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(54) **BUTTON ASSEMBLY OF A FLUSHING DEVICE FOR A FLUSH TANK**

(57) A button assembly (20) for a flushing device (1) of a flush tank comprises a support plate (27) and at least a first pushing element (31A) sliding with respect to the plate (27) along an axis (A) in a seat (30) carried by the

plate (27) and connectable to a control button operable by a user; the pushing element (31A) is coupled to the seat (30) via a joint (34) configured to allow the pushing element (31A) to tilt with respect to the plate (27).

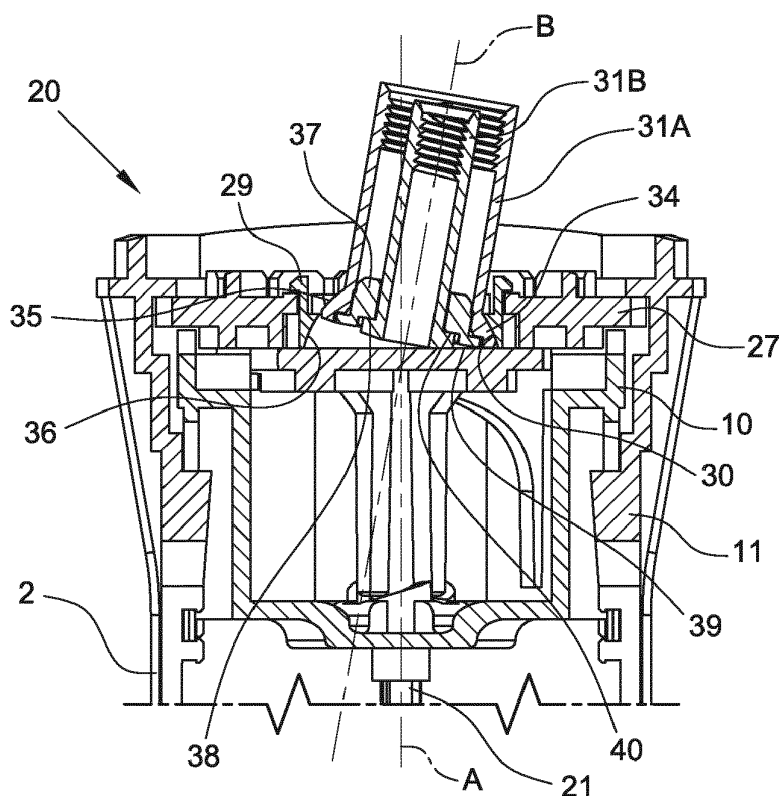


FIG. 6

Description

PRIORITY CLAIM

[0001] This application claims priority from Italian Patent Application No. 102017000039502 filed on April 10, 2017.

[0002] The present invention relates to a button assembly of a flushing device of a flush tank, in particular of the type having a dual flush (i.e. of the type alternatively permitting a full draining or a partial draining of the water contained in the flushing tank).

[0003] A known type of dual-flush flushing device comprises a support structure, which is fixable to a bottom wall of the flush tank and is provided with a drain hole delimited by a sealing seat, and a valve body (usually a tubular element also working as an overflow pipe), which is housed in the support structure in a sliding manner and is provided, at the bottom, with a shutter cooperating with the sealing seat so as to close the drain hole; the valve body is raised by means of suitable actuating organs, which are controlled by the user in order to alternatively activate the full or partial draining of the water from the flush tank. In order to obtain the two flushing modes (full or partial), it is known to vary the closing time of the shutter by engaging the valve body with one or more floats and/or with supplementary weights.

[0004] In a known configuration, the flushing device has a button assembly, through which the user controls the flush by acting upon one button or two buttons, arranged at a top end of the device and through a suitable opening made in a top lid of the flush tank.

[0005] Some flushing devices are provided with height-adjustment systems, which allow users to adjust the height of the device and, hence, adjust the device to flush tanks with different sizes.

[0006] In some cases, however, a problem can occur, which is linked to the correct alignment and/or centring of the device relative to the flush tank. In particular, once the support structure has been fixed to the bottom wall of the flush tank, the top end of the device with the button assembly can fail to be perfectly centred relative to the opening in the lid of the flush tank. Or the bottom wall and the lid of the flush tank can fail to be perfectly flat and parallel.

[0007] It is an object of the invention to provide a button assembly of a flushing device for a flush tank, which shows improvements relative to prior art solutions; in particular, it is an object of the invention to provide a button assembly which permits a position adjustment in a simple, effective and reliable manner.

[0008] Therefore, the invention relates to a button assembly of a flushing device for a flush tank as set forth in appended claim 1 and, for its preferred aspects, in the dependent claims.

[0009] The invention also relates to a flushing device for a flush tank comprising said button assembly.

[0010] The button assembly according to the invention

permits a change in the position of the control buttons, which are connected to respective pushing elements, relative to the axis of the flushing device, so as to make up for possible alignment and/or centring defects of the flushing device relative to the flush tank.

[0011] Furthermore, the button assembly is simple and economic to be manufactured and operates in a simple, safe and reliable manner.

[0012] The invention will now be described in detail in the following non-limiting embodiment, with reference to the accompanying drawings, wherein:

- figure 1 is a lateral elevation view of a flushing device according to the invention;
- figure 2 is an exploded view of the device of figure 1;
- figures 3 and 4 are two longitudinal section views of the device of figure 1 according to respective planes, which are orthogonal to each other;
- figures 5 and 6 are two longitudinal section views of the detail highlighted in figure 4, shown in respective operating configurations;
- figure 7 is a plan view from the top of the device of figure 1;
- figure 8 is a perspective view of a component of the device of figure 1;
- figure 9 is a plan view from the top of a further component of the device of figure 1;
- figure 10 is a lateral view, with parts removed for greater clarity, of a detail of the device of figure 1;
- figure 11 is a lateral view, with parts removed for greater clarity, of a further detail of the device of figure 1;
- figure 12 is a perspective view, with parts removed for greater clarity, of a further detail of the device of figure 1.

[0013] With reference to figures 1-4, a flushing device 1, in particular a dual-flush flushing device, for a flush tank (which is known and not shown herein) comprises: a support structure 2, which extends along an axis A (vertical, in use); a valve body 3, which extends and slides along the axis A in the structure 2; an actuating mechanism 4, which is connected to the valve body 3; a pair of movable floats 5A, 5B, which define a full flush float and a partial flush float, respectively, and are selectively connectible to the valve body 3 so as to operate respective flushing modes (full flush and partial flush).

[0014] The structure 2 comprises, at respective axially opposite ends: a lower base body 7, in this case consisting of different pieces joined to each other, which is fixable to a bottom wall of the flush tank (for example through a threaded portion) and is provided with a drain hole 8, which is delimited by a sealing seat 9; and an upper head 10, which supports the actuating mechanism 4.

[0015] In the preferred embodiment shown, the structure 2 comprises a height adjustment device 11, which connects the base body 7 and the head 10 so as to

change the distance between the base body 7 and the head 10 along the axis A, hence changing the height (measured along the axis A) of the structure 2 and of the device 1, as a whole, along the axis A.

[0016] The valve body 3 comprises a rod 13, possibly made up of different pieces joined to each other, which is housed in the structure 2 so as to slide along the axis A and has a bottom axial end 14, which is provided with a shutter 15 cooperating with the sealing seat 9 in order to close the drain hole 8, and a top axial end 16, which is provided with one or more coupling seats 17 engaged by the actuating mechanism 4 in order to raise the valve body 3.

[0017] In the preferred embodiment shown, the valve body 3 does not work as an overflow pipe, as it is not provided with a through inner duct going through the shutter 15. The device 1 comprises an overflow pipe 18, which is arranged on the side relative to the structure 2 and is fitted into the base body 7 downstream of (namely, in use, under) the sealing seat 9 with the drain hole 8. Obviously, on the other hand, the valve body 3 can also be shaped like a pipe and, therefore, act as an overflow pipe.

[0018] The actuating mechanism 4 comprises: a button assembly 20, which is supported by the head 10; a slider 21 extending along the axis A; and at least one and preferably, as you can see in the drawings, a pair of levers 22A, 22B, which are hinged to the structure 2 and engage respective coupling seats 17 of the valve body 3.

[0019] With reference also to figures 5-7, the button assembly 20 comprises: a support plate 27, which is fixed to the structure 2 and is provided with a transverse guide 28 extending crosswise to the axis A; a slide 29, which is housed in the guide 28, slides along the guide 28 and is provided with a through seat 30, which is substantially parallel to the axis A; and a pair of pushing elements 31A, 31B, which are housed in the seat 30 and axially slide relative to the structure 2 with respective different axial travels.

[0020] The plate 27, for example, is supported by the head 10 and extends substantially perpendicular to the axis A.

[0021] The guide 28 is defined by a slot formed through the plate 27 and elongated crosswise to the axis A.

[0022] The slide 29 is housed in the guide 28, is axially coupled (parallel to the axis A) to the plate 27, for example by means of lateral teeth, and slides along the guide 28 (hence, crosswise to the axis A). The seat 30 extends through the slide 29 parallel to the axis A and houses the pushing elements 31A, 31B.

[0023] The pushing elements 31A, 31B extend substantially parallel to the axis A and slide axially parallel to the axis A relative to the structure 2 with respective different axial travels.

[0024] In the preferred embodiment shown, though not necessarily, the pushing elements 31A, 31B are coaxial, are located inside each other and extend along a common longitudinal axis B, which is parallel to the axis A.

[0025] The radially outer pushing element 31A is

housed in the seat 30 and axially slides along the axis B in the seat 30 relative to the structure 2.

[0026] The pushing element 31A is coupled to the seat 30 by means of a joint 34, for example a spherical joint, which permits the oscillation of the pushing element 31A around the axis B. In particular, the joint 34 is configured so as to permit the inclination of the pushing element 31A relative to the plate 27 and, hence, to the axis A (for example an inclination of approximately 10°, but also different, for example of 5-20°) and the rotation of the pushing element 31A around the axis A (preferably a complete 360° rotation).

[0027] For example, the pushing element 31A has a rounded outer lateral surface 35, in particular shaped like a spherical cap portion, which cooperates with an inner lateral surface 36 of the seat 30, which for example is shaped like a spherical cap as well or has a cylindrical shape.

[0028] Advantageously, the lateral surface 35 of the pushing element 31A and the corresponding inner lateral surface 36 of the seat 30 have a central symmetry around the axis B (which means that they are surfaces of revolution around the axis B).

[0029] The pushing element 31A is hollow on the inside and houses the radially inner pushing element 31B, which is connected to the pushing element 31A by a connecting ring 37.

[0030] The pushing element 31B is connected in an angularly integral manner to the pushing element 31A by the ring 37, so that the pushing element 31B moves together with the pushing element 31A when the latter tilts and/or rotates.

[0031] The pushing element 31B, on the other hand, axially slides along the axis B both relative to the structure 2 and relative to the pushing element 31A.

[0032] In particular, the ring 37 has a pair of opposite, substantially annular, axial shoulders 38, abutting against respective opposite edges 39, 40 of the pushing elements 31A, 31B and precisely against an edge 39 facing downwards of the pushing element 31A and an edge 40 facing upwards of the pushing element 31B.

[0033] The pushing elements 31A, 31B are connected to respective control buttons (which are known and not shown), which can be operated by a user, precisely a full flush button and a partial flush button.

[0034] The slider 21, which is operated by the pushing elements 31A, 31B, is movable parallel to the axis A and, in turn, is operated by the control buttons; depending on the button pressed and, hence, on the pushing element 31A, 31B consequently operated, the slider 21 is movable with two predetermined travels with a different length, which correspond to the different axial travels of the pushing elements 31A, 31B: a long travel and a short travel. The travel of the slider 21 determines the raising of the valve body 3 to two different heights, i.e. to a full flush position (when the slider 21 covers the long travel) and to a partial flush position (when the slider 21 covers the short travel).

[0035] The slider 21 has a top end flange 41 facing the button assembly 20 and, in particular, the pushing elements 31A, 31B and cooperating with the pushing elements 31A, 31B; and a stem 42, which extends along the axis A from the flange 41 and is coupled to a pushing member 44 acting upon the levers 22A, 22B.

[0036] Preferably, the stem 42 is coupled to the pushing member 44 by means of a releasable and adjustable coupling 43, so as to adjust the position of the pushing member 44 along the stem 42.

[0037] For example, as you can see in detail in figures 8-9, the coupling 43 comprises a series of inclined notches 45, which radially project from the stem 42 and are axially spaced apart along the stem 42 so as to define thread interrupted by a pair of diametrically opposite longitudinal grooves; and a seat 46, which is made through the pushing member 44 and is provided with coupling teeth 47, which are shaped so as to selectively engage the notches 45. The stem 42 is inserted in the seat 46 and rotates around the axis A so as to take on a free position, in which the stem 42 axially slides in the seat 46, and a locked position, in which the coupling teeth 47 engage the notches 45 inside the seat 46, thus axially locking the stem 42 in the seat 46.

[0038] Advantageously, the stem 42, which freely slides relative to the valve body 3, is partially inserted inside the valve body 3 (in particular, inside the rod 13 of the valve body 3), which, for this purpose, is hollow on the inside and/or has a longitudinal housing (parallel to the axis A) to house the stem 42.

[0039] The pushing member 44, which is integral to the slider 21, acts upon the levers 22A, 22B.

[0040] The levers 22A, 22B are arranged so as to be substantially transverse to the axis A.

[0041] As you can see in figure 10, each lever 22A, 22B is hinged to the structure 2 in a fulcrum 50 and extends between two opposite ends 51, 52 arranged on opposite sides of the fulcrum 50: the end 51 is coupled to the top axial end 16 of the valve body 3, thus engaging a coupling seat 17, whereas the end 52 cooperates with the slider 21 through the pushing member 44.

[0042] In the preferred embodiment shown, though not necessarily, the ends 52 of the levers 22A, 22B are arranged at respective heights (measured parallel to the axis A) that are different from each other (as they are axially spaced apart from each other), and the pushing member 44 comes into contact with the ends 52 of the levers 22A, 22B with respective contact portions 53, which are also axially spaced apart from each other and are located at respective different heights (again, measured parallel to the axis A).

[0043] The coupling seats 17 as well, where the levers 22A, 22B come into contact with the valve body 3, are axially spaced apart from one another on the valve body 3, i.e. are located at respective different heights (again, measured parallel to the axis A) along the valve body 3.

[0044] The floats 5A, 5B are arranged, for example, in the base body 7 of the structure 2 on opposite sides on

the valve body 3, diametrically opposite each other.

[0045] With reference also to figure 11, each one of the floats 5A, 5B comprises a rod 54, which extends along a longitudinal axis C parallel to the axis A; and a hollow float body 55A, 55B, which is coupled to the rod 54 by a slide 56.

[0046] Preferably, each float body 55A, 55B is coupled to the rod 54 in a releasable and/or adjustable manner through an adjustment system 57, which allows the float body 55A, 55B to be fixed at a predetermined height along the rod 54 (i.e. in a predetermined position along the axis C).

[0047] For example, the adjustment system 57 comprises a series of seats 58, which are obtained on the rod 54 and are spaced apart along the axis C, and a pair of flexible teeth 59, which are arranged on each float body 55A, 55B and are shaped so as to be selectively coupled to a seat 58.

[0048] The floats 5A, 5B slide parallel to the respective axes C and, therefore, also to the axis A and are guided by respective guides 61 formed on the structure 2. For example, the guides 61 are defined by respective longitudinal slits made in a lateral wall of the base body 7 and engaged by respective lateral projections 62 protruding from the floats 5A, 5B.

[0049] The position of each float body 55A, 55B on the respective rod 54 is selected so as to adjust the quantity of water drained in each one of the two operating modes of the device 1, namely in the partial flush mode and in the full flush mode. In general, the float bodies 55A, 55B are arranged at different heights, measured parallel to the axis A: in particular, the float 5A, which is used to operate a full flush, has the float body 55A arranged at a lower height (measured along the axis A) than the float body 55B of the float 5B, which is used for the partial flush (i.e. the float body 55A is arranged closer to the drain hole 8 than the float body 55B).

[0050] The floats 5A, 5B are provided with respective triggers 63A, 63B, which selectively connect each float 5A, 5B to the valve body 3.

[0051] As you can see in detail in figures 11-12, the triggers 63A, 63B are hinged in a rotary manner to respective floats 5A, 5B, in particular to respective top ends of the rods 54, by means of respective pins 64; and to the structure 2, by means of respective rotary joints 65 defining respective rotation fulcrums of the triggers 63A, 63B.

[0052] Each trigger 63A, 63B, for example, is substantially L-shaped and comprises a first lever arm 66 and a second lever arm 67, which project from the joint 65; the first arm 66 is hinged to a top end of a float 5A, 5B (precisely, of a bar 54); the second arm 67 is provided with a joint member 68, which cooperates with a corresponding abutment portion 69 of the valve body 3.

[0053] The joint member 68 has a top contact surface 70, for example shaped like a step, which is designed to cooperate with the respective abutment portion 69 on the valve body 3.

[0054] The valve body 3 has a pair of abutment portions 69, which are defined by respective projections radially protruding from an outer lateral surface of the valve body 3.

[0055] The abutment portions 69 are axially spaced apart from one another, which means that they are arranged at respective different heights (measured parallel to the axis A) on the valve body 3; and are angularly spaced apart from each other on the valve body 3, which means that they are laterally staggered relative to each other. Optionally, though not necessarily, the abutment portions 69 are joined by a longitudinal rib, which is parallel to the axis A.

[0056] Each one of the abutment portions 69 has a corner 71, which is shaped so as to engage the contact surface 70 of the corresponding joint member 68.

[0057] The device 1 works as follows.

[0058] When the flush tank is full of water, the water in the flush tank is at an initial level H above the floats 5A, 5B or at least above the float bodies 55A, 55B thereof, which are immersed in the water; the valve body 3 is in a closing position in which the shutter 15 closes the drain hole 8 and the abutment portions 69 of the valve body 3 are arranged under the joint members 68 of the triggers 63A, 63B; the floats 5A, 5B are locked (as they cannot move upwards) by the triggers 63A, 63B cooperating with each other and/or with one or respective retainers (not shown) arranged on the valve body 3.

[0059] When the user operates the full flush by pressing the corresponding full flush button, the pushing element 31A is pushed downwards and consequently moves the slider 21 along the long travel.

[0060] The slider 21 covers the long travel and moves, through the pushing member 44, the lever 22A, thus raising the valve body 3 to a first predetermined height and opening the drain hole 8. The valve body 3 is lifted to a full flush position in which both abutment portions 69 are above the joint members 68 of the triggers 63A, 63B and in which, in particular, the abutment portion 69 of the trigger 63A of the full flush float 5A engages the corresponding abutment portion 69 arranged lower (relative to the other abutment portion 69), keeping the float 5A axially locked.

[0061] The partial flush float 5B is free to move, consequently rotating its trigger 63B, which, though, does not engage the corresponding abutment portion 69.

[0062] When the water, by flowing out of the flush tank through the drain hole 8, reaches the float body 55B of the float 5B (which, as already mentioned above, is arranged at a higher level, namely higher, than the float 5A), the float 5B freely moves downwards, always without engaging the valve body 3.

[0063] The valve body 3 remains raised, as it is axially constrained to the float 5A, and, therefore, the drain hole 8 stays open until the water reaches the float body 55A of the float 5A; at this point, the float 5A moves downwards and, by rotating the trigger 63A, disengages the joint member 68 from the abutment portion 69 and,

hence, frees the valve body 3, which goes back to closing the drain hole 8.

[0064] When the user operates the partial flush by pressing the corresponding partial flush button, the pushing element 31B is pushed downwards and consequently moves the slider 21 along the short travel.

[0065] The slider 21 covers the short travel and moves, through the pushing member 44, the lever 22B, thus raising the valve body 3 to a second predetermined height, which is lower than the height corresponding to the full flush, and opening the drain hole 8. The valve body 3 is lifted to a partial flush position in which only one of the abutment portions 69 is arranged above the joint members 68 of the triggers 63A, 63B and in which, in particular, the joint member 68 of the trigger 63B of the partial flush float 5B engages the corresponding abutment portion 69 arranged higher (relative to the other abutment portion 69), keeping the float 5B axially locked.

[0066] The full flush float 5A, on the other hand, is free to move, as the joint member 68 of its trigger 63A is arranged above the corresponding abutment portion 69.

[0067] The valve body 3 remains raised, as it is axially constrained to the float 5B, and, therefore, the drain hole 8 stays open until the water, by flowing out of the flush tank through the drain hole 8, reaches the float body 55B of the float 5B (which, as already mentioned above, is arranged at a higher level, namely higher, than the other float 5A); at this point, the float 5B moves downwards and, by rotating the trigger 63B, disengages the joint member 68 from the abutment portion 69 and, hence, frees the valve body 3, which goes back to closing the drain hole 8.

[0068] The flushing device described and explained herein can be subjected to changes and variants, which do not go beyond the scope of protection of the invention set forth in the appended claims.

Claims

1. A button assembly (20) for a flushing device (1) of a flush tank, comprising a support plate (27) and at least a first pushing element (31A) sliding with respect to the plate (27) along an axis (A) in a seat (30) carried by the plate (27) and connectable to a control button operable by a user; wherein said pushing element (31A) is coupled to the seat (30) via a joint (34) configured to allow the pushing element (31A) to tilt with respect to the plate (27).
2. A button assembly according to claim 1, wherein the joint (34) is configured to allow the pushing element (31A) to be slanted with respect to the axis (A).
3. A button assembly according to claim 1 or 2, wherein the joint (34) is configured to allow rotation of the pushing element (31A) about a longitudinal axis (B) of the pushing element (31A).

4. A button assembly according to one of the preceding claims, wherein the pushing element (31A) has a rounded outer lateral surface (35), in particular shaped as a spherical cap portion, cooperating with an inner lateral surface (36) of the seat (30). 5
5. A button assembly according to one of the preceding claims, wherein the joint (34) is a spherical joint.
6. A button assembly according to one of the preceding claims, comprising a pair of pushing elements (31A, 31B), coaxial and arranged one inside the other in the seat (30). 10
7. A button assembly according to claim 6, wherein the pushing elements (31A, 31B) slide axially with respect to the plate (27) along respective axial travels of different length. 15
8. A button assembly according to claim 6 or 7, wherein a first radially outer pushing element (31A) is internally hollow and houses a second radially inner pushing element (31B), which is connected angularly integral to the first pushing element (31A) so as to tilt integrally therewith. 20
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9. A button assembly according to claim 8, wherein the first pushing element (31A) is connected to the second pushing element (31B) by a connecting ring (37) having a pair of opposite, substantially annular, axial shoulders (38), abutting against respective opposite edges (39, 40) of the pushing elements (31A, 31B) and precisely against an edge (39) facing downwards of the first pushing element (31A) and an edge (40) facing upwards of the second pushing element (31B). 30
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10. A button assembly according to one of the preceding claims, wherein the plate (27) is provided with a transverse guide (28) extending crosswise to the axis (A); and the seat (30) is formed in a slide (29) housed in the guide (28) and sliding along the guide (28). 40
11. A button assembly according to claim 10, wherein the guide (28) is defined by a slot formed through the plate (27) and elongated crosswise to the axis (A). 45
12. A flushing device (1) for a flush tank, comprising a support structure (2) extending along an axis (A) and having a drain hole (8) delimited by a sealing seat (9); a valve body (3) extending and sliding along the axis (A) in the structure (2) and having a shutter (15) cooperating with the sealing seat (9) to open/close the drain hole (8); an actuating mechanism (4) connected to the valve body (3) for raising the valve body (3); wherein the actuating mechanism (4) comprises 50
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a button assembly (20) according to one of the preceding claims.

13. A device according to claim 12, wherein the actuating mechanism (4) is configured to selectively raise the valve body (3) to two different heights, i.e. in a full flush position and in a partial flush position.

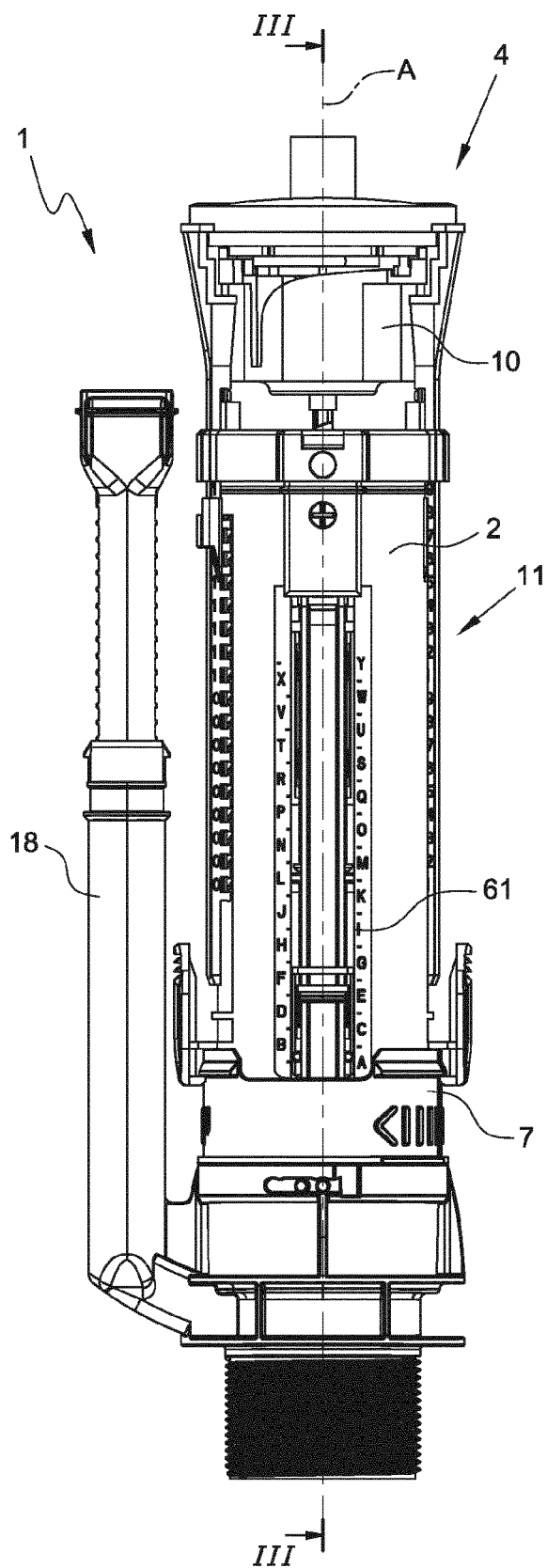


FIG. 1

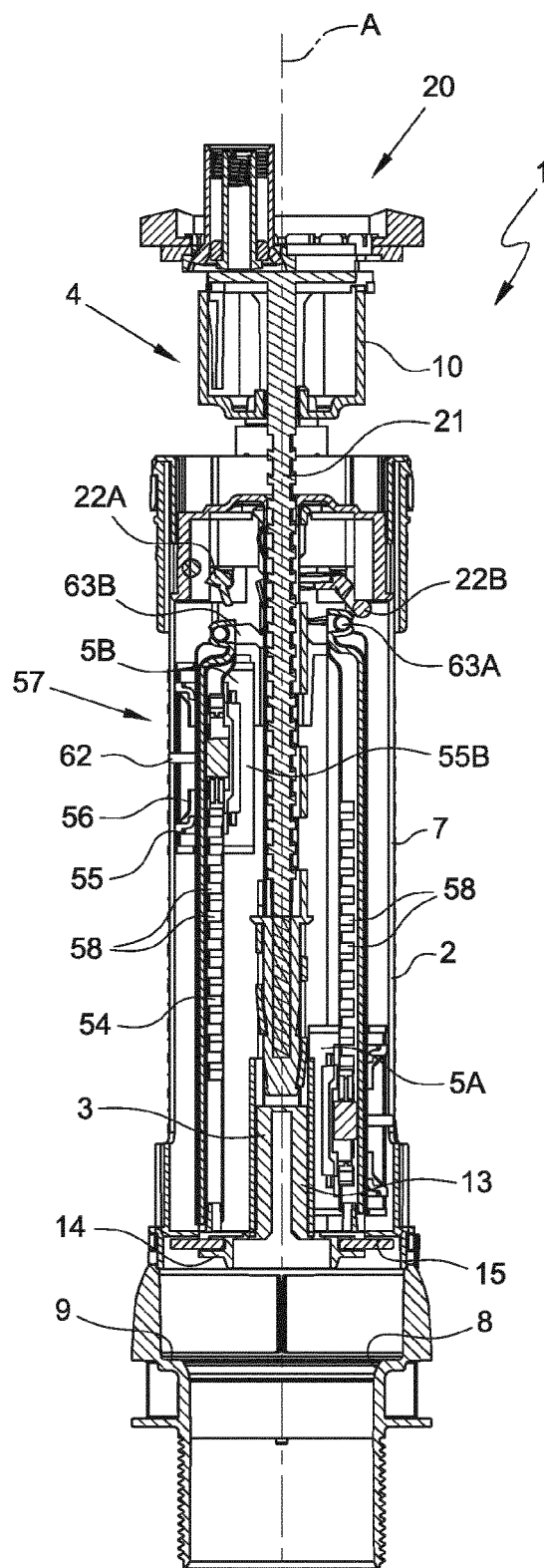


FIG. 3

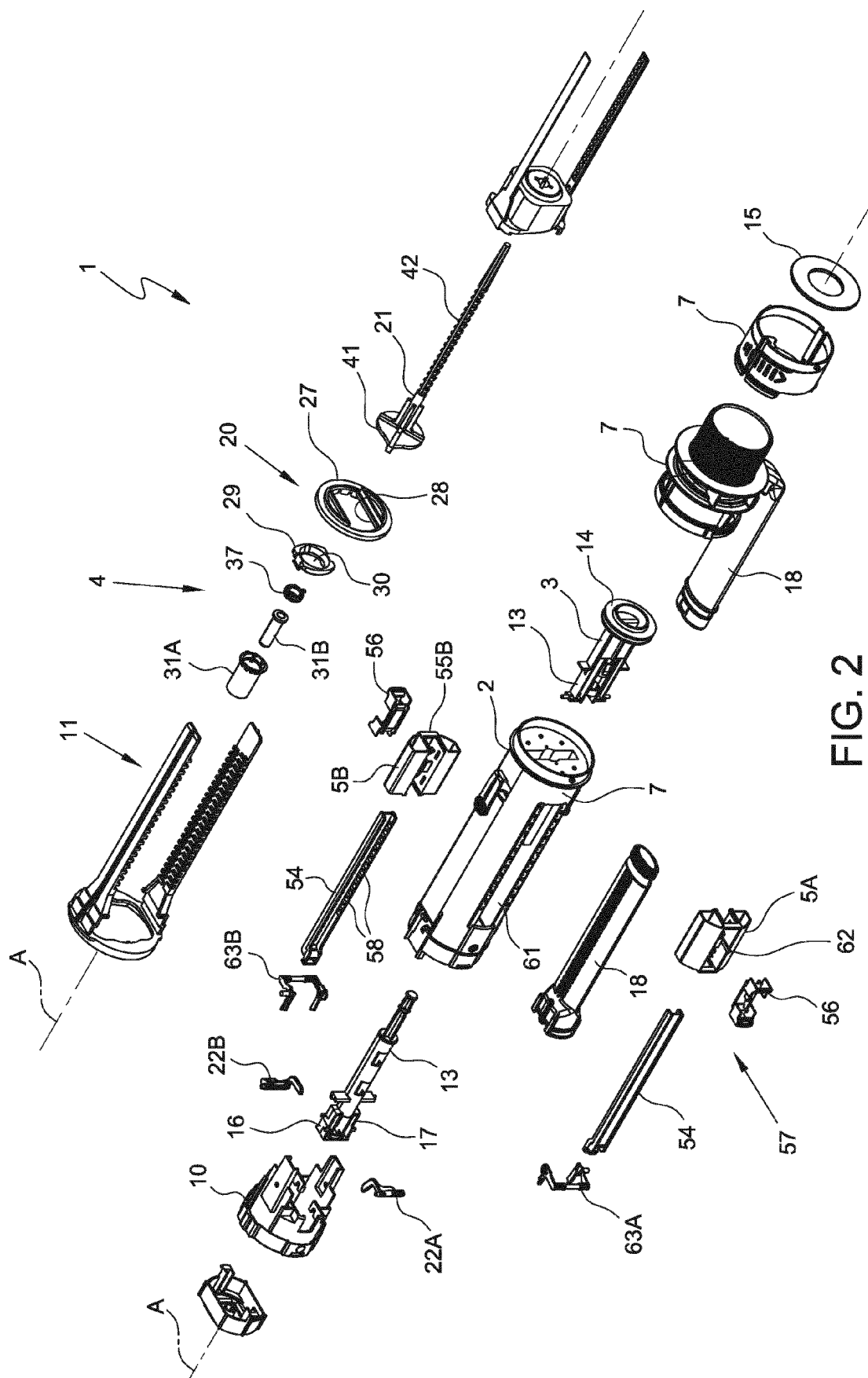


FIG. 2

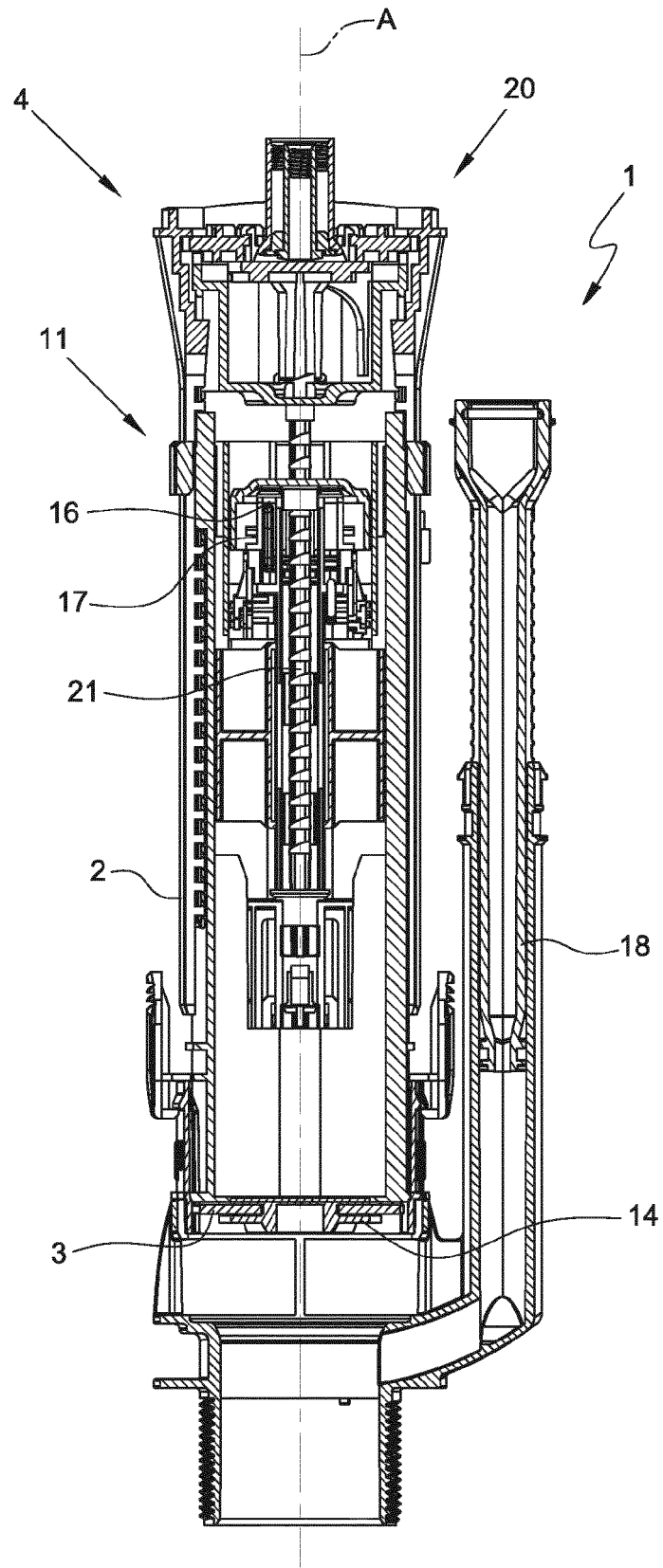


FIG. 4

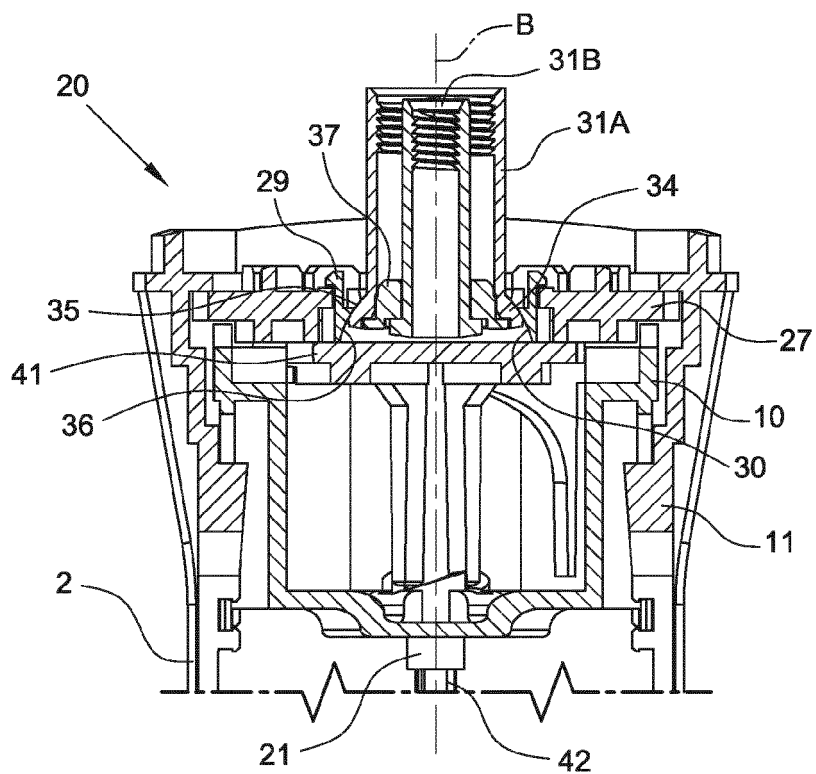


FIG. 5

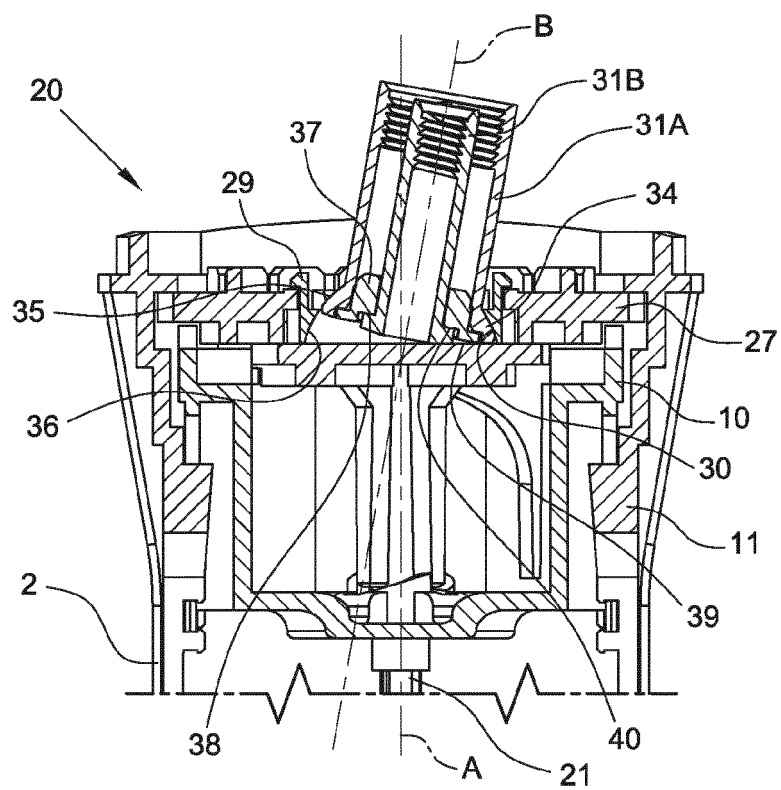


FIG. 6

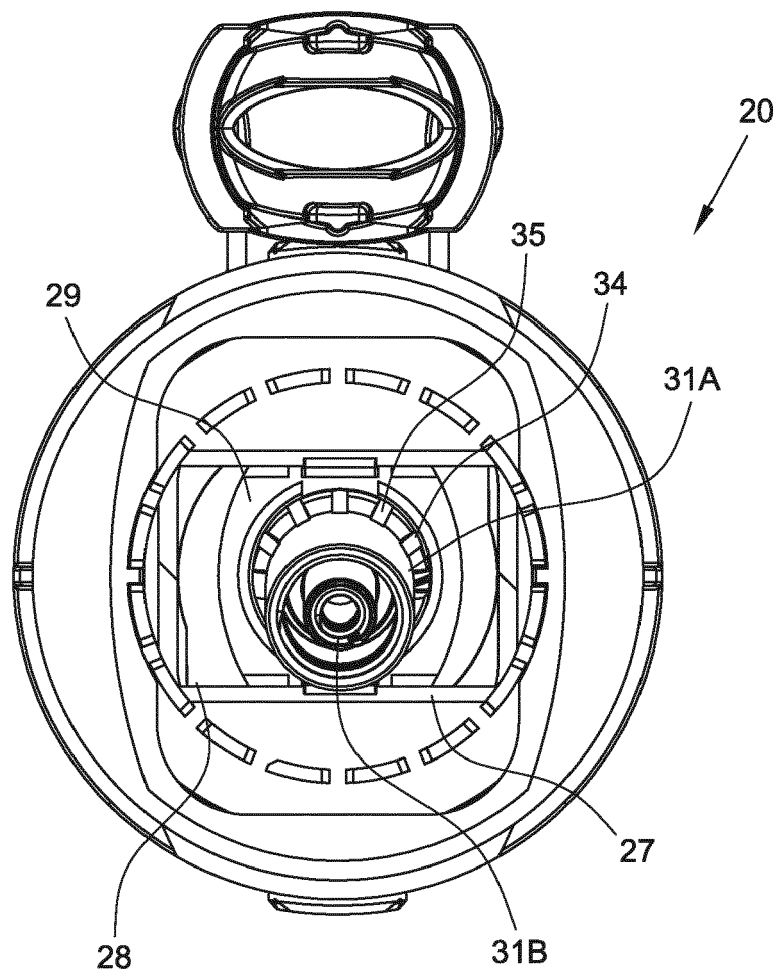


FIG. 7

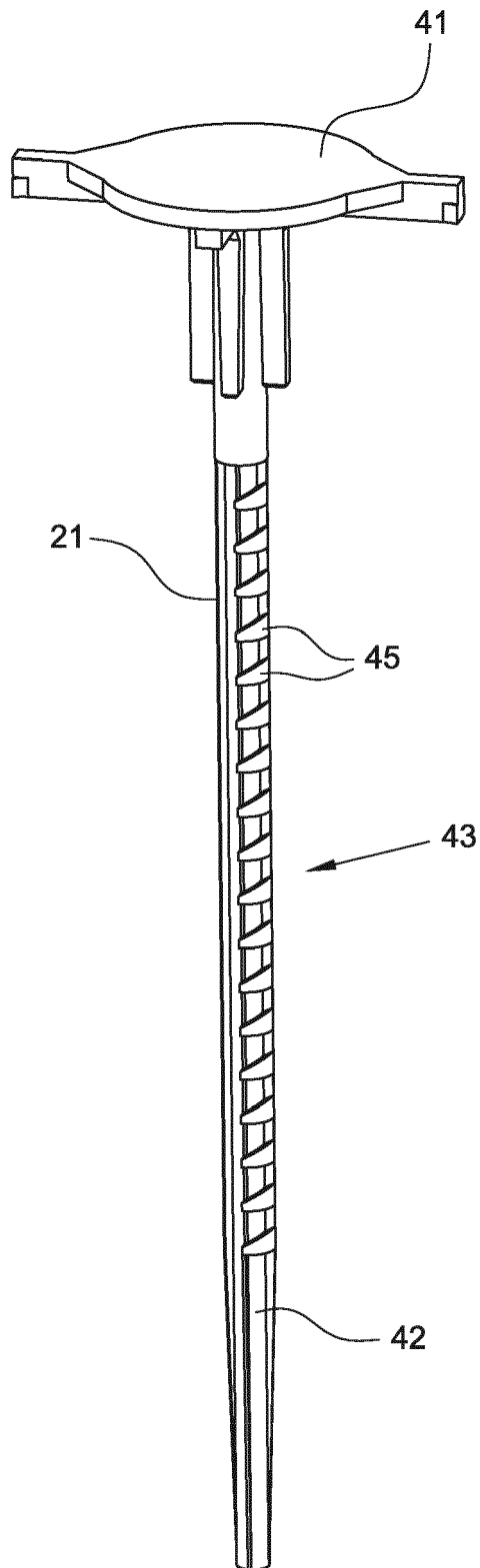


FIG. 8

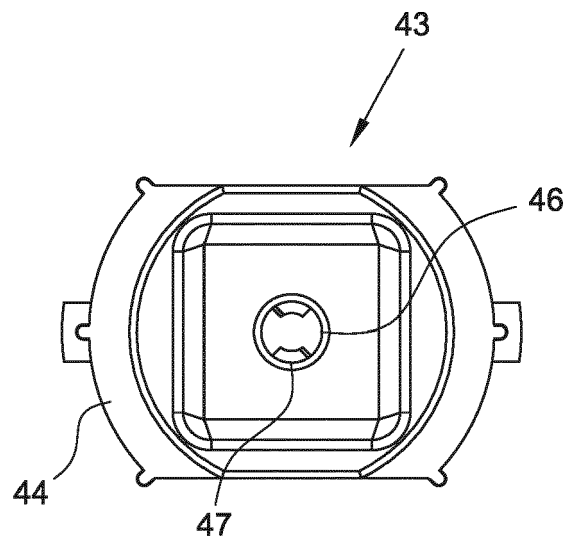


FIG. 9

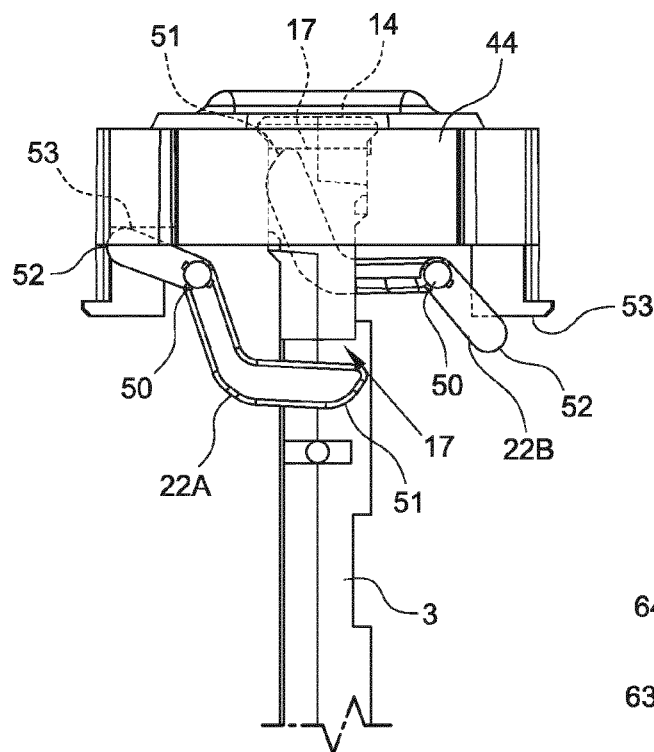


FIG. 10

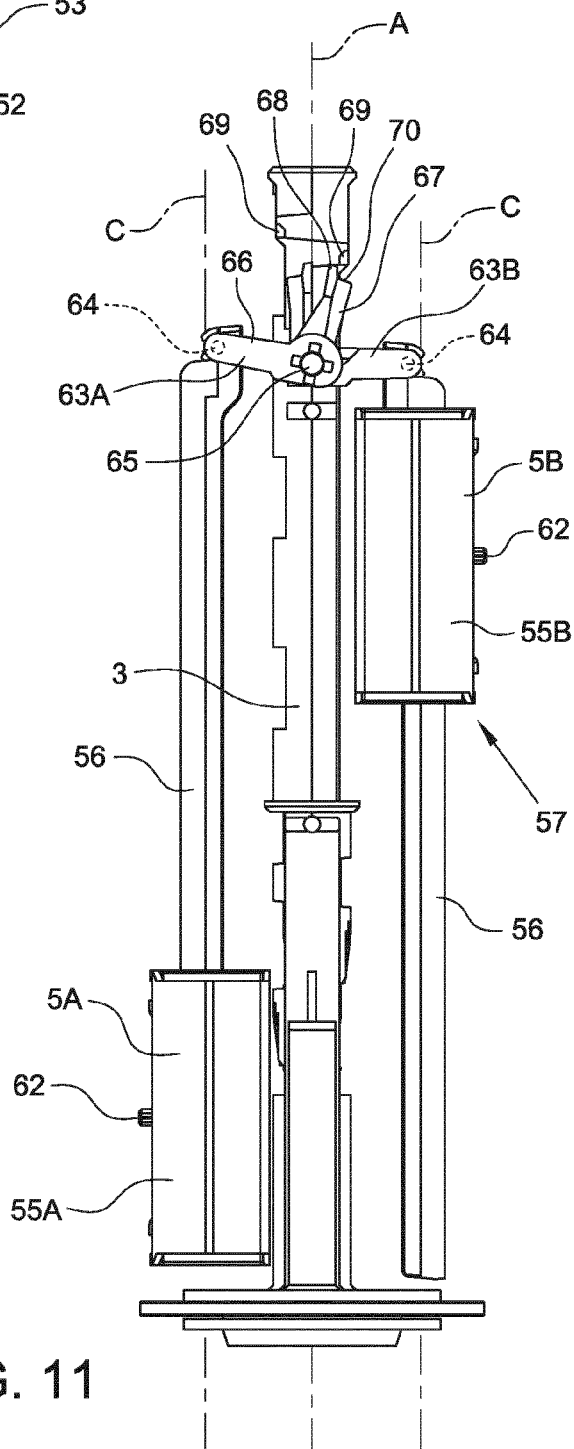


FIG. 11

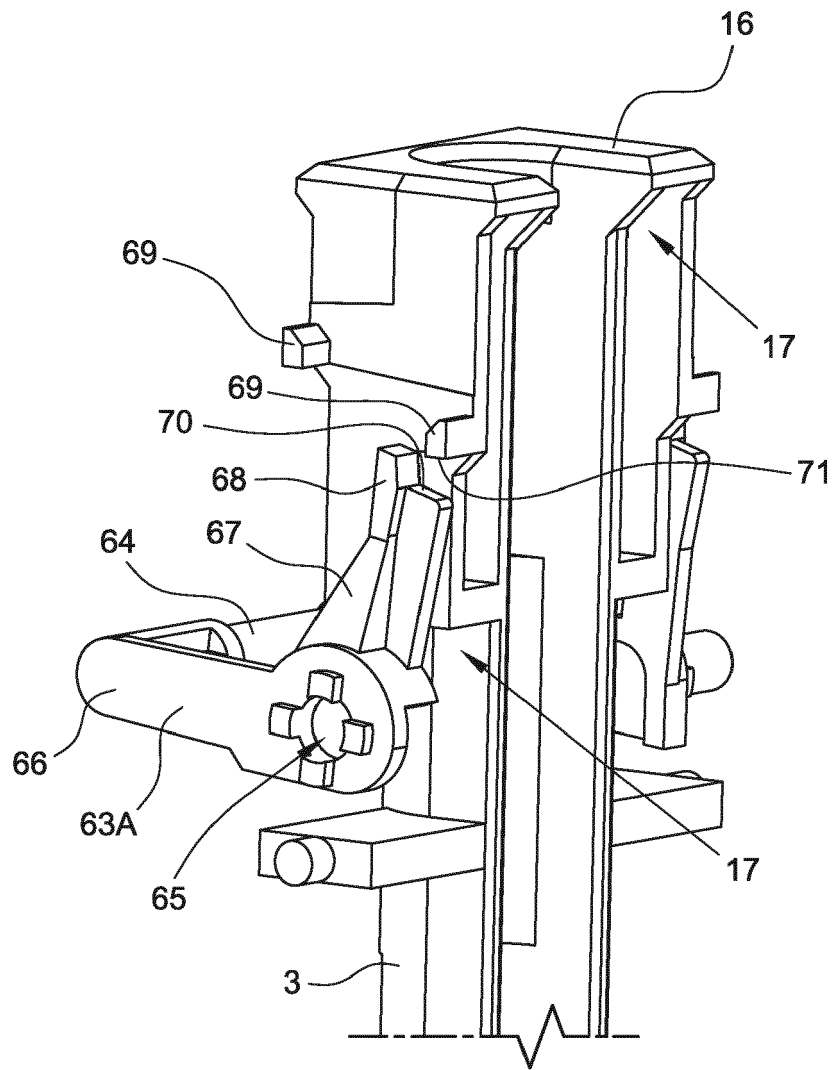


FIG. 12



EUROPEAN SEARCH REPORT

 Application Number
 EP 18 16 6693

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2 506 140 A (DELANY JOHN J) 2 May 1950 (1950-05-02) * figures 1, 5, 6 *	1-3	INV. E03D5/02 E03D5/09 E03D1/012
X	US 943 630 A (FROST WALTER J [US]) 14 December 1909 (1909-12-14) * figures 2, 3 *	1-3, 12, 13	
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X	US 2009/072177 A1 (O'CONNOR J TIMOTHY [US]) 19 March 2009 (2009-03-19) * figure 3c *	1-5	
A	DE 86 17 785 U1 (SCHNEIDER, HELMHOLD) 21 August 1986 (1986-08-21) * figure 1 *	6-9	TECHNICAL FIELDS SEARCHED (IPC) E03D
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 30 August 2018	Examiner Flygare, Esa
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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