Intervention workover control systems

Apparatus for use in providing an intervention workover control system for an underwater well, comprises: a first structure (1), comprising an umbilical termination unit, the first structure having means (2) for connecting to a hydraulic flying lead; first support means, for use with the first structure, for supporting at least one electrical flying lead (15, 16) and second support means (17, 18), for use with the first structure, for supporting a hydraulic flying lead (19); and second and third structures (3 and 4), there being third support means (11, 12), for use with the third structure, for supporting at least one electrical flying lead (13, 14), which structures can be connected to respective ones of opposite sides of the first structure. The first, second and third structures are adapted so that: to provide an intervention workover control system of a first configuration, the first structure is usable with the second and third structures connected to respective ones of opposite sides of the first structure; and to provide an intervention workover control system of a second configuration, the first structure is usable without the second and third structures connected to it.
This invention relates to apparatus for use in providing an intervention workover control system for an underwater well.

According to the invention, there is provided apparatus for use in providing an intervention workover control system for an underwater well.

Intervention workover control systems (IWOCS) for subsea hydrocarbon wells are typically designed and manufactured to suit specific variations of applications, such as mounting on mud mats or a lower marine riser package (LMRP) and having different lengths of hydraulic flying lead (HFL). This invention enables a flexible alternative with a modular approach, requiring minimal engineering to meet a wide range of applications.

Summary of the Invention

According to the invention, there is provided apparatus for use in providing an intervention workover control system for an underwater well, comprising:

- a first structure, comprising an umbilical termination unit, said first structure having means for connecting to a hydraulic flying lead;
- first support means, for use with said first structure, for supporting at least one electrical flying lead and second support means, for use with said first structure for supporting a hydraulic flying lead; and
- second and third structures, there being third support means, for use with at least one of said second and third structures, for supporting at least one electrical flying lead, which structures can be connected to respective ones of opposite sides of said first structure, wherein said first, second and third structures are adapted so that:
- to provide an intervention workover control system of a first configuration, said first structure is usable with said second and third structures connected to respective ones of opposite sides of said first structure; and
- to provide an intervention workover control system of a second configuration, said first structure is usable without said second and third structures connected to it.

Typically, fourth support means are provided, for use with said second and third structures, for use in supporting such a hydraulic flying lead in an intervention workover control system of said first configuration.

The apparatus is adapted so that such a hydraulic flying lead is supported by said second support means in an intervention workover control system of said second configuration.

The apparatus is adapted so that at least one such electrical flying lead is supported by said third support means in an intervention workover control system of said first configuration.

The apparatus is adapted so that at least one such electrical flying lead is supported by said first support means in an intervention control system of said second configuration.

Each of said second and third structures could be provided with means for engaging with an upright member located on or for location on a bed of a body of water, for supporting an intervention workover control system of said first configuration. Such engaging means could be generally tubular.

Said first structure could include means for engaging with an upright member, for supporting an intervention control system of said second configuration.

The apparatus could include at least one further structure, providing a parking position for equipment and for attachment to one of said second and third structures in an intervention workover control system of said first configuration or to said first structure in an intervention workover control system of said second configuration.

The apparatus could include at least one further structure for carrying further equipment and for attachment to one of said second and third structures in an intervention workover control system of said first configuration or to said first structure in an intervention workover control system of said second configuration.

Typically though, the apparatus could include:

- at least one further structure, providing a parking position for equipment and for attachment to one of said second and third structures in an intervention workover control system of said first configuration or to said first structure in an intervention workover control system of said second configuration; and
- at least one further structure, for carrying further equipment and for attachment to the other of said second and third structures in an intervention workover control system of said first configuration or to said first structure in an intervention workover control system of said second configuration.

Such further equipment could comprise at least one of hydraulic gauges and remotely operated vehicle (ROV) connections and ROV-operated valves.

The invention also comprises a method of providing an intervention workover control system for an underwater well, comprising the steps of providing apparatus according to the invention and using the apparatus to form a system according to the first or second configuration.
Detailed Description of the Invention

The following describes the use of apparatus according to an embodiment of the invention to provide two different IWOCS configurations: a first configuration (see Fig. 1) in which parts of the apparatus provide an IWOCS on a mud mat on the seabed and a second configuration (see Fig. 2) in which parts of the apparatus provide an IWOCS on a LMRP.

More particularly, the overall apparatus comprises: a first modular structure in the form of a subsea umbilical termination unit (SUTU) 1 having a plate 2 providing a parking (and flushing) position for a HFL; second and third modular structures 3 and 4; a further structure 5 (providing a parking plate during intervention workover and flushing) and third modular structures 3 and 4; a further structure 6 and 7 comprising four posts 8a around which a lengthy HFL 9 can be wound and support projections at 17 and 18 for a relatively short HFL 9 (typically 20 to 40 metres long). When used in the first configuration, the structure 1 is fitted with a post 8b for use in supporting such a HFL. For use in the first configuration, each of structures 3 and 4 also carries two conically-ended guide funnels 10 and structure 4 carries support posts 11 and 12 around which lengthy electric flying leads (EFLs) 13 and 14 can be wound. When used in the second configuration but not the first, SUTU 1 is fitted with projections (not shown) around which relatively short EFLs 15 and 16 can be wound and support projections at 17 and 18 for a relatively short HFL 19 (typically 20 to 40 metres long). Also, inside SUTU 1 there is a guide passageway for engagement with a post attached to a LMRP in the second configuration.

Fig. 1 shows parts of the apparatus before assembly in an IWOCS configuration suited for mounting on a mud mat 20 on the seabed.

Fig. 2 shows parts of the apparatus before assembly in an IWOCS of a second configuration.

Claims

1. Apparatus for use in providing an intervention workover control system for an underwater well, comprising:

   a. a first structure, comprising an umbilical termination unit, said first structure having means for connecting to a hydraulic flying lead;
   b. first support means for use with said first structure, for supporting at least one electrical flying lead and second support means, for use with said first structure, for supporting a hydraulic flying lead; and
   c. second and third structures, there being third support means, for use with at least one of said second and third structures, for supporting at least one electrical flying lead, which structures
can be connected to respective ones of opposite sides of said first structure, wherein said first, second and third structures are adapted so that:

- to provide an intervention workover control system of a first configuration, said first structure is usable with said second and third structures connected to respective ones of opposite sides of said first structure; and
- to provide an intervention workover control system of a second configuration, said first structure is usable without said second and third structures connected to it.

2. Apparatus according to claim 1, including fourth support means, for use with said second and third structures, for use in supporting such a hydraulic flying lead in an intervention workover control system of said first configuration.

3. Apparatus according to claim 1 or 2, adapted so that such a hydraulic flying lead is supported by said second support means in an intervention workover control system of said second configuration.

4. Apparatus according to any preceding claim, adapted so that at least one such electrical flying lead is supported by said third support means in an intervention workover control system of said first configuration.

5. Apparatus according to any preceding claim, adapted so that at least one such electrical flying lead is supported by said first support means in an intervention control system of said second configuration.

6. Apparatus according to any preceding claim, wherein each of said second and third structures is provided with means for engaging with an upright member located on or for location on a bed of a body of water, for supporting an intervention workover control system of said first configuration.

7. Apparatus according to claim 6, wherein said engaging means are generally tubular.

8. Apparatus according to any preceding claim, wherein said first structure includes means for engaging with an upright member, for supporting an intervention control system of said second configuration.

9. Apparatus according to any preceding claim, including at least one further structure, providing a parking position for equipment and for attachment to one of said second and third structures in an intervention workover control system of said first configuration or to said first structure in an intervention workover control system of said second configuration.

10. Apparatus according to any of claims 1 to 8, including at least one further structure for carrying further equipment and for attachment to one of said second and third structures in an intervention workover control system of said first configuration or to said first structure in an intervention workover control system of said second configuration.

11. Apparatus according to any of claims 1 to 8, including:

- at least one further structure, providing a parking position for equipment and for attachment to one of said second and third structures in an intervention workover control system of said first configuration or to said first structure in an intervention workover control system of said second configuration; and
- at least one further structure, for carrying further equipment and for attachment to the other of said second and third structures in an intervention workover control system of said first configuration or to said first structure in an intervention workover control system of said second configuration.

12. Apparatus according to claim 10 or 11, wherein said further equipment comprises at least one of hydraulic gauges, ROV connections and ROV-operated valves.

13. A method of providing an intervention workover control system for an underwater well, comprising the steps of providing apparatus according to any preceding claim and using the apparatus to form a system according to the first or second configuration.

14. A method according to claim 13, wherein the intervention workover control system is of the first configuration and is located on a mud mat on a bed of a body of water.

15. A method according to claim 13, wherein the intervention workover control system is of the second configuration and is located on a lower marine riser package.
## DOCUMENTS CONSIDERED TO BE RELEVANT

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The present search report has been drawn up for all claims

1 Munich 19 November 2012 Georgescu, Miheea
ANNEX TO THE EUROPEAN SEARCH REPORT
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