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(54) **EARTH RETAINING WALL**

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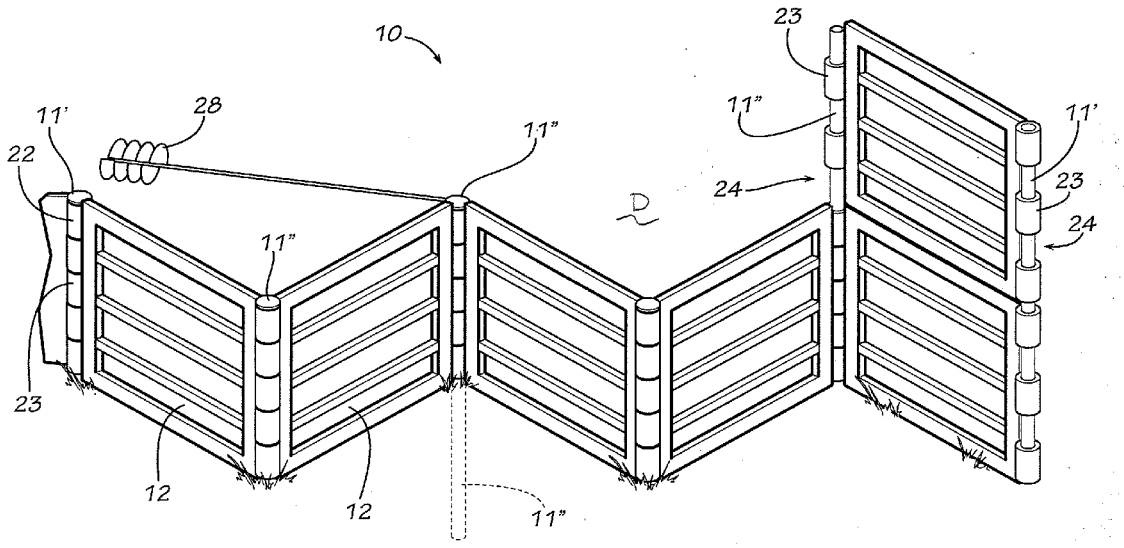
(57) **ABSTRACT**

A retaining wall (**10**) is disclosed having multiple piles (**11**) and multiple panels (**12**) mounted uprightly to the piles for lateral, pivotal movement. Each panel has a body portion (**13**) and an end hinge (**22**) mounted to each side end (**18**). Each hinge includes hinge barrels (**23**) adapted to conform with the laterally opposing hinge barrels and spaces (**24**) located at the opposite end of another panel.



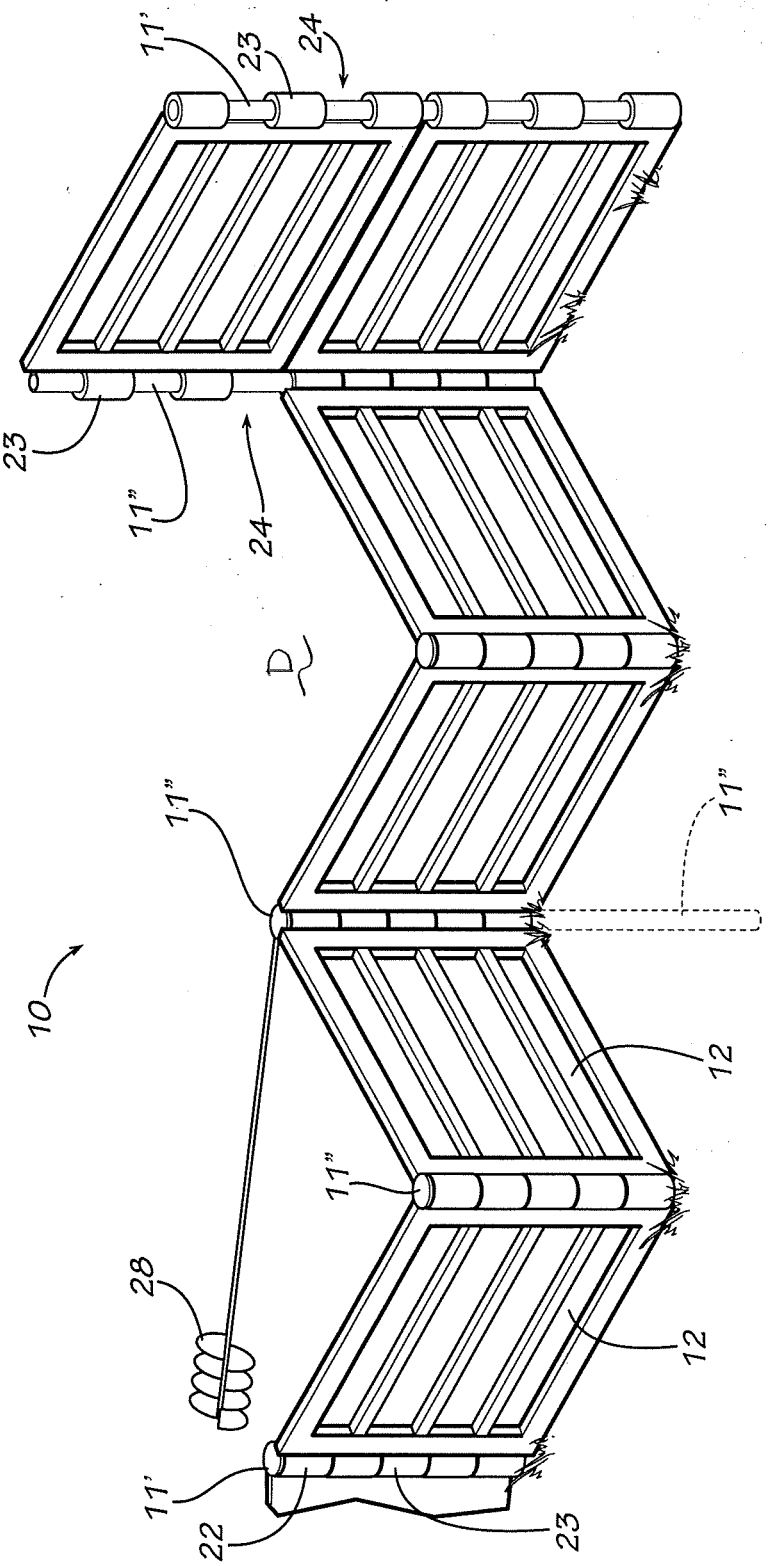


FIG. 1

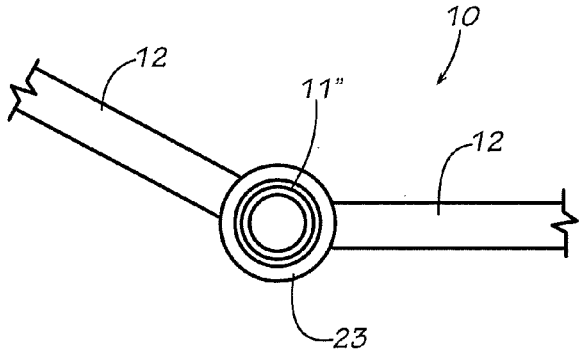


FIG. 2

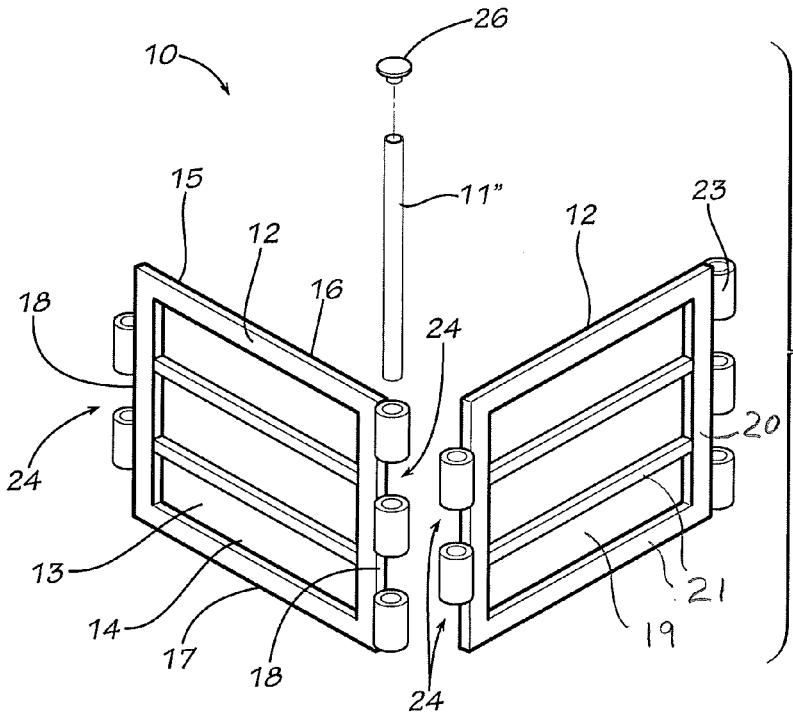


FIG. 3

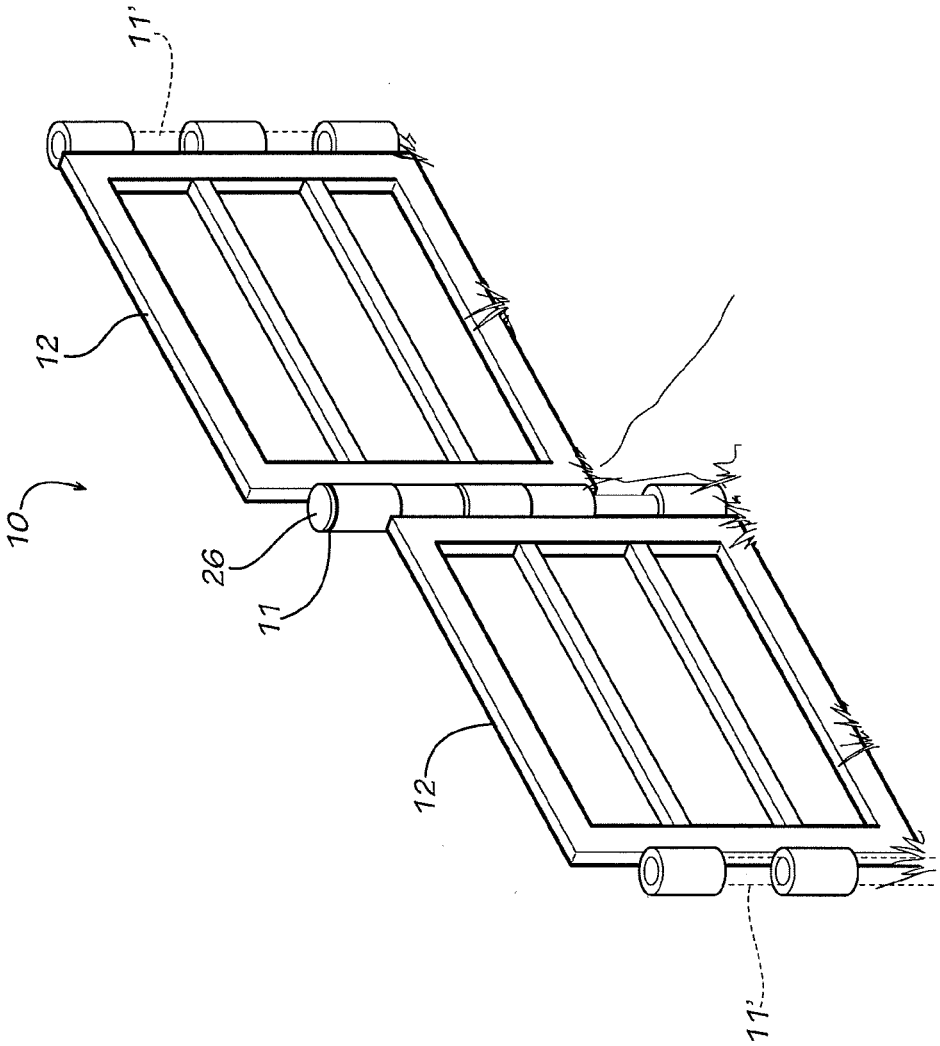


FIG. 4

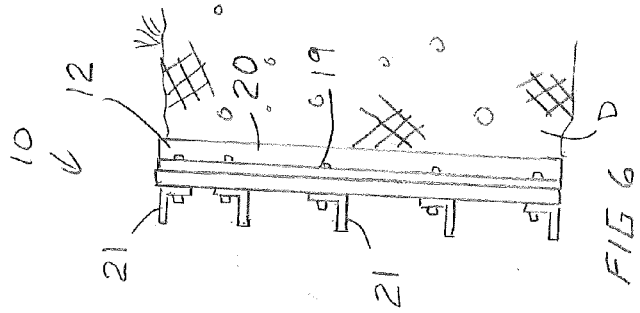


FIG 6

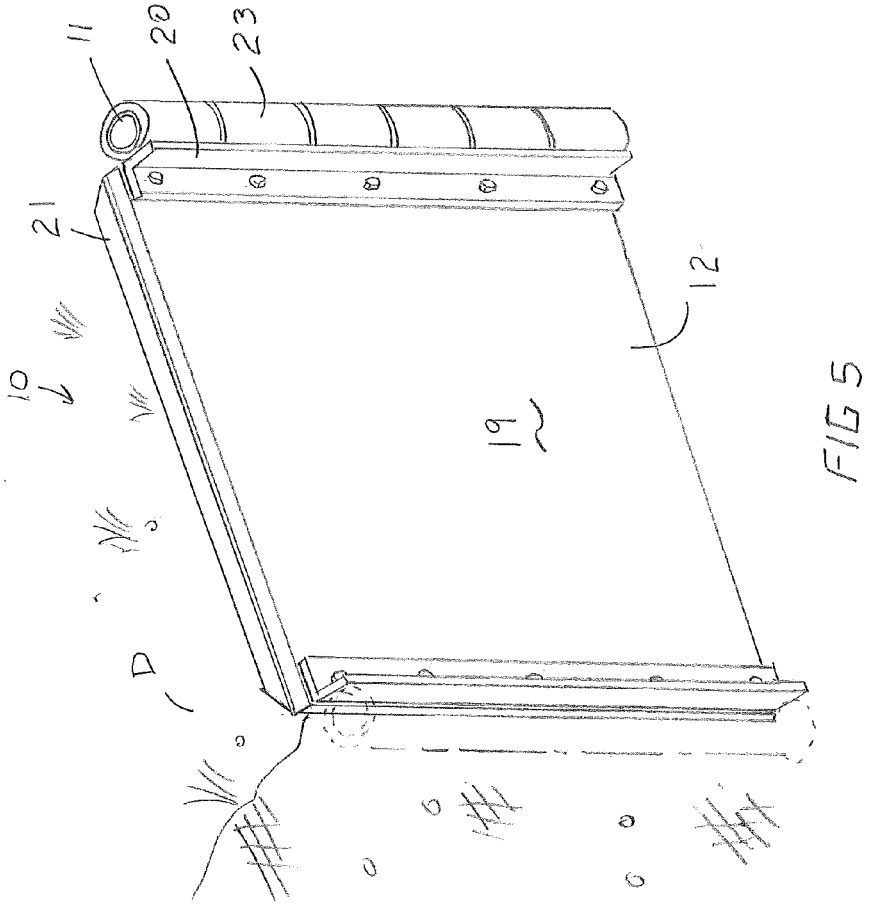


FIG 5

EARTH RETAINING WALL

REFERENCE TO RELATED APPLICATION

[0001] This is a continuation-in-part of U.S. patent application Ser. No. 13/757,272 filed Feb. 1, 2013 and entitled EARTH RETAINING WALL.

TECHNICAL FIELD

[0002] This invention relates to earth retaining walls.

BACKGROUND OF THE INVENTION

[0003] Today there exists many types of walls used to retain earth and the like. Some have been constructed by merely vertically stacking and cementing cement blocks or rocks together. This method of construction is costly and time consuming. Retaining walls are walls which are erected and then earth or dirt is backfilled against the wall to secure the earth. These walls must are constructed to prevent the thousands of pounds of force created by the backfilled earth from toppling the wall.

[0004] Walls have also been constructed by mounting a number of juxtaposed piles in the ground and vertically stacking elongated, horizontal members, such as railroad ties, one atop the other behind the piles. The piles prevent the stack from falling forward as earth is pressed against the rear of the wall. This method has also proven to be a costly and time consuming process. A variation in this method has been the use of preshaped, elongated members such as guard rails which are bent into in the desired shape of the wall. The preshaped members are stacked one atop the other in constructing the wall. The preshaping of the members however has limited the adaptability of the wall to particular sites and increased costs due to their lack in design versatility.

[0005] In recent years retaining walls have been made of precast, interlocking, concrete panels. However, because these panels are interlocked stresses exerted on them as adjacent earth settles causes them to weaken and break as they move relative to each other. Additionally, these types of walls are typically provided with anchors which must be buried in the ground behind the wall to prevent the wall from falling forward. The cost of these anchors and of their installation increases costs and construction time.

[0006] Retaining walls have also been formed by positioning piles in the ground and mounting panels between piles. The problem however with this type of system has been the limited number of positions the panel may be positioned, as the panel is typically limited to extending laterally, perpendicularly, or at a 45 degree angle from the piling. The limited number of angles does not allow the retaining wall to conform well in many applications.

[0007] Accordingly, it is seen that a need remains for a wall for retaining earth in a more cost efficient, durable and more conforming manner. It is to the provision of such therefore that the present invention is primarily directed.

SUMMARY OF THE INVENTION

[0008] In a preferred form of the invention, an earth retaining wall comprises at least two piles, and at least one panel having two laterally opposed end hinges. Each end hinge has a generally cylindrical barrel configured to receive one pile for pivotal movement of the panel relative to the pile.

BRIEF DESCRIPTION OF THE DRAWING

[0009] FIG. **1** is a perspective view of a retaining wall that embodies principles of the invention in a preferred form.

[0010] FIG. **2** is a top view of a portion of the retaining wall of FIG. **1**.

[0011] FIG. **3** is an exploded view of a portion of the retaining wall of FIG. **1**.

[0012] FIG. **4** is a perspective view of the retaining wall of FIG. **1**, shown in another configuration.

[0013] FIG. **5** is a perspective view of a retaining wall in another preferred form.

[0014] FIG. **6** is a side view of a portion of the retaining wall of FIG. **5**.

DETAILED DESCRIPTION

[0015] With reference next to the drawing, there is shown a retaining wall **10** having five laterally offset galvanized steel piles or pilings **11** mounted uprightly in the ground and five galvanized steel panels **12** pivotally mounted uprightly to the piles **11**. Of the five piles **11** there is shown two end piles **11'** and three inner piles **11"**.

[0016] Each panel **12** has a main or body portion **13** having front side **14**, a back side **15**, a top end **16**, a bottom end **17** and two side ends **18**. Each panel **12** has a generally planar main cover portion **19**, a peripheral frame formed from frame upright members **20** and a series of frame cross-members **21** extending between the upright members **20** and across and against the main cover or cover plate portion **19**. The cross-members **21** provide additional strength to the main cover portion **19** to prevent bending or buckling under the force of the backfilled dirt D. Preferably, the cross-members **21** are mounted along the front side **14** so that the main cover portion **19** pushes upon the frame and cross-members when under pressure or force from the retained dirt, i.e., the cover portion **19** is mounted to the surface of the frame upright members **20** and cross-members **21** facing the retained dirt. This positioning of the cover plate allows the cover plate to be pushed against the frame, rather than pushed away from the frame, thereby providing for better strength therebetween.

[0017] The panel **12** may be provided is several sizes which include different widths or lengths and heights. For example, the panels may be made in five foot lengths having a height of either two feet, four feet, or six feet. The panels may be combined together to form walls of various heights, for example, an eight foot wall may be constructed by placing a two foot high panel upon a six foot high panel. While the panels may be made in a variety of heights, in order to perform as a retaining wall, the minimal height of the panel should be approximately two feet.

[0018] Each panel **12** also has an end hinge or hinge structure **22** mounted to each side end **18**. Each hinge **22** includes at least one hinge sleeve or barrel **23**. Preferable, the hinge **22** is configured to have multiple hinge barrels **23** on each end with one side having a select number of barrels **23** and spaces **24** therebetween adapted to conform with the laterally opposing hinge barrels **23** and spaces **24** located at the opposite end of the panel. For example, in the preferred embodiment, each panel has three barrels **23** and two spaces **24** therebetween on the panel's right side which are adapted to mesh, mate, or conform with the two barrels **23** and three spaces **24** on the panel's left side, so that adjacent panels form a continuous barrel type hinge **22** having five mutually

and axially aligned barrels **23**. A space **24** may exist adjacent to and vertically outside or outboard of the endmost barrel, even though a second barrel does not define the outer limit of the space **24**.

[0019] Preferably, the piles **11** are round or cylindrical in shape along a horizontal plane or cross-section. If the pile is hollow, it may include a threaded top cap **26** which is threaded into the top end of the pile to prevent material and water from falling into or accumulating within the interior of the pile.

[0020] For exemplary purposes only, the hinge barrels **23** may have an interior diameter marginally greater than 3 inches so that a 3 inch diameter pile **11** may be inserted through the hinge barrels.

[0021] For additional support against the pressure of the retained earth, the retaining wall **10** may include anchors **28** coupled to the piles and buried in the retained earth. The anchor **28** may be any conventionally know anchoring system such as a cable coupled at one end to a pile and coupled to its opposite end to a screw in type helical ground anchor or anchor plate.

[0022] To erect the retaining wall **10** an end pile **11'** located at an extreme end of the retaining wall is driven into the ground. The endmost panel hinge barrels **23** are then journalled onto the pile **11** and the panel is lowered to a desired upright position to maintain the earth behind the panel. Alternatively, the pile may be driven into the ground while already positioned within the hinge barrels of the panel. Next, a second panel **12** is positioned so that its hinge barrels **23** are within the first panel hinge barrel spaces **24** and axially aligned with the first panel hinge barrels **23**. A second pile **11** (inner pile **11"**) is then journalled through the barrels **23** of the mutually aligned first and second panels and driven into the ground, thereby locking the panels together yet allowing pivotal movement therebetween and between each panel and its respective pile. This process is repeated until the retaining wall is complete. Dirt may then be backfilled against the retaining wall.

[0023] It should be understood that the retailing wall may include additional panels stacked upon the lowermost panel, as shown on the right hand side of FIG. **1**. This simply entails utilizing longer piles **11** to accommodate the increased height of the additional panel.

[0024] The wall may be constructed with laterally adjacent panels oriented at almost any lateral angle relative to each other, limited only by mutual contact therebetween, as each panel is allowed to laterally rotate or pivot about a pile and is not limited by the configuration of the pile itself. The term laterally rotate, rotatable, pivotal, pivotable or the like as used herein is intend to mean that it is capable of rotating or pivoting laterally or horizontally along an arc about a vertical axis, the vertical axis being aligned along the longitudinal length of the pile, as indicated by the arcuate arrow in FIG. **1**.

[0025] As best shown in FIG. **4**, the new earth retaining walls may have panels initially mounted at somewhat different levels as where the terrain is sloping.

[0026] It should be understood that a round pile is preferred as this provides the best pivotal movement, however, it should be understood that other pile shapes may be used so long at the panel hinge barrel is capable of being rotated or pivoted relative thereto. For example, a square shaped pile may also allow pivotal movement of a rounded barrel journalled thereon, but such is not preferred because of the rough or large tolerances therebetween and the absence of the best potential fit therebetween accomplished through a concentric fitting of a round hinge barrel upon a round pile. Similarly, the hinge barrels are round in shape, however, they may be formed in other shapes so long as the configuration of the barrel and the pile therein allows for lateral pivotal movement therebetween.

[0027] It should also be understood that the use of a round pile and/or a pivoting panel relative to its pile eases the mounting of the panels to the pile as compared with the prior art devices, as the panels do not have to be aligned at a pre-select limited number angles with respect to the pile.

[0028] Lastly, it should be understood that the panels may be made of virtually any shape or size and is not limited to that shown in the preferred embodiment. Similarly, the size and number of hinge barrels on each end of the panel is likewise not limited to that shown in the preferred embodiment. The piles and panel are of a size, construction, and strength to retain the force of dirt backfilled against the entirety of the panel without collapsing the earth retaining wall, this being different from the prior art type garden fence or wall which is typically constructed to simply separate portions of a garden, yard, etc. and are not intended to actually retain dirt or earth against the wall, such as that shown in U.S. Pat. No. 3,537,687.

[0029] It thus is seen that a new retaining wall is now provided that overcomes problems long associated with those of the prior art. Though the wall has herein been shown for use in retaining earth, it may, or course, be used in other applications. It should be understood that many modifications, additions and deletions may be made to the preferred embodiment that has been illustrated and described without departure from the spirit and scope of the invention as set forth in the following claims.

1. An earth retaining wall for retaining earth material placed against the entire height of the earth retaining wall, the earth retaining wall comprising at least two piles, and at least one panel having two laterally opposed end hinges, each said end hinge having a generally cylindrical barrel configured to receive one said pile for pivotal movement of said panel relative to said pile, said panel having an erected height of at least approximately two feet, said piles and said panel being of a size, construction, and strength to retain the force of dirt backfilled against the entire height of said panel without collapsing said earth retaining wall.

2. The earth retaining wall of claim **1** wherein each said at least one panel includes one said end hinge having at least two barrels vertically separated from each other to create a space therebetween, and the other said end hinge having at least one barrel sized and shaped to fit within said space and in axially alignment with said at least two barrels,

whereby the one barrel of a first panel may be positioned within the space of a second panel with the pile extending through both said one barrel and said at least two barrels.

3. The earth retaining wall of claim **2** wherein said piles are generally round in shape along a horizontal plane.

4. The earth retaining wall of claim **1** further comprising an earth anchor coupled to at least one said pile.

5. The earth retaining wall of claim **1** wherein said at least one panel has a support frame and a cover plate coupled to at least a portion of said support frame on the surface of said support frame facing the retained earth material.

6. The earth retaining wall of claim 1 wherein said panel height is at least four feet.

7. The earth retaining wall of claim 1 wherein said panel height is at least six feet.

8. An earth retaining wall comprising, a plurality of upright piles and a plurality of panels, each said panel having two oppositely disposed upright frame member, a plurality of horizontal frame cross-members extending between said upright frame members, and a cover plate member coupled to said frame upright members and said horizontal frame cross-members, each said panel being pivotally coupled at each end to one said pile through a sleeve mounted to each end of said panel and about one said pile to allow lateral rotatable movement of said sleeve about said pile extending through said sleeve, said plurality of upright piles and said plurality of panels being of a size, construction, and strength to retain dirt backfilled against the entirety of said plurality of panels without collapsing said earth retaining wall.

9. The earth retaining wall of claim 8 wherein each said panel includes a first sleeve having a first cylindrical portion and a second cylindrical portion spaced from and axially aligned with said first cylindrical portion so as to define a space therebetween, and wherein each said panel also includes a second sleeve having a third cylindrical portion sized to fit within said space,

whereby the third cylindrical portion of a first panel may be positioned within the space of a second panel with the pile extending through said first, second and third cylindrical portions.

10. The earth retaining wall of claim 9 wherein said piles are generally round in shape along a horizontal plane.

11. The earth retaining wall of claim 8 wherein said panel height is at least two feet.

12. The earth retaining wall of claim 8 wherein said panel height is at least four feet.

13. The earth retaining wall of claim 8 wherein said panel height is at least six feet.

14. The earth retaining wall of claim 8 further comprising an earth anchor coupled to at least one said pile of said plurality of piles.

15. The earth retaining wall of claim 8 wherein said cover plate member is coupled to said horizontal frame cross-members upon a surface of said horizontal frame cross-members facing the retained dirt.

16. An earth retaining wall comprising,

at least two end piles;

at least one inner pile, and

at least two panels having a support frame and a cover plate coupled to said support frame, each said panel support frame having a first end with at least one hinge barrel configure to be journalled upon said inner pile for pivotal movement of said panels relative to said inner pile, each said panel frame also having a second end coupled to one said end pile, said at least two end piles, said one inner pile and said at least two panels each being of a size, construction, and strength to retain dirt backfilled against the entirety of said panels without collapsing said earth retaining wall, said size of each said panel of said at least two panels includes a height of at least two feet.

17. The earth retaining wall of claim 16 wherein said second end of each said panel frame includes at least one hinge barrel configured to be journalled upon said end pile.

18. The earth retaining wall of claim 16 wherein a first said panel frame first end includes a plurality of axially aligned hinge barrels which are separated from each other to form a space therebetween, and wherein a second said panel frame first end includes a hinge barrel configured to be positioned within said first panel space and axially aligned with said first panel hinge barrels.

19. The earth retaining wall of claim 16 wherein said at least two panels includes a height of at least four feet.

20. The earth retaining wall of claim 16 wherein said at least two panels includes a height of at least six feet.

21. The earth retaining wall of claim 16 further comprising an anchor coupled to at least one pile.

22. The earth retaining wall of claim 16 wherein said cover plate covers a portion of said support frame surface facing the retained dirt.

* * * * *