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(72) Inventor: **Cappelletti, Aristide**
19032 Senato di Lerici (SP) (IT)

(74) Representative: **Lecce, Giovanni**
Dott. Giovanni Lecce & C. S.r.l.
Via G. Negri 10
20123 Milano (IT)

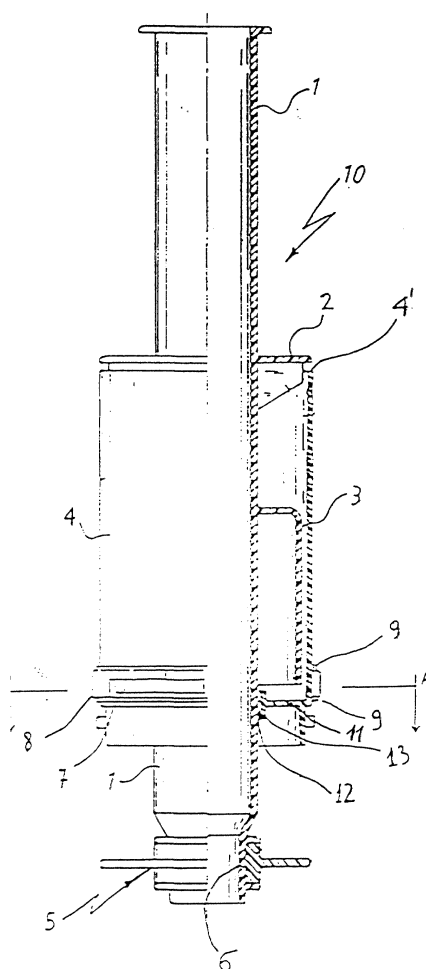
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(71) Applicant: **KARIBA S.p.A.**
19032 Senato di Lerici (La Spezia) (IT)

(54) **Calibratable valve for water discharge from toilet cisterns of toilet bowls**

(57) A calibratable valve (10) for water discharge from toilet cisterns comprises a substantially cylindrical fixed component (4) located in the inside of the toilet cistern (16) and provided with at least a radial opening (7) associated to a corresponding interception element (8), and a tubular body (1) constituted by an upper annular element (2), an intermediate float ball (3) and a sealing gasket (5) inserted at the depressed bottom end (6) sliding in the inside of said fixed cylindrical body (4). The tubular body (1) is associated to an opening/closing means (2) that operates on a equalizing lever (21) with adjustable load.

FIG. 1



Description

[0001] The present invention relates to a calibratable valve for water discharge from toilet cisterns of toilet bowls.

[0002] More particularly, the present invention relates to a valve provided with adjustable means that allow the control of the amount of water that can be discharged from a toilet cistern during each activation and depending on the specific washing requirements of WC cisterns.

[0003] The valve of the present invention is particularly suitable to be adopted in all the systems of discharge of a liquid, for instance water, wherein one wishes to control and adjust the discharged flow rate such as, for instance, the toilet cisterns for domestic systems.

[0004] As is known, toilet cisterns are provided with discharge valves whose function is that of allowing the downflow of a given amount of water from said cisterns to the toilet bowls underneath for the necessary washing. It is also known that the discharge valves utilized for this purpose are not provided with a means for the adjustment of the discharge, but are substantially configured in such a way as to cause the downflow of a constant water amount on each of their opening, independently on the different washing and/or rinsing needs, with obvious, useless and onerous water wastes.

[0005] Toilet cisterns are also known that are provided with discharge valve having leaf springs. Such springs have the purpose of allowing, depending on the required washing type, a quick return of the valves, with an accelerated closing and a limitation of the amount of water discharged.

[0006] However, tests carried out with such types of valves had not provided the expected results, either because the elastic return of spring changes in the time or because all the specimens that are at present available on the market require a particular type of spring.

[0007] Object of the present invention is to obviate the above drawbacks.

[0008] In a general point of view, the present invention allows to obtain this and other aims that will be clarified by the following description, thanks to a valve for the discharge of water from toilet cisterns in the toilet bowls underneath, comprising a fixed component wherein a tubular element slides that has an upper annular element, an intermediate float ball and a lower sealing gasket, said valve being provided with means for the adjustment and control of the flow of discharge fluid, acting on the descent and closing speed of said tubular body and the associated gasket.

[0009] The calibratable valve for water discharge from toilet cisterns of toilet bowls of the present invention comprises a substantially fixed component located in the inside of a toilet bowl, which component is provided with at least a radial opening associated to a corresponding interception element; a tubular body constituted by an upper annular element, an intermediate float

ball and a sealing gasket inserted in the depressed bottom end that slides within said fixed cylindrical component; said tubular body being associated to a lifting means whose activation may be either independent or coupled to a second lifting means that operates on an adjustable load equalizing control.

[0010] The calibratable valve of the present invention allows to control and adjust the amount of water that, on each activation, is discharged from the toilet cistern to the toilet bowl underneath, depending on the specific washing and/or rinsing needs. This is obtained through the greater or smaller interception of the radial opening of said fixed component to which it corresponds: a smaller or greater downflow of water under the float ball, an increase or a decrease of the valve descent and closing speed, and the ensuing greater or smaller water downflow in the toilet bowl.

[0011] Besides, the calibratable valve of the present invention allows to adjust the same amount of water discharged from the cistern to the toilet bowl proportionally to the closing speed to be imparted to said valve. Such closing speed is adjustable not only through the variation of the passage area of said radial opening, but also through the variation of the closing load which can be obtained on the valve by means of the action of a supplementary balance weight.

[0012] The construction and functional characteristics of the calibratable valve of the present invention shall be better understood thanks to the following description, wherein reference is made to the figures of the attached drawings that represent some embodiments solely reported by way of nonlimiting example, and wherein:

Figure 1 shows a partly sectioned schematic side view of the calibratable valve of the present invention;

Figure 2 shows the schematic side view of the fixed cylindrical component with radial opening and the corresponding interception element of the valve of Figure 1;

Figure 3 shows the schematic view of a section obtained by a plane passing along line A-A of Figure 1, of the fixed cylindrical component, when the interception element is located in a position of total opening and minimum interception with respect to the radial opening.

Figure 4 shows the schematic view of a section, obtained by a plane passing along the line A-A of Figure 1 of the fixed cylindrical component, when the interception element is located in a position of total closing and maximum interception with respect to the radial opening.

Figure 5 shows the schematic view of a partial side section of a toilet cistern with the calibratable valve in closing position, complete with the opening means associated to the stem, one of which is provided with an equalizer with an adjustable position balance weight;

Figure 6 shows the same schematic view of Figure 5, wherein the valve stem is lifted for the discharge of water by means of a traditional push-button activator; and

Figure 7 shows the same schematic view of Figure 5, wherein the valve stem is lifted for the discharge of water by means of a push-button activator connected to an adjustable position balance weight.

[0013] With special reference to the figures, the calibratable valve of the present invention, indicated as a whole by 10 in Figure 1, comprises:

- a mobile central body 1, provided with an annular element 2 and a float ball 3, and having a depressed bottom end 6;
- a gasket 5 inserted in said depressed bottom end 6;
- a fixed cylindrical component 4 provided with one or more peripheral radial openings 7, and
- interception means 8 associated to said peripheral openings 7.

[0014] The mobile central body 1 is inserted in the fixed cylindrical component 4 and the internal walls of said fixed component are a guide for the float ball 3.

[0015] Bottom 11 of the fixed component 4 is provided with an opening with a raised edge 13 protruding towards the inside and the outside, through which opening the mobile body 1 passes and can slide guided by said protruding raised edge 13.

[0016] The annular element 2 constitutes a bearing of the central mobile body 1, striking the upper edge 4' of the cylindrical component 4.

[0017] At the downwards stroke end of the mobile body 1, gasket 5 sealingly engages on the drain of a toilet cistern. In correspondence of and in coaxial alignment with the drain, the cylindrical component 4 engages with the cistern through any connection means, for instance bayonet means or the like.

[0018] According to a preferred embodiment shown in the figures of the attached drawings, in the middle-low part of said fixed cylindrical component 4, realized with a cylindrical tubular shape there is obtained at least a slit-like radial opening 7. To said slit-like opening 7 an interception element 8 is associated which is constituted by a friction ring nut that can freely rotate on the cylindrical body of the fixed component 4.

[0019] The friction ring nut 8 comprises at least a closed sector having a height and an extension sufficient to cover and intercept from partially to totally the corresponding opening 7, and at least an open sector having a height and an extension sufficient to allow a partial to total opening of said corresponding opening 7. Ring nut 8 is preferably realized with anti-sliding grip peripheral grooves and/or knurls.

[0020] Near the upper and lower edges of the slit-like opening(s) 7, parallel guides 9 are obtained, intended for the sealing, positioning and correct friction sliding of

the interception ring nut 8, which can freely rotate around the fixed cylindrical component 4. Both ring nut 8 and component 4 may be possibly provided with graduated references, useful to adjust and measure the interception value of openings 7.

[0021] By acting on a traditional activating means, such as for instance a push-button 17 operating on an equalizing lever 18 and a tie-rod 19, the tubular body 1, which constitutes the valve stem, the annular element 2, the float ball 3 and gasket 5 are shifted upwards, with axial sliding in the inside of the fixed cylindrical component 4. The detachment of gasket 5 from the drain causes the direct discharge of water from the cistern to the toilet bowl underneath. With the release of the pressure on the push-button 17, the tubular body 1 and the associated float ball 3 start descending by gravity along the water-filled component 4. The descent speed is slowed only by the presence of such water that can leak only through the annular passage gap 12, defined by the difference between the internal diameter of the circular opening with the raised edge 13 and the external diameter of the tubular body 1, and especially through the slit-like radial opening(s) 7.

[0022] By adjusting the position of the interception ring nut 8, it is possible to vary the passage section of the radial opening(s) 7, causing the more or less rapid water downflow from the inside of the fixed cylindrical component 4. By suitably rotating the interception ring nut 8, it is possible to obtain a total opening minimum interception configuration, and a total closing maximum interception configuration, passing through intermediate variable interception configurations with respect to the extreme positions. In so doing, it is possible to control the descent speed of the tubular body 1 and therefore of gasket 5, which at the end of its stroke engages in the drain of the toilet cistern, interrupting the flow of water discharged in the toilet bowl.

[0023] By arranging in the desired position the ring nut 8 so as to throttle the passage area of the slit-like radial openings 7, it is possible to cause the discharge from the cistern of a water amount smaller than its maximum rate. In particular, the amount of water that may be discharged on each activation can be smaller of the usual nine liters provided in the standard cisterns.

[0024] By this solution, also the advantage is obtained that a water reduced amount (for instance six liters) discharges at a higher pressure, corresponding to the one supplied by the total water amount (nine liters) actually present in the cistern.

[0025] In any case, it must be noted that by suitably adjusting the size of the annular passage gap 12, defined by the difference between the internal diameter of the raised edge circular opening 13 and the external diameter of the tubular body 1, it would be equally possible to cause the discharge from the cistern of a desired amount of water, determined and smaller than the total volume, but such solution would be definitive, established at the time of the realization of the valve, without

any possibility of subsequent checks and/or adjustments, contrary to the characteristics of the valve subject matter of the present invention.

[0026] In other solutions as much valid and comprised within the scope of the present invention, the interception element 8 of the friction ring nut type with a slit-like opening rotary movement may be replaced by an interception element, always of the friction ring nut type with a rotary movement provided with one or more through-holes partly and/or totally alignable with corresponding peripheral through-holes obtained on the fixed component 4. Another solution may include a vertical movement interception element of the gate-like type that superposes to slit-like openings or of other types, etc.

[0027] The calibratable valve 10 as has been described till now is clearly applicable and utilizable in an independent manner on toilet cisterns, but in an alternative application still more advantageous from the point of view of the containment of water consumption may be also associated to a supplementary activation means, such as for instance a second push-button 20 associated to a balance weight 21.

[0028] The pressure exercised on the push-button 20 causes the rotation of a lever 22 about its fulcrum 23, and the lifting of its end 24. The latter is provided with a hooking seat 25 which, during the rotation, engages a tooth 26 that protrudes laterally from lever 18 connected with the first activator or push-button 17.

[0029] Through the coupling of seat 25 with tooth 26, lever 22, activated by the push-button 20, causes the rotation of lever 18, with ensuing lifting of stem 1 and opening of the valve.

[0030] By releasing the pressure on the push-button 20, the tubular body 1 and the associated float ball 3 start the closing descent but in this case said descent does not take place only by the gravity of said elements, as in the previously described solution, but also by effect of the supplementary thrust caused by the balance weight 21 tied to lever 22. Under the action of a greater load, the valve closes quicker, and the amount of water discharged through the drain is still more reduced.

[0031] The amount of water discharged may be adjusted by shifting the balance weight 21 along its supporting arm 27; for this reason and according to an easily and economically realizable solution, the balance weight 21 engages arm 27 by means of a threaded coupler.

[0032] While the present invention has been described above with reference to some embodiment solely reported by way of non-limiting example, it will be obvious to those skilled in the art that various changes and modifications may be made, in the light of the above description. Therefore, the invention encompasses all the changes and modifications that fall within the spirit and the protection scope of the following claims.

Claims

1. A calibratable valve (10) for water discharge from toilet cisterns (16) into the toilet bowls underneath, comprising a fixed cylindrical component (4) wherein a central body (1) slides that is provided with an upper annular element (2), an intermediate float ball (3) and a lower sealing gasket (5), characterized in that said valve is provided with means for the adjustment and control of the fluid downflow, operating on the descent and closing speed of said central body (1) and the related gasket (5).
2. The calibratable valve according to claim 1, characterized in that the means for the adjustment and control of the fluid downflow comprise at least a radial opening (7), obtained in the fixed cylindrical component (4), and a complementary interception element (8) of said at least one radial opening (7).
3. The calibratable valve according to claim 2, characterized in that said at least one radial opening (7) and said complementary interception element (8) are mutually arranged in such a manner as to allow to obtain extreme configurations of total opening minimum interception, and total closing maximum interception, as well as intermediate variable interception configurations, comprising the extreme ones.
4. The calibratable valve according to any of claims 2 and 3, characterized in that said at least one radial opening (7) is obtained in the medium-lower part of the fixed components (4) and is constituted by a slit-like or hole-like through-aperture.
5. The calibratable valve according to any of the preceding claims, characterized in that the interception element (8) is constituted by a friction ring nut free to rotate on the cylindrical body of the fixed component, with a height and an extension sufficient to cover and intercept the corresponding slit from partial to total, and at least an open sector with a height and an extension sufficient to allow a partial to total opening of said corresponding slit (7).
6. The calibratable valve according to any of claims 1-4, characterized in that the interception element (8) is constituted by a constant height closed annular ring nut, provided with at least a through-hole, said ring nut being free to rotate on said fixed component (4).
7. The calibratable valve according to any of claims 1-4, characterized in that the interception element (8) is constituted by a gate-like ring nut free to slide vertically on said fixed component (4).

8. The calibratable valve according to any of claims 1-6, characterized in that the slit-like openings (7) near the upper and lower edges are provided with parallel guides (9) for the sealing, positioning and correct friction sliding of the interception element (8). 5
9. The calibratable valve according to any of the preceding claims, characterized in that the interception element (8) and the fixed cylindrical component (4) are provided with graduated references for the adjustment and measure of the interception value of each radial opening (7). 10
10. The calibratable valve according to any of the preceding claims, characterized in that it comprises a main opening activator constituted by an independent push-button (17) which, through an equalizing lever (18) and a tie-rod (19), operates on the mobile tubular body (1). 15 20
11. The calibratable valve according to any of the preceding claims, characterized in that the equalizing lever (18) is provided with a protruding tooth (26) and in that the main opening activator is coupled to a second activator constituted by a push-button (29) that operates on an equalizing lever (22) provided with a seat (25); said second activator activates the equalizing lever (18) by hooking tooth (26) in said seat (25), and said equalizing lever (22) is provided with a balance weight (21), positionable as one wishes along a supporting arm (27). 25 30

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FIG. 1

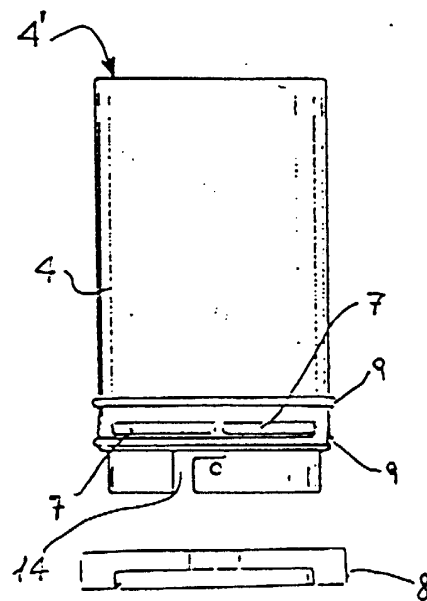
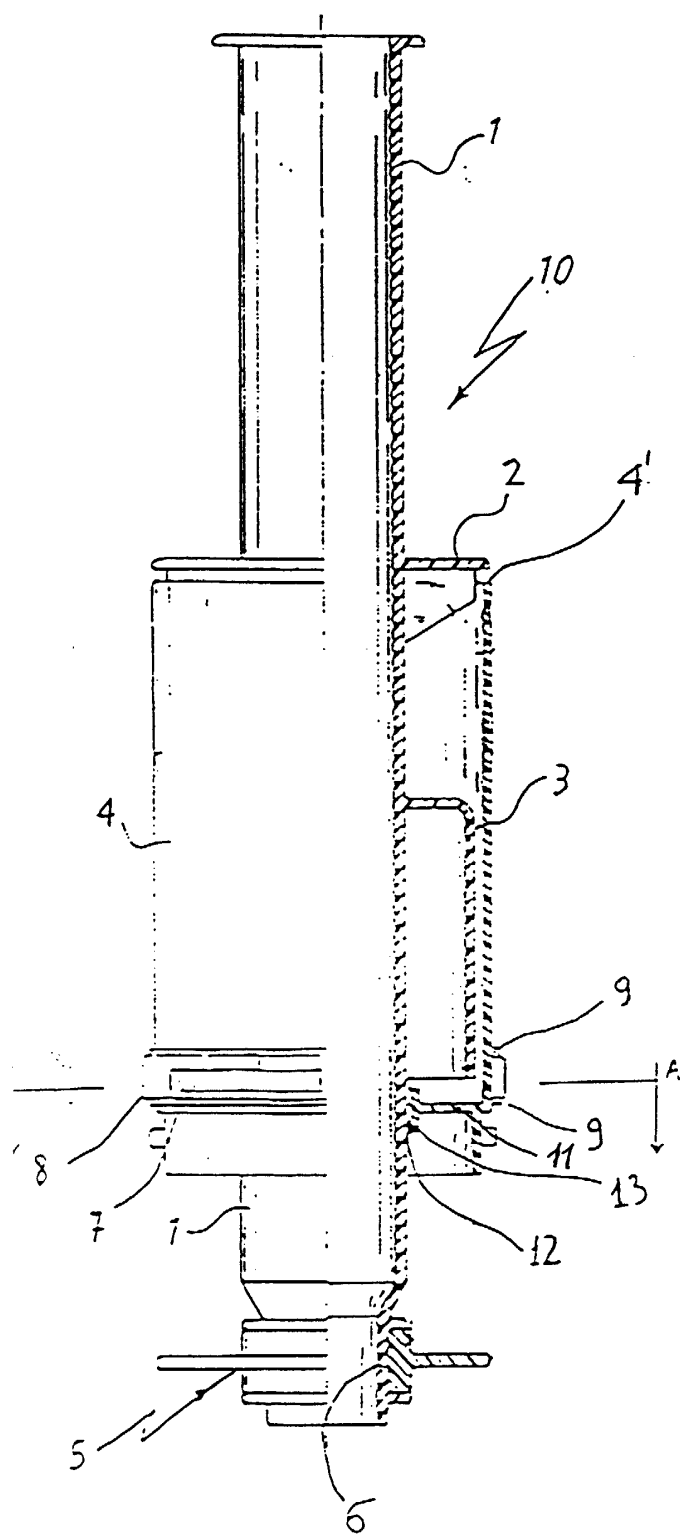


FIG. 2

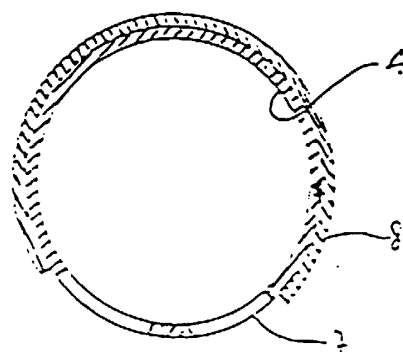


FIG. 3

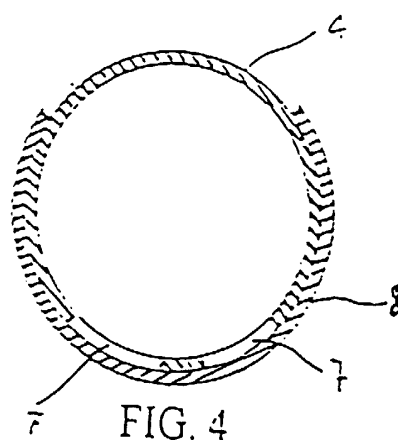


FIG. 4

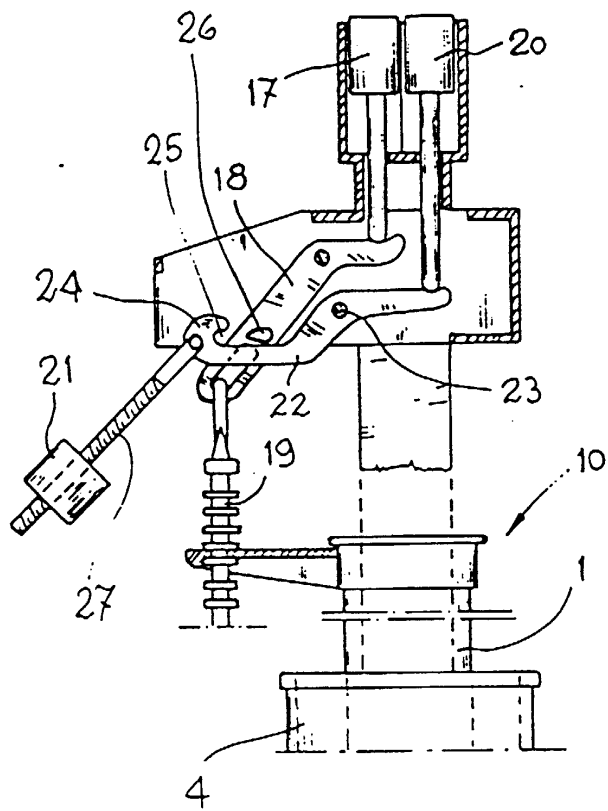


FIG. 5

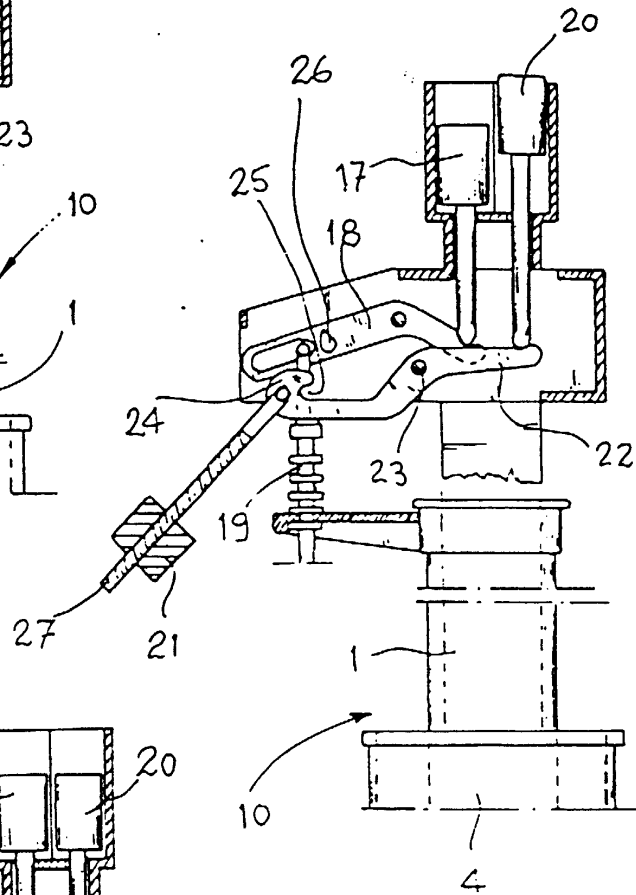


FIG. 6

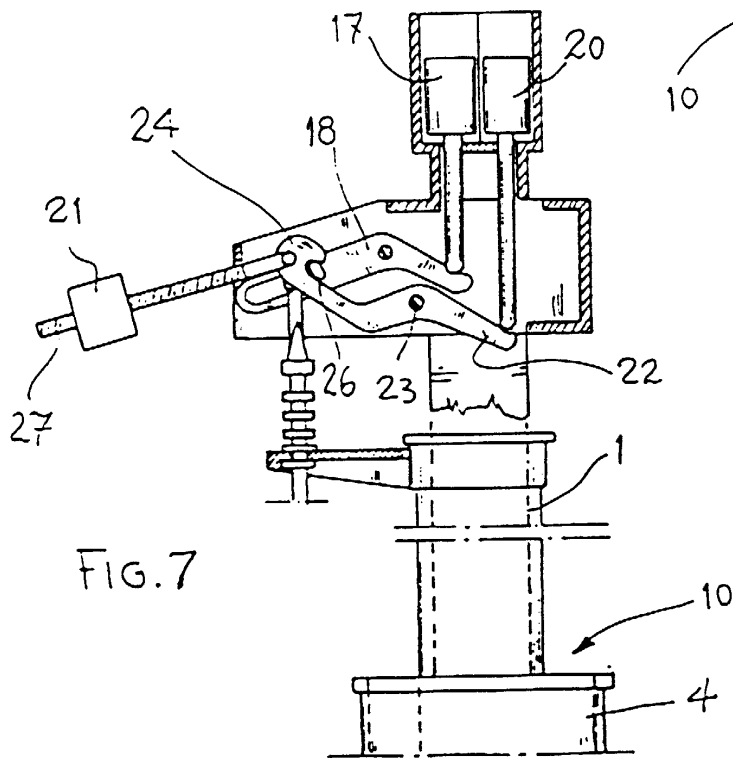


FIG. 7