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(54) **Flush tank overflow device, and drain valve for a flush tank equipped with such a device**

(57) A flush tank overflow device (2) has a tube (10) extending along an axis (A) and having two open opposite axial ends (12, 13); and a cover (11) at the top end (13) of the tube (10). The top end (13) of the tube (10) has an inlet opening (15) bounded by a substantially annular inlet edge (16); and the cover (11) has a bottom end edge (27), which surrounds the inlet edge (16) and is located

radially outwards of the inlet edge (16) and axially below or substantially flush with a top face (21) of the inlet edge (16).

The cover (11) and the inlet opening (15) thus form a siphon system (30) which allows to increase the flow rate when the overflow is active.

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Description

[0001] The present invention relates to an overflow device for a sanitary fixture (WC, urinal, etc.) flush tank, and to a drain valve for a flush tank equipped with such a device.

[0002] Flush tanks normally comprise a drain valve which, when activated, discharges water from the tank into a sanitary fixture; and a feed mechanism for refilling the tank to a given level each time the drain valve is activated.

[0003] A flush tank drain valve normally comprises a supporting structure fitted to the bottom wall of the tank and having a drain hole bounded by a sealing seat; and a valve body, which is housed to slide inside the supporting structure and has a shutter at the bottom, which cooperates with the sealing seat to close the drain hole. The valve body is raised by user-operated actuators.

[0004] The valve body is normally an open-ended tubular member, which also serves as an overflow tube.

[0005] The purpose of an overflow device is to prevent overflow and overflow of the tank, in the event, for example, of a fault in the feed mechanism and/or drain valve, thus resulting in flooding of the premises the tank is installed in.

[0006] Known overflow devices with an overflow tube normally operate satisfactorily, but still leave room for improvement.

[0007] For example, the amount of water the overflow tube can handle substantially depends on the size, in particular the inner cross section and length and/or the length to cross section ratio, of the tube, so, to ensure adequate overflow water disposal, the tube must be sized accordingly, which poses cost and/or space problems.

[0008] Moreover, some situations may result in turbulence at the overflow tube inlet, thus impairing its theoretical effectiveness.

[0009] It is an object of the present invention to provide an overflow device of a flush tank for a sanitary fixture (WC, urinal, etc.), optionally incorporated in the drain valve of the flush tank, which is simple, effective and reliable.

[0010] More specifically, it is an object of the present invention to provide an overflow device of improved water disposal capacity with respect to known devices.

[0011] According to the present invention, there is provided a flush tank overflow device comprising a tube extending along an axis and having two open opposite axial ends; and a cover at a top end of the tube; the top end of the tube having an inlet opening bounded by a substantially annular inlet edge; the device being **characterized in that** the cover and the inlet edge of the tube define a siphon system.

[0012] More specifically, the cover has a bottom end edge, which surrounds the inlet edge and is located radially outwards of the inlet edge, and axially below or substantially flush with a top face of the inlet edge.

[0013] The overflow device according to the invention

can be incorporated easily in the flush tank drain valve (of which it forms the valve body), and ensures adequate overflow disposal in a straightforward, effective, reliable manner.

[0014] More specifically, because of the cover, the overflow device according to the invention improves the performance of standard overflow tubes of comparable size, especially in terms of overflow water disposal capacity and speed.

[0015] The specific design and location of the cover, in fact, produces a sort of siphon, i.e. suction, effect for faster water disposal.

[0016] A non-limiting embodiment of the invention will be described by way of example with reference to the accompanying drawings, in which :

Figure 1 shows a schematic longitudinal section of a drain valve of a flush tank equipped with an overflow device in accordance with the invention;

Figure 2 shows a longitudinal section of a detail of the Figure 1 overflow device;

Figure 3 shows a larger-scale view of the highlighted detail in Figure 2;

Figure 4 shows an underside view in perspective of a component part of the overflow device according to the invention;

Figures 5 and 6 show two sections, in two perpendicular planes, of the Figure 4 component.

[0017] Number 1 in Figure 1 indicates a drain valve of a flush tank (not shown) equipped with an overflow device 2.

[0018] Drain valve 1 extends substantially along an axis A, and comprises a supporting structure 3 fixable (e.g. by means of a threaded sleeve 4) to a bottom wall of the tank and having a drain hole 5 bounded by a sealing seat 6; and a valve body 7 housed to slide along axis A inside supporting structure 3, and having a shutter 8 at the bottom, which cooperates with sealing seat 6 to close drain hole 5. Valve body 7 is raised by a known actuating mechanism 9 not described or shown in detail for the sake of simplicity. (In the example shown, mechanism 9 is cable-controlled, but may be of any other known type).

[0019] Valve body 7 comprises a tube 10, which also serves as an overflow tube and forms part of overflow device 2.

[0020] Overflow device 2 also comprises a cover 11, which, in the example shown, is a separate part fitted mechanically to tube 10.

[0021] Tube 10 extends along axis A, is positioned vertically in use (with a vertical axis A), is optionally formed in a number of pieces or tube sections, and has two open opposite axial ends 12 and 13. The bottom end 12 has shutter 8 cooperating with sealing seat 6, and terminates with a bottom outlet opening 14; and the top end 13 has a top inlet opening 15 bounded by an inlet edge 16.

[0022] Opening 15 is advantageously larger in cross section (perpendicular to axis A) than tube 10.

[0023] More specifically, as shown in more detail in Figures 2 and 3, the top end 13 of tube 10 has a funnel-shaped portion 17 flaring radially outwards and upwards, and which has a lateral wall 18 tapering downwards towards axis A and preferably curved with a convex inner surface (facing axis A) and a concave outer surface.

[0024] Wall 18 terminates at the top with inlet edge 16 bounding opening 15. Edge 16 is substantially annular, and has a top face 21 preferably substantially perpendicular to axis A; and a lateral face 22 which, for example, is substantially parallel to or slopes slightly with respect to axis A.

[0025] Top end 13 of tube 10 has cover 11, which is located over edge 16 and covers opening 15.

[0026] Cover 11 is located along and extends substantially about axis A, and is preferably (though not necessarily) substantially disk-shaped, e.g. substantially circular.

[0027] Cover 11 is larger across than opening 15, and covers the whole of opening 15, i.e. extends laterally (radially with respect to axis A) beyond edge 16 and, more specifically, beyond face 22 of edge 16.

[0028] Cover 11 has a substantially disk-shaped top wall 23; and a substantially annular lateral wall 24 projecting from a peripheral edge of top wall 23.

[0029] Top wall 23 has an inner surface 25 facing opening 15; and an outer surface 26 opposite inner surface 25. And inner surface 25 is raised a few millimetres with respect to edge 16 and, more specifically, with respect to face 21.

[0030] Preferably (though not necessarily), top wall 23 is curved, inner surface 25 is concave, and outer surface 26 is convex.

[0031] Lateral wall 24 extends substantially about axis A, and, in the example shown, is substantially parallel to or slopes slightly with respect to axis A.

[0032] Lateral wall 24 has a substantially annular, e.g. substantially circular, bottom end edge 27.

[0033] Lateral wall 24 surrounds edge 16 bounding opening 15, and is located a given distance radially outwards of edge 16.

[0034] More specifically, bottom end edge 27 extends about edge 16, and is separated radially from it by an annular gap 28 of a given radial width (i.e. measured radially with respect to axis A). Annular gap 28 defines an inlet opening 29 of overflow device 2, communicating with inlet opening 15 of tube 10.

[0035] More specifically, bottom end edge 27 is located radially outwards with respect to edge 16, i.e. with respect to face 22 of edge 16, and axially below or substantially flush with top face 21 of edge 16, so that cover 11 and edge 16 of tube 10 define a siphon system 30.

[0036] Bottom end edge 27 of cover 11 is located a given axial distance (measured parallel to axis A) from edge 16, i.e. from the highest part of tube 10 bounding opening 15.

[0037] With reference also to Figures 4 to 6, cover 11 has fasteners 31 for fastening cover 11 to tube 10.

[0038] More specifically, fasteners 31 project from cover 11 towards edge 16, and are shaped to engage edge 16.

[0039] In the example shown, fasteners 31 comprise two diametrically opposite teeth 32, which project radially inwards (towards axis A) from top wall 23 and/or lateral wall 24, face respective axial shoulders 33, and axially engage edge 16 inserted between teeth 32 and respective shoulders 33.

[0040] Fasteners 31 also comprise two facing, diametrically opposite pins 34, which are interposed between teeth 32, project axially downwards, rest radially against face 22 of edge 16, and have respective axial shoulders 35 which rest on edge 16 (more specifically, on face 21 of edge 16).

[0041] Clearly, changes may be made to the overflow device as described and illustrated herein without, however, departing from the scope of the accompanying Claims.

Claims

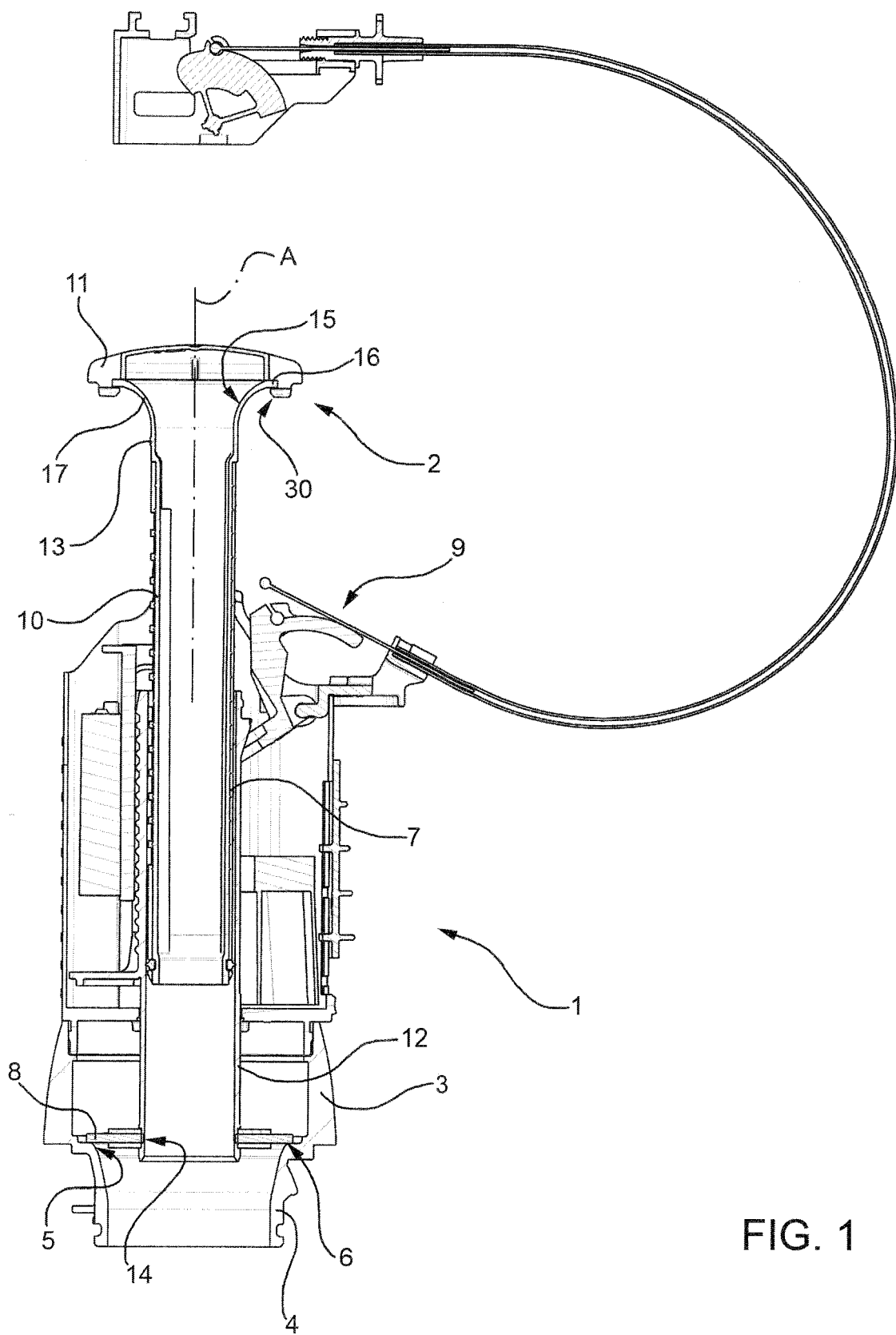
1. A flush tank overflow device (2) comprising a tube (10) extending along an axis (A) and having two open opposite axial ends (12, 13); and a cover (11) at a top end (13) of the tube (10); the top end (13) of the tube (10) having an inlet opening (15) bounded by a substantially annular inlet edge (16); and the device being **characterized in that** the cover (11) and the inlet edge (16) of the tube (10) define a siphon system (30).
2. A device as claimed in Claim 1, wherein the cover (11) has a bottom end edge (27), which surrounds the inlet edge (16) and is located radially outwards of the inlet edge (16) and axially below or substantially flush with a top face (21) of the inlet edge (16).
3. A device as claimed in Claim 2, wherein the bottom end edge (27) extends about the inlet edge (16), and is separated radially from the inlet edge (16) by an annular gap (28) of a given width and defining an inlet opening (29) of the device (2), which communicates with the inlet opening (15) of the tube (10).
4. A device as claimed in Claim 2 or 3, wherein the inlet edge (16) has a top face (21) substantially perpendicular to the axis (A), and a lateral face (22) substantially parallel to or sloping slightly with respect to the axis (A); and the bottom end edge (27) is located radially outwards of the lateral face (22) of the inlet edge (16).
5. A device as claimed in one of Claims 2 to 4, wherein the cover (11) has a substantially disk-shaped top wall (23); and a substantially annular lateral wall (24) projecting from a peripheral edge of the top wall (23)

and terminating with the bottom end edge (27).

6. A device as claimed in one of the foregoing Claims, wherein the cover (11) is substantially disk-shaped, and is located along and extends substantially about the axis (A). 5
7. A device as claimed in one of the foregoing Claims, wherein the cover (11) has fasteners (31) for fastening the cover (11) to the tube (10). 10
8. A device as claimed in Claim 7, wherein the fasteners (31) project from the cover (11) towards the inlet edge (16) of the tube (10), and are shaped to engage the inlet edge (16). 15
9. A device as claimed in Claim 7 or 8, wherein the fasteners (31) comprise teeth (32) facing respective axial shoulders (33), and which axially engage the inlet edge (16) inserted between the teeth (32) and the respective shoulders (33). 20
10. A device as claimed in one of Claims 7 to 9, wherein the fasteners (31) comprise pins (34), which rest radially against the inlet edge (16) and have respective axial shoulders (35) which rest on the inlet edge (16). 25
11. A device as claimed in one of the foregoing Claims, wherein the top end (13) of the tube (10) has a funnel-shaped portion (17) flaring radially outwards and upwards. 30
12. A device as claimed in Claim 11, wherein the funnel-shaped portion (17) has a curved lateral wall (18) tapering downwards towards the axis (A) and having a convex inner surface and a concave outer surface. 35
13. A flush tank drain valve (1) comprising a supporting structure (3) with a sealing seat (6) bounding a drain hole (5); and a valve body (7) housed to slide inside the supporting structure (3) and having a shutter (8) at the bottom, which cooperates with the sealing seat (6) to close the drain hole (5); the valve being **characterized by** comprising an overflow device (2) as claimed in one of the foregoing Claims, and wherein the tube (10) defines or forms part of the valve body (7). 40
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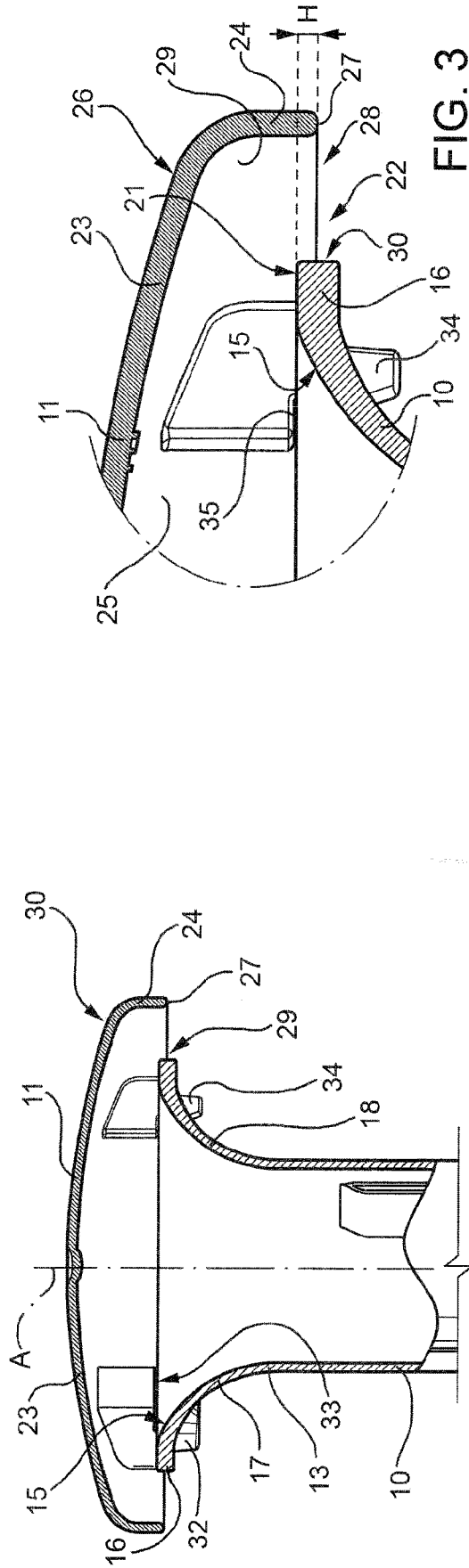


FIG. 3

FIG. 2

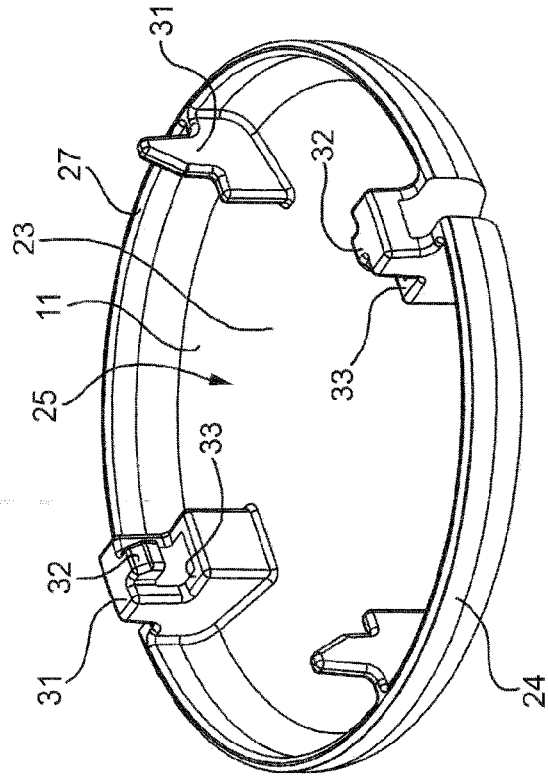


FIG. 4

FIG. 5

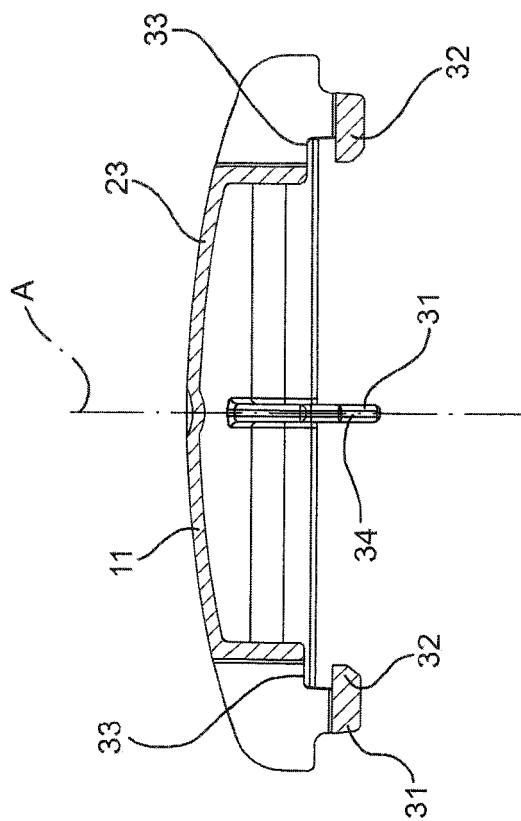
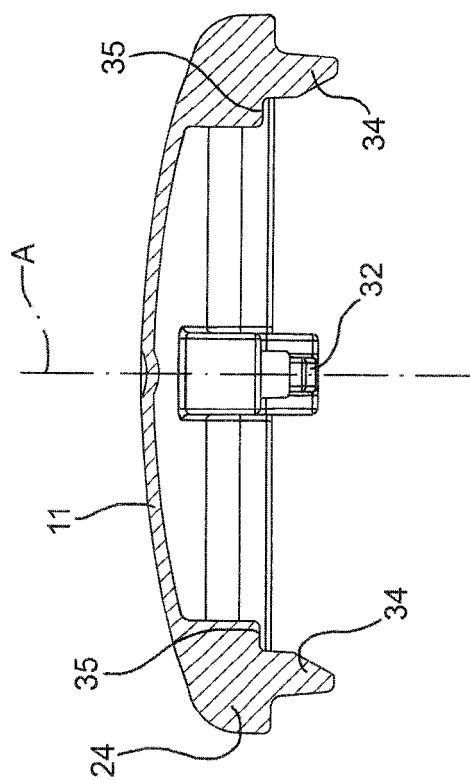


FIG. 6





EUROPEAN SEARCH REPORT

Application Number
EP 12 15 5677

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2009/033205 A1 (CAROMA IND LTD [AU]; ENGLAND SAM ROBERTSON [AU]) 19 March 2009 (2009-03-19)	1-7,12,13	INV. E03D1/34
Y	* page 5, line 25 - page 6, line 8; figures 1-3 *	8-11	
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Y	US 5 025 509 A (HOLT PETER K [CA] ET AL) 25 June 1991 (1991-06-25) * figure 1 *	10,11	
A	AT 254 695 B (GEBERT & CIE [CH]) 12 June 1967 (1967-06-12) * the whole document *	1	TECHNICAL FIELDS SEARCHED (IPC)
			E03D E03C A47K
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 18 April 2012	Examiner Geisenhofer, Michael
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			

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EPO FORM 1503 03.92 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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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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