

# United States Patent

[11] 3,593,346

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 [45] Patented **July 20, 1971**  
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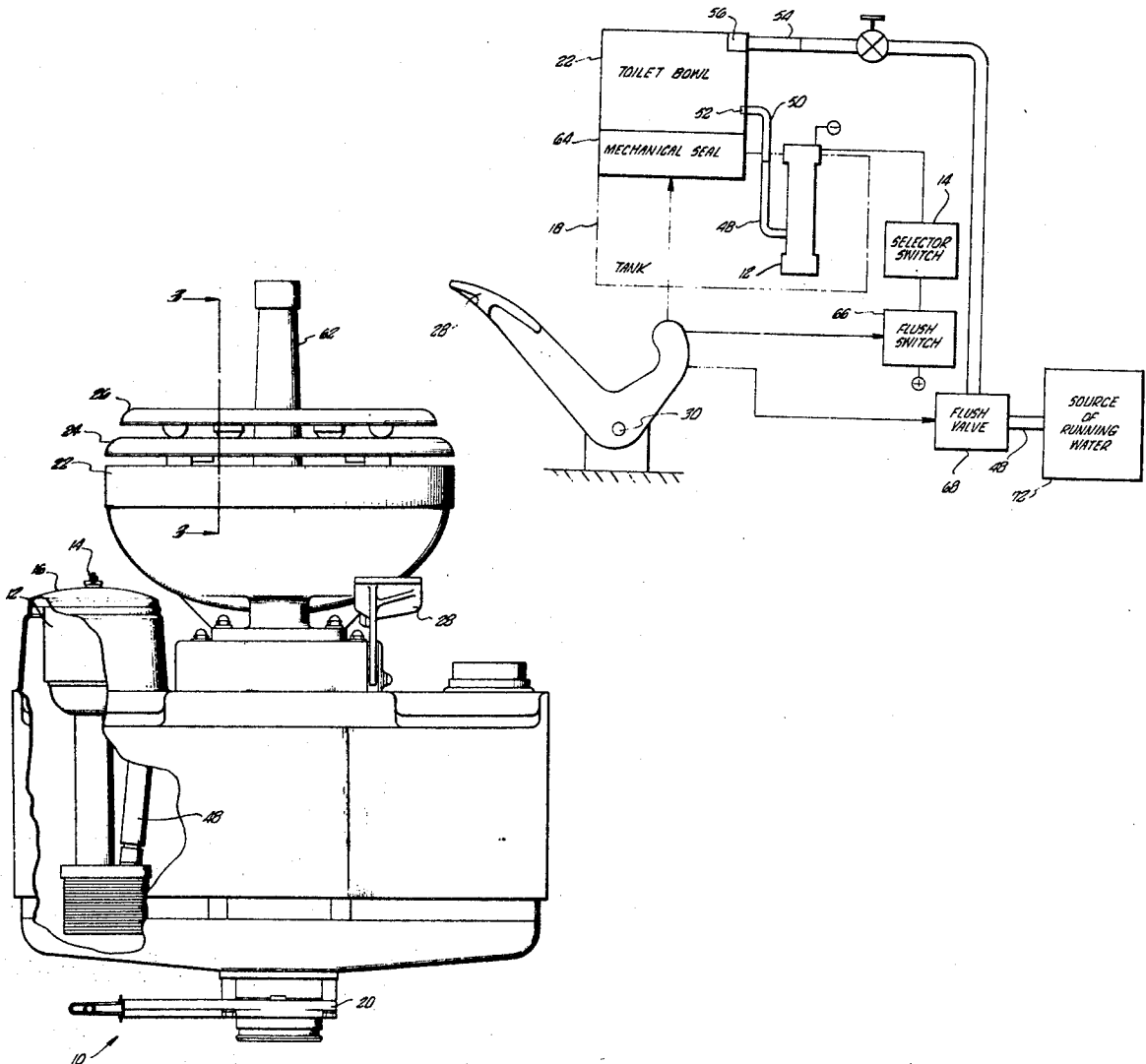
[54] **DUAL MODE RECIRCULATING TOILET SYSTEM**  
 7 Claims, 12 Drawing Figs.

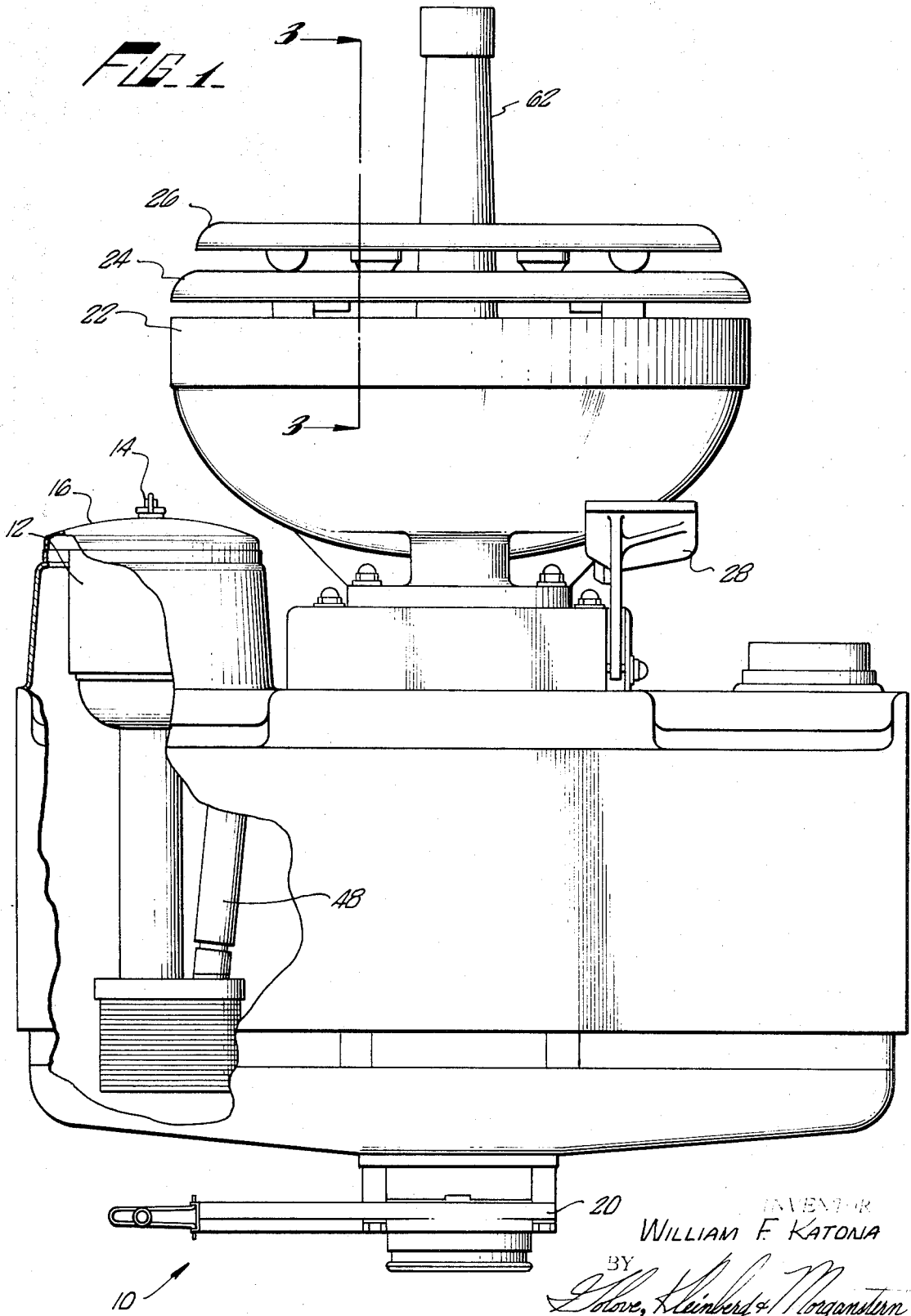
[52] U.S. Cl. .... 4/10, 4/78, 4/90  
 [51] Int. Cl. .... E03d 1/00, E03d 3/00, E03d 5/00  
 [50] Field of Search ..... 4/78, 10, 77, 76, 80, 87, 90, 115, 111, 116

[56] **References Cited**  
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**ABSTRACT:** A novel toilet system is disclosed which is alternatively operable on a recirculating fluid supply or an external water supply. A foot-operated pedal, in combination with a switch selector, opens a mechanical seal to a holding tank and energizes the flushing operation. A novel, slide valve directs the flushing fluid from the selected source.

In a specific embodiment, the toilet retracts into a wall fixture and combines a movable bowl member with a fixed receiver member. Separate flush lines clean the bowl and the receiver when in the retracted configuration.

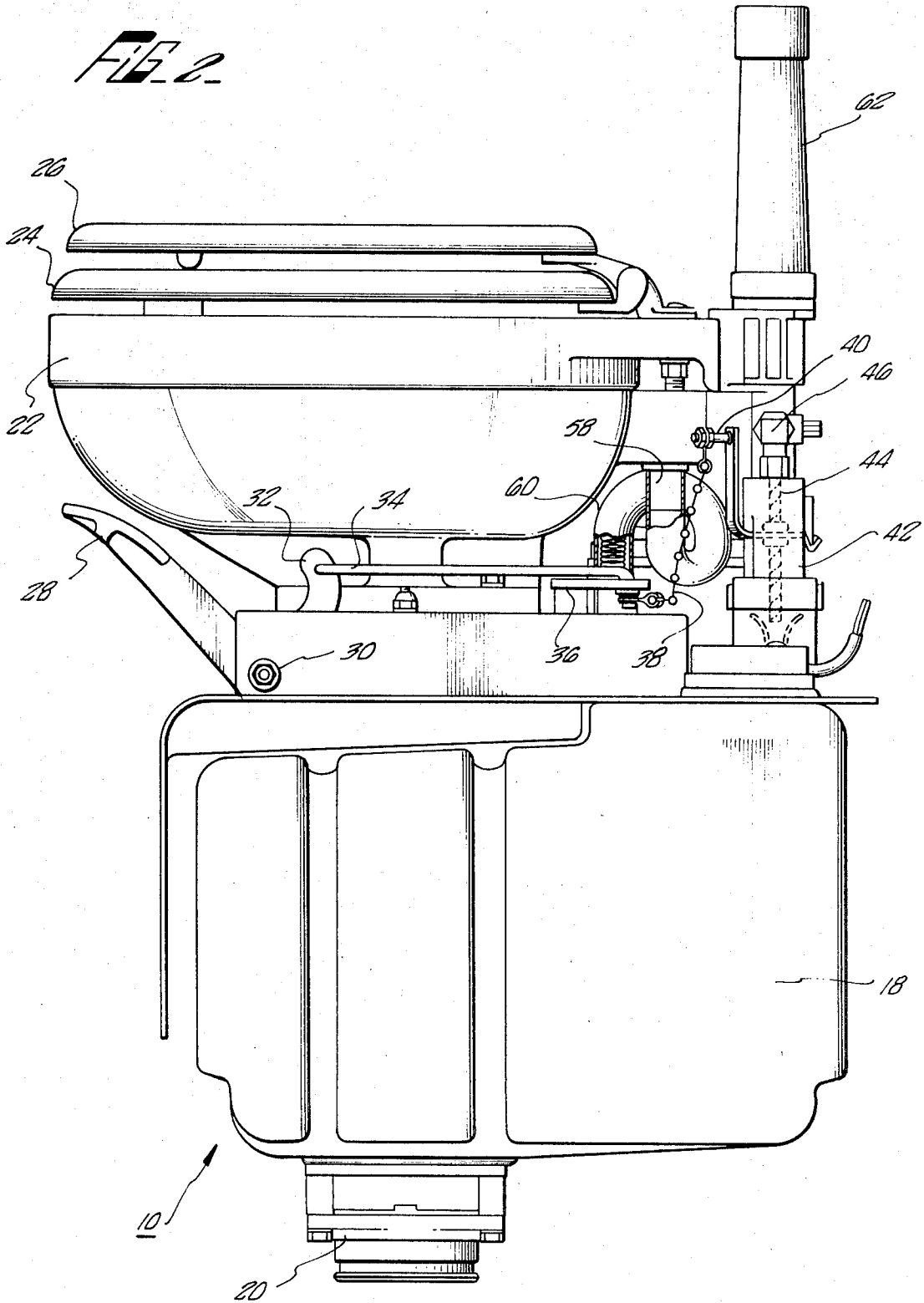


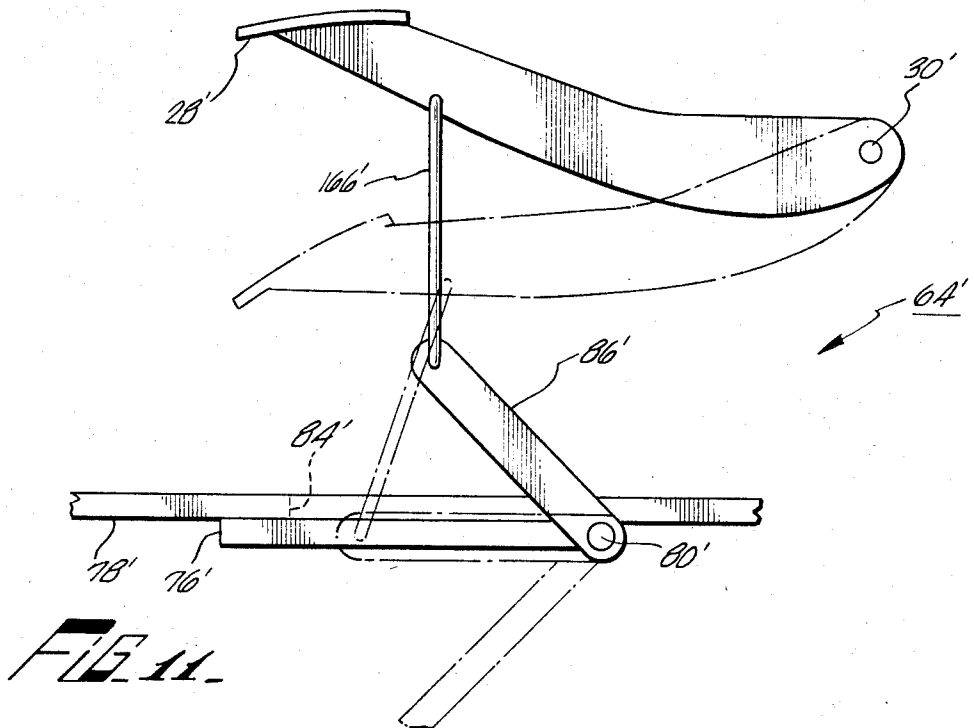
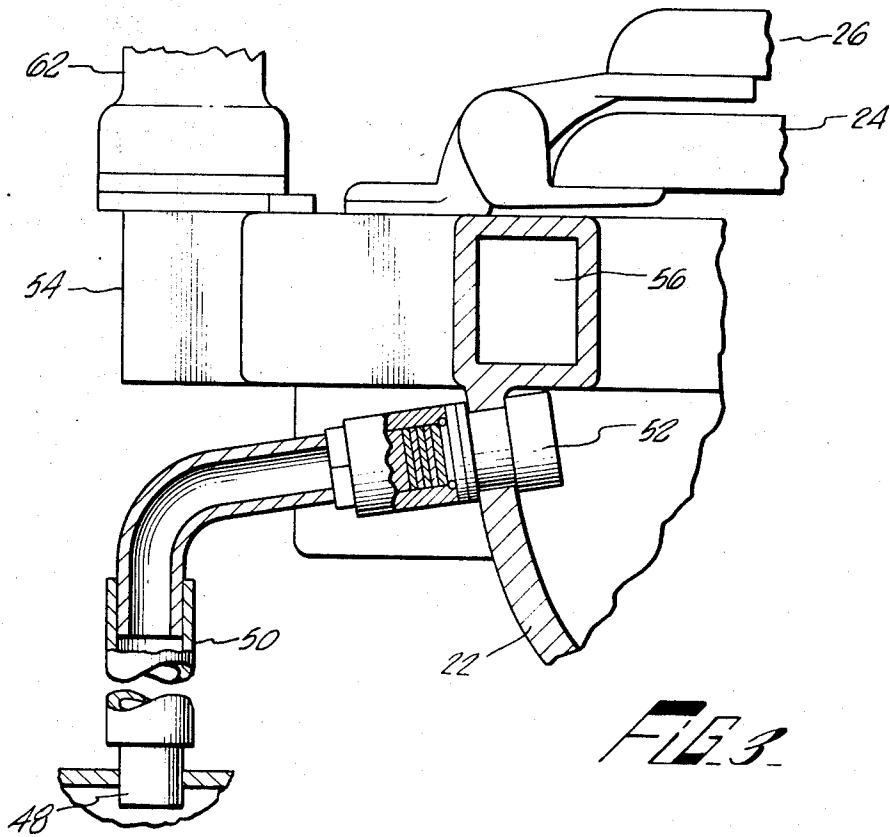


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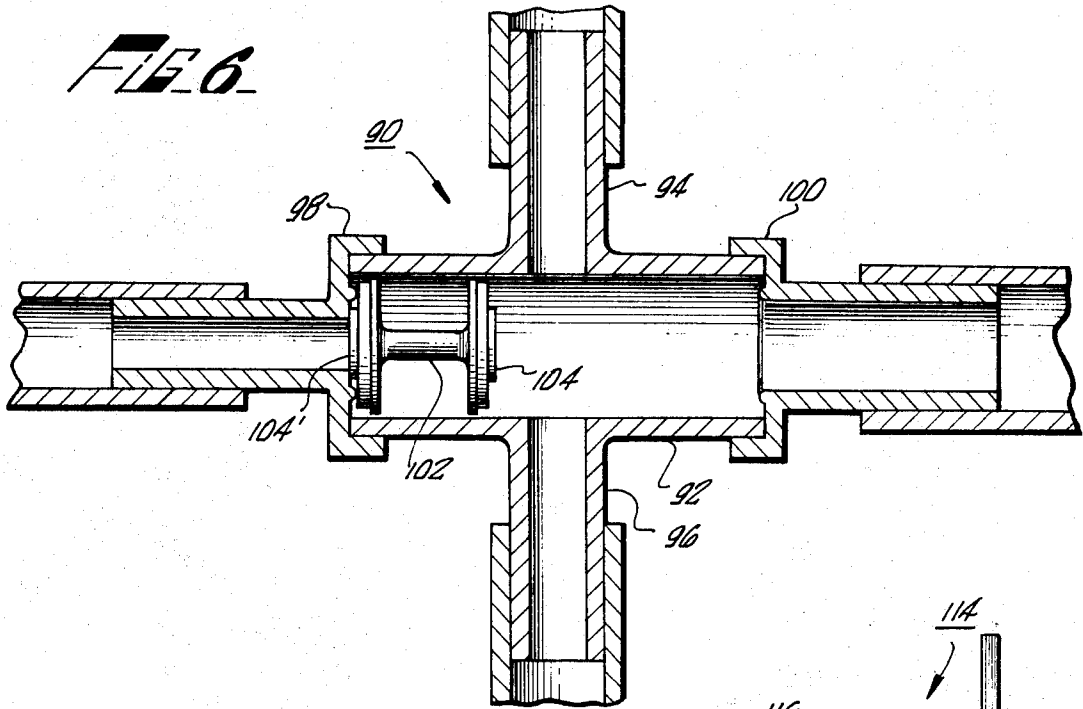
FIG. 2



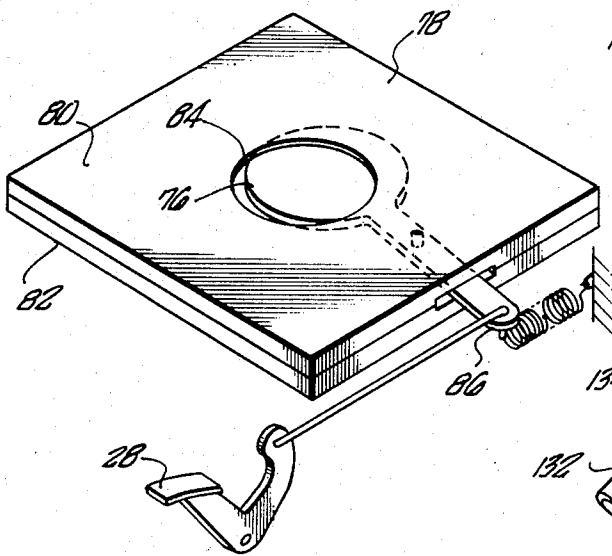




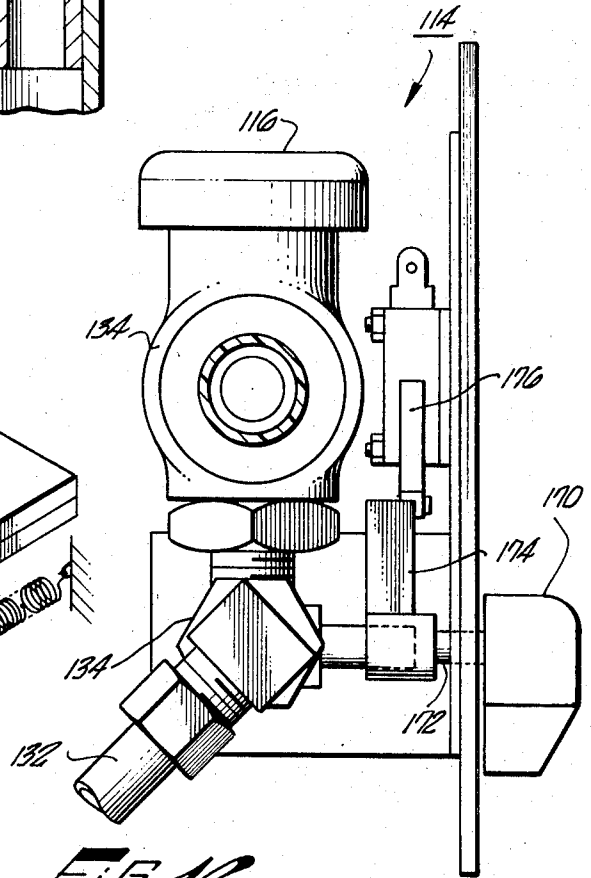
**FIG. 6**

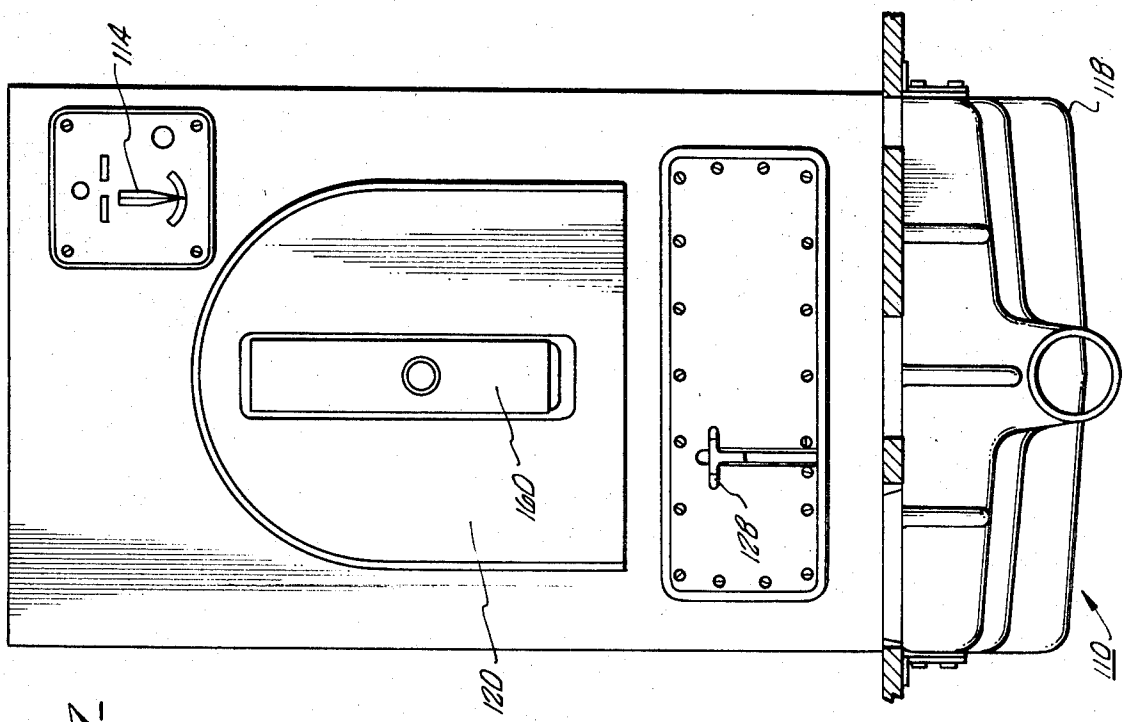
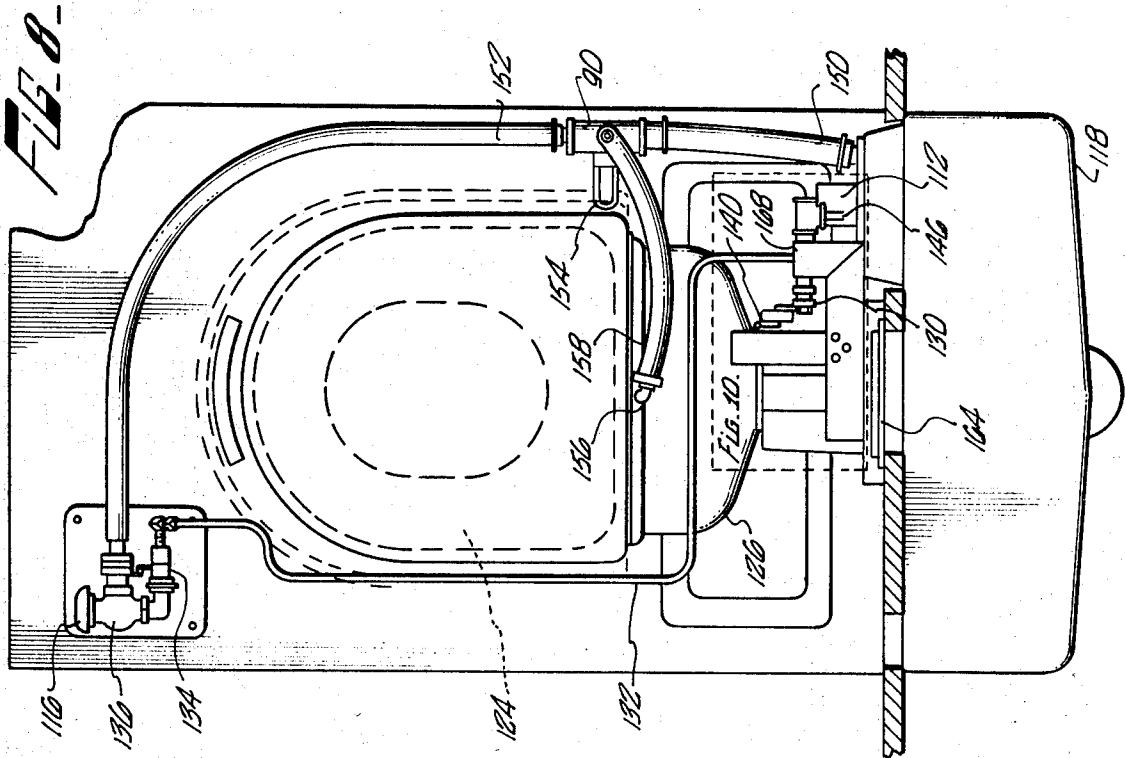


**FIG. 5**



**FIG. 10**





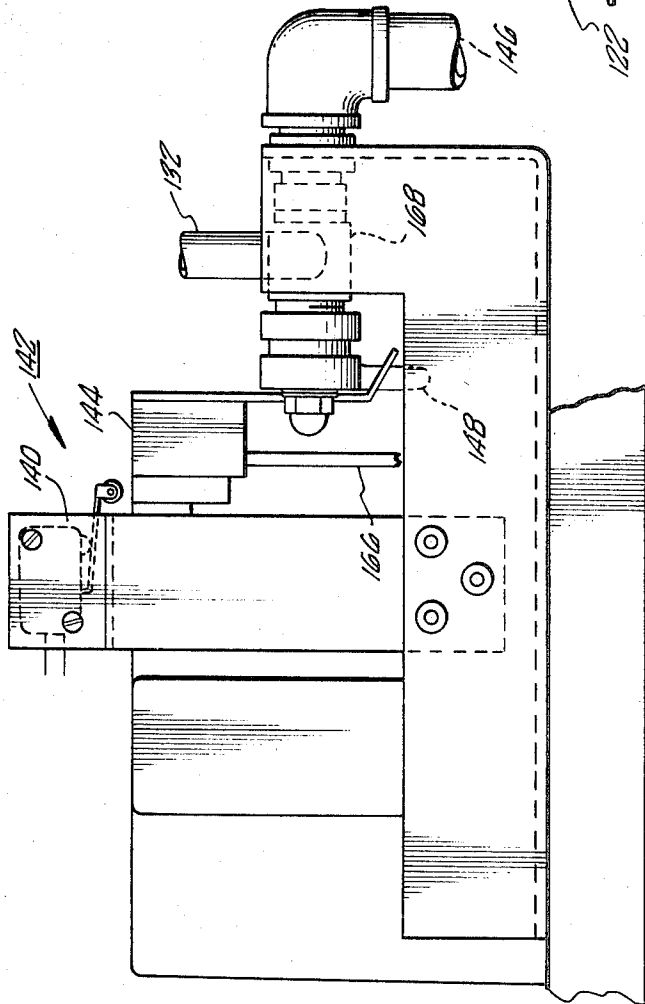
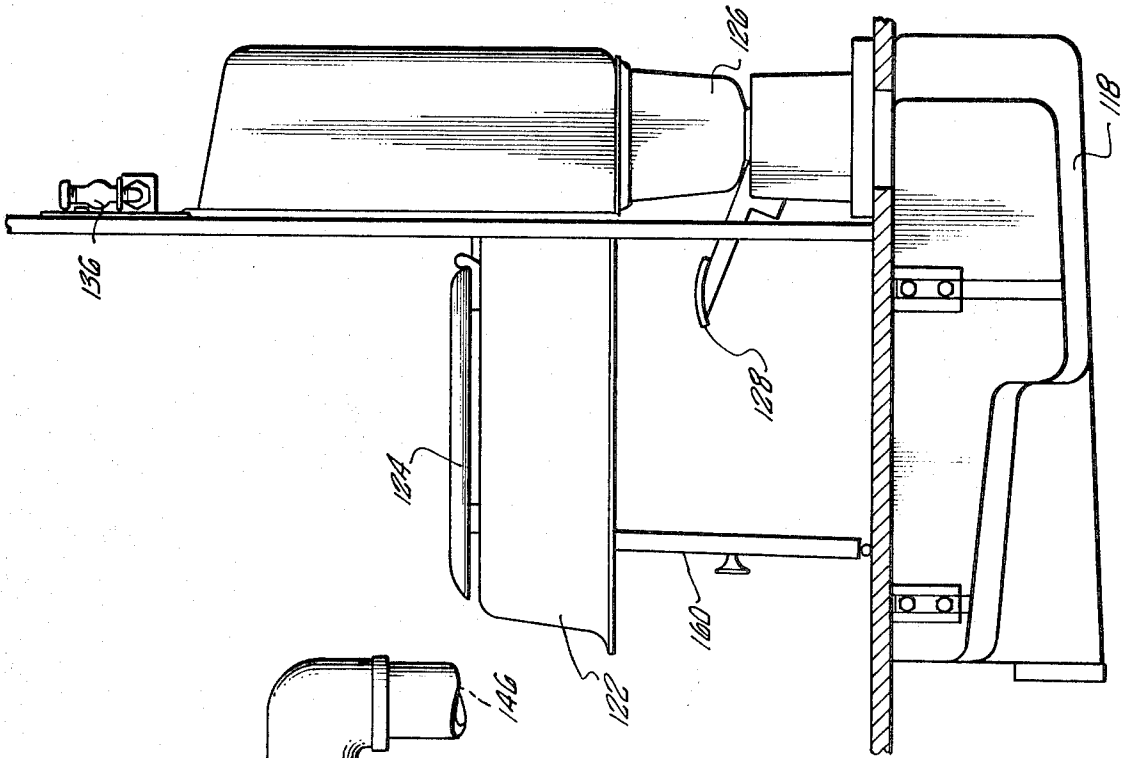


FIG. 9

FIG. 10

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## DUAL MODE RECIRCULATING TOILET SYSTEM

The present invention relates to toilet arrangements and, more particularly, a toilet system suitable for installation in house trailers, trains, boats, buses, aircraft or in other mobile, semimobile or even stationary installations.

In recent years, the popularity of recreational vehicles has increased substantially and it has been deemed desirable to provide self-contained sanitation facilities within such vehicles. Basically, two types of toilet systems have been developed to meet this need. A first type is the closed system, recirculating toilet unit such as is described in the U.S. Pats. to W. F. Katona et al., No. 3,356,221 and N. J. Palmer, U.S. Pat. Nos. 3,458,049 and 3,473,171. A second, more conventional, type is connected to the vehicle water supply system and empties into a holding tank.

The second type is marked by several disadvantages. Primarily, the storage capacities of the water supply tank and the holding tank impose limitations upon the usage of the system and, further, the available water supply is exhausted at a disproportionate rate. Mobility and range are restricted by the need for frequent emptying of the holding tank.

These disadvantages are avoided by the first type of system which neither diminishes the fresh water supply nor requires a large holding tank or the frequent drainage of a smaller tank. As taught in the above patents, the liquid in the tank is filtered and recirculated by an electric pump. As a result, the system can be operated for a number of cycles without attention.

Considering such recreational vehicles as campers, trailers and pleasure boats, in particular, extensive facilities are now available that provide connections to electrical power, running water, and waste disposal facilities. Under such circumstances, it would be desirable to have a system of the first type when such facilities are not available, as, for example, while in transit, and a system of the second type available while at the facility. It was therefore considered desirable to have a sanitation system that could be alternatively operable as a recirculating system or as a more conventional, running water flush system.

According to the present invention, a toilet system of the first type such as is described in the above-mentioned patents, includes a flush system which alternatively receives flushing liquid from a running water system or a recirculating system, the selection of which is made prior to use. A foot pedal is provided which opens a mechanical seal assembly, a flush valve, and also energizes a miniature, snap-action switch.

Depending upon the position of a selector lever, the toilet flushes either from the running water system or from the electrically operated, recirculating system and will continue to flush so long as the pedal is held down. Upon release of the pedal, the flushing action ceases and the mechanical seat isolates the toilet unit from the waste or holding tank.

The selector lever in a first configuration closes a water intake valve and closes a switch in the electrical circuit of the recirculating pump motor. The selector switch, in the second configuration opens the water intake valve and opens the circuit of the pump motor.

Since the foot pedal controlled valve and switch are serially connected to the valve and switch controlled by the selector lever, respectively, energization of the foot pedal causes a flushing action by whichever system is not disabled by the selector mechanism. A novel valve acts as a unidirectional flow device to direct flushing liquid from the selected source into the flush manifold and to prevent flushing liquid from entering into the nonselected source.

The use of a "floor-mounted" toilet unit, such as is described in the above patents represents an intrusion into the available "living" space. In the larger vehicles, this presents no great problem and can be accepted. However, in smaller vehicles such as campers and trailers and in small pleasure boats, it has been deemed desirable to have the sanitation facilities occupying a minimum of "floor" area and, accordingly, some

form of folding or disappearing toilet would appear to be desirable.

In the past, "folding" or "disappearing" toilet installation have been employed in cabins or passenger vessels, where the allocated space was insufficient for bathroom accommodations. Similar installations have been made in the private compartments of railroad cars. Generally, such toilet facilities included a conventional toilet which was "unfolded" prior to use. The toilet flushed from the available running water supply and drained into the normal waste disposal system. In operation, the flushing of the toilet was accomplished before the unit was folded into its compartment.

As an alternative embodiment of the present invention, a disappearing toilet system can be installed in some 9 inches of depth and, in various models, can be combined with a lavatory, a vanity, and a portable shower and shower pan. Such a unit permits the selection of either a recirculating flush system or a running water flush system, depending upon the setting of a control selector lever.

A foot pedal is provided which initiates and controls the flushing operation and the lever is so positioned that the toilet is retracted before flushing.

The toilet system includes a folding bowl having a flush manifold and a stationary, receiving bowl mounted within the system and having a separate flush manifold. The folding bowl acts as a temporary receptacle and discharges its contents into the receiver when the bowl is folded into its storage position. Operation of the foot pedal initiates the flushing action which separately flushes both the folding bowl and the receiver.

As with the above embodiment, operation of the foot pedal first opens a mechanical seal, and at the lower limit of travel, energizes a miniature, snap-action switch and opens a flushing valve. If the recirculating system has been selected by a lever, then the running water supply valve has been closed and the pump motor circuit has been enabled. Similarly, if a running water system has been selected, then the motor circuit is disabled and the water supply valve is opened.

In this embodiment, an interlock switch may be provided so that the toilet cannot be flushed unless the bowl is folded into its storage configuration to prevent inadvertent splashing during the flush operation, especially if a high-volume flow is provided from the running water source. A folding support member can be included in the bowl unit to reduce the mechanical support requirement on the hinge system.

The novel features which are believed to be characteristic of the invention, both as to organization and method of operation, together with further objects and advantages thereof will be better understood from the following description considered in connection with the accompanying drawings in which several preferred embodiments of the invention are illustrated by way of example. It is to be expressly understood, however, that the drawings are for the purpose of illustration and description only and are not intended as a definition of the limits of the invention.

FIG. 1 is a front view of a dual mode toilet of the free standing type;

FIG. 2 is a side view of the toilet of FIG. 1;

FIG. 3 is a side sectional view of a portion of the toilet of FIGS. 1 and 2;

FIG. 4 is a functional block diagram of the toilet system of the present invention;

FIG. 5 is a top view of a mechanical seal assembly;

FIG. 6 is a sectional view of a diverter valve assembly;

FIG. 7 is a front view of a folding toilet system according to the present invention;

FIG. 8 is a rear view of the folding toilet system of FIG. 7;

FIG. 9 is a side view of the folding toilet system with the toilet bowl folded out for use;

FIG. 10 is a view of a portion of the flushing valve assembly of FIG. 8;

FIG. 11 is a side view of the selection switch assembly of the toilet system of FIG. 7; and

FIG. 12 is a side view of an alternative mechanical seal useful in the system of FIG. 7.

Turning first to FIG. 1, there is shown a front view partly broken away, of a toilet system 10 operable alternatively as a recirculating toilet or as a running water, flush toilet. As indicated in the broken-away portion, there is a motorized filter pump combination 12, similar to that taught in the above-

identified Katona and Palmer patents. A selector switch 14, mounted on the top of the motor housing 16 is labeled to permit selection of either a recirculating operation or a running water operation. The toilet system 10 includes a holding tank 18, and a drain valve 20. A toilet bowl 22 is fitted with a conventional flush manifold (not shown) and is provided with a seat 24 and a cover 26. In alternative embodiments, a second flush orifice, independent of the flush manifold, is directly connected to the filter pump output. A foot pedal 28 is provided for operating the toilet and is connected to a mechanical seal (not shown) which isolates the interior of the toilet bowl 22 from the holding tank 18, a flush valve (not shown) and a switch (not shown) which controls the electrical circuits to the filter pump 12. Those elements not shown herein are shown in the figures below.

Turning to FIG. 2, which is a side view of the system of FIG. 1, some of the elements obscured in the front view are more plainly seen. The pedal 28 is mounted on a pivot 30 and includes a lever arm 32 which is coupled to a lever 34. The lever 34 terminates in a seal-actuating lever 36 and is also connected to a beaded chain 38 which connects to a switch lever 40.

A flush switch assembly 42 includes a flush plunger 44 which operates both an electrical switch and a flush valve (not shown). Appropriate fittings 46 are provided to connect to a source of running water in the vehicle, which may be a water storage tank. An external source of water can be connected to the tank or to the running water system, directly.

The filter pump 12 (FIG. 1) provides flushing liquid on a flush discharge line 48 which is connected to a flexible hose 50, in FIG. 3. Flexible hose 50 is connected to a flush diverter 52 which is positioned in the bowl 22. A flush manifold 54 is connected to the flush valve and is connected to a channel 56 which encircles the inner periphery of the bowl 22 and includes a plurality of orifices for the flow of flushing liquid from the running water supply.

Turning back to FIG. 2, an overflow outlet 58 is connected to a flexible tube 60 which returns overflow to the holding tank 18. A post assembly 62 includes a vacuum breaker, anti-siphon valve (not shown) which enables connection to the running water supply.

As shown in FIG. 3, the toilet bowl 22 may be of conventional vitreous china construction, including an internal flush channel 56 which requires a relatively large volume of water in a relatively short time to provide adequate flushing and cleaning action. The flush channel 56 then connects to the flush manifold 54, which is served by the running water supply from the flush valve 68. Toilet bowls normally utilized in the recirculating toilet systems described above, have special flush rings and are intended for use with lesser volumes of flushing liquid at a lower volumetric flow rate. Accordingly, the flushing liquid from the pump filter 12 is applied through the special flush diverter 52 which is designed to provide a cleaning action for the flushing liquid furnished by the filter pump 12.

The operation of the toilet system 10 can best be described in connection with FIG. 4, which is a functional block diagram of the various elements of the system, shown in highly stylized form. Operation of the foot pedal 28 through the mechanical linkage shown in FIG. 2, operates a mechanical seal 64 which provides a virtually airtight isolation as between the interior of the tank 18 and the interior of the toilet bowl 22. The lever 28 also closes a flush switch 66 which is in series with the electrical circuit that energizes the filter pump 12 and with the selector switch 14. The lever 28 also operates a flush valve 68 that admits running water to the system. As illustrated, a manually operated shutoff valve 70 is interposed between the flush valve 68 and the flush manifold 54. Alternatively, the shutoff valve 70 can be operated by the selector switch 14.

In operation, if the selector switch 14 is set to choose the recirculating system for operation as illustrated, the shutoff valve 70 must be manually closed to prevent the introduction of running water into the system. Actuation of the foot pedal 28 then closes the flush switch 66 which completes the electrical circuit of the filter pump 12 through the electrical contacts of the selector switch 14. Flushing liquid is then pumped from the tank 18 through the flush output line 48 and the flexible tube 50 into the flush diverter 52. The flush switch 66 is positioned to be energized only at the end of the travel of pedal 28. The initial movement of the pedal 28 operates the mechanical seal 64 opening the toilet bowl 22 to the holding tank 18.

The pedal 28 is held depressed for as long as is necessary to complete a flushing of the toilet 22. Releasing of the pedal 28 first opens the flush switch 66, deenergizing the filter pump 12. The mechanical seal 64 is then permitted to close, again isolating the toilet 22 from the tank 18.

To use the running water flush system, the selector switch 14 must be turned to the "running water" position which disables the electrical circuits to the filter pump 12. The shutoff valve 70 is opened and the system is ready to operate. Depression of the pedal 28 first opens the mechanical seal 64 and the flush valve 68 admitting running water from the source 72 into the flushing manifold 54 and through the channel 56. Releasing the pedal 28 closes the flush valve 68 and, finally, closes the mechanical seal 64.

Turning next to FIG. 5, there is shown in idealized form, a mechanical seal assembly 64, which may be utilized in the embodiment of FIGS. 1 and 2. As shown, the seal assembly 64 includes a flat, gate member 76 which is pivotally mounted for lateral motion within a gasket assembly 78. A gasket assembly 78 joins the bowl member 22 to the tank 18 and may be comprised of a pair of planar members 80, 82 which have an orifice 84 therein which is occluded by the gate member 76. An actuating handle 86 connects to the seal lever 46 to transmit translational motion to the gate member 76.

In alternative embodiments of the toilet system, a single flushing manifold and flushing "ring" could be utilized if some form of valve mechanism were provided which enables a flow of flushing liquid from one of the two sources, with appropriate safeguards against backflow into the other source.

Such a mechanism is illustrated in FIG. 6, which is a side section view of a diverter valve 90 suitable for use in the present invention. As shown, the valve 90 includes a cylindrical main body portion 92 with, as shown, a pair of centrally located flow outlets 94, 96. A pair of flow outlets is especially useful in connection with the embodiment of the invention described below which includes more than one bowl that must be flushed.

At one end of the cylindrical body members 92, an end cap 98 is provided which is adapted to connect to a first source of flushing liquid. A second end cap 100, is adapted to connect to the other source of flushing liquid. For example, the first end cap 98 may be connected to the recirculating fluid system and the second end cap 100 may be connected to the running water supply system.

A sliding, spool valve 102 is closely fitted to the interior of the main body member 92, and is made of a material that enables a substantially, liquid-impervious seal at the periphery so that the spool member 102 can function as a free-floating piston. Each exterior face of the spool member 102 is provided with a sealing ring 104' which is adapted to form a fluid-proof seal as between the spool 102 and the inner surface of an end cap 98, 100. Alternatively, the end caps may be provided with seats to engage the sealing rings.

If, for example, the recirculating fluid supply is energized, furnishing a stream of liquid to the left (as viewed in FIG. 6) end cap 98, the force of the liquid would propel the spool 102 to abut the inner face of the right-hand end cap 100. The sealing ring 104 would be held in a substantially fluidtight engagement with the face of the end cap 100. The fluid flow provided from the recirculating source then flows out of the two outlets 94, 96. Any fluid that can flow past the peripheral edges of the

spool member 102 is prevented from bypassing the compressed sealing ring 104.

If now the source of flushing liquid is changed and the running water source applies liquid through the right hand end cap 100, the spool 102 is propelled to the other end of the chamber and the seal 104' acts to keep the flushing liquid from entering into the recirculating fluid line, attached to the left-hand end cap 98.

Turning next to FIGS. 7 and 9, there is shown an alternative embodiment of the dual mode toilet of the present invention which is designed to occupy a minimum of floor space in a recreational vehicle. FIGS. 7 and 8 show the front and rear, respectively, of one model of such a dual mode toilet system, with the toilet bowl in the retracted or folded configuration.

Turning first to FIG. 7, there is shown a wall mounted toilet system 110 which is adapted to be installed in a vehicle. The system includes a pump filter combination 112 (as seen in FIG. 8) a selector switch 114 and a holding tank 118 which, for convenience is mounted below the "floor" of the vehicle. The toilet includes a retractable bowl unit 122 which has a seat 124 hingedly mounted thereon.

A foot pedal 128 is provided for operation of the flushing system. The flush pedal 128 is connected to a pivot member 130 and through a series of linkages and cams, controls an electrical flush switch 140', a mechanical seal 164' and a flush valve 168. The external source of running water is applied to the system at a water inlet 148 which connects to the flush valve 168.

The output of the flush valve 168 is applied to a water pipe 132, which is connected to a selector valve assembly 134, which is a part of the selector switch mechanism 114, shown in greater detail in FIG. 12, below. An antisiphon, vacuum breaker element 136, is also provided to enable use of the system with the running water supply.

The flush output of the filter pump 112 is applied to a flexible tubing 150 to a diverter valve 90 employing the valve 90 of FIG. 6, above. The diverter valve 90 is also coupled to a second flexible tube 152 to the selector valve assembly 134 to receive the water flow therefrom. In addition to the retractable bowl unit 122, there is also a receiver bowl assembly 126, which is permanently emplaced within the unit, and which connects, through the mechanical seal 164, to the holding tank 118. A first flush manifold in the retractable bowl 154 is coupled to the diverter valve 90 through a flexible tube, and a second flush manifold 156 in the receiver bowl 126 is connected to the diverter valve 90 through a flexible member 158.

A manually operated, support leg 160 is mounted on the front of the bowl unit 122 and supports the seat and bowl when in the unfolded position. The support leg 160 is a convenient member for bringing the seat out of the folded configuration. The bowl 122, in use, is intended to be a temporary receptacle. When there is no further need for the toilet and before the flushing operation has been commenced, the bowl unit 122 is returned to the folded configuration and the contents, temporarily stored therein, are free to flow into the receiver bowl 126.

Actuation of the pedal 128 opens the mechanical seal 164 into the holding tank 118 permitting a drainage of the contents of the receiver bowl 126. At the limit of pedal travel, both the electrical flush switch 140 and the mechanical flush valve 168 are actuated. Depending upon the selection made at the selector switch 114, either the electrical system to the pump filter 112 is disabled or the selector switch control valve 134 is disabled. Whichever system is operating, furnishes flushing liquid to the diverter valve 90 and then into the bowl unit 122 and the receiver bowl 126 to clean the interior thereof.

Turning next to FIG. 10, there is shown in somewhat greater detail, the foot pedal operated flushing mechanisms. Flush valve 168 applies running water to the pipe 132 that leads to the selector valve 134. At the same time, at the extreme of pedal travel, a cam member 144 operates the electric flush switch 140 which may be a miniature snap-action switch.

The flush valve 168 includes a rotating member with a return spring to maintain the valve in the normally closed configuration. An extension of the foot pedal 128, includes a lever arm 146 which operates flush valve lever 148. A separate linkage assembly 166 connected to the foot pedal lever also operates the mechanical seal 164.

In FIG. 11, there is shown an alternative mechanical 64' which is useful in the embodiment of FIGS. 7 through 9 and which may be adapted for use with the embodiments of FIGS. 1 and 2. This mechanical seal includes a hinged gate member 76' which is mounted below a gasket assembly 78' having an orifice 84' which is occluded by the gate member 76'.

The gate member 76' is mounted by means of a spring-loaded pivot 80' and is coupled for actuation to a pedal 28' through a linkage 166' that fastens to an actuating lever 86'. As indicated in the dotted configuration, depression of the pedal 28' through the linkage 166' operates the lever 86' which pivotally rotates the gate member 76' against the force of the biased pivot 80' opening the orifice 84' to enable communication between the tank and the bowl.

Turning finally to FIG. 12, there is shown in a side view the selector switch assembly 114 which is employed in the embodiment of FIGS. 7 through 9. Shown in greater detail is the water supply line 132 which connects to the selector valve 134 and the vacuum breaker antisiphon valve 116. As shown, a selector lever 170, which is accessible from the user's side of the system, can be placed in one of two positions for selecting either running water or recirculating operation. The switch lever 170 is mounted to a control shaft 172 which includes a cam member 174. The shaft 172 also controls the selecting valve 134 to open or close the valve to the flow of water.

The cam member 174 is positioned to actuate a miniature snap-action switch 176 which is in the electrical circuit between the flush switch 140 and the filter pump 112.

In the position that selects the running water system, the selector switch lever 170 is turned to an orientation that rotates the shaft 172 to open the selecting valve 134 and, at the same time, the cam member 174 places the switch 176 in the open circuit condition. Placing the selector switch lever 170 in the position to operate the recirculating system, the shaft 172 is rotated to a position that closes the selector valve 134 and the cam member 174 engages the switch 176 to a closed circuit configuration.

Depending upon the configuration of the selector switch lever 170, energization of the pedal 128 will close the electric flushing switch 140 and open the flushing valve 168. If the recirculating system has been selected, the selector valve 134 and electrical switch 176 will be closed and the filter pump 112 will operate. Alternatively, in the running water selection mode, the electric switch 176 will be open circuited and the selecting valve will pass water from the supply line 132. It will be obvious to those skilled in the art that a foot-operated pedal is not essential to the present invention and that other means might be devised for opening the mechanical seal and operating the electric flush switch and the flush valve. Other variations and combinations will appear to those skilled in the art.

Thus, there has been described and shown in several embodiments, a dual mode toilet system which is alternatively operable as a recirculating toilet system or as a running water toilet system. By the manipulation of an appropriate selecting switch lever, a running water system and an electrically operated filter pump recirculating system is selectively disabled. The flush control mechanism simultaneously energizes both systems after operating a mechanical seal which isolates the toilet from the holding tank. The system which has not been disabled is then selected to operate in its characteristic fashion.

In an alternative embodiment, a folding toilet system has been described in which the bowl member is hingedly mounted to a wall surface and may be manually unfolded from the wall for use. A permanently emplaced receiver bowl assembly remains within the wall and appropriate flush manifolds clean both the bowl and the receiving bowl during

the flushing operation with the seat folded into its stored configuration.

What I claim as new is:

- 1. A dual mode toilet system including a toilet adapted to connect to a holding tank alternatively operable as a recirculating system and a running water system comprising:
  - 1. pump and filter means adapted to mount in the tank, and operable to filter and recirculate flushing liquid as a source thereof;
  - 2. running water supply means adapted to connect to a source of running water;
  - 3. flush manifold means connected to said pump and filter means and to said running water supply means for flushing the toilet;
  - 4. selector switch means connected to said pump and filter means and between said running water supply means and said flush manifold means, including a valve for preventing the flow of running water to said flush manifold and further including means for disabling said pump filter means; and
  - 5. flushing means including means for simultaneously enabling both said pump and filter means and said running water supply means.
- 2. A dual mode toilet system as in claim 1, above, wherein said flushing means further include mechanical seal means normally isolating the toilet from the tank, and means coupled to said flushing means for opening said mechanical seal during operation of said flushing means.
- 3. A dual mode toilet system as in claim 1, above, wherein

said selector switch means are operable in a first configuration to open said valve and disable said pump and filter means, and in a second configuration to close said valve and enable said pump and filter means.

4. The dual mode toilet system of claim 1, above, further including an enclosure for housing the toilet system; a first toilet bowl pivotally mounted on said enclosure for substantially vertical storage therein, said first bowl being coupled to said flush manifold means for receiving flushing liquid therefrom.

5. The dual mode toilet system of claim 4, above, further including a second toilet bowl fixedly mounted within said enclosure and adapted to be in fluid communication with said first toilet bowl, said second bowl being coupled to said flush manifold means for flushing liquid therefrom.

6. The dual mode toilet system of claim 5, above, wherein said flushing means further include mechanical seal means coupled between said second toilet bowl and the tank for normally isolating said second toilet bowl from the tank, and means coupled to said flushing means for opening said mechanical seal during operation of said flushing means.

7. The dual mode toilet system of claim 1, above, wherein said pump and filter means are electrically operable, wherein said means for disabling said pump and filter means include a first switch in said pump and filter means electrical circuit; and wherein said flushing means include a second switch in said pump and filter means electrical circuit serially connected with respect to said first switch.

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UNITED STATES PATENT OFFICE  
CERTIFICATE OF CORRECTION

Patent No. 3,593,346 Dated July 20, 1971

Inventor(s) William F. Katona

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On the cover sheet [56], "Diatz et al." should read -- Dietz et al. --; "Harkenhine" should read -- Herkenhine --; and "Minnear" should read -- Minniear --. Column 1, line 53, "seat" should read -- seal --. Column 5, line 9, "and" should read -- through --. Column 7, line 19, "pump filter" should read -- pump and filter --.

Signed and sealed this 30th day of May 1972.

(SEAL)  
Attest:

EDWARD M. FLETCHER, JR.  
Attesting Officer

ROBERT GOTTSCHALK  
Commissioner of Patents