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(54) **Spanner Adaptor**

(57) An adaptor for a spanner, comprising an elongate body having a spanner engagement portion and a socket engagement portion, and a through bore to allow insertion of a constraining tool in use through the body is provided. The adaptor allows a conventional spanner, such as a ratchet ring spanner, to be used with a number of sockets. This advantageously reduces the number of tools required for a particular job. Additionally, the adaptor allows a suitable constraining tool to pass through its body and engage with a suitably adapted shaft of a fastener, e.g. an ASNA bolt. The constraining tool can be used to constrain rotation of a fastener whilst a nut is driven thereon by the socket. This is particularly desirable where access to the head of a fastener is not possible or is substantially limited, or where the shape of the fastener head prevents adequate engagement of a suitable tool therewith or where the fastener has no head. The adapter may be provided in a set, with a constraining tool and/or with a spanner or socket set.

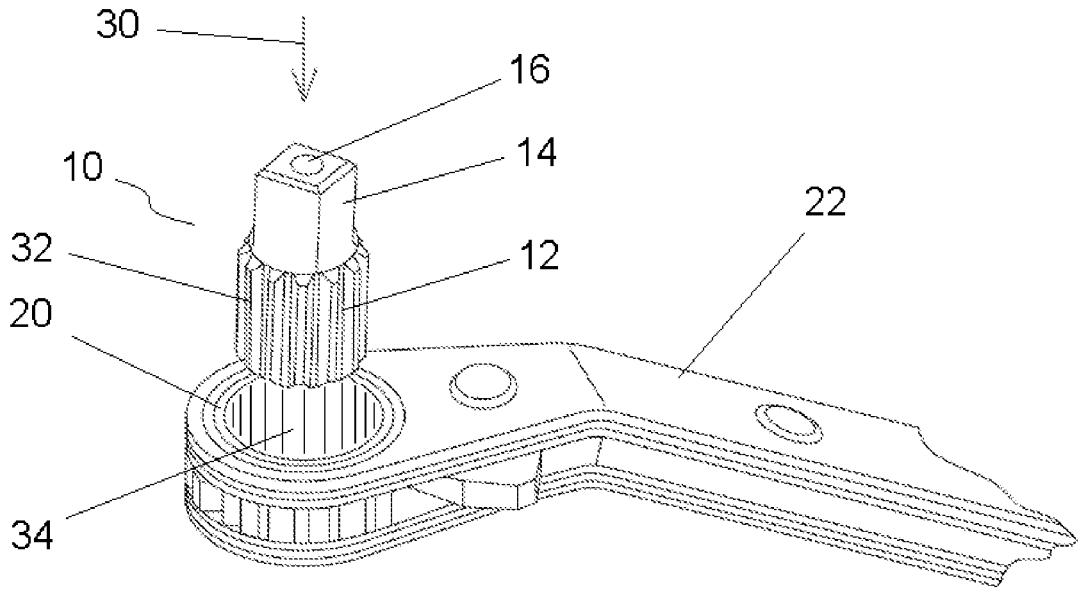

Figure 4

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Description

[0001] The present invention relates to spanners and in particular to an adaptor which allows a spanner to be used as a socket wrench and which allows an elongate threaded fastener such as a bolt to be constrained whilst a nut engaged in a socket of such a socket wrench is driven on the fastener.

[0002] Conventional spanners include open-ended, ring or box-end, and combination spanners. Such spanners have an elongate handle and an engagement formation arranged at one or both ends of the handle suitable for engaging with a nut body or bolt head, for example. An open-ended spanner comprises an open engagement formation having at least two flat and parallel faces to engage with corresponding flat surfaces on a nut body or bolt head. A ring spanner comprises a closed engagement formation defining a ring shaped internally to engage with a nut body or bolt head and for example having annularly arrayed inwardly protruding teeth.

[0003] It is known for conventional spanners, in particular ring spanners, to include a ratchet. Ratchet ring spanners typically include a toothed hollow wheel at one or both ends of the spanner, the teeth of which engage with a nut body or bolt head. The hollow wheel is rotatably mounted in the box end of the ring spanner. Typically, a pawl is mounted in a web area of the spanner handle and is biased by a spring to engage with the ratchet wheel such that the wheel is free to rotate when the handle is rotated in a direction and is driven when the handle is rotated in a reverse direction. The ratchet wheel of a ratchet ring spanner is sized and shaped according to a nut or bolt size. Therefore, various spanners having differently sized wheels are available to be selected according to the size of nut or bolt. It is known for the ratchets on such spanners to be reversible to provide a positive drive when tightening or loosing a nut or bolt, i.e. when driving the nut or bolt with the spanner in a clockwise or counterclockwise direction.

[0004] A disadvantage of spanners is that a plurality of spanners having differently sized engagement formations must be provided depending on the size of nut or bolt to be tightened or loosened.

[0005] Socket adaptors are known which allow a ratchet ring spanner to be used as a socket wrench. Such an adaptor comprises an elongate body having a spanner engagement portion which is adapted to engage with the ratchet wheel of a ratchet ring spanner, and a socket engagement portion adapted to engage with a socket. A socket generally comprises a body such as a cylindrical body having a receiving hole at one end adapted to receive the socket engagement portion of the adaptor and a fastener engagement portion at the other end. The fastener engagement portion is adapted and sized to engage with a correspondingly sized nut body or bolt head. A socket set generally comprises a plurality of such sockets having an identical receiving hole to selectively receive the socket engagement portion of the adaptor and different fastener engagement portions adapted and sized to engage with a correspondingly sized nut body or bolt head. A suitable socket is selected from the set depending on the size of nut body or bolt head to be driven. The socket is connected to the spanner via the adaptor to allow the spanner to be conveniently used as a socket wrench. A means for reducing the number of different spanners required for a particular job is therefore provided.

[0006] A problem experienced by a user when tightening or loosening a nut on a threaded shaft of a fastener such as a bolt can arise where rotation of the fastener can not be easily constrained. This problem can result when access to engage a bolt head with a suitable tool is not possible or is substantially limited or where the shape of a bolt head prevents adequate engagement of a suitable tool therewith or where there is no head. When driving a nut on a threaded fastener shaft which cannot practically be constrained, the fastener will tend to spin with the nut being driven thereon, making it more difficult to assemble or disassemble. This problem is made worse where the nut comprises nylon lining or similar which tends to resist the nut being driven on the fastener shaft and tends to make finger tightening to close the nut and fastener arrangement more difficult.

[0007] Modified fasteners are available which allow rotation of the bolt to be constrained by other means than restraining a bolt head when a nut is being driven thereon. Like conventional bolts, such fasteners comprise a threaded shaft. They may have a bolt head at on end. They are modified to have a coupling formation such as a recess at an end to which a nut would be offered, usually distal to a bolt head end if provided. The coupling formation is adapted to engage with and for example the recess is adapted to receive a complementarily shaped end of a constraining tool which is used to constrain rotation of the fastener whilst a nut is being driven thereon. Such a fastener includes an ASNA bolt, as used in the aerospace industry, which comprises a hexagonal shaped recess to receive an end of a hex key. It is known to place a nut on the distal end of such a fastener, engage a suitable spanner on the nut, insert a suitable constraining tool, such as a hex key, into the distal end of the fastener and tighten the nut on to the fastener using the spanner whilst constraining rotation of the fastener with the constraining tool engaged therewith.

[0008] However, it is not possible to use such a constraining tool with a socket wrench or conventional spanner using a socket adaptor as described above. The socket adaptor obstructs a constraining tool from engaging with the distal end of a suitably adapted fastener.

[0009] A first aspect of the present invention provides an adaptor for a spanner, comprising:

- an elongate body having at opposite ends an elongate spanner engagement portion which is shaped to be received by an engagement formation of a spanner and a socket engagement portion; and

- a through bore to allow insertion of a constraining tool in use through the body.

[0010] Conventionally, rotation of a fastener is constrained by a spanner or wrench engaged to a bolt head whilst a nut is driven thereon by a separate spanner or wrench engaged therewith. Where the fastener shaft cannot be so constrained to prevent it from spinning when a nut is driven thereon a constraining tool may be manipulated through the spanner end to engage with the end of the threaded shaft to which the nut is offered. In an arrangement making use of a conventional socket adaptor this is not possible. In an arrangement making use of a socket adaptor in accordance with the invention, the threaded shaft of a fastener can be constrained by using such a constraining tool. Of course, the present invention is not limited to bolts and a suitable constraining tool may be used to constrain a stud or threaded shaft having no head which is free to rotate whilst a nut is driven thereon by a socket engaged with the adaptor.

[0011] A suitable constraining tool comprises an end adapted to engage with an end of the threaded shaft of a fastener. Suitably, the end of the tool and the end of the threaded shaft of a fastener comprise complementarily shaped engagement formations, for example formed as complementary projections and recesses. Suitably the constraining tool may comprise a projection which is complementarily shaped with a recess in the end of a fastener shaft. Additionally or alternatively, the end of the constraining tool may comprise a recess complementarily shaped with a projection on the end of a fastener shaft. The constraining tool may have a polygonal cross section to engage with a polygonal recess in the distal end of the bolt. For example, the constraining tool may be square or hexagonal. Alternatively, the constraining tool may comprise a slot head, cross head, spanner head or triple square, for example. Suitably the constraining tool may comprise a handle or lever portion. Conveniently, the constraining tool may be a hex key to engage with a corresponding recess in the end of the fastener.

[0012] The bore in the body of the adaptor is adapted to allow the end of a constraining tool to be inserted and pass through and extend beyond the socket engagement portion of the adaptor. Available sockets are usually hollow having a through passage from the receiving hole to the fastener engagement portion of the socket. When a socket is engaged to the socket engagement portion of the adaptor, and a nut is engaged in the socket, the end of the constraining tool can be manipulated from one side of the assembly to pass through the passage created by the bore of the adaptor and the hollow socket and engage with the end of a fastener on which the nut is being driven by the socket at the other side of the assembly. The bolt constraining tool engages with the bolt to constrain its rotation whilst a nut is driven thereon.

[0013] In an alternative mode of operation the constraining tool may itself be rotated within the adaptor and socket engaged therewith and thus act on the fastener. For example, where space is substantially limited and rotation of a spanner handle is not possible, the constraining tool may conveniently be used to drive a fastener whilst a nut is constrained in a socket engaged with the adaptor. This would be particularly desirable where the space required to move the handle of a ratchet ring spanner, for example, through an angle to move the ratchet on at least one tooth may not be available. Even if the space was available, tightening or loosening a nut through very small angles at a time, is extremely time consuming and often frustrating. Advantageously in this mode of operation, the spanner and socket engaged therewith can be held in position whilst the constraining tool, passing through the bore of the adaptor and engaged with the end of a fastener, is rotated to drive the fastener to tighten or loosen a nut and fastener arrangement.

[0014] The bore is sized larger than a constraining tool with which it is designed to be used to allow the adaptor, and a socket engaged therewith, to rotate around the constraining tool inserted therethrough. The bore conveniently passes longitudinally through an elongate body of the adaptor, for example generally along a mid line. For example, the bore is an axial bore. The bore is conveniently of circular cross-section.

[0015] Suitably the spanner engagement portion is adapted to releasably engage with a conventional spanner, such as an open-ended, ring or combination spanner, for example. Preferably the spanner engagement portion is elongate and is adapted to be received by and in particular within an engagement formation of a spanner. For example, the spanner engagement portion is at least partly complementarily shaped with an engagement formation of a spanner with which it is to be used. In particular, the spanner engagement portion comprises one or more external faces complementarily shaped with and so as to bear against in use internal faces of an engagement formation of a spanner.

[0016] Suitably the spanner engagement portion may comprise at least two longitudinal and parallel faces which engage with corresponding faces of an engagement formation of a spanner. For example, the spanner engagement portion may comprise two or more flat surfaces provided thereon complementary in use to flat internal surfaces of an engagement formation of a spanner. The spanner engagement portion may be polygonal in cross section defining three or more longitudinal faces. Suitably at least two of the faces serve as parallel faces for the parallel faces of a spanner engagement formation to engage with. The spanner engagement portion may be substantially square or hexagonal for engagement with a similarly shaped spanner engagement formation.

[0017] Alternatively, the spanner engagement portion may define a plurality of longitudinal teeth formations arrayed about a central elongate body. Preferably such teeth formations are disposed in an evenly spaced array. Preferably such an array comprises a plurality of identically shaped teeth formations. Conveniently a tooth for-

mation is tapered from a wider base at the central body to a narrower distal edge. For example a tooth formation is trapezoidal.

[0018] Preferably the spanner engagement portion is complementarily shaped with the ratchet wheel of a ratchet ring spanner. For example the spanner engagement portion comprises a body having an axis of rotation and define a profile, e.g. a triple square, to correspond with the teeth of the box end of a ring spanner or ratchet wheel of a ratchet ring spanner. As will be understood, it is desirable to have as many engagement points as possible between the spanner engagement portion and the spanner to ensure the torque applied to a spanner is shared between and transferred across as many engagement points as possible. Of course, machining costs and time must also be considered.

[0019] Suitably the adaptor may further comprise locating means to ensure the adaptor is securely and stably positioned in use within an engagement formation of a spanner. The locating means may comprise a shoulder disposed on the spanner engagement portion of the adaptor. Suitably the shoulder outwardly extends from the spanner engagement portion thereby to enable the spanner engagement portion to be located and held within an engagement formation of a spanner. Preferably the shoulder is annular to define a disc-like member.

[0020] Additionally or alternatively, the spanner engagement portion may comprise a resiliently deformable retaining means to tend to retain the adaptor in an engagement formation of a spanner. Suitably the retaining means may comprise a recess in the spanner engagement portion adapted to receive a resilient member. The resilient member may be a rubber material, e.g. an O-ring, a spring-loaded captured ball or the like, which bears upon a surface of the engagement formation of a spanner to retain the adaptor therewithin.

[0021] Preferably the socket engagement portion is adapted to be releasably engageable with a complementary receiving means such as a receiving hole of a socket. Preferably the socket engaging portion is elongate and complementarily shaped with the receiving hole of a socket. Suitably the socket engagement portion is an elongate prism having polygonal and for example substantially square cross section. As will be known, the receiving holes of available sockets are usually square and are, generally, two standard sizes. Suitably the socket engagement portion may be either of these sizes or be shaped according to an alternative formation of receiving hole of a socket as desired.

[0022] Suitably the socket engagement portion may comprise resilient retaining means such as a snap-fit arrangement to securely and releasably engage a socket to the adaptor. Suitably the socket engagement portion may comprise a recess in a surface thereof adapted to receive a resilient member. The resilient member may be a resilient material, a spring-loaded captured ball or the like, which bears upon an inner surface of a socket recess to retain the adaptor therewithin. Additionally or alternatively, similar retaining means may be provided in association with a receiving means of a socket.

[0023] Suitably the adaptor is a metal material. The adaptor may be steel or an alloy steel. Suitably the adaptor is chrome vanadium steel. The adaptor may be chrome plated.

[0024] In a more complete embodiment, the adaptor described above comprises part of a spanner and adaptor set comprising:

- at least one spanner have an elongate handle and an engagement formation arranged at one or both ends of the handle;
- at least one adaptor having:
- an elongate body having a spanner engagement portion adapted to releasably engage with an engagement formation of the spanner and a socket engagement portion; and
- a through bore to allow insertion of a constraining tool in use through the body.

[0025] In a more complete embodiment yet, the adaptor described above comprises part of a spanner, adaptor and socket set comprising:

- at least one spanner have an elongate handle and an engagement formation arranged at one or both ends of the handle;
- a plurality of sockets each having a body comprising an adaptor receiving portion and a fastener engagement portion; and
- at least one adaptor having:
- an elongate body having a spanner engagement portion adapted to releasably engage with an engagement formation of the spanner; and
- a socket engagement portion adapted to releasably and selectively engage with an adaptor receiving portion of a socket; and
- a through bore to allow insertion of a constraining tool in use through the body.

[0026] The present invention further comprises a constraining tool in combination with and adapted for use with the foregoing.

[0027] Preferably the spanner is a ratchet ring spanner comprising a hollow ratchet wheel.

[0028] A further aspect of the present invention provides a kit of parts comprising:

- a spanner having an elongate handle and an en-

gagement formation arranged at one or both ends of the handle;

- an adaptor comprising an elongate body having a spanner engagement portion, a socket engagement portion and a through bore to allow insertion of a constraining tool in use through the body; and

- one or more sockets.

[0029] The kit of parts may further comprise a constraining tool.

[0030] An embodiment of the present invention will now be described, by way of example only, with reference to the following drawings, in which:

- Figure 1 shows an adaptor as viewed from the socket engagement portion;

- Figure 2 shows the adaptor of Figure 1 as viewed from the spanner engagement portion;

- Figure 3 shows the adaptor with a hex key inserted therethrough;

- Figure 4 shows the adaptor being offered up to a ratchet ring spanner;

- Figure 5 shows the adaptor engaged with a ratchet ring spanner;

- Figure 6 shows a socket engaged with the adaptor of Figure 5; and

- Figure 7 shows an alternative view of the spanner of Figure 6.

[0031] As shown in the Figures, an adaptor 10 of an embodiment of the invention particularly suited to use with a ratchet ring spanner comprising an elongate body having a spanner engagement portion 12 and a socket engagement portion 14. The spanner engagement portion 12 and socket engagement portion 14 are elongate and together make up the body. They may be similar in length, each defining approximately half of the body.

[0032] The spanner engagement portion 12 comprises longitudinal teeth 32 arrayed around and extending along the length of a generally cylindrical central body. The teeth have a generally trapezoidal cross section to define a profile corresponding with the longitudinal teeth 34 around the inside surface of a hollow ratchet wheel 20 of a ratchet ring spanner 22.

[0033] The elongate socket engagement portion 14 has a substantially square cross section complementarily shaped with, and thereby to engage in, the adaptor receiving portion of a socket 24. The edges 36 of the square socket engagement portion 14 may be chamfered to aid location and engagement with a socket 24.

[0034] The adaptor 10 has a longitudinal bore 16 centrally disposed in and extending through the adaptor 10 from the spanner engagement portion 12 to the socket engagement portion 14.

[0035] This allows a user to pass a constraining tool 18 through the bore 16 as illustrated in Figure 3. The bore 16 is sized to allow an end 28 of a hex key 18 to pass through the adaptor 10 and through passage of a socket 24 and engage in a corresponding hexagonal-shaped recess in the end of the shaft of a suitably adapted fastener (not shown), such as an ASNA bolt as typically used in the aircraft industry, on to which a nut is being driven. The bore 16 is larger in diameter than the hex key 18 to allow the adaptor 10, and socket 24 engaged thereto (see Figure 6), to rotate whilst the hex key 18 is held by a user to constrain rotation of the fastener shaft whilst a nut is being driven thereon. This is particularly advantageous where access to a fastener head is not possible or is substantially limited, where the fastener has a head to which a suitable tool cannot adequately engage or where the fastener has no head.

[0036] The adaptor of figures 1 and 2 is particularly adapted for use with a ratchet ring spanner 22. This is illustrated in Figures 4 to 7.

[0037] The spanner engagement portion 12 is slideably received by the ratchet wheel 20 to conveniently allow a ratchet ring spanner 22 to be used as a ratchet socket wrench. In familiar manner, a set of sockets will be provided, each having an identical recess shaped to receivingly engage with the square socket engagement portion 14 but with a differently shaped/sized socket recesses to receive and drive differently shaped fasteners. This advantageously reduces the number of tools required for an application and the number of tools stored and/or transported in a tool box.

[0038] In use, the spanner engagement portion 12 is slideably engaged in the ratchet wheel 20 of a ratchet spanner 22, in the direction of arrow 30 as shown in Figure 4. A socket 24 is generally hollow having a through passage from the adaptor receiving portion, generally a square hole adapted to receive a conventional socket wrench, to a fastener engagement portion 26. A suitable socket 24 is engaged on the socket engagement portion 14. Such a socket is shown in position in Figures 6 and 7.

[0039] The adaptor 10 allows a conventional ratchet ring spanner 22 to be conveniently operable as a ratchet socket wrench. A nut is placed on the distal end of the shaft of a fastener, e.g. an ASNA bolt, and the fastener engagement portion 26 of a socket 24 is offered to the nut to be engaged therein. The end 28 of a suitably sized hex key 18 is inserted into the hexagonal recess in the end of the fastener shaft. The spanner 22 can be rotated in a user's hand to positively drive the nut on the fastener shaft whilst the hex key 18 is held in the other hand to prevent rotation of the fastener whilst the nut is being driven thereon.

[0040] Alternatively, where space is substantially limited and rotation of the spanner handle 22 is not possible,

the hex key 18 may conveniently be used to drive the fastener shaft whilst the nut is constrained in the socket 24. In other words, in addition to being used to prevent a fastener shaft rotating, a hex key 18 may alternatively be used to drive the shaft of a fastener, such as a bolt, whilst the nut is held in place by the spanner 22. This may be particularly desirable where a nut and bolt arrangement is to be opened or closed but where space is limited and movement of the spanner handle 22 is substantially restricted.

[0041] The adaptor 10 is small relative to the length of a socket 24 and is adapted to allow a socket 24 to be driven from a point close to the throat of a spanner 22. This advantageously minimises the spacing between a plane of rotation of the spanner 22 and a plane of rotation of a nut, reducing any torque offset therebetween, as described above, which would occur when using an extension piece in a conventional socket wrench, for example.

Claims

1. An adaptor for a spanner, comprising:

- an elongate body having at opposite ends an elongate spanner engagement portion which is shaped to be received by an engagement formation of a spanner and a socket engagement portion; and
- a through bore to allow in use the insertion of a constraining tool through the body.

2. An adaptor according to claim 1 wherein the spanner engagement portion comprises at least two longitudinal and parallel faces which engage with an engagement formation of a spanner.

3. An adaptor according to claim 1 wherein the spanner engagement portion comprises a plurality of longitudinal teeth formations arrayed about a central elongate body.

4. An adaptor according to any of claims 1, 2 or 3 wherein the spanner engagement portion comprises a resiliently deformable retaining means to tend to retain the adaptor in the engagement formation of a spanner in use.

5. An adaptor according to any preceding claim wherein the spanner engagement portion is shaped so as to be complementary with the ratchet wheel of a ratchet ring spanner.

6. An adaptor according to any preceding claim wherein the socket engagement portion is elongate and complementarily shaped with a receiving hole of a socket so as to be releasably engageable therewith.

7. An adaptor according to claim 6 wherein the socket engagement portion is substantially square in cross section.

8. An adaptor according to claim 6 or 7 wherein the socket engagement portion comprises a resiliently deformable retaining means to tend to retain a socket thereon in use.

9. A spanner and adaptor set comprising:

- at least one spanner having an elongate handle and an engagement formation arranged at one or both ends of the handle;
- at least one adaptor in accordance with any preceding claim having:
- an elongate body having a spanner engagement portion adapted to releasably engage with an engagement formation of the spanner and a socket engagement portion; and
- a through bore to allow insertion of a constraining tool in use through the body.

10. A spanner, adaptor and socket set comprising:

- at least one spanner having an elongate handle and an engagement formation arranged at one or both ends of the handle;
- a plurality of sockets each having a body comprising an adaptor receiving portion and a fastener engagement portion; and
- at least one adaptor having:
- an elongate body having a spanner engagement portion adapted to releasably engage with an engagement formation of the spanner;
- a socket engagement portion adapted to releasably and selectively engage with an adaptor receiving portion of a socket; and
- a through bore to allow insertion of a constraining tool in use through the body.

11. A set according to claim 9 or 10 wherein the spanner is a ratchet ring spanner comprising a hollow ratchet wheel and the spanner engagement portion is complementarily shaped with the ratchet wheel.

12. A set comprising an adaptor according to any one of claims 1 to 8, or a set according to any one of claims 9 to 11 further comprising a constraining tool having an elongate portion at least as long as the elongate body and adapted to pass through and freely rotate within the through bore.

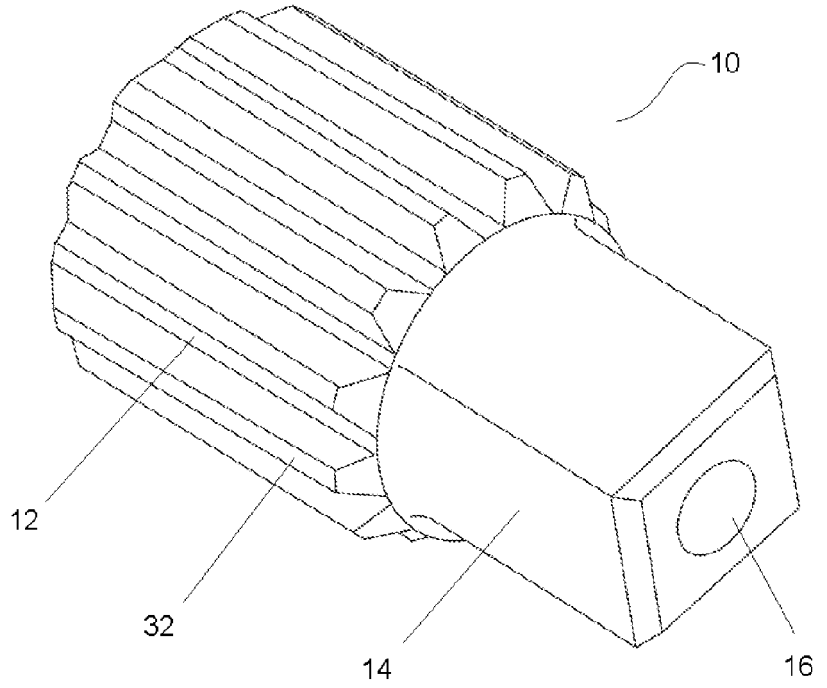

Figure 1

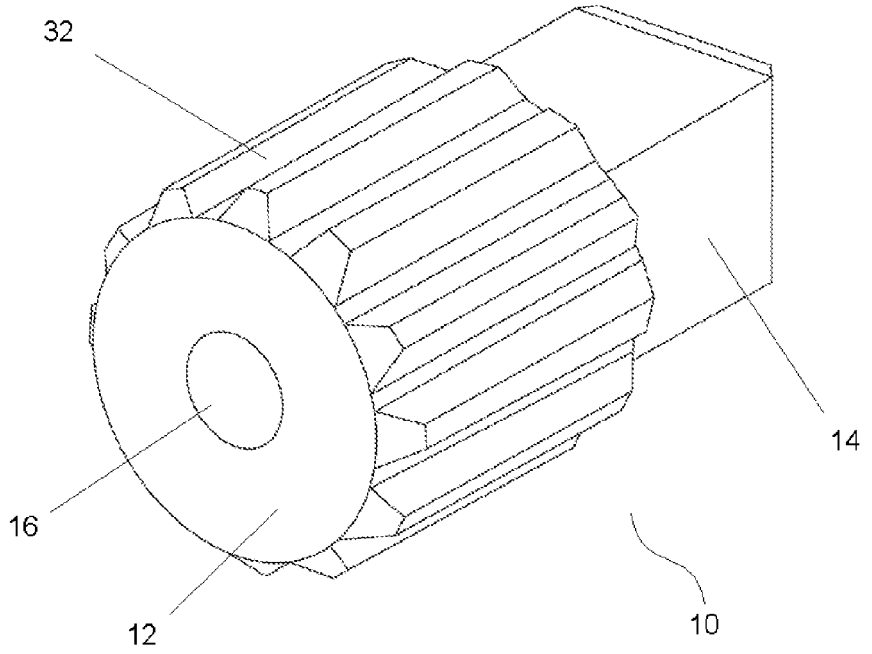

Figure 2

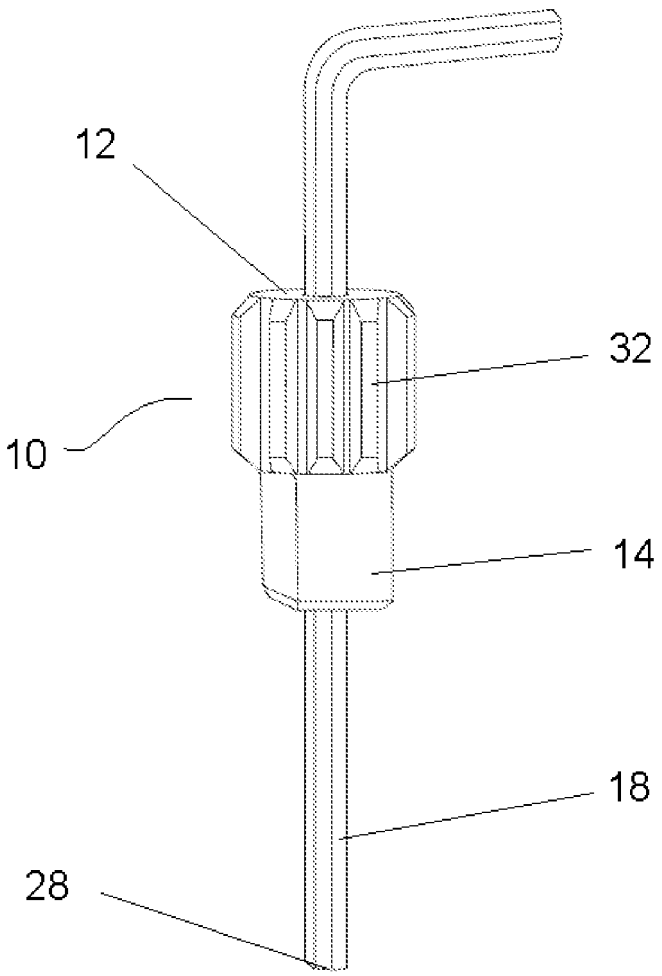

Figure 3

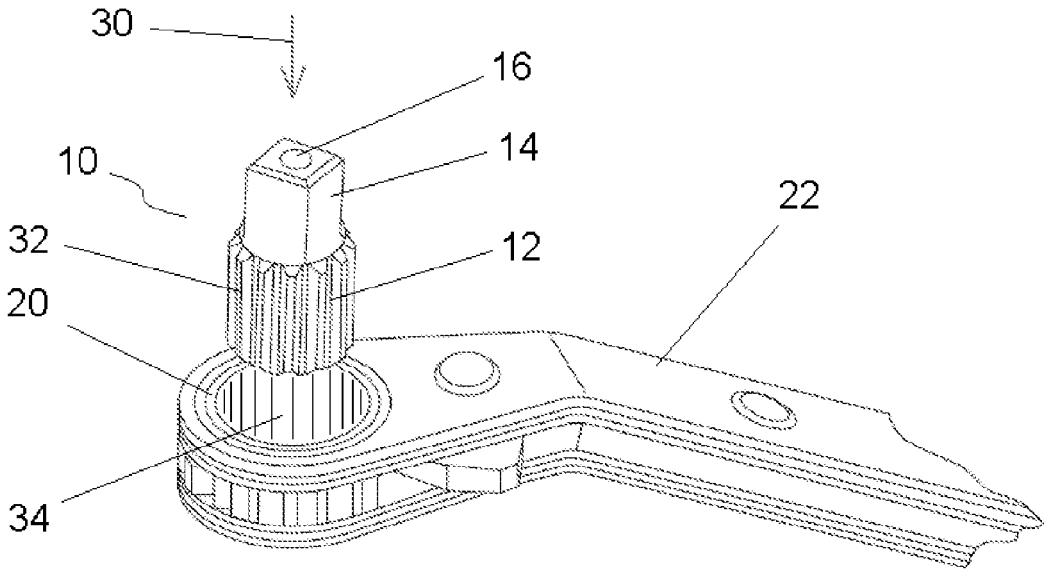

Figure 4

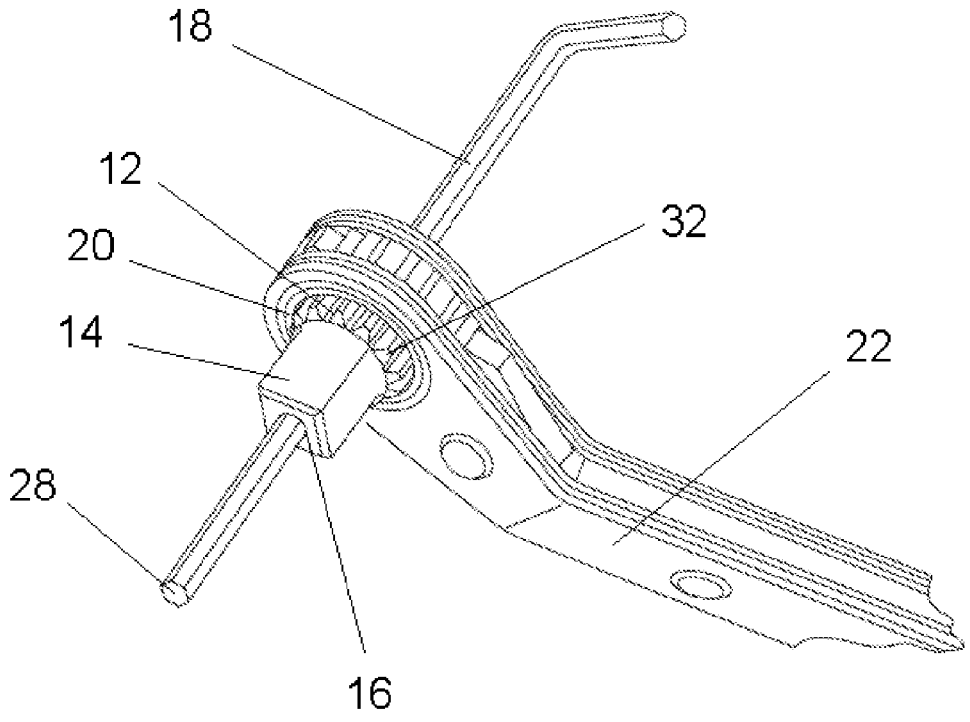

Figure 5

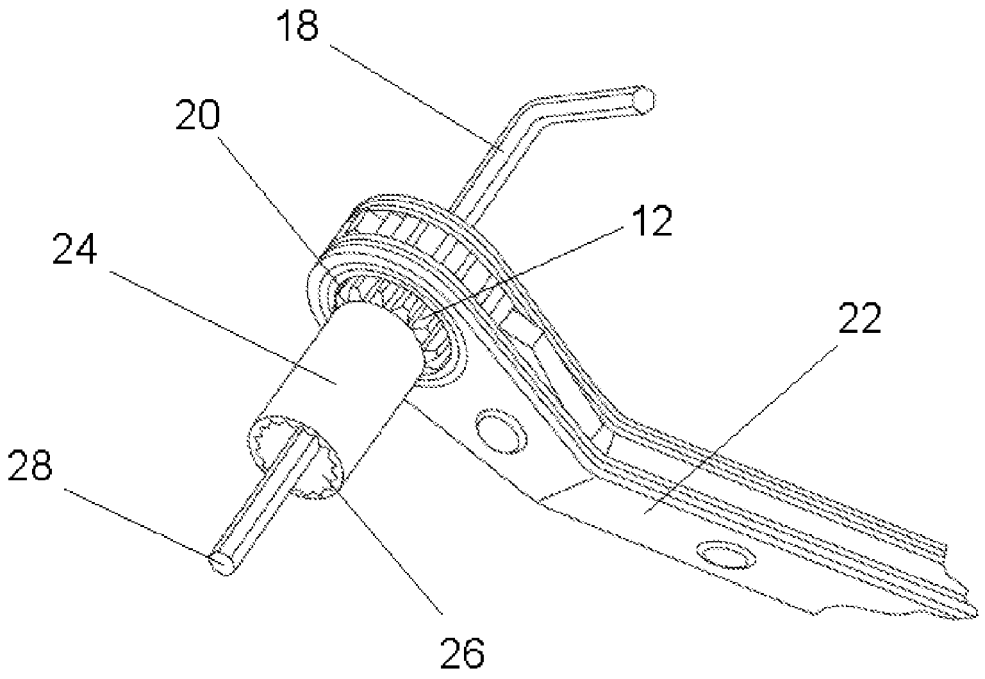

Figure 6

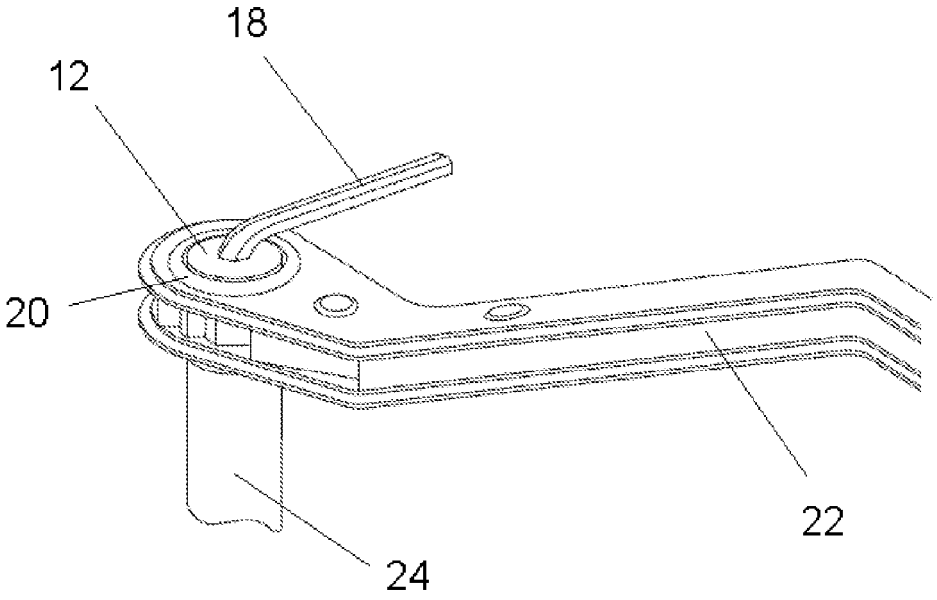

Figure 7

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EUROPEAN SEARCH REPORT

Application Number
EP 08 27 5035

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 203 16 821 U1 (HSIEN CHIH CHING [TW]) 15 January 2004 (2004-01-15) * paragraphs [0011] - [0013], [0015]; figures 1,4 *	1,3,5,6, 9-11	INV. B25B15/00 B25B13/48
X	US 2005/098001 A1 (WALKER RUSSELL E [US]) 12 May 2005 (2005-05-12) * paragraphs [0038], [0040]; figures 2-2b *	1,2,6-8	
X	WO 85/02574 A (MOETTELI JOHN BRENT) 20 June 1985 (1985-06-20) * page 33, line 27 - line 32 * * page 35, line 4 - line 14; figures 21,24 *	1,2,6,8	
A	US 2003/136230 A1 (CHEN HSIN NIEN [TW]) 24 July 2003 (2003-07-24) * paragraph [0023]; claims; figures 1,3 *	1-11	
A	US 6 019 019 A (HOBBS RICK ANTHONY [US]) 1 February 2000 (2000-02-01) * column 2, line 41 - line 58; figures 1-4 *	1-3,5-11	TECHNICAL FIELDS SEARCHED (IPC) B25B
A	US 2004/211299 A1 (CHEN TERENCE [TW]) 28 October 2004 (2004-10-28) * abstract; figures 3-6 *	1,2,4-11	
A	US 2003/097911 A1 (HU BOBBY [TW]) 29 May 2003 (2003-05-29) * paragraphs [0024], [0025]; figures 1,3,6,8 *	1,2,4-11	
A	US 2004/226413 A1 (CHEN TERENCE [TW]) 18 November 2004 (2004-11-18) * abstract; figures 2-5 *	1,2,4-11	

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	12 November 2008	Majerus, Hubert

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	WO 00/15392 A (MCCLURE TRAVIS [US]) 23 March 2000 (2000-03-23) * abstract; figures 1,4,5 * -----	1,12	
			TECHNICAL FIELDS SEARCHED (IPC)

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	12 November 2008	Majerus, Hubert

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