United States Patent [19]

Tupper

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[54] **CONTROL OF EROSION**

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** **61/3,** 52/726, 61/35, 61/37

[51] **Int. Cl.** **E02b 3/04,** E02d 3/14

[58] **Field of Search** 61/3, 4, 5, 37; 52/609, 52/611, 732, 578, 593, 726

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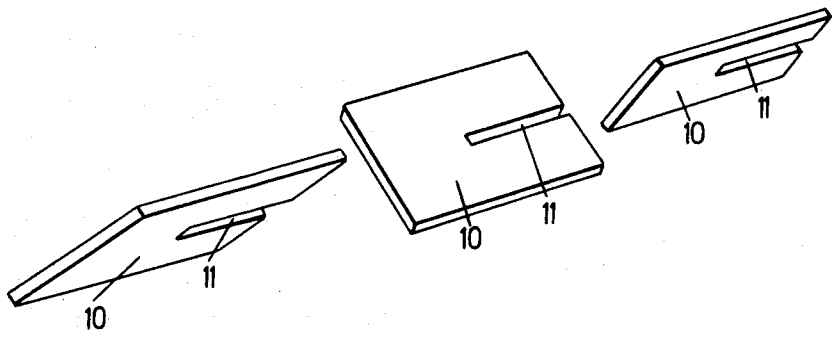
Attorney, Agent, or Firm—Pollock, Philpitt & VanderSande

[57] **ABSTRACT**

A length of mechanically strong material of cross-shaped cross-section, when placed along a beach, is resistant to tipping on wave-impact and prevents or hinders erosion. It can be made of concrete, in the shape of a cross of four equal arm lengths, either integrally or as interlocking slotted slabs. These slabs can also be built up into a chain of indefinite length, thus preventing gaps between individual members.

7 Claims, 6 Drawing Figures



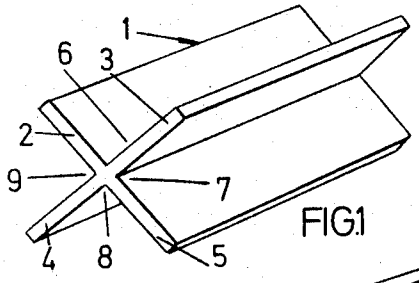
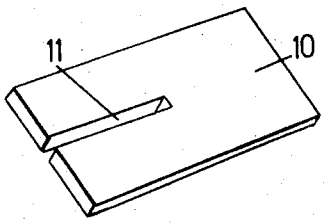


FIG.1



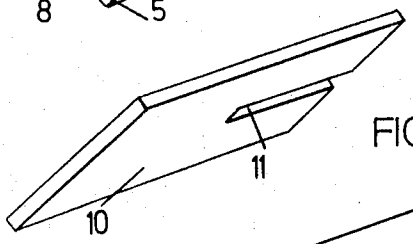
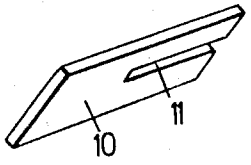
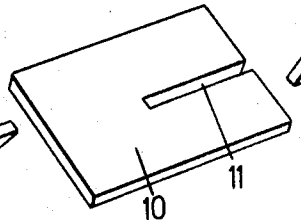


FIG.2





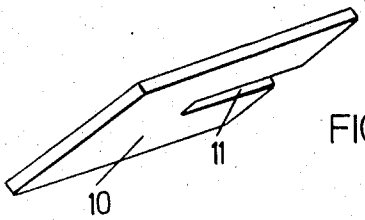


FIG.3

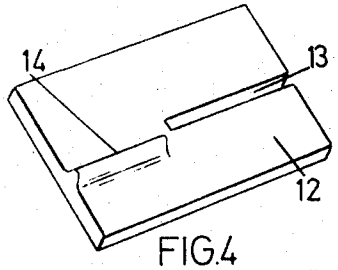


FIG.4

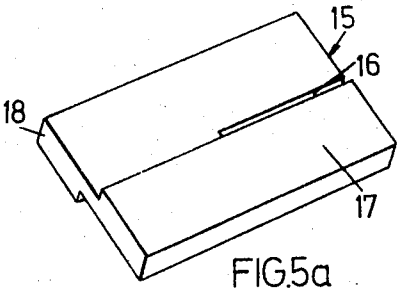


FIG.5a

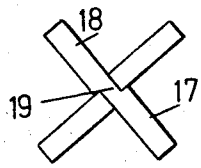


FIG.5b

CONTROL OF EROSION

This invention relates to control of land erosion due to flowing water, and more especially to the control of beach erosion, and loss of sand from beaches, due to wave action.

It is well known that after a period of stormy weather there is a tendency for beaches to be detrimentally affected and in some places to be washed clean of sand. Various expedients have been adopted to prevent or control such erosion. One expedient is to pile a line of stones as a breakwater to minimise the scouring force of the waves on the beach. This has the disadvantage that there are necessarily gulleys and channels left between individual stones and that water trapped behind the stones will pass out through such channels and scour sand from them. As stones are progressively dislodged by slipping into the channels which have been scoured in this way, fresh channels are exposed. There is thus a progressive loss of sand. Another expedient is to provide wooden groynes extending down the beach, to prevent loss of sand. However, these are expensive to erect, since they must be deeply set into the beach itself, and are difficult to maintain and to prevent from rotting. A third expedient is to provide a full sea-wall, especially in those instances where there is danger that erosion of the beach will progress beyond removal of the sand to attack the coast-line itself. Once again, this is expensive and such a wall needs frequent inspection and maintenance.

In one aspect the present invention provides a means for preventing or hindering land erosion by flowing water (for example beach erosion by wave impact) which consists of a longitudinally extending member made of mechanically strong material with a higher specific gravity than that of water, and of generally cruciform cross-section to provide resistance to tipping when laid with the ends of two arms of said cross-section on a surface.

Preferably the cross-section of the member is that of a generally square cross, that is to say with individual arms at right angles and with arm lengths all the same, and thus both total (i.e., diametrical) arm lengths equal.

A preferred total arm length is between 12 and 36 inches (30–90 cms).

The arm thickness can vary but is usually between one inch and six inches (2.5–15cms). Preferably the member is from one to three times as long as the total arm length.

Such a member may be made of a variety of materials, but a preferred material of construction is concrete, and especially those rich and relatively strong concretes which do not need internal reinforcement which could become exposed and unsightly as the member weathers in use.

In another aspect the invention provides a flat rectilinear slab of such mechanically strong materials (such as concrete) having an open-ended through slot generally square in cross-section extending along the centre of the slab for substantially half of its length from one end. This slab is preferably from 12 to 36 inches (30–90cms).wide, and from one to three times as long as its width, with a preferred thickness of from 1 inch to 6 inches (2.5–15cms).

It will be appreciated that on assembly of two such slabs (effected by arranging them in planes at right angles with the open ends of their respective slots facing and thereafter sliding them together) the generally cruciform longitudinally extending member will be produced. Moreover, by assembling such slabs, by again arranging them in planes at right angles to one another but with the open ends of the slots facing in same direction, a stable structure is obtained which can be extended as a chain of indefinite length from either end to form the longitudinally extending structure having a generally cruciform cross-section.

The slab as defined above may possess locating and stabilizing ribs extending along at least one edge of the slot, or of a line defined by extending such an edge, so that when two slabs are assembled the assembly is rigidified by such a rib.

A specific form of the invention provides such a slab where the thickness of the slab between the continued line of one slot edge on one face and the nearer parallel slab edge is (i) uniform (ii) equals that uniform thickness between the continued line of the other slot edge on the other face and its nearer parallel slab edge, and (iii) is greater than the uniform thickness of the slab between the two said continued lines, the transverse cross-section of the slab thus having a point of symmetry. Such a slab lends itself particularly well to manufacture and to the construction of an interlocking structure from a plurality of identical slabs, the interlocking structure possessing a generally cruciform cross-section.

In another aspect the invention consists in a method of preventing or hindering land erosion by flowing water (for example beach erosion by wave impact), wherein a plurality of longitudinally extending members of generally cruciform cross-section as described above are placed in contact, or fabricated as an interlocking line to form a longitudinally extending chain, with two arms contacting the ground in the area contacted by the flowing water. Preferably this method is achieved by assembly of such a structure from slabs as described above, especially where these are assembled to give a continuously interlocking line of identical slabs. The method is generally carried out by placing the structure on a beach, usually generally transversely to the prevailing wave pattern.

Alternatively, the structures can be placed below low water mark, (possibly in several parallel rows) so that waves will break further out and their impact on the beach will be minimised.

The invention will be further described with reference to the accompanying drawings in which:

FIG. **1** is a perspective view of a member for preventing beach erosion;

FIG. **2** is an exploded perspective view of such a member formed from two slabs;

FIG. **3** is an exploded perspective view showing how a fully interlocking chain structure having a generally cruciform cross-section can be build up from a plurality of slabs;

FIG. **4** shows in perspective a slab provided with a locating and stabilizing rib;

FIG **5***a* shows in perspective a slab which can be assembled to produce a cruciform member; and

FIG. **5***b* shows in end elevation a cruciform member produced using the slab as in FIG. **5***a*.

In FIG. **1** there is provided a concrete member **1** of uniform cruciform cross-section with four arms **2,3,4**

and 5. Between the arms there are defined spaces 6,7,8 and 9.

In use this member is placed on the beach with the two arms 4 and 5 contacting the sand. Any wave impinging upon the space 7 will have its impact absorbed and, although it will usually break over the member, will tend to deposit any sand it carries in the top space 6 or in the back space 9. Moreover, the exceptionally stable arrangement with the two widely spaced arms 4 and 5 resting on the sand means that wave impact can be accommodated without movement of the member. In practice, the arms 4 and 5 will tend to sink slightly into the sand, and the sand will tend to rise into space 8, to accumulate behind the member in space 9, and to some extent on top of the member in space 6 and in front of the member (space 7) so that the general appearance is of a hummock of sand. Moreover, it is envisaged to use a plurality of such members in end-to-end contact so that no gulleys are defined between them whereby water running down the beach can scour a channel and lead to successive displacement of the members.

FIG. 2 shows two identical slabs 10 each having a central through slot 11 extending half-way along its length from one end and of a square cross-section. If these two slabs are brought towards one another they will eventually interlock to form a member as shown in FIG. 1.

FIG. 3 shows three such slabs all of which face the same direction but which are alternately located at right angles. If these slabs, shown in exploded view, are brought together they will define a fully interlocking structure which can extend across the beach and be continued indefinitely. This has the advantage that end-to-end contact of notional members as shown in FIG. 1 is effectively achieved by the geometry of the slabs, and there is no possibility of a through gulley forming from the back to the front of the members. Moreover, the slabs will in practice be of sufficient tolerance in their manufacture that at least gentle changes in contour of the beach or in curvature in relation to the wave pattern can be accommodated progressively as the chain structure is built up. There is also resistance to removal by heavy wave action at any one point of a unit of the chain, which would lead to progressive deterioration of the structure.

FIG. 4 shows a slab 12 with a slot 13. Also provided is a stabilizing rib 14 in line with a slot edge so that when the slab is assembled in a structure as shown in FIG. 3 an additional stabilizing feature to prevent disruption of the chain is provided.

FIGS. 5*a* and 5*b* show a further development of this principle by providing a slab 15 which has a slot 16 and a first portion 17 of uniform thickness between one slot edge and its nearest parallel slab edge and a second portion 18 of increased thickness between the outer slot edge on the other face and its nearest parallel slab edge. The central portion 19 (see also FIG. 5*b*) that is to say the continuation of slot 16, is thinner than the portions 17 and 18. Such a slab can readily be assembled as shown in FIG. 3 to give a particularly stable and resistant chain structure which can extend across a beach.

It will be appreciated that one or more of such structures can be provided on the beach above or below low water mark and as individual units or in the form of a chain or of parallel chains. If desired the underlying units as shown can be dug up at, for example, the end of a winter season to leave a flat beach for the summer period, but in practice they will usually become covered by sand and present an acceptable appearance if left in place all the year round.

I claim:

1. A means for hindering land erosion by flowing water which consists of a chain of members fitted together, said chain having a generally cruciform cross-section with the ends of two arms of said cross-section contacting the ground so as to provide resistance to tipping, wherein each of said members is a generally flat rectilinear slab made of mechanically strong material with a specific gravity greater than that of water, and shaped to define an open-ended through slot of generally square cross-section extending along a notional center line of said slab for substantially one-half its length from one end thereof, and wherein the slots all face in the same direction and each slot accommodates substantially one-half the length of the next adjacent slab in said chain.

2. A means as claimed in claim 1 wherein the cross-section is that of a generally square cross.

3. A means as claimed in claim 1 wherein total arm length is 12 to 36 inches, arm thickness from 1 to 6 inches, and member length from 1 to 3 times total arm length.

4. A means as claimed in claim 1 made of rich strong concrete free from internal reinforcement members.

5. A means for hindering land erosion as claimed in claim 1, including a stabilizing rib extending along the line of at least one longitudinal edge of said slot in at least one of said members.

6. A means for hindering land erosion as claimed in claim 1, wherein the thickness of each said slab between the continued line of one slot edge on one face and the nearer parallel slab edge is (a) uniform, (b) equal to that uniform thickness between the continued line of the other slot edge on the other face and its nearer parallel slab edge, and (c) greater than the uniform thickness of the slab between the two said continued lines, the transverse cross-section of said slab thus having a point of symmetry.

7. A means for hindering land erosion as claimed in claim 1, wherein the width of each said slot is slightly greater than the thickness of each said slab, to provide sufficient play to accommodate minor changes in the contour of the ground contacted by said means.

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