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(54) **VACUUM CLEANER FOR RESERVOIRS**

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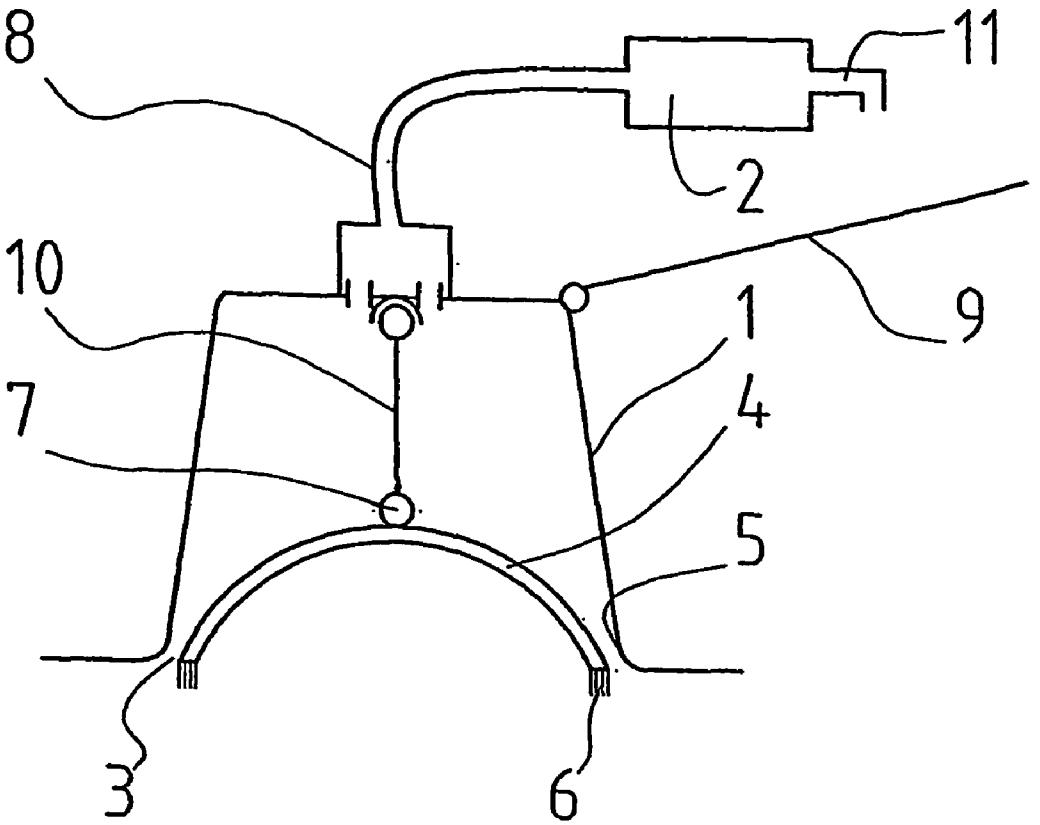
(57) **ABSTRACT**

A vacuum cleaner for reservoirs, especially swimming pools, including a working chamber provided with an inlet for liquid, connected with a vacuum generating unit. Between the inlet of liquid and the vacuum generating unit a rotary-shaped rolling rotor is placed in the flow of drawn in liquid. The rolling rotor is arranged in a swivelling and rotary manner and encompassed with a surface for rolling. In the contact point between the rolling rotor and the surface for rolling the rolling rotor has a smaller diameter than the surface for rolling. The rotor is connected with at least one brush.



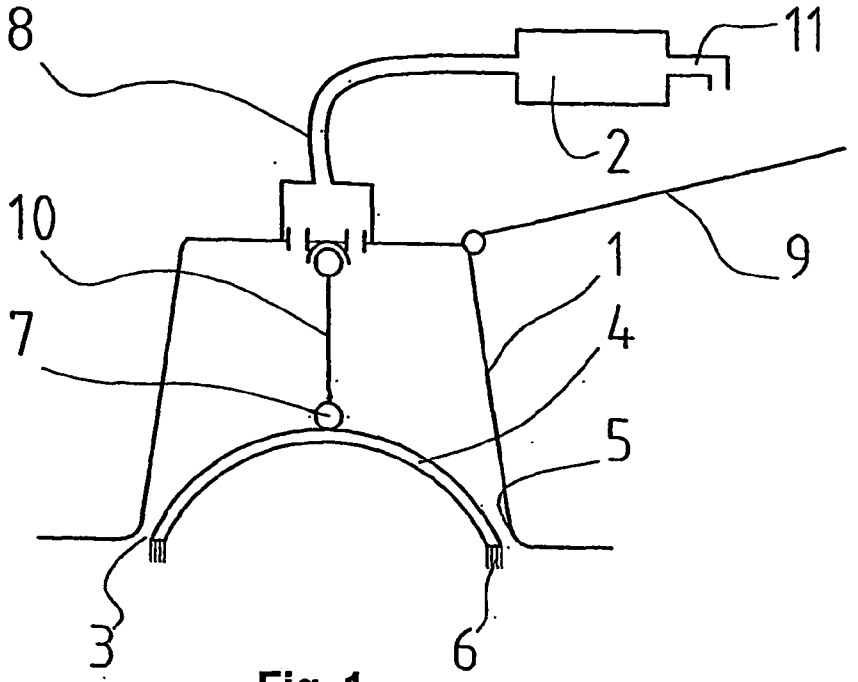


Fig. 1

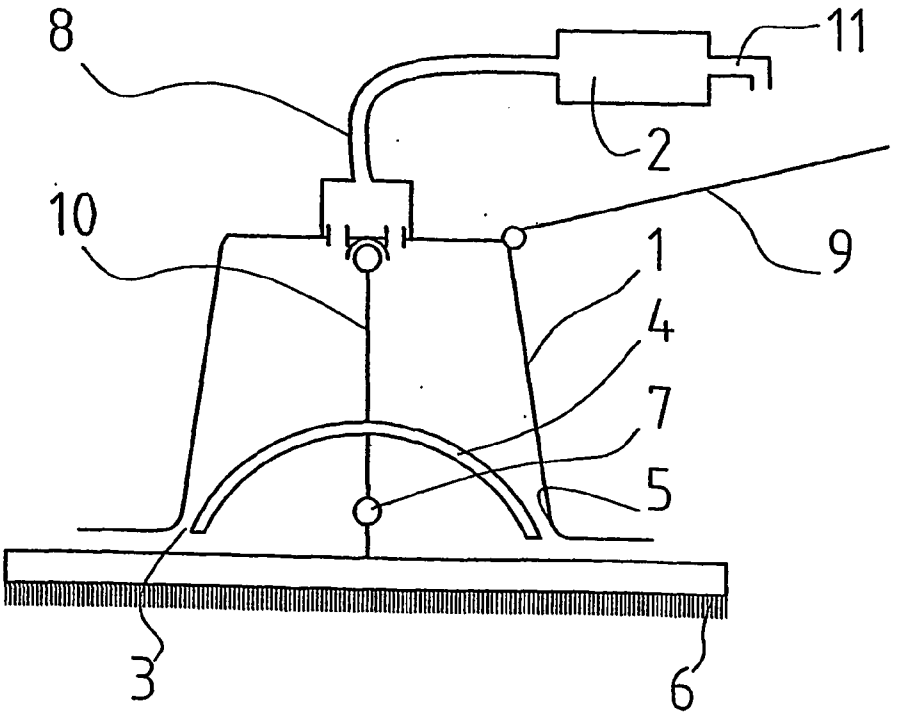


Fig. 2

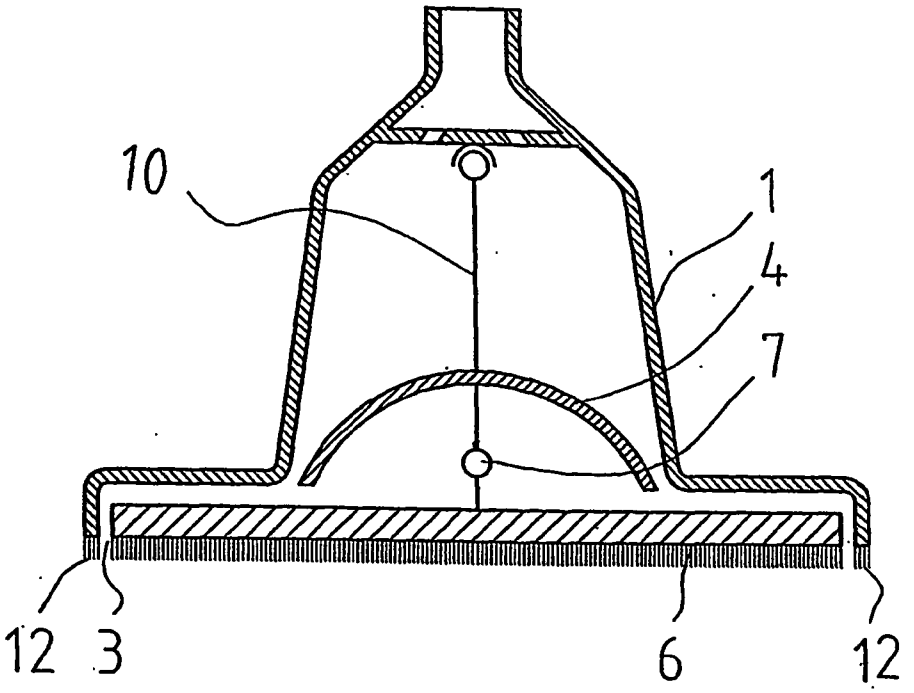


Fig. 3

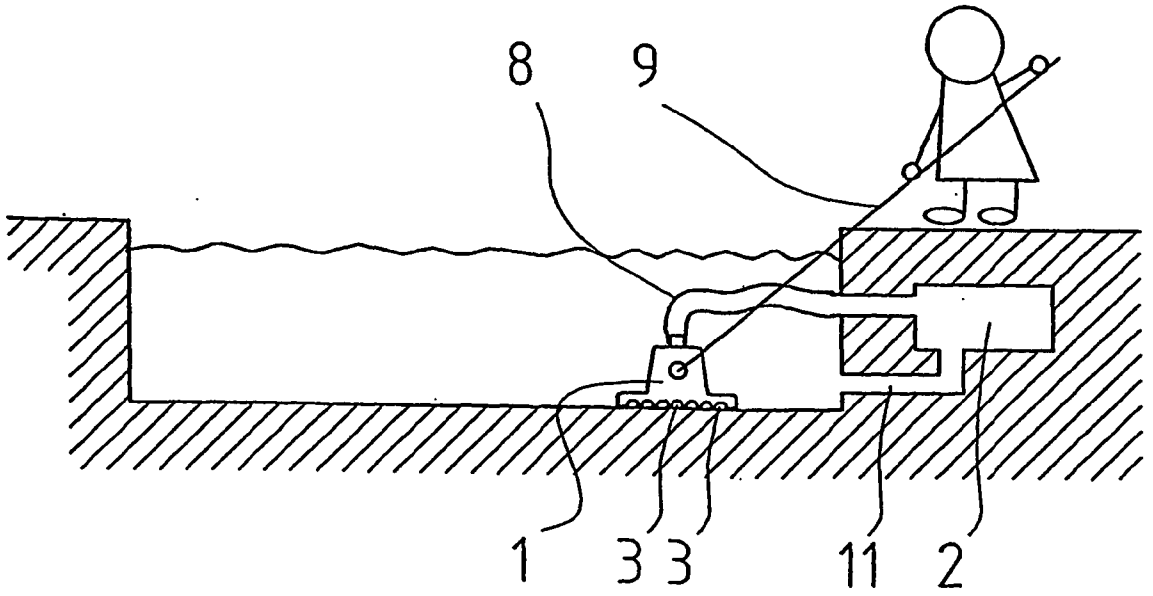


Fig. 4

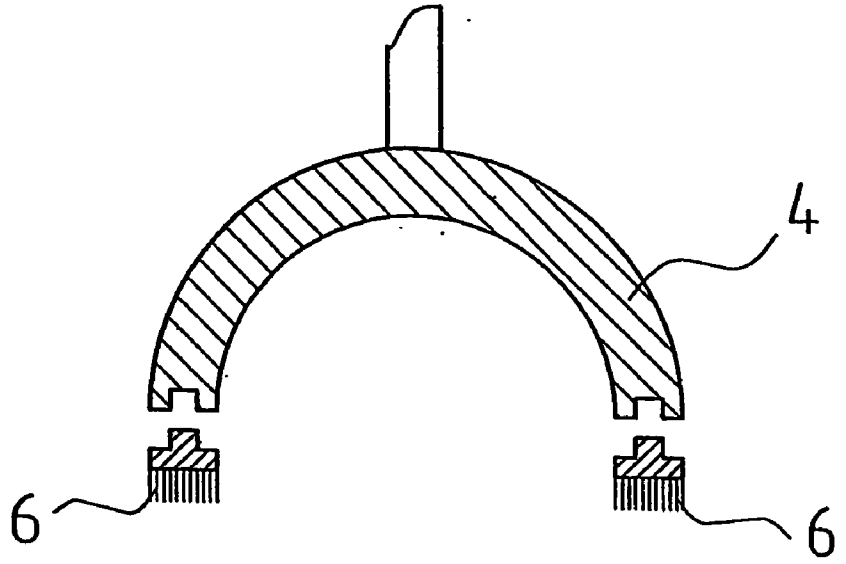


Fig. 5

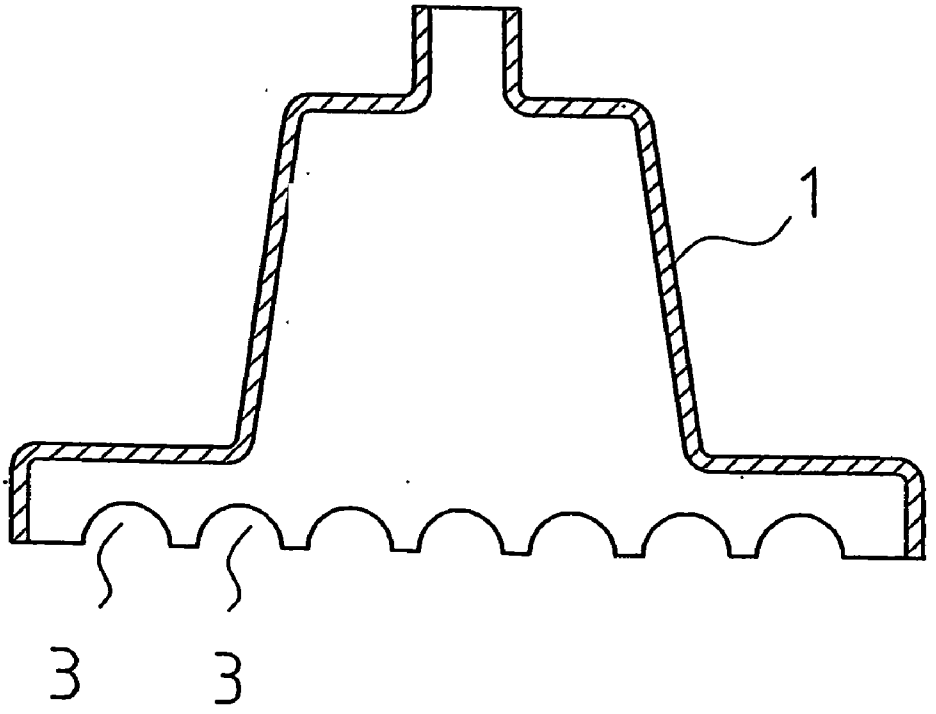


Fig. 6

VACUUM CLEANER FOR RESERVOIRS

TECHNICAL FIELD

[0001] The invention relates to a vacuum cleaner for reservoirs, especially swimming pools, comprising a working chamber provided with an inlet for liquid, connected with a vacuum generating unit.

BACKGROUND ART

[0002] The known vacuum cleaners for reservoir, mainly the ones applicable to the leisure swimming pools, but also to those for the industrial purposes, including the firewater reservoirs, are either manual, semiautomatic, or automatic. The vacuum-cleaners are drawing in the dirt together with water which will bring them to the filter seated just inside the vacuum cleaner, or in the filtration system off the cleaned reservoir. In order that the vacuum cleaner could work, it must be connected to the pump being mostly situated outside the reservoir and providing the necessary vacuum.

[0003] The known manual vacuum cleaners consist of the working chamber open at its bottom and fitted optionally with the immovable brushes. A flexible hose is used to connect the working chamber with the vacuum generating unit. The working chamber is moved along the reservoir bottom or side walls with the bar affixed to it. The bar tends to be of a telescopic type.

[0004] The semiautomatic or fully automatic vacuum cleaners are moreover fitted with a mechanism which moves the working chamber along the reservoir bottom, sometimes also with a remote control.

[0005] The disadvantage of all known water reservoir vacuum cleaners is that the efficiency of the mechanical part of the cleaning depends only on the speed with which the brush is moved along the surface being cleaned and on the press down force.

[0006] For a perfect contact between the brush and the surface being cleaned it is good for the brush to be connected with the rotor via a swinging joint.

[0007] In its convenient embodiment the rotor has a shape of a hollow hemisphere with its open side facing the incoming flow and the brush arranged along the circumference edge of the hemisphere.

[0008] With the utmost simplification of the construction in mind it is advantageous to have the rolling rotor seated inside the working chamber and the rolling surface made directly on the inner wall of the working chamber.

[0009] In accordance with its other advantageous embodiments the working chamber has at its bottom edge a set of inlets for liquid, the working chamber can be connected with the vacuum generating unit with a flexible hose and a bar designed to move the cleaner can be attached to the working chamber.

[0010] For the reduced operating costs the brush can be fitted in a replaceable way.

BRIEF DESCRIPTION OF DRAWINGS

[0011] The invention will be described with the use of the schematic drawings where the

[0012] **FIGS. 1, 2**, and **3** illustrate various examples of the vacuum cleaner.

[0013] The **FIG. 4** gives an example as how to use the vacuum cleaner in a swimming pool.

[0014] The **FIG. 5** shows an example of the rotor construction with a replaceable brush.

[0015] The **FIG. 6** shows an example of the working chamber design.

MODES FOR CARRYING OUT THE INVENTION

[0016] **FIG. 1** shows the first example of the vacuum cleaner designed to clean leisure swimming pools. The unit has a working chamber **1**, open in its bottom part, while this opening forms an inlet **3** for liquid. At the upper end, there is the working chamber **1** connected with a vacuum generating unit **2** by means of a flexible hose **8**.

[0017] A rolling liquid-operated machine, which can also be used to drive the rotating tools, is known from the published international patent applications No. WO 98/17910 and WO 99/61790, the disclosures of which are incorporated by references.

[0018] This machine consists of a chamber equipped with a liquid intake line and at least one outlet opening with the rolling rotor placed upstream the opening. The rolling rotor is of rotary-shaped body. A brush can be mounted on the output shaft. Such equipment can be used to clean the surfaces. In this case the dirt is disturbed mechanically with the rotating brush and flushed away by the liquid flowing out of the machine's chamber.

[0019] Goal of the invention is to design a liquid reservoir vacuum cleaner, which would make it possible to disturb mechanically the debris stuck to the reservoir's bottom and walls, using the rotating brushes, without the necessity to install any auxiliary power supply unit.

DISCLOSURE OF INVENTION

[0020] The above goal can be achieved with a vacuum cleaner designed to clean the liquid reservoirs, especially swimming pools, comprising a working chamber, which has an inlet for liquid, being connected with a vacuum generating unit. Between the liquid inlet and the vacuum generating unit there is a rotary shaped rolling rotor arranged in the flow of the liquid being drawn in. The rolling rotor is arranged both in inclinable and in rotary manner and encompassed with a surface for rolling. In the contact point between the rolling rotor and the surface for rolling the rolling rotor has smaller diameter than the surface for rolling. The rotor is connected with at least one brush.

[0021] The advantage of the vacuum cleaner pursuant to the invention rests in a substantially increased reservoir cleaning efficiency and quality, all this without the necessity to install any auxiliary power supply unit.

[0022] Vacuum generating unit **2** is formed by a pump installed in a circulation circuit, which is a part of technical equipments of the known swimming pools. These technical equipments are used to circulate water for its filtering and/or heating. In such an embodiment the vacuum cleaner uses a filter (not shown here) to capture the dirt. This filter forms a part of the known circulating circuit.

[0023] In another embodiment not shown here, the filter can be a part of the vacuum cleaner itself. Such a design is used to clean the liquid reservoirs or swimming pools

without any circulating circuits. In such a case, any movable pump can be used as the vacuum generating unit **2**.

[**0024**] In the case of the embodiment according to the **FIG. 1** the rolling rotor **4** is attached to a shaft **10**, which is placed in the working chamber **1** in inclinable and in rotary manner. Various supports of the rotor **4** will not be described in detail since they have been described in the published international applications no. WO 98/17910 or WO 99/61790 the disclosures of which are incorporated by references.

[**0025**] The rolling rotor **4** can have any rotary shape, having a smaller diameter than the rolling surface **5** in the point where the rolling rotor **4** comes in contact with the rolling surface **5** created on the inner wall of the working chamber **1**.

[**0026**] In the illustrated embodiment the rotor **4** is shaped like a hollow hemisphere with its open side upstream, with a brush **6** arranged along circumference edge of the hollow hemisphere. In the embodiment as per **FIG. 1** the bristles of the brush **6** are affixed straight in the edge of the rotor **4**. An advantageous embodiment is shown in the **FIG. 5** where the brush **6** is attached to the rotor **4** in a removable way. Such an embodiment makes it possible to replace the worn brush **6**.

[**0027**] For a perfect contact between the brush **6** and the surface being cleaned the design in the **FIG. 1** uses the rotor **4** affixed to the shaft **10** by means of the swinging joint **7**.

[**0028**] A telescopic bar **9** is attached to the working chamber **1** in order to move the cleaner along the bottom and walls of the reservoir being cleaned.

[**0029**] When a swimming pool is to be cleaned, the working chamber **1** has to be connected with the vacuum generating unit **2**, using the flexible hose **8**. The cleaner is now lowered down into the pool with the bar **9** (see **FIG. 4**). The water drawn in through the inlet **3** flows via the working chamber **1** to the filter (not shown here), coming in the filtered form back to the pool, using the line **11**.

[**0030**] The water current flowing through the working chamber **1** will cause the rolling rotor **4** rolling along the inner wall of the working chamber **1**. This principle has been described in the published international patent applications no. WO 98/17910 and WO99/61790 the disclosures of which are incorporated by references and will not therefore be analysed here in details. Along with the rotor **4**, the brush **6** will stay in a precession.

[**0031**] Once the vacuum cleaner is connected to the swimming pool's circulation circuit with the a filtration and a pump with the capacity of 50 m^3 of the pumped water in an hour, the rotor **4** has an average speed of 100 rpm, exerting the micro-oscillations at the same time, 1,500 per minute on average. The micro-oscillations resulting from the rotor **4** rolling along the rolling surface **5** spread themselves up to the brush **6**, using the shaft **10**. The dirt is disrupted mechanically with the brush **6**, being also flushed away with the flowing water via the working chamber **1** into the filter (not shown here) where the dirt is trapped and the clean water comes back to the swimming pool using the line **11**. A surface of 15 m^2 can be cleaned well with the described device being moved just manually with the telescopic bar **9** in about 10 minutes. Of course, any other known driving device can be used to move the working chamber **1** along the surfaces being cleaned, including an automatic or remote control system.

[**0032**] Another embodiment of the vacuum cleaner is shown in the **FIG. 2**. This embodiment differs from the one in **FIG. 1** in the rolling rotor **4** which is firmly attached to the shaft **10** and which has a separate brush **6** underneath. To be in perfect contact with the surface being cleaned this brush **6** is attached to the rotor **4**, using the swinging joint **7**. The brush **6**, of course, can be of a replaceable design.

[**0033**] The embodiment in **FIG. 3** is, in fact, the same as the one in **FIG. 2**, except of the bottom edge of the working chamber **1**, holding the immovable auxiliary brush **12**.

[**0034**] Functionally, the embodiments in the **FIGS. 2 and 3** is similar to the one described above in the **FIG. 1**.

[**0035**] Embodiment according to **FIG. 6** has the inlet **3** of the working chamber **1** formed by a set of openings, made on the bottom edge of the working chamber **1**.

[**0036**] In case of all the above-described embodiments the surface **5** for the rotor **4** rolling is created directly on the inner side of the working chamber **1**. Such a design is simplest as far as the driving of the brush **6** is concerned. But this in not the only possible arrangement. The surface **5** for rolling and the rotor **4** can, in fact be, placed wherever in the flow of water drawn in.

[**0037**] The experts take it for granted that the described vacuum cleaner can be used not only to clean the swimming pools, but also, in fact, any reservoirs containing a liquid.

1-7. (canceled)

8. A vacuum cleaner for reservoirs, comprising:

a working chamber provided with an inlet for liquid, connected with a vacuum generating unit;

a rotary-shaped rolling rotor placed in a flow of drawn in liquid between the inlet of liquid and the vacuum generating unit, the rolling rotor configured in swivelling and rotary manner and encompassed with a surface for rolling, while in a contact point between the rolling rotor and the surface for rolling the rolling rotor has a smaller diameter than the surface for rolling, and the rotor is connected with at least one brush.

9. The vacuum cleaner as in claim 8, wherein the at least one brush is attached to the rotor by a swinging joint.

10. The vacuum cleaner as in claim 8, wherein the rotor is shaped like a hollow hemisphere with its open side upstream, while the at least one brush is arranged along an circumference edge of the hollow hemisphere.

11. The vacuum cleaner as in claim 8, wherein the rolling rotor is placed in the working chamber and the surface for rolling is formed on an inner wall of the working chamber.

12. The vacuum cleaner as in claim 8, wherein the working chamber has at its bottom edge a set of the inlets for liquid.

13. The vacuum as in claim 8, wherein the working chamber is connected with the vacuum generating unit with a flexible hose, while the bar is attached to the working chamber to move the working chamber.

14. The vacuum cleaner as in claim 8, wherein the at least one brush is fitted to be replaceable.

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