



The subject of the present invention is a method and a device for assembling the chords of the legs for supporting an off-shore drilling and production oil rig.

Oil platforms, and especially jack-up platforms
5 include legs which bear on the sea bed and a barge mounted so that it can be moved and adjusted in terms of height along the legs.

The whole of the platform is floated out to the drilling or production site and the legs are lowered
10 until they come into contact with the sea bed, then, bearing on the legs, the barge is winched up above sea level to an altitude which places it out of reach of the highest waves.

Each leg is made up of vertical chords, for
15 example numbering three, joined together by a lattice of metal girders.

Each chord is made up of sections butt-welded together and each formed, on the one hand, by a rectangular plate and, on the other hand, by stiffeners in the
20 form of half-shells each welded to one of the main faces of the said plate.

The rectangular plates include teeth on their lateral faces, which teeth, over some of the length of the chords, form diametrically opposed racks intended to
25 interact with output pinions of drive mechanisms mounted on the barge of the platform.

Each stiffener welded to one of the main faces of the rectangular plates has a length which is shorter than the length of a plate so as to leave a free space at each
30 end of the plate allowing the sections to be butt-welded together when the chord is being assembled.

In order to ensure continuity of the stiffeners, a joining piece in the form of a half-shell and the profile of which corresponds to the profile of the
35 stiffeners, is positioned in the region of each free space and in the extension of the said stiffeners, after the sections of the chord have been butt-welded together.

This arrangement makes it possible to butt together the sections of the chord, which sections have



been premanufactured beforehand in the workshop, and weld them directly on site.

These joining pieces are welded from the outside onto the main faces of the rectangular plates and onto the edges of the stiffeners in order to form continuous stiffeners on each side of said plates, thus allowing the chords to be made more rigid.

These chords, which support the barge of the platform, are heavily loaded in terms of fatigue and the weld beads especially where the joining pieces are welded onto the other elements of the chord are also heavily loaded.

Now, with the assembly and welding techniques used to date, the weld beads, which can only be produced from the outside, exhibit joining defects more particularly in the region of the root of these weld beads, that is to say inside the joining piece in the zones of connection with the rectangular plates and the stiffeners.

These defects are stress concentration zones which are incompatible with the heavy fatigue loadings to which the legs of the oil platforms are subjected.

The object of the invention is to overcome these drawbacks by proposing an assembly method and device making it possible to produce a progressive connection of the weld beads of the joining pieces to the other elements of the chord, inside the chord, in order to avoid the formation of stress concentration zones.

The subject of the invention is a method for assembling the chords of the legs for supporting an oil platform, in which:

- a stiffener in the form of a half-shell is welded, from the outside, onto each main face of a rectangular plate, the said rectangular plate including teeth forming a rack on each of its lateral faces,

- several rectangular plates equipped with the said stiffeners are butt-welded together in order to form a chord, each stiffener having a length which is shorter than the length of a plate in order to leave a free space



between two adjacent stiffeners at the region where the plates are welded together,

5 - a joining piece in the form of a half-shell is positioned in the region of each free space and in the extension of the stiffeners,

10 - and each joining piece is welded from the outside onto the main face of the plates and onto the flanges of the adjacent stiffeners in order to form continuous stiffeners on each side of the said plates, characterized in that, prior to positioning and welding each stiffener and each joining piece, there is placed on the internal edge of each zone at which the stiffener connects with the plates and the joining piece connects with the plates and the stiffeners, a ceramic strip
15 matched to the profile of each zone of connection and intended to shape the root of the weld bead.

Another subject of the invention is a device for assembling the chords of the legs for supporting an oil platform, each chord comprising sections each formed by
20 a rectangular plate intended to be butt-welded to the rectangular plate of the adjacent sections and including teeth forming a rack on each of its lateral faces, a stiffener in the form of a half-shell welded to each main face of the rectangular plate, each stiffener having a
25 length which is shorter than the length of a plate in order to leave a free space at the region of the weld between two adjacent plates, and joining pieces in the form of half-shells welded to each main face of the plates and the flange of each adjacent stiffener in order
30 to form continuous stiffeners on each side of the said plates, characterized in that it includes means for welding, on the one hand, the stiffeners onto the main faces of the plates and, on the other hand, the joining pieces onto the main faces of the plates and onto the
35 flanges of each adjacent stiffener and means for shaping the root of the weld beads of the stiffeners and of the joining pieces, the means being located on the internal edge of each zone at which the said stiffeners connect with the rectangular plates and each zone at which the



said joining pieces connect with the rectangular plates and the stiffeners.

According to other features of the invention:

- 5 - the means for shaping the root of the weld beads are formed by ceramic strips located on a support joined to the chord by joining members,
- the ceramic strips intended to shape the roots of the weld beads where the stiffeners and joining pieces are welded to the rectangular plates have a cross-section
10 in the form of a triangle with rounded vertices,
- the ceramic strips intended to shape the roots of the weld beads where the stiffeners and joining pieces are welded to the rectangular plates are formed by independent elements and joined together by a tensioner
15 line passing through the said elements,
- the ceramic strips intended to shape the weld bead roots between the joining pieces and the stiffeners are formed by elements which are hinged together in order to match the radius of curvature of the said stiffeners,
20 - each element has a rectangular cross-section and includes a groove on that of its faces located facing the weld bead.

The invention will be better understood with the aid of the description which will follow, given solely by way of example and made with reference to the appended
25 drawings, in which:

- Fig. 1 is a diagrammatic elevation of an oil platform, for example a jack-up platform,
- Fig. 2 is a diagrammatic perspective view of a
30 portion of a chord of a leg for supporting the oil platform,
- Fig. 3 is a diagrammatic exploded perspective view of the chord portion represented in Fig. 2,
- Fig. 4 is a section along the line 4-4 of
35 Fig. 2,
- Fig. 5 is a section along the line 5-5 of Fig. 2,
- Fig. 6 is a diagrammatic perspective view of the means for shaping the weld bead where the stiffeners



and the joining pieces are welded onto the rectangular plates,

- Fig. 7 is a diagrammatic perspective view of the means for shaping the weld bead between the joining
5 pieces and the stiffeners.

Fig. 1 diagrammatically represents a jack-up oil platform comprising a barge 1 mounted so that it can move on vertical legs 2 which are intended to bear on the sea bed 3 when the platform is in the drilling or production
10 position.

Each of the vertical legs 2 in this case exhibits a triangular cross-section and is made up of three chords 10 joined together by a lattice of metal girders 4.

Each leg 2 ends at its lower part in a foot 5.
15 The platform is moreover equipped, in the region of each leg 2, with a mechanism 6 for driving and suspending the barge 1 with respect to the said legs 2.

The drive mechanisms 6 make it possible to lower the legs 2 until they come into contact with the sea bed, then, bearing on the legs, to winch the barge 1 up above
20 the sea to an altitude which places it out of reach of the highest waves.

As represented in Figs 2 and 3, each chord 10 of the legs 2 is composed of several sections 11 each formed
25 of a rectangular plate 12 and of two stiffeners 13 in the form of a half-shell.

The ends of the rectangular plates 12 are chamfered to allow the sections 11 to be butt-welded together when the chord 10 is assembled.

30 The lateral faces of the rectangular plates 12 include teeth 14 in order to form two diametrically opposed racks on the chord 10, these racks being intended to interact with output pinions, not represented, of the drive mechanisms 6.

35 Each stiffener 13 is welded from the outside onto one of the main faces of the corresponding rectangular plate 12 and is shorter than the plate 12 in order to leave a free space A in the region where two adjacent plates 12 are welded together (Fig. 3), which makes it



possible to butt-weld the sections 11 when the chord 10 is being assembled.

5 In order to allow the stiffeners 13 to be welded, the longitudinal flanges of these stiffeners 13 are chamfered.

Thus, the sections 11 making up the chord 10 may be prefabricated in the workshop, then butted together and welded together directly on site.

10 Each chord 10 also includes interposed joining pieces 15 in the form of half-shells and the profile of which corresponds to the profile of the stiffeners 13.

A joining piece 15 is positioned in the region of each free space A and in the extension of the stiffeners 13 after the sections 11 have been butt-welded together.

15 These joining pieces 15 are welded from the outside onto the main faces of the rectangular plates 12 and onto the flanges of the stiffeners 13 in order to form continuous stiffeners on each side of the said plates 12.

20 In order to allow the joining pieces 15 to be welded on, the flanges of these joining pieces 15, as well as the flange at each end of the stiffeners 13 are chamfered.

25 The device for assembling the joining pieces 15 includes means, not represented in the figures, for welding the stiffeners onto the main faces of the plates 12 and the joining pieces 15 onto the main faces of the plates 12 and onto the flanges of each adjacent stiffener 13 and means 20 (Fig. 3) for shaping the root of the weld
30 beads where the said stiffeners 13 are welded onto the main faces of the plates 12 and said joining pieces are welded onto the main faces of the plates 12 and onto the flanges of the adjacent stiffeners 13.

35 These shaping means 20 are located on the internal edge of each zone where the stiffeners 13 connect with the plates 12 and the joining pieces 15 connect with the plates 12 and the stiffeners 13 and are formed by ceramic strips 21a, 21b and 22a, 22b.

One strip 21a is located on the internal edge of



the zone of connection between one of the longitudinal flanges of each stiffener 13 and the main face of the corresponding plate 12 and one strip 21b is located on the internal edge of the zone of connection between the other longitudinal flange of each stiffener 13 and the main face of the corresponding plate 12.

On the other hand, a strip 21a is located on the internal edge of the zone of connection between the longitudinal flange 15a of the joining piece 15 at the main faces of the plates 12 and a strip 21b is located on the internal edge of the zone of connection between the longitudinal flange 15b of the joining piece 15 and the main faces of the said plates 12.

The strips 21a and 21b form a continuous line and have a cross-section in the form of a triangle with rounded vertices so as to match the shape of the connection between the stiffeners 13, the joining piece 15 and the plates 12, as represented in Figure 4.

These strips 21a and 21b are each mounted on a support 23, for example one made of steel (Fig. 4).

As represented in Fig. 6, the strips 21a and 21b are formed by independent elements 28 joined together by a tensioner line 29 passing through the said elements 28.

One strip 22a is located on the internal edge of the zone of connection between the lateral flange 15c of the joining piece 15 and the adjacent stiffener 13 and a strip 22c is located on the internal edge of the zone of connection between the lateral flange 15d of the joining piece 15 and the stiffener 13 adjacent to this lateral flange.

The strips 22a and 22b are mounted on a support 24, for example one made of steel (Fig. 5).

As represented in Fig. 7, the strips 22a and 22b are formed by elements 25 of rectangular cross-section hinged together in order to match the radius of curvature of the stiffeners 13 and of the joining pieces 15.

Each element 25 includes a groove 26 on that of its faces which is located facing the weld bead.

The supports 23 and 24 may be welded onto the



plates 12 and the stiffeners 13 or may be fixed onto the said plates and the said stiffeners by suitable fasteners.

5 The chords 10 are assembled in the following manner.

First of all, the ceramic strips 21a and 21b are placed on the internal edge of each zone of connection of the stiffeners 13 with the main faces of the corresponding rectangular plate 12 and a stiffener 13 is welded on
10 the outside onto each main face of a rectangular plate 12 in order to form sections 11, then the said sections 11 are butt-welded together directly on site in order to produce the chord 10.

Next, the ceramic strips 21a, 21b and 22a, 22b
15 are placed on the internal edge of each zone of connection of the joining piece 15 with the plates 12 and stiffeners 13 and each joining piece 15 is welded from the outside onto the main face of the plates 12 and onto the flanges of the adjacent stiffeners 13 in order to
20 form continuous stiffeners on each side of the said plates.

The ceramic strips 21a, 21b and 22a, 22b, while facilitating the task of the welders, support and shape the roots of the weld beads which makes it possible to
25 obtain progressive connection of the various components with less of a risk of defect and, thereby allows better fatigue strength.

What is more, the assembly tolerances for the components are wider, thus making it possible to reduce
30 the cost for preparing these components and to increase the speed of execution of the weld on the ceramic strips and requires a less highly qualified work force.



CLAIMS

1. Method for assembling the chords (10) of the legs
(2) for supporting an oil platform, in which:
 - a stiffener (13) in the form of a half-shell is
5 welded, from the outside, onto each main face of a
rectangular plate (12), the said rectangular plate (12)
including teeth (14) forming a rack on each of its
lateral faces,
 - several rectangular plates (12) equipped with
10 the said stiffeners (13) are butt-welded together in
order to form a chord (10), each stiffener (13) having a
length which is shorter than the length of a plate (12)
in order to leave a free space between two adjacent
stiffeners (13) at the region where the plates (12) are
15 welded together,
 - a joining piece (15) in the form of a half-
shell is positioned in the region of each free space and
in the extension of the stiffeners (13),
 - and each joining piece (15) is welded from the
20 outside onto the main face of the plates (12) and onto
the flanges of the adjacent stiffeners in order to form
continuous stiffeners on each side of the said plates,
characterized in that, prior to positioning and welding
each stiffener (13) and each joining piece (15), there is
25 placed on the internal edge of each zone at which, on the
one hand, the stiffener (13) connects with the plates
(12) and, on the other hand, the joining piece (15)
connects with the plates (12) and the stiffeners (13), a
ceramic strip (21a, 21b; 22a, 22b) matched to the profile
30 of each zone of connection and intended to shape the root
of the weld bead.
2. Device for assembling the chords (10) of the legs
(2) for supporting an oil platform, each chord comprising
sections (11) each formed by a rectangular plate (12)
35 intended to be butt-welded to the rectangular plate (12)
of the adjacent sections (11) and including teeth (14)
forming a rack on each of its lateral faces, a stiffener
(13) in the form of a half-shell welded to each main face
of the rectangular plate (12), each stiffener (13) having



a length which is shorter than the length of a plate (12) in order to leave a free space at the region of the weld between two adjacent plates (12), and joining pieces (15) in the form of half-shells welded to each main face of the plates (12) and the flange of each adjacent stiffener (13) in order to form continuous stiffeners on each side of the said plates (12), characterized in that it includes means for welding, on the one hand, the stiffeners (13) onto the main faces of the plates (12) and, on the other hand, the joining pieces (15) onto the main faces of the plates (12) and onto the flanges of each adjacent stiffener (13) and means (21a, 21b; 22a, 22b) for shaping the root of the weld beads of the stiffeners (13) and of the joining pieces (15), the means being located on the internal edge of each zone at which the said stiffeners (13) connect with the rectangular plates (12) and each zone at which the said joining pieces (15) connect with the rectangular plates (12) and the stiffeners (13).

3. Device according to Claim 2, characterized in that the means for shaping the root of the weld beads are formed by ceramic strips (21a, 21b; 22a, 22b) mounted on a support (23, 24) joined to the chord (10) by joining members.

4. Device according to Claim 3, characterized in that the ceramic strips (21a, 21b) intended to shape the roots of the weld beads where the stiffeners (13) and joining pieces (15) are welded to the rectangular plates (12) have a cross-section in the form of a triangle with rounded vertices.

5. Device according to Claim 4, characterized in that the strips (21a, 21b) are formed by independent elements (28) joined together by a tensioner line (29) passing through the said elements.

6. Device according to Claim 3, characterized in that the ceramic strips (22a, 22b) intended to shape the roots of the weld beads between the joining pieces (15) and the stiffeners (13) are formed by elements (25) which are hinged together in order to match the radius of curvature of the said stiffeners (13).





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7. Device according to Claim 6, characterized in that each element (25) has a rectangular cross-section and includes a groove (26) on that of its faces located facing the weld bead.

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