ABSTRACT: In a recirculating toilet construction having a tank with an outlet opening at its bottom, a gate slide valve is provided for draining the tank. The slide valve is sealingly mounted below the tank and has a second seal connecting the valve housing to an outlet pipe. A single bracket fastens the valve to the tank and to the outlet pipe.
The present invention relates to toilet arrangements which are particularly useful for installations in house trailers, boats, buses, trailers or similar mobile, semimobile or stationary installations. The toilet arrangement described herein involves generally a toilet bowl mounted on a storage tank with a filter pump assembly mounted within the tank to recirculate flushing fluid such as has been generally shown in the copending application for patent of William F. Katona et al., Ser. No. 590,757, now U.S. Patent No. 3,356,221, issued Dec. 5, 1967.

While similar arrangements have heretofore been provided for use in aircraft, the present arrangement is featured by its simplicity, inexpensiveness and compactness.

It is therefore a general object of the present invention to provide an improved toilet arrangement particularly useful in a practical and commercial sense for the above indicated purposes.

The features of the present invention which are believed to be novel are set forth with particularity in the appended claims. This invention itself, both as to its organization and manner of operation, together with further objects and advantages thereof, may be best understood by reference to the following description taken in connection with the accompanying drawings, in which:

FIG. 1 is generally a top plan view of a construction embodying features of the present invention, with some parts broken away to show internal constructions.

FIG. 2 is a view in side elevation with a portion of the tank broken away, and corresponds generally to a view taken along line 2-2 of FIG. 1.

FIG. 3 is a view taken substantially as indicated by line 3-3 in FIG. 2, with a portion of the odor seal broken away.

FIG. 4 is a view taken as indicated by the line 4-4 in FIG. 3.

FIG. 5 is a sectional view taken substantially on line 5-5 of FIG. 2.

FIG. 6 is a sectional view taken substantially on line 6-6 of FIG. 5.

FIG. 7 is a sectional view taken on line 7-7 of FIG. 2.

FIGS. 8 and 9 are sectional views taken on line 8-8 and 9-9, respectively, in FIG. 7.

The bowl 10 and tank 12 may be integrally formed and may be fabricated in accordance with conventional plastic moulding techniques, although it will be understood that, as illustrated, the bowl 10 and tank 12 may be separately formed and mechanically or chemically sealed together. In some instances, the tank 12 may be an existing tank on a house trailer normally used in storage of waste water from the trailer sink, shower and/or lavatory and suitably adapted to receive and mount the filter and pump assembly indicated at 14.

The assembly 14 includes a multipart housing 16 having an upper flanged portion 18 through which a series of screws 20 (FIG. 5) extends for fastening the assembly to the upper surface of tank 12 with a sealing gasket 22 sandwiched therebetween.

This multipart housing 16 is formed with a passageway 24 which terminates in an upper nipple portion 26 for convenient attachment of one end of a flexible hose 28 having its other end attached to a nipple portion 30 integrally formed with bowl 10 to thereby provide a confined path through which flushing fluid may flow from the tank 12 and into bowl 10 for return to the tank 12.

Preferably, as shown in FIGS. 2 and 3, the throat portion 10A of bowl 10 is generally elliptical and is fitted with a collapsible sleeve 10B which is normally closed to provide an odor seal, but which automatically opens under slight fluid pressure exerted on the sleeve.

The toilet seat 32 is hingedly mounted by hinge structure 32A on a tank 12 and has a cover 34 hinged thereeto.

Referring now to the detailed construction of the pump filter assembly 14 in FIG. 5, it is seen that the multipart housing 16 includes an upper cylindrical housing element 36 having the flanged portion 18 within which a drive motor 38, a protective fuse, and a time delay motor control switch 40 are disposed, the motor 38 being mounted on the base portion 36A by bolts 42, with its shaft 38A extending into an annular chamber 44 defined by a cup-shaped element 48 fitted within housing element 50 and disposed between an internal shoulder portion 50A and an annular flanged portion 36B of housing element 36.

The time delay switch 40 is mounted on the cover member 52 by bolts 53, with a manually operable pushbutton 54 extending through the cover. The switch 40 is of conventional construction and is operatively connected to pushbutton 54 such that depression and release of button 54 causes the switch 40 to close and remain closed only for, for example, 5 or 10 seconds, at which time the switch times itself out and returns to its normally open condition. The switch 40 is connected electrically in series with the motor 38 and power leads by flexible wires (not shown) in housing element 36. Such power leads sealingly entering the housing element 36 are also omitted from the drawings for purposes of simplification.

Motor shaft 38A is coupled by flexible coupling element 54 to the upper end of an impeller pump shaft 56. The shaft extends sealingly through the base portion 48A of housing element 48 and carries a small gear 58 meshing with a larger gear 60 on shaft 62. The shaft 62 is in sealed chamber 64 which may be filled with a lubricant.

These shafts 56, 62 extend sealingly through the large base portion of housing element 50 which provides a bearing for the same and into and through the housing and spacer element 66 and also through a thick wall portion 68A of pump casing element 68 which provides a bearing for the lower ends of shafts 56, 62.

A pump impeller 70 is on shaft 56 and serves to pump fluid upwardly, as indicated by the arrows, in a path which extends through an apertured portion 72A of a closure plate 72, such apertured portion being centrally aligned with the rotational axis of impeller 70 which acts as an element of a centrifugal pump to propel the fluid upwardly into the radially displaced passageway or channel 24 defined by aligned apertured portions in elements 66 and 68.

The lower end of shaft 62 mounts a gear 76 meshing within an internal gear 78 integrally formed on a filter element 80 which is rotated at a slower speed than rotor or impeller 70. The filter element 80 is cup-shaped and in addition to being formed with the internal gear 78 is formed with a plurality of circumferentially extending slit portions 80A which limit the size of particles that may enter the pump chamber. The filter element 80 is rotatably supported and cleaned by two straps or L-shaped wiper elements 84, each of which has a series of toothed portions 84A extending into outer circumferentially extending grooved portions 80B on the filter element 80, each of such wiper elements 84 being supported as a cantilever by fastening screws 86 threaded into the stationary pump housing 68.

The base portion of the filter element may also be provided with one or more series of slits, as indicated at 80C in FIG. 6.

The wipers 84 thus provide a bearing member for supporting the filter element 80, and also the upper portion 80E of the filter element 80 cooperates with a circular undercut portion 68D of pump housing 68 with such portion 68D also serving as a bearing element.

The housing elements 66, 68, 50 and 36 may be interconnected using various techniques such as, for example, threaded fasteners as exemplified by a series of fasteners 90 in FIG. 5 which serve to semi-permanently interconnect the elements 66 and 50.

The lower end of tank 12 is shown closed by a gate valve assembly 100 or may be fitted with a drain connection for a valve mounted under the floor, and is secured to a floor F of,
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for example, a building such as a trailer using the following construction. (FIGS. 2, 7, 8 and 9)

A drain pipe 102 is fitted with a threaded flange 104 which is secured to the floor F by screws 106.

The tank 12 is provided with an annular base portion 12A which rests on the floor F. A part of this base portion is in the form of a removable closure member 108 for gaining access to the drain valve 100 and gaining access to mounting studs 146. (FIG. 8)

The valve housing 110 or drain adapter is secured to the tank 12 by a series of screws 112 (FIG. 9) with an annular seal 116 within a grooved portion of tank 12 being contacted by a raised bead portion of a plate 118 that serves to retain the annular valve seat 120. A movable valve member 124 in the form of a sliding gate is slidably mounting in housing 110 for cooperation with the seat 120 to close the valve. The valve may be opened by removing the closure member 108 and actuating the handle 128, the handle 128 being on one end of a rod 130 attached to closure member 124.

As seen in FIG. 2, the valve housing 110 is fitted into a heavy rubber ring 140, as seen in FIG. 8, such ring 140 is clamped to the flange 104 using a series of studs 146 and brackets 148.

As shown in FIG. 7, the closure member 108 is a flexible curved plate and is provided with a hooked portion 108A at each of its ends whereby the same may be quickly attached to and detached from the stationary base portion 12A to gain access to the valve handle 128 or mounting studs 146.

Initially, the tank 12 is precharged with a mixture of water and conventional chemicals to the level indicated in FIG. 2. The bowl 10 may be flushed at any time by depressing and releasing button 54 in which case fluid in tank 12 is circulated by the impeller pump 70, with the filter basket 80 rotating and being cleaned by the stationary finger portions or blades 84A.

It will be seen that the assembly 14 may be conveniently disassembled as a unit from tank 12 for repair or replacement purposes by removing the fastening bolts 20, disconnecting the hose connection 28 and then pulling the unit upwardly through the apertured portion in the upper surface of tank 12 which normally supports the entire unit 14. When this is accomplished, access is also had to the odor seal for replacement purposes.

While the particular embodiments of the present invention have been shown and described, it will be obvious to those skilled in the art that changes and modifications may be made without departing from this invention in its broader aspects and, therefore, the aim in the appended claims is to cover all such changes and modifications as fall within the true spirit and scope of this invention.

I claim:

1. A toilet system including a tank having an outlet opening at its bottom; a gate slide valve having a housing and a gate valve element slidably mounted in said housing; first means sealingly interconnecting said housing to said outlet opening, including a raised bead on said housing engaging a seal ring within a grooved portion of said tank; and outlet pipe; second means sealingly interconnecting said housing to said outlet pipe, including a flange secured to said outlet pipe; a second seal ring between said flange and said housing; a bracket element; first fastening means securing said bracket element to said tank to press the first-mentioned seal ring between said housing and said tank; and second fastening means securing said bracket element to said flange to press said second seal ring between said housing and said flange; said valve element being slidable in said housing to effect a communication between said outlet opening and said outlet pipe.