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Applicant: **Azeta, S.r.l., Via Grivola, 8, I-20100 Milano (IT)**

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Inventor: **Crespi, Carlo, Via Bertinoro, 9, I-20100 Milano (IT)**

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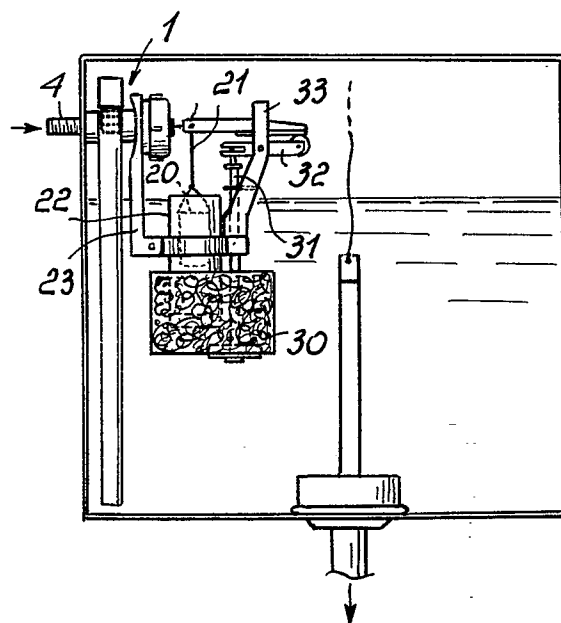
Representative: **Modiano, Guido et al, MODIANO & ASSOCIATI S.A.S. Via Meravigli, 16, I-20123 Milan (IT)**

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Water level control device, particularly for flush toilets.

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A water level control device for flush toilets comprises a body (1) associable with the flushing tank of a flush toilet and defining a chamber therein, in communication with a water inlet conduit (4). In the chamber there is housed a shutter operative to cover or uncover a water inlet port, as respectively controlled by level adjusting members (20, 22) and by an opening weight (30) adapted for moving the shutter to the port uncovering position when the water in the tank is at a lower level than a preset one.



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This invention relates to a water level control device, particularly for controlling the water level in the tank of a flush toilet.

As is known, the devices for filling a wall-mounted tank for flush toilets with water to a determined level generally comprise a lift rod or arm and related float, which serves the function of shutting and opening the water inlet port as well as of determining the water level to be reached within the tank or reservoir.

Such known devices, while having a variety of different designs and constructions, have in common the feature of unavoidably causing a progressive reduction of the water flow rate as the water level approaches its "full" limit. This is due to the fact that the water, in acting on the float whereto the rod is attached, urges the float upwards and brings the seal of the shutter provided on said rod closer to the water inlet port, thus gradually throttling down the water flow rate until no more water is admitted.

In many cases, this is also the source of an annoying whistling noise, due to the gradual restriction of the water inlet port, which stops after the tank has been completely filled.

It thus occurs in such devices that the force applied to the shutter to close the inlet port is a direct function of the buoyancy force of the float in combination with the lever arm provided by the

float rod; thus, in order to achieve an adequate shutting force, it becomes necessary to use a float rod of comparatively great length such as to develop the required shutting force, thereby the flush tanks or reservoirs must be given an extended width configuration to allow for the float rod swinging movement clearance.

Another shortcoming is that possible pressure surges in the water supply system adversely affect the shutting operation, because it may happen that an increased delivery pressure overcomes the shutting force developed by the shutter.

This invention sets out to eliminate such drawbacks affecting the conventional devices, by providing a water level control device, particularly for controlling the water level in the tank of a flush toilet, which allows the length of the float rod to be reduced considerably without, of course, prejudice for a tight sealed shutting action whenever required.

Within that general aim, it is possible to arrange that the device according to the invention provides a flushing tank filling cycle which takes place in a uniform manner without applying any restriction to the flow rate towards the end thereof, but rather providing a shutting action which may be defined as instantaneous.

It is further possible to arrange that the device of this invention can do practically without

a conventional float by using in its stead an element which merely functions to drive the shutting and opening phases of the water inlet control shutter.

5 It is further possible to provide that the device of this invention, in the event of a pressure increase in the water supply system, produces no decrease of the liquid tight sealing action, and rather an increase of the shutter sealing action.

10 It is further possible for the device according to this invention to be simple construction-wise, to require no special or complex maintenance, and to be assembled in an extremely quick and simple manner.

15 According to one aspect of the present invention, there is provided a water level control device, particularly for controlling the water level in the tank of a flush toilet, characterized in that it comprises a body associable with the flushing tank of a flush toilet and defining a chamber therein, in
20 communication with a water inlet conduit, said chamber accommodating a shutter operative to control a water inlet port in said tank, said shutter being movable from a first or open position, whereat said water inlet port is uncovered, to a second or closed
25 position, whereat it closes said water inlet port and is held in position by the pressure of the water contained in said chamber, and/or viceversa, there being also provided level adjusting means operative on said shutter in said second position, and opening
30 means operative on said shutter from the outside

of said chamber and adapted for moving said shutter to said first position when the water in said tank is at a lower level than a pre-set level.

Further features and advantages will be more
5 clearly apparent from a description of some preferred but not limitative embodiments of this water level control device, particularly for controlling the water level in the tank of a flush toilet, with reference to the accompanying exemplary drawings,
10 where:

Figure 1 shows, in a schematical form, the device according to this invention as applied to a flush toilet flushing tank or reservoir;

Figure 2 illustrates a first embodiment of the
15 device, shown in its closed or shut position;

Figure 3 is a partly sectional view of the first embodiment of this invention, with the device in its open position;

Figure 4 is a schematical detail view, in
20 section, of the device shutter element, according to the first embodiment of this invention;

Figure 5 is an exploded view of the shutter;

Figure 6 is a side view of the first embodiment of this invention's device;

25 Figure 7 illustrates a second embodiment of this device, shown in its closed position;

Figure 8 illustrates the second embodiment of this device, but shown in its open position;

Figure 9 illustrates a third embodiment of this

device, shown in its open position; and

Figure 10 illustrates the third embodiment of this device, shown in its closed position.

Making reference to the cited drawing figures,
5 and in particular to Figures 1 to 6, the water level control device particularly for controlling the water level in the tank of a flush toilet comprises, according to the invention, a body 1 which can be associated with the inside of a tank or reservoir 2
10 and defines a chamber 3 therein, which communicates with a water inlet conduit 4, generally connected to the water supply system.

Within said chamber 3, there is provided a shutter, indicated at 5, which has a rocker-arm
15 type of configuration the pivot whereof is provided at an O-ring 6 located at a middle portion of the rocker-arm type of shutter and ensuring a tight seal with the bottom 7 of the chamber 3 which is secured to the body 1 through a locking nut 8. The
20 end which carries the shutter 5, and having a certain weight, has a sealing or gasket member 10 which controls a water inlet port 11 within the tank 2. To the rocker-arm shutter, on the opposite side to the shutter 5 and externally to the chamber 3, there is
25 connected an adjustable counterweight comprising a cylindrical container 20 which is connected, through a string 21, to the rocker-arm shutter and is inserted into a cylindrical body 22 carried, through a bracket frame 23, by the body 1 itself at a lower

level than the attachment point of the body 1.

For reasons which will be apparent hereinafter, said container 20 is provided with a hole 24 at the bottom, whilst the cylindrical body 22 has at the
5 bottom a float-operated shutter 25 having the function of providing a tight sealed closure on the bottom of the cylindrical body 22 in conditions which will be explained hereinafter.

The cylindrical body 22 has at the top a lead-
10 in opening 26 which facilitates the introduction of water into the cylindrical container 20.

The cited container 20, in cooperation with the cylindrical body 22, constitutes the means for controlling the level of the water within the tank,
15 the means for opening the shutter comprising a weight, indicated at 30, having a lower specific gravity than the water contained in the tank, which is supported by a stem 31 arranged to slide vertically with respect to the bracket frame 23.

20 The stem 31 is articulated at the top, through a clevis type of joint, to a small connecting rod 32 hinged at a middle portion thereof to a lug 33 of the frame 23 and acting with its free end against the outermost end of the rocker arm shutter to
25 cause the shutter 5 to open in conditions which will be explained hereinafter.

The device just described operates as follows. After the water contained in the tank has been discharged, the weight of the shutter 5 overcomes
30 the action of the adjustable counterweight, thus

moving into its open position to admit water into the tank. As the water level raises in the tank, when the float-operated shutter 25 level is reached, the water displaces the float-operated shutter 25
5 to shut the bottom of the cylindrical body 22; also, as the water level raises, the weight 30, which has, as mentioned, a lower specific gravity than water, moves upwards to bring the connecting rod 32 to a position of non-interference with the outer end of
10 the rocker-arm shutter.

As water continues to flow in, when the water level reaches the upper edge of the cylindrical body 22, the overflow fills the container 20, thereby the latter acquires a certain weight and overcomes
15 the weight of the shutter 5, thus biasing the shutter element oppositely until it causes the shutter 5, and accordingly the seal 10, to shut the port 11. At this stage, the delivery pressure of the water supply system takes over and holds the
20 seal 10 firmly in the closed position to shut off the flow of water. It should be noted, here, that the displacement of the shutter element from the first or open position to the second or closed position occurs almost instantaneously, thus
25 preventing the emission of a whistling noise and the flow rate slowing down which are typical of conventional such devices.

It should be further added that the float-operated shutter 25 functions to tightly close the
30 bottom of the cylindrical body 22 to allow the

container 20 to acquire additional weight by filling with water, thereby accomplishing the position shift of the rocker-arm shutter; in fact, if the container 20 were immersed in the liquid, it would obviously
5 be unable to operate as a shutting element.

When it is desired to control it to open, the flushing tank discharge is operated, in a conventional manner, to flush the toilet; as the water level drops, the weight 30 moves downwards to rotate, this
10 time in the opposite direction, the connecting rod 32 which by acting on the free end of the rocker-arm shutter, returns it instantaneously to the open position and the liquid is allowed to enter the tank.

It should be noted that the water previously
15 introduced into the container 20 flows out through the hole at the bottom 24 and is then discharged by the float-operated shutter 25 moving down, which movement occurs as the water level in the tank drops.

In Figures 7 to 10, another embodiment of the
20 device according to the invention is illustrated which differs from the previously described one in that the level adjusting means and the shutter element opening means are a single piece.

With reference to Figures 7 and 8, an embodiment
25 of the level adjusting or control device is shown therein the shutter element whereof is similar to the one previously described and, therefore, will not be further discussed, similar parts being designated with the same reference numerals.

30 At the end of the rocker-arm shutter which is

externally to the chamber 3, there is provided a small block 40, whereto one clevis end of a lever 41 pivoted at a middle portion thereof in a supporting frame 42 is articulated. With its other end, the
5 lever 41 is articulated through a clevis joint to the upper end of a vertical stem 50 arranged to slide vertically in said frame 42 and carrying a buoyant weight 51 having a lower specific gravity than water while having an appreciable weight by
10 itself.

To allow the level to be adjusted, as will be explained hereinafter, the buoyant weight 51 is coupled to the vertical stem 50 by means of pins which are inserted through one of the holes 53
15 formed at spaced intervals along the vertical stem 50 and intended to permit the buoyant weight 51 to be secured at a predetermined position on the stem 50.

This embodiment operates in principle similarly
20 to the previous one, with the difference that as the water level raises in the tank 2, it is the buoyant weight 51 itself which, by moving upwardly on account of its specific gravity being lower than that of water, acts on the lever 41 which displaces
25 the rocker-arm shutter such as to bring the shutter 5 to the closed or shut-off position.

It is noteworthy that also in this case the closing action occurs instantaneously, in that as the seal or gasket 10 approaches the water inlet
30 port 11, a "sucking" action occurs as due to the

reduced pressure at the port resulting from the waterflow velocity; thus, the closure occurs in a practically instantaneous manner and is maintained by the pressure of the water supply itself.

5 When the water provided in the reservoir or tank 2 is discharged, the buoyant weight 51 moves under its own weight downwards to rotate the lever 41 in the opposite direction, which lever, in turn, causes a rotation of the rocker-arm shutter, owing
10 to the linkage described hereinabove, such as to open the water inlet port 11.

 Figures 9 and 10 illustrate another embodiment which is also characterized in that it comprises one-piece level control and opening means, with
15 the difference, with respect to the device shown in Figures 7 and 8, that a linear motion shutter is provided instead of a rocker-arm type.

 More specifically, there is provided in the chamber 3 a linear motion shutter 60 which moves in
20 a direction through the inlet port, back and forth. The linear motion shutter is connected to a small rod 61 which is arranged to slide in sealed relationship, by the interposition of an O-ring 62, through a wall of the chamber 3 and has at its free
25 end, externally located with respect to the chamber 3, a sleeve block 63 which engages with a middle portion of a small lever 64 having one of its ends articulated, in fixed-point relationship, to the supporting frame 65 of the device and its other end
30 articulated, through a clevis joint, to the upper

or top end of a vertically slidable stem 70 which is supported in the supporting frame 65 and carries a buoyant weight of a similar type to the buoyant weight 51 of the previous embodiment, designated
5 accordingly with the same reference numeral.

In this embodiment, when there is no water in the tank (Figure 9), the buoyant weight 51 moves linearly downwards to cause the lever 64 to rotate and move the rod 61, and accordingly the shutter 60,
10 linearly downwards, thereby the shutter 60 uncovers the inlet port 10.

Upon the water level inside the tank 2 reaching the buoyant weight 51, the latter, having a lower specific gravity than water, moves linearly upwards
15 and rotates the lever 64 such as to move linearly upwards the rod 63, which brings the shutter 60 close to the inlet port 11 whereat, also in this case, it is practically sucked in and held in close contact by the water supply pressure to ensure a
20 tight seal.

When the tank water is discharged, the buoyant weight 51 moves by gravity linearly downwards to re-open the inlet port 11 and admit water to the tank inside, as already explained hereinabove.

25 It will be appreciated from the foregoing descriptions of this device embodiments that they all eliminate the conventional design float, i.e. a float comprising a hollow body having a certain volume and as small a weight as possible, which
30 results in the advantage that it is no longer

necessary to provide the typical lever arm of conventional floats, the closure being no longer effected by the float action but rather by the delivery pressure of the water supply system which
5 ensures automatically a perfect seal.

In actual practice, the weight, which has a lower specific gravity than water, as utilized in the embodiments described hereinabove, merely has the function of allowing the uncovering of the
10 water inlet port; moreover, the buoyant weight also serves the function of an actuator which provides the consent to the movement of the shutter
5 to the closed position.

Furthermore, an added substantial difference
15 from level control devices of known design is that the weight constitutes in this case the element which provides for the opening of the water inlet port, whereas in conventional devices it was the water pressure itself which effected the opening or
20 uncovering, it no longer meeting the opposition force of the conventional float buoyancy.

Thus, it may be seen that the device according to this invention achieves substantial practical advantages, and it is noteworthy that the buoyant
25 weight 51 or weight 30, which in the embodiments discussed are formed from rigid foam material weighted with a lead insert may, if required, be formed from a homogeneous substance having a lower specific gravity than water, while having an
30 adequate weight to ensure the device operation.

The invention as described is susceptible to many modifications and variations within the purview of the instant inventive concept.

Moreover, all of the details may be replaced
5 by other technically equivalent elements.

In practicing the invention, the materials employed, as well as the dimensions and contingent shapes, may be any ones to suit individual application requirements.

C L A I M S

1 1. A water level control device, particularly
2 for controlling the water level in the tank of a
3 flush toilet, characterized in that it comprises a
4 body (1) associable with the flushing tank (2) of
5 a flush toilet and defining a chamber (3) therein,
6 in communication with a water inlet conduit (4),
7 said chamber (3) accommodating a shutter (5,60)
8 operative to control a water inlet port (11) in said
9 tank, said shutter (5,60) being movable from a first
10 or open position, whereat said water inlet port (11)
11 is uncovered, to a second or closed position, where-
12 at it closes said water inlet port (11) and is held
13 in position by the pressure of the water contained
14 in said chamber (3), and/or viceversa, there being
15 also provided level adjusting means (20,22) operative
16 on said shutter (5,60) in said second position, and
17 opening means (30) operative on said shutter (5,60)
18 from the outside of said chamber (3) and adapted
19 for moving said shutter (5,60) to said first position
20 when the water in said tank (2) is at a lower level
21 than a pre-set level.

1 2. A device according to Claim 1, characterized
2 in that said shutter (5) is located at the end of
3 a rocker-arm shutter having at a middle portion
4 thereof an O-ring (6) adapted for functioning as a
5 seal as well as a pivot element for balancing said
6 shutter (5), said rocker-arm shutter (5) passing
7 through said chamber (3) in tight sealed relation-
8 ship.

1 3. A device according to Claims 1 and 2,
2 characterized in that said shutter (5) has a
3 sufficient weight to keep said rocker-arm shutter
4 in said first position without resorting to addi-
5 tional elements.

1 4. A device according to Claims 1-3, character-
2 ized in that said level adjusting means comprise
3 and adjustable counterweight including a cylindrical
4 container (20) accommodated inside a cylindrical
5 body (22) adapted to become filled with water upon
6 said pre-set level being reached, as determined by
7 the upper edge of said cylindrical body (22), said
8 cylindrical container (20) having a hole (24) in
9 its bottom for gradually discharging the water,
10 and said cylindrical body (22) having at the bottom
11 a float-operated shutter actuated by the water level
12 in said tank.

1 5. A device according to Claims 1-4, character-
2 ized in that said opening means comprise a weight
3 (30) having a lower specific gravity than water,
4 and being carried by a stem (31) arranged to slide
5 with respect to the device frame (33) supported
6 by said body (1), and articulated with the free
7 end thereof to a small connecting rod (32) hinged at
8 a middle portion thereof to said frame (23) and act-
9 ing by contact with the free end thereof on the free
10 end of said rocker-arm shutter (5) to bring said
11 rocker-arm shutter to said first position as the
12 water level drops in said tank (2).

1 6. A device according to Claims 1-5, character-

2 ized in that said level adjusting means (20, 22) and
3 said opening means (30) comprise a single element
4 in the form of a buoyant weight (51) having a lower
5 specific gravity than water and acting on said
6 shutter (5).

1 7. A device according to Claims 1-6, character-
2 ized in that said buoyant weight (51) is associated
3 with a vertical stem (50) arranged to slide with
4 respect to a frame (42) associated with said body
5 (1) and acting on one end of a lever (41) pivoted
6 at a middle portion thereof to said frame (42) and
7 acting with the free end thereof on the free end
8 of said rocker-arm shutter (5).

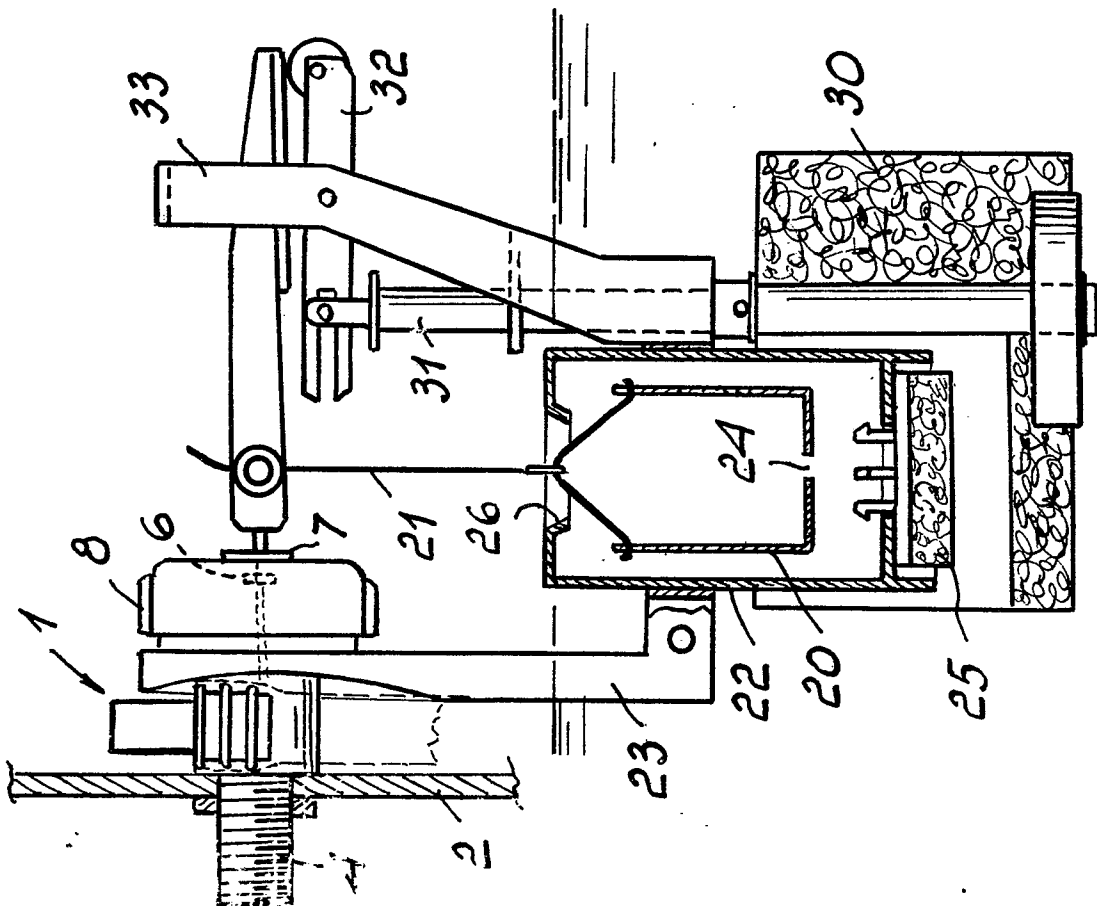
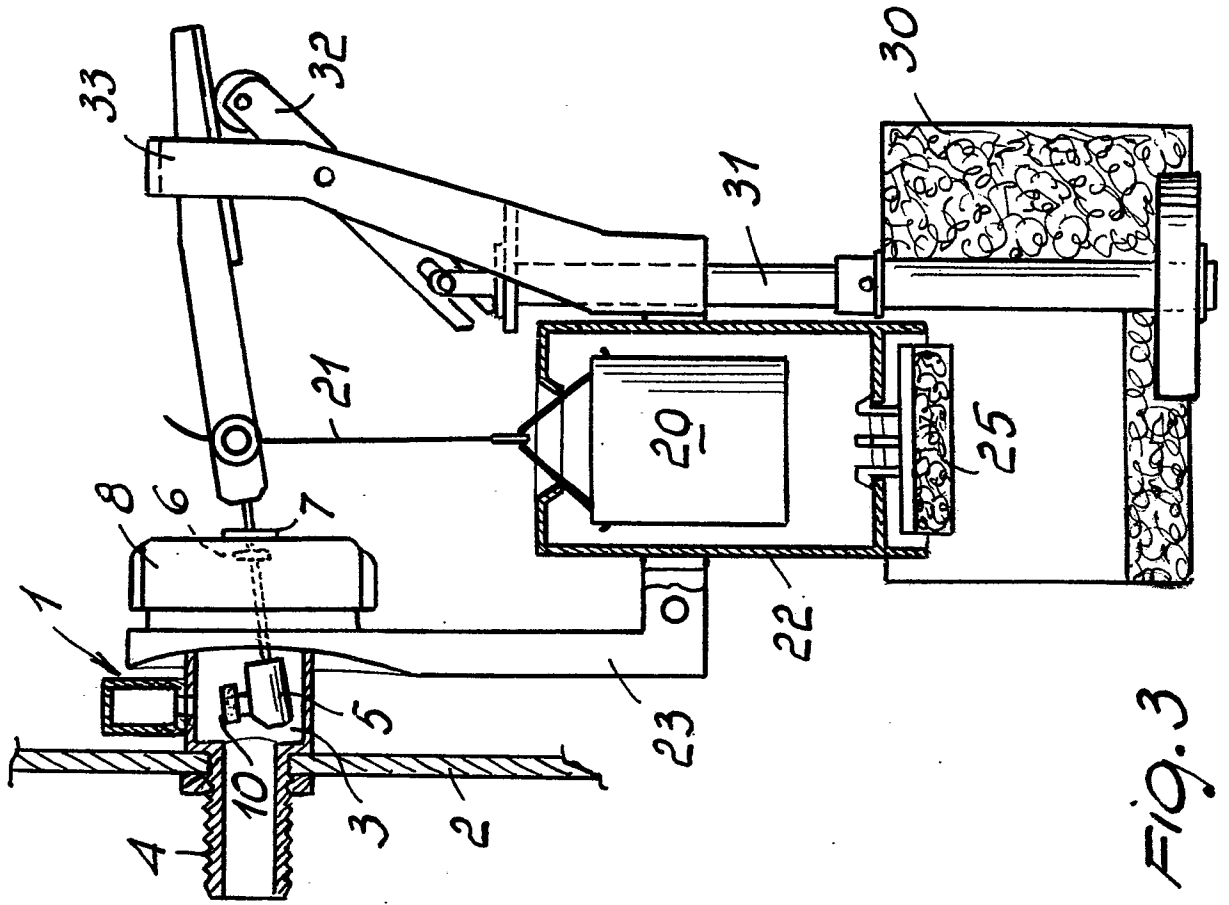
1 8. A device according to Claims 1-7, character-
2 ized in that said buoyant weight (51) is associated
3 with a stem (70) arranged to slide vertically with
4 respect to a supporting frame (65) connected to
5 said body (1) and articulated to the free end of
6 a small lever (64) articulated with its other end
7 in fixed-point relationship to said supporting
8 frame (65) and engaging, at a middle portion thereof,
9 with a sleeve block (63) associated to the free end
10 of a rod (61) connected to a linear motion shutter
11 (60) movable to and from said water inlet port (11).

1 9. A device according to Claims 1-8, character-
2 ized in that said buoyant weight (51) is position-
3 able at varying heights with respect to said vertical
4 stem (50) and to said vertically movable stem (70),
5 in said vertical stem and said vertically movable
6 stem there being provided a plurality of spaced

7 holes (53) wherein a locking pin of said buoyant
8 weight (51) is removably engageable.

1 10. A device according to Claims 1-9, character-
2 ized in that said buoyant weight (51) comprises an
3 amount of polystyrene foam weighted with a metallic
4 body.

1 11. A device according to Claims 1-10, character-
2 ized in that said buoyant weight (51) comprises an
3 amount of a homogeneous material having a lower
4 specific gravity than water.



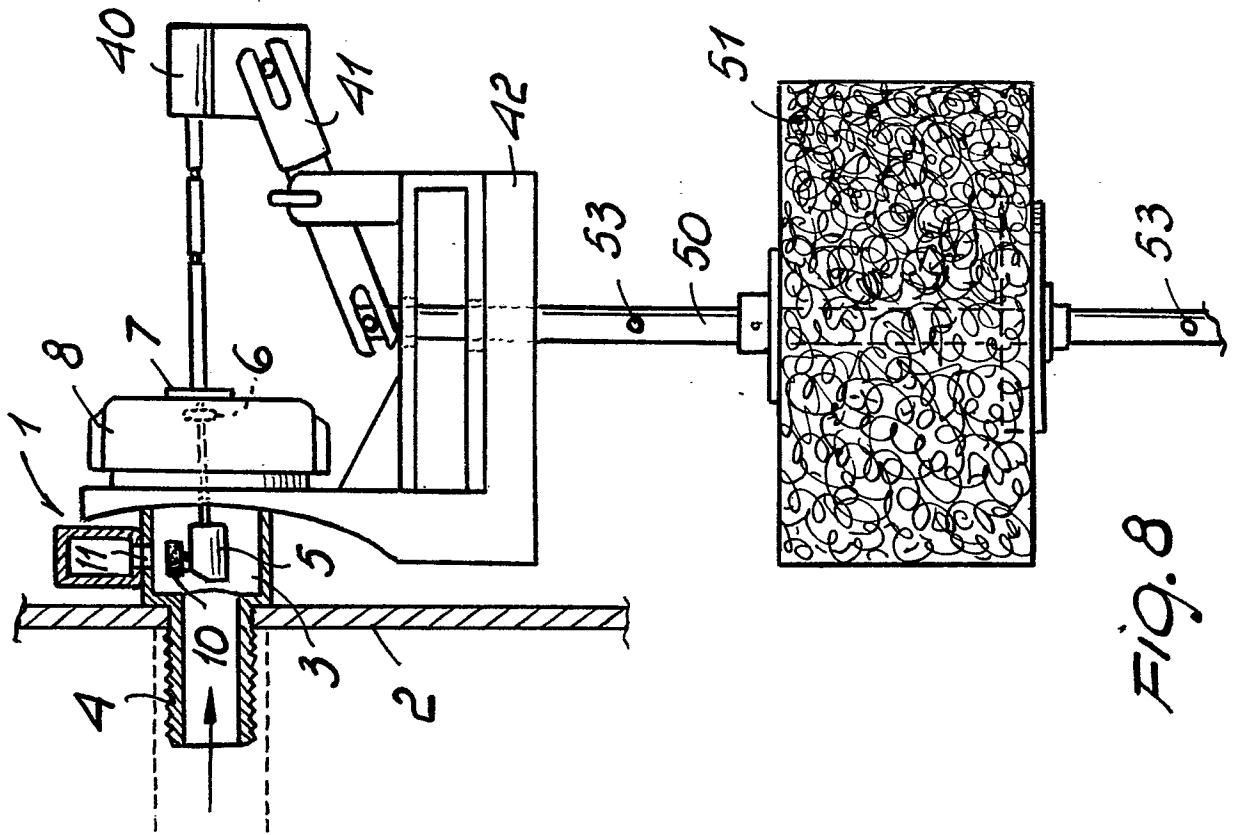


Fig. 8

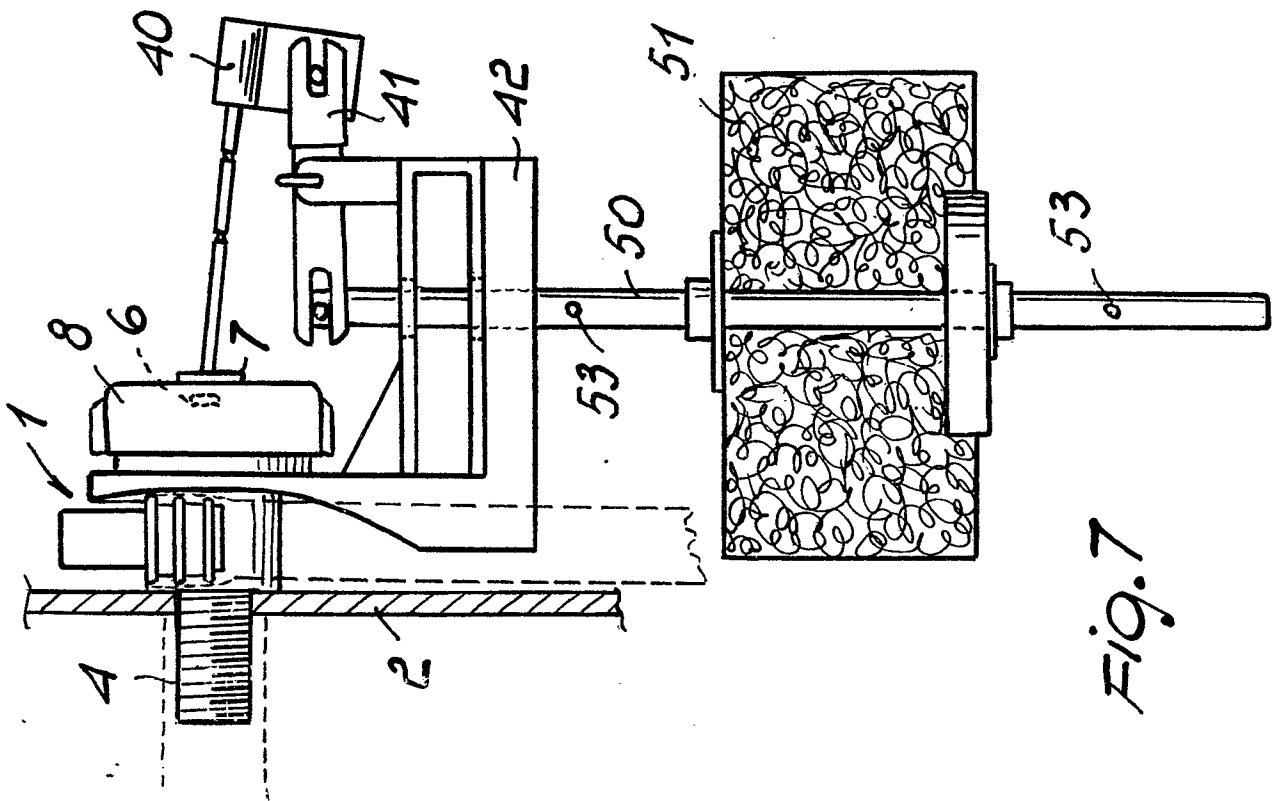


Fig. 7

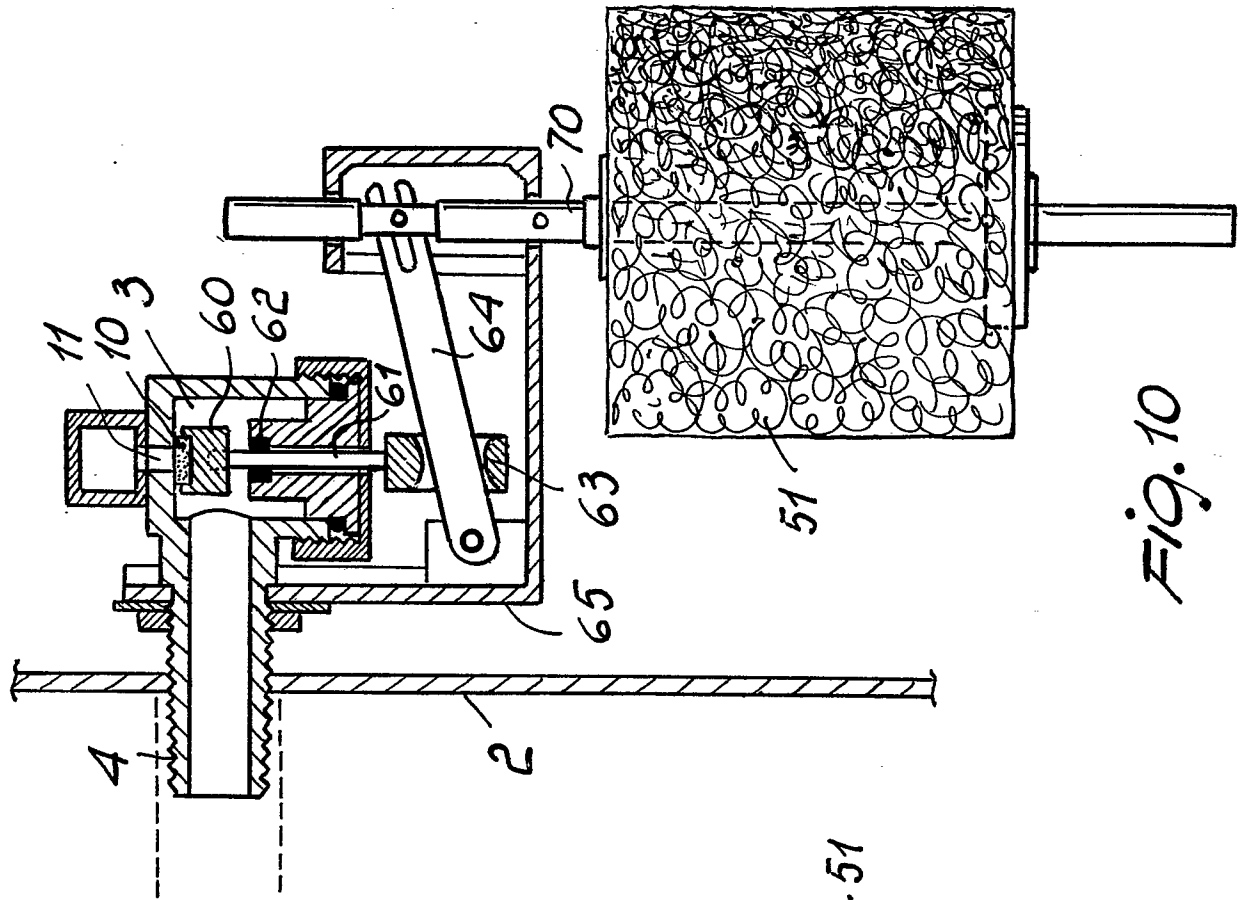


Fig. 9

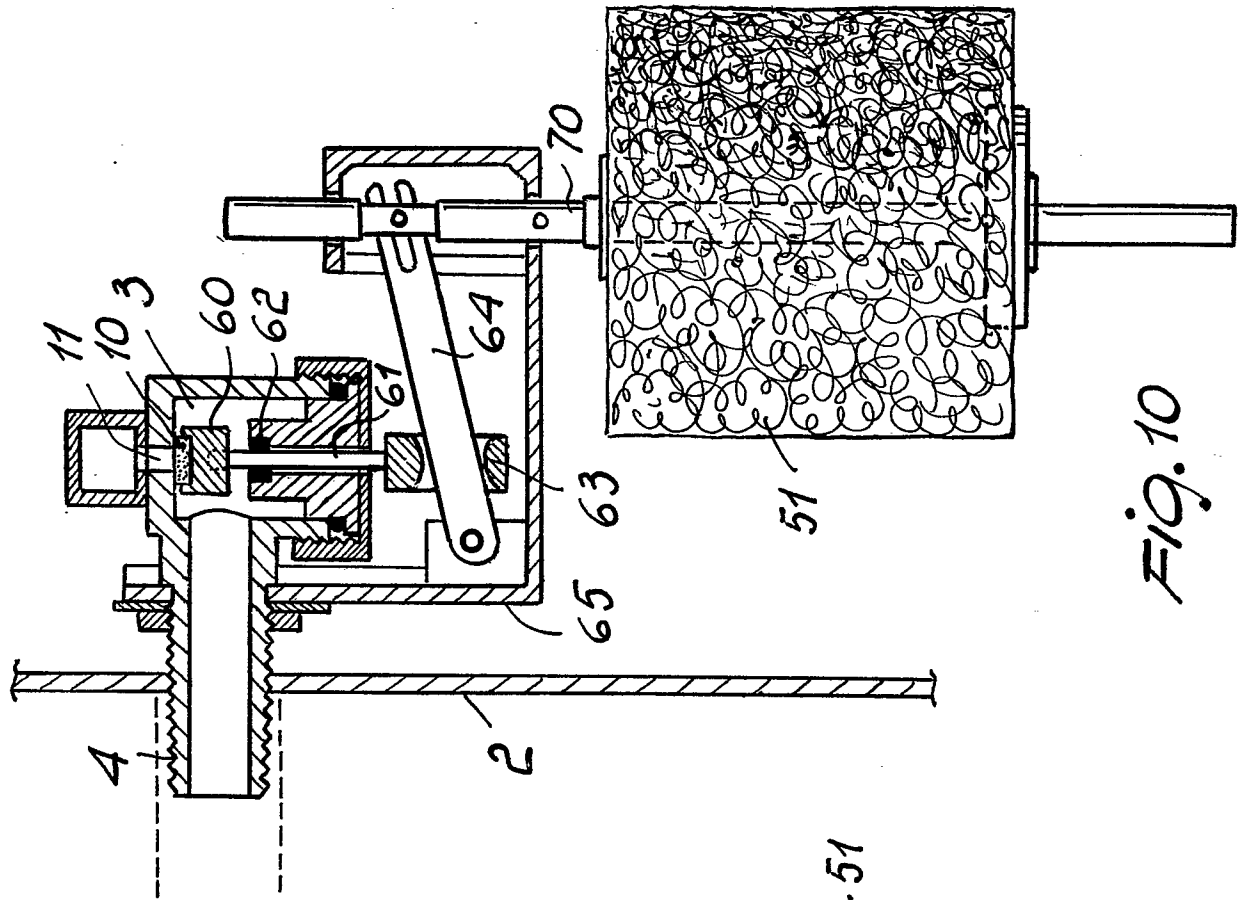


Fig. 10



European Patent
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EUROPEAN SEARCH REPORT

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Application number

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DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl.3)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
	<u>DE - U - 1 919 499</u> (PAG PRESSWERK AG) * pages 1 to 7; fig. 1, 2 * --- <u>DE - U - 7 312 964</u> (MACK & SCHNEIDER) * pages 1, 2 ; fig. 1 * --- <u>US - A - 2 206 996</u> (A.N. ASSELIN) * page 1, right hand column, line 6 to page 2, left hand column, line 42; fig. 1 * --- <u>DE - C - 293 629</u> (H. MENTZE) * whole document * --- <u>DE - C - 911 117</u> (D. MATTHEIS) * page 2, line 17 to page 3, line 104; fig. 1 * --- <u>CH - A - 68 944</u> (E. RITTMÜLLER) * whole document * --- <u>US - A - 2 747 605</u> (P.L. ADAMS) * column 1, lines 28 to 31 * --- <u>DE - U - 1 666 959</u> (K. FREYGANG) * whole document * --- . / . .	1,4,5 1,4,5 1,6, 8,9 1,8,9 1,8 9 10,11 10,11	E 03 D 1/32 E 03 D 1/33 E 03 D 9/14 TECHNICAL FIELDS SEARCHED (Int.Cl.3) E 03 D 1/00 E 03 D 9/00 G 05 D 9/00 CATEGORY OF CITED DOCUMENTS X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons &: member of the same patent family, corresponding document
X The present search report has been drawn up for all claims			
Place of search	Date of completion of the search	Examiner	
Berlin	28-08-1980	PAETZEL	



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