Shackle assembly

Background

The present invention relates to a shackle assembly comprising a shackle and a driving device coupled with the shackle for reciprocating a shackle bolt along the longitudinal axis of the shackle bolt between a shackle installed position and a shackle released position. The shackle assembly is in particular suitable for use in offshore and subsea operations which requires high allowable load and stringent safety standards.

Such a shackle assembly is known from WO 2006/055581 A2 which relates to a shackle assembly and a method for installing and/or releasing the shackle assembly subsea using a shackle pin pulling tool. This tool is separate from the shackle body which allows multiple subsea shackles to be operated with the use of a single hydraulic shackle pin removal or installation tool. Under circumstances this shackle assembly of WO 2006/055581 A2 is unpractical and not safe in use.

WO2011/117446 relates to a shackle connecting device which is intended to connect a shackle to the links of a chain using a bolt. A nut is screwed to the end of the bolt in order to secure the bolt. The nut is screwed to the bolt by an additional robot distinct from the shackle connecting device, which additional robot is costly, cumbersome and undesirable.

Summary of the invention

Embodiments of ~~T~~the invention ~~aims~~ seek to provide a shackle assembly wherein a known problem is at least partially solved.

~~Another object~~Embodiments of the invention ~~is~~seek to improve a shackle assembly.

~~Yet another object~~Embodiments of the invention ~~is~~ seek to provide a shackle assembly which is more safe during operations, in particular offshore operations.

According to a first aspect of the invention, there is provided a shackle assembly comprising a shackle, ~~this is realized with~~ a shackle bolt and a driving device coupled with the shackle and the shackle bolt for driving the shackle bolt along the longitudinal axis of the shackle bolt between a shackle installed position and a shackle released position, wherein the shackle bolt comprises a locking means for

~~According to a further aspect~~In an embodiment of the invention, the driving device is coupled with the driving device mounting frame and the further driving device mounting frame for moving the further driving device mounting frame. This enables improving redundancy of the shackle assembly and/or failure free operations.

In an embodiment of the invention, the further driving device is coupled with the further driving device mounting frame and moves with the further driving device mounting frame.

In an embodiment of the invention, the shackle assembly comprises a shackle mounting plate for mounting with a leg of the shackle. This enables use of a standardized shackle in the shackle assembly and enables an improved mating of the locking means and the recess in the mounting plate.

In an embodiment of the invention, both legs of the shackle are provided with a said mounting plate.

In an embodiment of the invention, at least one of both legs is on both sides provided with a said mounting plate. This improves the coupling between the driving device and the shackle.

In an embodiment of the invention, the mounting plate most remote from the driving system comprises a recess for passing the locking means there through.

In an embodiment of the invention, the locking means and the recess have a corresponding outline for allowing passage of the locking means only when the locking means is in its bolt release position.

Embodiments of ~~T~~the invention further relates to a device comprising one or more of the characterising features described in the description and/or shown in the attached drawings.

Embodiments of The invention further relates to a method comprising one or more of the characterising features described in the description and/or shown in the attached drawings.

The various aspects discussed in this patent can be combined in order to provide additional advantages.

Description of the drawings

The invention will be further elucidated referring to a preferred embodiment shown in the drawing wherein shown in:

Fig. 1 in perspective view the shackle assemble in the shackle released position;

fig. 2 the shackle assembly of fig. 1 in cross sectional side view;

fig. 3 the shackle assembly of fig 1 in the shackle installed position and the locking means in the shackle bolt released position;

fig. 4 the shackle assembly of fig. 3 in cross sectional side view;

fig. 5 the shackle assembly of fig 1 in the shackle installed position and the locking means in the bolt locked position; and in

fig. 6 the shackle assembly of fig. 5 in cross sectional side view.

Detailed description of embodiments

An embodiment of the shackle assembly is described below, referring to fig. 1-6.

The shackle assembly 1 comprises a shackle 2 and a driving device 9 coupled with the shackle for driving a shackle bolt 4. The shackle 2 has a U-shape with a first and second leg 19, 20. The second leg 20 faces the driving device 9 and is coupled with the driving device 9. Both the first and second leg are provided with a recess or opening 13, 25 for passing the shackle bolt 4 having a bolt outside surface 24 there through.

The shackle assembly 1 comprises means for rotating the shackle bolt 4 around the longitudinal axis 10 of the shackle bolt for moving the locking means 21. In this case, these means include a further driving device 8, here a hydraulic cylinder, and means for transforming a shackle bolt driving force along the longitudinal axis 10 of