



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) **EP 1 493 868 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
05.01.2005 Bulletin 2005/01

(51) Int Cl.7: **E02B 17/02, E02D 27/52**

(21) Application number: **04076781.6**

(22) Date of filing: **17.06.2004**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IT LI LU MC NL PL PT RO SE SI SK TR**
Designated Extension States:
AL HR LT LV MK

(72) Inventor: **Prins, Reinout Klaar Norfolc Jaap
1566 WG Assendelft (NL)**

(74) Representative: **Riemens, Roelof Harm
Exter Polak & Charlouis B.V.,
P.O. Box 3241
2280 GE Rijswijk (NL)**

(30) Priority: **03.07.2003 NL 1023813**

(71) Applicant: **Presign B.V.
1976 CE Ijmuiden (NL)**

(54) **Method for placing an offshore jacket on the seabed**

(57) A method for placing an offshore jacket (1) on the seabed in order to form a vertical supporting structure for an offshore platform or the like to be supported on, comprising the steps of slidably prefitting at least one anchoring pile (4) to the jacket, using a lifting device (10) to lower the jacket onto the seabed (12), and sinking the anchoring pile into the seabed. Immediately after or during the step of lowering the jacket onto the seabed, an initial penetration is applied to the anchoring pile over an initial penetration depth into the seabed while the jacket is still being held by the lifting device, after which, in a subsequent step, the anchoring pile is introduced further into the seabed down to a desired final depth, with the aid of a separate driving installation (14).

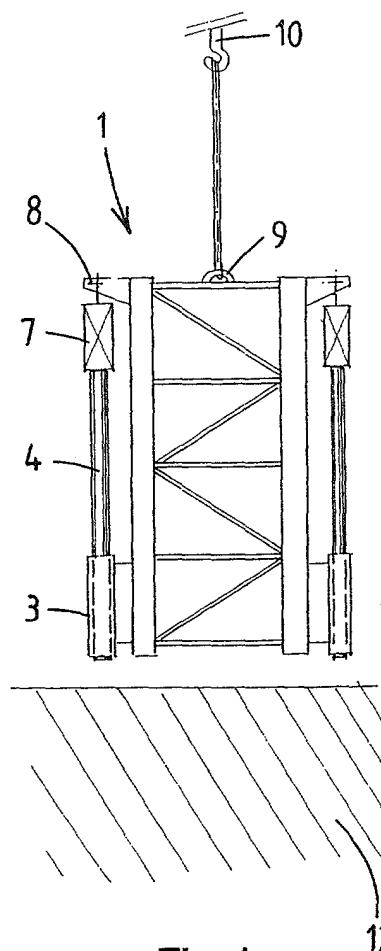


Fig.1

EP 1 493 868 A1

Description

[0001] The invention relates to a method for placing an offshore jacket on the seabed as part of a supporting structure for an offshore platform or the like to be supported on, in accordance with the preamble of claim 1.

[0002] A method of this type is known, for example, from US-A 4,812,080, which discloses an assembly of a plurality of vertical column elements of a jacket which is provided with guide sleeves, in which sleeves piles can be prefitted. According to the method, the jacket including the prefitted piles is in this case delivered on a pontoon in combination with a crane ship. At a desired location, the jacket is then lowered onto the seabed with the aid of a crane on the crane ship. Then, the prefitted piles are rammed into the seabed using a ramming block, with the ramming block being suspended from the same crane of the crane ship. Finally, an offshore platform is fitted on top of the column elements.

[0003] One drawback in this context is that before the ramming block can be suspended from the crane, the jacket has to be released from its suspension from the crane. The result of this is that there is a period of time between the jacket being placed on the seabed and the first pile starting to be rammed into the seabed, and during this period of time, the jacket is standing unsupported on the seabed. During this period, there is a risk of the jacket falling over. Furthermore, there is a risk of the jacket moving slightly out of an intended position on the seabed during this period. This can result in difficulty producing a coupling to a well which may already be present and from which ultimately oil or gas is to be drilled. Furthermore, it has been found that in bad weather in particular the beginning of ramming is also difficult to control and sometimes leads to damage.

[0004] To prevent the jacket from falling over before the piles start to be rammed into the seabed, the prior art has disclosed a number of solutions. For example, it is known to provide the jacket with a very wide foot structure. This produces dimensional stability. However, a drawback of this is that it makes the jacket heavy and therefore more difficult to handle. It is also known to accommodate what are known as suction anchors in the foot of the jacket. Suction anchors of this type can be activated by sucking water out of them, producing a pressure difference, with the result that the suction anchors are sucked securely into the seabed. Suction anchors of this type are, however, only effective in relatively soft, sandy seabeds. Finally, it is also known to place a foundation structure on the seabed, onto which the jacket can then be clamped. However, this requires additional work and material, making installation expensive.

[0005] It is an object of the present invention to at least partially overcome the abovementioned drawbacks and/or to create a usable alternative. In particular, it is an object of the invention to provide an efficient and reliable method for positioning an offshore jacket on the

seabed.

[0006] This object is achieved by a method as described in claim 1. The method comprises a step of slidably prefitting at least one anchoring pile to an offshore jacket. Then, the jacket is lowered onto the seabed with the aid of a lifting device. Immediately after or during this step of lowering the jacket onto the seabed, an initial penetration is applied to the anchoring pile over an initial penetration depth into the seabed. During this initial penetration, the jacket is held in place by the lifting device. Only after the jacket has in this way been sufficiently anchored to the seabed is the anchoring pile, in a subsequent step, introduced further into the seabed down to a desired final depth, with the aid of a separate main driving installation. The jacket is now advantageously provided with reliable support and/or locked such that it cannot fall over or move in an unintended way throughout the entire sequence of method steps, specifically, in succession, by the support provided by the lifting device, then by the initial penetration of the anchoring pile and ultimately by the anchoring pile having been sunk to the desired final depth.

[0007] The lifting device comprises, for example, a crane ship or lifting platform with a crane from which the jacket can be suspended. During the initial penetration of the anchoring pile, the jacket can advantageously remain suspended from the crane. During the initial penetration, there is no need for the crane to be used to hold a ramming block or the like. The initial penetration may, for example, be imparted to the anchoring pile by drive means which are prefitted in or on the anchoring pile, for example a vibratory unit, a ramming unit or a drilling and/or flushing unit. In the present context, the term prefitted drive means are to be understood as meaning both drive means which are supported directly on the anchoring pile and drive means which are suspended from the jacket in such a manner that they are in a suitable position with respect to the anchoring pile to either exert a driving force on the anchoring pile or to sufficiently reduce the resistance to penetration of the anchoring pile during the initial penetration.

[0008] In one particular embodiment, the jacket is detached from the lifting device after the step of initial penetration. Even more particularly, after this step of releasing the jacket from the lifting device, the main driving installation for sinking the anchoring pile to the desired final depth is suspended from the lifting device. The main driving installation may in this case comprise a ramming block suspended from a crane of a crane ship or lifting platform. By virtue of the fact that the jacket, on account of the initial penetration applied, has already been sufficiently anchored to the seabed, further driving of the anchoring pile using the main driving installation can be carried out more easily even in poor weather conditions without this directly giving rise to a high risk of damage.

[0009] Further preferred embodiments of the method are defined in the dependent subclaims.

[0010] The invention also relates to an offshore jacket in accordance with claim 8. In this case, the jacket comprises at least one anchoring pile which is prefitted slidably on or in the jacket, with drive means being provided prefitted on top of the anchoring pile. An offshore jacket of this type is intended to be positioned on the seabed and to be anchored thereto using the method according to the invention as described above. The drive means prefitted on the anchoring pile then serve to apply the initial penetration into the seabed over the initial penetration depth to the anchoring pile immediately after or during the step of lowering the jacket onto the seabed. In this context too, prefitted drive means are to be understood as meaning both drive means which are supported directly on the anchoring pile and drive means which are suspended from the jacket in such a manner that they are located in a suitable position with respect to the anchoring pile to either exert a driving force on the anchoring pile or sufficiently reduce the penetration resistance of the anchoring pile during the initial penetration.

[0011] Further preferred embodiments of the offshore jacket are defined in the dependent subclaims.

[0012] The invention will be explained in more detail on the basis of the appended drawings, in which:

- Figs 1-4 show a first embodiment of an offshore jacket with prefitted vibratory units and subsequent steps of a method for putting it in position;
- Figs 5-8 show a second embodiment of an offshore jacket with prefitted drilling and/or flushing unit; and
- Figs 9-12 show a third embodiment of an offshore jacket with drive means prefitted directly on the anchoring piles, and successive steps of a method for putting it in position.

[0013] In Fig. 1, an offshore jacket is denoted overall by reference numeral 1. The jacket 1 is intended to form part of a supporting structure which is intended to support an offshore platform or the like. Guide sleeves 3 in which anchoring piles 4 are slidably prefitted are secured to the jacket 1. A vibratory unit 7 is prefitted on top of each anchoring pile 4. The vibratory unit 7 is in this case temporarily suspended from a holding means 8 which projects from the jacket 1 at the top. The jacket 1 is provided with a hoisting eyelet 9, via which it is suspended from a crane 10 of a lifting device of a crane ship or lifting platform, which is not shown in more detail here.

[0014] To prevent the anchoring piles 4 from sinking downwards prematurely during displacement of the jacket 1, the guide sleeves 3 are preferably provided with actuable clamping members. In a variant, it is possible for the guide sleeves to be designed with a clamping fit matched to the anchoring piles in such a manner that the anchoring piles therein can be slid downwards after they have overcome the clamping resistance as-

sociated with the clamping fit. It is also possible for the vibratory unit 7 to be coupled to the anchoring pile 4 and for this combination of vibratory unit and anchoring pile to be suspended from the associated holding means of the jacket 1.

[0015] One possible method for placing the offshore jacket shown in Fig. 1 on the seabed will now be described with reference to Figs 1-4. Fig. 1 shows the step of using the crane 10 to lower the jacket 1 onto the seabed 12. During the step of lowering the jacket 1 onto the seabed, the vibratory units 7 are activated, and if desired clamping members in the guide sleeves 3 are unlocked. As a result, an initial penetration into the seabed 12 over an initial penetration depth is imparted to the anchoring piles 4. During this vibratory introduction of the anchoring piles 4, which is shown in Fig. 2, the jacket 1 remains suspended from the crane 10. After the desired initial penetration depth has been reached, the vibratory units 7 are switched off, the jacket 1 is released from the crane 10, and the vibratory units 7 are removed from the anchoring piles 4 with the aid of the crane 10 (cf. Fig. 3). Then, the anchoring piles 4 are one by one rammed into the seabed 12 down to the desired final depth with the aid of the ramming block 14 suspended from the crane 10. Finally, the anchoring piles can be fixedly joined to the jacket 1 (the guide sleeves 3), for example by means of welding or grouting using cement.

[0016] While the anchoring piles 4 are being vibrated into the seabed 12 over the initial penetration depth, it is advantageously possible to make do with relatively small, compact vibratory units 7. After the initial penetration depth has been reached, vibratory units of this nature will generally no longer be sufficient, which means that the ramming block suspended from the crane, for example, is then required.

[0017] In the variant shown in Figs 5-8, identical components of the offshore jacket are denoted by the same reference numerals. Now, however, there are prefitted anchoring piles 20 in the guide sleeves 3, these piles being prefitted in such a manner in the guide sleeves 3 that a part that is greater than or equal to the desired initial penetration depth projects beneath the jacket 1. To temporarily fix the anchoring piles 20 in this position with respect to the jacket 1, retaining members 21 are provided on the pile parts which project downwards. These retaining members are located at a larger diameter than the internal diameter of the guide sleeves 3 and ensure that the anchoring piles 20 cannot be pressed back upwards while the jacket 1 is being lowered onto the seabed 12. The advantageous result of this is that while the jacket 1 is being lowered onto the seabed 12, the pile parts which project downwards are pressed into the seabed 12 under the influence of the deadweight of the anchoring piles 20 and of the jacket 1. After the desired initial penetration depth, which may partially or completely correspond to the downwardly projecting part of the anchoring piles 20, has been reached in this way, it is once again advantageously

possible for the jacket 1 to be detached from the crane 10, after which the anchoring piles 20 can be rammed further into the seabed 12, down to the desired final depth, with the aid of a separate main driving installation, which is in this case too formed by a ramming block 14 suspended from the crane 10 (cf. Figs 6-8). The retaining members 21 are in this case also forced into the seabed 12, where they are responsible for more secure anchoring of the anchoring piles 20 in the seabed 12.

[0018] The anchoring piles 20 are advantageously of hollow design, and a drilling and/or flushing unit 25 is located in each hollow anchoring pile 20. The drilling and/or flushing units 25 are in this case also suspended from the holding means 8. Activating the drilling and/or flushing units 25 during the initial penetration causes the penetration resistance to be reduced to a sufficient extent, with the result that the anchoring pile 20 can penetrate into the seabed 12 more quickly, easily and to a greater depth under the influence of the deadweight of the piles and the jacket. When the desired initial penetration depth has been reached in this way, once the jacket 1 has been detached from the crane 10, each drilling and/or flushing unit 25 can be removed again from the hollow anchoring pile 20 with the aid of the crane 10, which has the advantage that they can be reused during subsequent positioning of another offshore jacket.

[0019] In the variant shown in Figs 9-12, the offshore jacket is denoted by reference numeral 30. Guide sleeves 31 in which there are prefitted anchoring piles 32 are connected to the jacket 30. A ramming unit 34 is prefitted on each anchoring pile 32. The combinations of anchoring piles 32 and ramming units 34 are in this case at least initially longer than the height of the jacket 30. To temporarily fix the anchoring piles 32 in this position with respect to the jacket 1, there are clamping members 35, which are in this case connected to the sleeves 31. The positioning method may otherwise be substantially identical to that used in the embodiment shown in Figs 1-4.

[0020] In addition to the embodiments shown, numerous variants are possible. For example, it is possible to prefite other types of drive means on the anchoring piles, in which context consideration may be given, for example, to a prefitted ramming unit. As an alternative to a ramming block for ramming the anchoring piles down to the desired final depth, it is also possible to use other types of main driving installations, such as for example vibratory blocks or augers. Furthermore, the jacket may be of any other desired shape, and it is possible to use a greater or smaller number of anchoring piles and associated guide sleeves. If desired, it is also possible for the drilling and/or flushing unit to be combined with a prefitted vibratory or ramming unit. As an alternative or in addition to using separate guide sleeves, it is also possible for anchoring piles to be held slidably in tubes which extend substantially over the entire height of the jacket and/or form bearing parts of the jacket. An offshore platform or the like can be supported directly on

the jacket, which for this purpose then preferably projects slightly above sea level. It is also possible for the jacket to end under water and merely to form a horizontal reinforcing frame. An offshore platform or the like can then be supported directly on the anchoring piles and/or on a partial structure fitted to the jacket. For weight, size and cost reasons, the jacket may also comprise a plurality of individual elements, for example a base frame and an intermediate frame which are connected to one another, for example, by the anchoring piles.

[0021] Thus advantageously an inexpensive and reliable method for placing an offshore jacket on the seabed is provided, allowing fast and reliable placing of an offshore jacket according to the invention. This allows considerable cost savings to be made, for example on account of the fact that a crane ship, the costs of using which are very high, does not have to be deployed for such a long period of time. On account of the fact that there is no longer a risk of the jacket falling over, the jacket can advantageously be of slender design.

Claims

1. Method for placing an offshore jacket (1) on the seabed in order to form a vertical supporting structure for an offshore platform or the like to be supported on, comprising the steps of:

- slidably prefitting at least one anchoring pile (4) to the jacket (1);
- using a lifting device (10) to lower the jacket (1) onto the seabed (12); and
- sinking the anchoring pile (4) into the seabed (12);

characterized in that

immediately after or during the step of lowering the jacket (1) onto the seabed (12), an initial penetration is applied to the anchoring pile (4) over an initial penetration depth into the seabed (12) while the jacket (1) is still being held by the lifting device (10), after which, in a subsequent step, the anchoring pile (4) is introduced further into the seabed (12) down to a desired final depth, with the aid of a separate driving installation (14).

2. Method according to claim 1, in which after the initial penetration step, the jacket (1) is detached from the lifting device (10).

3. Method according to claim 2, in which after the step of releasing the jacket (1) from the lifting device (10), the driving installation (14) is suspended from the lifting device (10).

4. Method according to one of the preceding claims,

in which the anchoring pile (20) is prefitted in the jacket (1) in such a manner that a part of the pile which substantially corresponds to the initial penetration depth projects from the bottom of the jacket (1), and the pile is temporarily fixed in this position with respect to the jacket (1), with the projecting part of the anchoring pile (20), during the step of lowering the jacket (1) onto the seabed (12), being pressed into the seabed (12) down to the initial penetration depth, using the deadweight of the anchoring pile (20) and the jacket (1).

5. Method according to one of claims 1-4, in which the anchoring pile (4), immediately after or during the step of lowering the jacket (1) onto the seabed (12), is vibrated into the seabed (12) over the initial penetration depth with the aid of a vibratory unit (7) which is prefitted to the anchoring pile (4).

6. Method according to one of claims 1-4, in which the anchoring pile (32), immediately after or during the lowering of the jacket (30) onto the seabed, is rammed into the seabed over the initial penetration depth with the aid of a ram unit (34) which is prefitted on the anchoring pile (32).

7. Method according to one of the preceding claims, in which the anchoring pile (20) is hollow, and the anchoring pile (20), immediately after or during the step of lowering the jacket (1) onto the seabed (12), is lowered into the seabed (12) over the initial penetration depth with the aid of a drilling and/or flushing unit (25) which is prefitted in the anchoring pile (20).

8. Offshore jacket (1) for forming a supporting structure for supporting an offshore platform or the like, comprising:

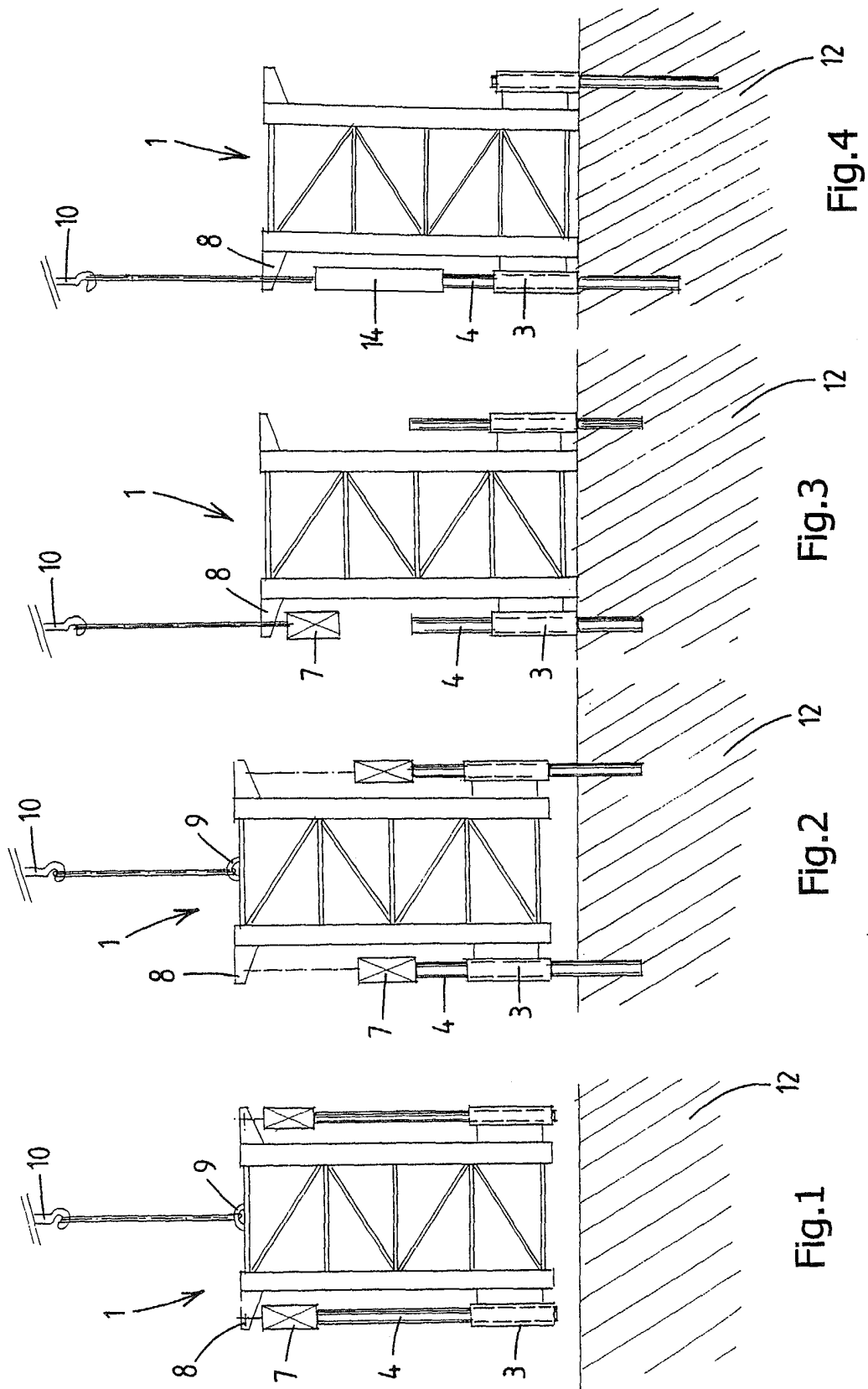
- at least one anchoring pile (4) which is slidably prefitted in the jacket (1);

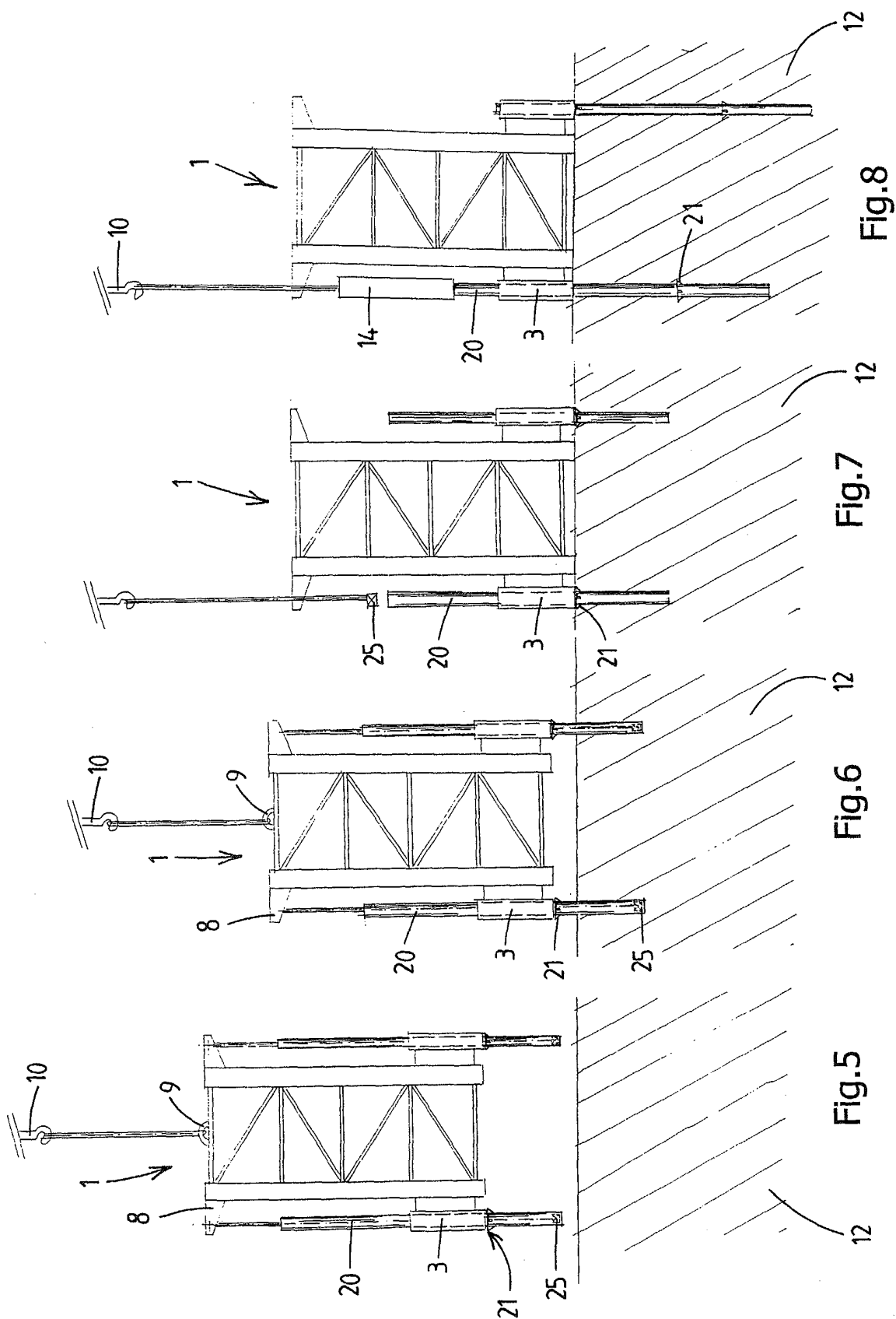
characterized in that

there are drive means which are prefitted on top of the anchoring pile (4).

9. Offshore jacket according to claim 8, in which the drive means comprise a vibratory unit (7) which is prefitted on the anchoring pile (4).

10. Offshore jacket according to claim 8, in which the drive means comprise a ram unit (34) which is prefitted on the anchoring pile (32).





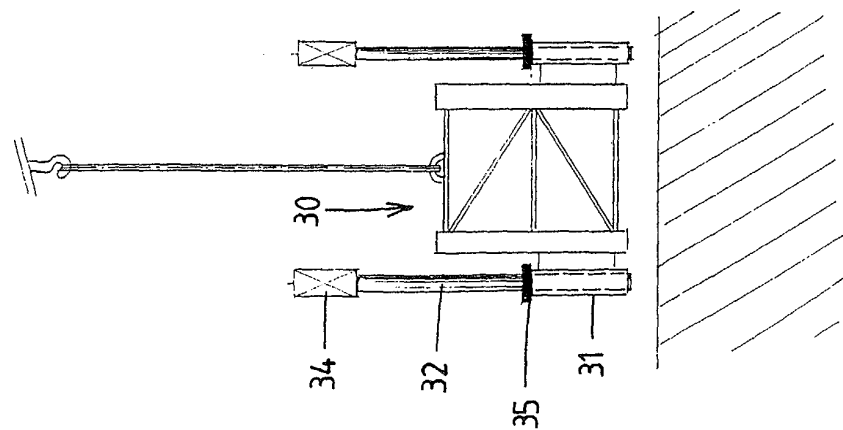


Fig. 9

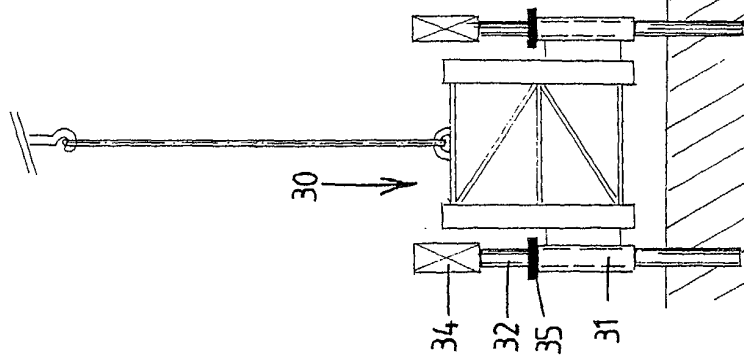


Fig. 10

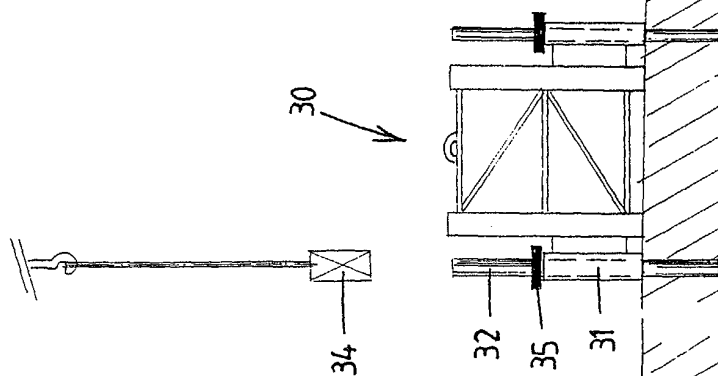


Fig. 11

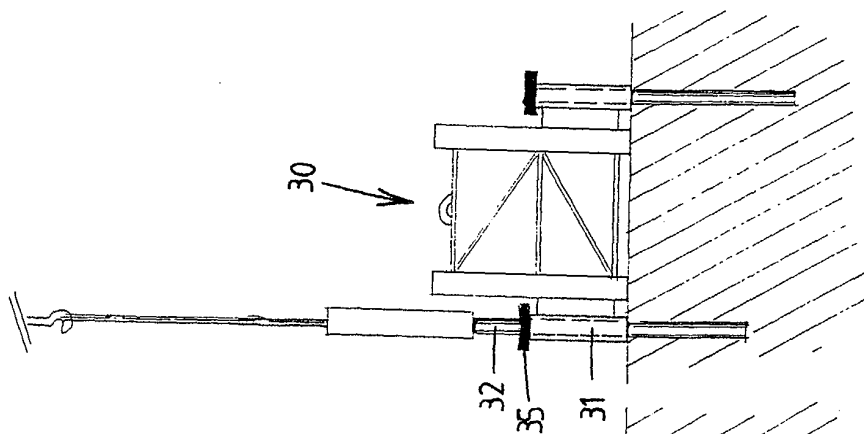


Fig. 12



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 07 6781

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	US 2 607 198 A (PARKS MERCER H) 19 August 1952 (1952-08-19) * column 1, line 48 - column 4, line 35; figures 1-4 *	1-4,7,8	E02B17/02 E02D27/52
A	----- US 4 367 800 A (ARENTSEN DIRK) 11 January 1983 (1983-01-11) * abstract *	1,5,6,9, 10	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			E02B E02D
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 23 July 2004	Examiner Zuurveld, G
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			

EPO FORM 1503 03 82 (P04C01)

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

EP 04 07 6781

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

23-07-2004

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2607198	A	19-08-1952	NONE

US 4367800	A	11-01-1983	DE 3007103 A1 04-09-1980
		GB 2043510 A ,B	08-10-1980
		JP 1520030 C	29-09-1989
		JP 55116924 A	08-09-1980
		JP 63065773 B	16-12-1988
		NL 8001151 A ,B,	29-08-1980

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82