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(71) Applicant: **Norcros Group (Holdings) Limited**
Wilmslow, Cheshire SK9 1BU (GB)

(72) Inventors:
- **GODFREY, Keith John**
  Cheddar, Somerset BS27 3EB (GB)
- **BREEDS, Andrew John**
  Cheddar, Somerset BS27 3EB (GB)

(74) Representative: **Stoner, Gerard Patrick**
Mewburn Ellis LLP
City Tower
40 Basinghall Street
London EC2V 5DE (GB)

(54) SHOWER APPARATUS AND HOSE STORAGE DEVICE

(57) Shower apparatus has a flexible hose and a flat storage box (1) defining a hose cavity to hold the hose. A running opening (5) for the hose is defined at the end of a top edge wall, and leads onto an indented end edge wall portion (12) constituting an interior deflector (3) to direct inserted hose diagonally onto the base of the box. A drainage outlet (6) in the base of the box, connected to a general bath drain, has a valve (7) with a buoyant sealing ball (73) to prevent water from rising up into the box through the drainage outlet.

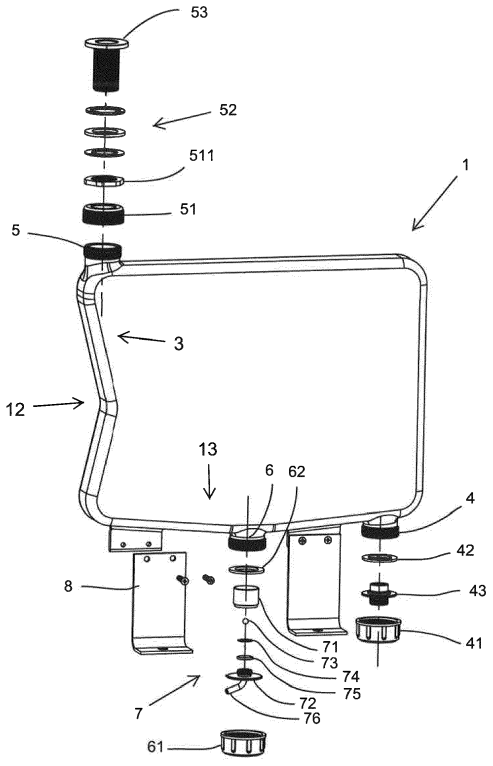

Fig 1A

EP 3 208 389 A1

Description

TECHNICAL FIELD

[0001] The invention relates to storage of hoses, and more specifically, concealed storage beneath or behind a surface where a stored length can be pulled out through an opening in said surface to extend its length for use and then be fed back into the hole for storage. More specifically, the invention relates to shower apparatus featuring a retractable shower hose such as in sanitary units, e.g. baths, wherein a length of shower hose is stored concealed beneath the rim of a bath-tub or behind a wall.

BACKGROUND

[0002] Retractable hoses are a common feature in luxury bathtubs, shower cubicles, sinks, salon wash-units, and other sanitary units. These give the user the option of extending the hose fully to dispense water the maximum distance away from the unit, or extending the hose only partially to keep excess length out of the way, improving the handling of the shower. Furthermore, such retractable shower systems are popular for their aesthetic effect when the shower hose is stored, the absence of exposed hose giving a clutter-free appearance.

[0003] A storage system of the general function and aesthetic described is achieved by passing a shower hose through an opening in a bathtub rim, which is then attached to a water source beneath the bathtub so that when stored the length of the shower hose is beneath the tub rim with only the shower head or shower handset sitting above the opening. The storage system is often adapted to address the issue of water entering the tub rim opening by collecting the water using a dedicated catcher and drainage system, or by using a drip-storage container which needs periodic emptying. By taking such measures, damage to the surrounding walls and floor is avoided. Also, a storage system can be adapted to address the problem of the hose catching on or tangling with piping, tubing, tub-supporting legs, and the like, which could limit the range of hose extension and risk damage to the shower hose and surrounding bathtub components.

[0004] Known storage systems overcome the issue of tangling by attaching a container underneath the bath rim which isolates the hose from fixtures. These containers also typically receive any water trickling in through the tub-rim opening. The water is removed either by periodic emptying of the container, or by installing a drainage pipe leading from the container to the main drainage system of the bath.

[0005] An issue with container-type storage systems is that the hose can jam during storage or on withdrawal from the container. This is because of the confined container space limiting the free movement of the hose which is often stiff, rough and/or tacky, causing considerable friction.

[0006] Whilst this can be overcome by using a larger container, there are often spatial confinements between the bathtub and wall and big containers cannot be installed without significant modification to the bathroom space. To overcome this trade-off, some known storage systems install container-based storage systems in specially made plinths built adjacent to a bathtub. Other known storage containers are adapted to use more of the space between a bathtub and wall by conforming to the curvature of the bathtub, the container flaring out toward its base. However a flared base tends to cause a bottle-neck effect, increasing the likelihood of jamming during extraction of the hose from the container.

[0007] Another issue is reverse flow, or siphoning of waste water up into a drained container during drainage of the bathtub, particularly when the drainage opening of the container is below or close to the height of the bathtub floor and plug hole, or when the fluid conductance of the system is unsatisfactory, by poor design or blockage. Such waste water deposits grime in the container and on the hose, which over time develops an undesirable odour.

[0008] Whilst it might seem possible to prevent reverse flow simply by installing a check valve at the drainage opening of the container, the small amount of water trickling into the container cannot reliably exert sufficient force in the forward direction to open a check valve to escape, while rising waste water might not reliably exert sufficient force in the reverse direction to close the valve.

[0009] EP1830008A2 discloses collecting and removing water from the hose without a container, by a device attached to the opening on the bath-tub rim through which the shower hose passes. The device provides a sliding seal around the hose which redirects trickling water and wipes residual water off the hose as it slides down past the seal so that it may be collected in a trough. A dedicated drainage tube is connected to the trough and transports the water to the bath's main drainage pipe. Whilst initially effective, in practice the device requires frequent maintenance, for example lubrication of the seal, eventual replacement of the worn seal, and periodic cleaning of the trough.

THE INVENTION

[0010] Aspects of the invention are set out in the claims.

In one aspect the invention provides shower apparatus comprising a flexible hose and a storage box defining a hose cavity to hold the hose, the storage box having a wall with a running opening through which the hose can be withdrawn from or inserted back into the hose cavity, an end wall adjacent said wall having the running opening and an opposed wall opposite the wall having the running opening;

the storage box further comprising a guide or deflector structure disposed inwardly of the running opening and operable to deflect hose entering the storage box through

the running opening away from the adjacent end wall of the storage box. Optional and preferred features of the apparatus are specified below and in the dependent claims.

[0011] In a further aspect, the invention provides a hose storage device comprising a flat container (storage box) with an edge, said edge comprising a base wall, the device further comprising a hose passage into which hose can be inserted generally perpendicularly relative to the container base wall for storage,
characterised in that
the device further comprises a guiding structure adjacent to the hose passage, the structure disposed to redirect the perpendicularly inserted hose, thereby guiding it obliquely towards the base wall. The features described in connection with this are applicable in the shower apparatus, as will be understood.

[0012] The device preferably includes a water drainage outlet for draining water from the container, and the outlet preferably includes a valve to restrict flow of liquid back into the container through the drainage outlet.

[0013] A preferred aim of the new storage device is to prevent jamming. Another preferred aim of the storage device is to prevent water accumulation, and reverse flow of water into the storage device. Another preferred aim of the new storage device is to reduce the necessity of frequent maintenance; e.g. by not using high-wearing mechanical parts. Another aim is to make occasional maintenance easier to perform.

[0014] In general terms the hose storage device comprises an opening to which the up-stream end of the hose is fixed. The hose may be fixed at the opening, or fixed at a point external to the container and passed through the opening so that its movement is relatively fixed. The container also comprises a hose passage through which the hose downstream from the fixed portion can be passed. When the hose is fully extended in the un-stored position, the hose in the container extends tautly across the container from the up-stream opening, through the hose passage, and out.

[0015] When storing the hose, the hose outside the container is fed back in through the hose passage and the hose between the passage and fixed point initially slackens. As more hose is inserted, a greater portion thereof contacts the inner surface of the container walls and other parts of the hose tube itself.

[0016] The action of the hose tube sliding past the walls and over itself has an associated degree of friction which must be overcome by the user inserting the tube. As more of the container volume is filled up with hose, subsequently inserted portions are increasingly forced to hug container walls and push past other sections of hose. When this occurs, friction on the tube increases drastically and this may be experienced as a jam by the user. The friction is hard to overcome since the directionality of the force which can be applied to the hose from the user's inserting action is limited by the orientation of the hose passage. As a result, instead of simply sliding the hose is forcibly deformed to conform to a confined space.

[0017] The hose arrangement resulting from such forcible insertion is hard to reverse when pulling the tube back out. The user experiences this difficulty as a jam on hose withdrawal.

[0018] An aim with the container proposed herein is to maximise the length of hose insertable before jamming becomes likely.

[0019] We propose a new hose storage assembly, shower apparatus comprising such a hose storage assembly and a bathroom installation comprising a bath tub in combination with the shower apparatus.

[0020] In general terms, the hose storage device or shower apparatus comprises a flexible hose and a storage box to hold it, in a hose cavity defined by the storage box. The storage box has a wall with a running opening for the hose, through which the hose is progressively withdrawn from or inserted into the storage box. Generally the hose has a free end - especially, connected to a shower head - outside the running opening. The other end of the hose may be connected to a water supply at a water supply connection and this connection may be e.g. inside or at a wall of the storage box, usually at a position remote from the running opening. Typically the hose is a relatively close fit through the running opening to inhibit water entry: for example the minimum transverse dimension or diameter of the running opening may be not more than one and a half times or not more than one and a quarter times the outer diameter of the hose. The running opening may comprise a tubular guide, e.g. with an axial extent at least as long as, or longer than the diameter thereof, to define a hose entry direction - typically axial relative to the running opening through the wall - for hose entering the box from outside. Typically this is by manual pushing of the hose into the box from outside, rather than retraction from within.

[0021] Preferably the hose cavity in the storage box is flat or laminar in form, that is, with thickness markedly less than its length and width. Hose coils then form in the laminar cavity substantially parallel with one another. The cavity thickness must of course be greater than the hose diameter, but preferably not more than four or not more than three hose diameters, e.g. more than two but less than three. Desirably the cavity thickness at the bottom is not greater than at the top.

[0022] In practice the storage box is desirably positioned beneath a top rim level of a bath tub but above floor level. Thus, it may have a top wall meeting an end wall or end edge wall at an angle, and/or a bottom wall meeting an end wall or end edge wall at an angle. In the preferred laminar or flat form of the storage box, it may have a pair of major face walls opposed across the thickness of the laminar cavity, and edge wall around the edge of the cavity. The edge wall may have top, bottom and end edge wall portions, with corners between. Top and bottom edge wall portions may be straight.

[0023] The hose running opening may be through a top wall or top edge wall as described, and desirably ad-

jacent an end or end edge wall as described. A hose entry direction defined by the running opening may be generally parallel to an end edge wall.

[0024] According to a first specific proposal herein, the storage box contains or comprises a guide or deflector structure disposed inwardly of the running opening to deflect or direct the hose as it enters the storage box away from an adjacent end wall of the storage box, and/or away from a hose entry direction of the running opening, and/or away from the perpendicular relative to an opposed wall of the storage box (such as a bottom edge wall), preferably all three of these.

[0025] There may be a deflector structure or deflector surface opposed obliquely to the running opening inside the storage box.

[0026] Conveniently a guide or deflector structure is provided by a re-entrant and/or inclined formation of the storage box wall, such as an end edge wall adjacent the hose running opening, so that hose entering through the running opening impinges on an inward surface of the re-entering formation to guide or deflect it in one or more of the senses mentioned above. Or, an overall inclination or curvature of the end edge wall can achieve a similar effect. The preferred form of the storage box is rectangular or trapezoidal. Desirably the storage box is a formed shell of plastics material.

[0027] The apparatus may include a support structure such as one or more support legs to support the storage box relative to the floor and/or relative to a bath tub.

[0028] A further combinable but independent proposal herein is that a bottom wall of the storage box has a drainage opening communicating with an external drain, such as a drain conduit from a bathtub. The drainage opening is desirably at a lowest point of the bottom wall, which may have an inclined internal surface leading towards it.

[0029] More preferably the desired effects are achieved by the guiding feature of the inner surface of the storage container component of the device. The inner surface is modified so that the hose is guided into the box in a more predictable, systematic and compact way which makes more efficient use of the container volume, reducing the likelihood of jamming. The resulting arrangement of the hose in the container is also easy to reverse.

[0030] The guiding feature and the hose passage are positioned and oriented so that when hose is inserted from the un-stored position, the first surface which the newly inserted hose contacts is that of the guiding feature. The contacting surface of the guiding feature is substantially non-perpendicular relative to the direction of force applied on the tube during insertion through the hose passage, thereby allowing the hose to easily slide across it. The guiding surface is preferably at 5 - 45° compared to the insertion direction of the hose, more preferably up to 30° angle, still more preferably 10 - 15°.

[0031] The guided inserted tube proceeds to meet a second contacting surface, preferably a smooth container base, at an angle substantially non-right-angular relative to the direction of the incoming hose so that there is a sufficient component of force parallel to the second surface to facilitate sliding across it. The second surface may be formed in the container wall or it may be formed in another guiding feature.

[0032] By encouraging the hose to slide, less of the hose is forced to conform to the shape of the container, allowing hose insertion to be performed in a smooth motion without excessive force. The hose fills the container systematically and in a way of little resistance, therefore the movement of the hose can be more easily reversed when extending the hose back out from the stored position.

[0033] Use of the container proposed herein markedly reduces the likelihood of jamming for the typical length of hose used in a shower installation, and also reduces the likelihood of jamming for longer lengths allowing storage of more hose than a regular container of similar size.

[0034] The preferred storage container is flat and generally cuboidal in shape, the thickness defined by the widths of surrounding relatively narrow faces of the container, with at least a top narrow face and a bottom narrow face which are substantially parallel. The tube passage is preferably disposed at one lateral extremity of the top face. The side wall adjacent to the tube passage preferably acts as the guiding structure, preferably at an indentation thereof. The direction of the inserted hose after guiding by the guiding structure is preferably 9 - 20 degrees inward compared to the original insertion direction - the insertion direction of the hose being normal to the top thin surface.

[0035] A guiding structure indentation may be shaped as a straight ramp, curve, step, or peak. Alternatively the guiding feature comprises an insert or an inwardly oriented member attached to the inside sidewall of the container. Desirably the inmost extremity of this is spaced above the opposed wall (bottom edge wall), such as by a re-entrant wall shape.

[0036] The preferred hose storage arrangement includes a fixed point where the most upstream part of the stored hose is fixed. Preferably this fixed point communicates with a water source. Also preferably the fixed point is disposed at a lateral extremity of the bottom thin face. Also preferred are that the hose passage and hose fixed point are located in diagonally opposite corners of the flat generally cuboidal container. The hose passage should provide more than about 1.5 mm clearance around the circumference of the tube to permit smooth motion of the tube.

[0037] With the upstream end of the hose fixed in the preferred position, and the tube extending out of the hose passage in an un-stored position, the hose spans the container diagonally with its remaining length outside the hose passage. As the un-stored length of hose is fed back into the outlet for storage, the diagonally spanning portion slackens and falls, and the newly inserted hose meets the guiding structure surface, the surface is at an angle substantially non-perpendicular, relative to the di-

rection and force applied along the moving hose. This guides the inserted hose diagonally downwards toward the container base surface to meet the surface obliquely.

[0038] The base face is substantially non-perpendicular relative to the direction of force conducted along the moving hose after being guided by the guiding feature. The force conducted along the length of the moving hose has a component parallel to the surface of the 2nd long face. This component is sufficient for the hose to slide across the surface.

[0039] Similar cuboidal containers without a guiding feature tend to suffer jamming during insertion as a result of the hose meeting a wall, (e.g. travelling down from the passage to the base) at a roughly 90° angle. The jamming results in part, from there being an insufficient component of force parallel to the bottom long face for the hose to easily slide across it. In this situation, the user must forcibly insert the hose until the hose deforms in a way which favours sliding.

[0040] The inventors have found that a indented angular shape formed integrally to the deflecting guide wall provides the best balance between the desired guiding effect, ease of manufacture, and conservation of container volume. Other deflecting wall shapes may be used to achieve a similar effect, which may redefine the shape of the compartment to the extent that it may not be described as generally cuboidal.

[0041] A novel proposal in this respect, separately or in combination with the other storage box features described above, is the provision of a valve mechanism in the drain from the storage box to prevent or inhibit reverse flow, i.e. flow of water into the storage box from outside, especially from an external drain conduit as mentioned. Preferably the valve comprises a valve member, movable between closed and open positions relative to a flow opening in a valve body having a corresponding valve seat, which is a float member. It may be for example a ball, less dense than water, so that in the event of water rising through the drain it is carried up to engage the valve seat and block reverse flow into the storage box. Conversely, in its normal rest condition it may lie open under gravity (the valve seat being above it) so that water can escape freely from the storage box. Thus, the drain valve may comprise an upper flow opening, a downwardly-directed annular valve seat around the flow opening, a valve chamber containing a buoyant valve member as described, and a flow-permeable retaining structure to keep the valve member in the valve. The retaining structure may be one or more projections from a conduit wall, spaced bars, a mesh or the like. A mesh layer is a preferred option because of ease of assembly.

[0042] The inventive valve overcomes the issues experienced in traditional check valves which fail to open and close reliably when the operating pressures are low.

[0043] More specifically - to be useful in the hose storage device of the invention, a valve must permit passage of even a drip or trickle in one direction, but positively prevent water flowing in the opposite direction.

[0044] The inventors have developed a valve which uses a sealing ball valve member enclosed in a valve chamber, and a sealing aperture and outlet aperture formed in the valve chamber. The inventive valve is operable when installed with the sealing aperture above the outlet aperture. The seal formed between the sealing aperture and the sealing ball is broken by means of gravity, and is formed by means of water filling the valve chamber.

[0045] Filling of the valve chamber displaces the ball which rises to meet the sealing aperture by means of buoyancy. A sufficiently strong seal is formed by the pressure exerted by the reverse flowing waste water, and by the buoyance of the sealing ball in water. The sealing ball has a low density, below that of water. The ball may be made of a low density material such as a plastic. The ball may also be hollow. The sealing ball may be made of a material with a density less than that of water. The sealing ball may take the form of a non-spherical float.

[0046] When installed in the operational position the valve has the sealing aperture at the top of the valve chamber, and the sealing valve member resting below in a position not blocking the valve outlet. This can be achieved by including a physical barrier dimensioned to limit movement of the ball in the valve chamber, thereby confining the valve member to some distance away from the valve outlet and preventing its obstruction. The preferred physical barrier is a mesh layer or other suitably restrictive layer which may act to block foreign bodies carried by reverse flowing waste water from affecting the ability of the sealing valve member to form sealing contact with the sealing aperture. Also preferably when the valve is in the vertical operating position the entirety of the sealing valve member is above the valve outlet aperture. Also preferably when resting on the physical barrier no water should accumulate between the valve member and the barrier so that sticking of the sealing valve member to the barrier by freezing etc. can be avoided. It is also preferred that the valve can be easily taken apart for maintenance e.g. by unscrewing the components.

[0047] As reverse flow of waste water occurs, water rises up through the valve outlet, filling the valve chamber up from the bottom causing the sealing ball valve member to float and rise. When the valve chamber is filled, the sealing ball rises to meet the sealing aperture. The sealing aperture is formed by the tapering inner walls of the inlet side chamber walls, which taper to form an aperture of a diameter less than that of the diameter of the chamber, and the diameter of the ball. The tapered walls act to guide the sealing ball to the aperture. The pressure differential on either side of the sealing aperture - more specifically the higher pressure in the valve chamber during reverse flow allows the sealing ball valve member and aperture to form a temporary water tight seal.

[0048] When the hose is in use and no siphoning is occurring, water trickles or drips out of the storage chamber at a rate not sufficient to fill the valve chamber completely and so the valve remains open. The trickle/drip of water is able to pass by the sealing ball and leave via

the valve outlet into the drainage tube.

[0049] The container of the invention may be manufactured out of suitably corrosion and wear resistant materials such as blow or injection moulded plastics like HDPE, or galvanised metal. It is also contemplated that any part of the storage device (e.g. the container, hose passage, and/or guiding structure) may be formed integrally to a bathtub or other body of a sanitary unit.

DESCRIPTION OF FIGURES

[0050]

Figure 1A shows the preferred embodiment of the invention, comprising the main components of the storage container 1, and the valve 7.

Figure 1B shows a profile view of the embodiment of the invention.

Figure 2 shows an exploded view of the valve.

Figure 3A and 3B show a cross sectional view of the valve, in the open and closed positions respectively.

DESCRIPTION OF THE EMBODIMENTS

[0051] Examples embodying our proposals are now described with reference to the accompanying drawings.

[0052] The storage container 1 of Figure 1A and 1B features a hose attachment point 4, a hose passage 5, and a drainage outlet 6.

[0053] The container 1 is flat, generally cuboidal in shape, and includes a horizontal and slightly concave bottom inner surface 13 for guiding liquid toward the drainage outlet 6, a convex inner guiding surface 3 and a corresponding indentation 12 on the outer surface of the container. The indentation 12 preferably having an obtuse angle (the exterior of the container) of 153°, to form the slanted deflecting surface of the desired angle. The deflector 3 is positioned adjacent to the hose outlet 5, thereby influencing the direction of movement of any part of hose inserted through outlet 5. The deflecting surface 3 serves to direct the inserted hose diagonally downward, at an angle of about 13.5° relative to the hose insertion direction wherein the horizontal component of the diagonal movement is toward the side of the box opposing the deflecting surface. Thus upon meeting the bottom inner surface 13, the hose is able to slide along it away from the deflector 3, hose passage 5, and any subsequently the length of hose subsequently inserted. The direction in which the hose moves reduces congestion of the volume of box immediately adjacent to the outlet 5, allowing for easier storage of the hose.

[0054] The dimensions of the container 1 are adapted for so that the storage unit may be installed to most commercially available bathtubs. The width of the container is adapted to suit the width of a narrow bathtub rim, whilst the container height is limited to less than the depth of a shallow bathtub.

[0055] The shower hose to be stored is fixed to the hose inlet 4 by means of hose fixator 43, washer 42, and nut 41. The end of the hose is passed through hose outlet 5 with a clearance of about 3mm, diagonally through container 1, out of hose inlet 4, and through a washer 42. The end of the hose is then attached to the smooth end of hose fixator 43. The smooth end of hose fixator 43 tapers outward slightly and is dimensioned so that sum of the thickness of the hose and the diameter of the outwardly tapered portion of fixator 43 is sufficiently smaller than the inner diameter of washer 42, but sufficiently large enough that pushing the washer 42 flush to the plate of fixator 43 compresses the hose between said washers inner circumference and fixators outer circumference to achieve a water tight seal. The outer diameter of washer 42 and fixator 43 is dimensioned so they are abutted on the rim of the opening of inlet 4, and so that the washer 42, fixator 43, and rim of inlet 4 can be put under compression by screwing nut 41 onto the threaded exterior of hose inlet 4. The nut 41 is attached to the water source, and so the up-stream end of the shower hose is attached to the hose inlet 4.

[0056] The hose outlet 5 includes an arrangement of nuts 51 & 511, washers 52, and an outlet fixture 53 for attachment to an opening of a bath tub rim, or similar exterior surface of sanitary unit. The inner diameters of the nuts 51 & 511, washers 52, and outlet fixture 53 are all no smaller than the outer diameter of the hose to be stored to permit its passage. In this particular embodiment the diameter of the opening is 20mm, the outer diameter of the hose is approximately 13mm. The outlet fixture 53 comprises a plate and a threaded shaft. The outer diameter of the plate of the outlet fixture 53 is greater than the opening in the bathtub rim, whilst the outer diameter of the shaft of the fixture 53 is less than the opening of the bathtub rim, thereby permitting the shaft to be passed through a rubber washer 52 and then the opening, with the plate and rubber washer 52 being abutted against the outer surface around the bathtub rim opening. The threaded shaft is passed through further washers 52 under the bathtub rim, and nut 511 is tightened to compress the fixture 53. The washers around the tub rim opening to form a water tight seal preventing water entering between the shaft and the tub rim opening. The downstream end of the hose attached to inlet 4 and passed out of outlet 5 is then passed through the fixture 53 fixed to the tub rim opening. The end of the shaft is then attached to the hose outlet 5 by means of nut 51.

[0057] The drainage outlet 6 on the bottom surface 13 includes a washer 61, a valve 7, and a nut 61. The outlet component 72 of the valve includes a plate, which has a diameter greater than that of the opening of the drainage outlet opening. A rubber washer 62 is placed between this plate and the rim of the drainage outlet opening and brought into compression with a nut 61 to form a water tight seal, with the valve outlet 76 protruding from the nut opening, and the nut being attached to the main drainage system.

[0058] The invention also uses mounting brackets 8

attachable to the container 1. Supporting legs shown in Figure 1B can be attached to the brackets, these legs comprising a threaded member 81, a nut 82 and a rubber cap 83. The threaded member is screwed into the bracket 8, so that the distance of the rubber cap from the base of the container can be adjusted by screwing or unscrewing the member in the bracket. These legs support the box, thereby reducing the strain on the hose outlet 5, and make installation easier.

[0059] Valve 7 contained in drainage outlet 6 is shown in detail in figures 2, 3A and 3B. The valve comprises an inlet portion 71, and an outlet portion 72 which together define a valve chamber 78 which houses sealing ball valve member 73. The inlet portion and outlet portion are sealingly joined with threading 721 and gasket 75. A valve member barrier 74 in the form of a meshing is sandwiched between the abutting surfaces of the inlet and outlet portions, thereby dividing the valve chamber 78 into an inlet portion 781 and an outlet portion 782, the sealing ball 73 being physically confined by the barrier 74 to the inlet portion 781. The inner walls of the inlet portion taper inward to define a sealing aperture 79, the sealing ball 73 and sealing aperture 79 are dimensioned so that the diameter of the ball is greater than that of the seal. The ball may thus form a seal at the aperture with the aperture's inner rim. The inlet portion further comprises a concave receiving surface 77 to advantageously direct water toward the inlet aperture.

[0060] Figure 3A specifically illustrates the valve when the shower is in use with water being drained from the hose container 1. Entry of water through the sealing aperture 79 via the concave surface 77 is permitted since the sealing ball is resting on top of the barrier 74. Water is free to pass through the physical barrier 74, and out of the valve outlet 76, which communicates to the main drainage pipe via a tube. Fig 3A also illustrates the complete absence of water.

[0061] Figure 3B specifically shows the situation where a bath-tub is being drained to cause reverse flow of waste water up through valve outlet 76 and into the valve chamber 78. As valve chamber 78 is filled, the sealing ball 73 made of a low density plastic rises with the surface of the waste water until it eventually meets the sealing aperture to form a seal. The high pressure in the valve chamber compared to the pressure on the exterior side of the inlet ensures a seal is maintained, thereby preventing the majority of waste water from passing the sealing aperture and entering container 1. At certain rates of reverse flow some turbulence can occur in the valve chamber causing the sealing ball 73 to move abnormally. This results in an insignificant amount of water flowing past the aperture 79 before the seal is eventually formed. Whilst the stoppage of reverse flow is not absolute, the amount of reverse flow permitted is not enough to fill the volume defined by the connecting parts of drainage outlet 6. Therefore the main container chamber 1 is kept waste water free and the valve serves the desired function.

[0062] In the rare event that water is contained in the container and reverse flow occurs simultaneously, provided the pressure of the reverse flow is greater than that exerted on the valve ball from the inlet side by the accumulated shower water, the seal will remain intact. Should the pressure on the inlet side exceed that of the pressure behind the sealing ball 73 in the valve chamber, the water in the valve chamber will flow back out of the valve outlet and be replaced by water from the container.

Claims

1. Shower apparatus comprising a flexible hose and a storage box defining a hose cavity to hold the hose, the storage box having a wall with a running opening through which the hose can be withdrawn from or inserted back into the hose cavity, an end wall adjacent said wall having the running opening and an opposed wall opposite the wall having the running opening;
   the storage box further comprising a guide or deflector structure disposed inwardly of the running opening and operable to deflect hose entering the storage box through the running opening away from the adjacent end wall of the storage box.

2. Shower apparatus according to claim 1 in which the guide or deflector structure is provided by a re-entrant formation of the storage box wall.

3. Shower apparatus according to claim 1 or 2 in which the guide or deflector structure is disposed to deflect said hose away from a hose entry direction defined by the running opening.

4. Shower apparatus according to claim 1, 2 or 3 in which the guide or deflector structure is disposed to deflect said hose away from the perpendicular relative to said opposed wall of the storage box before it reaches the opposed wall.

5. Shower apparatus according to any one of the preceding claims in which the guide or deflector structure has a deflector surface inside the storage box and opposed obliquely to the running opening.

6. Shower apparatus according to any one of the preceding claims in which the storage box has a flat or laminar shape, with a pair of major face walls opposed across the thickness of the laminar hose cavity defined thereby, and an edge wall having top, bottom and end edge wall portions, the running opening being through the top edge wall, the bottom edge wall being said opposed wall and a said end edge wall being said end wall, adjacent the running opening, away from which the hose is deflected.

7. Shower apparatus according to claim 6 in which a

hose entry direction defined by the running opening is generally parallel to a said end edge wall.

8. Shower apparatus according to claim 6 or 7 in which the top edge wall portion is substantially parallel to the bottom edge wall portion, and said side edge wall of the container adjacent to the hose passage has a re-entrant formation providing the deflector structure.

9. Shower apparatus according to claim 6, 7 or 8 in which the thickness across the hose cavity is not more than 3 times the outer diameter of the hose.

10. Shower apparatus according to any one of the preceding claims in which the hose has a free end connected to a shower head outside the running opening and another end connected to a water supply connection inside or at a wall of the storage box.

11. Shower apparatus according to claim 10 in which the water supply connection is diagonally opposite to the running opening.

12. Shower apparatus according to any one of the preceding claims in which the storage box has a drainage outlet.

13. Shower apparatus according to claim 12 wherein the drainage outlet comprises a valve to restrict flow of liquid back into said container through the drainage outlet.

14. Shower apparatus according to claim 13 in which the valve comprises a moveable sealing ball in a valve chamber, the sealing ball having a density below that of water so as to be liftable by water entering below the valve outlet to meet a sealing aperture.

15. Bathroom installation in which a device of any one of claims 1 to 14 is concealed below or behind a bath or cover.

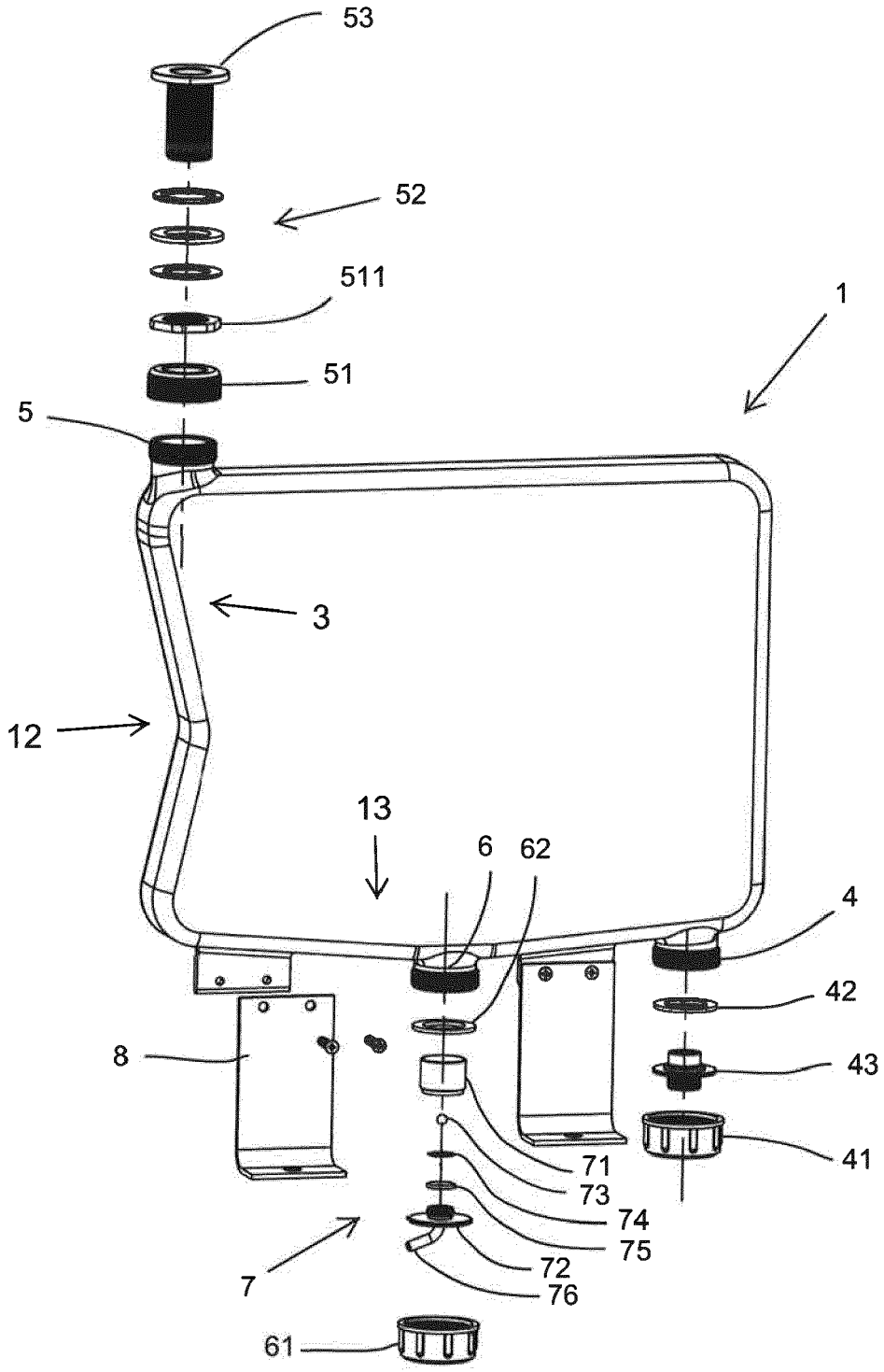

Fig 1A

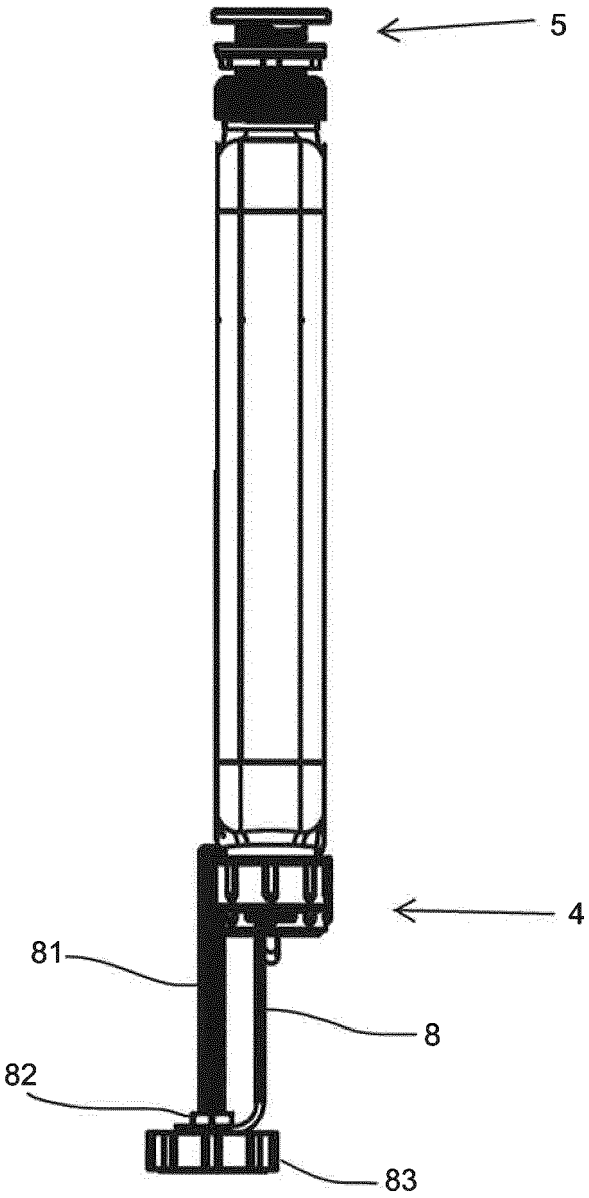

Fig 1B

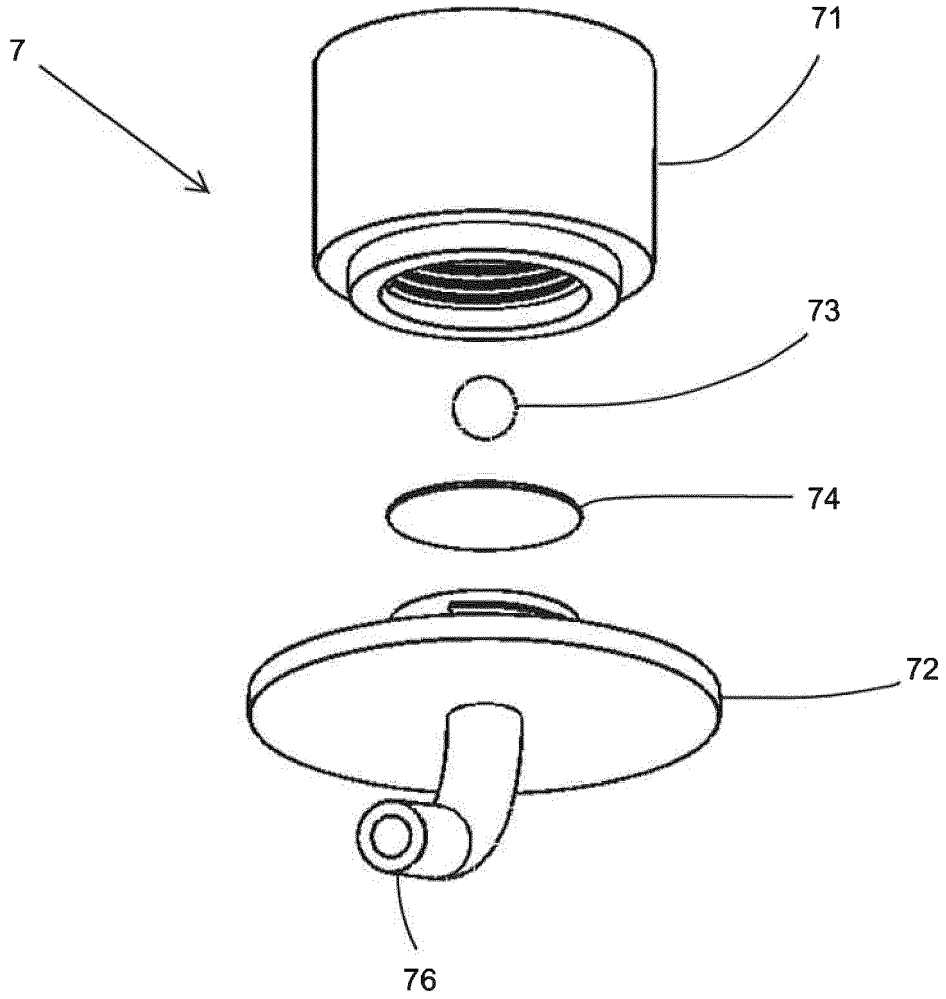

Fig 2

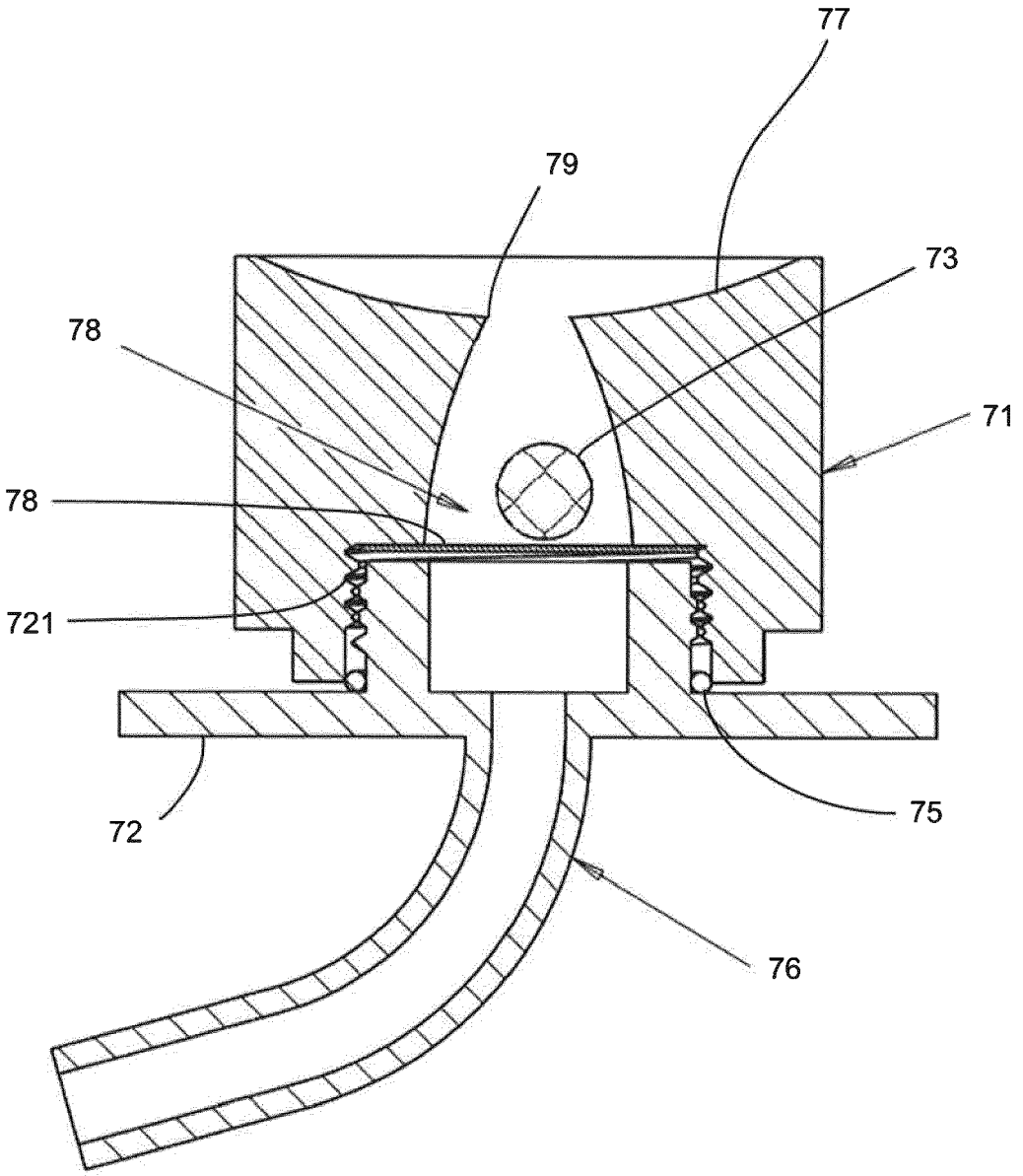

Fig 3A

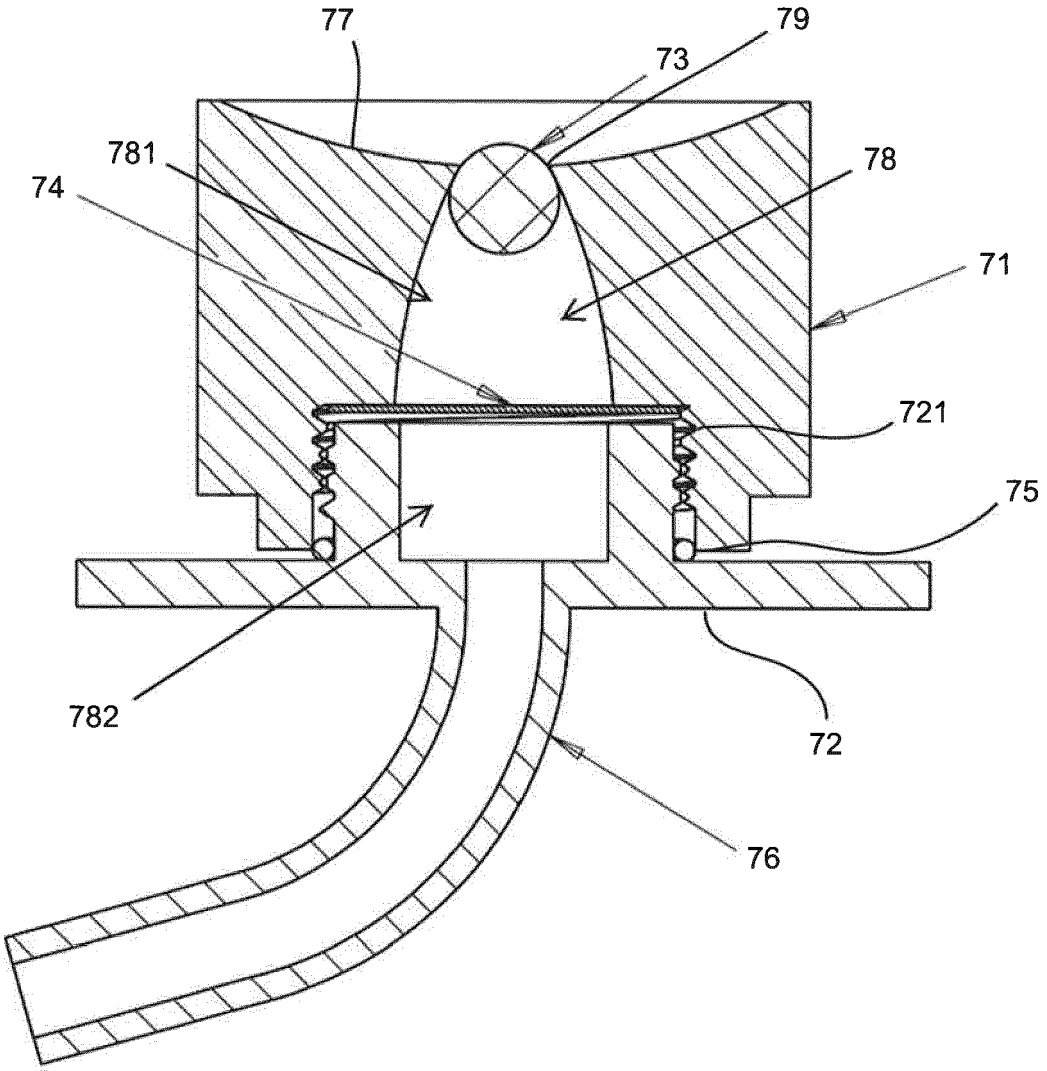

Fig 3B

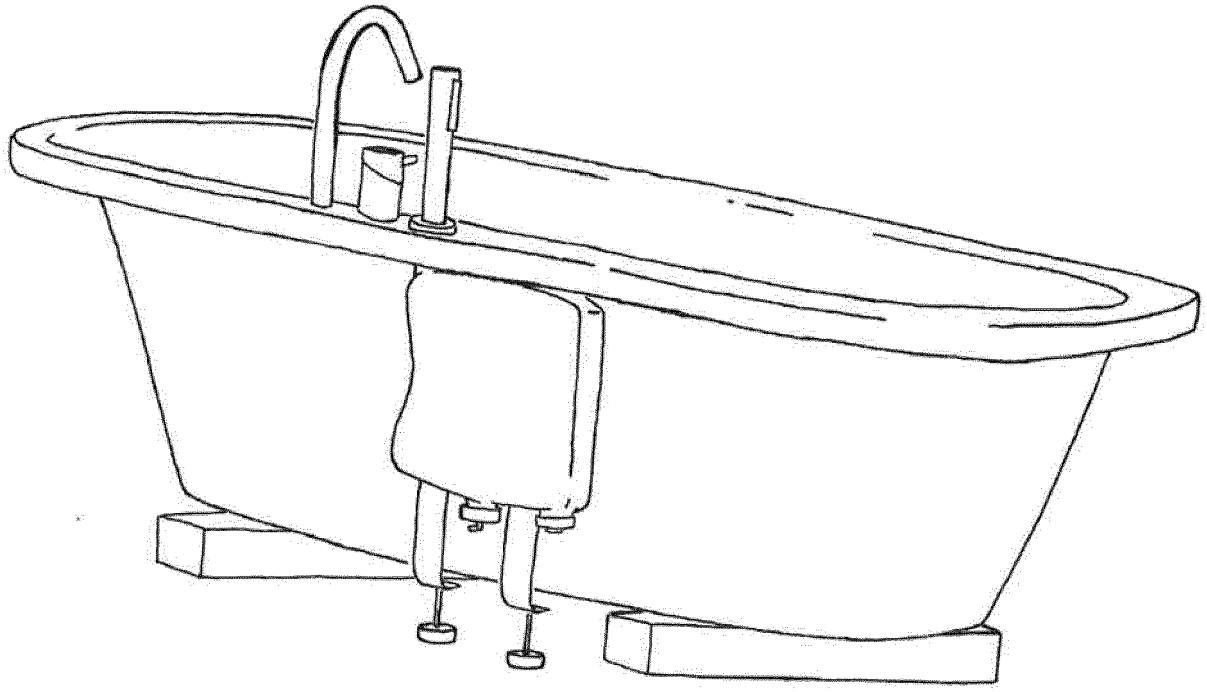

Fig 4

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EUROPEAN SEARCH REPORT

Application Number
EP 17 15 6609

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	DE 199 60 818 A1 (DESCH KURT MICHAEL [DE]) 16 November 2000 (2000-11-16) * figure 3c * -----	1-3,5-7, 9,10, 12-15	INV. E03C1/04
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X	DE 20 2008 015238 U1 (FRITZ EUGEN [DE]) 12 February 2009 (2009-02-12) * figure 1 * -----	1-7,9, 10,12,15	
			TECHNICAL FIELDS SEARCHED (IPC)
			E03C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	20 April 2017	Schikhof, Arnout

CATEGORY OF CITED DOCUMENTS

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20-04-2017

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DE 202008015238 U1	12-02-2009	NONE	

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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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