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Sticker, Jr.

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[54] **METHOD AND APPARATUS FOR PREVENTING EROSION AND FOR CONVEYING**

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[52] **U.S. Cl.** **61/4**

[51] **Int. Cl.** **E02b 3/06**, E02b 3/08

[58] **Field of Search** 61/4, 3, 10, 43, 61/37

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[57] **ABSTRACT**

This invention relates to improvements for preventing erosion of beaches by tidal waves comprising placing a plurality of conduit units in mating end-to-end relationship and bolting them together by stressing wires extending through registering holes. Each unit has a pair of deep legs or drag footers through which fluid is forced so as to stabilize the support. The same type of structure when considerably increased in size may serve as a vehicular tunnel and may be provided with a horizontal partition to provide ventilation at the top of the tunnel.

5 Claims, 4 Drawing Figures

Fig. 2.

Fig. 1.

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Fig. 3.

Fig. 4.

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METHOD AND APPARATUS FOR PREVENTING EROSION AND FOR CONVEYING

This application is a continuation-in-part of my application Ser. No. 26,829, filed Apr. 9, 1970 for a METHOD AND APPARATUS FOR PREVENTING EROSION.

This invention relates to a method and apparatus for preventing erosion of beaches by tidal waves. It also relates to placing of conduit units in end-to-end relationship to serve not only for the above purpose but for other purposes such as for conducting fluids or for protecting fluid conductors such as oil lines, or when enlarged in size, to serve as a tunnel for vehicles.

In my prior application I described apparatus similar to quansut huts for preventing erosion of beaches by placing such huts end-to-end and providing openings in the sidewalls through which tidal waves or water could flow.

The present invention relates to an improvement thereof, particularly in the means whereby the structures may be held tightly in end-to-end relationship. It also relates to the improvement whereby the structures may be dug into the beach or soil by introducing a jet of fluid, such as water, through the legs or footers thereof. Also the present invention relates to the application of the structure, when considerably, enlarged, for use as a tunnel for vehicles, either underwater or through hills or mountains.

Other objects and advantages will become more apparent from a study of the following description taken with the accompanying drawings wherein:

FIG. **1** is a side view of an erosion preventing unit embodying my invention;

FIG. **2** is a cross-sectional view taken along line II—II of FIG. **1**;

FIG. **3** is a front, perspective view of a plurality of units having a general outline somewhat similar to that shown in FIGS. **1** and **2** but of considerably larger size so that when similar units are tightly held end-to-end they will serve as a vehicular tunnel; and,

FIG. **4** is a side view of one of the units shown in FIG. **3**.

Referring more particularly to FIGS. **1** and **2** of the drawing, showing an erosion preventing unit, numeral **1** generally denotes such unit which is in the form of a cast concrete or reinforced concrete structure having an integral floor portion **2**, base or wing portions **3** and **4** and upper portion **5** of somewhat oval shape which surrounds the opening defined by the surface of floor portion **2** and the inner wall portion **6**. Holes, such as **8**, are formed on the land side whereas holes, such as **9**, are formed on the land side whereas holes, such as **9**, are formed on the sea side of a beach so that tidal wave water may flow therethrough to reduce hydraulic land side pressures and trap the sand inside the cavity. Base portions **4** and **3** may be about 1 ft. and 5 ft. long, respectively and about 1 ft. thick, while the curved top wall may be about 4.5 ft. in inner radius and about 6 feet in outer radius. The drainage slots or openings may be about 0.5 ft. by 3 ft. or may be circular.

An important feature of the present construction is the very deep drag footers or supports **7** which may be of the order of 4 feet in height and which are provided with tubes **11** extending vertically therethrough, through which air or other fluid, such as water, may be discharged through the bottom exits **14** so as to blow away sand underneath and form trenches for stabilizing and facilitating sinking of the footer portions **7** into the sand or soil. Such jet introduction of fluid is also useful when submerging the units under water instead of placing them on the beach.

While base portions **3** and **4** are shown unequal in size, they may, instead, both be of the same size as **3** to provide better stability or support. The tubes **11** may alternately serve the purpose of introducing drills, augers or other tools, for drilling anchoring holes or for drilling rock or other structure existing underneath exits **14**.

As will appear in FIG. **1**, when introducing jet fluid, a single inlet **11** may be provided connected to a plurality of outlets, such as **12** and **13**, so as to distribute the discharged fluid throughout the entire length of the footers **7**. If desired, a plurality of units, such as shown in FIGS. **1** and **2**, may be held tightly together by extending a wire or cable, such as **16**, through registering openings **15** along two sides and at the top of the units whereby upon tightening of the bolts on the outside end walls, the cables will be tensioned so as to tightly hold units together. Such cables also assist in sliding the units to proper placement under water in necklace fashion from barges. A suitable length is 10 feet for lifting by a crane from a truck or barge.

The top of the unit is preferably flattened, as shown at **19**, to enable fishermen or guards to walk thereon as an elevated walkway along the length of the beach.

The unit shown in FIGS. **1** and **2** but without holes **8** and **9** is suitable for conveying materials, such as sewage, outfall, thermo-discharge from electric generating plants; or as a protective enclosure for pipes carrying oil or other fluids or flowable materials, particularly for applications involving difficulty in stabilizing the conduit, as in marsh or muskeg land.

FIGS. **3** and **4** show a vehicular tunnel comprising units of substantially the same outline and construction as that shown in FIGS. **1** and **2**, but greatly enlarged in size sufficiently to allow movement of vehicles therethrough. The tunnel comprises a top portion **20** integrally cast with bases or side wings or stabilizers **21** and depending footers **22**. A tunnel opening **23** is provided through which vehicles may be driven and for this purpose it is preferred to provide a horizontal partition **24** of cast concrete or similar lasting material suspended by suspension rods **25** to provide a continuous air carrying ventilating space **26** when similar partitions **24** are placed end-to-end, for blowing out exhaust fumes. Slotted openings **27** permit air to enter the vehicular section **23** to provide air exhaust return to the ventilating fans (not shown).

Registering holes **28** are provided throughout the lengths of the various units and tensioning rods **29** extend therethrough which may be tensioned by threading the emerging portions of rods **29** and then applying a threaded bolt thereon and engaging a flat washer covering holes **28** (not shown). Underwater epoxy resin or other suitable sealing compound may be inserted to further seal the units end-to-end in a water-tight manner.

Jet fluid may be introduced through holes **30** and extended through the depths of footers **22** in the manner shown in FIGS. **1** and **2** to allow the structure to seat itself. Holes **30** may be disposed vertically such as tubes **11** in FIGS. **1** and **2** to enable introduction therethrough of drills etc. to prepare trench openings for the footers **22**.

Thus it will be seen that I have provided a concrete unit, or one of other suitable material, which is highly useful for stacking end-to-end for use in preventing erosion of seashores, or for use in conducting liquids either directly, or as conduits for pipes that conduct such liquids, particularly over marshy soil, muskeg or the like where difficulties are encountered in stabilizing the structure. Also I have provided an underground vehicular tunnel by enlarging the size of the unit, but still retaining the general features of construction thereof.

The precast tunnel design of the present invention provides an amazing increase in economy by enabling casting of the segmented tunnel on land or on a barge as opposed to using expensive underwater casting. Underwater methods require the use of pressurized caissons for the crews and complicated and expensive casting equipment. The work done in underwater methods is hazardous as compared to the simplicity of the present method and construction which requires a minimum number of divers to set and join the precast units. As a sufficient number of units are placed, suitable air lock compartments can be mounted in the tunnel to begin pumping of the water to clear the tunnel for final sealing of the joints against water leakage.

Greater stability of the structure against scouring erosion and current forces are also provided by employing stabilizing footers and aprons which are unavailable to conventional casting methods used underwater.

The units are also applicable for providing an economical pipe line for sewage disposal to discharge from points at a great distance out to sea. The inherent stability of the structures make it suitable for anti-pollutant requirement. The units also enable the system to use a pressurized discharge to increase flow and to establish a self cleaning pipe line. The unit is also applicable to discharge thermo-water from generating stations of electric companies. Similarly, the structure may be stacked in length to provide a protective enclosure or containment of high pressure pipe line that may convey on land or underwater, oil, chemicals, or other fluids or pressurized solids in suspension such as slurries etc.

Conduits **11** may be used to introduce sand blasting fluid under pressure, steel pins driven by air hammers or pile drivers to pierce rock so as to anchor thereto etc.,— also to introduce grout or cement in fluid condition. The conduit opening may be made round, rectangular or other shapes.

The structures shown in FIGS. **1** and **2** are useful also underwater for erosion control, in which case the holes or slits **8** and **9** may be used or omitted, as desired. When used on beaches, wings or bases **3** and **4** are supported on the sand, the ground level of which is shown in dot and dash outline. The sand carried in by waves is deposited on the land side of the unit **1** so as to build up the beach on such side along a wide strip of the beach. Reference is hereby made to the detailed description in my earlier U.S. Pat. application Ser. No. 26,829 as to how the structures shown in FIGS. **1** and **2** prevent erosion of beaches.

While I have illustrated and described several embodiments of my invention, it will be understood that these are by way of illustration only and that changes and modifications may be contemplated within the scope of the following claims.

I claim:

1. A cementitious elongated tubular assembly comprising a plurality of tubular units disposed in end-to-end relationship, each unit comprising a hollow enclosure defined by a cementitious, substantially semicircular wall supported on an integral, diametrically extending base portion forming a horizontal floor, said floor having integral outer extensions projecting beyond the outer diameter of said wall, spaced parallel footers integral with and extending downwardly, substantially at right angles, from said floor at its juncture with said extensions, each unit having projections on one end which closely fit into correspondingly shaped grooves in the end of an adjoining unit for preventing lateral displacement of the units, and conduit means extending through opposite sides of said wall and downwardly through said footers to introduce fluid under pressure for blowing away sand or earth immediately below said footers to enable said unit to be seated easily in sand or soil.

2. A structure as recited in claim **1** wherein said conduit means includes a single inlet on each side of said wall feeding a plurality of outlet outlets said footers.

3. A structure as recited in claim **1** together with slots extending along both sides of said wall to permit lateral flow therethrough of water from tidal waves to enable said units to be used for preventing erosion along a beach and wherein said extension which is on the side of said tidal waves is substantially greater than the opposite extension located landside.

4. A structure as recited in claim **1** wherein said tubular units include a plurality of registering holes extending longitudinally therethrough, and a tensioning rod extending through each of the holes so that when tensioned, said units will be tightly held together.

5. A structure as recited in claim **1** wherein said units include registering horizontally extending partition walls to define an upper ventilating chamber and a lower vehicular tunnel.

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