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(11) **EP 0 910 708 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention
of the grant of the patent:

09.04.2003 Bulletin 2003/15

(21) Application number: **97928205.0**

(22) Date of filing: **12.06.1997**

(51) Int Cl.7: **E02B 17/02**

(86) International application number:
PCT/EP97/03110

(87) International publication number:
WO 97/048858 (24.12.1997 Gazette 1997/55)

(54) **LIGHTWEIGHT OFFSHORE PLATFORM STRUCTURE**

LEICHTGEWICHT STRUKTUR FÜR EINE OFFSHORE-PLATTFORM

STRUCTURE PLATE-FORME DE FORAGE LEGERE

(84) Designated Contracting States:
DK GB NL

(30) Priority: **17.06.1996 EP 96201687**

(43) Date of publication of application:
28.04.1999 Bulletin 1999/17

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Description

[0001] The present invention relates to an offshore platform structure comprising a framework supporting a platform deck, the framework having at least one leg, and conductor means for conducting wellbore equipment from the platform deck into at least one wellbore extending into the earth formation below the platform structure.

[0002] An offshore platform structure of this type is disclosed in GB-B-2000211. The platform structure is formed of a framework with a leg at each platform corner, the legs being fixed to the seabed by piles extending through the legs. Conductor conduits extend from the top of the platform structure through a number of conductor guides into the seabed. Each conductor conduit consists of a straight, slanted, lower part and a curved upper part having a vertically extending upper end. Each conductor conduit is installed by first installing a straight, slanted, conductor, cutting off and removing an upper part of the straight conductor and replacing this upper conductor part by a curved conductor part which is welded to the remaining lower straight conductor part.

[0003] Another relevant offshore platform structure is disclosed in US-A-4,326,595, wherein a conductor conduit is carried in a cage, which is removably positioned in a platform leg.

[0004] It is an object of the invention to provide an improved offshore platform structure which is subjected to reduced environmental loading and has a reduced weight.

[0005] It is a further object of the invention to provide a platform structure having conductor means which are installed in a less complicated manner.

[0006] In accordance with the invention there is provided an offshore platform structure comprising a framework supporting a platform deck, the framework having at least one leg, and conductor means for conducting wellbore equipment from the platform deck into at least one wellbore extending into the earth formation below the platform structure, wherein said conductor means includes at least one conductor conduit extending through said at least one leg.

[0007] To achieve adequate fixation of the conductor conduits, suitably the outer diameter of each conductor conduit and the inner diameter of the corresponding leg are selected so that the longitudinal axes of the conductor conduit and the corresponding leg substantially coincide.

[0008] By locating the conductor conduit within the leg it is achieved that the platform structure is subjected to reduced wave- and current forces when compared to the conventional structure, so that the structure can be lighter than the conventional structure. The conductor conduit can be installed, for example, by driving the conductor conduit through the leg.

[0009] Preferably the platform structure comprises a plurality of said legs and a plurality of said conductor conduits, each conductor conduit extending through a

corresponding leg.

[0010] Adequate platform stability is achieved if each conductor conduit which extends through a corresponding leg provides stability to the platform structure on the seabed by forming an anchoring pile.

[0011] Enhanced platform stability is achieved by grouting each conductor conduit inside the corresponding leg.

[0012] The invention will be described hereinafter in more detail with reference to the appended drawing, in which

Fig. 1 shows schematically a plan view of an embodiment of the offshore platform structure according to the invention.

[0013] The platform structure shown in Fig. 1 includes a framework 1 with four tubular legs of which only two legs 5, 7 are shown, the legs being interconnected by a number of horizontal and sloping braces 11, 11a of which the braces 11a are indicated by dotted lines as these are located at the side of the framework opposite the plane of the drawing. Each leg has a curved upper part 12 with substantially constant curvature, and a substantially straight lower part 14. The upper end 16 of the curved upper part 14 of each leg extends substantially vertically, and the lower part 14 of each leg extends outwardly in downward direction at a selected inclination angle α .

[0014] A platform deck 18 is arranged on top of the framework 1, the platform deck 18 being provided with a skid beam arrangement 20 for allowing access of wellbore equipment to a selected one of a number of conductor conduits described hereinafter.

[0015] The platform structure is provided with four conductor conduits of which only the two front conductor conduits 22, 24 are shown in dotted lines, each conductor conduit extending through one of said legs. Thus, in Fig. 1 conductor conduit 22 extends through leg 5 and conductor conduit 24 extends through leg 7. One of the purposes of the conductor conduits 22, 24 is to conduct wellbore equipment into wellbores below the platform structure. To enable conventional drilling rigs to be positioned above all four conductor conduits, the width of the framework 1 at its upper end is restricted to a dimension which is equal to or less than the reach of the drill rigs considered for use. Further, to enable the wellbore equipment to be inserted into the conductor conduits substantially vertically, the longitudinal axes of the legs at their upper ends 16 extend vertically. The legs are curved outwardly in downward direction so that the width of the framework base is sufficient to achieve adequate platform stability. The curvature of the legs is selected such that conventional wellbore equipment can pass through the legs without special adaptation. The conductor conduits 22, 24 have been driven from the top of the platform structure through the respective legs to a selected depth z into the seabed, for which purpose conventional pile driving techniques can be used. To increase platform stiffness, the conductor conduits have

been fixed in the legs by inserting grout between each conductor conduit and the corresponding leg. The conductor conduits 22, 24 therefore have the twofold function of conducting wellbore equipment into wellbores extending from the conductor conduits into the earth formation, and of providing a structural load bearing capacity in analogy to anchoring piles driven into the seabed. Furthermore, the conductor conduits provide increased strength to the legs, especially when the conductor conduits are grouted inside the legs.

[0016] Optionally, additional skirt piles (not shown) can be provided which extend through skirt pile guides 25 into the foundation so as to increase the resistance against lateral forces acting on the structure.

[0017] Since the conductor conduits 22, 24 extend through the legs 5, 7 of the framework, the conductor conduits have substantially the same shape as the legs, i.e. each conductor conduit 22, 24 has a curved upper part with substantially constant curvature, and a substantially straight lower part. The upper end 27, 28 of the curved upper part of each conductor conduit 22, 24 extends substantially vertically, and the lower part 29, 30 of each conductor conduit 22, 24 extends at the inclination angle α in outward direction relative to the vertical longitudinal axis of the platform structure. Conventional blowout preventors (BOP's) and /or wellheads 31, 32 are located on top of the upper ends 27, 28 of the respective conductor conduits 22, 24.

[0018] In a first mode of normal operation of the platform structure of Fig. 1 BOP's 31, 32 are located on top of the upper ends 27, 28 of the respective conductor conduits 22, 24. A drilling rig (not shown) is positioned on the skid beam arrangement 20 vertically above one of the BOP's, for example BOP 31. A drill string (not shown) extends from the drilling rig through the BOP 31 and through the conductor conduit 22 into a wellbore extending from the conductor conduit 22 into the earth formation. The drill string is rotated so as to deepen the wellbore and to finally reach a hydrocarbon containing zone in the earth formation below the platform structure. Since the upper end 27 of the conductor conduit 22 extends vertically there is no need to apply a slanted drilling rig and a conventional type rig can be used.

[0019] When drilling of the wellbore through conductor conduit 22 is finalised, the drilling rig is repositioned using the skid beam arrangement 20 in order to place the rig vertically above BOP 32. The drill string is then inserted into the conductor conduit 24 via BOP 32 and into another wellbore extending from the conductor conduit 24 into the earth formation. The drill string is rotated so as to deepen the other wellbore and to finally reach the hydrocarbon containing zone. This procedure is repeated for the other two conductor conduits.

[0020] In this manner four wellbores are drilled from the platform structure, which wellbores extend in outwardly deviating directions due to the outwardly extending lower parts 29, 30 of the conductor conduits 22, 24. At the same time the conductor conduits 22, 24 form

anchoring piles which provide stability to the platform structure on the seabed 26.

[0021] In a second mode of operation of the platform structure of Fig. 1, reference signs 31, 32 refer to wellheads which are provided on top of the upper ends 27, 28 of the respective conductor conduits 22, 24. A production tubing (not shown) extends from each wellhead 31, 32, through the respective conductor conduit 22, 24, into the respective wellbore extending downward from the conductor conduit 22, 24. Hydrocarbon fluid is produced via the production tubing's to suitable production equipment (not shown) which can be of conventional type.

[0022] Instead of the framework having four legs, the framework can have any other suitable number of legs and corresponding conductor conduits, for example three or five legs/conductor conduits.

[0023] Instead of positioning the drilling rig on the skid beam arrangement, the wellbores can be drilled using a separate jack-up rig having a cantilever deck onto which the drilling rig is arranged. The jack-up rig is positioned adjacent the platform structure in a manner that the cantilever deck and the drilling rig are located above the upper ends of the respective conductor conduits. The wellbores are then drilled from the jack-up rig. In this mode of operation the skid beam arrangement can optionally be present on the platform structure.

30 Claims

1. An offshore platform structure comprising a framework (1) supporting a platform deck (18), the framework having at least one leg (5,7), and conductor means for conducting wellbore equipment from the platform deck into at least one wellbore extending into the earth formation below the platform structure, wherein said conductor means includes at least one conductor conduit (22,24) extending through said at least one leg, **characterized in that** the outer diameter of each conductor conduit (22,24) and the inner diameter of the corresponding leg (5,7) are selected so that the longitudinal axes of the conductor conduit and the corresponding leg substantially coincide.
2. The platform structure of claim 1, comprising a plurality of said legs and a plurality of said conductor conduits (22,24), each conductor conduit extending through a corresponding leg (5,7).
3. The platform structure of claim 1 or 2, wherein each leg (5,7) is of tubular shape and extends from the platform deck (18) to the seabed.
4. The platform structure of any of claims 1-3, wherein the upper end of each leg (5,7) extends substantially vertically and the lower end of the leg extends

outwardly in downward direction at a selected inclination angle.

5. The platform of claim 4, wherein an upper end part of each leg has a selected curvature, and wherein a lower end part of the leg is substantially straight. 5
6. The platform structure of any of claims 1-5, wherein each conductor conduit (22,24) is grouted inside the corresponding leg (5,7). 10
7. The platform structure of any of claims 1-6, further comprising a skid beam (20) arrangement provided at said platform deck (18) for allowing access of the wellbore equipment to a selected one of the conductor conduits (22,24). 15
8. The platform structure of any of claims 1-7, wherein the structure includes at least one skirt pile connected to the framework (1) and extending into the seabed. 20

Patentansprüche

1. Eine Offshore-Plattformstruktur mit einem Rahmen (1), der ein Plattformdeck (18) trägt, wobei der Rahmen zumindest ein Bein (5, 7) und Führungsmittel zum Führen einer Bohrlochausrüstung von dem Plattformdeck in zumindest ein Bohrloch aufweist, das sich unterhalb der Plattformstruktur in eine Erdformation erstreckt, wobei die Führungsmittel zumindest ein Leitungsrohr (22, 24) aufweisen, das sich durch das zumindest eine Bein erstreckt, **dadurch gekennzeichnet, daß** der Außendurchmesser jedes Leitungsrohres (22, 24) und der Innendurchmesser des entsprechenden Beines (5, 7) so gewählt sind, daß die Längsachse des Leitungsrohres und des entsprechenden Beines im wesentlichen koinzidieren. 30
2. Plattformstruktur nach Anspruch 1 mit einer Vielzahl von Beinen und einer Vielzahl von Leitungsrohren (22, 24), wobei sich jedes Leitungsrohr durch ein entsprechendes Bein (5, 7) erstreckt. 40
3. Plattformstruktur nach Anspruch 1 oder 2, bei welcher jedes Bein (5, 7) rohrförmige Gestalt hat und sich vom Plattformdeck (18) zum Meeresboden erstreckt. 45
4. Plattformstruktur nach einem der Ansprüche 1-3, bei welcher sich das obere Ende jedes Beines (5, 7) im wesentlichen vertikal erstreckt, und sich das untere Ende des Beines in Richtung nach unten unter einem vorbestimmten Neigungswinkel auswärts erstreckt. 50

5. Plattform nach Anspruch 4, bei welcher ein oberer Endteil jedes Beines eine vorbestimmte Krümmung hat, und bei welcher ein unterer Endteil des Beines im wesentlichen gerade ist.

6. Plattformstruktur nach einem der Ansprüche 1-5, bei welcher jedes Leitungsrohr (22, 24) innerhalb des entsprechenden Beines (5, 7) eingemörtelt ist. 5
7. Plattformstruktur nach einem der Ansprüche 1-6, die ferner eine Gleitträgeranordnung (20) aufweist, die am Plattformdeck (18) vorgesehen ist, um einen Zutritt der Bohrsausrüstung zu einem vorbestimmten Leitungsrohr (22, 24) zu gestatten. 10
8. Plattformstruktur nach einem der Ansprüche 1-7, bei welcher die Struktur zumindest einen Mantelpfahl aufweist, der mit dem Rahmen (1) verbunden ist und sich in den Meeresboden erstreckt. 15

Revendications

1. Structure de plate-forme marine comprenant une charpente (1) supportant un pont en plate-forme (18), la charpente comportant au moins un montant (5, 7) et un moyen de guidage pour guider un équipement de puits de forage du pont en plate-forme dans au moins un puits de forage s'étendant dans la formation terrestre en dessous de la structure de plate-forme, dans laquelle ledit moyen de guidage comprend au moins un conduit de guidage (22, 24) s'étendant dans au moins le montant précité, **caractérisée en ce que** le diamètre extérieur de chaque conduit de guidage (22, 24) et le diamètre intérieur du montant correspondant (5, 7) sont choisis de telle sorte que les axes longitudinaux du conduit de guidage et du montant correspondant coïncident sensiblement. 25
2. Structure de plate-forme suivant la revendication 1, comprenant une pluralité des montants précités et une pluralité des conduits de guidage (22, 24) précités, chaque conduit de guidage s'étendant dans un montant correspondant (5, 7). 30
3. Structure de plate-forme suivant l'une ou l'autre des revendications 1 et 2, dans laquelle chaque montant (5, 7) est de forme tubulaire et s'étend du pont en plate-forme (18) au fond de mer. 35
4. Structure de plate-forme suivant l'une quelconque des revendications 1 à 3, dans laquelle l'extrémité supérieure de chaque montant (5, 7) s'étend sensiblement verticalement et l'extrémité inférieure du montant s'étend extérieurement vers le bas suivant un angle d'inclinaison choisi. 40

5. Plate-forme suivant la revendication 4, dans laquelle une partie d'extrémité supérieure de chaque montant présente une courbure choisie, et dans laquelle une partie d'extrémité inférieure du montant est sensiblement droite. 5
6. Structure de plate-forme suivant l'une quelconque des revendications 1 à 5, dans laquelle chaque conduit de guidage (22, 24) est cimenté à l'intérieur du montant correspondant (5, 7). 10
7. Structure de plate-forme suivant l'une quelconque des revendications 1 à 6, comprenant de plus un agencement de poutrelles coulissantes (20) prévues au pont en plate-forme (18) précité pour permettre l'accès de l'équipement de puits de forage à un des conduits de guidage (22, 24) choisi. 15
8. Structure de plate-forme suivant l'une quelconque des revendications 1 à 7, dans laquelle la structure comprend au moins une pile additionnelle périphérique reliée à la charpente (1) et s'étendant dans le fond de mer. 20

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