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WASTE DISPOSAL SYSTEM

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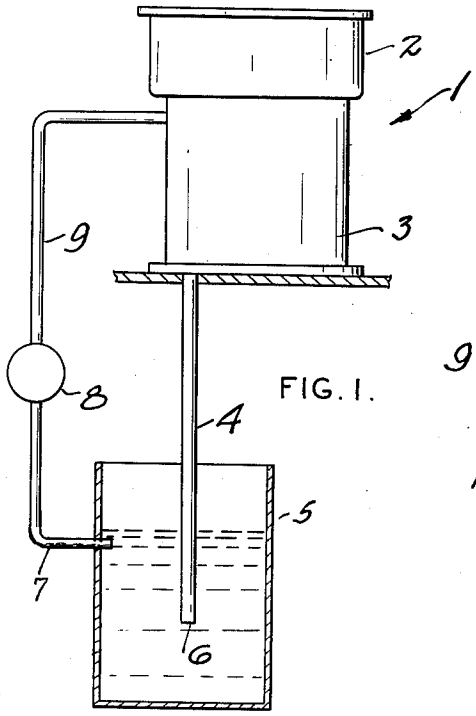


FIG. 1.

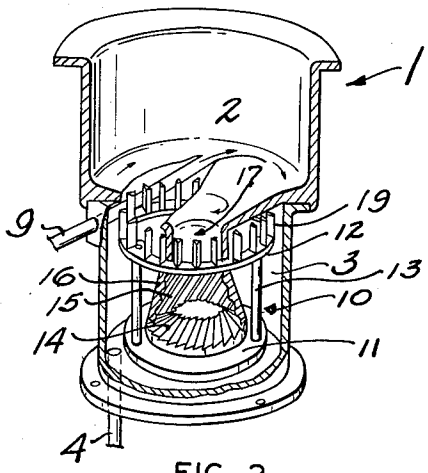


FIG. 2.

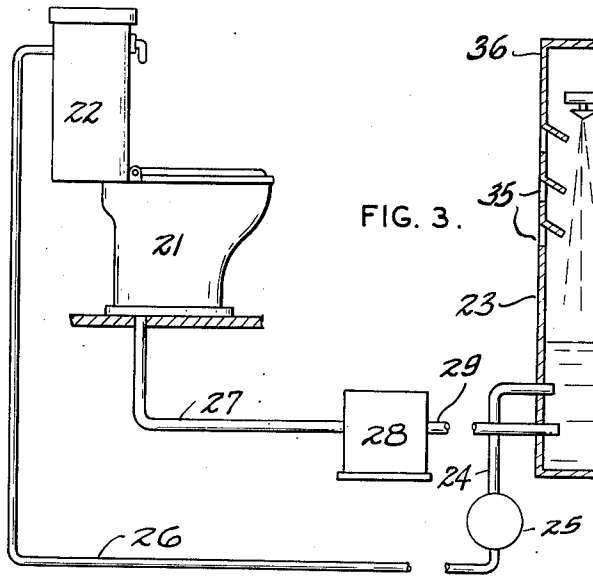


FIG. 3.

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WASTE DISPOSAL SYSTEM

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5 Claims. (Cl. 4—10)

The invention relates to waste disposal systems and, more particularly, to toilets for disposal of human excrement.

The main objects of the invention are to avoid the necessity of using septic tanks of elaborate sewage systems with consequent consumption of large quantities of water for flushing.

An additional object is to provide efficient waste disposal systems which are sanitary, preferably continuous in operation, and which do not require any filtrating, separating, chemical treating or settling steps or equipment.

Another object is to provide a system which is self-contained, having simple component elements, which is reliable and economical in operation, and which is readily transportable.

These and other detailed objects will be apparent from the following description and accompanying drawings, in which:

Figure 1 is a diagrammatic view, in partial vertical section, of a waste disposal system embodying the present invention.

Figure 2 is an enlarged fragmentary perspective view of the toilet and macerator in the system.

Figure 3 is a diagrammatic view, in partial vertical section, of another form of the invention.

Figure 1 of the drawings illustrates a generally closed waste disposal system comprising a toilet 1 having an upper bowl 2 and a lower cylindrical chamber 3 connected on its bottom wall by a downwardly directed outlet or drain pipe 4 which extends into a vertically elongated tank or reservoir 5 with its lower end 6 terminating well below the level of liquid therein. Tank 5 is spaced downwardly from the toilet 1 so that ample head will be provided to move waste and water from toilet 1 through a sewaged drain or pipe 4. At its upper end tank 5 may be opened or suitably provided with conventional venting means to permit escape of air or gases.

Leading from tank 5 at a point above its base, is a pipe section 7 connected to the inlet or suction side of a pump 8 which may be of the centrifugal type and is connected on its outlet side with a toilet supply pipe 9, the latter opening at its upper end tangentially into toilet 1 (as may be seen in Figure 2). The system thus comprises a closed circuit wherein water from tank 5 is pumped through supply pipe 9 into toilet 1 and is returned to tank 5 by gravity flow through drain pipe 4. Although control means could be readily provided for intermittent operation of pump 8 for toilet-flushing action immediately subsequent to each use of toilet 1, it has been found preferable for reasons presently to be described that pump 8 be operated continuously whereby water is constantly circulated through the system. The capacity of tank 5 will determine the amount of water available to the system, which quantity, due to recirculation, will remain fixed during usage of the system. Normally, a 50 to 60 gallon tank will be sufficient to

accommodate a toilet utilized by six to eight persons per day.

Disposed in chamber 3 of the toilet 1 is a motor 10 comprising a lower circular base plate 11 suitably mounted for rotation on the bottom of chamber 3, and an upper annular frame member 12 in parallel relation with base plate 11 and connected therewith by a plurality of radially spaced support rods 13. Centrally, the upper face of base plate 11 is provided with a generally frustro conical grinding surface 14 for coaction with a fixed companion grinding surface 15, provided on the inner face of a conical wall 16 forming a passage 17 leading from bowl 2 in a path substantially through the center of motor 10. The bottom margin of wall 16 is spaced from base plate 11 to permit material comminuted by the macerating means constituted by grinding surfaces 14, 15 to be ejected therethrough against the inner wall of chamber 3.

Upstanding from the upper surface of the annular frame member 12 are relatively short, radial vanes 19 for driving impingement thereon of the stream of water flowing therein from the supply pipe 9 to cause actuation of the motor 10. Thereby relative motion is created between the grinding surfaces 14, 15 for finely dividing solid waste matter deposited in the toilet 1 with the resultant particles being thrown violently outwardly by centrifugal action through the discharge space between elements 14 and 16 in a spray against the inner wall of chamber 3. The water flowing into the toilet 1 from supply pipe 9 will be directed tangentially of the bowl and with sufficient velocity to entrain substantial volumes of air so as the water works downwardly through passage 17, it will become airy and foamy to bring air into immediate contact with waste material and oxidize it. The oxidizing or so-called aerobic process is expedited by the above described comminution of the waste matter since maximum surfaces thereof are presented for reaction. Thus, the aeration of the excreta will be most effective in the space surrounding passage 17 into which the pulverized refuse matter has been discharged.

The organic matter comprising the waste is subjected to what might be termed wet combustion since the high volume of air entrapped in the water provides the oxygen necessary to consume the carbonaceous matter in the waste. The oxidation products are mainly methane and carbon dioxide, which escape as gas. As a result of the oxidation or aerobic treatment, the aqueous liquid flowing from tank 5 back to toilet 1 is non-toxic, clear and inoffensive. Any residual particles will be harmless and inert, comprising salts or solids comparable to ash remaining from fuel combustion and gradually deposited on the bottom of the tank, where they may be removed at long intervals. The water may be recirculated intermittently or continuously through the system which is completely sanitary since the aerating step is one of purifying or septicizing. Air or gases entrained in the water entering tank 5 from pipe 4 will bubble upwardly through the water therein for escape at the liquid surface, wtih any air thus entrained providing a source of oxygen as it moves through the tank 5. Any paper entering the system will be pulverized by grinders 14, 15 and the cellulosic particles thereby provided will be dispersed harmlessly through the water and oxidized.

Pump 8 is preferably designed for continuous running since it has been discovered that the entrainment of air is more readily accomplished by a constant stream than by an intermittent one. Furthermore, the reliability of performance of the system is thereby enhanced since manual operation or finely adjusted controls are obviated.

The precise structure of toilet 1 and its associated parts is not part of this invention but is solely illustrative of any type toilet or receptacle unit which embodies or has as-

sociated with it means whereby waste deposited therein can be subjected to maceration and oxidation. For use with the particular toilet described above, pump **8** should be capable of delivering about three gallons per minute under 20 lb. pressure. This will cause the motor **10** to rotate about 800 R. P. M.

The system is a completely closed recirculating structure including the means for grinding and oxidizing the waste and repeatedly utilizes the same liquid from a source of predetermined quantity, and may be operated indefinitely under non-contaminating conditions. This system is adapted for any service and eliminates use of large quantities of water for flushing purposes but the system is particularly advantageous for automobile trailers and for residences located in places where there is no established sewage system or where the water supply is very limited. The system can be operated at a minimum expense and the parts may be inexpensively fabricated. The pipe sections may be made of hose so that an operator of an automobile trailer could readily transport the system from place to place since the assembly and dismantling thereof would not require plumbing.

Another form of closed waste disposal is shown in Figure 3, which is designed for use with a conventional toilet **21** having the customary type flush tank **22**. The system comprises an enclosed tower or tank **23** connected by a pipe section **24** to a pump generally indicated **25**, the oulet side of which is connected to a flush tank supply pipe **26**. Leading from toilet **21** is a drain pipe **27** for communication at its lower end to a grinding or macerator unit **28**, connected to tank **23** by a conduit **29** opening adjacent the bottom of the tank. Tank **23** is connected by a pipe section **30** to a second pump **31**, the outlet side of which communicates with a vertically extending pipe **32** having at its uppper end a transverse section **33** for reentering a tower **36** above the tank and terminating in spray nozzles for discharging fluid in a mist-like dispersion into the air space above the liquid level in tank **23** to present waste particles carried therein for oxidation by air entering the tank through louvres **35** formed in the side of tower **36**.

Upon flushing toilet **21**, waste material will be conveyed through macerator **28** by the toilet effluent for comminution and the fine particles thereby resulting will be carried into tank **23** for ultimate aeration by discharge through spray nozzles **34**. By the spraying process, the ground, solid waste material is oxidized by contact with the air in the spray tower. Pump **31** may be continually operated so that the oxidizing process is uninterrupted for assuring complete aeration of all solid refuse matter in the tower. Pump **25** may be operated intermittently by manual flushing of toilet **21** and macerator **28** may be motivated by any desired means, either with or without relation to pump **25**. The system thus accomplishes the maceration and oxidation of solid waste in defined sequence, subsequent to the removal thereof from the toilet, and is adapted for use with conventional toilet installations.

The details of construction may be varied substantially without departing from the spirit of the invention and the exclusive use of those modifications coming within the scope of the claims is contemplated.

What is claimed is:

1. A unitary toilet and sewage treatment system comprising a tank adapted to contain a quantity of an aqueous effluent, a toilet bowl, means for pumping the effluent from the tank to the bowl for flushing purposes, means for conducting from the bowl to the tank a mixture of the flushing effluent and waste deposited in the bowl without separation thereof, means for continuously aerating the effluent and waste whereby the waste, including solid waste, is aerobically decomposed so that said effluent is clear and inoffensive, said system also including macerating means whereby solid waste deposited in the bowl is comminuted and mixed with flushing effluent prior to entering the tank.

2. A unitary toilet and sewage treatment system comprising a toilet bowl, a macerating unit disposed below the level of the bowl, said unit adapted to receive and comminute waste deposited in said bowl and to intermix the comminuted waste with water, a tank containing an aqueous liquid and so positioned relative to the bowl that the surface of the liquid is below the level of the bowl, a sewage drain connected to said macerating unit for carrying said comminuted waste and water mixture into said tank, means for continuously aerating the comminuted waste and water mixture whereby the waste is continuously aerobically decomposed to form a clear and inoffensive aqueous liquid in the tank, a pipeline having an inlet above the bottom of the tank and below the surface of the liquid therein, said pipeline having an outlet connected to the interior of the toilet bowl, and a pump interposed in said pipeline adapted to withdraw said clear and inoffensive aqueous liquid from the tank and discharge it into said toilet bowl and thus recirculate it through said system.

3. A unitary toilet and sewage treatment system comprising a toilet bowl, a continuously operable macerating and aerating unit disposed below the level of the bowl, said unit adapted to receive and comminute waste deposited in said bowl and continuously to intermix the comminuted waste with water and entrained air, a tank containing an aqueous liquid and so positioned relative to the bowl that the surface of the liquid is below the level of the bowl, a sewage drain connected to said macerating and aerating unit for carrying said comminuted waste and aerated water mixture into said tank wherein the waste is continuously aerobically decomposed to form a substantially clear and inoffensive aqueous liquid in the tank, a pipeline having an inlet above the bottom of the tank and below the surface of the liquid therein, said pipeline having an outlet connected to the toilet bowl, and a pump interposed in said pipeline adapted continuously to withdraw said clear and inoffensive aqueous liquid from the tank and discharge it into said toilet bowl and thus continuously recirculate it through said system.

4. A unitary toilet and sewage treatment system comprising a toilet bowl, a macerating unit disposed below the level of the bowl, said unit adapted to receive and comminute waste deposited in said bowl and to intermix the comminuted waste with water, a tank containing an aqueous liquid and so positioned relative to the bowl that the surface of the liquid is below the level of the bowl, a sewage drain connected to said macerating unit and having its discharge end below the surface of the water of said tank and adapted to carry said comminuted waste and water mixture into said tank, means for continuously spraying water and comminuted waste mixture within the tank to aerate it whereby the waste is continuously aerobically decomposed to form a clear and inoffensive aqueous liquid, a pipeline having an inlet above the bottom of the tank and below the surface of the liquid therein, said pipeline having an outlet connected to the interior of the toilet bowl, and a pump interposed in said pipeline adapted to withdraw said clear and inoffensive aqueous liquid from the tank and discharge it into said toilet bowl and thus recirculate it through said system.

5. A unitary toilet and sewage treatment system as set forth in claim 4 in which said aerating means comprises a second pump adapted to withdraw continuously water and comminuted waste mixture from the tank and to circulate it continuously through a circuit including an air space through which the mixture is sprayed to effect aeration thereof.

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