



US 20190330831A1

(19) **United States**(12) **Patent Application Publication**
PANCURAK(10) **Pub. No.: US 2019/0330831 A1**(43) **Pub. Date: Oct. 31, 2019**(54) **PRESSURE-FLUSHING SYSTEM FOR A
TOILET BOWL**(71) Applicant: **SWISS AQUA TECHNOLOGIES
AG, Berneck (CH)**(72) Inventor: **Frantisek PANCURAK, Presov (SK)**(73) Assignee: **SWISS AQUA TECHNOLOGIES
AG, Berneck (CH)**(21) Appl. No.: **16/467,020**(22) PCT Filed: **Dec. 6, 2017**(86) PCT No.: **PCT/EP2017/081755**

§ 371 (c)(1),

(2) Date: **Jun. 5, 2019**(30) **Foreign Application Priority Data**

Dec. 6, 2016 (SK) 5033-2016

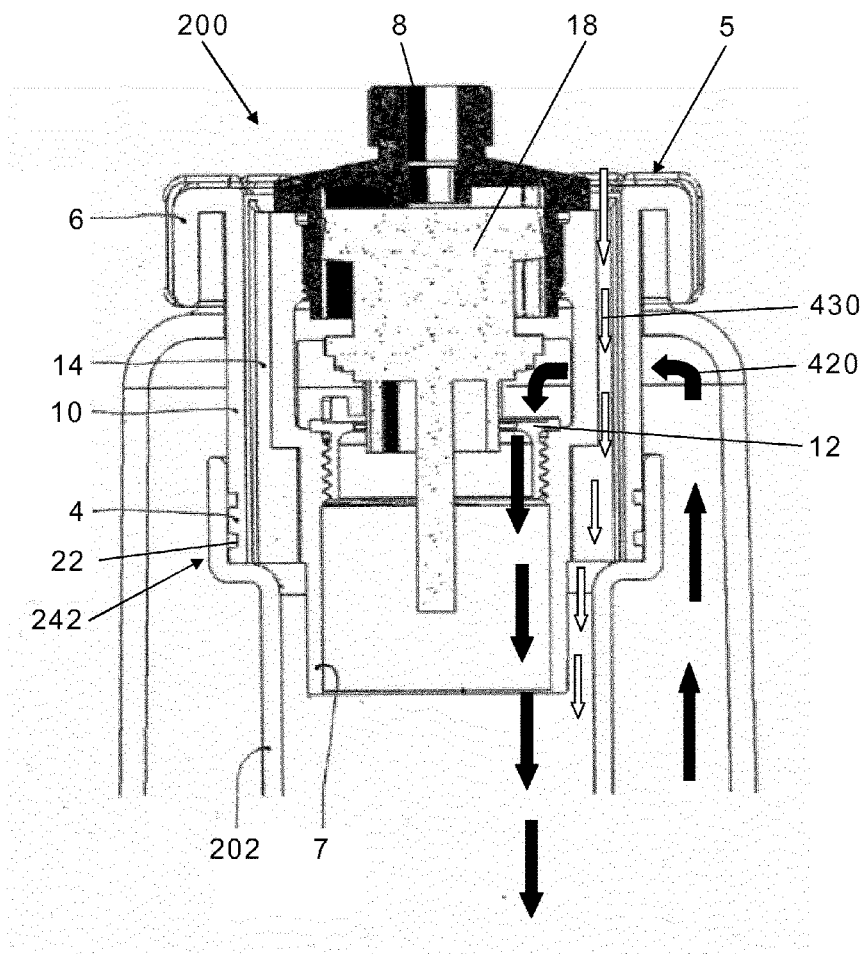
Dec. 6, 2016 (SK) 5034-2016

Publication Classification(51) **Int. Cl.****E03D 3/04** (2006.01)**E03D 3/10** (2006.01)(52) **U.S. Cl.**CPC **E03D 3/04** (2013.01); **E03D 3/10** (2013.01)

(57)

ABSTRACT

The invention relates to a pressure-flushing system (100) for toilet bowls, comprising a cistern mounting (500) and a drain module (200), said drain module (200) comprising a vertically oriented pressurized water tank (501) and a drain pipe (502), a hydraulic drain valve (18) and a DC pipe interrupter (5). The drain pipe (502) is mounted vertically in the pressurized water tank (501) and projects from the bottom of the pressurized water tank (201) for a flow connection with the toilet bowl. The drain module (200) is retained by the cistern mounting (500), which also carries a gas accumulator (19). The cistern mounting (500) has a water-carrying design and has a water connection (8) for connection to a drinking water mains or similar, and connecting channels (507, 510) that fluidically connect the pressurized water tank (501) and the gas accumulator. The pressure-flushing system (100) complies with standard EN 1717, is compact and easy to install. It allows pressure-wave flushing with little water and low noise emission.



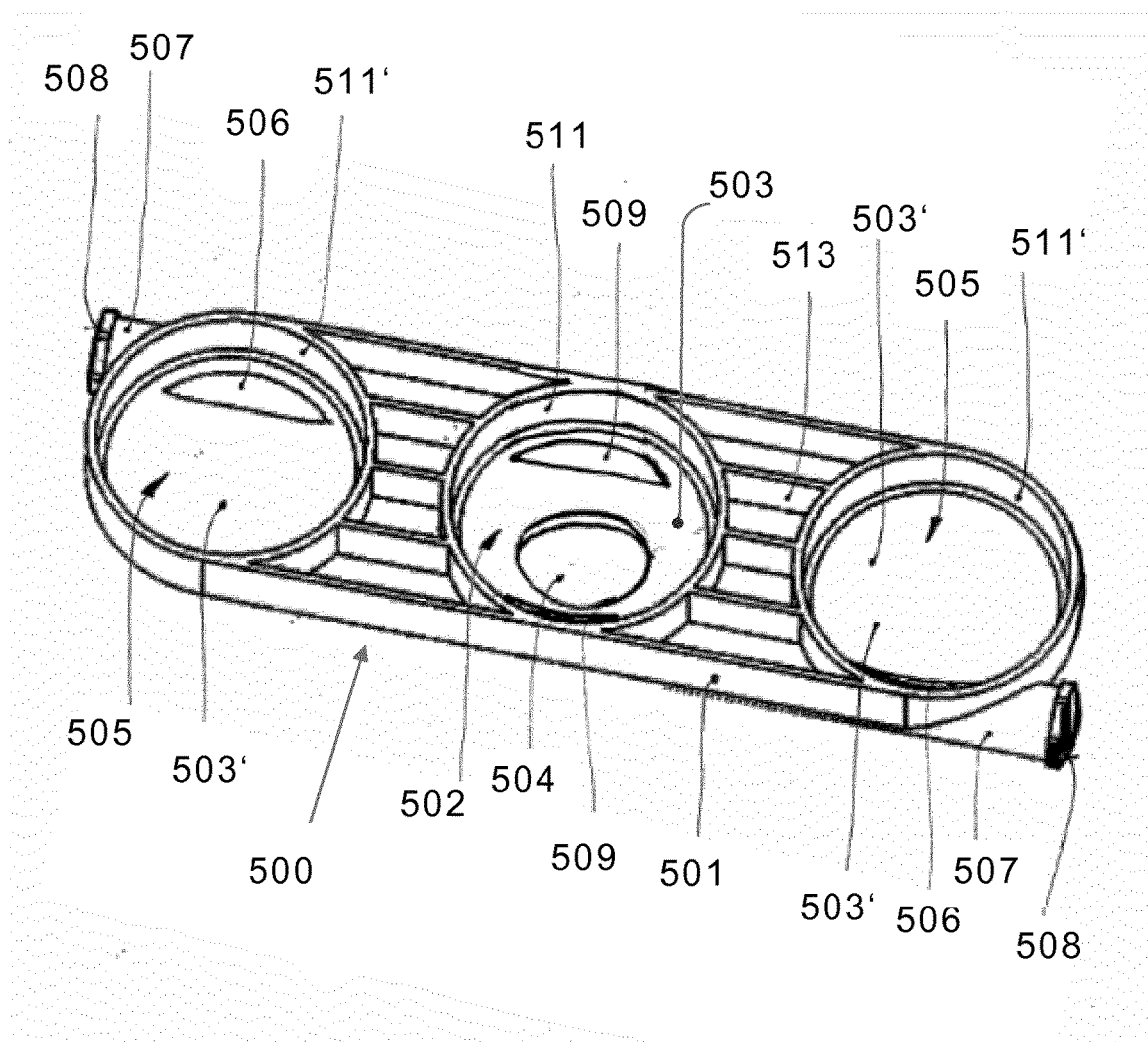


ABB. 1

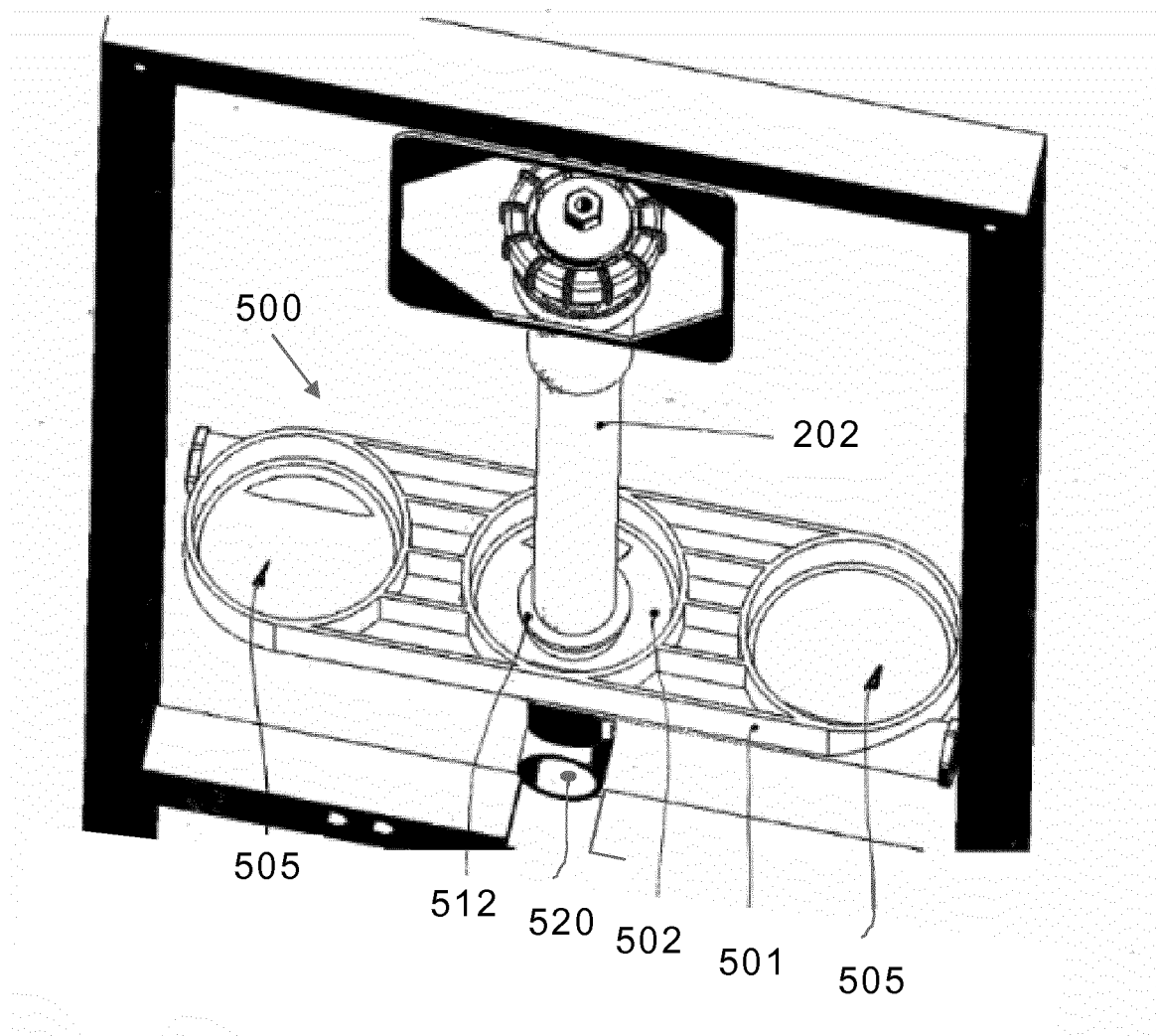


ABB. 2

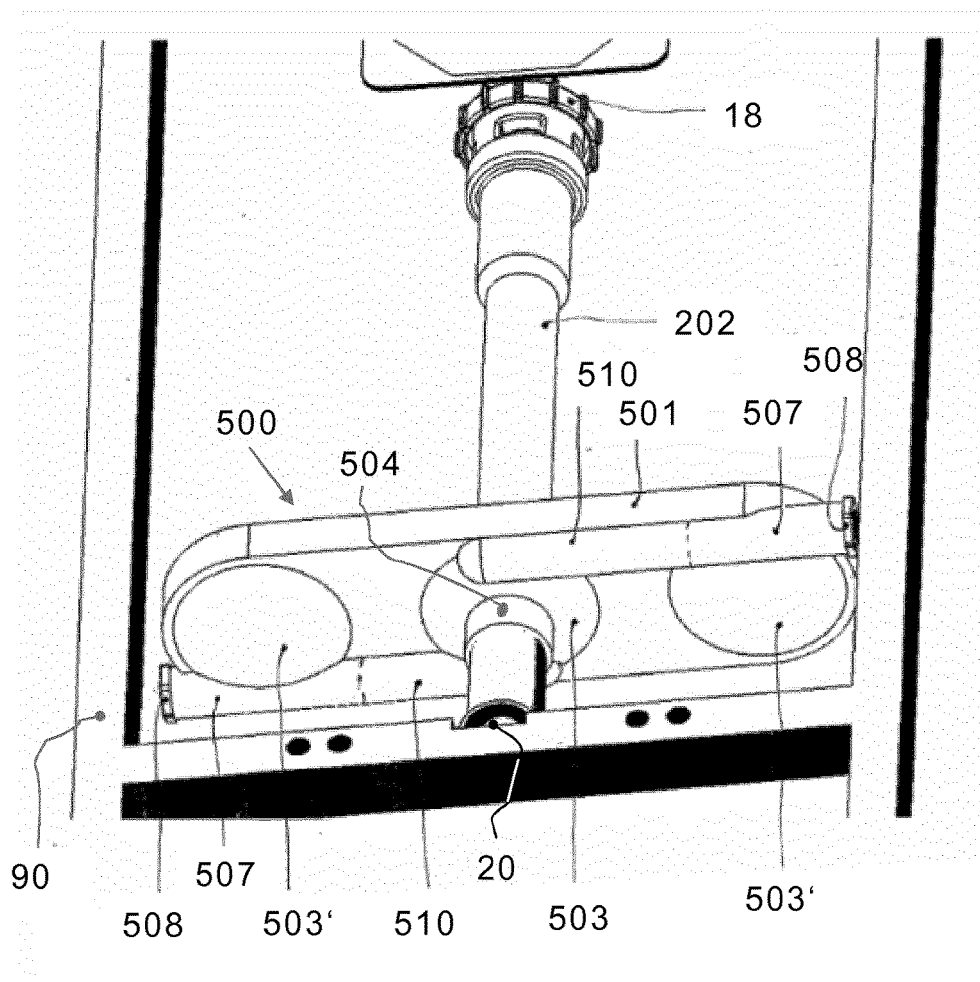


ABB. 3

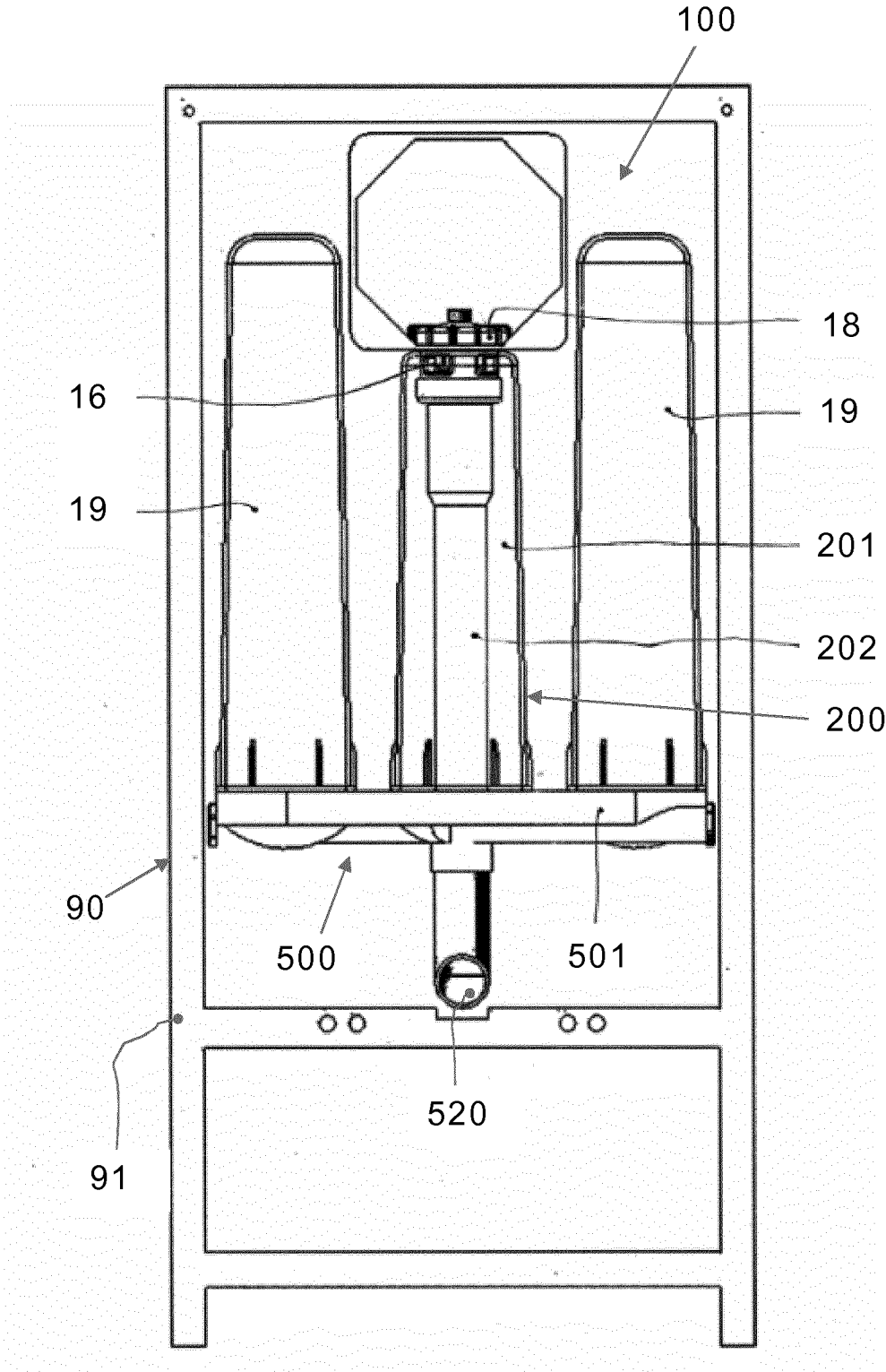


ABB. 4

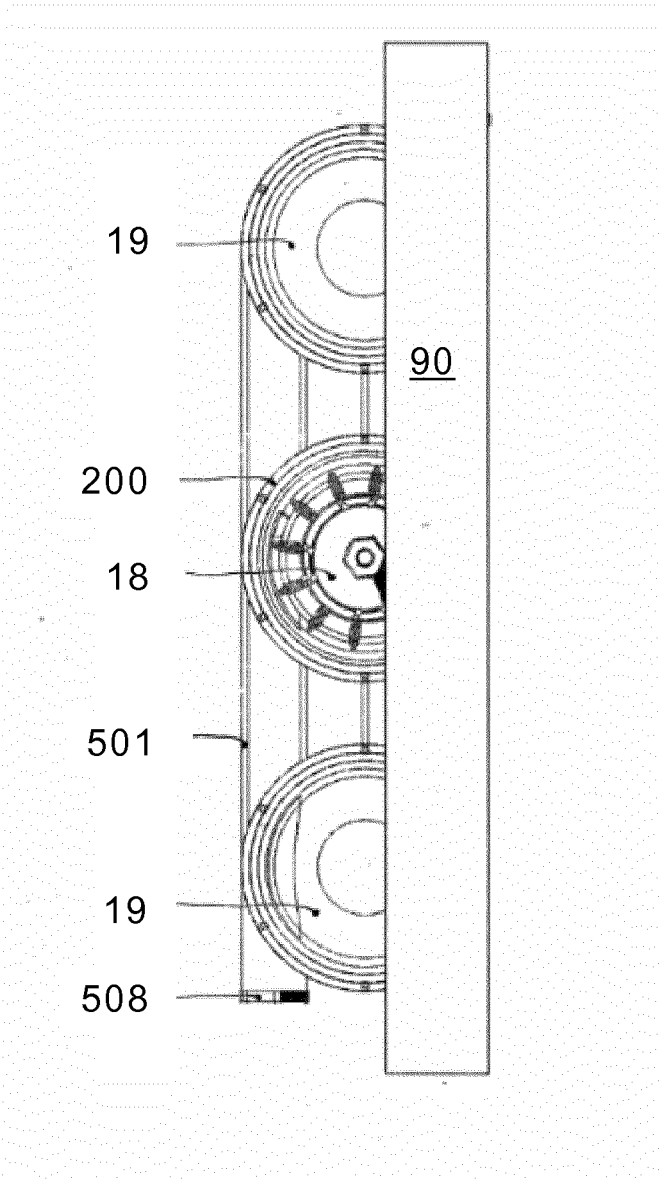


ABB. 5

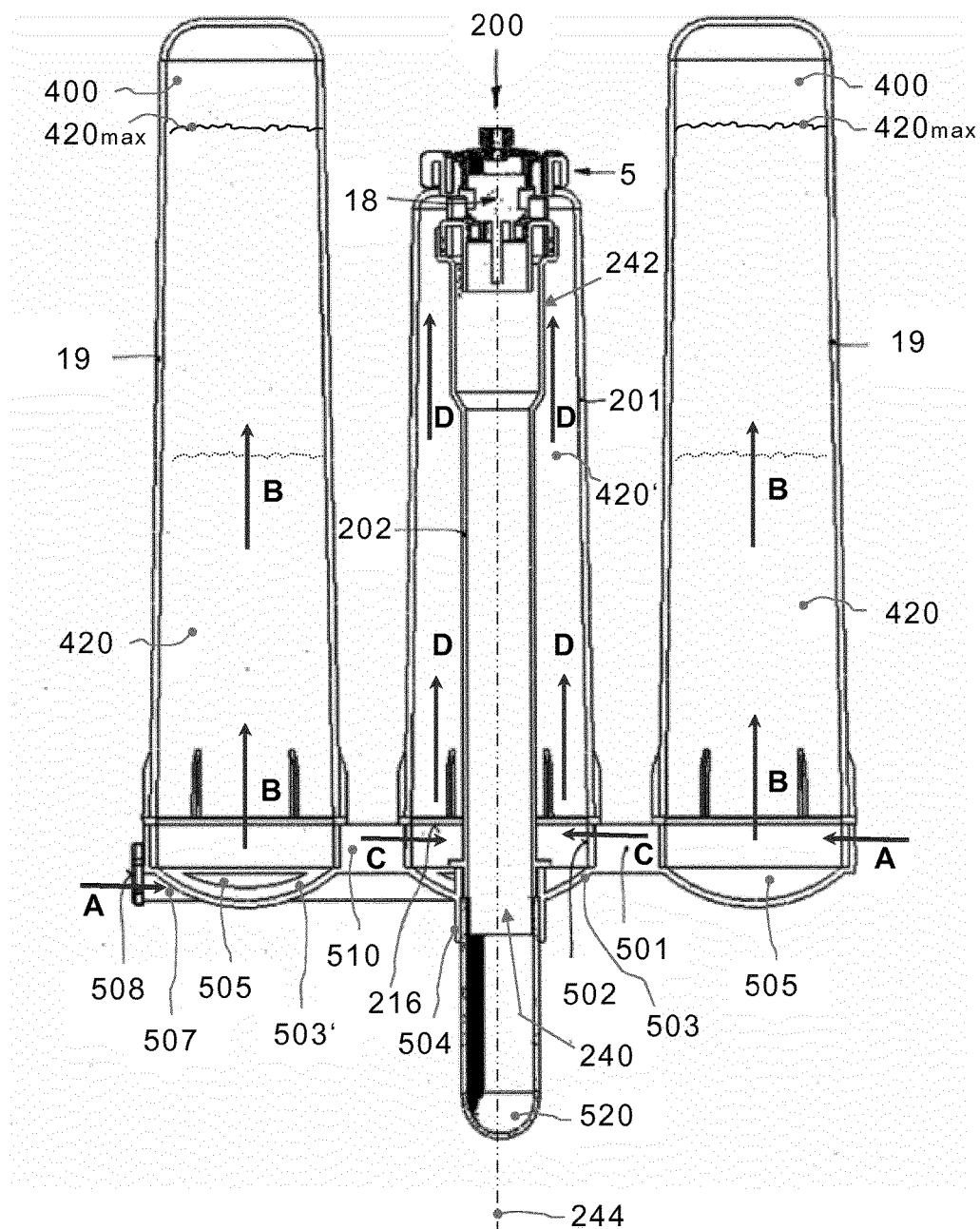


ABB. 6

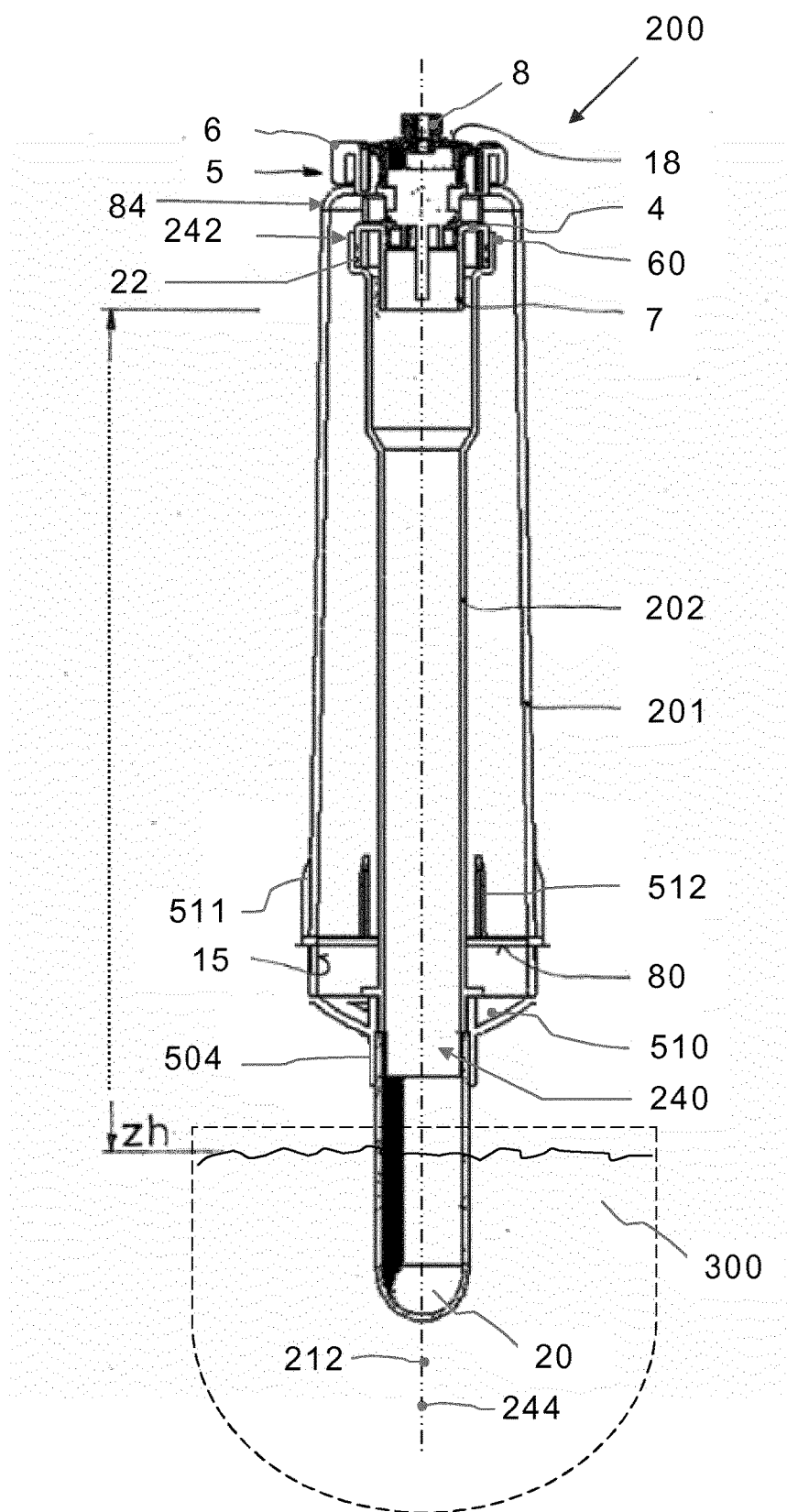


ABB. 7

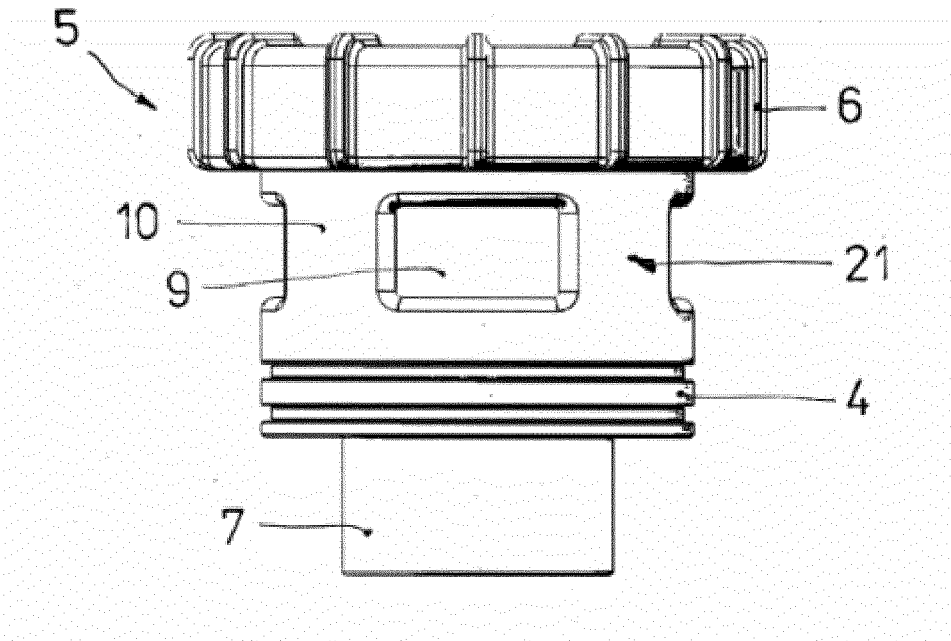


ABB. 8

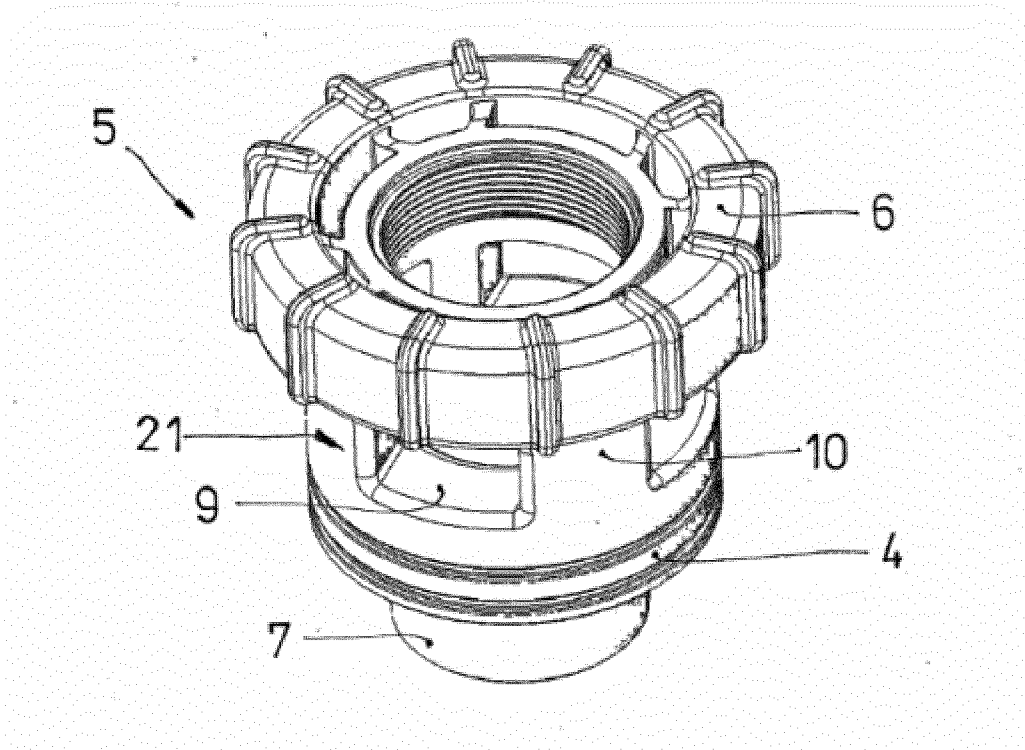
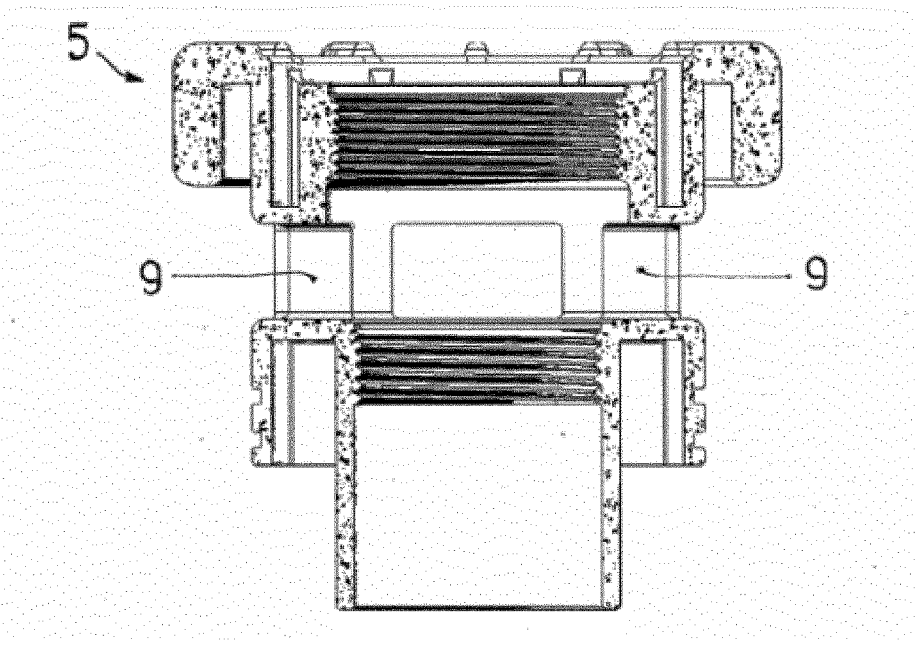
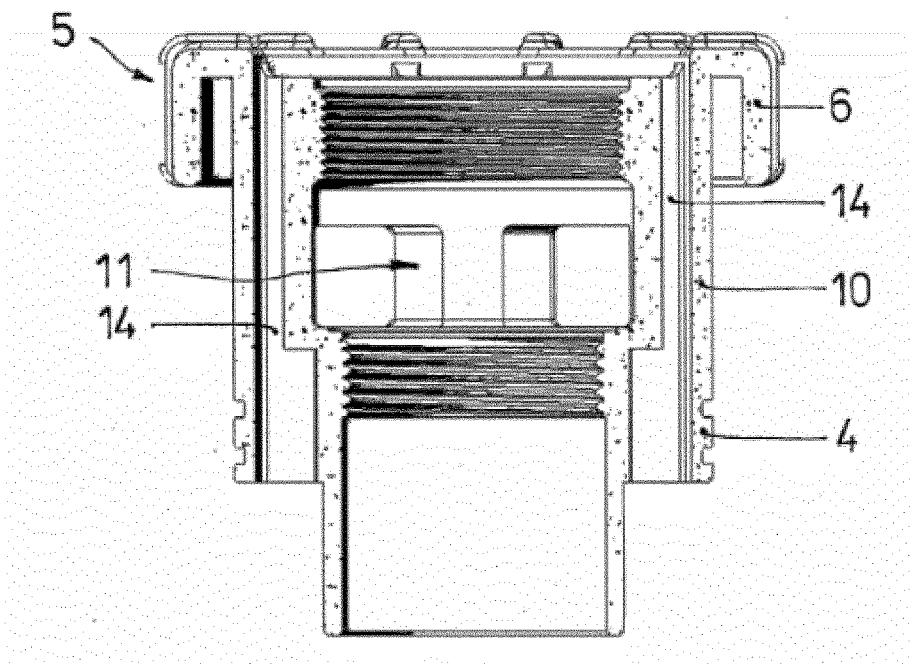


ABB. 9



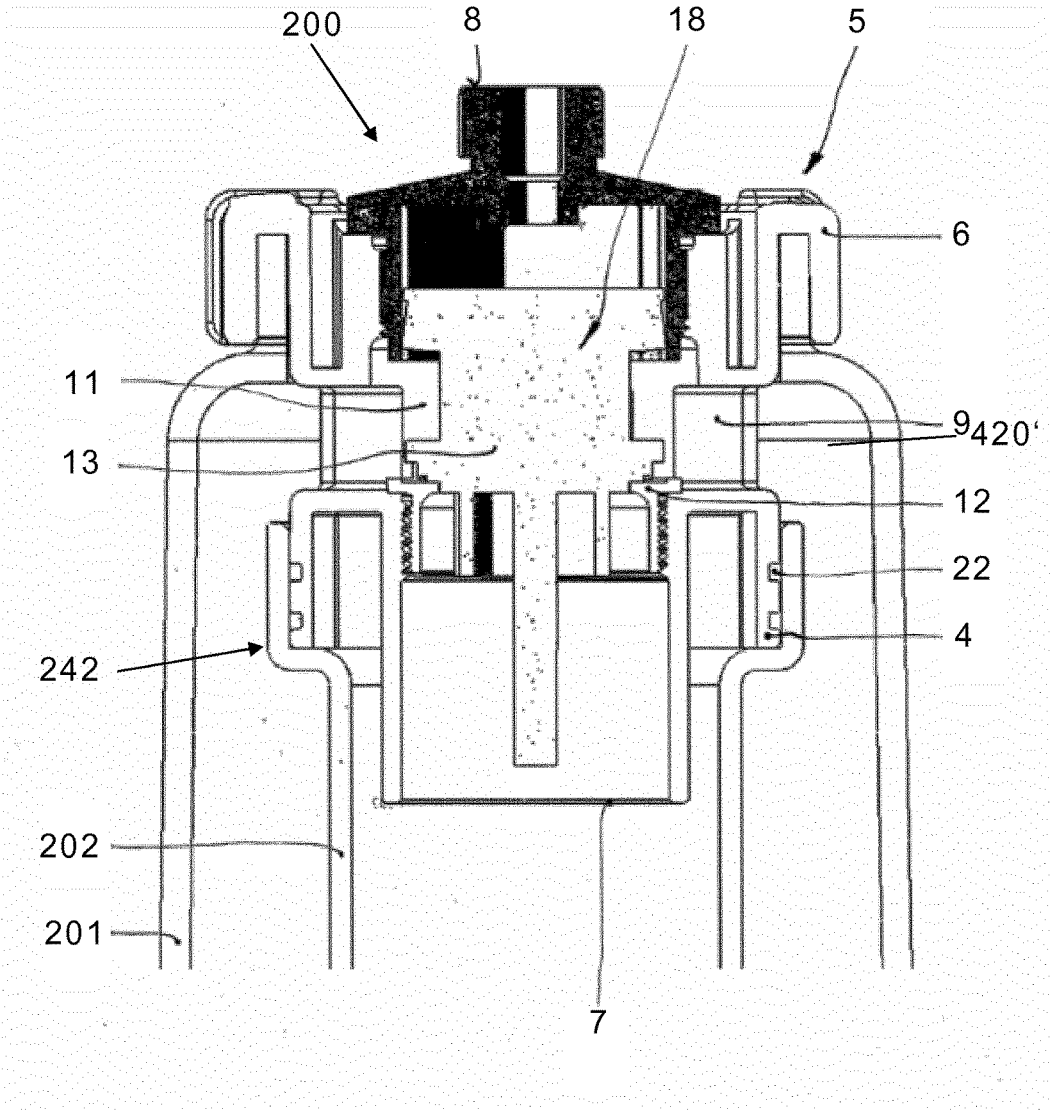


ABB. 12

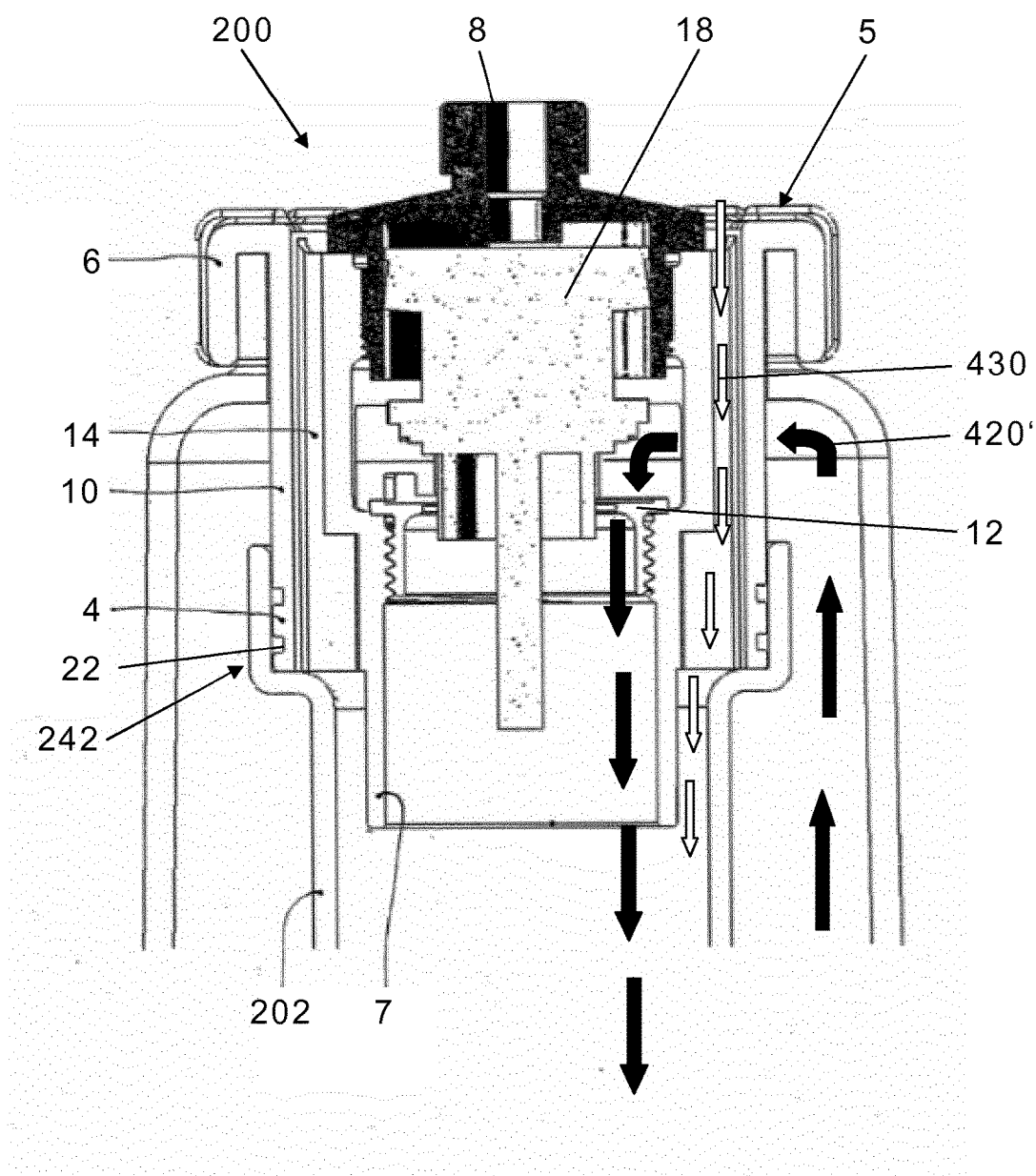


ABB. 13

PRESSURE-FLUSHING SYSTEM FOR A TOILET BOWL

FIELD OF THE INVENTION

[0001] The invention belongs to the field of sanitary technology and hygiene devices. It relates to a pressure flushing system for a toilet bowl and in particular to a constructive solution for a cistern mounting of the toilet pressure flushing system and to a constructive solution for an outflow module of this pressure flushing system, wherein the pressure flushing system flushes using a pressurized water wave referred to as a shockwave. The pressure flushing system is designed so that the flushing takes place with little noise development and low water consumption, wherein the avoidance of contamination of the drinking water by backflow in the event of malfunctions in the water supply system is ensured. In the documents of this application, the term "pressure flushing container" for toilet flushes is to be understood in the meaning of a sanitary fitting for toilet bowls.

BACKGROUND OF THE INVENTION

[0002] Pressure flushing devices are typically known in the sanitary field from the prior art, in which a self-closing pressure flushing valve having a complex structure and low flow rate is connected directly to the distribution system of the pressurized water supply or the drinking water line. Therefore, these pressure flushing devices are typically provided having the 1/4" fitting for pressurized water lines and typically only on flushing urinals. These pressure flushing devices are not suitable for toilet bowls, because they are not capable without a water collection pressure device of dispensing a sufficient water quantity within a short time.

[0003] Pressure flushing devices having pressurized water accumulators have been developed for flushing toilet bowls, which can dispense a specific water quantity in a specific time. A pressure flushing device is described in the prior art in the U.S. Pat. No. 6,470,505 B1, in which the flushing water flows with the aid of a flexible membrane by means of compressed air from a pressurized container via a connecting line and a valve into a toilet bowl. This system offers 2 L of water in three seconds, from which it is apparent that the initial water wave or the water front at the beginning of the water wave only flows out softly and does not have sufficient speed so that it is not sufficiently strong to reliably flush the toilet bowl.

[0004] Furthermore, a pressure flushing device is also described in FR 2 552 135, in which the flushing water also moves with the aid of compressed air from a pressurized container via a connecting line and a valve up to the toilet bowl. This system comprises a pressurized container having a capacity of 10 L, a rather thin flexible connecting line having a valve with inadequate water flow rate.

[0005] One significant disadvantage of pressure flushing devices as they are described in the published American and French documents is the fact that after the valve the speed of the initial water outflow is not sufficiently rapid, i.e., the initial water front of the water outflow is not steep enough to ensure the reliability in the case of a single flush.

[0006] From a design aspect, pressure flushing devices from the prior art are characterized by:

[0007] complex installation, because they consist of many structural parts, which have to be connected

gradually using pipe and hose systems up to the installation location, whereby reliable installation cannot be ensured in the long term;

[0008] complex service for the many fittings;

[0009] risk of contaminating the drinking water in the water supply system due to backflow in the event of malfunctions;

[0010] being bulky, because a comparatively large space has to be built-up.

[0011] The above-mentioned disadvantages are remedied by the invention. Using corresponding technical means, in a manner adapted to the respective given circumstances, design and service are simplified, noise and water consumption are minimized, the reliability of the flushing and design are improved, and contamination of the drinking water in water supply lines by backflow in the event of malfunctions is avoided, and also the built-up space for the pressure flushing device of the toilet facility is reduced.

[0012] The result of this invention is a toilet pressure flushing system comprising a cistern mounting and an outflow module for such a pressure flushing system, which provides a shockwave for flushing with low noise intensity and low water consumption at the same time. According to the invention, this pressure flushing system can be applied in or on corresponding toilet bowls.

SUMMARY OF THE INVENTION

[0013] According to the invention presented here, the above-mentioned disadvantages are remedied by the special design of the toilet pressure flushing system, in particular by the special design of the cistern mounting for a toilet pressure flushing system and by the special design of the outflow module for a toilet pressure flushing system, using at least one hydraulic gas accumulator and a pressurized water container. In this case, after the opening of a hydraulic outflow valve, the energy of a pressurized gas, in particular compressed air, in the hydraulic gas accumulator is used, which ensures a rapid pressurized outflow of the water "as a shockwave" from the pressurized water container into the toilet bowl having steep water front at the beginning of the water wave. All standing and hanging toilet bowls or toilet bowls mounted in another form are considered toilet bowls in the meaning of this invention.

[0014] The cistern mounting is designed so that it accommodates the pressurized water container and the gas accumulator or accumulators and fixedly connects them to one another. Moreover, it has installation elements, which are used for installation in a manner adapted to the respective surroundings, for example, in the region of the toilet bowl itself or on the wall behind the toilet bowl or also in the wall, in in-wall situations around the toilet bowl. A compact construction of the pressure flushing system and easy installation with few actions is possible using the mentioned cistern mounting. The cistern mounting is additionally designed as water-conducting comprising channels for the inflow and outflow of the flushing water and comprising connecting channels between the gas accumulator or accumulators and the pressurized water container, which further simplifies the installation of the toilet pressure flushing system and enables a very compact and very low-maintenance installation.

[0015] The outflow module comprises a pressurized water container, an outflow pipe in the pressurized water container, and a connection provided with a hydraulic outflow valve

between pressurized water container and outflow pipe, via which a regulated flushing procedure is ensured. Furthermore, a pipe interrupter of structural form A1 type DC (referred to as DC air filter or DC filter for short) is integrated, which reliably prevents the backflow of dirty water according to norm EN 1717 in the event of malfunctions in the pressurized water supply system or the drinking water line. Due to the integration of the outflow pipe into the pressurized water container, the noise development during the flushing procedure is damped by the surrounding pressurized water container having the water contained therein, so that in relation to typical pressure flushing devices, the noise intensity of the toilet pressure flushing system according to the invention is significantly reduced.

[0016] According to the invention, the cistern mounting of the toilet pressure flushing system comprises a carrier plate having an open outflow shell accessible from above, which is manufactured for the connection of an outflow module and has an outflow opening for placement of an outflow pipe in its base center. The carrier plate has at least one open inflow shell accessible from above, wherein each inflow shell is used for connecting a hydraulic gas accumulator and has an inlet/outlet opening on a peripheral section of the base, which is used both for the water inflow and also the water outflow into or out of, respectively, the hydraulic gas accumulator. The inlet/outlet opening is connected to an inflow channel, which has a water connection for the connection to a pressurized water supply line or drinking water supply line. The inlet/outlet opening of the open inflow shell is connected via a connecting channel or connecting pipe to an opening on the peripheral section of the base of the open outflow shell. The open outflow shell has attachment flanges for connecting the outflow module. The attachment of the outflow module to the outflow shell can be carried out with the aid of advantageous attachment technologies, wherein it is necessary for the connection to be pressure-tight. The open inflow shell(s) also has/have attachment flanges for the attachment of the hydraulic gas accumulator or accumulators.

[0017] The attachment of a hydraulic gas accumulator to the inflow shell can also be performed using advantageous attachment technologies, wherein it is necessary for the connection to be pressure-tight. The outflow opening in the base center of the outflow shell has a pressure seal for attaching an outflow pipe. In some embodiments, the outflow pipe is NOT a component of the cistern mounting. In other embodiments the outlet pipe IS a component of the cistern mounting. The cistern mounting can be used in conjunction with a toilet flushing system which can be based on the technology of pressure flushing. The proposed cistern mounting is also usable in conjunction with unpressurized flushing systems. The carrier plate is embodied variably with respect to respective solutions. It has, for example, thin walls having stabilizing ribs, for example, made of ribbed cast plastic. It is thus possible that the base of the outflow shell and/or the inflow shell protrudes out on the lower side of the carrier plate, for example, in the form of a spherical cap or a deep cylinder. For practical reasons, installation retention elements are located on the carrier plate.

[0018] In a special embodiment of the cistern mounting, for the purpose of optimum usage of the installation space which is provided for a cistern of a toilet pressure flushing device, two accessible open inflow shells—a right and a left—are provided on the top of the carrier plate for the

connection of one hydraulic gas accumulator in each case, wherein each of the inflow shells is connected to an inflow channel or to an inflow pipe having water connection. The inlet/outlet openings of the open inflow shell are connected via connecting channels or connecting pipes to supply openings at the base edge or on the peripheral section of the base of the open outflow shell. The outflow shell is located between the left and the right inflow shells.

[0019] The toilet pressure flushing system for toilet bowls using flushing shockwave is completed by two hydraulic gas accumulators having a predetermined water volume and compressed air volume, wherein the compressed air volume is filled using air or another favorable gas. The two hydraulic gas accumulators are provided via the cistern mounting with at least one water connection. The cistern mounting thus originally fulfills the function of a hydraulic connection for the water inflow out of the drinking water system into the hydraulic gas accumulators and for the water outflow into the toilet bowl via the outflow module.

[0020] The proposed cistern mountings can be used in conjunction with the outflow module and the hydraulic gas accumulators as a toilet pressure flushing system having pressure wave flushing at the consumer in toilet pressure flushing devices and can be mounted using two simple actions. The first action is the installation of the compact pressure flushing system having one end of the outflow pipe at the flushing opening in the ceramic toilet bowl. The second action is then the connection of the inflow channel of the cistern mounting to the pressurized water or drinking water system, in the standard construction embodiment having a pressure of approximately 0.15 to 0.5 MPa or also other pressures. If necessary, the water flow rate can also be optimally set.

[0021] The advantages of a cistern mounting for toilet pressure flushing devices having pressure wave flushing using an outflow module and hydraulic gas accumulators (referred to together as a pressure flushing system for toilet bowls or as a toilet pressure flushing system for short) are visibly effective according to the developed invention, which can also be noted from the outside. One essential advantage is the fact that the cistern mounting is universally usable for toilet pressure flushing devices having pressure wave flushing. It has a simple complete construction, whereby it can be installed easily and rapidly, operates reliably, and simplifies the maintenance, which enables its usage in corresponding pressure flushing devices having different types of toilet bowls of different manufacturers. A further essential advantage is the fact that thanks to the cistern mounting, on which the two most important components (outflow module and hydraulic gas accumulator(s)) are fastened, it is possible to fit the entire toilet pressure flushing system into the ceramic toilet bowl or into prepared existing ceramic water containers which are located in the region of the toilet bowl.

[0022] An advantage of the pressure flushing system as a whole is the special quality of the pressure wave flushing generated by this toilet pressure flushing system and the low noise development.

[0023] According to the invention, the outflow module of the toilet pressure flushing system having pressure wave flushing and low noise intensity comprises a vertically oriented pressurized water container, which is continuously flooded and in which a vertically arranged outflow pipe is located, which extends at its lower end beyond an opening

at the base of the pressurized water container and discharges into the toilet bowl. The pressurized water container has a slightly conical or cylindrical shape or another shape favorable with respect to pressure resistance. The axis of the outflow pipe is advantageously concentric with the axis of the pressurized water container but does not have to be.

[0024] The upper end of the outflow pipe is connected to a lower part of a pipe interrupter A1-DC (DC air filter or DC filter for short), for example, by means of an inserted connection and ring seals. The lower part of the DC air filter ends in an outlet connecting piece. An upper part of the DC air filter is connected to an upper part of the pressurized water container, for example, by means of a threaded connection or an adhesive bond. The upper part of the DC air filter is terminated using a flushing water regulator and/or control elements for opening and/or closing a hydraulic outflow valve.

[0025] The control elements of the hydraulic outflow valve for the opening and/or closing thereof can be located at various other points, which is dependent on the type of the hydraulic outflow valve used. They can be embodied according to a mechanical or electromechanical pressure, step, or hand lever principle with possible brake or with installed electronic time lock.

[0026] The flushing water regulator is connected to the upper part of the DC air filter by means of a threaded connection and restricts the raising of a valve core of the hydraulic outflow valve. By screwing the flushing water regulator further into or down into the upper part of the DC air filter, it is possible to adapt and optimize the total volume of the water flow rate of the hydraulic outflow valve, which is used for flushing the toilet bowl. The steepness of the water front of the shockwave for flushing toilet bowls can thus also be adapted to the design of the toilet bowls of various manufacturers and the shape of various toilet bowls can thus be taken into consideration.

[0027] Horizontal outflow channels, which connect the inner water volume in the pressurized water container to a space above the seat of the hydraulic outflow valve, which is located in a valve chamber of the hydraulic outflow valve, are located in the middle part of the DC air filter. The valve core is located in the valve chamber. A seat for the valve core of the hydraulic outflow valve is connected to the lower side of the DC air filter using a threaded connection. The middle part of the DC air filter has vertical connecting ribs, which connect the lower and upper parts of the DC air filter. Usually, these are four connecting ribs, but the number thereof is variable.

[0028] Vertical ventilation channels—usually four—are embodied extending over the upper part of the DC air filter, the connecting ribs, and the lower part of the DC air filter.

[0029] The pressurized water container of the outflow module is a design element for water volumes with continuous flooding after the completed installation. For the installation, the pressurized water container is connected via connecting flanges of the outflow shell of the cistern mounting to the cistern mounting and the outflow pipe is guided outward via the opening at the base of the pressurized water container. The pressurized water container is then closed using the upper part of the DC air filter. The toilet pressure flushing system using pressure wave flushing is completed by a hydraulic gas accumulator having a predetermined water volume and gas or compressed air volumes, which is also located on the cistern mounting, which has at least one

water connection. The use of two or more hydraulic gas accumulators is also expected.

[0030] The cistern thus originally fulfills the function of a hydraulic connection for the water supply from the water system into the hydraulic gas accumulators and the water outflow from the outflow module into the toilet bowl.

[0031] The material for producing a pressurized water container of the outflow module is, for example, polypropylene or a composite material based on polymer or the like. It can also be produced as a metal pressurized container or ceramic vessel comprising a plastic and/or metal reinforcement or carbon fiber reinforcement. The pressurized water container and/or even the outflow module itself can be embodied as a cartridge, which also corresponds to the essence of the pressurized water container with respect to the required shapes, properties, and uses. The cartridge solution also offers the option of simple exchange or replacement in the event of malfunctions, and also various ways of installation and actions, etc. The water volume can be 0.2 to 2 L or even more if necessary.

[0032] There is also great variability in the use of the outflow module as a component of a pressure flushing devices for toilets using a pressure wave flushing, which can be integrated into the ceramic body of the toilet bowl or can be installed in any other toilet, for example, in ceramic covers or covers made of corresponding usage material of the toilet, as a toilet bowl, or as a rear part of the toilet bowl or on/in the wall in the vicinity of a toilet bowl.

[0033] The protection of drinking water from contamination by backflow in the event of malfunctions, for example, in the event of partial vacuum in the drinking water line, is prescribed in EU norm EN 1717. It is also prescribed therein that for this purpose a DC filter can be provided as a safety device. The term DC filter is also known under the term “pipe interrupter having continuous atmospheric venting” or “pipe interrupter of structural form A1/type DC” or “DC pipe interrupter” in short. EN 1717 furthermore prescribes that a barrier cannot be provided in the flow direction after the DC filter, and the lower edge of the venting opening of the DC filter or its outlet connecting piece also has to be located at a minimum safety height of 0.150 m to 0.400 m above the flow level, depending on the corresponding norms in the individual countries and in consideration of the categorization of the pressurized water toilet flushing. Outlet-side lines of the toilet are to be produced so that backup of the wastewater cannot take place.

[0034] In the invention presented here, the protection of the drinking water from contamination due to backflow is ensured in the event of malfunctions, for example, in the event of partial vacuum in the drinking water line. For this purpose, a hydraulic outlet valve is implemented in the DC filter while maintaining the above-mentioned condition.

[0035] The invention does not preclude the option of using further hydraulic elements. In this case, for example, one of the following elements can be integrated into the pressurized water supply line: inlet shutoff valve, pressure reducer, backflow valve, reduction valve.

[0036] The advantages of an outflow module with simultaneous use of hydraulic gas accumulators according to the developed invention in a pressure flushing system for a toilet bowl are apparent from the effects which are recognizable solely externally: pressure wave flushing and low noise intensity during flushing. One essential advantage is the fact that the outflow module is universally usable in toilet

pressure flushing devices; i.e., also advantageously in pressure flushing devices for various toilet bowl types of various producers. It is a simple, complete design which enables simple, rapid, and reliable mounting and simplifies the service. The service work relates in principle to the removal of the flushing water regulator, whereby the entire valve chamber becomes accessible. The outflow pipe is also accessible due to the removal of the DC filter. A very essential advantage of the outflow module for toilet bowl pressure flushers using pressure wave flushing employing hydraulic gas accumulators according to this invention is the fact that the pressure flushing noises are substantially eliminated due to attachment of the outflow valve and the outflow pipe in the pressurized water container, since these function like a noise damper. This is a substantial advantage in relation to pressure flushers which are known from the prior art.

[0037] One essential advantage of the pressure flushing system having cistern mounting and outflow module is the fact that it is possible to fit the entire pressure flushing system, which enables the pressure wave flushing with low noise development, into a ceramic toilet bowl or into existing ceramic water containers which are located at the toilet bowl.

[0038] The principles of embodiments EN 14453 and EN 12541, which relate to avoidance measures against backup and for testing using partial vacuum, in conjunction with norm EN 1717, which relates to the protection of the drinking water in the pressurized water supply line from contaminants, are maintained by the invention, so that aspirating of the flushing water (water class 5) into the hydraulic inflow of the pressure flushing system of an individual cistern does not occur in the event of malfunctions (for example, upon the occurrence of a partial vacuum in the pressurized water supply line or in the event of backup of the flushing water above the water level of the toilet bowl).

[0039] The subject matter of the invention also meets the ecological criteria for issuing the environmental badge of EU number C (2013) 7317 for water toilets, for which it is defined that the required flushing action and cleanliness of the toilet bowl is achieved using a water quantity of 4 L.

BRIEF DESCRIPTION OF THE DRAWINGS

[0040] The design according to the invention of the pressure flushing system for toilet facilities having cistern mounting and outflow module, which enables a pressure wave flushing with lower noise intensity, is illustrated by way of example with reference to the appended drawings. The figures are only sketches and are not to scale. Identical elements are identified with identical reference signs in the figures.

[0041] FIG. 1 shows a perspective view from above of a cistern mounting.

[0042] FIG. 2 shows a perspective view from above of the cistern mounting having parts of an outflow module installed therein in a frame support design;

[0043] FIG. 3 shows the cistern mounting having parts installed therein of an outflow module in a frame support design in a perspective view from below;

[0044] FIG. 4 shows a side view of a pressure flushing system having cistern mounting, pressurized water container, gas accumulators, and outflow module, which is located in the wall frame for the toilet bowl fitting.

[0045] FIG. 5 shows a top view of the pressure flushing system in the wall frame from FIG. 4.

[0046] FIG. 6 shows an outflow module together with two hydraulic gas accumulators as part of the pressure flushing system.

[0047] FIG. 7 shows the outflow module from FIG. 6 in cross section from the side.

[0048] FIG. 8 shows a side view of a DC air filter of the outflow module.

[0049] FIG. 9 shows the DC air filter from FIG. 8 in a perspective view from above.

[0050] FIG. 10 shows the DC air filter from FIG. 8 with its vertical ventilation channels in a lateral cross section.

[0051] FIG. 11 shows the DC air filter from FIG. 10 in a second lateral cross section slightly pivoted from that of FIG. 10, so that its horizontal outflow channels are visible.

[0052] FIG. 12 shows the connection of the upper part of the pressurized water container to the DC air filter and outflow valve seated therein in the closed position in section.

[0053] FIG. 13 shows the connection of the upper part of the pressurized water container to the DC air filter having the outflow valve seated therein in the open position in section.

ILLUSTRATIVE EMBODIMENTS

[0054] It is obvious that individual embodiments of the invention are to be illustrative and are not restrictive for technical solutions. A person skilled in the art will be able to find or establish many equivalents to the specific embodiments of the invention using no more than routine experiments. Such equivalents also fall under the patent claims.

[0055] A specific embodiment of a cistern mounting **500** for a toilet water pressure flushing system **100** according to the invention using pressure wave flushing is shown in the example illustrated in FIGS. 1 to 3. The cistern mounting **500** for the toilet water pressure flushing system comprises a carrier plate **501** having a centrally arranged open outflow shell **502** accessible from above for accommodating an outflow module **200** (see FIG. 4), wherein the outflow shell **502** has an outflow opening **504** for the mounting of an outflow pipe **202** in its base **503** (FIG. 2). The carrier plate **501** furthermore has two open inflow shells **505** accessible from above, which are each used to accommodate one hydraulic gas accumulator **19** (see FIG. 4). Each inflow shell **505** has, in a peripheral section of its base **503'**, an associated inlet/outlet opening **506**, which is connected to an inflow channel **507**, which has a water connection **508**. The inlet/outlet openings **506** of the open inflow shell **505** are each connected via a connecting channel **510** (see FIG. 3) to a supply opening **509** in the peripheral section of the base **503** of the open outflow shell **502**. The open outflow shell **502** has an attachment flange **511** for the attachment of the outflow module **200**. The open inflow shell **505** also has attachment flanges **511'** for the attachment of the hydraulic gas accumulators **19**. The outflow opening **504** in the base center **503** of the outflow shell **502** has an overpressure seal **512** (see FIG. 2) for attaching the outflow pipe **202**. In this case, the outflow pipe **202** is not a component of the cistern mounting **500**. In alternative embodiments, the outflow pipe **202** is a component of the cistern mounting **500**.

[0056] The carrier plate **501** is formed thin-walled having stabilizing ribs **513**, preferably made of plastic. The base **503** of the outflow shell **502** and the base **503'** of the inflow shell **505** protrude at the lower side of the carrier plate **501** in the form of a spherical cap or a deep cylinder out of the carrier

plate **501** (FIG. 3). One water connection **508** is located on each of the left side and also the right side on the carrier plate **501**. However, it is sufficient if only one water connection **508** is used for the connection on/to a local pressurized water/drinking water line. For practical reasons, installation retention elements (not shown) are located on the carrier plate **501**.

[0057] A specific embodiment of the pressure flushing system **100** according to the invention for toilet bowls using pressure wave flushing is illustrated by way of example in FIGS. 4 and 5. A cistern mounting **500** having carrier plate **501** and hydraulic gas accumulators **19** installed thereon, and also a pressurized water container **1** installed thereon, which is associated in this example with an easily installable outflow module **200**, are shown. The outflow module **200** is attached to the outflow shell **502**, which is open on top, of the carrier plate **501**. The outflow module **200** comprises a pressurized water container **201**, which is continuously filled with water in the usage state, an outflow pipe **202**, a DC filter **205**, and a hydraulic outlet valve **18**. In addition, a hydraulic gas accumulator **19** is installed on each of the left and right inflow shells **505** and is attached with an included water volume and compressed air volume on the carrier plate **501** of the cistern mounting **500**.

[0058] FIG. 4 shows the position of the pressure flushing system **100** as a component of a pressure flushing device, which is arranged by means of a supporting construction, for example, in the wall behind the toilet bowl. The pressure flushing system **100** is fastened in a frame **90** of the supporting construction, so that a safety minimum height of 0.400 mm from the end of the jet above the overflow level of the toilet bowl is maintained in relation to the toilet bowl.

[0059] The functionality and the achieved action of the cistern mounting **500** according to the invention of the pressure flushing system **100** using pressure wave flushing can be explained as follows: The hydraulic gas accumulators **19** are filled with water, for example, from the drinking water line via the water connection or fittings **508** and via the supply channel or channels **507**. The water required for flushing passes via the connecting channels **510** in the carrier plate **501** of the cistern mounting **500**, on the one hand, via the hydraulic gas accumulators **19** into the pressurized water container **1**, on the other hand, at least during the initial filling also directly via the inflow channels **507** and the connecting channels **510** into the pressurized water container **1**.

[0060] A specific embodiment of the outflow module **200** according to the invention having pressure wave flushing and low noise development for toilet pressure flushing systems **100** is illustrated by way of example on the basis of FIGS. 6 and 7. The outflow module **200** for pressure flushing systems **100** for toilet bowls comprises a vertically oriented pressurized water container **201**, which is continuously filled with water **420** in the usage state. A vertically arranged outflow pipe **202** is located in the pressurized water container **201**. The outflow pipe **202** extends with its lower end **240** beyond the base **80** of the pressurized water container **201** and the base **503** of the outflow shell **502** into the outlet opening **504** of the cistern mounting **500** and either discharges itself via a toilet bowl fitting **20** into a toilet bowl **300** (FIG. 7), or discharges into a connecting pipe having toilet bowl fitting **20** (FIG. 7). The pressurized water container **201** has a shape tapering upward slightly conically in this example, but can also be formed cylindrical, conically

tapering in an inverted manner, or in a shape suitable in another manner for pressurized water. The axis **244** of the outflow pipe **202** is arranged concentrically with the axis **82** of the pressurized water container **201** in this example, but non-concentric arrangements are also conceivable.

[0061] Furthermore, the DC filter **5** and the hydraulic outflow valve **18** in the compact composite with the outflow module **200** are explained on the basis of FIGS. 7 and 8 to 13: The hydraulic outflow valve **18** is integrated into the DC filter **5**. The outflow pipe **202** is connected at its upper end **242** by means of an insertion connection **60** and ring seals **22** to a lower part **4** of a DC filter **5** (FIG. 7). The lower part **4** of the DC filter **5** is terminated using an outlet connecting piece **7**, which protrudes into the outflow pipe **202**. An upper part **6** of the DC filter **5** is connected to an upper part **84** of the pressurized water container **201** by means of a threaded connection and is terminated using a flushing water regulator **8** and using control elements (not shown, also called regulators) of the hydraulic outflow valve **18**, which are used for opening or closing the hydraulic outflow valve **18**. The flushing water regulator **8** is connected to the upper part **6** of the DC air filter **5** using a threaded connection.

[0062] A seat **12** of the hydraulic outflow valve **18** is also connected to the lower part **4** of the DC air filter **5** by means of a threaded connection. The valve seat **12** and a valve core **13** closing the valve seat in a leak-tight manner are located in a valve chamber **11** of the hydraulic outflow valve **18**. Horizontal outflow channels **9**, which connect the water volume in the interior of the pressurized water container **201** to a space above the valve seat **12**, are located in the middle part **21** of the DC air filter **5**. The middle part **21** of the DC air filter **5** has four vertical connecting ribs **10**, which connect the lower part **4** of the DC air filter **5** to the upper part **6** of the DC air filter **5** and separate the outflow channels **9** from one another. Four vertical ventilation channels **14** extend above the upper part **6** of the DC air filter **5** along the connecting ribs **10** into the lower part **4** of the DC air filter **5**.

[0063] The implementation of the outflow module **200** in a toilet pressure flushing system having pressure wave flushing and low noise intensity is described hereafter on the basis of FIGS. 4, 6, and 7. The outflow module **200** having the pressurized water container **201** with continuous flow, the outflow pipe **202**, the DC air filter **5**, and the hydraulic outflow valve **18** is connected by installation to the carrier plate **501** of the cistern mounting **500**. In this case, the outflow pipe **202** is inserted via an opening on the base **80** of the pressurized water container **501** into an outflow opening **504** of the cistern mounting **500** and the pressurized water container **501** is implemented via connecting flanges **511** of the carrier plate **501** in the cistern mounting **500**. An outflow part at the base **80** of the pressurized water container **201** has connecting surfaces **15**, which are used for a connection to the cistern mounting **500**. It can be inferred from the figures that the pressure flushing system **100** for toilet bowls having pressure wave flushing is completed by two hydraulic gas accumulators **19** having a predetermined water volume **420** and compressed air volume **400**, which are also connected to the cistern mounting **500** and via this to two water connections **8**. The water inflow to the hydraulic gas accumulators **19** and the water outflow via the outflow module **200** into the toilet bowl are effectuated via the cistern mounting **500**. The position of the outflow module as a component of an in-wall pressure flushing

system having pressure wave flushing comprising an in-wall supporting frame **90** in the wall behind the toilet bowl **300** can be seen from FIGS. **4** and **7**. It is apparent that the lower edge of the outlet connecting piece **7** of the DC air filter **5** is located at a minimum safety height zh of **0.400 m** above flow level **301** in the toilet bowl **300**.

[0064] The functionality and achieved effect of the outflow module **200**, which is implemented in a pressure flushing system **100** for toilet bowls using pressure wave flushing, can be explained as follows according to the invention: The water which is required for flushing enters the outflow module **200** from the hydraulic gas accumulators **19**. For this purpose, the water flows out of the hydraulic gas accumulators **19** via connecting channels **510** into the cistern mounting **500** and via the outflow shell **502** in the base region of the pressurized water container **501** into the pressurized water container **201** and continuously floods the pressurized water container **1**. Upon opening of the hydraulic outflow valve **18**, the water from the pressurized water container **1** passes via horizontal outflow channels **9** of the DC air filter **5** into the valve chamber **11** and then via the valve seat **12** by means of the outlet connecting piece **7** into the outflow pipe **202** and ends in the toilet bowl.

[0065] In the event of malfunctions (partial vacuum in the water supply line and risk of backflow of wastewater via the flow level **301** of the toilet bowl **300** upon opening of the hydraulic outflow valve **18**), atmospheric air is aspirated via the vertical ventilation channels **14** in the upper part **6** of the DC air filter **5** and flows through the vertical ventilation channels **14** along the connecting ribs **10** and also through the lower part **4** of the DC air filter **5**, wherein the aspirated air flows further through the gap between the outflow pipe **202** and the outlet connecting piece **7**. The aspirated air flows further through the outlet connecting piece **7** upward in the direction of valve chamber **11** and through the horizontal outflow channels **9** into the pressurized water container **1**. The aspirated air then passes via channels **510**, **507** in the cistern mounting **500** and the water connections **508** into the water supply line. Soiling of the drinking water due to backflow of dirty water can thus be reliably avoided.

[0066] A through-flow chamber **11**, which connects the water container **1** to the outlet pipe **2** and in which an outlet valve **18** for opening and closing the through flow is arranged, is located in the middle part **12** of the DC-L **5**. The outlet valve comprises a valve seat **12** and a valve closure **13**. The flow rate of the water which flows from the water container **1** into the outflow pipe **2** can be regulated via the lifting height of the valve closure **13**. The lifting height is settable by means of the flushing water regulator **8**, which is screwed from above into the upper part **6** of the DC-L: The further the regulator is screwed in, the less is the lifting height, and the less is the water quantity which can flow through the valve from the water container into the outlet pipe. The through-flow chamber **11** in the middle part of the DC-L **5** is delimited in relation to the water container **1** by vertical ribs **10**, which connect the upper part **6** to the lower part **4** of the DC-L **5** and between which horizontal through-flow channels **9** enable the inflow of water from the water container **1** into the through-flow chamber **11** via the valve seat **12** and, with open valve **18**, further into the outflow pipe **2**. Regulator parts of the hydraulic outlet valve **18**, which effectuate its opening and closing (not shown), can be designed in various ways and can be arranged at various locations, as is readily known for a person skilled in the art

from the prior art and can be implemented in conjunction with the hydraulic outlet valve **18** disclosed here. For example, they can be designed as mechanical or electromechanical according to the pressure, step, or hand lever principle with or without brake or time lock. The water container is permanently filled with water, up to the top, so that the through-flow chamber **11** is also permanently filled with water.

[0067] The functionality and mode of operation of the pressure flushing system **100** will be explained once again on the basis of the cross-sectional view of the pressure flushing system **100** of FIG. **5**: When the pressure flushing system is first put into use, water firstly flows, for example, from the local water line system (arrow A)—in this example via both water connections **508** into the supply channels **507** of the flushing system **100**. From there, it flows further via the supply-outflow opening **506** in the inflow shell **505** of the cistern mounting **500** into the gas accumulators **19** (arrows B). The water (arrows B) compresses the gas **400** (usually air) located in the gas accumulators there until the water has reached its maximum water level **420** and the water **420** in the gas accumulators **19** and also the gas **400** above the water **420** are at the same pressure as prevails in the local water line (generally typically 3-6 bar). Moreover, water flows simultaneously via the supply channels **507** and further through the connecting channels **510** connected thereto (arrows C) and flows further through supply openings **509** in the outflow shell **502** of the cistern mounting **500** into the pressurized water container **201** of the outflow module **200** (arrows D). The water flows until the pressurized water container **201** is completely filled, wherein the air contained in the pressurized water container can escape via the ventilation channels **14** of the DC filter **5**. Furthermore, the space above the valve seat **12** is also filled with water via the horizontal outflow channels **9** in the DC filter until the water **420** in the pressurized water container **201** is also under the pressure as prevails in the local water line.

[0068] If the hydraulic outflow valve **18** is opened, the water which is required for flushing passes from the pressurized water container **501** via horizontal outflow channels **9** of the DC air filter **5**, via the valve chamber **11**, and via the valve seat **12** by means of the outlet connecting piece **7** into the outflow pipe **202** and ends in the toilet bowl **300**. The same water quantity flows in out of the hydraulic gas accumulators **19** into the outflow module **200**, wherein the compressed gas/the compressed air expands and transmits this pressure energy to the flushing water, so that pressure wave flushing results. The water flowing in flows out of the hydraulic gas accumulators **19** via the connecting channels **510** into the cistern mounting **500** and via the outflow shell **502** in the base region of the pressurized water container **501** into the pressurized water container **201**. The pressurized water container **1** remains permanently flooded due to the flowing in. Water flows simultaneously out of the local drinking water/pressurized water line via the water connections **508** and the inflow channels **507** into the gas accumulators **19** of the pressurized water flushing system **100**, and does so until water and gas or air in the gas accumulators and the water in the pressurized water container again have the same pressure as the water in the local drinking water/pressurized water line.

[0069] The pressure flushing system **100** for toilet bowls having a cistern mounting **500** and an outflow module **200**, as illustrated above and wherein the outflow module **200**

comprises a vertically oriented pressurized water container **501** and an outflow pipe **502**, a hydraulic outflow valve **18**, and a DC pipe interrupter **5**, enable a pressure wave flushing having steep water front, whereby flushing can be performed very efficiently using small water quantities. The outflow pipe **502** is arranged vertically in the pressurized water container **501** and protrudes at the base out of the pressurized water container **201** for a flow connection to the toilet bowl, whereby a low noise development is implemented during flushing. The outflow module **200** is held by the cistern mounting **500**, which also carries a gas accumulator **19**. The cistern mounting **500** is designed as water-conducting and has a water connection **8** for the connection to a drinking water line or the like and connecting channels **507**, **510**, which fluidically connect the pressurized water container **501** and the gas accumulator **19**. The pressurized water flushing is very compact and is also suitable for retrofitting in existing facilities due to the cistern mounting **500**, which is designed as water-conducting. The pressure flushing system **100** meets the norm EN 1717 due to the integrated DC filter.

[0070] It is clear to a person skilled in the art that and the manner in which the described embodiments and/or the details described on the basis of the exemplary embodiments may be reasonably combined in the scope of the invention defined by the patent claims. However, it is not possible for reasons of space to illustrate all possible and reasonable combinations in detail in the figures and/or describe them.

INDUSTRIAL APPLICABILITY

[0071] The pressure flushing system **100** having pressure wave flushing and low noise intensity comprising the pressure cistern **50** having the cistern mounting **500** and the outflow module **200**, and also the outflow module **200** according to the invention presented here per se and the cistern mounting **500** for cisterns for pressure flushing devices for toilet bowls in conjunction with the outflow module **200** and the hydraulic gas accumulators find use in applications of sanitary technology and in hygiene devices.

1. An outflow module (**200**) for cisterns for toilet pressure flushing devices, characterized in that it comprises a vertically oriented pressurized water container (**201**), which is ideally continuously flooded with water in the operating state

and vertically arranged within the pressurized water container an outflow pipe (**202**), which extends with its lower part (**240**) beyond an opening (**504**) at the base of the pressurized water container (**201**),

wherein an upper part of the outflow pipe (**202**) is connected to a lower part (**4**) of a DC air filter (**5**),

the upper part (**6**) of which DC air filter is connected to an upper part (**84**) of the pressurized water container (**201**), and wherein the lower part (**4**) of the DC air filter (**5**) ends in an outlet connecting piece (**7**), which discharges into the outflow pipe (**202**), and the upper part (**6**) of the DC air filter (**5**) is terminated using a flushing water regulator (**8**) and/or using control elements of a hydraulic outflow valve (**18**),

wherein, in the middle part (**21**) of the DC air filter (**5**),

horizontal outflow channels (**9**) are located, which are separated from one another by vertical connecting ribs (**10**) and which are connected to the interior of the pressurized water container (**201**),

and a valve chamber (**11**) and a valve seat (**12**) of the hydraulic outflow valve (**18**) are located, wherein a valve core (**13**) is located in the valve chamber (**11**) and wherein vertical ventilation channels (**14**) extend over the upper part (**6**) of the DC air filter (**5**), the connecting ribs (**10**), and over the lower part (**4**) of the DC air filter (**5**).

2. The outflow module (**200**) according to claim 1, characterized in that a drain part at the base (**80**) of the pressurized water container (**201**) has connecting surfaces (**15**), which are used for a connection to a cistern mounting (**500**).

3. The outflow module (**200**) according to claim 1, characterized in that an upper end (**242**) of the outflow pipe (**202**) is connected by means of an insertion connection (**60**) and ring seals (**22**) to the lower part (**4**) of the DC air filter (**5**).

4. The outflow module (**200**) according to claim 1, characterized in that the valve seat (**12**) of the hydraulic outflow valve (**18**) is connected to the lower part (**4**) of the DC air filter (**5**) by a threaded connection.

5. The outflow module (**200**) according to claim 1, characterized in that the flushing water regulator (**8**) is connected to the upper part (**6**) of the DC air filter (**5**) by a threaded connection.

6. The outflow module (**200**) according to claim 1, characterized in that the upper part (**6**) of the DC air filter (**5**) is connected to the upper part of the pressurized water container (**1**) by a threaded connection.

7. A cistern mounting (**500**) for toilet pressure flushing devices using pressure wave flushing, characterized in that the cistern mounting (**500**) is a carrier plate (**1**) comprising an open outflow shell (**502**) accessible from above for attaching an outflow module (**200**), which has an outflow opening (**504**) in the center of its base (**503**) for inserting an outflow pipe (**202**) and at least one inflow opening (**509**) on the peripheral section of the base (**503**), wherein the carrier plate (**1**) furthermore has at least one open inflow shell (**505**) accessible from above for attaching a hydraulic gas accumulator, and wherein an inlet/outlet opening (**506**) is located on the peripheral section of the base (**503'**) of the open inflow shell (**505**), which inlet/outlet opening is connected to an inflow channel (**507**) or an inflow pipe of the cistern mounting (**500**), which has a water connection (**8**), wherein the inlet and/or outlet opening (**506**) of the open inflow shell (**505**) is connected via a connecting channel (**510**) or a connecting pipe of the cistern mounting to the at least one inflow opening (**509**) on the peripheral section of the base (**503**) of the open outflow shell (**502**).

8. The cistern mounting (**500**) according to claim 7, characterized in that the open outflow shell (**502**) has attachment flanges (**511**), which are used for attaching the outflow module (**200**).

9. The cistern mounting (**500**) according to claim 7, characterized in that the at least one open inflow shell (**505**) has attachment flanges (**511'**), which are used for attaching the hydraulic gas accumulator (**19**).

10. The cistern mounting (**500**) according to claim 7, characterized in that the outflow opening (**504**) in the center of the base (**503**) of the outflow shell (**502**) has a seal (**512**), which is used for the pressure-tight insertion of the outflow pipe (**202**).

11. The cistern mounting (**500**) according to claim 7, characterized in that the carrier plate (**501**) has thin walls and stabilizing ribs (**513**).

12. The cistern mounting (500) according to claim 7, characterized in that the base (503, 503') of the outflow shell (502) and/or the inflow shell (505) protrude downward out of the carrier plate (501).

13. The cistern mounting (500) according to claim 7, characterized in that two accessible open inflow shells (505) are located on top on the carrier plate (501), which are used for the respective attachment of a hydraulic gas accumulator (19), wherein each of the inflow shells (505) is connected to an inflow channel (7) or an inflow pipe having a water connection (508), wherein the inlet/outlet openings (506) of the open inflow shells (505) are each connected via connecting channels (510) or connecting pipes to an inflow opening (509) on the peripheral section of the base (503) of the open outflow shell (502).

14. The cistern mounting (500) according to claim 7, characterized in that the carrier plate (501) is fixedly connected to the outflow pipe (202).

15. The cistern mounting (500) according to any one of claims 7 to 14, characterized in that the carrier plate (501) has installation retention elements.

16. The cistern mounting (500) according to any one of claims 7 to 13, characterized in that the carrier plate (501) is manufactured in one piece, preferably as an injection-molded part or cast part.

17. A pressurized water flushing system (100) for toilet bowls comprising a pressurized water container (201) and a mounting for the pressurized water container (201) and also comprising an outflow pipe (202) and a hydraulic outflow valve (18), which is used for the regulated drainage of flushing water out of the pressurized water container (201) via the outflow pipe (202) into the toilet bowl (300), characterized in that the mounting is a cistern mounting (500) according to any one of claims 7 to 16 and pressurized water container (201), outflow pipe (202), and hydraulic outflow valve (18) are components of an outflow module (200) according to any one of claims 1 to 6, and it comprises at least one hydraulic gas accumulator (19), which is connected on the outflow side via the cistern mounting (500) to the pressurized water container (201) and is connectable on the inflow side via the cistern mounting (500) to a pressurized water supply system.

* * * * *