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(54) COUPLING STRUCTURE FOR A LEACHING CHAMBER

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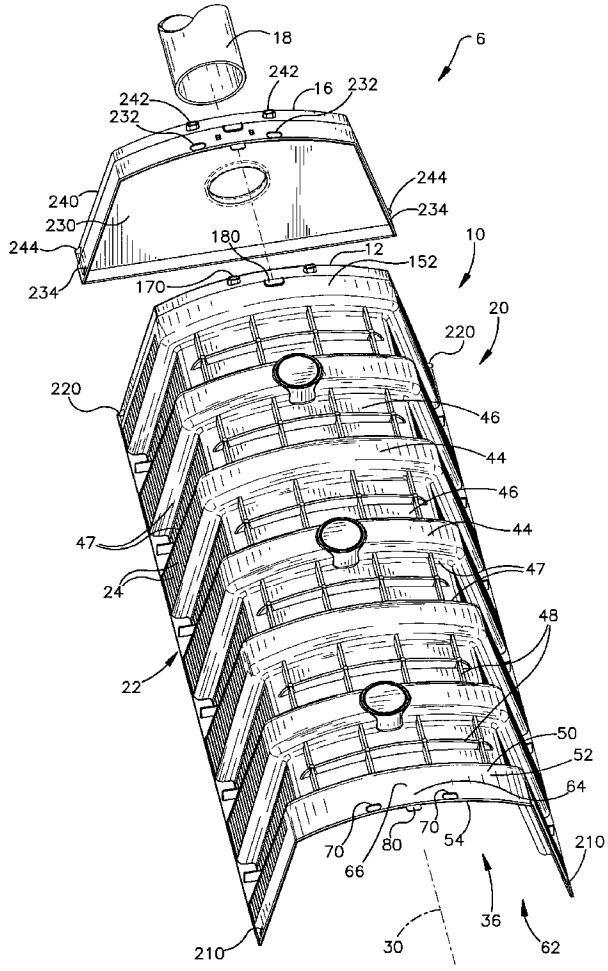
(57) ABSTRACT

A leaching chamber is configured to be coupled in series to another such leaching chamber located forward of the chamber and to yet another such leaching chamber located rearward of said leaching chamber. The leaching chamber comprises a conduit extending about an axis to define an axially extending cavity. The conduit includes an axially front section having an overlying wall and a rear section having an underlying wall. The overlying wall is configured to overlie the underlying wall of the forward chamber when the chambers are coupled together. The underlying wall is configured to underlie an overlying wall of the rearward chamber when said chambers are coupled together. A projection extends from the front section of the conduit. A pocket is located at the rear section of the conduit. The projection is configured to be received by the pocket of the front chamber, and the pocket is configured to receive the projection of the rear chamber. A notched structure extends radially inward from the front section and has a notch that is spaced from the front edge of the front section. The notched structure is configured to capture in the notch the underlying wall of the forward chamber when the chambers are coupled together.



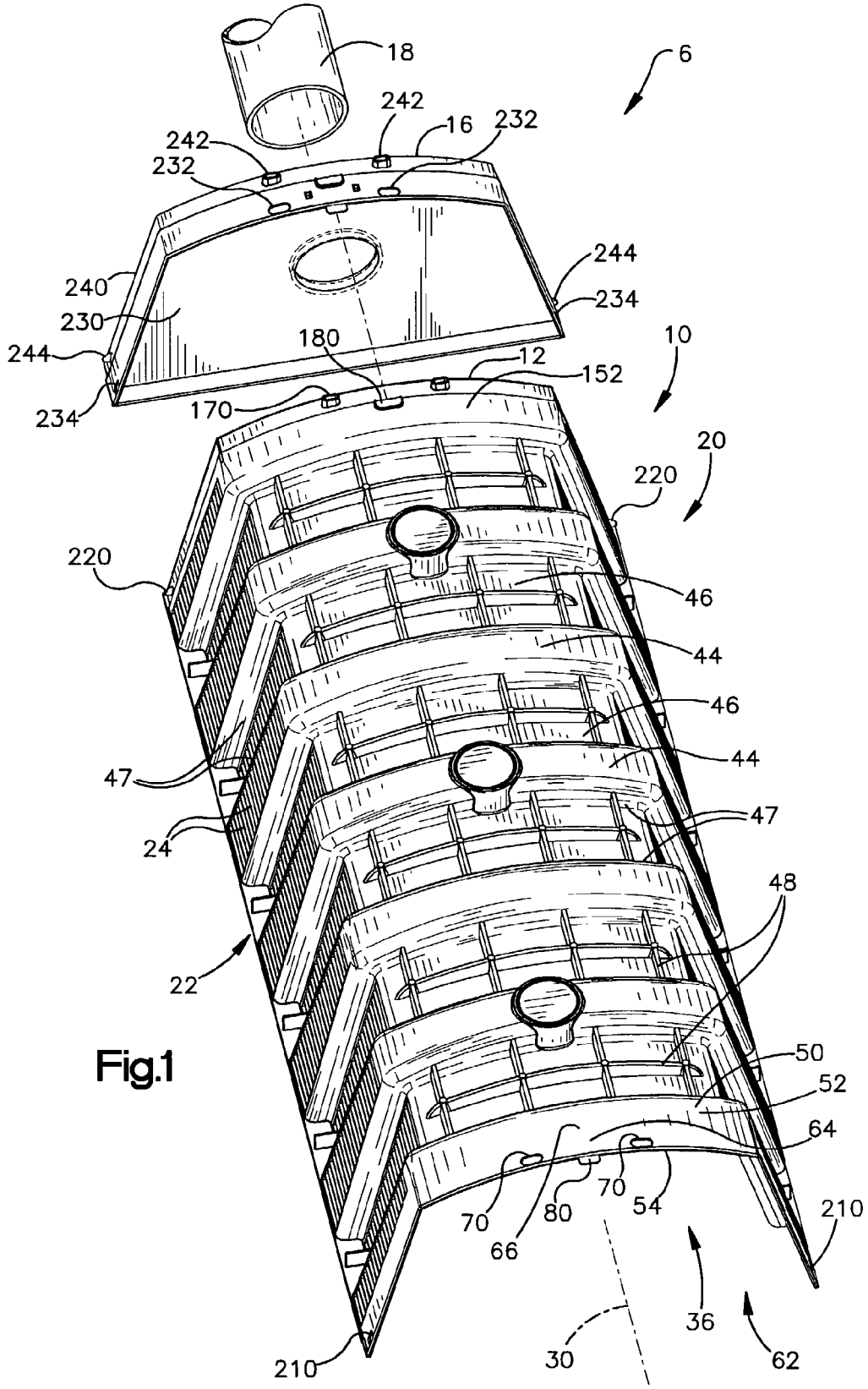

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Fig.1

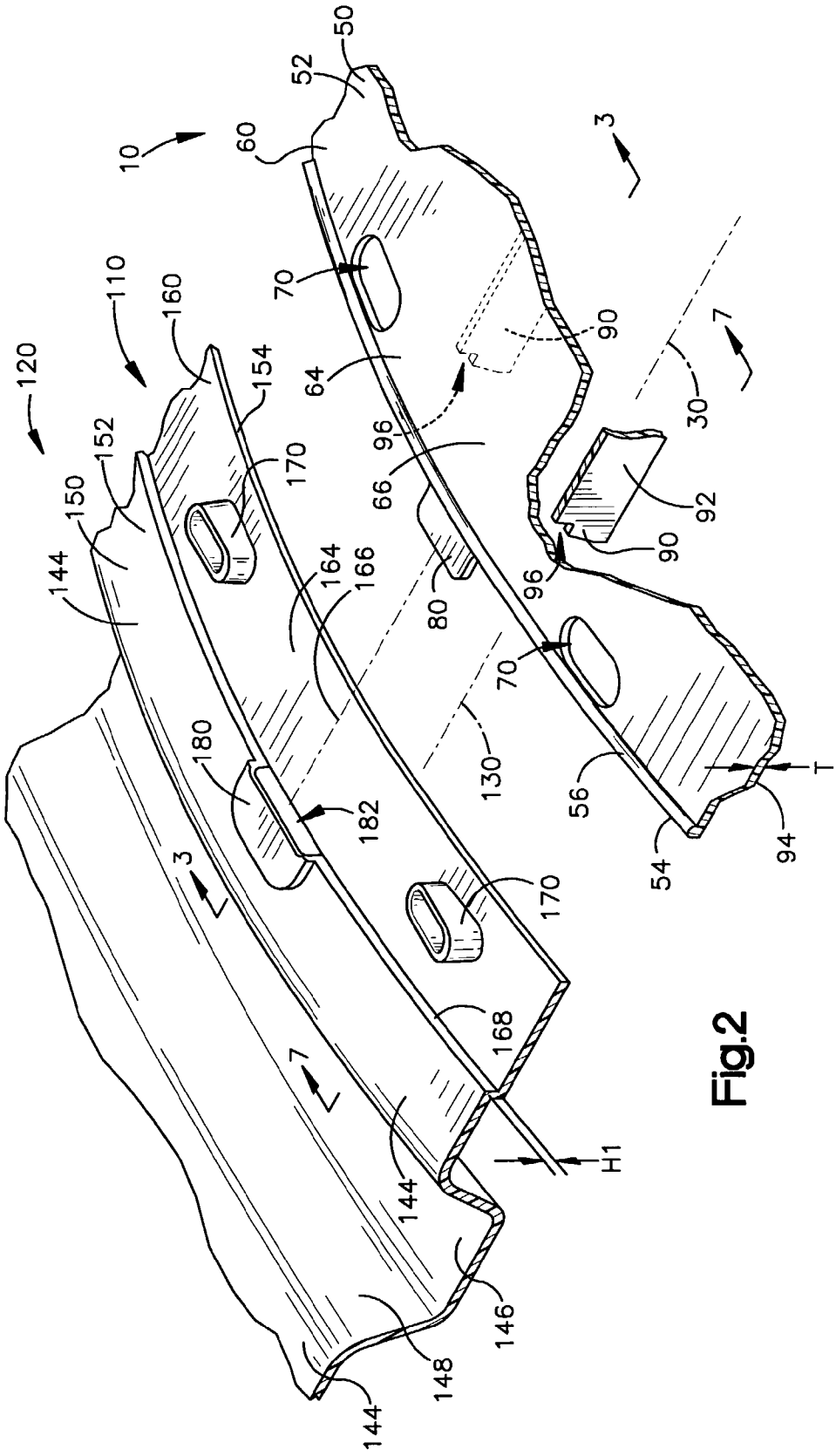
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Fig.2

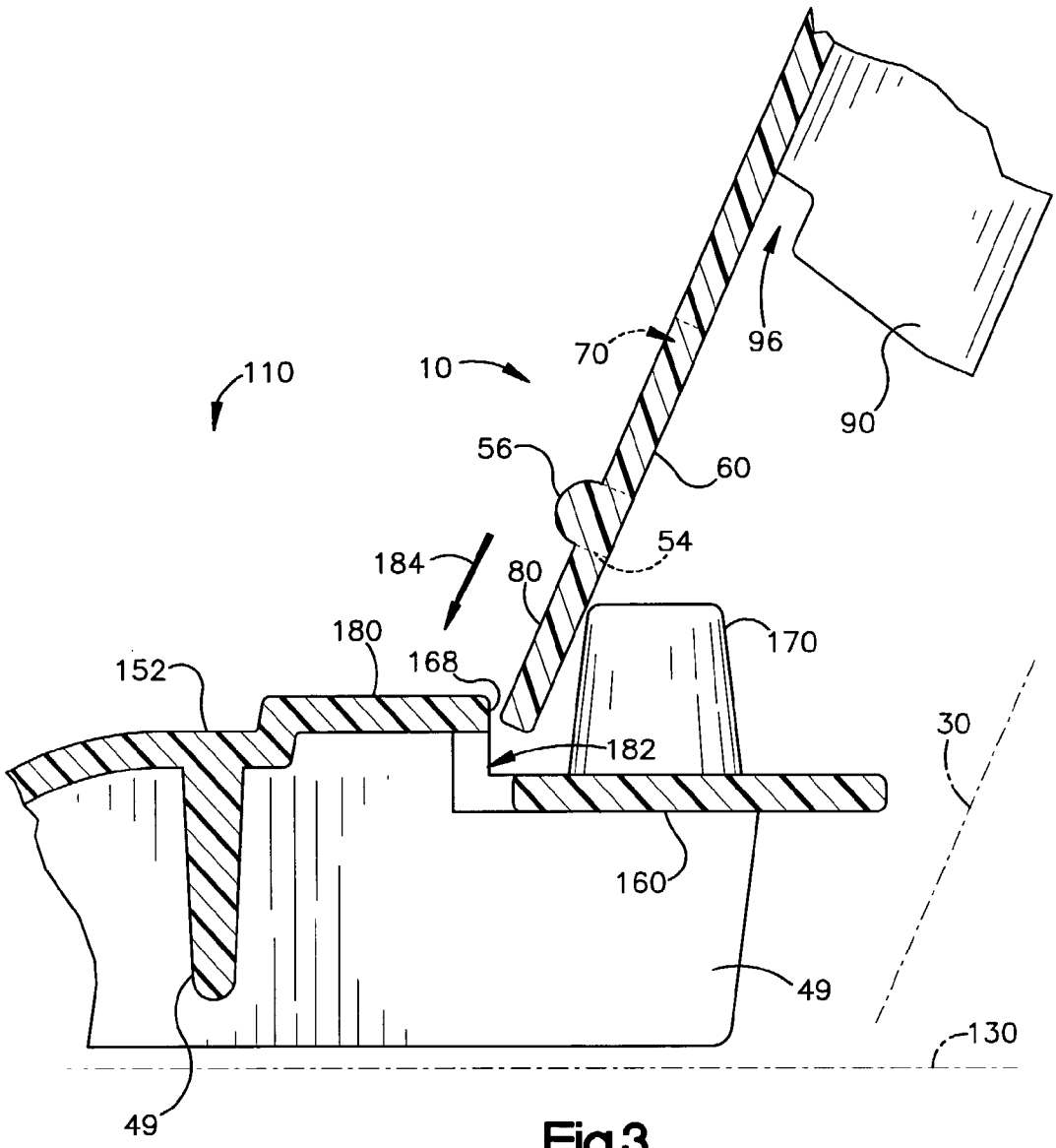

Fig.3

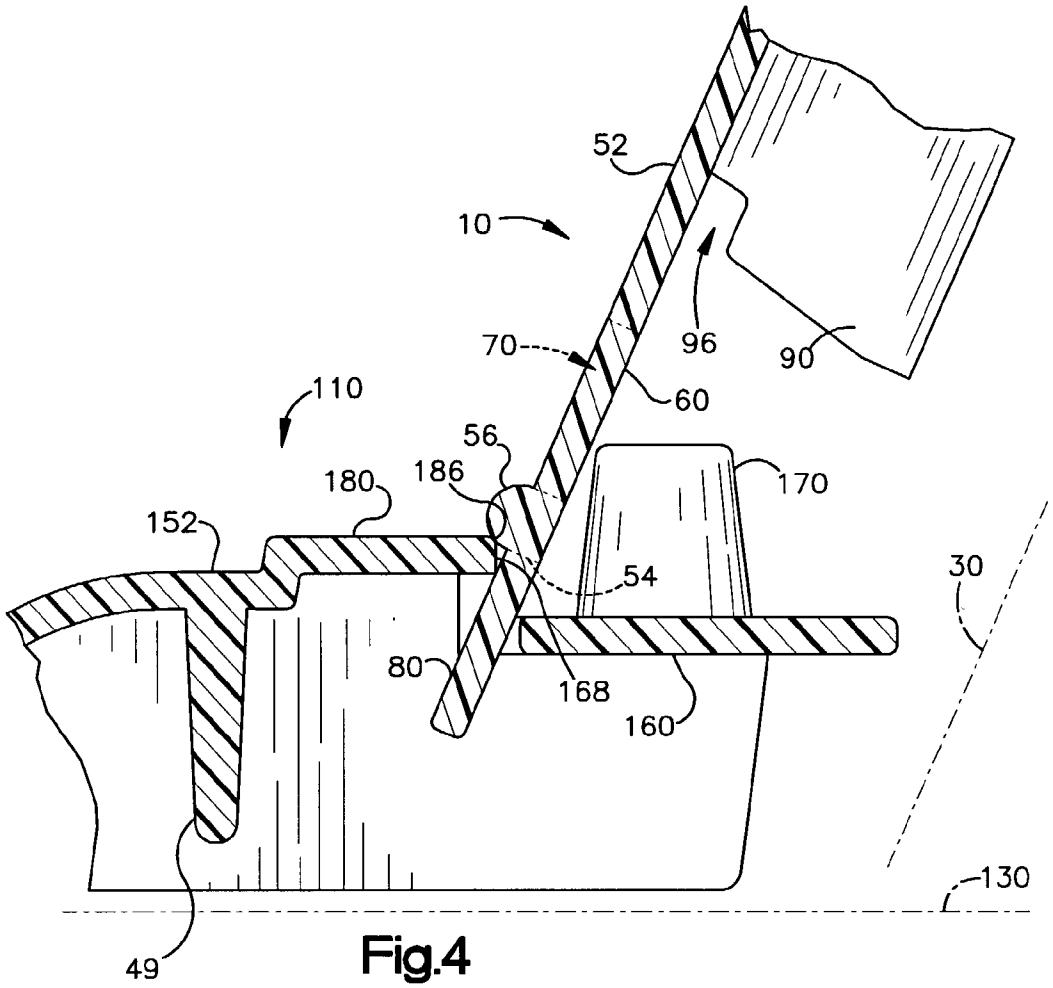

Fig.4

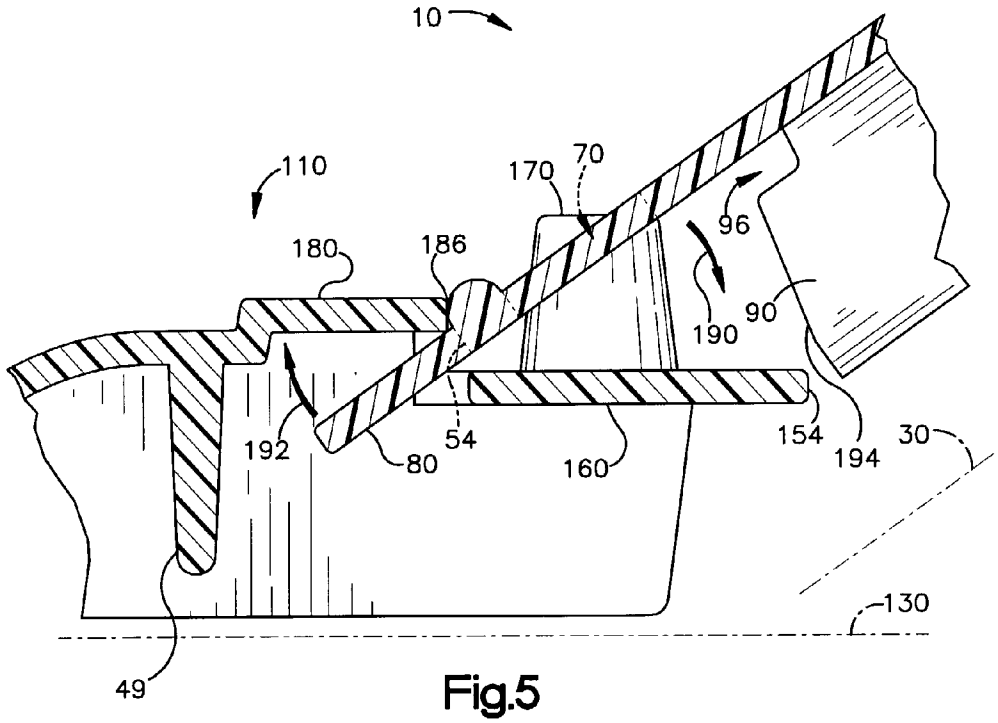
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Fig.5

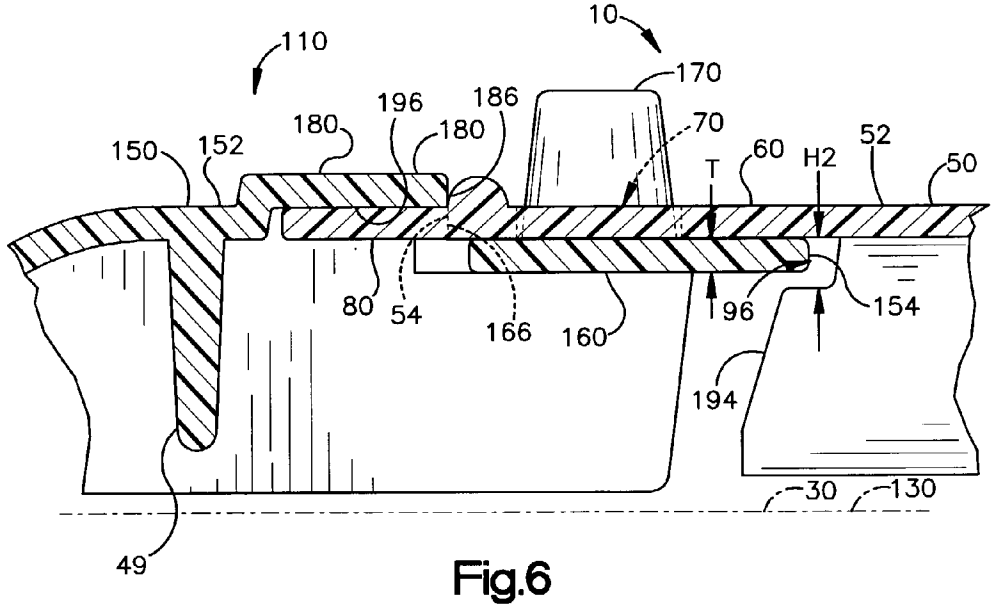
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Fig.6

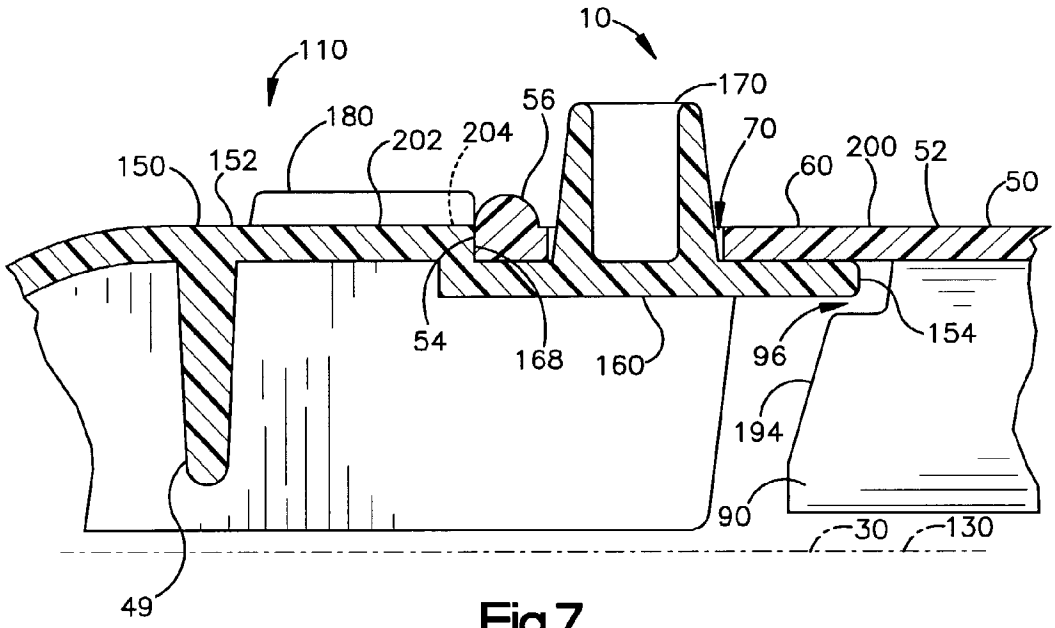
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Fig.7

COUPLING STRUCTURE FOR A LEACHING CHAMBER

TECHNICAL FIELD

[0001] The present invention relates to leaching chambers.

BACKGROUND

[0002] A leach field is used to disperse a fluid into the ground. The fluid is typically effluent from a septic tank. The leach field includes a series of leaching chambers, coupled in series and buried in the ground. A pipe conveys the effluent from the septic tank to the leach field, where the effluent spreads through the series of chambers that are oftentimes coupled end to end. Each chamber has perforated side walls and an open bottom through which the effluent escapes to be absorbed into the surrounding soil.

[0003] Each chamber must support the weight of the soil above it, along with anything resting on the soil, such as a vehicle. Therefore, the chamber walls are typically corrugated to increase weight bearing strength.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] **FIG. 1** is an exploded perspective view of a first leaching chamber according to the present invention;

[0005] **FIG. 2** is a perspective view of a portion of the first leaching chamber and of a second such leaching chamber;

[0006] FIGS. **3-5** are sectional views of the leaching chambers of **FIG. 2**, shown sectioned along line **3-3** of **FIG. 2** and in different orientations relative to each other, with the orientations corresponding to successive steps in a process of coupling the chambers together;

[0007] **FIG. 6** is a sectional view of the leaching chambers, shown sectioned along line **3-3** of **FIG. 2** and coupled together; and

[0008] **FIG. 7** is a view similar to **FIG. 6**, with the leaching chambers shown sectioned along line **7-7** of **FIG. 2**.

SUMMARY

[0009] An embodiment of the invention is a leaching chamber. The leaching chamber is configured to be coupled in series to another such leaching chamber located forward of the chamber and to yet another such leaching chamber located rearward of the leaching chamber. The leaching chamber comprises a conduit defining a cavity. The conduit includes a front section having an overlying wall and a rear section having an underlying wall. The overlying wall is configured to overlie the underlying wall of the forward chamber when the chambers are coupled together. The underlying wall is configured to underlie an overlying wall of the rearward chamber when said chambers are coupled together. A projection extends from the front section of the conduit. A pocket is located at the rear section of the conduit. The projection is configured to be received by the pocket of the front chamber, and the pocket is configured to receive the projection of the rear chamber. A notched structure defines a notch that is spaced from the front edge of the front section. The notched structure is configured to capture in the notch the underlying wall of the forward chamber when the chambers are coupled together.

[0010] Preferably, the pocket is configured to enable the projection of the forward chamber to pivot relative to the pocket when the projection is received by the pocket, so as to enable the forward chamber to pivot into and out of a coupled position. The notched structure is configured to enable the notch to swing into a position in which the notch captures the underlying wall of the forward chamber. The leaching chamber further comprises a hole in the overlying wall and a post extending radially outward from the underlying wall. The hole is configured to receive the post of the forward chamber when the chambers are coupled together. Correspondingly, the post is configured to be received by the hole of the rearward chamber when the chambers are coupled together.

[0011] Another embodiment comprises first and second chambers. The chambers include coupling structures that prevent the uncoupling of the chambers through translational movement of the chambers. Instead, the coupling structures enable the uncoupling to be achieved through a pivoting motion of the first chamber relative to the second chamber.

DESCRIPTION

[0012] The apparatus **6** shown in **FIG. 1** has parts which, as described below, are examples of the elements recited in the claims.

[0013] The apparatus **6** comprises a first leaching chamber **10**. The chamber **10** is used to disperse a fluid, such as effluent from a septic tank, into the ground. In its installed position, the chamber **10** is coupled in series with other such leaching chambers to form a leach field that is buried in the ground. The chambers may be positioned both end-to-end and side-to-side. An end **12** of the chamber **10** is capped with an end cap **16**, which has an opening to receive the end of a pipe **18**. The pipe **18** conveys the effluent from the septic tank to the leach field, where the effluent spreads through the series of chambers. The first chamber **10** comprises a first conduit **20** with an open bottom **22** and openings **24** through which the effluent escapes to be absorbed into the surrounding soil.

[0014] The first conduit **20** is an arched wall extending about a central axis **30** to define an axially extending cavity **36**. The conduit **20** is corrugated in that it comprises an axially extending alternating series of perforated crowns **44** and valleys **46**. The crowns **44** and valleys **46** are arched and separated from each other by radially-extending walls **47**. The valleys **46** are reinforced with axially-extending and radially-extending external ribs **48**. Correspondingly, the crowns **44** are reinforced with axially-extending and radially-extending internal ribs **49** (**FIG. 3**).

[0015] As shown in **FIG. 2** the frontmost crown **50** includes a front section **52**. The front section **52** includes a front edge **54** defined by a bead **56**. The front section **52** also includes an overlying wall **60** extending rearward from the front edge **54**. The overlying wall **60** is arched, with an open bottom end **62** (**FIG. 1**) and an opposite top side **64** having a central peak **66**.

[0016] Two holes **70** in the overlying wall **60** are located symmetrically about the central peak **66** at the top side **64** of the overlying wall **60**. A projection **80**, in this example a tongue, extends forward from and coplanar with the front section **52** at the central peak **66**.

[0017] Two notched structures **90** extend radially inward from the front section **52**, symmetrically spaced about the central peak **66**. The notched structures are formed from axially-extending reinforcement ribs **92** that reinforce the overlying wall **60**, and are extensions of ribs that reinforce the crowns **44**. The notched structures **90**, which include the bottom surface **94** of the overlying wall **60**, define notches **96** that are spaced axially rearward from the front edge **54**. In molding the chamber **10**, formation of the notches **96** may be facilitated by incorporating holes in the front section **52** above the notches **90** to make room for a core.

[0018] A portion of a second leaching chamber **110** is also shown in **FIG. 2**. The second chamber **110** is like the first leaching chamber **10**. Consequently, each feature described with reference to the second chamber **110** is also included on the first chamber **10**. A portion like the portion of the second leaching chamber shown in **FIG. 2** is positioned at the opposite end, the end not show of the first leaching chamber. Thus, each leaching chamber includes both a front section **150** and a rear section **152**, as discussed in greater detail below.

[0019] The second chamber **110** includes a second conduit **120** extending about a central axis **130**. Like the first conduit **20**, the second conduit **120** is corrugated, with crowns **144** and valleys **146** separated by radially-extending walls **148**.

[0020] The rearmost crown **150** of the second chamber **110** includes a rear section **152** with a rear edge **154**. The rear section **152** includes an underlying wall **160** extending forward from the rear edge **154**. The underlying wall **160** is configured to underlie the overlying wall **60** of the first chamber **10** when the chambers **10** and **110** are coupled together. Like the overlying wall **60**, the underlying wall **160** is arched, with a top side **164** having a central peak **166**. The underlying wall **160** is separated from the remainder of the rear section **152** by a rearward-facing shoulder **168**. The radially-extending height H1 of the shoulder **168** equals the wall thickness T of the overlying wall **60** of the first chamber **10**.

[0021] Two posts **170** extend outwardly from the underlying wall **160** and are located symmetrically about the central peak **166** at the top side **164** of the overlying wall **160**. The posts **170** are configured to be received by the holes **70** of the first chamber **10** when the chambers **10** and **110** are coupled together.

[0022] A pocket **180** is located at the rear section **152**. The pocket **180** is configured to receive the projection **80** of the first leaching chamber **10** when the leaching chambers **10** and **110** are coupled together. The outside opening **182** of the pocket **180** is defined in the shoulder **168**. The pocket **180** is raised slightly above the shoulder **168** on the crown **144**. In addition, the pocket **180** has an open bottom, which is useful in joining the first chamber **10** to the second chamber **110**, as discussed below.

[0023] The first step in coupling the chambers **10** and **110** together is illustrated in **FIG. 3**. The second chamber **110** lies horizontally on the ground. The first chamber **10** is oriented such that the projection **80** is near and directed obliquely toward the pocket opening **182**. Next, as shown by an arrow **184**, the projection **80** is translationally moved toward and into the pocket **180**. This continues until the front edge **54** abuts the shoulder **168**, as shown in **FIG. 4**. The point of abutment on the shoulder **168** serves as a pivot point **186** in the following step.

[0024] As indicated by arrow **190** in **FIG. 5**, the first chamber **10** is pivoted downward about the pivot point **186**. Concurrently, the following things happen. The projection **80** pivots upward about the pivot point **186**, as indicated by an arrow **192**. The holes **70** move downward and receive the posts **170**. Also, the notched structure **90** swings into a capturing position in which the underlying wall **160** is captured in the notch **96**. As the notched structure **90** swings downward, the rear edge **154** of the underlying wall **160** rubs against and bends the front edge **194** of the notched structure **90** until the notched structure **90** snaps into the capturing position. In a preferred embodiment, edge **194** has a resiliency to allow it to substantially maintain its original shape after the underlying wall **160** is captured in notch **96**.

[0025] **FIG. 6** shows the chambers **10** and **110** in a coupled position. In this position, translational movement (i.e., motion without rotation, for example purely axial or purely radial motion) of front section **52** the first chamber **10** relative to the rear section **152** of the second chamber **110** is limited, as follows. The posts **170** are captured in the holes **70**. This limits axial movement of the front section **52** away from the rear section **152**. Also, the underlying wall **160** is captured in the notch **96**. This limits radially-inward and radially-outward translational movement of the underlying wall **160** relative to the overlying wall **60**. Radially-outward movement of the underlying wall **160** is also limited by abutment of the projection **80** against the top wall **196** of the pocket **180**. Different modes of movement are also limited or deterred in other ways as evident to those of skill in the art. In each description above of limiting translational movement, the extent of movement that can occur is a function of the clearance, if any, between abutting structures and the flexibility of those structures.

[0026] Consequently, the posts **170** captured in the holes **70**, the projection **80** captured in the pocket **180**, and the underlying wall **160** captured in the notched structure **90** all deter uncoupling of the front and rear sections **52** and **152** through translational movement. However, these structures enable pivotal movement of the front and rear sections **52** and **152**. For example, although the pocket **180** has the upper wall **196** that limits radially outward movement of the projection **80**, the pocket **180** lacks a lower wall or other structure that would prevent downward pivoting of the projection **80** within the pocket **180**.

[0027] In fact, the posts **170** and holes **70** in combination with the projection **80** and pocket **180** not only enable, but require the coupling and uncoupling to be achieved through a pivoting motion of the first chamber **10** relative to the second chamber **110** because the projection **80** is spaced forward the posts **170**. At the beginning of the coupling process, depicted in **FIG. 3**, the projection **80** is directed downwardly into the pocket opening **182** while the overlying wall **60** remains sufficiently tilted upwardly and raised to clear the post **170**. The inward movement ends when the front edge **54** abuts the shoulder **168**. At that point, the hole **70** slips over the post **170** to allow the overlying section **60** to pivot downwardly. Similarly, in the uncoupling process, with the axially-extending projection **80** vertically captured in the opening **182**, the first chamber **10** is pivoted upwardly to raise the overlying wall **60** sufficiently to clear the post **170**.

[0028] As shown in **FIG. 6**, the height H2 of the notch **96** is greater than the thickness T of the underlying wall **160**

captured by the notch **96**. Furthermore, the notch **96** is axially spaced from the front edge **54**. These factors enable the notch structure **90** to swing into the capturing position without being blocked by the underlying wall **160**. The swinging movement is hindered, but not prevented, by the rear edge **154** of the underlying wall **152** rubbing against the front edge **194** of the notched structure **90**, because the notched structure **90** bends to accommodate the swinging movement.

[**0029**] As mentioned above, the height H1 (**FIG. 2**) of the shoulder **168** equals the wall thickness T of the overlying wall **60**. Consequently, as illustrated in **FIG. 7**, when the chambers **10** and **110** are coupled together, the top surfaces **200** and **202** of the front and rear sections **52** and **152** follow a single smooth curve interrupted only by the bead **56**, projections **170**, and pocket **180**.

[**0030**] In the above described embodiment, as shown in **FIG. 2**, each of the overlying and underlying walls **60** and **160** has a hole and a projection, to respectively mate with a corresponding projection and hole of the other wall. Specifically, the overlying wall **60** has the hole **70** and the axially-extending projection **80**. The underlying wall **160** also has a hole, referred to the pocket opening **182**, and a radially-extending projection, referred to as the post **170**.

[**0031**] However, in an alternative embodiment, both the axially-extending and radially-extending projections **80** and **170** can extend from the overlying wall **60**, and both holes **70** and **182** can be in or adjacent the underlying wall **160**. In such an embodiment, the radially-extending post **170** extends downward from the overlying wall **60**, instead of upward from the underlying wall **160** as shown in **FIG. 2**. Other positions may also be utilized for the posts **170** and holes **70**.

[**0032**] As shown in **FIG. 1**, the first chamber **10** has two lower holes **210** and two corresponding lower posts **220**, that are similar to the upper holes **70** and upper posts **170** described above. In the process of coupling the chambers **10** and **110** together, as the first conduit **20** is pivoted downward, its side walls are bent slightly to enable the lower holes **210** of the first chamber **10** to receive the lower posts **220** of the second chamber **110**. These holes **210** and posts **220** can be positioned on either end of the chamber in a number of different positions.

[**0033**] Referring to **FIG. 1**, the end cap **16** has, at its front side **230**, upper and lower holes **232** and **234** configured to receive the upper and lower posts **170** and **220** when the end cap **16** is coupled to the rear section **152** of the chamber **10**. The end cap **16** also has, at its rear side **240**, upper and lower posts **242** and **244** configured to be received by the upper and lower holes **70** and **210** when the end cap **16** is coupled to the front section **52** of another chamber **10**.

[**0034**] Although the chambers **10** and **110** in this example are made of polyethylene, the invention applies to any suitable material. Similarly, the invention applies to a chamber of any suitable shape and size. Also, although one projection **80**, two posts **170** and two notched structures **90** are shown in the example, different numbers of each structure and different suitable locations for each structure are possible.

[**0035**] While various features of the claimed invention are presented above, it should be understood that the features may be used singly or in any combination thereof. Therefore, the claimed invention is not to be limited to only the specific embodiments depicted herein.

[**0036**] This written description uses examples to disclose the invention, including the best mode, and also to enable any person skilled in the art to make and use the invention. The patentable scope of the invention is defined by the claims, and may include other examples that occur to those skilled in the art. Such other examples are intended to be within the scope of the claims if they have elements that do not differ from the literal language of the claims, or if they include equivalent structural elements with insubstantial differences from the literal language of the claims.

1. A leaching chamber configured to be coupled in series to another like leaching chamber located forward of said chamber and to yet another like leaching chamber located rearward of said leaching chamber comprising:

a conduit defining a cavity, said conduit including a front section having an overlying wall and a rear section having an underlying wall, said overlying wall being configured to overlie the underlying wall of a like forward chamber when said chambers are coupled together, and said underlying wall being configured to underlie an overlying wall of a like rearward chamber when said chambers are coupled together;

a projection extending from said front section of said conduit; and

a pocket formed in said rear section of said conduit, said projection being configured to be received by a like pocket of a like front chamber and said pocket being configured to receive a like projection of a like rear chamber;

a notched structure defining a notch that is spaced from the front edge of said front section, said notched structure being configured to capture in said notch the underlying wall of a like forward chamber when said chambers are coupled together.

2. The leaching chamber of claim 1 wherein said overlying wall has an arched cross-section, with an open bottom end and an opposite top end, said projection being located at said top end, and said conduit is a corrugated structure comprising an axially extending alternating series of crowns and valleys separated from each other by radially-extending walls, the frontmost crown including said front section.

3. The leaching chamber of claim 1 wherein said pocket is configured to enable a projection of a like forward chamber to pivot relative to said pocket when said projection is received by said pocket, so as to enable the like forward chamber to pivot into and out of a coupled position.

4. The leaching chamber of claim 1 wherein said pocket has a radially outer wall that limits radially outward movement of a projection of a like forward chamber when the projection is received by said pocket, and said pocket lacks a radially inner wall that would prevent pivoting of the projection in the pocket.

5. The leaching chamber of claim 1 wherein said notched structure is configured to enable said notch to swing into a position in which said notch captures the underlying wall of a like forward chamber.

6. The leaching chamber of claim 1 wherein said notched structure is part of an axially-extending reinforcement rib that reinforces said overlying wall.

7. The leaching chamber of claim 1 further comprising a hole defined in said overlying wall and a post extending radially outward from said underlying wall, said hole being configured to receive a post of a like forward chamber when said chambers are coupled together, and said post being configured to be received by a hole of a like rearward chamber when said chambers are coupled together.

8. The leaching chamber of claim 1 wherein said rear section includes a rearward-facing shoulder bordering said underlying wall, and the radially-extending height of said shoulder equals the wall thickness of the overlying wall.

9. A leaching chamber configured to be coupled in series to a like leaching chamber having a projection, said leaching chamber comprising:

a conduit extending about an axis to define an axially extending cavity, said conduit having a rear section and being configured to be coupled at said rear section to a like leaching chamber; and

a pocket located at said rear section and configured to receive a projection of a like leaching chamber when said leaching chamber is coupled to the like chamber;

said pocket being configured to enable a projection and a like leaching chamber to pivot relative to the pocket when the projection of the like leaching chamber is received by the pocket.

10. The leaching chamber of claim 9 wherein said pocket has a radially outer wall that limits radially outward movement of a projection when a projection is received by said pocket, and lacks a radially inner wall that would prevent pivoting of a projection.

11. The leaching chamber of claim 9 wherein said rear section includes an underlying wall configured to underlie an overlying wall of a like leaching chamber when said leaching chamber is coupled to the like leaching chamber.

12. The leaching chamber of claim 11 further comprising a post extending radially outward from said underlying wall and configured to be received by a hole in an overlying wall of a like leaching chamber when said leaching chambers are coupled together.

13. A leaching chamber configured to be coupled in series to another leaching chamber, said leaching chamber comprising:

a conduit extending about an axis to define an axially extending cavity, said conduit having a rear section and a front section, the rear section being configured to be coupled at said rear section to another leaching chamber, said rear section having a rearward-facing shoulder; and

a pocket comprising an opening in said shoulder and configured to receive a projection of another leaching chamber when said leaching chamber is coupled to the other leaching chamber.

14. The leaching chamber of claim 13 wherein the radially-extending height of said shoulder equals a wall thickness of the front section of the leaching chamber.

15. The leaching chamber of claim 13 wherein said pocket has a radially outer wall that limits radial outward movement of the projection when a projection is received by said pocket, and lacks a radially inner wall that would prevent radially inward pivoting of a projection.

16. A set of leaching chambers comprising:

a first leaching chamber comprising a first conduit extending about a first axis to define a first cavity, said first conduit having a front section and a rear section, said front section including an overlying wall; and

a second leaching chamber comprising a second conduit extending about a second axis to define a second cavity, said second conduit having a front section and a rear section and being configured to be coupled at said rear section to the front section of the first leaching chamber;

said first and second chambers including coupling structures at the front and rear sections that deter the uncoupling of said chambers solely through translational movement of said chambers, and enable and require the uncoupling to be achieved through a pivoting motion of said first chamber relative to said second chamber.

17. The set of claim 16 wherein said coupling structures include a projection extending axially from said front section and a pocket defined at said rear section, said projection of the first chamber is configured to be received by the pocket of the second chamber, thereby preventing radial movement of said first chamber away from said second chamber when coupled, and said coupling structures further include a post extending radially from one of said front and rear sections and a hole in the other of said front and rear sections, said post being configured to be received by said hole when said first and second chambers are coupled together, thereby limiting axial movement of said first chamber away from said second chamber.

18. The set of claim 16 wherein said coupling structures include a projection extending from each front section and a pocket defined in each rear section, each pocket being configured to receive the projection of another chamber when said chambers are coupled together, said pocket having a radially outer wall that limits radially outward movement of the projection when said projection is received by said pocket, and said pocket lacking a radially inner wall that would prevent redially-inward pivoting of the projection.

19. The set of claim 16 wherein said coupling structure includes a notched structure extending radially inward from said front section and defining a notch that is axially spaced from a front edge of said front section, said notched structure being configured to capture in said notch, in a capturing position, a portion of the rear section of the adjoining chamber when said chambers are coupled together to limit radially-inward and radially-outward translational movement of said rear section relative to said front section, and said notched structure being further configured to allow pivotal movement of the rear section into said capturing position.

20. A leaching chamber configured to be coupled in series to another leaching chamber, said leaching chamber comprising:

a conduit having a wall defining a cavity, said conduit having a front section and a rear section, with the front and rear sections being configured to be coupled to another leaching chamber;

a projection extending from the wall of the conduit at the front section, said projection being coplanar with the wall; and

a pocket defined in the wall of the conduit at the rear section, said pocket being sized to receive the projection therein.

21. A leaching chamber configured to be coupled in series to another such leaching chamber located forward of said chamber and yet another such leaching chamber located rearward of said leaching chamber comprising:

a conduit extending about an axis to define an axially extending cavity, said conduit including a front section having a front edge and an overlying wall and a rear section having an underlying wall, said overlying wall being configured to overlie the underlying wall of a forward chamber when said chambers are coupled together, and said underlying wall being configured to underlie an overlying wall of a rearward chamber when said chambers are coupled together; and

a notched structure extending radially inward from said front section, said notched structure having a notch axially spaced from the front edge of said front section, and said notched structure being configured to capture in said notch, in a capturing position, the underlying wall of the rearward chamber when said chambers are coupled together to limit radially-inward and radially-outward translational movement of the underlying wall to said overlying wall of said chamber, said notched structure being configured to pivotally swing into said capturing position.

22. The leaching chamber of claim 21 wherein said notched structure is part of an axially-extending reinforcement rib that reinforces said overlying wall.

23. The leaching chamber of claim 21, further comprising at least one post extending radially outwardly from the underlying wall and at least one hole defined in the overlying wall, said post and hole being axially aligned and said hole being shaped to receive the size of the post.

24. A method of coupling a first leaching chamber to a second leaching chamber lying horizontally on the ground, said first and second chambers extending about respective first and second axes to define respective first and second axially extending cavities, said method comprising:

providing a set of leaching chambers according to claim 17;

orienting said first chamber such that the projection of said first chamber is directed obliquely downward toward the pocket in said second chamber, and said first axis is directed obliquely upward away from said second chamber;

translationally moving said projection axially toward and into said pocket of said second leaching chamber until an edge of said first chamber abuts a shoulder of said second chamber, thereby defining a point of abutment; and

pivoting said first chamber downward about said point of abutment until the first and second axes coincide and such that, during said pivoting, the hole in one of the chambers receives the post of the other chamber.

25. The method of claim 24 wherein, during said pivoting, a notched structure defined on the first chamber swings into a position in which a notch of the notched structure captures a wall of the second chamber.

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