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(54) **SEAWALL USING SCREW PILES**

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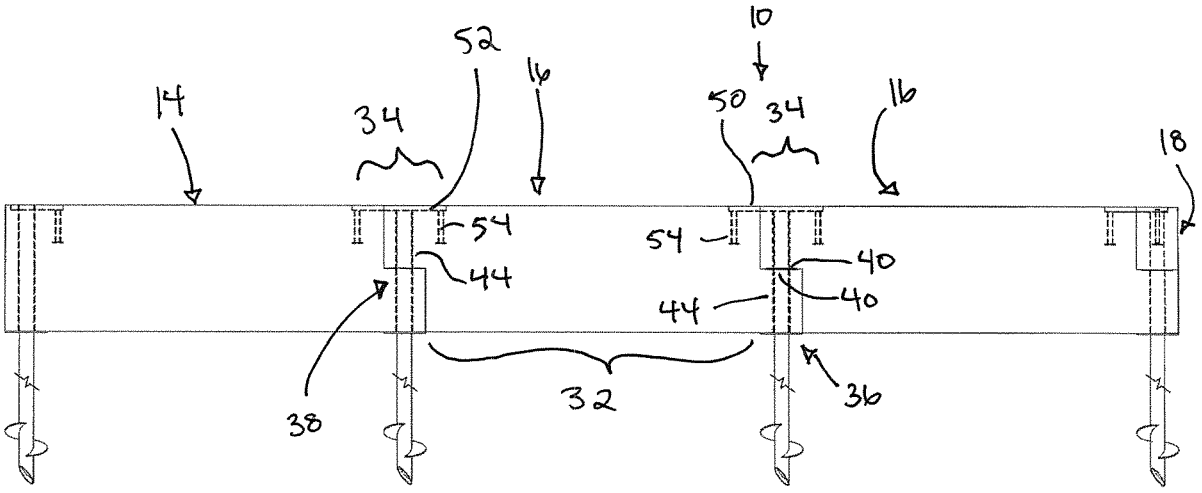
(57) **ABSTRACT**

A seawall is supported on a seabed along a coastline using a plurality of screw piles, each having a shaft and a helical flight about the shaft adjacent a bottom end of the shaft. The screw piles are penetrated into the seabed at spaced apart positions along the coastline such that each screw pile defines a lower portion embedded into the seabed and an upper portion protruding upwardly from the seabed. A plurality of modular wall panels, each formed of concrete material and having post apertures at opposing ends thereof, are each mounted onto two adjacent ones of the screw piles by inserting the upper portions of the screw piles into the post apertures at the opposing ends of the wall panel such that the wall panels are connected in series with one another along the coastline.



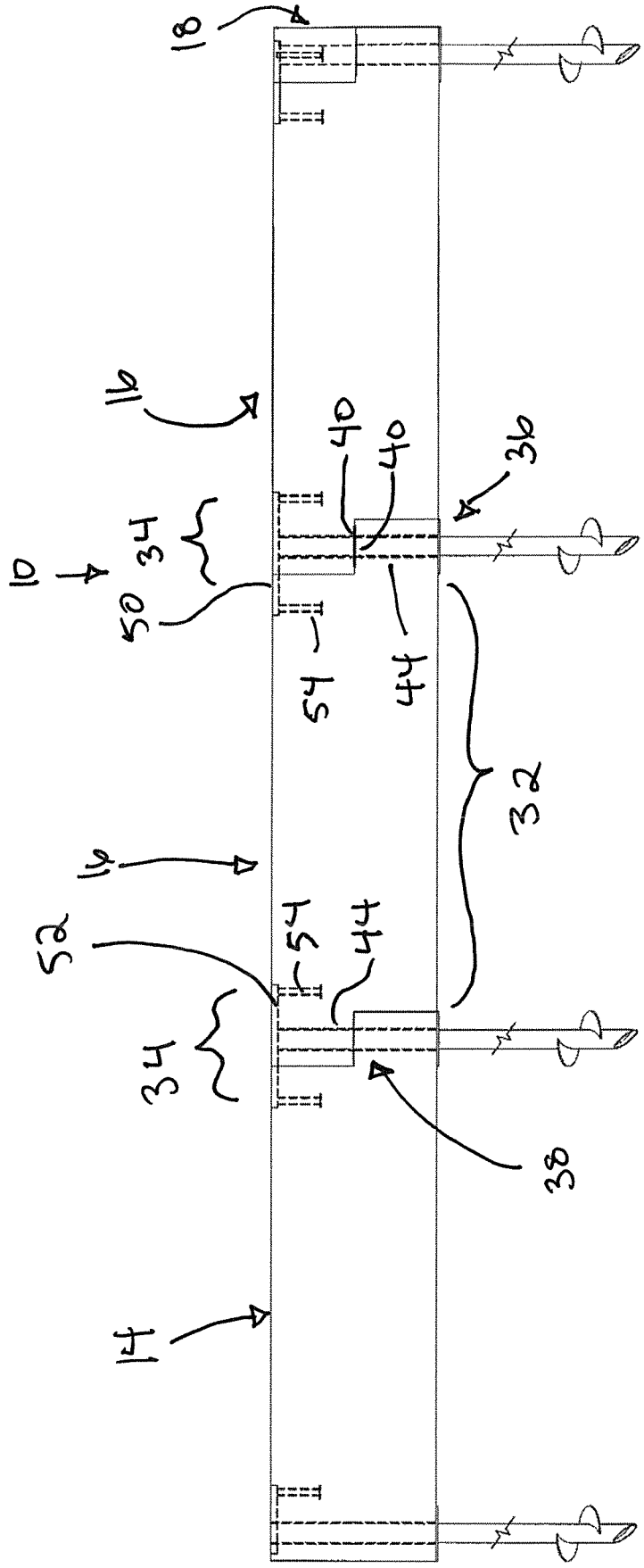


FIG. 1

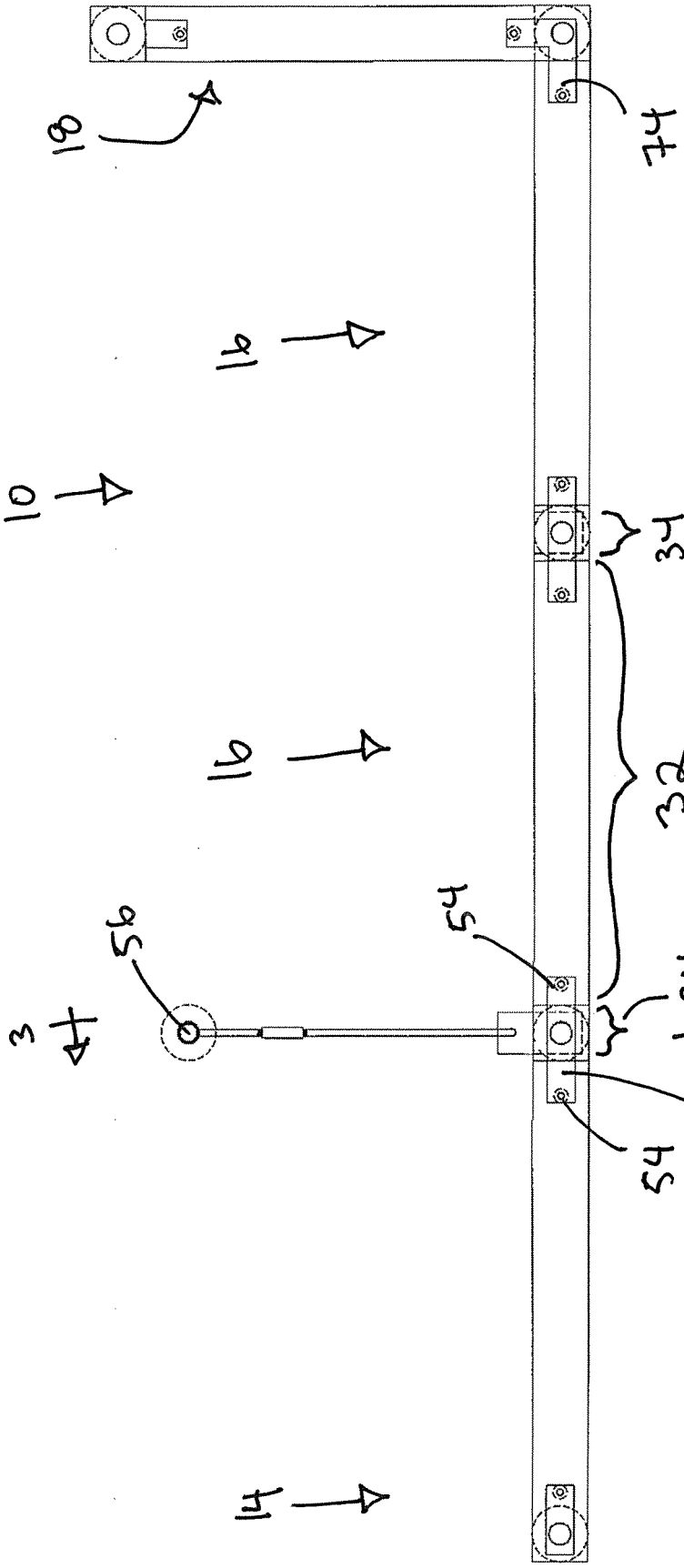


FIG. 2

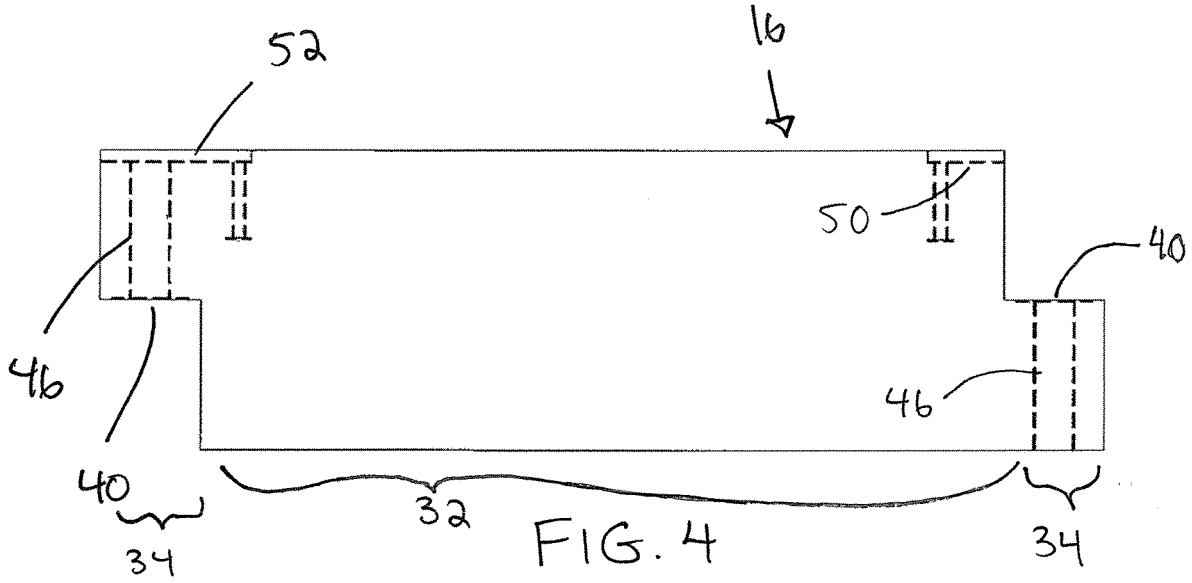


FIG. 4

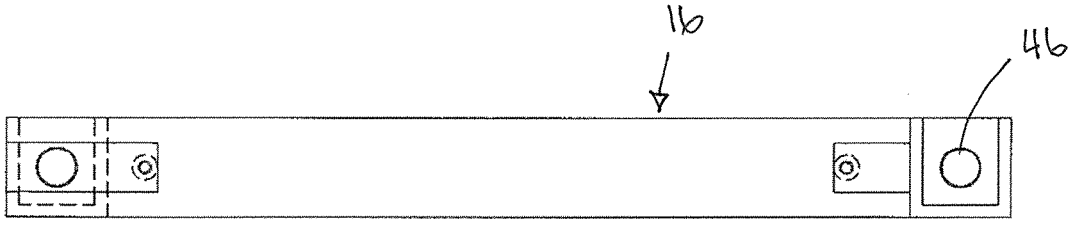


FIG. 5

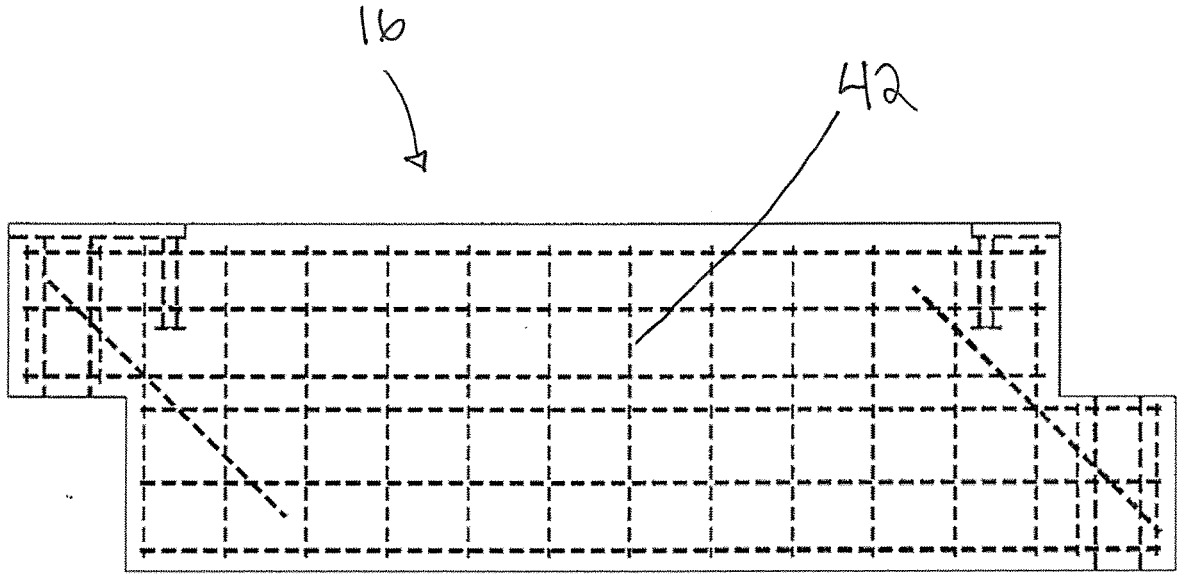


FIG. 6

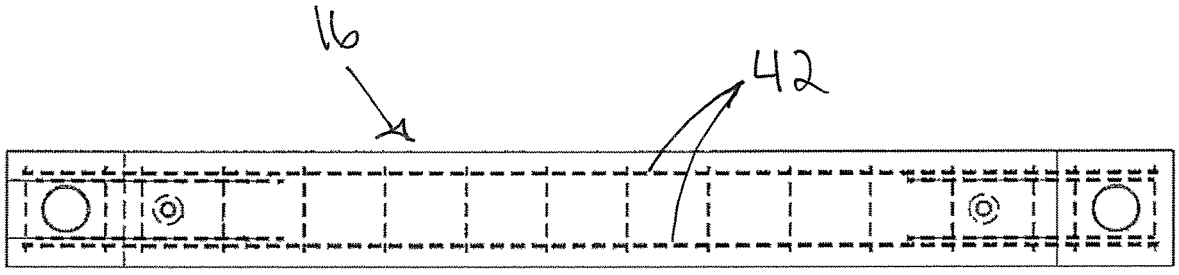


FIG. 7

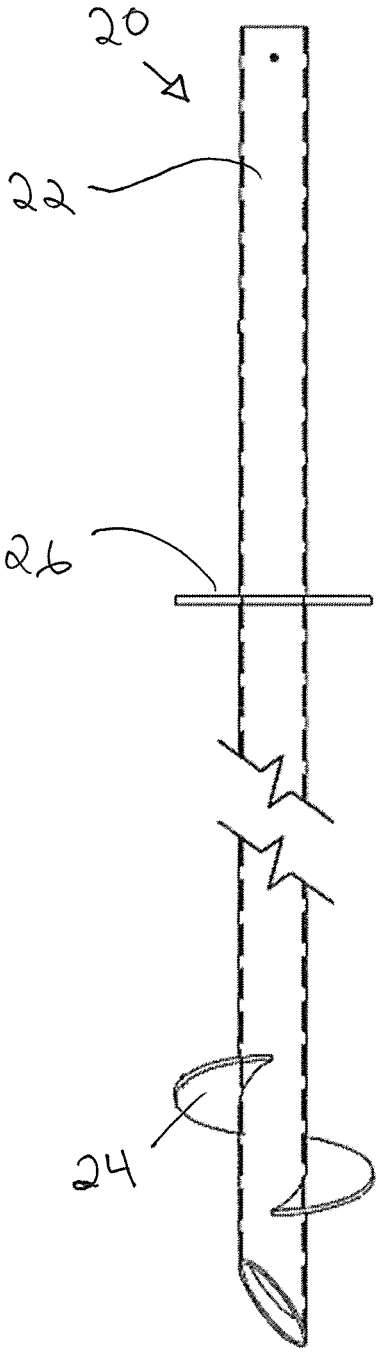


FIG. 8

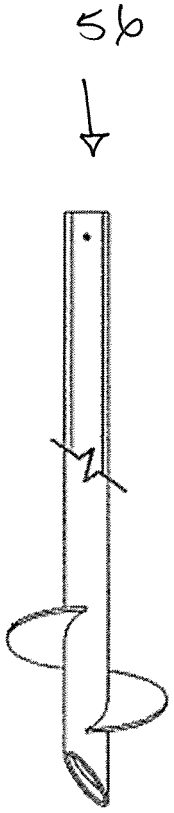


FIG. 9

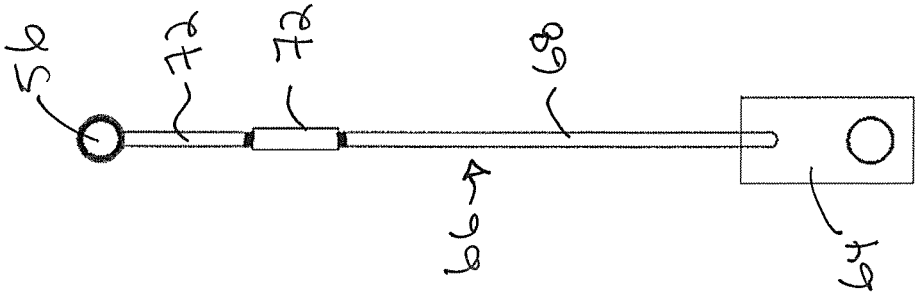


FIG. 11

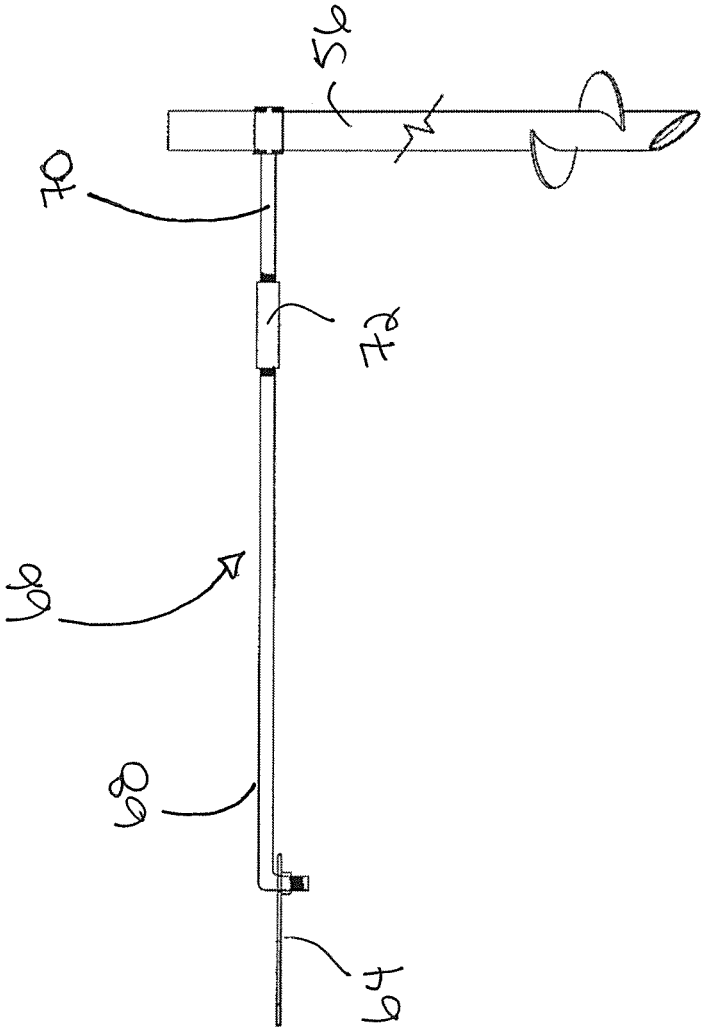


FIG. 10

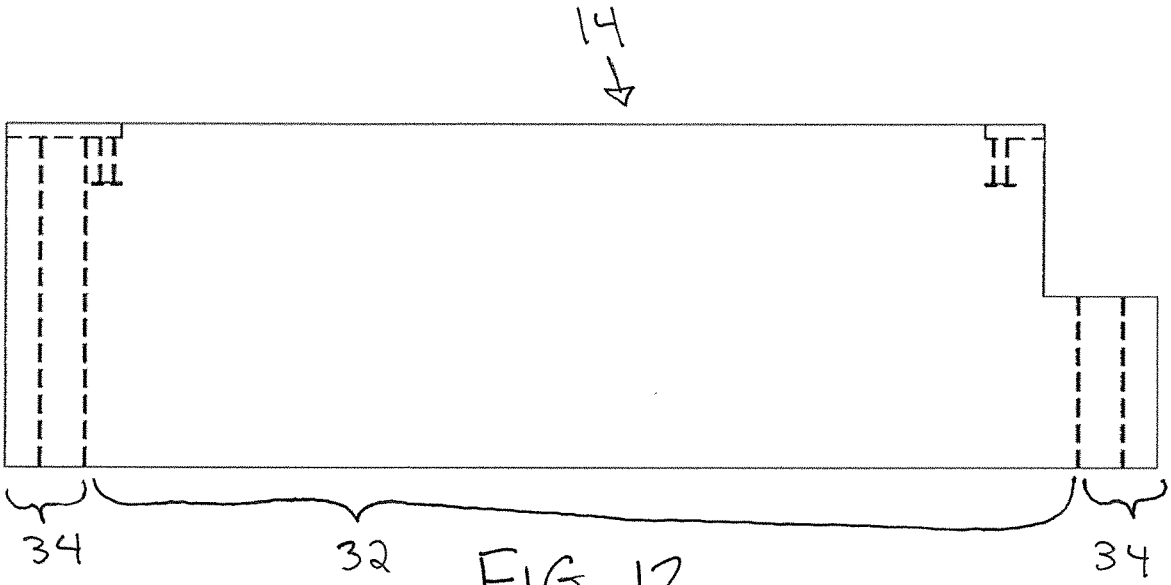


FIG. 12

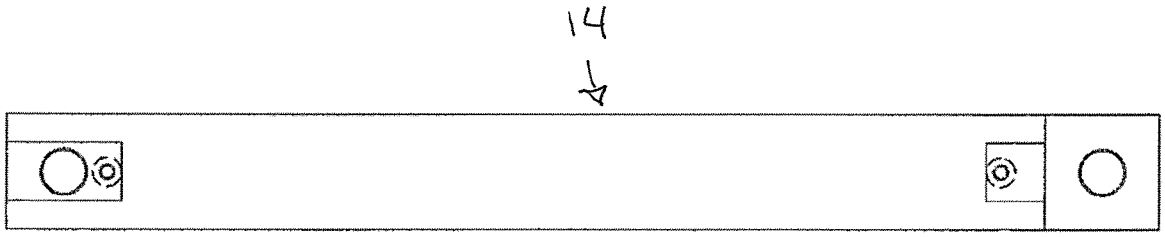


FIG. 13

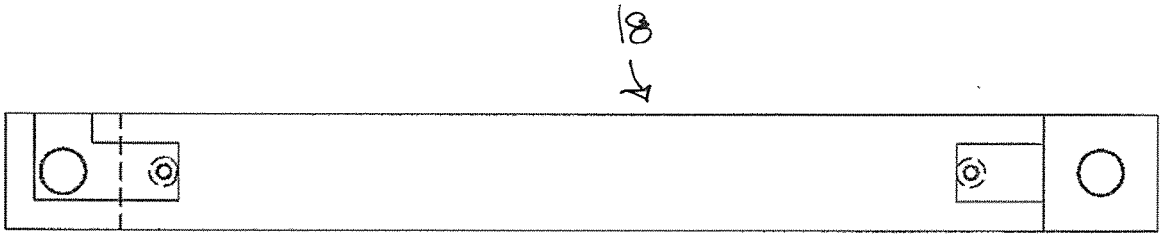


FIG. 14

SEAWALL USING SCREW PILES

[0001] This application claims the benefit under 35 U.S.C. 119(e) of U.S. provisional application Ser. No. 62/863,484, filed Jun. 19, 2019.

FIELD OF THE INVENTION

[0002] The present invention relates to a seawall for use along a coastline, and more particularly the present invention relates to a seawall using screw piles anchored into the seabed and modular wall panels supported on the screw piles.

BACKGROUND

[0003] Seawalls are commonly constructed along coastlines to impede erosion of the land by the exchange of sediment between land and sea and to protect areas of human activity from the action of tides, waves, or tsunamis. A typical seawall construction involves placement of piles into the seabed and a grade beam connected across the top ends of the piles at the sea floor. Corrugated metal sheets may be further anchored on the grade beam to extend upwardly from the sea floor and form a barrier wall which impedes the movement of water along the sea floor and thus limits the exchange of sediment between land and sea. Known seawalls constructed in this manner are costly to manufacture and install due to the requirement for forms to cast a concrete beam in place on the sea floor. Suitable equipment required for casting a concrete grade beam in place may not be able to access many remote areas that may benefit from a seawall.

SUMMARY OF THE INVENTION

[0004] According to one aspect of the invention there is provided a seawall system for being supported on a seabed along a coastline, the system comprising:

[0005] a plurality of screw piles having a lower portion arranged to be penetrated into the seabed and an upper portion above the lower portion arranged to protrude upward from the lower portion penetrated into the seabed; and

[0006] a plurality of modular wall panels formed of concrete material and arranged for connection in series with one another to form a wall, each wall panel being arranged for mating connection with one or more of the screw piles for anchoring the wall to the seabed.

[0007] According to a second aspect of the present invention there is provided a method of forming a seawall for being supported on a seabed along a coastline, the method comprising:

[0008] providing a plurality of screw piles, each having a shaft and a helical flight about the shaft adjacent a bottom end of the shaft;

[0009] penetrating the screw piles into the seabed at spaced apart positions along the coastline such that each screw pile defines a lower portion embedded into the seabed and an upper portion protruding upwardly from the seabed;

[0010] providing a plurality of modular wall panels formed of concrete material and having post apertures at opposing ends thereof;

[0011] mounting each wall panel onto two adjacent ones of the screw piles by inserting the upper portions of the screw piles into the post apertures at the opposing ends of the wall panel such that the wall panels are connected in series with one another along the coastline.

[0012] The use of screw piles with modular wall panels allows for all components of the seawall to be manufactured off site and installed with readily available equipment in a variety of locations, including remote locations where it may currently be difficult to install a seawall.

[0013] Preferably each wall panel includes an end portion locating a post aperture therein that is arranged to receive the upper portion of one of the screw piles vertically slidable therein. Each end portion locating the post aperture therein is preferably formed of concrete integrally with the wall panel.

[0014] Preferably each post aperture receives the upper portion of the respective screw pile therein such that a top end of the screw pile is substantially flush with a top end of the wall panel.

[0015] Any two adjacent wall panels may be coupled to one another define a common post aperture receiving the upper portion of a single screw pile therein. Preferably, each wall panel includes two end portions at opposing ends thereof which are stepped in profile so as to enable the end portion of a first one of the wall panels to be overlapped by the end portion of a second one of the wall panels to receive the shaft of the single screw pile therein. A top plate may be associated with each post aperture and arranged to be fastened to a top side of the wall panel locating the post aperture therein.

[0016] The top plate may further comprise a connecting plate associated with each adjacent pair of the wall panels which is arranged for fastened connection to each of the wall panels of the adjacent pair.

[0017] The system may also include (i) a plurality of secondary piles in which each secondary pile has a shaft portion and a helical flight so as to be arranged to be penetrated into the seabed, and (ii) a plurality of tethering assemblies arranged to tether each secondary pile to a respective one of the screw piles.

[0018] Preferably each tethering assembly includes a mounting member having an aperture arranged to receive the upper portion of the respective screw pile. When two adjacent wall panels are arranged to be coupled to define a common post aperture receiving the upper portion of a single screw pile therein, the mounting member of the tethering assembly is preferably arranged to receive said single screw pile therethrough at a junction of the two adjacent wall panels. More particularly, when each wall panel includes two end portions with respective post apertures therein at opposing ends thereof which are stepped in profile so as to enable the end portion of a first one of the wall panels to be overlapped by the end portion of a second one of the wall panels to receive the upper portion of a single screw pile through both post apertures of the overlapping end portions, preferably the mounting member of the tethering assembly is arranged to be received between the overlapping end portions for receiving said single screw pile therethrough.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] One embodiment of the invention will now be described in conjunction with the accompanying drawings in which:

[0020] FIG. **1** is a front elevational view of the seawall;

[0021] FIG. **2** is a top plan view of the seawall;

[0022] FIG. **3** is a sectional view along the line **3-3** in FIG. **2**;

[0023] FIG. **4** is a front elevational view of an intermediate wall panel of the seawall;

[0024] FIG. **5** is a top plan view of the intermediate wall panel of FIG. **4**;

[0025] FIGS. **6** and **7** are front elevational and top plan views of the intermediate wall panel of FIG. **4** in which internal reinforcing rebar is represented in broken line;

[0026] FIG. **8** is a side elevational view of one of the primary piles;

[0027] FIG. **9** is a side elevational view of one of the secondary piles;

[0028] FIG. **10** is a side elevational view of the tethering assembly connected to one of the secondary piles;

[0029] FIG. **11** is a top plan view of the tethering assembly of FIG. **10**;

[0030] FIG. **12** is a front elevational view of an end wall panel;

[0031] FIG. **13** is a top plan view of the end wall panel of FIG. **12**; and

[0032] FIG. **14** is a top plan view of a corner wall panel in which the front elevational view of the corner wall panel is substantially identical to the intermediate wall panel of FIG. **4**.

[0033] In the drawings like characters of reference indicate corresponding parts in the different figures.

DETAILED DESCRIPTION

[0034] Referring to the accompanying figures there is illustrated a seawall generally indicated by reference numeral **10**. The seawall **10** is particularly suited for being supported on a seabed **12** along a coastline using an assembly of modular components including anchoring components penetrated into the seabed and wall components protruding upwardly from the seabed while remaining partly or fully submerged in the sea.

[0035] The seawall assembled from a plurality of wall panels which are arranged for being connected in series with one another along the boundary formed by the seawall. The modular wall panels include (i) an end panel **14** located at one or both ends of the seawall, (ii) a plurality of intermediate panels **16** which are connected end to end with one another within a generally common plane for use along a majority of the wall boundary between opposing ends of the assembled seawall, and (iii) optionally one or more corner panels **18** used for joining two adjacent panels at right angles relative to one another at respective locations along the seawall.

[0036] Each wall panel is anchored relative to the seabed by a primary pile **20** at each of the opposing ends of the wall panel. At the junction of two adjacent panels, a single primary pile **20** serves to anchor the ends of both adjacent wall panels.

[0037] The primary pile **20** is a screw pile including a hollow pipe forming an elongate shaft **22** spanning the full height of the pile which in the illustrated embodiment has an outer diameter of approximately 5 inches and an overall length of approximately 20 feet. A helical flight **24** is provided about the shaft **22** in proximity to the bottom end thereof. In the illustrated embodiment, the helical flight has an outer diameter of approximately 16 inches and extends helically about the shaft approximately 1 to 2 turns about the shaft. The primary pile **20** further includes a support plate **26** which is oriented perpendicularly to the longitudinal direction of the shaft and which extends radially outward from the shaft at an intermediate location along the height of the pile. In the illustrated embodiment, the support plate has an overall diameter of approximately 16 inches and is located approximately 16 feet above the bottom end of the pile. The support plate **26** defines a lower portion of the pile below the support plate which is intended to be penetrated into the seabed, and an upper portion of the pile above the support plate which is intended to protrude upwardly above the seabed in the installed configuration of the pile. When the overall height of the pile is approximately 20 feet as in the illustrated embodiment, the upper portion of the primary pile protrudes approximately 4 feet above the sea floor.

[0038] Each intermediate panel **16** is elongate in a longitudinal direction between two opposing ends of the panel. The panel further includes a bottom face **28** at the bottom of the panel and a top face **30** at the top of the panel which are parallel to one another and elongate in the longitudinal direction of the panel. Opposing inner and outer faces of the intermediate panel span opposing vertical sides of the panel between the top and bottom faces so as to be parallel to one another and spaced apart by the overall thickness of the panel which is in the order of 16 inches in the illustrated embodiment. The inner and outer faces also span the full height of the panel between the top face and the bottom face, for example in the order of 4 feet in height in the illustrated embodiment.

[0039] The length of each intermediate panel includes the overall length of a main body portion **32** in addition to the lengths of two end portions **34** protruding longitudinally outward from the opposing ends of the main body portion **32**. The main portion is a generally rectangular body spanning the full height of the panel. Each end portion **34** is similarly rectangular in shape but is reduced in height relative to the main body portion so as to only extend approximately half the height of the wall panel. The combined height of the two end portions of the wall panel is approximately equal to the full height of the main body portion of the panel.

[0040] At the first end **36** of the main body portion **32**, the respective end portion **34** is substantially flush with the bottom face of the panel. At the opposing second end **38**, the respective end portion **34** is substantially flush with the top face of the panel. In this manner, when two of the intermediate wall panels are mounted end to end, in series with one another, the first end portion of a first wall panel is overlapped by the second end portion of a second wall panel such that the overlapping end portions collectively spend the full height of the wall and such that the resulting wall structure is free of any gaps communicating from the inner face to the outer face at the junction between the adjacent panels.

[0041] As described herein, each of the opposing ends of the intermediate wall panel **16** is effectively stepped in profile so as to define a horizontal shoulder surface **40** spanning the full thickness of the wall panel and extending longitudinally outward from the corresponding vertical end face of the main body portion **32** and the corresponding vertical end face of the respective end portion **34**. The shoulder surface **40** of the first end portion is upward facing surface and is intended to abut against the downward facing shoulder **40** at the bottom of the second end portion **34** at the junction of two adjacent wall panels. The shoulder surfaces **40** are arranged to be generally rectangular in shape such

that the length of the end portions in the longitudinal direction is approximately equal to the thickness of the end portions between in the inner and outer faces of the wall panel. In this manner, the junction between two adjacent wall panels is substantially free of gaps regardless of whether the wall panels are mounted in line with one another so as to be substantially coplanar or are mounted at right angles in a perpendicular relationship to one another.

[0042] Each wall panel is formed as a single integral body in which the end portions are formed integrally with the main body portion was to be seamless and unitary in construction throughout. More particularly the panels are formed of concrete material that is precast with suitable rebar **42** embedded therein as a mesh or array of intersecting bars forming a grid in the usual manner of reinforcing concrete.

[0043] Each end portion **34** of each wall panel is further provided with a vertical mounting aperture **44** extending vertically therethrough between opposing top and bottom faces of the panel. The vertical mounting aperture comprises a cylindrical bore extending fully through the panel at a centred location relative to the shoulder surface **40** in both the lateral and longitudinal directions. In this manner, each mounting aperture **44** is arranged for alignment with the corresponding mounting aperture of an adjacent panel when the panels are interlocked with one another so that the end portions overlap one another as illustrated in either parallel or perpendicular orientations. The mounting apertures **44** are formed by casting a plastic liner sleeve **46** into the concrete material forming each end portion when testing the concrete such that the liner sleeve remains hollow and free of concrete. The inner diameter of the liner sleeve is arranged to be slightly greater than the outer diameter of the shaft **22** of the primary piles **20** such that the wall panel is attached to the upper portion of the respective primary pile by sliding the wall panel downwardly over the primary pile so that the upper portion of the pile is vertically slidable into the mounting apertures **44** of two adjacent wall panels at the junction of the panels.

[0044] Adjacent wall panels of the seawall are partly held in coupled relationship relative to one another by the interlocking arrangement of the stepped end portions that receive the upper portion of a common primary pile **20** extending therethrough. The adjacent wall panels of the seawall are also held in coupled relationship relative to one another by a top plate **48** which is fastened between the top face of the main body portion of one panel and the top face of the second end portion of the adjacent wall panel.

[0045] To accommodate the top plate **48**, each wall panel includes a first plate cavity **50** recessed downwardly into the top face at the first end of the main body portion of the wall panel and a second plate cavity **52** recessed into the top face at the second end portion. Each of the plate cavities is generally rectangular in shape to receive part of the top plate **48** recessed therein in which the plate cavity has a depth corresponding approximately to the thickness of the top plate such that the top plate is substantially flush with the remainder of the top face of the wall panel in the mounted position within the plate cavities. The overall width of the plate cavities and the width of the corresponding top plate received therein is slightly less than the corresponding thickness of the panels. Both of the plate cavities are open longitudinally outward to the end of the wall panel such that the plate cavities of two adjacent wall panels are open to one another to form a single recessed cavity matching the dimensions of the top plate in the mounted configuration of the wall. Length of the second plate cavity is greater than the length of the first plate cavity such that the second plate cavity receives a portion of the top plate spanning over top of the mounting apertures in the wall panels while opposing ends of the top plate overlap corresponding portions of the assembled wall assembly on either side of the mounting aperture. Fastener apertures **54** are provided in the top plate **48** in proximity to longitudinally opposed ends of the top plate for receiving fasteners or anchors therethrough which are embedded into the concrete material of the wall panel below the top plate. One of the anchors is received in each wall panel of two adjacent wall panels at the junction thereof so that the top plate serves as another means of connecting the adjacent panels to one another at the junction thereof.

[0046] Additional reinforcement is provided to the seawall by tethering the wall to a plurality of secondary piles **56**. Typically, one secondary pile **56** is penetrated into the seabed at a location spaced inwardly from the seawall boundary towards the coast in alignment with each primary pile that is located at a junction between two intermediate wall panels **16** or at a junction between an intermediate wall panel and an end panel **14** where the panels are substantially in-line or coplanar with one another.

[0047] Each secondary pile includes an elongate shaft formed of hollow pipe spanning the full height of the pile, for example having a length of 20 feet and an outer diameter of approximately 3 inches according to the illustrated embodiment. A helical flight **60** is provided about the shaft in proximity to the bottom end of the pile, for example having an outer diameter of 16 inches and extending about the shaft helically in the order of one to two turns according to the illustrated embodiment.

[0048] Each secondary pile is typically penetrated into the seabed such that the majority of the secondary pile is fully embedded within the seabed. More particularly, the secondary pile may be located such that the top end of the pile is substantially at the seafloor or is protruding from the seafloor in the range of 1 to 2 feet. In preferred arrangements, the top end of the secondary pile is located at or below the elevation of the seam between the shoulder faces **40** of an adjacent pair of wall panels coupled by a primary pile in alignment with that secondary pile.

[0049] A tethering assembly extends laterally between the respective primary pile and the respective secondary pile along an axis which is generally perpendicular to the longitudinal direction of the seawall and so as to extend inwardly from the seawall towards the top end of the secondary pile in a horizontal orientation or at a slight downward slope. The tethering assembly includes a mounting plate **62** in the form of a flat, metal, rigid plate which is arranged to be supported in a horizontal orientation between the shoulder faces **40** of a coupled pair of wall panels. A suitable mounting aperture in the mounting plate **62** is provided which receives the upper portion of the shaft of the primary pile therethrough and serves to retain the mounting plate **62** clamped between the end portions of the adjacent wall panels. Each of the faces **40** of the adjacent end portions may be provided with a plate cavity **64** formed therein having a depth corresponding to approximately half of the thickness of the mounting plate so that the two cavities **64** together collectively receive the full thickness of the plate

therein without interference in the abutment of the remainder of the shoulder faces **40** with one another.

[0050] The tether assembly further includes a tethering arm **66** including a first portion **68** which is coupled to the mounting plate and a second portion **70** which is coupled to the secondary pile. The mounting plate **62** has suitable dimensions to protrude laterally outwardly beyond the interface of the wall panels at the inner end thereof as accommodated by the cavities **64** which are also open to the inner side of the wall to receive the mounting plate protruding therefrom. The first portion **68** of the tethering arm includes a hook formed at the outer end thereof which extends through the mounting aperture at the inner end of the mounting plate and which is threaded to receive a nut fastened thereon to retain the hook engaged upon the mounting plate **62**. The opposing inner end of the first portion **68** of the tethering arm is threaded for a suitable connection to the outer end of the second portion **70** of the tethering arm using a turnbuckle **72**. The second portion **70** of the tethering arm is accordingly threaded at the outer end thereof for threaded connection to the turnbuckle. The inner end of the second portion **70** of the tethering arm includes a collar welded thereon which has a suitable diameter to receive the top end of the shaft of the secondary pile therein for anchoring the tethering arm relative to the secondary pile. The threaded connection of the first and second portions of the tethering arm to the turnbuckle permits the overall length of the tethering arm to be adjusted and thus the tension in the tethering arm to be adjusted by rotation of the turnbuckle **72**. It is desirable to provide some tension on the tethering arm such that the tethering arm applies some inward force to the upper portion of the primary pile to pull the primary pile and the seawall supported thereon inwardly towards the shore to counter forces from receiving waves and tides acting to pull the wall away from the shore, thus acting to keep the primary piles and the wall in a vertical orientation.

[0051] Turning now to the configuration of the end panels **14**, as illustrated, each end panel is substantially identical to the intermediate panel, with the exception of one end of the wall panel having an end portion **34** that forms the mounting aperture **44** therein which spans the full height of the wall panel continuous with the main body portion of the wall panel. A plate cavity may remain at the top side to receive a top plate in alignment with the mounting aperture for capping the top end of the mounting aperture and the top end of the primary pile received therein. Two different configurations of end panels may be provided in which the remaining end portion **34** spanning only half the height of the wall panel may be flush with the top of the panel in one instance (not shown) or flush with the bottom of the panel as illustrated in FIG. **12**.

[0052] Turning now to the configuration of the corner panel, the corner panel is substantially identical to the intermediate panel with the exception of the second plate cavity **52** in the end portion **34** at the second end of the wall panel. Instead of the plate cavity being open longitudinally outward to the end of the panel, the second plate cavity in this instance is open laterally to one side of the wall panel so that the plate cavity is substantially L-shaped in plan view. The corner panel is joined to an adjacent panel by overlapping the second end portion thereof overtop of the first end portion of an adjacent panel but with the panels at a 90° orientation relative to one another. A corner top plate **74** is then provided to be received within the cooperating plate cavities at the 90° junction between the adjacent panels. Fastener apertures are similarly provided at opposing ends of the top plate to receive fasteners which are anchored into the concrete material of the panel for coupling the panels relative to one another at the corner junction. Tethering is typically not required at the corner junction; however, tethering may be provided when providing an inside corner between a first wall panel oriented parallel to the shore and a second wall panel extending away from the shore from the first panel.

[0053] The seawall is typically installed in shallow water of only a few feet in depth by anchoring of the seawall into the seabed substantially parallel to the coastline. The assembled seawall acts as a retaining wall to prevent erosion of soil and sediment from the seabed at the shore side of the wall, while also serving to break waves incoming towards the shoreline.

[0054] A typical seawall according to the present invention is a combination of modular wall panels which are mounted in line and planar with one another together with additional wall panels which are mounted perpendicularly so that the assembled seawall generally follows the shape of the coastline. In some instances it may be desirable to purposely form the boundary wall to have a stepped profile in plan view to provide extra strength, however, the seawall is intended to have sufficient strength even when the adjacent wall panels are mounted in-line with one another by use of the tethering assemblies and secondary piles for added strength.

[0055] The wall panels are formed of concrete material with the plastic liner sleeves within the end portions being cast in place when forming the concrete panel. Threaded sleeves may also be cast into the concrete at the anchoring locations to receive the fasteners used in securing the top plates at the junction of each adjacent pair of wall panels.

[0056] Assembly of the wall begins with driving the screw piles into the seabed such that the piles are properly spaced relative to one another corresponding to the approximate length of the wall panels along the designated boundary for the seawall. The piles are driven in until the intermediate support plates thereon are substantially located at the sea floor. The panels may then be mounted onto the primary piles by sliding the panels overtop of the top ends of the piles so that the piles are received upwardly through the mounting apertures at opposing ends of each wall panel.

[0057] Typically an end panel **14** is initially provided at one end of the seawall structure having a stepped end portion **34** at the first end thereof such that the next adjacent panel can be coupled to the starting panel by overlapping the second end portion of the next adjacent panel overtop of the already placed first end portion of the starting panel. Each subsequent wall panel is similarly placed sequentially with one another along the length of the wall boundary. The top ends of the primary piles and mounting apertures receiving the primary piles therein are capped by fastening the top plates in place to further secure the wall panels relative to one another.

[0058] The mounting plate for the tethering assembly at the junction of each adjacent pair of wall panels is mounted in place onto the primary pile after the first wall panel has been placed but before the second wall panel has been mounted in overlapping arrangement over the first wall panel such that mounting of the second wall panel traps the mounting plate **62** in a mounted position on the primary pile.

The secondary piles for the tethering assemblies can then be penetrated into the ground and connected to the relevant mounting plates **62** using tethering arms connected under tension to reinforce the seawall as described above.

[0059] Since various modifications can be made in my invention as herein above described, and many apparently widely different embodiments of same made, it is intended that all matter contained in the accompanying specification shall be interpreted as illustrative only and not in a limiting sense.

1. A seawall system for being supported on a seabed along a coastline, the system comprising:

a plurality of screw piles having a lower portion including a helical flight so as to be arranged to be penetrated into the seabed and an upper portion above the lower portion arranged to protrude upwardly from the lower portion penetrated into the seabed; and

a plurality of modular wall panels formed of concrete material and arranged for connection in series with one another to form a wall, each wall panel being arranged for mating connection with one or more of the screw piles for anchoring the wall to the seabed.

2. The system according to claim **1** wherein each wall panel includes an end portion locating a post aperture therein arranged to receive the upper portion of one of the screw piles vertically slidable therein.

3. The system according to claim **2** wherein each end portion locating the post aperture therein is formed of concrete.

4. The system according to claim **2** wherein each post aperture receives the upper portion of the respective screw pile therein such that a top end of the screw pile is substantially flush with a top end of the wall panel.

5. The system according to claim **1** wherein two adjacent wall panels are arranged to be coupled to define a common post aperture receiving the upper portion of a single screw pile therein.

6. The system according to claim **5** wherein each wall panel includes two end portions at opposing ends thereof which are stepped in profile so as to enable the end portion of a first one of the wall panels to be overlapped by the end portion of a second one of the wall panels to receive the shaft of the single screw pile therein.

7. The system according to claim **6** further comprising a top plate associated with each post aperture and arranged to be fastened to a top side of the wall panel locating the post aperture therein.

8. The system according to claim **1** further comprising a connecting plate associated with each adjacent pair of the wall panels which is arranged for fastened connection to each of the wall panels of the adjacent pair.

9. The system according to claim **1** further comprising a plurality of secondary piles, each secondary pile having a shaft portion and a helical flight so as to be arranged to be penetrated into the seabed, and a plurality of tethering assemblies arranged to tether each secondary pile to a respective one of the screw piles.

10. The system according to claim **9** wherein each tethering assembly includes a mounting member having an aperture arranged to receive the upper portion of the respective screw pile.

11. The system according to claim **9** wherein two adjacent wall panels are arranged to be coupled to define a common post aperture receiving the upper portion of a single screw pile therein, and wherein the mounting member of the tethering assembly is arranged to receive said single screw pile therethrough at a junction of the two adjacent wall panels.

12. The system according to claim **10** each wall panel includes two end portions with respective post apertures therein at opposing ends thereof which are stepped in profile so as to enable the end portion of a first one of the wall panels to be overlapped by the end portion of a second one of the wall panels to receive the upper portion of a single screw pile through both post apertures of the overlapping end portions, and wherein the mounting member of the tethering assembly is arranged to be received between the overlapping end portions for receiving said single screw pile therethrough.

13. A method of forming a seawall for being supported on a seabed along a coastline, the method comprising:

providing a plurality of screw piles, each having a shaft and a helical flight about the shaft adjacent a bottom end of the shaft;

penetrating the screw piles into the seabed at spaced apart positions along the coastline such that each screw pile defines a lower portion embedded into the seabed and an upper portion protruding upwardly from the seabed;

providing a plurality of modular wall panels formed of concrete material and having post apertures at opposing ends thereof;

mounting each wall panel onto two adjacent ones of the screw piles by inserting the upper portions of the screw piles into the post apertures at the opposing ends of the wall panel such that the wall panels are connected in series with one another along the coastline.

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