A vertical inlet riser for use with an underground drainage pipe system, includes a main body having a generally hollow cylindrical shape. A plurality of apertures are located in the main body and arranged to permit ground water to be received within the main body. A connection member is located on a lower end of the main body and adapted to mate with the underground drainage pipe system. A resilient flexible material maintains the main body in a generally vertical position when a majority of the main body is extending above the ground, bends the main body upon an incident of force on the main body, and returns the main body to the generally vertical position when the incident of force is removed.
FLEXIBLE INLET RISER

BACKGROUND OF THE INVENTION

[0001] The present invention relates to the field of drainage pipe systems. More particularly, the invention relates to a flexible vertical inlet riser, for use in a terraced environment such as is commonly found in an agricultural field.

[0002] Terraces, such as those commonly found in an agricultural field, reduce the effects of erosion by controlling and managing surface run-off. A terrace includes a generally horizontal bench, typically the tillable portion in an agricultural field, and a supporting generally vertical embankment adjacent the bench. Terraces are constructed across the slope of a field to break up long slopes into a series of short areas, with each area collecting excess water from an area above it. The collected water is then typically removed from the field safely via an underground drainage pipe system.

[0003] These underground drainage pipe systems include a vertical drain pipe for inletting collected water into the underground drainage pipe system, and a horizontal drain pipe for dispersing the collected water into the ground. A vertical inlet riser that extends above the ground level is typically connected to the vertical drain pipe to intake surface water from the terrace and outlet this water into the underground drainage pipe system. These vertical inlet risers are typically constructed of metal (as shown in U.S. Pat. No. 902,104) or of PVC piping (i.e. polyvinyl chloride plastic piping).

[0004] Unfortunately, existing terrace and drainage pipe system designs are based on the dimensions and maneuverability of antiquated farm machinery. For instance, an existing terrace and drainage pipe system may be designed to have a space between the vertical embankment of a terrace and the adjacent vertical inlet riser sufficient to allow the passage of a twelve row planter, which was the state of the art at the time the terrace and drainage pipe system was made. However, current planters are capable of planting up to twenty four rows, and are accordingly much wider than the prior twelve row models. An attempt to pass the twenty-four row planter between the vertical embankment of a terrace and the adjacent vertical inlet riser results in the twenty-four row planter impacting the vertical inlet riser. This impact will often break the PVC type vertical inlet riser, and displace the metal type vertical inlet riser sufficiently to dislodge the metal type vertical inlet riser from the horizontal drain pipe so that water is no longer efficiently communicated to the drainage pipe system.

[0005] It is a primary objective of this invention to provide a vertical inlet riser for use with an underground drainage pipe system, having a resilient flexible means that accommodates impact to the vertical inlet riser without compromising the performance of the drainage pipe system.

[0006] These and other objects will be apparent to those skilled in the art.

BRIEF SUMMARY OF THE INVENTION

[0007] A vertical inlet riser, for use with an underground drainage pipe system, includes a main body having a generally hollow cylindrical shape. A plurality of apertures are located in the main body and arranged to permit ground water to be received within the main body. A connection member is located on a lower end of the main body and adapted to mate with the underground drainage pipe system. A resilient flexible means maintains the main body in a generally vertical position when a majority of the main body is extending above the ground, bends the main body upon an incident of force on the main body, and returns the main body to the generally vertical position when the incident of force is removed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] FIG. 1 is a side view of the vertical inlet riser of the present invention in a terraced environment;

[0009] FIG. 2 is an additional side view of the vertical inlet riser of the present invention in a terraced environment;

[0010] FIG. 3 is a partial cross sectional top view the vertical inlet riser of the present invention taken along line 3-3 of FIG. 1;

[0011] FIG. 4 is a perspective view of a connection member of the vertical inlet riser of the present invention; and

[0012] FIG. 5 is a partial cross sectional side view the vertical inlet riser of the present invention taken along line 5-5 of FIG. 1.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0013] A drainage pipe system 10 having a vertical inlet riser 12 is shown in a terraced environment 14 in FIG. 1. The drainage pipe system 10 is located primarily underground with the vertical inlet riser 12 extending above ground level in a generally vertical direction.

[0014] The terraced environment 14 includes a supporting embankment 16 extending in a generally vertical direction and a bench 18. The bench 18 is typically the tillable portion in an agricultural field and is positioned adjacent the embankment 16 to extend in a generally horizontal direction from the embankment 16. The embankment 16 and bench 18 form a pair of structures that are repeated across the slope of a field to break up long slopes into a series of short areas, with each area collecting excess water in a channel 20 formed between each embankment 16 and bench 18 pair. The collected water in a channel 20 is removed from the terraced environment 14 via the adjacent vertical inlet riser 12 and underground drainage pipe system 10.

[0015] A space A separates the embankment 16 from an adjacent vertical inlet riser 12. This space A is utilized to pass equipment (not shown) such as planters between the embankment 16 and the adjacent vertical inlet riser 12. Where the space A is insufficient to accommodate the passing equipment, the vertical inlet riser 12 is impacted by the equipment. As shown in FIG. 2, the vertical inlet riser 12 of the present invention bends to accommodate the impact by the equipment and returns to its generally vertical orientation when the incident of force is removed.

[0016] While other forms of drainage pipe systems 10 may be used in conjunction with the vertical inlet riser 12 of the present invention, one exemplary drainage pipe system 10 is shown in FIG. 2. One or more generally horizontal drain pipes 22 extend laterally from a central pipe junction 24. The horizontal drain pipes 22 disperse the collected water from
the surface into the ground. A generally vertical drain pipe 26 extends from the central pipe junction 24 in an upward direction. The vertical drain pipe 26 inlets the collected water from the surface into the underground drainage pipe system 10 for dispersion into the horizontal drain pipes 22.

[0017] A connection member 28 is located on a lower end of the vertical inlet riser 12. The connection member 28 is adapted to mate with the vertical inlet riser 12 with the underground drainage pipe system 10 via the vertical drain pipe 26. Once the connection member 28 mates the vertical inlet riser 12 with the underground drainage pipe system 10, the vertical inlet riser 12 extends above the ground level to intake surface water from the terraced environment 14 and outlets this water into the underground drainage pipe system 10 via the vertical drain pipe 26.

[0018] With reference to Fig. 4, the connection member 28 includes a coupler piece 30. The coupler piece 30 has an upper portion 34 adapted to mate with the vertical inlet riser 12 and a lower portion 36 adapted to mate with the vertical drain pipe 26. The lower portion 36 of the connection member 28 is received within the vertical drain pipe 26, and is retained therein with glue or any other suitable fastening material and/or device. Likewise, the upper portion 34 is received within the vertical inlet riser 12, and is retained therein with glue or any other suitable fastening material and/or device.

[0019] With reference to Fig. 3, one embodiment for affixing the upper portion 34 of coupler piece 30 to the vertical inlet riser 12 is shown. A retention band 38 formed of metal or another suitable material is positioned around the vertical inlet riser 12. An outer lip 42 and an inner lip 44 are received in a portion of the drain pipe 26. The retention band 38 encircles the outer lip 42 and receives a plurality of fasteners 40 therethrough that secure the retention band 38, outer lip 42, and inner lip 44 to the upper portion 34 of coupler piece 30.

[0020] Other connection member 28 arrangements are contemplated by the present invention. For instance, the coupler piece 30 could be eliminated, so that the fasteners 40 secures the retention band 38, outer lip 42, and inner lip 44 directly to the vertical drain pipe 26. Likewise the outer lip 42 or inner lip 44 could be eliminated. Additionally, the connection member 28 may be comprised of other fastening materials and/or devices used to mate the vertical inlet riser 12 with the underground drainage pipe system 10 via the vertical drain pipe 26.

[0021] With reference to Fig. 2, a main body 46 having a generally hollow cylindrical shape forms the main portion of the vertical inlet riser 12 of the present invention. A close top 48 is formed at an upper end of the main body 46 to prevent large objects from entering the main body 46, and reducing the drainage ability of the vertical inlet riser 12. A plurality of apertures 50 are located in the main body 46, with the apertures 50 arranged to permit ground water to be received within the main body 46. As shown, the vertical inlet riser 12 of the present invention bends to accommodate the impact by the equipment and returns to its generally vertical orientation when the incident of force is removed. The vertical inlet riser 12 includes resilient flexible means for maintaining the main body 46 in a generally vertical position when a majority of the main body is extending above the ground, bending the main body upon an incident of force on the main body, and returning the main body to the generally vertical position when the incident of force is removed. In one embodiment, the resilient flexible means comprises the main body 46 itself being constructed from a flexible material with sufficient resilient structural integrity to return the main body 46 to the generally vertical position when the incident of force is removed. In this embodiment, the flexible material of the main body 46 can include a polymer based material.

[0022] With reference to Fig. 5, in another embodiment, the resilient flexible means comprises the main body 46 being constructed from a flexible material and a separate support member 52 in contact with the main body 46. As shown, the support member 52 has a coiled spring structure located within the hollow portion of the main body 46. The support member 52 has sufficient resilient structural integrity to return the main body 46 to the generally vertical position when the incident of force is removed.

[0023] Thus, the present invention provides a vertical inlet riser, for use with an underground drainage pipe system, having a resilient flexible means that accommodates impact to the vertical inlet riser without compromising the performance of the drainage pipe system.

[0024] It will be appreciated by those skilled in the art that other various modifications could be made to the device without departing from the spirit in scope of this invention. All such modifications and changes fall within the scope of the claims and are intended to be covered thereby.

1. An underground drainage pipe system, comprising:
   an inlet riser having a main body made of a flexible material adapted to bend when force is applied and return the main body to a generally vertical orientation when force is removed;
   a plurality of apertures located in the main body arranged to permit ground water to be received within the main body;
   a connection member located on a lower end of the main body; and
   a drain pipe secured to the connection member.
2. (canceled)
3. The drainage pipe system of claim 1, wherein the flexible material is a polymer based material.
4. The drainage pipe system of claim 1, wherein a support member is disposed within the main body with sufficient resilient structural integrity to return the main body to the generally vertical position when the incident of force is removed.
5. The drainage pipe system of claim 4, wherein the support member has a coiled spring structure.
6. The drainage pipe system of claim 1, wherein the lower end of the main body includes an outer lip and an inner lip adapted to receive a portion of the underground drainage pipe.
7. The drainage pipe system of claim 6, wherein the connection member includes a retention band encircling the outer lip and inner lip, as well as a plurality of fasteners received through the retention band, the fasteners adapted to
secure the retention band, outer lip, and inner lip to the portion of the underground drainage pipe.

8. The drainage system of claim 1, wherein the connection member includes a coupler piece having a lower portion adapted to mate with the portion of the underground drainage pipe and an upper portion adapted to mate with the main body.

9. The drainage pipe system of claim 8, wherein the connection member includes a retention band encircling an outer lip and inner lip, as well as a plurality of fasteners received through the retention band, the fasteners adapted to secure the retention band, outer lip, and inner lip to the upper portion of the coupler piece.

10. A method of draining surface water for use with an underground drainage pipe system, comprising:

- providing a vertical inlet riser having a generally hollow cylindrical shape;
- providing a plurality of apertures located in the vertical inlet riser arranged to permit ground water to be received within the vertical inlet riser;
- providing a connection member located on a lower end of the vertical inlet riser and adapted to mate with a vertical drain pipe;

maintaining vertical inlet riser in a generally vertical position when a majority of the vertical inlet riser is extending above the ground, bending the main body upon an incident of force on the vertical inlet riser, and returning the vertical inlet riser to the generally vertical position when the incident of force is removed; and

draining surface water by intaking surface water with the vertical inlet riser and outletting the surface water into the vertical drain pipe.

11. The method of claim 10, wherein the vertical inlet riser is constructed from a flexible material with sufficient resilient structural integrity to return the vertical inlet riser to the generally vertical position when the incident of force is removed.

12. The method of claim 11, wherein the flexible material is a polymer based material.

13. The method of claim 10, wherein vertical inlet riser is constructed from a flexible material and a support member is placed in contact with the vertical inlet riser with sufficient resilient structural integrity to return the vertical inlet riser to the generally vertical position when the incident of force is removed.

14. The method of claim 13, wherein the support member has a coiled spring structure located within the vertical inlet riser.

15. The method of claim 10, wherein the lower end of the vertical inlet riser includes an outer lip and an inner lip adapted to receive a portion of the vertical drain pipe therebetween.

16. The method of claim 15, wherein the connection member includes a retention band encircling the outer lip and inner lip, as well as a plurality of fasteners received through the retention band, the fasteners adapted to secure the retention band, outer lip, and inner lip to the portion of the vertical drain pipe.

17. The method of claim 10, wherein the connection member includes a coupler piece having a lower portion adapted to mate with the portion of the vertical drain pipe and an upper portion adapted to mate with the vertical inlet riser.

18. The method of claim 17, wherein the connection member includes a retention band encircling an outer lip and inner lip, as well as a plurality of fasteners received through the retention band, the fasteners adapted to secure the retention band, outer lip, and inner lip to the upper portion of the coupler piece.

19. The drainage pipe system of claim 1 wherein the main body includes a closed top.

20. The drainage pipe system of claim 1 wherein the main body has a generally cylindrical shape.

21. The drainage pipe system of claim 1 wherein the main body extends above ground level.