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(11) **EP 1 039 050 A2**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
27.09.2000 Bulletin 2000/39

(51) Int. Cl.⁷: **E03D 5/02, E03D 1/012**

(21) Application number: **00106132.4**

(22) Date of filing: **21.03.2000**

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE**
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **22.03.1999 IT TO990220**

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(54) **Multifunction flush tank control device**

(57) A control device (1) for a flush tank (2), wherein a discharge valve (18), having at least one lift lever (20), is activated by means of at least one operating push-button (6, 7) carried by a plate (5); the action of the operating push-button (6, 7) is transmitted to the lift lever (20) by a rocking body (28) of a control member

(23) hinged to a frame (4), and by a corresponding connecting arm (22); and the connecting arm (22) is clicked onto the rocking body (28) by inserting an end head (24) of the connecting arm inside a respective seat on the rocking body (28).

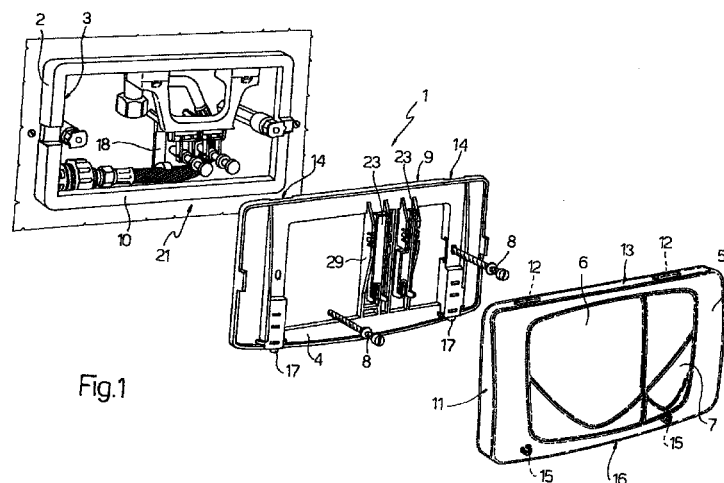


Fig.1

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Description

[0001] The present invention relates to a flush tank control device, particularly suitable for use on multifunction flush tanks with different operating modes (partial or total discharge, flow-stop function, outflow regulation, etc.).

[0002] Numerous types of flush tank control devices are known : single-discharge devices for discharging a predetermined quantity of water (more or less all the water in the tank); and devices which, once discharge is activated, provide for arresting outflow to reduce water consumption. The same effect can also be achieved by known differential-discharge devices, which provide for total or partial discharge of the water in the tank.

[0003] Known control devices, however, are not normally fittable to flush tanks with different operating modes : single-discharge tanks normally require a different control device from flow-stop or differential-discharge tanks; only a small number of components can be used indifferently for various operating modes; whereas certain types of tank require numerous specially designed component parts. Obviously, employing a relatively large number of different component parts increases both production and part-control costs.

[0004] Moreover, assembling and fitting known control devices to the respective tanks are normally long, painstaking jobs, and further adjustments are normally also required to regulate the outflow of both single- and differential-discharge tanks.

[0005] It is an object of the present invention to provide a flush tank control device designed to eliminate the aforementioned drawbacks of known devices, and which, in particular, is cheap and easy to produce, can be assembled and installed quickly and easily, and can be fitted, with very few adjustments, to tanks with different operating and discharge modes.

[0006] According to the present invention, there is provided a control device for a flush tank, comprising a discharge valve; at least one operating push-button; at least one lift lever for raising said discharge valve; and mechanical connecting means between said at least one operating push-button and said at least one lift lever; characterized in that said mechanical connecting means comprise a connecting arm; a control member activated by means of said at least one operating push-button; and first click-on fastening means for fastening said connecting arm to said control member.

[0007] As compared with known devices, the control device according to the present invention is therefore extremely cheap and easy to produce, can be assembled and installed quickly and easily, and can be fitted to flush tanks with different discharge modes (e.g. single-discharge, flow-stop, differential-discharge, etc.) by comprising numerous basic components which can be used on any type of tank, and an extremely small number of components specially designed for particular

operating modes. The device also provides for quickly and easily adjusting the amount of water discharged, both in single- and differential-discharge mode.

[0008] A non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a schematic, partially exploded view in perspective of a flush tank control device in accordance with the present invention;

Figure 2 shows an enlarged detail of the Figure 1 device;

Figures 3, 4, 5 and 6 show further enlarged details of the Figure 1 device in course of assembly;

Figure 7 shows a discharge valve which may be employed in a preferred embodiment of the device according to the invention;

Figures 8a and 8b show details of the Figure 7 discharge valve.

[0009] With reference to Figures 1 to 6, number 1 indicates as a whole a control device designed to permit total or partial discharge of the water inside a flush tank 2, which has at least one opening 3 for insertion of control device 2. Though located at the front in the non-limiting embodiment shown in Figure 1, opening 3 in tank 2 may obviously be located alternatively at the top as in known solutions.

[0010] Device 1 comprises a frame 4; and a plate 5 having a first and second operating push-button 6, 7 for selectively activating total or partial discharge of the water in tank 2, and which are hinged to plate 5 in known manner - e.g. clicked onto respective supporting elements (not shown) - and have respective known return springs (not shown). Frame 4 is fitted to tank 2, e.g. by means of screws 8, so that, when assembled, a peripheral edge 9 of frame 4 mates with a corresponding front frame 10 defining opening 3; and plate 5 clicks onto frame 4 so that a peripheral edge 11 of plate 5 mates with the matching peripheral edge 9 of frame 4.

[0011] In the example shown, plate 5 clicks onto frame 4 by means of a first pair of connecting teeth 12 located on one side 13 of peripheral edge 11 of plate 5, and which engage respective slots 14 formed on peripheral edge 9 of frame 4, and by means of a second pair of connecting teeth 15 projecting towards first connecting teeth 12 from a side 16, opposite side 13, of peripheral edge 11 of plate 5, and which cooperate with respective known elastically deformable connecting elements 17 carried on frame 4 (and not shown in detail for the sake of simplicity).

[0012] Device 1 also comprises a discharge valve 18 (shown partly in Figure 1 and as a whole in Figure 7), e.g. a dual-function type having two ties 19 for alternatively activating total or partial discharge and connected to respective substantially known lift levers 20 (not shown in detail); and mechanical connecting means 21 between operating push-buttons 6, 7 and lift levers 20.

[0013] Mechanical connecting means 21 in turn comprise, for each operating push-button 6, 7, a respective connecting arm 22, and a respective control member 23 activated by operating push-button 6, 7. Each connecting arm 22 comprises a respective end head 24 defined, for example, by a substantially cylindrical end portion 25 extending between two axial shoulders 26, 27; and each control member 23 is defined, in the example shown, by a rocking body 28 hinged to a respective support 29 carried by frame 4, and has a seat 30 into which clicks the end heads 24 of connecting arms 22.

[0014] In the example shown, seat 30 for each connecting arm 22 is defined by a cavity 31 formed at the connecting end 32 of respective rocking body 28 and provided internally, on opposite facing sides, with respective pairs of projections (not shown) between which end portion 25 of one of the connecting arms 22 clicks.

[0015] On the opposite side to end heads 24, connecting arms 22 also comprise adjustable connecting means 35 for connection to lift levers 20, and which comprise, for example, respective threaded rods 36 on connecting arms 22, and corresponding internally threaded seats 37 on lift levers 20.

[0016] At ends 32 for connection to connecting arms 22, rocking bodies 28 comprise respective pairs of feet 38 projecting perpendicularly towards, and which cooperate with and are pushed by, operating push-buttons 6, 7. Rocking bodies 28 are hinged to and clicked inside respective supports 29 at respective intermediate sections between connecting ends 32 and respective second ends 39 opposite connecting ends 32. More specifically, supports 29 comprise respective pairs of side by side, click-in hinge seats 40, 41 for receiving respective pins 42 extending laterally on opposite sides of rocking bodies 28.

[0017] In the preferred, non-limiting embodiment shown in Figure 7, discharge valve 18 comprises a float 43 sliding inside a fixed vessel 44 with respect to tank 2. Vessel 44 has a bottom wall 45 having a window 46, and a ring nut 47 which can be turned to selectively open/close window 46 to adjust the downward speed of float 43 inside vessel 44. Discharge valve 18 also comprises an additional movable weight 48, which only comes into play (according to a known solution) when partial discharge is activated. Additional weight 48 is defined by a hollow toroidal body having an annular top cover wall 49 in which is formed at least one hole 50 closed by a removable plug for adjusting the downward speed of additional weight 48.

[0018] As will be clear from the foregoing description and accompanying drawings, the various component parts of device 1 according to the invention can be assembled extremely quickly and easily, and device 1 itself installed quickly and easily to tank 2, by virtue of the various click-on component connections provided for. That is, after placing discharge valve 18 inside tank

2, together with lift levers 20 fitted beforehand with connecting arms 22 (by means of adjustable connecting means 35), frame 4 is fitted to frame 10; end heads 24 of connecting arms 22 (extending through frame 4) are inserted inside respective seats 30 of control members 23; control members 23 are clicked onto supports 29; and, finally, plate 5 (already fitted with operating push-buttons 6, 7) is fitted to frame 4.

[0019] Once assembled and installed, device 1 according to the invention operates as follows. When pressed, operating push-buttons 6, 7 act on and cooperate with respective rocking bodies 28 of control members 23 by exerting thrust on feet 38. The action of control members 23 is transmitted by connecting arms 22 to lift levers 20, which lift the corresponding ties 19 of discharge valve 18 to activate the desired discharge mode. Once the water is discharged (total or partial discharge), device 1 is restored to the start condition ready for the next operation.

[0020] Device 1 may obviously be fitted, with very few alterations, to tanks 2 operating differently from that described above by way of example. In particular, a known single-discharge valve 18 (i.e. for discharging a given quantity of water) may be used featuring one tie 19; in which case, frame 4 and plate 5 as described above may still be used, but with only one control member 23, one connecting arm 22 and one operating push-button 6.

[0021] In which case, the rocking body 28 of the single control member 23 may also comprise, at second end 39, at least one stop element 52 (shown in Figures 3 and 5) projecting perpendicularly from rocking body 28 towards operating push-button 6 and parallel to feet 38, and which cooperates with and is pushed by operating push-button 6 on the opposite side of pins 42 to feet 38, so that, once discharge is activated by pressing the bottom of operating push-button 6 to rotate rocking body 28, by means of feet 38, about pins 42 in a given rotation direction, the outflow of water can be stopped by pressing the top of operating push-button 6 to rotate rocking body 28 in the opposite direction about pins 42 by means of stop element 52.

[0022] The amount of water discharged may also be regulated using discharge valve 18 with float 43 sliding inside vessel 44, the bottom wall 45 of which comprises window 46 and regulating ring nut 47; and further adjustment can be made by means of hole 50 and respective plug 51 on additional weight 48.

[0023] Clearly, further changes can be made to the device as described and illustrated herein without, however, departing from the scope of the present invention.

Claims

1. A control device (1) for a flush tank (2), comprising a discharge valve (18); at least one operating push-button (6, 7); at least one lift lever (20) for raising said discharge valve (18); and mechanical connect-

ing means (21) between said at least one operating push-button (6, 7) and said at least one lift lever (20); characterized in that said mechanical connecting means (21) comprise a connecting arm (22); a control member (23) activated by means of said at least one operating push-button (6, 7); and first click-on fastening means (24, 30) for fastening said connecting arm (22) to said control member (23).

2. A device as claimed in Claim 1, characterized in that said control member (23) comprises a rocking body (28) hinged to a respective support (29) connectable to said tank (2); said first click-on fastening means comprising an end head (24) of said connecting arm (22), and a respective seat (30) formed on said control member (23).

3. A device as claimed in Claim 2, characterized in that said end head (24) of said connecting arm (22) is defined by a substantially cylindrical end portion (25) of said connecting arm (22) extending between two axial shoulders (26, 27); said seat (30) being defined by a cavity (31) formed at a connecting end (32) of said rocking body (28); and said cavity (31) being provided internally, on opposite facing sides, with respective pairs of projections (33, 34) between which said end portion (25) of the connecting arm (22) clicks.

4. A device as claimed in Claim 3, characterized in that said connecting arm (22) also comprises, on the opposite side to said end head (24), adjustable connecting means (35) for connection to said lift lever (20) and in turn comprising a threaded rod (36) of said connecting arm (22), and a corresponding internally threaded seat (37) carried by said lift lever (20).

5. A device as claimed in Claim 3 or 4, characterized in that said rocking body (28) comprises, at said connecting end (32), at least one foot (38) projecting perpendicularly from said rocking body (28) towards said operating push-button (6, 7), and which cooperates with and is pushed by the operating push-button to connect said control member (23) and said operating push-button (6, 7).

6. A device as claimed in Claim 5, characterized in that said rocking body (28) is clicked inside and hinged to said respective support (29) at an intermediate section of the rocking body, located between said connecting end (32) and a second end (39), opposite said connecting end (32), of the rocking body; said rocking body (28) also comprising, at said second end (39), at least one stop element (52) projecting perpendicularly from said rocking body (28) towards said operating push-but-

ton (6, 7) and parallel to said at least one foot (38), and which cooperates with and is pushed by said operating push-button (6, 7) on the opposite side of said intermediate section to said at least one foot (38).

7. A device as claimed in one of Claims 2 to 6, characterized by also comprising a frame (4) connectable to said tank (2); a plate (5) supporting said at least one operating push-button (6, 7); and second click-on fastening means (12, 14, 15, 17) for fastening said plate (5) to said frame (4) along respective matching peripheral edges (11, 9); said support (29) of said rocking body (28) being carried integrally by said frame (4); and said at least one operating push-button (6, 7) being hinged to said plate (5), being clicked onto a respective supporting element, and also comprising a return spring.

8. A device as claimed in Claim 7, characterized in that said second click-on fastening means comprise at least one first (12) and at least one second (15) connecting tooth, which are located on said peripheral edge (11) of said plate (5) and project towards each other from respective opposite sides (13, 16) of said plate (5); said at least one first connecting tooth (12) engaging a respective slot (14) formed on said peripheral edge (9) of said frame (4); and said at least one second connecting tooth (15) cooperating with a respective elastically deformable connecting element (17).

9. A device as claimed in Claim 7 or 8, characterized in that said frame (4) is designed to receive a pair of said control members (23); said frame (4) comprising a pair of supports (29) for respective rocking bodies (28) of two distinct control members (23); said plate (5) being designed to receive a pair of said operating push-buttons (6, 7); and said plate (5) comprising a through cavity through which extends a pair of supporting elements for respective operating push-buttons (6, 7).

10. A device as claimed in Claim 9, characterized in that said supports (29) with which said frame (4) is provided comprise respective pairs of side by side click-on hinge seats (40, 41) for receiving respective pins (42) extending laterally on opposite sides of said rocking bodies (28).

11. A device as claimed in one of the foregoing Claims, characterized in that said discharge valve (18) comprises a float (43) sliding inside a fixed vessel (44) with respect to said tank (2); said vessel (44) having a bottom wall (45) in turn having a window (46) and a ring nut (47), which can be rotated to selectively open/close said window (46) to regulate the downward speed of said float (43) inside said vessel

(44).

12. A device as claimed in one of the foregoing Claims, characterized in that said discharge valve (18) is a dual-function type, and comprises a first and a second tie (19) for alternatively activating total discharge or partial discharge of the water in said tank (2); in which case, the device (1) comprising a first and a second operating push-button (6, 7) for selectively activating said total discharge or said partial discharge; respective lift levers (20) for raising said ties (19) of the discharge valve (18); and respective mechanical connecting means (21) for connecting said operating push-buttons and said respective lift levers (20), and comprising respective connecting arms (22), respective control members (23) activated by said respective operating push-buttons (6, 7), and respective first click-on fastening means (24, 30) for connecting said connecting arms (22) to said control members (23).
13. A device as claimed in Claim 12, characterized in that said dual-function discharge valve (18) comprises a movable additional weight (48), which only intervenes when said partial discharge is activated; said additional weight (48) being defined by a hollow toroidal body having an annular top cover wall (49) in which is formed at least one hole (50) closed by a removable plug (51) for regulating the downward speed of said additional weight (48).

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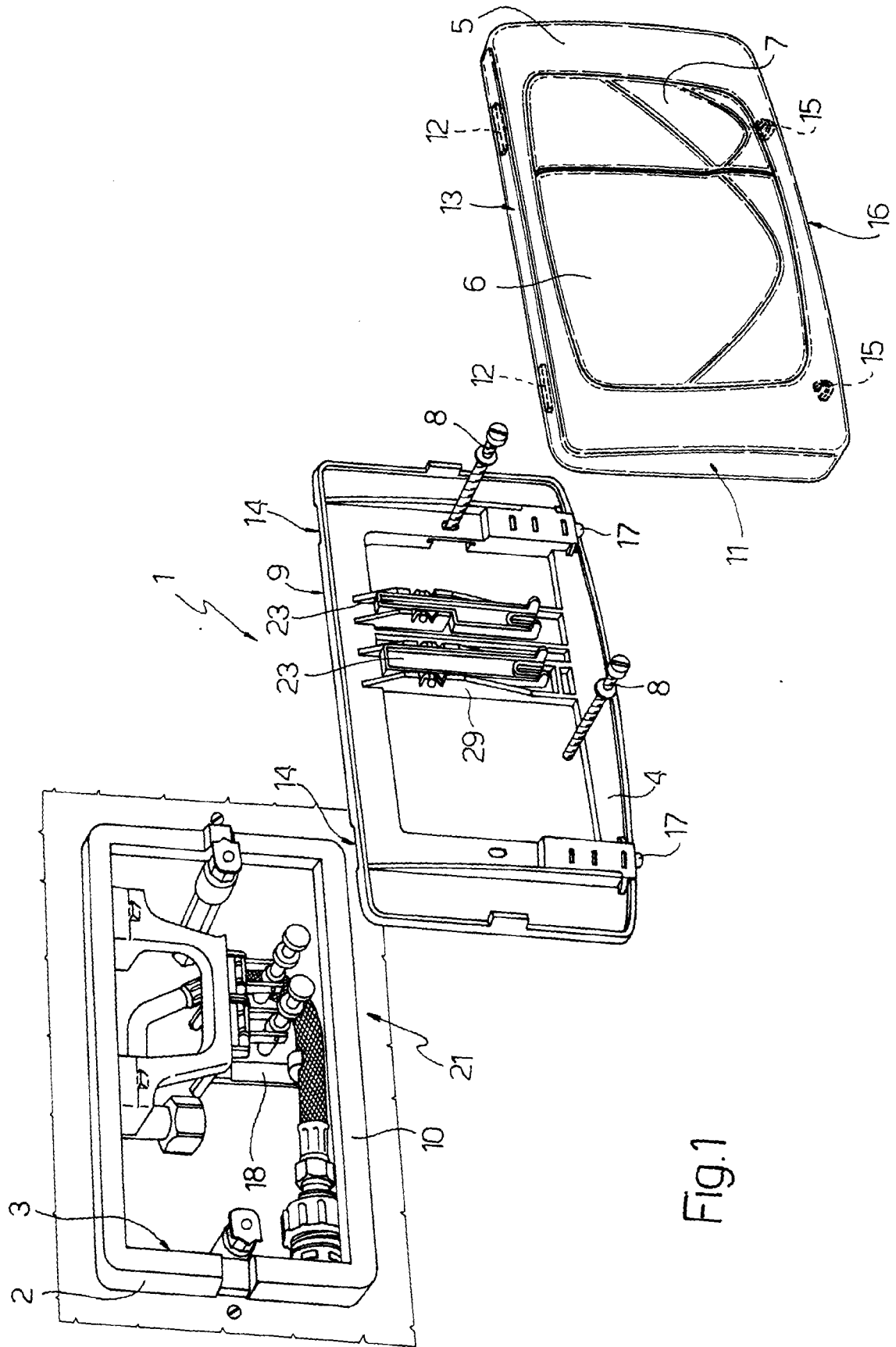
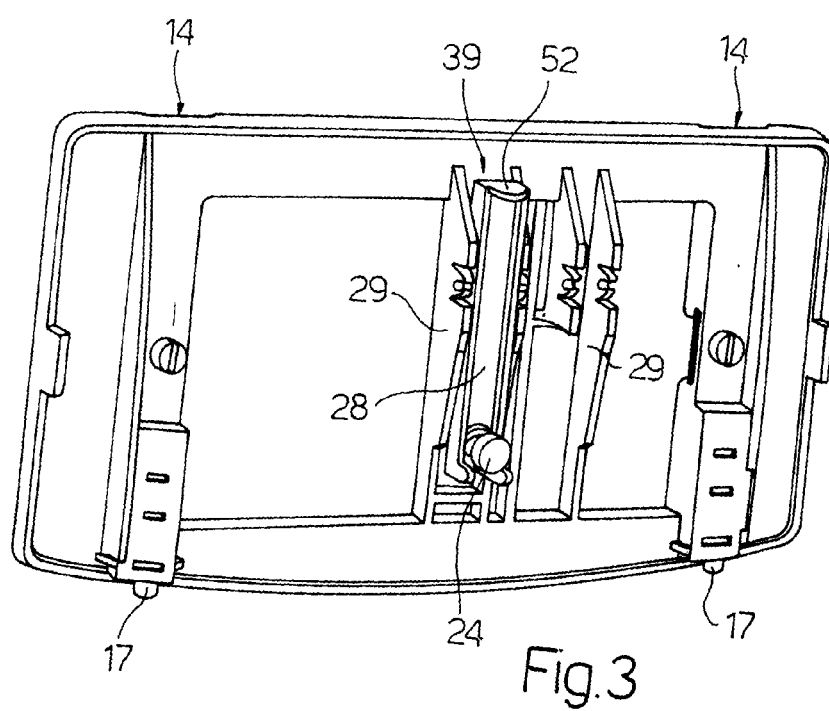
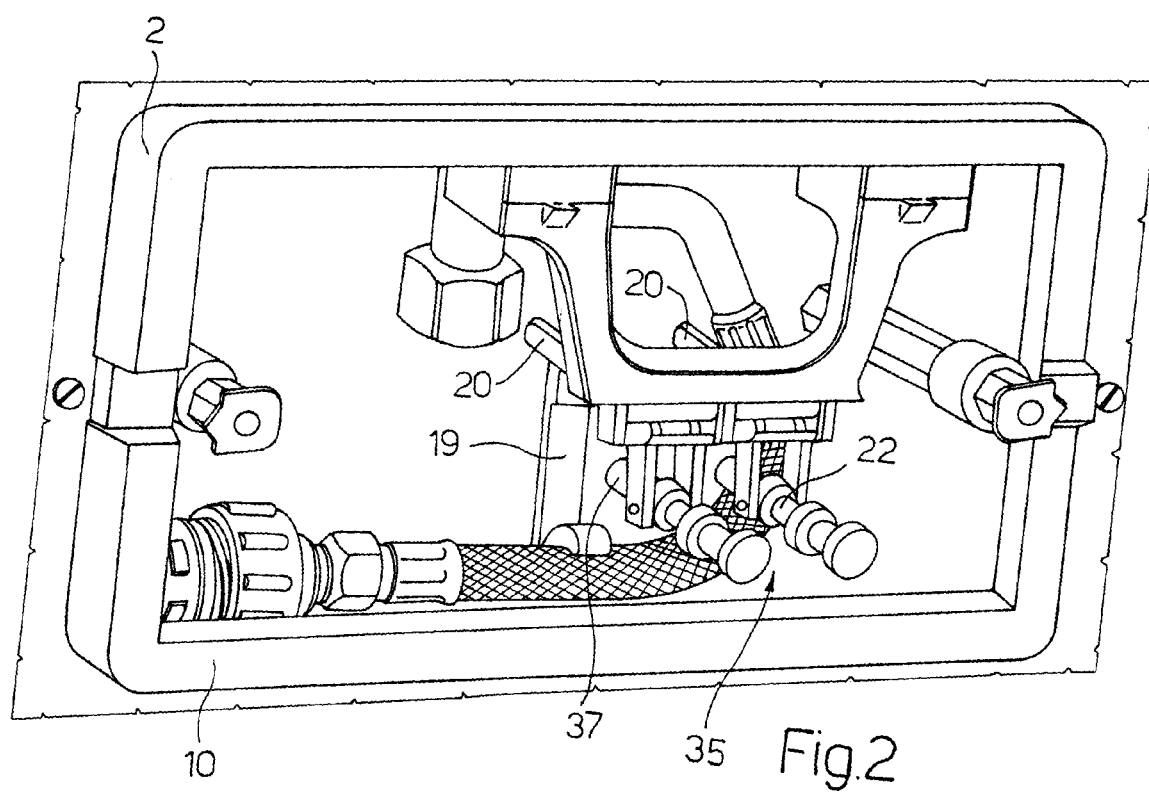


Fig.1



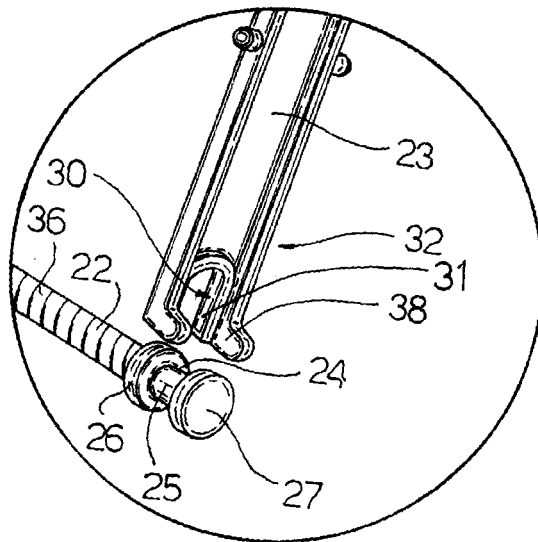


Fig. 4

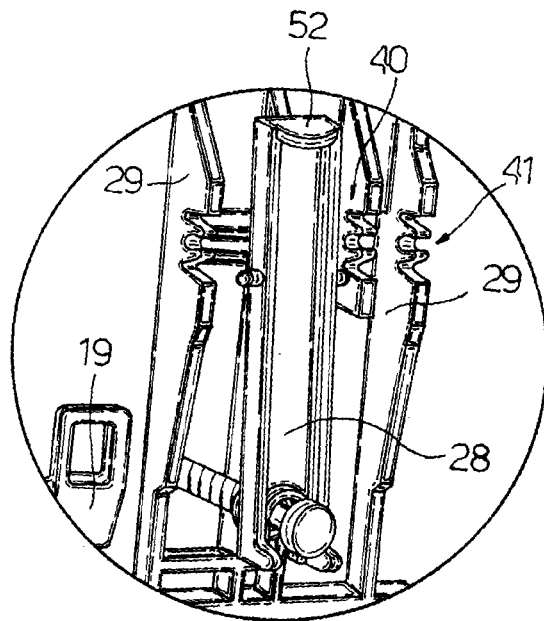


Fig. 5

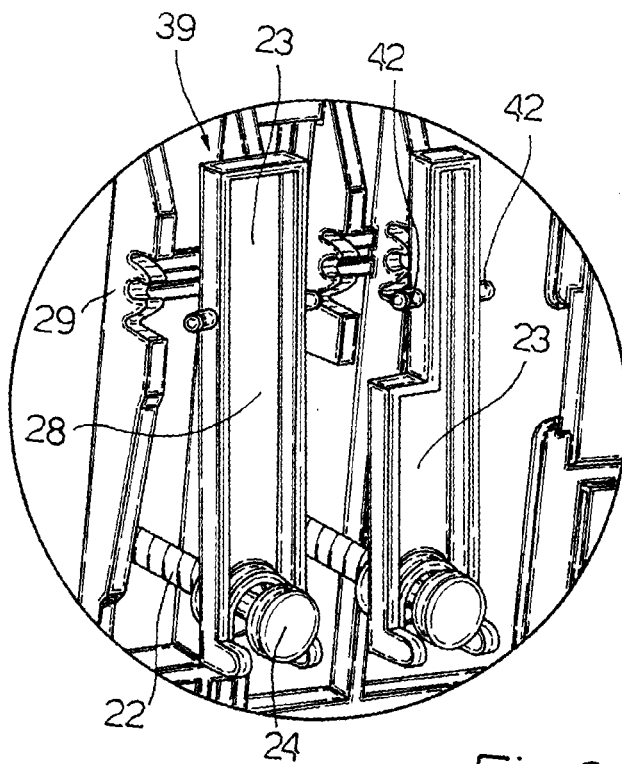


Fig. 6

