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(54) A valve device.

(57) A valve device 1 for admitting air to a pipe such as a stack pipe 2 in a domestic toilet system is shown. The valve device 1 comprises a body 3 adapted to be mounted on the pipe 2 at an open end 4 of the body 3 which has a closed end provided by an end closure or a cap 5 with a depending skirt 6 which reaches to the lower (as viewed) limit of an opening 7 in the body 3 to atmospheric air. The body 3 has an internal wall 8 which extends part way across the body 3 internally, the internal wall 8 having a through orifice or hole 9 and being part cylindrical. An upwardly extending part 10 of the wall 8 and a part 11 terminate in a nose 12 which supports the underside of a valve member 13.

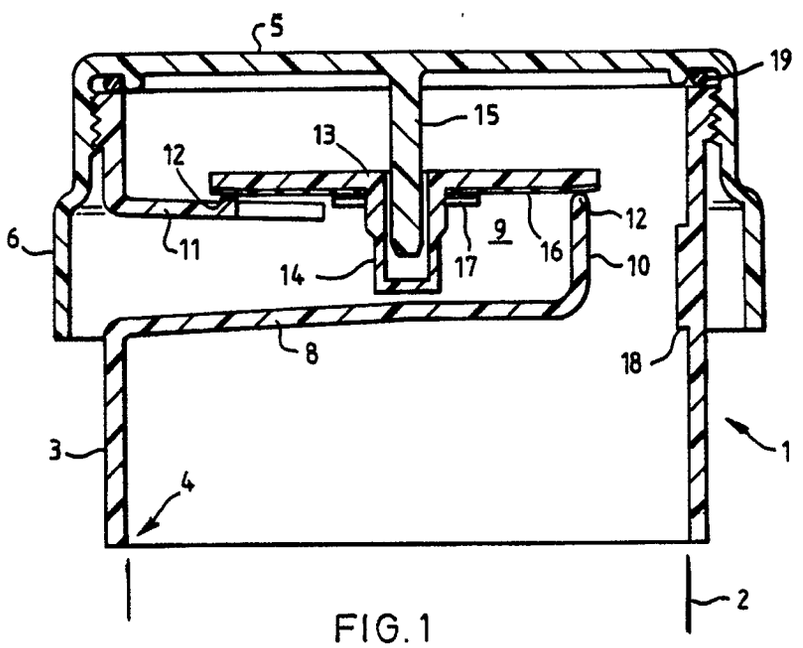

FIG.1

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A VALVE DEVICE

The invention relates to a valve device, particularly an air admittance valve for a pipe, for example for air flow in stack pipes forming part of drainage arrangements such as domestic drainage.

According to the invention there is provided a valve device for admitting air to a pipe, comprising a body adapted to be mounted on a pipe, a chamber in the body, a first passageway open for communication between the chamber and, in use, the interior of a pipe, a second passageway which communicates with the chamber and with the exterior of the body through an opening in a boundary wall of the body, an interior wall extending transversely of the chamber and defining a through orifice forming part of the second passageway, and a valve member associated with the through orifice, the arrangement being such that when the pressure in the chamber and ambient pressure are substantially equal the valve member obturates the through orifice and when the pressure in the chamber falls below ambient the valve member opens the through orifice for passage of ambient air through the second passageway to the chamber and thence to the first passageway.

There may be an open first passageway on each side of the interior transverse wall. This provides for a balanced flow.

The valve device may include guide means for guiding the valve member during movement to open and obturate the through orifice. The construction provides for repeatability of valving.

The guide means may comprise a spigot projecting from an end closure of the chamber and a blind socket in the valve member, and the spigot and socket may be mounted in sliding engagement so that the socket rises and falls on the spigot for guiding the valve member to open and obturate the through orifice. This is a relatively simple yet efficient construction of guiding means.

The guide means may comprise a peripheral flange upstanding from the interior wall and of a size and height sufficient to receive the periphery of the valve member for guiding the valve member to open and obturate the through orifice. This provides an alternative guide for the valve member which also provides for repeatability of the valving operation.

The guide means may comprise a cruciform structure depending from the valve member and a complementary structure carried by the interior wall, the cruciform structures being in slidable engagement for guiding the valve member to open and obturate the through orifice.

The periphery of the through orifice may have an upstanding flange which forms a seat on which the valve member is received in a position to obturate the through orifice. This provides for a positive seating and hence sealing of air flow through the device.

There may preferably be a flexible annular seal secured to the underside of the valve member and adapted to seat on the upstanding flange in the obturating position. This construction also enhances the sealing effect.

There may be two opposite openings in the boundary wall. This provides for balanced admittance of air.

The two open passageways may be defined by upstanding opposite wall portions spaced inwardly of the boundary wall of the body and terminating below the upper edge thereof.

The end closure may comprise a cap with a depending skirt.

The depending skirt may extend to the lower, in use, level of the opening.

Valve devices embodying the invention are hereinafter described, by way of example, with reference to the accompanying drawings.

Fig. 1 is a longitudinal sectional view through a first valve device according to the invention;

Fig. 2 is a longitudinal sectional view through a second valve device according to the invention;

Fig. 3 shows a side elevational view of a third valve device according to the invention;

Fig. 4 shows a plan view of a body of the valve device of Fig. 3 with an end closure removed;

Fig. 5 shows a longitudinal sectional view through the body of Fig. 3;

Fig. 6 shows a longitudinal sectional view of the valve device of Fig. 3 with a valve member thereof in a first or obturating position; and

Fig. 7 shows a longitudinal sectional view of the device of Fig. 3 with a valve member in a second or an admittance position.

Referring to Fig. 1 of the drawings, (in which like parts are denoted by like numerals), a valve device 1 for admitting air to a pipe such as a stack pipe 2 in a domestic toilet system is shown. The valve device 1 comprises a body 3 adapted to be mounted on the pipe 2 at an open end 4 of the body 3 which has a closed end provided by an end closure or a cap 5 with a depending skirt 6 which reaches to the lower (as viewed) limit of an opening 7 in the body 3 to atmospheric air. The body 3 has an internal wall 8 which extends part way across the body 3 internally, the internal wall 8 having a through orifice or hole 9 and being part cylindrical. An upwardly extending part 10 of the wall 8 and a part 11 terminate in a nose 12 which supports the underside of a valve member 13.

There is a guide means for the valve member 13 in the form of an integral well or socket 14 depending from the valve member 13 and a spigot 15 which depends centrally from the cap 5 and projects into the well 14 and is complementary therewith.

There is a seal ring 16 or washer of rubber secured to the underside of the valve member 13 by a retaining clip or ring 17 pushed up over the outside of the well 14.

The body 3 has an internal stop 18 to limit the amount the valve 1 is pushed into the pipe 2.

There is a seal like an 'O'-ring 19 between the cap and the body. The cap 5 may be screw engaged or a push fit on the body 3.

In use, the valve device 1 is pushed onto the pipe 2, the internal pressure of which is normally atmospheric or slightly greater than atmospheric.

The pressure in the pipe 2 is applied to the upper (as viewed) surface of the valve member 13 which sits down on the nose 12 and closes the interior of the pipe 1 off to atmosphere, as shown in Fig. 1. This is because the underside of the valve member 13 is exposed to atmospheric pressure through the opening 7, and differential pressure and the weight of the valve member 13 cause it to sit down on the nose 12.

If now the pressure the pipe 2 falls for any reason the upper surface of the valve member 13 is subject to less than atmospheric pressure. The underside is however still subject to atmospheric pressure through opening 7 so differential pressure between the outside of the pipe 2 (ambient or atmospheric) and the inside acts to lift the valve member 13 off its seating (the nose 12) so that the valve device 1 opens to admit air into the stack pipe to keep noxious effluvia from entering the atmosphere. On return to normal pressure in the stack pipe 1, the valve member 12 resumes the position shown to close the valve, again preventing expulsion of noxious effluvia.

Upward and downward movement of the valve member is guided by the well 14 riding over the spigot 15, so that the valve member 13 always assumes the required, desired, position.

The second embodiment 20 shown in Fig. 2 is similar to the first except that the guide means of the valve member is a cruciform 21 construction depending from the valve member 13 which seats on an 'O'-ring 22 mounted in grooves 23 in an annular internal wall 24, from which also depends a cruciform structure 25 complementary to that of the valve member 13 to guide it during upward and downward movements. In this embodiment 20, the cruciform structure 21, 25 allows the provision of two openings 7 to atmosphere, which can provide for a more balanced operation which otherwise is the same as described for the first embodiment.

Referring now to the third embodiment of valve device 30 shown in Figs. 3 to 7, that device has a body 31 which has a part for mounting on a stack pipe 2, and an end closure or cap 32 which is a push fit on an upstanding peripheral boundary wall part 33 which terminates in a rebated edge 34 for receiving sealing means such as an 'O'-ring 35 so that when the end closure or cap 32 is mounted on the wall 33, a depending skirt 36 thereof is in close-sliding engagement with the wall, which is received between the skirt and an annular flange 37, also with a close-sliding fit, the 'O'-ring 35 providing an air-tight seal.

The boundary wall part 33 is formed to provide an internal wall 38 with a central through orifice 39 the periphery of which is provided with an upstanding flange, nib or nose 40 which is rounded upwardly (as viewed).

The body 31 also has spaced from the internal wall 38 a raised crown 41 which extends across the diameter except at two diametrically opposed upstanding wall parts 41 a , 41 b , which are spaced from the boundary wall 33 and terminate short of the upper (as viewed) edge 34 thereof and provide entry to two parts 42 a , 42 b , of a first passageway 42 which communicates the interior of the body 31 below the crown 41 with a chamber 43 formed in the upper (as viewed) part interiorly of the wall 33 below the end closure 32.

Above the crown 41, the boundary wall of the body 31 is perforated by two openings 44 which are diametrically opposed and which communite ambient air externally of the valve device 30 with the through orifice 39, the through orifice 39 and openings 44 comprising a second passageway.

Interiorly of the chamber 43 there is a valve member 45 in the form of a valve disc 46 having an integral socket 47 in which is received a spigot 48 depending centrally from the end closure 32. The spigot 48 and socket or well 47 have a sliding relation, and there being on the underside (as viewed) of the disc 46 a rubber seal disc 49 which is held in place by a circlip 50 round the socket 47. The underside of the disc is chamfered or tapered upwardly as shown in Fig. 7, so that in the Fig. 6 position the rubber seal disc 50 is pressed against the disc 46 by the nose 40.

In use, operation is similar to that of the embodiments of Figs. 1 and 2.

When the pressure of air/gases in the stack pipe 2 is substantially equal to the ambient pressure, the pressure on the upper (as viewed) side of the valve member 45 is equal to that on the underside (as viewed) and the valve member sits down on the nose 40 to seal the device 30 against passage of air into the device or air/gases out of the device 40 (Fig. 6).

When however pressure in the stack pipe 2

falls to below atmospheric (ambient) pressure, the balance is upset and the pressure below the valve member 45 is greater than that above it, that is bearing on the upper (as viewed) surface of the valve disc 46. The valve member 45 then lifts off the nose 40 (Fig. 7) so allowing air to pass from atmosphere through the openings 46 and through the through orifice 39 into the chamber 43 and thence down the first passageways 42 a , 42b, into the stack pipe 2, so keeping noxious effluvia in the stack pipe and preventing their escape to atmosphere.

When the atmosphere internally and externally of the valve device balances once more, the valve member 45 instantaneously drops onto the nose 40 to seal off the interior from the exterior once more, the socket 47 sliding over the spigot 48 to accommodate this movement.

In a modification shown in dashed lines in Fig. 5, the guide means provided by the spigot 48 and socket 47 may be replaced by an annular guide wall 51 upstanding from the wall 38 and of sufficient diameter just to accommodate the diameter of the valve disc 46.

It will be understood that the valve devices described may be made by any suitable material as by being moulded from plastic such as ABS.

Claims

1. A valve device for admitting air to a pipe, comprising a body adapted to be mounted on a pipe, a chamber in the body, and a first passageway open for communication between the chamber and, in use, the interior of a pipe, characterised by a second passageway (7, 9, 39, 43) which communicates with the chamber (43) and with the exterior of the body (1, 31) through an opening in a boundary wall of the body (1, 31), and by an interior wall (8, 24, 38) extending transversely of the chamber (43) and defining a through orifice (9, 39) forming part of the second passageway, and by a valve member (13, 45) associated with the through orifice (9, 39), the arrangement being such that when the pressure in the chamber (43) and ambient pressure are substantially equal the valve member (13, 15) obturates the through orifice (9, 39) and when the pressure in the chamber (43) falls below ambient the valve member (13, 45) opens the through orifice (9, 39) for passage of ambient air through the second passageway to the chamber and thence to the first passageway.

2. A valve device according to Claim 1, characterised by an open first passageway (42 a , 42 b) on each side of the interior transverse wall (8, 24, 38).

3. A valve device according to Claim 1 or Claim 2, characterised by guide means (14, 15, 21, 47, 48) for guiding the valve member (13, 45) during movement to open and obturate the through orifice.

4. A valve device according to Claim 3, characterized by the guide means (14, 15, 21, 47, 48) comprising a spigot (15) projecting from an end closure (5, 32) of the chamber (43) and a blind socket (14, 47) in the valve member (13, 45), the spigot (15) and socket (14, 47) being mounted in sliding engagement so that the socket (14, 47) rises and falls on the spigot (15) for guiding the valve member to open and obturate the through orifice (9, 39).

5. A valve device according to Claim 3, characterized by the guide means (14, 15, 21, 47, 48) comprising a peripheral flange (51) upstanding from the interior wall (38) and of a size and height sufficient to receive the periphery of the valve member (45) for guiding the valve member to open and obturate the through orifice.

6. A valve device according to Claim 3, characterised by the guide means (14, 15, 21, 47, 48) comprising a cruciform structure (21) depending from the valve member (13) and a complementary structure carried by the interior wall, the cruciform structures being in slidable engagement for guiding the valve member to open and obturate the through orifice.

7. A valve member according to any preceding claim, characterised by the periphery of the through orifice (9, 39) having an upstanding flange (12, 40) which forms a seat on which the valve member (13, 45) is received in a position to obturate the through orifice (9, 39).

8. A valve member according to Claim 7, characterised by a flexible annular seal (16, 49) secured to the underside of the valve member (13, 45) and adapted to seat on the upstanding flange (12, 40) in the obturating position.

9. A valve member according to any preceding claim, characterised by two opposite openings (44) in the boundary wall of the device (20, 30).

10. A valve member according to Claims 2 to 9, characterised by the two open passageways (42 a , 42 b) being defined by upstanding opposite wall portions spaced inwardly of the boundary wall of the body and terminating below the upper edge thereof.

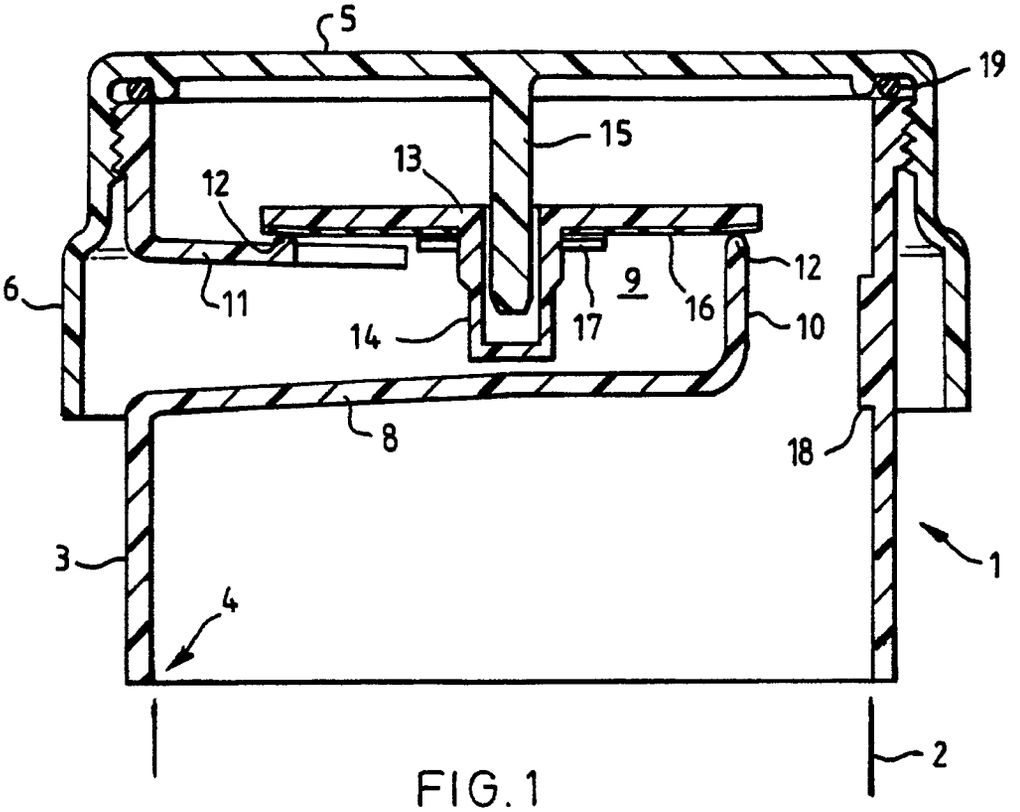
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FIG. 1

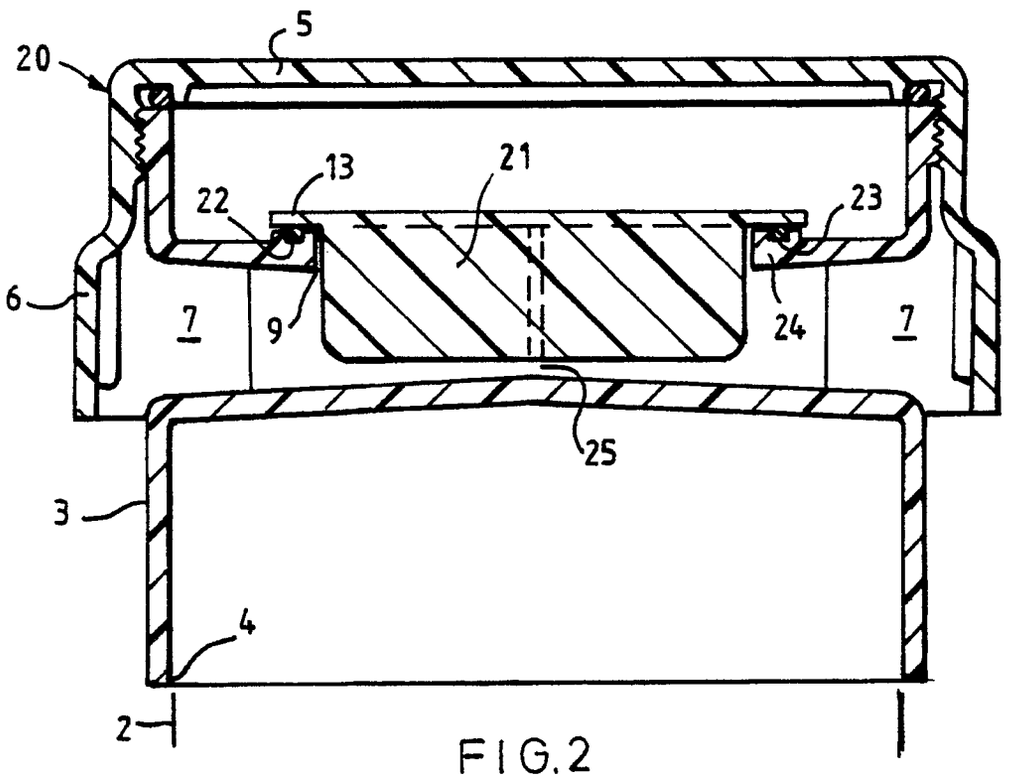
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FIG. 2

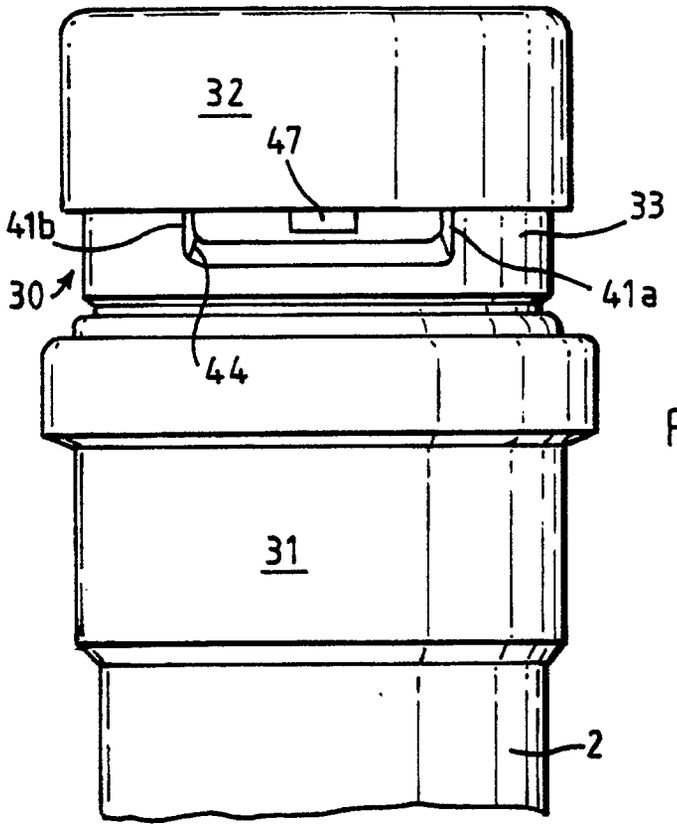

FIG.3

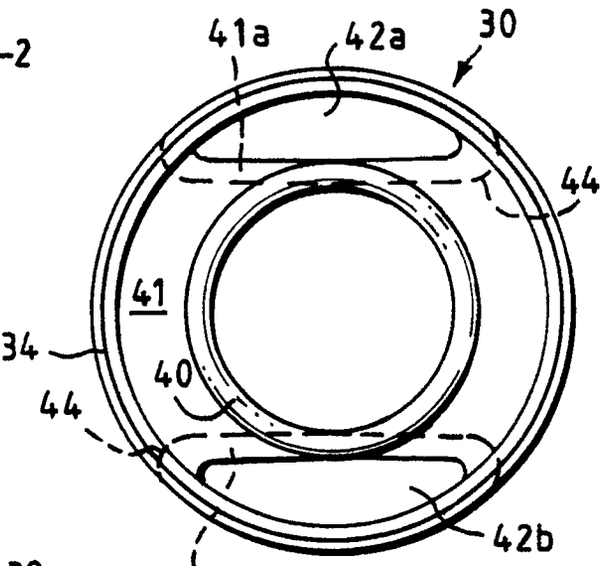

FIG.4

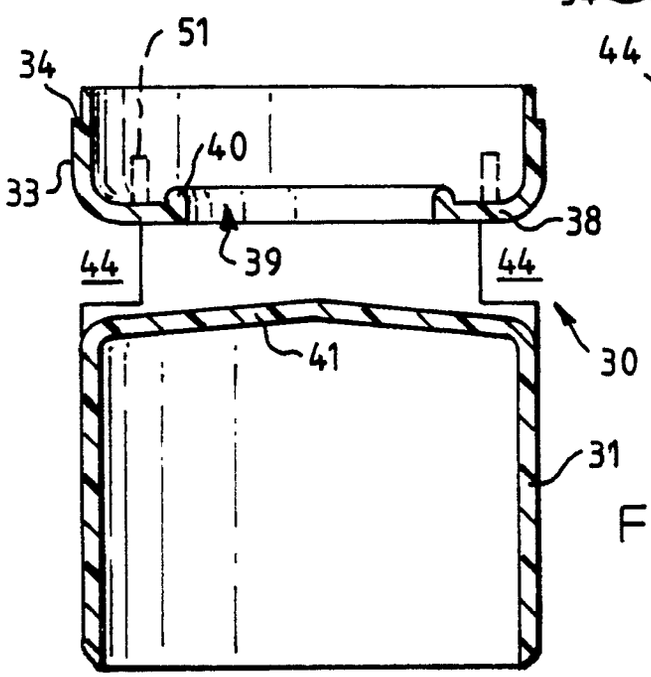

FIG.5

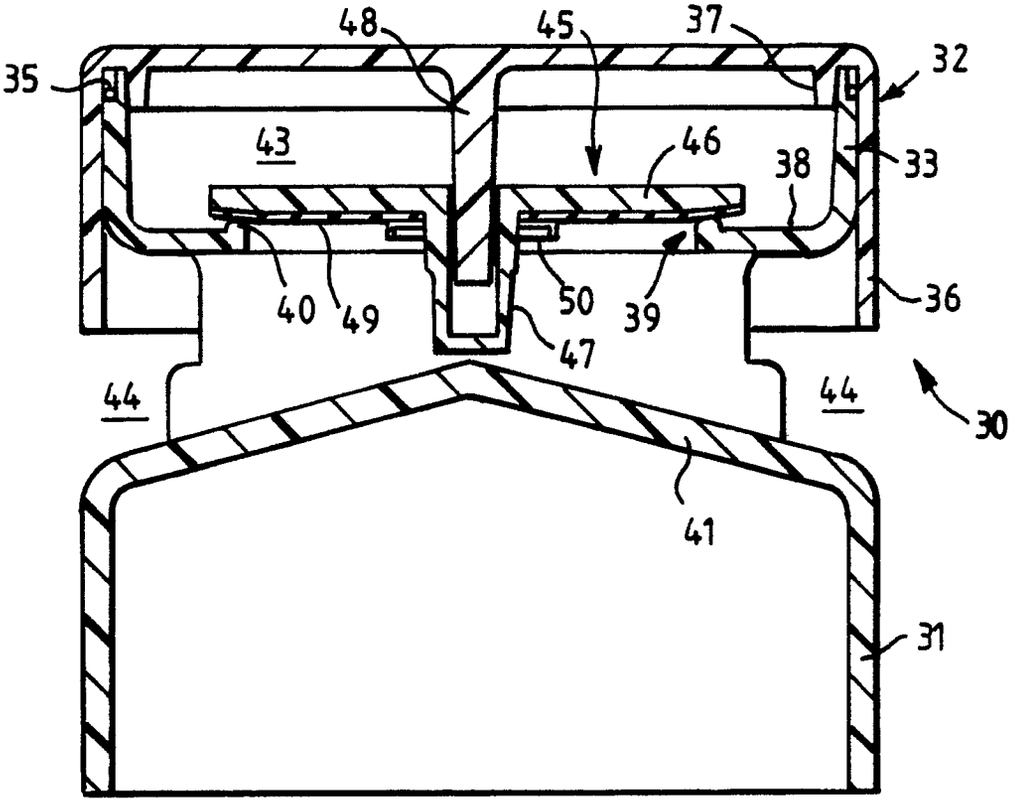
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FIG.6

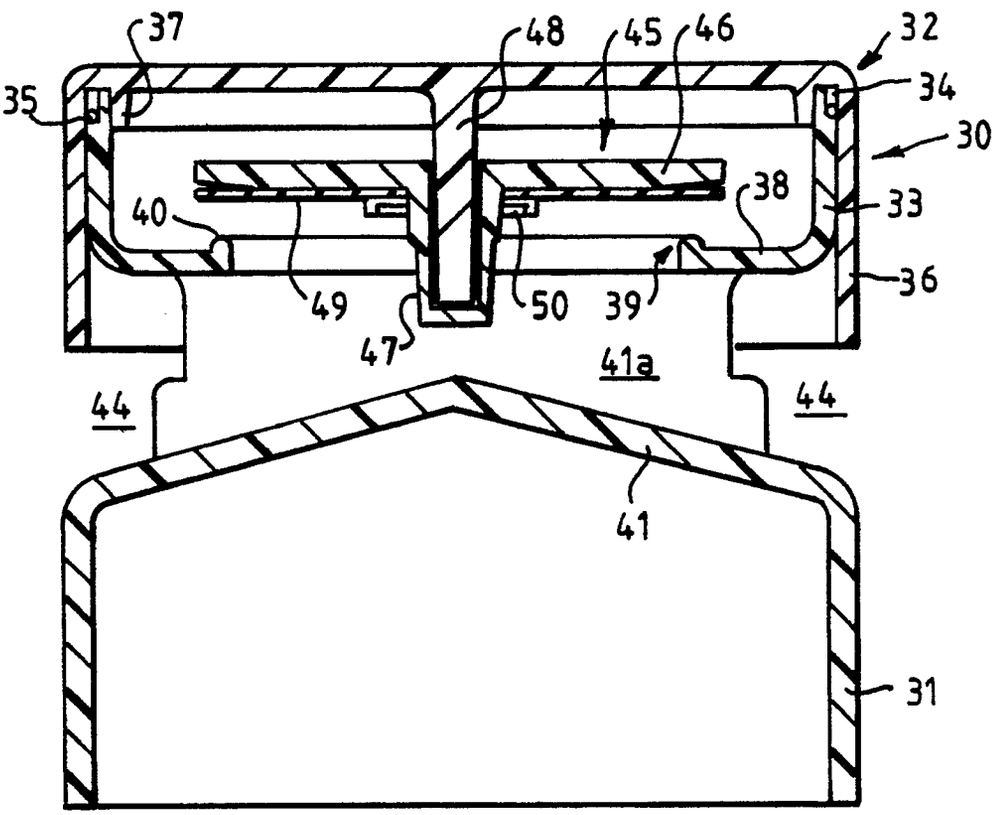
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FIG.7

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 90 30 7702

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.5)
X	EP-A-0 100 657 (KENTSUB) * Whole document *	1,3,4,7,8	E 03 C 1/122 F 16 K 24/06
A	GB-A-2 112 906 (McALPINE) * Whole document *	1,2,9	
A	EP-A-0 278 746 (EARL) * Whole document *	1,8	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

E 03 C
F 16 K

The present search report has been drawn up for all claims

Place of search	Date of completion of search	Examiner
The Hague	30 October 90	HANNAART J.P.

CATEGORY OF CITED DOCUMENTS

X: particularly relevant if taken alone
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