(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 249 313 A1

(12) EUROPEAN PATENT APPLICATION

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

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

(21) Application number: **01109074.3**

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

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE TR
Designated Extension States:
AL LT LV MK RO SI

(71) Applicant: **Wu, Arthur**
Shen Kang, Hsiang, Taichung (TW)

(72) Inventor: **Wu, Arthur**
Shen Kang, Hsiang, Taichung (TW)

(74) Representative: **Kühn, Alexander**
Patentanwälte Tiedtke-Bühling-Kinne & Partner,
Bavariaring 4
80336 München (DE)

Remarks:
Amended claims in accordance with Rule 86 (2) EPC.

(54) Adjustable wrench

(57) An adjustable wrench includes a frame (10), having a handle (11), a fixed jaw and a track (13) at one end of the handle. An adjusting worm (21) pivoted to the frame for free rotation. An adjustable jaw (30), having one end received in the track and meshed with the adjusting worm for moving relative to the fixed jaw upon rotating the adjusting worm. Two spaces defined at the two sides of adjustable jaw within the track. At least one packing device (41) provided in each of the two spaces, having one end at one of the adjustable jaw and the frame, the other end being against the other of the adjustable jaw and the frame.

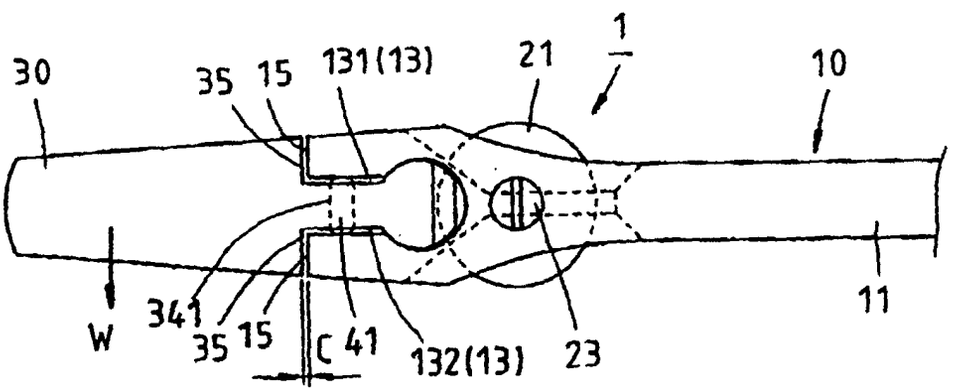

FIG.4

EP 1 249 313 A1

Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to hand tools and, more specifically, to an adjustable wrench.

[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 occurence 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.

SUMMARY OF THE INVENTION

[0003] 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.

[0004] To achieve the object of the present invention, an adjustable wrench is provided compromised of a frame, having a handle, a fixed jaw and a track at one end of the handle. An adjusting worm is pivoted to the frame for free rotation. An adjustable jaw is mounted in the track and meshed with the adjusting worm and moved relative to the fixed jaw upon rotating the adjusting worm. Two spaces or clearances are defined at two sides of the adjustable jaw within the track of the frame. At least one spacer or packing device is provided in each of two spaces ensuring a minimum width of the respective space for reducing or preventing the friction between side rails of the adjustable jaw and slide rails of the fixed jaw.

[0005] It is an advantageaus 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.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] FIG. 1 illustrates an adjustable wrench constructed according to the prior art.

[0007] FIG. 2 is an exploded view of an adjustable wrench constructed according to a first embodiment of the present invention.

[0008] FIG. 3 is a front view of the adjustable wrench according to the first embodiment of the present invention

[0009] FIG. 4 is a side view of the adjustable wrench according to the first embodiment of the present invention.

[0010] FIG. 5 is a front view of an adjustable wrench constructed according to a second embodiment of the present invention.

[0011] FIG. 6 is a side view of the adjustable wrench according to the second embodiment of the present invention.

[0012] FIG. 7 is a front view of an adjustable wrench constructed according to a third embodiment of the present invention.

[0013] FIG. 8 is a side view of the adjustable wrench according to the third embodiment of the present invention.

[0014] FIG. 9 is a side view of an adjustable wrench constructed according to a fourth embodiment of the present invention.

[0015] FIG. 10 is a side view of an adjustable wrench constructed according to a fifth embodiment of the present invention.

[0016] FIG. 11 is a front view of an adjustable wrench constructed according to a sixth embodiment of the present invention.

[0017] FIG. 12 is a side view of the adjustable wrench according to the sixth embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERED EMBODIMENT

[0018] Referring to FIGS. from 2 through 4, an adjustable wrench 1 in a 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.

[0019] The frame 10 has a handle 11, a fixed jaw 12 at one end of the handle 11, two parallel side rails 15 prependicularly 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.

[0020] 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.

[0021] 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.

[0022] 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 adjusable 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 cach adjustment.

[0023] Referring FIGS. 5 and 6, an adjustable wrench 2 according to a second embodiment of the present invention 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 elogated 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.

[0024] Referring to FIGS. 7 and 8, an adjustable wrench 3 according to a third embodiment of the present invention 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 embodiment, 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.

[0025] FIG. 9 shows an adjustable wrench 4 according to s fourth 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.

[0026] In the aforesaid embodiments, 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.

[0027] FIG. 10 shows an adjustable wrench 5 of a fifth embodiment of the present invention. 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 commu-

nication 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 third embodiment, 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.

[0028] FIGS. 11 and 12 show an adjustable wrench 6 according to a sixth embodiment of the present invention. According to this embodiment, 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.

[0029] 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.

[0030] 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 spirit and scope of the invention. Accordingly, the invention is not to be limited except as by the appended claims.

[0031] An adjustable wrench adjustable wrench includes a frame, having a handle, a fixed jaw and a track at one end of the handle. An adjusting worm pivoted to the frame for free rotation. An adjustable jaw, having one end received in the track and meshed with the adjusting worm for moving relative to the fixed jaw upon rotating the adjusting worm. Two spaces defined at the two sides of adjustable jaw within the track. At least one packing device provided in each of the two spaces, having one end fastened to the adjustable jaw and the other end being against the frame.

Claims

1. An adjustable wrench 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 one end 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 two clearances or spaces, are defined at the two sides of said adjustable jaw within said track of said frame; **characterized in that**
at least one spacer or packing device is provided in each of the spaces; said packing device has one end provided at one of said adjustable jaw and said frame and an opposite end being against the other of said adjustable jaw and said frame.

2. The adjustable wrench of claim 1 wherein said adjustable jaw comprises at least one through hole adapted to receive said at least one packing device respectivley, for enabling the two end of cach of said packing device to be respectively against said frame.

3. The adjustable wrench of claim 2 wherein said packing device is an cylindrical elastic member, having one end mounted in said through hole of said adjustable jaw and the other end being against said frame.

4. The adjustable wrench of claim 2 wherein said packing device comprises an elastic member, mounted in said through hole of said adjustable jaw, and two balls, respectively supported on two ends of said elastic member and forced out of said through hole of said adjustable jaw for against said frame.

5. The adjustable wrench of claim 1 wherein said adjustable jaw comprises at least one recessed slot respectively disposed at each of two opposite sides thereof; said at least one packing device mounted in the at least one recessed slot of said adjustable jaw, respectively.

6. The adjustable wrench of claim 5 wherein said slot of said adjustable jaw is elongated, and said packing device fits the elongated recessed slot of said adjustable jaw.

7. The adjustable wrench of claim 5 wherein said packing device comprises an elastic member, mounted in said recessed slot of said adjustable jaw, and a ball, supported on said elastic member and forced out of the recessed slot for against said frame.

8. The adjustable wrench of claim 1 wherein said frame has at least one slot disposed at each of the two sides of said track; one end of said packing devices mounted in said slots of said frame respectively, and the other end of said packing devices be-

ing against said adjustable jaw.

9. The adjustable wrench of claim 8 wherein said slots of said frame are elongated, and said packing devices having an elongated shape respectively fitting the elongated slots of said frame.

10. The adjustable wrench of claim 1 wherein said frame comprises at least one through hole respectively extended sideways from each of two sides of said track and adapted to receive said at least one packing device; said at least one packing device is respectively mounted in the at least one through hole of said frame and respectively against said adjustable jaw.

11. The adjustable wrench of claim 10 wherein said through has a stop element respectively fixedly fastened to an outer end of said through hole; said packing device comprises an elastic member, mounted in said through hole of said frame and supported on the stop element, and a ball supported on said elastic member and forced out of the respective through hole of said frame and being against said adjustable jaw.

12. The adjustable wrench of claim 10 wherein said packing device is a cylindrical elastic member, having one end fixedly fastened to said through hole of said frame and the other end being against said adjustable jaw.

13. The adjustable wrench of claim 1 wherein said packing device provides a friction resistance between said adjustable jaw and said frame.

14. The adjustable wrench of claim 1 wherein said adjustable jaw comprises a bottom neck and a sliding block, disposed at a bottom side of said bottom neck; said bottom neck and said sliding block of said adjustable jaw received in said track of said frame; said at least one packing device is respectively mounted in said spaces at two opposite leteral side walls of said track of said frame, each having one end fastened to one side of said bottom neck of said adjustable jaw and an opposite end being against said frame.

15. The adjustable wrench of claim 1 wherein said adjustable jaw comprises a bottom neck and a sliding block disposed at a bottom side of said bottom neck; said bottom neck and said sliding block of said adjustable jaw received in said track of said frame; said at least one packing device is respectively mounted in said spaces and two opposite lateral side walls of said track of said frame, each having one end fastened to said frame and an opposite end stopped against one side of said bottom neck of said adjustable jaw.

Amended claims in accordance with Rule 86(2) EPC.

1. An adjustable wrench 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;
characterised by
at least one through hole provided in said neck; and
a package device fixed in said through hole and extending through each said space into engagement with each of said opposite walls;
wherein said packing device is a cylindrical elastic member with ends respectively engaged against said opposite walls.

2. The adjustable wrench of claim 1, wherein said packing device comprises an elastic member, mounted in said through hole of said adjustable jaw, and two balls, respectively supported on two ends of said elastic member and forced out of said through hole of said adjustable jaw respectively against said opposite walls.

3. The adjustable wrench according to any one of claim 1 or 2, wherein said packing device provides a friction resistance between said adjustable jaw and said frame.

4. The adjustable wrench according to any one of claims 1 to 3, wherein said adjustable jaw further comprises a sliding block, disposed at a bottom side of said bottom neck; said bottom neck and said sliding block of said adjustable jaw received in said track of said frame.

STAND DER TECHNIK

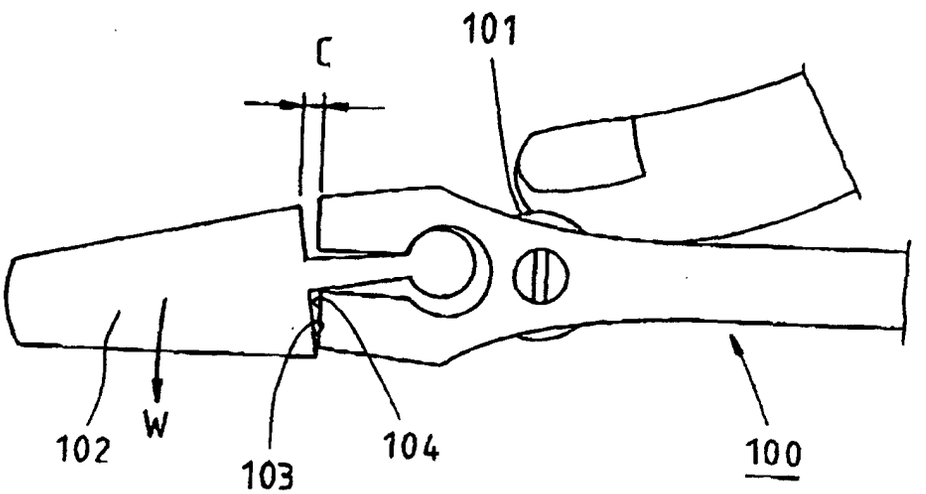

FIG. 1

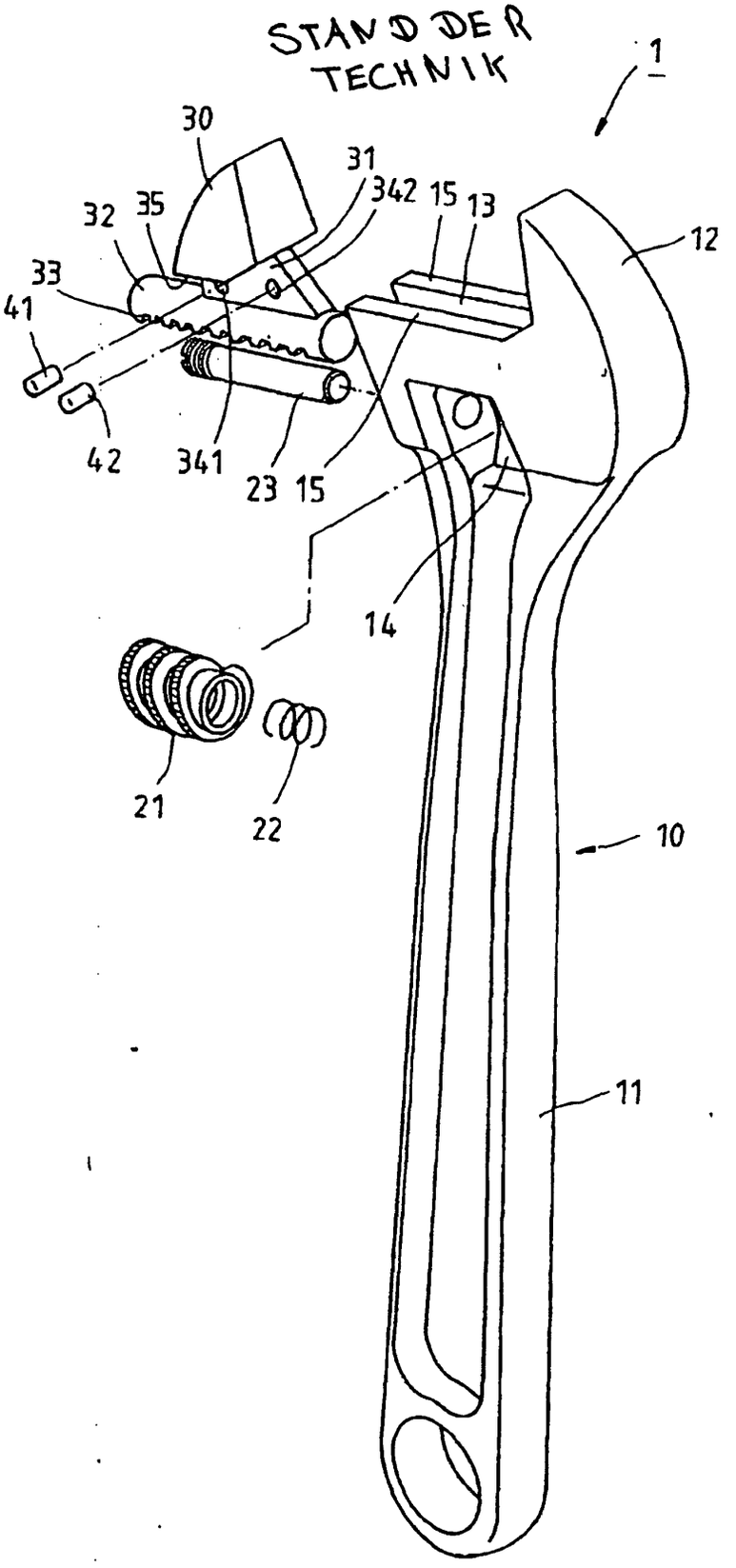
STAND DER TECHNIK
1
30
31
342
15
13
12
32
35
33
41
42
341
23
15
14
21
22
10
11

FIG.2

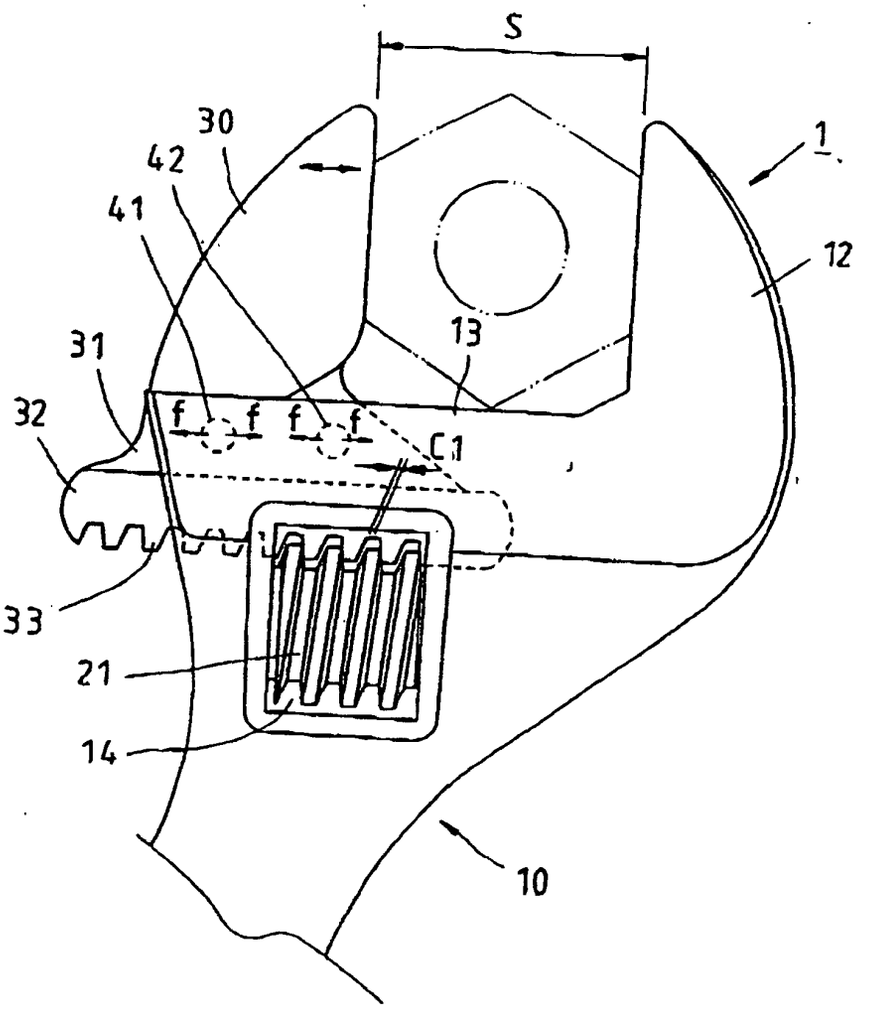
S
30
42
41
1
12
13
31
32
f
f
f
f
C1
33
21
14
10

FIG.3

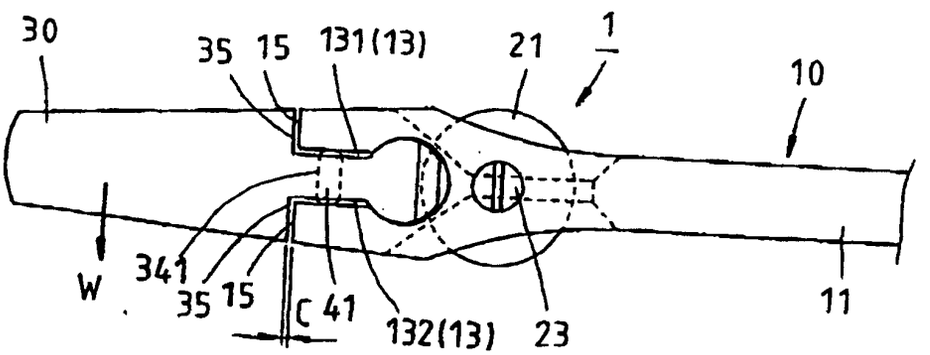
30
35
15
131(13)
21
1
10
W
341
35
15
C 41
132(13)
23
11

FIG.4

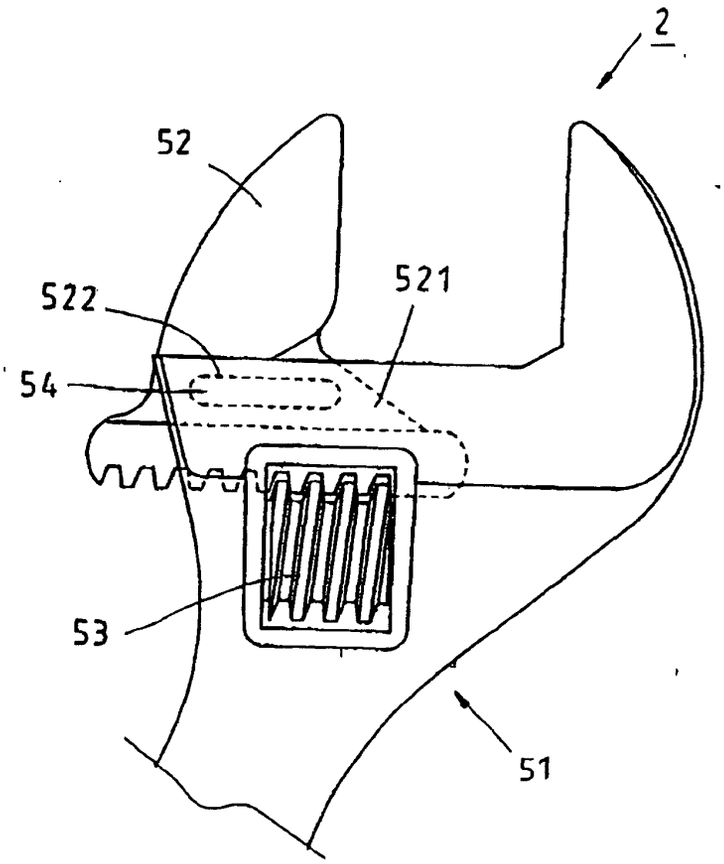

FIG.5

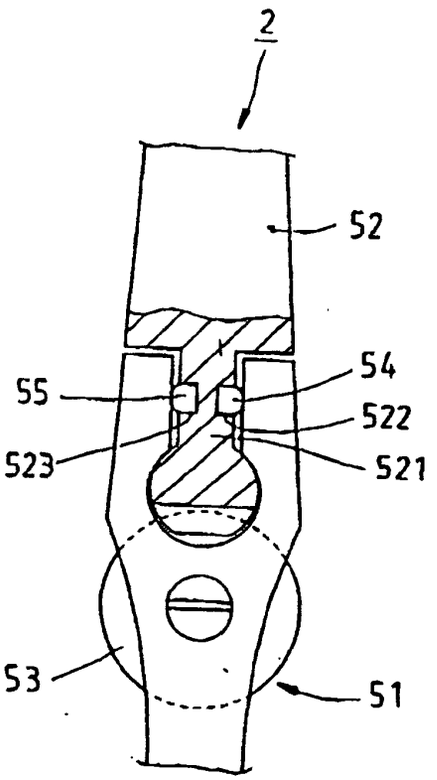

FIG.6

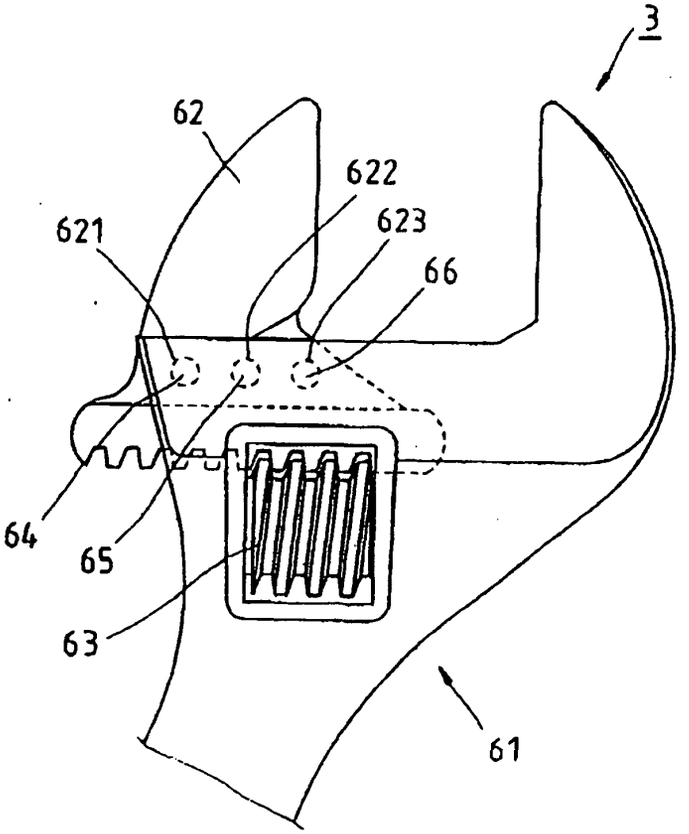

FIG. 7

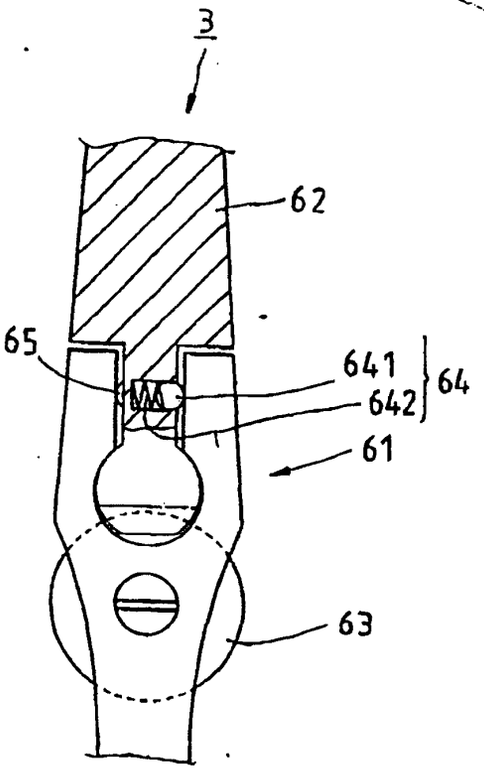

FIG. 8

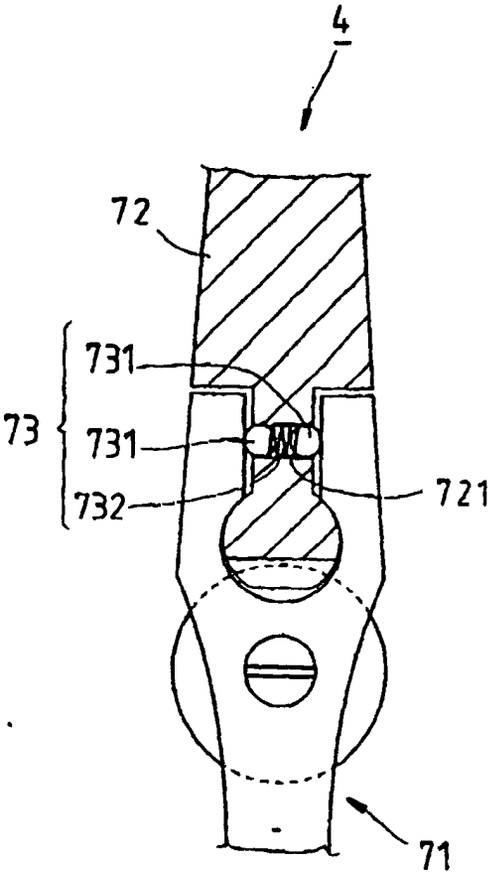
4
72
731
73
731
732
721
71

FIG.9

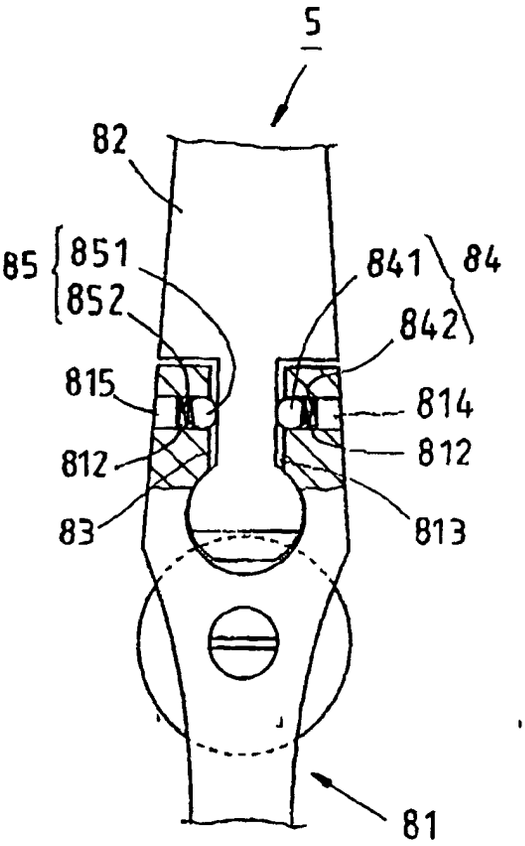
5
82
85
851
852
841
84
842
815
814
812
812
83
813
81

FIG.10

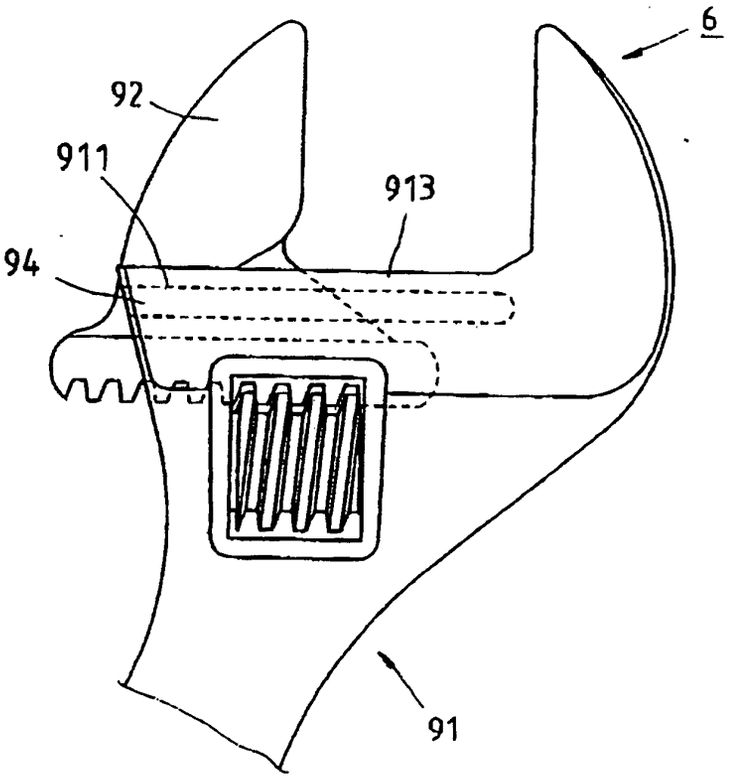

FIG. 11

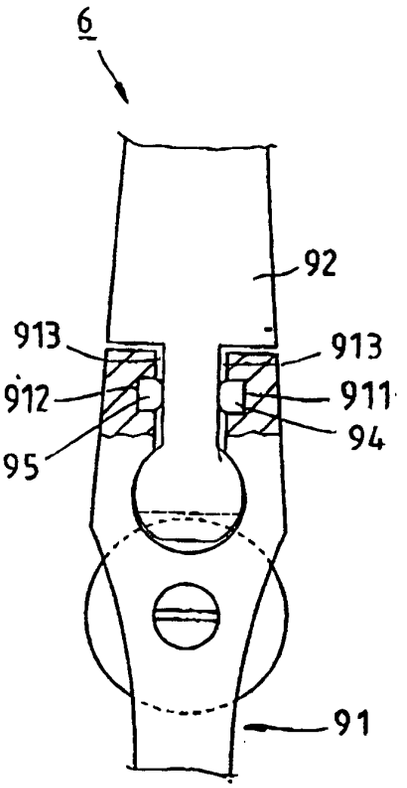

FIG. 12

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 01 10 9074

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	WO 94 01246 A (KZ O K BJURO SOJUZ ;FACHRUTDINOV IREK CHAIRULOVICH (RU); FOMIN VLA) 20 January 1994 (1994-01-20) * figure 3 *	1	B25B13/14
Y	DE 358 684 C (VOLLMER) * page 1, line 40 - line 45; figure 2 *	1,2,5,7, 13-15	
Y	US 4 344 339 A (PENNER JOHN) 17 August 1982 (1982-08-17) * column 4, line 32 - line 38; figure 4 *	1,5,7, 13-15	
Y	FR 916 961 A (ÉTABS MÉCANICARM) 31 January 1947 (1947-01-31) * page 1, line 24 - line 38; figure 2 *	1,5	
Y	US 4 449 431 A (BRUNOSSON BENGT B) 22 May 1984 (1984-05-22) * figures 1,3,4 *	1,2,14	
Y	US 3 546 982 A (KOHLER SAMUEL H ET AL) 15 December 1970 (1970-12-15)	1	TECHNICAL FIELDS SEARCHED (Int.Cl.7)
A	* column 1, line 54 - line 72; figures 1-3 *	7	B25B
A	FR 533 583 A (SCHLOTE GUIDO FRED) 6 March 1922 (1922-03-06) * figure 2 *	1,14	
A	US 1 444 793 A (THOMAS KELLER) 13 February 1923 (1923-02-13) * page 1, line 99 - line 104 *	1	
A	US 2 574 834 A (LEONARD JOHN R) 13 November 1951 (1951-11-13) * column 2, line 39 - line 45 *	8	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	11 October 2001	Carmichael, Guy

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 01 10 9074

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

11-10-2001

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
WO 9401246	A	20-01-1994	DE	4393213 T0	20-07-1995
			WO	9401246 A1	20-01-1994
DE 358684	C		NONE		
US 4344339	A	17-08-1982	NONE		
FR 916961	A	31-01-1947	NONE		
US 4449431	A	22-05-1984	SE	441075 B	09-09-1985
			JP	57156173 A	27-09-1982
			JP	62019990 B	01-05-1987
			SE	8101151 A	21-08-1982
US 3546982	A	15-12-1970	NONE		
FR 533583	A	06-03-1922	NONE		
US 1444793	A	13-02-1923	NONE		
US 2574834	A	13-11-1951	NONE		

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82