(12) UK Patent (19) GB (11) 2563067 (13) B

(45) Date of B Publication 10.08.2022

(54) Title of the Invention: Torque wrench and reaction arm assembly with safety tether

(51) INT CL: ***B25B 21/00*** (2006.01) ***B25B 23/00*** (2006.01)

(21) Application No: **1708826.1**

(22) Date of Filing: **02.06.2017**

(43) Date of A Publication **05.12.2018**

(56) Documents Cited:
GB 2558887 A **GB 2524825 A**
CN 106737348 A
AU2015218456

(58) Field of Search:
As for published application 2563067 A viz:
INT CL **A45F, B23P, B25B**
Other: **EPODOC, WPI**
updated as appropriate

Additional Fields
INT CL **A45F, B23P, B25B**
Other: **None**

(72) Inventor(s):
Mike Johnson

(73) Proprietor(s):
Enerpac UK Ltd
5 Coopies Lane, Morpeth, Northumberland, NE61 6JR, United Kingdom

(74) Agent and/or Address for Service:
Hargreaves Elsworth
26 Northumberland Square, North Shields, Tyne & Wear, NE30 1PW, United Kingdom

GB 2563067 B

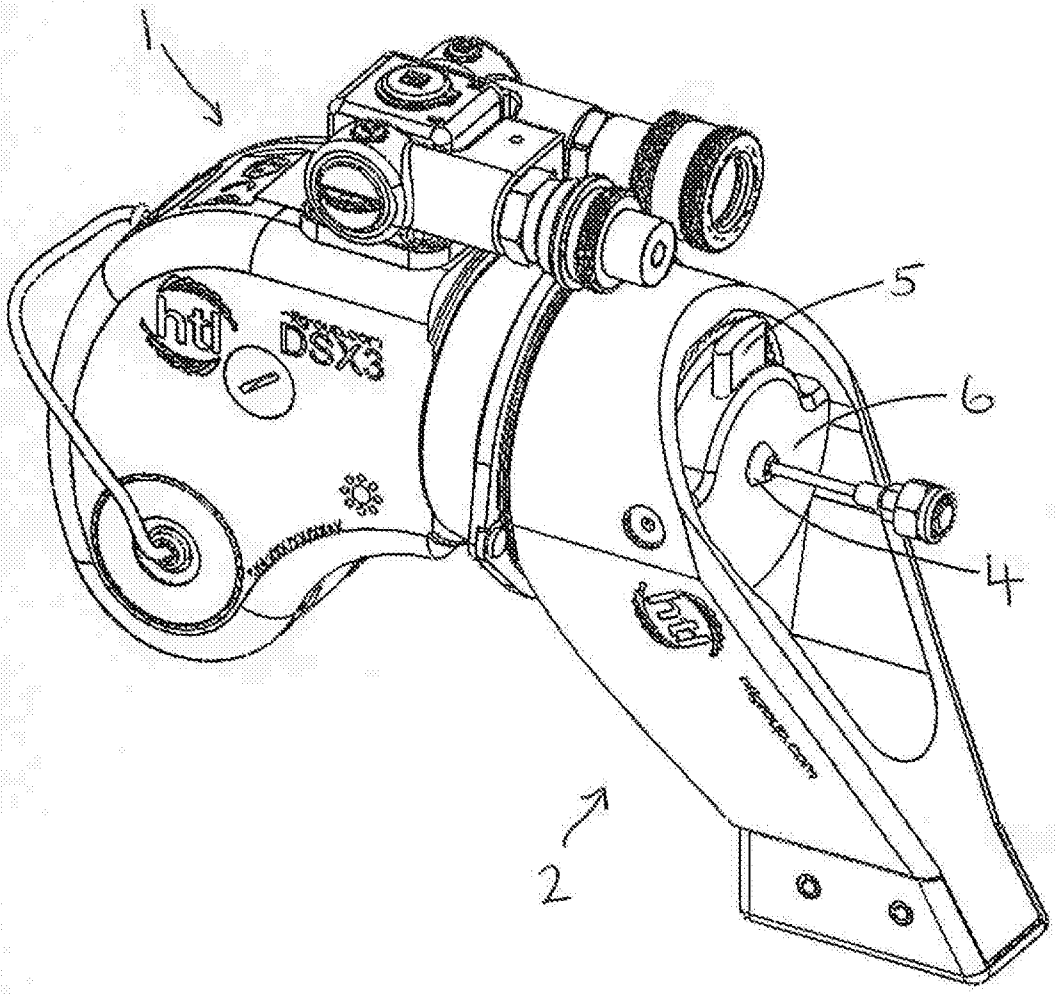

FIGURE 1a

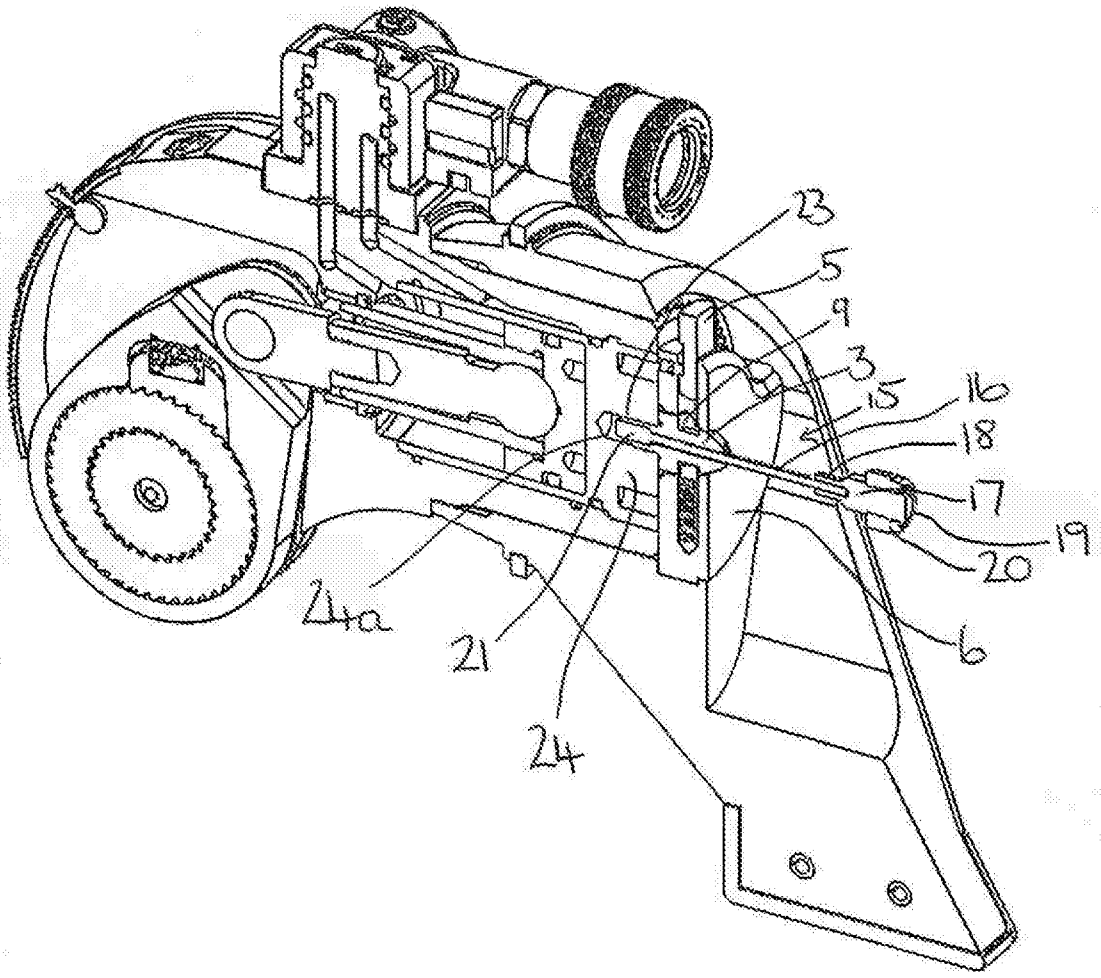

FIGURE 1b

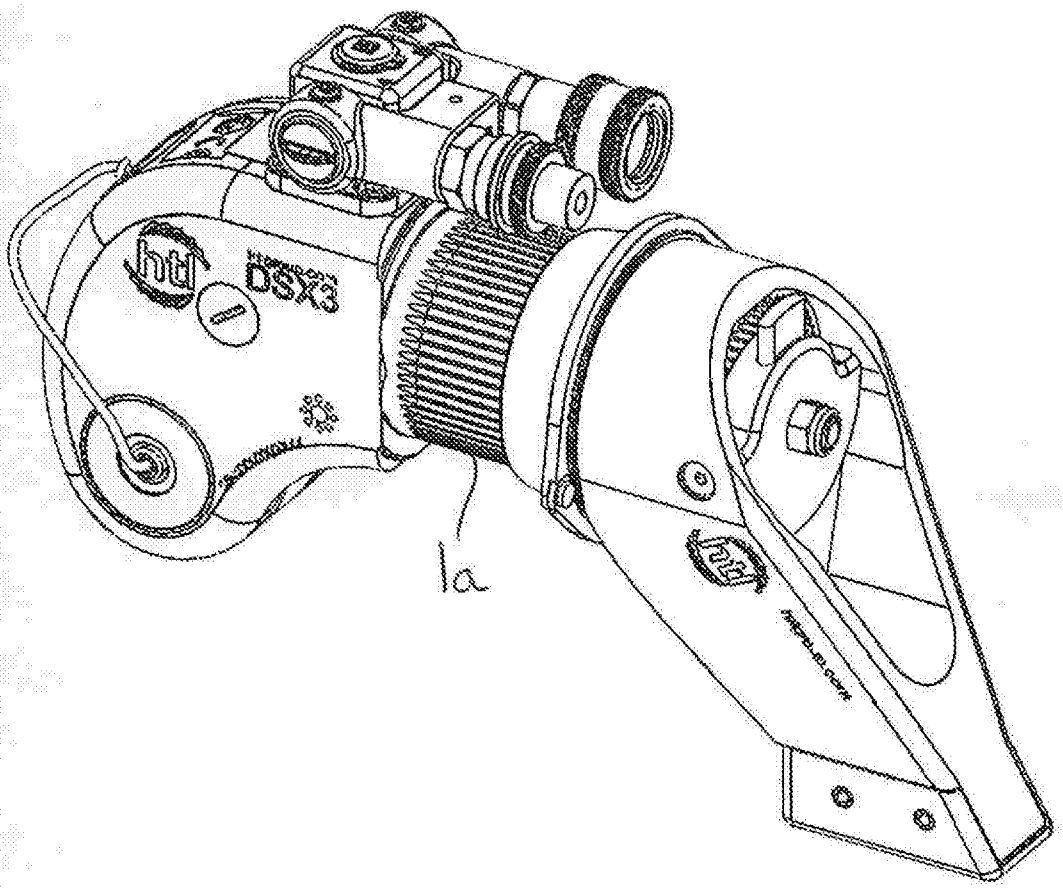

FIGURE 2a

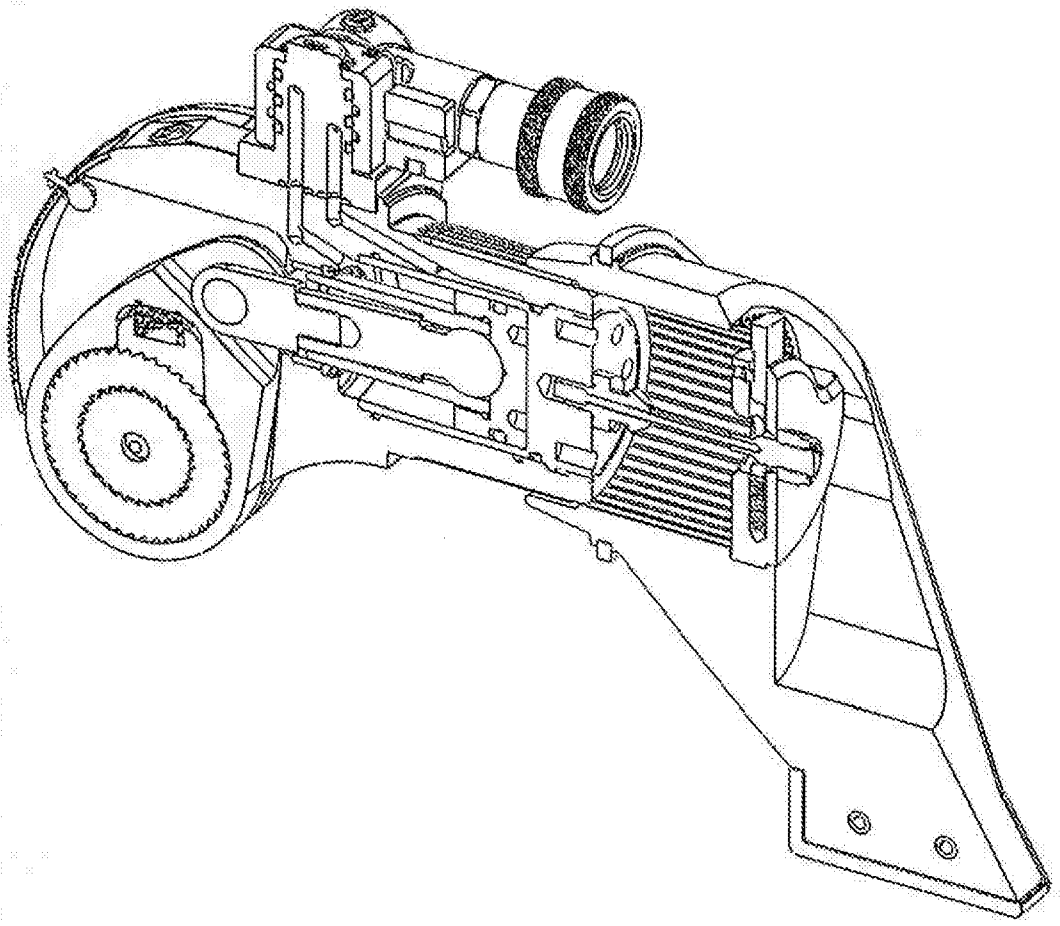

FIGURE 2b

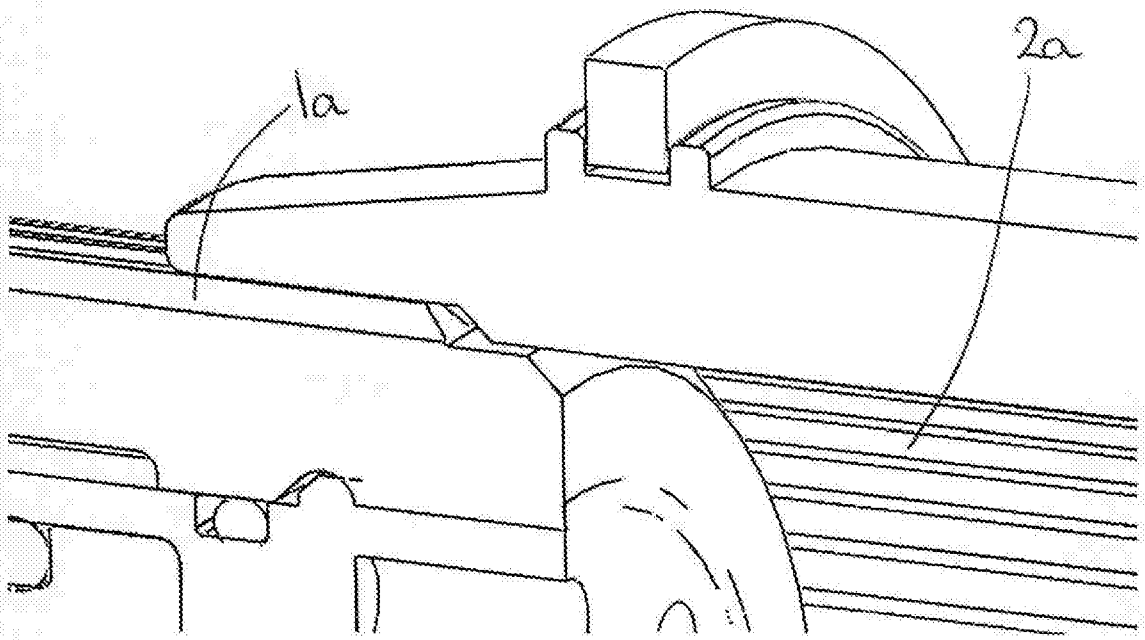

FIGURE 3a

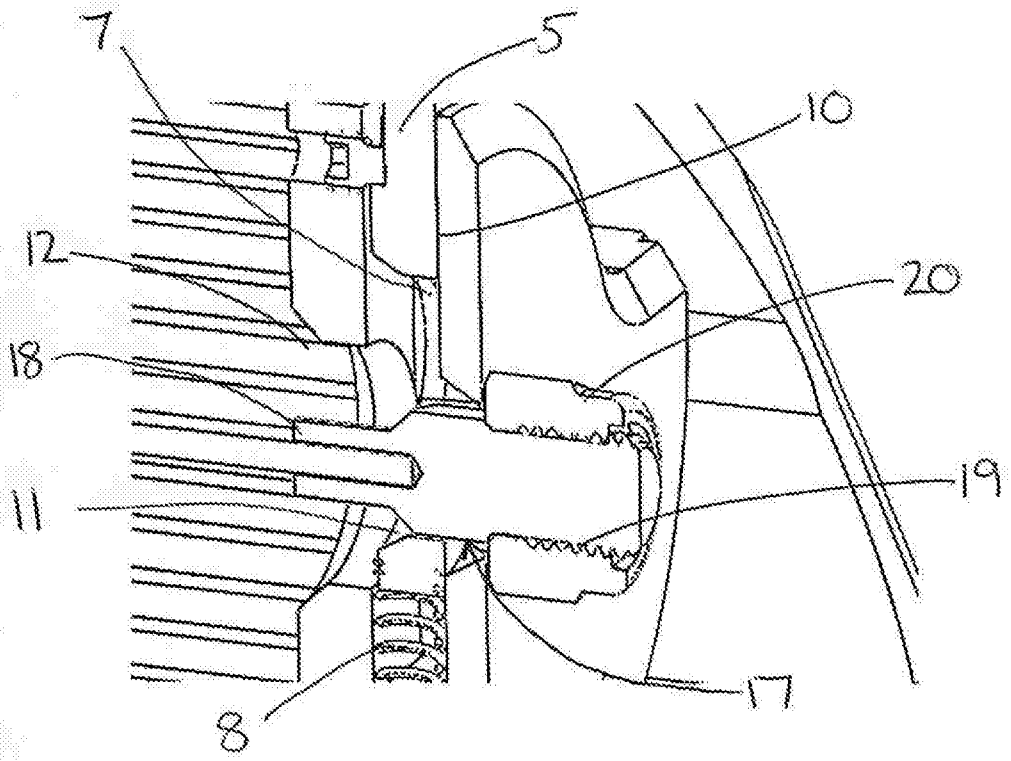

FIGURE 3b

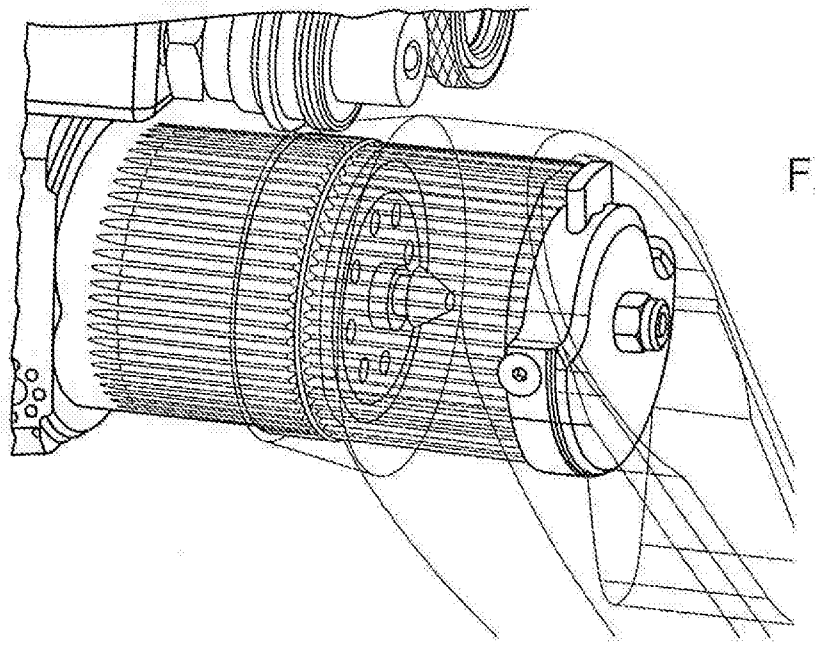

FIGURE 4a

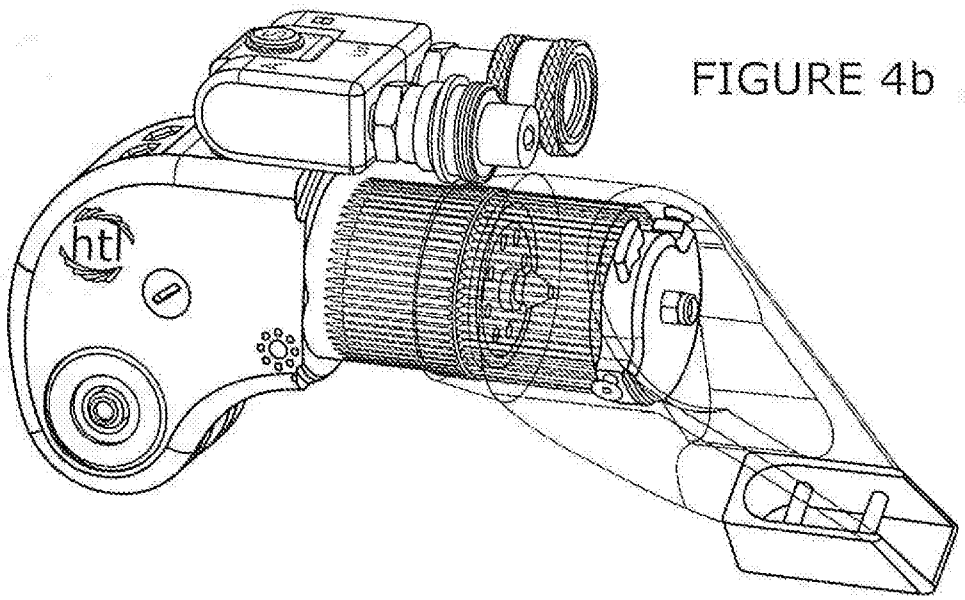

FIGURE 4b

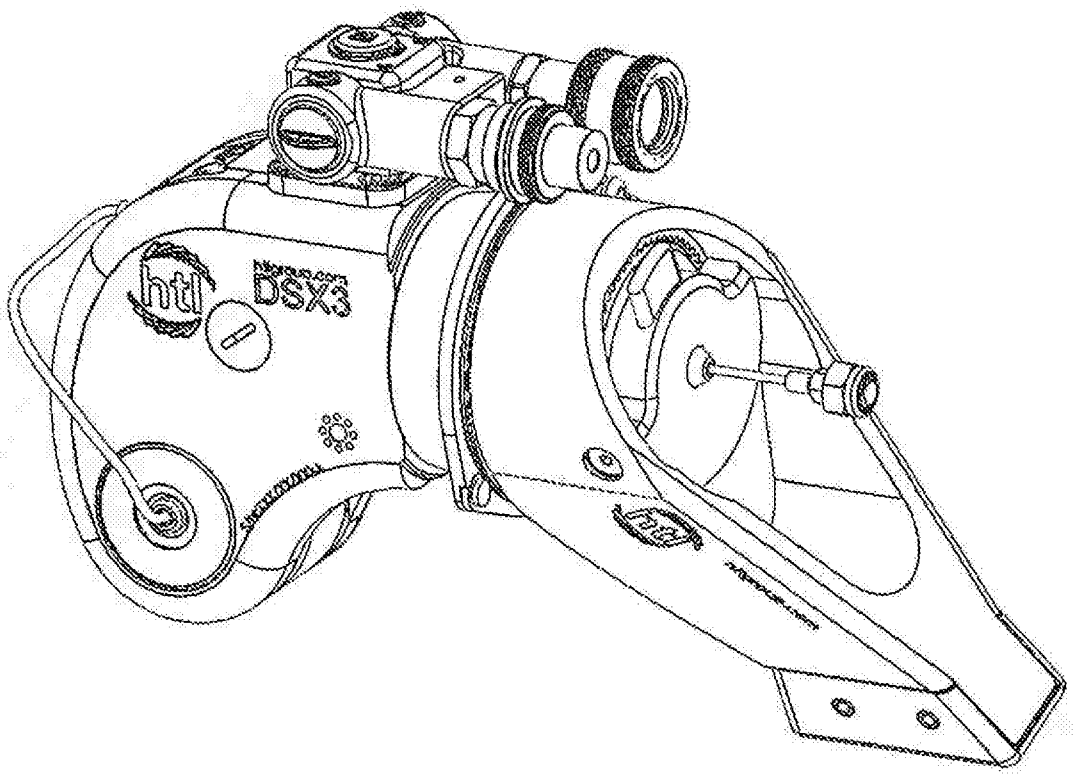

FIGURE 5

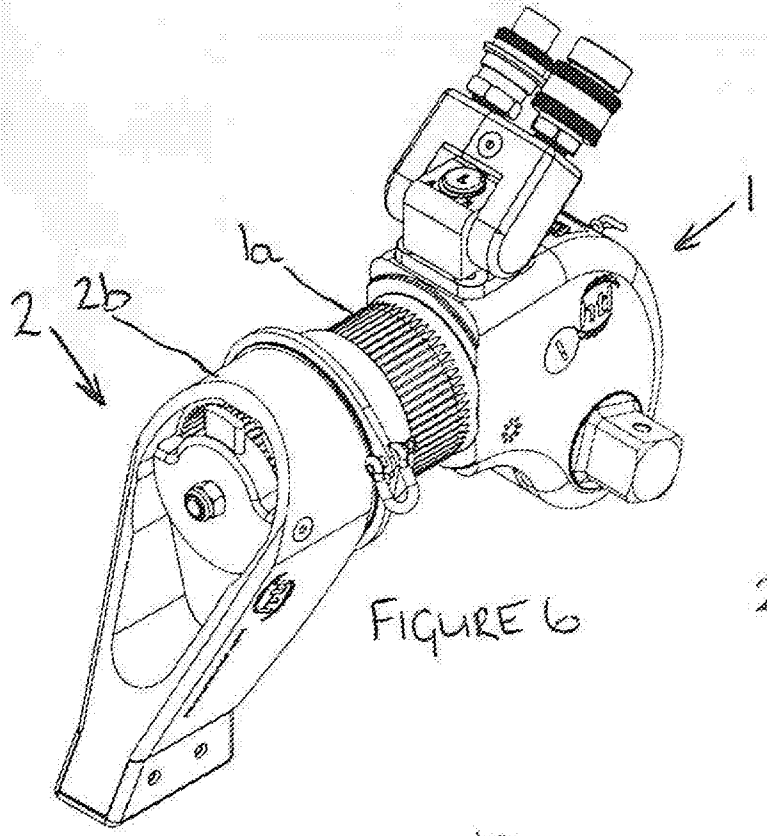

FIGURE 6

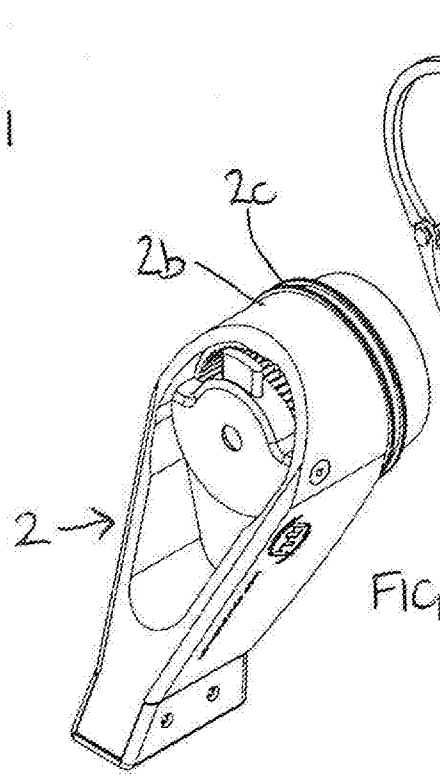

FIGURE 7

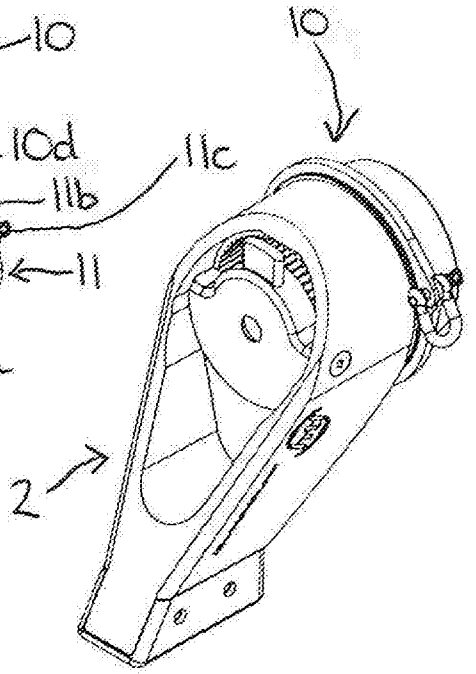

FIGURE 8

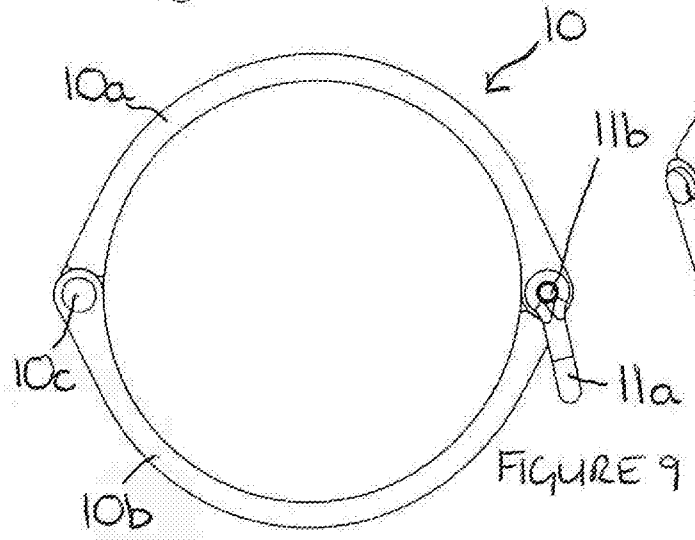

FIGURE 9

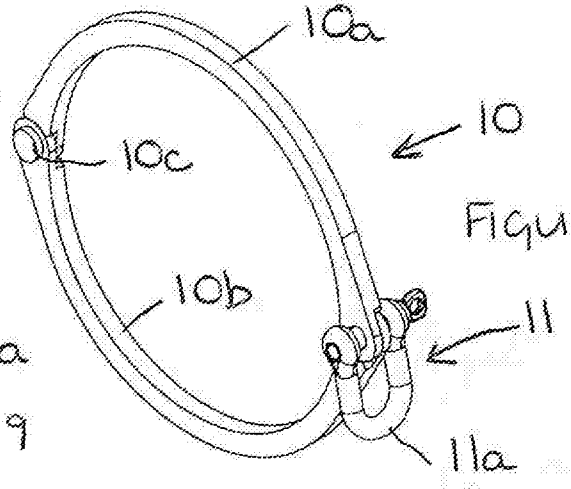

FIGURE 10

Torque Wrench and Reaction Arm Assembly with Safety Tether

Field of the Invention

The present invention relates to torque wrenches and in particular to a torque wrench mounting a reaction arm and a tether arrangement for such torque wrench and reaction arm assemblies.

Background of the Invention

Hydraulic torque wrenches are used widely, particularly in the oil and gas industries. Torque wrenches require some form of reaction member or reaction arm that engages with an immovable object to prevent the wrench from spinning about the component that is to be tightened or loosened. It is usually necessary to adjust the position the reaction arm on the torque wrench so that the reaction arm is in engagement with the immovable object. When carrying our a particular task, such as bolting up a flange connection it might be necessary to re-orientate the reaction arm on the torque wrench a number of times.

GB2524825 describes a torque wrench which couples to a reaction arm using a quick release mechanism.

An improved arrangement for attaching a torque wrench to a reaction arm is described in the applicant's earlier patent application, GB2558887, which is incorporated herein by reference.

Torque wrenches are often used when working at height. In order to adjust the position of the torque wrench relative to the reaction arm it is necessary to release the reaction arm and slide it from the torque wrench. The reaction arm is rotated relative to the torque wrench to a desired position and re-attached to the torque wrench. During this procedure there is a risk of the reaction arm falling as the operator attempts to manipulate its position.

It would therefore be desirable to reduce the possibility of a reaction arm and/or torque wrench falling with the potentially disastrous consequences that might follow.

The present invention provides arrangements of safety tethers which reduce the risk of a reaction arm and/or torque wrench falling.

Summary of the Invention

According to a first aspect of the invention there is provided a torque wrench assembly comprising a torque wrench, a reaction arm and a tether having a first end and a second end, the first end attached to the torque wrench and wherein the reaction arm includes an aperture and the tether passes through the aperture and wherein the second end of the tether comprises a stop member, at least a part of the stop member being wider than the aperture, and wherein, with the tether passing through the aperture, the reaction arm is slidable relative to and rotatable about the tether when the reaction arm is released from the torque wrench.

Preferably, the tether comprises a flexible elongate element and the stop member is attached to the flexible element. Preferably, the flexible element is comprised of a wire rope. Advantageously, the stop member comprises first and second components, releasably attachable to each other, and wherein one of the first and second components is so shaped and dimensioned as to pass through the aperture and the other of the first and second components is wider than the aperture.

The first component may comprise a ferrule attached to one end of the flexible element. The second component may comprise a keeper. The second component may be attachable to the ferrule. The keeper may include a nut. The keeper may include a washer.

The first end of the tether may include a connection member. The connection member may be releasably attachable to the torque wrench. The connection member may include a threaded portion for connection with a correspondingly threaded part of the torque wrench. The connection member may include a recess configured to receive a slidably mounted locking member of the reaction arm.

The reaction arm may be a reaction arm according to the second aspect of the invention described below.

According to a second aspect of the invention there is provided a reaction arm that is attachable to a torque wrench, wherein the reaction arm includes a wall having a circular cross section the wall including a

seat configured to receive a ring, wherein the ring rotatable around the said wall of the reaction arm, and wherein the ring includes an attachment element.

The attachment element is adapted to attach to a tether, clip or the like.

Preferably, the attachment element is a shackle.

Preferably, the ring comprises two parts, wherein the two parts are joined together by a hinge at one side and by a releasable fastener at the other side. When mounted on the reaction arm the hinge is on one side of the reaction arm and the releasable fastener on the other.

The releasable fastener may form part of the shackle. Preferably, the shackle includes a shackle body and a shackle pin and the releasable fastener is the shackle pin.

Advantageously, the seat is a groove formed in or on the wall of the reaction arm. The seat may be formed as a recess in the wall of the reaction arm or by spaced apart up stands formed on the wall of the reaction arm.

An elongate attachment member may be attached to the attachment element of the reaction arm at a first end, a second end of the elongate attachment member attachable to another object for securing the assembly when not supported by an operator.

A third aspect of the invention comprises a torque wrench assembly comprising a torque wrench, a reaction arm according to the second aspect of the invention.

Brief Description of the Drawings

In the Drawings, which illustrate preferred embodiments of a torque wrench according to the invention:

Figure 1a is a schematic representation of an assembled hydraulic torque wrench and reaction arm in a neutral position;

Figure 1b is a schematic cross-section of the assembled hydraulic torque wrench and reaction arm of Figure 1a;

Figure 2a is a schematic representation of the assembled hydraulic torque wrench and a reaction arm of Figure 1, with the reaction arm moved to an extended position;

Figure 2b is a schematic cross-section of the hydraulic torque wrench and reaction arm illustrated in Figure 2a;

Figure 3a is an exploded view of splined parts of the hydraulic torque wrench and reaction arm when the reaction arm is in the position shown in Figures 2a and 2b;

Figure 3b is an exploded view illustrating the interaction of the tether, the hydraulic torque wrench and the reaction arm;

Figure 4a exploded schematic representation of the reaction arm in a fully extended configuration with respect to the hydraulic torque wrench;

Figure 4b illustrates rotation of the reaction arm to a new position;

Figure 5 illustrates the reaction arm locked to the hydraulic torque wrench in the new position showing Figure 4b;

Figure 6 is a schematic representation of an alternative embodiment of a torque wrench of the invention;

Figure 7 is an exploded view of a reaction arm assembly forming part of the torque wrench shown in Figure 6;

Figure 8 is a schematic representation of the assembled reaction arm illustrated in Figure 7;

Figure 9 is a front view of a ring of the reaction arm assembly illustrated in Figures 7 and 8; and

Figure 10 is an oblique view of the ring illustrated in Figure 9.

Detailed Description of the Prior Art and Preferred Embodiments of the Invention

Figure 1 illustrates a torque wrench 1 and a reaction arm 2. The torque wrench 1 is provided with a connection member 3 and the reaction arm 2 includes an opening 12 (see Figure 7a) for receiving the connection member 3. In the illustrated embodiment the reaction arm 2 also includes a back plate 6 with a hole 4 therein, into which the connection member 3 locates. The reaction arm 2 includes a locking member 5 which is slidably mounted in a channel 10. The locking member 5 includes an aperture 7 sized to allow the connection member 3 to pass therethrough.

The locking member 5 has an upper end which protrudes from the reaction arm 2, as shown in the drawings, and a lower end which is connected to a spring 8. The spring is arranged to bias the locking member 5 so that it protrudes from the reaction arm 2 as shown. When the locking member 5 is at rest the aperture 7 is partially overlaps with openings 4 and 12 for receiving the connection member 3.

As shown in Figure 3b, when the connection member 3 of the torque wrench 1 is pushed into the opening 12 of the reaction arm 2, the end of the connection member 3 pushes down on the chamfered edge 11 of the aperture 7 which then pushes the locking member 5 downwards against the force of the spring 8. The part of the aperture 7 with larger diameter is now aligned with the opening 12, allowing the end of the connection member 3 to pass through the aperture 7 and locate in the hole 4 in the back plate 6. The connection member 3 includes a recess 9 located adjacent to the tapered end shaped to receive part of the locking member 5.

As shown in Figure 1b, once the tapered end of the connection member 3 has passed through the aperture 7 of the locking member 5, the locking member 5 springs up automatically and locks into the recess 9 behind the end of the connection member 3 due to the force exerted by the spring. The torque wrench 1 and reaction arm 2 are now securely locked together since the aperture 7 of the locking member is not aligned with the opening 12 on the reaction arm and the two devices cannot be unlocked without some manual intervention.

To unlock the reaction arm 2 from the torque wrench 1, the user simply presses down on the upper end of the locking member 5, and this causes the locking member 5 to slide towards the spring and causes

the aperture 7 to fully align with the first opening 12, allowing the connection member 3 of the torque wrench 1 to be withdrawn from the reaction arm 2, uncoupling the two devices.

The connection member 3 is mounted on a tether 15. The connection member includes a bore 21 extending through the connection member 3 on the centre axis thereof. One end of the connection member 3 has a threaded outer wall 23 for attachment of the connection member 3 to a component 24 of the torque wrench 1. The component 24 includes an internally threaded bore 24a. The threaded outer wall 23 of the connection member engages with the internally threaded bore 24a to secure the connection member 3 to the torque wrench 1. The tether 15 includes an end-stop 23 which engages in a bore 21 formed in the end of the connection member 3.

The tether 16 further comprises a flexible elongate element in the form of a wire rope 16 in the present example. The above-mentioned end stop 21 is attached to one end of the wire rope 16, with a ferrule 17 attached to the other end of the wire rope 16. The ferrule 17 includes an attachment portion 18 which receives and connects to the wire rope 16 and an externally threaded portion 19 which receives an internally threaded nut 20. The nut 20 is removable so that the reaction arm 2 may be detached completely from the torque wrench 1.

25 11 21

The tether 15 allows the reaction arm 2 to be moved axially with respect to the torque wrench 1 and rotated relative thereto for repositioning of the reaction arm 2 relative to the torque wrench 1. As can be seen best in Figures 2a, 2b, 3a, 4a and 4b the torque wrench 1 and the reaction arm 2 include respective internally and externally splined portions 1a, 2a. When the locking member 5 is depressed to release the reaction arm 2 from engagement with the torque wrench 1 the reaction arm may slide relative to the torque wrench 1 along the spines 1a, 2a. The tether 15 is configured such that when the back plate 6 of the reaction arm 2 engages with the nut 20 the splines 2a are clear of the splines 1a, thereby allowing the reaction arm 2 to rotate to a new position, as showing Figures 3a, 4a and 4b. Once the desired position of the reaction arm 2 has been obtained the operator slides the reaction arm 2 on the splines 1a, 2a towards the torque wrench 1 until the lock 5 engages the recess 9 in the connection member 3.

Referring now to Figures 6 to 10, the reaction arm 2 comprises an outer wall 2b in which a slip ring seat is formed. In the illustrated embodiment the slip ring seat is formed as a channel 2c. The channel 2c may be formed by reducing the thickness of the outer wall 2b, thereby forming a groove, or by forming spaced apart up-stands extending around the outer wall 2b.

A slip ring 10 comprises two parts 10a, 10b connected together by a hinge 10c. The free ends 10e, 10d of the respective parts 10a, 10b each comprise a hole 10e', 10d'. The free ends 10e, 10d are each offset so that when the free ends 10e, 10d are brought together they overlap one another and the holes 10e', 10d' align. A shackle 11 comprises a shackle pin 11b and a shackle body 11a. With the holes 10e', 10d' aligned the shackle body 11a is positioned so that the shackle pin 11b may pass through holes in the shackle body 11a and the aligned holes 10e', 10d'.

The slip ring 10 is shown in its closed configuration in Figures 8, 9 and 10. It will be appreciated from Figure 8 in particular that the reaction arm 2, and hence the torque wrench when attached thereto may be secured to an immovable object by attaching a lanyard (which may be in the form of a chain or rope) or the like to the immovable object and the shackle 11. The provision of ring 10 as a slip ring allows the reaction arm 2 to be repositioned relative to the torque wrench 1 as discussed above in relation to Figures 1 to 5.

25 11 21

Whilst Figures 6 to 10 show a reaction arm 2 and torque wrench 1 of the type described in GB2558887 the slip ring and slip ring seat described in relation to those figures may be used with other types of reaction arm, reaction arm and torque wrench assemblies.

The torque wrench assembly of the invention provides an improved mechanism for securely locking together a torque wrench and a reaction arm without the requirement for user input prior to assembly of the two devices.

Claims

1. A torque wrench assembly comprising a torque wrench, a reaction arm and a tether having a first end and a second end, the first end attached to the torque wrench and wherein the reaction arm includes an aperture and the tether passes through the aperture and wherein the second end of the tether comprises a stop member, at least a part of the stop member being wider than the aperture, and wherein, with the tether passing through the aperture, the reaction arm is slidable relative to and rotatable about the tether when the reaction arm is released from the torque wrench.

2. A torque wrench assembly according to Claim 1, wherein the tether comprises a flexible elongate element and the stop member is attached to the flexible element.

3. A torque wrench assembly according to Claim 1 or 2, wherein the flexible element is comprised of a wire rope.

4. A torque wrench assembly according to any preceding claim, wherein the stop member comprises first and second components, releasably attachable to each other, and wherein one of the first and second components is so shaped and dimensioned as to pass through the aperture and the other of the first and second components is wider than the aperture.

5. A torque wrench assembly according to any preceding claim, wherein the first end of the tether includes a connection member.

6. A torque wrench assembly according to Claim 5, wherein the connection member is releasably attachable to the torque wrench.

7. A torque wrench assembly according to Claim 6, wherein the connection member includes a recess configured to receive a slidably mounted locking member of the reaction arm.