EROSION-AND-SEDIMENT-CONTROL BLOCK AND METHOD OF MANUFACTURE

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ABSTRACT

In one aspect, the present invention relates to an erosion-and-sediment-control system. The erosion-and-sediment-control system includes a sleeve having a substantially-flat bottom surface and a fiber matrix disposed within, and substantially filling, the sleeve. A flap is formed at a first end of the sleeve. The substantially-flat bottom surface resists movement due to wave action and currents.
FIG. 1
FIG. 2
START

POSITION EROSION-CONTROL BLOCK

ARRANGE EROSION-CONTROL BLOCK GENERALLY PERPENDICULAR TO WAVE TRAVEL

POSITION SECOND EROSION-CONTROL BLOCK

CREATE SEAMLESS JOINT

ARRANGE PLURALITY OF STAKES

POUND STAKES TO APPROXIMATELY 4 INCHES ABOVE THE TOP OF THE EROSION-CONTROL BLOCK

SECURE EROSION-CONTROL BLOCKS WITH ROPE

POUND STAKES FLUSH WITH THE TOP OF THE EROSION-CONTROL BLOCK

FORM PILOT HOLES

PLACE VEGETATION

END

FIG. 4
START

ARRANGE SLEEVE AROUND OPENING

CLOSE FIRST END OF SLEEVE

FIBER MATRIX PRESSED THROUGH OPENING

FIBER MATRIX FILLS SLEEVE

SLEEVE CUT TO DESIRED LENGTH

END

FIG. 7
erosion-and-sediment-control block and method of manufacture

CROSS-REFERENCE TO RELATED APPLICATIONS


BACKGROUND

1. Field of the Invention

The present application relates generally to erosion-and-sediment-control systems, and more particularly, but not by way of limitation, to elongate, fiber-filled, erosion-and-sediment-control blocks having a substantially-flat bottom surface for increased contact with a subgrade.

2. History of the Related Art

Erosion-control devices, such as blankets and logs, are commonly utilized to reduce soil erosion and runoff from erosion-prone areas such as highway embankments or water drainage ditches (referred to as a “subgrade”). Erosion-control devices incorporate a variety of designs and may be manufactured from a variety of materials. For example, erosion-control blankets include a fibrous matting in which outer layers of netting or other material are commonly used to form an envelope or covering over a fibrous interior filler layer.

Erosion-control logs typically utilize fibers packaged within an elongate bag-type structure for reducing hydraulic energy and filtering sediment-laden runoff. A fibrous matrix is contained within the elongate bag-type structure. The erosion-control log is very porous, allowing water to pass through the fibrous matrix, which progressively slows velocity and filters sediment as the water passes through the erosion-control log’s diameter. Erosion-control logs of this type are lightweight and generally require no trenching. In addition, erosion-control logs present few disposal hassles and may be reusable while holding their shape. Erosion-control logs are commonly used in place of straw or hay bale checkers, which have been shown to be less than capable of prolonged use in heavy rains. Silt fences are another commonly utilized erosion-control device. Silt fences are generally prone to being knocked down when rain or strong winds are present, or when run over by vehicles.

The time required to pick up loose hay fibers from hay bales and/or to remove worn out, or dysfunctional silt fences imposes increased expense to contractors. Further, federal, state, and municipal regulations are increasingly requiring erosion control around construction sites.

SUMMARY

The present application relates generally to erosion-and-sediment-control systems, and more particularly, but not by way of limitation, to erosion-and-sediment-control blocks having a substantially-flat bottom surface for intimate contact with a subgrade. In one aspect, the present invention relates to an erosion-and-sediment-control system. The erosion-and-sediment-control system includes a sleeve having a substantially-flat bottom surface and a fiber matrix disposed within, and substantially filling, the sleeve. A flap is formed at a first end of the sleeve. The substantially-flat bottom surface resists movement due to wave action and currents.

In another aspect, the present invention relates to a method of installing an erosion-and-sediment-control system. The method includes positioning a first erosion-and-sediment-control block, having a substantially-flat bottom surface, along a shoreline of a body of water. A plurality of stakes are arranged on opposite sides of the first erosion-and-sediment-control block. A tether is stretched between the plurality of stakes thereby securing the first erosion-and-sediment-control block. The substantially-flat bottom surface resists movement due to wave action and currents present in the body of water.

BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the present invention and for further objects and advantages thereof, reference may now be had to the following description taken in conjunction with the accompanying drawings in which:

FIG. 1 is a perspective view of an erosion-and-sediment-control block according to an exemplary embodiment;

FIG. 2 is a perspective view of a junction between adjacent erosion-and-sediment-control blocks according to an exemplary embodiment;

FIG. 3A is a top view illustrating installation of an erosion-and-sediment-control block according to an exemplary embodiment;

FIGS. 3B-3E are illustrations of installation of an erosion-and-sediment-control block according to an exemplary embodiment;

FIG. 4 is a flow diagram of a process for installing an erosion-and-sediment-control system according to an exemplary embodiment;

FIGS. 5A-5B are cross-sectional views of arrangements of an erosion-and-sediment-control block according to an exemplary embodiment;

FIG. 5C is a front view of a stacked erosion-and-sediment-control system according to an exemplary embodiment;

FIG. 5D is an illustration of an arrangement of an erosion-and-sediment-control block according to an exemplary embodiment;

FIG. 6A is a schematic diagram of a system for manufacturing an erosion-and-sediment-control block according to an exemplary embodiment;

FIGS. 6B-6D are illustrations of a system for manufacturing an erosion-and-sediment-control block according to exemplary embodiment; and

FIG. 7 is a flow diagram of a process for manufacturing an erosion-and-sediment-control block according to exemplary embodiment.

DETAILED DESCRIPTION

Various embodiments of the present invention will now be described more fully with reference to the accompanying drawings. The invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein.

FIG. 1 is a perspective view of an erosion-and-sediment-control block according to an exemplary embodiment. An erosion-and-sediment-control block 100 includes a sleeve 102 filled with a fiber matrix 104. The sleeve 102 has a generally rectangular cross-sectional shape including a substantially-flat bottom surface 108. The substantially-flat bottom surface 108 allows the erosion-and-sediment-control block 100 to have increased intimate contact with a subgrade.
(not shown) and prevents shifting of the erosion-and-sediment-control block 100 due to currents or wave action present in, for example, a body of water (not shown). In a typical embodiment, the sleeve 102 is constructed from a biodegradable material such as, for example, cotton, jute, or other appropriate material; however, in other embodiments, the sleeve 102 may be constructed from a synthetic material. A flap 106 is disposed at one end of the erosion-and-sediment-control block 100. In a typical embodiment, the flap 106 is formed of the same material as the sleeve 102; however, in alternative embodiments, other materials may be utilized. The flap 106 allows formation of a seamless joint between the erosion-and-sediment-control block 100 and an adjacent erosion-and-sediment-control block (not shown).

[0024] Still referring to FIG. 1, the fiber matrix 104 is entirely contained in the sleeve 102. In a typical embodiment, the fiber matrix 104 includes curled interlocking fibers with barbed edges (not shown). The barbed edges cause the curled interlocking fibers to cling to each other thus lending strength and stability to the erosion-and-sediment-control block 100. The fiber matrix 104 may be constructed from, for example, wood wool. Wood wool, also known as “excelsior,” is a product constructed from wood shavings cut from logs. In a typical embodiment, the fiber matrix 104 is constructed from wood wool of, for example, Great Lakes Aspen, or other appropriate wood. The fiber matrix 104 is porous, thus allowing water and other fluids to easily pass therethrough. The curled interlocking fibers progressively slow velocity and filter sediment as the water or other fluid passes through a width of the erosion-and-sediment-control block 100. In a typical embodiment, the fiber matrix 104 is bio-compatible and able to foster vegetation growth.

[0025] FIG. 2 is a perspective view of a junction between adjacent erosion-and-sediment-control blocks. As shown in FIG. 2, a first erosion-and-sediment-control block 202 is positioned to abut a second erosion-and-sediment-control block 204 in, for example, an end-to-end fashion; however, in alternative embodiments, other arrangements could be utilized. A flap 206 extends from a first end 205 of the first erosion-and-sediment-control block 202. As shown in FIG. 2C, the flap 206 is stretched over a second end 207 of the second erosion-and-sediment-control block 204 and secured thereto. As shown in FIG. 2D, the flap 206 thus creates a seamless joint between the first erosion-and-sediment-control block 202 and the second erosion-and-sediment-control block 204. Although FIG. 2 depicts the first erosion-and-sediment-control block 202 and the second erosion-and-sediment-control block 204, one skilled in the art will recognize that, in other embodiments, any number of erosion-and-sediment-control blocks may be utilized.

[0026] FIG. 3A is a top view illustrating installation of an erosion-and-sediment-control system according to an exemplary embodiment. The erosion-and-sediment-control system 300 includes the first erosion-and-sediment-control block 202 positioned to abut the second erosion-and-sediment-control block 204 and a plurality of stakes 302 arranged alongside the first erosion-and-sediment-control block 202 and the second erosion-and-sediment-control block 204. The first erosion-and-sediment-control block 202 is positioned near a shore line of a body of water 308 such as, for example, a lake, a river, a stream, or other body of water. In a typical embodiment, a long axis 306 of the first erosion-and-sediment-control block 202 is positioned generally parallel to a direction of a current 310 of the body of water 308 and generally perpendicular to a direction of wave travel 312 in the body of water 308.

[0027] Still referring to FIG. 3A, the second erosion-and-sediment-control block 204 is positioned to abut the first erosion-and-sediment-control block 202 in an end-to-end fashion. The second erosion-and-sediment-control block 204 is secured to the first erosion-and-sediment-control block 202 to form a seamless joint in a manner similar to that described above with respect to FIG. 2. Although FIG. 3A illustrates the erosion-and-sediment-control system 300 as including the first erosion-and-sediment-control block 202 and the second erosion-and-sediment-control block 204, one skilled in the art will recognize that erosion-and-sediment-control systems utilizing principles of the invention may include any number of erosion-and-sediment-control blocks. Further, erosion-and-sediment-control systems utilizing principles of the invention may include a single erosion-and-sediment-control block such as, for example, the first erosion-and-sediment-control block 202.

[0028] FIGS. 3B-3E are illustrations of installation of an erosion-and-sediment-control block according to an exemplary embodiment. Referring to FIGS. 3A-3E, the plurality of stakes 302 are positioned on opposite sides of the first erosion-and-sediment-control block 202 and the second erosion-and-sediment-control block 204. In a typical embodiment, the plurality of stakes 302 extend into a sub-grade (not explicitly shown) approximately twenty-four inches. As shown in FIG. 3B, a rope 304 is wrapped around, and stretched between, each stake of the plurality of stakes 302, thus securing the first erosion-and-sediment-control block 202 and the second erosion-and-sediment-control block 204 to the sub-grade. In a typical embodiment, the rope 304 is stretched between each stake of the plurality of stakes 302 to form an approximate “saw-tooth” pattern; however, other securement patterns could be utilized. The substantially-flat bottom surface 108 (shown in FIG. 1) provides intimate contact with the subgrade. The substantially-flat bottom surface 108 resists rolling due to current and wave action within the body of water 308. As shown in FIG. 3C, a plurality of pilot holes 314 are formed in the first erosion-and-sediment-control block 202 and the second erosion-and-sediment-control block 204. As shown in FIG. 3D, the plurality of pilot holes 314 may be formed via, for example, driving a cylindrical rod through at least one of the first erosion-and-sediment-control block 202 and the second erosion-and-sediment-control block 204. As shown in FIG. 3E, in a typical embodiment, vegetation may be planted in the plurality of pilot holes 314. During operation, the fiber matrix 104 (illustrated in FIG. 1) allows the vegetation to take root. The fiber matrix 104 also prevents erosion of the sub-grade, which is harmful to vegetative growth. As the vegetation grows and becomes capable of preventing erosion of the subgrade, the erosion-and-sediment-control system 300 breaks down and biodegrades. Thus, in a typical embodiment, once installed, the erosion-and-sediment-control system 300 does not need to be removed.

[0029] FIG. 4 is a flow diagram of a process for installing an erosion-and-sediment-control system according to an exemplary embodiment. A process 400 begins at step 402. At step 404 an erosion-and-sediment-control block such as, for example, the first erosion-and-sediment-control block 202, is positioned along a shore line of the body of water 308. At step 406, the first erosion-and-sediment-control block 202 is
arranged such that the long axis 306 of the first erosion-and-sediment-control block 202 is generally perpendicular to the direction of wave travel 312. At step 407, the second erosion-and-sediment-control block 204 is positioned to abut the first erosion-and-sediment-control block 202 in an end-to-end fashion. At step 408, a seamless joint is formed between the first erosion-and-sediment-control block 202 and the second erosion-and-sediment-control block 204. [0045] At step 410, the plurality of stakes 302 are arranged on opposite sides of the first erosion-and-sediment-control block 202 and the second erosion-and-sediment-control block 204. At step 411, the plurality of stakes 302 are driven into the subgrade until a top of the plurality of stakes 302 is approximately 4 inches above a top surface of the first erosion-and-sediment-control block 202 and the second erosion-and-sediment-control block 204.

Still referring to FIG. 4, at step 412, the rope 304 is wrapped around, and stretched between, each stake of the plurality of stakes 302 thereby securing the first erosion-and-sediment-control block 202 and the second erosion-and-sediment-control block 204 to the subgrade. At step 413, the plurality of stakes 302 are driven into the subgrade until the top of the plurality of stakes 302 is approximately flush with the top surface of the first erosion-and-sediment-control block 202 and the second erosion-and-sediment-control block 204. At step 414, a plurality of pilot holes 314 are formed in the first erosion-and-sediment-control block 202 and the second erosion-and-sediment-control block 204. At step 416, vegetation is secured within the plurality of pilot holes 314. The process 400 ends at step 418. Although the process 400 describes utilizing the first erosion-and-sediment-control block 202 and the second erosion-and-sediment-control block 204, one skilled in the art will recognize that processes utilizing principles of the invention may utilize any number of erosion-and-sediment-control blocks including a single erosion-and-sediment-control block. In embodiments utilizing a single erosion-and-sediment-control block, steps 407-408 are omitted.

FIGS. 5A-5B are cross-sectional views of various arrangements of an erosion-and-sediment-control block according to exemplary embodiments. As shown in FIG. 5A, a trench 502 is formed to accommodate the erosion-and-sediment-control block 500. A secondary erosion-control device 503 such as, for example, an erosion control net or blanket is utilized in conjunction with the erosion-and-sediment-control block 500. As illustrated in FIG. 5A, such an arrangement is advantageous in applications where a subgrade 501 is sloped. In a typical embodiment, when the subgrade 501 is sloped less than or approximately equal to 4%, the trench 502 extends to a depth of approximately one-half of a height of the erosion-and-sediment-control block 500. When the subgrade 501 is sloped greater than or approximately equal to 5%, the trench 502 extends to a depth of approximately two-thirds of the height of the erosion-and-sediment-control block 500. In various embodiments, a second erosion-and-sediment-control block (not shown) may be stacked above the erosion-and-sediment-control block 500. Such an arrangement is necessary when the erosion-and-sediment-control block 500 is not taller than a mean high-water level of a body of water 508.

FIG. 5B illustrates use of multiple rows of erosion-and-sediment-control blocks. As illustrated in FIG. 5B, a first trench 552 is formed in a subgrade 560 adjacent to a shoreline 555 and a second trench 554 is formed uphill of the first trench 552. A first erosion-and-sediment-control block 556 is placed in the first trench 552 and the second erosion-and-sediment-control block 558 is placed in the second trench 554 thus creating a terraced subgrade 560. FIG. 5D is a photographic illustration of the arrangement described with respect to FIG. 5B.

FIG. 5C is a front view of a stacked erosion-and-sediment-control system according to an exemplary embodiment. An erosion-and-sediment-control system 570 includes a first erosion-and-sediment-control block 572, a second erosion-and-sediment-control block 574, and a third erosion-and-sediment-control block 576. As illustrated in FIG. 5C, the third erosion-and-sediment-control block 576 is arranged to span a joint formed between the first erosion-and-sediment-control block 572 and the second erosion-and-sediment-control block 574. Such an arrangement reduces unfiltered passage of water through the first erosion-and-sediment-control block 572, the second erosion-and-sediment-control block 574, and the third erosion-and-sediment-control block 576.

FIGS. 6A is a schematic diagram of a system for manufacturing an erosion-and-sediment-control block according to exemplary embodiment. FIGS. 6B-6D are illustrations of a system for manufacturing an erosion-and-sediment-control block according to exemplary embodiment. Referring to FIGS. 6A-6D, a manufacturing system 600 includes a table 602 arranged adjacent to a press 604. As shown in FIGS. 6A and 6C, the table 602 may be a conveyor table. As shown in FIG. 6C, during operation, the sleeve 102 is arranged around an opening 603 of the press 604. In a typical embodiment, a cone 607 (shown in FIG. 6D) may be attached to the opening 603 to assist positioning of the sleeve 102. A first end 605 of the sleeve 102 is closed through a process such as, for example, tying, sewing, or other appropriate closure method. The fiber matrix 104 is pressed through the opening 603 by the press 604. The opening 603 imparts a generally rectangular cross-sectional shape to the fiber matrix 104. The generally rectangular cross-sectional shape of the fiber matrix 104 causes the sleeve 102 to also assume a generally rectangular cross-sectional shape. The fiber matrix 104 fills the sleeve 102 causing the sleeve 102 to extend down the table 602 in a direction away from the opening 603. When the sleeve 102 reaches a desired length, the sleeve 102 is cut thus forming an erosion-and-sediment-control block such as, for example, the erosion-and-sediment-control block 100 (shown in FIG. 4). In a typical embodiment, the press 604 may be, for example, a hydraulic press, a pneumatic press, a mechanical press, or a manual press.

FIG. 7 is a flow diagram of a process for manufacturing an erosion-and-sediment-control block according to exemplary embodiment. A process 700 begins at step 702. At step 704, the sleeve 102 is arranged around the opening 603. At step 706, the first end 605 of the sleeve 102 is closed around the opening 603. At step 708, the press 604 presses the fiber matrix 104 through the opening 603 into the sleeve 102. The opening 603 imparts a generally rectangular cross-sectional shape to the fiber matrix 104. The generally rectangular cross-sectional shape of the fiber matrix 104 causes the sleeve 102 to also take on a generally rectangular cross-sectional shape. At step 710, the fiber matrix 104 fills the sleeve 102. At step 712, the sleeve 102 is cut to a desired length thus forming an erosion-and-sediment-control block such as, for example, the erosion-and-sediment-control block 100. The process 700 ends at step 714.
Although various embodiments of the method and system of the present invention have been illustrated in the accompanying Drawings and described in the foregoing Specification, it will be understood that the invention is not limited to the embodiments disclosed, but is capable of numerous rearrangements, modifications, and substitutions without departing from the spirit and scope of the invention as set forth herein. It is intended that the Specification and examples be considered as illustrative only.

What is claimed is:

1. An erosion-and-sediment-control system comprising: a sleeve comprising a substantially-flat bottom surface; a fiber matrix disposed within, and substantially filling, the sleeve; a flap formed at a first end of the sleeve; and wherein the substantially-flat bottom surface resists movement due to wave action and currents.

2. The erosion-and-sediment-control system of claim 1, comprising:
a second sleeve comprising a second substantially-flat bottom surface, the second sleeve positioned adjacent to the first end of the sleeve; a second fiber matrix disposed within, and substantially filling, the sleeve; wherein the flap facilitates formation of a seamless joint between the sleeve and the second sleeve.

3. The erosion-and-sediment-control system of claim 2, wherein the sleeve and the second sleeve abut each other in an end-to-end fashion.

4. The erosion-and-sediment-control system of claim 1, wherein the sleeve is biodegradable.

5. The erosion-and-sediment-control system of claim 1, wherein the fiber matrix comprises curled interlocking fibers with barbed edges.

6. The erosion-and-sediment-control system of claim 5, wherein the fiber matrix is wood wool.

7. The erosion-and-sediment-control system of claim 1, comprising:
a plurality of stakes disposed on either side of the sleeve; a tether stretched between individual stakes of the plurality of stakes, the tether and the plurality of stakes together securing the sleeve to a subgrade.

8. A method of installing an erosion-and-sediment-control system, the method comprising:
positioning a first erosion-and-sediment-control block comprising a substantially-flat bottom surface along a shoreline of a body of water; arranging a plurality of stakes on opposite sides of the first erosion-and-sediment-control block; stretching a tether between the plurality of stakes thereby securing the first erosion-and-sediment-control block; and wherein the substantially-flat bottom surface resists movement due to wave action and currents present in the body of water.

9. The method of claim 8, comprising forming a plurality of holes through the first erosion-and-sediment-control block.

10. The method of claim 9, comprising establishing foliage within at least one hole of the plurality of holes.

11. The method of claim 8, comprising positioning a second erosion-and-sediment-control block adjacent to the first erosion-and-sediment-control block, the second erosion-and-sediment-control block abutting the first erosion-and-sediment-control block in an end-to-end fashion.

12. The method of claim 8, wherein the first erosion-and-sediment-control block is positioned such that a long axis of the first erosion-and-sediment-control block is generally perpendicular to a direction of wave travel.

13. The method of claim 8, comprising forming a trench for receipt of the first erosion-and-sediment-control block.

14. The method of claim 13, wherein a second erosion-and-sediment-control block is positioned above the first erosion-and-sediment-control block.

15. A method of manufacturing an erosion-and-sediment-control block, the method comprising:
positioning a sleeve around an opening of a press; closing a first end of the sleeve so as to cover the opening; pressing, via the press, a fiber matrix into the sleeve, the press imparting a generally rectangular shape to the fiber matrix; and cutting the sleeve.

15. The method of claim 15, comprising attaching a cone to the opening of the press, the cone facilitating the positioning of the sleeve.

16. The method of claim 15, wherein the closing comprises tying the first end of the sleeve.

17. The method of claim 15, wherein the pressing imparts a generally rectangular shape to the erosion-and-sediment-control block.

18. The method of claim 15, wherein the cutting occurs when the sleeve reaches a desired length.

19. The method of claim 15, comprising filling the sleeve with the fiber matrix.

20. The method of claim 15, wherein the steps are performed in the order listed.

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