(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
16 October 2008 (16.10.2008)

PCT

(10) International Publication Number
WO 2008/123773 A1

(51) International Patent Classification:
B25B 13/46 (2006.01)

(21) International Application Number:
PCT/NL2008/050157

(22) International Filing Date: 20 March 2008 (20.03.2008)

(25) Filing Language: Dutch

(26) Publication Language: English

(30) Priority Data:
2000579 10 April 2007 (10.04.2007) NL

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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*

(54) **Title:** A WRENCH PROVIDED WITH A ROTARY HEAD MECHANISM HAVING PULLING MEANS

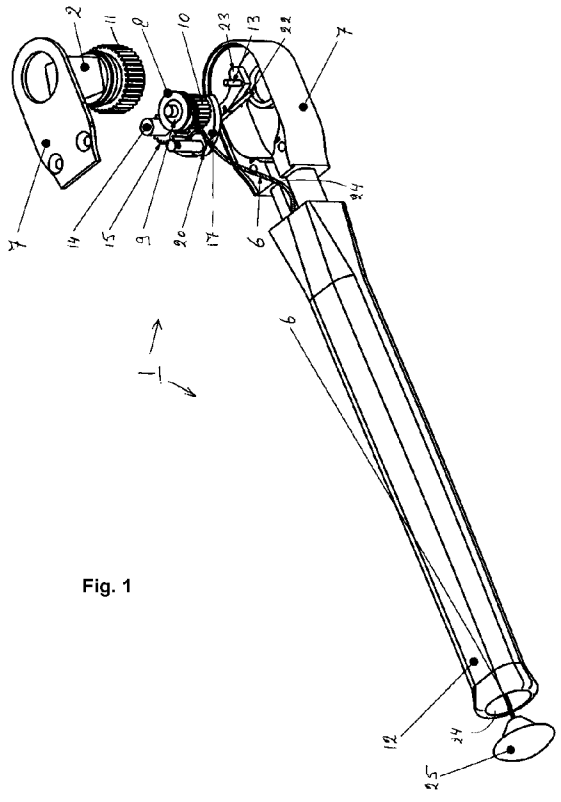

Fig. 1

(57) **Abstract:** There is disclosed a wrench (1), closed end wrench or socket wrench comprising a rotary head (2) and a double-acting rotary head mechanism (3) provided with ratchet means (4). The mechanism is provided with pulling means (5) comprising a pull cord (6), which are connected to the rotary head. When the pull cord is pulled, the rotary head will move in one direction or the other direction, depending on the setting of a tilting element (17). Classic wrenching with the wrench, possibly with the associated ratcheting sounds, remains possible.

WO 2008/123773 A1

A WRENCH PROVIDED WITH A ROTARY HEAD MECHANISM HAVING PULLING MEANS

The present invention relates to a wrench comprising a rotary head and a double-acting rotary head mechanism provided with ratchet means.

The present invention further relates to a method and to a double-acting rotary head mechanism suitable for use in a wrench, socket wrench, ratchet wrench or closed end wrench set comprising a rotary head.

Such a wrench is known, for example from US 2007/0012141 A1. The wrench that is known therefrom comprises a double-acting rotary mechanism on the rotary head. On the one hand, the rotary head of the wrench is rotated in a known, classic manner by wrench means, to be referred to below as ratchet wrench means, by pivoting (usually manually) an elongated handle connected to the rotary head. On the other hand, a further rotary mechanism is provided for transmitting a torque to the rotary head, which mechanism is based on pivoting the elongated handle about is longitudinal axis.

A drawback of the known double-acting mechanism is the relatively complex construction, which usually includes conical gears, as well as the amount of space that needs to be available all around for transmitting torque - or, in other known embodiments, swinging/pivoting force - to the handle to a sufficient degree. The complex construction of the known wrench further increases the weight and the cost price of the wrench; it makes such a tool liable to malfunction, whilst in addition a wrench having a known T-shaped end on the handle can only be operated by using two hands. Furthermore, such a wrench is not easy to use in

practice, whilst the risk of the wrench undesirably becoming detached from the socket, the nut or the head of a bolt increases when two hands are used, as is necessary, with all its consequences.

The object of the present invention is to provide a wrench that has been improved as regards one or more of the above points and a method for rotating the rotary head thereof.

In order to accomplish that object, the wrench according to the invention is characterised in that the mechanism is provided with pulling means connected to the rotary head.

The method comprises a similar feature, wherein the rotary head is rotated by pulling a pull cord of pulling means connected to a rotary head of a wrench.

The advantage of the wrench and the method according to the invention is inter alia the fact that it is now possible to quickly make the free turns that nuts or bolts generally must make before they can actually be tightened with some force by means of a wrench or, conversely, be easily loosened by simply pulling a pull cord of the pulling means.

Hardly any lateral space, if at all, is required for pulling the pulling means, in particular when said pulling takes place in a straight line. This is true all the more if, as preferred, the pull cord extends in longitudinal direction through a hollow handle. Moreover, said pulling at the pulling means can take place by one hand, with the other hand being available for preventing the rotary head from slipping off. This makes working with the wrench according to the invention safer and more efficient.

In an embodiment which is preferred in practice, the wrench according to the invention is fitted with a reversing mechanism gear comprising a first and/or a second gear to be brought into engagement with the rotary head gear, if desired, which can be reversed in a simple manner by tilting. As a result, the pulling means, which may or may not be combined with the ratchet, are capable of rotating the rotary head quickly and effectively in one or the other direction of rotation upon being pulled.

The wrench, a double-acting rotary mechanism for use therein, and the respective method according to the present invention will now be explained in more detail with reference to the figures below, in which like parts are provided with the same reference numerals. In the drawing:

Figure 1 is an exploded view of a possible embodiment of a wrench according to the invention;

Figure 2 is a detail view of a double-acting rotary mechanism used in the wrench of figure 1; and

Figure 3 is a bottom view of rotary mechanism shown in the detail view of figure 2.

Figure 1 shows a socket wrench, ratchet wrench, closed end wrench, nut wrench, to be referred to below as wrench 1, details of which are shown in figures 2 and 3. The wrench 1 comprises a rotary head 2 having a square head (in this embodiment), onto which a socket or box key can be snapped. Generally, such a wrench comprises a rotary head having a reversible direction of rotation with a unidirectional freewheel. Onto such a head, a socket or other means for tightening or loosening bolts or nuts is placed. The wrench 1 further comprises a double-acting rotary head mechanism 3 yet to be explained in more detail, which is provided with means 4 which may or may not audibly

ratchet upon being rotated, but which will be referred to below as ratchet wrench means 4 in either case. Such means 4 have already been used in common wrenches for manually and adjustably rotating the rotary head 2 in one direction or the other. The double-acting rotary head mechanism 3 is provided with pulling means 5 connected to the rotary head 2.

The pulling means 5 are made up of a wire, cable, strap, belt, chain which is generally pulled out manually, called pull cord 6 hereinafter, which is wound on a drawing pulley 8 of a particular diameter mounted in a housing 7. The drawing pulley 8 is rotatably mounted on a first shaft 9 via means enabling the pulley 8 to freewheel in one direction, such as a unidirectional bearing, as a result of which the pulley 8 will rotate in clockwise direction when the cord 6 is being pulled, causing a first gear 10 on the shaft 9 to rotate along therewith. When the cord 6 is released, the pulley 8 will freely rotate in anti-clockwise direction, however, under the influence of an internal retracting spring (not shown), without rotating the gear 10. Retracting means could also be realised in the form of elastic means to be accommodated at some location within the wrench 1, or use could be made of a so-called clock spring or an electric spring motor, for example, for pulling out and/or retracting the cord 6.

The rotary head 2, which is rotatably mounted in the housing 7, comprises a rotary head gear 11, which may be in engagement with the first gear 10 driven by the pull cord 6, causing the rotary head to rotate in one direction. When a wrenching force is manually exerted in classic fashion in that direction of rotation on a stable handle 12 that is fixedly connected to the rotary head 2, a first pin 16 (yet to be explained) mounted near the pulley 8, which slips between the internal surface of the housing 7 and the teeth of the rotary head gear 11, locks the rotary head 2 against

rotation, so that the rotary head will rotate along with the wrench 1 in said one direction. Thus a strong wrenching force can also be exerted in a known fashion in said one direction. The first pin 16 has a dual function, as it either locks the rotary head gear 11 in position or, in freewheel mode, audibly ratchets over the teeth of the rotary head gear 11 under spring pressure.

The wrench 1 further comprises a second gear 15 mounted on a second shaft 14, which is to mate with the first gear 10 and the rotary head gear 11. The first gear 10 is not in engagement with the rotary head gear 11 in that situation. Thus, the rotary head 2 rotates in the other direction when the pull cord 6 is being pulled. When a wrenching force is manually exerted in classic fashion on the handle 12, a second pin 13 (yet to be explained in more detail), which comes to be positioned between the inner surface of the housing 7 and the teeth of the rotary head gear 11 in that situation, locks the rotary head 2 against rotation. Thus, a wrenching force can also be exerted in the other direction in a known manner. The second pin 13, too, has a dual function, as it either locks or audibly ratchets over the teeth of the rotary head gear 11 under spring pressure in freewheel mode.

The first shaft 9 and the second shaft 14 are both adjustably supported at positions spaced a fixed distance apart in this case, on an element, in this embodiment configured as a plate 17, which is tiltable in position within the housing 7. In a first tilted position of the plate 17, the first gear 10 engages the rotary head gear 11, and in a second tilted position the second gear 15 engages the gear 11. The desired direction of rotation of the rotary head 2 is thus adjusted by tilting the plate 17.

The wrench 1 comprises an adjustable eccentric mechanism 18 connected to the tiltable plate 17 for influencing the direction in which the rotary head 2 is

rotatable. The illustrated mechanism 18 is in this case built up of an adjusting shaft 19, on which a rotatable eccentric cam 20 is mounted, which slips into an opening 21 of the plate 17 and which determines the tilted position of the plate 17 upon rotation, usually manually, of the adjusting shaft 19.

The wrench 1 further comprises a ratchet/locking mechanism which is connected to the eccentric mechanism 18 under spring tension of a spring 22, and which is automatically adjusted therewith as regards its possible position within the housing 7. The mechanism is provided with the two aforesaid spring-loaded ratchet/locking pins 13 and 16 provided on either side of the rotary head gear 11 on a movable plate 23 disposed loose within the housing 7. Depending on the one tilted position of the plate 17 adjusted by means of the adjusting shaft 19, the pin 13 may for example ratchet over the teeth of the rotary had gear 11 when the pull cord 6 is pulled, in which case the head 2 will rotate in one direction, or the pin 16 comes to be positioned between the teeth of the rotary head gear 11 and the housing 7, having a locking effect when a wrenching force is manually exerted in one direction, but the pin 13 will ratchet when the handle 12 is moved in the reverse direction during said wrenching. Conversely, in another tilted position of the plate 17 the pin 16 will ratchet over the teeth of the rotary head gear 11 when the pull cord 6 is pulled, in which case the head 2 will rotate in the other direction because the second gear 15 has been engaged, with the pin 16 being positioned between the teeth of the rotary head gear 11 and the housing 7 and having a locking effect when a wrenching force is manually exerted in the other direction, whilst the pin 16 will ratchet when the handle 12 is moved in the reverse direction during said wrenching. In an alternative embodiment, pins might in principle also be positioned between teeth of adjacent

gears so as to realise a locking effect, but in that case at least one of said gears will be smaller and will need to be able to handle comparatively more forces and will thus need to be stronger.

Preferably, albeit not necessarily, the pull cord 6, which is under the spring tension of the internal retracting spring in the drawing pulley 8, extends outside the housing 7 through an opening 24 extending in longitudinal direction through the handle 12, which opening can be closed by means of a pull-knob 25, by means of which a pulling force can be exerted on the cord 6. In principle it is not necessary for the cord 6 to extend through the handle 12, the cord 6 may also exit the housing 7 sideways. As the diameter of the drawing pulley 8 increases, the torque to be exerted therewith, given the selected gear transmission ratios, will increase as well. The diameter ratios between the various gears 10, 11, 15 can be selected according to the desired rotational speeds thereof.

CLAIMS

1. A wrench comprising a rotary head, and a double-acting rotary head mechanism provided with ratchet means, characterised in that said mechanism is provided with pulling means connected to the rotary head.

2. A wrench according to claim 1, characterised in that said pulling means comprise a wire, cable, cord, strap, belt or chain to be pulled out manually.

3. A wrench according to claim 1 or 2, characterised in that the wrench comprises a handle that is fixedly connected to the rotary head.

4. A wrench according to claim 3, characterised in that the rotary head is rotatably mounted in a housing, and that the pulling means are at least partially accommodated within the housing.

5. A wrench according to claim 4, characterised in that any further part of the pulling means extends through an opening extending in longitudinal direction through the handle.

6. A wrench according to claim 4 or 5, characterised in that the pulling means accommodated in the housing are provided with a drawing pulley to be rotated when the cord of the pulling means is pulled.

7. A wrench according to claim 6, characterised in that the pulley is mounted on a first shaft by means of a unidirectional bearing.

8. A wrench according to claim 7, characterised in that said pulley is provided with a retracting spring.

9. A wrench according to claim 7 or 8, characterised in that the wrench comprises a first gear mounted on the first shaft, which is to mate with a gear mounted on the rotary head, by means of which gear the rotary head can be rotated in one direction.

10. A wrench according to claim 9, characterised in that the wrench comprises a second gear mounted on a second shaft, which is to mate with said first gear and with the rotary head gear by means of which the rotary head can be rotated in one direction.

11. A wrench according to claim 9 or 10, characterised in that said first and said second shaft are mounted on a tiltable plate.

12. A wrench according to claim 11, characterised in that the wrench comprises an adjustable eccentric mechanism connected to said tiltable plate for influencing the direction in which the rotary head is to be rotated.

13. A wrench according to claim 12, characterised in that the wrench comprises an adjustable ratchet/locking mechanism which is spring loaded connected to said eccentric mechanism.

14. A wrench according to claim 13, characterised in that said ratchet/locking mechanism is provided with two pins mounted on either side of the rotary head gear in the housing, which pins can be adjusted by means of said eccentric mechanism, one of which pins, depending on the setting of the eccentric mechanism, either ratchets over teeth of the rotary head gear or locks the rotary head gear against rotation in one direction or the other direction as a result of being clamping between the rotary head gear on

the one hand and the housing on the other hand.

15. A double-acting rotary head mechanism suitable for use in a wrench, socket wrench, ratchet wrench or open end wrench set comprising a rotary head, characterised in that said mechanism is provided with pulling means connected to the rotary head.

16. A method wherein a rotary head of a wrench is rotated by pulling a pull cord of pulling means connected to said rotary head.

17. A method according to claim 16, characterised in that the rotary head is rotated in clockwise or anti-clockwise direction.

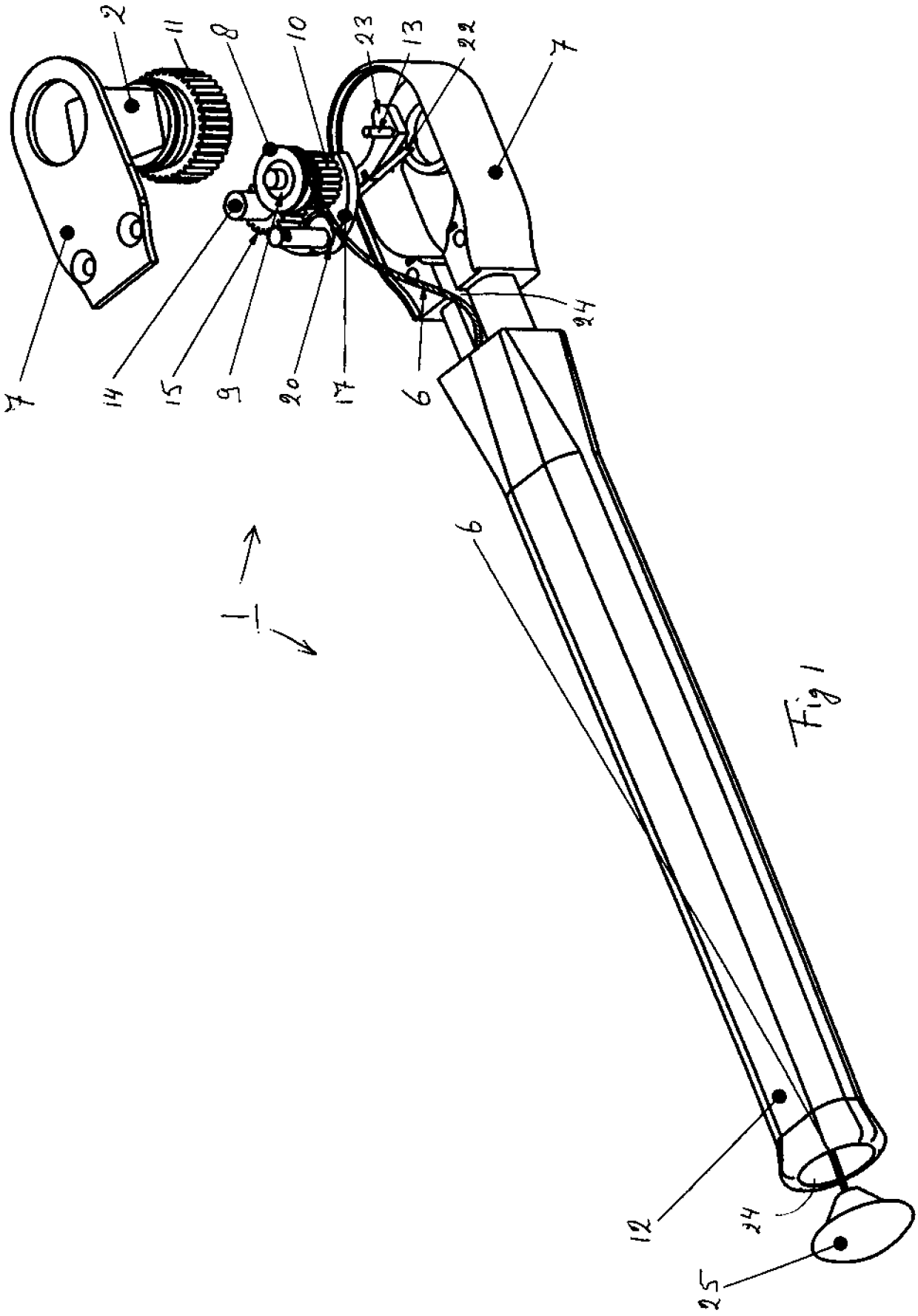

Fig 1

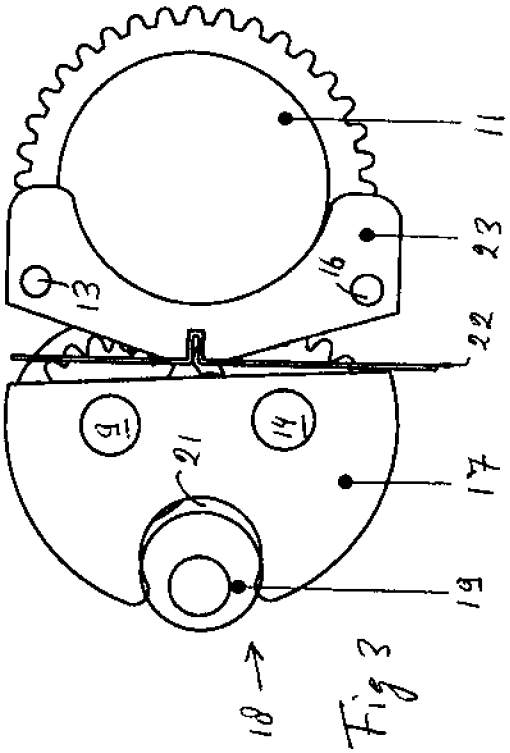
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Fig 3

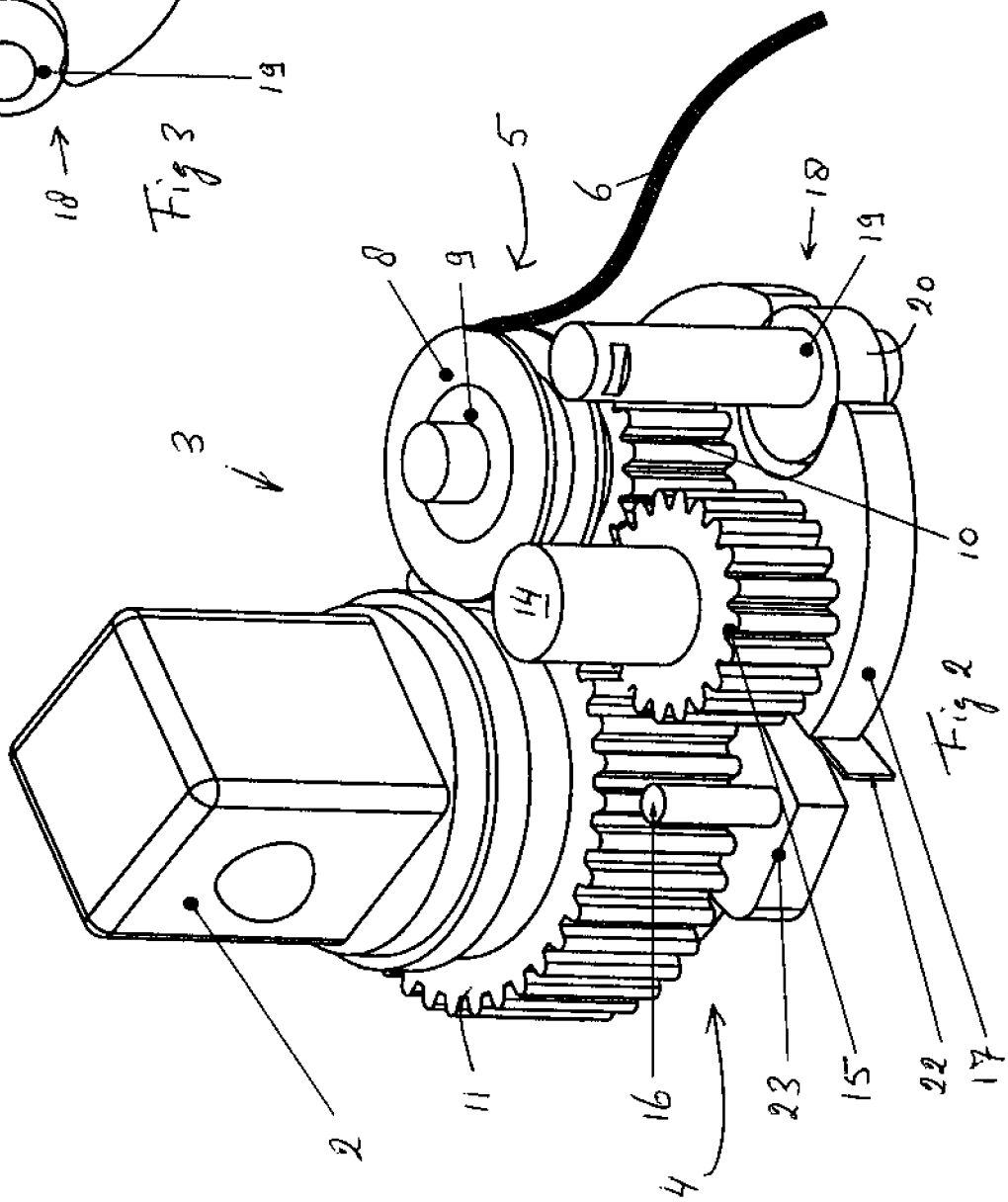
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Fig 2

INTERNATIONAL SEARCH REPORT

International application No
PCT/NL2008/050157

A. CLASSIFICATION OF SUBJECT MATTER
INV. B25B13/46

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B25B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 099 430 A (STUDOLA ROGER D) 11 July 1978 (1978-07-11) the whole document abstract; figures 1-5 column 1, lines 28-60	1-9, 15-17
X	GB 2 246 090 A (BAKER ALBERT THOMAS) 22 January 1992 (1992-01-22) the whole document abstract; figure 1	1-7, 15-17
X	AU 537 999 B2 (FALK I E; FALK N W) 26 July 1984 (1984-07-26) the whole document page 7, lines 18-24; figure 1	1-5, 15-17

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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Date of the actual completion of the international search	Date of mailing of the international search report
8 May 2008	16/05/2008

Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT

International application No
PCT/NL2008/050157

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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Information on patent family members

International application No
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