(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 671 789 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
11.12.2013 Bulletin 2013/50

(21) Application number: **11857877.2**

(22) Date of filing: **22.12.2011**

(51) Int Cl.:
B63B 21/56 *(2006.01)*

(86) International application number:
PCT/BR2011/000486

(87) International publication number:
WO 2012/103612 (09.08.2012 Gazette 2012/32)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(30) Priority: **02.02.2011 BR PI1100190**

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(54) DEVICE AND METHOD FOR TRANSPORTING EQUIPMENT AND THE LIKE THROUGH THE SURF ZONE

(57) A device and method are disclosed for transporting equipment and the like, through the surf zone. The device (1) and respective transport method (M) use a specially designed anchor (3) and sling (4), the anchor (3) carrying a cable (5), the free ends of which remain on the beach or similar location (P), thus allowing equipment (AP) and other articles to be transported between the beach (P) and the region beyond the surf area (ZA) of sandy beaches, dispensing with the use of boats for that purpose. The technical field encompasses any activity performed in the vicinity of the surf area, such as recreational and professional fishing, coastal engineering works, such as measurement of shore profiles in the submerged part thereof, marine geology, detection of nutrients or pollutants near the surf area, physical oceanography, marine biology and dynamic sedimentation processes, among many others.

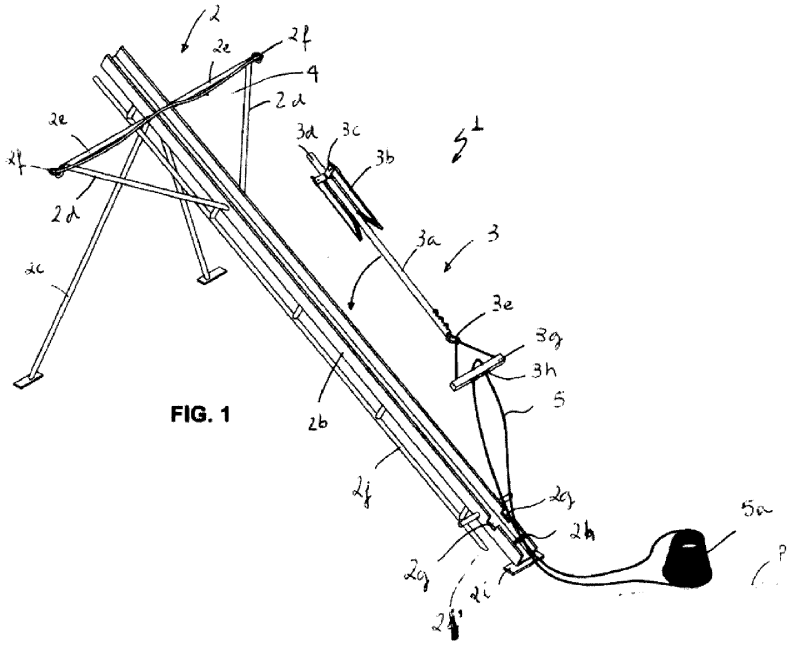

FIG. 1

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Description

TECHNICAL FIELD

[0001] The present invention relates to a device and method for transporting equipment and the like through the surf zone, more particularly, the device and respective transport method comprise a specially designed anchor and sling, the anchor carrying a cable, the free ends of which remain on the beach, thus allowing equipment and other articles to be transported between the beach and the region beyond the surf area of sandy beaches, dispensing with the use of boats for that purpose. The technical field encompasses any activity performed in the vicinity of the surf area, such as recreational and professional fishing, coastal engineering works, such as measurement of shore profiles in the submerged part thereof, marine geology, detection of nutrients or pollutants near the surf area, physical oceanography, marine biology and dynamic sedimentation processes, among many others.

BACKGROUND OF THE ART

[0002] The coastal area is a very dynamic region where bathymetric variations occur continuously due to the action of waves, wind and sea currents.

[0003] It is known that the sandy beach ecosystem, such as the coastal area, is formed by waves actively reworking the sediment, that is, it is a highly unstable region ranging from the mesolittoral or intertidal region up to approximately 20 m depth. It is known by the skilled in the art that sandy beaches are affected by aeolian, hydraulic and biological processes and, as a consequence, undergo morphological changes and sediment exchanges with nearby regions. These sediments are composed almost entirely of sand, of various sizes, such as coarse sands and fine sands.

[0004] The surf zone, in turn, can be defined as the portion of the beach profile where the breaking phenomenon occurs. As the breaking event occurs, the energy contained in the waves is dissipated, wherein the height of the breaking wave is limited by the depth.

[0005] Despite the great importance of the coastal processes responsible for relocating the sediments, many questions still remain unanswered on the main operating processes. One of the main obstacles to verifying the large number of theories found in the literature lies in the difficulty in obtaining measurements of the submerged beach profile.

ANALYSIS OF THE STATE OF THE ART

[0006] Conventional bathymetric survey techniques employing amphibious ships or hydrographic boats usually entail prohibitive costs in order to obtain profiles at the time scales of interest, which range from days to years. Additionally, these techniques are highly dependent on the sea state, which does not allow surveys in case of big waves, just when the sediment transport processes occur more intensely.

[0007] Techniques for determining submerged profiles can be generally divided into two types, namely, remote and 'in situ'. Remote techniques have as a chief advantage their large spatial coverage without the discontinuities typical of 'in situ' profiling techniques. However, remote techniques do not provide a direct measurement of the bathymetry of the beach, requiring interpretation on the data.

[0008] On the other hand, conventional 'in situ' techniques, such as those employing amphibious ships, sonar or topographic leveling, are able to directly measure the bathymetry. Among the various 'in situ' techniques for measuring beach profiles found in the literature, all of them suffer from one or more of the following limitations: (i) dependence on the sea state, (ii) the inability to obtain the profile in more than one position due to the employment of structures fixed to the seabed; (iii) high operating cost per measured profile; (iv) cannot be employed due to the access to the beach or due to the presence of bathers; (v) risk of vandalism by the use of materials that remain on the beach; (vi) inability to determine the beach cross-sectional profile due to drift caused by the sea currents. In view of these restrictions, this application seeks to provide a new methodology by which the limitations listed above are eliminated or mitigated, and particularly, at reasonable costs.

BRIEF DESCRIPTION OF THE INVENTION

[0009] The present invention innovates by providing a new device and method for transporting equipment and the like through the surf zone.

[0010] The device is simple to manufacture, being formed by an anchor and sling specially designed for the operation of transposing the surf zone.

[0011] The method, in turn, consists in launching the anchor from the beach face, passing over the surf zone, at a distance of approximately 656 ft (200 m). The anchor carries a double cable whose ends remain on the beach. After the anchor bites into the sand bottom, the ends of the cable are extended while keeping a line orthogonal to the beach face. The anchor is pulled from the beach by the cable, driving into the seabed, thus forming an anchoring member so that various appliances and equipment, including in particular measuring devices, can be carried by the cables between the beach and the seabed, allowing several measurements in the desired area to be performed.

[0012] Upon the withdrawal of the anchor, said appliances and equipment are returned to the beach by pulling the cable and are replaced by floats, which when driven towards the anchor, are forced, by their very floating nature, to remain on the water surface, setting the cable attached to the anchor in the vertical direction, causing its release from the seabed, thereby allowing it to be re-

trieved.

[0013] In order to meet the operation needs, the anchor employed must play two key roles. Firstly, during the launch, it should follow a ballistic trajectory (a parabolic arc), reaching a previously determined location. As a second critical condition, when reaching the ground, the anchor must have a high biting capacity, allowing the cable to remain properly tensioned. Since there are no anchors with these characteristics in the market, prototypes were developed aiming to incorporate the required needs into the design.

[0014] The weight of the anchor is a function of the amount of cable that needs to be launched. Preferably, 1.312 ft (400 m) of 6 mm polyester cable weigh around 3 kg, which is the ideal weight of the anchor. A lower weight would render it impossible to load the cable, whereas a weight superior to this value would reduce the shooting range. In order that the anchor has aerodynamic stability and keeps its route, its center of gravity must be located at the back portion, where its movable arms are located. The four arms have a similar movement to an umbrella, standing in the closed position during the flight, then being opened when the anchor touches the sand bottom. Upon opening, as the cable is extended, they keep it on the ideal position to be easily driven into the ground. It is also necessary that, along its rod, the anchor presents surfaces which allow the elastic strips of the sling to be attached.

[0015] The sling, in turn, is the structure that allows the anchor to be launched from the beach passing over the surf zone. In order that it can be easily transported on foot, thus facilitating the access to any beach, it is important to specify its length and weight. It is also crucial that its operation is simple, inexpensive and enables easy maintenance. A sling operating by spring action or compressed air does not meet these requirements; accordingly, a more interesting option would be the employment of low-cost elastic strips, as seen in the sling disclosed herein.

[0016] The weight of the sling, of approximately 15 kg, enables it to be transported by a single person. Its length of 3.0 m meets the compromise between transport convenience and shooting range. This length is ideal so that the structure is not long enough to make it impossible for it to be transported in a car, neither is too short so that its acceleration trail is insufficient. Another important factor, the maximum shooting range, is reached when the launch angle is 45 degrees, which is maintained through two movable supports attachable to the main body of the sling. Both the two supports and the main structure of the sling have tapered ends which allow the assembly to be firmly buried into the sand, ensuring a reliable shooting.

[0017] Many models of anchors and slings are known, such as shown in documents PI 9900165-9, PI 9510045-8, MU 5701052, MU 6801780, and the like, though not being relevant as prior art, since they do not have the characteristics necessary and fundamental to the objectives proposed in the present invention.

OBJECTIVES AND ADVANTAGES OF THE INVENTION

[0018] The main advantage of the present invention is the possibility of transporting an apparatus along the surf zone, even in the event of high energy waves. Having in mind, therefore, that the surf zone is an area of extreme importance for any activity carried out in the coastal region, the applicants consider to be extremely difficult any work operation in this region due to wave breaking. Thus, the device and method proposed herein comprises an operation performed entirely on the beach face, thus allowing it to be carried out in any sea state.

[0019] It is an objective of this invention to provide a device and a respective method for measuring submerged beach profiles at low cost. The investment in the manufacture of the device is relatively small as compared with some of the techniques found in the scientific literature.

[0020] Another objective of the invention consists in the fact that, since the device is fully installed on the face of the beach, the procedure and method of launching equipment can be used in any sea condition. The materials are lightweight and portable, enabling the access to any beach to occur easily.

[0021] Another objective consists in the fact that the assembly operation of the sling and the launch of the anchor can be performed by only two persons, and the material is easily transportable in a car.

[0022] Another objective consists in the fact that the anchor was designed to be employed in any sea condition, since the entire operation is performed on the beach and there is no need to cross the surf zone with any kind of vessel or person.

[0023] Another objective of this invention is to allow multiple profiles to be obtained in a short time at different points of the beach.

DESCRIPTION OF THE DRAWINGS

[0024] Complementary to the present disclosure in order to give a better understanding of the features of the present invention and according to a preferred embodiment thereof, a set of drawings accompanying the description is appended herein, by way of example and not by way of limitation, in which:

Figure 1 shows an exploded perspective view of the device comprised of the sling and anchor performing the innovative method;

Figure 2 shows another view of the assembled device, able to allow the launch of the anchor;

Figures 2.1 and 2.2 represent forms of mooring the anchor before the launch, wherein the elastic strips are responsible for determining the launching distance;

Figures 3, 4 and 5 illustrate steps of launching the anchor until its driving into the seabed;

Figure 6 is a perspective schematic representation of the use of the device and respective method shown herein upon surpassing the surf zone of a beach;

Figures 7 and 7.1 illustrate another perspective schematic view of the form of use of the device after the fixation of the anchor into the seabed for the transport of appliances and equipment through the surf zone;

Figures 8 and 8,1 show, in another schematic view, the manner in which the anchor is withdrawn from the seabed by means of floats.

DETAILED DESCRIPTION

[0025] According to the illustrations, the present invention relates to a "DEVICE AND METHOD FOR TRANSPORTING EQUIPMENT AND THE LIKE THROUGH THE SURF ZONE", where more precisely, the device (1) is formed by a sling (2) and an anchor (3), specifically designed to carry out a method (M) of launching the anchor (3) from the beach face or a similar place (P), passing over the surf zone (ZA), at a distance of approximately 656 ft (200 m).

[0026] The sling (2) is formed by a structure which includes a longitudinal rail (2b), preferably having a U-shaped section, the front end of which is firmly supported or pivotally attached to a tubular support (2c). Said rail provides two side arms (2d), arranged at an angle equidistant from the longitudinal axis by means of cross members (2e), forming symmetrical ends (2f) for fixing elastic tensioners (4).

[0027] Near the other end of the rail (2b) are provided two symmetrical recesses (2g), each of which made on a wall of the rail, and a center eyelet (2h), as well as a shoe (2i) for supporting on the beach ground (P). Said rail (2b) preferably provides a reinforcing structure (2j) arranged on the bottom surface thereof, the lower end (2j') of which has the function of assisting the shoe (2i) in supporting.

[0028] The anchor (3), in turn, is formed by a tube (3a), and provides, at one end thereof, at least four flukes (3b) mounted on respective bearings (3c), which flukes open automatically under the actuation of a mechanical pin (3d) immediately after it is pushed into the interior of said tube (3a), for example, when said anchor reaches the seabed (FM). The other end of the tube (3a) provides an eyelet (3e) responsible for carrying a locking member (3g), sized to fit in the recesses (2g) of the rail. Said lock (3g) is provided with means (3h) that allow the passage of a cable (5) which, in turn, also traverses the eyelet (2h) of the sling (2) and has its free ends (5a) anchored on the beach (P). Near the end of the eyelet (3e) the tube (3a) is provided with at least three hooking points (3i) to support at least one elastic strip (4) of the sling (2).

[0029] In a preferred embodiment, the weight of the anchor (3) is about 3 kg, corresponding to a 6 mm polyester cable (5) having at least 1.312 feet (400 meters).

[0030] In another preferred embodiment, the sling (2) has a length of 9,8 feet (3,0 meters) and a weight of about 15 kg, which allows it to be transported by a single person.

[0031] The method (M) for transporting an apparatus through the surf by means of the device (1) consists of some steps as defined below:

a) Mounting the sling (2) and the anchor (3) positioned in the rail (3b) on the ground area of the beach or similar location (P) orthogonally to the surf zone (ZA);

b) Hooking at least one of the elastic strips (4) on the hooking point (31) of the anchor and pulling it until the locking member (3g) can be fit into the recesses (2g) of the sling;

c) Launching the anchor (3) from the beach face (p), passing over the surf zone (ZA), at a distance (x) of at least 656 ft (200 m) and at a suitable depth (y);

d) After the anchor (3) bites into the seabed (FM) (see figures 3 and 4), the ends of the cable (5) are extended (figure 5) by keeping a line orthogonal to the beach face (P), while the anchor is pulled from the beach by the cable (5), driving into the seabed (FM);

e) With the anchor (3) stationary on the seabed (FM), it forms an anchoring member for the transport (T1) of appliances and equipment, generally including measuring devices, by means of the cable (5) between the beach (P) and the seabed (FM) (see figures 7 and 7.1);

f) For withdrawing the anchor (3), once the works are complete, the appliances and equipment (AP) are returned to the beach (P) by pulling (T2) the cable (5);

g) The appliances (AP) are replaced by floats (6) (see figures 8 and 8.1), which when driven towards the anchor (3) through the cable (5), are forced, by their very floating nature, to remain on the surface of the water, setting the cable attached to the anchor (3) in the vertical direction (V), causing its release from the seabed (FM), thereby allowing it to be retrieved to the beach (P).

[0032] It is apparent that, when practicing the present invention, modifications may be made regarding certain construction details and its form, without thereby departing from the fundamental principles clearly set out in the claims, and it is intended that the terminology used is for descriptive purposes only and should not be construed in a limiting sense.

Claims

1. Device and method for transporting equipment and the like through the surf zone, **characterized in that**

the device (1) is formed by a sling (2) and an anchor (3), designed to carry out a method (M) of launching the anchor (3) from the beach face or a similar place (P), passing over the surf zone (ZA), preferably at a distance of approximately 656 ft (200 m); said anchor (3) having a cable (5) which transports appliances and equipment (AP) through the surf zone (ZA).

2. Device, according to claim 1, **characterized in that** the sling (2) is formed by a structure which includes a longitudinal rail (2b), preferably having a U-shaped section, the front end of which is firmly supported or pivotally attached to a tubular support (2c); said rail providing two side arms (2d), arranged at an angle equidistant from the longitudinal axis by means of cross members (2e), forming symmetrical ends (2f) for fixing elastic tensioners (4); near the other end of the rail (2b) being provided two symmetrical recesses (2g), each of which made on a wall of the rail, and a center eyelet (2h), as well as a shoe (2i) for supporting on the beach ground (P); said rail (2b) preferably providing a reinforcing structure (2j) arranged on the bottom surface thereof, the lower end (2j') of which being supported on the beach ground (2i).

3. Device, according to claims 1 and 2, **characterized in that** the sling (2) has a length of 9,8 feet (3,0 meters) and a weight of about 15 kg.

4. Device, according to claim 1, **characterized in that** the anchor (3) is formed by a tube (3a), and provides, at one of its ends, at least four flukes (3b) mounted on respective bearings (3c), which flukes open automatically under the actuation of a mechanical pin (3d) immediately after it is pushed into the interior of said tube (3a) when said anchor reaches the seabed (FM); the other end of the tube (3a) providing an eyelet (3e) responsible for carrying a locking element (3g), sized to fit into the recesses (2g) of the rail; said locking member (3g) being provided with means (3h) that allow the passage of a cable (5) which, in turn, also traverses the eyelet (2h) of the sling (2) and has its free ends (5a) anchored on the beach (P); near the end of the eyelet (3e) the tube (3a) being provided with at least three hooking points (3i) to support at least one elastic strip (4) of the sling (2).

5. Device, according to claims 1 and 4, **characterized in that** the weight of the anchor (3) is 3 kg, corresponding to a 6 mm polyester cable (5) having at least 1.312 feet (400 meters).

6. Method for transporting equipment and the like, through the surf zone, according to any one of the preceding claims, **characterized in that** the method (M) utilizes the device (1) and consists of the following steps:

a) Mounting the sling (2) and the anchor (3) positioned in the rail (3b) on the ground area of the beach or similar location (P) orthogonally to the surf zone (ZA);

b) Hooking at least one of the elastic strips (4) on the hooking point (31) of the anchor and pulling it until the locking element (3g) can be fit into the recesses (2g) of the sling;

c) Launching the anchor (3) from the beach face (p), passing over the surf zone (ZA), at a distance (x) of at least 200 m and at a suitable depth (y);

d) After the anchor (3) bites into the seabed (FM) the ends of the cable (5) are extended by keeping a line orthogonal to the beach face (P), while the anchor is pulled from the beach by the cable (5), driving into the seabed (FM);

e) With the anchor (3) stationary on the seabed (FM), it forms an anchoring member for the transport (T1) of appliances and equipment, generally including measuring devices, by means of the cable (5) between the beach (P) and the seabed (FM);

f) For withdrawing the anchor (3), once the works are complete, the appliances and equipment (AP) are returned to the beach (P) by pulling (T2) the cable (5);

g) The appliances (AP) are replaced by floats (6), which when driven towards the anchor (3) through the cable (5), are forced, by their very floating nature, to remain on the surface of the water, setting the cable attached to the anchor (3) in the vertical direction (V), causing its release from the seabed (FM) and retrieving it to the beach (P).

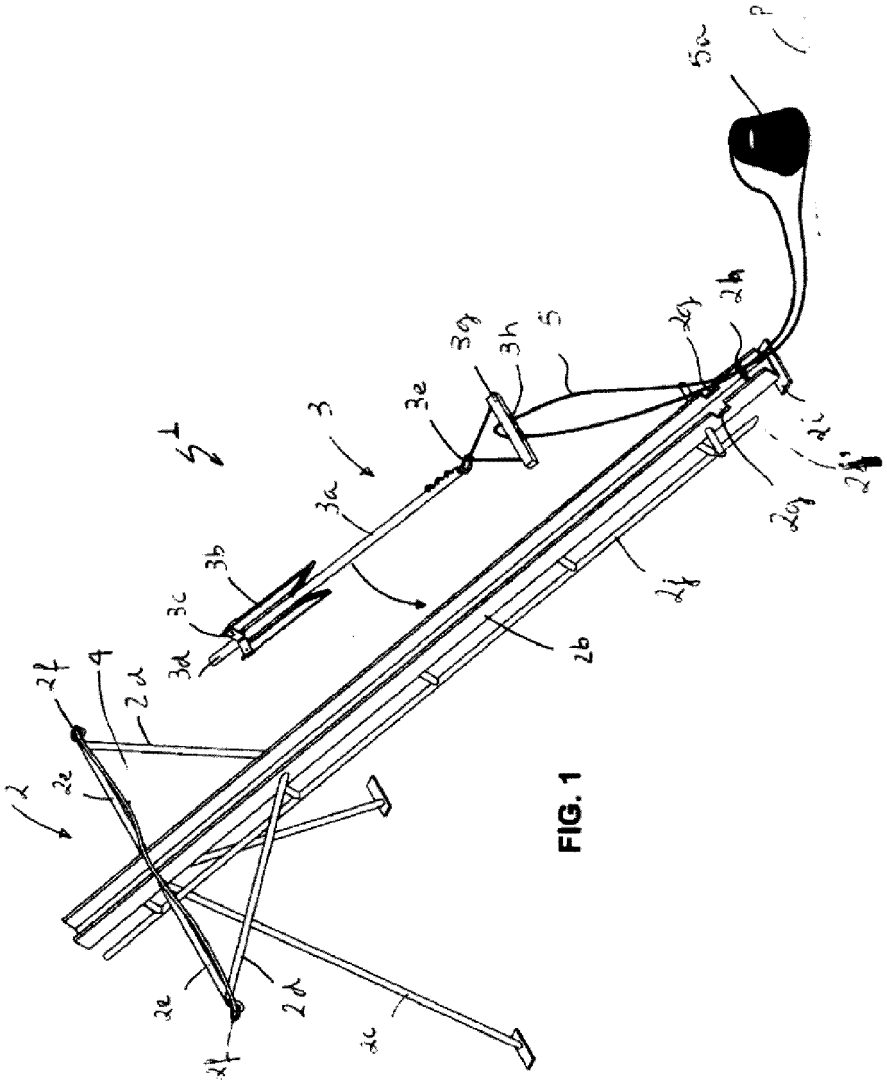

FIG. 1

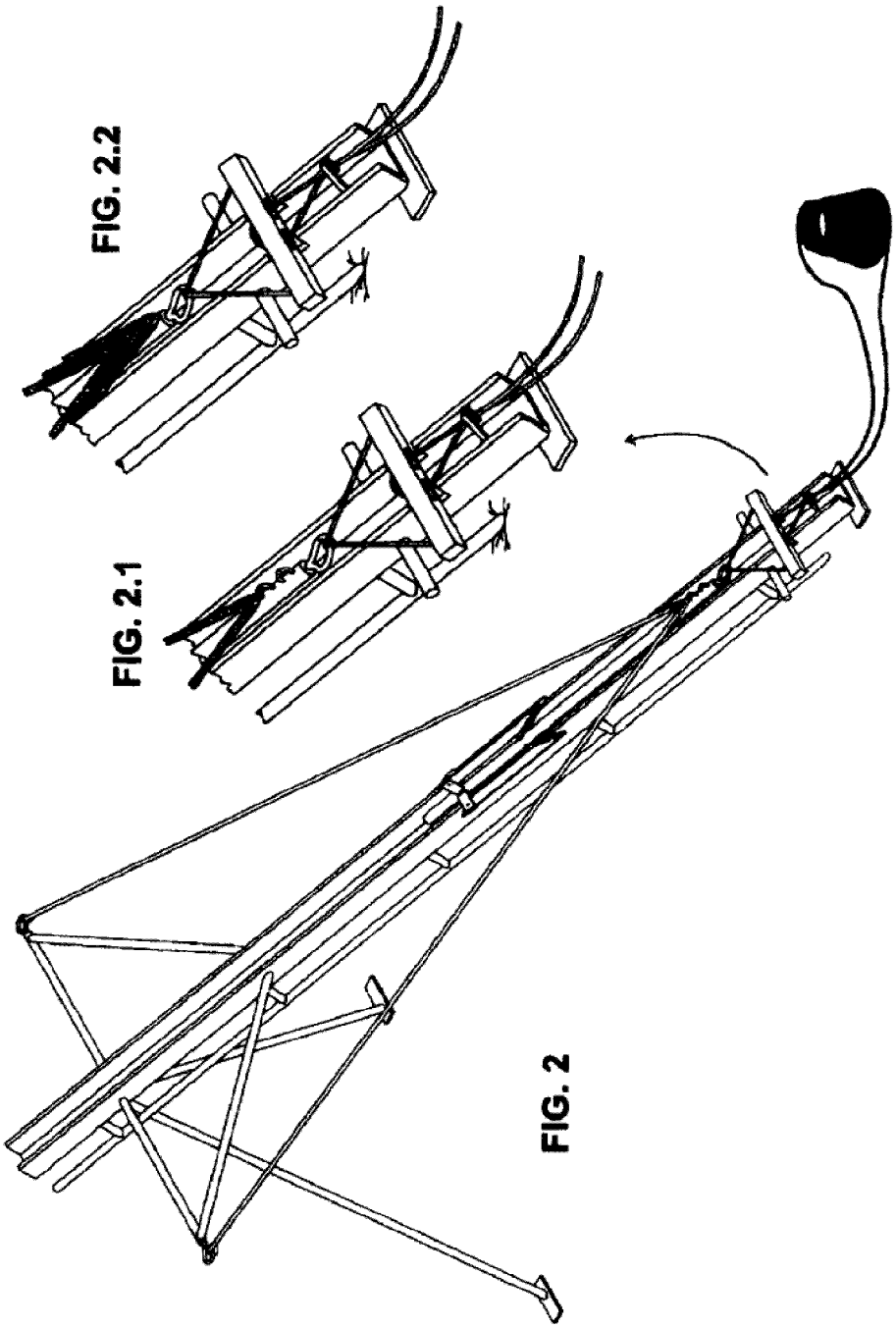

FIG. 2.2

FIG. 2.1

FIG. 2

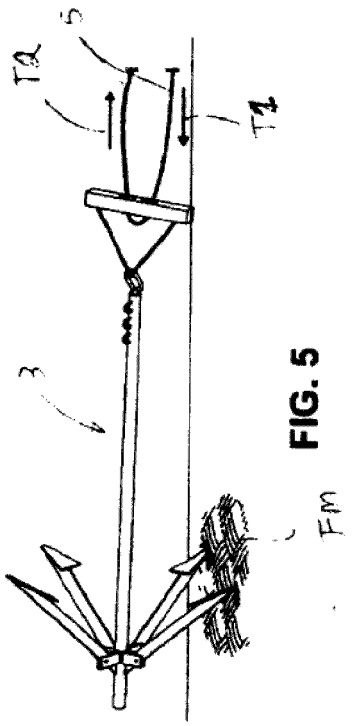

FIG. 5

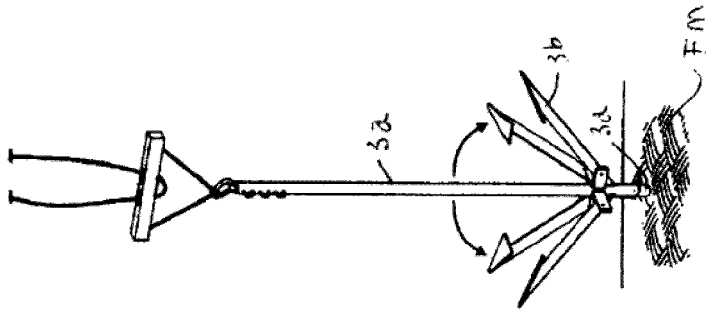

FIG. 4

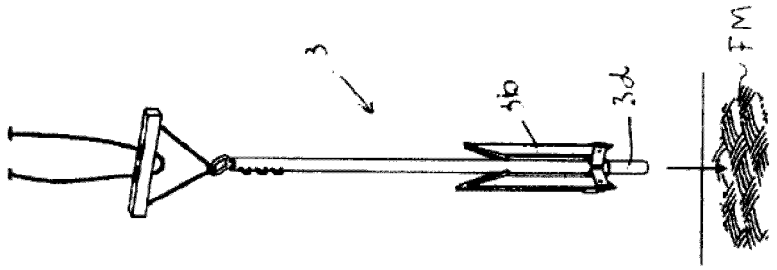

FIG. 3

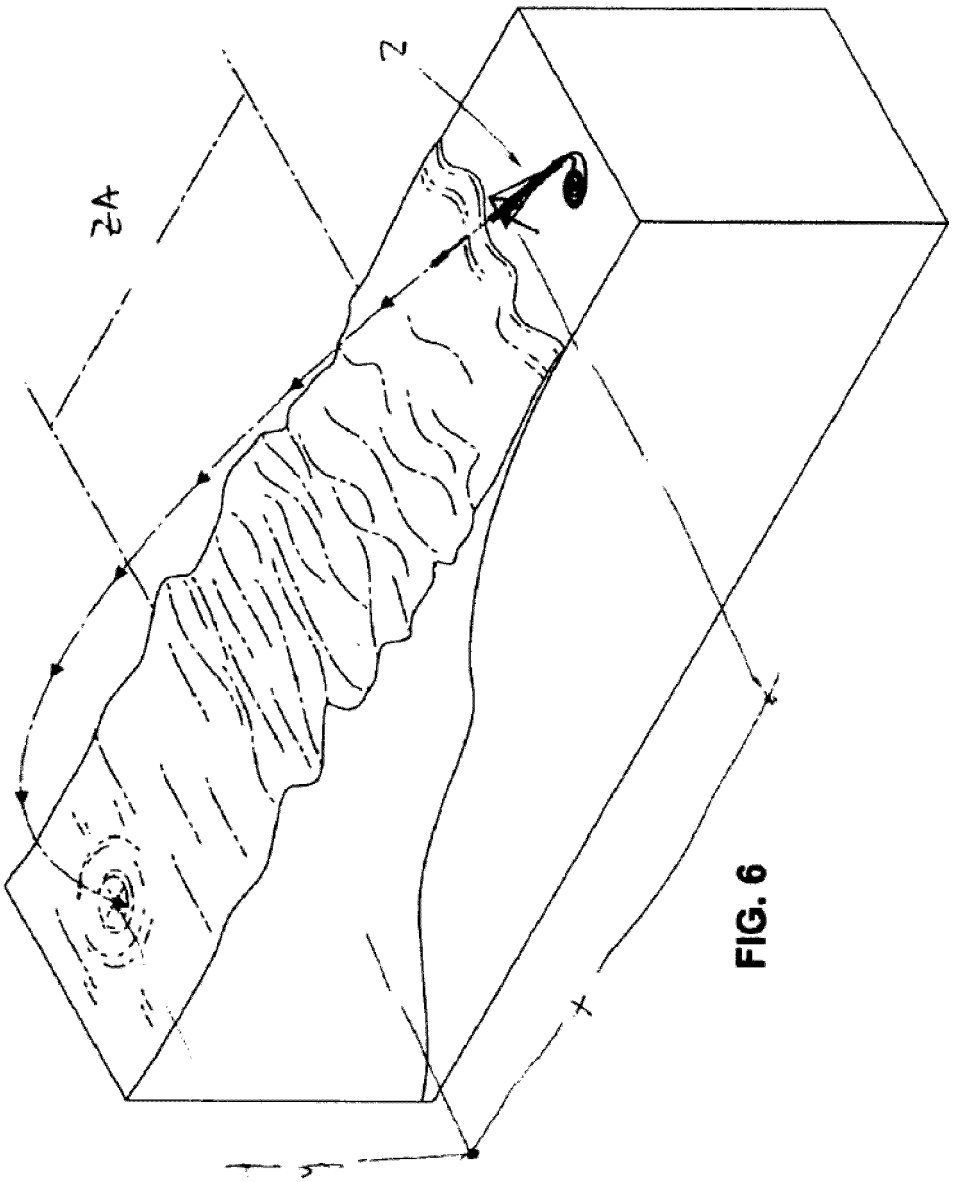

FIG. 6

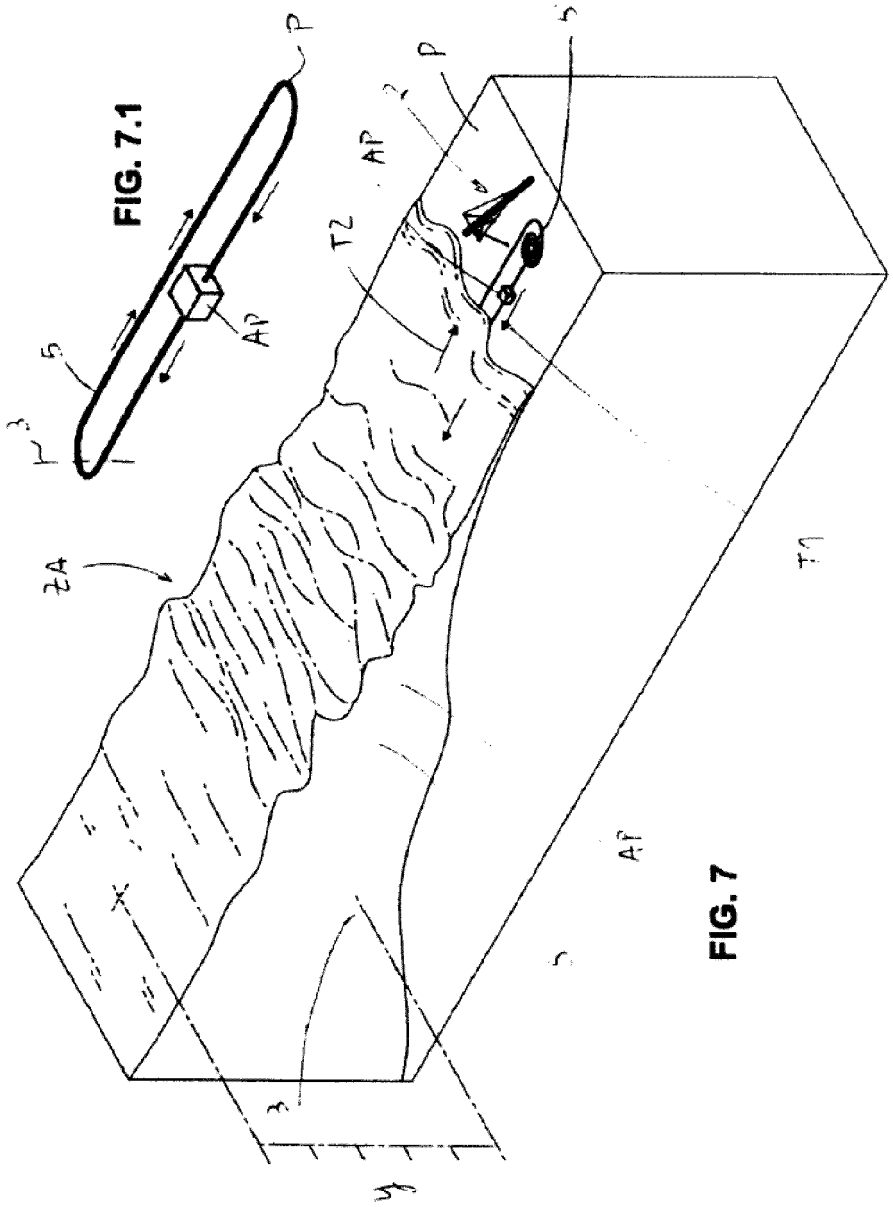

FIG. 7.1

FIG. 7

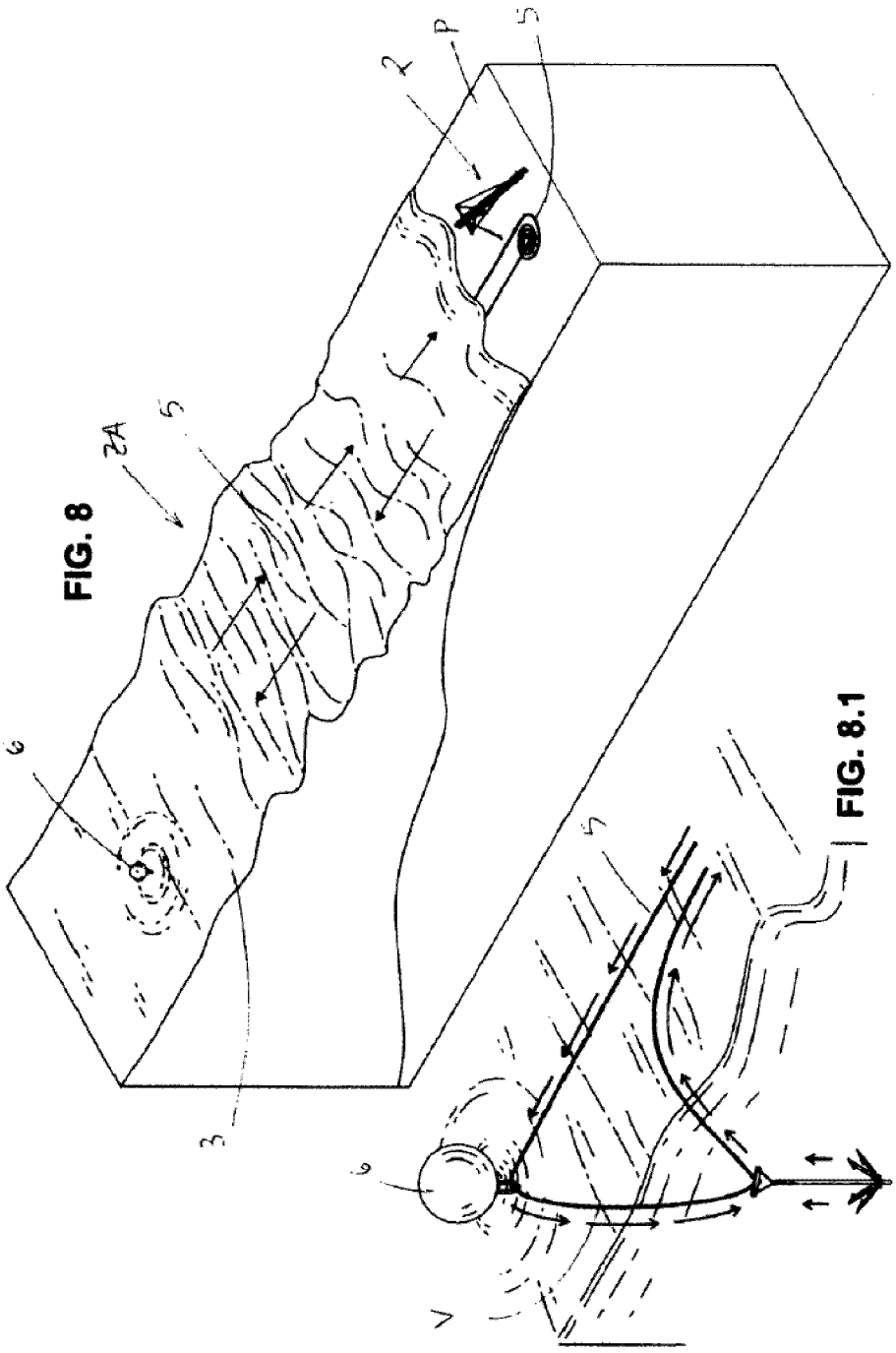

FIG. 8

FIG. 8.1

INTERNATIONAL SEARCH REPORT

International application No.
PCT/BR2011/000486

A. CLASSIFICATION OF SUBJECT MATTER
B63B21/56 (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B63B

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

ESPACENET, EPODOC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 7320289 B1 (Robert A. Clarke) 22 **January** 2008 (2008-01-22)	1-6
A	US 20040237870 A1 (Robertr A. Clarke) 02 **December** 2004 (2004-12-02)	1-6

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
12 March 2012	290312
Name and mailing address of the ISA/ **BR** INPI INSTITUTO NACIONAL DA PROPRIEDADE INDUSTRIAL Rua Mayrink Veiga nº 9, 18º andar Facsimile No. +55 21 3037-3663	Authorized officer **Luiz Antonio da Costa Faria** Telephone No. +55 21 3037-3493/3742

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/BR2011/000486

US 7320289 B1	2008-01-22	None	
US 20040237870 A1	2004-12-02	None	

Form PCT/ISA/210 (patent family annex) (July 2009)