Title of the Invention: **Pipe connector anti-rotation mechanism**

Abstract Title: **Anti rotation pipe connector for downhole casing joints**

An anti rotation connection comprising a pin 2 and box 1 connection where the pin has a cam profile 4 that reacts with anti rotation screws 3 in the box. There are a series of anti rotation screws in the box. The cam profile of the pin is continuous around the circumference and consists of plural crests and troughs. The anti rotation screws are spaced differently around the circumference than the crests of the cam profile.
Invention Description:

Title: Pipe Connector Anti-rotation Mechanism

Background of Invention:

This invention outlines an anti-rotation device for mating connectors in the fully made up position of large diameter tubular members.

Large diameter pipes are used for casing and risers in offshore drilling and production activities, typically these pipes are supplied in 40 feet long lengths. To connect these lengths of pipe leak tight connectors that will not become disconnected or further made up are desirable.

The essential feature of this invention is that the pin and box do not have to be orientated, manufactured as a matched set, machined once they are assembled or deformed once they are assembled. In addition a hardened anti-rotation key does not have to be inserted into the made up connection.

Problem Invention solves:

The connections are typically threaded together and without matching the thread profile of the pin and box it is impossible to predict where the made up connection will be positioned to allow an anti-rotation device to be inserted.

Current designs require a machining operation to be completed once the connection is assembled or the box deformed to engage with the pin or a hardened anti-rotation key be inserted into the assembled joint. This invention removes the requirement for all of these activities and the anti-rotation screws can be installed and removed repeatedly without affecting the performance of the anti-rotation feature.

Key Features of Invention:

The invention requires anti-rotation screws in the box to be engaged with a cam profile of the pin. The profile on the pin of this invention forces the anti-rotation screw to ride up a tapper as the connection is either made up or broken out. The anti-rotation screws and the profile may be positioned perpendicular to the axis through the connection or set at an angle such that as the anti-rotation screws ride up the profile they cause the thread form to be loaded.
The invention utilizes a cam profile that is machined into the pin connector that mates with the anti-rotation screws that are incorporated into the box. What makes this invention unique is that the cam profile of the pin has a different number of tapered surfaces compared to the number of anti-rotation screws of the box. The profile and number of screws is chosen such that the screws either align with a section of the profile that prevents the connection being made up or broken out.

The connection has a different quantity of screws compared to the number of profiles. As the connection is threaded together the anti-rotation screws align with different profiles and different sections of the profile. This acts in a similar manner to a vernier scale on a micrometer and does not require the anti-rotation screws to be orientated to the mating pin and box.

**Introduction to Drawings**

Figure 1 outlines a cross sectional view through the box and pin connectors with an anti-rotation screw engaged with the cam profile of the pin.

In figure 1 the box is labelled item 1 and the pin is labelled item 2. The anti-rotation screws are labelled item 3.

Figure 2 outlines a cross sectional view through the box, item 1, and pin, item 2. The cam profile and anti-rotation screws are drawn perpendicular to the axis through the connection but these may be rotated so that the anti-rotation screws are not perpendicular to the axis through the connection. In this condition any rotational torque would generate a tensile load on the connector threads.

Figure 2 outlines a typical cam profile, Detail 4, that the anti-rotation screws, item 3, react against and it can also be seen that whatever position the pin is relative to the box several of the anti-rotation screws react to prevent the connection making up and several act to prevent it being broken out.

**Example of Invention:**

Typically this design is used when a pipe is driven into the seabed with the use of a hydraulic hammer to form the first tubular member of an oil or gas well. When subject to installation loads it is common for the connection to either make up of break out, this invention stops this happening and therefore the integrity of the joint is maintained.

This invention can also be used on smaller diameter pipe that is lowered into a pre-drilled hole that may require the pipe to bend or be rotated to allow insertion. These actions can case the threaded connection to make up or break out and this invention prevents this from happening.

Should it be required to break out the connections which are above the seabed when the well is abandoned this invention allows the anti-rotation device to be removed with ease on the drill floor.
Should these retrieved joints be required to be re-used then the anti-rotation device can be re-used repeatedly.

This invention does not require specialized tools or knowledge for it to be activates and neither does it require the use of a hammer or some such tool in order to engage it. When used in an offshore oil or gas well this is a significant safety and time saving advantage.
Claims:

The invention claimed relates to an anti-rotation device comprising:

1. A pin connector that has a cam profile that reacts with anti-rotation screws of the box.

2. A box connector as claimed in claim 1 has a series of anti-rotation screws that interface with the cam profile of the pin.

3. The cam profile as claimed in claim 1 and 2 and that is incorporated into the pin is continuous around its circumference and consists of numerous lobes.

4. The anti-rotation screws of the box as outlined in previous claims are spaced with a different pitch compared to the pitch of the cam lobes on the pin.

5. The anti-rotation screws in the box and the cam profile on the pin as outlined in previous claims may be machined perpendicular to the connection axis or at an angle to the connection axis.
Application No: GB1102298.5
Claims searched: 1 to 5
Examiner: Mr Colin Walker
Date of search: 29 March 2011

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

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Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^X:

Worldwide search of patent documents classified in the following areas of the IPC

E21B; F16L

The following online and other databases have been used in the preparation of this search report

Online : WPI, EPODOC

International Classification:

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