United States Patent

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[54] **MARINE TOILET ASSEMBLY**

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[52] **U.S. Cl.** **4/90,** 4/77, 210/152

[51] **Int. Cl.**.....**E03d 11/11,** E03d 11/10

[58] **Field of Search**.....4/10, 90, 89, 77, 76, DIG. 4, 4/69, 78, 80; 210/152

[56] **References Cited**

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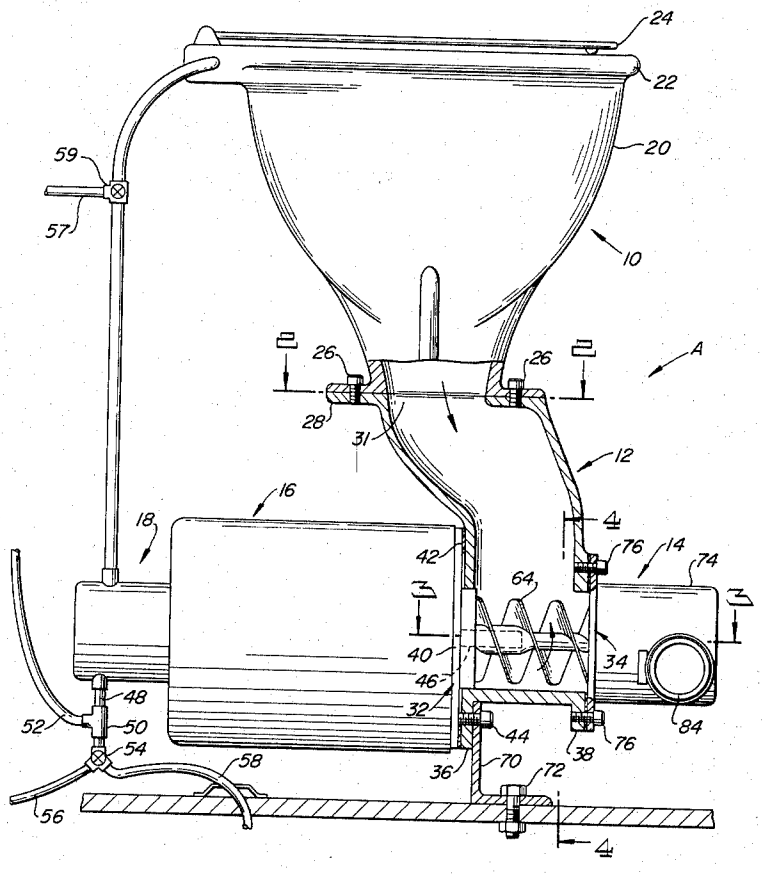
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[57] **ABSTRACT**

The drawings show a marine toilet assembly comprising a first tubular member having an open upper end connected to and supporting a conventional toilet bowl and seat assembly. The lower end of the tubular member has an outlet opening facing generally horizontally and a motor is releasably connected to the tubular member on the side opposite the outlet with its drive shaft extending generally horizontally and aligned with the outlet opening. Positioned in the lower end of the tubular member and releasably connected to the drive shaft is a rotary macerator and waste pump assembly with the waste pump located outwardly of the outlet. A housing member encloses the waste pump and is sealingly and releasably connected to the outlet opening on the tubular member. The housing member has a discharge opening adapted to receive the output from the waste pump. A flush water pump is connected to the motor at the side opposite the outlet and means are provided for supplying treatment chemicals to the water supplied to the flush water pump.

12 Claims, 6 Drawing Figures



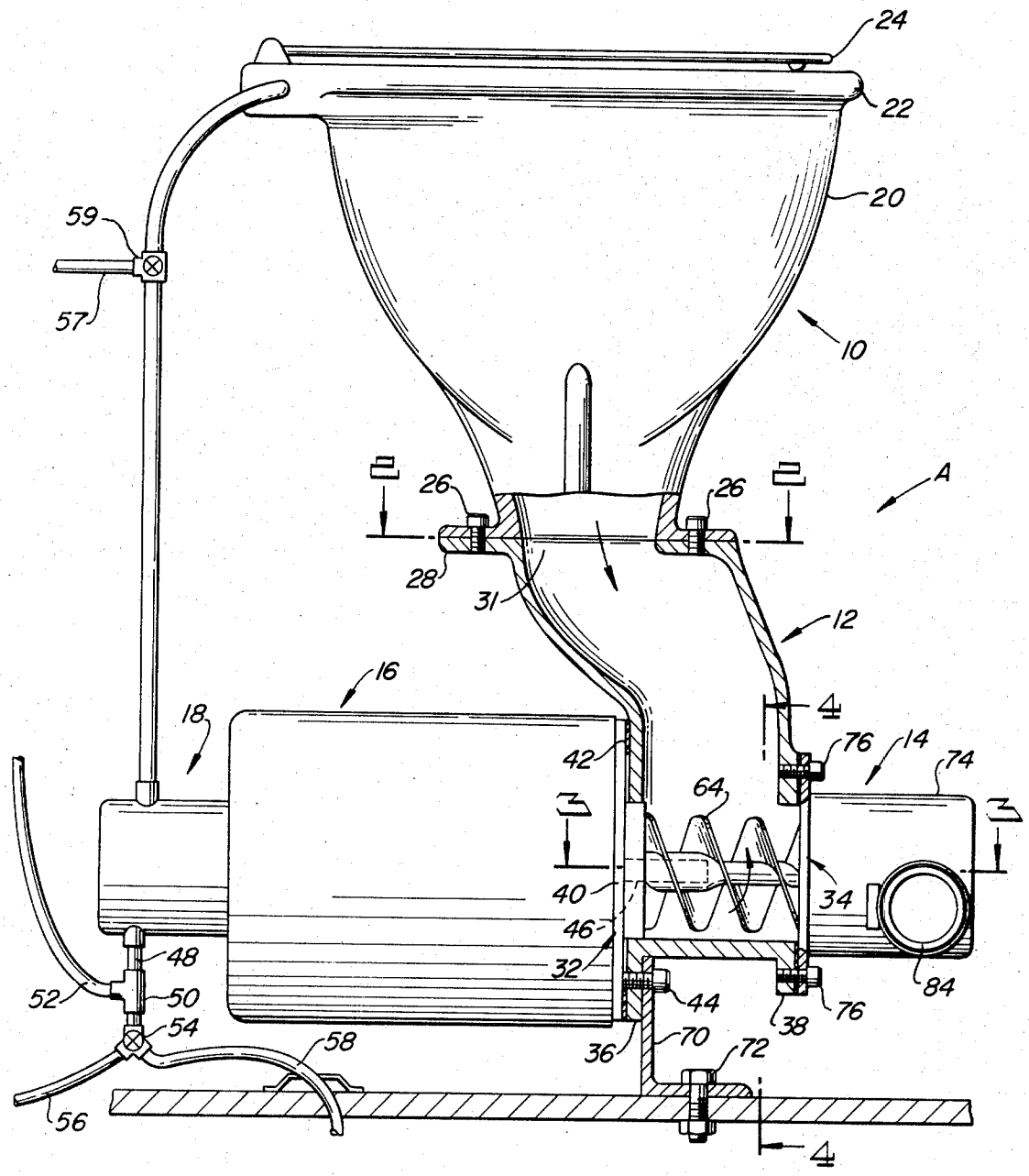


Fig 1

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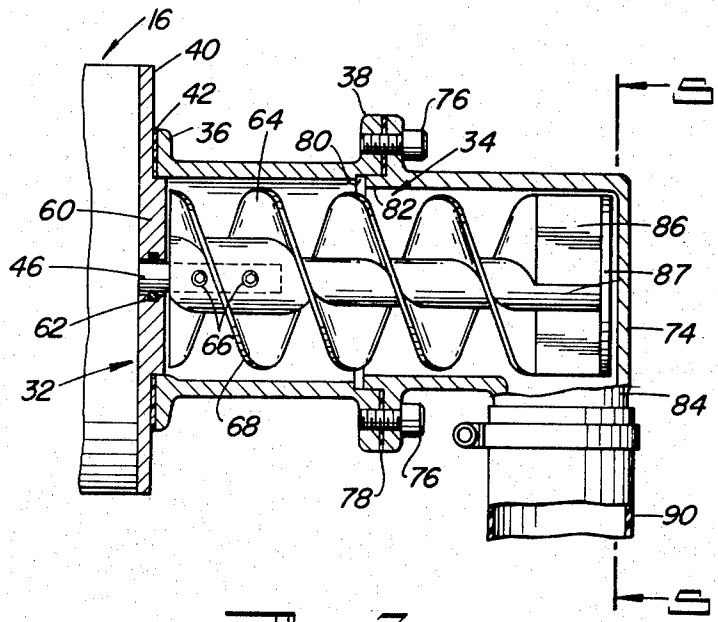


FIG 3

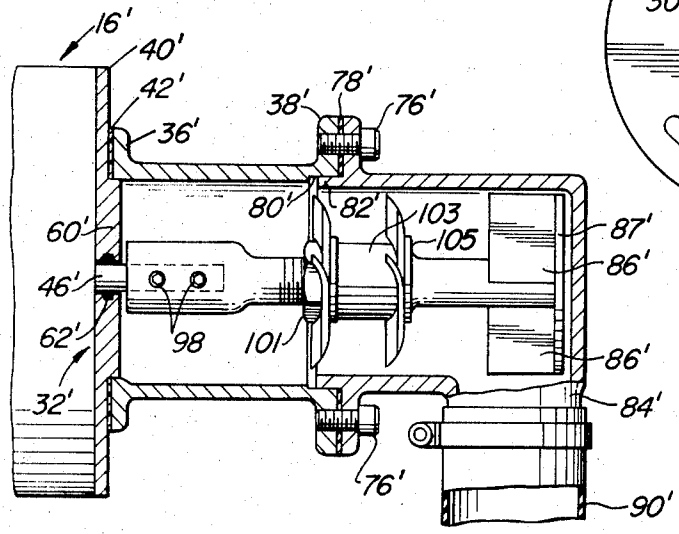


FIG 6

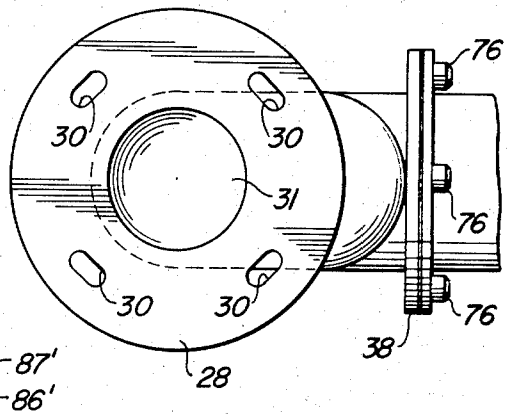


FIG 2

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Fig 4

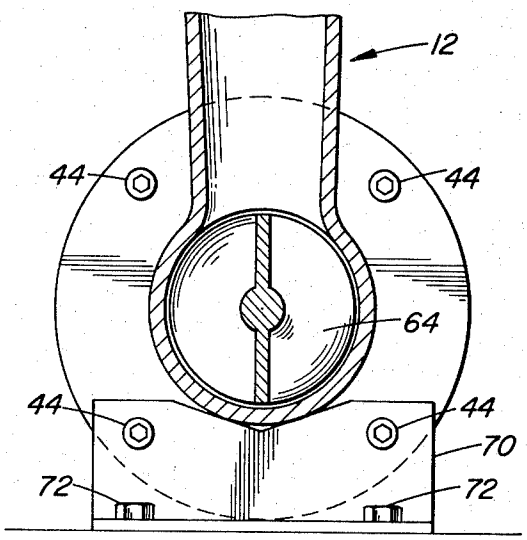
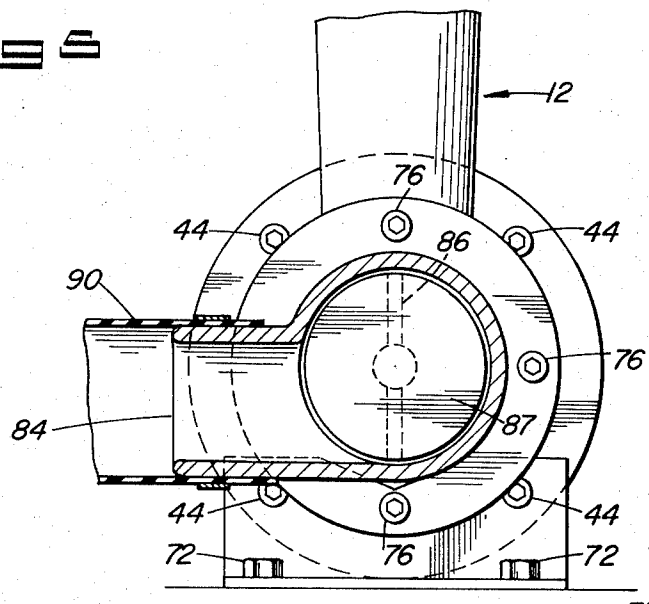


Fig 5



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MARINE TOILET ASSEMBLY

The present invention is directed toward a toilet assembly for macerating and chemically treating human waste materials.

The invention is particularly suited for use as a marine toilet and will be described with particular reference thereto; however, it will be appreciated that the invention is capable of broader application and could be used in many other types of vehicles, mobile homes and the like.

The continuing interest in pollution control has required that marine toilet systems by arranged to eliminate overboard dumping of contaminated effluent. The main types of systems currently in use include on-board holding tanks, recirculating systems, or systems using overboard dumping of chemically treated effluent. In each of these systems, it is manditory or highly preferably that the waste, eg. human feces, paper, etc., be finely macerated. Further, in those systems in which the waste is chemically treated, it is desirable to mix intimately the macerated waste with chemical treatment solution prior to the time it is discharged from the toilet assembly.

Several different macerating toilet assemblies have been proposed in the prior art. These prior assemblies have been less than completely satisfactory for a variety of reasons. For example, some of the assemblies can only be used with one type of waste disposal system. Further, some of the prior units have failed to provide sufficient intermixing of the waste particles and the chemical solution. And, in addition, generally all of the prior units have been relatively complex and very difficult to assemble and disassemble for maintenance or service.

The present invention overcomes the above problems and provides a toilet assembly which can be used in any of the standard disposal systems, but yet, is simple in construction and easy to maintain. In particular, the invention contemplates a toilet assembly comprising a first tubular member having an open end adapted to be connected to a toilet bowl member and a lower end with an outlet opening facing generally horizontally. A motor is releasably connected to the tubular member on the side opposite the outlet with its drive shaft extending generally horizontally and aligned with the outlet opening of the tubular member. Rotary macerator means are carried in the lower end of the tubular member and are releasably connected to the drive shaft. A waste pump means is also drivingly connected to the drive shaft and mounted at a location outwardly of the tubular outlet. Enclosing the waste pump and sealing and releasably connected to the outlet opening on the tubular member is a cup-shaped housing. The housing is provided with a discharge opening adjusted to receive output from the waste pump. Preferably, but not necessarily, the entire assembly is supported from a single bracket connected to the tubular member intermediate the motor and cup-shaped housing so that either the motor or the housing can be removed without dismounting the entire unit.

In accordance with a further aspect of the invention, a flush water supply pump is mounted on the motor on the end opposite the tubular member and arranged to supply flush water to the toilet whenever the motor is actuated to drive the macerator and waste pump. Preferably, but not necessarily, the intake of the flush water pump is connected with a chemical solution supply to automatically draw a chemical treatment solution into the flush water.

In accordance with a still further aspect of the invention, the macerator means preferably comprises an auger-type blade extending through the lower end of the tubular member and into the cup-shaped member whereby removal of the cup-shaped housing member allows immediate access to the waste pump and the macerator for cleaning or the like.

Accordingly, a primary object of the invention is the provision of a macerator-type marine toilet assembly which is highly efficient and extremely simple to service.

A further object is the provision of a marine toilet assembly of the type described which can be used with all conventional marine waste disposal systems.

Yet another object is the provision of a toilet assembly wherein the macerator and pump units are readily accessible for maintenance and repair.

The above and other objects and advantages will become apparent from the following description when read in conjunction with the accompanying drawings wherein:

FIG. **1** is a side elevation of a marine toilet assembly formed in accordance with the preferred embodiment of the invention (portions of the assembly have been broken away to more clearly show the internal structure);

FIG. **2** is a partial cross-sectional view taken on line **2—2** of FIG. **1**;

FIG. **3** is a cross-sectional view taken on line **3—3** of FIG. **1** showing the construction of the macerator and waste pump portion of the assembly;

FIG. **4** is a cross-sectional view taken on line **4—4** of FIG. **1** showing the assembly mounting arrangement;

FIG. **5** is a cross-sectional view taken on line **5—5** of FIG. **3**; and,

FIG. **6** is a cross-sectional view showing a modified form of macerator means.

Referring more particularly to the drawings wherein the showings are for the purpose of illustrating the preferred embodiment of the invention and not for the purpose of limiting same, FIG. **1** shows the overall arrangement of a marine toilet assembly A including a standard toilet bowl and seat assembly **10** which is supported from a deck mounted waste receiving tube member **12**. A waste macerator and pump unit **14** which embodies inventive features of the invention is carried in the lower end of the tube **12**. The unit **14** is driven by an electric motor **16** supported from the tube **12**. The motor **16** also functions to drive a flush water supply pump **18**.

The details of the toilet bowl and assembly **10** form no part of the present invention and are illustrated merely as a standard toilet bowl having a contoured body **20** provided with the usual flush ring arrangement **22**. A hinged seat and/or cover **24** is mounted in the usual manner at the top of the bowl. The bowl assembly **10** is removably connected to the upper end of the waste receiving tube **12** in any convenient manner such as by a plurality of machine screws or the like **26**.

Preferably, the subject assembly is arranged so that it can accept most standard toilet bowl units. This allows it to be used as a replacement unit in existing marine

toilet systems without requiring purchase of a new bowl. Note that, as shown in FIG. 2, the upper end of the waste discharge pipe 12 has an outwardly extending flange 28 provided with four elongated bolt receiving openings 30. The openings 30 are positioned and sized so as to allow the tube 12 to accept the majority of standard bowl configurations.

The tube 12 is formed from bronze, brass, plastic, or any suitable material which is preferably impervious to electrolysis or salt water corrosion. In the embodiment shown, the upper end of tube 12 has an inlet opening 31 which receives the waste material from bowl 10. The tube is laterally offset as best shown in FIG. 1 and terminates at its lower end in a pair of laterally facing openings 32 and 34 having mounting flange portions 36 and 38 respectively (see FIG. 3). The lateral offset is preferred since it prevents waste from being splashed upwardly during operation of the macerator.

The motor 16 and the flush water pump 18 are supported from the flange 36. As shown, the motor 16 includes a mounting plate 40 provided with a peripheral gasket 42. The gasket is sealingly engaged with the outer face of the flange 36 and clamped thereto by four socket screws or the like 44 which extend into engagement with the motor mounting plate 40. As shown, the motor drive shaft 46 is centrally aligned with the opening 32. The opposite end of the drive shaft is directly connected to the small centrifugal water pump 18 which functions to supply flush water to the flush ring 22 of the toilet bowl 10.

Note that the intake line 48 of the pump 18 is connected through a T-fitting 50 with a chemical solution or disinfecting agent supply line 52. Line 52 is sized relative to line 48 so so that during operation of pump 18, a metering of the disinfecting agent into the water supplied to the system takes place automatically. Immediately upstream of the T-fitting 50 is a Y-valve 54 connected to a first line 56 and a second line 58. Line 56 is suitably connected with a water inlet below the water line of the craft so that water can be supplied directly to the pump from the lake, river or other waterway. Line 58 is preferably connected to the vessel's bilge so that in those locations where overboard dumping of waste is permitted, the unit can be used as an auxiliary bilge pump. Note that a second line 57 having a valve 59 is connected downstream of the pump to an overboard discharge. Merely by shifting the valves 54 and 59, water can be drawn from the vessel's bilge through line 58 and discharged through the line 57. Of course, when the unit is used in a holding tank system, valve 54 and line 58 would be eliminated.

Referring again to FIG. 3, it will be noted that the motor mounting plate 32 has a raised boss portion 60 which is closely received in the opening 32. A suitable seal for example, an O-ring member 62, is positioned about the drive shaft 46 to completely seal the opening 32.

Releasably connected to the outer end of the output shaft 46 is a grinder or macerator means which could be of many types but is shown in the subject embodiment as an auger-type blade 64. The auger blade 64 is removably connected to the shaft 46 by set screws 66 which engage a flat formed on shaft 46. The auger 64 can be formed from any suitable material capable of handling the usual waste material. In the embodiment shown, the auger is formed from a relatively hard steel and has the outer peripheral edges 68 sharpened at a substantially right angle to the blade body. It will be noted that the auger is supported from the shaft 46 and no outer bearing assemblies are required, however, if desired, additional bearings could be provided at the outer end.

As best shown in FIGS. 4 and 5, the entire unit is preferably mounted from a single mounting or support positioned generally in line with the vertical axis of the bowl 10. Thus, only small moments are applied to the mounting bracket. In the embodiment shown, the mounting bracket comprises an angle member 70 which, as best shown in FIG. 4, is connected to the assembly through the two lower machine screws 44. The lower leg of the angle 70 is connected to the deck in any suitable manner such as through the use of bolts 72. As can be appreciated, the entire toilet assembly can be removed simply by disconnecting the various hose connections and removing machine screws 44 or bolts 72.

Access to the macerator assembly is provided by enclosing the outer free end of the macerator with a generally cup-shaped housing member 74 which is releasably joined to the tube 12 by four socket screws 76. The member 74 is suitably sealed about the flange 38 by a gasket member 78. Additionally, a recess and boss portion 80 and 82 respectively serve to properly position the member 74 relative to the end of the macerator.

The member 74 also includes a waste discharge outlet opening 84, positioned to extend laterally from its outer end at a location best shown in FIGS. 1 and 5. To assist in discharging the waste from the unit, a pair of outwardly extending paddle members 86 are carried at the outer end of the macerator 64. The paddles 86 are aligned with the outlet 84 and direct the waste therethrough.

A disc or plate 87 is connected to the paddles 86 in the manner best shown in FIGS. 3 and 5. The plate serves to increase the pump action of the paddles.

The device is designed so that the combination of the pulverizing action of the macerator means and the chemical treatment disintegrates and sterilizes all waste. The waste is in condition so that it can be directed through the outlet tube or pipe 90 to a holding tank, a recirculating system, or even overboard if regulations permit.

FIG. 6 is a cross-sectional view similar to FIG. 3 but showing a modified form of the macerator means. In the FIG. 6 embodiment, all features which are the same as those described with reference to the FIG. 5 embodiment are identified with the same reference numeral differentiated by a prime(') suffix. In particular, it will be noted that the macerator comprises a pair of cutters 94 releasably connected to the motor drive shaft 46' in any convenient manner such as through the use of set screws 98. The cutters 94 are of the type used in the standard home blender and includes four cutting blade portions each having sharpened edges. The blade portions are formed integrally in the embodiment shown but can be provided with separate cutting edge inserts or the like if desired. Additionally, although two cutters are shown, one or more of the blades could be used. Preferably, the blades are releasably connected to the

center shaft **100** so that they can be removed for replacement or repair without the necessity of changing the entire shaft and pump assembly. This can be accomplished in many ways but is shown as a nut **101** and a spacer **103** which clamps the blades against a shoulder **105**.

As is apparent from the foregoing, the overall assembly is extremely simple and allows maintenance to be easily carried out on any portion of the machine. Note that merely by removing the four machine screws **44** and disconnecting the water and chemical supply tubes, the motor and macerating blade assembly can be pulled out of the tube **12**. Alternately, by disconnecting the four machine screws **76**, access is had to the interior of the macerating and waste pump portion of the unit for cleaning or inspection.

The invention has been described in great detail sufficient to enable one of ordinary skill in the art to make and use the same. Obviously, modifications and alterations of the preferred embodiment will occur to others upon a reading and understanding of the specification and it is my intention to include all such modifications and alterations as part of my invention insofar as they come within the scope of the appended claims.

What is claimed is:

1. A toilet assembly comprising:

a first tubular member having an open upper end adapted to be connected to and support a toilet bowl, and a lower end with an outlet opening facing generally horizontally;

a motor releasably connected to and supported by said tubular member on the side opposite said outlet in line therewith with its drive shaft extending generally horizontally and aligned with the outlet opening;

rotary macerator means positioned in the lower end of said first tubular member being and extending in the direction of said outlet releasably connected to said drive shaft;

a waste pump means drivingly connected to said drive shaft and mounted at a location outwardly of said outlet; and,

a housing member enclosing the waste pump and sealingly and releasably connected to and supported from the outlet opening on said first tubular member, said housing member having a discharge opening adapted to receive the output from the said waste pump.

2. The toilet assembly as defined in claim **1** including a water pump connected to said motor at the side opposite said outlet and means for conducting water from said pump to a toilet bowl mounted on the upper end of said tubular member.

3. The toilet assembly as defined in claim **1** wherein said open upper end is laterally offset from said macerator means.

4. The toilet assembly as defined in claim **1** wherein macerator means comprises an auger-type blade extending through the lower end of said first tubular member and into said housing member.

5. The toilet assembly as defined in claim **4** wherein said waste pump means comprises rotary impeller blades formed on the end of said auger-type blade.

6. A marine toilet assembly for finely macerating and chemically treating waste products comprising:

a first tubular member adapted to be positioned generally vertically and having an upper end for connection to and support of a toilet bowl assembly, the lower end of said tubular member having a laterally facing outlet;

a motor mounted on and supported by the lower end of said tubular member on the side opposite the outlet, said motor having a drive shaft extending toward and generally aligned with said outlet;

a macerator means carried in said tubular member in general alignment with said outlet and connected with said drive shaft;

a waste pump means driven from said shaft and positioned outwardly of said macerator means on the opposite side of said tubular member from said motor; and,

a housing member removably connected to said outlet opening and enclosing said waste pump means, said housing member having a waste discharge opening for receiving and discharging waste from said waste pump means.

7. The marine toilet assembly of claim **6** including a flush water pump connected to and driven by said motor.

8. The marine toilet assembly of claim **6** wherein said macerator means and said waste pump means are releasably connected to said drive shaft and wherein the upper end of said tubular member is laterally offset from the lower end.

9. The marine toilet assembly of claim **6** including flush water pump means carried and driven by said motor.

10. The marine toilet assembly of claim **9** wherein said flush water pump means includes intake lines selectively connectable to two separate water sources and supply means for supplying chemicals to water from either source.

11. The marine toilet assembly of claim **6** wherein said macerator means comprises an auger blade.

12. The marine toilet assembly of claim **6** wherein said macerator means comprises at least one rotatable blade having a sharpened edge portion.

* * * * *