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(54) Mooring system

(57) A mooring system for a vessel (1) is disclosed, including a mooring anchor (2) and an interconnection line (3) for connecting the anchor to the vessel, the anchor comprising and/or being linked to monitoring means (4) arranged for monitoring the anchor's condition and for outputting anchor condition data. The monitoring means are connected to an acoustic modem (5, 8) arranged to transmit the anchor condition data to the vessel and/or another involved vessel (9). One acoustic modem (8) may be arranged to transmit the anchor condition data to the vessel and/or another involved vessel (9) via a wireless transmission path. Another acoustic modem (5) may be arranged to transmit the anchor condition data to the vessel (1) via the interconnection line (3). More in general a system is disclosed for data transfer between two objects (1) which are mechanically interconnected by an interconnection line (3), each object including an acoustic modem (5) which is arranged to transmit and/or receive data via the interconnection line.

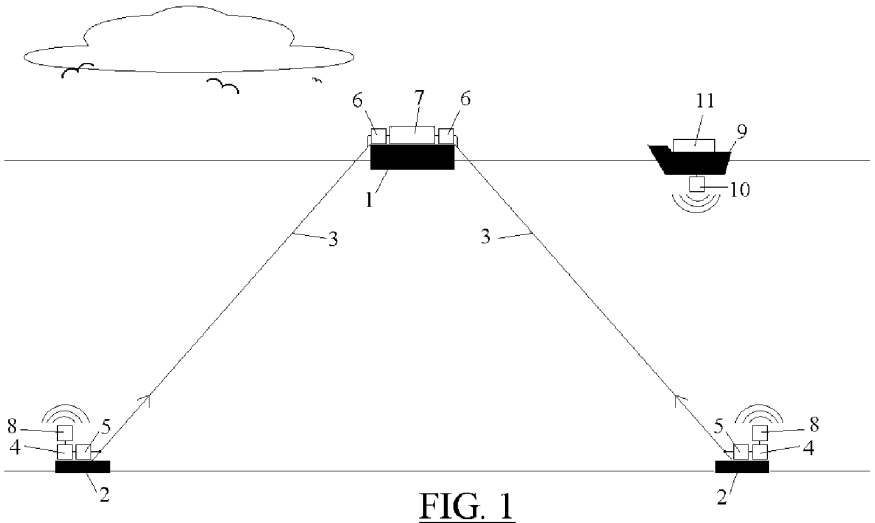

FIG. 1

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Description

[0001] The invention refers to a mooring system for a vessel, including a mooring anchor and an interconnection line for connecting the anchor to the vessel. Within the scope of this document the concept of interconnection line is deemed to include any type of line, cable etc. arranged to interconnect objects like vessels, buoys, anchors etc. especially, however not exclusively, in oceanic and/or deep-water environments. Such interconnection lines may be called mooring lines or mooring cables.

[0002] In ocean engineering, for instance, safe mooring of structures like floating off-shore platforms etc. is crucial.

[0003] One aim of this invention is to provide a mooring system in which an anchor -which can be located several hundreds meters to a few kilometers from the anchored vessel, e.g. an oil or gas platform- is enabled to pass information related to, but not limited to, e.g. the anchor's position, its orientation angle, depth under the seafloor etc.- to a platform or any other involved vessel to which it is connected.

[0004] Another aim of this invention is to provide a mooring system in which the anchor part is able to communicate with any involved vessel via an interconnecting interconnection line.

[0005] Still another aim of this invention is to use a cable like an interconnection line or cable as a transmission medium for exchanging data.

[0006] Yet another aim of this invention is to interconnect acoustic modems via an interconnection line or cable, whereas acoustic modems are normally used as wireless communication devices for transmitting data and information through the ocean. Within the scope of this document the concept of acoustic modems are deemed to include acoustic transceivers and acoustic transmitters or receivers respectively, especially, however not exclusively, arranged for transmitting and/or receiving data in oceanic and/or deep-water environments.

[0007] According to the invention a mooring system for a vessel is provided, including a mooring anchor and an interconnection line for connecting the anchor to the vessel, wherein it is preferred that the anchor comprises and/or is linked to monitoring means arranged for monitoring the anchor's condition and for outputting anchor condition data, and wherein the monitoring means are connected to an acoustic modem arranged to transmit the anchor condition data to the vessel and/or another involved vessel.

[0008] The acoustic modem may be arranged to transmit the anchor condition data to the vessel and/or another involved vessel via a wireless transmission path. However, it may be preferred that the acoustic modem is arranged to transmit the anchor condition data to the vessel via the interconnection line.

[0009] In connection with the latter preferred option, the invention may, alternatively, be defined more in general as a system for data transfer between two objects which are mechanically interconnected by an interconnection line, each object including an acoustic modem which is arranged to transmit and/or receive data via the interconnection line. Such an interconnection line could be operated -as defined in the preamble- for interconnecting a vessel and an anchor, or e.g. an electricity cable hanging between (and thus interconnecting) pylons, or a cable of a (cable) lift. In all such configurations data could be exchanged using acoustic modems on either cable end and using the cable as a transmission medium for those acoustic modems. Thus, it is proposed here to use cable which has another primary purpose than data transmission as an acoustic communication channel (waveguide), through which structure borne (guided) elastic waves can be transmitted. The cable can be used as an acoustic transmission line (wave guide). By using appropriate acoustic sources at specific frequencies, acoustic modes can be excited in the cable which looses only a small portion of the acoustic energy, or no acoustic energy at all, to the surrounding sand and water.

[0010] Hereinafter the invention will be elucidated by means of an exemplary embodiment, shown in Figure 1.

[0011] Figure 1 shows a mooring system for a vessel 1, including (in twofold) a mooring anchor 2 and an interconnection (mooring) line 3 for connecting the anchor 2 to the vessel 1. The anchor 2 comprises a monitoring unit 4 which is arranged for monitoring the anchor's condition, e.g. the anchor's position, its orientation angle, depth under the seafloor etc., detected by suitable detectors (not shown) and reported possibly as a function of time. The anchor condition data are outputted to an acoustic modem 5 which is arranged to transmit the anchor condition data to the vessel 1 via the interconnection line 3. At the side of the vessel 1 an acoustic modem 6 is arranged to receive the anchor condition data and to pass it to a monitoring system 7.

[0012] An additional acoustic modem 8 may be arranged to transmit the anchor condition data to another involved vessel, e.g. an inspection and maintenance vessel 9, via a wireless transmission path, constituted by the (sea)water between the modem 8 and the vessel 9 The data sent to the vessel 9 may be identified -to prevent confusion about its origin- by means of a specific anchor or modem identifier added to the anchor condition data. The identifier and the anchor condition data are received at the side of the vessel 9 by an acoustic modem 10, which passes it to a processing system (not shown) in vessel 9.

Claims

1. Mooring system for a vessel (1), including a mooring anchor (2) and an interconnection line (3) for connecting the anchor to the vessel, said anchor comprising and/or being linked to monitoring means (4) arranged for monitoring the anchor's condition and for outputting anchor condition data, said monitoring

means being connected to an acoustic modem (5, 8) arranged to transmit said anchor condition data to said vessel and/or another involved vessel (9).

2. Mooring system according to claim 1, the acoustic modem (8) being arranged to transmit said anchor condition data to said vessel and/or another involved vessel (9) via a wireless transmission path.

3. Mooring system according to claim 1, the acoustic modem (5) being arranged to transmit said anchor condition data to said vessel (1) via said interconnection line (3).

4. System for data transfer between two objects (1) which are mechanically interconnected by an interconnection line (3), each object including an acoustic modem (5) which is arranged to transmit and/or receive data via said interconnection line (3).

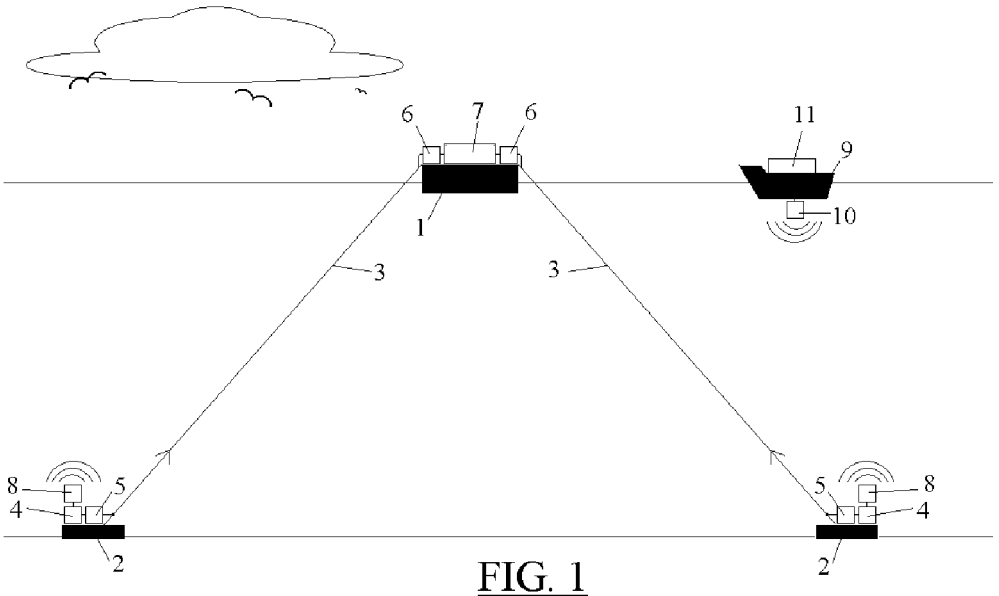

FIG. 1

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EUROPEAN SEARCH REPORT

Application Number
EP 10 15 0556

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2006/207488 A1 (HAAS MARK E [US] HAAS MARK EDWARD [US]) 21 September 2006 (2006-09-21) * paragraph [0038]; figure 2 *	1-4	INV. B63B21/22
X	WO 2007/079556 A1 (PONTES ANSELMO CARVALHO [BR]; MATOS JOSE MAURICIO FERREIRA D [BR]) 19 July 2007 (2007-07-19) * the whole document *	1-4	
X	EP 0 129 833 A1 (OETTLI MARTIN W) 2 January 1985 (1985-01-02) * the whole document *	1-4	
X	GB 2 133 151 A (SHELL INT RESEARCH) 18 July 1984 (1984-07-18)	1,3,4	
A	* the whole document *	2	
X	US 3 810 081 A (RININGER P) 7 May 1974 (1974-05-07)	1,2,4	
A	* the whole document *	3	TECHNICAL FIELDS SEARCHED (IPC)
X	US 4 912 464 A (BACHMAN DONALD H [US]) 27 March 1990 (1990-03-27)	1,2,4	B63B
A	* the whole document *	3	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	1 July 2010	Lindner, Volker

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 10 15 0556

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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01-07-2010

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2006207488 A1	21-09-2006	GB 2436052 A	12-09-2007
		WO 2006102221 A1	28-09-2006
WO 2007079556 A1	19-07-2007	NONE	
EP 0129833 A1	02-01-1985	CH 659981 A5	13-03-1987
		DE 3465727 D1	08-10-1987
		US 4651139 A	17-03-1987
GB 2133151 A	18-07-1984	NONE	
US 3810081 A	07-05-1974	NONE	
US 4912464 A	27-03-1990	NONE	

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82