SUMMARY OF THE INVENTION

In an embodiment, a~~A~~ riser tensioning system includes a tensioning ring~~18~~ for secured engagement with the riser, a plurality of hydraulic cylinders~~12~~ each extending between the tensioning ring and a folding platform, and a gimbal mechanism below the tensioning ring and acting between the platform and the riser to allow the riser axis to tilt relative to the platform. One or more torque transfer members or supports extend between the tensioning ring and the gimbal mechanism and allow axial movement of the tensioning ring and the riser with respect to the floating platform.

According to a first aspect, there is provided a riser tensioning system for tensioning a riser extending from a subsea wellhead to a floating platform, the riser tensioning system comprising: a tensioning ring for secured engagement with the riser; a plurality of hydraulic cylinders each extending between the tensioning ring and the floating platform; a gimbal mechanism stationary with respect to the floating platform and below the tensioning ring, the gimbal mechanism surrounding the riser and acting between the platform and the riser and allowing the riser axis to tilt relative to the floating platform; and one or more elongate torque transfer members radially outward of the riser and extending between the tensioning ring and gimbal mechanism, the one or more torque transfer members transferring riser torque from the tensioning ring through the gimbal mechanism and to the floating platform while allowing axial movement of the tensioning ring and the riser with respect to the floating platform.

According to a second aspect, there is provided a riser tensioning system for tensioning a riser extending from a subsea wellhead to a floating platform, the riser tensioning system comprising: a tensioning ring for secured engagement with the riser; a plurality of hydraulic cylinders each having an inclined cylinder axis with respect to a central riser axis, extending between the tensioning ring and the floating platform, such that a lower end of each cylinder is spaced radially from the riser more than an upper end of each

cylinder; a gimbal mechanism stationary with respect to the floating platform and below the tensioning ring, the gimbal mechanism surrounding the riser and acting between the platform and the riser and allowing the riser axis to tilt relative to the floating platform, and the gimbal mechanism including a pair of diametrically opposite gimbal axes each perpendicular to the other gimbal axis for accommodating tilting of the riser in any direction; and one or more elongate torque transfer members radially outward of the riser and extending between the tensioning ring and gimbal mechanism, the one or more torque transfer members transferring riser torque from the tensioning ring through the gimbal mechanism and to the floating platform while allowing axial movement of the tensioning ring and the riser with respect to the floating platform.

According to a third aspect, there is provided a method of tensioning a riser extending from a subsea wellhead to a floating platform, the method comprising: securing a tensioning ring with the riser; providing a plurality of hydraulic cylinders each extending between the tensioning ring and the floating platform; positioning a gimbal mechanism stationary with respect to the floating platform and below the tensioning ring, the gimbal mechanism surrounding the riser and acting between the platform and the riser and allowing the riser axis to tilt relative to the floating platform; and providing one or more elongate torque transfer members radially outward of the riser and extending between the tensioning ring and gimbal mechanism, the one or more torque transfer members transferring riser torque from the tensioning ring through the gimbal mechanism and to the floating platform while allowing axial movement of the tensioning ring and the riser with respect to the floating platform.

These and further features and advantages of the present invention will become apparent from the following detailed description, wherein reference is made to the figures in the accompanying drawings.