

AN UNDERSEA DRILLING TEMPLATE

FIELD OF THE INVENTION

The present invention relates to an undersea drilling template.

BACKGROUND OF THE INVENTION

Undersea drilling templates are placed adjacent the sea bed to provide a stable hole through which drill bits, drill pipes and other undersea drilling equipment are passed into holes drilled into the sea bed by drilling platforms seeking oil and gas deposits. The template's main purpose is to stabilise the sea bed adjacent the top of the drill hole to avoid collapsing of the wet sand adjacent the hole. The templates are generally a metal annulus having an outer diameter of about 3048 mm (12 feet) and an inner diameter of about 974 mm (38.38 inches).

Templates are lowered to the sea bed over distances ranging from 100 metres to 2500 metres by a running tool attached to the drill pipe by a box-pin thread.

When the template has been lowered to the sea bed the tension in drill pipe is released to allow the running tool to be rotated out of engagement with the template and then pulled to the surface. A drill bit is then attached to the drill pipe and lowered the sea bed where it must be manoeuvred into passing through the central hole in the template for drilling to commence.

This can be a very time consuming process taking from between 3 hours in shallow depths to up to 24 hours in deep depths. Further, it can be extremely difficult to manoeuvre the drill bit into alignment with the template hole as it must first pass through various depths of sea. Remote control submarines fitted with video cameras are often used to assist in manoeuvring the drill bit into the template hole.

It is an object of the present invention to substantially overcome or at least ameliorate one or more of the prior art deficiencies.

SUMMARY OF THE INVENTION

In a first aspect, the present invention provides an undersea drilling template adapted to be lowered on to a seabed by a drill pipe, the template comprises:

- a template base, and

- at least one arm having a releasable clamping assembly for releasably connecting the template to the drill pipe, wherein the clamping assembly is adapted to be clamped to the drill pipe during lowering of the template and release from the drill pipe when the lowering is completed.

Preferably, the arm(s) have a first end mounted to the template base and a second end including all of, or a portion of, the clamping assembly.

Preferably, the template includes a pair of V or U-shaped arms having their free ends pivotally mounted to the template base and a portion of the clamping assembly at their apex or base.

The clamping assembly is desirably adapted to slide along the drill pipe into abutting relationship with a first shoulder provided on the drill pipe for suspending the template base below the first shoulder.

The clamping assembly is preferably adapted to release from the drill pipe when the continued downward travel of the drill pipe, after the template has been lowered onto the sea bed at the completion of the template lowering, causes the clamping assembly to contact a second shoulder provided on the drill pipe above the first shoulder.

The clamping assembly preferably includes a pair of part cylindrical portions with external flanges that may be clamped together around the drill pipe by bolts, shear pins or the like. The bolts, shear pins or the like are preferably adapted to fracture when the part cylindrical portions are contacted and driven apart by a downwardly facing frusto-conical portion comprising the second shoulder.

In another embodiment, the clamping assembly includes a latching member pivotally mounted to one of the arms and releasably engageable with the other, the latching member being adapted to be pivoted out of engagement from the other arm after the latching member is contacted by the second shoulder. In one form, the latching member includes a striking plate adapted to release the latching member when contacted by a downwardly facing frusto-conical portion comprising the second shoulder.

The template base preferably includes an inner substantially central hole and the arms are adapted to pivot away from the hole when released so as to provide the drill bit at the end of the drill pipe with access to the inner hole.

The template base also includes a number of compartments adapted to hold ballast material.

BRIEF DESCRIPTION OF THE DRAWINGS

A preferred embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawings in which:

Fig. 1 is a side view of an under sea drilling template according to a first embodiment of the invention being lowered by a drill pipe towards a sea bed;

Fig. 2 is a side view of the template shown in Fig. 1 after it has been lowered to the sea bed;

Fig. 3 is a plan view of the template shown in Fig. 1 in the closed configuration shown in Fig. 1;

Fig. 4 is a plan view of the template shown in Fig. 1 in an open position as shown in Fig. 2;

Fig. 5 is a detailed view of the template as shown Fig. 1;

Fig. 6 is a detailed view of the template shown in Fig. 6;

Fig. 7 is a partial close up view of the template of Fig. 1;

Fig. 8 is a partial detailed close up view of the template of Fig. 1 during release of the clamping assembly;

Fig. 9 is a plan view of a template according to a second embodiment of the invention in the clamped position;

Fig. 10 is a plan view of the embodiment of Fig. 9 in an open position;

Fig. 11 is a partial side view of the second embodiment in a closed position during lowering;

Fig. 12 is a side view of the embodiment of Fig. 9 in the open position after lowering;

Fig. 13 is a partial detailed view of the embodiment of Fig. 9 during lowering;

Fig. 14 is a partial detailed view of the embodiment of Fig. 9 during initial release of the clamping means;

Fig. 15 is a cross-sectional view of the clamping means of Fig. 9;

Fig. 16 is a cross-sectional view of the clamping means of Fig. 15 oriented through 90°;

Fig. 17 is a cross-sectional view of the clamping means of Fig. 16 during initial release;

Fig. 18 is a cross-sectional view of the clamping means of Fig. 16 during further release;

Fig. 19 is a cross-sectional view of the clamping means of Fig. 15 during further release;

Fig. 20 is a partial rear view of a clamping assembly according to a third embodiment of the invention in a closed configuration;

Fig. 21 is a partial side view of the clamping assembly shown in Fig. 20 in the closed configuration; and

Fig. 22 is a partial side view of the clamping assembly shown in Fig. 20 in open configuration.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Figs. 1 to 8 show an undersea template 20 according to a first embodiment of the invention. Fig. 1 shows the template 20 being lowered on to the sea bed 22 by a drill pipe 24 extending beneath a drilling platform 26. The template 20 is constructed from steel and comprises a template base 28 and a pair of arms 30 having a releasable clamping assembly 42 for releasably clamping around the drill pipe 24 to releasably

connect the template 20 thereto. In Fig. 1, the clamping assembly 42 is shown in a clamped or closed configuration clamping the template 20 to the drill pipe 24 during lowering of the template.

Fig. 2 shows the clamping assembly 42 in a released or open configuration releasing the template 20 from the drill pipe 24 after the template 20 has been lowered to the sea bed 22.

As both Figs. 1 and 2 show, drill bit 34 of the drill pipe 24 is positioned just above the template 20 when it reaches the sea bed 22 and can thus continue on through the template 20 and into the sea bed 22 without the need to retract the drill pipe, attach the drill bit and thereafter re-lower the drill pipe and manoeuvre the drill bit through the template. This represents a significant time, effort and cost saving compared to the drill pipe retraction and re-lowering required for prior art templates.

Referring to Figs. 3 to 6, the template 20 is of metal annular construction having an inner opening 36 through which the drill bit 34 and the drill pipe 24 passes during drilling. The template 20 also includes a number of compartments 38 into which ballast material can be introduced in varying amounts to suit the geology of the sea bed and to resist guide line tension and environmental loads.

The arms 30 are substantially U-shaped and are hinged at ends 40 to brackets 41 attached to the template base 28. The apex of the arms each include one part of the two part clamping assembly 42 comprising an hemispherical collar 44 bounded by two outer flanges 46. Bolts 48 pass between the flanges 46 to bolt the clamping assembly 42 in the closed configuration shown in Fig. 3 around the drill pipe 24. Shear pins or other fasteners can, of course, be used in place of the bolts 48.

As best shown in Fig. 5, the drill pipe 24 includes a first shoulder 50 against to which the clamping assembly 42 abuts to suspend the template 20 from the drill pipe 24.

The drill pipe 24 also includes a second shoulder 52 having a downwardly facing frusto-conical portion 54. When the template 20 reaches the sea bed 22, the drill pipe 24 continues its downward motion and the frusto-conical portion 54 is driven into contact with the clamping assembly 42 and fractures the bolts 48 (see Fig. 8). This releases the clamping assembly 42 and causes the arms 30 to fall into the open configuration and disconnect the template 20 from the drill pipe 24. The arms 30 fall towards the exterior of the template 20 to provide the drill bit 34 with access to the inner opening 36 of the template. Further downward travel of the drill pipe 24 progresses the drill bit 34 through the sea bed 22, as shown in Fig. 6.

A template 60 according to a second embodiment of the invention is shown in Figs. 9 to 19. Like reference numerals to those used in describing the first embodiment will be used to denote like features with relation to the second embodiment.

The template 60 includes chains 62 between the template 60 and the arms 30 to prevent tipping of the template 60 by supporting the template 60 in an orientation perpendicular to the drill pipe 24 during lowering to the sea bed 22.

As best seen in Fig. 16, the arms 30 are manufactured from steel beams having an I-shaped cross-section and are held in the closed configuration adjacent the drill pipe 24 by shear pins 66 inserted through complementary flanges 68 provided on each of the arms 30 adjacent the hemispherical collars 44. Smaller shear pins 64 also assist in holding the arms 30 in the closed position.

As with the first embodiment, the clamping assembly 42 abuts against the first shoulder 50 of the drill pipe 24 during lowering and after lowering the second shoulder 52 continues its downward motion to contact and fracture the small shear pins 64 and then drive the two portions of the clamping assembly 42 apart by fracturing the larger shear pins 66. This process is exemplified in Figs. 17 to 19. As with the first embodiment, the two arms 30 fall towards the exterior of the template 60 to provide the drill bit 34 with access to the inner opening 36 of the template 60.

A clamping assembly 70 of a third embodiment of the invention is shown in Figs. 20 to 22. Like reference numerals to those used in describing the first embodiment will also be used to denote like features with relation to the third embodiment.

The clamping assembly 70 includes first and second hemispherical collars 71 and 72 respectively mounted to the apex of each of the arms 30 by bolts 73. A latching member 74 is pivotally mounted to the first collar 71 by bolts 76 passing through a pair of lower flanges 78. The flanges 78 also each include a cutout 80 adapted to engage bolts 82 in the second collar 72 when the latching member 74 is in the closed configuration shown in Fig. 21. The latching member 74 also includes a striking plate 84 upwardly and outwardly angled away from the lower flanges 78.

When the template reaches the sea bed and the drill pipe continues its downward motion, the second shoulder is driven into contact with the striking plate 84 which causes the latching member 74 to pivot away from the second collar 72 and release the lower flanges 78 from engagement with the bolts 82. The arms 30 then fall away towards the exterior of the template and release the template in a manner consistent with the first and second embodiments.

Additional advantages of the third embodiment are that the first and second collars 71, 72 and the latching member 74 can be easily replaced with ones of a different size to cater for drill pipes of varying external diameters and the template can be re-used without any component replacement.

Although the invention has been described with reference to specific examples, it would be appreciated by those skilled in the art, that the invention may be embodied in many other forms.



The claims defining the invention are as follows:

1. An undersea drilling template adapted to be lowered on to a seabed by a drill pipe, the template comprises:
a template base, and
at least one arm having a releasable clamping assembly for releasably connecting the template to the drill pipe, wherein the clamping assembly is adapted to be clamped to the drill pipe during lowering of the template and release from the drill pipe when the lowering is completed.
2. A template as claimed in claim 1, wherein the arm(s) have a first end mounted to the template base and a second end including all of, or a portion of, the clamping assembly.
3. A template as claimed in claim 1 or 2, wherein the template includes a pair of V or U-shaped arms having their free ends pivotally mounted to the template base and a portion of the clamping assembly at their apex or base.
4. A template as claimed in claim 1, 2 or 3, wherein the clamping assembly is adapted to slide along the drill pipe into an abutting relationship with a first shoulder provided on the drill pipe for suspending the template base below the first shoulder.
5. A template as claimed in claim 4, wherein the clamping assembly is adapted to release from the drill pipe when the continued downward travel of the drill pipe, after the template has been lowered onto the sea bed at the completion of the template lowering, causes the clamping assembly to contact a second shoulder provided on the drill pipe above the first shoulder.
6. A template as claimed in claim 5, wherein the clamping assembly includes a pair of part cylindrical portions with external flanges that may be clamped together around the drill pipe by bolts, shear pins or the like.
7. A template as claimed in claim 6, wherein the bolts, shear pins or the like are adapted to fracture when the part cylindrical portions are contacted and driven apart by a downwardly facing frusto-conical portion comprising the second shoulder.
8. A template as claimed in claim 5, wherein the clamping assembly includes a latching member pivotally mounted to one of the arms and releasably engageable with the other of the arms, the latching member being adapted to be pivoted out of engagement from the other arm after the latching member is contacted by the second shoulder.
9. A template as claimed in claim 8, wherein the latching member includes a striking plate adapted to release the latching member when contacted by a downwardly facing frusto-conical portion comprising the second shoulder.



10. A template as claimed in any one of the preceding claims, wherein the template base includes an inner substantially central hole and the arms are adapted to pivot away from the hole when released so as to provide a drill bit at the end of the drill pipe with access to the inner hole.

11. A template as claimed in any one of claims, wherein the template base includes a number of compartments adapted to hold ballast material.

12. An undersea drilling template substantially as described herein with reference to Figs. 1 to 8, Figs. 9 to 19 or Figs. 20 to 22 of the accompanying drawings.

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