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(54) **SURFACE BLOW-OUT PREVENTION
SUPPORT SYSTEM**

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(57) **ABSTRACT**

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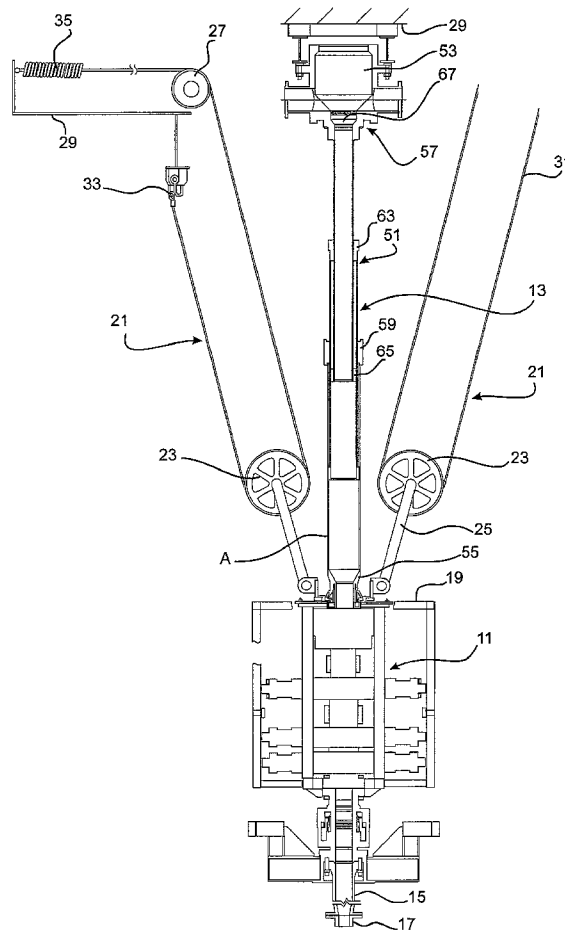
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A surface blow-out prevention support system comprising a support accommodating the blow-out preventor which is adapted to be supported from an associated support structure, the support facilitating connection between the blow-out prevention system and a riser extending from an under-water well, a connector providing a fluid connection between the blow-out preventor and the associated support structure, the support comprising a plurality of suspension members extending between the associated support structure and the support, where the suspension members are mounted to the support at angularly equidistant positions around the central axis of the support, each suspension member comprising a flexible cord member extending between the support and the associated support structure through a sheave arrangement, the sheave arrangement including a resilient tensioning member which is capable of resilient longitudinal extension to cause the spacing between the support and the associated support structure to be varied.



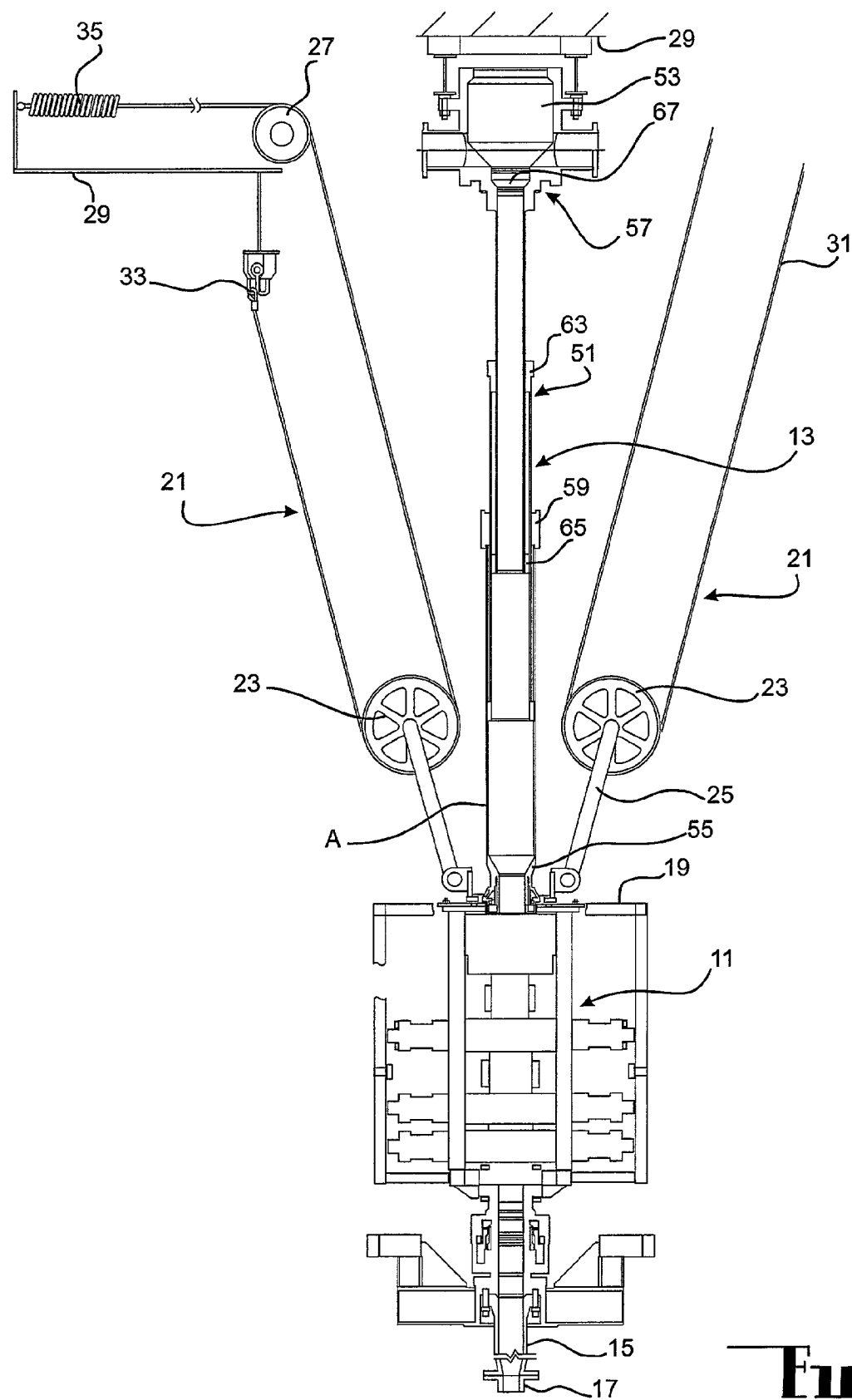


Fig. 1,

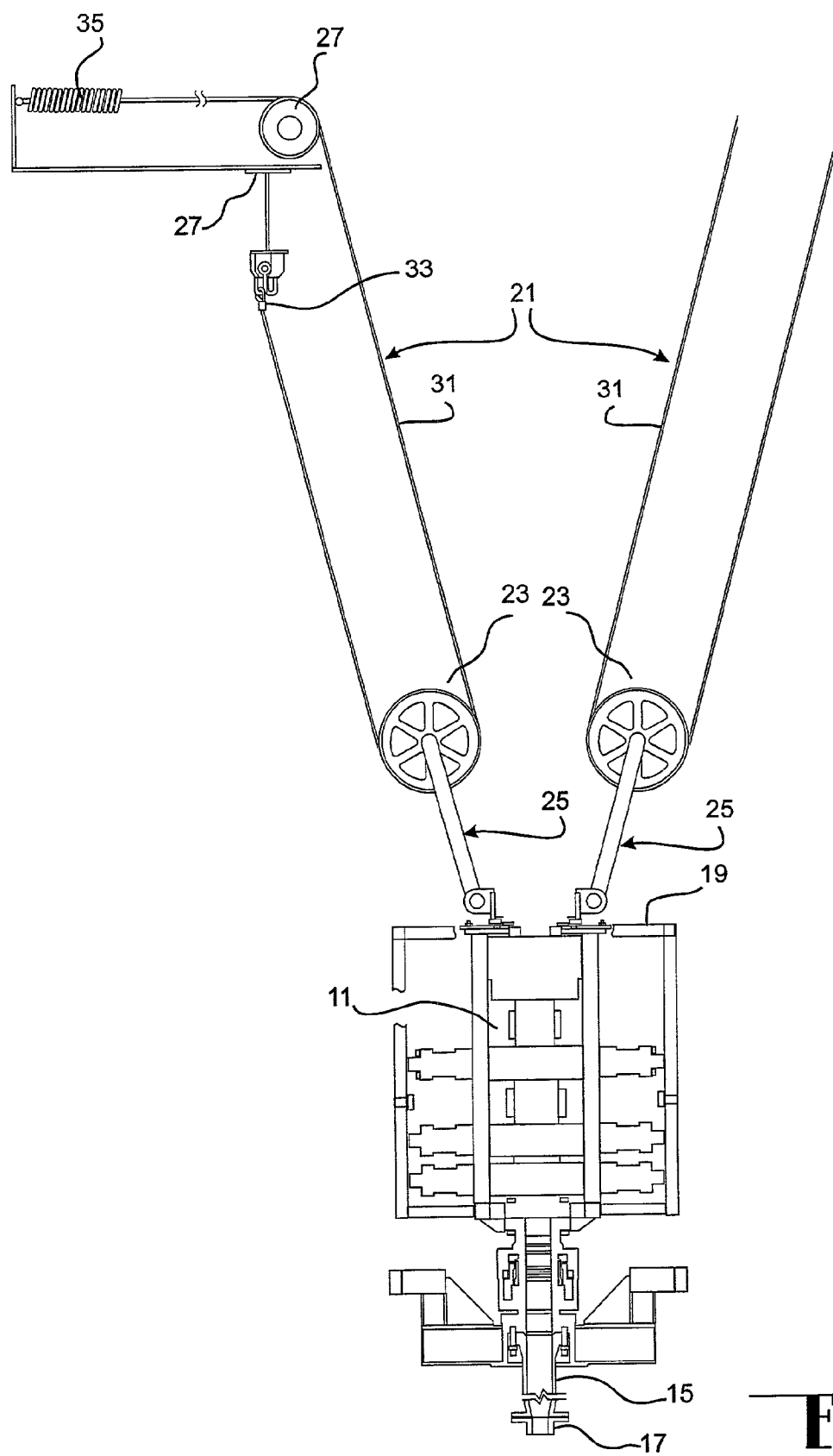


Fig. 2

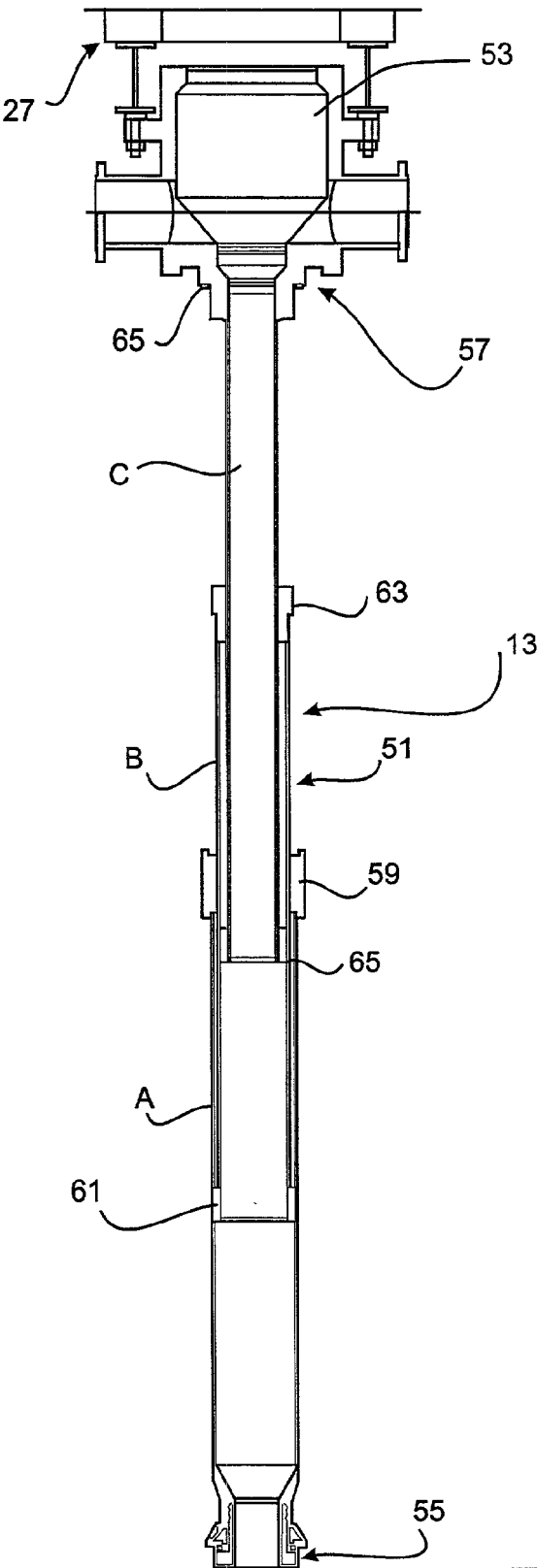


Fig. 3.

SURFACE BLOW-OUT PREVENTION SUPPORT SYSTEM

FIELD OF THE INVENTION

[0001] This invention relates to a surface blow-out prevention supporting system for use in providing a connection between an underwater well and an associated structure such as a drill rig located at the surface.

BACKGROUND

[0002] In providing a connection between an underwater well and a drill rig, it is conventional practice to provide a blow-out prevention system at the mudline or seabed which serves to control any excessive pressure within the borehole during the drilling of the borehole. In the event of there being excessive pressure in the borehole which could result in a blow-out, the blow-out prevention system is designed to shut the borehole off. However, a difficulty with such an arrangement relates to the servicing of the blow-out prevention system and the well in deep water drilling conditions. Therefore in at least some instances it can be advantageous to locate the blow-out prevention system in the region of the surface, however this can cause a difficulty as a result of the need to accommodate.

[0003] In some circumstances, it has been known to support the blow-out prevention system from the rig where the blow-out prevention system is supported by the support rig to be able accommodate for relative longitudinal movement between the riser and the rig. However, the degree of movement which is available to the blow-out prevention system relative to the structure or rig is extremely limited which results in considerable stresses being applied to the riser.

[0004] It is an object of this invention to provide a blow-out prevention support system which enables the blow-out prevention system to be located at or about the surface of the water and which is able to accommodate for rotational, pivotal and longitudinal movement of support structure relative to the riser.

DISCLOSURE OF THE INVENTION

[0005] Accordingly, the invention resides in a surface blow-out prevention support system comprising a support accommodating the blow-out preventor which is adapted to be supported from an associated support structure, the support facilitating connection between the blow-out prevention system and a riser extending from an underwater well, a connector providing a fluid connection between the blow-out preventor and the associated support structure, said support comprising a plurality of suspension members extending between the associated support structure and the support, said suspension members being mounted to the support at substantially angularly equidistant position around the central axis of the support, each suspension member comprising a flexible cord member extending between the support and the associated support structure through a sheave arrangement, said sheave arrangement including a resilient tensioning member which is capable of resilient longitudinal extension to cause the spacing between the support and the associated support structure to be varied.

[0006] According to a preferred feature of the invention at least three suspension members are provided between the

support and the associated support structure. According to one embodiment four suspension members are provided between the support and the associated support structure.

[0007] According to a preferred feature of the invention, each suspension member comprises a sheave block mounted to the support and a further sheave block mounted to the associated support structure, one end of said cord being fixed to the associated support structure or the support. According to one embodiment the other end of the cord is connected to the associated support structure through the tensioning member.

[0008] According to a preferred feature of the invention the connector is adapted to provide fluid connection between the blow-out preventor and a fluid line provided on the associated support structure, said connector having an elongate tubular body, the body having a first end adapted to be mounted to the blow-out prevention means and the body having a second end adapted to be connected to the fluid line where the connector accommodates for relative longitudinal movement between the riser and the associated support structure, said body comprising a plurality of tubular portions which are telescopically and sealingly interengaged to enable the spacing between the ends to be varied, one of said ends having an engagement member adapted to be fixed to said blow-out prevention means or to said support structure, said engagement member being pivotally mounted to the one end of said ends to be rotatable about the longitudinal axis of the body and to be pivotable about the transverse axis of the body.

[0009] According to a preferred feature of the invention, the said one end of the body is provided with an annular collar having an outer face which is of a part spherical configuration, said collar being received within a socket of complementary configuration within the engagement member to permit said rotatable and pivotal relative movement between the body and the engagement member.

[0010] The invention will more fully understood in the light of the following description of one specific embodiment.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] The description is made with reference to the accompanying drawing of which;

[0012] **FIG. 1** is a schematic illustration of a support for a blow-out protector according to the embodiment;

[0013] **FIG. 2** is a schematic illustration a support arrangement for the blow-out prevention support means according to the embodiment; and

[0014] **FIG. 3** is a schematic sectional elevation of the connector according to the embodiment.

DETAILED DESCRIPTION OF SPECIFIC EMBODIMENT

[0015] The embodiment is directed to the support and connection arrangement for a surface blow-out prevention system of an underwater well where the arrangement comprises a blow-out preventor **11** and connector **13** supported from a rig **29** where the lower most end of the blow-out preventor is connected via a hydraulic connection to a tapered stress joint **15** connected to the riser **17** of an

underwater well at a position located in the vicinity of the surface of the water. The upper end of the blow-out protector **11** is connected to a conduit (not shown) provided on the rig through the connector **13** which extends between the blow-out protector and the conduit.

[0016] The blow-out protector **11** of the embodiment is supported from the rig **29** through a support frame **19** which accommodates the blow-out protector and which is supported from the rig through a set of four suspension members **21**. The suspension members **21** are spaced at angularly equidistant intervals around the central longitudinal axis of the blow-out protector. Each suspension member comprises a first sheave block **23** which is supported from the upper end of the support frame **15** through a link member **25** which is pivotally supported from the frame **19**. Each suspension member further comprises a second sheave block **27** which is supported from the rig **29**. A cable or like flexible cord member **31** is fixed at one end **33** to the rig **29** and extends from the one end **33** over the first sheave block **19** and the second sheave block **27**. The other end (not shown) of the flexible cord member **31** is fixed to the rig **27** through a tensioning member **35** which is capable of resilient extension to allow for relative movement between the support frame **19** and the rig **29**.

[0017] The arrangement according to the embodiment enables the blow-out protector system to be supported from underneath the rig in a manner whereby the support arrangement will resiliently accommodate for relative movement between the rig and the riser **13** without inducing any significant undue stresses on the support arrangement.

[0018] The connection between the blow-out protector and the rig **29** is effected through the connector **13** which is able to accommodate for relative longitudinal rotational and pivotal movement between the blow-out protector and the rig. The connector **13** facilitates the transfer of fluid from the well to the conduit **53** while accommodating for relative movement between the rig and the riser pipe **17** which will arise from relative movement of the platform or rig as a result of variations in the water level which can arise from tidal movements and/or wave action. The connector **11** comprises a telescopic elongate body **51** which enables connection between the blow-out protector **11** and the conduit **53** provided on the rig **29**. The body has a first end **55** which is adapted to be sealingly engaged with the outlet of the blow-out protector system and the body has a second end **57** which is adapted to be fixed to the conduit **53**. The body **51** comprises **3** tubular portions A, B and C. The lower most portion A provides the first end **55** of the body and is dimensioned to receive the intermediate portion B. The lower most portion A is provided at its other end with a first seal **59** which is slidably and sealingly received over the outer surface of the intermediate portion B to enable relative elongate movement between the lower most portion A and the intermediate portion B. The end of the intermediate portion B which is received within the lower most portion A is provided on its outermost surface within a first annular collar **61** which is intended to be sealingly and slidably received with the internal face of the lower most portion A. In addition the first annular collar **61** is intended to be engageable with the first seal **59** provided on the lower most portion A to prevent the axial movement of the intermediate portion B out of engagement with the lower most portion A. The intermediate portion B is dimensioned to receive the

upper most portion C and the outer end of the intermediate portion B is provided with a second seal **63** which is slidably and sealingly received over the outer surface of the upper most portion C. The end of the upper most portion within the intermediate portion B is provided with a second annular collar **65** which is intended to be sealingly and slidably received with the internal face of the intermediate portion B. In addition the second annular collar **65** is intended to be engageable with the second seal **63** provided on the intermediate portion B to prevent the axial movement of the upper most portion C out of engagement with the intermediate portion B.

[0019] The second end **57** of the body is adapted to be able to accommodate for pivotal and rotational movement between the connector and the rig **27**. This is effected by providing an annular flange member **65** which is adapted to be fixed to the rig **27** and which has an interior which is formed as a socket **67** which receives the outer end of the upper most portion C of the body **51**. The lowermost portion of the internal face of the socket is formed as a concave part spherical surface. The outer end of the upper most portion C is provided with an annular sealing collar which has a spherical outer configuration where the socket defined by the annular flange member which accommodates the outer end of the upper most portion C is of complementary configuration to the outer surface of the annular sealing collar **27** (ie: is of a part spherical configuration) to enable the annular sealing collar **27** to be both rotatably received within the flange member **25** and to be pivotable about the transverse axis of the flange **25**. Suitable seals are provided between the annular sealing collar **27** and the socket of the flange member **25** to provide a fluid tight connection.

[0020] The connector of the embodiment enables the connection between an blow-out protector and the rig to accommodate relative movement there between without inducing excessive or undue stresses on the interconnection.

[0021] Throughout the specification, unless the context requires otherwise, the word "comprise" or variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated integer or group of integers but not the exclusion of any other integer or group of integers.

[0022] The scope of the invention is not to be limited to the particular scope of the embodiment described above.

The claims defining the invention are as follows:

1. A surface blow-out prevention support system comprising a support accommodating the blow-out preventor which is adapted to be supported from an associated support structure, the support facilitating connection between the blow-out prevention system and a riser extending from an underwater well, a connector providing a fluid connection between the blow-out preventor and the associated support structure, said support comprising a plurality of suspension members extending between the associated support structure and the support, said suspension members being mounted to the support at substantially angularly equidistant position around the central axis of the support, each suspension member comprising a flexible cord member extending between the support and the associated support structure through a sheave arrangement, said sheave arrangement including a resilient tensioning member which is capable of resilient longitudinal extension to cause the spacing between the support and the associated support structure to be varied.

2. A surface blow-out prevention support system as claimed at claim 1 wherein at least three suspension members are provided between the support and the associated support structure.

3. A surface blow-out prevention support system as claimed at claim 2 wherein four suspension members are provided between the support and the associated support structure.

4. A surface blow-out prevention support system as claimed at claim 1 wherein, each suspension member comprises a sheave block mounted to the support and a further sheave block mounted to the associated support structure, one end of said cord being fixed to the associated support structure or the support.

5. A surface blow-out prevention support system as claimed at claim 2 wherein, each suspension member comprises a sheave block mounted to the support and a further sheave block mounted to the associated support structure, one end of said cord being fixed to the associated support structure or the support.

6. A surface blow-out prevention support system as claimed at claim 3 wherein, each suspension member comprises a sheave block mounted to the support and a further sheave block mounted to the associated support structure, one end of said cord being fixed to the associated support structure or the support.

7. A surface blow-out prevention support system as claimed at claim 4 wherein the other end of the cord is connected to the associated support structure through the tensioning member.

8. A surface blow-out prevention support system as claimed at claim 5 wherein the other end of the cord is connected to the associated support structure through the tensioning member.

9. A surface blow-out prevention support system as claimed at claim 6 wherein the other end of the cord is connected to the associated support structure through the tensioning member.

10. A surface blow-out prevention support system comprising a support accommodating the blow-out preventor which is adapted to be supported from an associated support structure, the support facilitating connection between the blow-out prevention system and a riser extending from an underwater well, a connector providing a fluid connection between the blow-out preventor and the associated support structure, said support comprising a plurality of suspension members extending between the associated support structure and the support, said suspension members being mounted to the support at substantially angularly equidistant position around the central axis of the support, each suspension member comprising a flexible cord member extending between the support and the associated support structure through a sheave arrangement, said sheave arrangement including a resilient tensioning member which is capable of resilient longitudinal extension to cause the spacing between the support and the associated support structure to be varied, wherein the connector is adapted to provide fluid connection between the blow-out preventor and a fluid line provided on the associated support structure, said connector having an elongate tubular body, the body having a first end adapted to be mounted to the blow-out prevention means and the body having a second end adapted to be connected to the fluid line where the connector accommodates for relative longitudinal movement between the riser and the associated support

structure, said body comprising a plurality of tubular portions which are telescopically and sealingly interengaged to enable the spacing between the ends to be varied, one of said ends having an engagement member adapted to be fixed to said blow-out prevention means or to said support structure, said engagement member being pivotally mounted to the one end of said ends to be rotatable about the longitudinal axis of the body and to be pivotable about the transverse axis of the body.

11. A surface blow-out prevention support system as claimed at claim 10 wherein the said one end of the body is provided with an annular collar having an outer face which is of a part spherical configuration, said collar being received within a socket of complementary configuration within the engagement member to permit said rotatable and pivotal relative movement between the body and the engagement member.

12. A surface blow-out prevention support system as claimed at claim 10 wherein at least three suspension members are provided between the support and the associated support structure.

13. A surface blow-out prevention support system as claimed at claim 11 wherein at least three suspension members are provided between the support and the associated support structure.

14. A surface blow-out prevention support system as claimed at claim 12 wherein four suspension members are provided between the support and the associated support structure.

15. A surface blow-out prevention support system as claimed at claim 13 wherein four suspension members are provided between the support and the associated support structure.

16. A surface blow-out prevention support system as claimed at claim 10 wherein, each suspension member comprises a sheave block mounted to the support and a further sheave block mounted to the associated support structure, one end of said cord being fixed to the associated support structure or the support.

17. A surface blow-out prevention support system as claimed at claim 11 wherein, each suspension member comprises a sheave block mounted to the support and a further sheave block mounted to the associated support structure, one end of said cord being fixed to the associated support structure or the support.

18. A surface blow-out prevention support system as claimed at claim 12 wherein, each suspension member comprises a sheave block mounted to the support and a further sheave block mounted to the associated support structure, one end of said cord being fixed to the associated support structure or the support.

19. A surface blow-out prevention support system as claimed at claim 13 wherein, each suspension member comprises a sheave block mounted to the support and a further sheave block mounted to the associated support structure, one end of said cord being fixed to the associated support structure or the support.

20. A surface blow-out prevention support system as claimed at claim 14 wherein, each suspension member comprises a sheave block mounted to the support and a further sheave block mounted to the associated support structure, one end of said cord being fixed to the associated support structure or the support.

21. A surface blow-out prevention support system as claimed at claim 15 wherein, each suspension member comprises a sheave block mounted to the support and a further sheave block mounted to the associated support structure, one end of said cord being fixed to the associated support structure or the support.

22. A surface blow-out prevention support system as claimed at claim 16 wherein the other end of the cord is connected to the associated support structure through the tensioning member.

23. A surface blow-out prevention support system as claimed at claim 17 wherein the other end of the cord is connected to the associated support structure through the tensioning member.

24. A surface blow-out prevention support system as claimed at claim 18 wherein the other end of the cord is

connected to the associated support structure through the tensioning member.

25. A surface blow-out prevention support system as claimed at claim 19 wherein the other end of the cord is connected to the associated support structure through the tensioning member.

26. A surface blow-out prevention support system as claimed at claim 20 wherein the other end of the cord is connected to the associated support structure through the tensioning member.

27. A surface blow-out prevention support system as claimed at claim 21 wherein the other end of the cord is connected to the associated support structure through the tensioning member.

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