

(19)



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(11)

EP 1 249 313 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
21.12.2005 Bulletin 2005/51

(51) Int Cl.7: **B25B 13/14**

(21) Application number: **01109074.3**

(22) Date of filing: **11.04.2001**

(54) **Adjustable wrench**

Einstellbarer Schraubenschlüssel

Clé réglable

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE TR**

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(43) Date of publication of application:
16.10.2002 Bulletin 2002/42

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Description

[0001] The present invention relates to an adjustable wrench according to the preambles of claims 1 and 2.

[0002] When operating a conventional adjustable wrench 100, as shown in FIG. 1, the user may hold the adjustable wrench 100 in horizontal, and then rotates the adjusting worm 101 with the thumb to move the adjustable jaw 102 to the desired position. In order to let the adjustable jaw 102 be smoothly moved along the slide rails 104 of the fixed jaw (not shown), a clearance *c* is left between the slide rails 103 of the adjustable jaw 102 and the slide rails 104 of the fixed jaw. However, the moment produced by the weight *w* of the adjustable jaw 102 forces the adjustable jaw 102 to incline in one direction, thereby causing one slide rail 103 of the adjustable jaw 102 to attach one slide rail 104 of the fixed jaw. When moving the adjustable jaw 102 at this time, the rails 103 and 104 are rubbed against each other, causing an unstable movement of the adjustable jaw 102. A conventional method of eliminating the aforesaid problem is to reduce the clearance *c* between the adjustable jaw and the fixed jaw. For example, ASME (The American Society of Mechanical Engineers) B107.8M-1996 defines that the clearance of the adjustable jaw must be as low as within 0.3mm~0.47mm. ISO (International Standard Organization) 6786-1982 (E) defines that the clearance of the adjustable jaw must be as low as within 0.25mm~0.36mm when applying a slight side pressure on the adjustable jaw. The definitions of ISO and ASME do not stop the occurrence of friction between the slide rails of the adjustable jaw and the slide rails of the fixed jaw, i. e., these definitions do not eliminate the aforesaid problem.

[0003] WO94 01246 A discloses a generic adjustable wrench according to the preambles of claims 1 and 2 comprising: a frame, said frame comprising a fixed jaw and a track at one end thereof; an adjusting worm pivoted to said frame for free rotation; an adjustable jaw having a bottom neck received in said track of said frame and meshed with said adjusting worm; said adjustable jaw moves in said track relative to said fixed jaw upon rotating said adjusting worm; wherein a space is defined between each side of said neck and each of opposite walls of said track.

[0004] Another adjustable wrench is shown in US-4 449 431 A.

[0005] It is an object of the present invention to provide an adjustable wrench, which reduces friction during movement of the adjustable jaw relative to the fixed jaw.

[0006] This object is solved by an adjustable wrench having the features of claims 1 or 2.

[0007] It is an advantageous feature of the present invention that the adjustable wrench prevents the adjustable jaw from trembling in its moving direction when adjusted to the desired position.

[0008] Further advantages and features are disclosed in the description of the figures.

FIG. 1 illustrates an adjustable wrench constructed according to the prior art.

FIG. 2 is an exploded view of an adjustable wrench constructed according to a first embodiment of the present invention.

FIG. 3 is a front view of the adjustable wrench according to the first embodiment of the present invention

FIG. 4 is a side view of the adjustable wrench according to the first embodiment of the present invention.

FIG. 5 is a front view of an adjustable wrench constructed according to a comparative example.

FIG. 6 is a side view of the adjustable wrench according to Fig.5.

FIG. 7 is a front view of an adjustable wrench constructed according to another comparative example.

FIG. 8 is a side view of the adjustable wrench according to Fig. 7.

FIG. 9 is a side view of an adjustable wrench constructed according to a second embodiment of the present invention.

FIG. 10 is a side view of an adjustable wrench constructed according to another comparative example.

FIG. 11 is a front view of an adjustable wrench constructed according to another comparative example.

FIG. 12 is a side view of the adjustable wrench according to Fig 11.

[0009] Referring to FIGS. from 2 through 4, an adjustable wrench 1 in accordance with a first embodiment of the present invention comprises a frame 10, an adjusting worm 21, a worm spring 22, a worm pin 23, an adjustable jaw 30, and two spacers or packing devices 41 and 42.

[0010] The frame 10 has a handle 11, a fixed jaw 12 at one end of the handle 11, two parallel side rails 15 perpendicularly extended forwards from one side of the fixed jaw 12, a transverse track 13 defined between the rails 15, and an opening 14 disposed below the track 13 and in communication with the track 13. The adjusting worm 21 is pivotally mounted in the opening 14 of the frame 10 by the pivot pin 23. The worm spring 22 is mounted on the pivot pin 23, having one end being

against one end of the adjusting worm 21 and the other end being against the frame 10. The adjustable jaw 30 has a bottom neck 31, two through holes 341 and 342 extended through the bottom neck 31, a cylindrical sliding block 32 transversely disposed at the bottom side of the bottom neck 31. The neck 31 and the sliding block 32 of the adjustable jaw 30 are received in the track 13 of the frame 10 for enabling the adjustable jaw 30 to be moved along the track 13. A rack 33 is provided at the bottom side of the sliding block 32 and meshes with the adjusting worm 21 for enabling the adjustable jaw 30 to be moved in the track 13 upon rotating the adjusting worm 21. Two slide rails 35 are disposed at two sides of the neck 31 above the adjusting block 32. After insertion of the neck 31 and sliding block 32 of the adjustable jaw 30 into the track 13 of the frame 10, two spaces or clearances 131 and 132 are left at two opposite sides of the neck 31 of the adjustable jaw 30 within the track 13 of the frame 10. The packing devices 41 and 42 are elastic rubber rods of length not shorter than the width of the track 13 of the frame 10. The packing devices 41 and 42 are respectively pressed into the through holes 341 and 342 of the bottom neck 31 of the adjustable jaw 30 with interference fit. Each of the packing devices 41 and 42 have two rounded distal end respectively suspended in the spaces 131 and 132 and being against the frame 10.

[0011] Referring to FIG. 4 again, when the user holds the frame 10 of the adjustable wrench 1 in horizontal and rotates the adjusting worm 21 with the thumb. The packing devices 41 and 42 bear the moment produced by the weight W of the adjustable jaw 30, preventing the rails 35 of the adjustable jaw 30 from contacting with the rails 15 of the frame 10. Therefore, no friction is produced between the rails 15 and 35. After long uses, the adjustable jaw 30 can still be moved smoothly and maintained in balance when moving.

[0012] Referring to FIGS. 3 and 4 again, because of the adjustable wrench can be used to rotate different sizes of hexagonal (or square) bolts or nuts. A clearance $c1$ is produced between the rack 33 of the adjustable jaw 30 and the adjusting worm 21. After the adjustable jaw 30 has been adjusted to the desired position, the clearance $c1$ will cause the adjustable jaw 30 to tremble in its moving direction, resulting a variation of the size s between the fixed jaw 12 and the adjustable jaw 30. If the adjustable jaw 30 trembles, interference will be produced when repeatedly turning the workpiece. The adjustable wrench of the present invention can eliminate above problem. This achievement is described hereinafter.

[0013] Referring to FIG. 3 again, as stated above, the two distal ends of the each of the packing devices 41 and 42 are respectively against the frame 10. After the adjustable jaw 30 has been adjusted to the desired position, a friction force f is produced between the packing devices 41 and 42 and the frame 10. This friction force f can stop the tremble of the adjustable jaw 30 resulted

form the clearance $c1$ between the adjusting worm 21 and the rack 33. In general, the adjustable wrench 1 eliminates friction between the rails 15 of the frame 10 and the rails 35 of the adjustable jaw 30, and provides a friction force to secure the adjustable jaw 30 in position after each adjustment.

[0014] Referring FIGS. 5 and 6, an adjustable wrench 2 according to a comparative example is shown comprised of a frame 51, an adjustable jaw 52, an adjusting worm 53, and two spacers or packing devices 54 and 55. Different from the aforesaid first embodiment of the present invention, the bottom neck 521 of the adjustable jaw 52 has two elongated recessed slots 522 at two opposite sides. The packing devices 54 and 55 are coated with a layer of Teflon coating or friction-resisting coating, each having one end engaged into one elongated recessed slot 522 and an opposite end stopped against the frame 10.

[0015] Referring to FIGS. 7 and 8, an adjustable wrench 3 according to another comparative example is shown comprised of a frame 61, an adjustable jaw 62 and an adjusting worm 63. The adjustable jaw 62 has two recessed round slots 621 and 622 disposed at one side and one recessed round slot disposed at one side and one recessed round slot 623 disposed at an opposite side. Three spacers or packing devices 64, 65 and 66 (in FIG. 8, only one packing devices 64 is shown in complete), each of which has a metal ball 641 and elastic member 642 (in this comparative example, the elastic member is a spring). The elastic member 642 is mounted inside the recessed round slot 621. The ball 641 is supported on the elastic member 642, and forced outwards by the elastic member 642 and being against the frame 61.

[0016] FIG. 9 shows an adjustable wrench 4 according to a second embodiment of the present invention. The adjustable wrench 4 has an adjustable jaw 72, which has two through holes 721 (only one through hole is shown in the drawings), and two spacers or packing devices 73 (only one packing device is shown in the drawings) are respectively mounted in the through holes 721. The packing devices 73 each has an elastic member 732, which is a spring, mounted in one through hole 721. Two metal balls 731 respectively supported on the two ends of the elastic member 732 and respectively partially projecting out of the two opposites orifices of the through hole 721 and forced by the elastic member 72 against the frame 71.

[0017] In the aforesaid embodiments and examples, each packing device is installed in the adjustable jaw of the adjustable wrench. In practice, the packing devices can be installed in the frame to achieve the same function.

[0018] FIG. 10 shows an adjustable wrench 5 of another comparative example. The adjustable wrench 5 has a frame 81, which has two pairs of through holes 811 and 812 (only one of the through holes 811 and 812 are shown in the drawing) disposed in communication

with and aligned at two sides of the track 813. Four spacers or packing devices 84 and 85 are respectively installed in the through holes 811 and 812 (only two packing devices are shown in the drawing). Similar to the aforesaid comparative example according to Fig.7, the packing devices 84 and 85 each has a metal ball 841 or 851 and a elastic member 842 or 852. After installation of the packing devices 84 and 85 in the through holes 811 and 812, stop elements 814 and 815 are respectively fixedly fasted to the outer end of the each of the through holes 811 and 812 to close the through holes 811 and 812 and to stop the respective packing devices 84 and 85 in place. After installation of the stop elements 814 and 815, the outer end of each of the stop elements 814 and 815 is respectively polished and maintained in flush with the outside wall of the frame 81.

[0019] FIGS. 11 and 12 show an adjustable wrench 6 according to another comparative example. According to this comparative example, a frame 91 has two elongated slots 911 and 912 bilaterally disposed in the track 913 and respectively longitudinally extended to the open end of the track 913. Two spacers or packing devices 94 and 95 are respectively mounted in the elongated slots 911 and 912 and being against the adjustable jaw 92.

[0020] A prototype of adjustable wrench has been constructed with the features of the annexed drawings. The adjustable wrench functions smoothly to provide all of the features discussed carlier.

[0021] Although particular embodiments of the invention have been described in detail for purposes of illustration, various modifications and enhancements may be made without departing from the scope of the invention. Accordingly, the invention is not to be limited except as by the appended claims. comparative example

Claims

1. An adjustable wrench (1) comprising:

a frame (10), said frame (10) comprising a fixed jaw (12) and a track (13) at one end thereof;
an adjusting worm (21) pivoted to said frame (10) for free rotation;
an adjustable jaw (30) having a bottom neck (31) received in said track (13) of said frame (10) and meshed with said adjusting worm (21);
said adjustable jaw (30) moves in said track (13) relative to said fixed jaw (12) upon rotating said adjusting worm (21);

wherein a space is defined between each side of said neck (31) and each of opposite walls of said track (13);

characterised by

at least one through hole (341, 342) provided

in said neck (31); and
a packing device (41, 42) received in said through hole (341, 342) and extending through each said space into engagement with each of said opposite walls;

wherein said packing device (41, 42) is a cylindrical elastic member with ends respectively engaged against said opposite walls.

2. An adjustable wrench (4) comprising:

a frame (71), said frame (71) comprising a fixed jaw and a track at one end thereof;
an adjusting worm pivoted to said frame (71) for free rotation;
an adjustable jaw (72) having a bottom neck received in said track of said frame (71) and meshed with said adjusting worm; said adjustable jaw (72) moves in said track relative to said fixed jaw upon rotating said adjusting worm;

wherein a space is defined between each side of said neck and each of opposite walls of said track;
characterised by

at least one through hole (721) provided in said neck; and
a packing device (73) received in said through hole (721) and extending through each said space into engagement with each of said opposite walls, wherein said packing device (73) comprises an elastic member (732), mounted in said through hole (721) of said adjustable jaw (72), and two balls (731), respectively supported on two ends of said elastic member (732) and forced out of said through hole (721) of said adjustable jaw (72) respectively against said opposite walls.

3. The adjustable wrench (1; 4) according to claim 1, wherein said packing device (41, 42) provides a friction resistance between said adjustable jaw (30) and said frame (10).

4. The adjustable wrench (1; 4) according to any one of claims 1 to 3, wherein said adjustable jaw (30; 72) further comprises a sliding block (32), disposed at a bottom side of said bottom neck (31); said bottom neck (31) and said sliding block (32) of said adjustable jaw (30; 72) received in said track (13) of said frame (10; 71).

Patentansprüche

1. Verstellbarer Schraubenschlüssel (1) mit:

einem Rahmen (10), wobei der Rahmen (10) eine feste Klaue (12) und eine Schiene (13) an seinem Ende aufweist;

einer Verstellschnecke (21), die an dem Rahmen (10) frei drehbar angelenkt ist;

einer verstellbaren Klaue (30) mit einem unteren Hals (31), der in der Schiene (13) des Rahmens (10) aufgenommen ist und die Verstellschnecke (21) kämmt; wobei sich die verstellbare Klaue (30) in der Schiene (13) relativ zu der festen Klaue (12) bei einer Drehung der Verstellschnecke (21) bewegt;

wobei ein Raum zwischen jeder Seite des Halses (31) und den entsprechenden gegenüberliegenden Wänden der Schiene (13) definiert ist;
gekennzeichnet durch

zumindest ein Durchgangsloch (341, 342), das in dem Hals (31) vorgesehen ist; und eine Packungsvorrichtung (41, 42), die in dem Durchgangsloch (341, 342) aufgenommen ist und sich **durch** den jeweiligen Raum in einen Eingriff mit der entsprechenden gegenüberliegenden Wand erstreckt;

wobei die Packungsvorrichtung (41, 42) ein zylindrisches elastisches Element mit Enden ist, die mit der jeweils gegenüberliegenden Wand im Eingriff sind.

2. Verstellbarer Schraubenschlüssel (4) mit:

einem Rahmen (71), wobei der Rahmen (71) eine feste Klaue und eine Schiene an seinem Ende aufweist;

einer Verstellschnecke, die an dem Rahmen (71) frei drehbar angelenkt ist;

einer verstellbaren Klaue (72) mit einem unteren Hals, der in der Schiene des Rahmens (71) aufgenommen ist und die Verstellschnecke kämmt; wobei sich die verstellbare Klaue (72) in der Schiene relativ zu der festen Klaue bei einer Drehung der Verstellschnecke bewegt;

wobei ein Raum zwischen jeder Seite des Halses und den entsprechenden gegenüberliegenden Wänden der Schiene definiert ist;

gekennzeichnet durch

zumindest ein Durchgangsloch (721), das in dem Hals vorgesehen ist; und eine Packungsvorrichtung (73), die in dem Durchgangsloch (721) aufgenommen ist und sich **durch** den entsprechenden Raum in einen Eingriff mit der entsprechenden gegenüberliegenden Wand erstreckt, wobei die Packungsvorrichtung (73) ein elastisches Element (732)

aufweist, das in dem Durchgangsloch (721) der verstellbaren Klaue (72) angebracht ist, und wobei sie zwei Kugeln (731) aufweist, die entsprechend an beiden Enden des elastischen Elementes (732) gestützt sind und aus dem Durchgangsloch (721) der verstellbaren Klaue (72) gegen die entsprechende gegenüberliegende Wand gedrückt werden.

3. Verstellbarer Schraubenschlüssel (1; 4) gemäß Anspruch 1, wobei die Packungsvorrichtung (41, 42) für einen Reibungswiderstand zwischen der verstellbaren Klaue (30) und dem Rahmen (10) sorgt.

4. Verstellbarer Schraubenschlüssel (1; 4) gemäß einem der Ansprüche 1 bis 3, wobei die verstellbare Klaue (30, 72) des weiteren einen Schiebblock (32) aufweist, der an einer Bodenseite des unteren Halses (31) angeordnet ist; wobei der untere Hals (31) und der Schiebblock (32) der verstellbaren Klaue (30; 72) in der Schiene (13) des Rahmens (10; 71) aufgenommen sind.

Revendications

1. Clé réglable (1) comprenant :

un cadre (10), ledit cadre (10) comprenant une mâchoire fixe (12) et un canal (13) à une extrémité de celle-ci ;

une vis sans fin de réglage (21) montée à pivot par rapport audit cadre (10) pour tourner librement ;

une mâchoire réglable (30) ayant un col inférieur (31) reçu dans ledit canal (13) dudit cadre (10) et en prise avec ladite vis sans fin de réglage (21) ; ladite mâchoire réglable (30) se déplace dans ledit canal (13) par rapport à ladite mâchoire fixe (12) lorsqu'on fait tourner ladite vis de réglage (21) ;

dans laquelle un espace est défini entre chaque côté dudit col (31) et chacune des parois opposées dudit canal (13) ;

caractérisée par :

au moins un trou traversant (341, 342) disposé dans ledit col (31) ; et

un dispositif d'appui (41, 42) reçu dans ledit trou traversant (341, 342) et s'étendant à travers chacun desdits espaces pour venir en prise avec chacune desdites parois opposées ;

dans laquelle ledit dispositif d'appui (41, 42) est un élément élastique cylindrique avec des extrémités respectivement en prise avec lesdites parois opposées.

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2. Clé réglable (4) comprenant :

un cadre (71), ledit cadre (71) comprenant une mâchoire fixe et un canal à une extrémité de celle-ci ;

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une vis sans fin de réglage tournée vers ledit cadre (71) pour tourner librement ;

une mâchoire réglable (72) ayant un col inférieur reçu dans ledit canal dudit cadre (71) et en prise avec ladite vis de réglage ; ladite mâchoire réglable (72) se déplace dans ledit canal par rapport à ladite mâchoire fixe lorsqu'on fait tourner ladite vis de réglage ;

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dans laquelle un espace est défini entre chaque côté dudit col et chacune des parois opposées dudit canal ;

caractérisée par :

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au moins un trou traversant (721) disposé dans ledit col ; et

un dispositif de liaison (73) reçu dans ledit trou traversant (721) et s'étendant à travers chacun desdits espaces pour venir en prise avec chacune desdites parois opposées, dans laquelle ledit dispositif de liaison (73) comprend un élément élastique (732), monté dans ledit trou traversant (721) de ladite mâchoire réglable (72), et deux billes (731), respectivement supportées sur deux extrémités dudit élément élastique (732) et sorties de force dudit trou traversant (721) de ladite mâchoire fixe (72) respectivement contre lesdites parois opposées.

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3. Clé réglable (1 ; 4) selon la revendication 1, dans laquelle ledit dispositif d'appui (41, 42) fournit une résistance au frottement entre ladite mâchoire réglable (30) et ledit cadre (10).

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4. Clé réglable (1 ; 4) selon l'une quelconque des revendications 1 à 3, dans laquelle ladite mâchoire réglable (30 ; 72) comprend en outre un coulisseau (32), disposé au niveau de la face inférieure dudit col inférieur (31) ; ledit col inférieur (31) et ledit coulisseau (32) de ladite mâchoire réglable (30 ; 72) sont reçus dans ledit canal (13) dudit cadre (10 ; 71).

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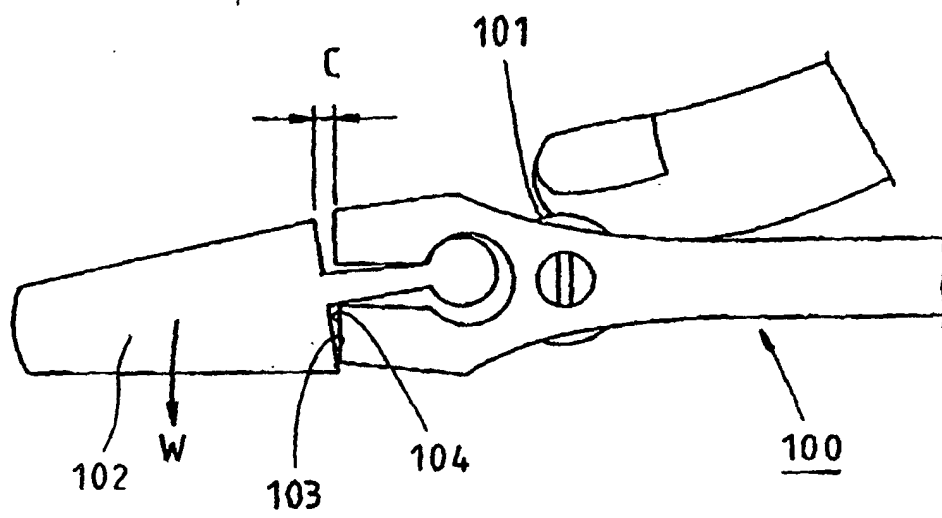


FIG. 1

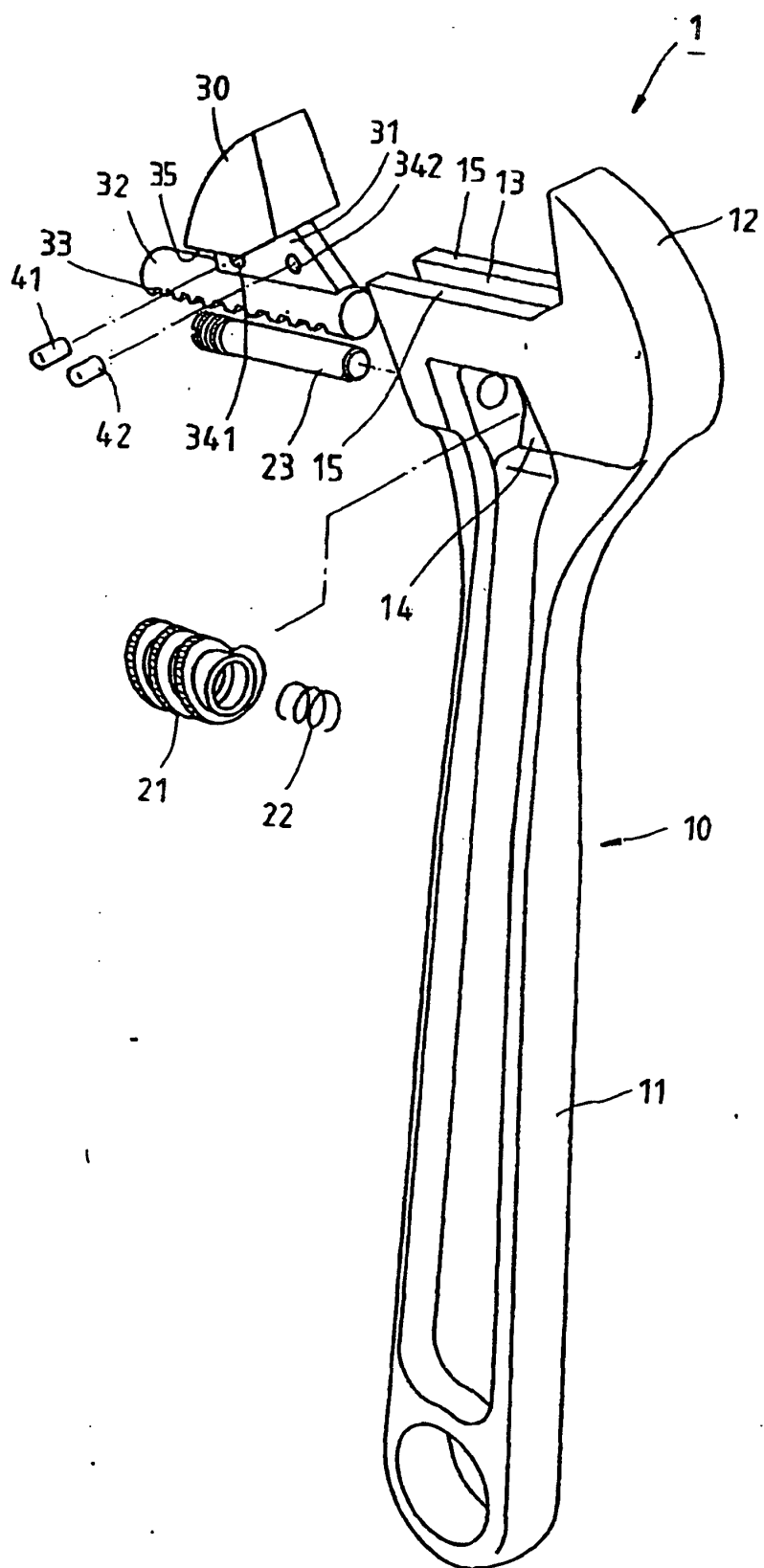


FIG. 2

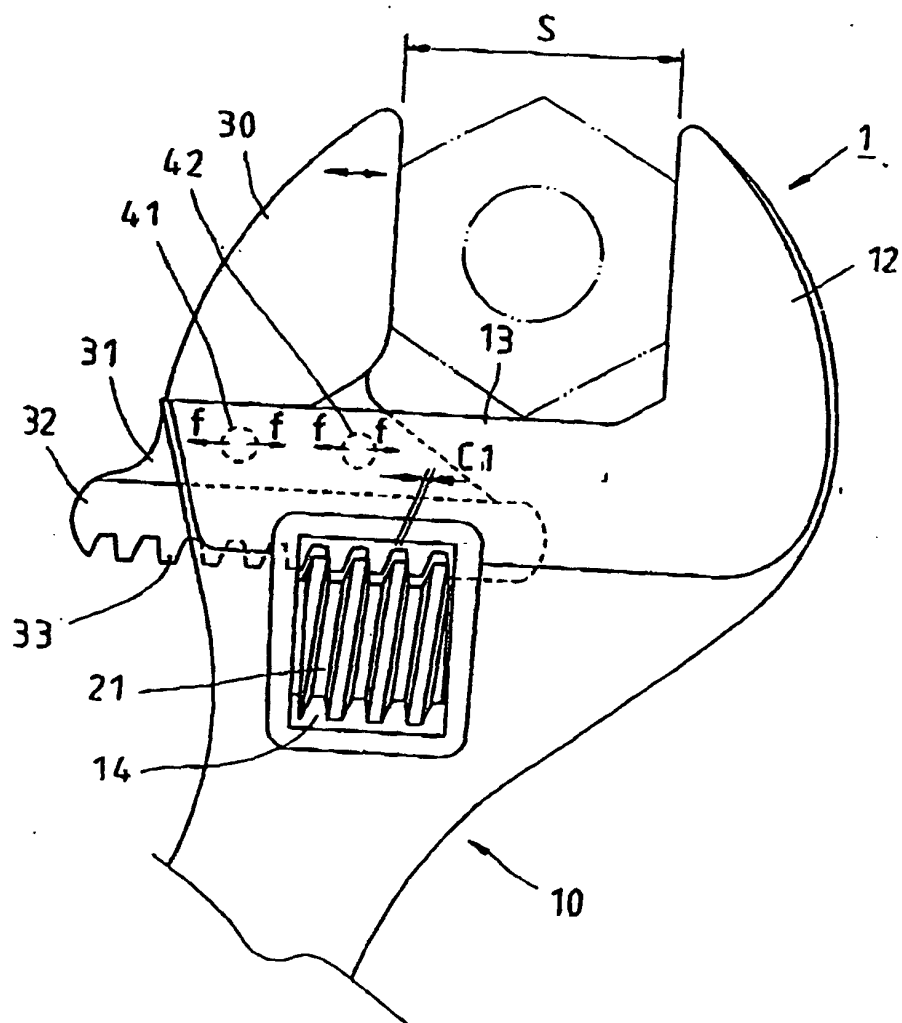


FIG. 3

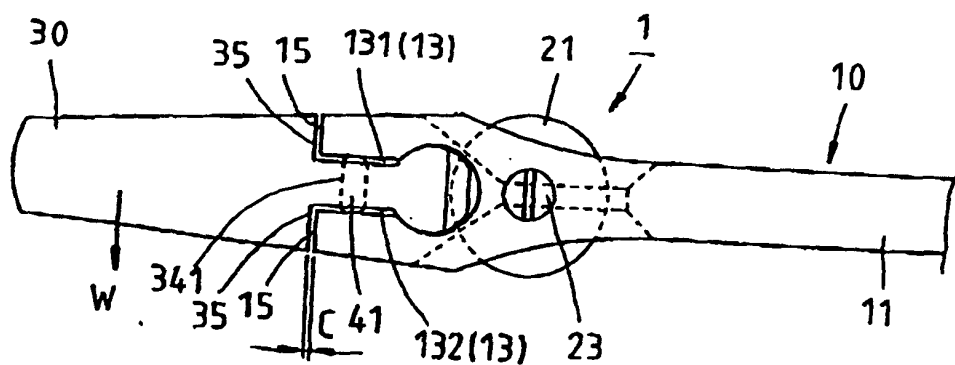
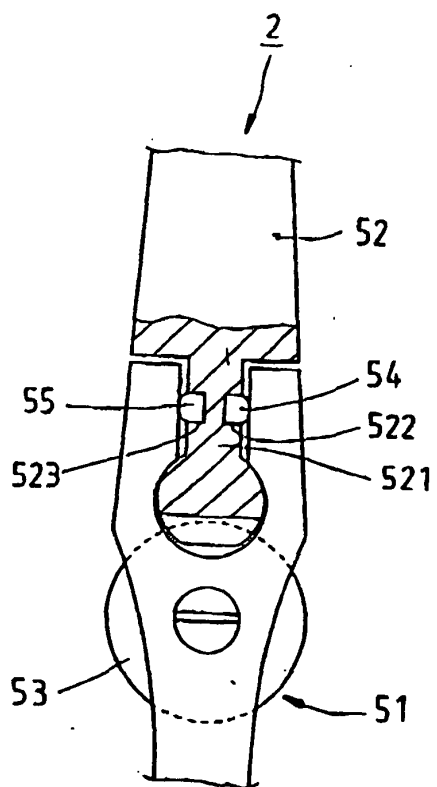
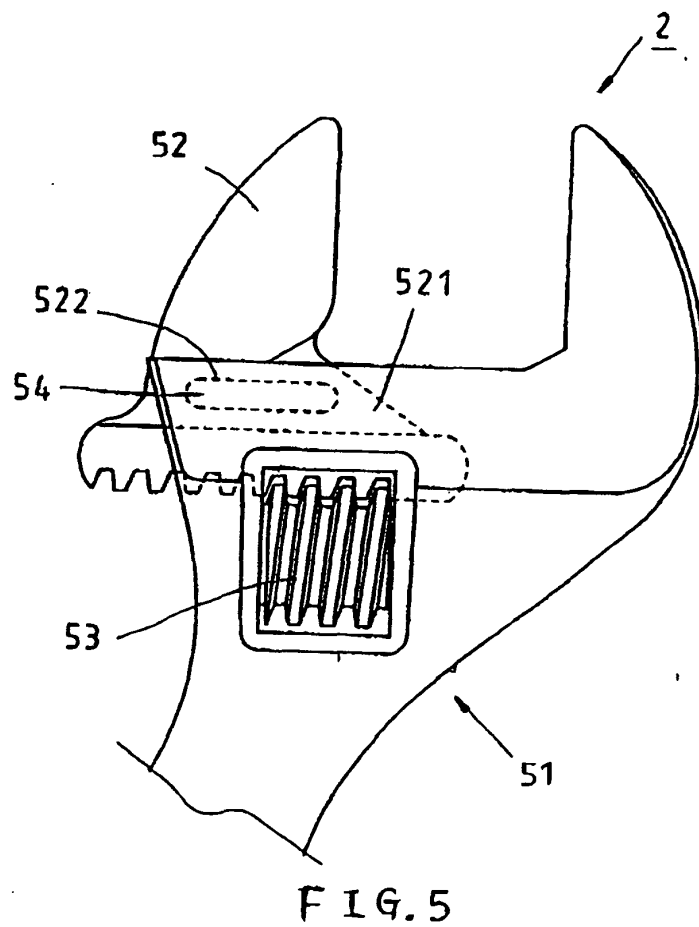


FIG. 4



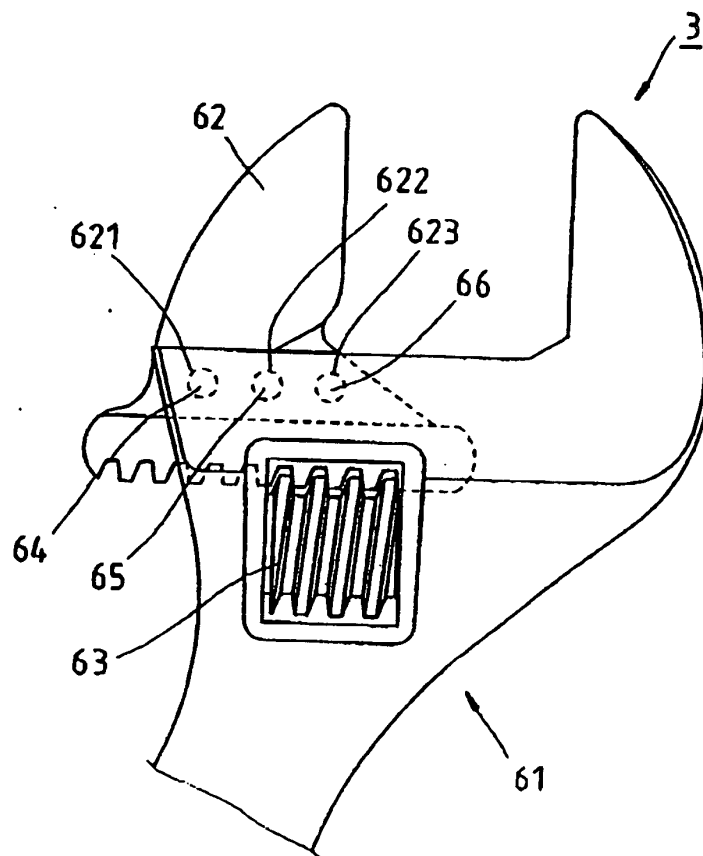


FIG. 7

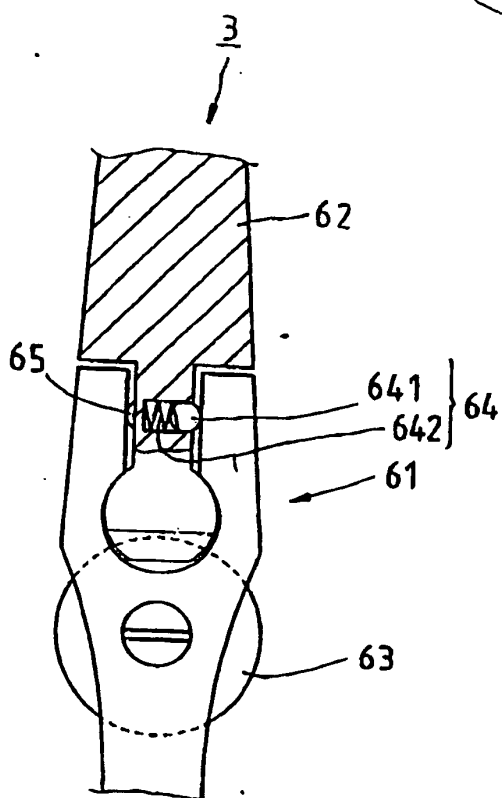


FIG. 8

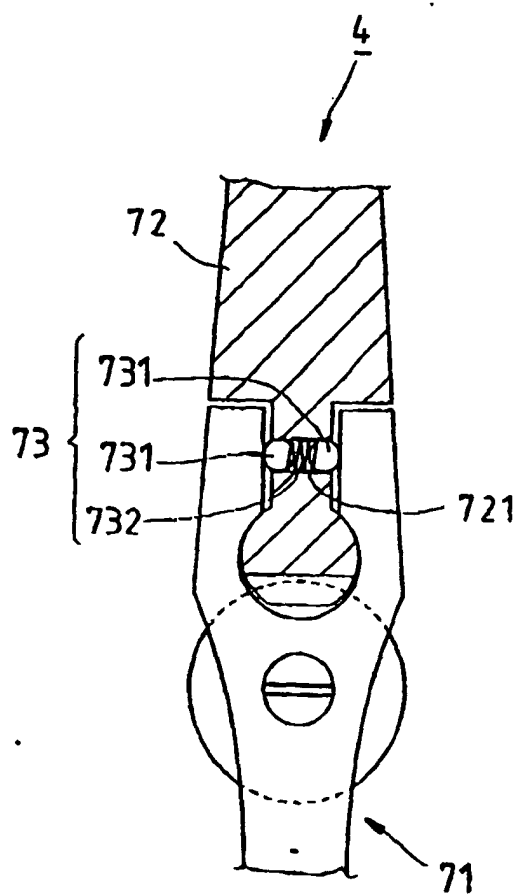


FIG. 9

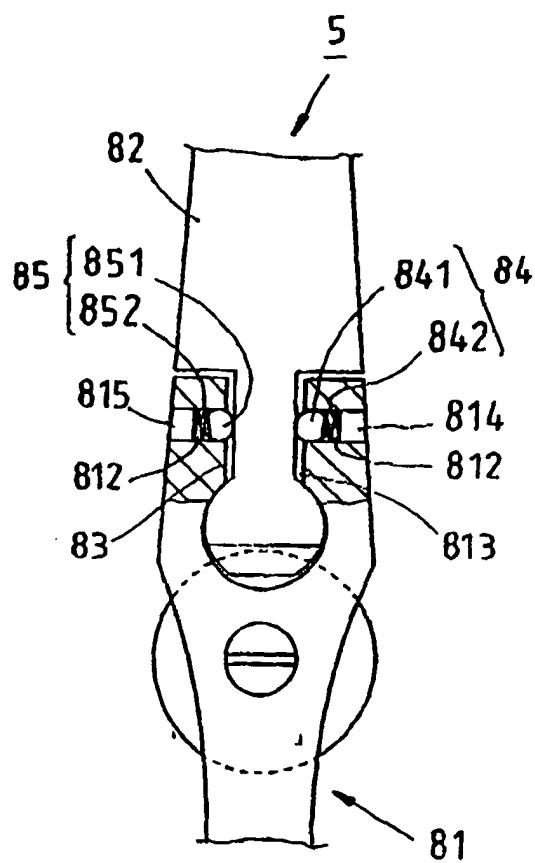


FIG. 10

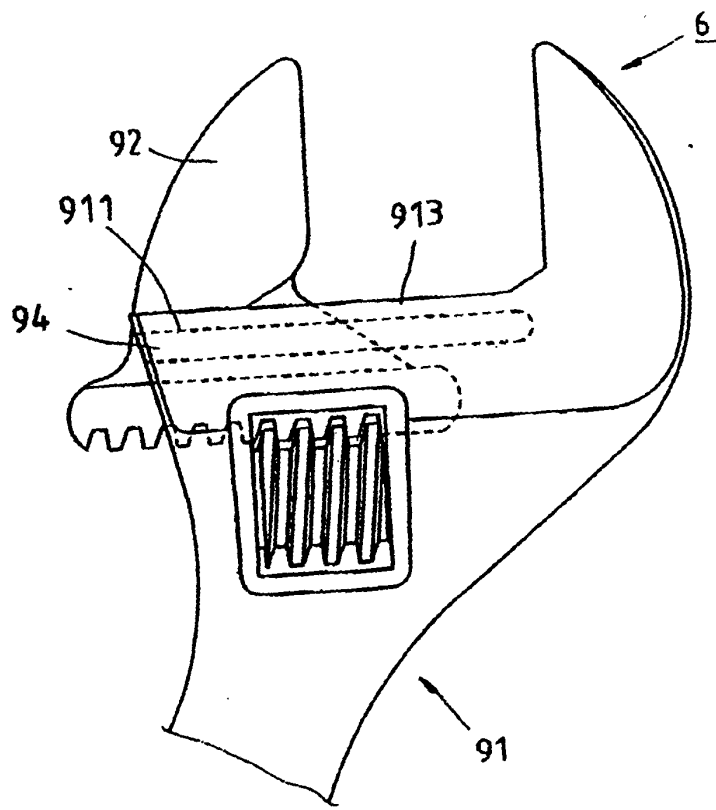


FIG. 11

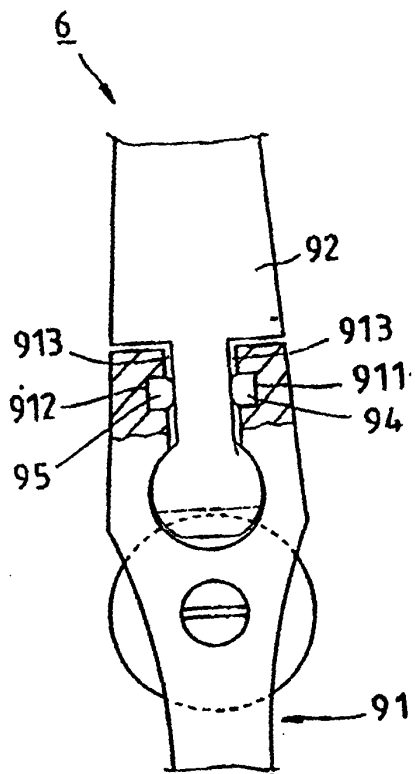


FIG. 12