Dec. 29, 1970 H. W. JONG 3,550,163

TOILET CONSTRUCTION

Filed March 5, 1969 2 Sheets-Sheet 1

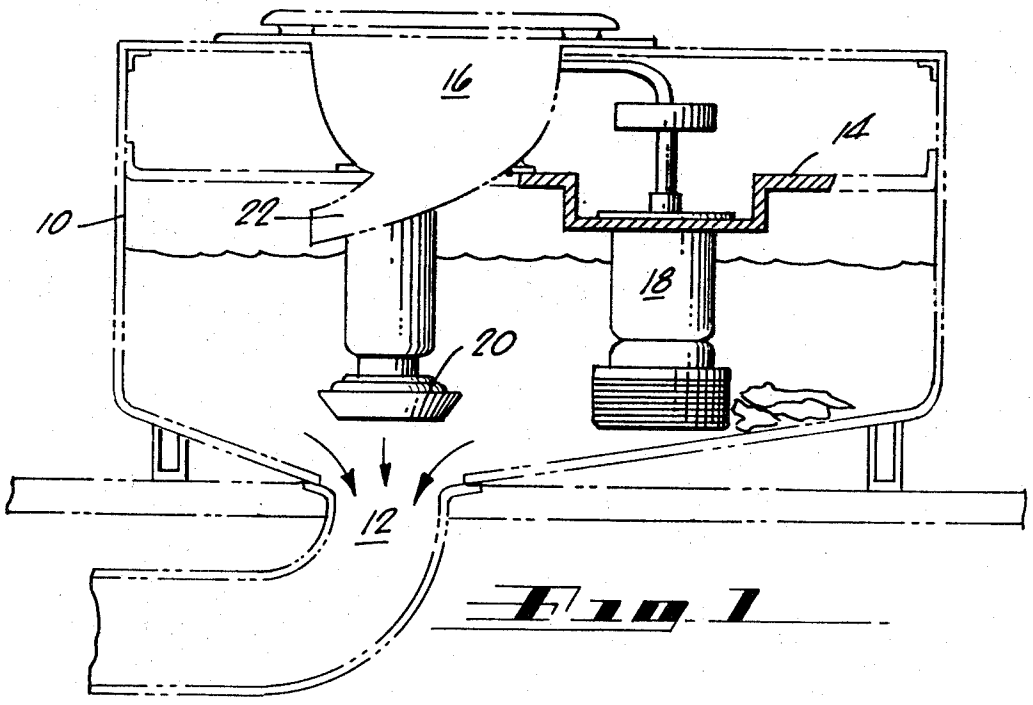


Fig. 1

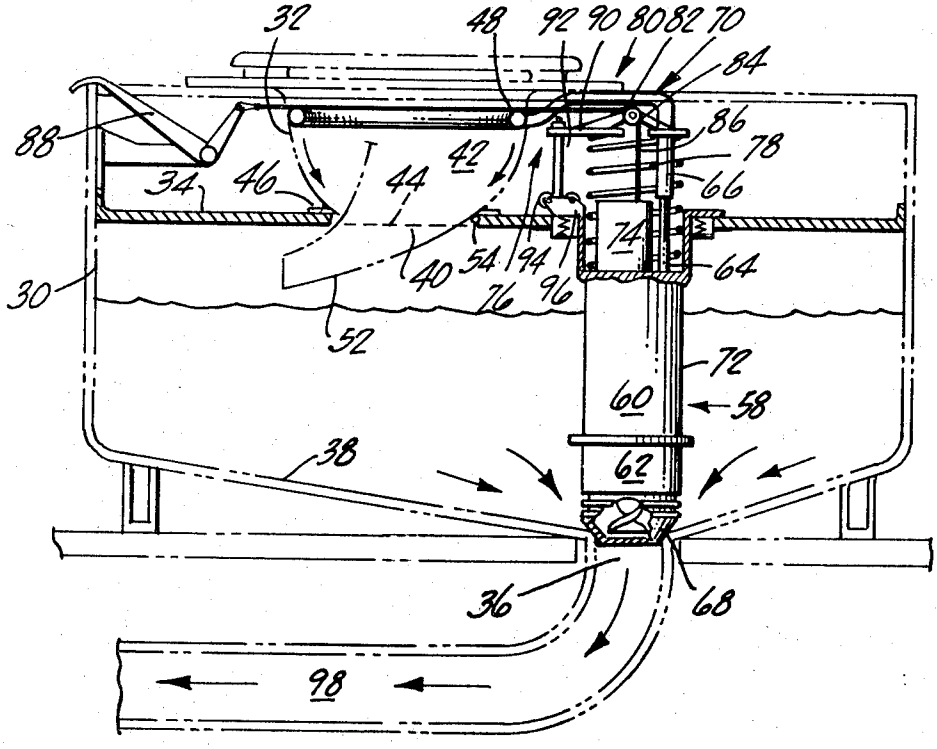


Fig. 2

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2 Sheets-Sheet 2

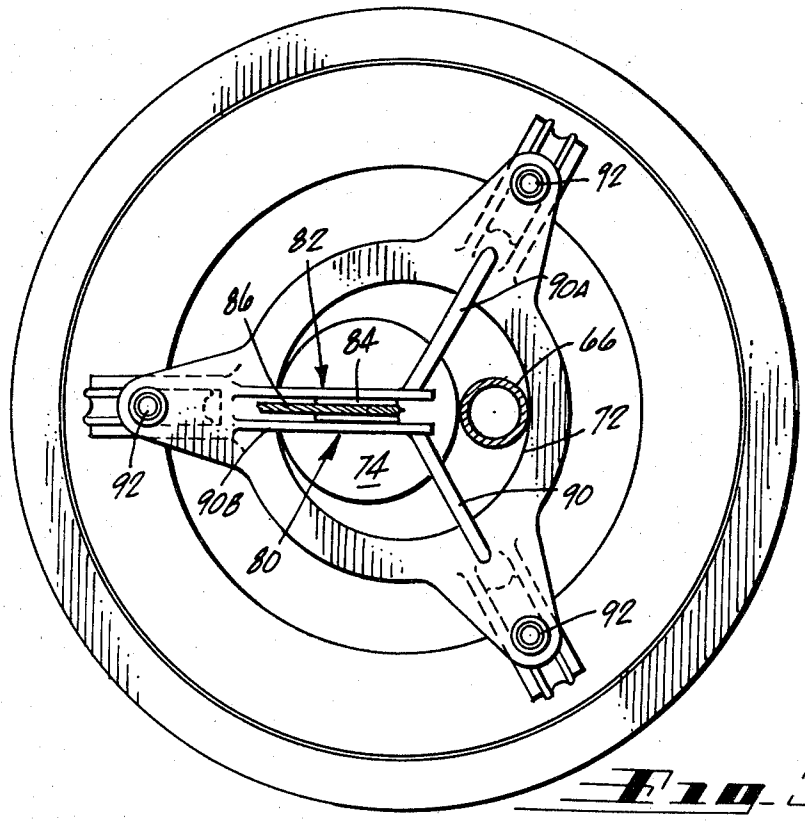


Fig. 3

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TOILET CONSTRUCTION

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Int. Cl. E03d 1/00, 3/00, 5/00
U.S. Cl. 4—10 8 Claims

ABSTRACT OF THE DISCLOSURE

A recirculating, flush-type toilet including a pump-filter assembly and a drain valve secured in a storage container adapted to be drained periodically. The pump-filter assembly and the drain valve are incorporated into a single vertical lift arrangement which provides unrestricted egress of the contents in the storage container when the drain valve is actuated during servicing.

BACKGROUND OF THE INVENTION

The present invention relates to toilet constructions which are particularly useful for installation in aircraft, house trailers, boats, buses, and other mobile, semimobile, or stationary installations.

The sewage systems used in various commercial and business transportation vehicles such as planes and buses are generally self-contained and include a flush bowl mounted on a container having commercial water solution therein for flushing and deordorization. To flush the contents of the bowl into the container, a power-operated pump is energized to force the solution from the container through a manifold surrounding the upper portion of the flush bowl, and allowing the side walls of the flush bowl to wash the contents thereof into the container. The flushing solution is filtered during such flushing cycle by suitable filter means to remove the solid particles therefrom so that the pump and manifold will not be clogged.

Since in aircraft and other mobile vehicle applications, all waste elements are initially stored in the container and subsequently cleaned out at appropriate service stations, the self-contained toilet systems generally include a drain port located at the lowest portion of the container, and a drain valve for controlling the opening and closing of the drain port. During servicing the drain valve is lifted to empty the contents overboard into a service tank. However, a serious problem encountered in using conventional self-contained recirculating, flush-type toilets is that towels and other debris do not drain due to obstruction of the motor pump and filter assembly which protrudes into the container in a fixed position constituting a flow obstruction. Such flow obstructions cause extension of service time resulting in flight delay. Thus, it is a direct improvement on the state-of-the-art to provide a toilet construction of the recirculating, flush-type which would eliminate all obstructions and produce unrestricted drainage during servicing.

SUMMARY OF THE INVENTION

In carrying out the principles of this invention according to one embodiment thereof, there is provided a recirculating, flush-type toilet comprising a storage container with a drainage opening formed at its bottom, and a drain valve which is normally biased to position over the drainage opening for retaining liquid in the container. A pump is positioned adjacent to the bottom of the container for circulating liquid from the container to a bowl for flushing contents therein into the container. A lifting means connected to the pump and the drain valve is provided for lifting the valve and the pump vertically from a close position to an open position, whereby an exit path

is formed by the liquid passing through the drainage opening, with the pump being outside the exit path thereby allowing unrestricted drainage during servicing.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a vertical sectional view through a conventional self-contained sewage system;

FIG. 2 is a vertical sectional view through a sewage system involving the invention; and

FIG. 3 is a top view of the system shown in FIG. 2.

DETAILED DESCRIPTION OF THE SHOWN EMBODIMENT

FIG. 1 illustrates a conventional self-contained sewage system having a container **10** which includes a drainage opening **12** formed in its bottom portion. The container **10** has secured therein a partition **14** which is designed to support substantially all of the operating components of the sewage system. A flush bowl **16**, a pump-filter assembly **18**, and a drainage valve **20** are secured in one manner or another to the partition **14**.

In the operation of the system, the filter pump assembly **18** draws fluid from the container **10** and pumps it into a manifold around the upper periphery of the bowl **16** from which it flows through a plurality of openings in the manifold along the inside of the bowl **16** in a swirling manner to wash the contents of the bowl **16** through a spout **22** and into the container **10**.

After a number of uses the contents in the container **10** will be increased and drainage becomes necessary. Drainage from the contanier **10** is provided by the drainage opening **12** which is controlled by the drainage valve **20**. In the conventional system as shown in FIG. 1 the drainage valve **20** and the filter-pump assembly **18** are two separate assemblies with the latter being placed in a fixed position. When the drainage valve **20** is placed in an open position for drainage, the filter-pump assembly **18** remains stationary and constitutes a flow obstruction for towels and other debris. Such flow obstruction causes extension of service time and results in flight delay.

Shown in FIG. 2 is a self-contained sewage system of the recirculating types which eliminates all obstructions and produces unrestricted drainage during servicing. It includes a container **30** having commercial water solution therein for flushing and deodorization and a flush bowl **32** mocnted thereon. The container **30** has a cover **34** secure therein and a drainage opening **36** formed in its bottom portion **38**. The cover **34** has an aperture **40** formed therein and is designed to support substantially all of the operating components of the system so that they may easily be removed for maintenance purposes.

The flush bowl **32** has a main body portion **42** and a discharge outlet **44**. An angular flange **46** is secured around the lower periphery of the discharge outlet **44** and extends horizontally therefrom to engage the cover **34** around the periphery of aperature **40** to support the flush bowl **32** on the cover **34**. A manifold **48** which extends substantially around the main bowl body portion **42** adjacent to the top thereof is provided for directing flow of flushing liquid downwardly over the interior of the main bowl body portion **46** and thence into the container **30**.

A spout **52** is pivotally connected to the flange **46** by a suitable hinge **54** which is secured thereto to permit movement of the spout **52** to a normal position, as shown in FIG. 2, wherein waste material in the bowl **32** is flushed through the spout **52** and into the container **30** at a point spaced laterally from directly below the discharge outlet **44**. In this normal position the contents of the container **30** are visible through the flush bowl **32** and the liquid in the container **30** will not be splashed into the bowl **32**. When necessary the spout **52** may be manu-

ally pivoted to an inactive position wherein waste material can drop directly from the flush bowl 32 into the container 30 without flushing it through the spout 52. To hold the spout 52 in its normal position, flexible pressure clamps are secured to the spout at spaced intervals around the upper periphery thereof which release the spout when downward pressure is applied thereto.

The sewage system as shown in FIG. 2, further includes a pump-filter assembly 58 which is supported by the cover 34 of the container 30. The pump-filter assembly 34 comprises a pump 60 and a filter 62. The pump 60 includes an inlet connected to withdraw liquid from the container 30 adjacent to the bottom thereof and an outlet 64 connected to the manifold 48 through a receiving member 66. The filter 62 is positioned to surround the inlet of the pump 60 for preventing large particles from flowing therethrough. The pump-filter assembly 58 provides circulating means for circulating liquid from the container 30 to the manifold 48 and from which the liquid flows along inside of the bowl 32 to wash the contents therein into the container 30 through the spout 52.

Positioned below the filter 62 is a drain valve or stopper means 68 which is positioned over the drainage opening 36 for retaining liquid in the container 30. The operation of the drain valve 68 is controlled by lifting means 70 which is provided for lifting the drain valve 68 from a closed position to an open position for drainage during servicing. The lifting means 70 comprises a housing 72 which is substantially a cylindrical member adapted for vertical movement. The housing 72 has fixedly secured thereto at its lower extremity the drain valve 68 and at its upper extremity a motor 74 for operation of the pump 60, the pump 60 and the filter 62 being supported by and positioned within the housing 72. In this configuration the motor driven pump 60, filter 62, and drain valve 68 are incorporated into a single vertical lift arrangement which offers the advantage of unrestricted egress of the contained fluids and solids in the container 30 when the drain valve 68 is placed in its open position during servicing.

The lifting means 70 further comprises guide means 76 for guiding the vertical movement of the housing 72, bias spring means 78 for normally biasing the drain valve 68 into the close position on the drainage opening 36, and actuating means 80 for causing vertical movement of the housing 72 in opposition to force exerted by the bias spring 78.

The actuating means 80 comprises a pulley 82 which includes a small wheel 84 used to transmit power by means of a control cable 86 passing over its grooved rim. The control cable 86 has one end fixedly secure to the casing of the motor 74 and its other end connected to a handle 88 through which a person may apply force to cause the housing and the components secured thereto to lift vertically away from the drainage opening 36 thereby allowing unrestricted drainage of the contents in the container 30. The pulley 82 is supported by three pulley supports 90, 90A and 90B. Each pulley support is secured to the guide means 76. The guide means 76 includes three guide rods 92 each being secured to the cover 34 and upstanding therefrom. The rods 92 are positioned apart from each other approximately 120°. In operative association with each rod 92 is a pair of rollers 94 which are fixedly secure to the housing 72 through roller supports 96, the rollers being adapted for rolling contact with rods 92 when the housing 72 is moving vertically.

The bias means 78 includes a spring which is positioned intermediate the housing 72 and the pulley supports for normally biasing the housing 72 and consequently the valve 68 into a close position on the drainage opening 40. The discharge outlet 64 of the pump 60 is a cylindrical member having a diameter slightly less than the diameter of the receiving member 66 within which the outlet 64 is

slidably mounted in a telescopic arrangement. The receiving member 66 is connected to the manifold 48 for delivering liquid thereto.

In operation of the system, the motor driven pump 60 draws liquid from the container 30 and delivers it to the manifold 48 through the discharge outlet 64 and the receiving member 66. From the manifold 48, which is positioned around the upper periphery of the bowl 32, the liquid flows throuhg a plurality of openings in the manifold 48 along the inside of the bowl 32 in a swirling manner to wash the contents of the bowl through a spout 52 and into the container 30. After a number of uses and when drainage is necessary, a force is applied to the handle 88 to cause the housing 72 and all the components secured thereto including the pump filter and drainage valve to lift vertically from a close position to an open position away from the drainage opening 36. When the drainage opening 36 is opened an exit path is formed by the liquid passing therethrough, with the housing 72 and the pump-filter assembly 58 being outside the exit path thereby allowing unrestricted drainage of the contents in the container 30 through a drainage tube 98. When the force applied to the handle 88 is stopped, the spring 78 causes descent of the housing 72, pump 60, filter 62 and the valve 68 into position to close the drainage opening 40. Vertical lift and descent movement of the housing 60 is guided by the guide means 72 which includes rods 92 and rollers 94.

I claim:

1. A self-contained sewage system comprising:
   - a container having a bottom portion and a drainage opening formed in said bottom portion;
   - a bowl mounted on said container and having a discharge opening therefrom projecting into said container;
   - stopper and circulating means positioned adjacent said bottom portion over said drainage opening for retaining liquid in said container and for circulating liquid from said container to said bowl; and
   - lifting means for lifting said stopper and circulating means from a closed position to an open position, whereby an exit path is formed by the liquid passing through said drainage opening and whereby said stopper and circulating means when lifted by said lifting means to the open position are outside said exit path thereby allowing unrestricted drainage.

2. The sewage system of claim 1 including bias means for normally biasing said stopper and circulating means into said closed position on said drainage opening for retaining liquid in said container.

3. The sewage system of claim 2 wherein said lifting means comprise:
   - a housing having secured thereto said stopper and circulating means, said housing being adapted for vertical movement;
   - guide means for guiding the vertical movement of said housing; and
   - actuating means for actuating vertical movement of said housing in opposition to said bias means.

4. The sewage system of claim 3 wherein said guide means include:
   - at least one guide rod secured to said container and upstanding therefrom; and
   - at least one roller secured to said housing, said roller being adapted for rolling contact with said guide rod when said housing is moving vertically.

5. The sewage system of claim 3 wherein said actuating means include:
   - a control cable having one end fixedly secured to said housing; and
   - pulley means secured to said guide means and in operative association with said control cable for actuating vertical movement of said housing.

6. A self-contained sewage system comprising:

a storage container having a bottom portion and a drainage opening formed in said bottom portion;

a bowl mounted on top of said container and having a discharge opening therefrom projecting into said container;

a housing adapted for vertical movement and having fixedly secured thereto pump means and drain valve means, said pump means having an inlet connected to withdraw liquid from said container adjacent to the bottom thereof, said pump means being connected to discharge into said bowl, said drain valve means controlling said drainage opening;

bias means for normally biasing said drain valve means into a closed position on said drainage opening to retain liquid in said container; and

actuating means for actuating said housing and said drain valve means into an open position thereby allowing unrestricted drainage through said drainage opening.

7. The sewage system of claim 6 including:

a manifold extending substantially around said bowl adjacent to the top thereof for receiving liquid from said pump means and for directing flow of flushing liquid downwardly over the interior of said bowl and thence into said container; and

filter means surrounding said inlet of said pump means for preventing large particles from flowing therethrough.

8. A self-contained sewage system comprising:

a storage container having a bottom portion and a drainage opening formed in said bottom portion;

a bowl mounted on top of said container and having a discharge opening therefrom projecting into said container; and

a housing having fixedly secured thereto pump means and drain valve means, said pump means having an inlet connected to withdraw liquid from said container adjacent to the bottom thereof and having an outlet connected to discharge into said bowl, said drain valve means controlling said drainage opening, said housing being movable to move said drain valve means from a closed position to an open position thereby allowing drainage from said storage container which is unrestricted by said pump means and said drain valve means.

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