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(54) **FLUSH FOR TOILETS**

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(57) **ABSTRACT**

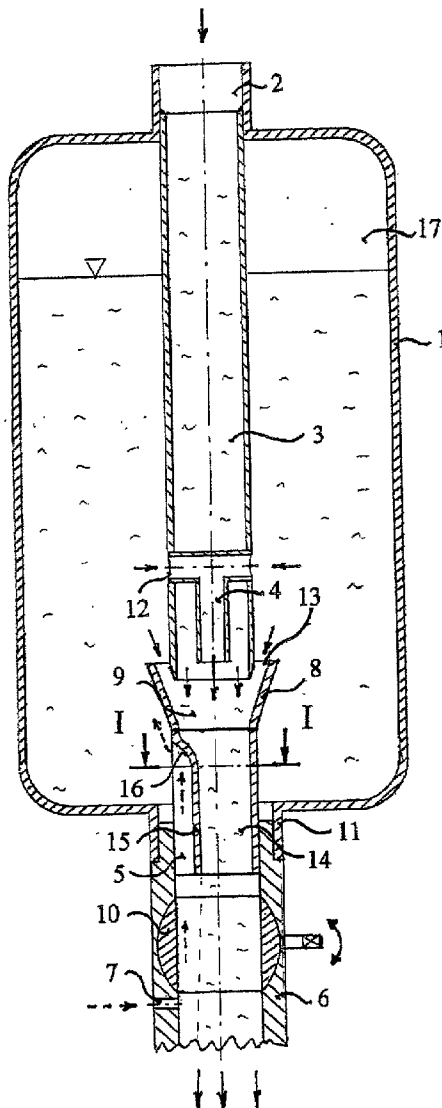
The invention relates to a flush for toilets containing a container with an air vessel, a connection piece for the network, a connection piece for the flush, a valve housing comprising a control device and an injector tube. A suction device is joined to the injector tube. The flush is characterized in that an air-refilling opening (7) is arranged in the valve housing (6) underneath the control device (10) that is suitably accommodated in the valve housing (6). A jet tube (15) is arranged above the control device in order to deviate the flushing water. An air-introducing chamber (5) is arranged in and/or next to the jet tube (15).

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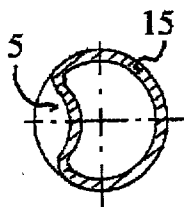
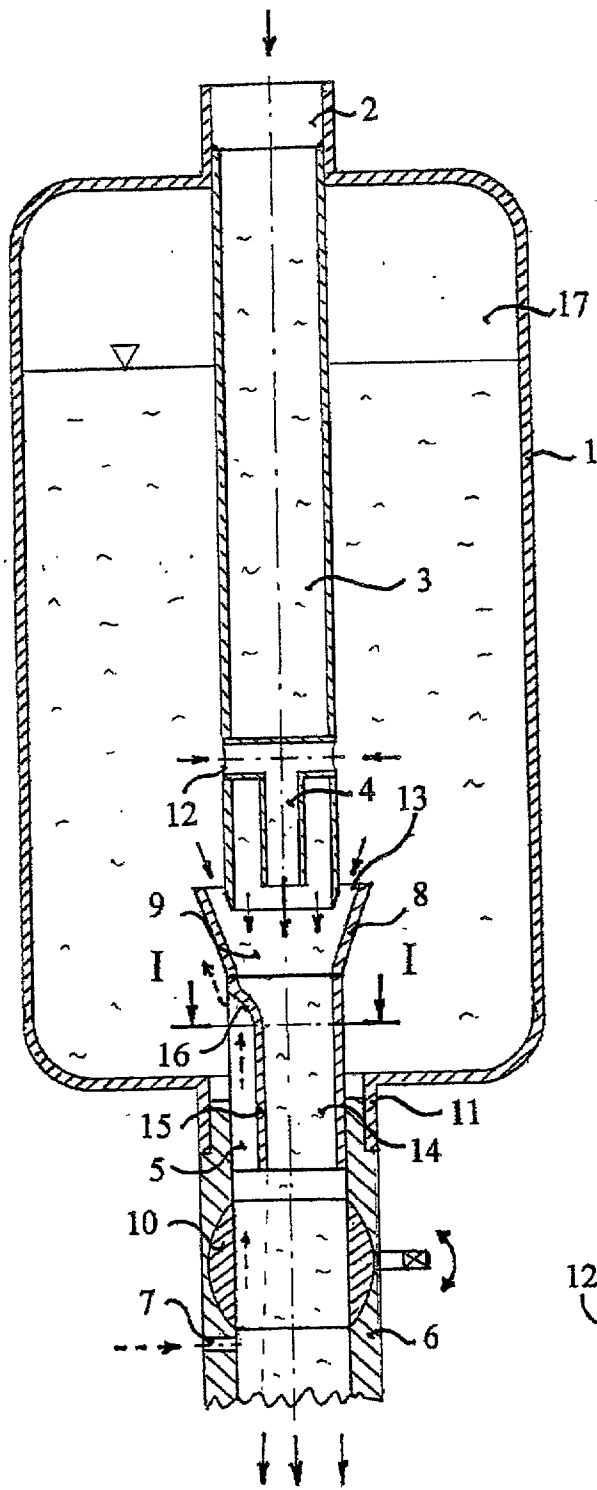


Fig. 2

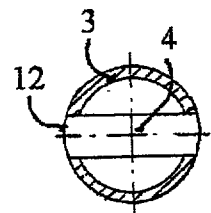


Fig. 3

Fig. 1

## FLUSH FOR TOILETS

[0001] This is a continuation of PCT/HU99/00080.

### DESCRIPTION

[0002] Subject of the invention is a flushing device for toilets containing a container with an air vessel, a connection piece for the network, a connecting pipe end for the valve, a connecting pipe end for the flush, a valve housing with a control device and jet tube. The jet tube is connected with the suction device.

[0003] Many devices for the flushing of toilets are known. The traditional flushing devices are in detail described in the book "Water supply, sewerage, gas supply" by Ballai-Marton (Technical Edition, Budapest 1977), page 593-599. Traditional flushing devices are equipped with an open water container with a volume of about 8 l, a water float and a weighted valve. When operated the whole quantity of water must run down from the container and for this reason these devices are economically disadvantageous. A braked, rapid stop cock is also known, which is directly joined in the network and flushes the pan from a height of about 700 mm. A disadvantage of this solution is that it requires a larger water branch (with a diameter of  $\frac{3}{4}$ -1") and thus the effect of flushing mainly depends on the pressure in the water conduct.

[0004] Further on, in case of a pressure drop and a breakdown the sewage may be sucked back.

[0005] Closed containers with an air vessel at flushing also make use of the pressure in the water conduct. Such a solution is described in the patent documents HU 174,527, HU 190,422 and FR 2,122,069. The drawback of this solution is, that the air is continuously escaping from the pressure container. After a certain time the container loses its air cushion and operates as a valve being connected with the water network without a container. That means that compensation of the air cushion requires maintenance.

[0006] The U.S. Pat. No. 5,046,201 discloses a pressure container with a pressure control device where water feeds the injector, which is sucking air into the air vessel. The flush valve is provided with bars. The publication WO 98/39522 discloses a flushing system with a multiple valve under pressure. The U.S. Pat. No. 5,136,732 contains flushing devices with a piston and a needle valve. The patent document JP 6,158,699 discloses a pressure container with a vacuum valve. The patent document HU 205,409 describes a flushing device with an injector and a spring loaded and weight loaded external valve to introduce air. A common disadvantage of these solutions is, that they are relatively complicated, that the different valves and pressure controls are submitted to the forming of scale and choking, that means that they all need maintenances.

[0007] Purpose of the invention is the elimination of the existing disadvantages, development of a flushing device needing no maintenance and no introduction of air by the operator, which is silent, water saving and absolutely reliable in service.

[0008] Base of the idea being subject of the invention is the recognition that if the supply of air during the flushing process is solved through an opening without moving parts and if for the introduction of air the stream of the flushing

water is deflected and stabilized, a more advantageous solution can be reached than up to now.

[0009] According to the purpose of the invention the device according to the invention is a flushing device for toilets comprising a container with an air vessel, a connecting pipe end for the network, a flushing pipe end, a valve housing provided with a control device and a jet tube, a suction device being connected with the jet tube in a way that on the housing of the valve beneath the control device an air refill opening is provided whereas above the control device—preferably inserted into the valve housing—an appropriate jet tube is arranged to deflect the flushing water, within the jet tube and/or beside it an air inlet chamber being left free.

[0010] Another characteristic of the invention may be that the suction device in the bottom part of the jet tube is provided at least with one inlet pipe end discharging into the container. The air inlet chamber is surrounded by a vault conducting the air to the air vessel.

[0011] In one embodiment of the invention the part of the jet pipe protruding into the valve housing contains a stabilizing chamber, which determines the direction of the water jet. The injector pipe, the suction device, the jet tube and the flushing pipe end are coaxial.

[0012] In another embodiment a complementary unit is built in between the suction device and the jet tube with a suction throat suitable to increase the yield of water. The complementary unit surrounds the integrating chamber.

[0013] The flushing device for toilets according to the invention has many advantages. It is extraordinarily simple and reliable in service, besides the control device by means of which the user starts and stops flushing it contains no moving parts. The device needs no maintenance and contains no parts subjected to scale or choking. Its functioning is noiseless and water saving. The user can stop flushing at any time. The introduction of air during the flushing process works automatically.

[0014] The application of an air refill opening has the advantage that a valve preventing back suction is not necessary. In case of a trouble the air refill opening cuts the suction effect and prevents the sewage from possible penetration into the water network.

[0015] In the following we present a more detailed description of the invention on the base of the enclosed drawings. The drawings present:

[0016] **FIG. 1:** Longitudinal section of the device

[0017] **FIG. 2:** Cross-section of the jet tube at **14** in **FIG. 1**.

[0018] **FIG. 3:** Cross-section of the jet tube over the suction device.

[0019] In **FIG. 1** the container is shown in vertical position. At the top the connecting pipe end **2** for the network is arranged, the upper part of the container is being the air vessel **17**. The actual water level is marked by a triangle. The container **1** can be made of plastics, of metal or of a combination of both of them. It can be made of one or of more pieces. The injector tube **3** is arranged in the longitudinal axis of the container **1** and can be of a narrow shape or have a diameter according to **FIG. 1**. The suction device

is in the lower part of the injector tube 3 and has two inlet pipe ends 12 discharging into the container 1. The suction device 4 and the injector tube 3 are coaxial. In some cases the lower part of the injector tube 3 is choked.

[0020] The valve housing 6 is beneath the container 1 and preferably joins with the flushing pipe end 11. In case of need the valve house is integrated with the container. The control device 10 can be a simple shut-off valve or a valve with remote control. Beneath the control device 10 the air refill opening 7 is arranged. Between the suction device 4 and the control device 10 the jet tube 15 is arranged which is suitable for the deflection of the flushing water. The jet tube 15 surrounds the stabilizing chamber 14 beside him the air flows in the air inlet chamber 5. The air inlet chamber 5 is at the top surrounded by the guide vault 16, which directs the air into the pressure vessel 17. The jet tube 15 and the flush pipe end 11 are preferably coaxial. The complementary unit 8 is inserted between the injector pipe 3 and the jet tube 15. The complementary unit 8 joins in the container 1 through the suction throat 13 suitable for increasing the water yield. The complementary unit 8 surrounds the collecting chamber 9.

[0021] FIG. 2 shows the cross section of the jet tube 15 with the air inlet chamber 5. FIG. 3 shows the cross section of the injector pipe 3 with the inlet pipe end 12 of the suction device 4. Another embodiment is also possible in which the injector pipe 3 is connected with the jet tube 15 without the complementary unit 8. The complementary unit serves for increasing the efficiency of the suction device 4 as a secondary element. The suction device 4, the injector pipe 3 and the complementary unit 8, applied according to need, are together named "water jet pump". Within the framework of the claim hereafter specified the flushing device according to the present invention can also be made in other embodiments, e.g. the suction device 4 can also be arranged beneath the injector pipe 3.

[0022] Functioning of the flushing device according to the invention:

[0023] In FIG. 1 the path of the water is marked by an arrow, the path of the air by a hatched arrow. The user opens the control device 10. In the moment of opening the pressure in the air vessel 17 corresponds with the pressure in the water conduct. At the beginning of the flushing the water flows out of the container and the pressure in the air vessel 17 is gradually decreasing. As the pressure is falling the fresh water from the water conduct is flowing into the injector pipe 3 at a gradually increasing pressure. The water streaming into the injector pipe 3 exercises a sucking effect on the suction device 4 and the complementary unit 8 whereby the water in the container 1 through the inlet pipe end 12 and the suction throat 13 joins the main stream and mixes with it in the collecting chamber 9.

[0024] The decrease of the quantity of water in the container originates a vacuum in the air vessel 17. As a result of the pressure difference air is streaming into the air vessel 17

through the air refill opening 7 and the air inlet chamber 5, which automatically compensates the air lost with the flushing water. The water in the container joining the water from the conduct under the effect of the injector in the stabilizing chamber 14 of the jet tube 15 assumes the cross section of the stabilizing chamber and while it flows through the control device 10 it nearly retains it. The rim of the water stream is marked by a dashed line. Owing to the shape of the jet tube 15 the water stream does not entirely fill up the cross section of the control device 10 and the valve housing 6 and thereby promotes the introduction of air in to the air vessel 17.

[0025] After the flushing process is finished the control device 10 is being closed. Now the water from the network is filling the container 1 through the injector pipe 3 until the pressure in the air vessel 17 is equal to the pressure in the water conduct.

[0026] The flushing device according to the invention is used for water saving and reliable flushing of toilets.

What is claimed by the inventors:

1. Flushing device for toilets comprising a container with an air vessel, a connecting pipe end for the network, a flushing pipe end, a valve housing with a control device and an injector tube, a suction device being connected with the injector tube characterized in that on the valve housing (6) beneath the control device (10) an air-refill opening (7) is arranged, whereas above the control device (10)—preferably integrated in the valve housing (6)—the jet tube (15) is built in to the guide the flushing water, nevertheless leaving free an air inlet chamber (5) in the jet tube (15) and/or beside it.

2. Flushing device according to claim 1, characterized in that the suction device (4) is inserted in the lower part of the injector pipe (3) having at least one inlet pipe end (12) discharging into the container (1).

3. Flushing device according to claim 1, characterized in that the air inlet chamber (5) is limited by the guide vault (16), guiding the water to the air vessel (17).

4. Flushing device according to claim 1, characterized in that the part of the jet tube (15) protruding into the valve housing (6) contains a stabilizing chamber (14) which determines the direction of the water stream.

5. Flushing device according to claim 1, characterized in that the injector pipe (3), the suction device (4), the jet tube (15) and the flushing pipe end (11) are coaxial.

6. Flushing device according to claim 1, characterized in that between the suction device (4) and the jet tube (15) a complementary unit (8) is built in, the complementary unit (8) being provided with a suction throat (13) suitable to increase the water yield.

7. Flushing device according to claim 6, characterized in that the complementary unit (8) is surrounded by a collecting chamber (9).

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