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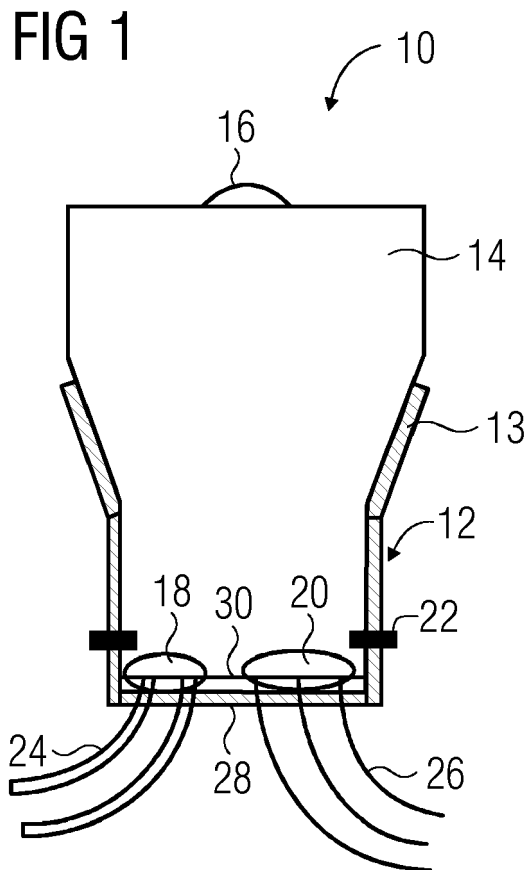
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(54) **Subsea docking station**

(57) A subsea docking station (12) for an exchangeable module (14) is presented. The subsea docking station (12) includes at least one connector (18,20) connectable to a respective connector of the exchangeable mod-

ule (14), and a guidance (13) for the exchangeable module (14) for engaging into a position in the docking station (12), such that connectors of exchangeable module (14) and the docking station (12) are connected.



Description

[0001] The present invention relates to a subsea docking station for an exchangeable module.

[0002] Subsea environment generally refers to an environment including marine biology, undersea geology and in the emerging field of deep-water, floating wind turbine technology, offshore oil and gas and underwater mining.

[0003] Presently, there is a shift towards subsea production systems. These increasingly complex subsea systems pose a number of technical challenges. The subsea environment is mainly unexplored due to difficult environmental conditions at the floor of the sea, which may sometimes be at a depth of around 3000 meters. At such depths the pressure is extremely high and thus involves use of specialized equipment.

[0004] Seabed power distribution systems are used for oil and gas production, processing and boosting. In addition there is a growing increase in technological areas like subsea communication and control which require specialized equipment to be installed under the sea.

[0005] One of the challenges in subsea environment is the installation and connection of electrical and mechanical components on the sea bed. Currently, these equipments are installed with the help of submarines. In case where the equipments have to be replaced or repaired the whole unit needs to be removed, this may result in huge amount of expenses and also significant loss of time.

[0006] It is therefore an object of the present invention to provide an arrangement for subsea equipments which enables quicker exchange of components or equipments.

[0007] The object is achieved by providing a subsea docking station for an exchangeable module according to claim 1.

[0008] A subsea docking station for an exchangeable module includes at least one connector connectable to a respective connector of the exchangeable module and a guidance for guiding the exchangeable module to engage into a position in the docking station, such that connectors of the exchangeable module and the docking station are connected. Such an arrangement provides flexibility in changing of exchangeable module. The guidance provides means for guiding the docking station are able to guide the exchangeable module to get coupled to the docking station at the desired position.

[0009] In one embodiment, one or more locks are present in the docking station for fixing the exchangeable module to the docking station. The locks prevent movement of the exchangeable module.

[0010] In one embodiment, the connector is an electrical connector for providing a connection between the electrical component and the docking station.

[0011] In another embodiment, the connector is a mechanical connector for providing a connection between the mechanical component and the docking station.

[0012] The exchangeable module includes means for lifting, such that the exchangeable module could be lifted from the seabed via a crane.

5 **[0013]** The exchangeable module is an electrical and/or a mechanical or an electromechanical component such as a transformer, a compressor, a switchgear or a compressor with integrated motor.

10 **[0014]** In one embodiment, the connector is a wet mate connector, which helps in electrical connections underwater.

[0015] In one embodiment, the docking station includes a channel for passage of wires of an electrical connector.

15 **[0016]** In one embodiment, the guidance for the exchangeable module is in the shape of a funnel. The funnel shape reduces the effort for placing the exchangeable module at the desired position in the docking station and further enables the exchangeable module to easily slide and fix to the docking station.

20 **[0017]** In one embodiment, the docking station includes a base portion attached to the sea bed.

[0018] The above-mentioned and other features of the invention will now be addressed with reference to the accompanying drawings of the present invention. The illustrated embodiments are intended to illustrate, but not limit the invention. The drawings contain the following figures, in which like numbers refer to like parts, throughout the description and drawings.

25 **[0019]** FIG. 1 is a schematic diagram of a subsea docking station with an exchangeable module in accordance with aspects of the present technique.

30 **[0020]** Embodiments of the present invention relate generally to installation and connection of electrical and mechanical components under the sea and more particularly to a subsea docking station for an exchangeable module. However, it may be noted that the embodiments of the present invention may also be used for devices placed underground at great depths.

35 **[0021]** FIG. 1 is a schematic diagram 10 depicting an arrangement of the subsea docking station with an exchangeable module. A docking station 12 is placed at the sea floor. An exchangeable module 14 which includes an electrical component or a mechanical component is fixed to the docking station 12.

40 **[0022]** In accordance with aspects of the present technique, the electrical component may include devices such as, but not limited to a motor, a generator, a transformer, or switchgear. Furthermore, the mechanical component may include devices such as but not limited to a compressor, pumps or separators.

45 **[0023]** As previously noted, the docking station 12 is fixed to the bottom of the sea floor that is, at the sea bed. The docking station 12 has a flat base portion 28 which is attached to the sea bed. In addition, the docking station 12 includes a guidance 13, which is in the shape of a funnel as depicted in FIG. 1. More particularly, the guidance 13 is such that the docking station 12 has a wider portion at the top and a narrow base portion.

[0024] The exchangeable module 14 includes a means for lifting 16 through which the exchangeable module may be lifted. The means for lifting 16 may include a portion projected from the exchangeable module such as a hook. A rope, a chain or a wire capable of bearing the weight of the exchangeable module is coupled to the means for lifting the exchangeable module. A crane (not shown) may be used to lift the exchangeable module 14 from the sea bed.

[0025] The docking station 12 includes one or more connectors 18, 20, which may be electrical connectors, mechanical connectors or electromechanical connectors.

[0026] In accordance with the aspects of the present technique, the electrical connector 20 is a wet mate connector, which enables electrical connections at an underwater environment, such as at the bottom of the sea.

[0027] One or more wires 26 are connected to the electrical connector 20, such that the wires 26 are receivable through a channel in the docking station 12. It may be noted that wires also includes cables for the purpose of the present invention.

[0028] More particularly, the wires 26 are receivable through the base portion 28 of the docking station 12. The channel (not shown) may include a hole or a gap present at the base portion 28 of the docking station 12 providing a passage to the wires 26 for connecting to the electrical connectors 20.

[0029] In another embodiment depicted in FIG. 1, the connector is a mechanical connector 18; the mechanical connector 18 is typically used in subsea pipes in oil and gas and petrochemical industries. Mechanical connectors replace the need for welding of topside and subsea pipes. The mechanical connector 18 includes the connection of tubes of pipes and also of the pipelines for a supply of the operating material. In addition, the mechanical connector 18 may also be used for the production of oil and gas.

[0030] In accordance with aspects of the present technique, one or more pipes 24, such as a gas or oil supply pipe pass through a channel (not shown) at the base portion 28 of the docking station 12 to form a connection with the mechanical connector 18.

[0031] As previously noted, the exchangeable module 14 which is an electrical or a mechanical component is introduced into the bottom of the sea via use of a crane which may be at a great depth. The exchangeable module 14 includes a bottom portion 30. The bottom portion 30 also includes connectors which are adapted to be connected to the connectors 18, 20 present at the docking station 12. The shape of the docking station 12 enables the exchangeable module 14 by providing guidance to get coupled to the base portion 28 of the docking station 12. As previously mentioned, in one embodiment the shape of the docking station 12 is like a funnel which reduces the effort for placing the exchangeable module 14 at the desired position in the docking station 12 and further enables the exchangeable module 14 to easily

slide and fix to the docking station 12. More particularly, the bottom portion 30 of the exchangeable module 14 gets physically coupled to the base portion 28 of the docking station 12.

[0032] Alternatively, the docking station 12 may include moveable slides and locks to fix the exchangeable module 14 to a desired location.

[0033] Furthermore, the docking station 12 includes one or more locks 22 for securing the exchangeable module 14 in the docking station 12. The locks 22 prevent the exchangeable module 14 to move from the desired position.

[0034] In accordance with aspects of the present technique, the locks 22 may be electromechanical locks. As the exchangeable module 14 is introduced in the docking station 12, the locks 22 are designed to provide easy coupling to the exchangeable module 14 and thereafter secure the exchangeable module 14 by engaging into a portion (not shown) in the exchangeable module and hence get physically coupled to the docking station 12. In addition, the electromechanical locks 22 may be operated from a remote location for convenience and security.

[0035] In situation where the exchangeable module 14 has to be removed from the docking station 12, a control signal is given to the locks 22 for releasing the exchangeable module 14, the locks 22 disengage enabling lifting of the exchangeable module 14 by the crane for example.

[0036] The present invention has several advantages such as but not limited to an easier assembly and maintainability of the electrical or mechanical components, in addition the present technique also provides faster servicing of component since the component can be easily removed from the docking station, the present technique obviates the need of disassembling the entire components, instead provides flexibility to remove the components for which servicing is required. This makes the process of servicing faster.

Claims

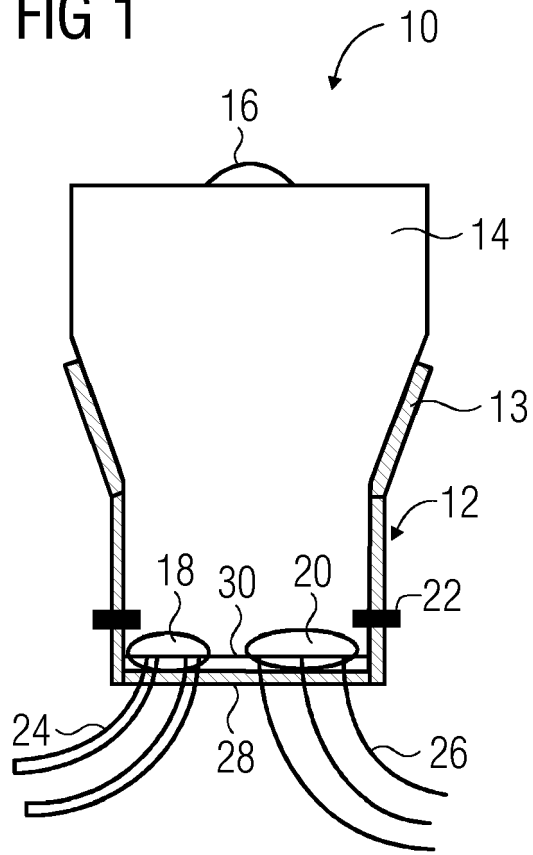
1. A subsea docking station (12) for an exchangeable module (14) comprising:
 - at least one connector (18,20) connectable to a respective connector of the exchangeable module (14), and
 - a guidance (13) for the exchangeable module (14) for engaging into a position in the docking station (12), such that connectors of exchangeable module (14) and the docking station (12) are connected.
2. The subsea docking station (12) according to claim 1 further comprising one or more locks (22) for securing the exchangeable module (14) in the docking station (12).

3. The subsea docking station (12) according to claim 1 and 2, wherein the at least one connector comprises an electrical connector (20).
4. The subsea docking station (12) according to claims 1 to 3, wherein the at least one connector comprises a mechanical connector (18). 5
5. The subsea docking station (12) according to any of the claims 1 to 4, wherein the exchangeable module (14) comprises means for lifting (16) the exchangeable module (14). 10
6. The subsea docking station (12) according to claim 5, wherein the means for lifting (16) comprises hooks that are adapted to attach to the exchangeable module (14). 15
7. The subsea docking station (12) according to any of the claims 1 to 5, wherein the exchangeable module (14) is at least one of a motor, a transformer, a compressor, a pump or a switchgear. 20
8. The subsea docking station (12) according to any of the claims 1 to 6, wherein the electrical connector (20) comprises a wet mate connector. 25
9. The subsea docking station (12) according to any of the claims 1 to 8, wherein the electrical connector (20) comprises wires (26) receivable through a channel in the docking station (12). 30
10. The subsea docking station (12) according to any of the claims 1 to 9, wherein the guidance (13) for the exchangeable module (14) comprise a funnel shape of the docking station (12). 35
11. The subsea docking station (12) according to any of the claims 1 to 10, wherein the docking station (12) comprises a base portion (28) attached to the seabed. 40
12. The subsea docking station (12) according to claim 11, wherein the exchangeable module (14) comprises a bottom portion (30) physically couplable to the base portion (28) of the docking station (12). 45

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FIG 1





EUROPEAN SEARCH REPORT

Application Number
EP 11 18 0024

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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 1 February 2012	Examiner van Berlo, André
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ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.

EP 11 18 0024

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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