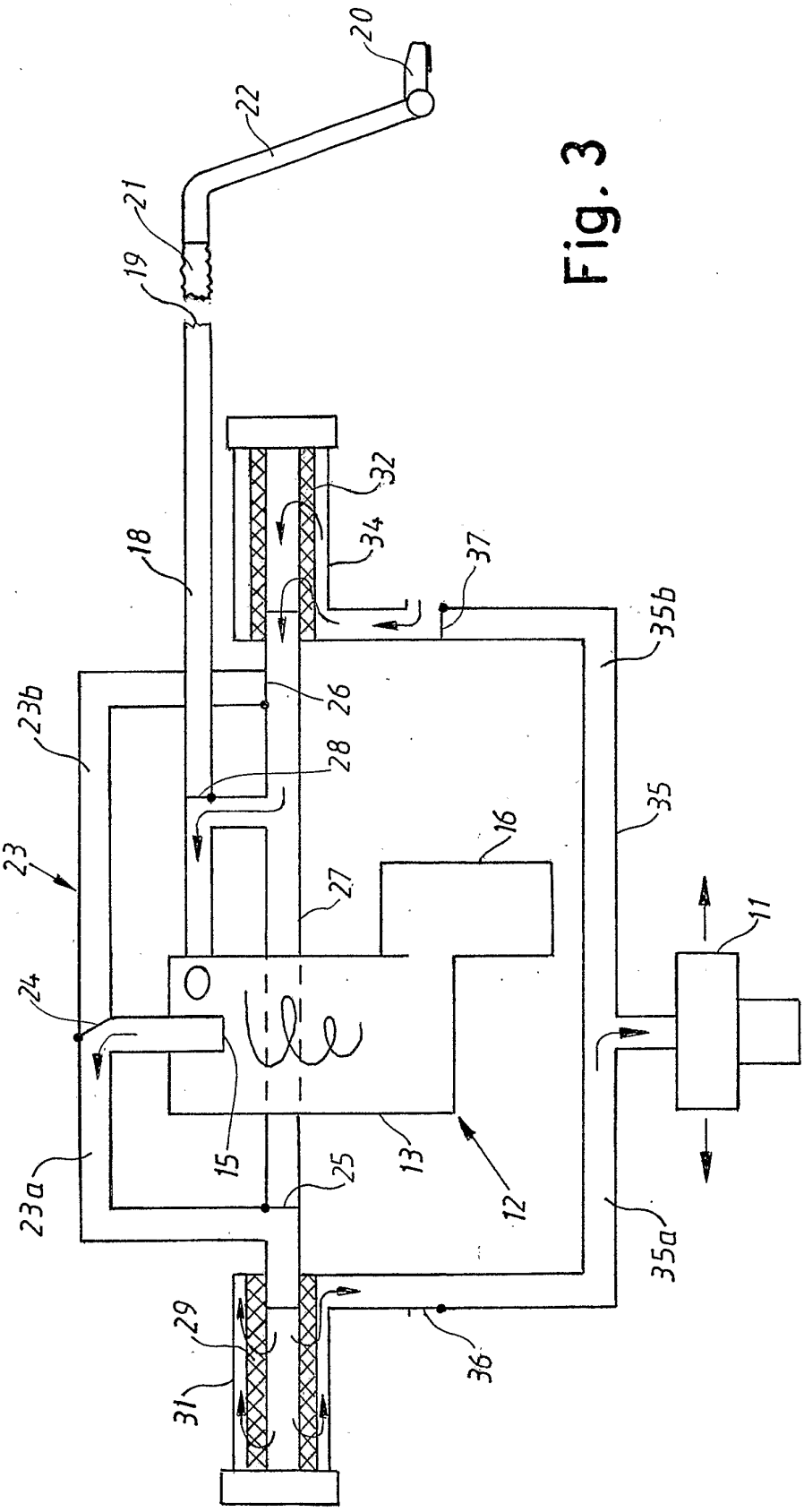
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Fig. 3

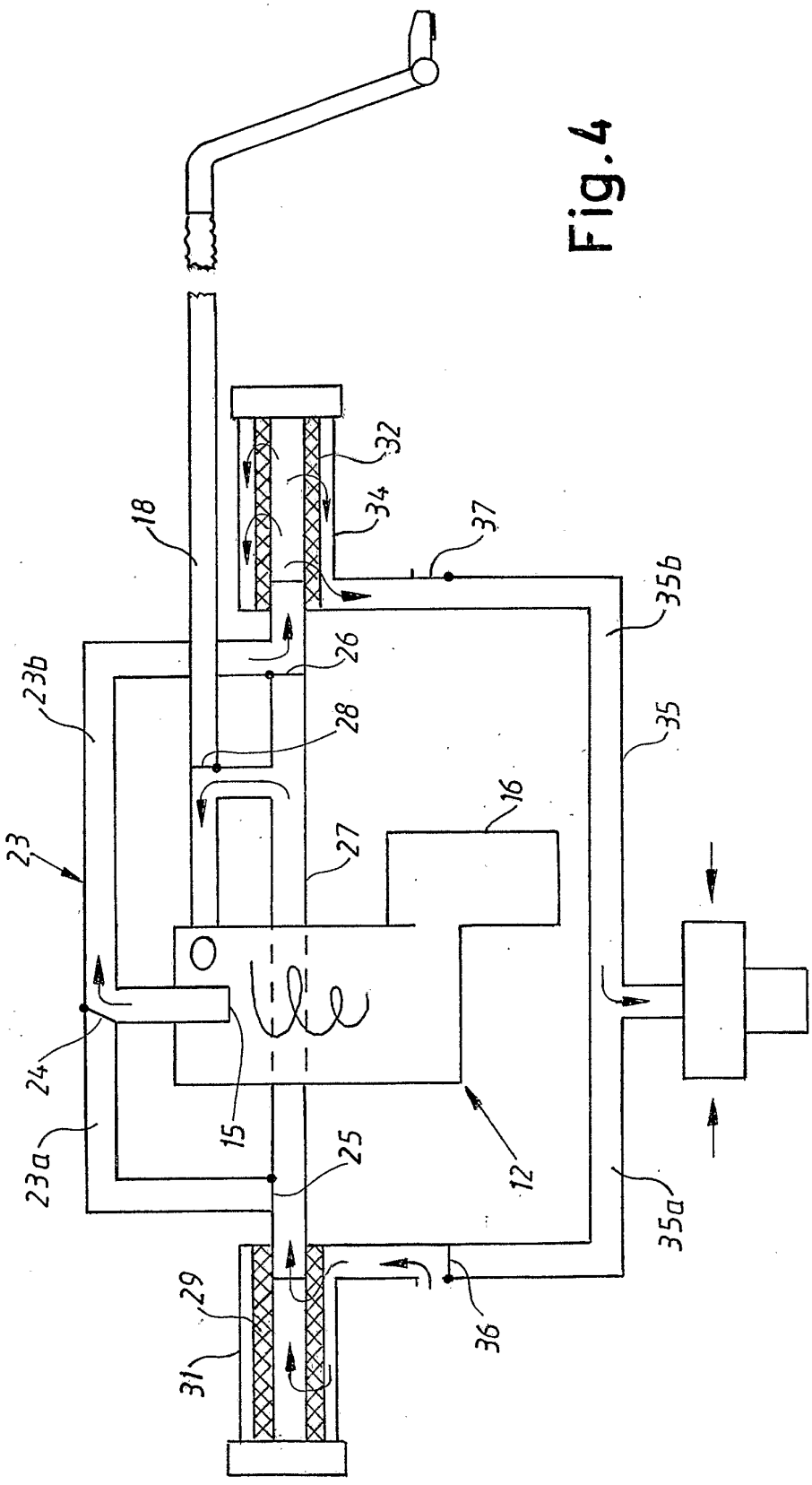

Fig.4

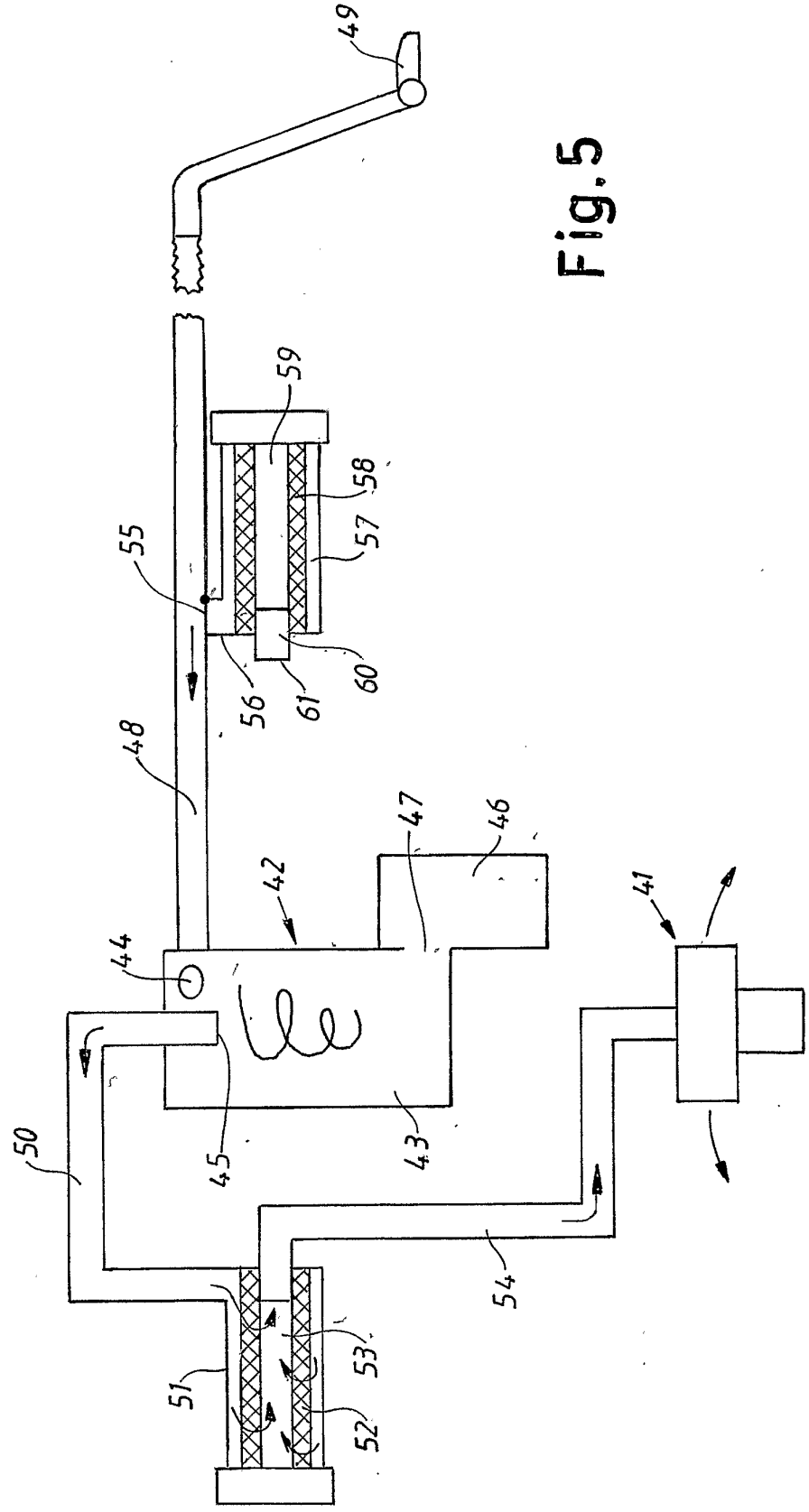

Fig. 5

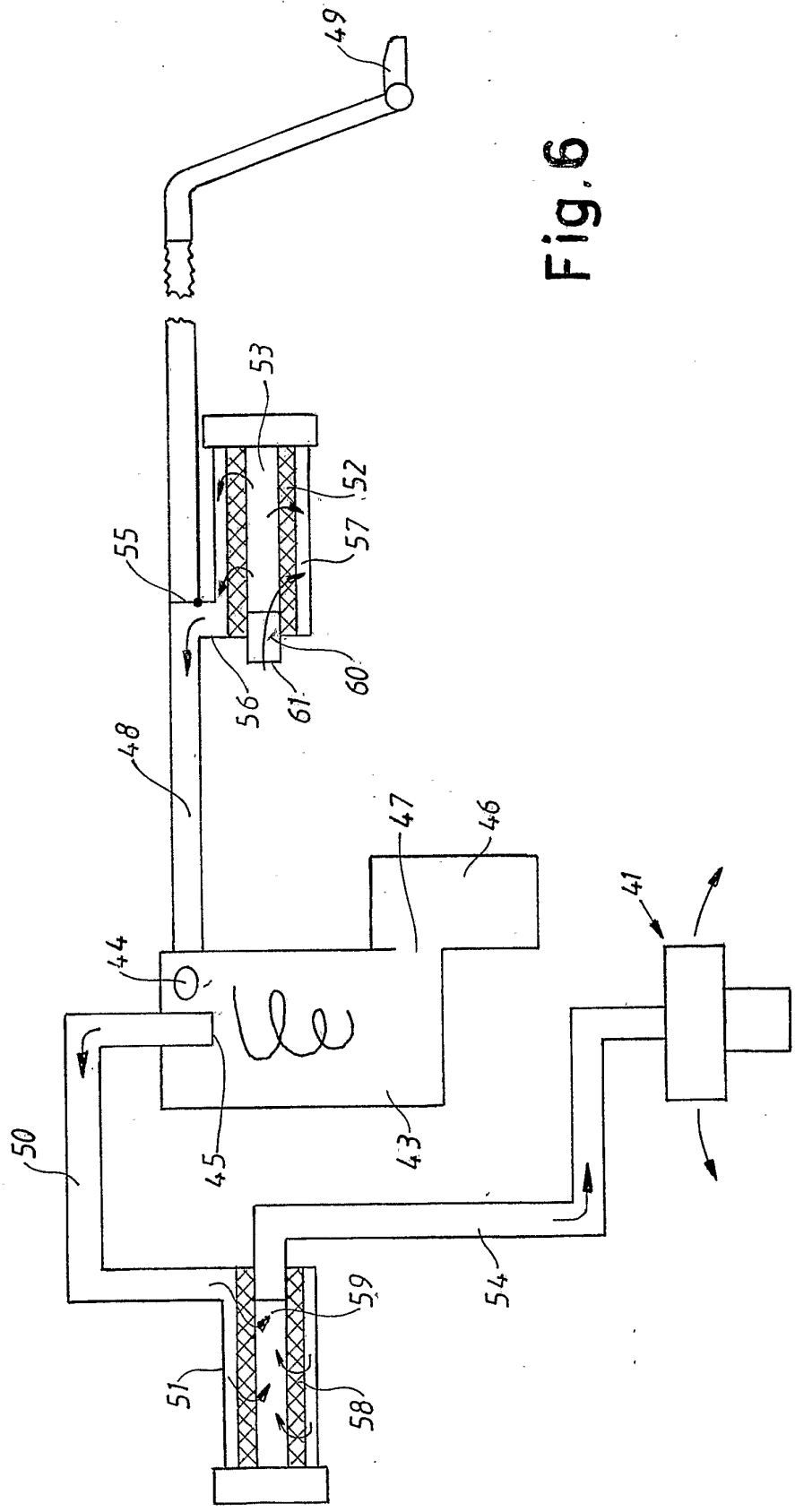

Fig. 6

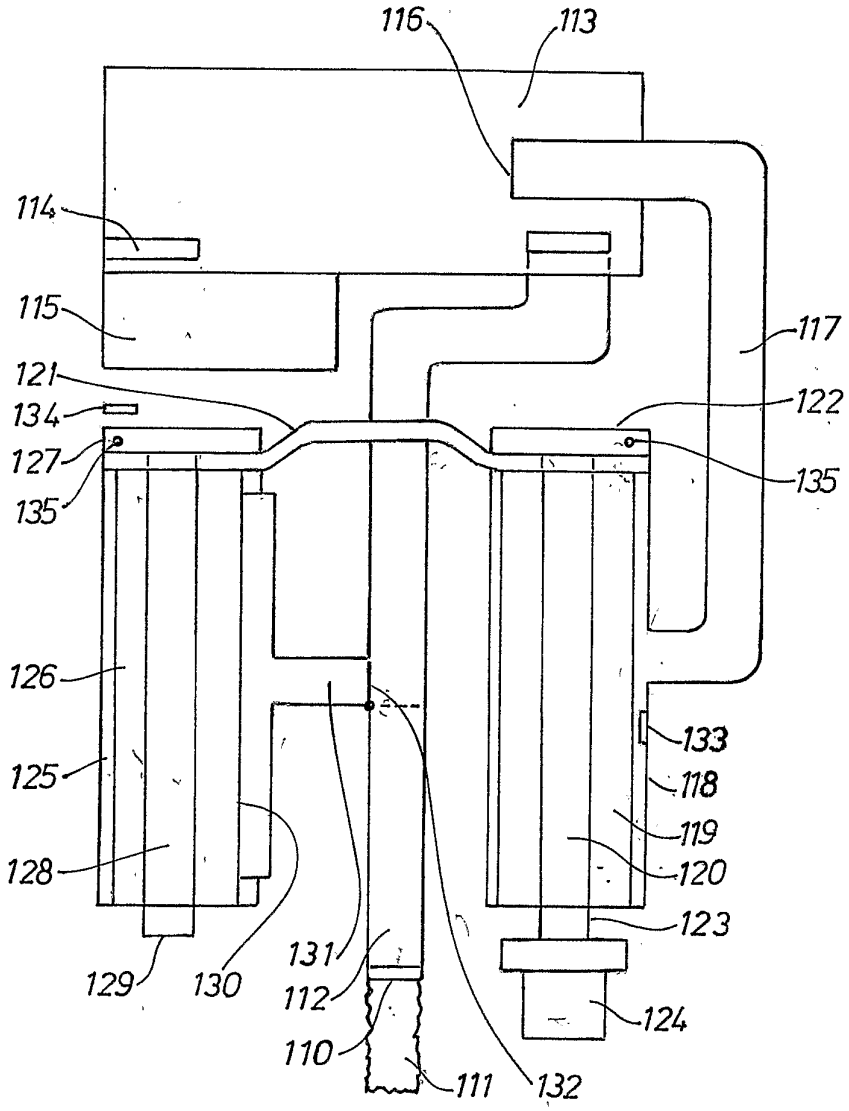
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Fig. 7

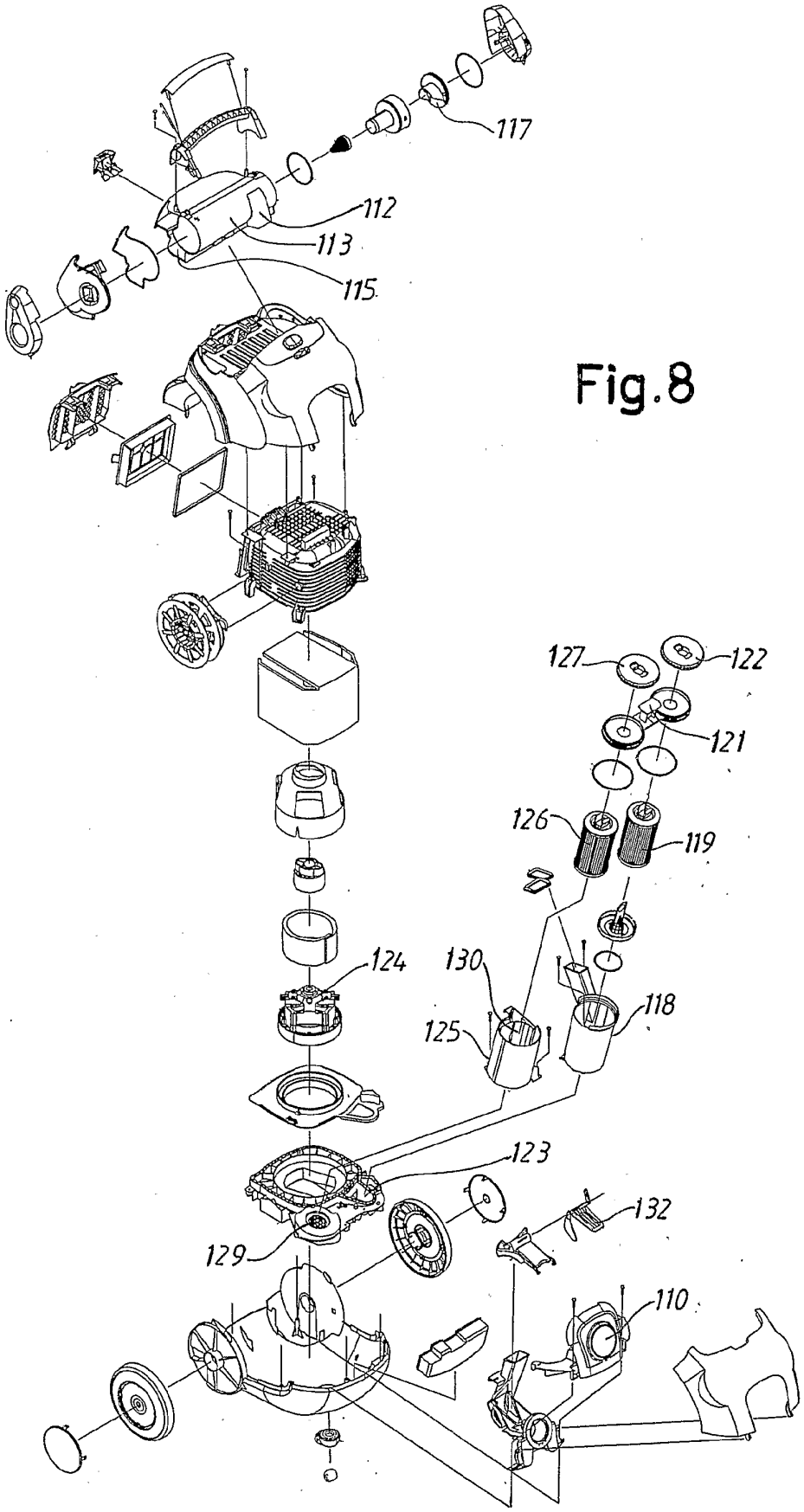
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Fig.8

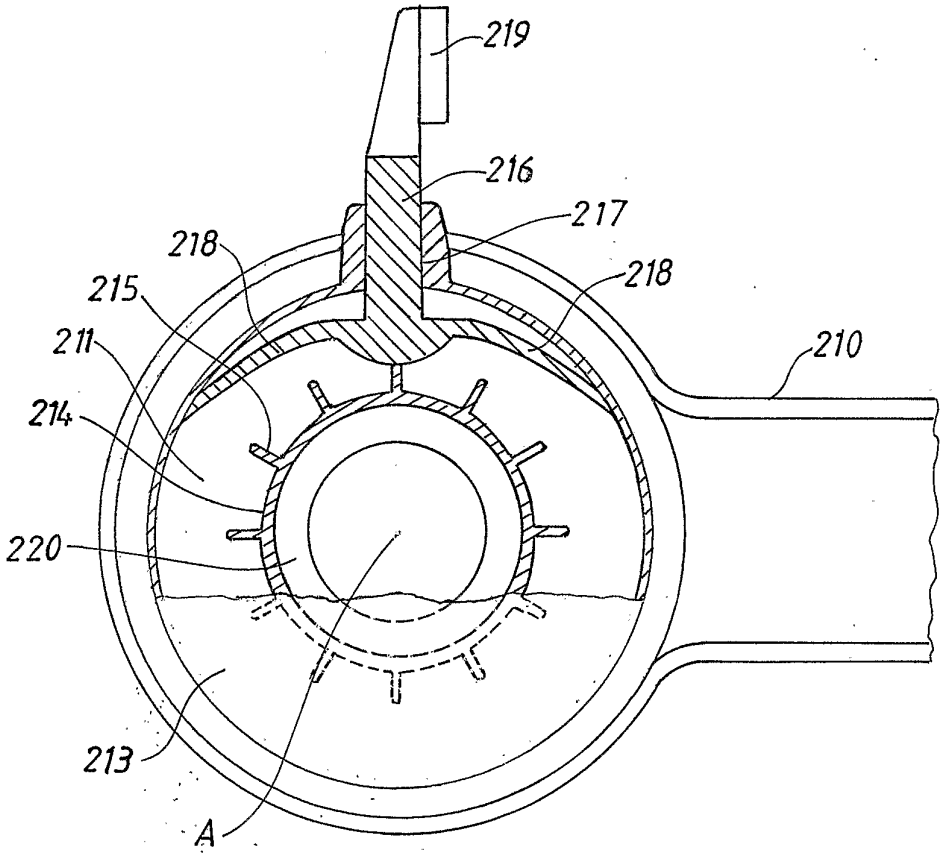

FIG. 9