

(19)



(11)

EP 2 065 136 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
21.09.2011 Bulletin 2011/38

(51) Int Cl.:
B25B 13/50 (2006.01)

(21) Application number: **07121790.5**

(22) Date of filing: **28.11.2007**

(54) **Pliers having greater holding force**

Zangen mit verstärkter Haltekraft

Pinces dotées d'une force de préhension améliorée

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IS IT LI LT LU LV MC MT NL PL PT RO SE
SI SK TR**

(43) Date of publication of application:
03.06.2009 Bulletin 2009/23

(73) Proprietor: **MH Corporation**
Belize City (BZ)

(72) Inventor: **Yu, Chiu-Ying**
Belize City (BZ)

(74) Representative: **Lerner, Christoph et al**
LangRaible GbR
Patent- und Rechtsanwälte
Rosenheimerstrasse 139
81671 München (DE)

(56) References cited:
WO-A-89/09115 US-A- 460 230
US-A- 2 559 973 US-A- 6 026 714
US-A1- 2002 121 162 US-A1- 2003 209 109
US-A1- 2004 154 440

EP 2 065 136 B1

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a pair of pliers, and more particularly to a pair of pliers for operating a workpiece, such as a pipe, rod and the like.

2. Description of the Related Art

[0002] A conventional pliers comprise an elongated shank, a fixed jaw locked onto at least one end of the shank, and a movable jaw pivotally mounted on the at least one end of the shank and movable relative to the fixed jaw. The fixed jaw has a surface provided with a plurality of locking teeth. The movable jaw has a surface provided with a first toothed face and a second toothed face. The first toothed face of the movable jaw is provided with a plurality of first engaging teeth. The second toothed face of the movable jaw is provided with a plurality of second engaging teeth. Thus, a workpiece is clamped between the locking teeth of the fixed jaw, the first engaging teeth of the first toothed face of the movable jaw and the second engaging teeth of the second toothed face of the movable jaw. In such a manner, the movable jaw is movable relative to the fixed jaw to clamp workpieces of different sizes by a pivot action of the movable jaw. However, when the swinging angle of the movable jaw exceeds a determined value, the locking teeth of the fixed jaw, the first engaging teeth of the first toothed face of the movable jaw and the second engaging teeth of the second toothed face of the movable jaw cannot engage the surface of the workpiece efficiently, so that the workpiece easily slips from the fixed jaw and the movable jaw of the pliers, thereby causing inconvenience to the user.

[0003] The closest prior art references of which the applicant is aware are disclosed in U.S. Patent No. 2,559,973; 6,026,714; 6,742,419; 7,044,030 and 7,096,764.

SUMMARY OF THE INVENTION

[0004] The present invention is to mitigate and/or obviate the disadvantage of the conventional pliers.

[0005] The primary objective of the present invention is to provide a pair of pliers having an enhanced friction to prevent from incurring a slip during operation of the pliers.

[0006] Another objective of the present invention is to provide a pair of pliers, wherein the first contact point of the locking teeth of the fixed jaw and the second contact point of the first engaging teeth of the first toothed face of the movable jaw have a larger friction with the surface of the workpiece by the special angle design of the fixed jaw and the movable jaw to enhance the clamping force of the fixed jaw and the movable jaw on the surface of

the workpiece, so that the workpiece is clamped by the fixed jaw and the movable jaw exactly and closely to prevent the workpiece from being slipped from the fixed jaw and the movable jaw during operation of the pliers.

5 [0007] A further objective of the present invention is to provide a pair of pliers, wherein each of the locking teeth of the fixed jaw, the first engaging teeth and the second engaging teeth of the movable jaw is designed to have an obtuse angle to enhance the strength of the locking teeth, the first engaging teeth and the second engaging teeth.

10 [0008] A further objective of the present invention is to provide a pair of pliers, wherein the first tangent line of the locking teeth of the fixed jaw and a face of a contacting one of the locking teeth of the fixed jaw have an included angle ranged between 37° and 45° to prevent the workpiece from being slipped from the fixed jaw due to a deformation of the workpiece.

15 [0009] In accordance with the present invention, there is provided a pair of pliers as defined in claim 1.

20 [0010] Further benefits and advantages of the present invention will become apparent after a careful reading of the detailed description with appropriate reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011]

30 Fig. 1 is a side view of a pair of pliers in accordance with the preferred embodiment of the present invention;
Fig. 2 is a schematic operational view of the pliers as shown in Fig. 1 in use; and
35 Fig. 3 is a locally enlarged view of the pliers as shown in Fig. 2.

DETAILED DESCRIPTION OF THE INVENTION

40 [0012] Referring to the drawings and initially to Fig. 1, a pair of pliers in accordance with the preferred embodiment of the present invention comprise an elongated shank 10, a substantially convex fixed jaw 15 locked onto at least one end of the shank 10, a movable jaw 20 pivotally mounted on the at least one end of the shank 10 by a pivot shaft 12 and movable relative to the fixed jaw 15, and a torsion spring 13 mounted on the pivot shaft 12 and having a first end pressing the at least one end of the shank 10 and a second end pressing the movable jaw 20 to move the movable jaw 20 toward the fixed jaw 15 at a normal state. The fixed jaw 15 has a surface provided with a plurality of locking teeth 150. The movable jaw 20 has a surface provided with a first toothed face 21 and a second toothed face 22 which are arranged to form a substantially V-shaped profile. The first toothed face 21 of the movable jaw 20 is provided with a plurality of first engaging teeth 210. The second toothed face 22 of the movable jaw 20 is provided with a plurality of sec-

ond engaging teeth 220.

[0013] Referring to Figs. 1-3, when the pliers are used to operate a workpiece 30, such as a pipe, rod and the like, the workpiece 30 is clamped between the locking teeth 150 of the fixed jaw 15, the first engaging teeth 210 of the first toothed face 21 of the movable jaw 20 and the second engaging teeth 220 of the second toothed face 22 of the movable jaw 20. In such a manner, each of the locking teeth 150 of the fixed jaw 15 has an angle (D) ranged between 90° and 92°. Each of the first engaging teeth 210 of the first toothed face 21 of the movable jaw 20 has an angle (B) ranged between 93° and 97°, and each of the second engaging teeth 220 of the second toothed face 22 of the movable jaw 20 also has an angle (B) ranged between 93° and 97°.

[0014] A line (L1) passing apexes of the first engaging teeth 210 of the first toothed face 21 of the movable jaw 20 and a line (L2) passing apexes of the second engaging teeth 220 of the second toothed face 22 of the movable jaw 20 have an included angle (H) ranged between 134° and 136°.

[0015] In addition, the locking teeth 150 of the fixed jaw 15 and the workpiece 30 have a first contact point (P1) and a first tangent line (L3), the first engaging teeth 210 of the first toothed face 21 of the movable jaw 20 and the workpiece 30 have a second contact point (P2) and a second tangent line (L4), and the second engaging teeth 220 of the second toothed face 22 of the movable jaw 20 and the workpiece 30 have a third contact point (P3) and a third tangent line (L5). A line (L6) passing the first contact point (P1) and a center (O) of the workpiece 30 and a line (L8) passing the third contact point (P3) and the center (O) of the workpiece 30 have an included angle (G) ranged between 160° and 176°. A line (L7) passes the second contact point (P2) and the center (O) of the workpiece 30. The first tangent line (L3) and a face of a contacting one of the locking teeth 150 of the fixed jaw 15 have an included angle (A) ranged between 37° and 45°. The second tangent line (L4) and a face of a contacting one of the first engaging teeth 210 of the first toothed face 21 of the movable jaw 20 have an included angle (E) ranged between 40° and 55°. The third tangent line (L5) and a face of a contacting one of the second engaging teeth 220 of the second toothed face 22 of the movable jaw 20 have an included angle (C) ranged between 45° and 60°.

[0016] In practice, the workpiece 30 is clamped by the first contact point (P1) of the locking teeth 150 of the fixed jaw 15, the second contact point (P2) of the first engaging teeth 210 of the first toothed face 21 of the movable jaw 20 and the third contact point (P3) of the second engaging teeth 220 of the second toothed face 22 of the movable jaw 20, so that the workpiece 30 is positioned by the fixed jaw 15 and the movable jaw 20 and is operated by rotation of the shank 10. In such a manner, the first contact point (P1) of the locking teeth 150 of the fixed jaw 15 and the second contact point (P2) of the first engaging teeth 210 of the first toothed face 21 of the movable jaw 20 produce

a larger friction with the surface of the workpiece 30 by the special angle design of the fixed jaw 15 and the movable jaw 20 to enhance the clamping force of the fixed jaw 15 and the movable jaw 20 on the surface of the workpiece 30, so that the workpiece 30 is clamped by the fixed jaw 15 and the movable jaw 20 exactly and closely to prevent the workpiece 30 from being slipped from the fixed jaw 15 and the movable jaw 20 during operation of the pliers.

[0017] Accordingly, the first contact point (P1) of the locking teeth 150 of the fixed jaw 15 and the second contact point (P2) of the first engaging teeth 210 of the first toothed face 21 of the movable jaw 20 have a larger friction with the surface of the workpiece 30 by the special angle design of the fixed jaw 15 and the movable jaw 20 to enhance the clamping force of the fixed jaw 15 and the movable jaw 20 on the surface of the workpiece 30, so that the workpiece 30 is clamped by the fixed jaw 15 and the movable jaw 20 exactly and closely to prevent the workpiece 30 from being slipped from the fixed jaw 15 and the movable jaw 20 during operation of the pliers. In addition, each of the locking teeth 150 of the fixed jaw 15, the first engaging teeth 210 and the second engaging teeth 220 of the movable jaw 20 is designed to have an obtuse angle to enhance the strength of the locking teeth 150, the first engaging teeth 210 and the second engaging teeth 220. Further, the first tangent line (L3) of the locking teeth 150 of the fixed jaw 15 and a face of a contacting one of the locking teeth 150 of the fixed jaw 15 have an included angle (A) ranged between 37° and 45° to prevent the workpiece 30 from being slipped from the fixed jaw 15 due to a deformation of the workpiece 30.

[0018] Although the invention has been explained in relation to its preferred embodiment(s) as mentioned above, it is to be understood that many other possible modifications and variations can be made without departing from the scope of the present invention as defined in the appended claims.

Claims

1. A pair of pliers, comprising:

- an elongated shank (10);
- a substantially convex fixed jaw (15) locked onto at least one end of the shank;
- a movable jaw (20) pivotally mounted on the at least one end of the shank and movable relative to the fixed jaw; wherein
- the fixed jaw has a surface provided with a plurality of locking teeth (150);
- the movable jaw has a surface provided with a first toothed face (21) and a second toothed face (22);
- the first toothed face of the movable jaw is provided with a plurality of first engaging teeth (210);

the second toothed face of the movable jaw is provided with a plurality of second engaging teeth (220);

a workpiece (30) of a circular cross-section is clamped between the locking teeth of the fixed jaw, the first engaging teeth of the first toothed face of the movable jaw and the second engaging teeth of the second toothed face of the movable jaw;

each of the locking teeth of the fixed jaw has an angle (D) ranged between 90° and 92°;

each of the first engaging teeth of the first toothed face of the movable jaw has an angle (B) ranged between 93° and 97°;

each of the second engaging teeth of the second toothed face of the movable jaw has an angle (B) ranged between 93° and 97°;

a straight line (L1) passing apexes of the first engaging teeth of the first toothed face of the movable jaw and a straight line (L2) passing apexes of the second engaging teeth of the second toothed face of the movable jaw have an included angle (H) ranged between 134° and 136°;

the locking teeth of the fixed jaw and the workpiece have a first contact point (P1) and a first tangent line (L3);

the first engaging teeth of the first toothed face of the movable jaw and the workpiece have a second contact point (P2) and a second tangent line (L4);

the second engaging teeth of the second toothed face of the movable jaw and the workpiece have a third contact point (P3) and a third tangent line (L5);

a straight line (L6) passing the first contact point (P1) and a center (O) of the workpiece and a straight line (L8) passing the third contact point (P3) and the center (O) of the workpiece have an included angle (G) ranged between 160° and 176°.

2. The pliers in accordance with claim 1, wherein the first tangent line (L3) and a face of a contacting one of the locking teeth of the fixed jaw have an included angle (A) ranged between 37° and 45°.
3. The pliers in accordance with claim 1, wherein the second tangent line (L4) and a face of a contacting one of the first engaging teeth of the first toothed face of the movable jaw have an included angle (E) ranged between 40° and 55°.
4. The pliers in accordance with claim 1, wherein the third tangent line (L5) and a face of a contacting one of the second engaging teeth of the second toothed face of the movable jaw have an included angle (C) ranged between 45° and 60°.

5. The pliers in accordance with claim 1, wherein the first toothed face and the second toothed face of the movable jaw are arranged to form a substantially V-shaped profile.

6. The pliers in accordance with claim 1, wherein the movable jaw is pivotally mounted on the at least one end of the shank by a pivot shaft (12).

7. The pliers in accordance with claim 6, further comprising a torsion spring (13) mounted on the pivot shaft and having a first end pressing the at least one end of the shank and a second end pressing the movable jaw to move the movable jaw toward the fixed jaw at a normal state.

Patentansprüche

1. Zange, umfassend:

einen länglichen Schaft (10);

eine im Wesentlichen konvexe und fixierte Backe (15), die an wenigstens einem Ende des Schaftes befestigt ist;

eine bewegliche Backe (20), die drehbar auf dem wenigstens einen Ende des Schaftes angeordnet ist und gegenüber der fixierten Backe beweglich ist; wobei

die fixierte Backe eine Oberfläche umfasst, die mit einer Vielzahl von sperrenden Zähnen (150) versehen ist;

die bewegliche Backe einer Oberfläche umfasst, die mit einer ersten Zahnfläche (21) und einer zweiten Zahnfläche (22) versehen ist;

die erste Zahnfläche der beweglichen Backe mit einer Vielzahl von ersten eingreifenden Zähnen (210) versehen ist;

die zweite Zahnfläche der beweglichen Backe mit einer Vielzahl von zweiten eingreifenden Zähnen (220) versehen ist;

ein Werkstück (30) mit einem kreisförmigen Querschnitt ist zwischen den sperrenden Zähnen der fixierten Backe, den ersten eingreifenden Zähnen der ersten Zahnfläche der beweglichen Backe und den zweiten eingreifenden Zähnen der zweiten Zahnfläche der beweglichen Backe geklemmt;

jeder der sperrenden Zähne der fixierten Backe weist einen Winkel (D) zwischen 90° und 92° auf;

jeder der ersten eingreifenden Zähne der ersten Zahnfläche der beweglichen Backe weist einen Winkel (B) zwischen 93° und 97° auf;

jeder der zweiten eingreifenden Zähne der zweiten Zahnfläche der beweglichen Backe weist einen Winkel (B) zwischen 93° und 97° auf;

eine gerade Linie (L1) durch die Spitzen der er-

- sten eingreifenden Zähne der ersten Zahnfläche der beweglichen Backe und eine gerade Linie (L2) durch die Spitzen der zweiten eingreifenden Zähne der zweiten Zahnfläche der beweglichen Backe weisen einen eingeschlossenen Winkel (H) zwischen 134° bis 136° auf; die sperrenden Zähne der fixierten Backe und das Werkstück weisen einen ersten Kontaktpunkt (P1) und eine erste Tangentenlinie (L3) auf;
- die ersten eingreifenden Zähne der ersten Zahnfläche der beweglichen Backe und das Werkstück weisen einen zweiten Kontaktpunkt (P2) und eine zweite Tangentenlinie (L4) auf; die zweiten eingreifenden Zähne der zweiten Zahnfläche der beweglichen Backe und das Werkstück weisen einen dritten Kontaktpunkt (P3) und eine dritte Tangentenlinie (L5) auf; eine gerade Linie (L6) durch den ersten Kontaktpunkt (P1) und die Mitte (O) des Werkstücks und eine gerade Linie (L8) durch den dritten Kontaktpunkt (P3) und die Mitte (O) des Werkstücks weisen einen eingeschlossenen Winkel (G) zwischen 160° bis 176° auf.
2. Zange nach Anspruch 1, bei welcher die erste Tangentenlinie (L3) und die Seitenfläche eines in Kontakt stehenden sperrenden Zahns der fixierten Backe einen eingeschlossenen Winkel (A) von 37° bis 45° aufweisen.
 3. Zange nach Anspruch 1, bei welcher die zweite Tangentenlinie (L4) und die Seitenfläche eines in Kontakt stehenden Zahns der ersten eingreifenden Zähne der ersten Zahnfläche der beweglichen Backe einen eingeschlossenen Winkel (E) zwischen 40° bis 55° aufweisen.
 4. Zange nach Anspruch 1, bei welcher die dritte Tangentenlinie (L5) und die Seitenfläche eines in Kontakt stehenden Zahns der zweiten eingreifenden Zähne der zweiten Zahnfläche der beweglichen Backe einen eingeschlossenen Winkel (C) zwischen 45° bis 60° aufweisen.
 5. Zange nach Anspruch 1, bei welcher die erste Zahnfläche und die zweite Zahnfläche der beweglichen Backe so angeordnet sind, dass sie ein im Wesentlichen V-förmiges Profil aufweisen.
 6. Zange nach Anspruch 1, bei welcher die bewegliche Backe über einen Drehschaft (12) drehbar an dem wenigstens einen Ende des Schaftes angeordnet ist.
 7. Zange nach Anspruch 6, die ferner eine Torsionsfeder (13) umfasst, die an dem Drehschaft angeordnet ist und ein erstes Ende, das gegen das wenigstens eine Ende des Schaftes drückt, und ein zweites Ende

umfasst, das die bewegliche Backe drückt, um im normalen Zustand die bewegliche Backe zu der fixierten Backe hin zu bewegen.

Revendications

1. Pince comprenant :

un corps allongé (10) ;
 une mâchoire fixe substantiellement convexe (15) bloquée sur au moins une extrémité du corps ;
 une mâchoire mobile (20) montée de manière pivotante sur l'extrémité du corps qui existe au moins et qui est mobile par rapport à la mâchoire fixe, dans laquelle
 la mâchoire fixe a une surface pourvue d'une pluralité de dents de blocage (150) ;
 la mâchoire mobile a une surface pourvue d'une première face dentée (21) et d'une seconde face dentée (22) ;
 la première face dentée de la mâchoire mobile est pourvue d'une pluralité de premières dents d'accrochage (210) ;
 la seconde face dentée de la mâchoire mobile est pourvue d'une pluralité de secondes dents d'accrochage (220) ;
 une pièce à travailler (30) d'une section circulaire est serrée entre les dents de blocage de la mâchoire fixe, les premières dents d'accrochage de la première face dentée de la mâchoire mobile et les secondes dents d'accrochage de la mâchoire mobile ;
 chacune des dents de blocage de la mâchoire fixe a un angle (D) de l'ordre de 90° à 92°,
 chacune des premières dents d'accrochage de la première face dentée de la mâchoire mobile a un angle (B) de l'ordre de 93° à 97°,
 chacune des secondes dents d'accrochage de la seconde face dentée de la mâchoire mobile a un angle (B) de l'ordre de 93° à 97°,
 une ligne droite (L1) qui passe par des pointes des premières dents d'accrochage de la première face dentée de la mâchoire mobile et une ligne droite (L2) qui passe par des pointes des secondes dents d'accrochage de la seconde face dentée de la mâchoire mobile ont un angle inclus (H) de l'ordre de 134° à 136°,
 les dents de blocage de la mâchoire fixe et la pièce à travailler ont un premier point de contact (P1) et une première ligne tangente (L3),
 les premières dents d'accrochage de la première face dentée de la mâchoire mobile et la pièce à travailler ont un second point de contact (P2) et une seconde ligne tangente (L4),
 les secondes dents d'accrochage de la seconde face dentée de la mâchoire mobile et la pièce à

travailler ont un troisième point de contact (P3) et une troisième ligne tangente (L5), une ligne droite (L6) qui passe par le premier point de contact (P1) et un centre (O) de la pièce à travailler et une ligne droite (L8) qui passe par le troisième point de contact (P3) et le centre (O) de la pièce à travailler ont un angle inclus (G) de l'ordre de 160° à 176°.

2. Pince selon la revendication 1 dans laquelle la première ligne tangente (L3) et une face d'une dent qui est en contact des dents de blocage de la mâchoire fixe ont un angle inclus (A) de l'ordre de 37° à 45°. 10
3. Pince selon la revendication 1 dans laquelle la seconde ligne tangente (L4) et une face d'une dent qui est en contact des premières dents d'accrochage de la première face dentée de la mâchoire mobile ont un angle inclus (E) de l'ordre de 40° à 55°. 15
4. Pince selon la revendication 1 dans laquelle la troisième ligne tangente (L5) et une face d'une dent qui est en contact des secondes dents d'accrochage de la seconde face dentée de la mâchoire mobile ont un angle inclus (C) de l'ordre de 45° à 60°. 20 25
5. Pince selon la revendication 1 dans laquelle la première face dentée et la seconde face dentée de la mâchoire mobile sont arrangées pour former un profil substantiellement en forme de V. 30
6. Pince selon la revendication 1 dans laquelle la mâchoire mobile est montée pivotante sur l'extrémité qui existe au moins du corps par le biais d'une tige d'articulation (12). 35
7. Pince selon la revendication 6, comprenant de plus un ressort de torsion (13) monté sur la tige d'articulation et ayant une première extrémité pressant sur l'extrémité qui existe au moins du corps et une seconde extrémité pressant sur la mâchoire mobile pour déplacer la mâchoire mobile vers la mâchoire fixe à un état normal. 40

45

50

55

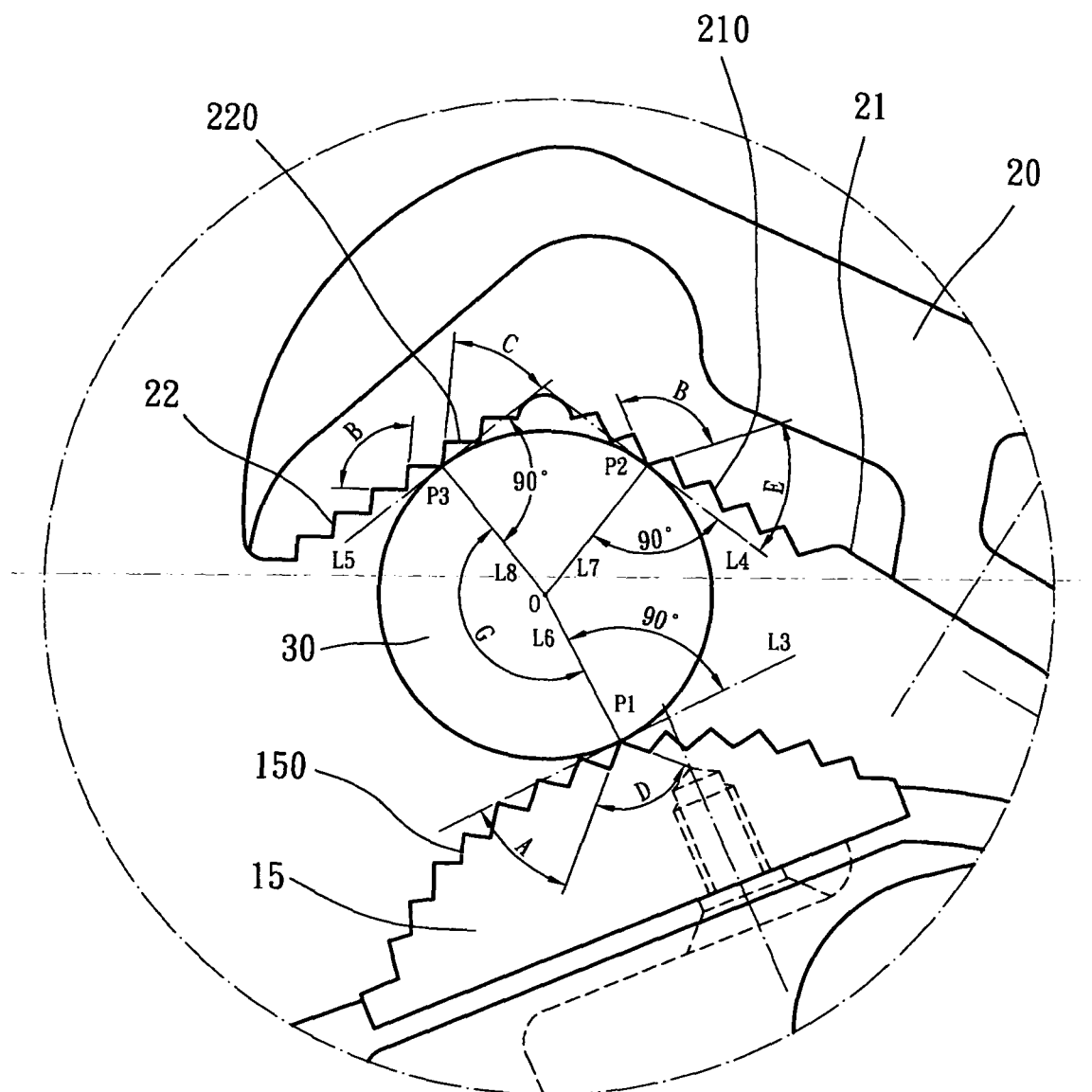


FIG. 3

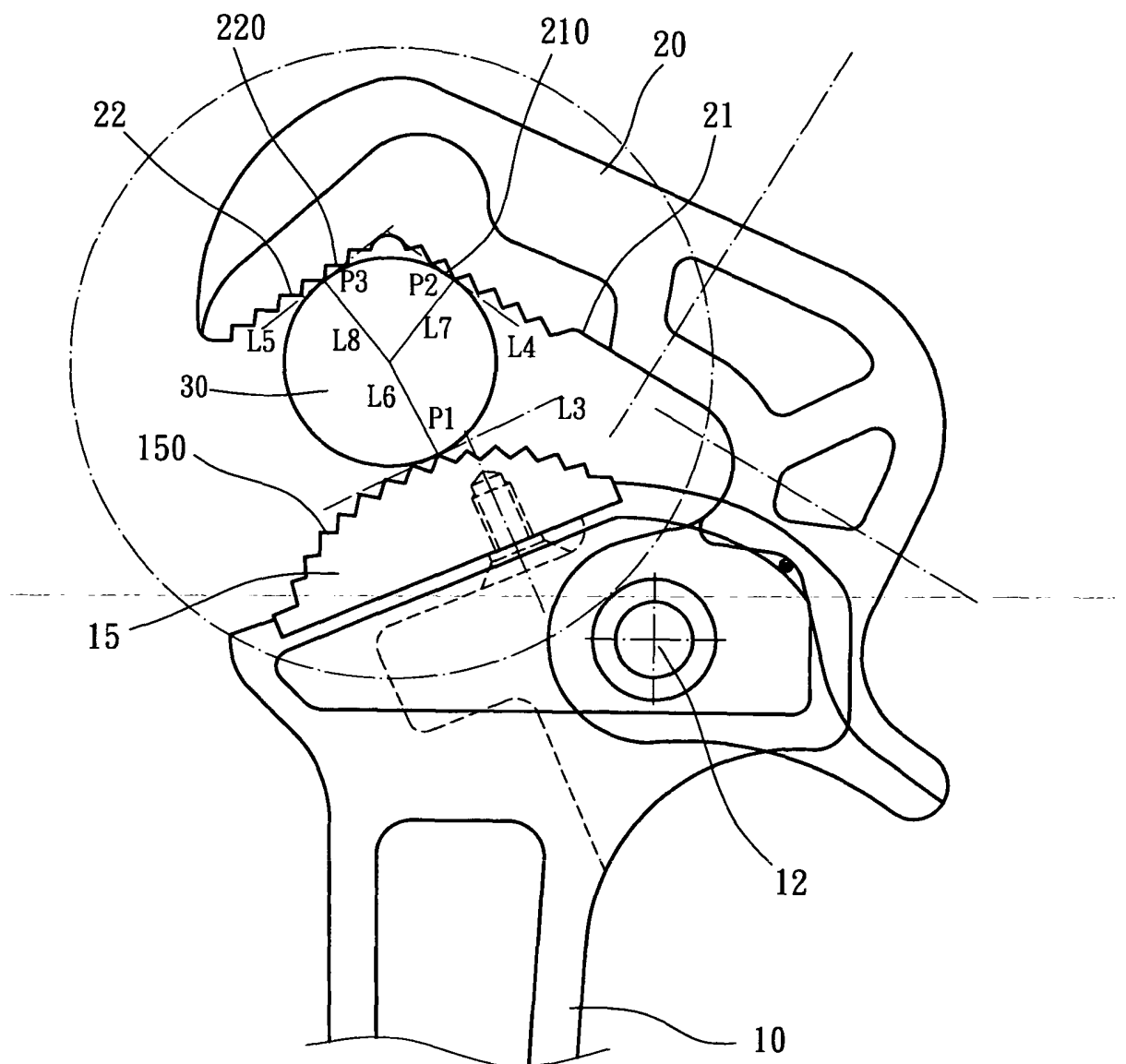


FIG. 2

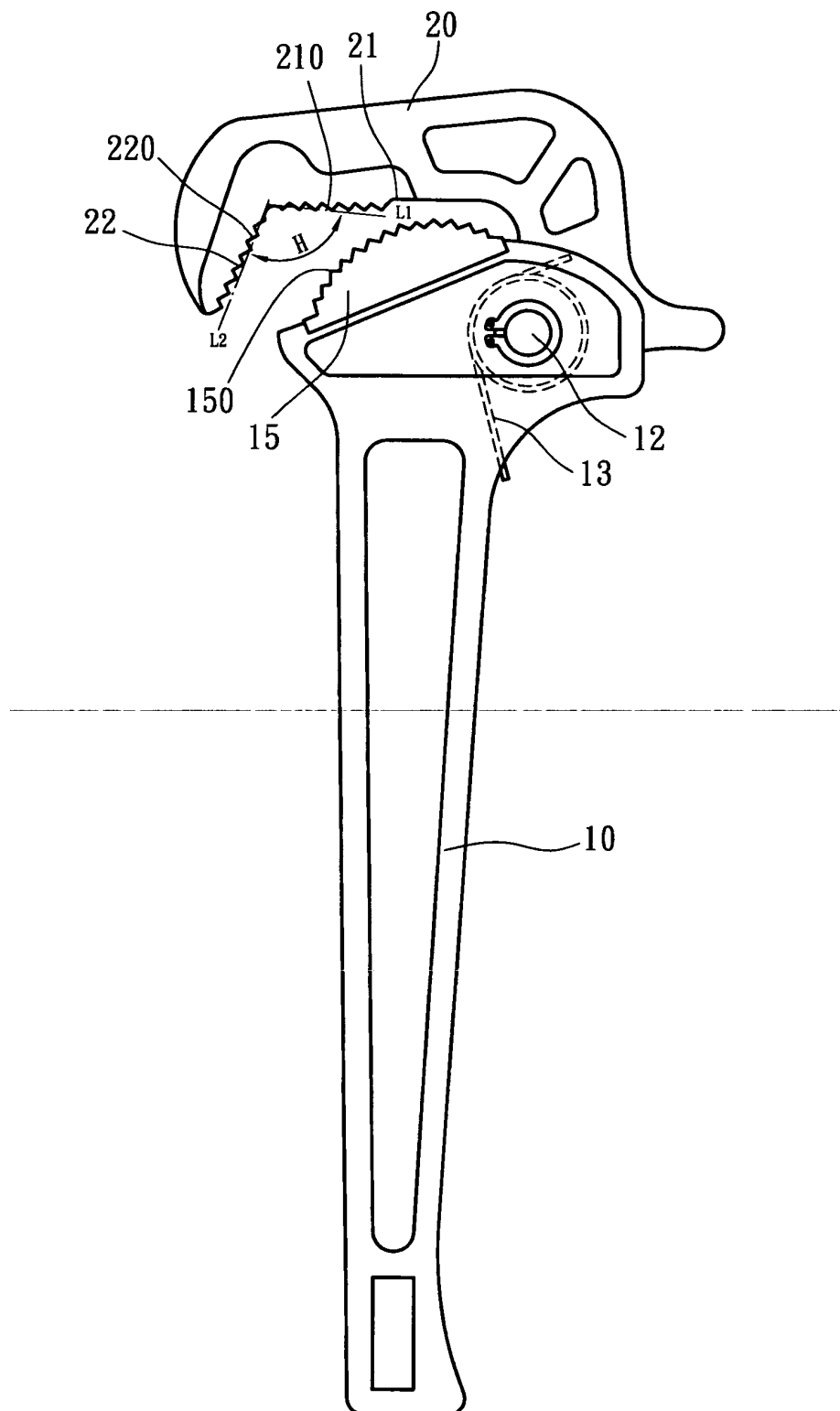


FIG. 1

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 2559973 A [0003]
- US 6026714 A [0003]
- US 6742419 B [0003]
- US 7044030 B [0003]
- US 7096764 B [0003]