United States Patent [19]

Hargraves

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[54] **OVERFLOW ARRANGEMENT**

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[52] **U.S. Cl.** **210/199,** 210/201, 210/207, 210/221, 210/322

[51] **Int. Cl.** **B01d 21/08**

[58] **Field of Search** 210/63, 199, 201, 210/205, 221, 322, 84, 207

[56] **References Cited**

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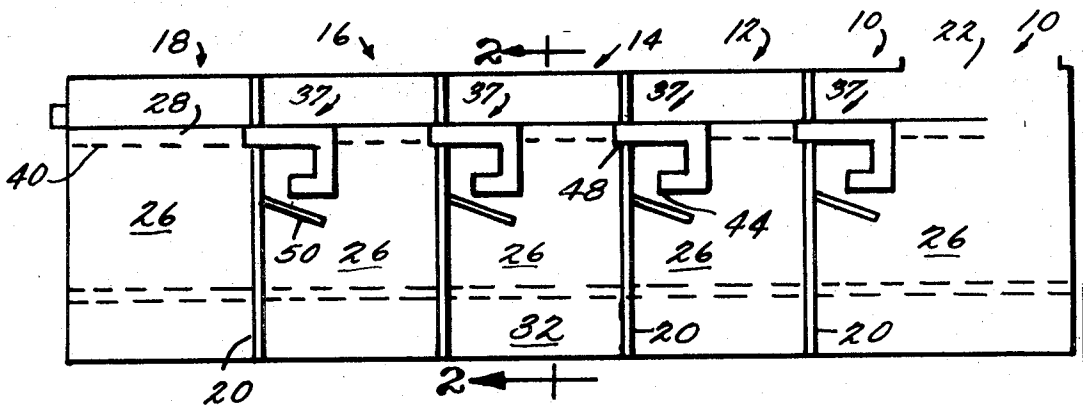
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[57] **ABSTRACT**

An aerobic sewage treatment system includes a plurality of series-connected aerated digestion chambers. In order to prevent passage of solids from one chamber to the next downstream chamber the liquid connection between the chambers is formed by a specially shaped conduit having an open inlet end disposed within a quiet portion of its respective chamber.

6 Claims, 3 Drawing Figures



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Fig. 1.

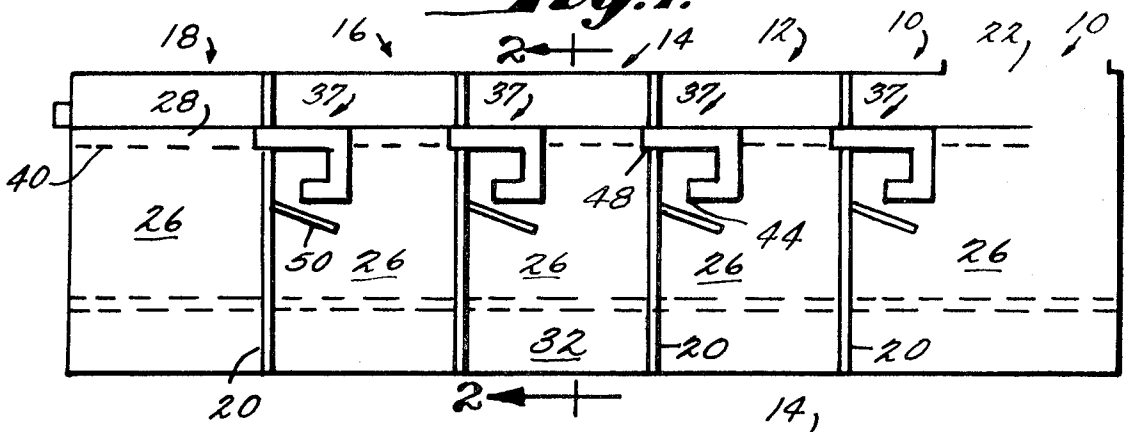
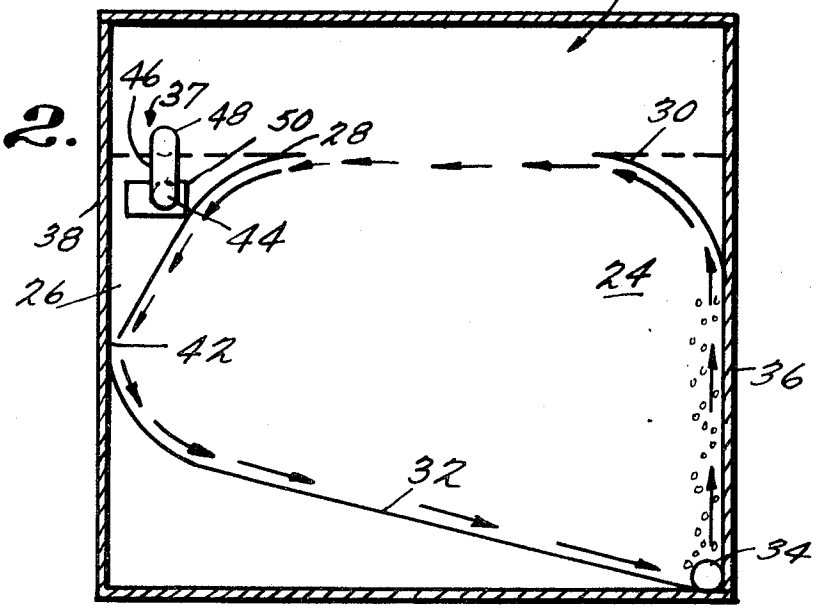


Fig. 2.



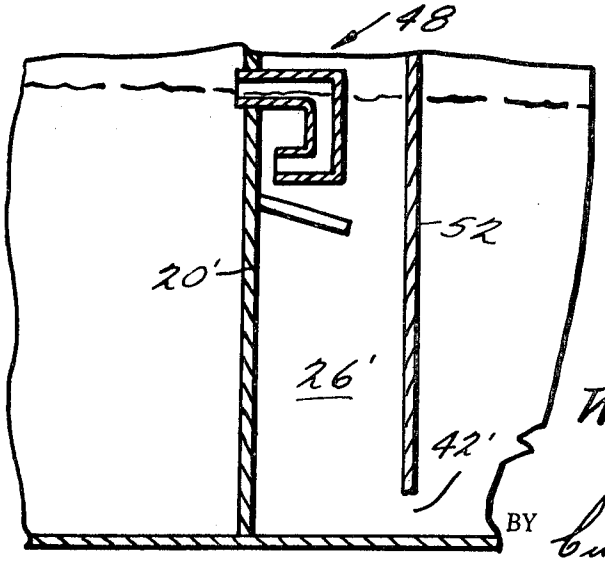


Fig. 3.

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OVERFLOW ARRANGEMENT

This invention relates to multistage aerobic sewage treatment systems and in particular to the construction of the liquid connections between the digestion stages and to the internal configuration of the stages.

FIG. 1 is a schematic vertical sectional view of a multistage aerobic system embodying the principles of the present invention;

FIG. 2 is a sectional view taken on the line 2—2 of FIG. 1; and

FIG. 3 is a partial sectional view of a modified digestion chamber.

FIGS. 1 and 2 illustrate in simplified form a multistage aerobic digestion system having a main digestion chamber **10** and a plurality of secondary digestion chambers **12, 14, 16** and **18** separated from each other by partitions **20.** The main chamber **10** is provided with an inlet **22** for receiving undigested raw sewage. A more detailed description of this type of system appears in my application Ser. No. 813,242, filed Apr. 3, 1969, now abandoned.

Each chamber is divided into a mixing and aerating portion **24** and a quiet portion **26** by a suitable baffle arrangement. In the illustrated embodiment each chamber includes two downwardly facing concave baffles **28** and **30** disposed generally on opposite sides of the chamber. These baffles also cooperate with an upwardly facing concave bottom wall **32** and with an aerator device **34** to mix the contents of the chamber as shown by the arrows in FIG. **2.** The aerator device **34** may be a horizontal perforated tube or one or more conventional air stones located at or near the lowermost point in the chamber and next to the respective side wall **36.**

In accordance with the principles of the present invention the liquid connection between digestion chambers is made in such a manner that there will be little or no tendency for solid material to flow from one chamber to another, the purpose of this feature being to prevent entry of raw sewage into the downstream stages. At the same time it is desirable to avoid the use of filters for this purpose because in the event of a closgged filter the upstream stages will overflow during operation. The present invention accomplishes this objective by providing unobstructed, specially-shaped conduit connections **37** between a quiet portion of an upstream stage and an aerating portion of the adjacent downstream stage. The configuration of the quiet portion is not critical, and the quiet portions **26** defined between the baffles **28** and the adjacent side walls **38** is merely illustrative. However, the structure which defines a quiet portion should extend above liquid level **40** to prevent floating solids from approaching the connection **37.** Also, the structure should include a bottom opening, such as shown at **42,** in communication with the aerating portion **24** to allow any solids finding their way into the portion **26** to settle and return to the portion **24.**

Each of the connections **37** is constructed as a double elbow having a horizontal inlet portion **44** disposed below liquid level **40,** a vertical portion **46** extending to above liquid level **40,** and a horizontal outlet portion **48** projecting through the respective portion **20.** Preferably, the inlet aperture faces the partition **20** and is closely spaced therefrom. Also, it is preferred to provide a baffle **50** below the inlet aperture to prevent any

rising solids from approaching the inlet aperture. The illustrated baffle **50** is a flat plate secured to the partition **20** and extending downwardly and in an upstream direction as viewed in FIG. **1.** The size of the quiet portion **26** should be larger in volume than the greatest maximum expected intake volume of the main chamber **10** at any one time or hour.

In operation organic waste is delivered to the main chamber through the inlet **22,** causing an increase in liquid level with the result that liquid flows sequentially through the chambers via the connectors **37.** The liquid is thoroughly agitated and aerated in each chamber portion **24,** but the agitated solids do not pass into the portions **26.** Therefore, raw sewage particles are retained in the main chamber **10,** and the liquid in each successive chamber **12, 14, 16** and **18** is progressively purified by aerobic digestion.

FIG. **3** illustrates a modification in which the quiet chamber portion **26'** is defined between a partition **20'** and a vertical transverse baffle **52** which extends between the side walls of the chamber.

What is claimed is:

1. A digestion treatment system for purifying organic waste material dissolved in or dispersed in water comprising: walls defining a main digestion chamber having inlet means for receiving organic waste material and walls defining a plurality of separate secondary digestion chambers, each of said secondary chambers including baffle means dividing the chamber into an agitating and aerating portion and a smaller quiet portion which are in communication with each other only through a submerged passageway of relatively small cross-sectional area; means in each agitating and aerating portion for introducing air bubbles into the liquid in that portion and for mixing the entire liquid contents of that portion; and conduit means for connecting the quiet portion of each secondary chamber to the aerating portion of one other chamber to thereby provide for flow of liquid waste from the main chamber sequentially through the secondary chambers to an outlet means, each conduit means having an unobstructed bore and including a horizontally facing inlet aperture disposed below the liquid level in the quiet portion of the respective secondary chamber, a vertical tubular portion extending upwardly through the liquid surface, and a horizontally facing outlet aperture disposed at the liquid level in the aerating portion of the downstream chamber.

2. Apparatus as in claim **1** wherein each said baffle means which divides a secondary chamber into an aerating portion and a quiet portion includes a downwardly concave baffle having an upper end disposed at about liquid level and a lower end disposed below the respective conduit means and wherein the respective aerating and mixing means includes means for introducing air bubbles into the bottom of the aerating portion at a location remote from the respective conduit means and an additional concave baffle which directs the rising air bubbles toward said first-named baffle as the bubbles approach roach the surface of the liquid.

3. Apparatus as in claim **2** wherein the quiet portion of each secondary chamber is defined between an upright wall of that chamber and said first-named baffle and wherein the passageway between the chamber portions is defined by a space betwen said upright wall and the lower end of said first-named baffle.

4. Apparatus as in claim 1 wherein each said conduit means is formed as a double elbow with the inlet and outlet apertures facing downstream.

5. Apparatus as in claim 4 including an inclined baffle disposed below the inlet aperture of each conduit means and extending downwardly from a point downstream of the aperture to a point upstream of the aperture.

6. Apparatus as in claim 5 wherein each chamber is separated from the adjacent downstream chamber by a common vertical wall, said conduit means being located at the common wall, and said baffle extending from the common wall.

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