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(72) Inventor: **Bente, Robertus C. W. M.**  
**6815 EJ Arnhem (NL)**

(74) Representative: **Bartelds, Erik et al**  
**Arnold & Siedsma,**  
**Advocaten en Octrooigemachtigden,**  
**Sweelinckplein 1**  
**2517 GK Den Haag (NL)**

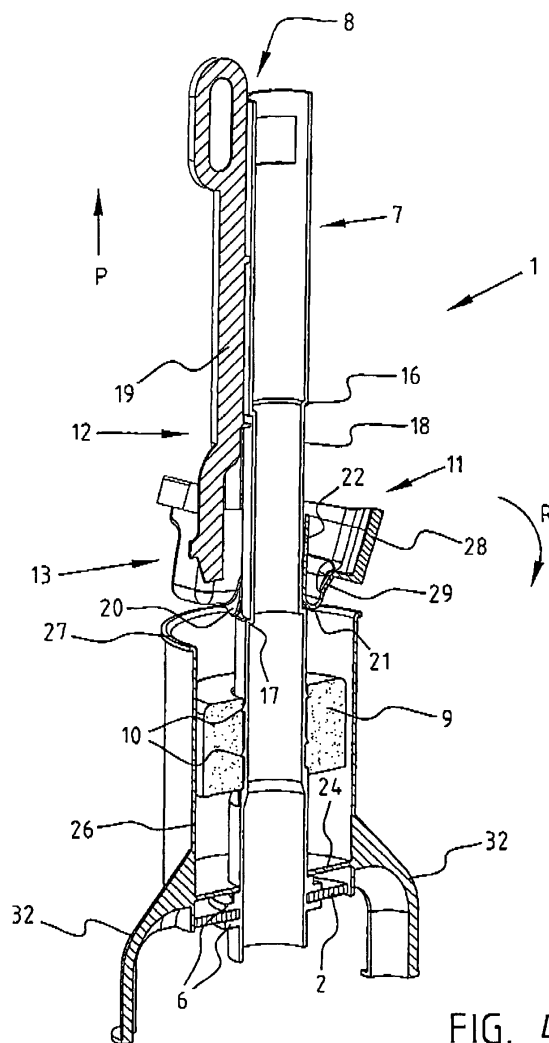
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(71) Applicant: **Wisa B.V.**  
**6827 BP Arnhem (NL)**

(54) **Flushing device having a full or partial flushing capability**

(57) The invention relates to a device for flushing a water closet, comprising a valve for closing an outflow opening of a cistern of the water closet, a float connected to the valve, means to be selectively connected to the valve for weighting thereof, and means for operating the valve, which operating means are adapted to optionally lift only the valve or the valve in combination with the weighting means. The operating means comprise a first part acting directly on the valve and a second part acting on the weighting means, and the weighting means are movable under the influence of a second operating part between a rest position leaving the valve clear and a weighting position in which they load the valve. The weighting means can comprise a vessel which is open at the top and which is pivotable about a shaft situated at a distance from its centre of gravity.

The invention further relates to a water closet, comprising a bowl and a cistern connected thereto via a flow tube, and incorporating such a flushing device.



**FIG. 4**

## Description

**[0001]** The invention relates to a device for flushing a water closet, comprising a valve for closing an outflow opening of a cistern of the water closet, at least one float connected to the valve, means to be selectively connected to the valve for weighting thereof, and means for operating the valve, which operating means are adapted to optionally lift only the valve or the valve in combination with the weighting means. Such a flushing device is known, for instance from EP 0 722 020.

**[0002]** There is a growing realization worldwide that clean water is becoming scarce. It is therefore being used in more conscious manner in recent years, and waste is being reduced as much as possible in many fields. A significant part of domestic water use is the result of flushing water closets. Possibilities for limiting the quantity of water per flush are therefore being sought. Two methods have herein come into use.

**[0003]** A first method is the flush interruption. The flushing device is herein provided with a control which acts in two directions. When operated in a first direction a flushing is started by lifting a valve from a seat on an outflow opening in the bottom of the cistern. Operation in a second, opposite direction results in the valve being urged back onto its seat and the outflow opening being closed, so that the flushing is ended before the cistern is entirely emptied. This manner of limiting the quantity of water per flush has the drawback that an extra operation is required of the user. There is furthermore the risk here of the flushing being interrupted prematurely and insufficient water being delivered to flush the toilet bowl clean and discharge the contents hereof through the sewage system.

**[0004]** Another method, which is preferred at the moment, consists of the user being offered the choice between two predetermined flushes, a full and a partial flush. Use is made here of a flushing device with dual control, wherein a part of the control is responsible for starting a full flushing and the other part for starting the partial flushing. For both flushes it is the case that they are ended when the outflow valve, which is lifted from its seat at the beginning of the flush, drops back of itself onto its seat. The difference between the flushes is determined by the difference in the time which elapses before the valve begins to drop back. This difference in the moment of dropping back is in turn caused by a variable buoyancy of the valve in the water of the cistern. In the case of a partial flushing the valve is urged back to the seat in accelerated manner by loading it with an extra weight.

**[0005]** A flushing device of this type is described in the above stated document EP 0 722 020. The flushing device is provided with a weighting member in the form of a vessel which is open at the top and which is arranged slidably around a tube carrying the valve. On the underside of the weighting member is mounted a lever or switch which has a widened foot. This foot protrudes into an

opening in the upper side of a housing which encloses the tube and supports the weighting member in the rest position. In order to carry out a partial flush the weighting member is lifted by means of a pull rod, wherein this latter comes into engagement with an edge of the tube, which is co-displaced upward. During this movement the lever is pulled up through the opening in the housing, wherein an edge of the opening engages on the widened foot, and thus forces the lever toward the tube. In this position the foot of the lever comes to rest on an edge of the tube when the weighting member drops back down again after releasing the pull rod. The tube and thereby the valve are thus loaded by the weight of the weighting member, and will drop back in accelerated manner to the position in which the valve closes the outflow opening.

**[0006]** This known flushing device has the drawback that it has a relatively large number of components, some of which are moreover quite small. The assembly of the flushing device hereby requires a large number of operations to be carried out accurately. In addition, there is the risk that the operation of the relatively small lever will be adversely affected during the lifespan of the flushing device by the growth of organisms present in the water, whereby malfunction can occur.

**[0007]** A flushing device with full and partial flushing is further known from EP 0 448 092, wherein the valve is loaded in its rest position by a weighting member which is suspended therefrom by means of hooking arms. In the case of a partial flushing the valve is pulled up together with the weighting member, while for a full flushing the hooking arms are operated and the weighting member is uncoupled from the valve. This flushing device also has the drawback of having a relatively large number of small components. These components are here moreover often situated at the boundary surface of water and air, whereby, in addition to growth developing, limescale can also affect operation.

**[0008]** The invention has for its object to provide a flushing device of the above described type which has a simpler construction, is more robust and thus more reliable than the known devices. According to the invention this is achieved in such a flushing device in that the operating means comprise a first part acting directly on the valve and a second part acting on the weighting means, and the weighting means are movable under the influence of a second operating part between a rest position leaving the valve clear and a weighting position in which they load the valve. By giving the weighting means themselves a movable form and connecting them directly or indirectly to the valve, they themselves in fact function as coupling or lever, and all manner of vulnerable and structurally complicated moving transmissions can be omitted.

**[0009]** A movement which is easy to realize is obtained when the weighting means comprise at least one weighting body which is pivotable about a shaft situated at a distance from its centre of gravity. The at least one weighting body can here advantageously take the form

of a vessel open at the top, so that the weighting means are operated by the displacement through the water in the cistern.

**[0010]** The first operating part preferably comprises a tube which carries the valve and is movable along the weighting means, and the weighting means have at least one element engaging on the tube in the weighting position. By making use of the overflow tube present in many flushing devices a simple and robust connection is achieved between the weighting means and the valve. In addition, this construction is rotation symmetrical, whereby the installation and assembly thereof are simplified. The second operating part can herein advantageously comprise a ring slidably receiving the tube and bearing the pivot shaft of the at least one weighting body.

**[0011]** So as to create a considerable distance between the centre of gravity of the weighting body and the point of rotation thereof, and thus a rapid movement of the weighting body, it is recommended that the pivot shaft is situated on one side of the tube and the at least one weighting body at least partially encloses the tube. For the same reason the pivot shaft can be formed close to the top side of the at least one weighting body and the at least one engaging element can be formed close to the underside thereof.

**[0012]** In order to bring about a precisely determined rest position and a readily reproducible operation, the flushing device is preferably provided with means for supporting the weighting means in their rest position.

**[0013]** When the support means herein comprise a cylindrical housing enclosing the tube and the at least one weighting body, a rotation symmetrical and therefore easily installed mechanism is once again obtained.

**[0014]** The invention further relates to a water closet with a cistern in which the flushing device as described above is applied.

**[0015]** The invention is now elucidated on the basis of a number of examples, wherein reference is made to the accompanying drawing, in which:

Fig. 1 is a schematic perspective view of a flushing device according to a first embodiment of the invention in the rest position,

Fig. 2 is a view corresponding with fig. 1, but cross-sectional, in which a part of a cistern is also shown,

Fig. 3 is a view corresponding with fig. 2, but without cistern, of the flushing device when performing a full flushing,

Fig. 4 is a cross-sectional perspective view from a different angle, which shows the flushing device during a partial flushing, and

Fig. 5 and 6 are schematic side views of alternative embodiments of the flushing device.

**[0016]** A device 1 for flushing a water closet comprises a valve 2 for closing an outflow opening 3 in the bottom 4 of a cistern (fig. 2). This valve 2 here takes the form of

an annular element of rubber or an elastomer, which rests in the closing position on a valve seat 5 around outflow opening 3. The annular valve element 2 is clamped between two flanges 6 on the underside of an overflow tube 7.

**[0017]** Overflow tube 7 forms a first part, acting directly on valve 2, of means 8 for operating the valve 2. In conventional manner these operating means 8 can further comprise a linkage or lever mechanism (not shown here) engaging on the top side of overflow tube 7, whereby a movement of a pushing or pulling element to be operated by a user is converted into an upward directed movement of overflow tube 7 and the valve 2 fixed thereon.

**[0018]** A float 9 is further connected to valve 2. In the shown embodiment the float 9 is a ring of a light material, for instance a closed-cell foam, which is clamped around overflow tube 7 by means of protrusions 10. This float 9 ensures that overflow tube 7 and valve 2 remain floating on or suspended in the water in the cistern once they have been moved upward. Valve 2 thus drops back onto seat 5 only gradually with emptying of the cistern, thereby achieving that sufficient water can indeed flow out of the cistern to ensure a proper flushing.

**[0019]** In addition, means 11 can be connected to valve 2 which weight the valve 2 and thus ensure that it drops back onto seat 5 in accelerated manner. By connecting these weighting means 11 to valve 2, the time for which outflow opening 3 remains opened after valve 2 is lifted is thus shortened, and the quantity of water flowing out of the cistern is thereby reduced. A partial flushing is thus achieved.

**[0020]** The choice between a partial and a full flushing is made by the user. Operating means 8 are herein adapted to lift valve 2 only or valve 2 in combination with weighting means 11 subject to the choice of the user. In addition to the first operating part, here in the form of overflow tube 7, which engages directly on valve 2, operating means 8 comprise for this purpose a second operating part 12 which acts on weighting means 11. Weighting means 11 are hereby displaceable between a rest position, in which they leave valve 2 free during flushing (fig. 3), and a weighting position in which during flushing (fig. 4) they load valve 2 and thus urge it back to its seat 5 in accelerated manner.

**[0021]** In the shown embodiment the weighting means 11 comprise a weighting body 13, here in the form of a partly annular vessel which is open at the top. This weighting body 13 is pivotable about a shaft 14, which is situated at a distance from its centre of gravity. This pivot shaft 14 is here mounted in an open ring 15 which partly encloses a narrowed part of overflow tube 7 bound by edges 16, 17. Further fixed to this ring 15 is a pull rod 19 which is connected at the top to the linkage or lever mechanism (not shown here) of operating means 8. Ring 15 and pull rod 19 thus together form the second operating part 12. The first operating part, in the form of overflow tube 7, and second operating part 12, in the form of ring 15 and pull rod 19, are thus slidable relative to each other

over the length of the narrowed tube part 18.

**[0022]** As stated, valve 2 is loaded in the weighting position by weighting means 11. For this purpose the vessel 13 is provided close to its underside with two engaging elements 20, here in the form of protrusions projecting obliquely downward from the edge between its base 21 and its partly annular inner wall 22. In the weighting position (fig. 4) these engaging elements 20 come to rest on either side of overflow tube 7 on the lower edge 17 of the narrowed part 18 thereof. This edge 17 can also take an oblique form so that engaging elements 20 can be held in reliable manner between edge 17 and the periphery of overflow tube 7.

**[0023]** In the shown embodiment a cylindrical housing 23 is arranged around the assembly of overflow tube 7, valve 2, float 9 and weighting means 11, which housing is accommodated in fixed position in the cistern in that it rests with two legs 32 on bottom part 4. This housing 23 has a bottom part 24 with an opening 25 therein, through which protrudes the overflow tube 7. This bottom part 24 functions as a stop bounding the upward movement of valve 2.

**[0024]** Housing 23 further serves to support the weighting means 11 in the rest position. For this purpose the cylinder wall 26 of housing 23 is provided with a bent upper edge 27 on which engages a protruding part 28 of vessel 13. Protrusion 28 here forms an integral part of outer wall 29 of vessel 13.

**[0025]** The operation of flushing device 1 is now as follows. When a user wishes to flush the water closet, he opts for a full or a partial flushing by operating an associated knob or handle.

**[0026]** When the user selects a full flushing, the first operating part, including overflow tube 7, is activated. Tube 7 is moved upward (arrow F) from the rest position drawn in fig. 1 and 2, whereby valve 2 is lifted from seat 5 and outflow opening 3 is left clear. During this movement of overflow tube 7 the narrowed part 18 slides through ring 15 (fig. 3). This ring 15 forms part of the second operating part 12, which is not active during a full flushing and thus remains in place. Weighting body 13 herein also remains resting with its protrusion 28 on upper edge 27 of housing 23, so that inner wall 22 and engaging elements 20 remain clear of lower edge 17 of the narrowed tube part 18. Valve 2 is thus not loaded by weighting body 13 and, due to the buoyancy of float 9, will only drop back slowly onto valve seat 5. This dropping-back is slowed still further because the water level in housing 23 drops more slowly than in the surrounding cistern. The water can after all only flow out of housing 23 through the narrow gap between opening 25 and overflow tube 7. Outflow opening 3 thus remains open long enough to allow the greater part of the contents of the cistern to flow away, so that a full flushing is achieved.

**[0027]** When on the other hand the user opts for a partial flushing, the second operating part 12 formed, among other parts, by pull rod 19 and ring 15 is activated. Pull rod 19 and ring 15 are moved upward (arrow P), wherein

overflow tube 7 is co-displaced on the upper edge 16 of its narrowed part 18, so that valve 2 is also lifted from seat 5 again and outflow opening 3 is left clear. Weighting body 13 is also moved upward by the movement of ring 15 and the pivot shaft 14 mounted therein. Protrusion 28 herein detaches from upper edge 27 of housing 23.

**[0028]** Because weighting body 13 takes the form of an open vessel, it will as it were "scoop" water out of the cistern during the upward movement, whereby a resistant force is exerted on vessel 13. Because vessel 13 extends only partially around overflow tube 7, the imaginary point of engagement of this resistant force, in fact the centre of gravity of weighting body 13, lies outside this tube 7, while pivot shaft 14 is mounted on the opposite side of tube 7. The resistant force on vessel 13 hereby results in a moment round pivot shaft 14 which urges the base 21 of vessel 13 and the engaging elements 20 connected hereto in the direction of overflow tube 7 (arrow R). Engaging elements 20 herein come to rest on the lower edge 17 of narrowed tube part 18, so that overflow tube 7, and therefore also valve 2, are loaded by the weight of weighting body 13 once the water level in the cistern has dropped below weighting body 13. The relatively great distance between pivot shaft 14 and engaging elements 20 ensures that these elements are pressed firmly onto lower edge 17. The extra weight on overflow tube 7 results in valve 2 dropping back onto seat 5 in accelerated manner, and only part of the water in the cistern is thus delivered, so that only a partial flushing is carried out.

**[0029]** Because weighting body 13 can be manufactured from a plastic having practically the same density as water, there is a risk that it will continue to swing upward at the end of an abrupt pulling movement. Weighting body 13 could also be pivoted upward by a swirling flow in the cistern, so that the engagement on overflow tube 7 does not come about. In order to prevent all this, provisions (not shown here) can be present for preventing such an upward pivoting movement of weighting body 13. These provisions can consist of a stop, for instance mounted on housing 23, which comes into engagement with the upper edge of weighting body 13, thus preventing the upward pivoting movement. It is however also possible to make the open vessel clearly heavier than the surrounding water, for instance by adding a ballast weight.

**[0030]** Instead of engaging elements 20 on the underside of vessel 13 it is of course also possible to form an engaging element 120 on the top side of vessel 113 (fig. 5). This engaging element 120 must here then be placed on the same side of overflow tube 107 as pivot shaft 114 in order to come into engagement with tube 107 during rotation of vessel 113. In this embodiment the engaging element 120 is otherwise arranged on an arm 130 in order to create a considerable distance from pivot shaft 114. Engaging element 120 is herein embodied as a hook which can grip round a protrusion 131 on overflow tube 107.

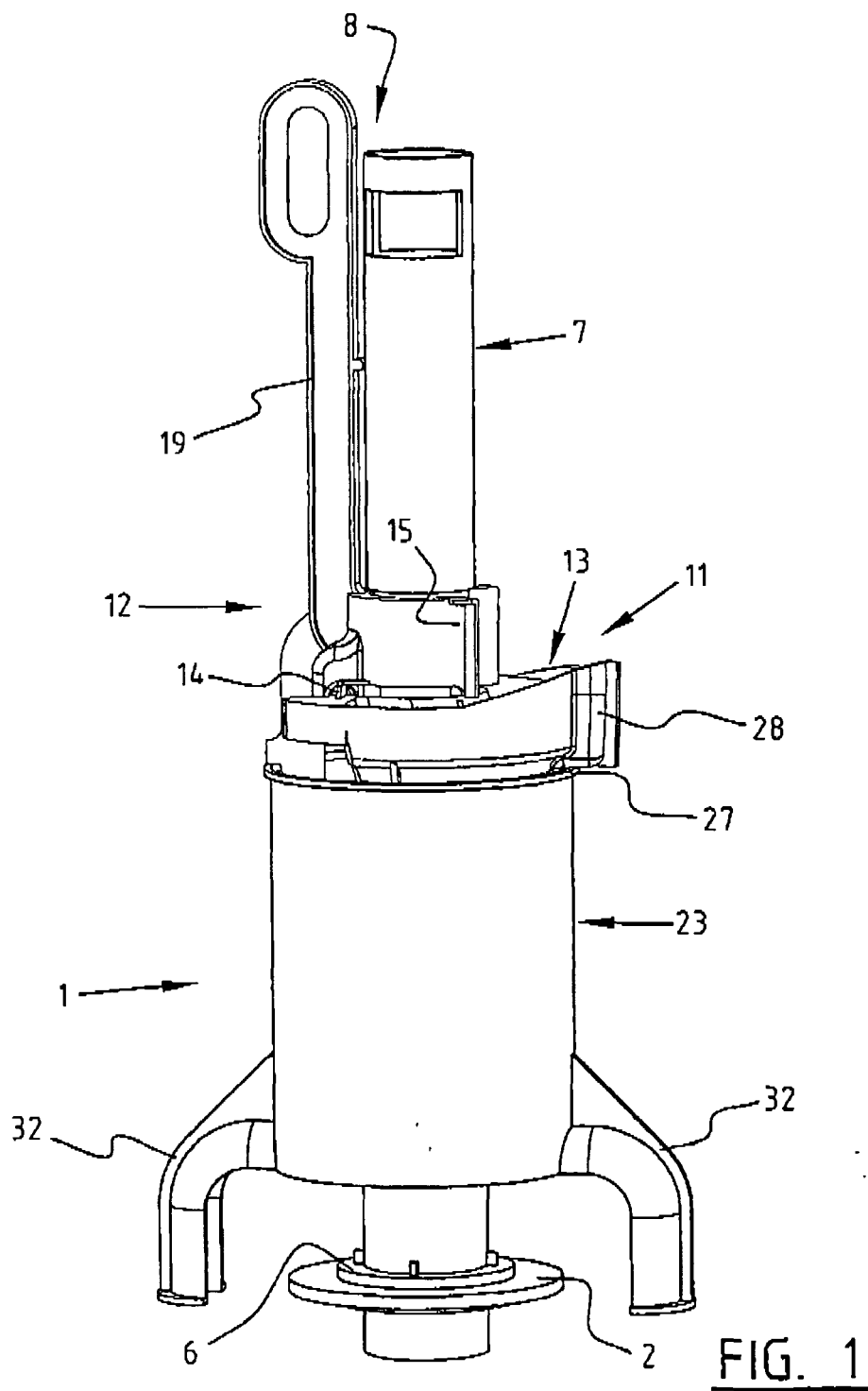
**[0031]** In yet another embodiment, wherein engaging element 220 lies on the same side of overflow tube 207 as pivot shaft 214 (fig. 6), this pivot shaft 214 is placed close to the bottom 221 of vessel 213 in order to maximize the distance from engaging element 220. In this embodiment the engaging element 220 takes the form of a single, central hook which engages on a peripheral rib 231 on overflow tube 207. This variant, like that of fig. 1 to 4, is hereby substantially rotation-symmetrical, from which ensues that the different components can be mounted in a random position. The installation of the flushing device is thus simplified considerably.

**[0032]** The invention thus makes it possible to form a reliably operating flushing device using simple means and a minimum of components, the device offering the choice between a full and a partial flushing.

**[0033]** Although the invention is elucidated above with reference to a number of embodiments, it will be apparent that it is not limited thereto. The weighting body could thus have a form and embodiment different from that shown here, and could for instance perform a sliding movement along a guide instead of a pivoting movement about a shaft. The form and embodiment of the or each engaging element could also be chosen differently. The scope of the invention is therefore defined solely by the following claims.

## Claims

1. Device for flushing a water closet, comprising a valve for closing an outflow opening of a cistern of the water closet, at least one float connected to the valve, means to be selectively connected to the valve for weighting thereof, and means for operating the valve, which operating means are adapted to optionally lift only the valve or the valve in combination with the weighting means, **characterized in that** the operating means comprise a first part acting directly on the valve and a second part acting on the weighting means, and the weighting means are movable under the influence of a second operating part between a rest position leaving the valve clear and a weighting position in which they load the valve.
2. Flushing device as claimed in claim 1, **characterized in that** the weighting means comprise at least one weighting body which is pivotable about a shaft situated at a distance from its centre of gravity.
3. Flushing device as claimed in claim 2, **characterized in that** the at least one weighting body takes the form of a vessel open at the top.
4. Flushing device as claimed in any of the foregoing claims, **characterized in that** the first operating part comprises a tube which carries the valve and is movable along the weighting means, and the weighting means have at least one element engaging on the tube in the weighting position.
5. Flushing device as claimed in claim 2 or 3 and 4, **characterized in that** the second operating part comprises a ring slidably receiving the tube and bearing the pivot shaft of the at least one weighting body.
6. Flushing device as claimed in claim 5, **characterized in that** the pivot shaft is situated on one side of the tube and the at least one weighting body at least partially encloses the tube.
7. Flushing device as claimed in claim 6, **characterized in that** the pivot shaft is formed close to the top side of the at least one weighting body and the at least one engaging element is formed close to the underside thereof.
8. Flushing device as claimed in any of the foregoing claims, **characterized by** means for supporting the weighting means in their rest position.
9. Flushing device as claimed in any of the claims 5-7 and 8, **characterized in that** the support means comprise a cylindrical housing enclosing the tube and the at least one weighting body.
10. Water closet, comprising a bowl and a cistern connected thereto via a flush pipe, and incorporating a flushing device as claimed in any of the foregoing claims.



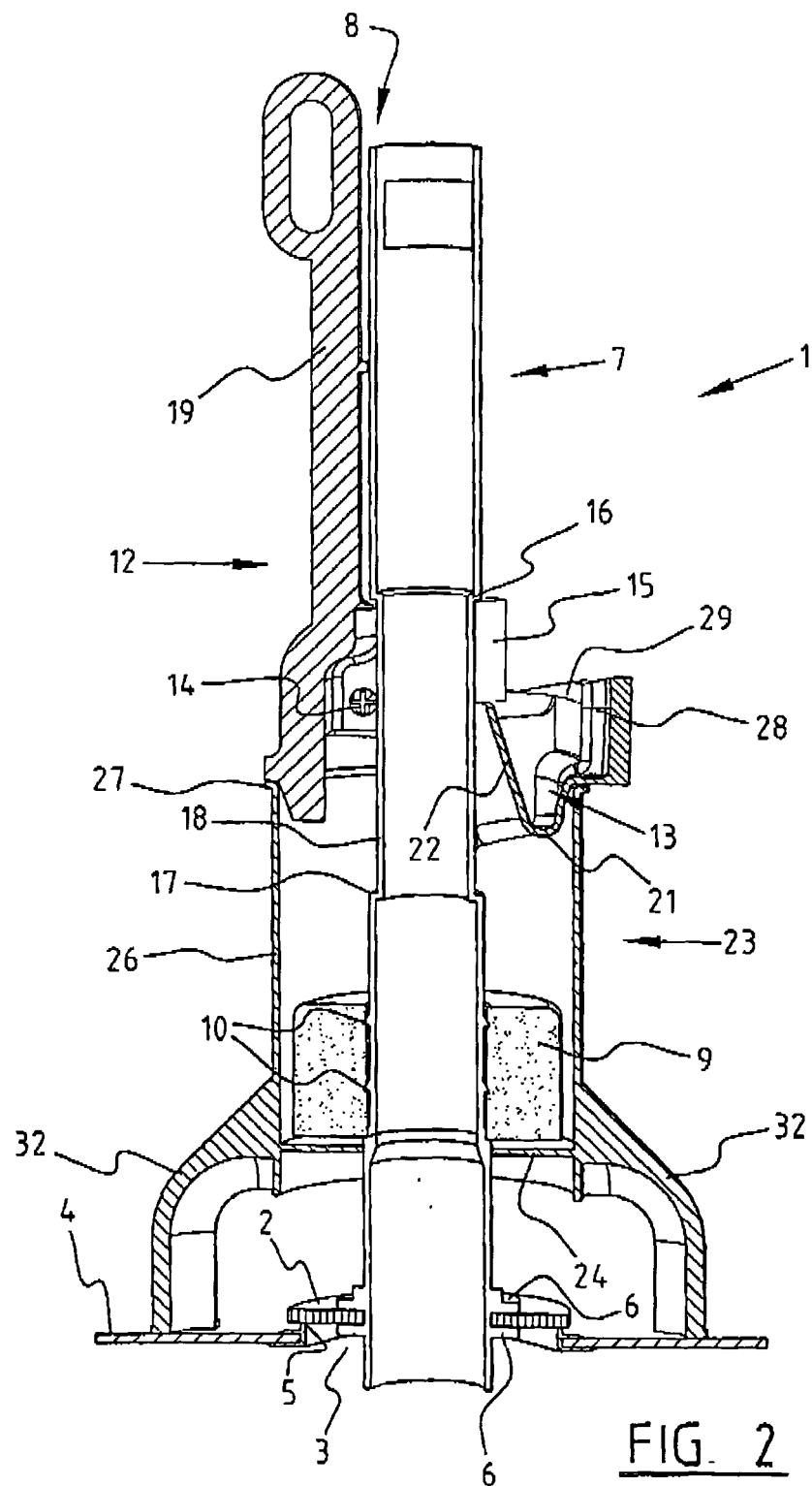


FIG. 2

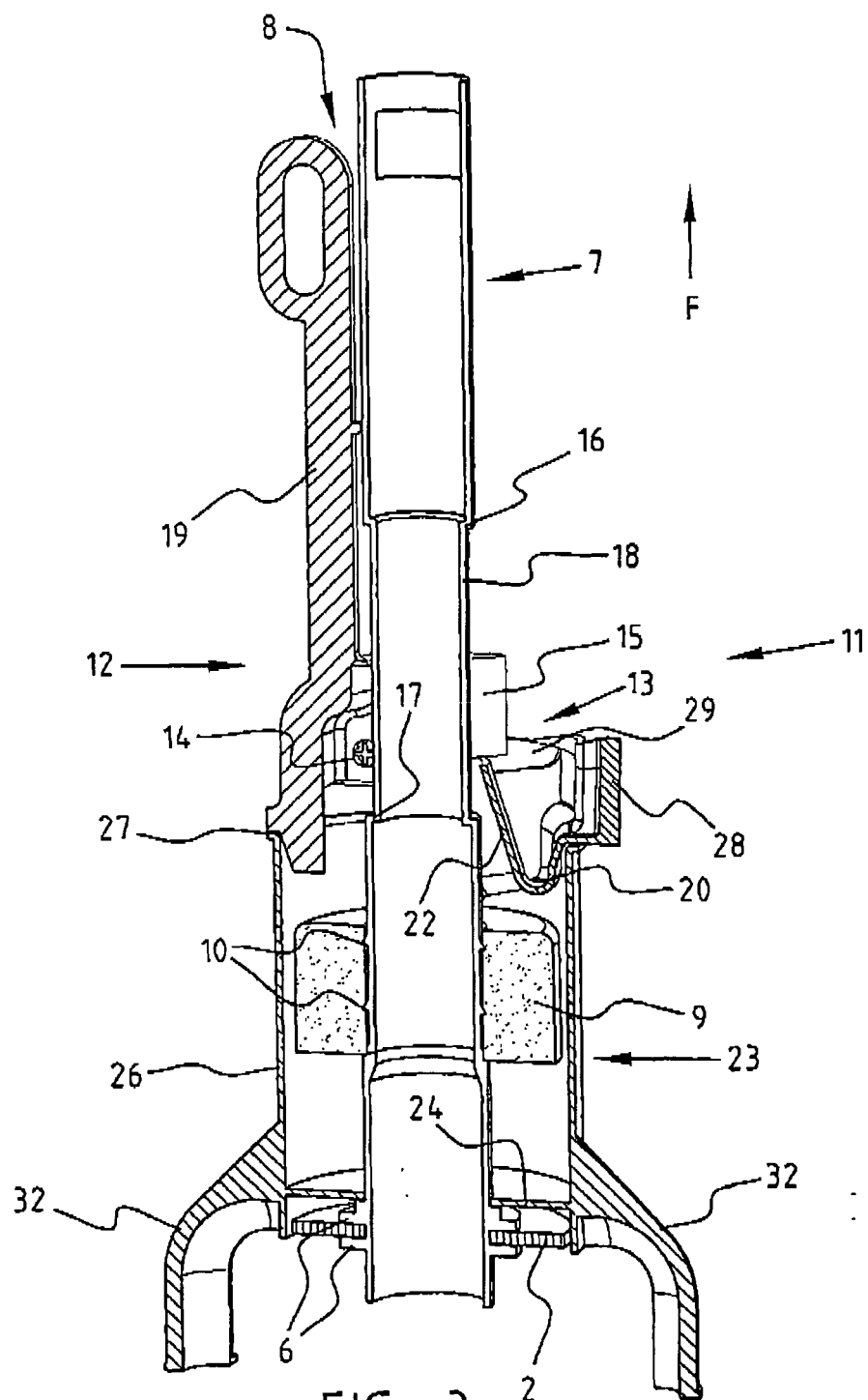


FIG. 3



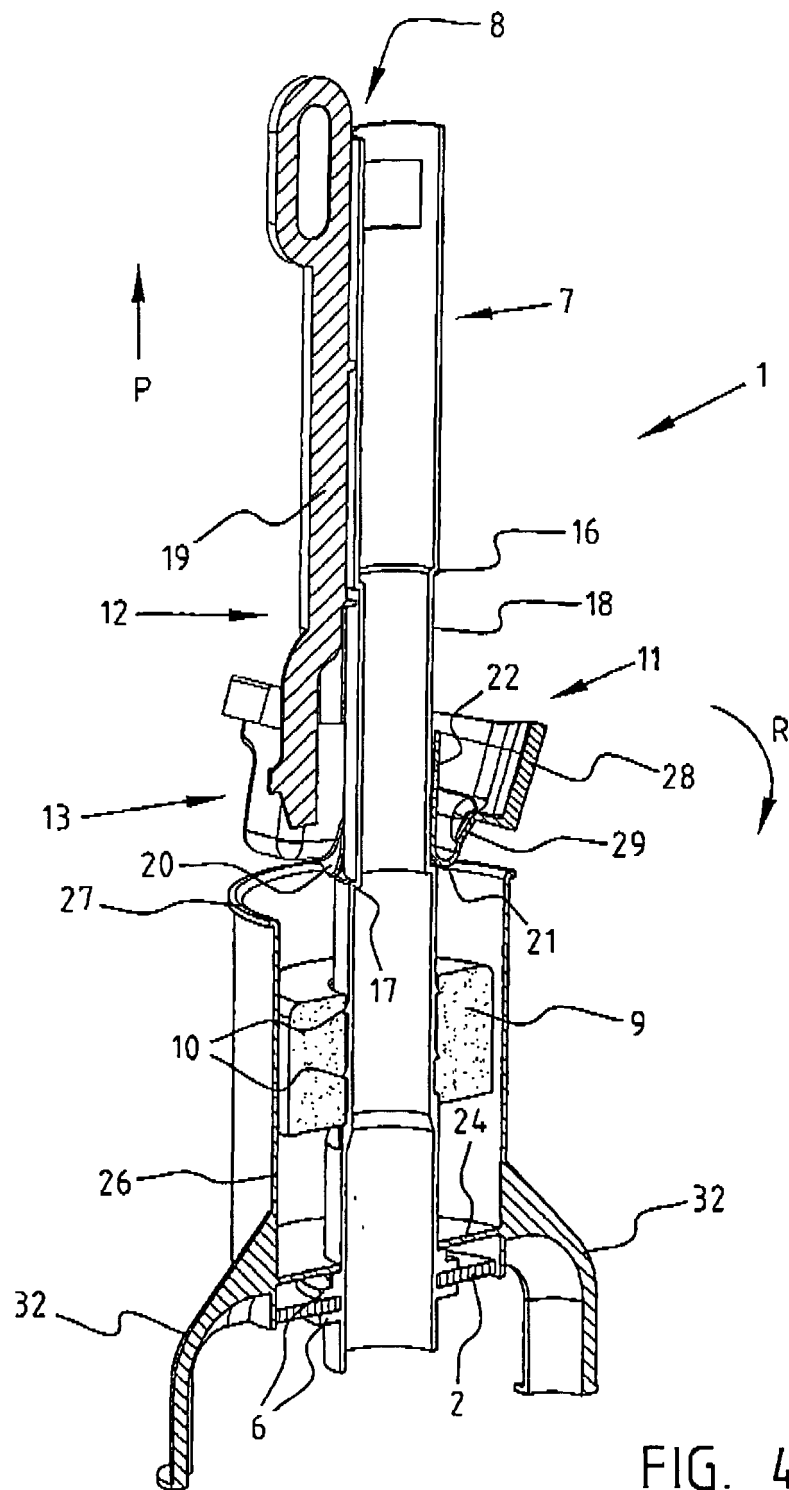


FIG. 4

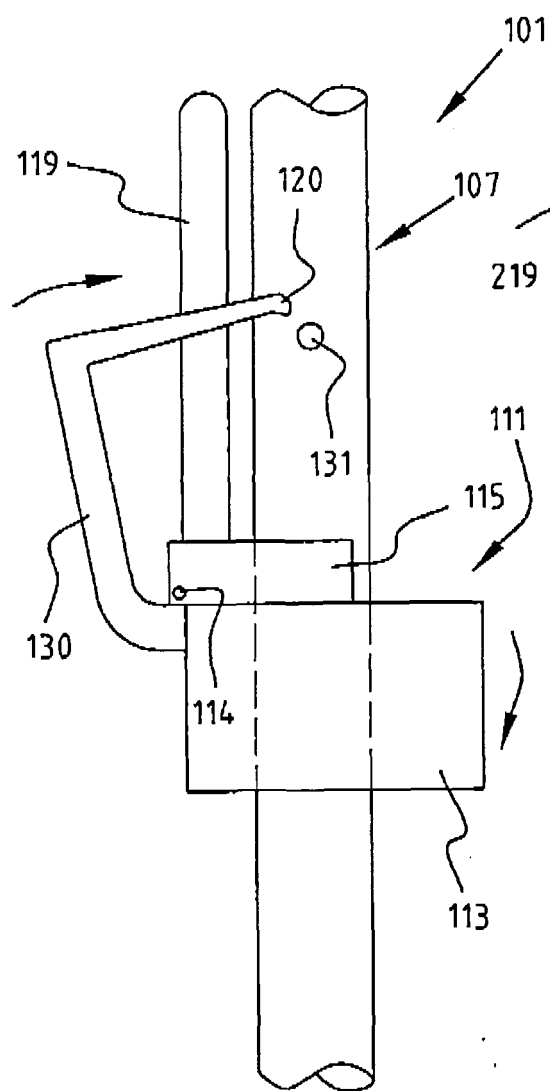


FIG. 5

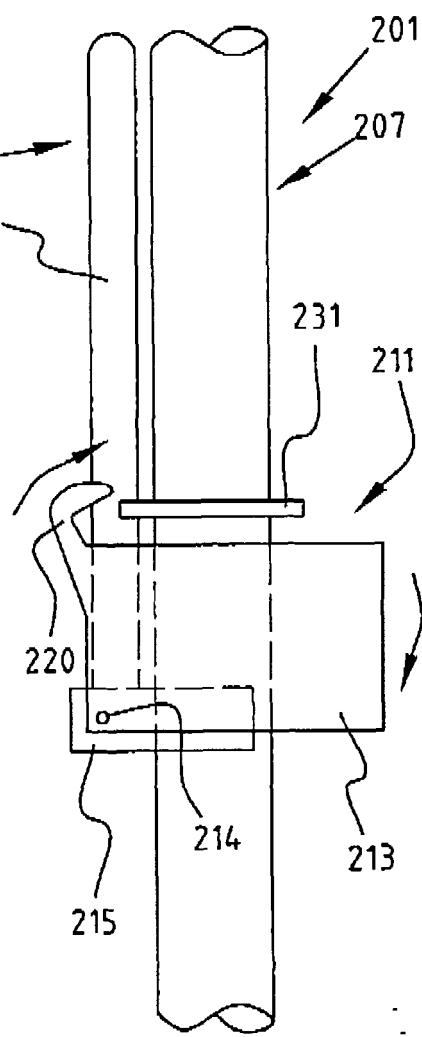


FIG. 6



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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	

**ANNEX TO THE EUROPEAN SEARCH REPORT  
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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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