United States Patent

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[45] Patented **June 28, 1971**
Continuation-in-part of application Ser. No. 710,084, Mar. 4, 1968, now Patent No. 3,528,462, Continuation-in-part of application Ser. No. 797,601, Feb. 7, 1969.

[54] **WASTE DISPOSAL SYSTEM**
21 Claims, 8 Drawing Figs.

[52] **U.S. Cl.** **4/10,** 4/115
[51] **Int. Cl.** **E03d 9/00,** E03d 11/00
[50] **Field of Search** 4/1, 3, 4, 5, 8, 10, 77, 79, 89, 90, 114, 115, 132, 131; 210/153, 169, 360, 259, 300, 301, 441, 442

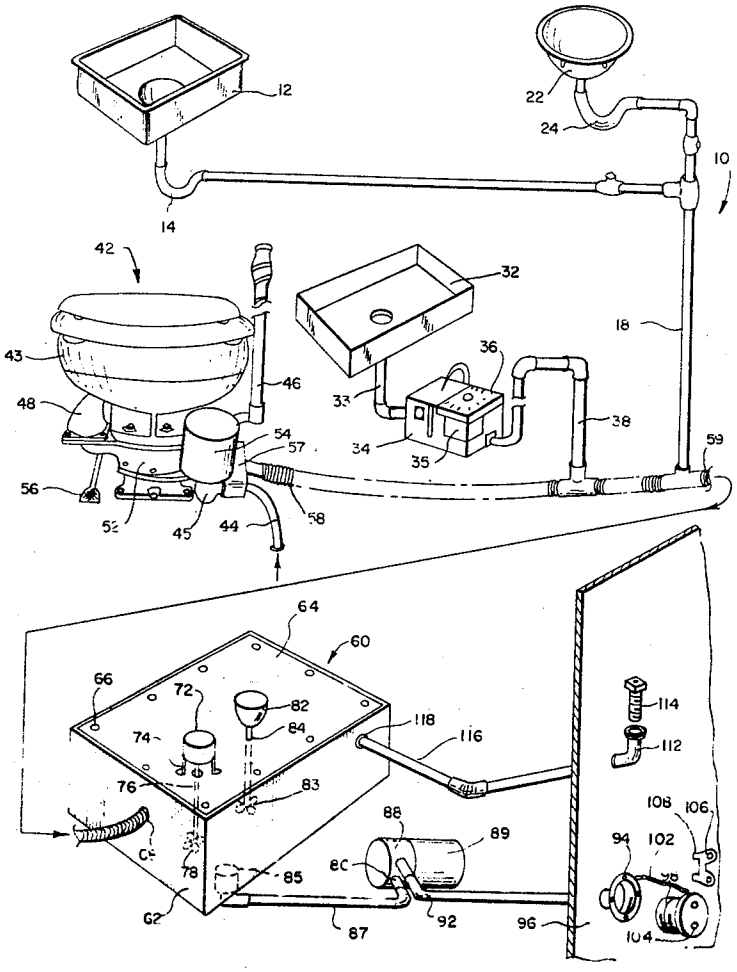
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ABSTRACT: An onboard waste disposal system has a main flexible drain interconnecting a toilet and a waste storage tank. Wash water from a basin, a sink and a shower base is drained into the main drain, supplying the main drain with relatively solid-free water to facilitate flow through the main drain. The large storage tank has a small motor driven agitator and a chemical additive and mixing container mounted on the top of the tank. An outlet of the tank leads through a motor-driven pump to a discharge port in the side of the boat. The discharge port has a fitting for securing a flexible hose to empty the storage tank into a sewage disposal facility.



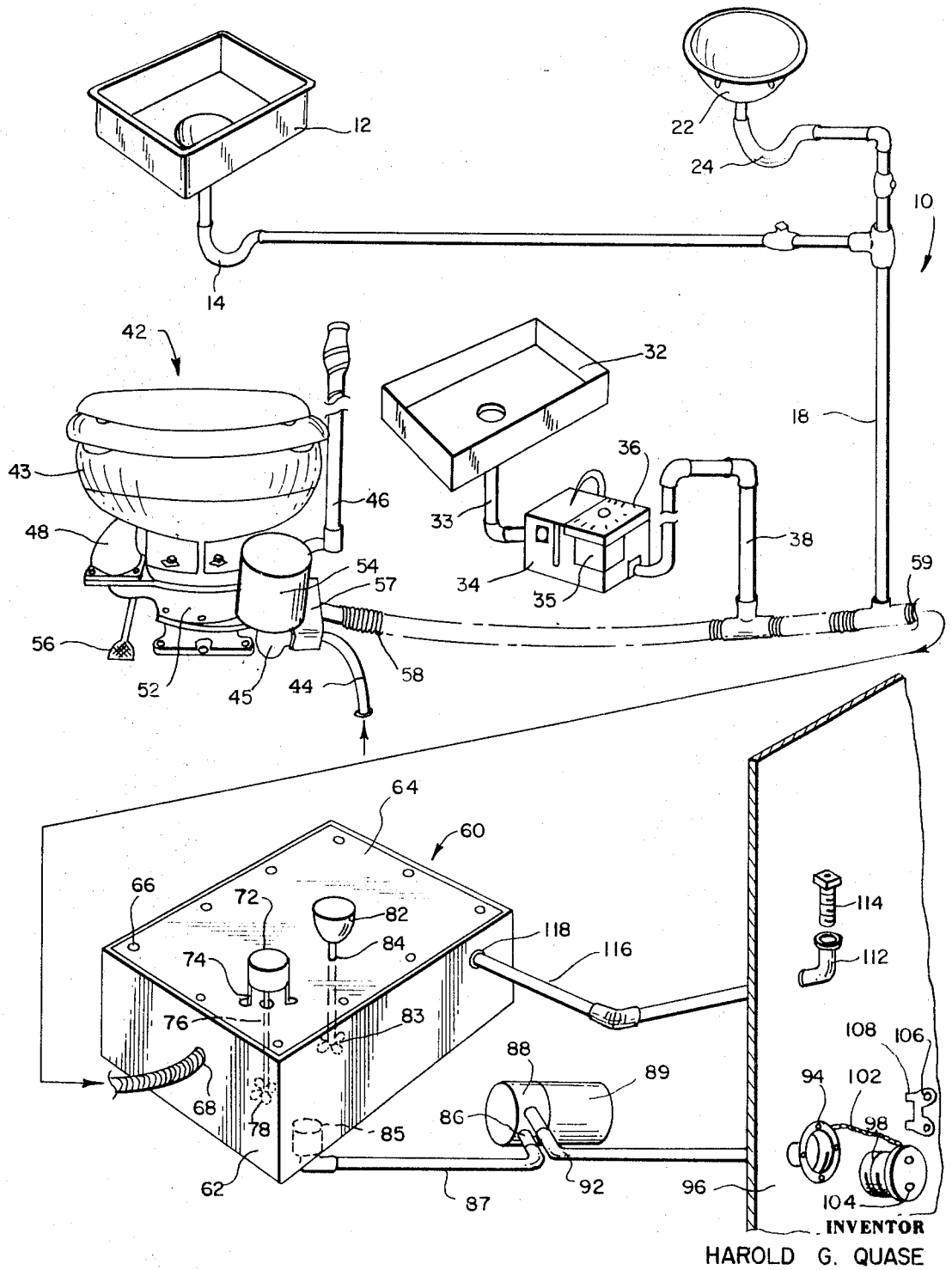


FIG. 1

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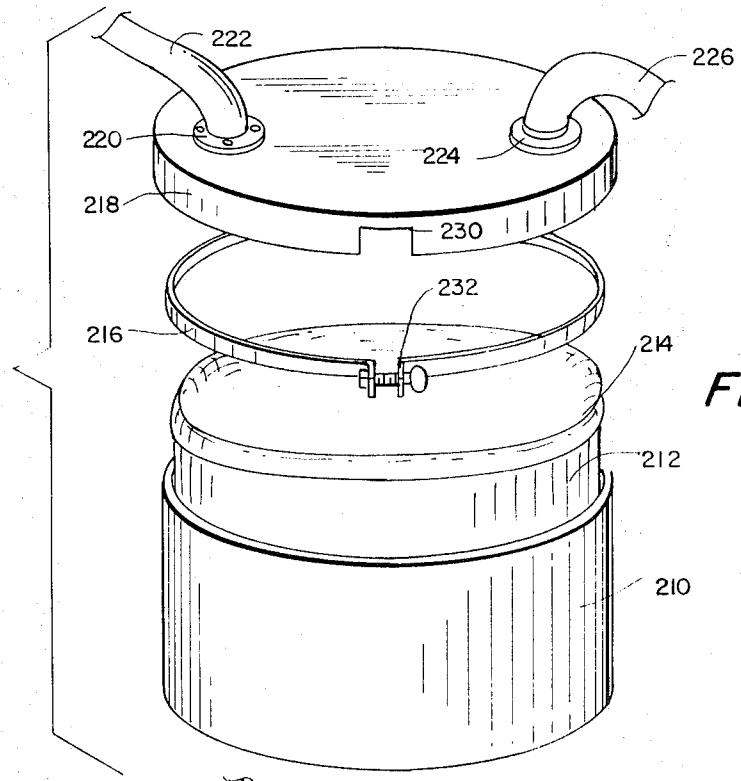


FIG. 3

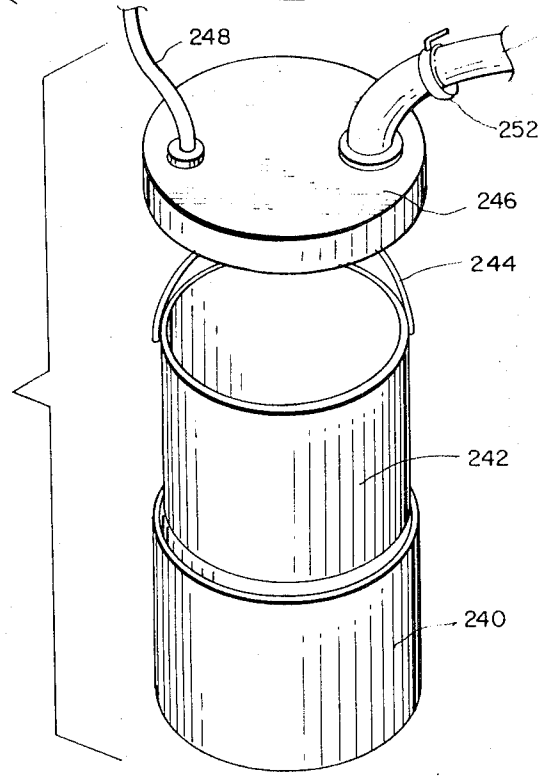


FIG. 4

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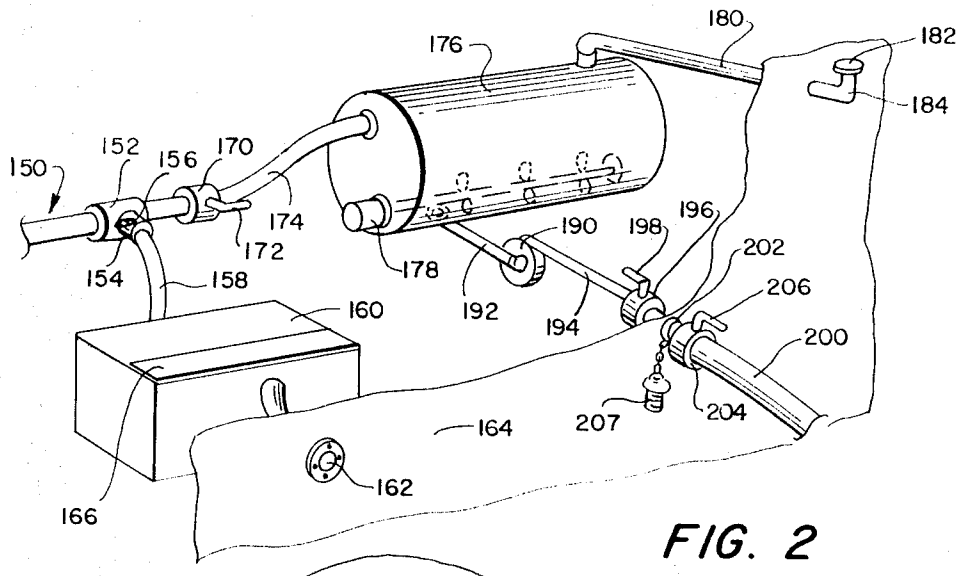


FIG. 2

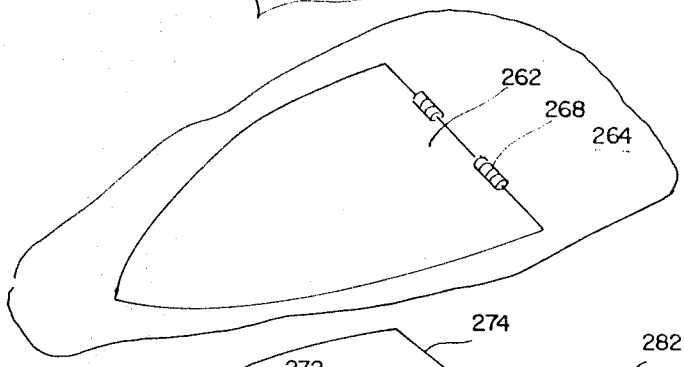
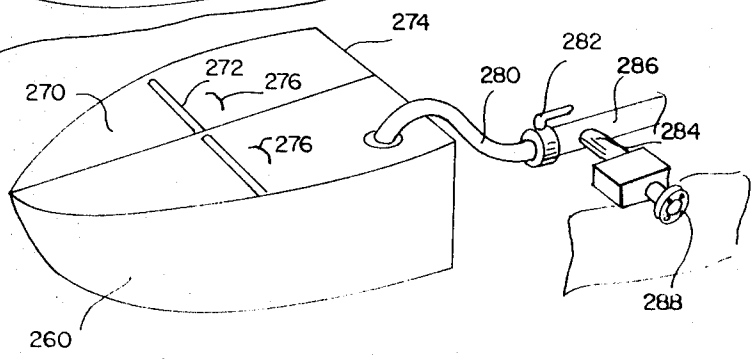


FIG. 5



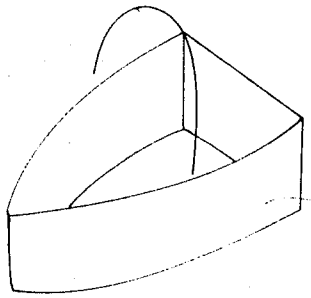


FIG. 6

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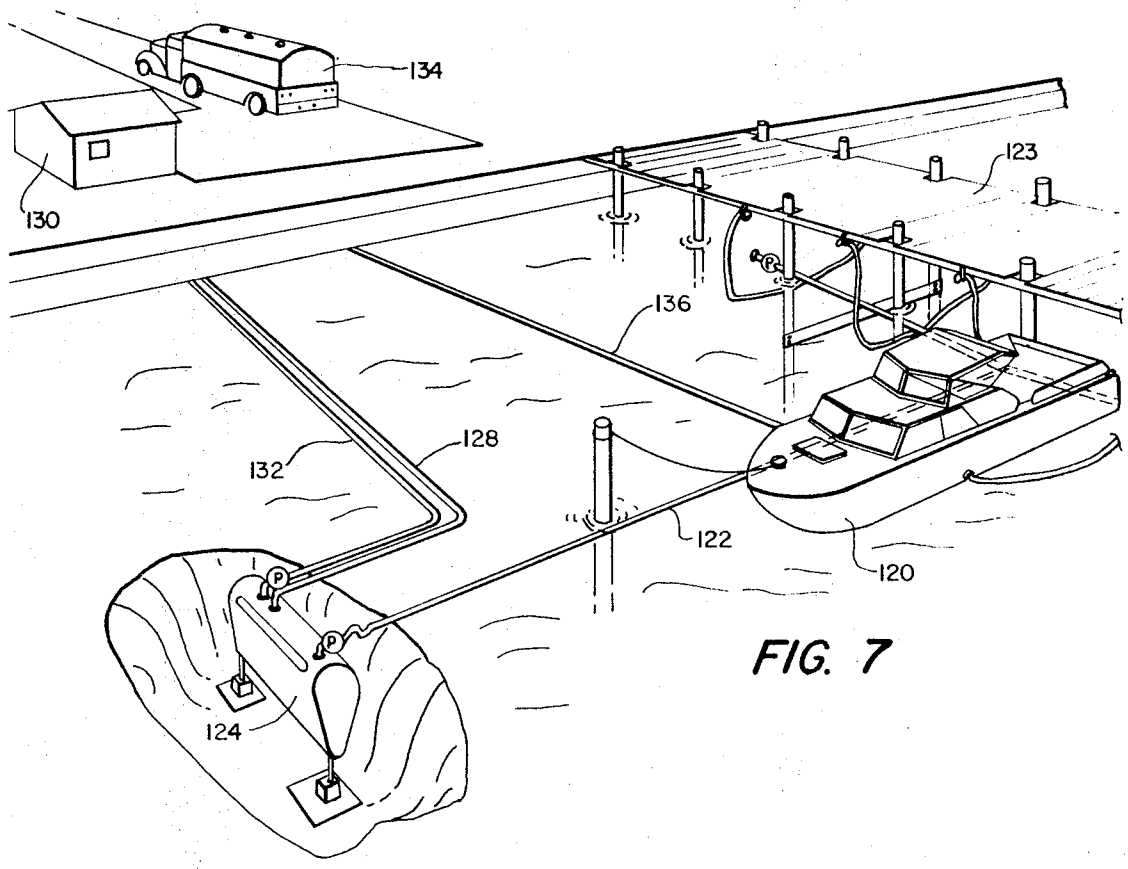


FIG. 7

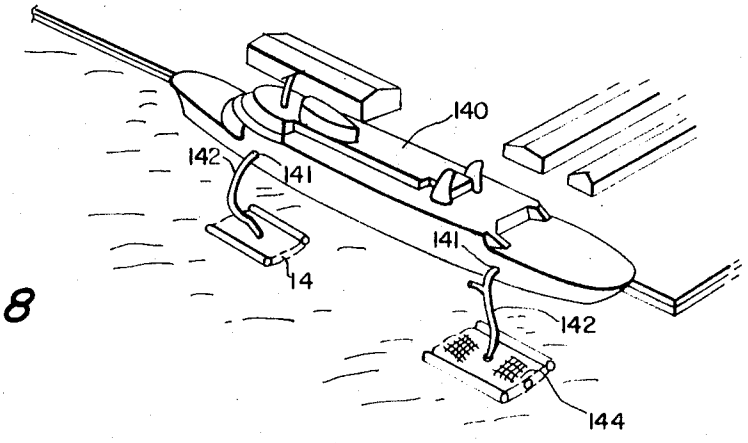


FIG. 8

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WASTE DISPOSAL SYSTEM

This is a continuation in part of two patent applications filed by Harold G. Quase, Ser. No. 710,084, now U.S. Pat. No. 3,528,462 filed Mar. 4, 1968 for Sewage Disposal and Ser. No. 797,601, filed Feb. 7, 1969 for Port Facility Ship Sewage Collection, Transportation and Disposal System.

BACKGROUND OF THE INVENTION

The problem of water pollution is continually under attach by Governmental and private organizations. Although a major source of fresh water pollution is the disposal of urban and industrial waste in bodies of water, small craft and large oceangoing ships make a significant contribution to the befouling of coastal and inland waters, especially near port facilities where craft and ships are gathered.

Methods of coping with wastes of small craft and of large oceangoing vessels have been disclosed in the above-cited copending patent applications.

One of the problems in preventing pollution of harbors by small craft and large vessels is the inability to control waste discharges from craft. Another problem lies in the necessity of using an excess of water in the flushing of toilets to insure that all waste materials are fully discharged from the drain lines so that the drain lines do not become blocked.

SUMMARY OF THE INVENTION

The present invention provides storage means for all water wastes of conveyances, notably ships and small craft. Waste from onboard sinks and basins passes through a first drain into a main drain line. Waste water from baths, such as showers, pass through second drains. The bath drains are equipped with filter boxes which have relatively large cross sections with respect to the drains. Thus, water in the filter boxes is slow moving, and the slow-moving water passes through removable filters for trapping all solids from the baths. The main drain is preferably a flexible tube which interconnects toilet facilities with a main storage tank. Toilet facilities are equipped with intakes which take in ambient water as in the case of water conveyances or which take water from a storage tank as in the case of other conveyances. Pumps, usually manually operated, pump water from the intakes into the bowl. Flushing valves open the bottom of the bowl, dropping contents into a lower container section. Chemical additives are provided in a container adjacent each toilet and release controlled amounts of the additives into the subbowl container upon each flushing, in a well known manner. The same pump which pumps water into the bowl also pumps treated waste from the subbowl container through the flexible main drain. The sink and basin and bath drains drain into the main drain preferably at points higher than the toilet connection so that the auxiliary drains tend to continually supply the main drain with contaminated, but otherwise solid-free water. This water mixes in the flexible main drain with the toilet wastes, so that it not necessary to flush the main drain with each toilet flushing. Thus, while fresh water is used in the bowls of the toilet facilities, disintegration of wastes and the flushing of the toilet drain are accomplished using the contaminated but solid free water of the sink, basin and bath collections. The main drain is preferably flexible so that it may be physically moved from time to time to dislodge any blockage and to agitate the contents. A raised portion of the main drain between the auxiliary drains and the storage tank insures that water from the baths, sinks and basins mixes with the toilet discharge before the contents of the main drain pass into the storage tank.

The storage tank is equipped with a motor-driven agitator and a chemical holder and mixer for adding appropriate chemicals. An outlet line interconnects an outlet of the storage tank with an intake of a pump which discharges through a discharge port in the outer surface of the conveyance. Discharge port has a fitting of preferably a quick coupling type for connecting the discharge port to a flexible delivery hose. A plug chained to the discharge port screws into the discharge port when the hose is detached. A pipe interconnecting the outer surface of the conveyance with the storage tank also may serve as an overflow for the storage tank when a plug is removed therefrom.

The only changes required between facilities which prevent pollution of the water environment and land and air facilities which prevent environmental pollution by waste disposal is that the latter require fresh water storage tanks for the supply of water to the basins, sinks, baths and toilet. At appropriate waste collection points, which in the case of ships will be ports or harbors or at sea waste disposal collection points, and which in the case of aircraft will be airports, and which in the case of land vehicles is any convenient station, hoses are connected and the tank is discharged. Large conveyances require one or more large storage tanks, whereas smaller conveyances such as small pleasure craft may require only a single relatively small storage tank.

This invention has as a broad objective the provision of onboard waste mixing, treatment and storage to prevent environmental pollution.

This and other objectives of the invention are apparent in the specification, claims and drawings which comprise the disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic representation of an onboard waste mixing, treating and storage system.

FIG. 2 is a schematic diagram of preferred discharge system showing an alternate form of a storage tank.

FIG. 3 is a description of an alternate embodiment of storage tank in which a flexible plastic liner is employed.

FIG. 4 is an alternate embodiment of the storage tank in which a lift out pail is used.

FIG. 5 is a representation of another embodiment of the storage tank which is configured according to a specific hull section.

FIG. 6 is a rigid lift out liner which may be employed with the storage tank of FIG. 5.

FIG. 7 is a schematic representation of a marina waste receiving facility showing alternate means of discharge.

FIG. 8 is a schematic representation of a waste discharge system which employs towable, collapsible tanks.

DETAILED DESCRIPTION OF THE DRAWINGS

Referring to FIG. 1, a sink **12** and a basin **22**, generally referred to collectively as wash basins, are connected through traps **14** and **24** to a first drain **18**. A shower base **32** is connected through pipe **33** to a solid trap box **34**, where filter **35** catches solids from the shower base, and the filter and the box are cleanable by removing cover **36**. Another primary drain **38** leads from the filter box **34** to a main drain.

Toilet **42** has a bowl **43** which is supplied with fresh water through an intake **44** and a pump **45** which is operated by a manual pump handle **46**. Wastes are drained from the bowl through drain **48** into base container **52**, which is supplied with chemicals from container **54**, each time foot pedal **56** is operated. A separate section of the pump **57** operated by the same handle **46** pumps waste through the flexible main drain **58** which interconnects the toilet and storage tank **60**.

Primary drains **18** and **38** are connected to the flexible main drain **58** at points between the toilet and a raised portion of the drain **59** so that waters from the sink, basin and bath mix with waste from toilet **42** in main drain **58** so that the contaminated but solid-free waters from the sinks and baths are used in the flushing of the main drain.

In a preferred embodiment, the storage tank **60** comprises a base and rectangular sides **62** with a rectangular cover **64** secured to the sides by bolts **66**. Main drain **58** enters one of the sides **62** at an inlet **68**. A small electric motor **72** is mounted on the top of the box with legs **74**. A shaft **76** extends downward from motor **72** and terminates in propeller **78** which agitates waste within the storage tank. A chemical container **82** is mounted on top **64**. Hollow tube **84** extends

downward into tank 60 and terminates in a propeller 83. In small installations, chemicals may be placed within container 82 and the entire container 82, tube 84 and propeller 83 may be turned by hand, agitating the chemicals into the waste as they fall through tube 84.

Outlet 85 of tank 60 screens large solids from passing into pump intake 86 through tank outlet line 87. A pump 88 is driven by an electric motor 89 to propel waste through pump outlet line 92. Outlet port 94 is mounted in an exterior surface 96 of the conveyance, which in this case is a boat. A flush plug 98 fits within the internal hose connection in outlet port 94 to seal the outlet port when it is not being used. Chain 102 prevents the losing of plug 98. Keyways 104 in the flush plug receive the lugs 108 of key 106. A vent 112, which is provided with a plug 114, communicates with an opening 118 in tank 160. Vent 112 can alternately be used as a flushing port to flush line 116. When plug 114 is removed, the flushing line may operate as a safety overflow for tank 60.

In FIG. 2 a flexible main drain 150 from a toilet and other primary drains is connected to a tee 152. Valve 154 is shown with handle 156 in the closed position. When valve 154 is opened, waste may proceed directly through discharge line 158 and through a solids filter 160 and may be discharged out of port 162 in hull 164 of the craft. Filter 166 is removable so that the filter and filter box may be cleaned. As shown in the drawing, when the ship is in port, handle 156 of valve 154 is moved to the shut position. Handle 172 of valve 170 is in the open position so that waste from main drain 150 flows through tube 174 into tank 176. There, a motor 178 with a shaft and propellers agitates the waste in the tank to insure the liquefaction of all solid waste. Tank 176 is provided with a vent line 180 with a cap 182 which is vented downwardly about upturned end 184 of pipe 180. Pipe 180 may also be used as a flushing connection to tank 176.

Tank 176 is discharged by pump 190 which is connected to a drain line 192 and a discharge line 194. A valve 196 immediately adjacent the ship's hull 164 may be opened by handle 198 whenever a discharge hose 200 is connected to tank discharge port 202. A valve 204 is mounted in the end of discharge hose 200 closest port 202 so that valve 204 may be shut off with handle 206 before hose 200 is disconnected from the bayonet-type coupling in port 202. Shutting off valves 204 and 196 before hose 200 is uncoupled for the port prevents the leakage of waste from the line 194 and hose 200. Cap 206 is provided for discharge port 202 and a similar cap may be provided for the end of hose 200.

Although it is desirable to use storage tank 176 at all times, long cruises in open water without discharge facilities may require that valve 170 be shut off and valve 154 be opened so that the liquor from main drain 150 may be discharged directly overboard through port 162. At the same time that valve 154 is opened, valve 170 may be left open so that solids that cannot pass through filter 166 may flow into line 174 and then into tank 176. In port valve 154 is closed, and valve 170 is opened.

Tubes, pipes, hoses and tanks may be made of any suitable material. For example, tanks may be made of galvanized steel or neoprene. The tanks may be rubberized or lined and the tanks may be rigid or flexible, usually in the latter case with rigid frames. Any shape of tank may be used as most conveniently fits the installation requirements.

FIG. 3 reveals an oval tank having a base 210 which receives a flexible plastic liner 212 that may be lifted out of the base by raising cuff 214 and bringing the cuff together to carry the bag in a conventional manner. A clamp 216 is supplied to clamp cuff 214 to an upper surface of base 210. Cover 218 is equipped with a fitting 220 for receiving vent tube 222 and a fitting 224 for receiving vent tube 226. Both of the fittings are provided with conventional clamps 228. Recesses 230 in cover 218 cooperate with clamps 232 on clamp band 216 to hold the cover down on the base 210.

FIG. 4 describes an alternate embodiment of a storage tank in which a vertical cylindrical base 240 receives a pail-type liner 242 with a bail 244 which fits inside the base 240. When cover 246 is removed, bail 244 is raised and the liner pail 242 is removed to dump the waste from the storage container. In a similar arrangement to the apparatus of FIG. 3, fittings are provided for a vent tube 248 and main drain 250. A valve 252 is provided in the main drain so that the valve may be shut off before the cover is removed form base 240.

FIG. 5 depicts an embodiment in which a storage container 260 is configured to fit in a front hold portion of a pleasure craft. Hatch 262 on deck 265 of the craft is hinged at 268 to provide access to the storage tank 260. Cover 270 on storage tank 260 is hinged centrally at hinge 272 and at the edge of the storage tank at hinge 274 so that the cover may be folded and lifted at the same time by handles 276. A similarly configured pail 278 fits within the storage tank 260. Main drain 280 has a valve 282 which may be shut off when the valve 284 is opened to directly discharge waste from main drain tube 286 through discharge port 288.

FIG. 6 shows details of a lift out liner for FIG. 5.

FIG. 7 shows a small craft 120 moored at a marina. Flexible discharge hose 122, which is hung from dock 123, interconnects an outlet port on craft 120 with a fully submerged waste storage tank 124. Periodically, storage 124 is emptied through line 128 by pumping a suitable medium, usually air, from pump house 130 through vent line 132 into tank 124. Truck 134 hauls the sewage to a remote treatment facility. As shown in the drawings, the discharge lines may be rigid galvanized pipe or flexible rubberized or neoprene hoses up to 12 inches in diameter.

As an alternative, a flexible hose 136 may directly interconnect a discharge port on craft 120 with an onshore sewage facility. The lines shown in hidden view may be used to interconnect the discharge hoses with adjacent moored craft which are not shown. A more detailed discussion of a marina sewage collection facility is found in copending application Ser. No. 710,084.

As shown in FIG. 8, a large ocean vessel 140, which has several onboard systems similar to FIG. 1 with a multiplicity of elements and drains, discharges its onboard waste tanks through discharge ports 141. Flexible discharge hoses 142 interconnect ports 141 and large collapsible waste-receiving containers 144 which may be towed to remote sewage treatment facilities. A discussion of a system in which similar large bags are employed is found in copending application Ser. No. 797,601.

I claim:

1. In water craft, a waste disposal system comprising first drain, a washing facility having a discharge connected to the first drain, a second drain, a toilet connected to the second drain, the toilet having a bowl, having an inlet connected to a source of fluid, and having a flushing control device for controlling the removing of matter from the bowl and the passing of matter into the second drain, a storage tank connected to the drains, a discharge outlet connected to the storage tank, an outlet line having a first end connected to the discharge outlet, an outlet port mounted above water on an exterior surface of the water craft and connected to a second end of the outlet line and to the exterior surface of the water craft and connection means on the outlet port for connecting the outlet port to a delivery tube for controlling the discharging of waste from the water craft whereby the storage tank is discharged via the storage tank outlet through the outlet line through the outlet port, and through a waste delivery tube connected to the outlet port.

2. Water craft of claim 1 wherein the second drain is a flexible tube.

3. Water craft of claim 2 wherein the first drain is connected to the second drain intermediate the toilet and the storage tank.

4. Water craft of claim 1 wherein the toilet further comprises pump means connected to the toilet inlet for pumping fluid into the bowl.

5. Water craft of claim 4 wherein the pump means is further connected to the second drain for pumping fluid from the bowl into the second drain.

6. Water craft of claim 5 wherein the toilet means further comprises chemical storage means connected to the pump means for discharging chemicals into fluid moving into the second drain.

7. Water craft of claim 1 wherein the first drain comprises parallel drains connected to the second drain and wherein the washing facility means comprises sink means connected to one drain and bath means connected to another drain, and wherein a solids trap is mounted in the last drain, the trap comprising a box having an inlet and outlet connected sequentially in the last drain and removable filter interposed between the box inlet and outlet for catching solids moving through the box.

8. Water craft of claim 1 wherein the storage tank further comprises motor means mounted on the storage tank means having shaft means extending into the storage tank means and having propeller means fixed to the shaft means for agitating waste within the storage tank.

9. Water craft of claim 1 wherein the storage tank further comprises chemical-dispensing means having a hollow tube means interconnecting the dispensing means and the tank and extending into the tank and terminating in a second propeller means for adding and mixing chemicals in the storage tank.

10. Water craft of claim 1 wherein the storage tank further comprises a flushing line connected adjacent an upper surface of the storage tank and extending therefrom to the outer surface of the water craft and having a plug means mounted in an outer end of the flushing pipe, whereby, upon removal of the plug means, the flushing pipe serves as an overflow for the storage tank.

11. Water craft of claim 1 wherein the outlet line is a flexible hose and the storage tank is a flexible storage tank.

12. Water craft of claim 1 further comprising a flexible hose having a first end connected to the outlet port and having a second end connected to a shore waste removal facility.

13. Water craft of claim 1 further comprising a flexible hose having a first end connected to the outlet port and having a second end connected to a permanent subsurface relatively large storage container.

14. Water craft of claim 1 further comprising an outlet port valve connected in the outlet line adjacent the exterior surface of the water craft for preventing flow through the outlet line.

15. Water craft of claim 1 further comprising a flexible hose having a first end connected to the outlet port, and having a second end connected to a permanent subsurface relatively large storage container, and a hose valve mounted in the flexible hose adjacent the first end for preventing leakage from the hose when the hose is disconnected from the outlet port.

16. Water craft of claim 1 further comprising a drain-closing valve mounted in the second drain adjacent the storage tank and an auxiliary drain connected to the second drain adjacent the drain-closing valve on a side thereof opposite the storage tank, an auxiliary valve mounted in the auxiliary drain adjacent the second drain and an auxiliary outlet port mounted in the exterior surface of the water craft and connected to the auxiliary drain whereby when the auxiliary valve is open, fluid may flow through the auxiliary drain and the auxiliary port for discharge from the water craft and whereby when the auxiliary valve is closed and the drain valve opened, fluid flows through the second drain into the storage container.

17. Water craft of claim 16 further comprising a filter mounted in the auxiliary drain for preventing the flow of solids through the auxiliary drain.

18. Water craft of claim 1 wherein the storage tank comprises a base, a liner removably mounted in the base, and a cap overlying the liner and the base, the cap having a fitting for receiving and end of the second drain, whereby the cap maybe removed from the base for removal of the liner therefrom.

19. Water craft of claim 18 wherein the liner comprises a flexible plastic container.

20. Water craft of claim 18 wherein the liner comprises a rigid container having a handle and defining a shape similar to the shape of the base.

21. Water craft with a waste disposal system according to claim 1 wherein pump means is interposed in the outlet line to pump from the storage tank toward the outlet port.