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(54) **OVERFLOW DEVICE OF A FLUSHING TANK AND FLUSH VALVE WITH AN OVERFLOW DEVICE FOR A FLUSHING TANK**

(57) An overflow device (2) for a flushing tank for sanitary appliances, comprises an overflow tube (15), extending along an axis (A) between a top end (16), open for communicating in use with the inside of the flushing tank in which the device is installed, and a lower end (17), connectable to a drain hole of the flushing tank; the tube (15) comprises a narrowing (20), positioned in an intermediate position between the ends (16, 17) of the tube (15) and between an upper tube portion (21) and a lower tube portion (22), the narrowing (20) having an internal cross-section smaller than the internal cross-section of at least one of the upper tube portion (21) and the lower tube portions (22).

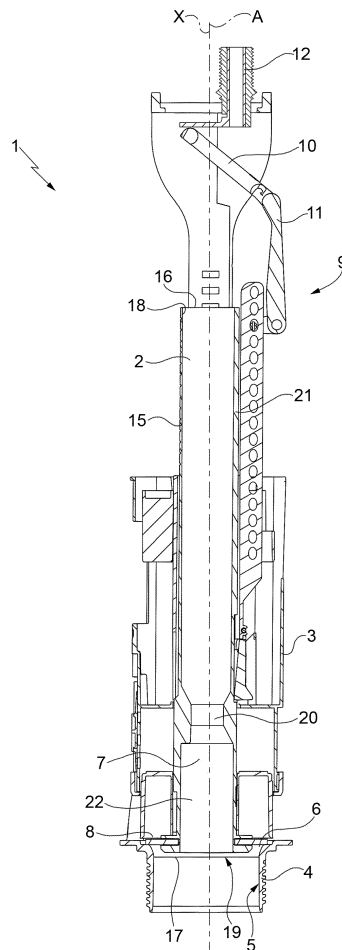


FIG. 1

Description

[0001] The present invention relates to an overflow device of a flushing tank for sanitary appliances (toilets, urinals, etc.), and a flush valve of a flushing tank provided with such a device.

[0002] In general, a flushing tank is provided with a flush valve, which is actuated to flush the water contained in the tank into the sanitary appliance to be flushed, and a feed mechanism, which fills the tank up to a predetermined level, after each activation of the flush valve.

[0003] A flush valve of a flushing tank commonly comprises a support structure, which can be fixed to a bottom wall of the tank and is provided with a drain hole bordered by a sealing seat, and a valve body housed so as to slide in the support structure and provided at the bottom with a shutter cooperating with the sealing seat to close the drain hole; the valve body is lifted by means of suitable actuator members controlled by the user.

[0004] The valve body is usually a tubular element, having open axial ends, which also performs the function of the overflow tube.

[0005] An overflow device is in fact necessary to avoid that, for example, following a failure of the feed mechanism and/or of the flush valve, the water continues to enter the tank exceeding the maximum predetermined level and then overflowing from the tank, flooding the room which the tank is installed in.

[0006] The known flushing devices provided with overflow tubes are generally satisfactory, but still have room for improvement.

[0007] For example, since the flow of water which the overflow tube is able to dispose of essentially depends on the size of the tube, in particular on the inner cross-section and the length of the same, and/or on the ratio between length and cross-section of the tube, to ensure an adequate flow it is necessary to provide suitably sized tubes, but this can lead to problems of cost and/or space.

[0008] In addition, under certain conditions turbulence phenomena may occur at the entrance of the overflow tube, phenomena which reduce the theoretical efficiency of the overflow tube.

[0009] In particular, it has been found that the flow of water entering the overflow tube brings with it a certain amount of air, which reduces the flow of water running through the tube. Air also enters the tube from the bottom, further reducing the disposal efficiency of the overflow tube.

[0010] It is an object of the present invention to provide an overflow device of a flushing tank for sanitary appliances (toilets, urinals, etc.), optionally associated with a flush valve of the flushing tank, which is simple, effective and reliable.

[0011] In particular, it is an object of the invention to provide an overflow device, optionally included in a flush valve or connected to it, which makes it possible to drain a high flow of water, in a simple, effective and reliable manner.

[0012] The present invention therefore relates to an overflow device for a flushing tank, and a flush valve with overflow device as defined in the appended claims 1 and 7 respectively.

[0013] The overflow device according to the invention makes it possible, in an extremely simple, effective and reliable manner, to ensure an adequate disposal capacity of the water.

[0014] In particular, the specific conformation of the overflow tube makes it possible to avoid or significantly reduce the entrance of air into the tube, not just from the upper opening, but also from the lower opening of the tube, thereby increasing the flow of water disposed and consequently, the speed and the overall efficiency of the device.

[0015] The invention is described in detail in the following non-limiting embodiment examples, with reference to the appended drawings, wherein:

- Figure 1 is a schematic view in longitudinal cross-section of a flush valve of a flushing tank provided with an overflow device in accordance with the invention;
- Figure 2 is a view in longitudinal cross-section of a detail of the overflow device shown in Figure 1;
- Figure 3 is a schematic view in side elevation and with parts removed for clarity, of a variant of the flush valve with overflow device of Figure 1;
- Figure 4 is a cross-section view along the dashed line IV-IV in figure 3.

[0016] In figure 1 reference numeral 1 denotes a flush valve of a flushing tank (not shown) provided with an overflow device 2.

[0017] The flush valve 1 extends substantially along an axis X (vertical in use) and comprises a support structure 3, attachable to a bottom wall of the tank (for example, via a threaded sleeve 4) and provided with a drain hole 5 bordered by a sealing seat 6, and a valve body 7 housed so as to slide along the axis X in the support structure 3 and provided underneath with a shutter 8 cooperating with the sealing seat 6 to close the drain hole 5; the valve body 7 is lifted by means of an actuator mechanism 9.

[0018] In the example illustrated, but not necessarily, the mechanism 9 comprises a lever 10, hinged to the support structure 3, and a connecting rod 11 that connects the lever 10 to the valve body 7; the lever 10 cooperates with at least one slider 12 actuated by a button operable by a user.

[0019] It is however understood that the mechanism 9 may be of any other known type (also pneumatic, electromechanical, electronic, etc.).

[0020] The overflow device 2 comprises an overflow tube 15 which, in the embodiment shown in Figure 1 (but not necessarily), constitutes or is part of the valve body 7, being provided with the shutter 8.

[0021] The tube 15 extends along a longitudinal axis

A that in the embodiment of Figure 1 coincides with the axis X of the flush valve 1; the tube 15 is thus placed in use, vertically (with the axis A vertical); the tube 15, which is optionally formed of multiple pieces or sections of tube, has a top end 16 and a lower end 17 axially opposite and open, respectively provided with an inlet opening 18 (positioned at the top end 16) and an outlet opening 19 (positioned at the lower end 17).

[0022] The openings 18, 19 respectively define an inlet and outlet for the water when the tube 15 acts as an overflow tube and communicate, respectively, with the inside of the tank and with the inside of the sleeve 4 and thus with the drain hole 5.

[0023] The lower end 17 supports the shutter 8 cooperating with the sealing seat 6.

[0024] The tube 15 comprises a narrowing 20, positioned in an intermediate position between the ends 16, 17 of the tube 15 and in particular between an upper tube portion 21 and a lower tube portion 22 and having an internal cross-section smaller than the internal cross-section of the upper tube portion 21 (positioned above the narrowing 20 i.e. closer to the top end 16 with respect to the narrowing 20), and/or the lower tube portion 22 (positioned below the narrowing 20 i.e. nearer to the lower end 17 with respect to the narrowing 20).

[0025] Advantageously, the narrowing 20 has an internal cross-section which is smaller at least than the internal cross-section of the upper tube portion 21.

[0026] Preferably, the narrowing 20 has an internal cross-section which is also smaller than the internal cross-section of the lower tube portion 22.

[0027] In the preferred embodiment illustrated (but not necessarily), the upper tube portion 21 extends along the axis A from the top end 16 downwards (i.e., toward the lower end 17); and the lower tube portion 22 extends along the axis A from the lower end 17 equipped with the shutter 8, upwards (i.e. towards the top end 16).

[0028] With reference also to figure 2, the narrowing 20 is positioned between the upper tube portion 21 and the lower tube portion 22 and has an internal cross-section smaller than the internal cross-section of the upper and lower tube portions 21, 22.

[0029] The narrowing 20 is defined by a variation of the internal transverse cross-section (perpendicular to the axis A) of the tube 15, i.e. the cross-section available for the passage of water inside the tube 15.

[0030] In particular, the narrowing 20 defines a reduction of internal cross-section inside the tube 15 with respect to at least one internal cross-section of the upper tube portion 21, for example with respect to the section of an inlet opening 18 positioned at the top end 16 of the tube 15; and/or with respect to at least one internal cross-section of the lower tube portion 22, for example with respect to the cross-section of an outlet opening 19 positioned at the lower end 17 of the tube 15.

[0031] The upper and lower tube portions 21, 22 are placed at respective axially opposite ends of the narrowed portion 20 and have, preferably both, a larger in-

ternal cross-section than the narrowed portion 20.

[0032] The upper and lower tube portions 21, 22 may have various shapes, for example being substantially cylindrical or prismatic or having yet another shape; also, the shape of the internal cross-section of the upper and lower tube portions 21, 22 may be varied, for example it may be substantially circular, oval, elliptical, polygonal, square, or otherwise.

[0033] Preferably, but not necessarily, the tube portions 21, 22 are rectilinear and aligned along the axis A and have a constant internal cross-section along the axis A (but not necessarily equal to each other: in the example illustrated, the lower tube portion 22 has a larger internal cross-section than the upper tube portion 21).

[0034] The narrowing 20 may be in any position along the axis A.

[0035] In the non-limiting example shown, the narrowing 20 comprises a throat portion 23 extending along the axis A and having an internal cross-section constant along the axis A.

[0036] The throat portion 23 preferably has a length (measured along the axis A) significantly less than the tube portions 21, 22.

[0037] The throat portion 23 may have the same shape as the tube portions 21, 22 or as one of them, or even a different shape; the throat portion 23 may thus have a circular, oval, elliptical, polygonal etc. internal cross-section.

[0038] Advantageously, the throat portion 23 is connected to the tube portions 21, 22 by respective opposite connection portions 24, 25, positioned at axially opposite ends of the throat portion 23 and convergent, (i.e. having an internal cross-section that decreases) towards the throat portion 23.

[0039] Indicatively, the connection portions 24, 25 have walls inclined by approximately 30° with respect to the axis A; but they may also have a different inclination.

[0040] The connection portions 24, 25 may for example be defined by respective rotation bodies in central symmetry around the axis A, or have a symmetrical shape with respect to a plane passing through the axis A, or may also have a different shape, even not symmetrical around the axis A.

[0041] For example, in the non-limiting embodiment illustrated, the connection portion 25, positioned towards the bottom end 17 of the tube 15 and thus connected to the lower tube portion 22, has a lateral recess and has a substantially trapezoidal longitudinal cross-section. The connection portions 24, 25 have in this case a different shape from one another, so as to facilitate assembly.

[0042] In use, the tube 15, as well as acting as a valve body in normal operation of the flush valve 1, also acts, in case of need, as the overflow pipe.

[0043] When the water level in the tank, for example as a result of a failure of the feed mechanism and/or of the flush valve, exceeds the top end 16 of the tube 15, the water enters the tube 15 through the inlet opening 18.

[0044] The flow of water entering the tube 15 tends to bring air with it, but the specific conformation of the tube 15 makes it possible to avoid or significantly reduce the entrance of air in the tube 15, both from above and from below, and thus increases the flow of water disposed of and consequently the speed and the overall efficiency of the device 2.

[0045] In the variant shown in Figures 3 and 4, in which any details similar or identical to those already described are indicated using the same reference numbers, the tube 15 is placed in a lateral position with respect to the flush valve 1 and extends along a longitudinal axis A parallel and shifted laterally with respect to the axis X of the flush valve 1.

[0046] For simplicity, Figure 1 shows only a lower part of the support structure 3 of the flush valve 1 with the sleeve 4 inside which the drain hole 5 is made.

[0047] The tube 15 in this case does not perform the function of valve body and does not hold the shutter 8.

[0048] The tube 15 always extends between a top end 16, provided with the inlet opening 18 communicating with the inside of the tank, and a lower end 17, provided with the outlet opening 19 communicating with the inside of the sleeve 4 and thus with the drain hole 5.

[0049] In particular, the tube 15 is connected to the drain hole 4 by means of a lateral connector 28 which juts out from a side wall 29 of the support structure 3. The outlet opening 19 is made through the side wall 29.

[0050] Also in this embodiment, the tube 15 comprises a narrowing 20, placed in an intermediate position along the axis A between the ends 16, 17 of the tube 15 and in particular between an upper tube portion 21 and a lower tube portion 22 and having an internal cross-section smaller than the internal cross-section of the upper tube portion 21 (positioned above the narrowing 20 i.e. closer to the top end 16 with respect to the narrowing 20), and/or the lower tube portion 22 (positioned below the narrowing 20 i.e. closer to the lower end 17 with respect to the narrowing 20).

[0051] In the embodiment of Figures 3-4, the tube 15 is made of two pieces 31, 32 joined in a telescopic manner to vary the length of the tube 15 along the axis A. The pieces 31, 32 are inserted partially inside one another and are provided with a top end 16 with the inlet opening 18 and, respectively, the lower end 17 with the outlet opening 19.

[0052] The narrowing 20 is made for example, but not necessarily, at a lower end of the piece 31 inserted inside the piece 32.

[0053] It is understood that the flush valve with overflow device described and illustrated herein may be subject to modifications and variations without departing from the scope of the appended claims.

Claims

1. Overflow device (2) for a flushing tank for sanitary

appliances, comprising an overflow tube (15), extending along an axis (A) between a top end (16), open for communicating in use with the inside of the flushing tank in which the device is installed, and a bottom end (17), connectable to a drain hole of the flushing tank; **characterized in that** the tube (15) comprises a narrowing (20), positioned in an intermediate position between the ends (16, 17) of the tube (15) and between an upper tube portion (21) and a lower tube portion (22), the narrowing (20) having an internal cross-section smaller than the internal cross-section of at least one of the upper tube portion (21) and the lower tube portion (22).

2. A device according to claim 1, wherein the narrowing (20) has an internal cross section smaller than the internal cross section of the upper tube portion (21), and/or smaller than the internal cross section of the lower tube portion (22).

3. A device according to claim 2, wherein the narrowing (20) defines a reduction of internal cross-section inside the tube (15) with respect to at least one internal cross-section of the upper tube portion (21), for example with respect to the section of an inlet opening (18) positioned at the top end (16) of the tube (15); and/or with respect to at least one internal cross-section of the lower tube portion (22), for example with respect to the section of an outlet opening (19) positioned at the lower end (17) of the tube (15).

4. A device according to one of the preceding claims, wherein the narrowing (20) is positioned between the upper tube portion (21) and the lower tube portion (22) and has an internal cross-section smaller than the internal cross section of the upper and lower tube portions (21, 22) .

5. A device according to one of the preceding claims, wherein the narrowing (20) comprises a throat portion (23) extending along the axis (A) and having an internal cross-section constant along the axis (A).

6. A device according to claim 5, wherein the throat portion (23) is connected to the upper and lower tube portions (21, 22) by respective opposite connection portions (24, 25), positioned at axially opposite ends of the throat portion (23) and convergent, i.e. having an internal cross-section that decreases, towards the throat portion (23).

7. Flush valve (1) with an overflow device (2) for a flushing tank, comprising a support structure (3), having a sealing seat (6) delimiting a drain hole (5); a valve body (7) provided with a shutter (8) cooperating with the sealing seat (6) for closing the drain hole (5); and an overflow device (2) according to one of the preceding claims.

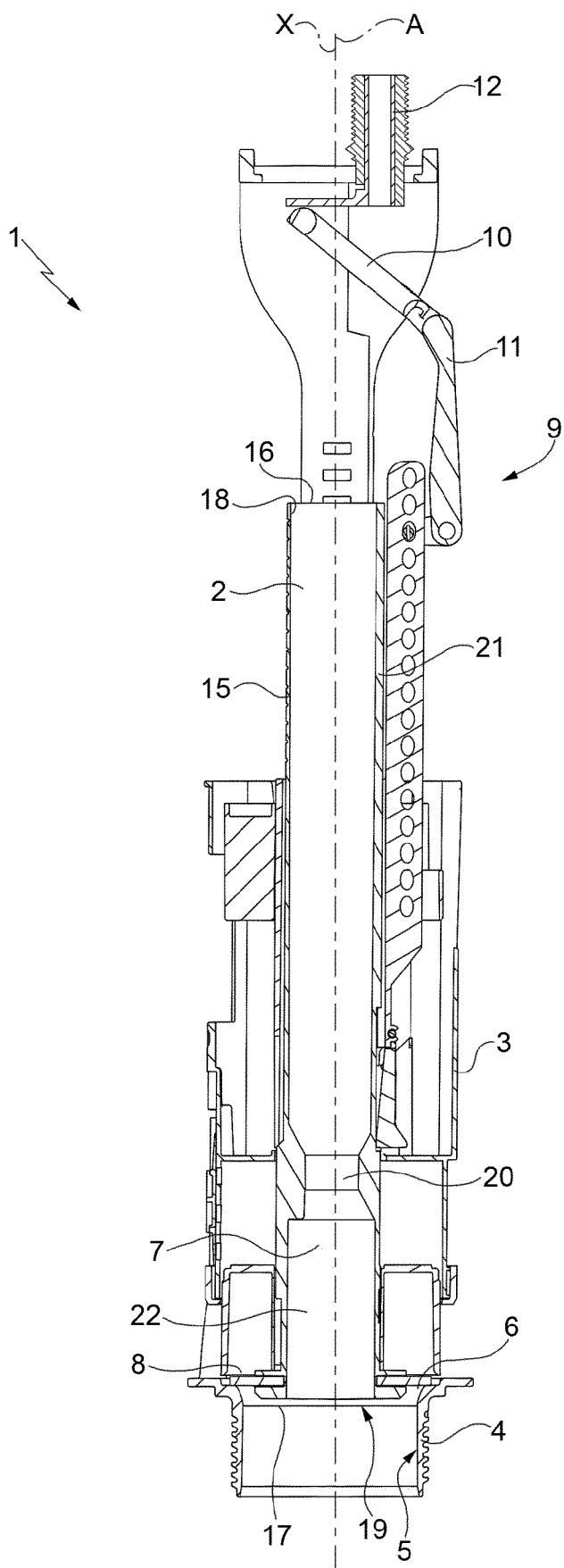


FIG. 1

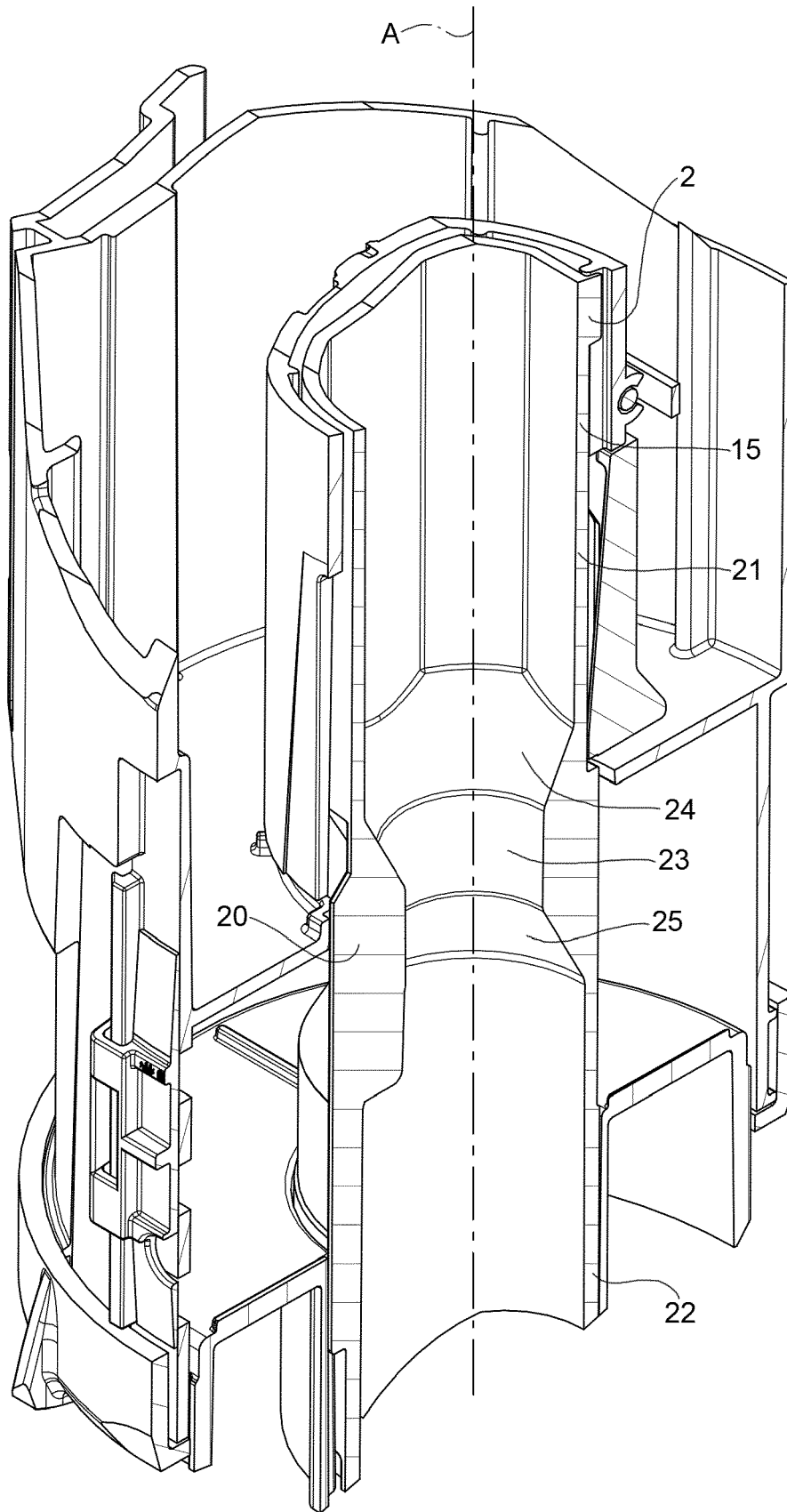


FIG. 2

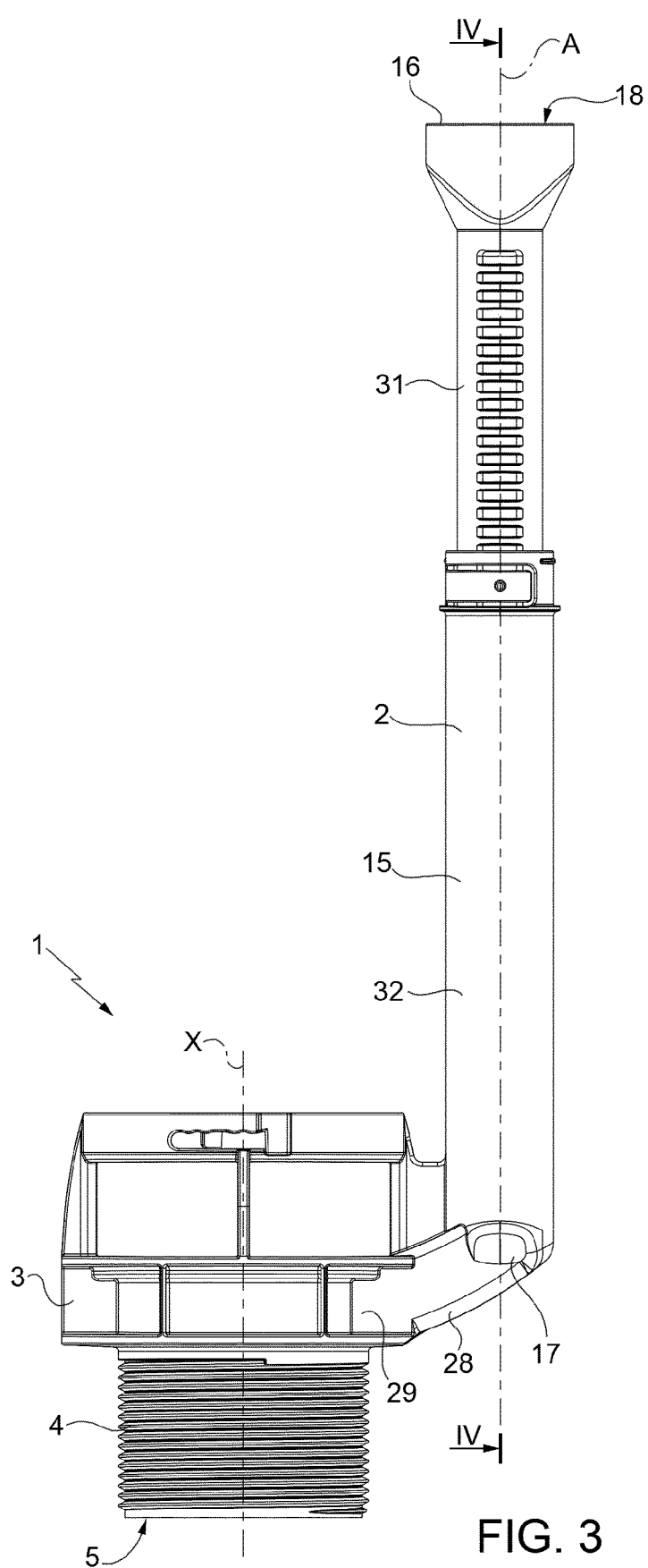


FIG. 3

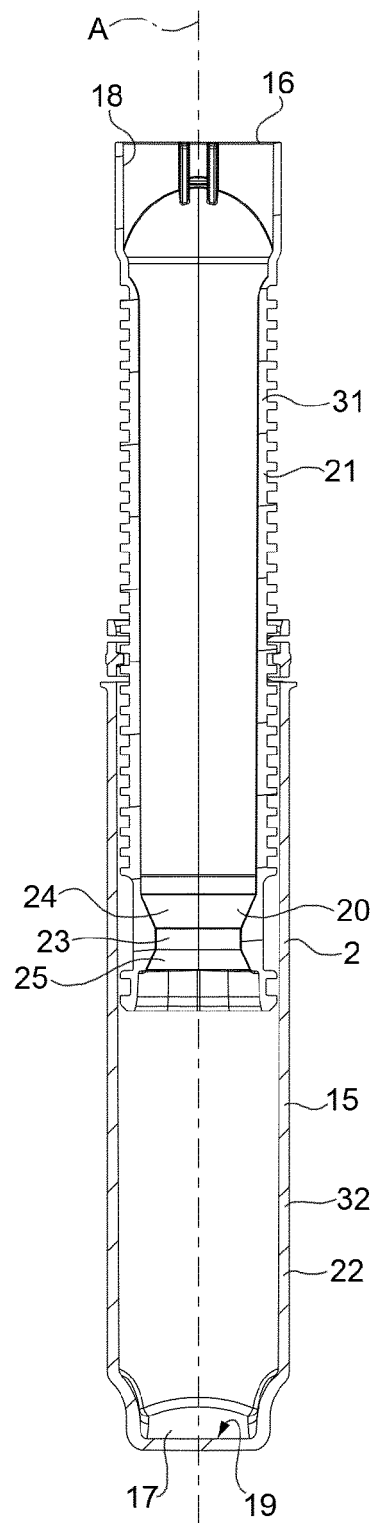


FIG. 4



EUROPEAN SEARCH REPORT

 Application Number
 EP 17 20 1206

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 9 April 2018	Examiner Isailovski, Marko
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
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