



US 20030161685A1

(19) **United States**

(12) **Patent Application Publication**

Vasseur

(10) **Pub. No.: US 2003/0161685 A1**

(43) **Pub. Date: Aug. 28, 2003**

(54) **METHOD OF FABRICATING AN INSULATED LEACHING CHAMBER AND AN INSULATED LEACHING CHAMBER**

(30) **Foreign Application Priority Data**

Feb. 26, 2002 (CA) 2,373,217

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Publication Classification

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(51) **Int. Cl.⁷** **E03F 1/00; E02B 11/00**

(52) **U.S. Cl.** **405/36; 405/46; 210/170**

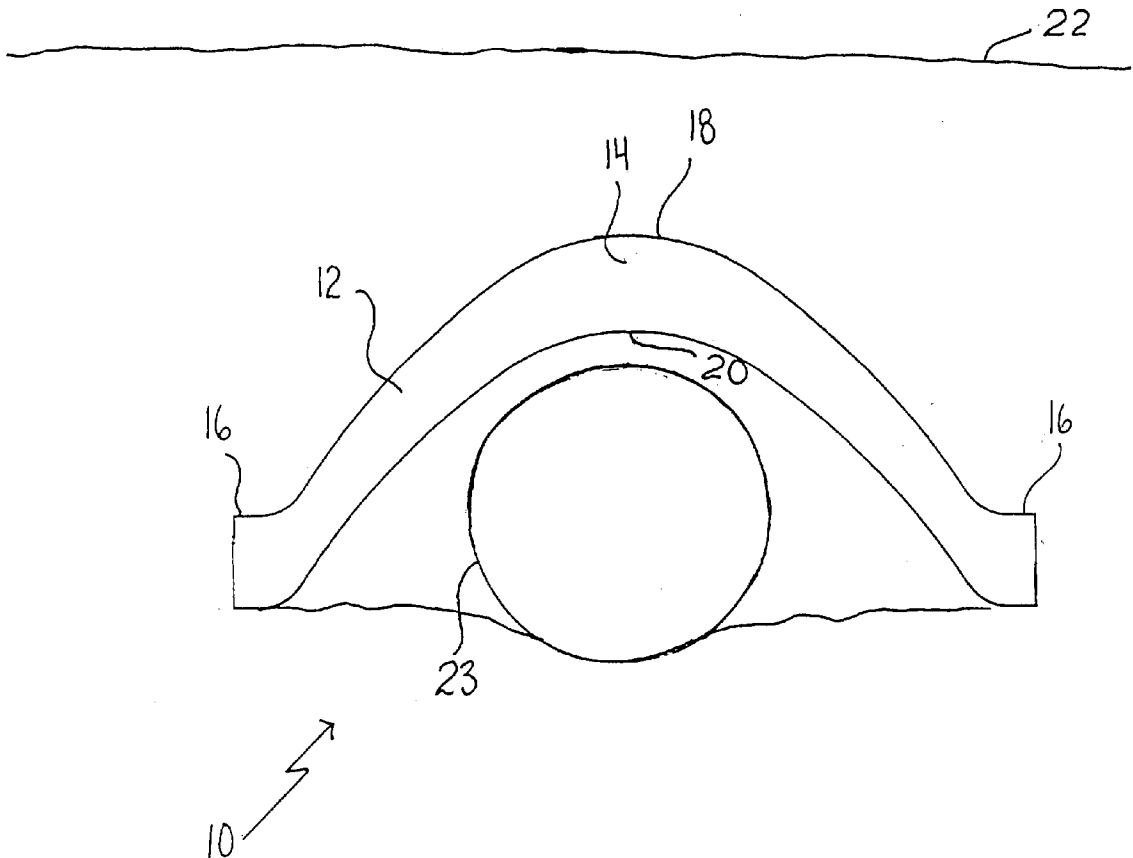
(57) **ABSTRACT**

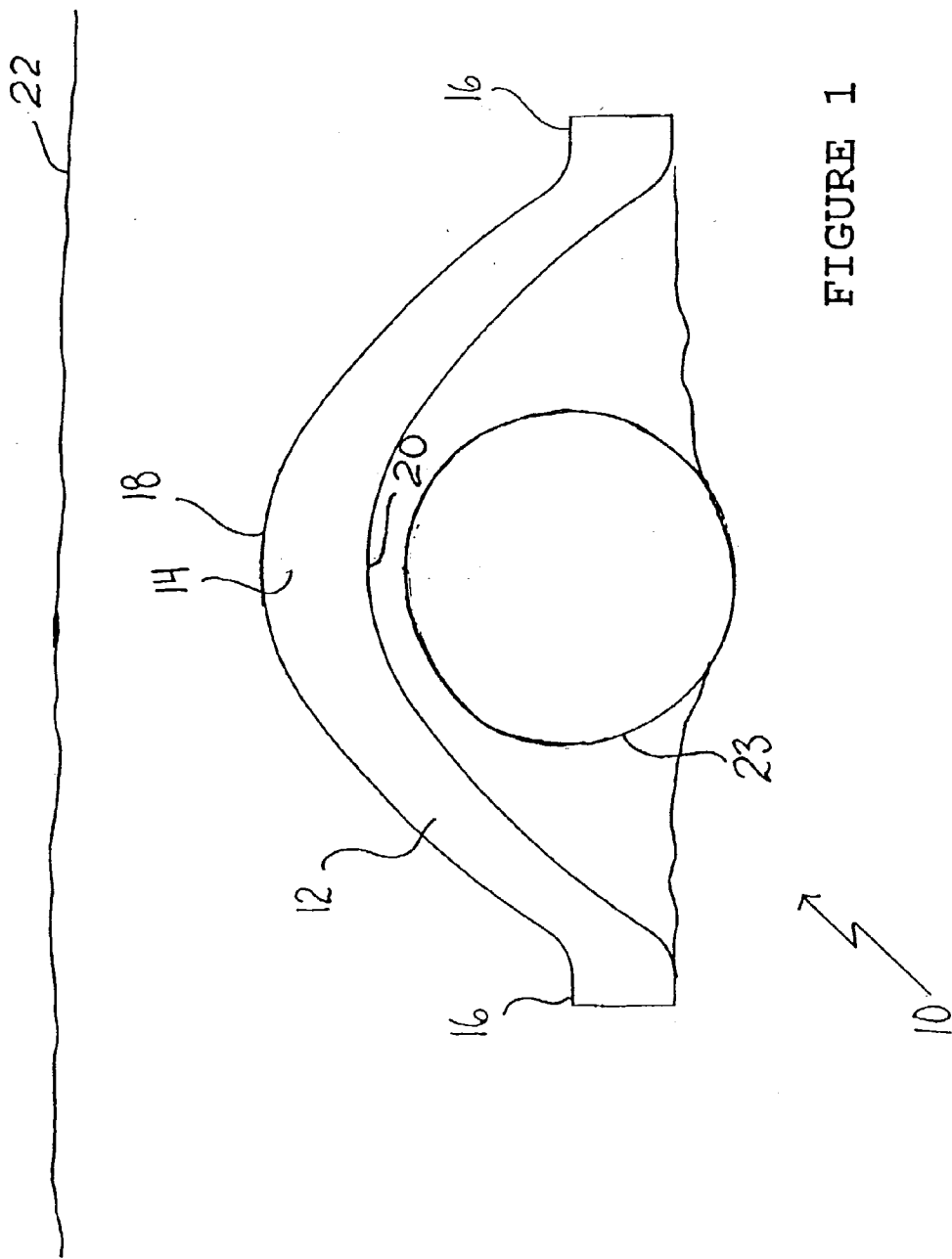
An insulated leaching chamber and a method of fabricating the same from a block of expanded polystyrene. The insulated leaching chamber includes a body of rigid air-permeable insulating material, having at least one arch centrally positioned between opposed outwardly projecting terminus. The at least one arch has an convex upper surface, and a concave lower surface. The use of the insulated leaching chamber reduces freezing and promotes increased biological activity.

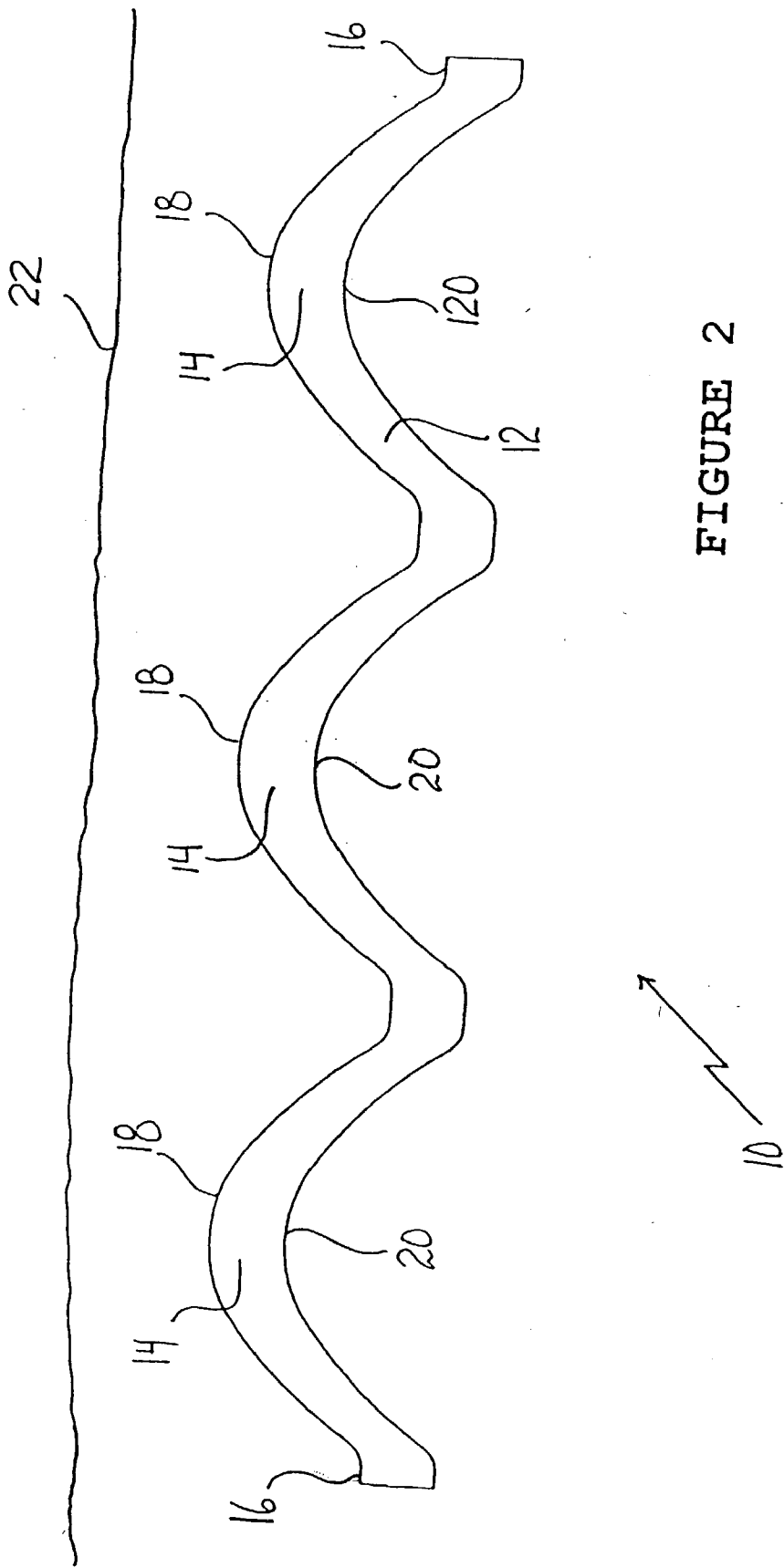
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(21) Appl. No.: **10/357,039**

(22) Filed: **Jan. 31, 2003**







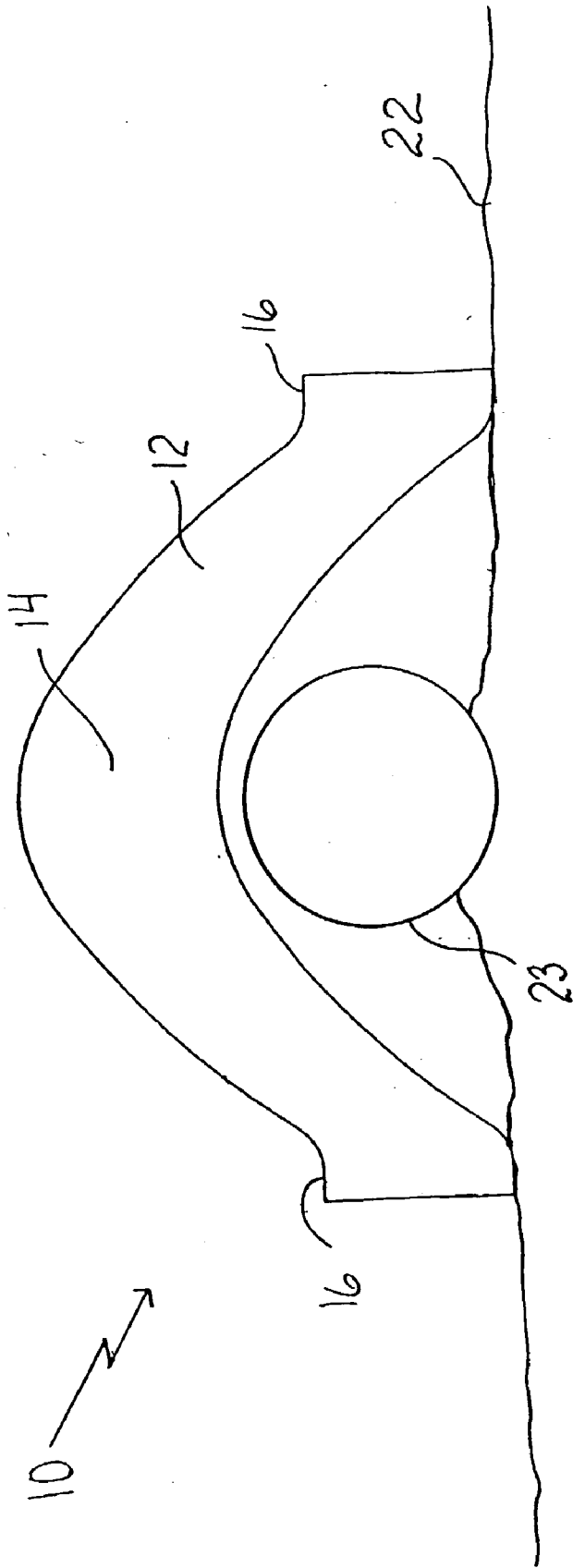


FIGURE 3

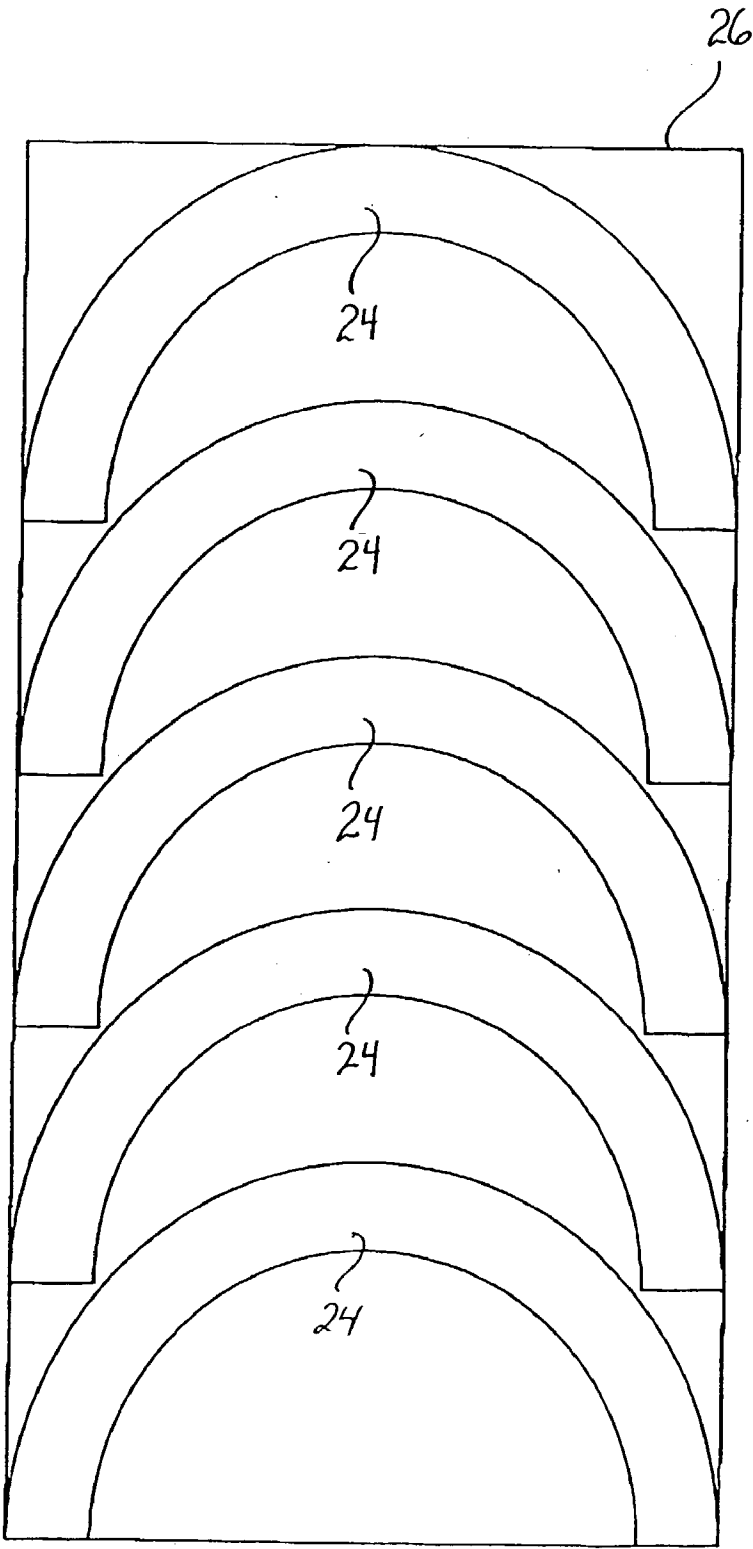


FIGURE 4

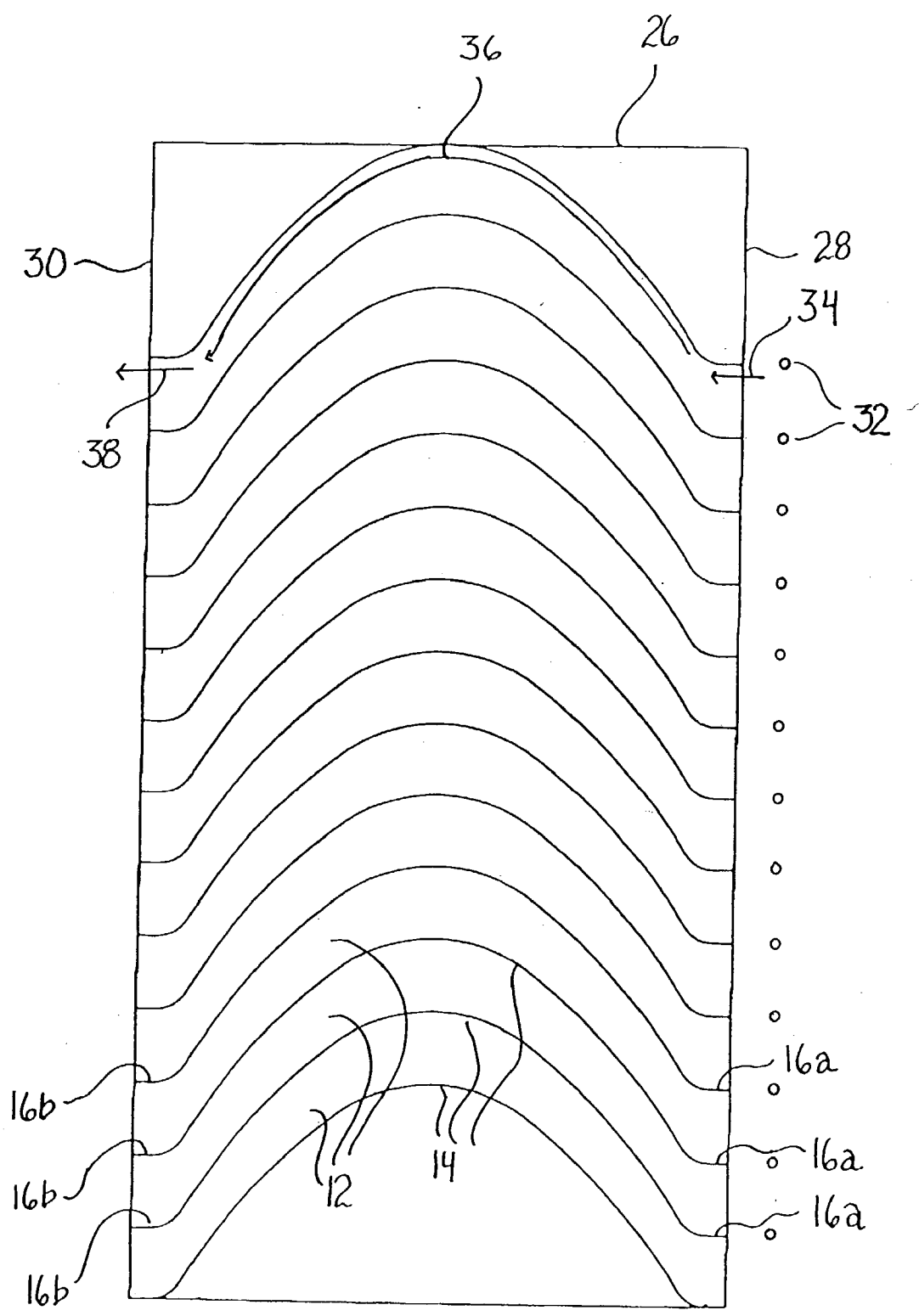


FIGURE 5

METHOD OF FABRICATING AN INSULATED LEACHING CHAMBER AND AN INSULATED LEACHING CHAMBER

FIELD OF THE INVENTION

[0001] The present invention relates to a method of fabricating an insulated leaching chamber and an insulated leaching chamber.

BACKGROUND OF THE INVENTION

[0002] Leaching chambers are presently fabricated from moulded polymer plastic. Examples of commercially available leaching chambers are the products of Infiltrator Systems Inc. as illustrated and described in U.S. Pat. Nos. 5,716,163; 5,588,778; 5,511,903; 5,401,116; 5,336,017; 5,156,488; 5,017,041; and 4,759,661.

[0003] Presently available leaching chambers are produced from polymer plastics that have virtually no thermal insulation properties. As these polymer plastics are air-impermeable, vents must be incorporated to allow needed oxygen into the leaching chambers. These vents further contribute to heat loss. For this reason, polymer plastic leaching chambers do not perform well in cold weather climates, as they are prone to freezing. This is especially the case during winters where there is a lack of snowfall or where the snow cover has become packed due to human, animal or vehicular traffic. When leaching chamber becomes frozen, there is little alternative but to re-configure the septic system to discharge onto the ground for the balance of the winter. It has been estimated that more than half of the leaching chambers in the Canadian Prairie Provinces of Alberta, Saskatchewan and Manitoba freeze during winters where there is a lack of snowfall to provide an insulating snow cover.

SUMMARY OF THE INVENTION

[0004] What is required is an insulated leaching chamber which will not be as prone to freezing.

[0005] According to the present invention there is provided an insulated leaching chamber which includes a body of rigid air-permeable insulating material, having one or more arches centrally positioned between opposed outwardly projecting terminus. Each arch has a convex upper surface, and a concave lower surface.

[0006] An insulated leaching chamber, as described above, has a number of advantages. Biological activity doubles for every 10 degree celsius increase in temperature. The insulating properties of the leaching chamber not only prevents freezing, but increases the efficiency of the leaching field by increasing biological activity. In order to avoid freezing, a non-insulated leaching chamber has to be buried below the frost line. However, there is more of the oxygen necessary for biological activity near the surface. The use of insulated leaching chambers enables the leaching chambers to be buried closer to the surface where there is a more abundant oxygen supply to further increase biological activity.

[0007] Once a decision was made to make an insulated leaching chamber, the selection of materials became a problem. Polymer plastic leaching chambers generally have vents or slots placed in them to allow oxygen in, while

keeping dirt out. It was determined that if an air-permeable insulating material was used, it would serve to allow oxygen in, while keeping dirt out. An air-permeable insulating material actually serves this purpose better than vents or slots, as plastic soils can ooze in through slots and slots can become clogged. In addition, vents or slots allow heat to escape from the leaching chamber, whereas the insulated leaching chamber retains natural geothermal heat as well as heat carried into the leaching chamber by warm effluent liquids.

[0008] In initial experiments, expanded polystyrene was selected as the air-permeable insulating material. However, as expanded polystyrene is considered to be a non-structural material, further problems were presented in ensuring that a leaching chamber made from expanded polystyrene had the requisite structural integrity. Experiments were conducted with A-Frame structures. These A-Frame structures utilized raw materials well, but had poor flexural strength. They had to be made in an unusually thick cross-section, otherwise they would fail under load. Through stress/strain engineering, the geometry of a complex structural arch was determined to be best suited to withstand soil hydraulic load over its entire surface. An arch with opposed outwardly projecting terminus provided a number of advantages. It eliminated failure at the extremities which was experienced with arches that were tapered at their extremities. The outwardly projecting terminus provided a horizontal surface at the lower edges that provided better anchorage in backfill material. This anchorage helped create resistance to deflection of the arch body from vertical loads which, if unchecked, would cause premature flexural failure.

[0009] Although beneficial results may be obtained through the use of the insulated leaching chamber, as described above, even more beneficial results may be obtained when the arched body is nestable with a series of other arched bodies, thereby facilitating transport and storage.

[0010] Although beneficial results may be obtained through the use of the insulated leaching chamber, as described above, the insulated leaching chamber can be adapted for various types of installations by providing several arches centrally positioned between the opposed outwardly projecting terminus, thus producing a leaching chamber with a much lower profile. The use of several arches makes the insulated leaching chamber suitable for use in shallow trenches, raised beds, mounds and at-grade disposal systems.

[0011] According to another aspect of the present invention there is provided a method of fabricating an insulated leaching chamber. As will hereinafter, be further described, the use of a simple arch not only does not have all of the benefits described above, but results in a waste of material. The problem presented itself as to how to manufacture an insulated leaching chamber with an arch body, with negligible waste of material. The method developed included a steps of providing a block of rigid air-permeable insulating material having a first side and a second side. A further step involves passing a rack of wires through the block from the first side to the second side. The movement of the wires included an initial substantially linear movement upon the rack of wires entering from the first side to form a first outwardly projecting terminus. It was followed by one or

more intermediate arcuate movements to form one or more arches, depending upon the configuration desired. The movement ends with a final substantially linear movement as the rack of wires exits from the second side to form a second outwardly projecting terminus.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] These and other features of the invention will become more apparent from the following description in which reference is made to the appended drawings, the drawings are for the purpose of illustration only and are not intended to in any way limit the scope of the invention to the particular embodiment or embodiments shown, wherein:

[0013] FIG. 1 is an end elevation view of an insulated leaching chamber having a single arch constructed in accordance with the teachings of the present invention.

[0014] FIG. 2 is an end elevation view of an insulated leaching chamber having several arches constructed in accordance with the teachings of the present invention.

[0015] FIG. 3 is an end elevation view of the insulated leaching chamber illustrated in FIG. 1, for use in a surface application.

[0016] FIG. 4 is an end elevation view of a block of expanded polystyrene out of which simple arches are being cut.

[0017] FIG. 5 is an end elevation view of a block of expanded polystyrene out of which arches as illustrated in FIG. 1 are being cut in accordance with the teachings of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0018] The preferred embodiment, an insulated leaching chamber generally identified by reference numeral 10, will now be described with reference to FIGS. 1 through 5.

[0019] Structure and Relationship of Parts:

[0020] Referring to FIG. 1, there is provided an insulated leaching chamber 10, which includes a body 12 of rigid air-permeable insulating material. In the illustrated embodiment, air-permeable insulating material is expanded polystyrene, however other permeable insulating materials can also be used. Body 12 has one arch 14 centrally positioned between opposed outwardly projecting terminus 16. All of body 12, including arch 14 and outwardly projecting terminus 16 are of substantially equal thickness. Arch 14 has a convex upper surface 18 and a concave lower surface 20. Referring to FIG. 5, the shape of arched body 12, allows arched body 12 to nest with a series of other arched bodies 12, thereby facilitating transport and storage.

[0021] Use And Operation of Insulated Leaching Chamber 10:

[0022] The use and operation of insulated leaching chamber 10 will now be described with reference to FIGS. 1 through 5. FIG. 1, illustrates a version of leaching chamber 10 which can be used for the same applications as conventional non-insulated leaching chambers. However, it provides increased frost protection. Referring to FIG. 3, there is illustrated a slightly lower profile version of insulated leaching chamber 10 which is shown installed in an at grade

application. Non-insulated leaching chambers which are installed at grade level are particularly susceptible to freezing. Insulated leaching chamber 10 provides very necessary frost protection in an at grade application.

[0023] Variations:

[0024] Referring to FIG. 2, there is illustrated a low profile multi-arch version of the insulated leaching chamber. Body 12 of insulated leaching chamber 10 includes several arches 14 that are centrally positioned between opposed outwardly projecting terminus 16. With additional arches 14, insulated leaching chamber is suitable for use in shallow trenches, raised beds, mounds and at-grade disposal systems.

[0025] Computer simulations indicate that leaching chamber 10 buried at a depth of 12 inches, has similar thermal performance to a non-insulated leaching chamber buried at a depth of 24 inches. This gives the illustrated versions of insulated leaching chamber 10 an advantage in providing frost protection in applications where difficult soil conditions prevent trenching to normal depth. Even in normal soil conditions, however, insulated leaching chamber 10 can be buried closer to surface 22, where there is a more abundant oxygen supply to further increase biological activity. As biological activity doubles for every 10 degree celsius increase in temperature, leaching chamber 10 not only prevents freezing, but increases the efficiency by increasing biological activity. Air-permeable insulating material of body 12 serves to allow oxygen in, while keeping dirt out. Insulating material also serves to retain natural geothermal heat as well as heat carried into leaching chamber 10 by warm effluent liquids flowing through perforated flow chamber 23.

[0026] Method of Fabricating Insulated Leaching Chamber 10:

[0027] Referring to FIG. 4, it can be seen the amount of waste that is encountered when simple arches 24 are cut from a block 26 of expanded polystyrene.

[0028] Referring to FIG. 5, the preferred method involves providing block 26 of rigid air-permeable insulating material with a first side 28 and a second side 30. Block 26 is then passed through a rack of wires 32 from first side 28 to second side 30. Wires 32 are parallel and spaced equidistant apart. The movement of wires 32 includes an initial substantially linear movement 34 upon rack of wires 32 entering from first side 28 to form a first outwardly projecting terminus referenced as 16a. One intermediate arcuate movement 36 is made to form arch 14. Additional intermediate movements 36 can be made if additional arches 14 are desired. A substantially linear movement 38 is made as rack of wires 32 exits from second side 30 to form a second outwardly projecting terminus referenced as 16b.

[0029] In this patent document, the word "comprising" is used in its non-limiting sense to mean that items following the word are included, but items not specifically mentioned are not excluded. A reference to an element by the indefinite article "a" does not exclude the possibility that more than one of the element is present, unless the context clearly requires that there be one and only one of the elements.

[0030] It will be apparent to one skilled in the art that modifications may be made to the illustrated embodiment

without departing from the spirit and scope of the invention as hereinafter defined in the claims.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. An insulated leaching chamber, comprising:
a body of rigid air-permeable insulating material, having at least one arch centrally positioned between opposed outwardly projecting terminus, the at least one arch having an convex upper surface, and a concave, lower surface.
2. The insulated leaching chamber as defined in claim 1, wherein the at least one arch and the opposed outwardly projecting terminus are of substantially equal thickness.
3. The insulated leaching chamber as defined in claim 1, wherein the air-permeable insulating material is expanded polystyrene.
4. The insulated leaching chamber as defined in claim 1, wherein the arched body is nestable with a series of other arched bodies, thereby facilitating transport and storage.
5. The insulated leaching chamber as defined in claim 1, wherein there are several arches centrally positioned between the opposed outwardly projecting terminus.

6. A method of fabricating an insulated leaching chamber, comprising the steps of:

- providing a block of rigid air-permeable insulating material having a first side and a second side;
- passing a rack of wires through the block from the first side to the second side, the movement of the wires including:
 - an initial substantially linear movement upon the rack of wires entering from the first side to form a first outwardly projecting terminus;
 - at least one intermediate arcuate movement to form at least one arch;
 - a final substantially linear movement as the rack of wires exits from the second side to form a second outwardly projecting terminus.
7. The method as defined in claim 6, the wires being parallel and spaced equidistant apart.
8. The method as defined in claim 6, the rigid air-permeable insulating material being expanded polystyrene.
9. The method as defined in claim 6, there being several intermediate arcuate movements to form several arches.

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