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(54) **Float for flush valves, modular-valve system featuring such a float and method for manufacturing such a float**

Schwimmer für Ablaufventil, modulares Ventilsystem mit einem solchen Schwimmer und Herstellverfahren für solch einen Schwimmer

Flotteur pour clapet de vidange, système de clapet modulaire comprenant un tel flotteur et méthode pour fabriquer un tel flotteur

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EP-A- 0 448 092 **DE-A- 4 327 061**
GB-A- 624 704 **GB-A- 2 077 790**

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Description

[0001] The present invention relates to a float for flush valves for use in lavatory flush tanks; to a modular-valve system featuring such a float; and a method for manufacturing such a float.

[0002] Floats currently used for flush valves are defined either by solid bodies made of material with a specific weight lighter than water, or by hollow bodies defining a sealed inner chamber of given volume and containing air to define a buoyancy chamber.

[0003] The first type are made of synthetic foam material, such as polystyrene, and the second normally of plastic.

[0004] A major drawback of floats made of solid material lighter than water lies in buoyancy being strictly dependent on and normally small with respect to the volume, and hence external size, of the float. As a result, such floats are invariably bulky and, being normally made of soft, friable material (such as polystyrene), are easily damaged both during assembly and in actual use.

[0005] Hollow floats, on the other hand, to be pressed, must normally comprise two parts or half-shells joined end to end about the edges, which poses serious problems in the manufacture of this type of float. A mechanical joint, even made using sophisticated techniques from gluing to hot-blade or ultrasonic welding, fails to ensure against water eventually seeping inside the float, thus resulting not only in the float eventually becoming unserviceable, but also, in the meantime, in a variation in the force and speed with which the float closes the valve. Moreover, assembly and sealing of such floats involve considerable cost.

[0006] Such floats are described in the documents GB-A-624 704 and GB-A-2 077 790.

[0007] It is an object of the present invention to provide a float which, besides eliminating the aforementioned drawbacks typically associated with the known state of the art, is so designed as to combine a small volume with a high degree of buoyancy. The need for a float combining these two characteristics arises from increasing demand from lavatory flush tank manufacturers for modular flush valves, which, with only a few minor component alterations, can be fitted to tanks of different volumes, and provide for varying amounts of discharge.

[0008] As such, the float, which is undoubtedly one of the most important valve components, must be small enough to fit inside small tanks, while at the same time being buoyant enough to also be used effectively in larger tanks designed for large discharge volumes.

[0009] According to the present invention, there is provided a float for flush valves, comprising a hollow body made of synthetic plastic material and defining internally a sealed buoyancy chamber; characterized in that said body is made in one seamless, rigid piece; in combination, said sealed buoyancy chamber having an inside pressure lower than atmospheric pressure.

[0010] The float according to the present invention is

also toroidal in shape so as to fit in sliding manner along a central tube of a flush valve supporting the shutter member.

[0011] The resulting float is therefore hollow, while at the same time being formed in one piece, thus safeguarding against water seeping between the joints and so impairing the buoyancy and efficiency of the float. Moreover, no high-cost techniques are required to obtain a perfectly sealed joint, and the float also has the great advantage of combining compactness with a high degree of buoyancy.

[0012] The invention also relates to a modular-valve system for lavatory flush tanks, comprising a first number of elements of fixed size, and a second number of elements connectable to the first to form a valve suitable for a given tank; said first number of elements comprising a float as described above.

[0013] A non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawing showing a schematic longitudinal section of a flush valve in accordance with the present invention.

[0014] Number 1 in the accompanying drawing indicates a flush valve for a known lavatory flush tank (not shown for the sake of simplicity), and which provides, on command, for opening and closing a drain outlet on the tank by means of a shutter member 6 carried integrally by a tube 3 housed in sliding manner inside a supporting structure 4 defined by two elements 4a and 4b fitted one inside the other at a region 5. Central tube 3 is fitted with a float 2, and valve 1 comprises an actuating device 17 for controlling partial or total discharge.

[0015] Float 2 is defined by a hollow body 2a made of synthetic plastic material and defining internally a sealed buoyancy chamber 2b, and, according to the invention, is so made that body 2a is formed in one seamless, rigid piece, and, in combination, the pressure inside sealed chamber 2b is lower than atmospheric pressure.

[0016] This is achieved by means of a special injection molding technique wherein float 2 is made from plastic material injected in the fluid state inside a mold in which a vacuum is subsequently formed, while the plastic material is still in the fluid state, so as to form a hollow, one-piece molding.

[0017] More specifically, the mold is designed to form a toroidal float 2 fittable to central tube 3 of valve 1.

[0018] A weight 7 about central tube 3 is free to move axially, and rests on an edge 8 of supporting structure 4; the top end of central tube 3 is connected by pins 9 to a head 11, which terminates with an eyelet 10 defining a seat for a first control lever; head 11 supports hooks 12 rotating about respective pins 13; and, in the position shown, hooks 12 engage weight 7 beneath a collar 14, and are rotated outwards about pins 13 to release weight 7 by the upward movement of further respective pins 15 integral with a second eyelet 16 defining a seat for a second control lever.

[0019] Actuating device 17, which comprises both eyelets 10 and 16, provides for partial or total discharge.

[0020] In actual use, the first lever in eyelet 10 raises central tube 3 to open the drain outlet and raise head 11 together with hooks 12, which in turn raise weight 7 by the underside of collar 14. When the control lever is released, shutter 6, together with tube 3, moves down to close the drain outlet, and, given the greater weight exerted on the shutter (due to weight 7), drops down rapidly to discharge only part of the water in the flush tank. Conversely, total discharge is effected using the second lever in eyelet 16, which raises pins 15 to release weight 7, which remains resting on supporting structure 4.

[0021] Shutter 6, together with tube 3, is therefore lighter, and, when the second lever is released, moves down more slowly and in opposition to the thrust exerted by float 2, to discharge all the water in the tank.

[0022] The valve described may form part of a flush valve system, for lavatory flush tanks, comprising a first number of elements of fixed size, and a second number of elements connectable to the first to form a valve suitable for a given tank. The first number of elements definitely comprises float 2 as described above, and, for example, shutter 6. And the second number of elements comprises, for example, tube 3, which must be of a length in proportion to the size of the tank; weight 7, which, given its function, must also conform with the size and water capacity of the tank; and definitely the part defining supporting structure 4, which must adapt to the size of the tank.

[0023] Clearly, changes may be made to the float and modular-valve system as described herein without, however, departing from the scope of the accompanying Claims.

Claims

1. A float (2) for flush valves, comprising a hollow body (2a) made of synthetic plastic material and defining internally a sealed buoyancy chamber (2b); **characterized in that** said body (2a) is made in one seamless, rigid piece; and **in that**, in combination, said sealed buoyancy chamber (2b) has an inside pressure lower than atmospheric pressure.
2. A float as claimed in the Claim 1, **characterized by** being toroidal in shape so as to be fittable to a central tube (3) of a flush valve (1).
3. A flush valve (1), **characterized by** comprising a float (2) as described in Claims 1 or 2.
4. A flush valve as claimed in Claim 3, **characterized by** comprising an actuating device (17) for effecting a partial flush or a total flush.
5. A modular flush valve system for lavatory flush

tanks, **characterized by** comprising a first number of elements (2) of fixed size, suitable for any tank to be assembled, and a second number of elements (3, 7, 4) connectable to the first to form a valve (1) suitable for a predetermined tank; said first number of elements comprising a float (2) as claimed in one of Claims 1 or 2.

6. A method for manufacturing a flush valve float (2) having a hollow body (2a) made of synthetic plastic material and defining internally a sealed buoyancy chamber (2b), the method being **characterized by** comprising the steps of:

- injecting a fluid state plastic material inside a mold;
- subsequently forming a vacuum in the mold, while the plastic material is in the fluid state,
- and forming a hollow, one-piece molding which defines said body (2a), so that said body (2a) is made in one seamless, rigid piece and said sealed buoyancy chamber (2b) has an inside pressure lower than atmospheric pressure.

Patentansprüche

1. Schwimmer (2) für Ablauf- bzw. Spülventile, umfassend einen Hohlkörper (2a), der aus synthetischen Kunststoffmaterial gefertigt ist und im Inneren eine abgedichtete Auftriebs- bzw. Schwimmerkammer (2b) definiert, **dadurch gekennzeichnet, daß** der Körper (2a) in einem nahtlosen, starren Stück gefertigt ist; und daß im Verbund dieser abgedichtete Auftriebskörper (2b) einen Innendruck niedriger als der Atmosphärendruck aufweist.
2. Schwimmer nach Anspruch 1, **dadurch gekennzeichnet, daß** er in der Form ringförmig ist, um in ein zentrales Rohr (3) eines Ablaufventils (1) einsetzbar zu sein.
3. Ablauf- bzw. Spülventil (1), **gekennzeichnet durch** ein Umfassen eines Schwimmers (2), wie er in Ansprüchen 1 oder 2 beschrieben ist.
4. Ablaufventil nach Anspruch 3, **gekennzeichnet durch** ein Umfassen einer Betätigungsvorrichtung (17), um ein teilweises Spülen oder ein vollständiges Spülen durchzuführen.
5. Modulares Ablauf- bzw. Spülventilsystem für Toilettenspülbehälter, **gekennzeichnet durch** ein Umfassen einer ersten Anzahl von Elementen (2) mit feststehender Größe, die für jeden Behälter, der zusammenzubauen ist, geeignet sind und einer zweiten Anzahl von Elementen (3, 7, 4), die mit der ersten verbindbar ist, um ein Ventil (1) auszubilden,

das für einen vorbestimmten Behälter geeignet ist; weiche erste Anzahl von Elementen einen Schwimmer (2), wie in einem der Ansprüche 1 oder 2 beansprucht ist, umfaßt.

6. Verfahren zur Herstellung eines Ablauf- bzw. Spülventilschwimmers (2), der einen Hohlkörper (2a) aufweist, der aus synthetischem Kunststoffmaterial gefertigt ist und im Inneren eine abgedichtete Auftriebs- bzw. Schwimmerkammer (2b) umfaßt, welches Verfahren durch das Umfassen der Schritte gekennzeichnet ist:

- Einspritzen eines Kunststoffmaterials in fluidem Zustand in eine Form;
- nachfolgendes Ausbilden eines Vakuums in der Form, während das Kunststoffmaterial in dem fluiden Zustand vorliegt;
- und Ausbilden einer hohlen, einstückigen Form, welche den Körper (2a) definiert, so daß der Körper (2a) in einem nahtlosen, starren Stück gefertigt ist und daß die abgedichtete Auftriebskammer (2b) einen Innendruck niedriger als der Atmosphärendruck ausweist.

adapté pour un réservoir prédéterminé ; ledit premier nombre d'éléments comprenant un flotteur (2) tel que représenté dans l'une des revendications 1 ou 2.

6. Méthode pour fabriquer un flotteur de clapet de vidange (2) ayant un corps creux (2a) constitué d'une matière plastique synthétique et définissant en interne une chambre de flottabilité scellée (2b), cette méthode étant **caractérisée par** les étapes consistant à :

- injecter un matériau plastique à l'état fluide dans un moule ;
- former ensuite un vide dans le moule, cependant que le matériau plastique est à l'état fluide ;
- et former un moulage creux d'une seule pièce qui définit ledit corps (2a), de façon que ledit corps (2a) soit fait d'une pièce rigide sans joint et que ladite chambre de flottabilité scellée (2b) a une pression intérieure inférieure à la pression atmosphérique.

Revendications

1. Flotteur (2) pour clapets de vidange, comprenant un corps creux (2a) fait de matériau plastique synthétique et définissant de façon interne une chambre de flottabilité scellée (2b) ; **caractérisé en ce que** ledit corps (2a) est constitué d'une pièce rigide sans joint ; et **en ce que**, en combinaison, ladite chambre de flottabilité scellée (2b) présente une pression interne plus faible que la pression atmosphérique.
2. Flotteur selon la revendication 1, **caractérisé en ce qu'il** est de forme toroïdale de façon à pouvoir être monté sur un tube central (3) d'un clapet de vidange (1).
3. Clapet de vidange (1) **caractérisé en ce qu'il** comprend un flotteur (2) ainsi que décrit dans les Revendications 1 ou 2.
4. Clapet de vidange selon la revendication 3, **caractérisé en ce qu'il** comprend un dispositif d'actionnement (17) pour réaliser une vidange partielle ou une vidange totale.
5. Système de clapet de vidange modulaire pour réservoirs de vidange de toilettes, **caractérisé en ce qu'il** comprend un premier nombre d'éléments (2) de taille fixe, adapté à tout réservoir à assembler, et un second nombre d'éléments (3, 7, 4) connectables au premier pour constituer un clapet (1)

