RESILIENT RETAINING WALL

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UNITED STATES PATENTS
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2,332,812 10/1943 Rieger et al. .................................. 61/62
2,405,289 8/1946 Cardwell ........................................ 61/39
1,084,120 1/1914 Wemlinger ........................................ 61/60
1,689,678 10/1928 Mauterer ........................................ 61/62
1,937,758 12/1933 Harris ........................................... 61/62
2,355,102 8/1944 Odmann ........................................... 61/62

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ABSTRACT

A marine retaining wall and the like comprised of a series of hingedly interconnected corrugated metal sheets anchored in place by adjustable earth anchors, whereby adjacent corrugated sheets can move relative to each other in response to the normal movement of water, wave and soil without becoming disengaged from each other, fracturing, or losing their effectiveness in sealing the land off from the water.

2 Claims, 5 Drawing Figures
3,739,588

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RESILIENT RETAINING WALL

BACKGROUND

This invention relates to a retaining wall. More particularly, it relates to a retaining wall suitable for use as a canal or marina bulkhead and the like. In areas where bodies of water, such as canals and marinas, are provided for various commercial, residential or recreational purposes, it is standard practice to erect retaining walls to minimize shoreline erosion, etc. In addition to environmental suitability, e.g., durability and weathering characteristics of the materials used, labor and materials costs are prime considerations in the construction of such retaining walls.

Specially formed and reinforced corrugated metal, plastic and fibrous composition sheets have been used in the past in the construction of retaining walls in an effort to provide sufficient seals at the various joints between the sheets or panels. These have not been completely satisfactory for various reasons. Panels of plastic and fibrous composition materials, although inexpensive and resistant to rot, water, fungi, etc., are still relatively brittle and any severe stress or shearing action can cause fracture and breaking of the panels in the panel joint areas and a destruction of the wall or barrier made up of such panels. The metal panels proposed or used for such purposes in the past have not been provided with satisfactory soil or sand-proof interlocking joint elements which permit flexing or shifting of the installed panels under various loading conditions while at the same time inhibiting the settling of soil or sand therethrough and without becoming disengaged from each other, distorting or failing. Typical examples of such prior art walls having the aforesaid deficiencies are illustrated in U.S. Pat. Nos. 1,084,120, granted Jan. 13, 1914, and 3,229,468, granted Jan. 18, 1966.

Accordingly, it is a primary purpose of the present invention to provide an improved retaining wall or the like made up of resiliently or hingedly connected links that overcomes the above-mentioned difficulties, and has a relatively long life expectancy.

Another object is to provide an improved bulkhead utilizing structural corrugated panels that can, if desired, be prepunched and provided with improved means for hingedly connecting a pair of panels together along the entire lengths of the various panels.

A further object is to effect an improved interlock between a pair of corrugated panels or sheets forming a sheet metal piling, which will provide a permanent joint therebetween similar to a ball and socket in design. This joint arrangement allows the individual wall sheets once emplaced to flex under normal external loadings without fracture, or becoming disengaged from the total wall structure formed of such sheets, while at the same time permitting the building of walls that can have bends or curves that follow the natural and sometimes quite irregular curvature of the terrain, where the sheets are emplaced.

Still another object is to provide a marina wall equipped with an improved adjustable land anchor means to compensate for any shifting or loosening of the sheets or panels forming pilings due to wind, weather and/or wave action.

SUMMARY OF THE INVENTION

Briefly stated, the invention is directed to a resilient retaining wall of straight and/or curvilinear configuration comprised of a series of corrugated metal sheets arranged adjacent to each other and hingedly joined together in an improved fashion.

The various panels making up the wall are further held in place against the usual earthen backfill by means of a plurality of improved adjustable metal anchors connected thereto by means of tie rods embedded in the earth fill.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary and partly broken away plan view of a retaining wall showing joined together corrugated metal sections incorporating the novel concepts of the instant invention;

FIG. 2 is a partly broken side elevational view taken substantially along the line 2-2 of FIG. 1 and illustrating a typical installation of the wall of the instant invention with parts added;

FIG. 3 is a view of a typical disc type anchor device that can be used in the installation of the wall, when taken along the line 3-3 of FIG. 2;

FIG. 4 is a top plan view, on an enlarged scale of the hinged ball and socket type joint between a pair of panels when generally taken within the circumscribing line 4 of FIG. 1; and

FIG. 5 is an enlarged cross-sectional view of a cap element that fits over the top of a wall panel, and illustrates the manner in which the cap element is installed.

It will be understood that the embodiments shown in the drawings and described hereafter are merely illustrative of preferred embodiments of the invention.

DETAILED DESCRIPTION

Referring now to the drawings and particularly FIGS. 1 and 2, the retaining wall or sheet metal piling 5 of the instant invention is generally comprised of a series of rectangular bulkhead sheets 10, formed of standard corrugated metal sheet or plate of the appropriate gauge, temper, etc., such as those made of a corrosion resistant aluminum alloy and vertically disposed along a shoreline or other embankment by the usual jetting, trenching or driving techniques.

Each corrugated sheet 10 is usually prepared for installation by first attaching, such as by welding, to one side edge of the sheet an elongated sinusous fitting 11 which combines with the sheet edge to form a hinge pocket 12. The opposing side edge of the sheet has an elongated and roughly J-shaped tongue element 13 similarly welded or riveted thereto. The bulbous end 14 of the tongue element 13 of one sheet 10 fits loosely yet firmly within the pocket 12 formed by the fitting 11 attached to an adjacent sheet element 10 to form a hinged ball and socket type joint J. The opening or mouth 15 leading into pocket 12 is slightly larger in width than the thickness of the web portion 13' of tongue element 13.

The bulbous element 14 is fitted in a pocket 12 by raising the bottom of the sheet edge provided with a tongue element 13 above the top of the edge of the adjacent sheet provided with pocket 12, telescoping the fitting or inserting the tongue 13 of the one sheet 10 into pocket 12 of the other sheet and then sliding the two sheets lengthwise in opposite directions until the entire tongue 13, which preferably runs the entire length of a sheet, has its bulbous element 14 fully enclosed within the joint pocket 12 of the other sheet. Pocket 12 preferably extends for the full length of the sheet with
which it is associated. If a water-proof grease is previ-
ously applied to bulbous element 14, insertion of the
element into and along a pocket 12 will be facilitated.

The aforesaid interlocking arrangement of parts re-
results in a hinge-like connection or joint J between adja-
cent sheets whereby individual sheets 10 can bend, flex,
or bow relative to another sheet without becoming dis-
engaged from each other and without any significant
loss in the sand-tight integrity of the joint between adja-
cent sheets. In this connection, it is to be observed that
the sealing characteristics of the joint J of the instant
invention are important and particularly useful in keep-
back sandy soils on beach-front property and even
the fine so-called sugar sands of many inland waterways
and lakeshores. In instances where fine sandy or silty
soil is present along with tide water, the fluctuating
water line at high and low tides results in a tendency for
the backfill to be sucked or sifted through the joints be-
tween adjacent panels or sheets unless the joint is rela-
tively impermeable as in the instant case.

The generous rounded curvature of bulbous element
14 permits substantial pivoting or hinge movement of
one sheet 10 relative to its adjacent sheet without their
becoming disengaged from each other. Mouth 15 of
pocket 12 is sufficiently large to prevent binding of the
tongue 13 in the pocket 12. The unique hinged connec-
tion of sheets 10 enables the wall or pilings made up of
such sheets to have substantial or severe installation
curvatures, etc., whereby the sheets 10 do not have to
be arranged linearly and allows a wide range of adjust-
ment of the sheets to the terrain during installation.
The hinged joint comprised of tongue and pocket acts
to provide an efficient seal against the erosion of sand or
earth fill from the landward side of the wall toward
the water side.

In most installations, it will be advantageous to pro-
vide a top reinforcing metal cap 16 for the wall 5 at-
tached by suitable means to the upper edges of the cor-
rugated sheets 10. Cap 16 enhances the structural ri-
gidity of the overall wall and can be bent or curved lon-
gitudinally within limits during manufacture. It acts to
restrict vertical movement and shifting of sheets 10 rela-
tive to each other and at the same time is somewhat
decorative. This cap as indicated in FIG. 5 can be
roughly T-shaped and provided with apertured sidewalls
17 and 18 and when a cap 16 bridges the joint J
between sheets, it acts as a unique splice for the sheets
and also can have the advantageous characteristics of
a load transfer bar as noted hereinafter.

In an advantageous embodiment of the invention, the
threaded ends 19 of the ground anchor tie rods 20 fit
in the aligned openings 21 in walls 17 and 18 of cap 16
and in matching holes 22 in sheets 10 at various spaced
points along the tops of the sheets 10. Holes 22 are
preferably offset somewhat from a joint J. The threaded
anchor end of each rod 20 is adjustably con-
ected to anchor plate or disc 25 by a standard double
lock nut assembly 26 and reinforced by angle irons 27.
Anchor disc 25 can be buried in the earth fill or the like
behind the retaining wall and acts to stabilize the wall.
The ground anchor is preferably attached to the wall in
the area of a cap 16 because of the rigidity afforded to
this area of the wall by cap 16. When the ground an-
chor is attached to cap 16 and the cap bridges a joint
J and in effect is secured to two panels, connection of
a ground anchor to such a cap in turn means a ground
anchor connection with a plurality of panels and not
just one panel. This type of connection also tends to re-
lieve undue stresses on the joint J by distributing and
transferring a given load to several panels, which are
spliced together by cap 16.

Any slack in this anchoring system resulting from the
shifting of the wall and/or earth adjacent the wall can be
readily compensated for by tightening up in a well-
known manner the individual nuts of double lock nut
assembly 26 attached to the land anchors as well as the
wall ends of the appropriate tie rods 20 in order to sta-
bilize the wall panels in their fully erected positions.
An advantageous embodiment of the invention has
been disclosed and described. It is obvious various
changes and modifications can be made therein.

What is claimed is:

1. A marine wall and the like comprised of corrug-
ated metal sheets connected by ball and socket type
joint assemblies, a joint assembly for a pair of adjacent
sheets comprising an elongated sinuous fitting affixed
to one of the sheets adjacent to and extending for sub-
stantially the entire length of the marginal edge thereof
and forming in conjunction with and at the said mar-
ginal edge of the said one sheet of the joint assembly an
elongated tongue receiving hinge pocket, an elongated
and roughly J-shaped tongue element projecting from
and extending for substantially the entire length of the
marginal edge of the other sheet of the joint assembly,
said tongue element being provided with a generously
rounded bulbous end, the bulbous end of the tongue
element being snugly yet loosely and telescoping in-
serted in said hinge pocket, a generally T-shaped rein-
forcing and load transferring cap element overlying and
attached to the tops of the sheets and bridging the joint
assembly, the lower stem portion of the T-shaped cap
element being split so as to have side walls which en-
compass both sides of a sheet to which the T-shaped
cap element is attached and which the T-shaped cap
element overlies, an adjustable ground anchor means
and adjustable bolt and tie rod means affixing said an-
chor means to the tops of said sheets as well as to the
cap element in areas offset from said joint assembly
whereby said anchor means can stabilize the sheets in
the ground in an upstanding position.

2. A wall as set forth in claim 1 wherein said ground
anchor means includes a ground anchor disc.

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