

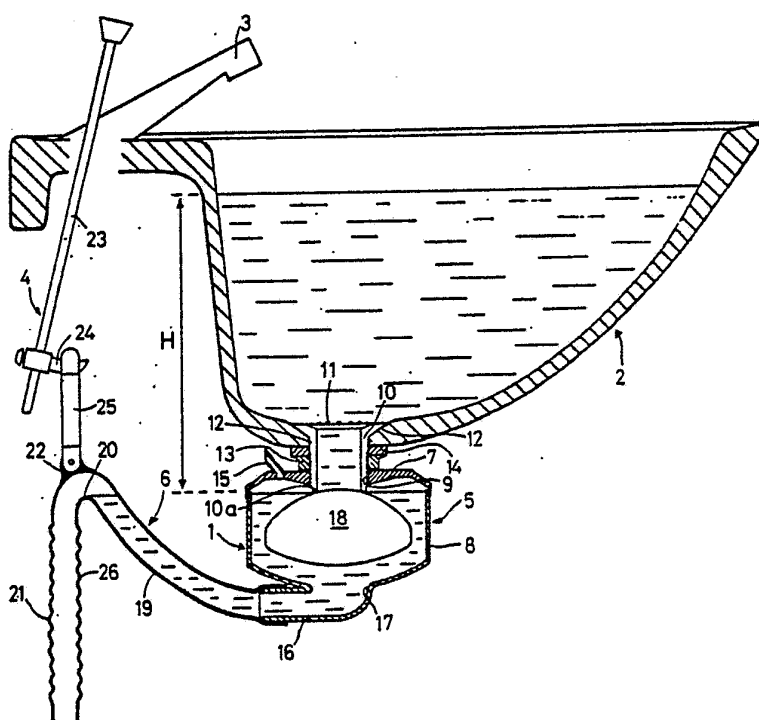


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(54) Title: LEVEL REGULATING BOTTOM VALVE DEVICE FOR LIQUID RECEPTACLES**(57) Abstract**

A level-regulating bottom valve device with a water trap function for liquid receptacle outlets comprises a float housing (5) with a float (18), an upper opening (9) connected or connectable to the receptacle outlet (10) and a lower opening (16, 17) connected to an outlet conduit member (6) for connection to a wastewater system, the float (18) being adapted for actuation to sealing engagement against said upper opening or said receptacle outlet (10), thereby to close it off when the buoyancy of the float (18) in the float housing (5) is greater than the head (H) of water over the float in the receptacle (2), but is released from the opening or receptacle outlet when said head (H) exceeds the buoyancy of the float (18), said conduit (6) having in its flow path a portion (20) of regulatable level which can be brought to a greater level than the bottom opening of the float housing (5), whereby the level of liquid in the float housing (5) can be regulated so that opening the receptacle outlet (10) is provided by lowering said regulatable-level portion (20) until the liquid level in the float housing (5) has a level such that the float (18) does not seal, and that closure is provided by raising the level-regulatable portion (20) to a liquid level in the float housing (5) such that the float (18) seals the upper opening or the receptacle outlet (10), said increase in height being adjustable to give desired maximum liquid level in the receptacle (2).



that closure is provided by raising the level-regulatable portion (20) to a liquid level in the float housing (5) such that the float (18) seals the upper opening or the receptacle outlet (10), said increase in height being adjustable to give desired maximum liquid level in the receptacle (2).

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Level regulating bottom valve device for liquid receptacles.

The present invention relates to a level-regulating and anti-overflow bottom valve device with a water trap function, preferably for tap water installations such as sanitary components, e.g. wash-basins, baths, sinks etc.

5 To prevent water in a wash-basin from running over the edge, the basin is normally (and usually according to regulations) provided with an overflow. Apart from such an overflow making manufacture of the basin considerably more expensive as well as being deficiently reliable in many cases, it is to a certain extent a sanitary nuisance also, since it is difficult to keep clean and can
10 sometimes cause unpleasant odours, further to which it may be said to be unpleasing to the eye.

An attempt to replace the overflow with an anti-overflow device at the outlet is described in DE-OS 2 036 586, for example. This proposed device, also forming a water trap at the same time, and thereby replacing the conventional
15 water trap, consists of a closed container with three partially communicating parallel chambers, of which the first is connected to the outlet of the basin and the third is intended for connection to the waste-water system. The third chamber is separated from the second chamber by a wall which leaves upward and downward spaces. A plunger means is sealingly accommodated in the third
20 chamber and is vertically displaceable so that it can be set for breaking communication between the outlet opening and said spaces at the upper and lower portions of the separating wall. In height, said separating wall extends up to a relatively high level in the basin, and when communication between the second chamber and the waste is closed with the aid of the plunger means, the
25 water in the second chamber is compelled to rise to the edge of the separating wall for it to flow out through the outlet in the third chamber. In its simplest embodiment the wash-basin forms a U-shaped tube together with the first and second chambers, the remote leg forming a fixed overflow guard by the water in the basin never being able to exceed the height of the separating wall between
30 the second and third chambers, since the water then flows over it and out through the outlet in the third chamber. Easily removable plugs close the openings at the bottom of the device for enabling it to be easily cleaned on the inside.

In a preferred modification, a float is arranged in the first chamber. By
35 using a float it is intended to reduce the height of the separating wall between the second and third chambers, and thereby the necessary extension in height of this part of the device. The buoyancy of the submersed volume of the float in the water, in conjunction with a supplementary pressure from the water in the

second chamber will then seal the basin outlet. The float will seal as long as its buoyancy is equal to, or greater than, the head of water acting on its upper side through the basin outlet. If the head of water acting on the float becomes greater than its buoyancy, it is pressed downwards so that water is tapped off
5 through the outlet until a balance is restored between head of water and buoyancy, allowing the float to seal.

In the preferred embodiment it appears that the second chamber still needs considerable extension in height to ensure the function. The described construction will be rather voluminous and complicated, due to the division into
10 three chambers and the use of a plunger means for regulating the outlet from the third chamber to waste. Because of the absolute sealing of the plunger and the means for controlling the movements of the float, such a construction would in practice appear to be sensitive to the different kinds of foreign matter normally found in wastewater. The preferred embodiment can similarly result in a water
15 trap, which has a tendency to hinder flow due to its implementation, and thereby a tendency to cause functional disturbances. The described device, which relates to a bottom valve and water trap in conjunction with overflow protection at a given level, would thus not appear to afford any advantages compared to previously known constructions of conventional water traps and overflows.

20 The present invention relates to a bottom valve device, based on a principle closely associated with the one in the described device. Apart from its lacking the above-mentioned disadvantages, it permits the further function and also affords decisive advantages with regard to function and form in relation to known constructions. This bottom valve device has the distinguishing features
25 disclosed in the accompanying claims and is described in detail below.

The level-regulating bottom valve device in accordance with the invention distinguishes itself in relation to the known device described above in at least three essential aspects, namely that the device only has a single chamber provided with a float for sealing the basin outlet, that the potential buoyancy of
30 the float is utilized without any supplementary compressive forces; and that no plunger means is used, opening and closing being regulated by operating an infinitely variable level-regulatable portion of, or in, the outlet conduit connecting the outlet of the float housing with the wastewater system.

This device obtains a very simple construction without any parts which
35 are sensitive to foreign matter in the water. Because of the manoeuvrability due to the infinitely variable level regulation of, or in, the conduit portion from the float housing outlet and in contradistinction to the above-described known device, it is possible to set some optionally selected maximum level in the wash-basin, which is determined by the liquid level in the float housing, and thereby



the buoyancy of the float. In a similar way as with the known device, the level-regulating bottom valve device in accordance with the invention also comprises a water trap, thus dispensing with the need of any conventional water trap. Due to this, and since the device can be given relatively small dimensions (the float is to advantage relatively flat, as will be described in detail below), the space normally taken up in a conventional wash-basin by the water trap becomes free, and thereby very favourable for the handicapped since a wheelchair can be pushed in under the wash-basin. Due to the absence of the conventional overflow, the dimension in height of the wash-basin itself will be less, thus further increasing the saving in space.

An air bleed is preferably arranged in the upper part of the float housing, so that no air cushion is formed which has to be compressed when the liquid level rises in the float housing.

The level-regulatable portion of the outlet conduit can be arranged in different ways. Although there is formed in a preferred embodiment a raisable and lowerable portion of the outlet conduit from the bottom valve, e.g. a flexible hose or pipe portion, it can also be provided by some means in the outlet conduit regulatable externally as to its level, and which the water in the conduit will flow over in the outlet conduit, e.g. a rotatable eccentric means or the like.

In a simple embodiment, the device includes a suitably cylindrical float housing with a centrally arranged upper opening for direct connection to the outlet, e.g. of a wash-basin, and a suitably opposing bottom opening connected to a raisable and lowerable conduit connectable to the waste-water system in question. This conduit can be of an at least somewhat flexible pipe of suitable material extending laterally from the closure means, and suitably backwards, to continue substantially vertically downwards to the waste connection. Raising of the transition or "bend" between the laterally and downwardly directed conduit portions results in that the former and the float housing form a U-tube, and that the level of the bend determines the liquid level in the float housing. The bend is raised for closing the closure means, whereby the liquid level obtained in the float housing on filling the wash-basin with water comes to a level corresponding to a desired water level in the basin. The float will then seal against the outlet of the basin until the force of the head of water in the basin acting on the float becomes greater than the buoyancy obtained by the float from the liquid in the float housing. When the water in the wash-basin tends to exceed this level, the float will be forced downwards so that water can flow past to the outlet and over the bend until the float seals once again. Opening of the valve means takes place in a corresponding manner by lowering the bend to a level where the liquid level in the float housing is not sufficient for the float to press against the outlet of

the wash-basin.

The raisability and lowerability of the conduit can be provided in different ways. For example, the vertical portion can be provided with a bellows portion, it can be arranged spirally or as a loop, or the vertical portion can
5 comprise two telescopically arranged parts. In the latter case a water trap may possibly be needed below the lower telescopic part if satisfactory gas tightness cannot be obtained between the telescopic parts.

Raising and lowering the vertical conduit portion can be provided in different ways. A simple solution is to utilize an operating rod as used on
10 conventional wash-basins for operating the closing stopper.

The level-regulating bottom valve device in accordance with the invention replaces, as mentioned above, not only the overflow and stopper but also the water trap for such as a wash-basin. This water trap permits a free flow of water due to its simple implementation, and together with the raising and
15 lowering of the conduit this actively counteracts stoppages in the water trap. The device may therefore be said to be self-cleaning. Effective flushing of the trap can be provided, however, by simply lowering and straightening out the horizontal conduit portion to a level below the lowest part of the float housing, whereby possible flow restricting foreign bodies are flushed effectively away.
20 The float housing can also be made so as to be easily kept clean. For this purpose it is preferably made in two parts so that it can easily be taken apart.

The water trap and valve construction also has an implementation such that it greatly reduces negative effects of pressure differences in the wastewater system and in evaporation.

25 Even if the closure means in accordance with the invention is primarily conceived for sanitary components such as wash-basins, baths, sinks and the like, it can naturally be used on all other types of liquid receptacles also, where it is desirable to have overflow protection. For example, the invention could also be applied to swimming-pools and thus replace the conventional overflows which are
30 required for water circulation with retained water level.

The invention will now be described in detail in the following in respect of some particular, non-restricting embodiments and with reference to the accompanying drawings, on which

Figure 1 is a cross-sectional view of a wash-basin provided with an
35 embodiment of the valve device in accordance with the invention in an open position,

Figure 2 is a view corresponding to the one in Figure 1 but with the valve device in a closed, level-regulating position corresponding to maximum filling level in the wash-basin,



Figure 3 is an enlarged partial view of the device in Figures 1 and 2, illustrating the function of the overflow guard in the valve device,

Figure 4 is a view corresponding to the one in Figure 3, illustrating the level-regulating function of the valve device for an arbitrarily set filling level,

Figure 5 is a comparative side view of a wash-basin provided with a valve device in accordance with the invention and a wash-basin with a conventional overflow and water trap,

Figure 6 is a side view of a bath provided with an embodiment of the valve device in accordance with the invention and

Figure 7 is a cross-sectional view of a portion of the valve device in Figure 6.

The bottom valve device, generally denoted by the numeral 1 is illustrated mounted to a wash-basin 2 in Figures 1 and 2. A tap is denoted by the numeral 3, and 4 is an operating means for opening and closing the bottom valve device. The bottom valve device 1 includes a float housing 5 and a raisably and lowerably arranged conduit 6 coupled to the operating rod 4.

The float housing 5 is comprised in the illustrated case of two parts which can suitably be fastened together, preferably by a screw thread, in the form of an upper part 7 and a bottom part 8. In the Figures, the upper part 7 has the least height so that fitting it to the wash-basin will be facilitated, but the attachment can naturally be arranged at any optional height. The outer shape of the float housing is suitably cylindrical. The upper part 7 is provided with a central threaded opening 9, which is screwed onto a downwardly threaded outlet pipe 10 forming the bottom outlet of the basin 2. The flanged outlet pipe 10, covered by a strainer 11, is of the type normally used for wash-basins and is fixed in the bottom opening 12 of the wash-basin material with the aid of a nut 13 and an intermediate gasket 14. The gasket 14 seals the connection between the wash-basin material and the outlet pipe 10 and thus no seal or sealing engagement between the nut 13 and the upper part 7 of the float housing needs to be provided, enabling the float housing 5 to be readily oriented in a desired position, as will be described in detail below. The upper part 7 is further provided with a bleed pipe 15, the function of which will also be described later on. The bottom part 8 of the float housing has an outlet portion 16 extending sideways from an opening 17 directly opposite the opening 9 in the upper part 7. As is well known in hydraulic flow technology, and as will be accounted for in detail below, the outlet should at least have the same dimensions as the inner diameter of the outlet pipe 10 for satisfactory function. The outlet portion 16 may naturally be implemented otherwise than is illustrated in the Figures. In the illustrated case it serves as an

attachment for the conduit 6, but it is, of course, possible also to connect the conduit 6 directly to the lower opening 17 in any suitable way.

5 A float 18 is disposed in the float housing 5. The exterior shape of the float is not critical per se as long as its upper surface can be brought into sealing
10 contact with the outlet pipe 10 of the wash-basin. It is suitable that at least a substantial part of the upper surface of the float 18 is spherical. The seal is further ensured either by the float or the upper part thereof being manufactured from some at least partially resilient material, e.g. plastics or rubber, or by a ring of such material being disposed on the underside of the outlet pipe 10,
15 indicated in Figures 1 and 2 by the numeral 10a. The float 18 can be entirely spherical, but to allow reduced height dimensions for the float housing it has preferably a flattened shape as indicated in the Figures. The float can either be massive or hollow and may be manufactured of any suitable material. The centre of gravity shall be so low in the float that it does not risk being tipped or in some
20 other way coming into an attitude preventing sealing. A suitable implementation of the float is for it to be hollow and with a greater wall thickness in the bottom portion than in the top portion. It can furthermore preferably have a substantially circular horizontal cross-section and in its bottom part can possibly be provided with fins, blades or the like to promote rotation about its vertical axis for increased stability.

The conduit 6, the lowest portion of which is not shown, includes a portion 19 extending from the outlet portion 16 of the float housing 5 approximately horizontally under the rear portion of the basin and via a pipe bend 20 merges into an approximately vertical portion 21, the lower portion of
25 which is connected to the wastewater system. The operating means 4 is suitably attached to the pipe bend 20, e.g. via a lug 22 on the curved portion.

In the illustrated embodiment, the operating means 4 is similar to the lifting means that is used on conventional hand-basins for operating the bottom stopper and includes an operating rod 23 suitably mounted in the upper part
30 (unillustrated) of the basin and an adjustably disposed cross-arm 24. The cross-arm 24 is actively connected to the conduit 26 via a link 25 which is pivotably mounted on the lug 22 and rests with its upper portion on the cross-arm 24. Such a construction allows the link 25 to be easily hooked off the cross-arm 24, which can be important, as will be described in detail below.

35 At least the backwardly directed conduit portion 19 should have sufficient flexibility to allow movement in height of the pipe bend 20 between an upper position giving a desired liquid level in the float housing 5 in accordance with what will be accounted for hereafter and a lower position where the pipe



bend 20 is at a level with or preferably under the horizontal outlet portion 16 of the float housing 5. To provide the desired flexibility of the conduit 6 without creases or the like being obtained on it is well-known technique in itself and can easily be carried out by one skilled in the art.

5 In order to enable the above-mentioned raising and lowering of the bend 20, the vertical conduit portion 21 must have corresponding flexibility. This can be provided, e.g., by a bellows portion indicated by the reference numeral 26 in Figures 1 and 2. Alternatively, two telescopically connected pipe portions can be utilized, or the vertical conduit portion 21 may be allowed to constitute, or
10 include, a vertical spiral. Together with the conduit portion 19 the float housing 5 forms a water trap, and no extra conventional type of water trap is needed for the described embodiment. A water trap may be needed in the variant indicated with a telescopic connection in the vertical conduit portion, if satisfactory gas sealing can not be achieved between the telescopic parts.

15 The bottom valve device is illustrated in Figure 1 in an open position after emptying the wash-basin 2. This position is suitably the lower position obtained when the operating means 4 is pushed maximally downwards. The conduit 6 which is suspended by the link 25 on the cross-arm 24 is then lowered to the illustrated position. The liquid level in the float housing 5 will be
20 determined all the time by the level of the bottommost part of the pipe bend 20, and the position illustrated in Figure 1 is when the liquid level is not sufficient for urging the float 18 up into engagement against the bottom edge of the basin outlet pipe 10. The wash-basin 2 is illustrated filled with water in Figure 2, and with the bottom valve 1 in a closed position. This position is set by lifting the
25 bend 20 of the conduit 6 with the aid of the operating rod 23 to a liquid level in the float housing 5 corresponding to a desired depth of water in the basin when the basin is filled. So that the float 18 in the float housing 5 will seal against the outlet opening 10 in the manner illustrated in Figure 2, the displacement of the float 18 minus its own weight must be equal to or greater than the head of water
30 with the height H extending from the water surface in the basin down through the outlet pipe 10 to the float 18 where it becomes a load on the upper side of the float, or, if the density of water is denoted by ρ , the cross-section of the interior of the outlet pipe 10 by A, the submerged volume of the float 18 in the float housing by V and the weight of the float 18 by G we have:

35
$$H \times A \times \rho = V \times \rho - G.$$

In Figure 2 the submerged volume V of the float 18 is at a maximum, since possible further raising of the liquid level in the float housing 5 does not give any increase in V.

If it is now assumed that H in Figure 2 corresponds to the head of water for the maximum filling level in the wash-basin, then for further filling, as illustrated in Figures 3 and 4, the tendency of the head of water H to increase will press the float 18 down so that water can flow past it through the float housing 5 and out through the conduit 6 over the bend 20. When the water level has once again dropped to the predetermined level in the basin, the head of water is balanced and the float seals once again. A stable function with negligible fluctuation of the water level in the basin is obtained provided that the dimensioning of the outlet pipe 10, outlet opening 17 and conduit 6 in relation to each other and to the tap 3 is correct. Further precision in level regulation is obtained if the negative effect of surface tension is reduced in a suitable and conventional manner by suitably designing the bend 20. A possible alternative or supplementary development of the illustrated device, with reference to said tendency to level fluctuation in conjunction with the overflow function, would be to give the upper side of the float 18 an implementation such that a relatively large level change is required in the float housing to increase the sealing ability of the float at higher filling levels.

No further increase of the liquid level above the small change required for depressing the float 18 to open the outlet opening can thus occur in the wash-basin, and the illustrated valve device affords at least equally reliable overflow protection as is obtained with the conventional overflow. Due to the air bleed 15 in the upper part of the float housing 5, no air cushion is enclosed in the float housing, as with the known device described in the introduction, with accompanying risk of functional disturbance. The spherically formed surface of the float 18 enables it always to seal irrespective of whether it has been displaced laterally. The space between the side wall of the float housing 5 and the float 18 can, of course, be reduced in relation to what is illustrated in the Figures and still give sufficient room for the passage of liquid.

The liquid level in the wash-basin which must not be exceeded can be optionally set. As previously mentioned, the level in the wash-basin is determined by the level in the float housing 5 (which decides how great the submerged volume V of the float will be) and in turn this is determined by the height of the bend 20 of the conduit 6. Figure 4 illustrates the valve device set for a lower level than in Figure 3 and is intended to illustrate the automatic level regulation of the device, i.e. its overflow protection, at a freely selected level. Further lowering of the bend 20 results in successively lower levels in the wash-basin, until the stage is reached (as in Figure 1) when the float no longer reaches up to the outlet 10. This can sometimes be an advantage, e.g. in cleaning the basin (or sink) when it is desired to have a continuous flow of clean water with retained

desired filling level.

An intrinsic characteristic of the bottom valve construction is that backflow in, and drying out of, the water trap are prevented, since the float 18 seals against the opening 17 in the lower part of the float housing when the float is in its bottom position.

Flushing the conduit 6, where foreign matter can possibly have collected in the portion 19 or in the float housing outlet 16, is performed by turning on the tap 3, hooking off the link 25 from the cross-arm 24 of the operating means 4 and pressing down the bend 20 so that the conduit portion 19 is straightened out or bent downwards as indicated by the chain-dotted line in Figure 4. Cleaning the float housing and float is easily done by screwing off the bottom portion 8 from the upper portion 7 or the whole of the housing from the basin outlet pipe 10.

It will be understood from the foregoing that considerable space is saved under the wash-basin, partly since the bottom valve device can be made very compact and low in itself, and also since the basin itself can be made lower than a conventional basin with an overflow. This is illustrated in Figure 5 where the saving of space achieved under the wash-basin is clearly apparent in comparison with a conventional construction 27. As mentioned above, this is a large advantage, particularly for toilets for the handicapped, since there is no trouble in pushing in a wheelchair under a wash-basin provided with a bottom valve device in accordance with the invention.

In Figures 6 and 7 the valve device in accordance with the invention is illustrated as applied to a bath 28. The valve device illustrated here is different from that illustrated in Figures 1-5 mainly in that the float and thereby the float housing has been made wider to lift the larger head of water in question here. In the illustrated embodiment, the operating means 4 in Figures 1 and 2 has been replaced by a simple operating rod 4'. For the remainder, corresponding parts have been given the same reference numerals as in the other figures, and the valve device functions in the same way as described above.

The invention can, of course, be applied to other liquid receptacles than baths and wash-basins. To advantage it can thus be used for kitchen sinks, for example. The size of the receptacle does not constitute any limitation either, and it could also be used for such as swimming pools, even if the float must then be suited to the considerably larger head of water that it is required to carry.

The invention is not limited otherwise to the embodiments which have been specially shown and described, and many modifications and variations are possible within the scope of the following claims.



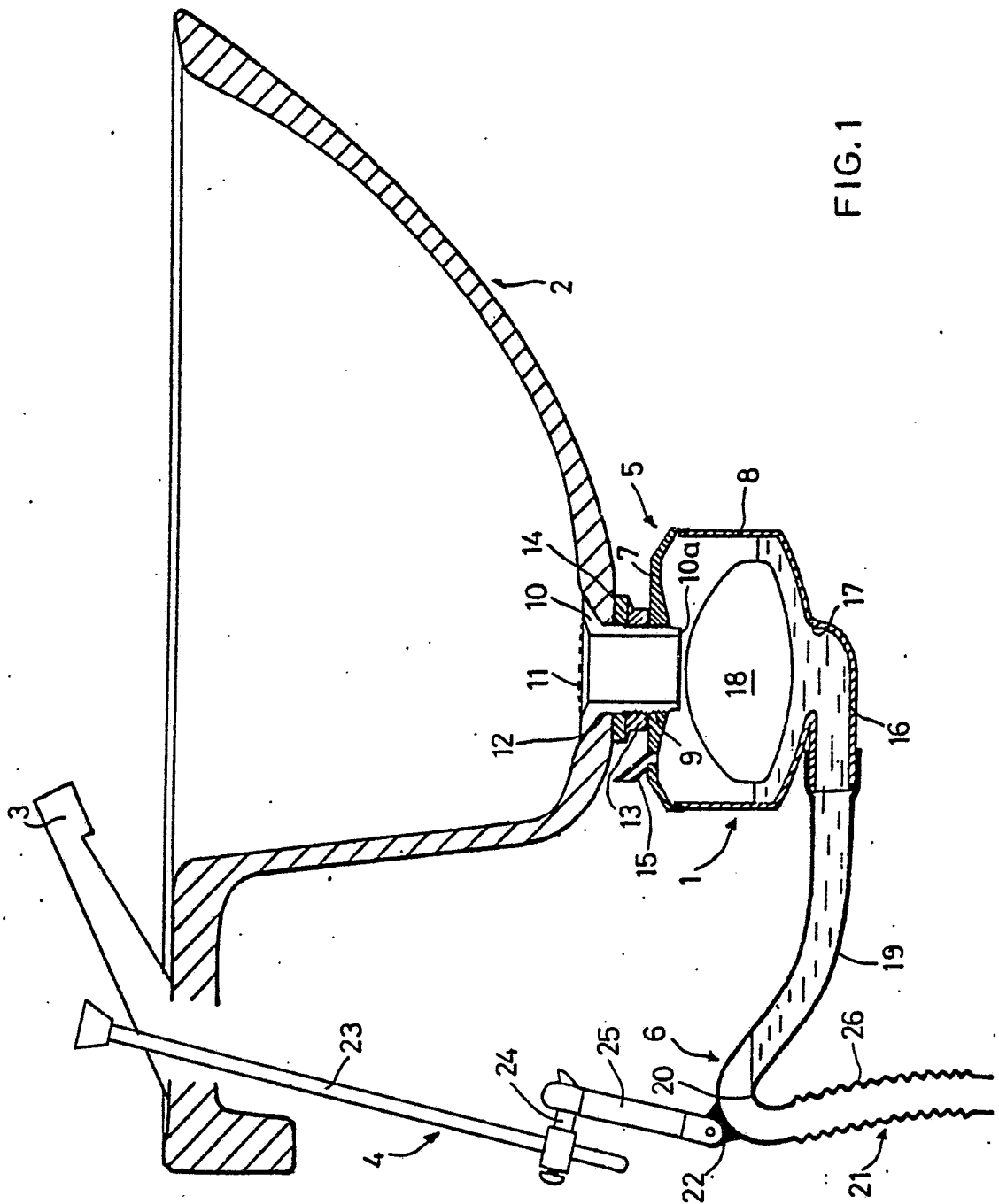
CLAIMS

1. A level-regulating bottom valve device with a water trap function for liquid receptacle outlets, characterized in that it comprises a float housing (5) with a float (18) and an upper opening (9) connected or connectable to the receptacle outlet (10) and a bottom opening (16, 17) connected to an outlet conduit member (6) for connection to a wastewater system, the float (18) being disposed for urging into sealing engagement against said upper opening or said receptacle outlet (10), thereby to close it off when the buoyancy of the float (18) in the float housing (5) is greater than the head (H) of water over the float in the receptacle (2), but is released from the opening or receptacle outlet when the head (H) exceeds the buoyancy of the float (18), and that said outlet conduit member (6) comprises in its flow path a portion (20), the level of which can be regulated and brought to a higher level than the lower opening of the float housing (5), whereby the liquid level in the float housing (5) can be regulated so that opening the outlet (10) is provided by lowering said level-regulatable portion (20) until the liquid level in the float housing (5) is at a level such that the float (18) does not seal and that closing is provided by raising the level-regulatable portion (20) to a liquid level in the float housing (5) such that the float (18) seals the upper opening or the receptacle outlet (10), said raising being adjustable to give desired maximum liquid level in the receptacle (2).
2. Valve device as claimed in claim 1, characterized in that the float housing (5) is provided with an air bleed opening (15) in its upper portion (7).
3. Valve device as claimed in claim 1 or 2, characterized in that the float housing (5) is essentially cylindrically shaped with said openings (9, 17) arranged on its upper and bottom sides.
4. Valve device as claimed in any one of claims 1 - 3, characterized in that the conduit member (6) includes an at least partially raisable and lowerably adapted conduit member, e.g. a flexible hose or corresponding pipe, to form said regulatable portion (20).
5. Valve device as claimed in claim 4, characterized in that the raisable and lowerable conduit member (6) includes a compressible portion (26), e.g. of bellows type.
6. Valve device as claimed in claim 4, characterized in that the raisable and lowerable conduit member (6) includes a telescopic portion.



7. Valve device as claimed in any one of claims 1-6, characterized in that the portion of the float (18) intended to seal against the receptacle outlet (10) has a spherical surface.
8. Valve device as claimed in claim 7, characterized in that the float (18) has a circular horizontal cross-section and a larger diameter than height.
9. Valve device as claimed in any one of claims 1 - 8, characterized in that for regulating the level of the portion (20) having a regulatable level, it is operatively connected to an operating rod (4, 4') arranged on the receptacle (2).
10. Valve device as claimed in any one of claims 1-9, characterized in that the level-regulatable portion (20) is adapted for being brought to a lower level which is lower than the lower opening (16, 17) of the float housing (18) for allowing effective flushing out of the outlet conduit member (6).
11. Valve device as claimed in any one of claims 1-10, characterized in that the receptacle (2) is a sanitary component such a wash-basin, a bath, a sink or the like.

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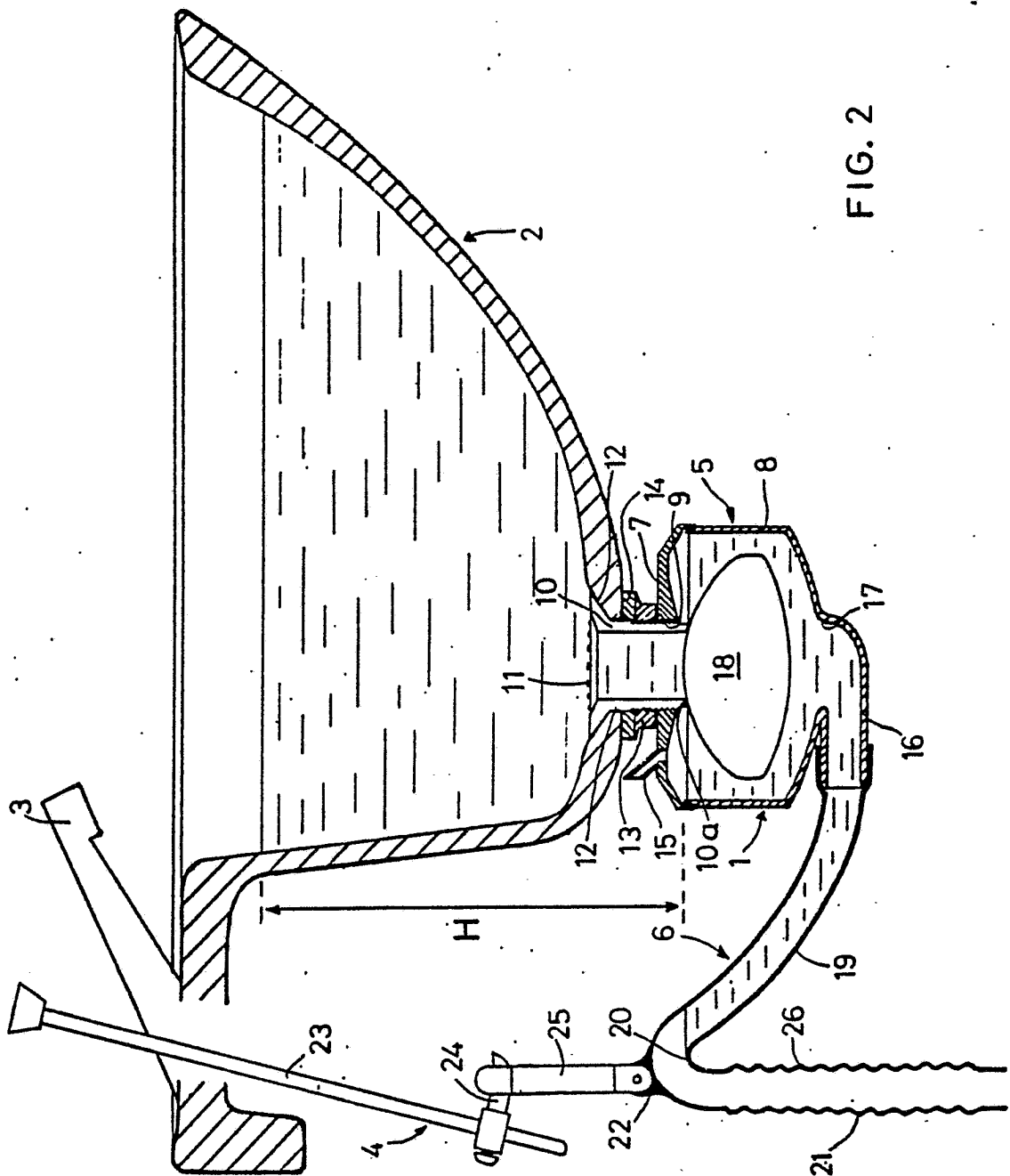


FIG. 2

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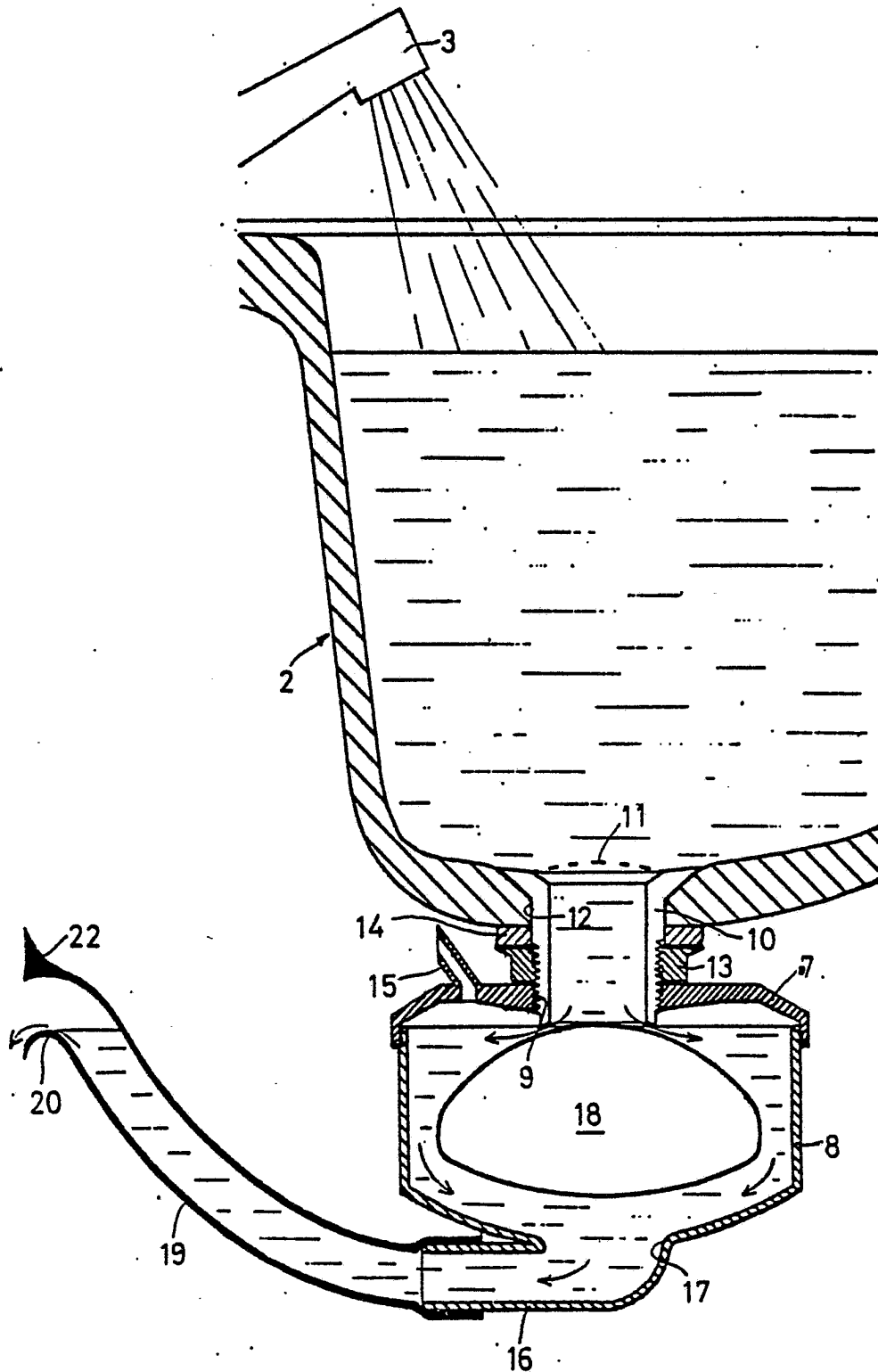


FIG. 3



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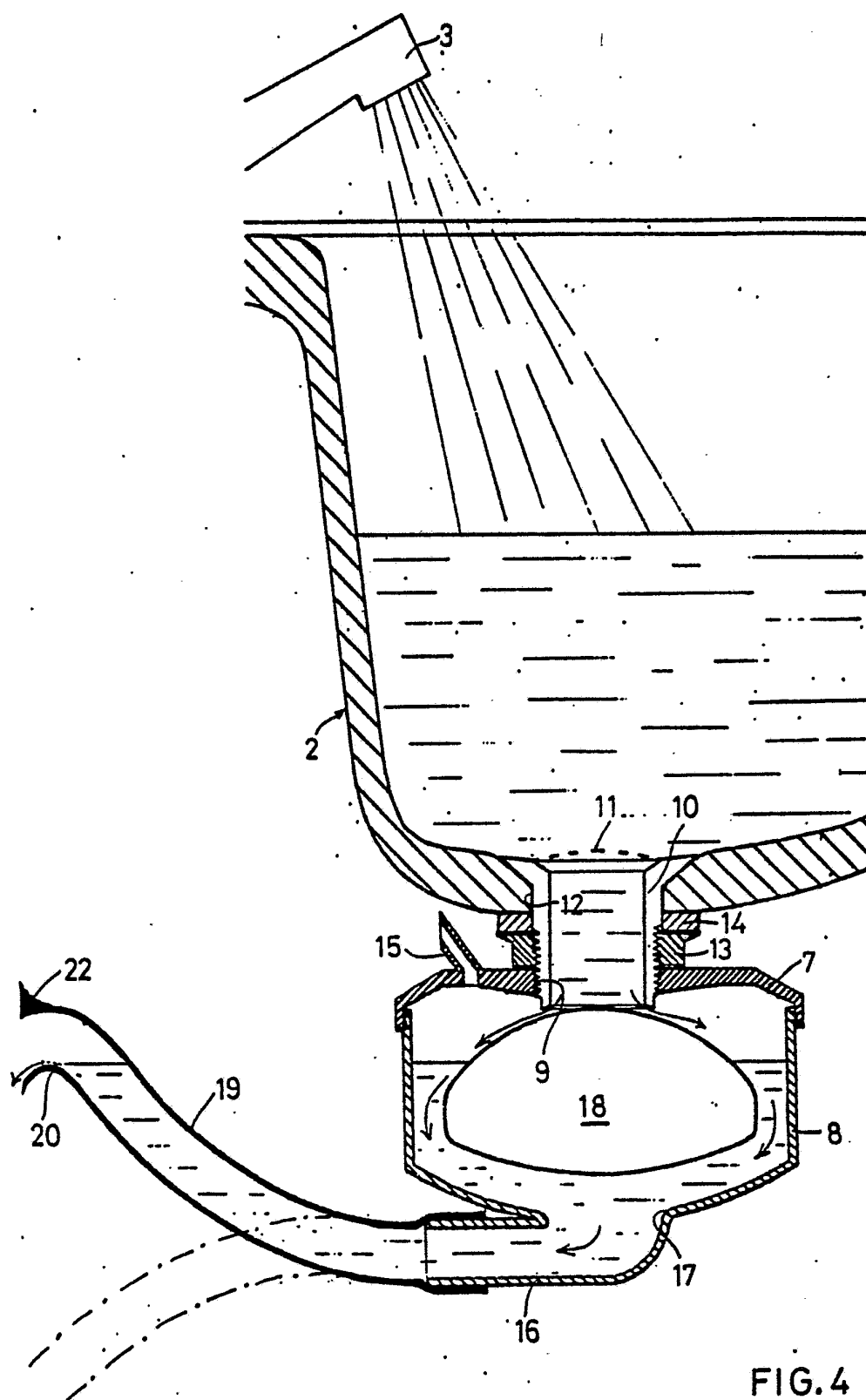


FIG. 4

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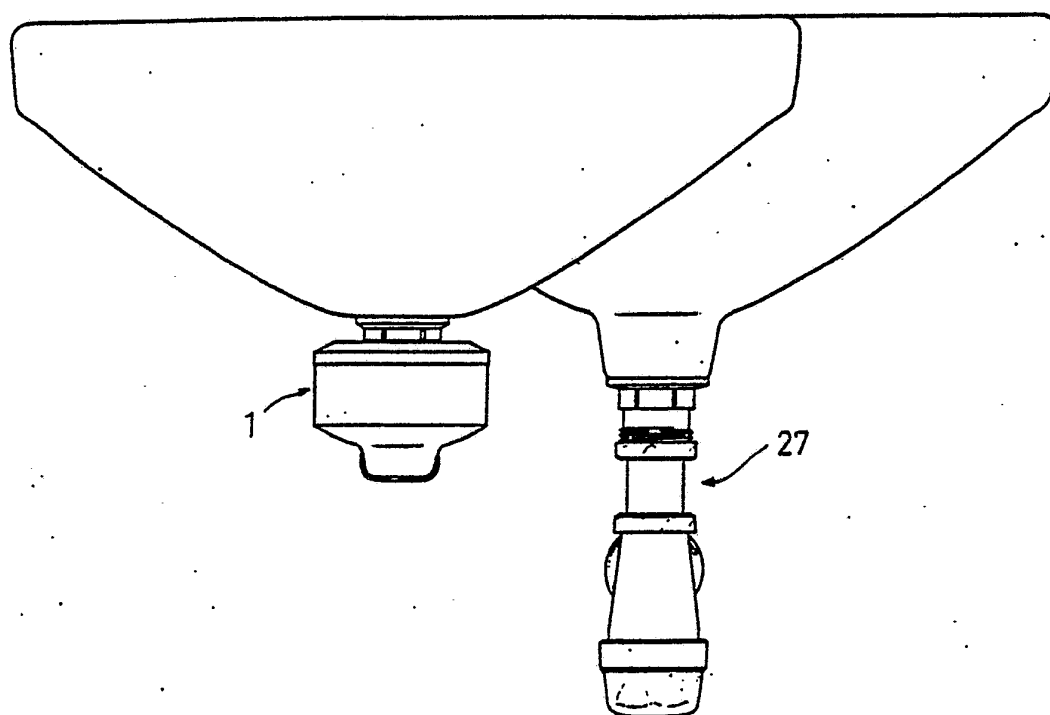


FIG.5

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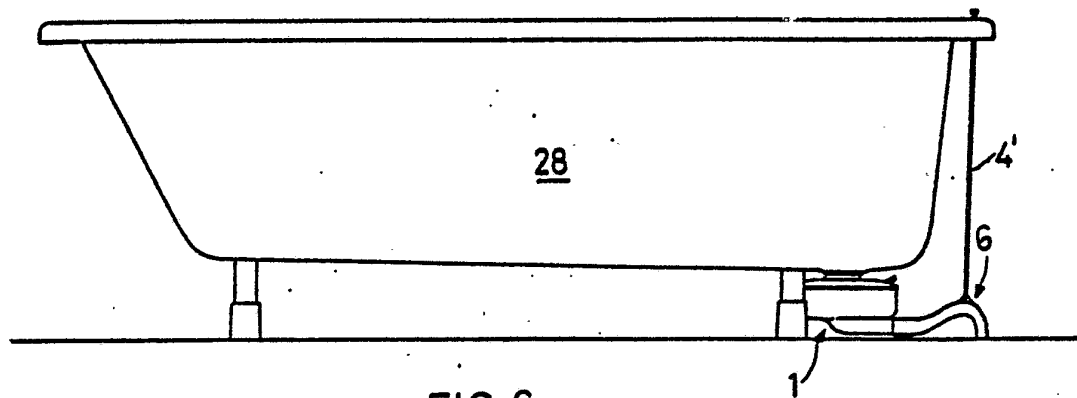


FIG. 6

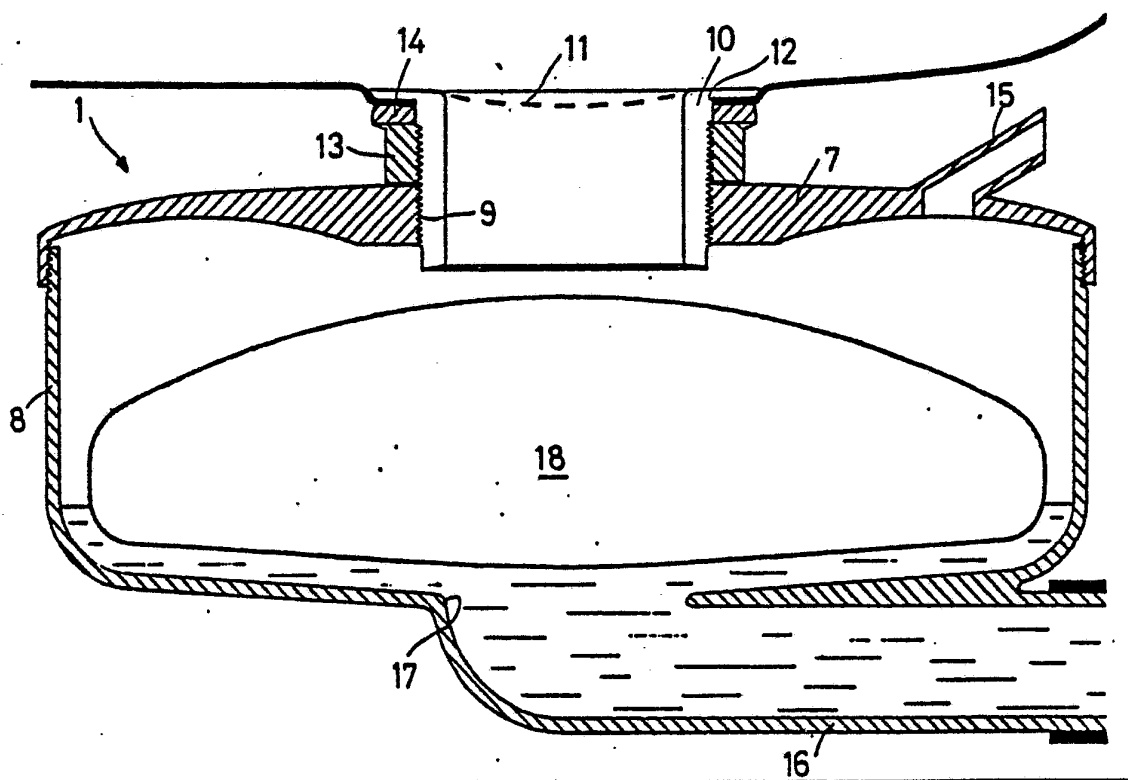


FIG. 7

INTERNATIONAL SEARCH REPORT

International Application No PCT/SE84/00047

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ³ According to International Patent Classification (IPC) or to both National Classification and IPC 3 E 03 C 1/232											
II. FIELDS SEARCHED Minimum Documentation Searched ⁴ <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <tr> <th style="width: 20%;">Classification System</th> <th style="width: 80%;">Classification Symbols</th> </tr> <tr> <td>IPC 3</td> <td>E 03 C 1/12, 122, 22-244</td> </tr> <tr> <td>National Cl</td> <td>85e:21/10, 15</td> </tr> <tr> <td>US Cl</td> <td>4:197-206; 137:247.13-23</td> </tr> </table> Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁵ SE, NO, DK, FI classes as above			Classification System	Classification Symbols	IPC 3	E 03 C 1/12, 122, 22-244	National Cl	85e:21/10, 15	US Cl	4:197-206; 137:247.13-23	
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III. DOCUMENTS CONSIDERED TO BE RELEVANT ¹⁴ <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <tr> <th style="width: 10%;">Category ⁶</th> <th style="width: 60%;">Citation of Document, ¹⁶ with indication, where appropriate, of the relevant passages ¹⁷</th> <th style="width: 30%;">Relevant to Claim No. ¹⁸</th> </tr> <tr> <td style="text-align: center; vertical-align: top;">A</td> <td>DE, A, 2 036 586 (IDEAL STANDARD GMBH) 11 March 1971</td> <td></td> </tr> <tr> <td style="text-align: center; vertical-align: top;">A</td> <td>FR, A, 1 282 897 (VILLEROY & BOCH KERAMISCHE WERKE GMBH) 18 December 1961</td> <td></td> </tr> </table>			Category ⁶	Citation of Document, ¹⁶ with indication, where appropriate, of the relevant passages ¹⁷	Relevant to Claim No. ¹⁸	A	DE, A, 2 036 586 (IDEAL STANDARD GMBH) 11 March 1971		A	FR, A, 1 282 897 (VILLEROY & BOCH KERAMISCHE WERKE GMBH) 18 December 1961	
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¹⁵ Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. "&" document member of the same patent family											
IV. CERTIFICATION <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <tr> <td style="width: 50%; padding: 5px;"> Date of the Actual Completion of the International Search ¹ 1984-04-17 </td> <td style="width: 50%; padding: 5px;"> Date of Mailing of this International Search Report ¹ 1984-05-07 </td> </tr> <tr> <td style="width: 50%; padding: 5px;"> International Searching Authority ¹ Swedish Patent Office </td> <td style="width: 50%; padding: 5px;"> Signature of Authorized Officer ²⁰ Sven Kalling </td> </tr> </table>			Date of the Actual Completion of the International Search ¹ 1984-04-17	Date of Mailing of this International Search Report ¹ 1984-05-07	International Searching Authority ¹ Swedish Patent Office	Signature of Authorized Officer ²⁰ Sven Kalling					
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L.E.