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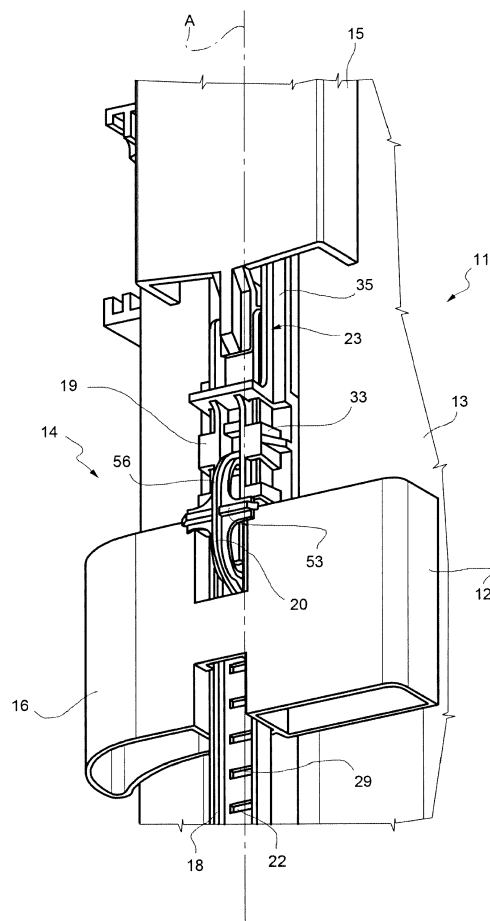
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(54) **POSITION ADJUSTING DEVICE FOR ADJUSTING THE POSITION OF A COMPONENT ALONG AN AXIS, IN PARTICULAR FOR ADJUSTING THE POSITION OF A FLOAT OF A FLUSHING VALVE OF A FLUSH TANK**

(57) A position adjusting device (11) for adjusting the position of a component (12) along an axis (A) with respect to a support body (13) comprises: a guide (18), extending along the axis (A) and either attached or attachable to the body (13); a releasable locking element (20), which is connected or joined to the component (12) and engages the guide (18) for locking the component (12) on the guide (18); and a slide (19) sliding along the axis (A) with respect to the guide (18) cooperating with the locking element (20) for moving the locking element (20) in both directions along the axis (A) and disengaging the locking element (20) from the guide (18).

FIG. 2



Description

[0001] The present invention relates to a position adjusting device for adjusting the position of a component along an axis, in particular for adjusting the position of a float of a flushing valve of a flush tank.

[0002] The invention can be advantageously used, in particular, in a system for adjusting the amount of water flushed by a flushing valve of a flush tank.

[0003] A common type of flushing valve of a flush tank comprises a support structure, which can be attached to a bottom wall of the tank and is provided with a drain hole delimited by a sealing seat, and a valve body (usually a tubular element which also works as overflow tube), housed in sliding manner in the support structure and provided on the bottom with a shutter cooperating with the sealing seat to close the drain hole; the valve body is lifted by means of an actuator mechanism and is provided with one or more floats which adjust the descent speed of the valve body, and thus the closing speed of the flushing valve.

[0004] Some flushing valves are provided with systems for adjusting the amount of flushed water, which allow an initial adjustment (during the step of installing of the flush tank) of the amount of flushed water. In brief, when the flushing valve is installed in the flush tank, the position (height) of the float which delays the closing of the flushing valve is adjusted with respect to the lower end of the flushing valve (and thus to the bottom of the flush tank).

[0005] The known adjusting systems appear to be improvable particularly in terms of simplicity and manufacturing cost-effectiveness, operating reliability, and efficiency and simplicity of use.

[0006] It is the object of the present invention to provide a position adjusting device, in particular a device for adjusting the position of a float of a flushing valve of a flush tank, and more in general to adjust the position of a component along an axis, which is particularly simple, effective and reliable.

[0007] In particular, it is an object of the present to provide a position adjusting device which can be operated by a user in simple, functional manner from an end of the device (specifically from the top), so as to permit, for example, to adjust the position of a float of a flushing valve by operating the flushing valve from the top also when this is installed, without requiring to disassemble or remove the flushing valve from the flush tank.

[0008] The present invention thus relates to a position adjusting device to adjust the position of a component along an axis, in particular to adjust the position of a float of a flushing valve of a flush tank, substantially as defined in appended claim 1 and for its preferred aspects in the dependent claims.

[0009] The position adjusting device of the invention is particularly simple and cost-effective to make and has a simple, safe, reliable operation; furthermore, the device can be easily operated from an end (e.g. from the top)

by means of a handling rod, which can be easily accessed by a user without needing to access other components of the device.

[0010] For example, if the device of the invention is applied to a flushing valve of a flush tank to adjust the position of a float of the flushing valve (and to thus adjust the amount of water flushed by the flushing valve) the device can be operated without removing the flushing valve from the tank.

[0011] The invention is described in the following non-limitative embodiments, with reference to the accompanying figures, in which:

- figure 1 is an exploded, perspective view of a position adjusting device for adjusting the position of a component along an axis, in particular for adjusting the position of a float of a flushing valve of a flush tank according to the invention;
- figure 2 is a partial perspective view of the position adjusting device in figure 1, fitted on a flushing valve, shown only in part and with parts removed for clarity, of a flush tank;
- figures 3 and 4 are a front view and a side view of the position adjusting device in figure 2, respectively;
- figure 5 is a longitudinal section view of the position adjusting device in figure 2;
- figure 6 is a top view of a detail of the position adjusting device in figure 2.

[0012] In figures 1 and 2, reference numeral 11 indicates as a whole a position adjusting device for adjusting the position of a component 12 along an axis A, with respect to a supporting body 13.

[0013] In the non-limiting example shown, the device 11 is used in a system 14 for adjusting the amount of water flushed by a flushing valve 15 of a flush tank, for adjusting the position of a float 16 of the flushing valve 15, and in particular for adjusting the position of the float 16 along axis A with respect to a lower end of the flushing valve 15 and, thus, with respect to a bottom wall of the flush tank.

[0014] The flushing valve 15 and the flush tank are known in themselves and therefore are not described in detail for the sake of simplicity, except for the parts needed to understand the present invention.

[0015] In general, the flushing valve 15 extends substantially along a longitudinal axis (vertical in use) either coinciding with or parallel to axis A and comprises a support structure which can be attached to a bottom wall of the tank; a valve body which extends and is slidable vertically within the support structure and is provided with the float 16 and a shutter, cooperating with a sealing seat to selectively open/close a drain hole delimited by the sealing seat; and an actuating mechanism for lifting the valve body.

[0016] In the illustrated example, the valve body (or a part thereof) defines the support body 13 of the device 11; the float 16 is part of the component 12 the position

of which is to be adjusted with respect to the support body 13.

[0017] The device 11 comprises: the component 12 (the float 16 in the case in point); a guide 18 which extends along axis A and is attached or attachable to the support body 13 (e.g. to the valve body or to another component of the flushing valve); a slide 19 sliding along axis A with respect to the guide 18; a releasable locking element 20, which is either connected or joined to the component 12, axially supports the slide 19 and engages the guide 18 for selectively locking the component 12 on the guide 18 (in particular preventing the component 12 from sliding along the guide 18) and releasing the component 12 from the guide 18 (allowing the component 12 to slide with respect to the guide 18 along axis A).

[0018] The guide 18 comprises a bar 21, which extends along axis A and is provided with a series of coupling seats 22 axially spaced apart from one another along axis A.

[0019] The bar 21 is provided with fasteners 23 to be attached to the body 13, e.g. by means of at least one tooth which engages a seat, carried by the bar 21 and by the body 6 or vice versa. Preferably, as shown in figure 5, the bar 21 is raised (spaced apart) from the outer wall of the body 13 on which it is fitted, e.g. by means of feet 24 which protrude from the bar 21 and rest on the outer wall of the body 13.

[0020] With reference also to figure 6, the bar 21 has a longitudinal channel 25, arranged along axis A and delimited by a bottom wall 26, having a bottom surface 27, and a pair of sides 28 perpendicular to the bottom wall 26 and to the surface 27; the sides 28 have respective rear edges 29 facing towards the component 12 and respective front edges 30 opposite to the rear edges 29.

[0021] The coupling seats 22 are formed, for example, on the surface 27 and in the bottom wall 26 and are substantially transversal (perpendicular) to the axis A; the coupling seats 22 may be arranged along the entire bar 21 either only on one portion of the bar 21, or on several portions distanced apart from one another along axis A of the bar 21.

[0022] Each coupling seat 22 is defined by a recess 31 formed in the bottom wall 26; the recesses 31 may be through recesses, formed through the bottom wall 26, or closed bottom blind recesses.

[0023] Each coupling seat 22 has a pair of opposite transverse sides 32, substantially perpendicular to axis A. The slide 19 comprises a slider 33, cooperating with the guide 18 and provided with a control portion 34 cooperating with the locking element 20, and a handling rod 35, which extends from the slider 33 and can be operated by a user.

[0024] The slider 33 (including the control portion 34) and the handling rod 35 are integrally joined, for example to form a monolithic body of the slide 19.

[0025] The slider 33 is shaped so as to engage the guide 18 and slide on the guide 18 along the axis A, remaining engaged to the guide 18 in a direction trans-

verse to the axis A and precisely along two directions orthogonal to each other: perpendicular to the bottom wall 26 and to the surface 27 of the guide 18, and perpendicular to the sides 28 of guide 18.

[0026] With reference also to figures 3 and 4, for example the slider 33 has a substantially C-shaped cross section, with a central portion 36 and two parallel arms 37 which protrude from the central portion 36.

[0027] The slider 33 is provided with a sliding seat 40, which extends along axis A and in which the bar 21 is inserted and axially slidable.

[0028] For example, the sliding seat 40 is delimited by the arms 37 and by the central portion 36 and is open at opposite axial ends (along axis A).

[0029] The sliding seat 40 is provided with side locators 41, 42 which constrain the bar 21 inserted in the sliding seat 40, in transverse direction with respect to axis A, and specifically in a direction orthogonal to the sides 28 and in a direction orthogonal to the bottom wall 26.

[0030] For example, a first pair of locators 41 is defined by respective portions, which laterally come into contact with respective sides 28 of the bar 21, of the arms 37; pairs of second opposite locators 42 engage the sides 28 perpendicular to the bottom wall 26 and are arranged on respective projections which extend laterally from respective opposite ends of the arms 37.

[0031] The control portion 34 extends longitudinally, for example from the central portion 36 and is aligned with the central portion 36 along axis A.

[0032] The control portion 34 has a front surface 43, facing the locking element 20, and is provided with a pair of through openings 44, formed for example in the surface 43, axially spaced apart from each other and aligned along axis A; the openings 44 face the bottom wall 26 of the guide 18 to receive respective ends 45 of the locking element 20, as will be explained hereinafter.

[0033] The control portion 34 comprises a pair of opposite pushers 46, for example wedge-shaped, arranged on respective opposite axial ends 47 of the control portion 34 and provided with respective contact surfaces 48 inclined (or curved, in particular convex) with respect to axis A and with respective opposite axial shoulders 49, for example substantially perpendicular to axis A.

[0034] In particular, the contact surfaces 48 are inclined with respect to axis A and converge towards the surface 43 and towards the locking element 20. The contact surfaces 48 are inclined starting from the surface 43 towards the axial ends 47 and towards the guide 18.

[0035] The shoulders 49 extends substantially perpendicular to axis A from the surface 43 of the control portion 34 towards the bottom surface 27 of the bar 21 and join to respective contact surfaces 48.

[0036] Each pusher 46 is associated with an opening 44; in particular, each pusher 46 is placed near an opening 44 or in the opening 44; in particular, the contact surface 48 and the shoulder 49 of each pusher 46 are either arranged in the opening 44 or face the opening 44.

[0037] The handling rod 35 (figure 1) extends from the

slider 33, e.g. by an upper axial end, by the side of the sliding seat 40 or in all cases transversely spaced apart from the sliding seat 40. The handling rod 35 has a longitudinal attachment end 51, joined to the slider 33, and a free longitudinal end 52, opposite to the end 51 and which can be gripped by the user, possibly by means of a laterally protruding head.

[0038] The locking element 20 comprises a central support 53, joined to the component 12 (i.e. to the float 16), and a pair of opposite arms 54, in particular elastic arms 54, which extend from the support 53.

[0039] The locking element 20 is joined to the component 12, i.e. to the float 16, by means of the support 53; the support 53 (and possibly the entire locking element 20) may either form one monolithic piece with the component 12 or may be joined integrally to the component 12 in other manner.

[0040] The arms 54 are either elastically hinged to the support 53 or flexible with respect to the support 53 and are provided with respective end teeth 55, arranged at respective free ends of the arms 54.

[0041] In the illustrated example, the arms 54 extend from the support 53 aligned along one another and substantially parallel to axis A and form a substantially C-shaped clip body 56, centrally hinged to the support 53.

[0042] Hereinafter, the word "hinged" includes, in addition to the case of components joined by a mechanical hinge, also the particular condition in which an arm 54, or clip body 56 as a whole, is connected to the support 53 in rotational manner about a rotation axis by effect of the elastic deformation and thus by means of an elastic hinge.

[0043] Advantageously, the locking element 20 consist of a monolithic piece 57 (formed by the support 53 and by the arms 54 with the teeth 55, i.e. by the support 53 and by the clip body 56).

[0044] In the illustrated example, the clip body 56 and the support 53 are joined as a cross, and extend substantially orthogonal to one another.

[0045] The arms 54 extend from the support 53 and are at least partially inserted through respective openings 44 to engage, with respective teeth 55, respective coupling seats 22, selected between the coupling seats 22 formed on the guide 18.

[0046] In the locking element 20 in non-deformed condition, the teeth 55 are at an axial distance (measured along axis A) which is substantially equal to the distance between two coupling seats 22.

[0047] In the illustrated example, in which the arms 54 and the support 53 form the monolithic piece 57, the arms 54 are hinged to the support 53 by means of respective elastic hinges, defined by respective flexible connecting portions which join the arms 54 to the support 53.

[0048] In other words, the geometry of the piece 57 and/or the elasticity of the material with which the piece 57 is made allow the arms 54 to bend with respect to the support 53, about a rotation axis or respective rotation axes, orthogonal to axis A.

[0049] It is understood that the single arms 54 or the clip body 56 as a whole may also be hinged to the support 53 in other manner, e.g. by means of mechanical hinges (formed by rotation pins housed in respective seats), optionally loaded by springs.

[0050] The teeth 55 are shaped so as to engage the coupling seats 22, e.g. having a shape mating that of the coupling seats 22.

[0051] The arms 54 have (figure 5) respective contact surfaces 58, facing towards the control portion 34 and in particular towards respective contact surfaces 48 of the pushers 46; and respective axial shoulders 59, opposite to, and facing each other and respective shoulders 49 of the pushers 46.

[0052] The contact surfaces 58 face each other and are inclined or curved (convex) with respect to axis A and converge toward the support 53; the contact surfaces 58 face respective contact surfaces 48 of the pushers 46.

[0053] The shoulders 59 extend substantially perpendicular to axis A from a rear surface, facing towards the locking element 20 and the guide 18 of the clip body 56, and are joined to respective contact surfaces 58.

[0054] The component 12 (in the case in point, the float 16) is provided (figure 1) with a longitudinal guide seat 60 which extends along axis A and is axially open; the gliding seat 60 is shaped so as to receive the bar 21, which is axially sliding (along axis A) in the guide seat 60; and to constrain the bar 21, inserted in the guide seat 60, in direction transversal to axis A, by means of pairs of opposite transverse locators 61, 62, acting in respective directions orthogonal to each other and to axis A.

[0055] For example, a pair of first locators 61 is defined by respective opposite side walls, which laterally contact respective sides 28 of the bar 21 on the outside; pairs of second opposite locators 62 engage the sides 28 perpendicular to the bottom wall 26 and are located on respective protrusions, perpendicular to the side walls defining the first locators 61 and which engage respective opposite edges of the sides 28 of the bar 21.

[0056] In the illustrated example, but not necessarily, the float 16 which defines the component 12 comprises a pair of floating tanks 63 arranged side-by-side, separated by a longitudinal groove 64 (in which the guide seat 60 is obtained) and joined by a strap 65 which crosses the groove 64; the support 53 is arranged bridging the floating tanks 63 parallel to the strap 65; the locking element 20 is partially housed in the groove 64.

[0057] In use, the guide 18 is attached to the body 13, by means of fasteners 23. The slide 19 is mounted in sliding manner on the guide 18, the bar 21 being inserted in the sliding seat 40 between the locators 41, 42. The component 12 (i.e. the float 16) is mounted on the guide 18, the bar 21 being inserted in the guide seat 60 between the locators 61, 62.

[0058] The locking element 20 locks the component 12 on the guide 18, engaging a selected pair of coupling seats 22 with the teeth 55; in this condition, the locking element 20 presses against the guide 18 in direction or-

thogonal to the bottom surface 27 and exerts an axial fastening force (along axis A) on the coupling seats 22, maintaining the component 12 engaged with the guide 18 and axially supporting the slide 19 on the guide 18. The weight of the slide 19 is lower than the force needed to disengage the teeth 55 from the coupling seats 22, so that even if the slide 19 rests underneath on an arm 37, it does not cause it to bend/rotate.

[0059] In order to adjust the position of the component 12 (and thus of the float 16) along the guide 18, the user grips the longitudinal free end 52 of the handling rod 35 and moves the slide 19 along axis A, in the direction required for adjustment: the user thus pushes the slide 19 either upwards or downwards.

[0060] The slide 19 slides along the axis A with respect to the guide 18 cooperating with the locking element 20 for moving the locking element 20 in both directions along the axis A and disengaging the locking element 20 from the guide 18.

[0061] In particular, in both directions of movement of the slide 19 along the axis A, the slide 19 comes into contact with the corresponding contact surface 58 of the locking element 20 by means of one of the contact surfaces 48 (specifically, the contact surface 48 facing the direction of movement of the slide 19).

[0062] The contact surface 48 of the control portion 34 and the contact surface 58 of the locking element 20 slide on one another, and the handling portion 34 of the slide 19 thus raises the corresponding arm 54 of the locking element 20; the arm 54 bends (or rotates) with respect to the support 53 to disengage the tooth 55 from the coupling seat 22.

[0063] The contact surfaces 48, 58 slide until the respective shoulders 49, 59 abut against each other.

[0064] Proceeding with the movement of the slide 19 along the guide 18, the slide 19 drags the locking element 20.

[0065] The tooth 55 opposite to the tooth 55 disengaged by the coupling seat 22 is pulled, in turn, by the movement of the locking element 20 and also exits from the respective coupling seat 22.

[0066] The tooth 55 having exited from the coupling seat 22 slides on the bottom surface 27, pushed by the pusher 46, with respect to the subsequent coupling seat 22, which it engages but then disengages if the movement of the slide 19 proceeds, and so on. The opposite tooth 55 also snappingly engages the subsequent coupling seats 22, from which it is disengaged if the movement of the slide 19 continues.

[0067] After having reached the desired position of the component, possibly indicated to the user by specific indicators, the locking element 20 engages a new pair of coupling seats 22 with the teeth 55, thus locking the component 12 in its new position.

[0068] It is understood that the position adjusting device of the invention described and illustrated with specific reference to a system for adjusting the amount of water flushed by a flushing valve in a flush tank may be

used in other applications, if it is necessary to adjust the position of a component along an axis.

[0069] It is also understood that further changes and variations may be made to the position adjusting device described and illustrated herein, without departing from the scope of the invention as defined in the appended claims.

10 Claims

1. A position adjusting device (11) for adjusting the position of a component (12) along an axis (A) with respect to a support body (13), in particular for adjusting the position of a float (16) of a flushing valve (15) of a flush tank; the device (11) comprising a support body (13); a component (12) movable along an axis (A) with respect to the support body (13); a guide (18), extending along the axis (A) and attached or attachable to the support body (13); a releasable locking element (20), which is connected or joined to the component (12) and engages the guide (18) for locking the component (12) on the guide (18); and a slide (19) sliding along the axis (A) with respect to the guide (18) and cooperating with the locking element (20) for moving the locking element (20) in both directions along the axis (A) and disengaging the locking element (20) from the guide (18); the device being **characterized in that** the guide (18) has a series of coupling seats (22) axially spaced from one another along the axis (A); and the locking element (20) comprises a substantially C-shaped clip body (56) provided with end teeth (55) apt to engage respective coupling seats (22).
2. A device according to claim 1, wherein the slide (19) comprises a pair of opposite pushers (46), set at respective opposite axial ends (47) of a control portion (34) and provided with respective slanted contact surfaces (48).
3. A device according to claim 2, the pushers (46) are wedge shaped.
4. A device according to claim 2 or 3, wherein the pushers (46) are provided with respective opposite axial shoulders (49), substantially perpendicular to the axis (A) and joined to respective contact surfaces (48).
5. A device according to one of claims 2 to 4, wherein each pusher (46) is positioned close to an opening (44) or inside an opening (44) formed on the slide (19) and housing an arm (54) of the locking element (20).
6. A device according to one of the preceding claims, wherein the locking element (20) comprises a central support (53), attached or attachable to the compo-

ment (12), and a pair of opposite elastic arms (54), projecting from the support (53) and elastically hinged to the support (53) or flexible with respect to the support (53) and provided with respective teeth (55), positioned at respective free ends of the arms (54) for engaging respective coupling seats (22) on the guide (18).

7. A device according to claim 6, wherein the support (53) and the arms (54) with the teeth (55) form a monolithic piece (57) of the locking element (20); and the arms (54) are hinged to the support (53) via respective elastic hinges, defined by respective flexible connecting portions that connect the arms (54) to the support (53).
8. A device according to one of the preceding claims, wherein the slide (19) and the locking element (20) have respective contact surfaces (48, 58) cooperating so as to slide over each other and to bend or rotate selectively one or the other of a pair of arms (54) of the locking element (20), provided with respective teeth (55) that engage respective coupling seats on the guide (18).
9. A device according to one of the preceding claims, wherein the locking element (20) has a pair of first contact surfaces (58), slanted or curved with respect to the axis (A) and facing towards the slide (19) and cooperating with respective second contact surfaces (48), slanted or curved with respect to the axis (A), of the slide (19); and a pair of first axial shoulders (59), opposed and facing to each other and to respective second axial shoulders (49) of the slide (19).
10. A device according to one of the preceding claims, wherein the slide (19) comprises a slider (33), cooperating with the guide (18) and provided with a control portion (34) cooperating with the locking element (20); and a handling rod (35), projecting from the slider (33) parallel to the axis (A) and is maneuverable by a user.
11. A device according to claim 10, wherein the slider (33) and the handling rod (35) are integrally joined to each other, forming a monolithic body of the slide (19).
12. A device according to claim 10 or 11, wherein the slider (33) is shaped so as to engage the guide (18) and slide on the guide (18) along the axis (A), remaining engaged to the guide (18) in a direction transverse to the axis (A) and along two directions perpendicular to each other.
13. A device according to one of the preceding claims, wherein the component (12) is provided with a longitudinal guide seat (60), extending along the axis

(A) and axially open and shaped so as to receive the guide (18), that is axially slidable in the guide seat (60), and to lock the guide (18), inserted in the guide seat (60), in a direction transverse to the axis (A) via pairs of opposite transverse locators (61, 62), acting in respective directions perpendicular to each other and to the axis (A).

14. A flushing valve (15) of a flush tank, comprising a valve body, provided with a float (16), and a system (14) for adjusting the amount of water discharged by the flushing valve (15) by adjusting the position of the float (16) with respect to a bottom end of the flushing valve (15); wherein the system (14) for adjusting the amount of water discharged by the flushing valve (15) comprises a position adjusting device (11) according to any one of the preceding claims for adjusting the position of the float (16).

FIG. 1

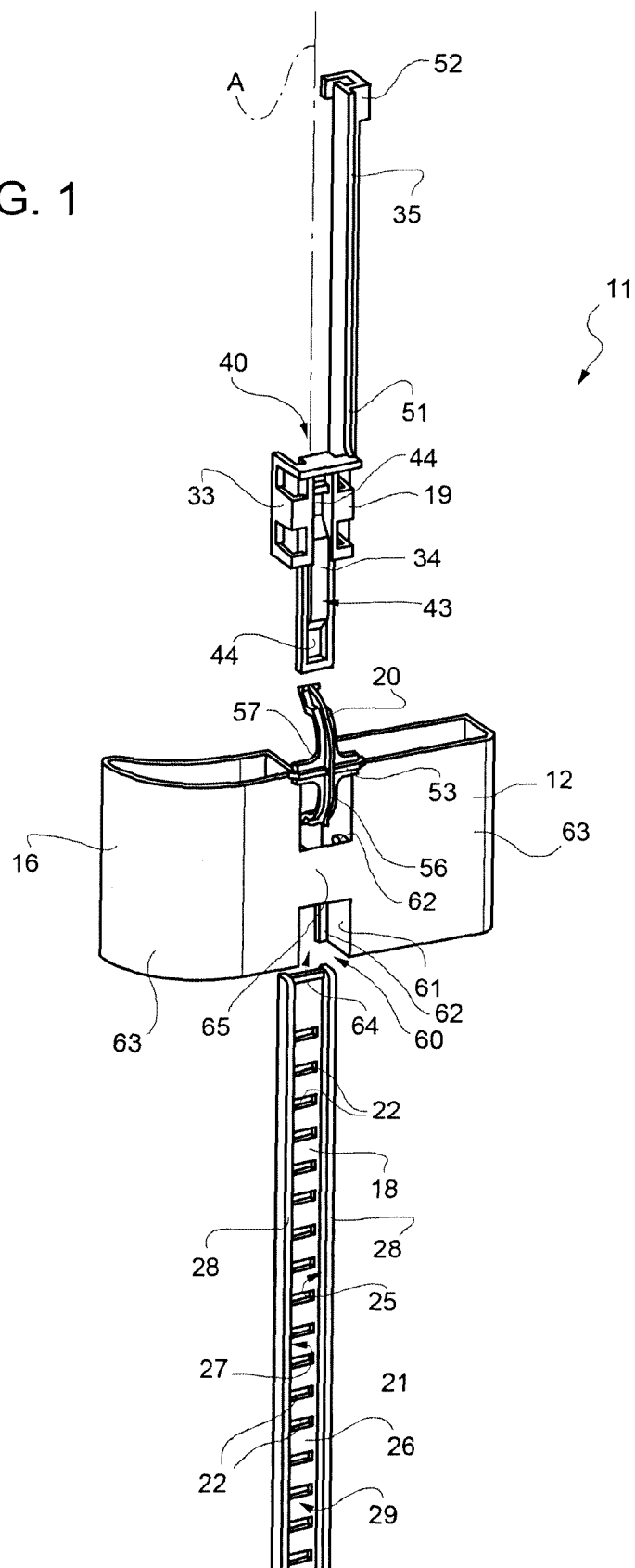


FIG. 2

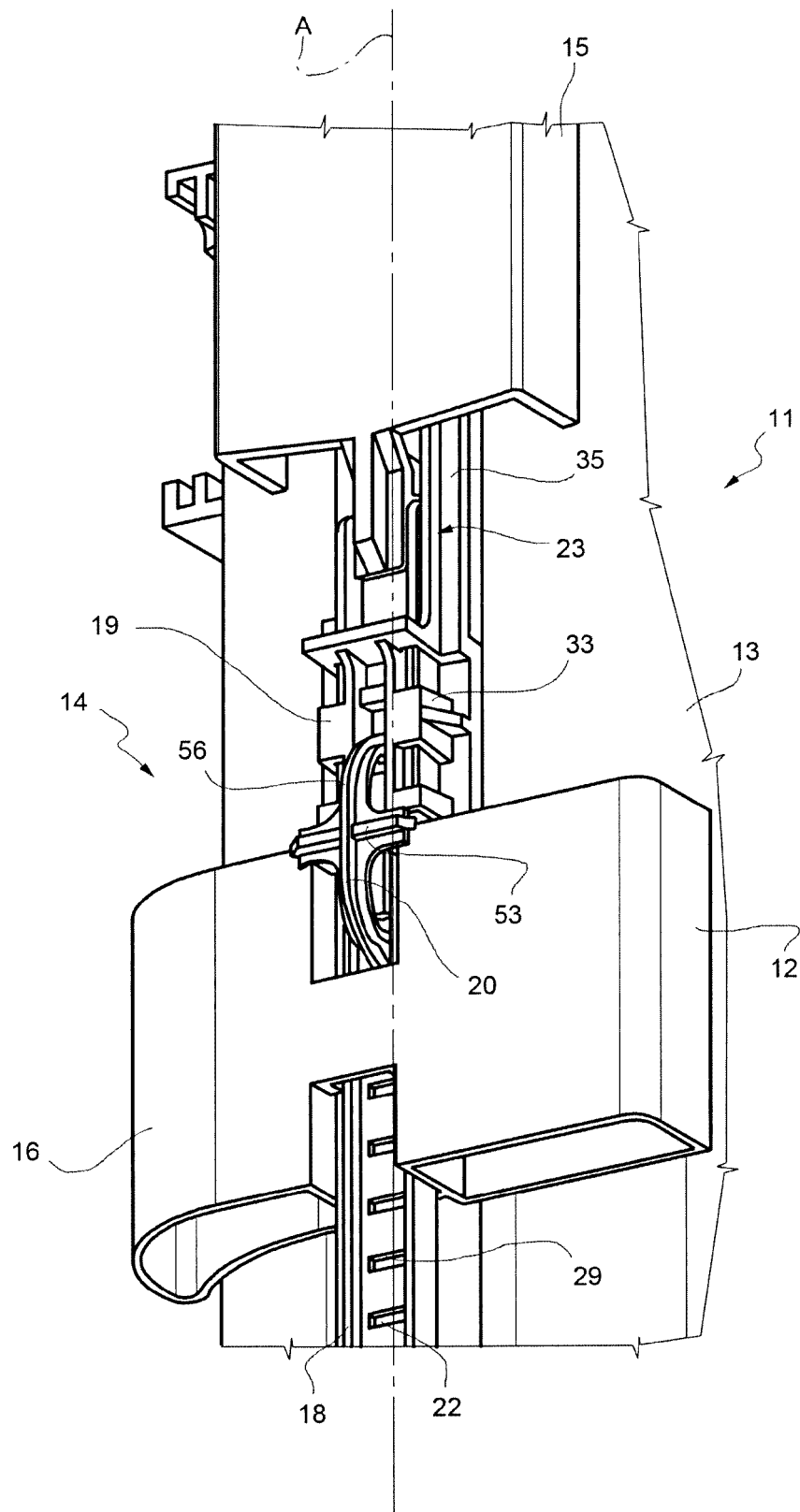


FIG. 4

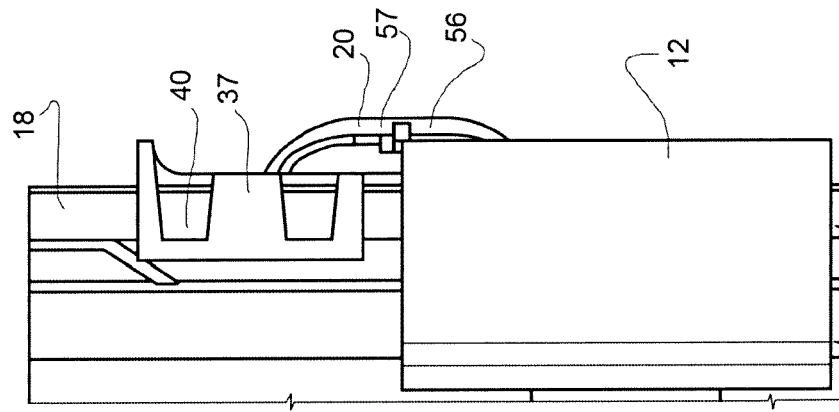


FIG. 3

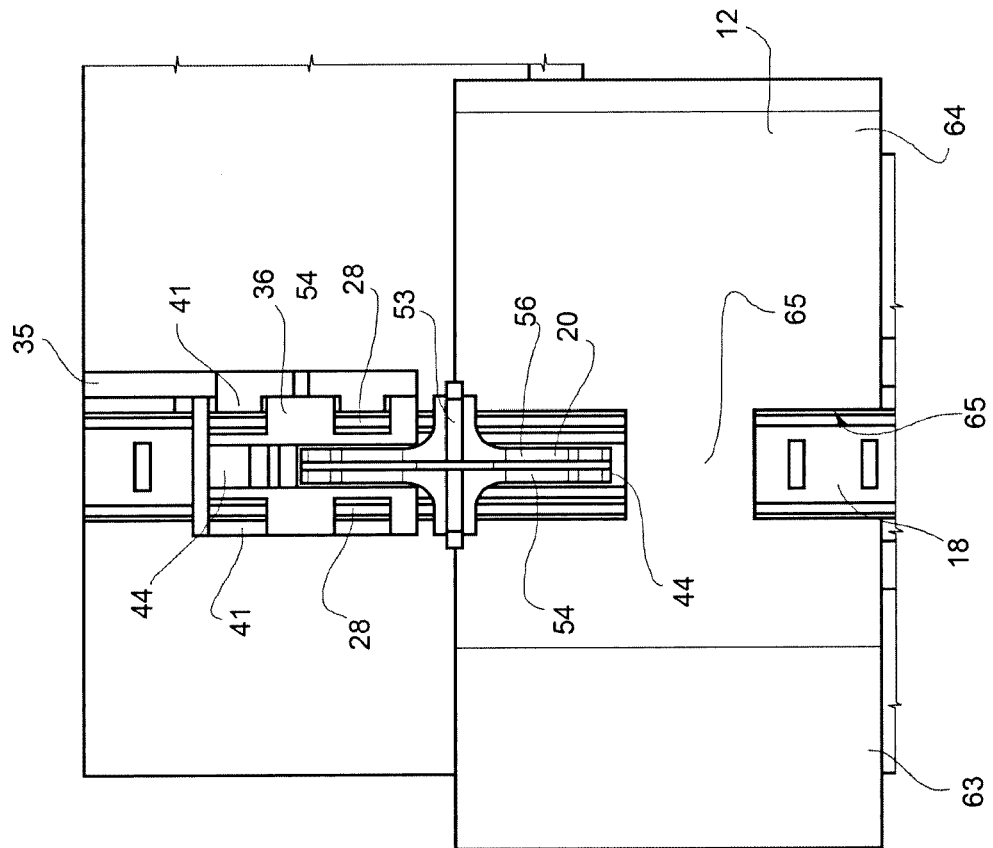


FIG. 5

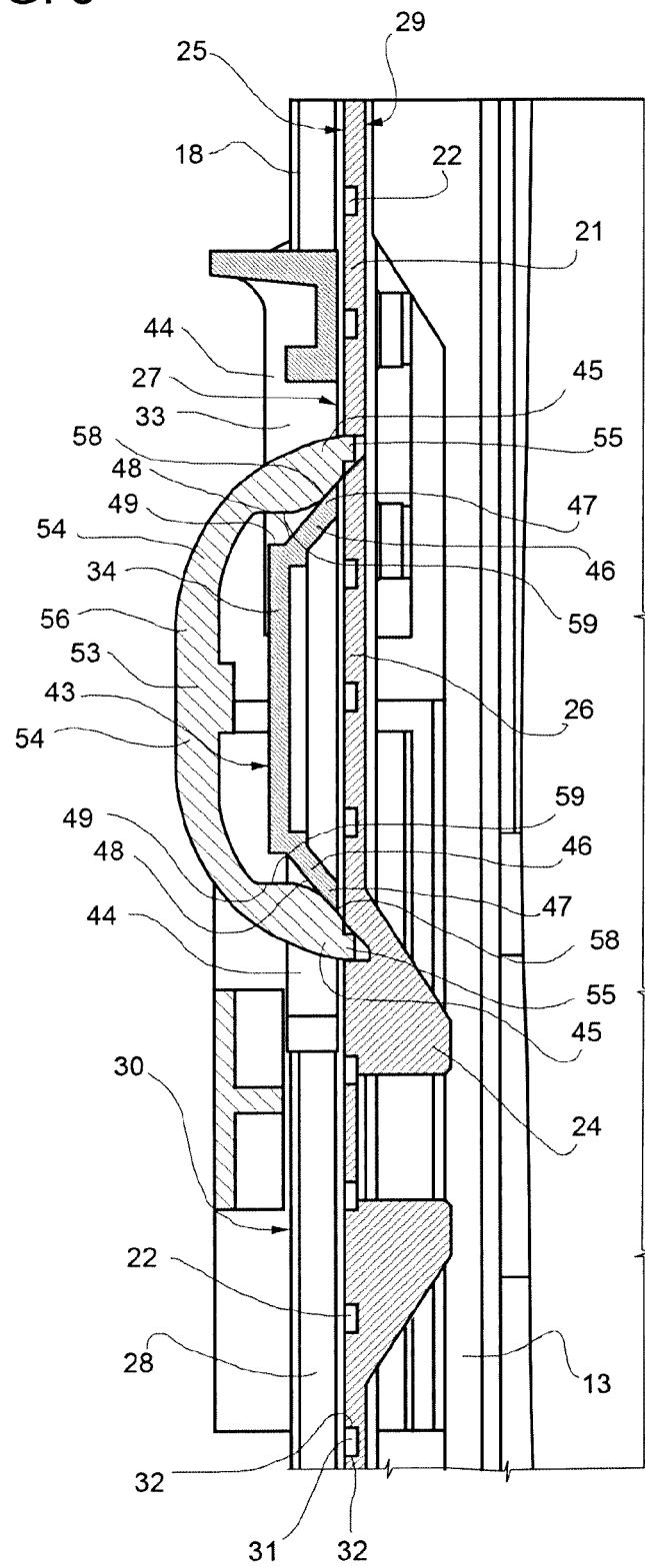
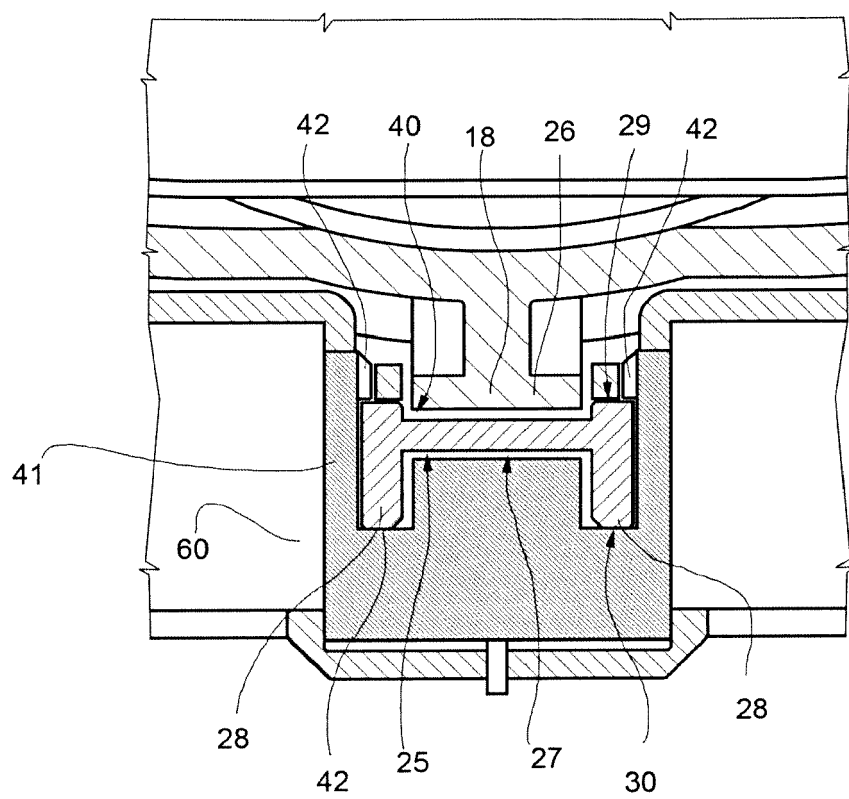


FIG. 6





EUROPEAN SEARCH REPORT

Application Number
EP 15 39 8002

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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)
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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			E03D
Place of search		Date of completion of the search	Examiner
Munich		15 July 2015	Leher, Valentina
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			

EPO FORM 1503 03 82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 15 39 8002

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15-07-2015

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