WASTE TREATMENT ASSEMBLY

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ABSTRACT
A waste treatment assembly for processing organic waste includes a frame having rails interconnected by a plurality of cross members. A waste treatment system is supported on the frame. A cabin of organic polymer presenting a floor and side walls extends upwardly from and connected to the frame. A metal plate extends over the floor and connects the floor to the frame by sandwiching the floor between the plate and the frame thereby clamping the cabin to the frame. A toilet unit of the waste treatment system is connected to the metal plate. A support interconnects the frame and the metal plate for distributing loads under the toilet unit equally over the floor for preventing the floor from bending under the loads applied thereto.
WASTE TREATMENT ASSEMBLY

RELATED APPLICATION

[0001] The subject patent application claims priority to and all the benefits of U.S. Provisional Patent Application Ser. No. 60/499,244 filed on Aug. 29, 2003.

FIELD OF THE INVENTION

[0002] The subject invention relates to a waste treatment system, which may be used in commercial transportation vehicles such as railroad vehicles, and the like.

BACKGROUND OF THE INVENTION

[0003] Maintenance transportation industry has limited options for handling organic waste having liquids and solids generated from on-board restroom facilities. Such facilities are preferably mobile and do not have septic systems. One solution has been to store the organic waste in the on-board restroom facility, until it can be pumped out at a designated location. However, the aforementioned solution is undesirable for various reasons, such as, for example, a storage space, required for storing the organic waste, not to mention the time it takes to pump the organic waste in combination with the cost and inconvenience of storage of the organic waste.

[0004] A typical toilet or waste treatment assembly adaptable for mobile use includes a cabin having walls formed from thermoplastic material such as polyethylene-type plastic, secured to a base to define both the height and the width of the cabin enclosure. One wall typically includes a door frame with a door hinged thereon. This typical toilet assembly is commonly used at construction sites, parks, and other locations, where the toilet assembly is needed for a limited time period only or where sanitary sewers are unavailable. The art is replete with various toilet assemblies that function as restroom facilities at the construction sites, parks, and other locations. Examples of such toilet assemblies are disclosed in U.S. Pat. No. 3,074,076 to Kersten; U.S. Pat. No. 4,032,995 to Kemper; U.S. Pat. No. 4,319,366 to Baker, Jr. et al.; U.S. Pat. No. 5,245,710 to Haselswerdt et al.; U.S. Pat. No. 5,251,342 to Samson et al.; U.S. Pat. No. 5,398,465 to Tagg; U.S. Pat. No. 5,671,487 to Chen; U.S. Pat. No. 6,370,706 to Waizer; U.S. Pat. No. 6,507,958 to Tagg; and U.S. Pat. No. 6,585,899 to Edwardsson et al.

[0005] The '958 patent, for example, teaches a waste treatment assembly having a base including a floor. The floor includes a waste water port and a sink unit. The waste water port is designed for draining waste water from the sink unit. The floor also includes a toilet port over which a toilet is placed to communicate with a waste-holding tank. The waste treatment assembly includes a cabinet connected to the base. The waste treatment assembly does not include a septic waste treatment system for flushing the organic waste.

[0006] The aforementioned United States Patents teach various prior art cabin designs, wherein a floor of the cabin is connected to a frame by bolts or screws extending through and around the periphery and at the corners of the floor to the frame thereby eliminating clearance between the corners of the floor of the cabin and the frame. During transportation of the prior art cabin between various locations, the deficit of clearance, defined between the corners of the floor of the cabin and the frame in the aforementioned fashion, may result in cracking of the floor and walls integrally connected to and extending upwardly from the floor of the cabin, specially when the cabin is used in open and windy area, such as, for example, the aforementioned construction sites, parks, and railroad tracks.

[0007] A septic waste processing system, which may be used on trains, buses, airplanes, boats or the like, is sold by Microphor, Inc. of Willis, Calif. However the waste processing system sold by Microphor, Inc. requires a source of a water supply, i.e. a water tank, to be positioned at least six feet above a toilet seat necessary to operate the waste treatment processing system. In a system designed for mobile use

[0008] Because the system the toilet assembly should be compact and lightweight and be capable of being disassembled into easily transportable components.

[0009] The present invention is aimed at one or more of problems set forth above.

SUMMARY OF THE INVENTION

[0010] In one aspect of the present invention, a waste treatment system for processing organic waste having liquids and solids capable of treating the organic waste by decomposing the organic waste into vapor and liquids includes a frame and a cabin. The cabin has a floor defining a periphery and side walls extending upwardly from the periphery. The cabin is supported on the frame. A support is connected to the frame with the floor positioned adjacent the support. A plate is disposed over at least a portion of the floor with the plate and is removably coupled to the support for clamping the floor with the frame.

[0011] In another aspect of the present invention, the waste treatment assembly includes a frame and a waste treatment system supported by the frame. A source of a fluid supply, i.e. a water tank, of the waste treatment system is fluidly connected to a toilet unit with the water tank extending up to five feet above the frame.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] Other advantages of the present invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

[0013] FIG. 1 shows a side view of a waste treatment assembly of the present invention;

[0014] FIG. 2 shows a rear side view of the waste treatment assembly;

[0015] FIG. 3 shows a front side view of the waste treatment assembly;

[0016] FIG. 4 shows a top view of a frame of the waste treatment assembly;

[0017] FIG. 5 shows a partial broken view of the waste treatment assembly showing a supporting device, partially in phantom, of the waste treatment assembly;

[0018] FIG. 6 shows an exploded and partially broken view of the support of the waste treatment assembly shown in FIG. 5, and
FIG. 7 shows a fragmental view of the frame showing a waste treatment tank for processing organic waste and a vent for evaporating gas out from the waste treatment tank.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the Figures, wherein like numerals indicate like or corresponding parts, a waste treatment assembly 10 includes a waste treatment system, generally shown at 12 and discussed in greater detail further below, provides a sanitary toilet facility in a mobile environment such as, for example, railroad work sites or construction sites. The waste treatment system 12 processes organic waste having liquids and solids and is capable of treating the organic waste by decomposing the organic waste into vapor and liquids.

Referring to FIGS. 1 through 4, the waste treatment assembly 10 includes a platform or frame 16 having parallel rails 16, 18 and a pair of cross or end beams 22, 23 defining first and second ends 20, 21, respectively. The parallel rails 16, 18 are interconnected by a plurality of cross beams 24 spaced one from the other and extending parallel to and between the cross or end beams 22, 23 for reinforcing the frame 14. In one embodiment of the present invention, the cross beams 24, the cross or end beams 22, 23, and the parallel rails 16, 18 have a tubular configuration. In another embodiment of the present invention, the cross beams 24, the cross or end beams 22, 23, and the parallel rails 16, 18 are solid. A pair of V-shaped supports 26 of the frame 14 are spaced one from the other and extend upwardly from the parallel rails 16, 18 interconnected by a horizontal top beam 28. A ladder 30, connected to one of the V-shaped supports 26, extends from the top beam 28 to one of the parallel rails 16, 18. The frame 14 includes a deck 32 extending from the V-shaped supports 26 in a cantilevered fashion. The deck 32 is designed to hold components of the waste treatment system 12 such as a source of water supply or water tank 34, a waste treatment tank 36, positioned below the deck 32, an air tank 38, a pair of tool boxes 40, 42 for storing rolls of toilet paper, and the like, and other components of the waste treatment system 12. A railing 44 of the frame 14 defines an entrance at one of the terminal ends 21.

A pair of axle devices 48, 50 are connected to the frame 14 and located at the terminal ends 20, 21. In the illustrated embodiment, the axle devices 48, 50 support railroad wheels 52 for transporting the waste treatment assembly 10 between various locations. While only the embodiment of the waste treatment assembly 10 having the railroad wheels 52 has been shown and discussed, the railroad wheels 52 are not intended to limit the present waste treatment assembly 10, which may include several alternative embodiments. For example, the waste treatment assembly 10 may include wheels, skis, or skates, respectively, operably connected to the frame 14 for transporting the waste treatment assembly 10 between various locations and in various climatic environments. The frame 14 of the waste treatment assembly 10 presents a robust framework to prevent frame 14 racking when the waste treatment assembly 10 is transported between the locations or is lifted to be positioned on a railroad track 54.

A cabin, generally shown at 60 in FIGS. 1 through 3, is disposed on the frame 14 between the V-shaped supports 26. The cabin 60 includes a floor or bottom wall 62 defining a periphery 64, as shown in FIG. 6, and side walls 66, 68, and a back wall (not shown). A downwardly extending rim 70 is integral with and extends downwardly from the periphery 64 of the floor 62 presenting a void or opening 72 defined in the floor 62. A front wall 74 is integral with the side walls 66, 68 and includes an opening defined therein to form a door frame, generally indicated at 76. A door 78 is hinged in the opening and pivotally connected to the door frame 76. The cabin 60 is enclosed by a molded roof 80. In one embodiment, for example, the cabin 60 is molded from a polymer. Such cabins are known in the art. One of such cabins is available from Satellite Industries, Inc. of Minneapolis, Minn.

Referring to FIGS. 5 and 6, the cabin 60 is connected to the frame 14 of the waste treatment assembly 10 by a clamping mechanism, having a support, generally indicated at 82 and a plate 84, formed from a metal, disposed over the floor 62 substantially to at least a portion of the periphery 64 of the floor 62. The support 82 is connected to the frame 14 with the floor 62 positioned adjacent the support 82. The plate 84 is disposed over at least a portion of the floor 62 with the plate 84 removably coupled to the support 82 for clamping the floor 62 with the frame 14. The plate 84 covers the void or opening 72 defined in the floor 62 and does not extend to the periphery 64. This design does not require a plurality of screws extending through the periphery 64 of the floor 62, like in the prior art designs. Clamping engagement of the floor 62 to the frame 14 by the plate 84, which partially covers the floor 62 and fully covers the void or opening 72 does not extend to the corners of the floor 62 and provides a clearance defined between the corners of the floor 62 of the cabin 60 and the frame 14 necessary to prevent cracking of the side walls 66, 68, the front wall 74, the back wall, and the floor 62 by forcing the middle portion of the floor 62 to the frame 14. The aforementioned clamping engagement solves problems of cracking of the cabin 60, specially during transportation of the waste treatment assembly 10 or when the waste treatment assembly 10 is used in open and windy area, such as, for example, the aforementioned construction sites, parks, and railroad tracks and subject to winds, and the like.

In an alternative embodiment of the present invention, not shown, the plate 84 may be disposed over the floor 62 within but not up to the periphery 64 of the floor 62 for supporting the waste treatment system 12 and for distributing loads under the waste treatment system 12 equally over the floor 62 and preventing the floor 62 from bending under the loads applied thereto. A pair of shelves 86, 88 of the supporting mechanism 82 extend along the parallel rails 16, 18 and are connected to and supported by the cross beams 24 of the frame 14.

A pair of support tubes 90, 92 of the supporting mechanism 82 extend into the void or opening 72. Each of the support tubes 90, 92 extends vertically between first 94, 96 and second 98, 100 ends, respectively. The support tubes 90, 92 are spaced one from another and with the first ends 94, 96 of each support tube 90, 92 connected to and supported by the frame 14. A pair of beams 102, 104 of the supporting mechanism 82 extend between the second ends 98, 100 of the support tubes 90, 92. The beams 102, 104 are spaced from one another and have an elongated axis and engage the floor 62 extending into the void or opening 72.
The beams 102, 104 interconnect the support tubes 90, 92 at the second 98, 100. The floor 62 is partially sandwiched between the plate 84 and the rails 102, 104 extending into the void or opening 72 and is connected therewith by a plurality of connectors, i.e. fasteners 106 extending therethrough for clamping the cabin 60 with the frame 14.

[0027] A toilet unit 110 of the waste treatment system 12 is connected to the plate 84 above the support 82 and is fluidly coupled to the waste treatment tank 36 by a pipe or waste line 112. The toilet unit 110 has a toilet bowl 114, which incorporates a water rinse ring (not shown) for flushing water having an antifreeze agent, such as, for example, PROPYL GLYCOL, and the like, for decomposing the organic waste in a cold environment. Water flows from the water tank 34 into the toilet bowl 114 with the water tank 36 positioned up to five feet above the toilet unit 110. While only the distance of five feet defined between the toilet unit 110 and the water tank 36 has been discussed, it is to be understood that this distance is not intended to limit the present invention. With respect to different embodiments of the present invention, the water tank 36, for example, may be positioned up to two, or three, or four feet, or any distance below five feet and above the toilet unit 110 enough to facilitate water communication between the water tank 36 and the toilet unit 110.

[0028] The toilet bowl 114 further includes a discharge opening (not shown) for flushing the organic waste into a hopper 116. A waste valve or flapper (not shown) is operably connected to and is disposed between the discharge opening and the hopper for controlling the flow of the organic waste into the hopper 116. An air and water sequence valve (not shown) is the air controlled valve designed to operate the toilet unit 110 and facilitate flushing of the organic waste. The water tank 34 is fluidly connected to the toilet unit 110 for flushing the organic waste from the toilet unit 110 to the waste treatment tank 36 through the pipe 112. A water line, defined by a water pipe 117 extending from the water tank 36 has a diameter three and a quarter of an inch to facilitate communication of water from the water tank 36 to the toilet unit 110. While only one diameter of the water pipe 117 has been disclosed, it is to be understood that the aforementioned diameter is not intended to limit the present invention and may vary with respect to different embodiments of the present invention. The structure and operational mode of the toilet unit 110 are known to those skilled in the art and are not discussed in greater details.

[0029] Referring back to FIGS. 1 and 2, the aforementioned waste treatment system 12 includes the waste treatment tank 36 for processing the organic waste having the liquids and solids with the waste treatment tank 36 capable of treating the organic waste by decomposing the organic waste into vapor and liquids. The waste treatment tank 36 includes a plurality of fiber members (not shown) positioned vertically relative to the frame 14 and acting as filters. At least one chlorinator 120 of the waste treatment tank 36 is operably and fluidly connected to the waste treatment tank 36. The chlorinator 120 contains a plurality of chlorine slugs (not shown).

[0030] The air tank 38 of the waste treatment system 12 is designed for providing the toilet unit 110 with compressed air necessary to operate the toilet unit 110. The air tank 38 is operably connected to the toilet unit 110 for facilitating flushing. The air tank 38 receives compressed air from an independent source of air supply (not shown) for facilitating multiple flushing. Alternatively, the waste treatment assembly 10 of the present invention may include an independent source of air supply (not shown) supported on the frame 14.

[0031] When the organic waste enters the toilet bowl 114 filled with the water supplied from the water tank 34 through the by the water pipe 117 and is flushed, the flapper at the discharge opening of the toilet bowl 114 opens to allow the organic waste mixed with the water forming a waste water to enter the hopper 116. When the organic waste escapes from the hopper 116 through the pipe 112 to the waste treatment tank 36, compressed air enters the hopper 116 from the air tank 38 and pushes the waste water into the waste treatment tank 36 through the waste line or pipe 112. When the flap is closed subsequent load of water enters the toilet bowl 114 from the water tank 34 and fills the toilet bowl 114 before next flushing cycle is initiated.

[0032] The vertical columns of fiber act as filters to catch solids of the organic waste, which bacteria convert into liquid and vapor or gas (primarily CO2). Gas is vented out from the waste treatment tank 36 through a vent pipe 122, as shown in FIG. 7. Liquids of the waste water flow through the fibers and then through the chlorinator 120 containing the chlorinator 120. The chlorine slugs dissolve in the liquids thereby adding chlorine to the liquids before the liquid escapes the waste treatment tank 36.

[0033] While the invention has been described with reference to an exemplary embodiment, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted for elements thereof without departing from the scope of the invention. In addition, many modifications may be made to adapt a particular situation or material to the teachings of the invention without departing from the essential scope thereof. Therefore, it is intended that the invention not be limited to the particular embodiment disclosed as the best mode contemplated for carrying out this invention, but that the invention will include all embodiments falling within the scope of the appended claims.

1. A waste treatment assembly having a waste treatment system for processing organic waste having liquids and solids and capable of treating the organic waste by decomposing the organic waste into vapor and liquids, comprising:
   - a frame;
   - a cabin supported on said frame and having a floor defining a periphery and side walls extending upwardly from said periphery;
   - a support connected to said frame with said floor positioned adjacent said support; and
   - a plate disposed over at least a portion of said floor with said plate removably coupled to said support for clamping said floor with said frame.

2. A waste treatment assembly, as set forth in claim 1, wherein said plate is further disposed over said floor substantially to at least a portion of said periphery of said floor for supporting the waste treatment system.

3. A waste treatment assembly, as set forth in claim 1, wherein said support further includes at least one beam having an elongated axis and engaging said floor.
4. A waste treatment assembly, as set forth in claim 3, wherein said support further includes at least one support tube extending vertically between first and second ends with said first end of said support tube connected to and supported by said frame and with said second end connected to said beam.

5. A waste treatment assembly, as set forth in claim 4, wherein said frame further includes a pair of parallel rails and cross beams connected to and extending between said parallel rails.

6. A waste treatment assembly, as set forth in claim 5, wherein said floor of said cabin defines a downwardly extending rim.

7. A waste treatment assembly, as set forth in claim 6, wherein said frame further includes a pair of shelves extending along said parallel rails and said cross beams with said downwardly extending rim disposed and supported by said shelves.

8. A waste treatment assembly, as set forth in claim 5, including a pair of said beams spaced and parallel one another.

9. A waste treatment assembly, as set forth in claim 8, including two of said support tubes with said beams extending along opposite sides of said support tubes.

10. A waste treatment assembly, as set forth in claim 9, further including a plurality of connectors extending through said plate, said floor and said beams for mechanically connecting said cabin with said frame.

11. A waste treatment assembly, as set forth in claim 1, wherein said support and said plate are metallic.

12. A waste treatment assembly, as set forth in claim 1, wherein said cabin further includes a front wall integral with said side walls with said front wall having an opening defined therein to form a frame and a door hinged in said opening.

13. A waste treatment assembly, as set forth in claim 12, wherein said cabin is fabricated from a polymer.

14. A waste treatment assembly, as set forth in claim 13, including front and rear axle devices to hold wheels positioned thereon for moving said waste treatment assembly.

15. A waste treatment assembly comprising:

- a frame;
- a waste treatment system for processing organic waste having liquids and solids and capable of treating the organic waste by decomposing the organic waste into vapor and liquids with said waste treatment system connected to and supported on said frame; and
- a source of a fluid supply fluidly connected to said waste treatment system with said source extending up to five feet above said frame.

16. A waste treatment assembly, as set forth in claim 15, wherein said source of fluid supply is further defined by a water tank.

17. A waste treatment assembly, as set forth in claim 16, wherein said waste treatment system further includes a toilet unit fluidly communicated with said water tank.

18. A waste treatment assembly, as set forth in claim 17, wherein said waste treatment system further includes a pipe interconnecting said water tank with said toilet unit.

19. A waste treatment assembly, as set forth in claim 18, wherein said waste treatment system further includes a waste treatment tank fluidly communicated with said toilet unit for processing the organic waste and separating the organic waste into liquid and gas.

20. A waste treatment assembly, as set forth in claim 19, wherein said waste treatment system further includes a source for holding compressed air for flushing said toilet unit.

21. A waste treatment assembly, as set forth in claim 20, wherein said waste treatment system further includes a thermal device for thermally decomposing the organic waste.

22. A waste treatment assembly, as set forth in claim 15, including a cabin having a floor defining a periphery and side walls extending upwardly from said periphery to form a closure with said toilet unit positioned inside said cabin.

23. A waste treatment assembly, as set forth in claim 22, including a support connected to said frame with said floor positioned adjacent said support.

24. A waste treatment assembly, as set forth in claim 23, including a plate disposed over at least a portion of said floor substantially to said periphery of said floor.

25. A waste treatment assembly, as set forth in claim 24, wherein said cabin is fabricated from a polymer.

26. A waste treatment assembly comprising:

- a cabin having a floor defining a periphery and side walls extending upwardly from said periphery and a downwardly extending rim integral with and extending downwardly from said periphery of said floor presenting a void defined in said floor and a front wall integral with said side walls with said front wall having an opening defined therein to form a frame and a door hinged in said opening;
- a frame disposed under said floor for supporting said cabin with said frame having parallel rails interconnected by a plurality of cross beams and front and rear axle devices connected to said frame for holding wheels positioned thereon for moving said waste treatment assembly;
- a waste treatment system supported on said frame for processing organic waste having liquids and solids and capable of treating the organic waste by decomposing the organic waste into vapor and liquids;
- a toilet unit of said waste treatment system connected to said floor of said cabin;
- a treatment tank of said waste treatment system fluidly communicated with said toilet unit for processing the organic waste and separating the organic waste into liquid and gas;
- a first source of said waste treatment system for containing and supplying compressed air for flushing said toilet unit;
- a second source of said waste treatment system for containing and supplying water for flushing said toilet unit with said second source extending of up to five feet above said frame;
- a support connected to said frame with said floor positioned adjacent said support;
- a plate disposed over at least a portion of said floor with said plate removably coupled to said support for clamping said floor with said frame;
a pair of spaced beams having elongated axis and spaced from one another engaging said floor opposite to said waste treatment system;

a pair of support tubes of said support each extending vertically between first and second ends with said support tubes spaced one from another with said first end of each support tube connected to and supported by said frame and with said second end connected to said beams;

a plurality of connectors extending through said plate, said floor and said beams of said support for mechanically interconnecting said cabin with said frame; and

a pair of shelves connected to said cross beams and adjacent said parallel rails of said frame for supporting said downwardly extending rim.