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EUROPEAN PATENT SPECIFICATION

④⑤ Date of publication of patent specification: **21.08.85**

⑤① Int. Cl.⁴: **B 25 B 17/00**

⑦① Application number: **80302131.0**

⑦② Date of filing: **25.06.80**

⑤④ **Torque multiplier assembly.**

④③ Date of publication of application:
06.01.82 Bulletin 82/01

④⑤ Publication of the grant of the patent:
21.08.85 Bulletin 85/34

⑧④ Designated Contracting States:
BE DE FR GB IT SE

⑤⑥ References cited:
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DE-U-7 819 341
US-A-3 564 955

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Courier Press, Leamington Spa, England.

Description

The present invention relates to an assembly that is portable, compact, and may be easily and conveniently disposed adjacent a nut, bolt or similar threaded elements to removably engage the same.

The present invention seeks to provide a torque wrench assembly that is capable of exerting the same maximum torque on a nut, bolt head, or other rotatable element, as my prior invention described in U.S. Patent No, 3,564,955 entitled "High Torque Wrench Assembly" that was granted on February 23, 1971; but one that has the operational advantage that it is more compact, lighter in weight than my prior high torque wrench, and does not require a torque indicating device as a part thereof. In the invention, this is achieved by the provision of a torque multiplier such as of the general type described in DE—U—7819341. This specification describes a torque multiplier comprising a worm and gear arrangement in which the gear is mounted between a pair of bearings in an annular housing. The present invention seeks to improve on this construction.

In accordance with the invention there is provided an assembly comprising an elongate torque wrench of the type that has a head, an elongate handle extending from said head, engageable torque input means on said head, manually adjustable means on said handle that limit the maximum torque said torque input means can exert when said torque wrench and torque input means are concurrently rotated, and a first numbered scale on said handle that is so operatively associated with said adjustable means as to visually indicate the particular maximum torque input for which said torque wrench is set, and a torque multiplier assembly capable of exerting a predetermined maximum torque on a rotatable element, said torque multiplier assembly comprising a housing having first and second mutually-orthogonal through-apertures, said second aperture being situated tangentially with respect to the first, a worm gear situated within said first aperture and mounted for rotation with an axis extending coaxially with respect to said first aperture, a worm positioned coaxially within said second aperture and having teeth which mesh with those of the worm gear, said worm having oppositely disposed cylindrical end portions having torque receiving means that are removably engageable with said torque input means, and said shaft having respective torque output means on its ends, said assembly being characterised in that the worm gear comprises a cylindrical hub mounted on a shaft and having a flange extending from an axially central position thereof on the periphery of which flange the teeth are formed, said flange being positioned on the hub so as to define two cylindrical shoulders, one on each side of the flange, by a pair of rolling bearings for rotatably mounting said shaft within said first aperture, said bearings each comprising

an inner race mounted on a respective one of said cylindrical shoulders, an outer race mounted on the inside wall of the aperture and a plurality of rolling elements therebetween, by respective annular closure plates mounted around said shaft near the respective entrances to said first aperture said closure plates being equipped with sealing means whereby to define a sealed chamber within which said worm gear may rotate, said closure plates being retained in place by retaining rings located in annular grooves in the inside wall of the aperture, and by a second numbered scale on said handle which scale is so operatively associated with said adjustable means as to visually indicate the maximum torque that will be provided by said torque output means when said torque input means is in engagement with said torque receiving means and said torque wrench is actuated to rotate said torque input means.

The invention will now be described with reference to the accompanying drawings, in which:—

FIGURE 1 is a perspective view of the multiplier assembly of the invention fully illustrating one side thereof, and the view also including a low torque output wrench used in actuating the torque multiplier assembly, as well as a stabilizing bar that may be used to maintain the torque multiplier in a fixed position relative to the rotatable element to which torque is being applied;

FIGURE 2 is a second perspective view of the torque multiplier assembly illustrating a second side thereof;

FIGURE 3 is an end elevational view of the torque multiplier assembly;

FIGURE 4 is a second end elevational view of the torque multiplier assembly with the torque output element removably engaging a socket wrench which, in turn, engages a nut or bolt head of the element that is to be rotated;

FIGURE 5 is a front elevational view of the torque multiplier assembly;

FIGURE 6 is a transverse cross-sectional view of the torque multiplier assembly taken on the line 6—6 of Figure 5; and

FIGURE 7 is a second transverse cross-sectional view of the torque multiplier assembly taken on the line 7—7 of Figure 5.

The torque multiplier assembly A of the present invention as may best be seen in FIGS. 1, 2, 6 and 7 is actuated by a conventional elongate torque wrench B that has a head C and the wrench being commercially available. The torque multiplier assembly A is preferably held in a stabilized stationary position when imparting torque to a desired rotatable element by use of a stabilizing rod D shown in FIG. 1 or other anchoring means.

The torque wrench B includes an elongate handle 10 that has a rotatable portion 12 that moves longitudinally relative to the handle as the portion 12 is rotated. The handle 12 has a first scale 14 over which the free edge portion 12a of the rotatable portion 12 moves as the handle 10 is rotated. The first scale 14 has numbers 14a thereon which indicate the maximum torque that

can be applied to a rotatable element by use of the head C. Torque wrenches B of the above-described type are commercially available and are normally designed to provide not over fifty foot pounds of torque through the head C. The head C includes a torque imparting means 16 which may be either a protuberance of non-circular transverse cross-section or a recess that is likewise not of circular transverse cross-section. The torque imparting means 16 as may be seen in FIG. 6 is adapted to removably engage a torque receiving member 18 as shown in FIG. 6 that is of non-circular transverse cross-section, and is a part of the torque multiplier assembly A. The torque wrench B is of such structure that when the maximum torque for which it is set is reached the torque wrench becomes inoperative into far as producing additional torque.

The torque multiplier assembly A as may be seen in the drawings includes first and second housing half portions E and E' that have first and second abutting surfaces 20 and 22. First and second transverse bores 24 and 26 are formed on the peripheral portions of the housing half portions E and E', with the second bores having threads on the interior thereof that are engaged by cap screws 28 that serve to hold the two housing half portions in abutting contact.

The first and second housing half portions E and E' have an opening 30 of substantial diameter extending transversely therethrough, which opening is defined by first circular side walls 32 formed in the first and second housing half portions E and E'. The first and second housing half portions E and E' have an elongate opening 34 therein that is tangential to the opening 30, with the elongate opening 34 being defined by a second circular side wall within the first and second housing half portion E and E'.

A heavy torque output shaft 38 is provided that has a longitudinal slot 42 therein that is engaged by a key 40, with the key also engaging a radially aligned slot 44 formed on the interior surface of a cylindrical hub 46 of a worm gear 48 as shown in FIGS. 6 and 7. The worm gear 48 has teeth 50 on the outer periphery thereof.

A pair of laterally spaced anti-friction roller bearing assemblies 52 are provided, each of which assemblies includes a number of tapered rollers 54 that rotatably engage a bearing cup 56 and bearing cone 58. The shaft 38 as may best be seen in FIG. 7 has a torque output plug 60 of non-circular transverse cross-section projecting outwardly from one end thereof and a torque output recess 62 extending into the shaft 38 from the opposite end thereof.

A pair of oil seals 64 are disposed within the first and second housing portions E and E' as shown in FIG. 7 to encircle the shaft 38, with the oil seals being removably held in position within the housing portion by a pair of retainer seals 66. A pair of retainer rings 68 are provided that abut against the retainer seals 66, and the retainer rings removably engaging grooves 70 that extend into the first circular side wall 32. The worm gear

48 is held in a fixed longitudinal position on the shaft 38 by a pair of transversely spaced retainer rings 67 that engage grooves 69 formed in the shaft 38.

A pair of laterally spaced, anti-friction ball bearing assemblies 72 are provided, with each assembly including an outer race 74, inner race 78 and a number of balls 76 situated therebetween. A worm 80 is provided that has cylindrical end portions 82, with each of the end portions being rotatably supported by the inner races 78 of the anti-friction ball bearing assemblies 72. The worm 80 and the anti-friction ball bearing assembly 72 as can best be seen in FIG. 6 are mounted in the elongate opening 34 defined between the first and second housing half portions E and E'.

A torque receiving plug 18 projects outwardly from one end of the worm 80, which plug is of non-circular transverse cross-section. A torque receiving cavity 18 extends inwardly into an opposite end of the worm 80. The ball bearing assembly 72 as may best be seen in FIG. 6 are maintained in a fixed position within the first and second housing half portions E and E' by a pair of longitudinally spaced ring-shaped retainers 88 that engage circular grooves 90 formed in the half housing portions.

Two transversely aligned lugs 92 project outwardly from the half housing portions E and E' as shown in FIGS. 6 and 7, with each lug having a semi-circular groove 94 extending therethrough, with the grooves cooperating to provide a first cylindrical opening 96. The first opening 96 may be removably engaged by the stabilizing rod B as shown in FIG. 1. The pair of lugs 92 also have transversely and axially aligned second openings 98 therein, which openings may be engaged by a chain or the like (not shown) to hold the torque multiplier assembly A in a substantially stationary position during the time that it is being used to supply torque through the plug 60 or recess 62 shown in FIG. 7. In FIG. 4 the plug 60 is shown in removable engagement with a conventional socket wrench 100, which wrench 100 is in turn in engagement with a nut or bolt head 102 to which it is desired to impart a high torque either in loosening or rotating the same.

The elongate torque wrench B has a longitudinally extending first numbered scale 14 thereon over which the rotatable portion 12 moves as the latter is rotated, with the free edge portion 12a of the portion 12 when transversely aligned with a graduation of scale 14 indicating the maximum torque in foot pounds that can be delivered by the torque wrench B. The graduations 14 have numbers 14a imprinted on the handle B that indicate the magnitude of the torque.

The handle B preferably has a second longitudinal scale 15 thereon opposite the scale 14, with numbers 14a of the second scale indicating the torque output of the torque multiplier assembly A. Each number 15a is obtained by multiplying the number 14a opposite thereof by the factor previously described. Once the factor has been determined it may be used to obtain all

of the torque output numbers on the second scale 15, for the friction between the gears and bearing assemblies will not vary appreciably over the entire range of the low torque input to the multiplier assembly A.

The torque wrench B may be used individually over the entire low torque range thereof in a conventional manner. When a higher torque is required the torque multiplier assembly A is placed in direct engagement with a socket wrench as shown in FIG. 4 to apply a desired high torque to a nut or bolt head 102. The torque multiplier assembly A is held in a non-rotatable position relative to the nut or bolt head 102 by use of the stabilizer rod D, or a chain or restraining element (not shown) that extends through openings 98 and is secured to a suitable anchor. The torque wrench B is now placed in operative engagement with the multiplier assembly A, and the wrench portion 12 rotated for it to move longitudinally on the handle 10 until the free edge 12a thereof is transversely aligned with the graduation 15 that indicates the maximum torque output that will be exerted by the plug 60 or recess 62 when the torque wrench is exerting the maximum torque input 14a for which it is set. The torque wrench B exerts torque on torque multiplier assembly A by being pivoted upwardly and downwardly relative thereto as shown in FIG. 4.

The torque multiplier assembly A is illustrated as having a projecting torque receiving member 18 of non-circular transverse cross-section on one end of worm 80 and a torque receiving recess 18 on the opposite end thereof, each of which may receive input torque from the torque input member 16 of head C of torque wrench B. The direction of rotation of torque output plug 60 is controlled by changing the direction in which torque is imparted to worm 80 by torque wrench B. From the prior description of torque multiplier assembly A it will be apparent that lubricant may be disposed within the housing portions E and E', and retained therein by the oil seals 64.

The use and operation of the torque multiplier assembly A has been previously described in detail and need not be repeated.

There has been described a torque multiplier assembly that is actuated by a conventional elongate low torque output wrench that may be manually adjusted to provide any one of a number of maximum torques and which has a torque output which is the torque input of the torque wrench multiplied by a factor that is inherent to the gear structure of the torque multiplier assembly.

Claims

1. An assembly comprising an elongate torque wrench (B) of the type that has a head (C), an elongate handle (10) extending from said head, engageable torque input means (16) on said head, manually adjustable means (12) on said handle that limit the maximum torque said torque input means can exert when said torque wrench and

torque input means are concurrently rotated, and a first numbered scale (14) on said handle that is so operatively associated with said adjustable means as to visually indicate the particular maximum torque input for which said torque wrench is set, and a torque multiplier assembly (A) capable of exerting a predetermined maximum torque on a rotatable element, said torque multiplier assembly comprising a housing (E, E') having first and second mutually-orthogonal through-apertures (30, 34), said second aperture (34) being situated tangentially with respect to the first, a worm gear (48) situated within said first aperture and mounted for rotation with an axis (38) extending coaxially with respect to said first aperture, a worm (80) positioned coaxially within said second aperture and having teeth which mesh with those of the worm gear, said worm having oppositely disposed cylindrical end portions (82) having torque receiving means (18) that are removably engageable with said torque input means (16), and said shaft having respective torque output means (60, 62) on its ends, said assembly being characterised in that the worm gear (48) comprises a cylindrical hub (46) mounted on a shaft (38) and having a flange extending from an axially central position thereof on the periphery of which flange the teeth (50) are formed, said flange being positioned on the hub so as to define two cylindrical shoulders, one on each side of the flange, by a pair of rolling bearings (52) for rotatably mounting said shaft within said first aperture 30, said bearings (52) each comprising an inner race (58) mounted on a respective one of said cylindrical shoulders, an outer race (56) mounted on the inside wall (32) of the aperture (30) and a plurality of rolling elements (54) therebetween, by respective annular closure plates (66) mounted around said shaft (38) near the respective entrances to said first aperture said closure plates being equipped with sealing means (64) whereby to define a sealed chamber within which said worm gear (48) may rotate, said closure plates being retained in place by retaining rings (68) located in annular grooves in the inside wall (32) of the aperture 30, and by a second numbered scale (15) on said handle, which scale (15) is so operatively associated with said adjustable means (12) as to visually indicate the maximum torque that will be provided by said torque output means (60, 62) when said torque input means (16) is in engagement with said torque receiving means (18) and said torque wrench (B) is actuated to rotate said torque input means.

2. An assembly as claimed in claim 1 in which said housing is defined by first and second solid housing portions (E, E') that are in abutting contact, and in addition fastening means (28) for holding said first and second solid housing portions in said abutting contact.

3. An assembly as claimed in claim 2 in which said first and second housing portions have a plurality of pairs of spaced transversely aligned first and second bores (24, 26) therein, said second bores (24) being tapped, and said fasten-

ing means being a plurality of cap screws (28) that extend through said first bores to threadedly engage said tapped second bores.

4. An assembly as claimed in any one of claims 1, 2 or 3 which in addition includes third means (D) for preventing said housing rotating when said torque multiplier is applying torque to a rotatable element through said torque output means.

5. An assembly as claimed in claim 2 in which said torque output means is a plug (60) of non-circular transverse cross-section that projects from an end of said shaft.

6. An assembly as claimed in claim 2 in which said torque output means is a recess (62) of non-circular transverse cross-section that extends into said shaft from an end thereof.

7. An assembly as claimed in claim 2 in which said manually adjustable means is an elongate member (12) that moves longitudinally on said handle (10) when it is manually adjusted to provide a desired torque input from said torque wrench, and the free edge (12a) of said member most adjacent said head when transversely aligned with graduations on said first and second scales visually indicating the torque input from said torque wrench and the torque output from said torque multiplier assembly.

Revendications

1. Ensemble comprenant une clé dynamométrique allongée (B) du type qui comporte une tête (C), une poignée allongée (10) s'étendant depuis la tête, des moyens d'entrée de couple (16) contactables se trouvant sur ladite tête, des moyens réglables manuellement (12) se trouvant sur la poignée et limitant le couple maximal que peuvent exercer lesdits moyens d'entrée de couple lorsque la clé dynamométrique et les moyens d'entrée de couple tournent concurremment, et sur ladite poignée une première échelle (14) à chiffres qui est associée fonctionnellement de telle manière avec les moyens réglables, qu'elle permet d'indiquer visuellement l'entrée de couple maximum pour laquelle la clé dynamométrique est spécialement réglée, et un ensemble (A) de multiplicateur de couple capable d'exercer un couple maximal prédéterminé sur un élément rotatif, l'ensemble multiplicateur de couple comprenant un enveloppe (E, E') ayant des premiers et seconds orifices traversants (30, 34) orthogonaux entre eux, le second orifice (34) étant situé tangentielllement par rapport au premier, une vis sans fin (48) située à l'intérieur du premier orifice et montée pour tourner avec un axe (38) s'étendant coaxialement par rapport au premier orifice, une vis sans fin (80) placée coaxialement à l'intérieur du second orifice et ayant des dents qui engrènent avec celles de l'autre vis sans fin, ladite vis sans fin ayant des parties cylindriques d'extrémités (82) disposées de façon opposée et comportant des moyens (18) de réception de couple qui peuvent être contactés amoviblement par les moyens d'entrée de couple

(16), et ledit arbre ayant des moyens respectifs de sortie de couple (60, 62) à ses extrémités, ledit ensemble étant caractérisé en ce que la vis sans fin (48) comprend un moyeu cylindrique (46) monté sur un arbre (38) et ayant une bride s'étendant depuis une position axialement centrale de celui-ci et sur la périphérie de laquelle les dents (50) sont formées, ladite bride étant placée sur le moyeu de manière à définir deux épaulements cylindriques, l'un de chaque côté de la bride; et par deux paliers à roulements (52) pour monter de façon rotative l'arbre à l'intérieur du premier orifice (30), lesdits paliers (52) comprenant chacun une piste interne (58) montée sur un épaulement cylindrique respectif, une piste externe (56) montée sur la paroi interne (32) de l'orifice (30) et plusieurs éléments de roulements (54) placés intermédiairement, par des plaques (66) annulaires de fermeture respectives montées autour dudit arbre (38) près des entrées respectives vers le premier orifice, lesdites plaques de fermeture étant équipées de moyens d'étanchéité (64) de manière à définir une chambre étanche à l'intérieur de laquelle ladite vis sans fin (48) peut tourner, les plaques de fermeture étant retenues en place par des anneaux de retenue (68) situés dans des rainures annulaires de la paroi interne (32) de l'orifice (30), et par une seconde échelle (15) à chiffres se trouvant sur la poignée, l'échelle (15) étant associée fonctionnellement de telle manière aux moyens réglables (12), qu'elle permet d'indiquer visuellement le couple maximal qui sera fourni par les moyens de sortie de couple (60, 62) lorsque les moyens d'entrée de couple (16) sont en contact avec les moyens (18) de réception de couple et que la clé dynamométrique (B) est actionnée pour faire tourner les moyens d'entrée de couple.

2. Ensemble selon la revendication 1 dans lequel l'enveloppe est définie par des première et seconde sections d'enveloppe solides (E, E') qui sont en contact de butée, et en plus par des moyens de fixation (28) pour maintenir les première et seconde sections solides d'enveloppe en contact de butée.

3. Ensemble selon la revendication 2, dans lequel les première et seconde sections d'enveloppe comportent plusieurs paires de premiers et seconds alésages (24, 26) alignés et espacés transversalement, les seconds alésages (24) étant taraudés, et les moyens de fixation étant un ensemble de vis à capuchon (28) qui s'étendent à travers les premiers alésages pour contacter par vissage les seconds alésages taraudés.

4. Ensemble selon l'une quelconque des revendications 1, 2 ou 3 qui, en plus, comprend des troisièmes moyens (D) pour empêcher la rotation de ladite enveloppe lorsque le multiplicateur de couple applique un couple à un élément rotatif par l'intermédiaire des moyens de sortie de couple.

5. Ensemble selon la revendication 2, dans lequel les moyens de sortie de couple sont constitués par un bouchon (60) de section transversale non circulaire qui dépasse d'une extré-

mité dudit arbre.

6. Ensemble selon la revendication 2, dans lequel les moyens de sortie de couple sont constitués par une cavité (62) ayant une section transversale non circulaire qui s'étend dans l'arbre depuis une de ses extrémités.

7. Ensemble selon la revendication 2, dans lequel les moyens ajustables manuellement sont constitués par un élément allongé (12) qui se déplace longitudinalement sur la poignée (10) lorsqu'il est réglé manuellement pour fournir une entrée désirée de couple à partir de la clé dynamométrique, et le bord libre (12a) dudit élément la plus voisin de la tête indique, lorsqu'il est aligné transversalement avec les graduations de la première et de la seconde échelle et visuellement, l'entrée de couple provenant de la clé dynamométrique et la sortie de couple provenant de l'ensemble multiplicateur de couple.

Patentansprüche

1. Anordnung mit einem langgestreckten Drehmomentschlüssel (B) derjenigen Art, die einen Kopf (C), einen vom Kopf abgehenden langgestreckten Griff (10), eine auf dem Kopf befindliche ansetzbare Drehmoment-Eingabeeinrichtung (16), eine von Hand verstellbare Einrichtung (12), die das maximale Drehmoment begrenzt, das die Drehmoment-Eingabeeinrichtung bei gleichzeitiger Drehung des Drehmomentschlüssels und der Drehmoment-Eingabeeinrichtung ausüben kann, sowie auf dem Griff eine erste Ziffernskala (14) aufweist, die der einstellbaren Einrichtung betrieblich so zugeordnet ist, daß sie das jeweilige maximale Eingabe-Drehmoment sichtbar anzeigt, auf das der Drehmomentschlüssel eingestellt ist, und mit einer Drehmoment-Vervielfacheranordnung (A), die auf ein drehbares Element ein vorbestimmtes maximales Drehmoment ausüben kann, wobei die Drehmoment-Vervielfacheranordnung ein Gehäuse (E, E') mit einer ersten und einer zur ersten rechtwinklig verlaufenden und tangential liegenden zweiten Durchgangsöffnung (30, 34), ein in der ersten Öffnung angeordnetes Schneckenrad (48), das um eine mit der ersten Öffnung koaxiale Achse (38) drehbar gelagert ist, und eine koaxial in der zweiten Öffnung angeordnete Schnecke (80) aufweist, deren Wendel mit der Zahnung des Schneckenrades kämmt und die entgegengesetzte zylindrische endabschnitte (82) mit jeweils einer drehmoment-aufnehmenden Einrichtung (18) hat, an die die Drehmoment-Eingabeeinrichtung (16) abnehmbar angesetzt werden kann, wobei die Welle auf ihren Enden zugehörige Drehmoment-Ausgabeeinrichtungen (60, 62) hat, dadurch gekennzeichnet, daß das Schneckenrad (48) eine auf einer Welle (38) angeordnete zylindrische Nabe (46) aufweist, die einen von einer axial mittigen Stelle der Welle abstehenden Flansch aufweist, auf dessen Umfangsfläche die Zahnung (50) ausgebildet ist, wobei der Flansch auf der Nabe so angeordnet ist, daß er beiderseits des Flan-

sches je eine zylindrische Schulter bildet, daß zwei Rollenlager (52) vorgesehen sind, die die Welle in der ersten Öffnung (30) lagern und jeweils einen auf einer der zylindrischen Schultern angeordneten inneren Laufring (58), einen auf der Innenfläche (32) der Öffnung (30) angeordneten äußeren Laufring (56) sowie eine zwischen den Laufringen angeordnete Vielzahl von Abwälzelementen (54) aufweisen, daß auf der Welle (38) nahe den Mündungen der ersten Öffnung ringförmige Verschlussplatten (66) angeordnet sind, die mit Dichtringen (64) versehen sind, so daß sie eine abgeschlossene Kammer bilden, in der das Schneckenrad (48) drehen kann, wobei die Verschlussplatten durch Ringe (68) in der Sollage gehalten werden, die in Ringnuten in der Innenfläche (32) der Öffnung (30) eingesetzt sind, und daß auf dem Griff eine zweite Ziffernskala (15) vorgesehen ist, die betrieblich der einstellbaren Einrichtung (12) zugeordnet ist, um sichtbar das maximale Drehmoment anzuzeigen, das die Drehmoment-Ausgabeeinrichtung (60, 62) abgibt, wenn bei an die drehmomentaufnehmende Einrichtung (18) angesetzter Drehmoment-Eingabeeinrichtung (16) der Drehmomentschlüssel (B) gedreht wird, um die Drehmoment-Eingabeeinrichtung zu drehen.

2. Anordnung nach Anspruch 1, dadurch gekennzeichnet, daß das Gehäuse durch einen ersten und einen zweiten massiven Gehäuseteil (E, E'), die aufeinanderliegen, sowie durch Befestigungseinrichtungen (28) gebildet wird, die den ersten und den zweiten massiven Gehäuseteil aufeinander festhalten.

3. Anordnung nach Anspruch 2, dadurch gekennzeichnet, daß der erste und der zweite Gehäuseteil jeweils eine Vielzahl beabstandeter und in Querrichtung fluchtender erster bzw. zweiter Bohrungen (24, 26) enthalten, daß die zweiten Bohrungen (24) mit Innengewinden versehen sind und daß es sich bei den Befestigungseinrichtungen um eine Vielzahl von Kopfschrauben (28) handelt, die durch die ersten Bohrungen verlaufen und in die zweiten Gewindebohrungen eingeschraubt sind.

4. Anordnung nach Anspruch 1, 2 oder 3, dadurch gekennzeichnet, daß sie weiterhin eine dritte Einrichtung (D) aufweist, die eine Drehung des Gehäuses verhindert, wenn der Drehmomentvervielfacher über die Drehmoment-Ausgabeeinrichtung ein Drehmoment auf ein drehbares Element aufbringt.

5. Anordnung nach Anspruch 2, dadurch gekennzeichnet, daß die Drehmoment-Ausgabeeinrichtung ein massiver Ansatz (60) mit nicht kreisförmigem Querschnitt ist, der von einem Ende der Welle her absteht.

6. Anordnung nach Anspruch 2, dadurch gekennzeichnet, daß die Drehmoment-Ausgabeeinrichtung eine Vertiefung (62) mit nicht kreisförmigem Querschnitt ist, die von einem Ende der Welle her in diese hinein verläuft.

7. Anordnung nach Anspruch 2, dadurch gekennzeichnet, daß die von Hand einstellbare Einrichtung ein langgestrecktes Element (12) ist,

das, wenn von Hand verstellt, sich auf dem Griff (10) in Längsrichtung bewegt, um den Drehmomentschlüssel auf ein gewünschtes Eingabe-Drehmoment einzustellen, und daß die dem Kopf am nächsten liegende freie Kante (12a) des Elements, wenn sie mit den Skalenteilungen auf der

ersten und der zweiten Skala in Querrichtung ausgerichtet ist, das Eingabe-Drehmoment des Drehmomentschlüssels sowie das Ausgabe-Drehmoment der Drehmoment-Vervielfacheranordnung anzeigt.

5

10

15

20

25

30

35

40

45

50

55

60

65

7

FIG. 1

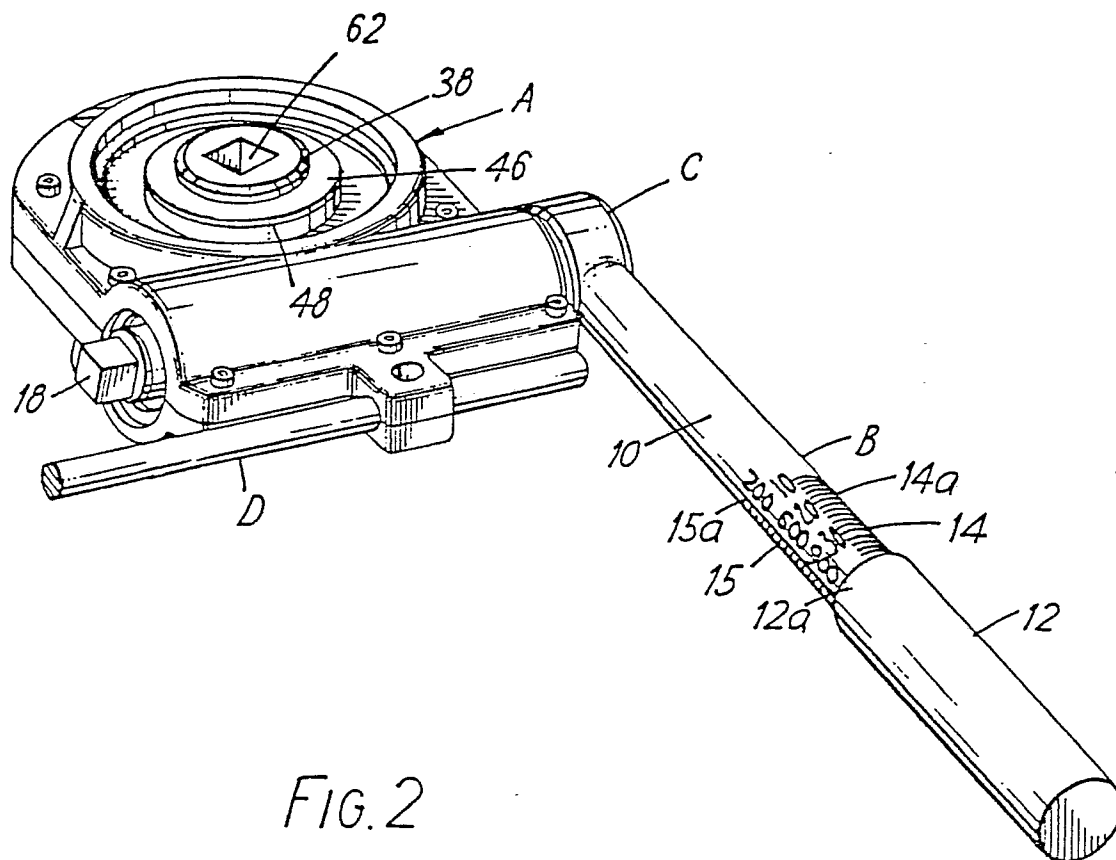


FIG. 2

