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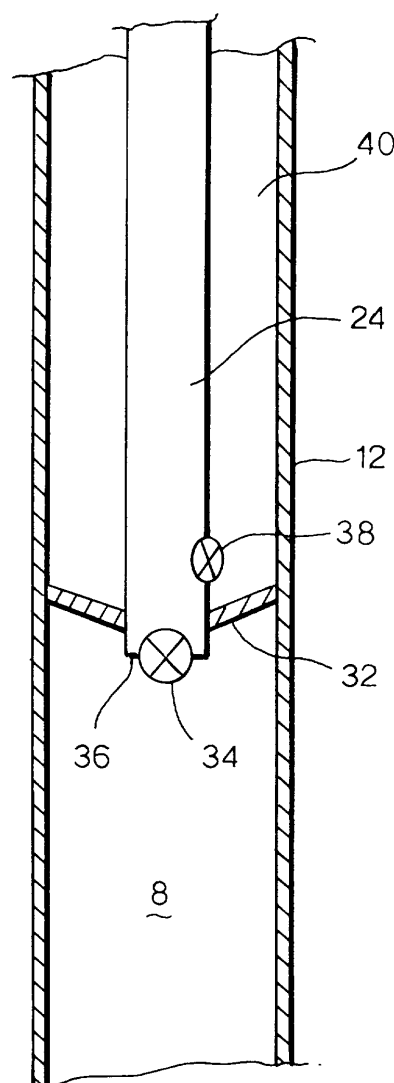
(71) Applicant: **SHELL INTERNATIONALE RESEARCH
MAATSCHAPPIJ B.V.**
2596 HR Den Haag (NL)

(72) Inventor: **Betts, Michael John**
2288 GD Rijswijk (NL)

(54) **Method of installing a wellbore tubular**

(57) A method of lowering an inner wellbore tubular (24) into an outer wellbore tubular (12) is disclosed, which outer tubular contains a body of fluid. The method comprises providing the inner tubular with an annular sealing member (32) arranged to seal the inner tubular relative to the outer tubular when the inner tubular is inserted into the outer tubular, the sealing member being capable of exerting a downward force to the inner tubular. The inner tubular is inserted into the outer tubular at an upper end part thereof, and fluid is pumped into the annular space between the outer tubular and the inner tubular so as to exert said downward force on the inner tubular via the sealing member thereby lowering the inner tubular into the outer tubular.

Fig.2.



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Description

[0001] The present invention relates to a method of lowering an inner tubular into an outer tubular extending into a wellbore containing a body of fluid. In the field of oil or gas production from a wellbore it is common practice to lower an inner tubular into an outer tubular extending into the wellbore, for example by means of an injector head installed at the wellhead of the wellbore. The outer tubular can be, for example a production tubing or a wellbore casing. The injector head exerts a mechanical force to the inner tubular so as to push the inner tubular into the outer tubular against the upward pressure of the wellbore fluid present in the outer tubular. A typical situation whereby an inner tubular is lowered into an outer wellbore tubular is the running of a logging tool on coiled tubing into a producing, pressurised well.

[0002] A problem of the known method of lowering an inner tubular into an outer wellbore tubular is that the fluid pressure in the outer tubular acts to exert an upward force to the inner tubular. The problem is even more pronounced for high-pressure wells. As a consequence the downward force necessary to overcome the upward force from the fluid also must be high, which has necessitated in the prior art the need for non-standard equipment applications.

[0003] It is an object of the invention to provide an improved method of lowering an inner tubular into an outer wellbore tubular, which method overcomes the drawback referred to above.

[0004] In accordance with the invention there is provided a method of lowering an inner wellbore tubular into an outer wellbore tubular, the outer tubular containing a body of fluid, the method comprising:

- providing the inner tubular with an annular sealing member arranged to seal the inner tubular relative to the outer tubular when the inner tubular is inserted into the outer tubular, the sealing member being capable of exerting a downward force to the inner tubular;
- inserting the inner tubular into the outer tubular at an upper end part thereof; and
- pumping fluid into the annular space between the outer tubular and the inner tubular so as to exert said downward force on the inner tubular via the sealing member thereby lowering the inner tubular into the outer tubular.

[0005] In this manner it is achieved that the inner tubular is subjected to a downward force from the fluid pumped in the annular space between the two tubulars, which downward force supplements the aforementioned mechanical force or obviates such mechanical force.

[0006] The invention will be described hereinafter in more detail and by way of example with reference to the accompanying drawings in which:

Fig. 1 schematically shows an embodiment of a system for use with the method of the invention; and Fig. 2 schematically shows a detail of Fig. 1.

[0007] In the Figures like reference numerals relate to like components.

[0008] In Fig. 1 there is shown a wellbore 1 formed into an earth formation 3 and having a lower section 4 extending into a hydrocarbon fluid containing layer 6 of the earth formation. The wellbore 1 contains a body of wellbore fluid 8 and is provided with a casing 10 extending from a wellhead 8 at the earth surface 10 to the lower wellbore section 4.

[0009] An outer tubular in the form of production tubing 12 for the production of hydrocarbon fluid from the earth layer 6 extends from the wellhead 8 through the casing 10 to the lower wellbore section 4. The tubing 12 has an open lower end and is sealed relative to the casing 10 by a production packer 14. The tubing 12 is provided with an outlet 16 and a production valve 18 arranged at the wellhead 8 for controlled outflow of hydrocarbon fluid or wellbore fluid from the tubing 12 to a production facility (not shown) at surface, and with an inlet 20 connected to a pump 22 for pumping wellbore fluid into the tubing 12. A subsurface safety valve (SSSV) 23 for selectively closing or opening the production tubing 12 is arranged in an upper part of the production tubing 12. The SSSV has a through-bore of diameter allowing passage there through of a coiled tubing provided with a swab cup arrangement referred to hereinafter.

[0010] An inner tubular in the form of coiled tubing 24 stored on a reel 26 extends from the reel 26 via an injector head 28 at the wellhead 8 into the production tubing 12. The coiled tubing 24 is sealed relative to the production tubing 12 by an upper annular seal 30 fixedly connected to the production tubing 12 near the upper end thereof, and by a lower annular seal in the form of swab cup arrangement 32 fixedly connected to the coiled tubing 24 near the lower end thereof. The coiled tubing 24 is capable of sliding through the upper seal 30, and the swab cup arrangement 32 is capable of sliding through the production tubing 12.

[0011] Referring to Fig. 2 there is shown the lower part of coiled tubing 24 in more detail, indicating an inlet valve 34 arranged at the lower end 36 of the coiled tubing 24 and an outlet valve 38 arranged a short distance above the swab cup arrangement 32. The inlet valve 34 is arranged to selectively allow fluid from the body of wellbore fluid 8 to enter the coiled tubing 24. The outlet valve 38 is arranged to selectively allow fluid to be discharged from the coiled tubing 24 into the annular space 40 between the coiled tubing 24 and the production tubing 12. The inlet valve 34 and the outlet valve 38 are controlled, for example, by means of an electrical cable extending within the coiled tubing 24 or embedded in the wall of the coiled tubing. Alternatively the inlet valve 34 and outlet valve 38 can be controlled by means of fluid pressure pulses induced in a body of fluid present

in the coiled tubing 24 or the tubing 12.

[0012] During an initial stage of normal use, hydrocarbon fluid is produced from the earth layer 6 via the production tubing 12 to the production facility at surface, whereby the coiled tubing 24 and the upper seal 30 are absent from the wellbore system and whereby the upper end of the production tubing 12 is closed by a closure member (not shown). When it is desired to lower a tool, such as a logging tool, on coiled tubing into the production tubing 12 the closure member is replaced by the upper seal 30. Subsequently the coiled tubing 24 with the tool attached thereto is inserted via the injector head 28 and the upper seal 30 into the production tubing 12. The production valve 18 is closed, the inlet valve 34 is opened and the pump 22 is operated to pump wellbore fluid into annular space 40 between the production tubing 12 and the coiled tubing 24. As a result the fluid pressure in the annular space 40 increases, which pressure acts on the swab cup 32 in downward direction. When the fluid pressure has reached a sufficiently high level the fluid pushes the swab cup 32, and consequently also the coiled tubing 24, in downward direction thereby gradually lowering the coiled tubing 24 into the production tubing 12 and unreeling the coiled tubing 24 from the reel 26. During the lowering process the coiled tubing assembly passes through the through-bore of the SSSV 23.

[0013] As lowering of the coiled tubing 24 proceeds, wellbore fluid flows from the body of wellbore fluid 8 via the inlet valve 34 into the coiled tubing 24. When a selected volume of wellbore fluid has entered the coiled tubing 24, pumping is stopped, the inlet valve 34 is closed and the outlet valve 38 is opened in order to allow the fluid to be discharged from the coiled tubing 24 into the annular space 40. The fluid is discharged into a suitable reservoir (not shown) via outlet valve 38, the annular space 40, and the outlet 16. After having discharged the fluid from the coiled tubing 24, the outlet valve 38 is closed, the inlet valve is re-opened and pumping is resumed so as to repeat the above cycle. Thus, lowering of the coiled tubing 24 is carried out in a stepwise manner whereby in each step a selected volume of wellbore fluid enters the coiled tubing, which is subsequently discharged from the coiled tubing via the annular space 40.

[0014] After a certain length of coiled tubing has been pumped into the production tubing, the part of the coiled tubing 24 already present in the production tubing 12 is of sufficient weight to allow further lowering of the coiled tubing 24 without assistance from the pump 22 as described above.

[0015] Suitably a separation plug capable of floating on the fluid flown into the coiled tubing, is inserted into the coiled tubing before lowering thereof into the production tubing. The plug serves to separate an amount of a selected fluid present in the coiled tubing from the wellbore fluid which flows into the coiled tubing 24.

[0016] The method of the invention can also be ap-

plied for a wellbore for water production or for a geothermal wellbore.

5 Claims

1. A method of lowering an inner wellbore tubular into an outer wellbore tubular, the outer tubular containing a body of fluid, the method comprising:

- providing the inner tubular with an annular sealing member arranged to seal the inner tubular relative to the outer tubular when the inner tubular is inserted into the outer tubular, the sealing member being capable of exerting a downward force to the inner tubular;
- inserting the inner tubular into the outer tubular at an upper end part thereof; and
- pumping fluid into the annular space between the outer tubular and the inner tubular so as to exert said downward force on the inner tubular via the sealing member thereby lowering the inner tubular into the outer tubular.

2. The method of claim 1, wherein the inner tubular is provided with an inlet valve arranged to selectively allow flow of fluid from the wellbore into the inner tubular, and wherein the method further comprises controlling the inlet valve so as to allow flow of fluid from the wellbore into the inner tubular during lowering of the inner tubular into the outer tubular.

3. The method of claim 2, further comprising inserting into the secondary tubular a separation plug capable of floating on the fluid flown into the secondary tubular from the wellbore.

4. The method of claim 2 or 3, wherein the secondary tubular is provided with an outlet valve arranged to selectively allow flow of fluid from the inner tubular into said annular space, and wherein the method further comprises controlling the outlet valve so as to allow flow of fluid from the inner tubular into said annular space during periods of time that pumping of fluid into the annular space is stopped.

5. The method of any one of claims 1-4, wherein the outer tubular is provided with a safety valve for selectively closing the outer tubular so as to prevent flow of fluid from the wellbore into the outer tubular, and wherein the method further comprises closing the safety valve and lowering the fluid pressure in the outer tubular prior to inserting the inner tubular into the outer tubular.

6. The method of any one of claims 1-5, wherein the inner tubular is a coiled tubing.

7. The method substantially as described hereinbefore with reference to the drawings.

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Fig.1.

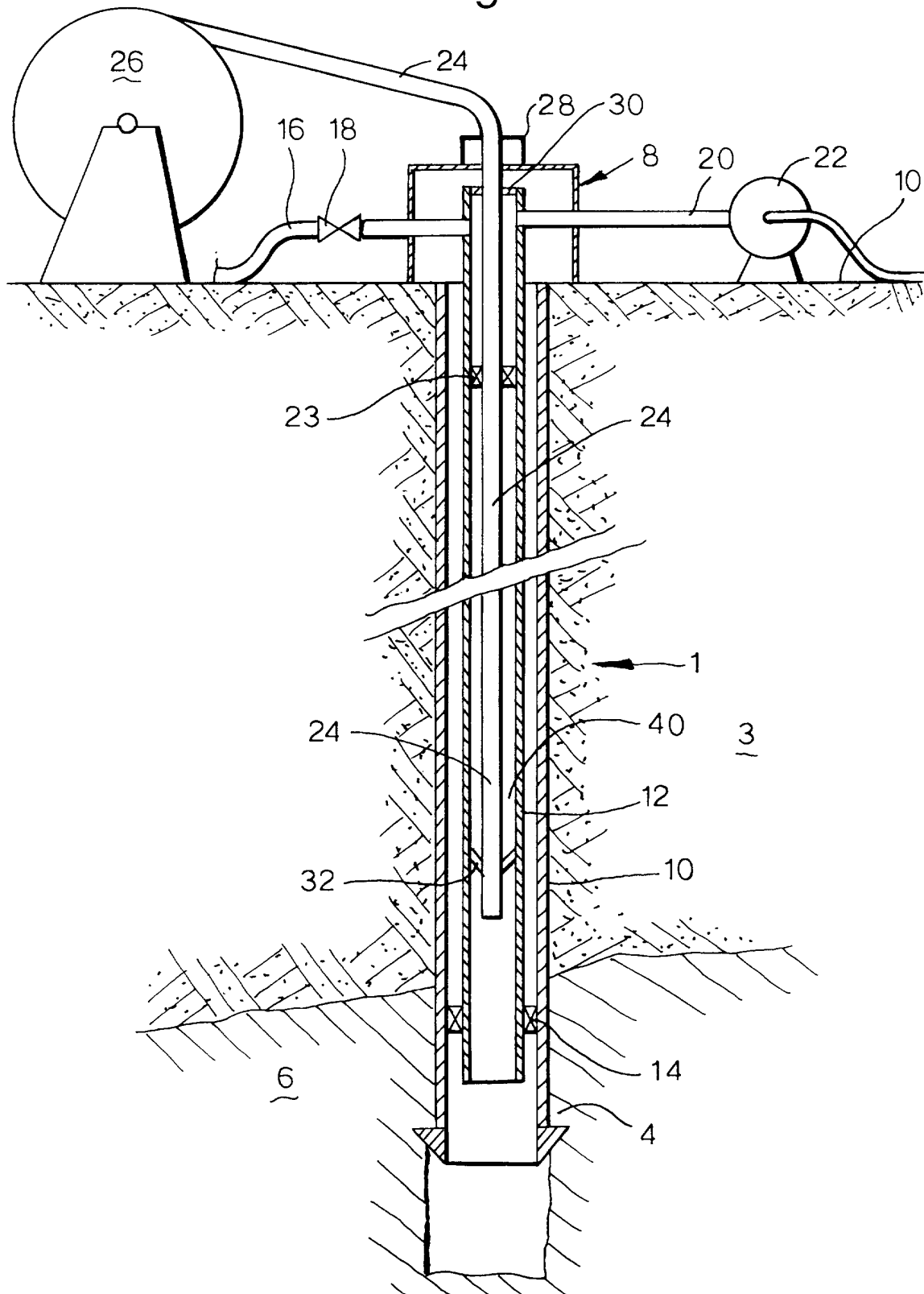
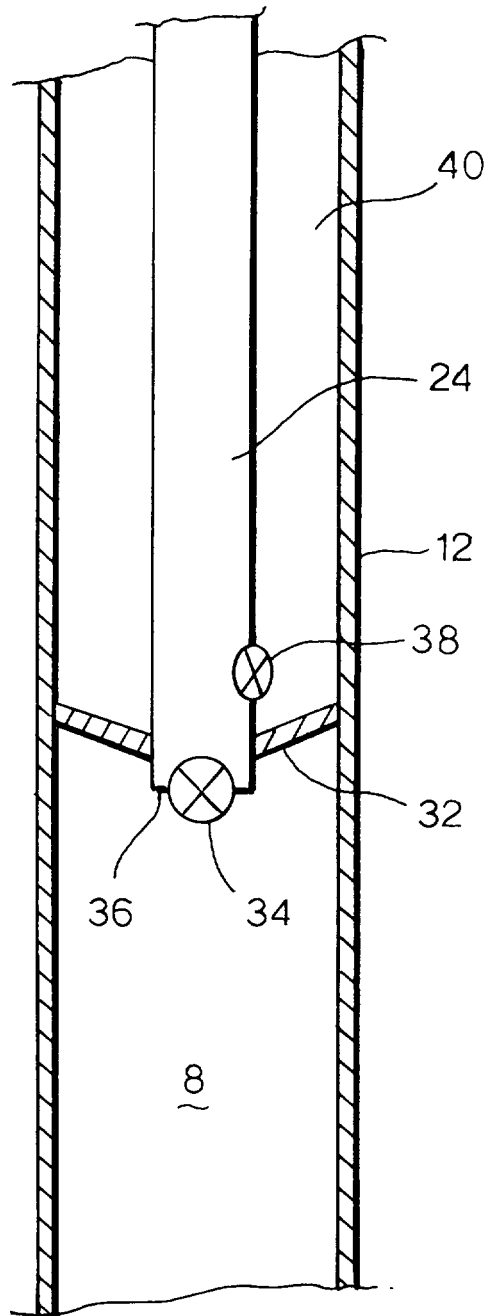


Fig.2.





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EUROPEAN SEARCH REPORT

Application Number
EP 01 30 3684

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			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			E21B
The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 8 August 2001	Examiner Bellingacci, F
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			

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

EP 01 30 3684

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The members are as contained in the European Patent Office EDP file on
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