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(72) Inventor: **Wang, Mei-Jung**
Taichung (TW)

(74) Representative:
LOUIS, PÖHLAU, LOHRENTZ & SEGETH
Postfach 3055
90014 Nürnberg (DE)

(71) Applicant: **Wang, Mei-Jung**
Taichung (TW)

(54) **Locking device and guide member for a movable jaw of an adjustable wrench**

(57) An adjustable wrench includes a handle and a head extended from the handle. The head includes a fixed jaw, a movable jaw, and an adjusting screw. The movable jaw is rectilinearly movable relative to the fixed jaw upon rotation of the adjusting screw. A locking de-

vice is provided for locking the adjusting screw in place to thereby preventing rotation of the adjusting screw. A guide member is provided for guiding rectilinear movement of the movable jaw to thereby prevent staggering of the movable jaw.

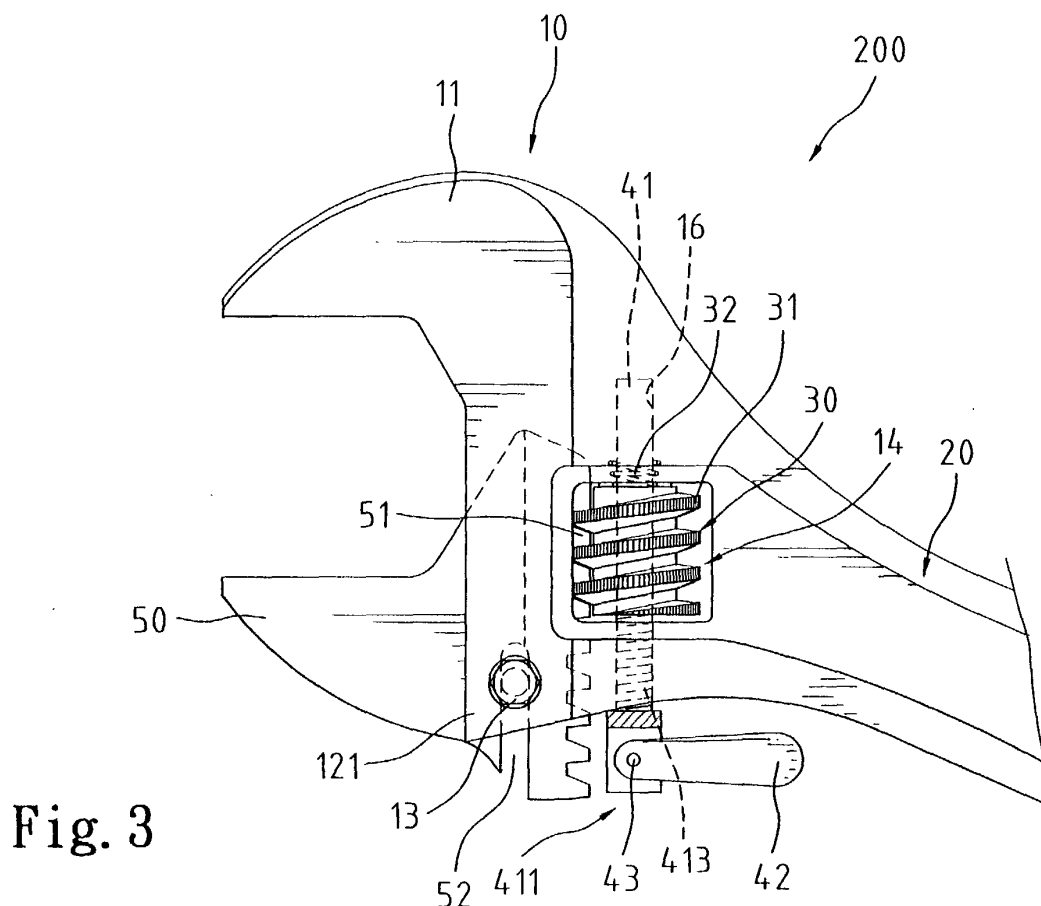


Fig. 3

Description

Background of the Invention

1. Field of the Invention

[0001] The present invention relates to a locking device for retaining a movable jaw of an adjustable wrench after a fastener has been held between the movable jaw and a fixed jaw of the adjustable wrench. The present invention also relates to a guide member for preventing staggering of the movable jaw.

2. Description of the Related Art

[0002] Fig. 7 of the drawings illustrates a conventional adjustable wrench. It is well known to use an adjustable wrench for holding and driving fasteners (e.g., nuts, bolts, etc.) of various sizes. After the fastener has been securely clamped between the movable jaw 1 and the fixed jaw 3 by means of rotating an adjusting screw 2 of the adjustable wrench, the adjusting screw 2 is rotated in a reverse direction to form a gap between the jaws and the fastener for allowing easy disengagement of the jaws from the fastener and reengagement of the jaws with the fastener. The disengagement/reengagement of the jaws from/with the fastener are repeated until the fastener is tightened or loosened. If the gap is too small, the disengagement/reengagement is very difficult, yet the corner areas of a hexagonal outer periphery of the fastener will be damaged if the gap is too large. In addition, the adjusting screw tends to be rotated inadvertently during operation of the adjustable wrench such that the gap becomes larger, which results in damage to the corner areas of the fastener. The adjustable wrench is thus known as "nut killer". Further, the upper and lower side walls 4 (only one of them is shown) of the head of the adjustable wrench are apt to be damaged or deformed, as some users use the adjustable wrench as a hammer. As a result, the movable jaw 1 staggers when holding a fastener and thus causes damage to the corner areas of the fastener.

Summary of the Invention

[0003] It is an object of the present invention to provide a locking device for retaining a movable jaw of an adjustable wrench after a fastener has been held between the movable jaw and a fixed jaw of the adjustable wrench.

[0004] It is another object of the present invention to provide a guide member for preventing staggering of the movable jaw of an adjustable wrench.

[0005] In accordance with a first aspect of the invention, an adjustable wrench comprises:

- a handle;
- a head extended from the handle, the head includ-

ing a fixed jaw, a movable jaw, and an adjusting screw, the movable jaw being rectilinearly movable relative to the fixed jaw upon rotation of the adjusting screw; and

means for locking the adjusting screw in place.

[0006] The movable jaw includes a rack portion for engaging with the adjusting screw, and the head includes a track groove along which the rack portion of the movable jaw is moved. The head includes a compartment that is defined by two mutually facing walls and that is communicated with the track groove. The adjusting screw is freely rotatably received in the compartment. One of the walls includes a blind hole, and the other wall includes a screw hole. The locking means includes a locking rod that extends through the blind hole, the adjusting screw, and the screw hole. The locking rod includes a threaded portion that engages with the screw hole, and the locking rod is rotatable to a position such that the threaded portion of the locking rod is in contact with the adjusting screw, thereby preventing rotation of the adjusting screw. A turn-piece is mounted to an end of the locking rod for manually turning the locking rod by the turn-piece. The end of the locking rod includes a slit and a transverse through-hole. The turn-piece includes an end received in the slit of the locking rod. A pin is extended through the transverse through-hole of the end of the locking rod and a hole in the end of the turn-piece.

[0007] The head includes an end opposite to the fixed jaw, the end of the head including two mutually facing upper and lower side walls, the upper side wall including a first hole, the lower side wall including a second hole that is aligned with the first hole. A guide member is extended through the first hole and the second hole. The movable jaw comprises a groove in which the guide member is located, whereby rectilinear movement of the movable jaw is guided by the guide member. The guide member may be a bolt or a pin.

[0008] In accordance with a second aspect of the invention, an adjustable wrench comprises:

- a handle;
- a head extended from the handle, the head including a fixed jaw, a movable jaw, and an adjusting screw, the movable jaw being rectilinearly movable relative to the fixed jaw upon rotation of the adjusting screw; and
- means for guiding rectilinear movement of the movable jaw.

[0009] In accordance with a third aspect of the invention, an adjustable wrench comprises:

- a handle;
- a head extended from the handle, the head including a fixed jaw, a movable jaw, and an adjusting screw, the movable jaw being rectilinearly movable

relative to the fixed jaw upon rotation of the adjusting screw;
 means for locking the adjusting screw in place; and
 means for guiding rectilinear movement of the movable jaw.

[0010] Other objects, advantages, and novel features of the invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings.

Brief Description of the Drawings

[0011]

Fig. 1 is a perspective view of a head portion of an adjustable wrench in accordance with the present invention.

Fig. 2 is an exploded perspective view of the head portion of the adjustable wrench in accordance with the present invention.

Fig. 3 is a top view of the head portion of the adjustable wrench in accordance with the present invention.

Fig. 4 is a top view similar to Fig. 3, illustrating operation of the adjustable wrench.

Fig. 5 is a top view similar to Fig. 4, wherein a locking device of the adjustable wrench is in a locking position for preventing displacement of an adjusting screw.

Fig. 6 is an exploded perspective view of a modified embodiment of the head portion of the adjustable wrench in accordance with the present invention.

Fig. 7 is a top view of a conventional adjustable wrench.

Detailed Description of the Preferred Embodiment

[0012] Referring to Figs. 1 through 6 and initially to Figs. 1 through 3, an adjustable wrench 200 in accordance with the present invention generally includes a handle 20 and a head 10 extended from the handle 20. The head 10 includes a fixed jaw 11 formed on a side thereof and a movable jaw 50. The other side of the head 10 includes a track groove 12 defined therein along which a rack portion 51 of the movable jaw is moved. The other side of the head 10 includes two mutually facing upper and lower side walls 121 and 123, the upper side wall 121 having a hole 122 and the lower side wall 123 having a screw hole 124 aligned with the hole 122. A guide member 13 (in the form of a bolt) is extended through the hole 122 and the screw hole 124. As illustrated in Fig. 3, the bolt 13 is received in a groove 52 in the movable jaw 50 to guide rectilinear movement of the movable jaw 50 relative to the fixed jaw 11, thereby preventing staggering of the movable jaw 11. The diameter of the bolt 131 is the same as or slightly smaller than a width of the groove 52. In conventional designs, the

movable jaw 11 tends to stagger when it is moved away from the fixed jaw 11 by a larger distance, yet this drawback is mitigated by the provision of the guide member (i.e., the bolt) 13. The bolt 13 also provides improved structural strength for the head 10 of the adjustable wrench 200.

[0013] The head 10 of the adjustable wrench 200 further includes an opening or compartment 14 for rotatably receiving an adjusting screw 30 that meshes with the rack portion 51 of the movable jaw 50. A blind hole 16 is defined in a wall 14a that defines a portion of the compartment 14, and a screw hole 15 is defined in another wall 14b that defines another portion of the compartment 14 and that faces the wall 14a, best shown in Fig. 2.

[0014] A locking device 40 is provided to retain the adjusting screw 30 in place after the movable jaw 50 has been moved to a position for tightening/loosening operation of a fastener. As illustrated in Fig. 2, the locking device 40 includes a locking rod 41 and a turn-piece 42.

The locking rod 41 has a threaded portion 413 and a slit 411 defined in an end thereof. A pin 43 is extended through a transverse through-hole 412 in the end of the locking rod 41 and a hole 421 in an end of the turn-piece 42 that is received in the slit 411 of the locking rod 41.

The locking rod 41 is extended through the screw hole 15, a longitudinal hole 33 of the adjusting screw 30, and the blind hole 16. An elastic member 32 is mounted around the locking rod 41 and attached between the wall 14a and an end of the adjusting screw 30 for biasing the adjusting screw 30 toward the other wall 14b. The adjusting screw 30 may rotate freely in the compartment 14 for moving the movable jaw 50 away from or toward the fixed jaw 11. The adjusting screw 30 has a helical anti-slip surface 31 to avoid slip during manual rotation.

[0015] Referring to Fig. 4, when in use, the movable jaw 50 is moved toward the fixed jaw 60 upon manual rotation of the adjusting screw 30 to securely clamp a fastener (e.g., a nut 60). Next, the adjusting screw 30 is rotated in a reverse rotation to obtain required gap between the jaws 11 and 50 and the nut 60 for operation. Then, the turn-piece 42 is turned until the threaded portion 413 is in contact with the adjusting screw 30 (see Fig. 5), thereby preventing rotation of the adjusting screw 30. Thus, potential damage to the corner areas 61 of the nut 60 is prevented.

[0016] Of course, the adjustable wrench 200 may be retained in this status such that it can remain on the nut 60 even if the user's hand lets go. Thus, the user may leave the working site for other priority matters, and the adjusting wrench will be still there when he/she returns.

[0017] Fig. 6 illustrates a modified embodiment of the adjustable wrench, wherein the guide member is in the form of a pin 13a, and the hole 124 in the lower side wall 123 is not a screw hole.

[0018] Although the invention has been explained in relation to its preferred embodiment, it is to be understood that many other possible modifications and variations can be made without departing from the spirit and

scope of the invention as hereinafter claimed.

Claims

1. An adjustable wrench (200) comprising:

a handle (20);
a head (10) extended from the handle (20), the head (10) including a fixed jaw (11), a movable jaw (50), and an adjusting screw (30), the movable jaw (50) being rectilinearly movable relative to the fixed jaw (11) upon rotation of the adjusting screw (30); and
means for locking the adjusting screw (30) in place.

2. The adjustable wrench as claimed in claim 1, wherein the movable jaw (50) includes a rack portion (51) for engaging with the adjusting screw (30), and wherein the head (10) includes a track groove (12) along which the rack portion (51) of the movable jaw (50) is moved.

3. The adjustable wrench as claimed in claim 2, wherein the head (10) includes a compartment (14) that is defined by two mutually facing walls and that is communicated with the track groove (12), the adjusting screw (30) being freely rotatably received in the compartment (14).

4. The adjustable wrench as claimed in claim 3, wherein one of the walls (14a) includes a blind hole (16), and the other wall (14b) includes a screw hole (15), and wherein the locking means (40) includes a locking rod (41) that extends through the blind hole (16), the adjusting screw (30), and the screw hole (15).

5. The adjustable wrench as claimed in claim 4, wherein the locking rod (41) includes a threaded portion (413) that engages with the screw hole (15), and wherein the locking rod (41) is rotatable to a position such that the threaded portion (413) of the locking rod (41) is in contact with the adjusting screw (30), thereby preventing rotation of the adjusting screw (30).

6. The adjustable wrench as claimed in claim 5, wherein the locking rod (41) includes an end, further comprising a turn-piece (42) mounted to the end of the locking rod (41) for manually turning the locking rod (41) by the turn-piece (42).

7. The adjustable wrench as claimed in claim 6, wherein the end of the locking rod (41) includes a slit (411) and a transverse through-hole (412), and wherein the turn-piece (42) includes an end re-

ceived in the slit (411) of the locking rod (41), the end of the turn-piece (42) including a hole (421), further comprising a pin extended through the transverse through-hole (412) of the end of the locking rod (41) and the hole (421) of the end of the turn-piece (42).

8. The adjustable wrench as claimed in claim 2, wherein the head (10) includes an end opposite to the fixed jaw (11), the end of the head (10) including two mutually facing upper and lower side walls (121, 123), the upper side wall (121) including a first hole (122), the lower side wall (123) including a second hole (124) that is aligned with the first hole (122), further comprising a guide member (13) extended through the first hole (122) and the second hole (124), the movable jaw (50) comprising a groove (52) in which the guide member (13) is located, whereby rectilinear movement of the movable jaw (50) is guided by the guide member (13).

9. The adjustable wrench as claimed in claim 8, wherein the guide member (13) is a bolt.

10. The adjustable wrench as claimed in claim 8, wherein the guide member (13) is a pin.

11. An adjustable wrench comprising:

a handle (20);
a head (10) extended from the handle (20), the head (10) including a fixed jaw (11), a movable jaw (50), and an adjusting screw (30), the movable jaw (50) being rectilinearly movable relative to the fixed jaw (11) upon rotation of the adjusting screw (30); and
means for guiding rectilinear movement of the movable jaw (50).

12. An adjustable wrench comprising:

a handle (20);
a head (10) extended from the handle (20), the head (10) including a fixed jaw (11), a movable jaw (50), and an adjusting screw (30), the movable jaw (50) being rectilinearly movable relative to the fixed jaw (11) upon rotation of the adjusting screw (30);
means for locking the adjusting screw (30) in place; and
means for guiding rectilinear movement of the movable jaw (50).

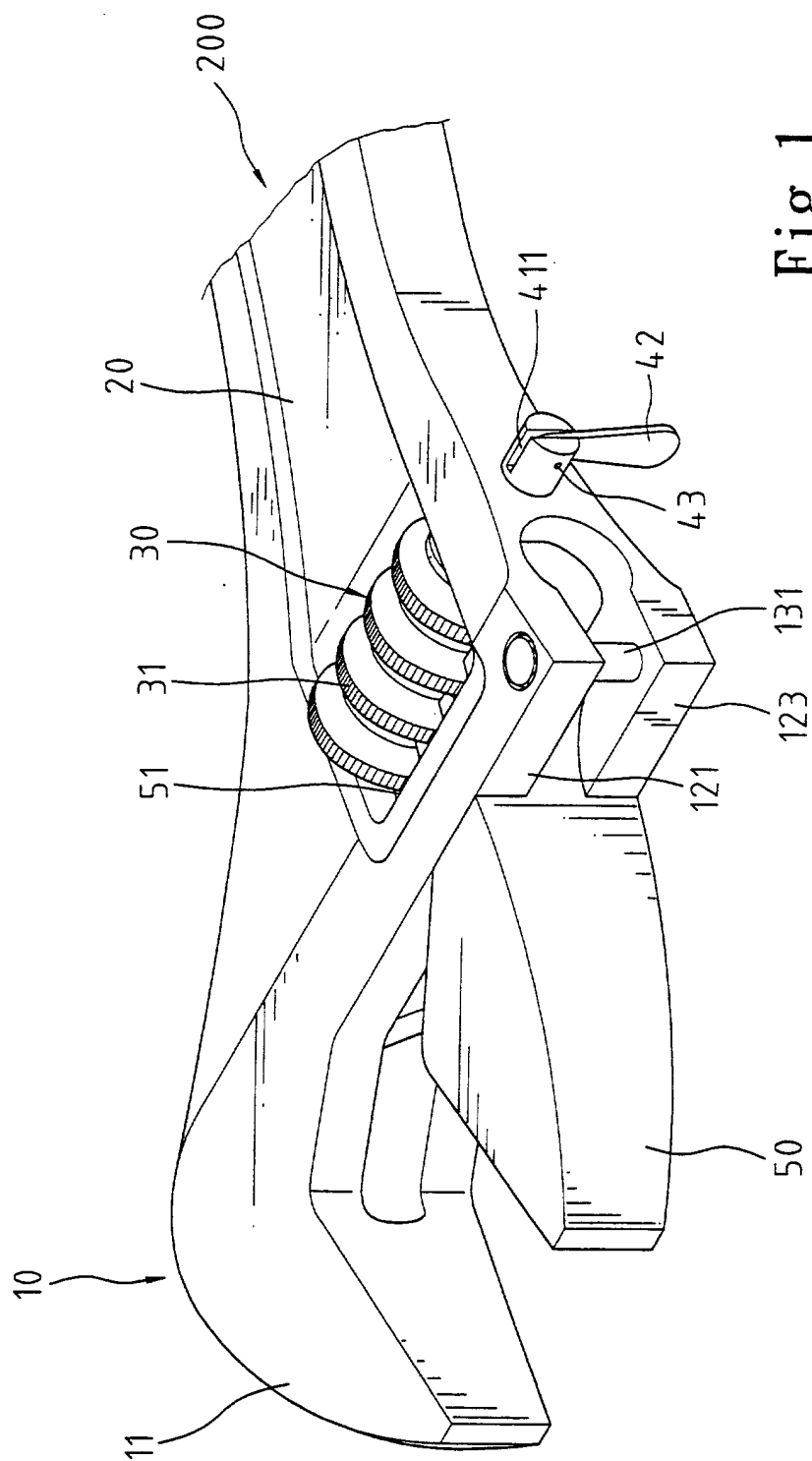


Fig. 1

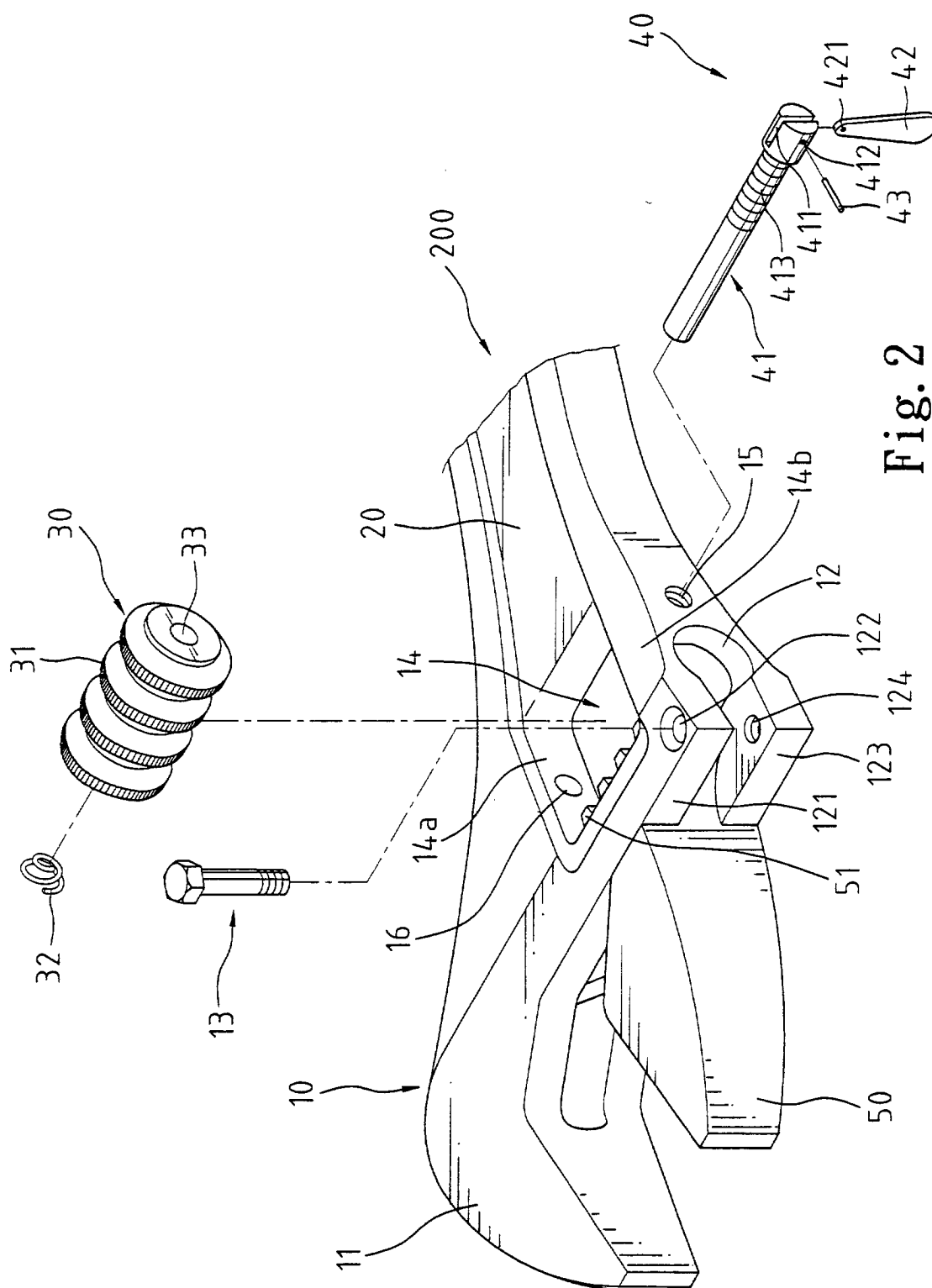


Fig. 2

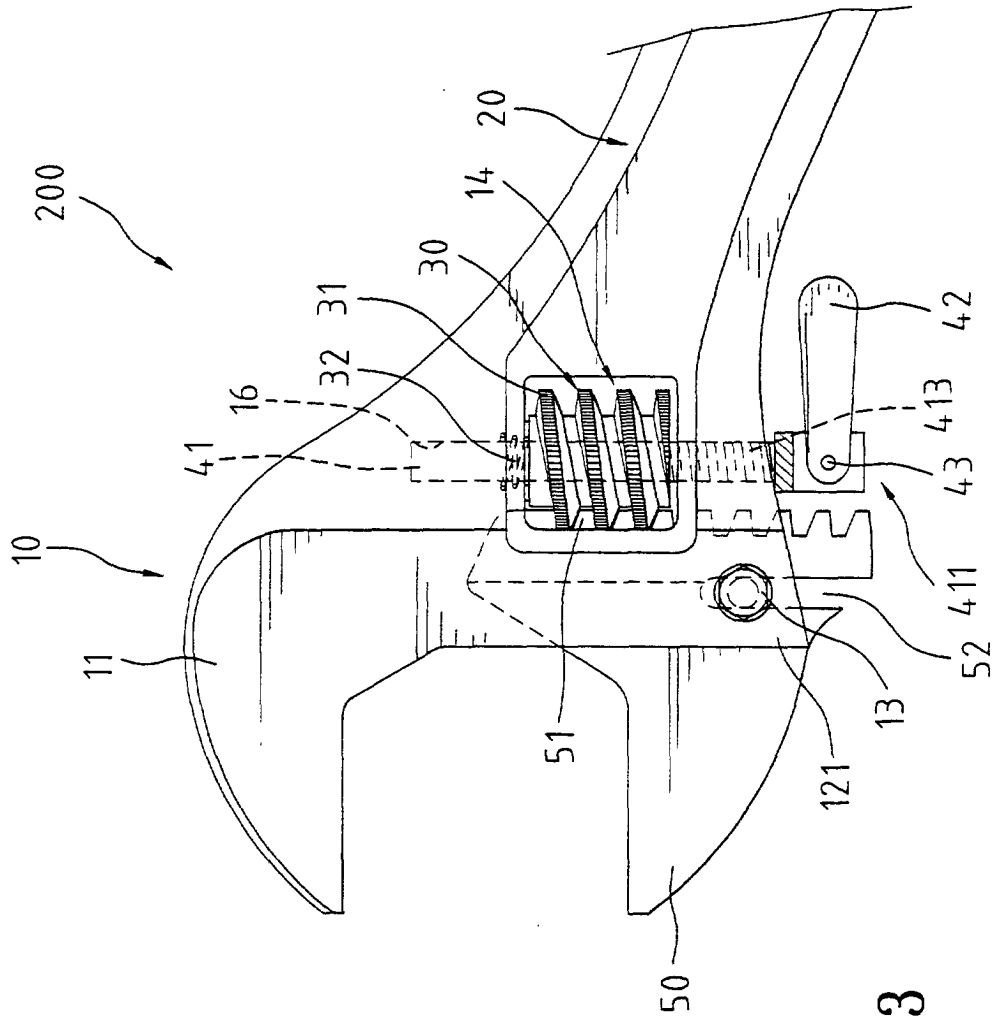


Fig. 3

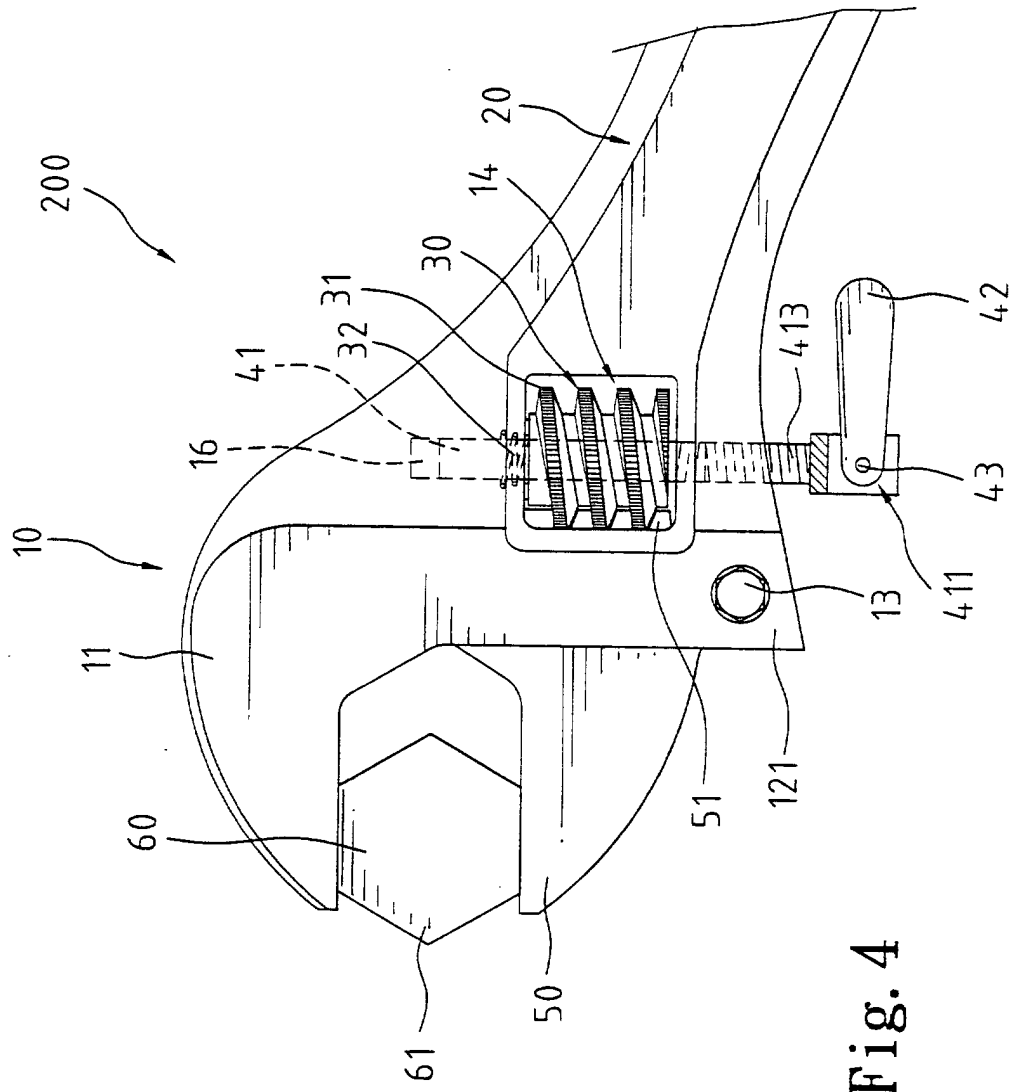


Fig. 4

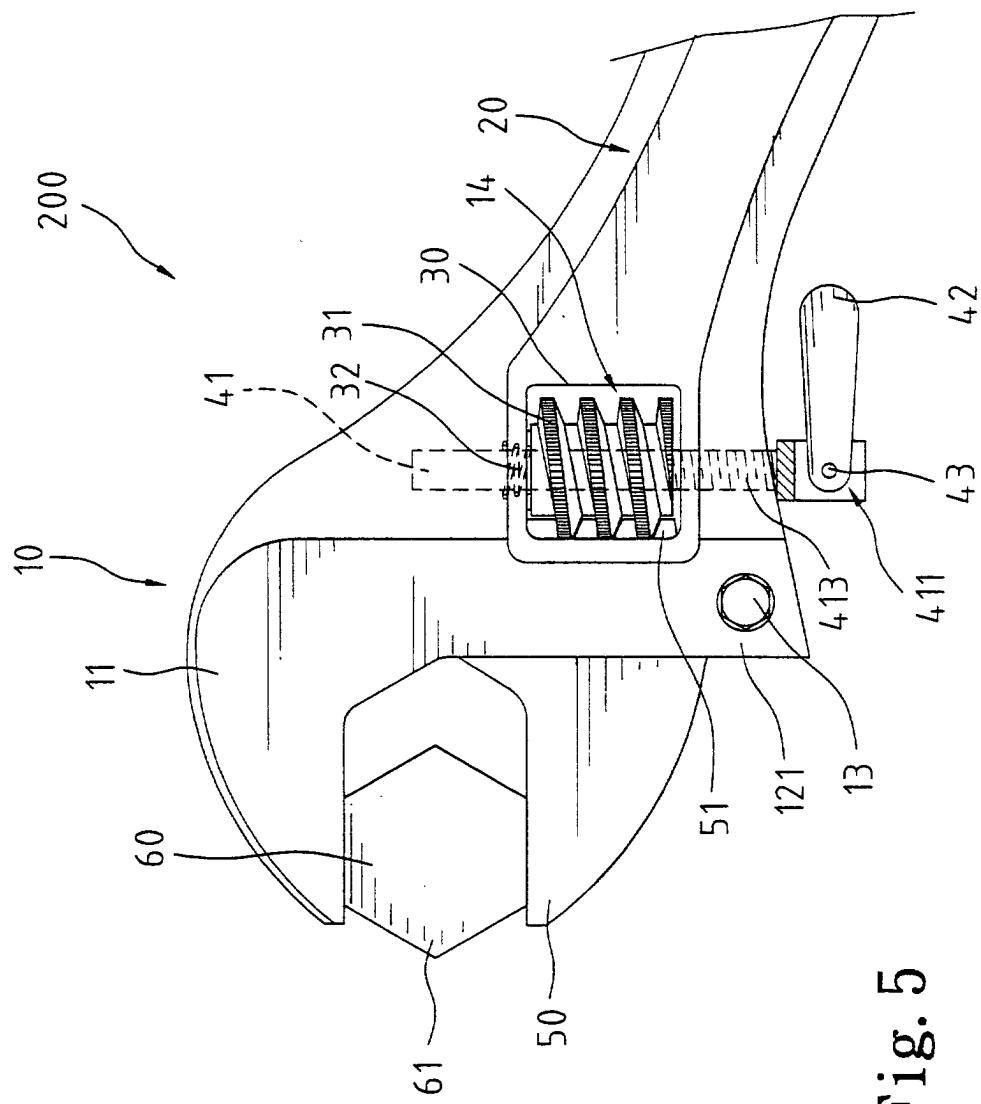


Fig. 5

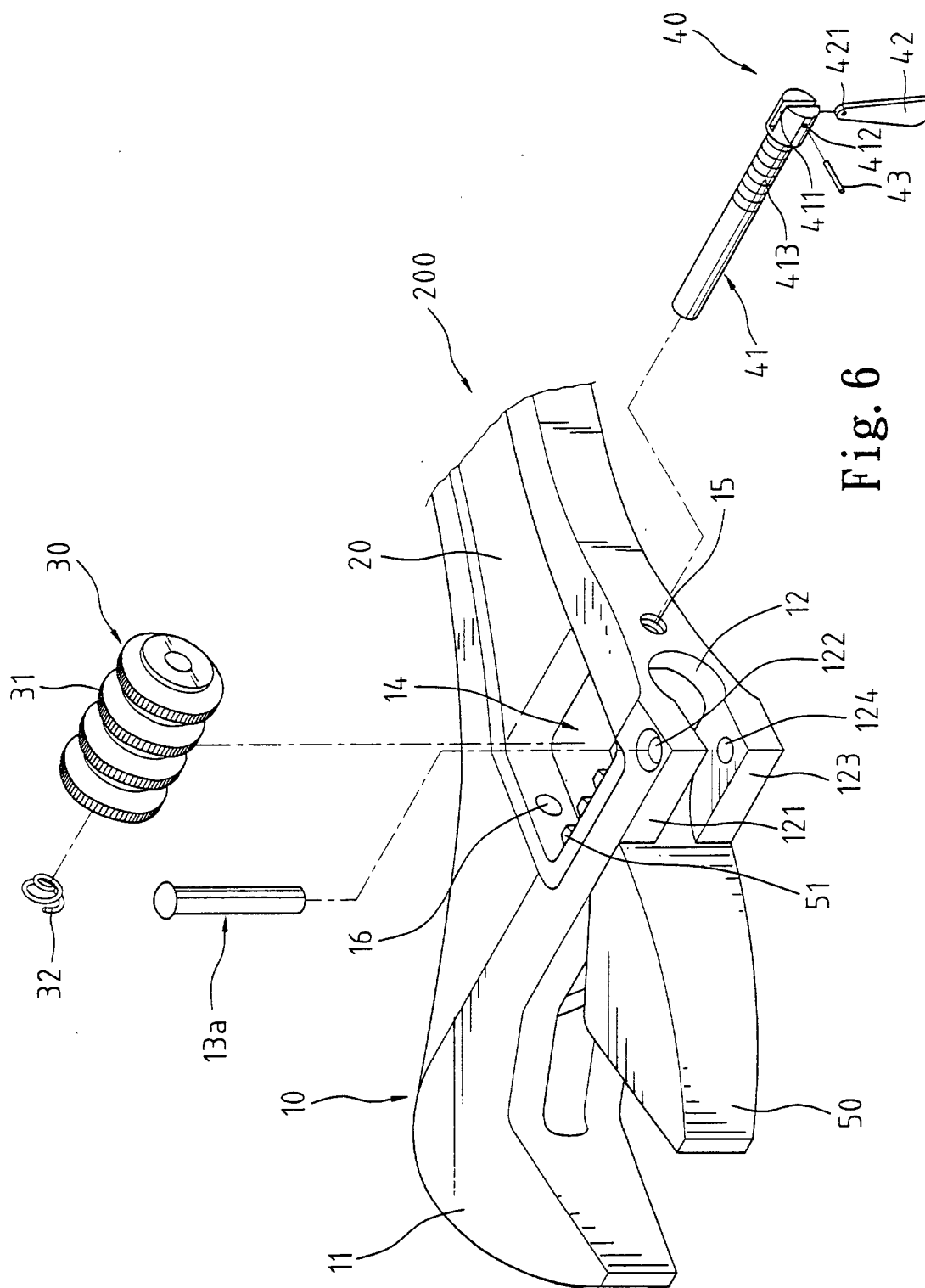


Fig. 6

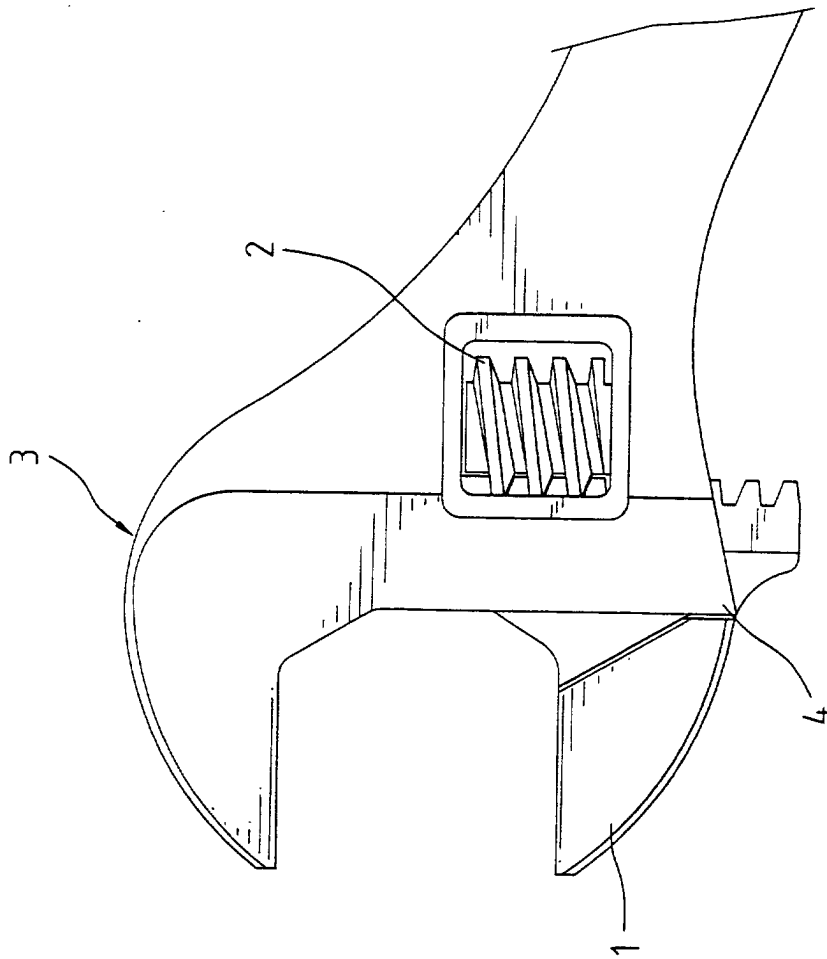


Fig. 7
PRIOR ART



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 00 12 6903

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)
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		-/--	
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 27 August 2001	Examiner Majerus, H
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)



European Patent
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Application Number
EP 00 12 6903

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

- ☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):
- ☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

- ☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- ☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.
- ☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:
- ☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 00 12 6903

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)
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			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 27 August 2001	Examiner Majerus, H
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			

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European Patent
Office

LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 00 12 6903

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. Claims: 1-7

Adjustable wrench with adjusting screw lockable in place

2. Claims: 8-12

Adjustable wrench with means for guiding the rectilinear movement of the movable jaw

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 00 12 6903

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
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27-08-2001

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