on an anchor buried in a mooring bed and data receiving equipment on a floating vessel but, in each application, the means disclosed suffers from at least two of the disadvantages noted in the preceding paragraph.

~~It is an object~~Embodiments of the present invention seek to provide a system for communicating data between an anchor buried in a mooring bed below a body of water and a structure floating in the body of water which avoids or mitigates at least one of the above-mentioned disadvantages.

In the following: a mooring line, for carrying tensile loading and connecting an anchor to a moored structure, is to be construed as including all components thereof such as, for example, wire ropes and wire rope terminations, synthetic ropes and synthetic rope terminations, chains, and any connecting shackles, swivels, and links that may be present between mooring line portions or attached thereto by way of extension for the purpose of carrying tensile loading; a transceiver is to be construed as a device adapted for transmitting and or receiving data-containing signals electrically, or optically, or electromagnetically when connected to an antenna; a transponder is to be construed as a device adapted for transmitting and or receiving data-containing signals electrically, or optically or, where said signals are transmitted or received via a body of water, acoustically; and "heading" is to be construed in the marine sense as meaning azimuthal direction.

According to a first aspect of the present invention, an anchor data communication system, for communicating data at least one way between instrumentation attached to an anchor for burial in a mooring bed under a body of water and a transceiver carried by a structure floating on said body of water, said anchor being attached to a mooring line comprising a lower portion and an upper portion for connection to a structure floating on said body of water, comprises a first transponder connected by first conductor means to said instrumentation, and a second transponder communicating at least partially via second conductor means with said transceiver, wherein at least one transponder is attached to a line member connected to said anchor such that an axis of an emission beam of said at least one transponder is constrained by the heading of said line member, said first transponder being attached to said lower portion of said mooring line at a spacing distance from a point of attachment of said mooring line to said anchor, measured along said mooring line, such as to be maintained in a position at or above a surface of said mooring bed when said anchor is buried there-below during installation ~~thereofis substantially constrained in heading by said line member to maximize the strength of signals from said first transponder (10) arriving at said second transponder (12, 12A)~~.

According to a second aspect of the present invention, an anchor data communication system, for communicating data at least one way between instrumentation attached to an anchor for burial in a mooring bed under a body of water and a transceiver carried by a structure floating on said body of water, said anchor being attached to a mooring line comprising a lower portion and an upper portion for connection to a structure floating on said body of water, comprises a first transponder connected by first conductor means to said instrumentation, and a second transponder communicating at least partially via second conductor means with said transceiver, wherein at least one transponder is attached to a line member connected to said anchor such that an axis of an emission beam of said at least one transponder is constrained by the heading of said line member, said first transponder being attached to a line member comprising a drogue tail connected to said anchor and including a drag means for dragging behind said anchor in contact with a surface of said mooring bed to produce a force for constraining the heading of said anchor in the direction of dragging prior to embedment of said anchor in said mooring bed, said drogue tail being of sufficient length to allow said drag means to remain on said surface when said anchor is buried there-below during installation thereof, and said first transponder being attached to said drogue tail in the vicinity of said drag member whereby said first transponder is maintained at or above said surface.

Preferably, said line member comprises said mooring line.

Preferably, said axis has the heading of said line member.

Preferably, said at least one transponder is directional in having a directional axis along which substantially maximum signal strength occurs in a directional beam emitted therefrom.

Preferably said directional beam has a conical divergence included angle which does not exceed 90°, and further preferably does not exceed 60°.

Preferably, said at least one transponder is attached to said line member such that said directional axis forms an acute angle with an adjacent portion of said line member.

Preferably said acute angle is in the range 0° to 60°.

~~Preferably, said line member comprises a drogue tail including a drag member for dragging behind said anchor in contact with a surface of a mooring bed to produce a force for constraining the heading of said anchor in the direction of dragging prior to embedment of said anchor.~~

~~Preferably, said drogue tail is of sufficient length to allow said drag member to remain on said surface when said anchor is buried there-below.~~

~~Preferably said first transponder is attached to said drogue tail in the vicinity of said drag member whereby said first transponder is maintained at or above said surface.~~

~~Preferably said first transponder is attached to said lower portion of said mooring line at a spacing distance from a point of attachment of said mooring line to said anchor, measured along said mooring line, such as to be maintained in a position at or above a surface of said mooring bed.~~

Preferably said spacing distance is between 1 and 7 times the depth of penetration of said point of attachment below said surface of said mooring bed.

Preferably at least one of said first transponder and said second transponder is attached to said line member by rotatable attachment means whereby said at least one transponder can rotate about said line member.

Preferably said rotatable attachment means is equipped with at least one of buoyancy means and counter-weight ballast means offset from said line member whereby a force is produced to rotate said rotatable attachment means such as to maintain said one transponder above an adjacent point on said line member.

Preferably, the position of said second transponder on said mooring line is separated from said structure sufficiently to obviate acoustic signal swamping at said second transponder of signals from said first transponder by acoustic noise emanating from said structure.

Preferably, said second transponder is movable along said mooring line to reduce separation from said first transponder and to reduce attenuation of signal received therefrom.

Preferably at least one of said first and second conductor means comprises an electrical conductor, an optical conductor, or a fluid conductor.

Transceiver 9, 9A is energised by a power supply (not shown) which also powers transponder 12, 12A, or 12D, via conductors 13 in corresponding armoured cables 13A, 13B, or 13C. Transceiver 9, 9A is capable of transmitting and or receiving data-containing signals at least one of electrically, optically, and electromagnetically when connected to an antenna. Transponders 10,12, 12A, and 12D, are capable of transmitting or receiving data-containing signals at least one of electrically, optically, acoustically (where said signals are sonar signals propagating in said body of water), and electromagnetically (when connected to a suitable underwater antenna). Transponder 10 includes a pressure transducer (not shown) which enables transponder 10 to transmit pressure data to transceiver 9 enabling both the depth of transponder 10 below surface 6A of body of water 6 and the height of transponder 10 above surface 5 of mooring bed 4 to be determined.

Mooring line 7 comprises lower portion 7A, an intermediate portion 7B, and an upper portion 7C (Fig. 1). A low friction swivel 7D connects pin 3A of shackle 3B at attachment point A on anchor 3 to lower portion 7A by means of connecting links 7E and 7F while shackle 7G serves to connect lower portion 7A to intermediate portion 7B and shackle 7H serves to connect intermediate portion 7B to upper portion 7C. Hereinafter, portions 7A, 7B, and 7C of mooring line 7 will be referred to respectively as forerunner 7A (comprising torque-balanced wire rope, as shown in Figs. 1, 2, 4, and 5, or chain), synthetic rope 7B, and work-wire 7C, using terminology typical of the offshore industry. A long length of work-wire 7C is stored on winch drum 8B on deck 8C of anchor handling vessel 8. The use of torque-balanced wire rope, or chain, in forerunner 7A, in conjunction with low friction swivel 7D, minimises or avoids rotation of anchor 3 occurring undesirably due to turns induced by tension in forerunner 7A during lowering anchor 3 from vessel 8 to mooring bed surface 5.

In ~~the~~a first arrangement of anchor data communication system 1, second transponder 12 is omni-directional and is suspended by armoured cable 13A, with emission beam axis 12E vertical, at position C below and separated from vessel 8 (Fig. 1).

In ~~the~~a second arrangement of anchor data communication system 1, second transponder 12A is directional, having an emission beam axis 12B, and is attached to work-wire 7C at a position D thereon to utilise the heading of work-wire 7C to direct emission beam axis 12B towards first transponder 10.

Position C of transponder 12 in the first arrangement of system 1 and position D of carriage 19 on work-wire 7C in the second arrangement of system 1 are chosen with a distance of separation from vessel 8 sufficient to ensure that acoustic noise emanating

there-from is attenuated and so does not swamp acoustic signals arriving from first transponder 10 at second transponder 12, 12A.

First and second conductors 11 and 13 comprise conductors of any or all of the following: electrical signals; optical signals; or electrical power. First and second conductors 11 and 13 are incorporated respectively in armoured cables 11A and 13A or 13B (or, in ~~the~~a third arrangement described later, 13C) which are strengthened to provide protection from crushing and to carry significant tensile loading such as that induced in armoured cable 11A when dragged in mooring bed 4.

In addition to conductors 11, armoured cable 11A includes a water filled tubular conductor 14 (Fig. 3), terminated at an upper end 14A (Fig. 4) by an elastically deformable pressure transmitting bulb 14B, serving to conduct pressure in order to provide effectively an extension of the water column above mooring bed surface 5 to pressure transducer 15 (Fig. 2) connected to instrumentation 2 and located adjacent to attachment point A on buried anchor 3 whereby total water column water pressure at attachment point A is measured uninfluenced by pore pressure in adjacent soil of mooring bed 4. This allows the depth of attachment point A below surface 5 to be determined by subtracting the pressure previously measured by pressure transducer 15, when attachment point A was at surface 5, from the pressure measured at the buried position of attachment point A. Also, when anchor 3 is above surface 5, pressure transducer 15 serves to provide pressure measurements from which the height of attachment point A above surface 5 may be determined.

Instrumentation 2 includes a microprocessor and measures roll and pitch of anchor 3, load and direction of load in pin 3A of shackle 3B, and height or depth of attachment point A (i.e. height or depth of pin 3A) respectively above or below surface 5 of mooring bed 4 by computation from pressure measurements made by pressure transducer 15. Instrumentation 2 also measures distance moved along a burial trajectory of anchor 3 in mooring bed 4 and measures the inclination of the trajectory at points thereon as described in European Patent EP 0 820 400 B3. The measurement data is digitally encoded and transmitted electrically to transponder 10 for acoustic transmission to transponder 12 or 12A (or transponder 12D in the third arrangement) followed by electrical transmission to transceiver 9 (or to transceiver 9A followed by electromagnetic transmission to transceiver 9 in the third arrangement). The data received by transceiver 9 is stored in a computer and displayed in real time on a monitor screen for viewing by mooring personnel on vessel 8.

First transponder 10 is arranged to face second transponder 12, or 12A, and is located on mounting 16 (Figs. 4 and 5) comprising planar fin 16A, cylindrical tube 16B housing

first transponder 10, splittable cylindrical sleeve 16C and splittable cylindrical clamp 16D. Clamp 16D is configured internally to be suitable for clamping onto a wire rope, such as wire rope forerunner 7A (Fig. 4), or onto a link of a chain forerunner 7A (not shown). Sleeve 16C is rotatably mounted on clamp 16D. Planar fin 16A is attached to sleeve 16C in alignment with axis 16E common to sleeve 16C and clamp 16D. Clamp 16D is fixed by means of bolts 16F to forerunner 7A (or to wire rope 3E as shown in Fig. 8). When clamp 16D is fixed to forerunner 7A, axis 16E coincides with axis 7AX (Fig. 4). Cylindrical tube 16B is attached to plate 16G which is fastened to planar fin 16A by bolt 16H and bolt 16J. A series of alternative holes 16K, disposed in an arc centred on bolt 16H, are provided in planar fin 16A to receive bolt 16J so that cylindrical tube 16B, transponder 10 therein, and axis 10A thereof can be inclined to axis 7AX of forerunner 7A (or axis 3EX of wire rope 3E as shown in Fig. 8) by a forward-opening acute angle α (Fig. 4) selectable in steps of 5° in the range 0° to 60° by locating bolt 16J in an appropriate hole 16K. Acute angle α thus opens in the direction of second transponders 12 and 12A (Fig. 1) due to heading constraint provided by forerunner 7A (or wire rope 3E, Fig.8). Mounting 16 permits first transponder 10 to be rotated in an orbit around axis 7AX of forerunner 7A (or axis 3EX of wire rope 3E) while inclined at a selected acute angle α.

When mounting 16 is attached to forerunner 7A, an aft edge 16L of planar fin 16A faces anchor 3 and is aligned with a position B on forerunner 7A (Fig. 1). Position B is separated from attachment point A by a minimum spacing distance d, measured along forerunner 7A, such that first transponder 10 is located above or at surface 5 of mooring bed 4 during drag embedment of anchor 3 in order to avoid acoustic signal transmission and reception being muffled by soil due to burial of first transponder 10 in mooring bed 4. Minimum spacing distance d is chosen to be at least equal to the maximum calculated embedded length of forerunner 7A which becomes embedded in the soil of mooring bed 4 during installation of anchor 3. Typically, minimum spacing distance d will be in the range of 1 to 7 times the desired penetration depth Z (Fig. 1) of pin 3A of shackle 3B of anchor 3 below surface 5 of mooring bed 4.

Termination 11B of armoured cable 11A is mechanically attached via hole 16M in fin 16A at edge 16L so that tensile loading in armoured cable 11A induced by being dragged in mooring bed 4 is transferred to forerunner 7A via fin 16A, sleeve 16C, and clamp 16D. Termination 11C of armoured cable 11A is mechanically attached to shank 3C of anchor 3 adjacent to instrumentation 2 so that armoured cable 11A can trail behind forerunner 7A during burial of anchor 3 into mooring bed 4 and carry tensile loading which otherwise would be imposed on conductors 11 and 14. Rotation of sleeve 16C prevents armoured cable 11A from being wrapped around forerunner 7A if

any turns are induced in forerunner 7A by tensile loading therein and so avoids the possibility of subsequent damage occurring to armoured cable 11A by kinking about forerunner 7A during installation of anchor 3 or by crushing between forerunner 7A (loaded by the weight of anchor 3) and stern roller 8A of anchor handling vessel 8 during recovery of anchor line 7 and anchor 3 over stern roller 8A. The length of armoured cable 11A is arranged to exceed minimum distance d sufficiently to ensure that elongation of forerunner 7A due to tensile loading therein does not induce tensile loading in armoured cable 11A and to ensure that armoured cable 11A can be hauled well to one side of forerunner 7A to avoid crushing due to a slack bight of armoured cable 11A wedging there-under during traversal of stern roller 8A. Typically, the length of armoured cable 11A will be some 6 to 9 metres greater than distance d.

During embedment of anchor 3, rotation of cylindrical sleeve 16C, together with the presence of slack in armoured cable 11A, enables armoured cable 11A to be deflected automatically into a minimum energy position by following in the wake of forerunner 7A, that is, in soil disturbed by forerunner 7A cutting through mooring bed 4 during installation of anchor 3 since the disturbed undrained shear strength of typical clay soil in mooring bed 4 is generally less than half that of the undisturbed undrained shear strength. This confers considerable benefit by greatly reducing the magnitude of tensile loading induced in armoured cable 11A while trailing behind forerunner 7A in mooring bed 4.

Planar fin 16A of mounting 16 is fitted with buoyancy elements 16N (Figs. 4, 5 and ~~5~~8) which provides positive buoyancy sufficient to rotate sleeve 16C about clamp 16D such that first transponder 10 is maintained in a position above adjacent forerunner 7A when submerged. This also serves to keep first transponder 10 free from being muffled by soil when forerunner 7A is initially laid out on surface 5 of mooring bed 4 prior to tensioning mooring line 7 to embed anchor 3. The moment of buoyancy forces about axis 16E and axis 7AX enables fin 16A to resist being rotated about forerunner 7A by transverse friction forces arising from clamp 16D being rotated by turns developing in forerunner 7A due to tensile forces increasing therein.

First transponder 10 emits a directional acoustic beam 10B having substantially maximum signal strength propagating along axis 10A (Figs. 1 and 4) of transponder 10. Acoustic beam 10B is axially symmetrical about axis 10A and substantially contained within a conical included angle β which does not exceed 90° and preferably does not exceed 60°. As mentioned previously, first transponder 10 is attached to mounting 16 such that axis 10A is maintained at a pre-selected acute angle α to forerunner 7A (or

CLAIMS

1. An anchor data communication system (1), for communicating data at least one way between instrumentation (2) attached to an anchor (3) for burial in a mooring bed (4) under a body of water (6) and a transceiver (9) carried by a structure (8, 21A) floating on said body of water (6), said anchor (3) being attached to a mooring line (7) comprising a lower portion (7A) and an upper portion (7C) for connection to a structure (8) floating on said body of water, comprises a first transponder (10) connected by first conductor means (11) to said instrumentation (2), and a second transponder(12, 12A, 12D) communicating at least partially via second conductor means (13) with said transceiver (9), wherein at least one transponder (10, 12A) is attached to a line member (7, 3D) connected to said anchor (3) such that an axis (10A, 12B) of an emission beam (10B, 12C) of said at least one transponder (10, 12A) is substantially constrained in heading by said line member (7, 3D).

2. An anchor data communication system (1), according to claim 1, wherein said line member (7) comprises said mooring line (7).

3. An anchor data communication system (1), according to claim 1, wherein said axis (10A, 12B) has the heading of said line member (7, 3D).

4. An anchor data communication system (1), according to claims 2 or 3, wherein said at least one transponder (10, 12A) is directional in having a directional axis (10A, 12B) along which substantially maximum signal strength occurs in a directional emission beam (10B, 12C) emitted therefrom.

5. An anchor data communication system (1), according to claim 4, wherein said directional emission beam (10B, 12C) has a conical divergence included angle (β, δ) which does not exceed 90°, and further preferably does not exceed 60°.

6. An anchor data communication system (1), according to claim 4, wherein said at least one transponder (10, 12A) is attached to said line member (7, 3D) such that said directional axis (10A, 12B) forms an acute angle (α, γ) with an adjacent portion (7A, 7C, 3E) of said line member (7, 3D).

7. An anchor data communication system (1), according to claim 6, wherein said acute angle (α, γ) is in the range 0° to 60°.

8. An anchor data communication system (1), according to any preceding claim, wherein said line member (3D) comprises a drogue tail (3D) including a drag member (3F) for dragging behind said anchor (3) in contact with a surface (5) of a mooring bed (4) to produce a force for constraining the heading of said anchor (3) in the direction of dragging prior to embedment of said anchor (3).

9. An anchor data communication system (1), according to claim 8, wherein said drogue tail (3D) is of sufficient length to allow said drag member (3F) to remain on said surface (5) when said anchor (3) is buried there-below.

10. An anchor data communication system (1), according to claim 9, wherein said first transponder (10) is attached to said drogue tail (3D) in the vicinity of said drag member (3F) whereby said first transponder (10) is maintained at or above said surface (5).

11. An anchor data communication system (1), according to claims 2 to 8, wherein said first transponder (10) is attached to said lower portion (7A) of said mooring line (7) at a spacing distance (d) from a point of attachment (A) of said mooring line (7) to said anchor (3), measured along said mooring line (7), such as to be maintained in a position at or above a surface (5) of said mooring bed (4).

12. An anchor data communication system (1), according to claim 11, wherein said spacing distance (d) is between 1 and 7 times the depth of penetration (Z) of said point of attachment (A) below said surface (5) of said mooring bed (4).

13. An anchor data communication system (1), according to any preceding claim, wherein at least one of said first transponder (10) and said second transponder (12A) is attached to said line member (7, 3D) by rotatable attachment means (16, 19) whereby said at least one transponder (10, 12A) can rotate about said line member (7, 3D).

14. An anchor data communication system (1), according to claim 13, wherein said rotatable attachment means (16, 19) is equipped with at least one of buoyancy means (16N) and counter-weight ballast means (19L) offset from said line member (7, 3D) whereby a force is produced to rotate said rotatable attachment means (16, 19) such as

to maintain said at least one transponder (10, 12A) above an adjacent point on said line member (7, 3D).

15. An anchor data communication system (1), according to any preceding claim, wherein the position of said second transponder (12A) on said mooring line (7) is separated from said structure (8) sufficiently to obviate acoustic signal swamping at said second transponder (12A) of signals from said first transponder (10) by acoustic noise emanating from said structure (8).

16. An anchor data communication system (1), according to claims 2 to 14, wherein said second transponder (12A) is movable along said mooring line (7) to reduce separation from said first transponder (10) and to reduce attenuation of signal received therefrom.

17. An anchor data communication system (1), according to any preceding claim, wherein at least one of said first and second conductor means (11, 13) comprises an electrical conductor, an optical conductor, or a fluid conductor.

18. An anchor data communication system (1), according to claim 17, wherein said fluid conductor (14) is filled with water and closed at an upper end (14A) by an elastically deformable pressure-transmitting element (14B) and at a lower end by a pressure transducer (15) whereby total water column pressure at said pressure transducer (15), when buried in said mooring bed (4), is measurable uninfluenced by pore pressure in adjacent soil of said mooring bed (4).

19. An anchor data communication system (1), according to any preceding claim, wherein said instrumentation (2) on said anchor (3) includes a chargeable element, such as a supercapacitor, which is chargeable by a power source (10C) of said first transponder (10) whereby said chargeable element acts to provide an interim local power supply for sustaining said instrumentation (2) during underwater replacement of said power source (10C) or said first transponder (10).

20. An anchor data communication system (1), according to any preceding claim, wherein at least one of said transponder (10, 12, 12A, 12D) and said transceiver (9, 9A) is a device adapted for transmitting and receiving data-containing signals at least one of electrically, electromagnetically, optically, and acoustically.

21. An anchor data communication system (1), according to any preceding claim, wherein said first transponder (10) includes a pressure transducer to enable monitoring of depth of immersion and height of said first transponder (10) above said surface (5) of said mooring bed (4).

22. An anchor data communication system (1), according to claims 1 to 8, and 11 to 21, wherein said anchor (3) is provided with a trailable resistance member (3H) arranged to produce a drag resistance force when dragged in a body of water (6).

23. An anchor data communication system (1), according to claim 22, wherein said trailable resistance member (3H) comprises an underwater parachute (3J).

Claims

1. An anchor data communication system, for communicating data at least one way between instrumentation attached to an anchor for burial in a mooring bed under a body of water and a transceiver carried by a structure floating on said body of water, said anchor being attached to a mooring line comprising a lower portion and an upper portion for connection to a structure floating on said body of water, comprises a first transponder connected by first conductor means to said instrumentation, and a second transponder communicating at least partially via second conductor means with said transceiver, wherein at least one transponder is attached to a line member connected to said anchor such that an axis of an emission beam of said at least one transponder is constrained by the heading of said line member, said first transponder being attached to said lower portion of said mooring line at a spacing distance from a point of attachment of said mooring line to said anchor, measured along said mooring line, such as to be maintained in a position at or above a surface of said mooring bed when said anchor is buried there-below during installation thereof.

2. An anchor data communication system, according to claim 1, wherein said spacing distance is between 1 and 7 times the depth of penetration of said point of attachment below said surface of said mooring bed.

3. An anchor data communication system, for communicating data at least one way between instrumentation attached to an anchor for burial in a mooring bed under a body of water and a transceiver carried by a structure floating on said body of water, said anchor being attached to a mooring line comprising a lower portion and an upper portion for connection to a structure floating on said body of water, comprises

a first transponder connected by first conductor means to said instrumentation, and a second transponder communicating at least partially via second conductor means with said transceiver, wherein at least one transponder is attached to a line member connected to said anchor such that an axis of an emission beam of said at least one transponder is constrained by the heading of said line member, said first transponder being attached to a line member comprising a drogue tail connected to said anchor and including a drag means for dragging behind said anchor in contact with a surface of said mooring bed to produce a force for constraining the heading of said anchor in the direction of dragging prior to embedment of said anchor in said mooring bed, said drogue tail being of sufficient length to allow said drag means to remain on said surface when said anchor is buried there-below during installation thereof, and said first transponder being attached to said drogue tail in the vicinity of said drag member whereby said first transponder is maintained at or above said surface.

4. An anchor data communication system, according to claim 3, wherein said drogue tail includes at least one bend restricting element.

5. An anchor data communication system, according to any preceding claim, wherein said at least one transponder is constrained by the heading of said line member to have substantially the heading of said line member.

6. An anchor data communication system, according to any preceding claim, wherein at least one transponder is directional in having a directional axis along which substantially maximum signal strength occurs in a directional emission beam emitted therefrom.

7. An anchor data communication system, according to claim 6, wherein said directional emission beam has a conical divergence included angle which does not exceed 90° and preferably does not exceed 60°.

8. An anchor data communication system, according to any previous claim, wherein said at least one transponder is attached to said line member such that said directional axis forms an acute angle with an adjacent portion of said line member, said acute angle being preferably in the range 0° to 60°.

9. An anchor data communication system, according to any preceding claim, wherein at least one of said first transponder and said second transponder is attached to said line member by rotatable attachment means whereby said at least one transponder can rotate about an axis of said line member.

10. An anchor data communication system, according to claim 9, wherein said rotatable attachment means is equipped with at least one of buoyancy means and counter-weight ballast means offset from said axis of said line member whereby a force is produced to rotate said rotatable attachment means such as to maintain said at least one transponder above an adjacent point on said line member.

11. An anchor data communication system, according to any preceding claim, wherein said second transponder is movable along said mooring line to reduce separation from said first transponder and so reduce attenuation of signal received therefrom.

12. An anchor data communication system, according to any preceding claim, wherein at least one of said first and second conductor means comprises an electrical conductor, an optical conductor, or a fluid conductor, said fluid conductor being filled with water and closed at an upper end by an elastically deformable pressure-transmitting element and at a lower end by a pressure transducer whereby

total water column pressure at said pressure transducer, when buried in said mooring bed, is measurable uninfluenced by pore pressure in adjacent soil of said mooring bed.

13. An anchor data communication system, according to any preceding claim, wherein said instrumentation on said anchor includes a chargeable element, such as a supercapacitor, which is chargeable by a power source of said first transponder whereby said chargeable element acts to provide an interim local power supply for sustaining said instrumentation during underwater replacement of said power source or said first transponder.

14. An anchor data communication system, according to any preceding claim, wherein said first transponder includes a pressure transducer to enable monitoring of depth of immersion and height of said first transponder above said surface of said mooring bed.

15. An anchor data communication system, according to any preceding claim, wherein trailable resistance means, preferably comprising an underwater parachute, is attached to said anchor to produce a drag resistance force acting thereon when said anchor is dragged in a body of water.