Abstract: Improved water control and breaking system employing a set of breakwater construction blocks having a rugged top portion that can have several design shapes, and when combined with other construction blocks and interlocking shear key blocks disclosed herein, can serve important functions, including total water energy control and reaction to wave attack, and changing flow velocities through a composite structure which can allow sand, shell or stone particles in suspension more time to settle. In order to control severe problems along shorelines including rivers, streams and bluffs, the improved breakwater construction block system should be ideal for rapid construction of off-shore berms which can be effective in controlling shoreline erosion.

FIG. 30A
— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

(88) Date of publication of the international search report:
14 May 2015
INTERNATIONAL SEARCH REPORT

International application No.
PCT/US14/51557

A. CLASSIFICATION OF SUBJECT MATTER
IPC (8): E02B 3/04, 3/06, 3/14 (2014.01)
CPC: E02B 3/04, 3/06, 3/129

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC(8): E02B 3/00, 3/34, 3/06, 3/14 (2014.01)
CPC: E02B 3/04, 3/06, 3/129; USPC: 405259, 33

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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</thead>
<tbody>
<tr>
<td>X</td>
<td>US 4,370,075 A (SCALES J. M.) January 25, 1983; figures 1, 4-9, 16-17</td>
<td>1-16, 38-42, 44-45</td>
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<td></td>
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<td>17-20</td>
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<tr>
<td>Y</td>
<td>US 4,269,537 A (ONEILL R. J.) May 26, 1981; figures 6a-6b; column 2, lines 35-45</td>
<td>23</td>
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<td>18-20</td>
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<tr>
<td>Y</td>
<td>US 7,862,253 B2 (VAN DEN DERGE A. et al.) January 4, 2011; figures 1, 3</td>
<td>17</td>
</tr>
</tbody>
</table>

Further documents are listed in the continuation of Box C.

Date of the actual completion of the international search
13 January 2015 (13.01.2015)

Date of mailing of the international search report
02 MAR 2015

Name and mailing address of the ISA/US
Mail Stop PCT, Attn: ISA/US, Commissioner for Patents
P.O. Box 1450, Alexandria, Virginia 22313-1450
Facsimile No. 571-273-3201

Authorized officer:
Shane Thomas

Form PCT/ISA/2 10 (second sheet) (July 2009)
<table>
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<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
</table>
This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. □ Claims Nos.: because they relate to subject matter not required to be searched by this Authority, namely:

2. □ Claims Nos.: because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. □ Claims Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

This International Searching Authority found multiple inventions in this international application, as follows:

- ""-Please See Supplemental Page.""-

1. □ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. □ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. □ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. □ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

   Group I claims 1-20, 23, 38-45

   Remark on Protest

   □ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

   □ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

   □ No protest accompanied the payment of additional search fees.
This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I: claims 1-20, 23, 38-45 are directed toward a construction block system wherein each said interlocking shear key block has X and Y dimensions, and is adapted for placement between the sidewall surfaces of an opposing set of said construction blocks.

Group II: claims 21 are directed toward a breakwater construction block design that can be produced with various degrees of stability by reducing the height of the rear leg portions of the blocks.

Group III: claims 22, 24, 63-64, 68-71 are directed toward a modular-type multi-form breakwater construction block molding system comprising: a plurality of molding portions, along with multiple attachments and filler segments.

Group IV: claims 25-27, 33-37 are directed toward a breakwater construction block comprising an axially-disposed borehole for passage of a pile rod.

Group V: claims 28-32, 47-61 are directed toward a multi-tiered seawall erosion-protection system beneath which is a layer of filter fabric.

Group VII: claim 62 are directed toward a transportable breakwater construction block factory comprising: an ISO-shipping container, storable at a warehouse, for dispatch and shipment (e.g. via rail, air, roadway or sea) to a remote work site location, near an oceanfront, for in situ manufacturing.

Group VIII: claim 65 are directed toward a method of constructing erosion-protection systems using preassembled subsystems, banding techniques and interlocking shear key blocks.

Group IX: claims 66-67 are directed toward a method of designing and implementing a water control and breaking system comprising the steps of: (a) design a water control and breaking system for resolving one or more water control problems to be encountered in a given environment.

The inventions listed as Groups I-IX do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons.

The special technical features of Group I include a set of construction blocks, wherein each said construction block includes: (i) a central trapezoidal core portion of substantially trapezoidal cross-sectional dimensions and having sidewall surfaces (which is not present in Group II), (ii) a set of four trapezoidal support legs (which is not present in Groups II, VI-IX), each said trapezoidal support leg extending from one corner of the central trapezoidal core portion in a radially-extending manner, and (iii) a top portion extending axially from the central trapezoidal core portion (which is not present in Groups II, VI-IX); and a plurality of interlocking shear key blocks, each being adapted for placement between an adjacent set of said construction blocks (which is not present in Groups II, IV) so as to form a closely-nested arrangement of construction blocks; wherein each said interlocking shear key block has X and Y dimensions, and is adapted for placement between the sidewall surfaces of an opposing set of said construction blocks in said closely-nested arrangement of construction blocks (which is not present in Groups II-IX).

The special technical features of Group II include a breakwater construction block design that can be produced with various degrees of stability by reducing the height of the rear leg portions of the blocks, as shown by the three lines drawn above the right leg of the level unit, and thereby increase the batter, which automatically provides an increase in the stability of the works (which is not present in Groups I, II-IX).

The special technical features of Group III include a modular-type multi-form breakwater construction block molding system comprising: a plurality of molding portions, along with multiple attachments and filler segments, for molding various kinds of breakwater construction blocks and various interlocking shear key block designs, that can be readily used to design and implement effective solutions for resolving water control and soil erosion problems; configured to form at least sixteen different breakwater construction blocks, each having in common (which is not present in Groups II, IV-IX), a central trapezoidal core portion (which is not present in Group II) and at least one pair of leg portions that extend from the central trapezoidal core portion of the block design (which is not present in Groups II, VI-IX); a transportable breakwater construction block manufacturing system comprising: a plurality of multi-form block molding subsystems, having base mold portions mechanically coupled to the factory floor, and the side molding portions being mechanically coupled so that all or multiple groups of side mold portions (for the construction blocks and the matching key blocks) can be simultaneously lifted to remove the side mold portions from the caste blocks; a transportable breakwater construction block manufacturing system comprising: one or more hydraulically-powered wanes, concrete mixers and other equipment arranged about a breakwater construction block factory platform temporarily set up at a construction work site where breakwater construction blocks and interlocking shear key blocks are to be efficiently manufactured using multi-form block molding technology, and when cured, these blocks can be assembled to construct the any system design under construction with an unprecedented level of efficiency, flexibility and economy (which is not present in Groups II, IV-IX).

**Continued Within the Next Supplemental Box**
The special technical features of Group IV include a central trapezoidal core portion of substantially trapezoidal cross-sectional dimensions (which is not present in Group II), a set of four trapezoidal support legs (which is not present in Groups II-IX), each extending from one corner of the central trapezoidal core portion in a radially-extending manner (which is not present in Groups II-IX), wherein a pair of the trapezoidal support legs are truncated at its bottom end, and a tower-type portion (which is not present in Groups II-IX), at least 1/2 height of central trapezoidal core portion (which is not present in Groups II-IX), extending axially along the central axis of the central trapezoidal core portion (which is not present in Groups II-IX) and beyond the trapezoidal leg portions, for the purpose of breaking up and slowing down the flow of water passing over the central trapezoidal core portion of the breakwater construction block and allowing suspended sand to settle within the breakwater construction; and an axially-disposed borehole extending along the central axis of the central trapezoidal core portion, and for passage of a pile rod driven there through and into the bottom of a stream bed, riverbed or coastal shore or region, as the application may require; and a water flowhole transversely extending along the central axis of the central trapezoidal core portion, for allowing water to flow there through and slow down in velocity and allowing suspended sand to settle within the breakwater construction and prevent erosion of streams, rivers and coastal regions (which is not present in Groups II-IX).

The special technical features of Group V include a multi-tiered seawall erosion-protection system comprising: (i) a seawall subsystem installed at the top elevation of a coastal incline upon a bed of crushed rock and/or stone, beneath which is a layer of filter fabric, and constructed from a continuous row of breakwater construction blocks (which is not present in Groups I-IV, VI-IX) comprising: multiple continuous rows of tower-type breakwater construction blocks of the type with truncated (which is not present in Groups II-IX) leg portions (which is not present in Groups I, II, VI-IX) tailored to the incline surface (which is not present in Groups II-IV, VI-IX), and interconnected by interlocking shear key blocks (which is not present in Groups II-IV, VI-IX), having a height substantially equal to the height of the breakwater construction block on the purpose of which is to dissipate wave energy, entrap sand suspended in ocean waters, and protect against the erosion (i.e. scouring) of shoreline, along which the multi-tiered seawall subsystem is installed; wherein a discontinuity in the waterfront dam system allows for the control of water flow along the river or stream determined by the spatial extent of the discontinuity in the waterway dam system, and (ii) a scour protection subsystem installed on the inclined surface of the coastal region, disposed in front of the seawall subsystem, and constructed from (a) multiple continuous rows of low-front-file flat-top breakwater construction blocks (which is not present in Groups I-IV, VI-IX) with truncated leg portions tailored to the incline surface (which is not present in Groups II-IV, VI-IX), and interconnected by interlocking shear key blocks (which is not present in Groups I-IV, VI-IX), and (b) a continuous row of flat top breakwater construction blocks, comprising: a central trapezoidal core portion of substantially trapezoidal cross-sectional dimensions (which is not present in Group I), a set of four trapezoidal support legs (which is not present in Groups II-IV, VI-IX), each extending from one corner of the central trapezoidal core portion in a radially-extending manner (which is not present in Groups I-IV, VI-IX), and a pair of the trapezoidal support legs being truncated at its bottom end (which is not present in Groups I-IV, VI-IX), a substantially flat top portion (which is not present in Groups I-IV, VI-IX) extending axially from the central trapezoidal core portion (which is not present in Groups II-IX) and on level with the top surface of the trapezoidal leg portions for allowing water to flow freely over the central trapezoidal core portion of the breakwater construction block, and a pair of transverse bores passing through the central axis of the central trapezoidal core portion, at orthogonal directions so as to allow the passage of cable or tie rods to pass through each breakwater construction block and interconnect a group of breakwater construction blocks; and an axially-disposed shaft projecting along the central axis of the central trapezoidal core portion, and capable of supporting any device while the breakwater construction block is mounted on the bottom of a stream bed, riverbed or coastal shore or region, as the application may require; behind which is a rock shelf that interlocks and wedges with the breakwater construction blocks and becomes an integral part of the overall structure, for increased stability (which is not present in Groups I-IV, VI-IX).

The special technical features of Group VI include an ocean-groin type beach erosion-prevention barrier system comprising: an arrangement of at least four tiered rows of interconnected breakwater construction blocks assembled on a beach shore (which is not present in Groups I-IV, VII-IX), wherein each row of breakwater construction blocks is constructed by a series of breakwater construction blocks connected together by interlocking shear key blocks (which is not present in Groups II, IV) having a height less than (which is not present in Groups I-IV, VII-IX) the central trapezoidal core portion (which is not present in Group II) of the breakwater construction blocks, so as to facilitate the reduction of water speed across the breakwater construction blocks and allow sand to collect and settle around the ocean-groin structure and prevent beach erosion (which is not present in Groups I-IV, VII-IX).

The special technical features of Group VII include a transportable breakwater construction block factory comprising: an ISO-shipping container, storable at a warehouse, for dispatch and shipment (e.g. via rail, air, roadway or sea) to a remote work site location, near an oceanfront, for in situ manufacturing (which is not present in Groups I-IV, VIII-IX) of breakwater construction blocks (which is not present in Group II) and interlocking shear pin key blocks of the present invention (which is not present in Groups II, IV).

The special technical features of Group VIII include a method of constructing erosion-prevention systems using preassembled subsystems, banding techniques (which is not present in Groups I-VII, IX) and interlocking shear key blocks (which is not present in Groups II, IV) comprising the steps: preassembling breakwater construction block subsystems (which is not present in Group II) on land, interlocking them using interlocking shear key blocks, and banding the blocks together as a subsystem; transporting the banded subsystem to a designated construction site location for installation; repeating the steps above to build resultant systems; and removing the bands when completed (which is not present in Groups I-VII, IX).

---Continued from Previous Supplemental Box---
The special technical features of Group IX include A method of designing and implementing a water control and breaking system comprising the steps of: (a) design a water control and breaking system for resolving one or more water control problems to be encountered in a given environment (which is not present in Groups I-VIII); and (b) using a system of breakwater construction blocks (which is not present in Group II) of varying sizes and shapes (which is not present in Groups I-VIII), including the use of interlocking shear blocks (which is not present in Groups II, IV), to construct said water control and breaking system so that it resolves said one or more water control problems encountered in said given environment (which is not present in Groups I-VIII).

The common technical features of Groups I-IX include a set of construction blocks, wherein each said construction block includes (i) a central trapezoidal core portion of substantially trapezoidal cross-sectional dimensions and having sidewall surfaces, (ii) a set of four trapezoidal support legs, wherein a pair of the trapezoidal support legs are truncated at its bottom end, each said trapezoidal support leg extending from one corner of the central trapezoidal core portion in a radially-extending manner, and (iii) and a tower-type portion extending axially from the central trapezoidal core portion; and a plurality of interlocking shear key blocks, each being adapted for placement between an adjacent set of said construction blocks so as to form a closely-nested arrangement of construction blocks.

These common technical features disclosed by US 4,370,075 A (SCALES): a set of construction blocks (a plurality of grids 1 (construction blocks) are shown; figure 1), wherein each said construction block includes (i) a central trapezoidal core portion of substantially trapezoidal cross-sectional dimensions and having sidewall surfaces (trapezoidal cross-section corresponding to the generally trapezoidal prism shown in figures 5, 6, 9), (ii) a set of four trapezoidal support legs (12, 13, 15, 16; shown in figures 4, 6), wherein a pair of the trapezoidal support legs are truncated at its bottom end (as shown, legs 12-16 are truncated the bottom surface of the block; figures 7-8); each said trapezoidal support leg extending from one corner of the central trapezoidal core portion in a radially-extending manner (shown in figures 4, 6), and (iii) and a tower-type portion (raised top surface 24 (tower-type portion); figures 4, 6; column 5, lines 1-10) extending axially from the central trapezoidal core portion (shown in figures 4, 6); and a plurality of interlocking shear key blocks (38”; figures 16, 17; column 5, lines 30-35), each being adapted for placement between an adjacent set of said construction blocks so as to form a closely-nested arrangement of construction blocks (shown in figure 16).

Because the common technical features are disclosed by Scales, the inventions are not so linked as to form a single general inventive concept. Therefore, Groups I-IX lack unity.