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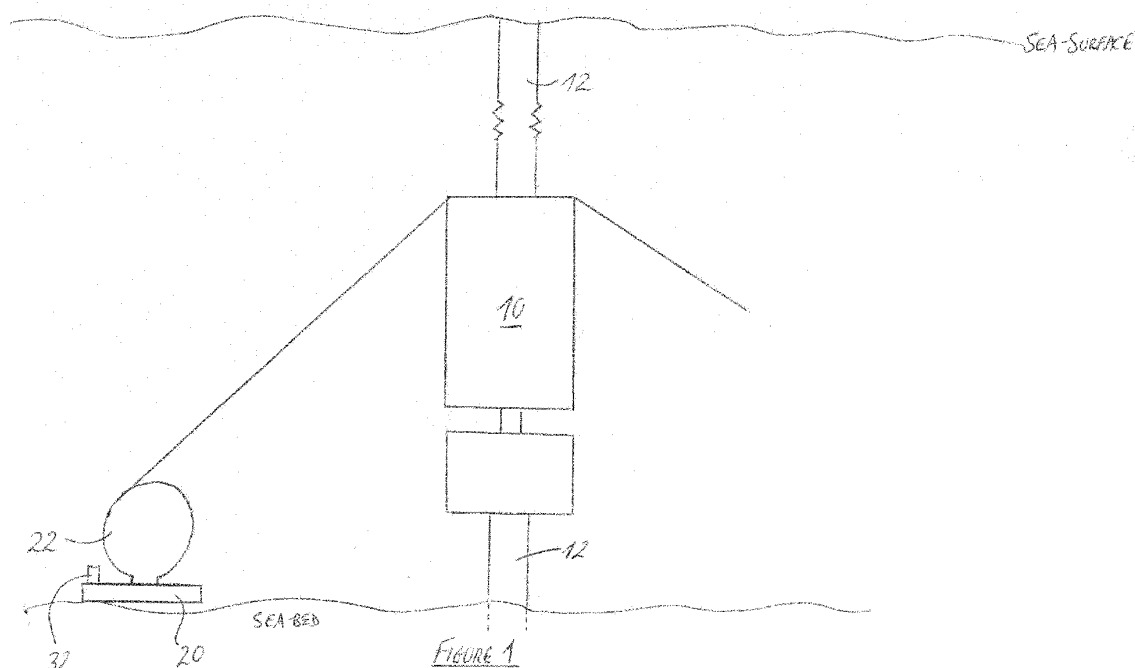
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(54) A TETHERING SYSTEM FOR A BLOW-OUT PREVENTER

(57) Firstly, a system for stabilising a BOP is disclosed. The system comprises a winch drum mounted for rotation in either direction about its main drum axis. A motor connected to the winch drum drives rotation of the winch drum about its main axis in either direction. Two or more cables are wound about said winch drum,

the cables being joined at one end to a connector. The connector is connectable to a BOP or a structure associated therewith.

Secondly, a method of stabilising a BOP is disclosed, the method comprising the use of a stabilising system, with said stabilising system being as described herein.



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Description

Field of the Invention

[0001] The present invention relates to a tethering system for preventing a blow-out preventer (BOP), included as part of an oil and gas extraction installation, from moving from its assigned position. In particular, the BOP is typically located on or close to a seabed and subject to various forces from water currents.

Background to the Invention

[0002] Blow-out preventers are widely used in the oil and gas extraction industry to prevent large amounts of oil and gas escaping from the well in the event of an uncontrolled and unintended release. A BOP is usually located at the top of a well - for subsea operations, close to the seabed - and stays in place during the operation of the well. Should an unwanted release event occur, the BOP acts to cut off flow from the well and/or seal about the leak area.

[0003] Many modern BOPs are much heavier than older models which can lead to problems with their use. For example, an older installation may have used thinner pipes or be subject to corrosion, and so the greater weight of the BOP can lead to failure of the supporting structure. Also, smaller mobile units used in drilling may be unable to support a BOP over the long term. Should the BOP be subject to environmental forces, then this exacerbates the problem and can lead to early failure.

[0004] In order to minimise the risk of damage and to stabilise the BOP a technique referred to as tethering is widely used in the industry. In this technique, the BOP is secured by one or more cables or the like - referred to as a line - each line secured under tension to a secure housing. The tension in a line can be altered to ensure that the BOP is prevented from moving far from its desired position.

[0005] The disadvantage of conventional systems is that reliance is placed on a single tensioning line. This has two disadvantages. Firstly, the rating of the line needs to be high to deal with the forces experienced. Second, should the line break, then the BOP no longer has any restraint which can result in damage to the well-head.

[0006] It is an object of the present invention to provide an improved system of tethering a BOP which addresses the above problems.

Summary of the Invention

[0007] According to a first aspect of the invention there is provided a system for stabilising a BOP;

the system comprising a winch drum mounted for rotation in either direction about its main drum axis;

a motor connected to the winch drum to drive rotation of the winch drum about its main axis in either direction;

two or more cables wound about said winch drum, the cables being joined at one end to a connector, the connector being connectable to a BOP or a structure associated therewith.

[0008] The use of two or more cables enables the system to continue to function even in the event of failure of one cable. Additionally, the use of cables of a lower rating than would otherwise be the case is enabled, saving costs.

[0009] Preferably, the system includes a sensor to determine the load on the motor. Further preferably, the sensor is connected for transmission of data to a processor. The processor is yet further preferably connected to the motor to issue operating instructions to the motor. Additionally and/or alternatively preferably the processor is linked to transmit data to an operator who can determine if action needs to be taken.

[0010] The operation of the motor can therefore be controlled to allow the motor to exert a different force on a cable in the event that a cable becomes weaker or breaks. The application of the restraining force on the BOP can therefore be maintained.

[0011] The main axis of the drum is preferably deployed in the horizontal position to minimise lateral slippage of the cable along the drum.

[0012] Preferably a cable is selected which has a stretch co-efficient greater than the creep percentage expected to ensure that the load on each of the cables is similar.

[0013] According to a second aspect of the invention, there is provided a method of stabilising a BOP comprising the use of a stabilising system, as set out in Claim 1.

Brief Description of the Drawings

[0014] The invention is now described with reference to the accompanying drawings which show, by way of example only, one embodiment of a tethering system. In the drawings:

Figure 1 illustrates securing a BOP by means of a tethering system; and

Figure 2 illustrates a top view of a tethering system.

Detailed Description of the Invention

[0015] As indicated above, tethering systems to prevent a BOP from moving to an extent that damage might be caused by such movement to connected structures are well known in the art.

[0016] For example, US10233606B discloses a tethering system comprising anchors, which are located on

a seabed, a winching system and a flexible tensioning means, such as a cable, connecting the winching system to each of the anchors. The winch acts to produce the required tension in the tensioning means. The tensioning means disclosed consists of a single length of cabling.

[0017] US 2020/0240244 discloses a tensioning system, similarly including anchors, a winching system and a flexible tensioning means connecting the winching system to each of the anchors, whereby a winch is included in each of the anchors to provide the appropriate tension in the tensioning means.

[0018] Each of these prior art systems has the drawback that in the event of failure of a cable, the BOP could become unstable. Moreover, each of the cables needs to be of sufficiently high rating to be able to withstand the forces exerted.

[0019] The present invention addresses these problems in that it provides a tethering system having one or more winches, each winch being connected to a BOP or other item to be tethered, by two or more cables.

[0020] Referring to Figure 1, this illustrates a general set up for a tethering system as disclosed herein. The BOP 10 to be stabilised is linked to a pipeline 12 extending in one direction into the seabed and in the other direction to a platform (not shown) or the like. An anchor, generally referenced 20, is secured to or rests on the seabed. Although the anchor 20 can be retained in position by virtue of its high mass, additional means can be included to retain the anchor 20 in position. Such an additional means can be for example a pile driven into the seabed.

[0021] The anchor 20 supports a winch drum 22 which is rotatably mounted about a central cylindrical axis, which in this preferred embodiment is horizontally deployed. A motor, not illustrated, is provided in order to drive rotation, in either direction, of the drum 22 about the drum axis. The drum 22 comprises a central cylindrical support 24, with discs 26 of greater diameter than the cylindrical support 24 at either end of the cylindrical support 24. The discs 26 act to prevent a cable 28 from becoming detached from the drum 22 by sliding off the reel of cable 28 wound about the drum 22.

[0022] In order to determine the load being applied, the motor includes a sensor 32 to determine the load on the motor. The data from the sensor is transmitted to a processor which then determines the status of the motor. In the event that the operation of the motor needs to be changed, the processor includes a link is linked to the motor to cause said change: such as altering the wind rate of the drum, applying a greater torque to the drum 22 etc.

[0023] In the current invention, each winch has two cables 28a, 28b wrapped about the cylindrical support 24. The cables 28a, 28b are wound or unwound from the support 24 at the same time and at the same rate. From Figure 2 it can be seen therefore that cables 28a, 28b are provided, linked pairwise to each other by means of a connector 30. The connector 30 itself is operably con-

nected to the BOP 10 to stabilise the BOP 10. In an alternative embodiment, a BOP 10 is secured to a surrounding supporting structure, in which case the connector 30 can be secured to said supporting structure. Typically the combined weight pulled by a cable on the BOP 10 is around 5 Tonne. In the present invention, because of the utilisation of 2 cables, each cable pulls only 2.5 tonnes. This enables the rating of any cable used to be lower than in the prior art which saves on costs and also allows the motor to pull at a lower tension. The working life of a cable is thereby increased.

[0024] Additionally, in the event that one of the cables becomes weak or breaks, this event can be sensed by the sensor associated with the motor. Further power can be imparted to the motor to enable the remaining cable to continue to pull the required weight on the BOP 10. The processor can also signal an operator that a cable needs to be replaced. The operation of the tethering apparatus therefore can be continued with minimal interruption and with fewer occasions on which the action of tethering the BOP 10 is compromised. There is therefore a lower risk of damage to any connected structures.

[0025] It is preferable that the tension in each of the cables 28a, 28b be the same during operation. It is recognised that, with time, the elasticity of a cable changes as wear occurs to the material of the cable. Rope creep can therefore occur in which the length of a cable changes over time or the response to a load changes over time. A cable is therefore preferably selected which has a stretch co-efficient which is greater than the amount of creep to minimise the dissimilarity between the loads borne by the two cables which are connected together.

[0026] In a further embodiment, not illustrated, 3 or more cables can be connected together and be wound about and operated from the same winch drum.

Claims

1. A system for stabilising a BOP;

the system comprising a winch drum (22) mounted for rotation in either direction about its main drum axis;

a motor connected to the winch drum (22) to drive rotation of the winch drum about its main axis in either direction;

characterised in that the system comprises two or more cables (28a, 28b) wound about said winch drum (22), the cables (28a, 28b) being joined at one end to a connector (30), the connector (30) being connectable to a BOP (10) or a structure associated therewith.

2. A system according to Claim 1, wherein the system includes a sensor (32) to determine the load on the motor.

3. A system according to Claim 2, wherein the sensor is connected for transmission of data to a processor.
4. A system according to Claim 3, wherein the processor is connected to the motor to issue operating instructions to the motor. 5
5. A system according to Claim 3 or Claim 4, wherein the processor is linked to transmit data to an operator who can determine is action needs to be taken. 10
6. A system according to any preceding claim, wherein the main axis of the drum is deployed in the horizontal position. 15
7. A system according to any preceding claim, wherein the cable has a stretch co-efficient greater than the creep percentage expected.
8. A method of stabilising a BOP comprising the use of a stabilising system, the stabilising system being in accordance with Claim 1. 20

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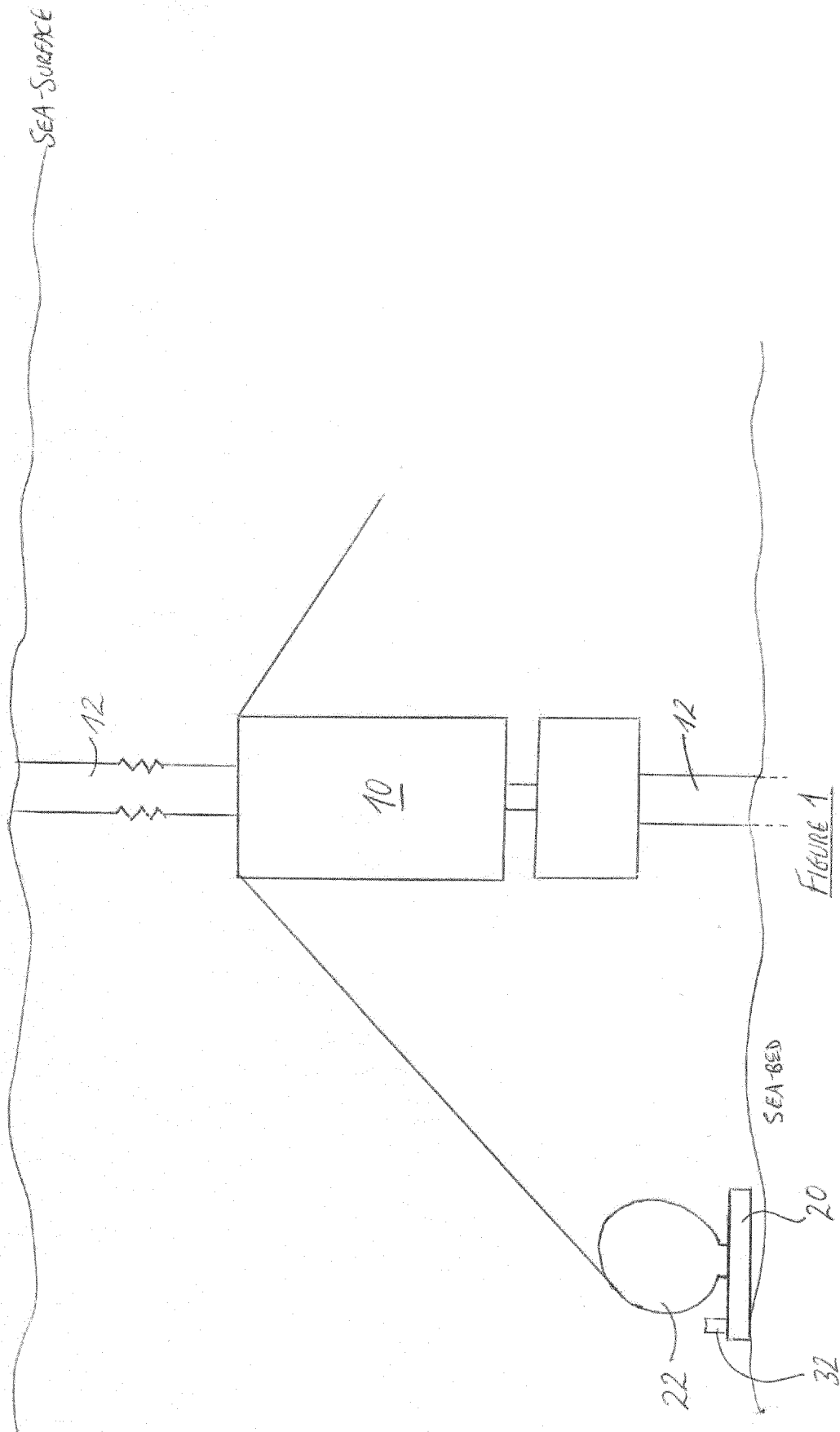
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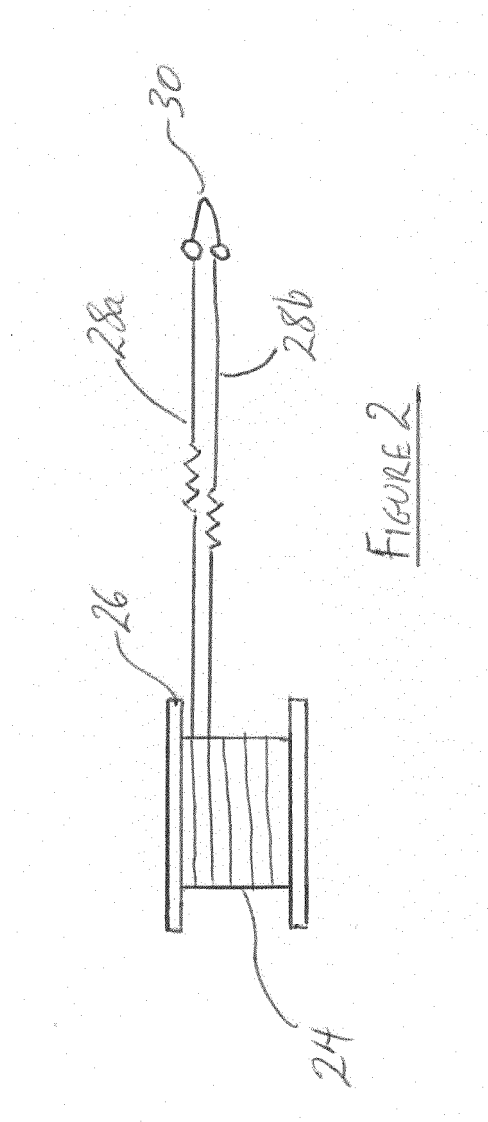
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EUROPEAN SEARCH REPORT

Application Number

EP 23 15 6898

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EPO FORM 1503 03.82 (P04C01)

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 2 June 2023	Examiner Strømme, Henrik
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	

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

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