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STUD TENSIONER FOR BLOWOUT PREVENTER

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This invention relates to stud tensioners.

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The bonnets of ram type blowout preventers are generally secured to the preventer body with fasteners such as bolts or studs and nuts. To facilitate ram changes, the number of fasteners used has been minimised. With increased working pressures both fastener diameter and length increase to accommodate the increased pressure and the resultant increased bonnet thickness. The use of torque to tension bonnet bolting is not reliable since the torque-stress relationship for such fasteners varies substantially and with larger fasteners the torques recommended exceed the capacity of commonly available wrenching equipment.

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Bolt tensioning equipment is available for use on pressure vessels, on large anchor bolts and other applications but such equipment is not well adapted for tensioning blowout preventer bonnet studs.

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U.S. Patent Specification Nos. 3 015 975 and
4 075 923 each disclose a stud tensioning apparatus
using a pressure responsive member to place the stud
under tension. The apparatus of Specification No.
5 3 015 975 provides a bevel gearing system to set the
nut once the stud is under tension. The device of
Specification No. 4 075 923 remains a part of the nut
support permanently. The apparatus of Specification
No. 3 015 975 tensions only one stud at a time and
10 requires special gearing to set the nut since it is
completely covered by the apparatus. A similar
structure is available commercially but it differs by
providing a port for access to the nut. Apparatus
disclosed in U.S. Patent Specification No. 4 015 801
15 is similar to such commercial device. Each of these
devices tensions a single stud at a time. Multiple
tensioning is accomplished only by multiple devices
having a common pressure fluid manifold.

Such devices would not provide uniform
20 tensioning of bonnet studs in minimum time and would
not be a portable apparatus which can be used quickly
and effectively on blowout preventers in the field.

This present invention relates to an improved
apparatus for tensioning studs in the bonnets of
25 blowout preventers. Such improved apparatus also

provides direct tensioning of the studs and does not rely on the torque-tension relationship which is not a reliable indicator of stress in the stud. The present invention also insures that the tension in opposite studs is uniform and set at the same time.

According to the present invention there is provided a stud tensioner for tensioning the studs of a blowout preventer bonnet, said tensioner comprising a body having a pair of recesses forming cylinders and means for communicating fluid pressure to said cylinders, a piston positioned within each of said cylinders and having a piston rod, the rods of said pistons extending from said body in generally parallel relationship to each other and having a centering recess in their outer ends adapted to be positioned over two opposite studs and nuts of the bonnet, a pair of tension rods having internal threads for threaded engagement with the outer end of bonnet studs other than said two opposite studs, and characterised by an enlarged head on the outer end of each tension rod, swinging links, and means for pivotally connecting said swinging links to said body, said swinging links having a recess adapted to engage the enlarged heads on said tension rods to exert tension thereon whereby application of pressure to said cylinder exerts

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tension in the tension rods and the studs engaged by the tension rods.

5 The invention will be described now by way of example only with particular reference to the accompanying drawings. In the drawings:

 Figure 1 is an end view of a blowout preventer bonnet;

 Figure 2 is a sectional view of the one form of stud tensioner taken along line 2-2 in Figure 1;

10 Figure 3 is an end view of one form of stud tensioner, and

 Figure 4 is a sectional view of the cup engaging the end of the tensioning member taken along line 4-4 in Figure 2.

15 The present stud tensioner 10 includes a body 12, having a pair of cylinder recesses 14 in communication with passage 16 through body 12. Pistons 18 are positioned within said recesses 14 with suitable seals 19 sealing between pistons 18 and walls
20 of recesses 14 and their piston rods 20 extend from body 12 in parallel relation relative to each other. Cylinder recesses 14 are positioned to allow the outer hollow ends 21 of piston rods 20 to be freely received over opposite studs 22 and nuts 24 to engage bonnet 26
25 of a blowout preventer.

A pair of tension rods 28 are engaged to the other two studs 22 by threaded engagement of their outer internally threaded recesses 30 thereon. With recesses 30 threaded on opposed studs 22, nuts 24 are free to turn and are not obstructed in any way by tensioner 10 as shown in Figure 2. The outer ends of tension rods 28 are enlarged to form heads 32. Pivot pins 34 extend through ears 36, links 38 and into body 12 to pivotally mount links 38 to body 12. Links 38 each have recess 40 therein which recesses face inward toward each other and have shoulders 42 which engage the under side of heads 32 as shown in Figure 2. This provides the means on body 12 for engaging the outer ends of the tension rods.

Tensioner 10 has a very substantial weight so that it usually is lifted by a hoist or other available lifting means. Lifting lug 44 is mounted on arcuate track 46 which is secured between projections 48 on body 12. As shown in Figure 3, lug 44 is positioned as shown in solid lines for lifting tensioner 10 in one position and may be moved to the position shown in dashed lines for lifting in another position. For example, piston rods 20 may initially be received over studs 22 a and b and tension rods 28 connected to studs 22c and d. After studs 22c and d

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have been tensioned, the positions are reversed so that studs 22a and b are tensioned.

With tension rods 28 threaded onto opposite studs 22, links 38 are pivoted outward to the position shown in broken lines in Figure 2 until tensioner 10 is in position with piston rods 20 on the other opposite studs. Then they are moved into engagement with heads 32. Tension rods 28 should be adjusted so that they are tightly engaged by links 38 with body 12 substantially parallel with the outer surface of bonnet 26. This allows the force exerted by pistons 18 responsive to the introduction of pressure fluid through passage 16 to be applied equally and without side loads on both studs being tensioned. As soon as nuts 24 are tightened on the tensioned studs, the pressure in passage 16 is reduced and tensioner 10 reengaged and repositioned to tension the other two studs.



CLAIMS

1. A stud tensioner for tensioning the studs of
5 a blowout preventer bonnet, said tensioner comprising
a body having a pair of recesses forming cylinders and
means for communicating fluid pressure to said
cylinders, a piston positioned within each of said
cylinders and having a piston rod, the rods of said
10 pistons extending from said body in generally parallel
relationship to each other and having a centering
recess in their outer ends adapted to be positioned
over two opposite studs and nuts of the bonnet, a pair
of tension rods having internal threads for threaded
15 engagement with the outer end of bonnet studs other
than said two opposite studs, and characterised by an
enlarged head on the outer end of each tension rod,
swinging links, and means for pivotally connecting
said swinging links to said body, said swinging links
20 having a recess adapted to engage the enlarged heads
on said tension rods to exert tension thereon whereby
application of pressure to said cylinders exerts



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tension in the tension rods and the studs engaged by the tension rods.

5 2. A stud tensioner according to claim 1 wherein said pistons and said tension rods are arranged so that opposite studs are tensioned simultaneously.

10 3. A stud tensioner substantially as described herein with reference to and illustrated by the accompanying drawings.

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