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(54) **REMOTE COMMUNICATION DOWNLINE SYSTEM**

(57) System for communicating with an offshore sub-sea system connected to a shore facility by a first communication cable. The system comprising a buoyant device adapted for wireless communication with an offshore control facility, a second communication cable adapted

for connecting the buoyant device to a subsea connector on the first communication cable, such that the buoyant device is in communication with the shore facility and the offshore control facility is in communication with the offshore subsea system via the shore facility.

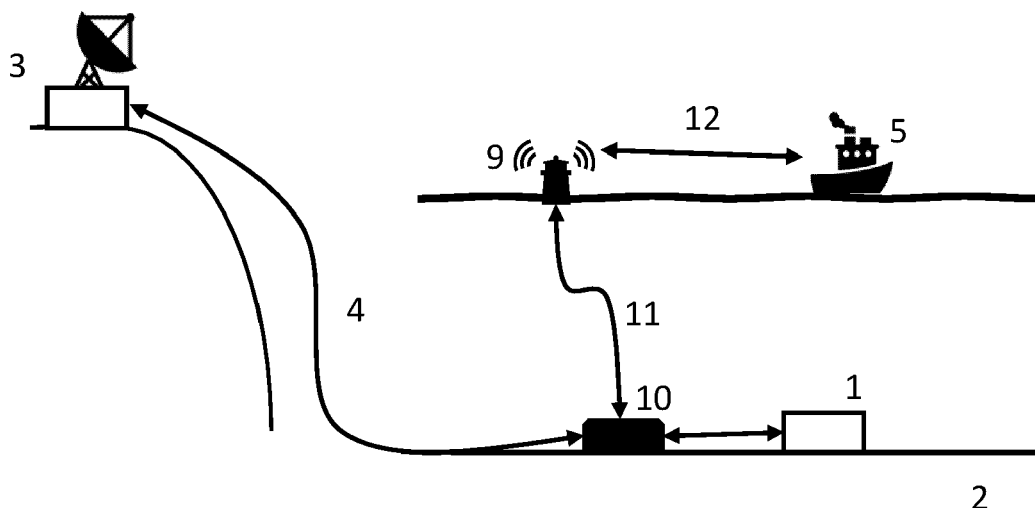


Fig. 2

Description

Technical field

[0001] The present invention relates to offshore sub-sea communication systems, in particular to a system for providing communication to an offshore system via a shore communication cable.

Background

[0002] Offshore subsea systems are provided with a cable from shore to the offshore subsea system. The cable usually provides power to the subsea system and a communication link, such as a fiber optical cable, between a shore facility and the subsea system. The communication link is used to control the subsea system from the shore facility. During offshore operations an offshore vessel needs to communicate with and/or control the sub-sea system. The offshore vessel is not within range of WLAN networks or cellular networks but have to rely on satellite communication between the offshore vessel and the shore facility. An exemplary system of prior art is illustrated in Fig. 1. Fig. 1 show an offshore subsea system 1 on the seabed 2. The subsea system 1 may be a subsea production system or any other subsea system. The sub-sea system 1 is in communication with a shore facility 3 by a cable 4. An offshore vessel 5 is in communication with the shore facility 3 via a communication satellite 6 on satellite communication links 7 and 8.

[0003] A problem often occurring when the offshore vessel 5 needs to communicate with an offshore subsea system 1 at high latitude is that the communication link 7 between the offshore vessel 5 and the communication satellite 6 is disrupted by rain, atmospheric pressure and other meteorological conditions. These disruptions may last for weeks, hindering the offshore vessel 5 from communicating with the offshore subsea system 1 below.

[0004] WO2018160982 describes a communication buoy for wireless communication to shore connected to a subsea system via a fiber optical cable to the seabed as a backup communication system for control of the subsea system in case of broken communication link between the subsea system and a platform. The system does not disclose wired connection to shore and have the same shortcoming as the prior art system illustrated in Fig. 1 when satellite communication on high latitude is disrupted.

[0005] In view of the above, the aim of the present invention is to provide a system to be used in case of missing/broken communication via satellite between a sub-sea production system and platform/onshore facility.

Summary of the invention

[0006] In one aspect of the present invention it is provided a system for communicating with an offshore sub-sea system connected to a shore facility by a first com-

munication cable. The system comprising a buoyant device adapted for wireless communication with an offshore control facility and a second communication cable adapted for connecting the buoyant device to a subsea connector on the first communication cable, such that the buoyant device is in communication with the shore facility; and the offshore control facility is in communication with the offshore subsea system via the shore facility.

[0007] In one embodiment, the wireless communication may comprise at least one of a cellular network communication and a wireless local area network communication.

[0008] In one embodiment, the at least one of the first communication cable and the second communication cable may comprise a fiber optical cable.

[0009] In one embodiment, the buoyant device may be a buoy.

[0010] In one embodiment, the buoyant device may be adapted for anchoring to a seabed.

[0011] In one embodiment, the offshore control facility may be at least one of a ship, a boat, a drilling rig, an airplane, a helicopter, an unmanned aerial vehicle and an unmanned underwater vehicle.

[0012] In one embodiment, the buoyant device may be adapted to be powered by the first communication cable via the subsea connector and the second communication cable.

Brief Description of the drawings

[0013] Following drawings are appended to facilitate the understanding of the invention. The drawings show embodiments of the invention, which will now be described by way of example only, where:

Fig. 1 is a schematic illustration of a prior art communication system.

Fig. 2 is a schematic illustration of a system according to the present invention.

Detailed description of the invention

[0014] In the following, different alternatives will be discussed in more detail with reference to the appended drawings. It should be understood, however, that the drawings are not intended to limit the scope of the invention to the subject-matter depicted in the drawings. The scope of the invention is defined in the appended claims.

[0015] In the exemplary embodiments, various features and details are shown in combination. The fact that several features are described with reference to a particular example should not be construed as implying that those features be necessity have to be included together in all the embodiments of the invention.

[0016] Conversely, features that are described with reference to different embodiments should not be construed as mutually exclusive. As those skilled in the art

will readily understand, embodiments that incorporate any subset of features described herein and that are not expressly interdependent have been contemplated by the inventor and are part of the intended disclosure. However, explicit descriptions of all such embodiments would not contribute to the understanding of the principles of the invention, and consequently some permutations have been omitted for the sake of simplicity.

[0017] Fig. 2 is a schematic illustration of a system according to the present invention communicating with an offshore subsea system 1 connected to a shore facility 3 by a first communication cable 4. The first communication cable 4 may be a fiber optical cable for high speed data communication. The first communication cable 4 may in some embodiments additionally provide power to the offshore subsea system 1. The offshore subsea system 1 may be a subsea production system or any other subsea system communicating with a shore facility. The shore facility 3 may be a control site for controlling the offshore subsea system 1. Alternatively, the shore facility 3 may be a communication hub or communication system for relaying communication to and from the offshore subsea system 1 to other computer systems or control sites. The illustrated system comprises a buoyant device 9 adapted for wireless communication 12 with an offshore control facility 5. Depending on the requirements of the system, such as the distance between the buoyant device 9 and the offshore control facility 5, different wireless communication protocols may be used. The buoyant device 9 may also be adapted to use several different wireless communication protocols and switch between them based on measured Quality of service (QoS). In one exemplary embodiment, the wireless communication 12 comprises a cellular network communication protocol, such as 3G, 4G and 5G. In another exemplary embodiment, the wireless communication 12 comprises a wireless local area network (WLAN) communication protocol. A second communication cable 11 is connecting the buoyant device 9 to a subsea connector 10 on the first communication cable 4, such that the buoyant device 9 is in communication with the shore facility 3. The second communication cable 11 may be a fiber optical cable for high speed data communication. The second communication cable 11 may in some embodiments additionally provide power to the buoyant device 9 via the subsea connector 10 and the first communication cable 4. By use of this system, the offshore control facility 5 can communicate with the offshore subsea system 1 via the shore facility 3. This is particularly useful when the offshore control facility 5 is unable to communicate wirelessly with the shore facility, such as when satellite communication between the offshore control facility 5 and the shore facility 3 is missing or disrupted.

[0018] If the first communication cable 4 is damaged or otherwise unavailable for communication to the shore facility 3, the subsea connector 10 is adapted to reconfigure the connection between the second communication cable 11 and the first communication cable 4 such

that the buoyant device 9 is communicating directly with the offshore subsea system 1.

[0019] The offshore control facility 5 may be any vessel in wireless communication range of the buoyant device 9, such as at least one of a ship, a boat, a drilling rig, an airplane, a helicopter, an unmanned aerial vehicle and an unmanned underwater vehicle.

[0020] In one embodiment, the buoyant device 9 may be a buoy. The buoyant device 9 may be adapted for anchoring to the seabed 2. Alternatively, the buoyant device 9 may be provided with a dynamic positioning (DP) system adapted to automatically maintain a position of the buoyant device 9 relative to the offshore subsea system 1.

Claims

1. A system for communicating with an offshore subsea system (1) connected to a shore facility (3) by a first communication cable (4), the system **characterized by** comprising:
 - a buoyant device (9) adapted for wireless communication (12) with an offshore control facility (5),
 - a second communication cable (11) adapted for connecting the buoyant device (9) to a subsea connector (10) on the first communication cable (4), such that the buoyant device (9) is in communication with the shore facility (3); and the offshore control facility (5) is in communication with the offshore subsea system (1) via the shore facility (3).
2. The system of claim 1, wherein the wireless communication (12) comprises at least one of a cellular network communication and a wireless local area network (WLAN) communication.
3. The system of any of the preceding claims, wherein at least one of the first communication cable (4) and the second communication cable (11) comprises a fiber optical cable.
4. The system of any of the preceding claims, wherein the buoyant device (9) is a buoy.
5. The system of any of the preceding claims, wherein the buoyant device (9) is adapted for anchoring to a seabed (2).
6. The system of any of the preceding claims, wherein the offshore control facility (5) is at least one of a ship, a boat, a drilling rig, an airplane, a helicopter, an unmanned aerial vehicle and an unmanned underwater vehicle.

7. The system of any of the preceding claims, wherein the buoyant device (9) is adapted to be powered by the first communication cable (4) via the subsea connector (10) and the second communication cable (11).

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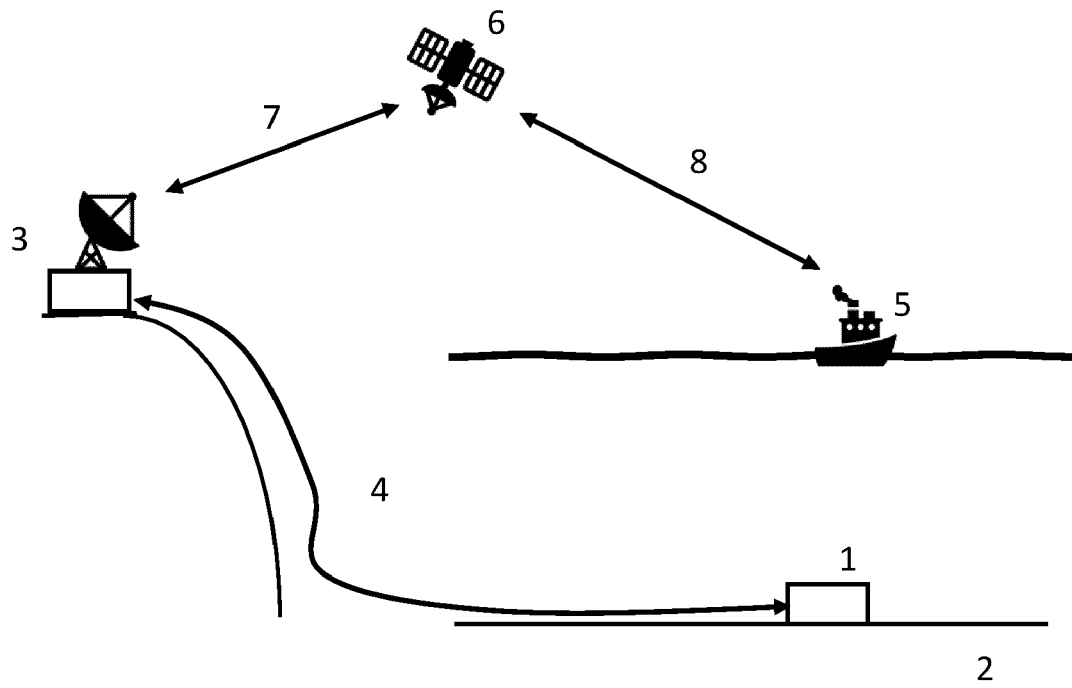


Fig. 1

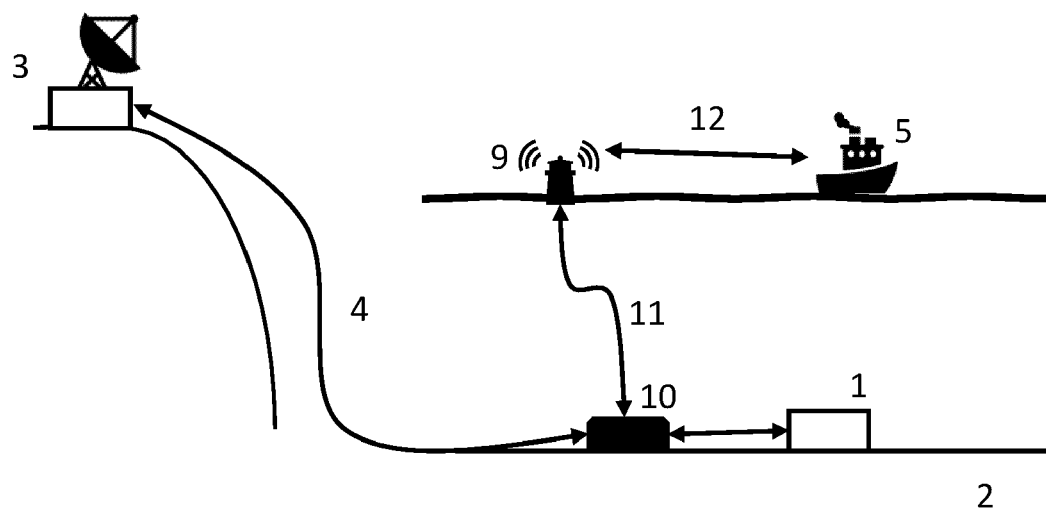


Fig. 2



EUROPEAN SEARCH REPORT

Application Number
EP 21 30 5312

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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			E21B
Place of search		Date of completion of the search	Examiner
Munich		27 September 2021	Pieper, Fabian
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 21 30 5312

5 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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