US 20070180785A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2007/0180785 A1**

Trotter (43) **Pub. Date: Aug. 9, 2007**

(54) **METHOD AND DEVICE FOR CREATING A DRAINAGE CONDUIT**

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(21) Appl. No.: **11/728,110**

(22) Filed: **Mar. 23, 2007**

Related U.S. Application Data

(63) Continuation-in-part of application No. 11/512,673, filed on Aug. 30, 2006, which is a continuation-in-part of application No. 10/666,320, filed on Sep. 18, 2003, now Pat. No. 7,118,772.

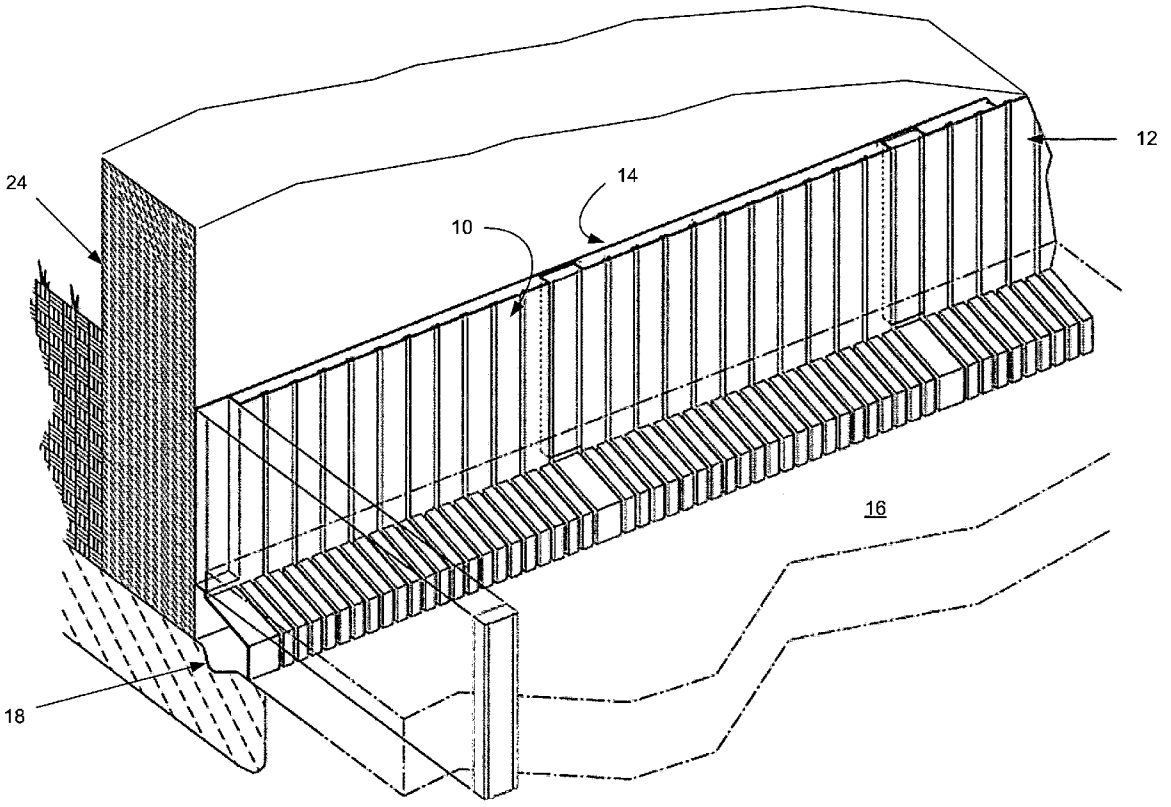
Publication Classification

(51) **Int. Cl.**
E04B 1/70 (2006.01)
E04F 17/00 (2006.01)

(52) **U.S. Cl.** **52/302.1**

(57) **ABSTRACT**

Disclosed herein is an apparatus for forming a drainage conduit including a body portion, a level indicator affixed to the body portion operable for indicating a pitch of the body portion, and a handle affixed to the body portion, wherein the handle is operable to adjust the pitch of the body portion. The body portion of the apparatus includes a lower portion including a first end and a second end and a front portion affixed to the first end of the lower portion, wherein the front portion may have a width greater than the lower portion.



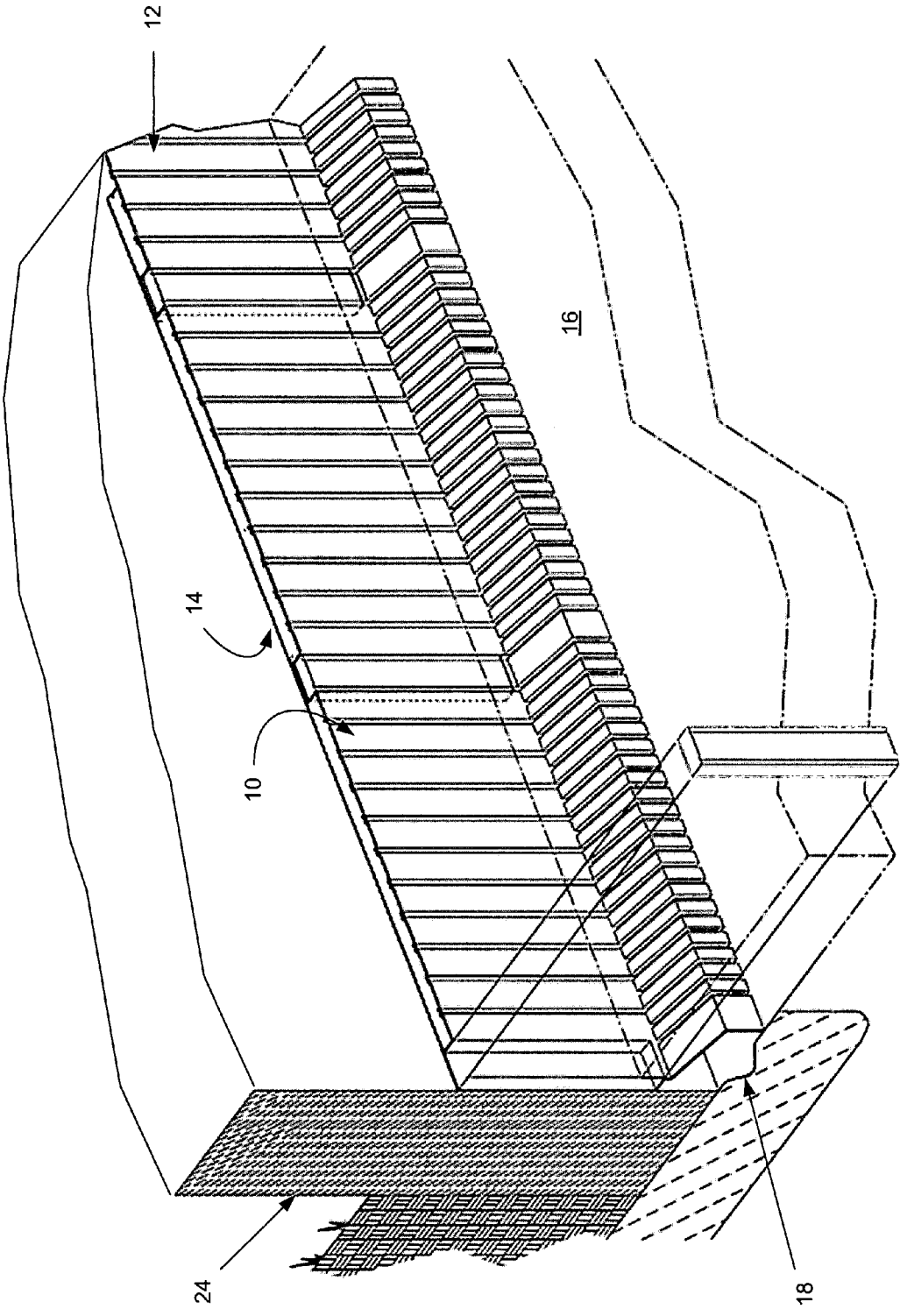


FIG. 1

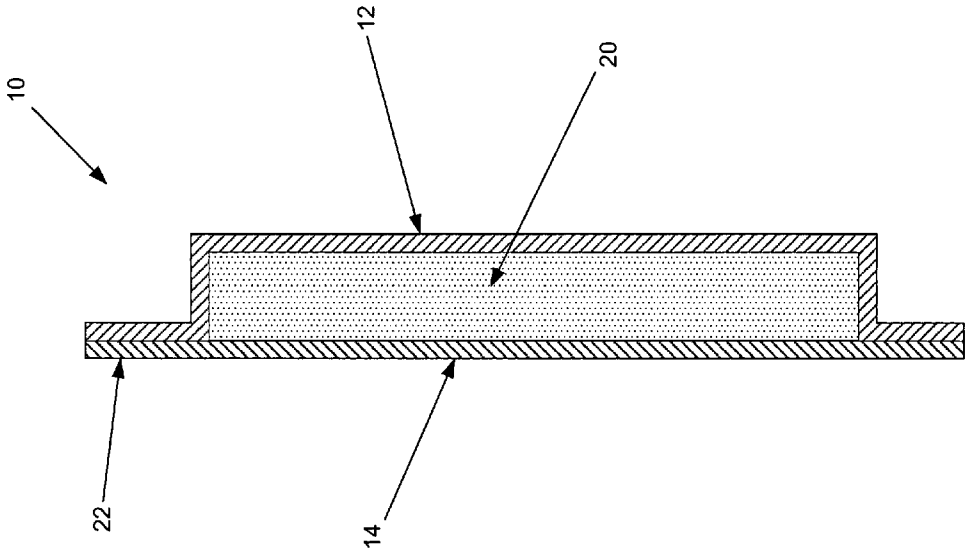


FIG. 2

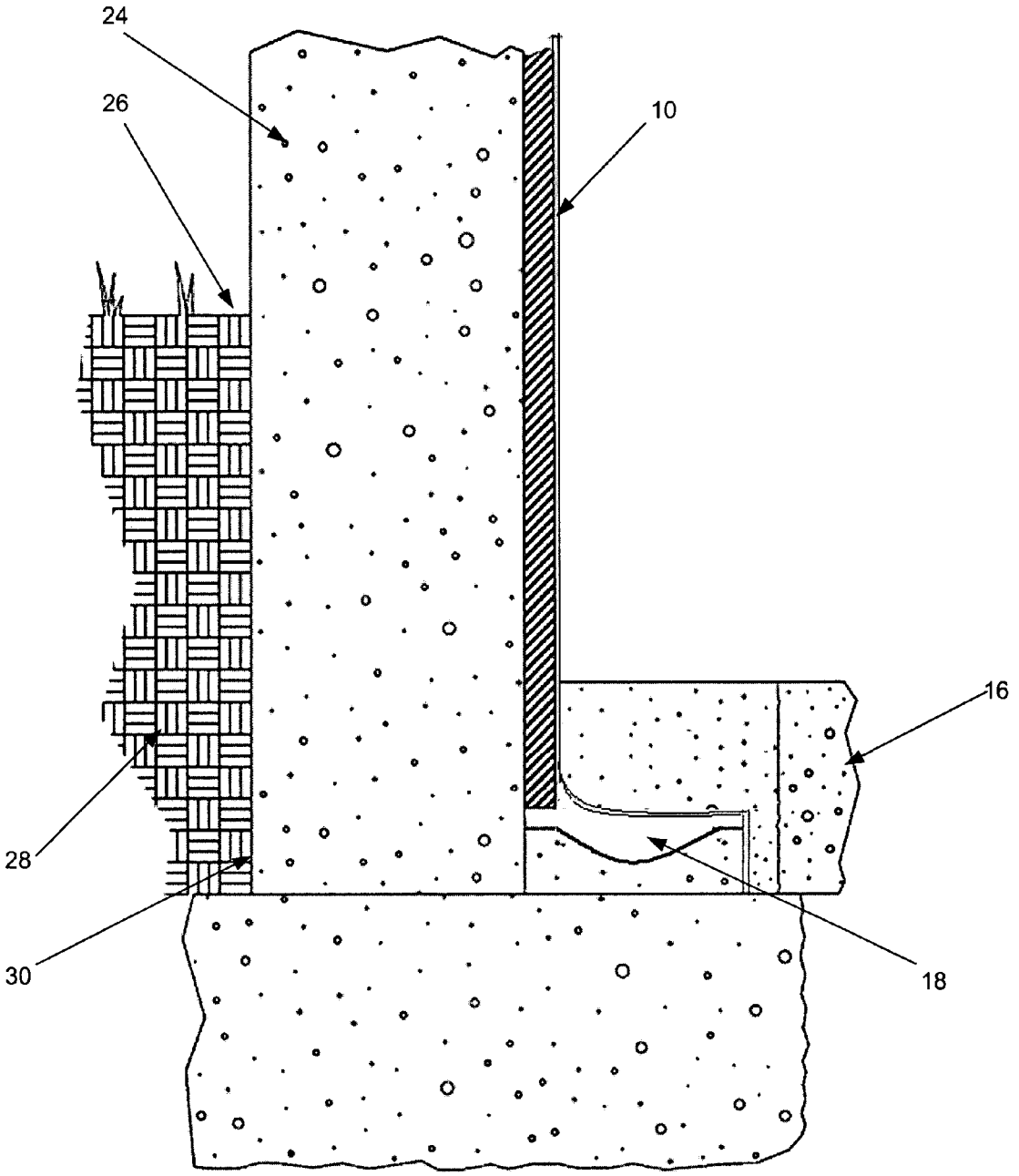


FIG. 3

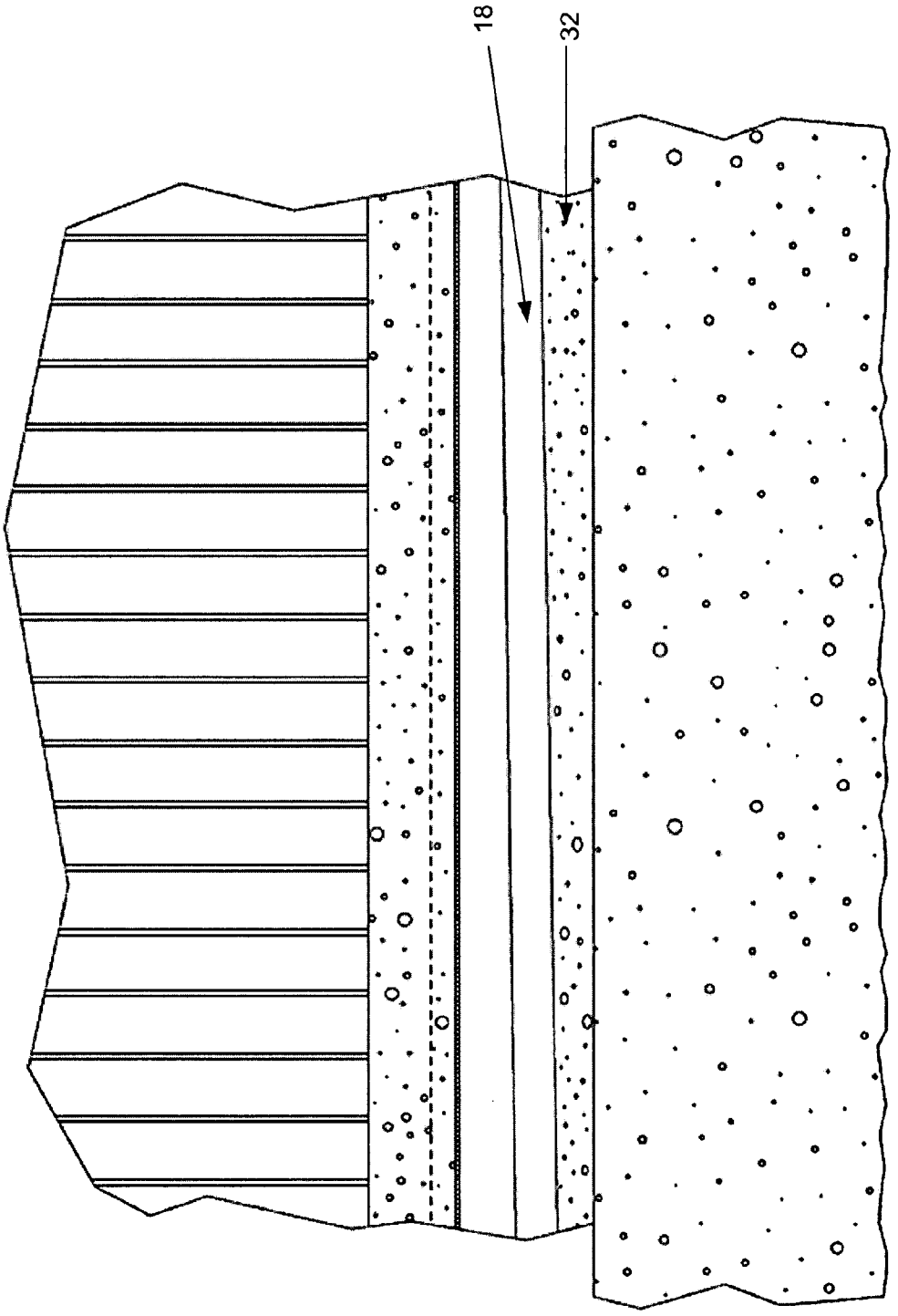


FIG. 4

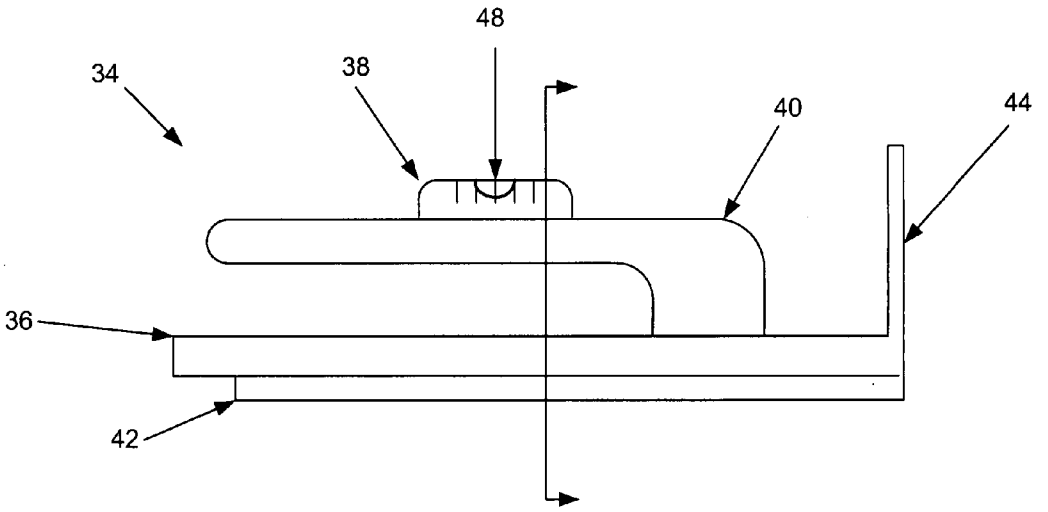


FIG. 5A

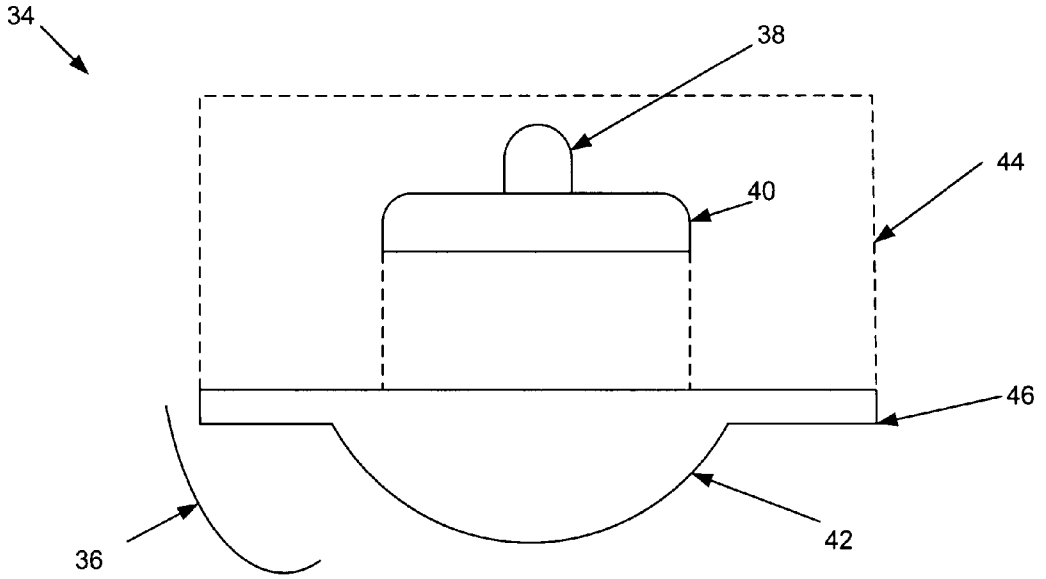


FIG. 5B

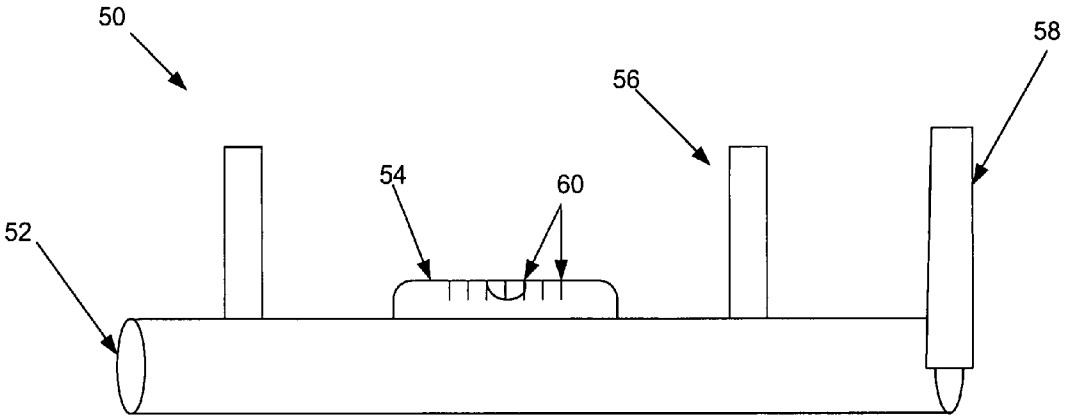


FIG. 6

METHOD AND DEVICE FOR CREATING A DRAINAGE CONDUIT

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation-in-part of U.S. patent application Ser. No. 11/512,673, filed 30 Aug. 2006, and entitled "Condensation Inhibition system for Structural Waterproofing", which is a continuation-in-part of U.S. patent application Ser. No. 10/666,320, filed 19 Sep. 2003, and entitled "Drying System for Structural Waterproofing."

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates generally to relieving and eliminating water problems associated with the exterior and interior of an enclosure's foundation and, more particularly, to an method and device for creating a drainage conduit for use in eliminating such water problems.

[0004] 2. Description of the Related Art

[0005] The foundations of buildings often experience water problems due to a variety of causes. When such foundations are constructed, the surrounding soil must be removed prior to construction and then replaced after the foundation is completed. As a result, foundations can become damaged as soil settles outside of the foundation. Furthermore, a negative grade sloping toward the foundation is also often formed due to such settling. With the negative grade, the force of gravity causes water to move toward the foundation cracking the foundation and eventually entering into the building. This is especially true of basements and crawl spaces. When water enters a dwelling, many problems arise, both to the physical structure of the dwelling and to the air.

[0006] It is known in the art to install structural waterproofing systems to drain water from basements and crawl spaces. While certain waterproofing systems involve systems outside of the homes, many typical waterproofing systems include some method of draining the water from inside the building to the outside. U.S. Pat. No. 4,798,034 discloses a basement draining channel that extends around the periphery of a basement floor, next to the wall, for draining away collected water. The channel includes a plurality of drain entrance holes leading to drain tubes. When water enters the basement walls, it is directed to a preformed channel and directed toward the entrance holes due to gravity. The water is channeled via gravity to a drain connector pipe to a sump pump.

[0007] A problem may exist with current waterproofing systems which utilize such devices. With these devices collecting water and in contact with the walls of the basement, the temperature of the exposed surfaces of the devices are cooled below the temperature of the basement or crawl space due to the water being collected. Consequently, water condensation may occur within the room along the face of the interior panel as the moisture vapor within the room, at the temperature of the room, contacts the colder surface. Such condensation may lead to the development of mold.

[0008] Dampness and associated mold from such evaporation causes damage to buildings, ruins possessions, produces foul odors, and even presents potential health problems. When excessive moisture or water accumulates indoors, growing molds produce allergens, irritants, and potentially toxic substances. Although mold growth can be treated, it cannot be eliminated as long as a moisture problem exists. Thus, there is a need in the art for a waterproofing system that inhibits the growth of mold.

[0009] Additionally, other deficiencies with certain waterproofing system exists. Typical interior panels are not insulated. Other problems include retaining large amounts of water in the drainage systems or in the soil under the basement floor. Accordingly, there is a need for improved interior waterproofing systems.

SUMMARY OF THE INVENTION

[0010] The present invention provides a condensation inhibition system for structural waterproofing. In accordance with one embodiment of the present invention, a waterproofing system is provided within a dwelling having a wall and a foundation. The wall having a first surface for defining an interior of the dwelling and an exterior in communication with graded soil. The waterproofing system further including a waterproofing panel having a front vapor diffusion retarder portion, a back vapor diffusion retarder portion, and an insulator carried between said front portion and said back portion. Additionally, a collection channel is provided for collecting water entering into the dwelling from the exterior.

[0011] Also disclosed herein is an apparatus for forming a drainage conduit including a body portion, a level indicator affixed to the body portion operable for indicating a pitch of the body portion, and a handle affixed to the body portion, wherein the handle is operable to adjust the pitch of the body portion. The body portion of the apparatus includes a lower portion including a first end and a second end and a front portion affixed to the first end of the lower portion, wherein the front portion has a width greater than the lower portion.

[0012] Further disclosed herein is a method of creating a drainage conduit including pouring a concrete channel, inserting an apparatus for forming a drainage conduit, as described above, adjusting the pitch of the body portion to a desired inclination level, and sliding the apparatus in the concrete channel.

BRIEF DESCRIPTION OF THE FIGURES

[0013] FIG. **1** is a perspective view of a preferred embodiment of present invention.

[0014] FIG. **2** is a perspective view of a preferred embodiment of the present invention.

[0015] FIG. **3** is a cross-sectional view of a waterproofing panel according to a preferred embodiment of the present invention.

[0016] FIG. **4** is a view taken along line **4-4** of FIG. **3** illustrating a crown channel having a downwardly sloping grade for carrying water way from the interior of the waterproofing system according to one embodiment of the present invention.

[0017] FIG. **5**A is a side view of an apparatus for forming a drainage conduit in accordance with exemplary embodiments of the present invention.

[0018] FIG. 5B is a view taken along line 5-5 of FIG. 5A illustrating the apparatus for forming a drainage conduit.

[0019] FIG. 6 is a perspective view of another apparatus for forming a drainage conduit in accordance with exemplary embodiments of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0020] The present invention relates to an insulated waterproofing system and materials for making and installing the same. The insulated waterproofing system is preferably a system installed in the interior of a basement or crawlspace that maintains the face of the waterproofing panel at substantially equal to the temperature of the interior air to inhibit the condensation of moisture from inside the dwelling on the face of the waterproofing panel.

[0021] Referring now in detail to the drawing figures, wherein like reference numerals represent like parts, FIG. 1 illustrates a perspective view of a preferred embodiment of the present invention. The waterproofing system comprises a waterproofing panel 10 having a front vapor diffusion retarder portion 12 and a back vapor diffusion retarder portion 14. The front vapor diffusion retarder portion 12 is intended to be in communication with the interior of a dwelling. The back vapor diffusion retarder portion 14 is intended to be in communication with the foundation or wall of the dwelling. An insulating material 20 may be contained between the front portion 12 and the back portion 14 of the waterproofing panel 10. While the preferred embodiment is shown as a waterproofing panel 10, in its broadest sense, a single sheet of rigid insulation may be utilized. The face of the rigid insulation would be exposed to the interior of the dwelling forming a vapor diffusion retarder, while the rearwardly extending portion of the insulation would constitute the insulating material and the back retardant portion. Those of skill in the art will appreciate that many insulations materials exhibit vapor diffusion retardant properties and thus could serve as both the insulation and provide the diffusion retarder surfaces.

[0022] As shown in FIG. 2, waterproofing panel 10 includes the front vapor diffusion retarder portion 12 and the back vapor diffusion retarder portion 14 that are preferably made from a polymeric material which may have additional additives for strength, color, or other desired characteristics. The front vapor diffusion retarder portion 12 and the back vapor diffusion retarder portion 14 can be comprised of materials exhibiting a wide range of vapor permeance values or "perm" ratings. Those of skill in the art will appreciate that the perm ratings of the materials used can be altered according the climate and other parameters of a particular installation. For example, and not limitation, in a preferred embodiment both the front vapor diffusion retarder portion 12 and the back vapor diffusion retarder portion 14 are comprised of a polyethelene material with a perm rating of less than 0.05, and preferably 0.03. In an alternative embodiment, an installation in a more mild climate may allow for the use of painted drywall, with a perm rating of around 2-3, as the front vapor diffusion retarder portion 12 and back vapor diffusion retarder portion 14 of the waterproofing panel 10. Many different materials of varying perm ratings can be used to provide the surfaces of the waterproofing panel 10 in different embodiments, such as asphalt-coated paper backing on insulation (perm rating ~0.40), plywood with exterior glue (perm rating ~0.28), aluminum foil (perm rating ~0.05), and vapor barrier paint (perm rating ~0.45).

[0023] Waterproofing panel 10 also includes an insulating material 20 which is integrally in contact with the back vapor diffusion retarder portion 14 and the front vapor diffusion retarder portion 12. The insulating material 20 may be a rigid fiberglass, styrofoam, or many other suitable materials that provide insulating benefits to the face of the panel. The depth or "R" factor of the insulating material may depend on the location of the waterproofing system and the normal room temperature of the basement. For instance, in the southeast, basement temperatures typically do not drop below fifty-five degrees Fahrenheit, accordingly, the "R" factor of the insulating material may only need to be R3. However, in other regions, the temperature drop may be more severe requiring more insulating "R" value. In exemplary embodiments a collection channel is located below the waterproofing panel 10. Many basements are unfinished, and consequently, by installing for panel 10, a surface may be provided for attaching finishing material. For instance, a furring strip is utilized for attaching the waterproofing panel 10 to the basement wall.

[0024] Waterproofing panel 10 includes transitional areas 22 wherein adjacent waterproofing panels 10 may overlap and be attached together with the wall via the furring strip, or a stud. The transitional areas 22 are of a sufficient width and depth to encircle the furring strip so that a planar surface is provided by the attached panels. In exemplary embodiments, the transitional areas 22 are formed by the vapor diffusion retarder portion 12 extending around the sides of the insulating material 20 and contacting the back portion 14, such that the back portion 14 and the vapor diffusion retarder portion 12 are planer with a back of the insulating material 20. This planar surface provides for a smooth surface area for attaching finishing materials such as paneling and the like onto the panels 10. The furring strip provides a surface area for receiving any fasteners, i.e., nail or screw which is utilized for attaching the finishing material in a mounted position along the basement wall.

[0025] As shown in FIG. 3, in the preferred embodiment, waterproofing panel 10 extends up along the basement wall to a height at least above a grade 26 of the external ground. In this manner, waterproofing panel 10 is in a position to collect any groundwater which may enter into the dwelling and also ensures that the face of waterproofing panel 10 may be completely insulated from any cool water entering into the basement. A drainage conduit 18 is designed to be installed below a floor 16 of the basement. As show in FIG. 3, the waterproofing system typically involves breaking up a portion of the basement floor 16 such that the waterproofing system may be installed in fluid communication with the foundation of the dwelling. The foundation of the dwelling supports the dwelling wall 24. Frequently, the interface 30 between the earthen surrounding 28 and the wall 24 is where the water seeps into the basement. Consequently, the waterproofing system provides for a channel which is designed to remove water from the foundation. As mentioned in the parent application, the removal of water from the foundation is critical to provide for stability of the dwelling.

[0026] As shown in FIG. 4, in operation, waterproofing panel 10 may be integrated with additional panels along the

entire interior of the room such that they form waterproofing system within a dwelling such as a basement. The typical basement has four walls and a sub-floor **32**. Drainage conduit **18** is built into an existing sub-floor and preferably extends along the entire perimeter of the basement or crawlspace. However, other drainage conduit lengths and configurations may be had depending on the water problems affecting the basement or crawlspace. The formation of the drainage conduit **18** includes breaking up an exterior portion of a basement floor, pouring fresh concrete around the exterior portion of the basement, and molding the drainage conduit in the wet concrete before it sets. Currently, this process can be quite time consuming.

[**0027**] Turning now to FIGS. **5**A and **5**B. various views of an apparatus **30** for forming a drainage conduit **18** in accordance with exemplary embodiments of the present invention are illustrated. The apparatus **30** includes a body portion **36**, a level indicator **38**, and a handle **40**. In exemplary embodiments, the body portion **36** includes a partially cylindrical portion **42** that extends along the length of the body and has a first end and a second end. The partially cylindrical portion **42** is designed to be depressed into the wet concrete to form a portion of the drainage conduit. The body portion **36** also includes a front portion **22** that is affixed to the first end of the partially cylindrical portion **42**. The front portion **22** is designed to scrape, or slide, along the concrete surface above the partially cylindrical portion **42** to provide a smooth surface. The handle **40** is affixed to the body portion **36** and allows a user to slide the apparatus **30** to form a drainage conduit **18**. The level indicator **38** may be affixed to the handle **40** or to the body portion **36** and is operable for indicating a pitch of the body portion **36**.

[**0028**] In exemplary embodiments the level indicator **38** may be a bubble level, which includes an air bubble **22** in a liquid filed tube. The liquid filed tube includes a plurality of markings that are used in conjunction with the bubble **22** to determine the inclination of the bubble level. The level indicator **38** may be mounted on the apparatus **30** such that when the bubble level indicates a level surface the angle of inclination is a specified angle, such as two or three degrees. In another embodiment, the level indicator may be mounted such that a level reading is actually indicative of a zero inclination angle.

[**0029**] The front portion **22** of the body portion **36** is designed to extend horizontally beyond the partially cylindrical portion **42** forming protrusions **46**. The protrusions **46** are designed to create flat horizontal surfaces on either side of the drainage conduit **18**. In exemplary embodiments, as shown in FIG. **5**A, the front portion **22** may be integrally formed with the body portion **30** and the body portion may also include protrusions **46**. The body portion **36** may have a length ranging from four to forty-eight inches. The varying lengths of the body portion may be more desirable for different applications. For example, a shorter body portion may be better suited to working in small spaces or in the corner of a room, while longer body portions may be better suited to working along walls in larger rooms. In other exemplary embodiments, the lower portion of the body of the apparatus for forming a drain conduit may have various shapes including, but not limited to, partially cylindrical, triangular, trapezoidal, or the like.

[**0030**] Turning now to FIG. **6**, an alternative exemplary embodiment of an apparatus **32** for forming a drainage conduit **18** is illustrated. The apparatus **32** includes a body **52**, a level indicator **54**, and a handle **56**. Affixed to the front of the body **52** is a front portion **58**, which extends horizontally from both sides of the body **52** and vertically from the top of the body **52**. The body **52** is generally cylindrical in shape and may be constructed of a suitable durable material, such as a polymer or metal. The level indicator **54** may be a bubble level that includes a plurality of markings **18**, which are used to indicate the inclination angle of the body **52**. The level indicator **54** may be flushly mounted to the body **52** or may be mounted to the body at a desired inclination level. The front portion **58** affixed to the body **52** is designed to extend horizontally beyond the body **52** forming protrusions. The protrusions are designed to create flat horizontal surfaces on either side of the drainage conduit **18**.

[**0031**] In exemplary embodiments, to facilitate in the removal of moisture and water vapor from drainage conduit **18**, air may be circulated throughout the length of drainage conduit **18** by a waterproof drying system. By circulating air throughout the drainage conduit **18**, the water vapor is removed, enabling the liquid water to experience a phase shift into becoming water vapor which is then subsequently removed. This facilitates the drying of the waterproofing system. For example, if the temperature of water is 25 degrees Celsius, the liquid water tries to maintain sufficient water vapor in contact with it to maintain a pressure of 25 mm of mercury. When air removes the water vapor away, the liquid water re-establishes the 25 mm of mercury by evaporating more liquid and hence increases the rate of evaporation. By providing moving air throughout the drainage conduit, the water vapor and water standing in the drainage conduit are removed.

[**0032**] In operation, with the air in the basement being drier than the air in the waterproofing system, the air in the basement is utilized for transporting water vapor from the interior of the waterproofing system facilitating in rapid drying of the interior of the waterproofing system. Additionally, air is circulated throughout the dwelling by circulating the air within the basement outside which further reduces any moisture build up within the basement from the presence of water.

[**0033**] One method that can be used to create a drainage conduit includes pouring a concrete channel and inserting an apparatus for forming a drainage conduit, as describe above with reference to FIGS. **5**A-B and FIG. **6**. Once the apparatus for forming a drainage conduit is inserted into the concrete the user adjusts the pitch of the body portion to a desired inclination level using the handle and the level indicator. Finally, after positioning the apparatus for forming a drainage conduit at the desired inclination level the user slides the apparatus in the concrete channel and created the drainage conduit.

[**0034**] The combination of providing a graded drainage trough **18** in addition to an air flow for removing any residue moisture from the trough provides for an effective water removal system which does not leave a damp surface which promotes the growth of mold. In the preferred embodiment, the drainage trough **18** is created by pouring a distinct cement layer on top of the level foundation. This cement drainage trough initially inhibits any further water flow into the basement area as a barrier is created at the interface of

the foundation and basement wall. Consequently, the water is forced to rise up and into the trough wherein the concave shape collects the water and the downwardly sloping grade carries the water to a drainage such as a gravity drain.

[0035] Accordingly, in operation, an improved waterproofing system may be had. By utilizing preformed panels **10**, the system may be installed very quickly and provide for the reduction of condensation collecting on the surface of the waterproofing system. The primary importance of prohibiting the condensation of interior water vapor on the vapor diffusion retarder is that once the waterproofing system is installed, for building code purposes, finishing material such as paneling or drywall will be erected over the panels. Consequently, under prior systems, water vapor from within the basement would pass through the finishing material and condense against the cool uninsulated vapor diffusion retarder. Consequently, the condensation would run down behind the drywall and unbeknownst to the home owner, mold would start growing in the wet environment in combination with the paper of the drywall. Applicant's invention is focused on removing the possibility of condensation from occurring behind the drywall. Alternatively, panel **10** could serve as the interior wall of the basement or crawlspace.

[0036] While the various embodiments of this invention have been described in detail with particular reference to exemplary embodiments, those skilled in the art will understand that variations and modifications can be effected within the scope of the invention as defined in the appended claims. Accordingly, the scope of the various embodiments of the present invention should not be limited to the above discussed embodiments, and should only be defined by the following claims and all equivalents.

What is claimed is:

1. An apparatus comprising:

a body portion comprising:

a lower portion including a first end and a second end; and

a front portion affixed to the first end of the lower portion;

a level indicator affixed to the body portion operable for indicating an pitch of the body portion; and

a handle affixed to the body portion, wherein the handle is operable to adjust the pitch of the body portion.

2. The apparatus of claim 1, wherein the level indicator is a bubble level.

3. The apparatus of claim 2, wherein the bubble level includes a plurality of marking indicating various inclination levels.

4. The apparatus of claim 1, wherein the level indicator is an electronic level with alarms when the pitch of the body is over or under a preferred pitch.

5. The apparatus of claim 1, wherein the front portion has a width greater than the lower portion.

6. The apparatus of claim 5, wherein the lower portion is centrally located about the width of the front portion.

7. The apparatus of claim 1, wherein the body further comprises a horizontal portion having a width equal to a width of the front portion.

8. A method of creating a drainage conduit comprising:

pouring a concrete channel;

inserting an apparatus comprising:

a body portion comprising:

a lower including a first end and a second end; and

a front portion affixed to the first end of the lower portion;

a level indicator affixed to the body portion operable for indicating and pitch of the body portion; and

a handle affixed to the body portion, wherein the handle is operable to adjust the pitch of the body portion;

adjusting the pitch of the body portion to a desired inclination level; and

sliding the apparatus in the concrete channel.

9. The method of claim 8, wherein sliding the apparatus in the concrete channel creates the drainage conduit with the desired inclination level.

10. The method of claim 8, further comprising breaking up an exterior portion of a basement floor and wherein the concrete channel is poured in the exterior portion of the basement floor.

11. An apparatus comprising:

a body portion including a first end and a second end;

a front portion affixed to the first end of the body portion;

a level indicator affixed to the body portion operable for indicating an pitch of the body portion; and

a handle affixed to the body portion, wherein the handle is operable to adjust the pitch of the body portion.

12. The apparatus of claim 11, wherein the body portion is at least partially cylindrical.

13. The apparatus of claim 11, wherein the level indicator is a bubble level.

14. The apparatus of claim 13, wherein the bubble level includes a plurality of marking indicating various inclination levels.

15. The apparatus of claim 11, wherein the level indicator is an electronic level with alarms when the pitch of the body is over or under a preferred pitch.

16. The apparatus of claim 11, wherein the front portion has a width greater than the body portion.

17. The apparatus of claim 12, wherein the body portion is centrally located about the width of the front portion.

18. The apparatus of claim 11, wherein body portion has a length ranging from approximately four inches to approximately twenty-four inches.

19. The apparatus of claim 11, wherein body portion has a length ranging from approximately twenty-four inches to approximately forty-eight inches.

* * * * *