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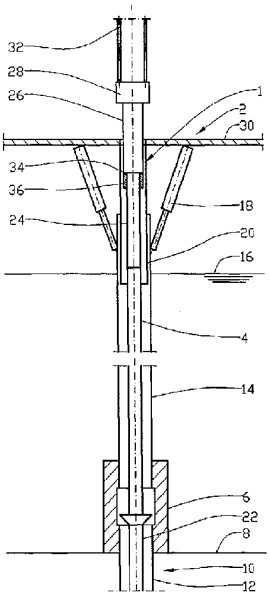
(54) Title: METHOD AND ARRANGEMENT BY A WORKOVER RISER CONNECTION



(57) Abstract: A method and arrangement for well completion and intervention operations where a workover riser (4) projecting from a wellhead (6) and up to a vessel (2) is used, and where the upper portion of the workover riser (4) is designed to be displaced from an upper position to a lowered position favourable for rigging work, where at least the upper displaceable portion of the workover riser (4) essentially follows the heave motion of the vessel (2), whereupon the upper displaceable portion of the workover riser (4) is again raised to its upper position, the workover riser (4) being equipped with a telescoping connection (1).

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

METHOD AND ARRANGEMENT BY A WORKOVER RISER CONNECTION

This invention regards a method of facilitating well operations from a vessel, in particular operations connected with well completion and well intervention, where use is made of a workover riser preferably equipped with surface valves, especially in connection with petroleum production. The invention also regards an arrangement for implementation of the method.

A common method of well completion is contingent upon a vessel equipped for the work operations in question being anchored or positioned over the well after the well has been drilled, cased and closed off. When the vessel has been positioned over the well, the well is opened and a wellhead comprising a number of valves and connecting pipes is lowered onto the seabed and connected to the casing. A riser is connected to the wellhead, projecting up through the sea to the vessel, where it is hung off in a heave compensator device designed to maintain tension in the riser during the

heave motion of the vessel. A telescoping section of the riser may be connected to the vessel.

A production tubing is lowered into the well and hung off in the well head, whereupon a workover riser pipe is run into the riser and connected communicatingly to the production tubing. The workover riser is equipped with surface valves and suspended via a tensioner in the crane arrangement of the vessel. The surface valves comprise connections for various fluids and sluicing chambers for tools.

The area surrounding the surface valve is a work site for personnel during completion and intervention operations. The workover riser and the surface valves are connected to the seabed and are fixed, while the vessel is subjected to heave motion. Thus a certain amount of relative motion is imparted to the surface valve with respect to the vessel, and it is common for personnel during these types of operations to work in a harness in order to be able to follow the relative movements of the surface valve.

As a result of the danger that exists of personnel getting caught in the surface valve during such work, existing regulations do not allow work at the surface valve when the relative motion exceeds 1.5 metres. Clearly production is often interrupted in winter (windy periods) due to excessive heave motion.

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According to a first aspect of the present invention there is provide a method for well completion and intervention operations where a working pipe projecting from a wellhead and up to a vessel is used, and where the upper part of the working pipe by the help of a telescopic connection is axially movable related to the lower part of the working pipe, whereby the upper part of the working pipe is allowed to follow the heave movement of the vessel, wherein the upper part of the working pipe is lifted relative to the vessel to carry the weight and the pressure forces of the working pipe.

According to a second aspect of the present invention there is provided an arrangement for well completion and intervention operations where a working pipe projecting from a wellhead and up to a vessel is used, the working pipe having a telescopic connection wherein the respective telescopic connection when fully extended is designed to carry the weight and pressure forces of the working pipe.

By arranging the surface valve in a fixed position relative to the vessel, preferably immediately above the working deck, rigging work for well completion and intervention operations, and also to some degree the actual said operations, could be carried out in a far simpler and safer manner, as the personnel would then be able to work on a fixed platform and use conventional safety equipment. It would also be possible to work during significantly greater heave, with interruptions in the work only being required when the heave motion exceeds the level tolerated by the adjoining equipment. As an example, the maximum heave motion for coiled tubing operations is approximately 4 metres. If the heave motion exceeds 4 to 5 metres, the workover riser must be disconnected from the wellhead in order to allow the riser to be disconnected from the wellhead in the case of the heave motion increasing further.

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In order to be able to place the surface valves on the working deck during said operations, the workover riser is equipped with a telescoping, pressure-proof sliding connection. The sliding connection is disposed on the

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workover riser between the wellhead and the travelling block of the vessel and designed to telescope the sliding connection about its axial central position when the surface valves are immediately above the working deck. When the workover riser is to be pressurised, the telescoping sliding connection is extended to its limit of travel, and in this extended position it is designed to withstand the tensile forces that occur in workover risers of this type.

The following describes a non-limiting example of a preferred method and an arrangement for implementing the method, illustrated in the accompanying drawings, in which:

Figure 1 schematically shows a workover riser equipped with a telescoping sliding connection, where the sliding connection is fully extended;

Figure 2 schematically shows the sliding connection with the surface valve in the process of being lowered to the working deck of the vessel;

Figure 3 schematically shows the sliding connection as the surface valve is placed on the working deck and coiled tubing is being run into the well; and

Figure 4 shows the sliding connection of figure 1 on a larger scale.

In the drawings, reference number 1 denotes a telescoping sealing sliding connection connected onto the workover riser 4 of a vessel 2. A wellhead 6 is arranged on the seabed 8 and connected to the casing 12 of a well 10. A riser 14 is connected to the wellhead 6, projecting up through the surface of the sea 16 and on up to where it is connected to the vessel 2 by means of a heave compensator device 18. A telescopic pipe 20 is connected to the vessel 2 and designed to be displaced in the riser 14.

A production tubing 22 is arranged in the well 10 and hung off in the wellhead 6. From the vessel, the workover riser 4 projects down to the wellhead 6, where the workover riser 4 is communicatingly connected to the production tubing 22.

The telescoping sliding connection 1 comprises a lower inner telescopic pipe 24 fixed to the workover riser 4 and an upper outer telescopic pipe 26 connected to a surface valve 28. The surface valve 28 is arranged over the working deck 30 of the vessel 2 and suspended from a travelling block 32.

The lower telescopic pipe 24 has a smooth outside cylindrical surface, and its upper end portion is equipped with a radial outwardly projecting, enclosing flange 34.

At its lower end portion, the upper telescopic pipe 26 is equipped with an end gable 36 comprising a sealing device (not shown) of a type that is known *per se*, which sealing

device is designed to provide a sliding seal against the outside cylindrical surface of the lower telescopic pipe 24.

When the workover riser 4 is to be pressurised, the telescoping sliding connection 1 is extended until the flange 34 stops against the end gable 36, see figure 1. In this position it is possible to transfer the occurring tension load, including the required pretensioning force, via the tensioner 32, whereby normal well operations can be carried out.

When rigging work such as the sluicing in tool strings by means of e.g. coiled tubing 38 or cable equipment is to be carried out, the pressure in the workover riser 4 is relieved, whereupon the surface valve 28 is lowered to the working deck 30 as the upper telescopic pipe 26 is lowered over the lower telescopic pipe 24, see figure 2. The weight of the workover riser 4 and the lower telescopic pipe 24 is carried by the wellhead 6. Rigging work, and to some extent completion and intervention operations, can be carried out with the surface valve in this for the operator highly favourable position, see figure 3. The heave motion of the vessel 2 is absorbed by the telescoping sliding connection 1 when the surface valve 28 is lowered to the working deck 30.

In the case of operations that may require pressurisation of the workover riser 4, the telescoping sliding connection 1 is

extended and pretensioned in a known manner by means of the travelling block 32.

An umbilical (not shown) used for communication with the wellhead 6 may be tensioned by means of a constant tension winch (not shown).

An arrangement according to the invention would also remedy malfunctions that might occur in the travelling block 32 or any other adjoining lifting and compensating equipment.

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THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A method for well completion and intervention operations where a working pipe projecting from a wellhead and up to a vessel is used, and where the upper part of the working pipe by the help of a telescopic connection is axially movable related to the lower part of the working pipe, whereby the upper part of the working pipe is allowed to follow the heave movement of the vessel, wherein the upper part of the working pipe is lifted relative to the vessel to carry the weight and the pressure forces of the working pipe.

2. An arrangement for well completion and intervention operations where a working pipe projecting from a wellhead and up to a vessel is used, the working pipe having a telescopic connection wherein the respective telescopic connection when fully extended is designed to carry the weight and pressure forces of the working pipe.

3. An arrangement in accordance with Claim 2, wherein a flange connected to one of the telescopic pipes abuts an end gable of the other telescopic pipe when the telescopic connection is fully extended.

4. An arrangement in accordance with either Claim 2 or 3, wherein the telescoping connection is pressure-proof.

5. A method for well completion and intervention operations substantially as herein described with reference to the accompanying drawings.

6. An arrangement for well completion and intervention operations substantially as herein described with

reference to the accompanying drawings.

Dated this 1st day of September 2006
BLAFRO TOOLS AS
By their Patent Attorneys
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Fellows Institute of Patent and
Trade Mark Attorneys of Australia

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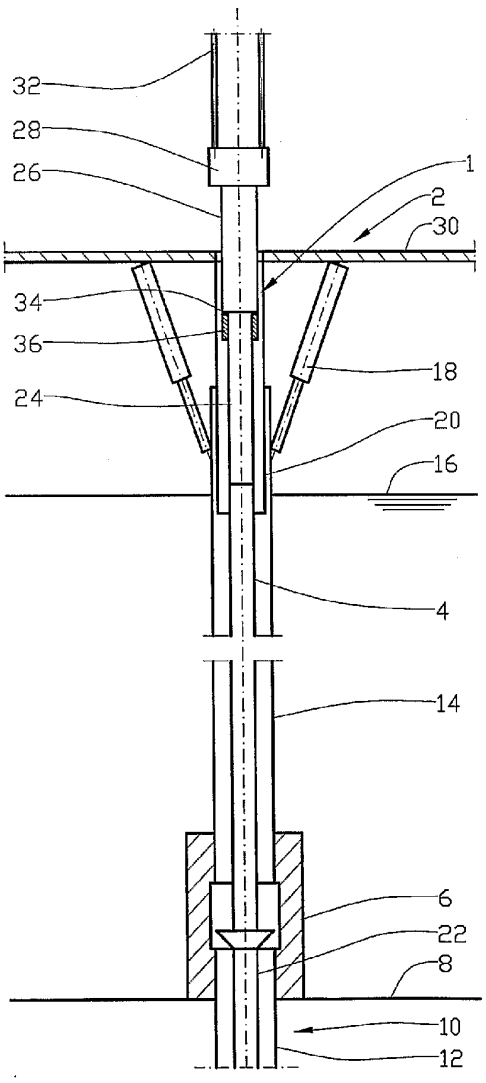

Fig. 1

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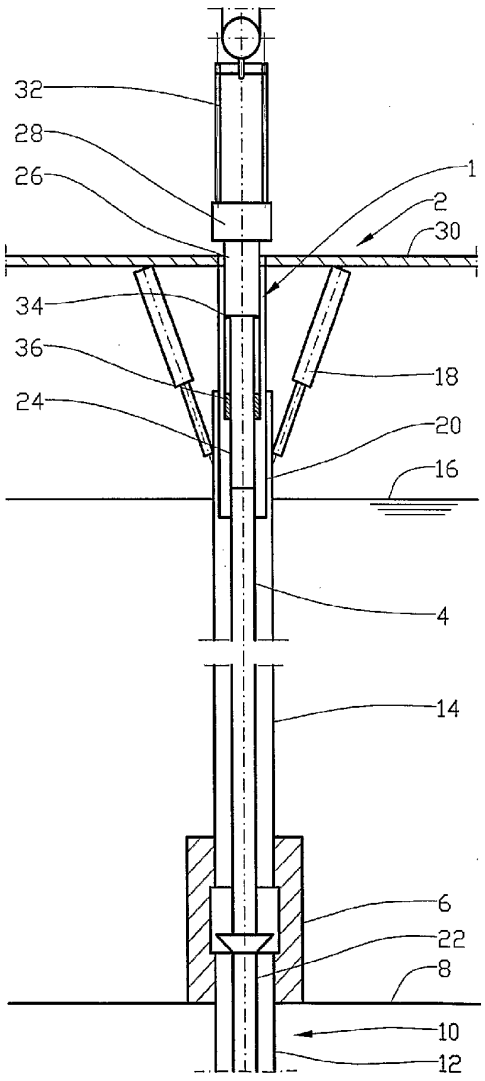

Fig. 2

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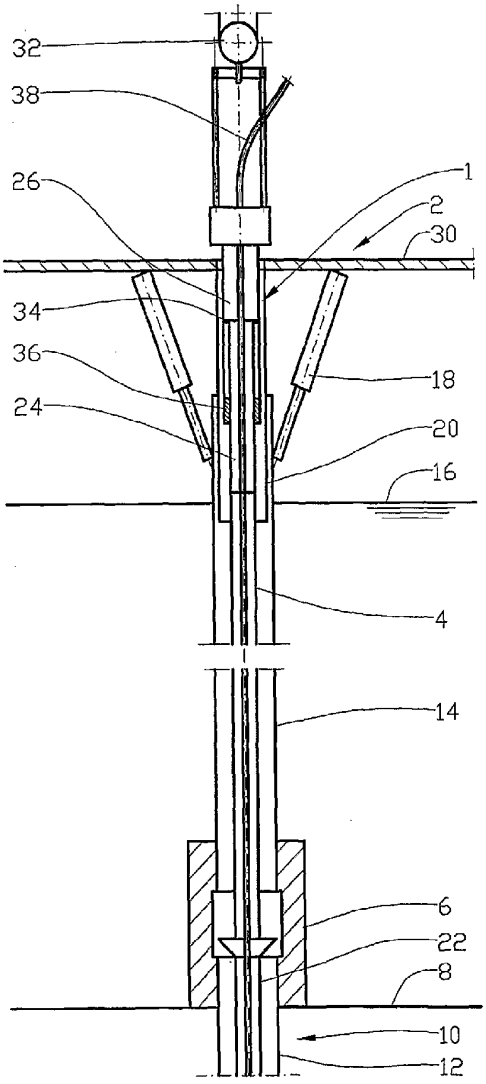

Fig. 3

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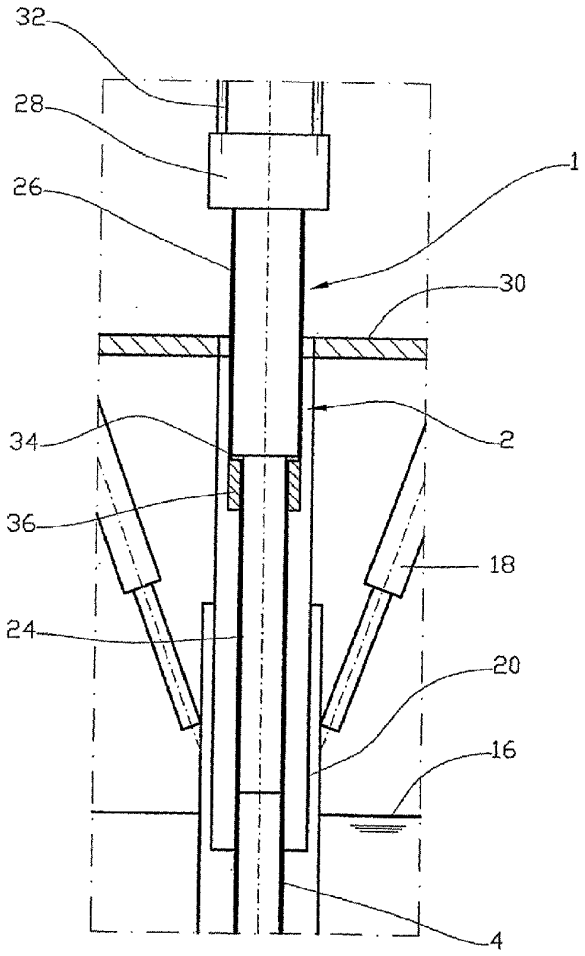

Fig. 4