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(54) **A siphonic flushing device**

(57) A siphonic flushing device is provided, comprising a tube (110) extending from an open inlet end (112) to an open outlet end (114) via a bend (116), arranged above said inlet end (112) and said outlet end (114), as well as via a water trap (118) formed between said bend (116) and said outlet end (114), and wherein said outlet end (114) is arranged below said inlet end (112); and an air intake device (300) having an air outlet connected to said tube (110) for allowing air to enter said tube (110) for terminating an ongoing flush, wherein said air intake device (300) further comprises a first air inlet (304) arranged vertically below said air outlet, and a second air inlet (306) arranged vertically below said first air inlet (304), and wherein a first flush volume is provided if air is introduced through the first inlet (304), and a second flush volume is provided if air is introduced through the second inlet (306).

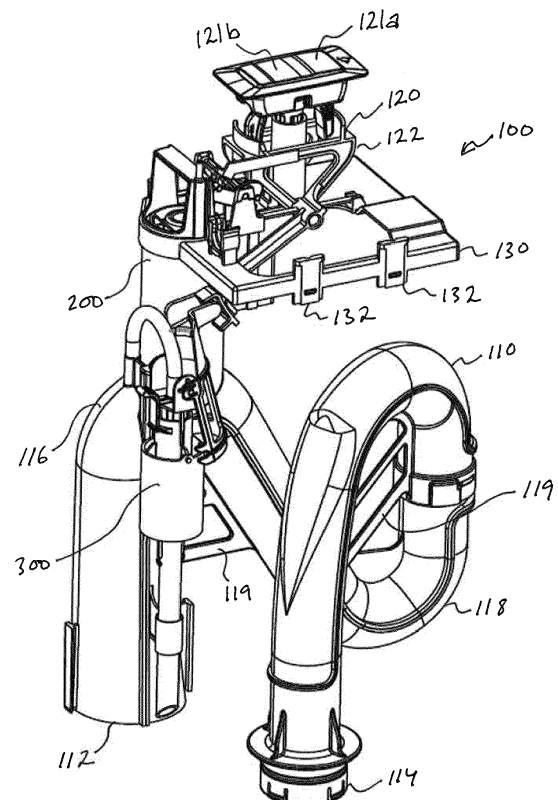


Fig. 1

Description

Technical Field

[0001] The present invention relates to a siphonic flushing device. More particularly, the present invention relates to a dual flush siphonic flushing device, as well as to a toilet including such flushing device.

Background

[0002] Siphonic flushing devices have been available on the market for many years. Operating on the general principle of a siphon, such flushing device generally consists of a tubular bend being submerged into water enclosed within a water cistern.

[0003] For a siphon action of a flushing device having only one upper bend, water inside the tube is normally mechanically forced upwards to start a flow of water through the bend. However, as significant force is necessary for actually moving the required quantity of water upwards double siphons have been suggested.

[0004] Double siphons include a tube being bent to form an M-shape. Hence, a water trap is formed between the inlet and the outlet such that air may be compressed between the inlet and the water trap.

[0005] Prior to flushing, i.e. in the phase of filling the cistern with water compressed air will be entrapped within the first bend, thus being arranged at the highest vertical position of the tube and preventing water from flowing through the bend.

[0006] Upon flushing the air is allowed to escape through a vent valve whereby the water inside the tube is allowed to flow over the bend and further into the WC bowl. As the outlet is arranged vertically below the inlet, i.e. the open tubular end arranged within the cistern, the siphon will draw water from the cistern until the water level of the cistern is below the inlet.

[0007] After flushing an inlet valve will open for refilling the cistern. As the water level of the cistern rises, water will also start to fill the tube of the flushing device. As the vent valve is now closed, air will be compressed within the bend. Filling of water is finished when a specific water level is reached, whereby a subsequent flushing sequence may again be initiated.

[0008] A siphonic flushing device provides a number of advantages compared to other flushing devices since there is no need for a moveable outlet valve. However, different solutions on the market still have some major drawbacks, especially when it comes to siphonic flushing devices having dual-flush capabilities, i.e. configurations allowing for small and large volume flushes.

[0009] For example, EP1640515 describes a double flush siphon flushing system. Similarly to the general description above, a vent valve allows compressed air to escape whereby the flushing sequence is performed. By providing two different push buttons corresponding to large or small flush volume, venting is controlled such

that different volumes of water are discharged. Hence, this system provides a dual flush functionality. However, a number of disadvantages are associated with this kind of solution. As an example, it does not allow the flush volumes to be easily changed. A cistern divider is provided for changing the large volume flush from 6 liters to 9 liters; however no adjustment between these values is possible. Hence, this particular solution may not fit different markets having different standards for flushing volumes.

[0010] It would therefore be advantageous to provide a more versatile flushing device which allows for easy adjustment of the flushing volume in order to fit various needs on the market.

Summary

[0011] The present invention seeks to mitigate or eliminate the above-identified deficiencies and solves at least the above mentioned problems by providing a siphonic flushing device with a dual flush functionality.

[0012] An idea of the present invention is to provide a siphonic flushing device having an air intake device in connection with the siphon tube such that air intake may be controlled for terminating the flushing sequence at a specific flushing volume.

[0013] According to a first aspect, a siphonic flushing device is provided. The flushing device comprises a tube extending from an open inlet end to an open outlet end via a bend, arranged above said inlet end and said outlet end, as well as via a water trap formed between said bend and said outlet end, and wherein said outlet end is arranged vertically below said inlet end; and a venting device connected to said bend for allowing air entrapped within said bend to escape; wherein said flushing device further comprises an air intake device having an air outlet connected to said tube for allowing air to enter said tube, wherein said air intake device further comprises a first air inlet arranged vertically below said air outlet.

[0014] According to another aspect, a siphonic dual flushing device is provided. The device comprises a tube extending from an open inlet end to an open outlet end via a bend, arranged above said inlet end and said outlet end, as well as via a water trap formed between said bend and said outlet end, and wherein said outlet end is arranged below said inlet end; and an air intake device having an air outlet connected to said tube for allowing air to enter said tube for terminating an ongoing flush, wherein said air intake device further comprises a first air inlet arranged vertically below said air outlet, and a second air inlet arranged vertically below said first air inlet, and wherein a first flush volume is provided if air is introduced through the first inlet, and a second flush volume is provided if air is introduced through the second inlet.

[0015] The air outlet of said air intake device may preferably be connected to said bend. Inside the tube, a sub-pressure will be present during flushing due to the flow

of water. Since air is introduced in the air inlet as the water level within the cistern lowers, flushing will always be terminated as air will be drawn into the bend due to the sub-pressure.

[0016] The first air inlet of said air intake device may comprise a float valve being moveable in a vertical direction, which is advantageous in that the air inlet will open as soon as the water level inside the cistern lowers to a predetermined level, set by the float valve.

[0017] The air intake device may comprise a second air inlet arranged below said first air inlet. Hence, the volume of a large flush may be controlled such that a large volume flush not necessarily must correspond to the water level inside the cistern being lowered below the tube inlet end. Further, by terminating a large volume flush by introducing air into the bend via the second air inlet, undesired sound, such as bubbling noise is reduced. This is due to the fact that the second air inlet, having a diameter substantially less than the diameter of the tube inlet, will provide smaller air bubbles entering the tube at a higher level.

[0018] The second air inlet may comprise an open conduit end having an oblique cut. This further decreases unwanted noise associated with introducing air into the tube.

[0019] The vertical position of said air intake device may be adjustable relative the tube, which is advantageous in that the volumes corresponding to large and small flushes may be easily adjusted.

[0020] A first flushing volume may thus be achieved when the first air inlet is opened, and a second flushing volume being larger than the first flushing volume may thus be achieved when the first air inlet is locked in a closed position such that air is introduced via the second air inlet.

[0021] The venting device may be connected to flush initiating means such that said venting device opens when a user operates said flush initiating means. Hence, immediate flushing is provided as soon as the user requests such action.

[0022] The flush initiating means may preferably comprise two different push buttons, or rocker buttons or lift buttons, mechanically connected to said venting device.

[0023] The flush initiating means may be mechanically connected to said air intake device, which is advantageous in that the choice of push button may control activation of the first air inlet.

[0024] The first air inlet of the second venting device may be locked in a closed position when a user initiates a flushing sequence of a first volume, such that flushing is terminated when the water level outside the tube is below the vertical lever of the second air inlet of the air intake device.

[0025] Further, the first air inlet of the second venting device may be released from said closed position when a user initiates a flushing sequence of a second volume being smaller than said first volume, such that flushing is terminated when the water level outside the tube is

below the vertical lever of the first air inlet of the air intake device.

[0026] According to a second aspect, a water cistern is provided enclosing a siphonic flushing device according to the first aspect.

[0027] According to a third aspect a WC suite is provided comprising a water cistern according to the second aspect.

10 Brief Description of Drawings

[0028] These and other aspects, features and advantages of which the invention is capable of will be apparent and elucidated from the following description of embodiments of the present invention, reference being made to the accompanying drawings, in which

Fig. 1 is an isometric view of a siphonic flushing device according to an embodiment;

Fig. 2a is side view of the flushing device shown in Fig. 1 in an idle mode;

Fig. 2b is a cross-sectional view of a venting device in a closed position;

Fig. 2c is a cross-sectional view of the venting device in an open position;

Fig. 3a is a cross-sectional view of a flushing device prior to initiating a flush sequence;

Fig. 3b is a view of the flushing device of Fig. 3a upon initiating a large volume flush sequence;

Fig. 3c is a side view of an air intake device of the flushing device;

Fig. 4 is a side view of the flushing device of Fig. 3a upon initiating a small volume flush sequence; and

Fig. 5a-b are side views of the flushing device of Fig. 4 after a small volume flushing water is discharged.

Detailed Description

[0029] In the following, embodiments of a siphonic flushing device 100 will be described. Starting with Fig. 1 the flushing device 100 generally includes a hollow tube 110, a venting device 200, as well as an air intake device 300. Additional components preferred for a proper functionality includes a flush initiating means 120 and a support structure 130 for fixation of the flush initiating means 120 and possibly also an inlet valve.

[0030] The entire flushing device 100 is intended to be arranged inside a water cistern, such that water enclosed in the cistern may be flushed into an associated toilet bowl by means of the flushing device 100.

[0031] The hollow tube 110 forms a water conduit extending from an open inlet 112 to an open outlet 114. The tube 110 extends vertically upwards from the inlet 112 to a bend 116 from which the tube 110 extends downwards to a second bend forming a water trap 118. Hence, the tube 110 has an M-shape. However, in order to reduce the lateral extension the tube 110 is preferably twisted around the vertical axis as is shown in Fig. 1.

[0032] Preferably, the tube 110 is manufactured as two or more parts which may be easily connected by a snap-lock, threads, or similar. Further, ribs 119 may be provided for increasing the stability of the tube 110 and arranged to connect different portions of the outer surface of the tube 110. However the tube 110 may also be manufactured by welding two or more parts together or it may be formed as one part by means of blow molding technology.

[0033] As the siphonic tube 110 is configured to draw flushing water from the inlet 112 to the outlet 114, the outlet 114 is connected to an inlet port of a WC bowl (not shown). The outlet 114 is arranged vertically below the inlet 112.

[0034] The flushing device 100 is configured to be arranged within a water cistern (not shown), e.g. a separate cistern, on a WC suite, or enclosed within the back rest of a WC bowl or enclosed within a wall supporting a wall hung WC. For securely fastening the flushing device in the cistern the support structure 130 has portions 132 for engagement with corresponding fastening portions of the cistern. The flushing device 100 is aligned within the cistern such that the outlet 114 of the tube connects with inlet port to the WC bowl. In such position, the inlet 112 of the tube 110 is arranged at a certain vertical distance from the bottom of the cistern such that water present in the cistern may flow through the inlet 112.

[0035] Before turning into details of the flush initiating means 120, the venting device 200, and the air intake device 300, some details of the general functionality will be given.

[0036] Before a flush, water is enclosed within the cistern up to a predefined level. As the inlet 112 of the tube 110 is always open water will also have entered the tube 110 up to the same level. The predefined water level, corresponding to a full cistern, is arranged above the bend 116. Hence, a small volume of water may flow into the water trap 118 until the pressure of the compressed air is preventing water to flow over the bend 116. The water trap 118 also accommodates water from a prior flush, such that air is entrapped between the bend 116 and the water trap 118. Since the water within the tube 110 (i.e. water coming from the inlet 112) has forced the air within the tube 110 to move towards the bend and the water trap 118, this air is compressed.

[0037] A venting device 200 is configured to release the air entrapped within the bend 116 such that the pressure is reduced, whereby cistern water will start to flow into the tube 110 and over the bend 116, into the water trap 118, and subsequently out through the outlet 114.

[0038] Flushing is aborted when the water level in the cistern is below the inlet 112 of the tube 110, or when air is again introduced into the tube 110. Upon this, an inlet valve will open whereby the cistern is again filled with water returning the flushing system to a state where it is ready to begin flushing.

[0039] Now turning to particular embodiments of a siphonic flushing device, a venting device 200 is preferably

mechanically linked to the flush initiating means 120. The flush initiating means 120 may e.g. include two push buttons 121a, 121b, which when pressed down provides a small volume flush or a large volume flush, respectively. It should however be appreciated that the push buttons may be replaced by rocker buttons or lift buttons, providing the same functionality of activating flushing sequences of different water volumes.

[0040] When one of the buttons 121a, 121b is pressed down a tilting of a lever construction 122 will cause a release action on the venting device 200 such that it opens, thus allowing air compressed within the bend 116 to escape. Releasing the air will thus create a sub-pressure within the tube 110 which will draw water from the inlet 112, over the bend 116, and out through the outlet 114. That is, releasing air will start flushing.

[0041] Correspondingly, when the buttons are resting in their idle position (i.e. not being pressed down) the lever construction 122 locks the venting device 200 in a closed position thus preventing it from open and from releasing entrapped air.

[0042] The push buttons 121a, 121b are preferably accessible from the outside of the water cistern such that they are readily available for a user.

[0043] Turning now to Figs. 2a-c, side views and cross sectional views of the venting device 200 are shown. As can be seen in Fig. 2a the venting device is arranged at the bend 116 and includes a fluid connection 202 at the highest position of the tube 110. The fluid connection 202 extends upwards as a hollow conduit 204 which is surrounded by a hollow housing 206 being sealed against the outer surface of the tube 110. The hollow housing 206 forms an annular volume 207 delimited by the hollow conduit 204. During cistern filling, this annular volume 207 is at least partly filled with water.

[0044] The hollow conduit 204 has an open upper end 208 which may be sealed against a piston 210 being moveable and engagable by a respective motion of the lever construction 122. The piston, having a cylindrical shape with a closed upper end, extends into the water of the annular volume 207 thus forming a water trap preventing air inside the tube 110 to escape.

[0045] That is, when a user uses the flush initiating means 120 for starting a flush the piston 210 will move in a vertically linear manner as will be further described below.

[0046] Turning now to Fig. 2b, a zoomed-in view of the venting device 200 is shown. In this position, there is no movement of the push buttons 121a, 121b such that the venting device 200 is closed. As is clearly seen, the piston 210 is thus pressed down such that the sidewall of the piston 210 extends into the water of the annular volume 207. Air inside the bend 116 may thus not escape, whereby flushing is prevented. However, as soon as a user presses any one of the push buttons 121a, 121b, the lever construction 122 will unlock the piston 210 whereby the compressed air will be able to force the piston 210 upwards to allow escape. This is shown in Fig. 2c, where

the piston 210 is raised by the air pressure inside the bend 116 such that the sidewall of the piston 210 no longer extends into the water of the annular volume 207. The lever construction 122 is preferably spring biased towards its idle position such that the piston 210 will automatically return to the position where the piston 210 is submerged into the water of the annular volume 207 and blocked from moving upwards. Hence, the piston 210 forms an open-ended cylinder.

[0047] In accordance with the description so far the venting device 200 provides a mechanical connection between the flush initiating means 120 and the tube 110, such that upon initiating a flush, the venting device 200 unlocks the piston 210 whereby the compressed air inside the bend 116 is allowed to escape, thereby starting the flushing. The venting device 200 operates in the same manner independently of a large or small flush.

[0048] Now turning to Figs. 3a-c, details of the air intake device 300 will be discussed. The air intake device 300 is arranged outside the tube 110 and has an air outlet connected to the tube 110 at the bend 116 at a position close to the venting device connection 202 (shown in Fig. 2a). The air intake device 300 is connected to the tube 110 via a flexible hose 302 (see e.g. Fig. 5b) such that the vertical position of the air intake device 300 relative to the tube 110 may be easily adjusted. Further, some sort of fastener, such as a guiding rod, may be provided along the outer surface of the tube 110 to which the air intake device 300 may be attached at different vertical positions. The air intake device 300 includes two separate air inlets 304, 306 arranged at different vertical positions. The air inlets 304, 306 are provided such that the first inlet 304 will be opened when a small volume flush is initiated, whereby the second air inlet 306 is operational when a large volume flush is initiated.

[0049] In Fig. 3a, the air intake device 300 is shown where a large volume flush is activated. When the corresponding push button 121a is pressed down a mechanical link 310 connected to the lever construction 122 will cause a mechanical locking action on the air intake device, as shown in Fig. 3c. Hence, a float valve 320 (also shown in Fig. 3c) associated with the first air inlet 304 will be locked in its position thus keeping the first air inlet 304 closed. The locking action may preferably be provided by a protrusion on the air intake device 300 being engagable with a recess of the mechanical link 310 such that when the mechanical link 310 is in a first position, the recess prevents the float 320 of the air intake device 300 from moving downwards. Correspondingly, when the mechanical link 310 moves corresponding to a small volume flush, the recess will no longer engage the protrusion of the air intake device such that the float 320 of the air intake device 300 is free to move downwards. As the flushing proceeds the water level inside the cistern will lower until it goes below the vertical position of the second air inlet 306. Hence, air will be allowed to flow into the bend 116 whereby flushing is terminated.

[0050] From above it is clear that the air intake device

300 operates by allowing or preventing a float 320 from moving with the water level inside the cistern. When a large volume flush is initiated the float 320 is locked in an upright position whereby the upper air inlet 304 is closed. Even when the water level inside the cistern lowers during flushing, the float 320 will remain in its upper position thus keeping the air inlet 304 closed. On the other hand, when a small volume flush is initiated the float will no longer be locked due to a different movement of the mechanical link 310 (please note that the venting device 200 is always actuated independently of large or small volume flush initiation). When the water level lowers the float 320 will move correspondingly, thus exposing the air inlet 304 when the water level is below the vertical position of the air inlet 304.

[0051] Now turning to Fig. 4, the flushing device 100 is shown wherein a small volume flush is initiated. When a user presses the corresponding push button 121b, the mechanical link 310 will release the float valve 320 of the air intake device 300 at the same time as the venting device 200 is maneuvered, i.e. when the flush starts. Hence, when the water level of the cistern drops, the float valve 320 will also move downwards. Turning to Figs. 5a and 5b, the movement of the float valve 320 will open the first air inlet 304 such that air will be allowed to enter the bend 116 for terminating the flushing sequence.

[0052] As is readily understood, during flushing there will be no or very little air inside the tube 110 since the air has escaped during initiating the flush. However, once air is allowed to enter the tube 110 at the position of the bend 116, flushing will be terminated since the suction force will draw air instead of water into the bend 116. Large and small volume flush is thus controlled by setting the water level at which the air intake device 300 introduces air into the tube 110, i.e. the water level of the cistern in which the tube 110 is arranged.

[0053] The float valve 320 may include a floating body 322 being slidable on a vertical venting tube 324. The floating body 322, which is released upon initiating a small volume flush, will move downwards along with the water level during flushing due to gravity. As the floating body 322 lowers, it will eventually allow air to enter the vertical venting tube 324 (see Fig. 5b). For this, a valve seat 326 is provided on the upper part of the vertical venting tube 324 adjacent to and connected to the flexible hose 302. The valve seat 326 has tapered surfaces 328 engagable with corresponding tapered surfaces 330 on the inner side of the floating body 322. A small slit, preferably annular, is provided between the vertical venting tube 324 and the valve seat 326 for allowing air flow into the valve seat 326, as indicated by the arrow in Fig. 5b. Hence, flushing will be terminated as air is allowed to enter the vertical venting tube 324 and escapes upwards into the bend 116 via the valve seat 326 and the flexible hose 302. When the water level in the cistern is raised upon filling, the floating body 322 will move upwards and again seal the holes in the vertical tube 324.

[0054] The second air inlet 306 may preferably be pro-

vided with an oblique cut, which has been proven to reduce undesired sound when air is introduced for terminating the flushing sequence. As previously described, reduced diameter of the air intake pipe will reduce the size of air bubbles thus reducing the generated sound. The second air inlet 306 is operational only when the float 320 is locked, i.e. when initiating a large volume flush.

[0055] The air intake device 300 thus provides a highly advantageous construction for allowing two different volumes of flushing. The floating body 322 is locked or unlocked depending on the last flush initiating being either one of the buttons 121a, 121b. A new flush initiation will directly cause a corresponding action on the floating body, i.e. causing it to be locked or unlocked.

[0056] The present invention has been described above with reference to specific embodiments. However, other embodiments are equally possible within the scope of the invention. The invention is thus only limited by the appended claims.

[0057] It is also to be understood that the present invention may be used for WC bowls suspended from a wall structure as well as WC bowls securely attached to the floor; or separate flushing cisterns arranged inside or outside a wall. Vertical flushing buttons providing mechanical activation of the flushing will only requiring minor modifications for connecting the manual flush buttons with the venting device and the air intake device. Further, all references to "upper", "lower", "above", "below", "upwards", "downwards", or similar should be interpreted as a position during normal use, i.e. when the flushing device is mounted in a water cistern.

Claims

1. A siphonic dual flushing device, comprising a tube (110) extending from an open inlet end (112) to an open outlet end (114) via a bend (116), arranged above said inlet end (112) and said outlet end (114), as well as via a water trap (118) formed between said bend (116) and said outlet end (114), and wherein said outlet end (114) is arranged below said inlet end (112); and an air intake device (300) having an air outlet connected to said tube (110) for allowing air to enter said tube (110) for terminating an ongoing flush, wherein said air intake device (300) further comprises a first air inlet (304) arranged vertically below said air outlet, and a second air inlet (306) arranged vertically below said first air inlet (304), and wherein a first flush volume is provided if air is introduced through the first inlet (304), and a second flush volume is provided if air is introduced through the second inlet (306).
2. The siphonic flushing device according to claim 1, wherein the air outlet of said air intake device (300) is connected to said bend (116).

3. The siphonic flushing device according to claim 1 or 2, wherein said first air inlet (304) of said air intake device (300) comprises a float valve being moveable in a vertical direction.
4. The siphonic flushing device according to any one of the preceding claims, further comprising a venting device (200) connected to said bend (116) for allowing air entrapped within said bend (116) to escape for initiating a flush.
5. The siphonic flushing device according to any one of the preceding claims, wherein said second air inlet (306) comprises an open conduit end having an oblique cut.
6. The siphonic flushing device according to any one of the preceding claims, wherein the tube (110) comprises a support to which the air intake device (300) is connected such that the vertical position of said air intake device (300) is adjustable relative the tube (110).
7. The siphonic flushing device according to any one of the preceding claims, wherein a first flushing volume is achieved when the first air inlet (304) is opened thus allowing air to flow into the tube (110), and a second flushing volume being larger than the first flushing volume is achieved when the first air inlet (304) is locked in a closed position such that air is introduced via the second air inlet (306) thus allowing air to flow into the tube (110).
8. The siphonic flushing device according to any one of the preceding claims, wherein said venting device (200) is connected to flush initiating means (120) such that a piston (210) of said venting device (200) is unlocked and allowed to open when a user operates said flush initiating means (120).
9. The siphonic flushing device according to claim 8, wherein said flush initiating means (120) comprises two different push buttons (121a, 121b) mechanically connected to the piston (210) of said venting device (200).
10. The siphonic flushing device according to claim 8 or 9, wherein said flush initiating means (120) is mechanically connected to said air intake device (300).
11. The siphonic flushing device according to claim 4, wherein said first air inlet (304) of the air intake device (300) is configured to be locked in a closed position when a user initiates a flushing sequence of a first volume, such that flushing is terminated when the water level outside the tube (110) is below the vertical level of the second air inlet (306) of the air intake device (300) whereby air is allowed to flow into the

tube (110).

12. The siphonic flushing device according to claim 11, wherein said first air inlet (304) of the air intake device (300) is configured to be released from said closed position when a user initiates a flushing sequence of a second volume being smaller than said first volume, such that flushing is terminated when the water level outside the tube (110) is below the vertical level of the first air inlet (304) of the air intake device (300) whereby air is allowed to flow into the tube (110).
13. A water cistern, enclosing a siphonic flushing device according to any one the preceding claims.
14. A WC suite, comprising a water cistern according to claim 13.

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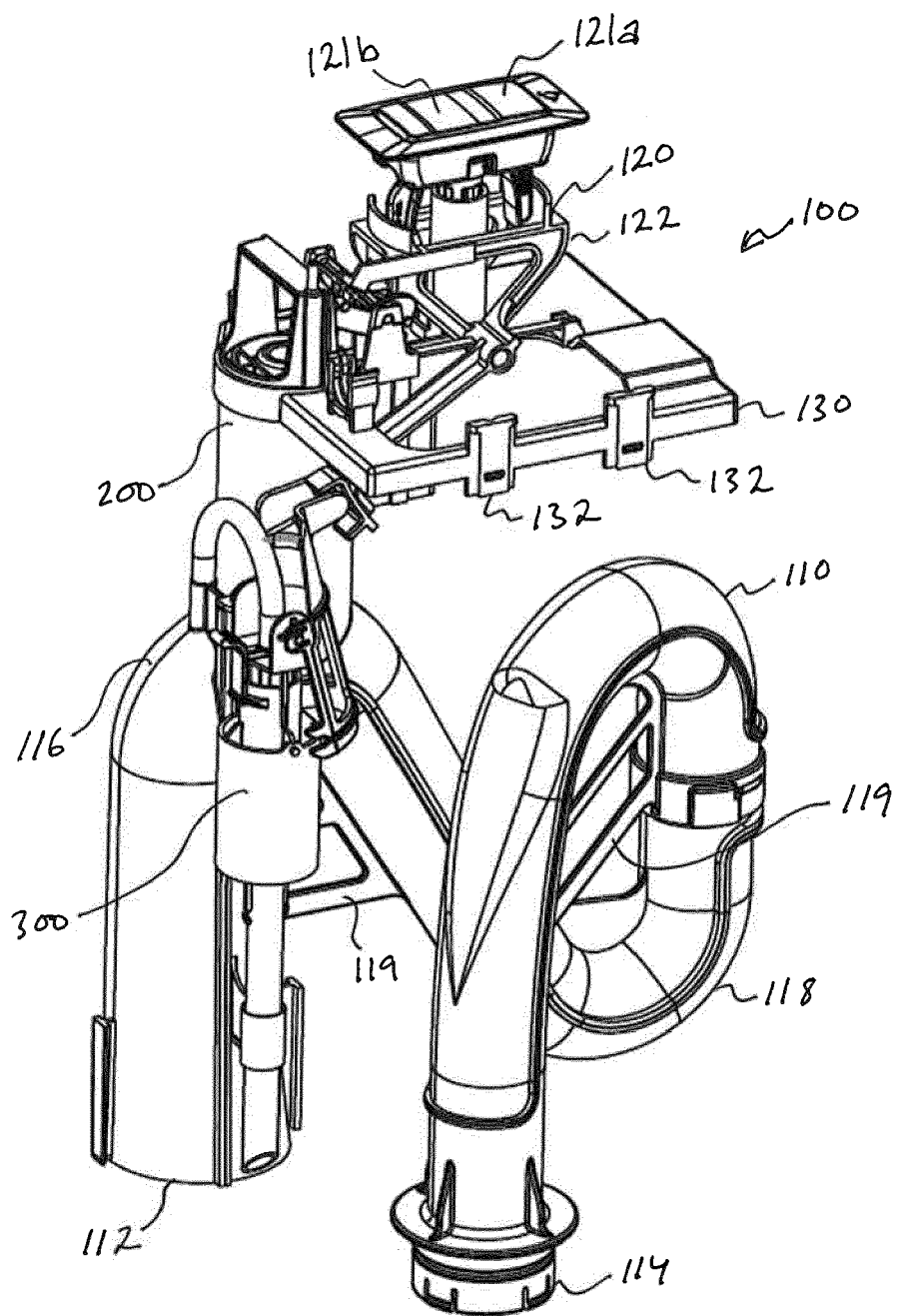


Fig. 1

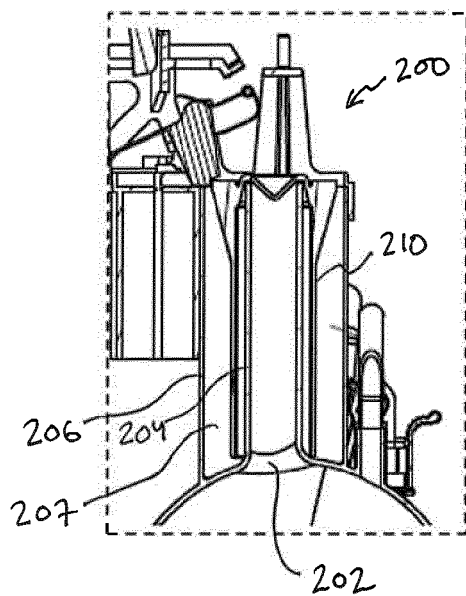


Fig. 2b

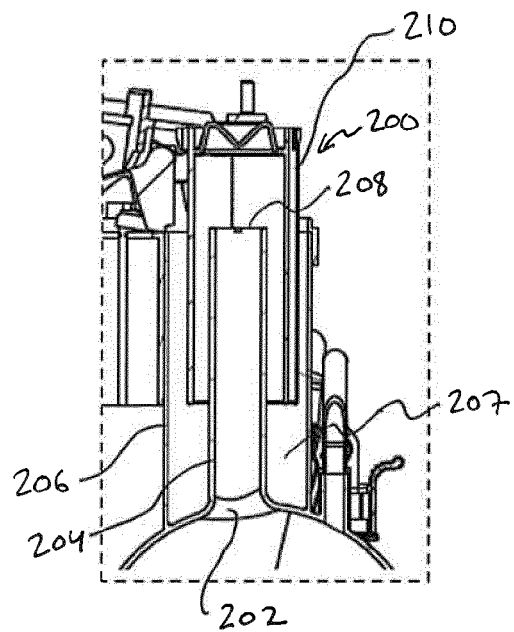


Fig. 2c

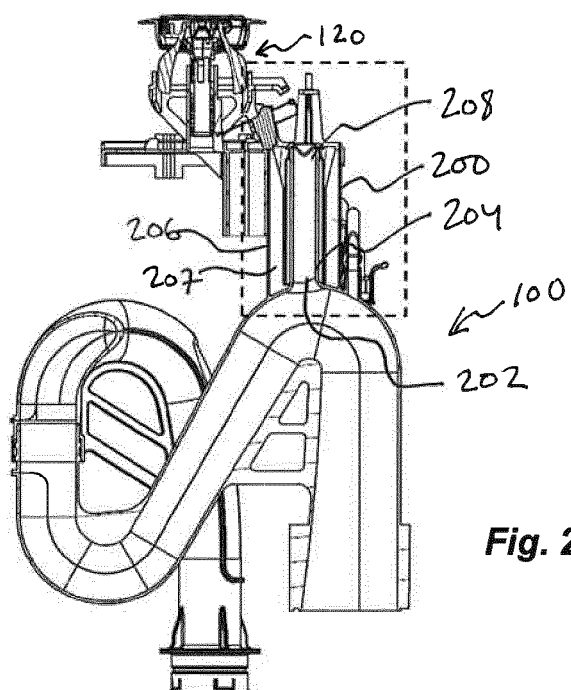
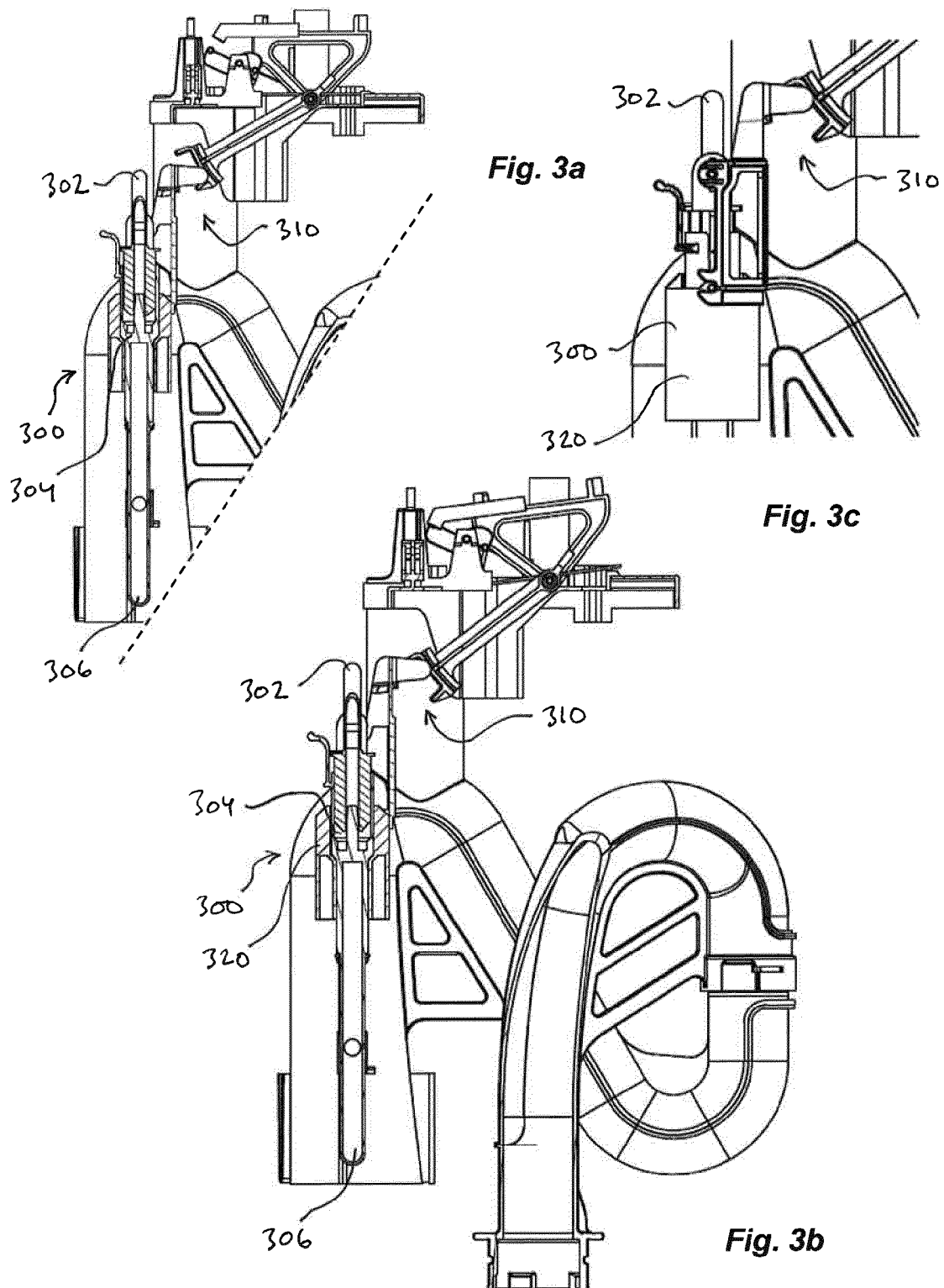


Fig. 2a



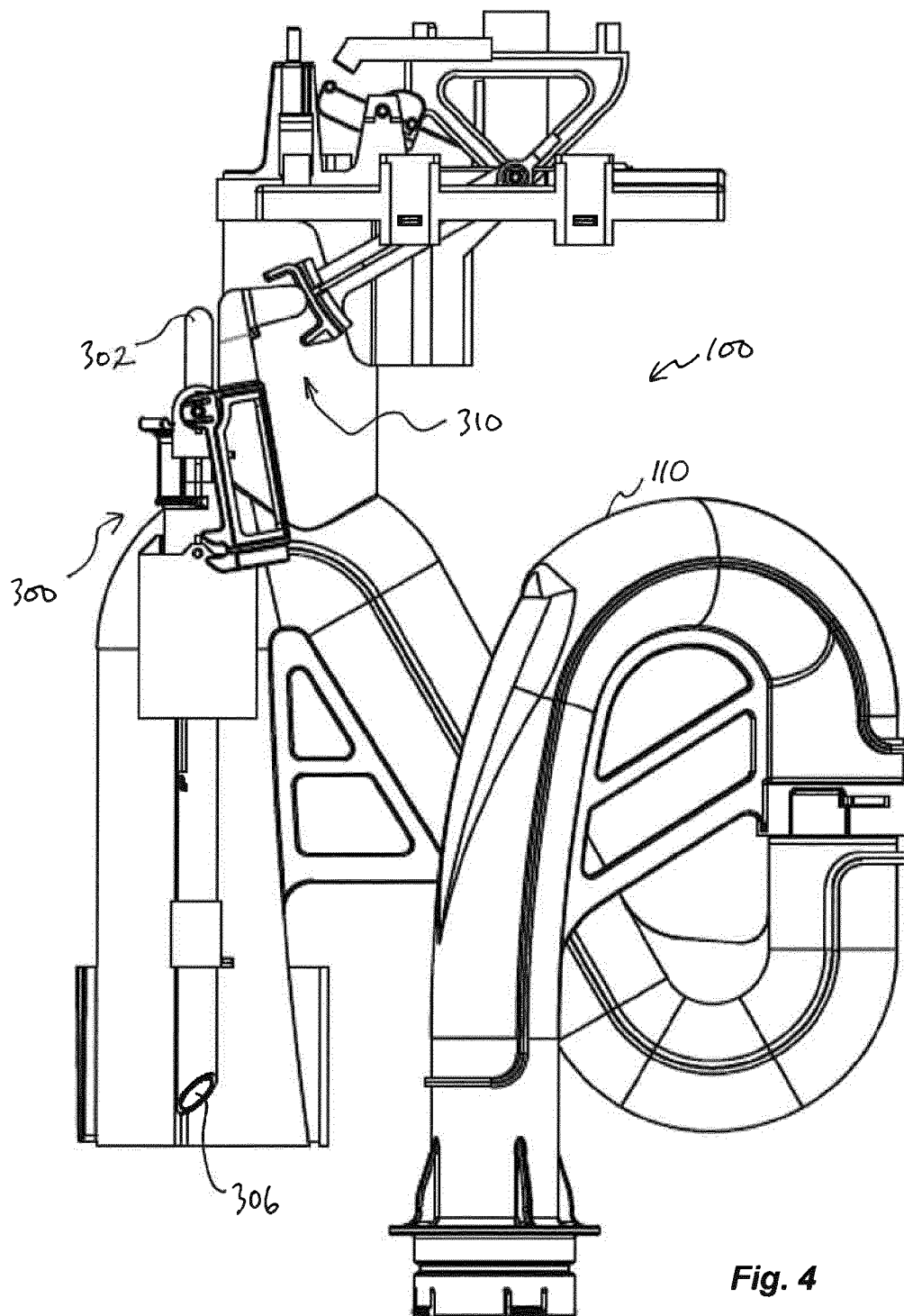
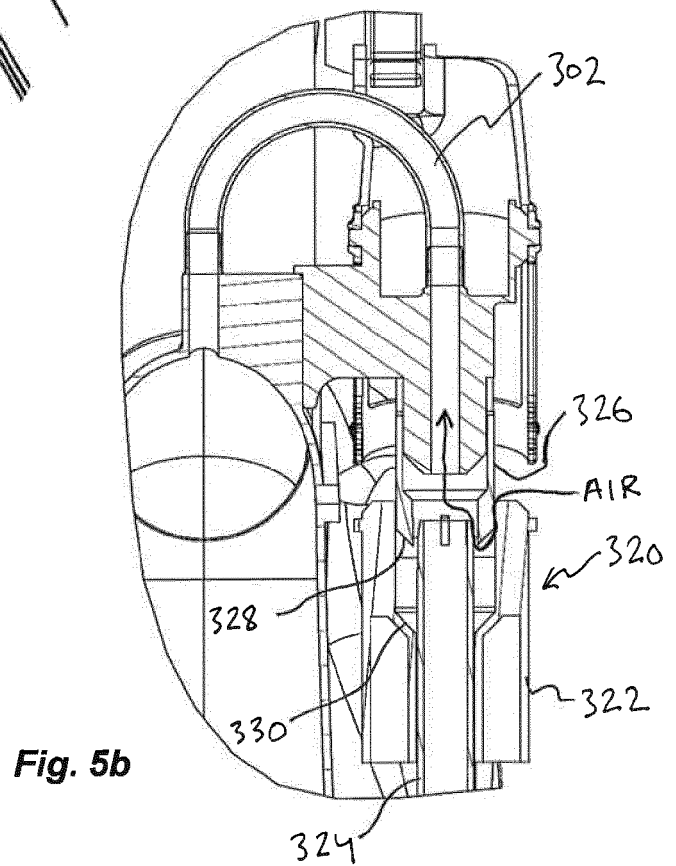
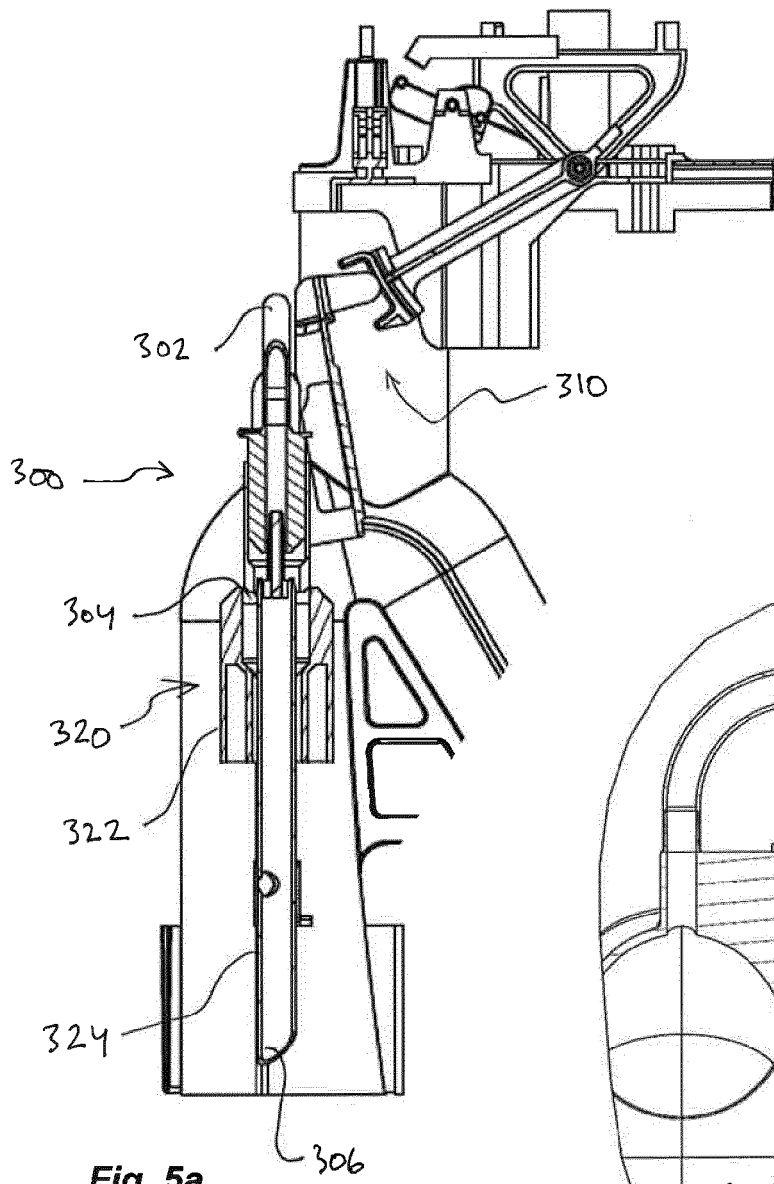


Fig. 4





EUROPEAN SEARCH REPORT

 Application Number
 EP 14 15 4130

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	GB 2 276 640 A (SOMERFIELD ALAN DAVID [GB]; BRITISH TECH GROUP [GB]) 5 October 1994 (1994-10-05) * abstract * * page 2, line 21 - line 30; figure 1 * * page 3, line 1 - line 28 *	1,2,13,14	INV. E03D1/12 E03D1/14
X	EP 0 794 292 A1 (HAMMARSTEDT GOESTA LEOPOLD [SE]) 10 September 1997 (1997-09-10) * abstract * * column 9, line 45 - line 51 *	1,2,13,14	
A	AU 437 147 B2 (AQUAIR CORPORATION LTD.) 22 June 1973 (1973-06-22) * figure 2 *	1,13,14	
A	GB 618 980 A (ERIC BAYLY) 2 March 1949 (1949-03-02) * page 1, line 66 - page 2, line 32; figure 1 *	1,13,14	
A	US 1 604 759 A (RICHARDS HAROLD B) 26 October 1926 (1926-10-26) * the whole document *	1,13,14	E03D
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 5 June 2014	Examiner Flygare, Esa
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 03.82 (P04C01)

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

EP 14 15 4130

5

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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05-06-2014

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20

25

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35

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45

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55

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 2276640 A	05-10-1994	GB 2276640 A	05-10-1994
		WO 9423141 A1	13-10-1994
EP 0794292 A1	10-09-1997	AT 163709 T	15-03-1998
		AT 247198 T	15-08-2003
		AU 7089894 A	17-01-1995
		DE 69408860 D1	09-04-1998
		DE 69408860 T2	24-09-1998
		DE 69433039 D1	18-09-2003
		DE 69433039 T2	15-04-2004
		DK 0725866 T3	11-05-1998
		DK 0794292 T3	20-10-2003
		EP 0725866 A1	14-08-1996
		EP 0794292 A1	10-09-1997
		ES 2113112 T3	16-04-1998
		ES 2200097 T3	01-03-2004
		FI 955824 A	12-12-1995
		FI 990178 A	01-02-1999
		NO 955162 A	19-12-1995
		SE 9302173 A	23-12-1994
		SG 49589 A1	15-06-1998
		WO 9500719 A1	05-01-1995
AU 437147 B2	22-06-1973	AU 437147 B2	22-06-1973
		AU 3507968 A	25-09-1969
GB 618980 A	02-03-1949	NONE	
US 1604759 A	26-10-1926	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 1640515 A [0009]