

Description

[0001] The present invention relates to a device, in particular a pneumatic device, for controlling a flush tank drain valve.

[0002] Generally speaking, a flush tank drain valve comprises a movable member fitted with a shutter which cooperates with a fluidtight seat; and, to drain the water from the tank, the movable member is raised by means of a pneumatic system connected to a user-operated pneumatic control device.

[0003] In the case of walled-in or recessed tanks, the pneumatic control device generally comprises a supporting structure fixed to the wall and having a button for operating a lever mechanism which cooperates with a piston sliding inside a chamber to produce an air pulse; and the air pulse is fed to the pneumatic system which raises the shutter to drain the water from the tank.

[0004] In known control devices, the mechanism connecting the button to the piston comprises numerous interconnected component parts, and is therefore relatively complex and expensive to produce and assemble. Moreover, the presence of lever mechanisms may impair operation and/or reliability of the device as a whole.

[0005] It is an object of the present invention to provide a flush tank drain valve control device which is extremely straightforward to produce and assemble, while at the same time providing for maximum efficiency and reliability.

[0006] According to the present invention, there is provided a device for controlling the drain valve of a flush tank, and comprising a supporting structure fitted with at least one button cooperating with an actuator of a pneumatic assembly to generate an air pulse; the device being characterized in that said button is a rocking button which cooperates with and exerts thrust directly on said actuator.

[0007] The control device according to the invention is therefore extremely straightforward and cheap and easy to produce and assemble, while at the same time providing for maximum efficiency and reliability.

[0008] An important aspect of the invention is that the supporting structure comprises a frame supporting the pneumatic assembly; and a plate fixable removably to the frame and supporting the button. And the frame is designed to selectively support one or more pneumatic assemblies.

[0009] Control devices can thus be produced cheaply and easily for both single-drain valves (i.e. permitting full drainage of the tank only) and dual-function drain valves (i.e. selectively enabling full or partial drainage of the tank) by simply changing a small number of component parts of the control device to switch from one version to the other.

[0010] Known solutions, on the other hand require a specially designed control device for each application (single-drain or dual-function drain valves), or at least comprise numerous component parts specially de-

signed for one version or the other, with only a very few parts being common to both.

[0011] A number of non-limiting embodiments of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a schematic exploded view in perspective of a first embodiment of a flush tank drain valve control device in accordance with the invention;

Figure 2 shows a lateral section, with parts removed for clarity, of the Figure 1 device assembled;

Figure 3 shows a view in perspective of a first component part of the Figure 1 device;

Figure 4 shows a view in perspective of a second component part of the Figure 1 device;

Figure 5 shows a schematic exploded view in perspective of a second embodiment of the invention.

[0012] Number 1 in Figures 1 and 2 indicates as a whole a pneumatic device for controlling a flush tank drain valve, in particular a pneumatic drain valve (known and not shown for the sake of simplicity), which, as is known, is opened by a pneumatic actuating system acting on a movable member of the valve. In the Figure 1 version, device 1 provides for activating one operating mode of the drain valve (full drainage), so the drain valve associated with device 1 is a single-drain valve.

[0013] Device 1 comprises a supporting structure 2 supporting a button 3 and a pneumatic assembly 4. Structure 2 comprises a frame 5 supporting pneumatic assembly 4; and a plate 6 fixable removably to frame 5 and supporting button 3.

[0014] With reference in particular to Figures 2 and 3, frame 5 comprises a substantially rectangular peripheral border 7 defining an opening 8; and a central portion 9 bridging opening 8 between two opposite sides of border 7. And border 7 has holes 10 for the insertion of screws by which to fix frame 5 to a wall (e.g. the front wall of the cavity in which the flush tank is housed).

[0015] Portion 9 comprises a plate 11 set back with respect to border 7 and connected to border 7 by two end arms 12; and plate 11 supports three substantially cylindrical seats 13 bounded by respective lateral wall portions 14 projecting perpendicularly from plate 11. More specifically, a central seat 13a and two lateral seats 13b, 13c, located on opposite sides of central seat 13a, are provided; seats 13 are arranged substantially side by side and overlap laterally on plate 11; and each seat 13 comprises a back wall 15, through which a central through hole 16 is formed, and two diametrically opposite retaining seats 17 formed, for example, in lateral wall portions 14 or in back wall 15.

[0016] With reference in particular to Figures 2 and 4, plate 6 comprises a plate 18, and a peripheral edge 19 substantially perpendicular to plate 18; and plate 18 has a front surface 21, a rear surface 22, and an oblong window 23 formed through plate 18 and bounded by a collar

24 projecting from rear surface 22.

[0017] Structure 2 also comprises reversible fastening means of any known type for fixing plate 6 removably to frame 5. For example, as shown in Figures 3 and 4, the fastening means comprise teeth 26 projecting from rear surface 22 to engage respective seats 27 formed in frame 5; and frame 5 supports elastic members 28, e.g. flexible tongues, which cooperate with peripheral edge 19 of plate 6 to permit engagement of respective seats 27 by teeth 26.

[0018] In the Figure 1 version, frame 5 supports one pneumatic assembly 4 housed inside one seat 13, in particular inside central seat 13a.

[0019] With reference to Figures 1 and 2, pneumatic assembly 4 comprises a casing 30 and an actuator 31; casing 30 is cup-shaped, and comprises a cylindrical inner chamber 32 bounded by a lateral wall 33 and by a back wall 34; actuator 31 comprises a slide 35 housed and sliding inside chamber 32; slide 35 comprises a tubular rod 36 extending axially from a disk 37 fitted to an elastomeric sealing ring 38 which cooperates in sliding manner with lateral wall 33; slide 35 slides axially inside chamber 32 in opposition to a spring 39 interposed between disk 37 and back wall 34; and rod 36 is fitted through hole 16 in seat 13a, and has an end head 40 on the opposite side to disk 37.

[0020] Back wall 34 has an outlet hole 41 engaged by a conduit 42 which is connected in known manner (not shown) to the pneumatic actuating system (known and not shown) of the drain valve; and casing 30 has retaining teeth 43 which cooperate with retaining seats 17 to fix casing 30 to seat 13a, and therefore pneumatic assembly 4 to frame 5.

[0021] Pneumatic assembly 4 may be provided with an optional relief valve 45. In which case, slide 35 has an inner cylindrical channel 46 housing a pin 47 which slides in opposition to spring 39; and pin 47 has, at one axial end, a shutter 48 loaded by spring 39 and cooperating with disk 37 or sealing ring 38 to close channel 46, and, at the opposite axial end, an end portion 49 projecting axially from head 40.

[0022] Button 3 is a rocking button hinged to plate 6 and housed inside window 23, and comprises a user-operated oblong base portion 52 substantially the same shape as and housed inside window 23; a longitudinal rod 53 parallel to base portion 52; and a brace 54 connecting rod 53 to base portion 52. Rod 53 comprises cylindrical pin portions 55; and reinforcing ribbed portions 56 between pin portions 55.

[0023] With reference to Figures 2 and 4, plate 6 has a number of supports 57 aligned to support button 3 in rotary manner. More specifically, four supports 57 project from rear surface 22 and have respective rotation seats 58 for click-in insertion of respective pin portions 55.

[0024] In actual use, button 3 contacts actuator 31 directly to cooperate with and exert thrust directly on actuator 31, in particular on head 40, and, if relief valve 45

is provided, on the end portion 49 of pin 47. When the user presses button 3, which is hinged to plate 6 by pin portions 55 inserted inside rotation seats 58, rotation of button 3 causes slide 35 to slide inside chamber 32 and produce an air pulse which is fed along conduit 42 to the pneumatic actuating system to open the drain valve.

[0025] The Figure 5 embodiment, in which details similar to or identical with those already described are indicated using the same reference numbers, shows a two-button control device 1a for selectively activating full or partial drainage; so the drain valve associated with device 1a in this case is a dual-function valve.

[0026] Device 1a comprises supporting structure 2 as described above; two identical pneumatic assemblies 4 identical with that of device 1 described above; and two rocking buttons 3a, 3b hinged to plate 6 and housed side by side inside window 23.

[0027] Each button 3a, 3b comprises a user-operated base portion 52 housed inside window 23; a longitudinal rod 53 parallel to base portion 52; a brace 54 connecting rod 53 to base portion 52; and two cylindrical pin portions 55 at respective opposite axial ends of rod 53 to engage rotation seats 58.

[0028] In other words, device 1a comprises the same component parts as device 1 described above, except that the single button 3 is replaced by two buttons 3a, 3b, and two pneumatic assemblies 4 are inserted inside respective seats 13b and 13c.

[0029] Frame 5, in fact, is designed to selectively support one or more pneumatic assemblies 4, and in particular has a number of seats 13 to selectively house one or more pneumatic assemblies 4 inside respective seats 13; and plate 6 also has supports 57 for supporting for rotation one button 3 or two side by side buttons 3a, 3b.

[0030] In actual use, buttons 3a, 3b cooperate with and exert thrust directly on actuators 31 of respective pneumatic assemblies 4; and the drain valve is activated for full or partial drainage by the user pressing button 3a or 3b.

Claims

1. A device (1, 1a) for controlling the drain valve of a flush tank, and comprising a supporting structure (2) fitted with at least one button (3) cooperating with an actuator (31) of a pneumatic assembly (4) to generate an air pulse; the device being **characterized in that** said button (3) is a rocking button which cooperates with and exerts thrust directly on said actuator (31).
2. A device as claimed in Claim 1, **characterized in that** said actuator (31) comprises a slide (35) having an end head (40) projecting axially from the pneumatic assembly (4); the button (3) cooperating with and exerting thrust directly on said head (40).

3. A device as claimed in Claim 1 or 2, **characterized in that** the supporting structure (2) comprises a frame (5) supporting the pneumatic assembly (4); and a plate (6) fixable removably to the frame (5) and supporting the button (3). 5
4. A device as claimed in Claim 3, **characterized in that** the button (3) is hinged to the plate (6) and housed inside a window (23) formed through the plate (6). 10
5. A device as claimed in Claim 3 or 4, **characterized in that** the frame (5) is designed to selectively support one or more pneumatic assemblies (4). 15
6. A device as claimed in one of Claims 3 to 5, **characterized in that** the frame (5) comprises a number of seats (13) to selectively house one or more pneumatic assemblies (4) inside respective seats (13). 20
7. A device as claimed in Claim 6, **characterized in that** the frame (5) comprises three seats (13). 25
8. A device as claimed in Claim 6 or 7, **characterized in that** the seats (13) are substantially side by side. 30
9. A device as claimed in one of Claims 6 to 8, **characterized in that** the seats (13) are substantially cylindrical, and overlap laterally. 35
10. A device as claimed in one of Claims 6 to 9, **characterized in that** each seat (13) comprises a hole (16) formed through a back wall (15) of the seat (13) to house an actuator (31). 40
11. A device as claimed in one of Claims 3 to 10, **characterized in that** the plate (6) has supports (57) for supporting for rotation a single button (3) or a pair of side by side buttons (3a, 3b). 45
12. A device as claimed in Claim 11, **characterized in that** said supports (57) are aligned, and have respective rotation seats (58) for click-in insertion of respective pin portions (55) carried by said single button (3) or by respective ends of each button in said pair of buttons (3a, 3b). 50

55

Fig. 1

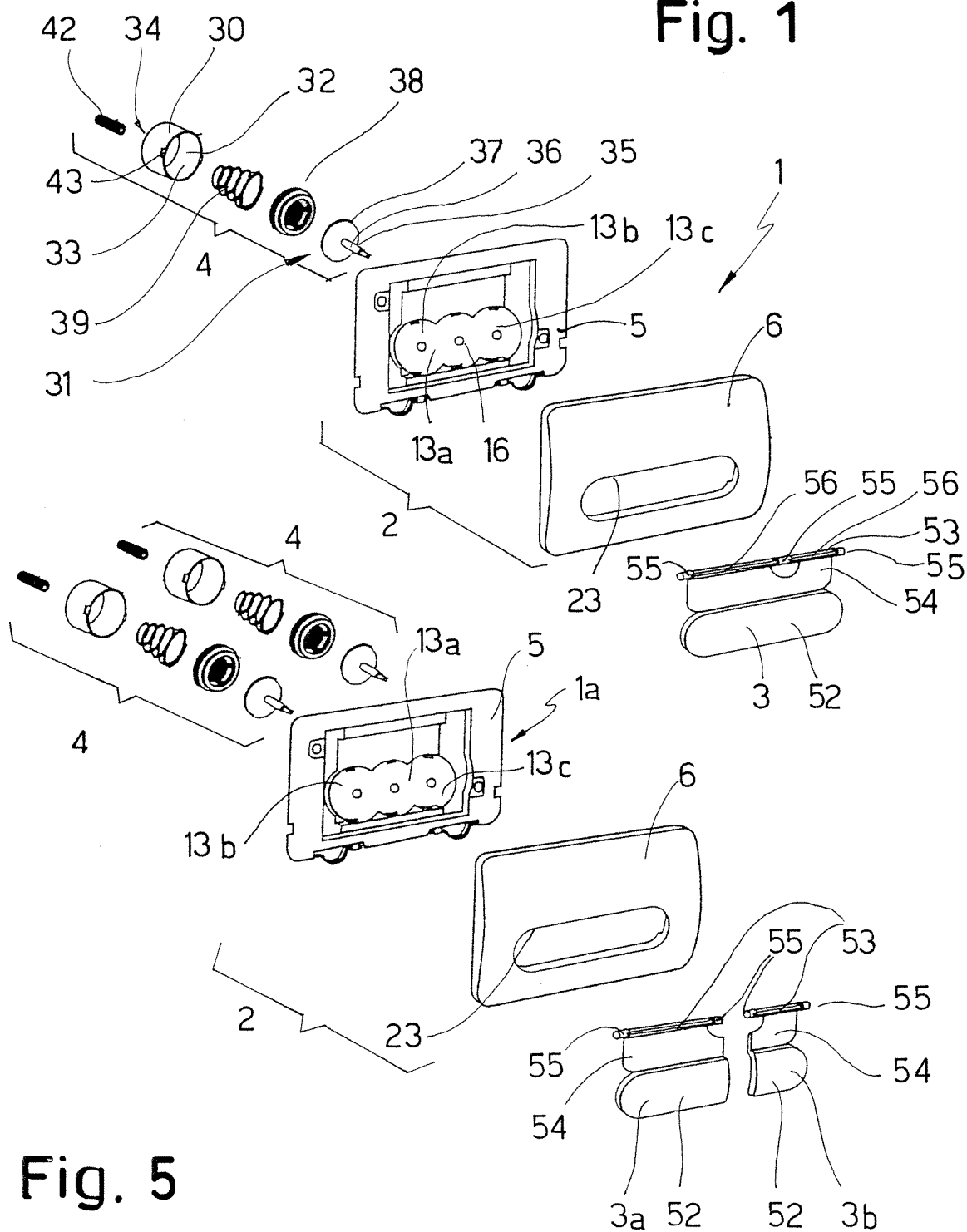


Fig. 5

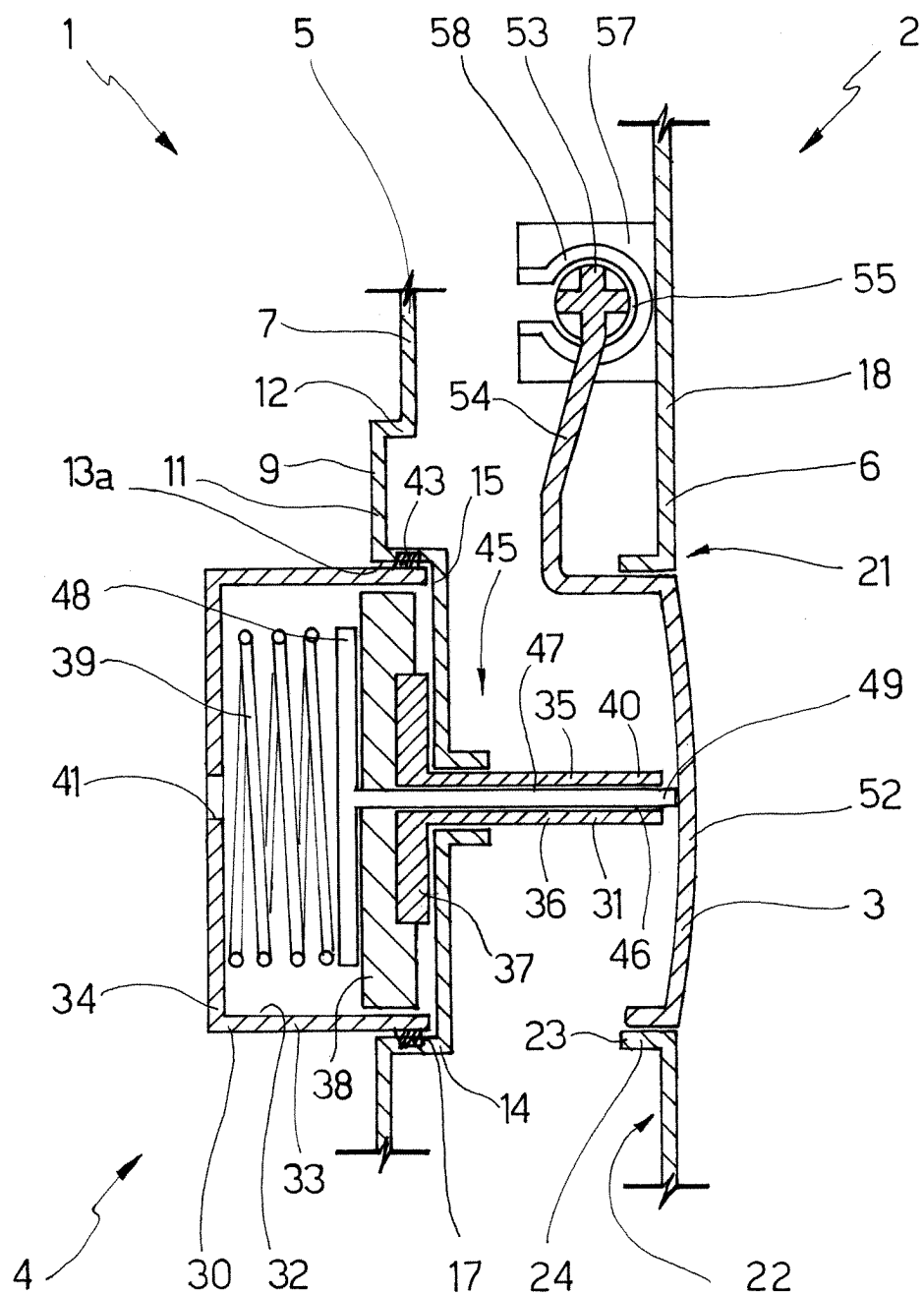


Fig. 2

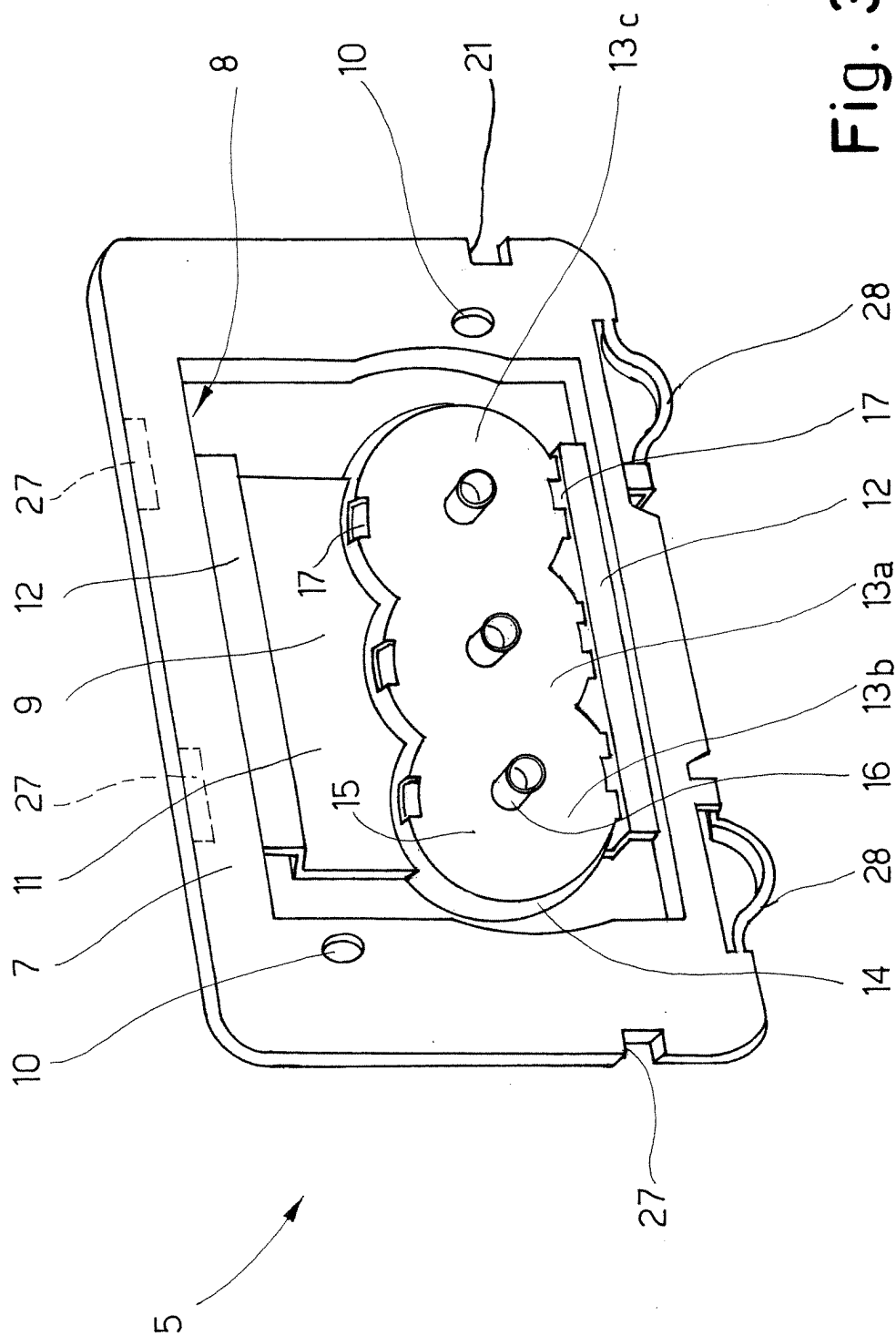


Fig. 3

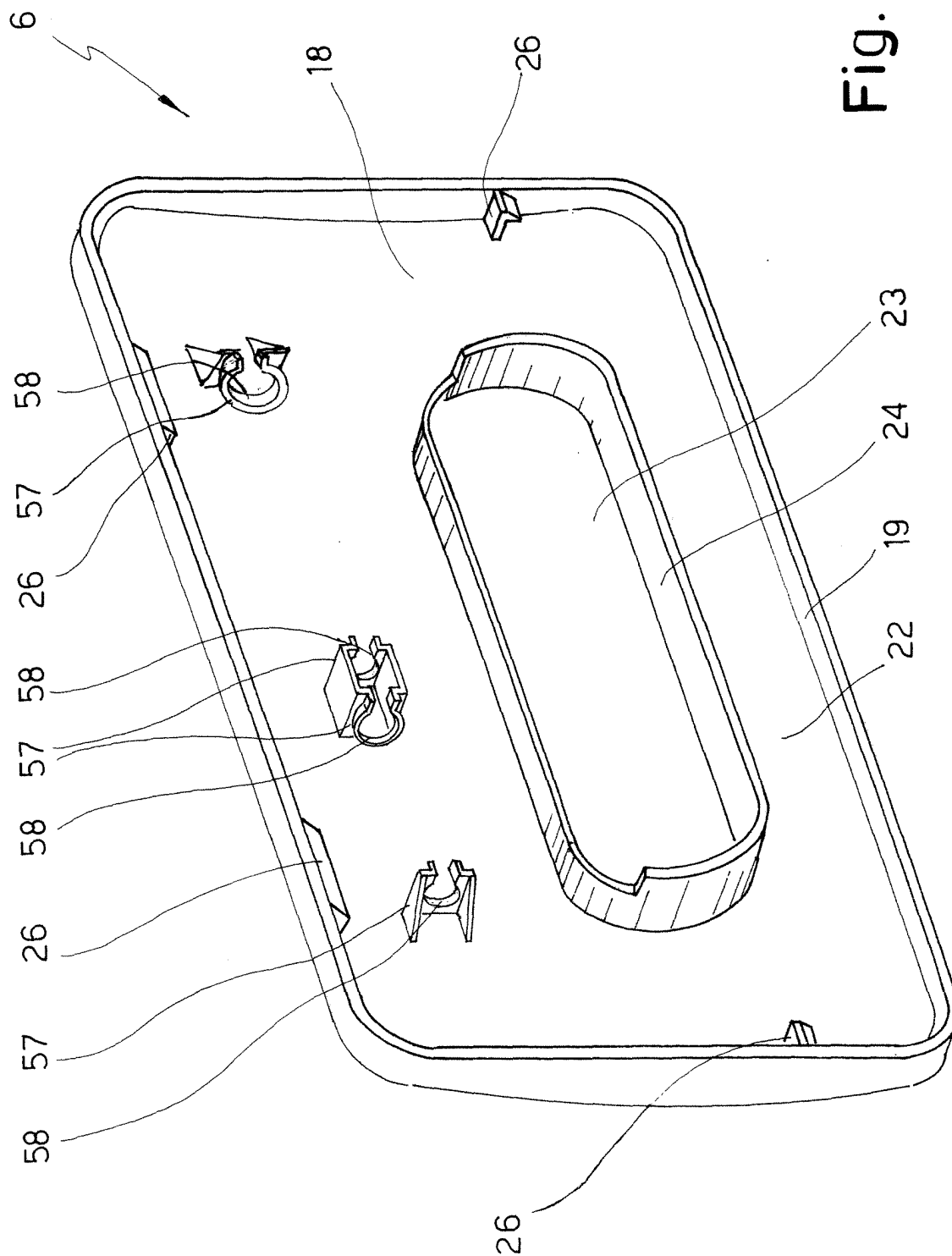


Fig. 4



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 10 2958

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	US 4 304 015 A (HUBATKA ALEX) 8 December 1981 (1981-12-08) * column 2, line 26 - line 35; figure 3 *	1-6,11	E03D5/02
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			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
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The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 3 September 2004	Examiner Flygare, E
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03 82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 04 10 2958

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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03-09-2004

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