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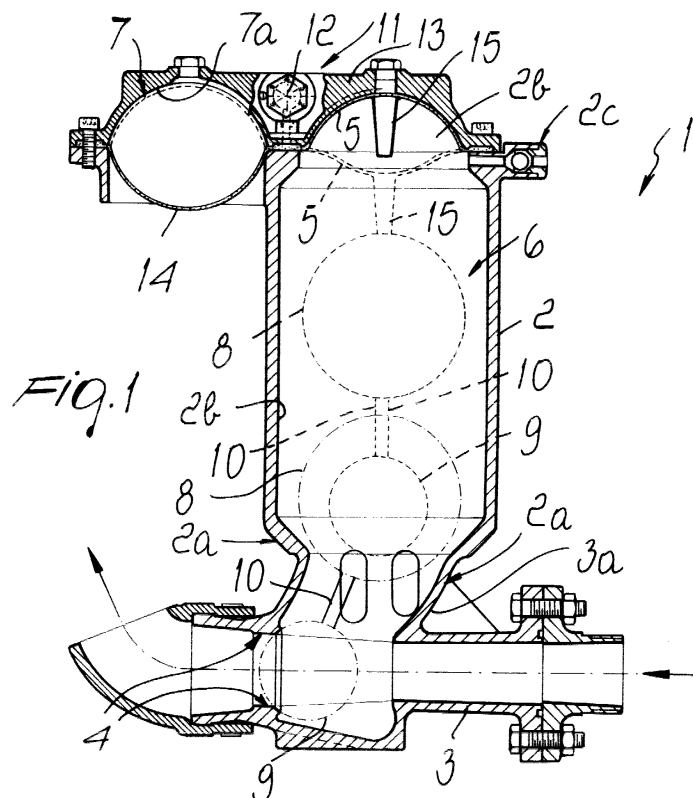
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(54) Intermittently operating flushing valve

(57) An intermittently operating flushing valve (1) comprising a container valve body (2) which is internally hollow and provided with a vent valve (2c) arranged above, and connected at its base (2a) to, a pipe (3) for the passage of a stream of liquid that arrives from a

pumping means, the pipe (3) being provided with a Venturi tube-like choke (4) located directly downstream of the valve body (2), which has, in its upper inner portion, a first membrane (5) for pushing a flow control element (6) composed of at least one pair of spherical bodies (8,9).



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Description

[0001] The present invention relates to a flushing valve.

[0002] In storm sewage and wastewater management systems, sump pits are placed at preset intervals along the extension of the pipes.

[0003] Due to the sedimentation caused by the generally static condition of the collected water before it is sent to downstream destinations, deposits form in these sump pits, accumulate on their bottom and also cling to their walls, producing a hygienic and sanitary condition which is intolerable for currently applicable statutory provisions.

[0004] Currently, in order to obviate this drawback, flushing valves are used which are immersed in said sump pits and are associated with a conventional submerged pump adapted to send the collected wastewater to the downstream piping, allow to automatically activate a jet of water which is adapted to keep under agitation the overall mass of water collected in the sump pits, thus greatly limiting deposition phenomena.

[0005] Conventional valves substantially consist of a body inside which there is provided a chamber in which a ball of heavy material, usually a metallic one, is placed by gravity; said ball is adapted to act as a flow control element for a Venturi tube-like forced passage formed in the piping that arrives from the pump and passes through said valve body.

[0006] The suction generated downstream of the choke of said forced passage determined by the flow of the water arriving from the pump, draws upward the ball, which normally lies in a chamber formed under the pipe, the suction drawing it so as to close the passage section of the pipe, automatically interrupting the flow of water and thus creating a multiplicity of pulsed jets which keep in motion the overall mass of water being present in the sump pits.

[0007] More specifically, said ball is first raised by an elastic membrane which is hermetically coupled on the bottom of the chamber that accommodates it and is gradually inflated by a flow of oil contained in a suitably provided reservoir embedded in the valve body; said oil flow is triggered by the suction generated on the membrane by the Venturi tube-like passage and the lifting of said membrane gradually moves the ball towards the mouth of the forced passage: when the position of the ball is such that it interferes with the flow of water arriving from the pump, it is pushed, as mentioned, so as to block the mouth of said passage.

[0008] Although they provide a substantially satisfactory performance, conventional flushing valves are susceptible of further improvements, especially as regards their overall structure, which, in conventional valves, is substantially complicated and ultimately fragile and therefore expensive.

[0009] Conventional valves in fact entail fitting on the valve body bellows made of elastomeric material which

constitute the oil containment chamber and which, in the long term, also due to their stable placement in an aggressive environment, deteriorate and have to be replaced, wasting time for their recovery from the sump pits, for their indispensable cleaning, for the repair operation and for their subsequent reinstallation.

[0010] Moreover, the heavy metal balls can be easily deteriorated by the liquids present in the sump pits and can be damaged by the violent impacts to which they are subjected when the water passage is closed; their consequent fall also damages the membranes with which conventional valves are provided.

[0011] The aim of the present invention is to eliminate the above-noted drawbacks of the prior art by providing a flushing valve which has a simple structure, is durable, has a low cost and does not have elements made of materials which can deteriorate due to use and permanence in a particularly aggressive environment.

[0012] This aim and these and other objects which will become better apparent hereinafter are achieved by a flushing valve, characterized in that it is constituted by a container valve body which is internally hollow and provided with a vent valve and is arranged above, and connected at its base to, a pipe for the passage of a stream of liquid that arrives from a pumping means provided with a Venturi tube-like choke located directly downstream of the valve body, which has, in its upper inner portion, a first membrane for pushing a flow control element for closing the choke, said flow control element normally floating in the hollow body, said first membrane being connected to at least one reservoir for containing incompressible liquid which is connected to the internal cavity of the body.

[0013] Advantageously, said flow control element is composed of at least one pair of spherical bodies which are interconnected by means of a wing, a first body acting as a float and a second one acting as ballast and closure for said Venturi tube-like choke.

[0014] Further characteristics and advantages of the present invention will become better apparent from the description of a preferred embodiment of a flushing valve, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

Figure 1 is a sectional view of the flushing valve according to the invention;

Figure 2 is an overall front view thereof.

[0015] With reference to the figures, 1 designates a flushing valve which is constituted by a container valve body 2 which is internally hollow, forming a chamber 2b, and is provided with a valve 2c for venting the air that can accumulate therein and is arranged on top of, and connected at its base 2a to, a pipe 3 in which a stream of liquid flows; in this specific case, said liquid is water which arrives from a pumping means which is conventional and therefore not shown and is immersed in a sump pit for collecting the so-called storm sewage or

wastewater.

[0016] The pipe 3 is provided with a choke or throttling 4 which shapes a Venturi tube and is arranged directly downstream of the valve body 2.

[0017] Said valve body has, in its inner upper portion, a first membrane 5 adapted to push on a flow control element 6 which controls said choke 4 and floating in the hollow body 2; the first membrane 5 is connected to at least one reservoir 7 for containing incompressible liquid, usually oil, which is connected to the internal chamber 2b of the valve body 2.

[0018] The flow control element 6 is composed of at least two bodies 8 and 9, both of which are preferably spherical, and which are interconnected by means of a wing 10: the first body 8 floats and the second body 9 acts as ballast and closes the Venturi tube-like choke 4; the diameters of the spherical bodies 8 and 9 are different one from the other and the diameter of the first body 8 is larger than the diameter of the second body 9.

[0019] The valve body 2 is connected to the pipe 3 by interposing a connecting first duct 3a having a calibrated diameter which is comprised between the diameters of the first spherical body 8 and of the second spherical body 9, so as to allow the passage only of the first spherical body 8 and retain the second body 9.

[0020] The reservoir 7 is connected to the internal chamber 2b of the valve body 2 by means of a corresponding second duct (not shown in the drawings) leading into an upper region for contact between the first membrane 5 and the top of the internal chamber 2b and whose cross-section passage is adjustable by way of corresponding throttling means 11 being substantially constituted by a cylindrical selector 12 which is mounted so as to rotate transversely and hermetically in said cross-section passage and has through holes having predefined diameters; the rotation of said selector aligns with said cross-section a hole having a selectable diameter.

[0021] In the preferred embodiment of the flushing valve 1, the reservoir 7 is arranged externally with respect to the chamber 2b of the valve body 2; moreover, said reservoir 7 and the top of the chamber 2b of the valve body 2 are formed contiguously in an element 13 for the upper closure of said body.

[0022] The reservoir 7 is composed of a hemispherical cavity 7a which is formed in the upper closure element 13 and is closed hermetically in a downward region by means of a second elastically deformable membrane 14.

[0023] Both said first membrane 5 and said second membrane 14 are shaped like a spherical dome and in an alternative embodiment of the invention can also be formed as a single monolithic body.

[0024] Finally, at least the first membrane 5 has, on the face directed towards the flow control element 6, a tooth 15 for contact with the first floating spherical body 8.

[0025] The operation of the invention is as follows: in

the initial condition, the submersion of the flushing valve 1 causes the inflow, into the chamber 2b of the valve body 2, of the liquid present in the sump pit, with automatic venting of the air that is present through the corresponding valve 2c and the consequent floating of the flow control element 6, thus making the pipe 3 and the choke 4 fully pervious.

[0026] When a flow of water is then sent by the pump (not shown) through the pipe 3 towards the water sump pit, the choke 4, being in practice a Venturi tube, produces a suction which diffuses inside said chamber 2b, drawing the first membrane 5 downward.

[0027] The gradual deformation of said membrane 5 in turn draws oil from the reservoir 7 through the corresponding duct, whose passage, and therefore outflow rate, is adjusted by acting on the cylindrical selector 12: the oil flows out into the chamber 2b, more specifically between the first membrane 5 and the top of said chamber, gradually deforming said first membrane 5.

[0028] Said first membrane, being in contact with the first spherical body 8 by way of the tooth 15, pushes it downward, assisted in this action by the weight of the second spherical ballast body 9 transmitted through the connecting wing 10.

[0029] When the second spherical body 9 has reached such a submersion level that it is influenced by the suction generated by the choke 4, it is drawn towards it until it arranges itself in front of it and closes it, interrupting the flow of water arriving from the pump and directed towards the sump pit.

[0030] The pressure created accordingly in the chamber 2b also acts on the membrane 5, which gradually returns the oil to the reservoir 7 until said membrane 5 is allowed to regain its initial position.

[0031] Once the thrust of the pump has ceased, the spherical bodies 8 and 9 also tend to rise, being drawn by the flotation of the first body 8, up to the initial position.

[0032] Every subsequent priming of the pump again determines the above described operation of the flushing valve 1, which accordingly produces a multiplicity of violent jets of water within the sump pits, keeping in motion the water collected therein and preventing the formation of deposits.

[0033] In practice it has been found that the described invention achieves the intended aim and objects.

[0034] The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims.

[0035] All the details may further be replaced with other technically equivalent ones.

[0036] In practice, the materials used, as well as the shapes and the dimensions, may be any according to requirements without thereby abandoning the scope of the protection of the appended claims.

[0037] The disclosures in Italian Patent Application No. MO2000A000098 from which this application claims priority are incorporated herein by reference.

[0038] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A flushing valve, **characterized in that** it is constituted by a container valve body (2), which is internally hollow and provided with a vent valve (2c), and is arranged above, and connected at its base (2a) to, a pipe (3) for the passage of a stream of liquid that arrives from a pumping means, said pipe (3) being provided with a Venturi tube-like choke (4) located directly downstream of said valve body (2), which has, in its upper inner portion, a first membrane (5) for pushing a flow control element (6) for closing said choke (4), said flow control element (6) normally floating in said hollow body (2), said first membrane (5) being connected to at least one reservoir (7) for containing incompressible liquid which is connected to said internal cavity (2b) of said body (2).
2. The flushing valve according to claim 1, **characterized in that** said flow control element (6) is composed of at least one pair of bodies (8, 9) which are interconnected by way of a wing (10), a first body (8) acting as a float and a second body (9) being spherical and acting as ballast and closure for said Venturi tube-like choke (4).
3. The flushing valve according to claim 2, **characterized in that** said first floating body (8) has a spherical shape.
4. The flushing valve according to claims 2 and 3, **characterized in that** the diameters of said spherical bodies (8, 9) are different one from the other, the diameter of said first body (8) being larger than the diameter of said second body (9).
5. The flushing valve according to the preceding claims, **characterized in that** said valve body (2) is connected to said pipe (3) by interposition of a connecting duct (3a) having a calibrated diameter.
6. The flushing valve according to the preceding claims, **characterized in that** the diameter of said first duct (3a) is comprised between the diameters of said first (8) and second (9) spherical bodies of the flow control element (6).
7. The flushing valve according to claim 1, **character-**

ized in that said reservoir (7) is connected to the internal cavity (2b) of said valve body (2) by way of a corresponding second duct which leads to an upper region of contact between said membrane means (5) and the top of the internal cavity (2b) of the valve body (2).

8. The flushing valve according to claims 1 and 7, **characterized in that** the cross-section passage of said second duct can be adjusted by way of corresponding throttling means (11).
9. The flushing valve according to claim 8, **characterized in that** said means (11) for throttling the cross-section passage of said second duct is constituted by a cylindrical selector (12) which is mounted so as to be rotatable transversely and hermetically in said cross-section passage and is provided with through holes having predefined diameters, the rotation of said selector (12) aligning with said cross-section passage a hole having a selectable diameter.
10. The flushing valve according to claim 1, **characterized in that** said reservoir (7) is arranged externally with respect to said cavity (2b) of the valve body (2).
11. The flushing valve according to claims 1, 7 and 10, **characterized in that** said reservoir (7) and the top of the cavity (2b) of the valve body (2) are formed contiguously in an element (13) for the upper closure of said valve body (2).
12. The flushing valve according to the preceding claims, **characterized in that** said reservoir (7) is composed of a hemispherical cavity (7a) which is formed in said upper closure element (13) and is closed hermetically in a downward region with a second elastically deformable membrane (14).
13. The flushing valve according to claims 1 and 12, **characterized in that** said first (5) and second (14) membranes are shaped like spherical domes.
14. The flushing valve according to claims 1 and 13, **characterized in that** at least said first membrane (5) has, on its face directed towards said flow control element (6), a tooth (15) for contact with said first floating spherical body (8).
15. The flushing valve according to claims 13 and 14, **characterized in that** said first (5) and second (14) membranes are formed as a single monolithic body.

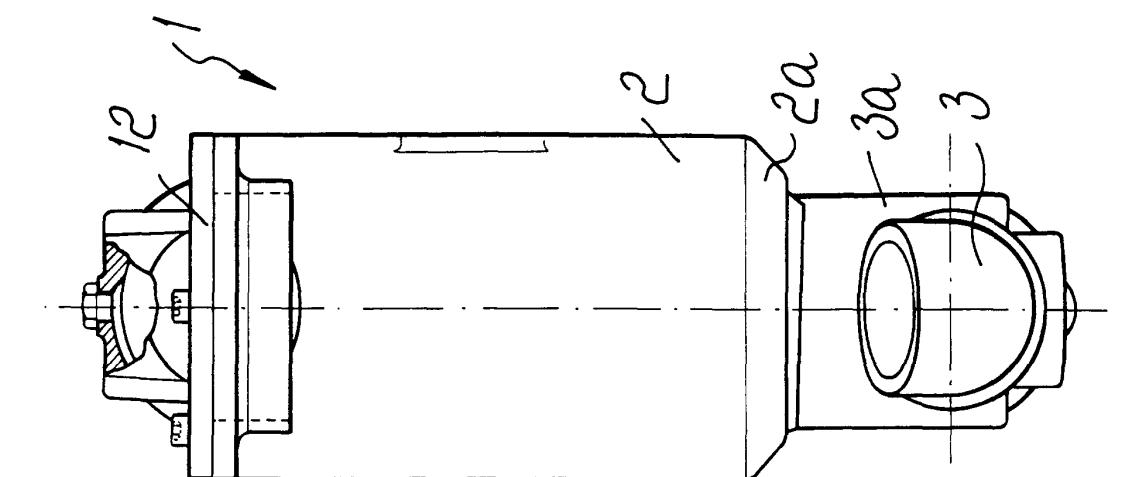


Fig. 2

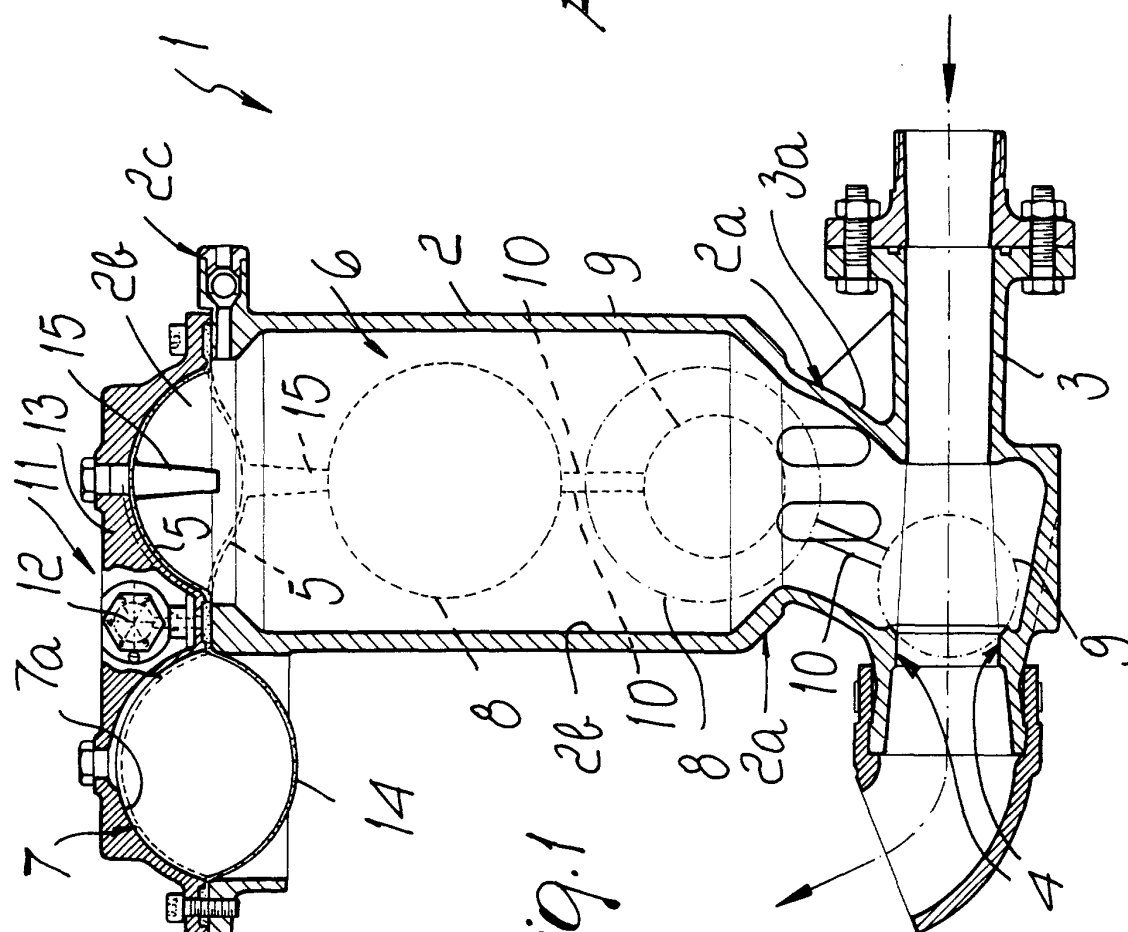


Fig. 1



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EUROPEAN SEARCH REPORT

Application Number
EP 01 11 0148

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	DE 197 54 751 C (KLEIN SCHANZLIN & BECKER AG) 18 March 1999 (1999-03-18) * the whole document *	1	E03F5/22
A	EP 0 384 903 A (FLYGT AB) 29 August 1990 (1990-08-29) * the whole document *	1	
A	EP 0 623 713 A (FLYGT AB ITT) 9 November 1994 (1994-11-09) * the whole document *	1	
A	WO 99 54565 A (SZUSTER MIROSDAW) 28 October 1999 (1999-10-28) * page 4, line 36 - page 5, line 16; figures 1,2 *	1	
A	EP 0 359 730 A (FLYGT AB) 21 March 1990 (1990-03-21) * the whole document *	1	
A	EP 0 594 548 A (FLYGT AB ITT) 27 April 1994 (1994-04-27) * the whole document *	1	TECHNICAL FIELDS SEARCHED (Int.Cl.7) E03F
The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 16 August 2001	Examiner Ellis, D
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 01 11 0148

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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16-08-2001

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 19754751 C	18-03-1999	NONE	
EP 0384903 A	29-08-1990	SE 463218 B AT 88231 T AU 628425 B AU 4549389 A CA 2009906 A DE 69001311 D DE 69001311 T DK 384903 T JP 2111630 C JP 2252994 A JP 8030476 B SE 8900597 A US 4948342 A	22-10-1990 15-04-1993 17-09-1992 30-08-1990 21-08-1990 19-05-1993 26-08-1993 10-05-1993 21-11-1996 11-10-1990 27-03-1996 22-08-1990 14-08-1990
EP 0623713 A	09-11-1994	SE 501192 C AU 674561 B AU 5789394 A CA 2122087 A DE 69419562 D DE 69419562 T DK 623713 T JP 2607839 B JP 7076873 A NO 941463 A SE 9301459 A	05-12-1994 02-01-1997 03-11-1994 30-10-1994 26-08-1999 03-02-2000 29-11-1999 07-05-1997 20-03-1995 31-10-1994 30-10-1994
WO 9954565 A	28-10-1999	PL 326007 A AU 3177399 A	25-10-1999 08-11-1999
EP 0359730 A	21-03-1990	SE 461993 B AT 66269 T AU 614658 B AU 4012889 A CA 1315176 A DE 68900206 D DK 448389 A JP 2211398 A US 4925375 A	23-04-1990 15-08-1991 05-09-1991 22-03-1990 30-03-1993 19-09-1991 14-03-1990 22-08-1990 15-05-1990
EP 0594548 A	27-04-1994	SE 469844 B DE 69313069 D DE 69313069 T SE 9202759 A	27-09-1993 18-09-1997 19-02-1998 27-09-1993

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