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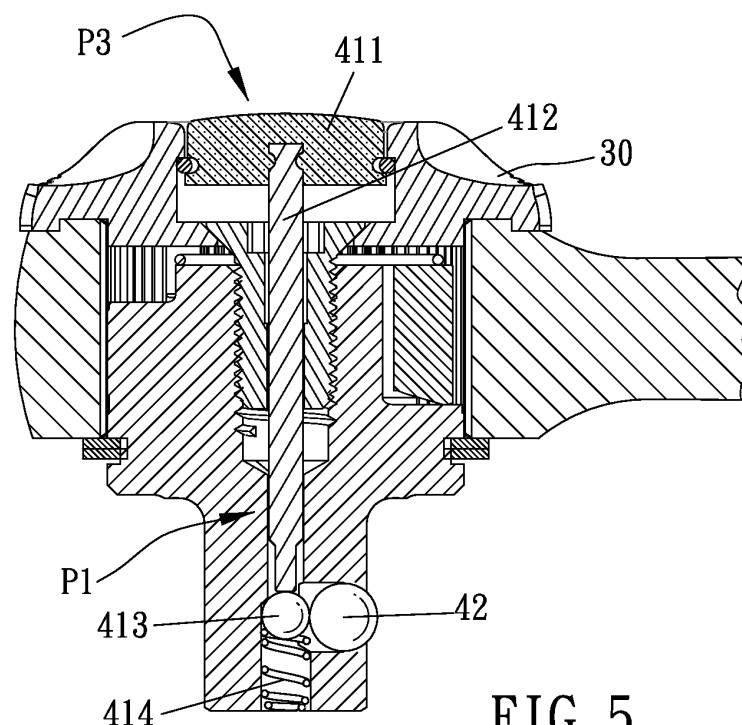
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(54) Ratchet socket wrench

(57) A ratchet wrench is provided, including a main body, including a receiving slot and a first anti-dust portion annularly arranged around outside the receiving slot; a ratcheting head, rotatably disposed in the receiving slot; a seal cap, capped on the main body and located above the ratcheting head, having a second anti-dust portion whose structure corresponding to a structure of the first anti-dust portion; a latching mechanism, including a pushing assembly and an abutting member, wherein the

pushing assembly is inserted in the ratcheting head and movable to be in an abutting position and a releasing position, the abutting member is movably disposed in the ratcheting head and selectively partly protrudes or retreats. The other ratchet wrench is also provided, further including a ratcheting head of the second anti-dust portion whose shape corresponding to that of the first anti-dust portion.

**FIG. 5****EP 3 002 083 A1**

Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a wrench, and more particularly to a ratchet wrench.

Description of the Prior Art

[0002] A conventional ratchet wrench has a mounting portion in a center of a ratchet. The mounting portion is provided for sockets to be assembled thereto, so a user can operate the wrench to drive the socket to screw tightly or disassemble a bolt or a nut. The ratchet wrenches disclosed in TWM449061 and TWM426472 are provided for clamping work pieces or sockets tightly through a clamping assembly. Furthermore, the clamping assembly mentioned above usually uses an elastic member and clamps the work pieces or sockets through deformation of the elastic member.

[0003] However, usually, an elasticity of the elastic member fatigues as the time and number of use increase, so the deformability of the elastic member decreases, and clamping effect becomes worse.

[0004] The present invention is, therefore, arisen to obviate or at least mitigate the above-mentioned disadvantages.

SUMMARY OF THE INVENTION

[0005] The main object of the present invention is to provide a ratchet wrench, which can be controlled by pressing and is provided for being assembled to and engaged with a tool to prevent the tool from falling off during the operating process. It is safe to operate the ratchet wrench during the operating process and is convenient to remove the ratchet wrench after operating. In addition, with designs of an annular face and an anti-dust wall, a mechanism can be protected from dust and kept clean.

[0006] To achieve the above and other objects, the ratchet wrench of the present invention is provided, including a main body, including a receiving slot and a first anti-dust portion annularly arranged around outside the receiving slot, the first anti-dust portion including a first annular face and an anti-dust wall, the first annular face extending from an outer circumferential face of the main body toward the receiving slot, the anti-dust wall protruding from an inner annular edge of the first annular face; a ratcheting head, rotatably disposed in the receiving slot, including a mounting protrusion; a seal cap, capped on the main body and located above the ratcheting head, having a second anti-dust portion whose structure corresponds to a structure of the first anti-dust portion and a sliding slot disposed through the seal cap, the second anti-dust portion including an annular protrusion facing the first annular face and an annular recession adjacent

to an inner annular edge of the annular protrusion, the annular recession and the anti-dust wall engaged with each other, the annular protrusion and the anti-dust wall radially disposed neighboring to each other, a blocking edge provided at an end of the sliding slot and extending radially inward; a latching mechanism, including a pushing assembly and an abutting member, wherein the pushing assembly is inserted in the ratcheting head and movable to be in an abutting position and a releasing position, the pushing assembly includes a pressing board, a circumferential face of the pressing board is protrudingly disposed a restricting member therearound, the restricting member and the blocking edge abut against and are stuck with each other to restrict the pressing board in the sliding slot, the abutting member is movably disposed in the ratcheting head and selectively protrudable outside the mounting protrusion, the pushing assembly is able to move from the abutting position to the releasing position through pressing the pressing board from outside, when the pushing assembly is in the abutting position, the pushing assembly abuts against the abutting member and partly protrudes outside the mounting protrusion, when the pushing assembly is in the releasing position, the pushing assembly is disengaged from the abutting member, and the abutting member can retreat back into the mounting protrusion.

[0007] To achieve the above and other objects, the other ratchet wrench of the present invention is provided, including a main body, including a receiving slot and a first anti-dust portion annularly arranged around outside the receiving slot, the first anti-dust portion including a first annular face and an anti-dust wall, the first annular face extending from an outer circumferential face of the main body toward the receiving slot, the anti-dust wall protruding from an inner annular edge of the first annular face; a ratcheting head, rotatably disposed in the receiving slot, including a second anti-dust portion whose shape corresponds to a shape of the first anti-dust portion and a mounting protrusion, wherein the second anti-dust portion includes an annular protrusion facing the first annular face and an annular recession adjacent to an inner annular edge of the annular protrusion, the annular recession and the anti-dust wall are engaged with each other, and the annular protrusion and the anti-dust wall are radially disposed neighboring to each other; a seal cap, capped on the main body and located above the ratcheting head, having a sliding slot disposed through the seal cap, a blocking edge provided at an end of the sliding slot and extending radially inward; a latching mechanism, including a pushing assembly and an abutting member, wherein the pushing assembly is inserted in the ratcheting head and movable to be in an abutting position and a releasing position, the pushing assembly includes a pressing board, a circumferential face of the pressing board is protrudingly disposed a restricting member therearound, the restricting member and the blocking edge abut against and are stuck with each other to restrict the pressing board in the sliding slot, the abut-

ting member is movably disposed in the ratcheting head and selectively protrudable outside the mounting protrusion, the pushing assembly is able to move from the abutting position to the releasing position through pressing the pressing board from outside, when the pushing assembly is in the abutting position, the pushing assembly abuts against the abutting member and partly protrudes outside the mounting protrusion, when the pushing assembly is in the releasing position, the pushing assembly is disengaged from the abutting member, and the abutting member can retreat back into the mounting protrusion.

[0008] The present invention will become more obvious from the following description when taken in connection with the accompanying drawings, which show, for purpose of illustrations only, the preferred embodiment(s) in accordance with the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009]

Fig. 1 is a sketch of a preferred embodiment of the present invention;

Fig. 2 is a breakdown drawing of a preferred embodiment of the present invention;

Fig. 3 is a schematic drawing showing assembling of a preferred embodiment of the present invention;

Fig. 4 is the other schematic drawing showing assembling of a preferred embodiment of the present invention;

Fig. 5 is a drawing showing a preferred embodiment of the present invention in use;

Fig. 6 is the other drawing showing a preferred embodiment of the present invention in use; and

Fig. 7 is a sketch of the other preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0010] Please refer to Figs. 1 to 4 for a first preferred embodiment of a ratchet wrench of the present invention, including a main body 10, a ratcheting head 20, a seal cap 30 and a latching mechanism 40.

[0011] The main body 10 includes a receiving slot 11 and a first anti-dust portion 12 annularly disposed around outside the receiving slot 11. A circumferential wall inside the receiving slot 11 is provided with a ratcheting portion 13 therearound. Specifically, the main body 10, the receiving slot 11, the first anti-dust portion 12 and the ratcheting portion 13 can be made of metal (for example, aluminum alloy, steel and others) and integrally formed through melting or forging. More specifically, the first anti-dust portion 12 includes a first annular face 121 and an anti-dust wall 122. The first annular face 121 extends from an outer circumferential face of the main body 10 toward the receiving slot 11, and the anti-dust wall pro-

trudes from an inner annular edge of the first annular face. In other embodiments, the first annular face 121 can be a radial slanted face, for example, there can be an included angle between the first annular face 121 and a cross-section of the receiving slot 11.

[0012] The ratcheting head 20 is rotatably disposed in the receiving slot 11, and the ratcheting head 20 includes a mounting protrusion 21. In this embodiment, the ratcheting head 20 is formed with a restricting tooth member 22 selectively meshable with the ratcheting portion 13. More specifically, the restricting tooth member 22 includes a restricting tooth portion 23 for being meshed with the ratcheting portion 13, and the restricting tooth portion 23 includes a plurality of protruding teeth. Preferably, the restricting tooth member 22 can be made of carbon steel so as to allow the restricting tooth member 22 to have high wear resistance and rigidity.

[0013] The restricting tooth member 22 can restrict the rotating direction of the ratcheting head 20, for example, the restricting tooth member 22 can make the restricting tooth member 22 controllably engaged with the ratcheting head 20 through a positioning mechanism. Furthermore, in this embodiment, the positioning mechanism, for example, includes an elastic member 50 and a protruding column 51 disposed through the elastic member 50. The elastic member 50 is assembled to the restricting tooth member 22, and the protruding column 51 can connect to the seal cap 30. Through rotating the seal cap 30 and the protruding column 51, the protruding column abuts against an end of the elastic member 50 and to drive the elastic member 50. The restricting tooth member 22 is positioned to a predetermined position to be meshed with the ratcheting portion 13 through co-moving with the elastic member 50. The restricting tooth member 20 is meshed with the ratcheting portion 13 to actuate the ratcheting head 20 so as to restrict the rotating direction of the ratcheting head 20.

[0014] The seal cap 30 is capped on the main body 10 and is located above the ratcheting head 20. The seal cap 30 has a second anti-dust portion 31 whose structure corresponds to a structure of the first anti-dust portion 12 and a sliding slot 32 disposed through the seal cap 30. The second anti-dust portion 31 includes an annular protrusion 311 facing the first annular face 121 and an annular recession 312 adjacent to an inner annular edge of the annular protrusion 311. The annular recession 312 and the anti-dust wall 122 are engaged with each other, and the annular protrusion 311 and the anti-dust wall 122 are radially disposed neighboring to each other. A blocking edge 33 is provided at an end of the sliding slot and extends radially inward. The annular protrusion 311 has a second annular face 313 whose shape corresponds to a shape of the first annular face 121; therefore, when the first anti-dust portion 12 and the second anti-dust portion 31 are assemble with each other, the first and second annular faces 121, 313 contact with each other so as to achieve anti-dust effect. Preferably, a gap between the first and second annular faces 121, 313 can be set to be,

for example, 0.1 mm, and the coordination between the first and second annular faces 121, 313 can be improved through manufacturing after polishing process so as to allow the seal cap 30 and the main body 10 to operate smoothly (for example, to allow the seal cap 30 to rotate relative to the main body 10) and prevent foreign objects (such as dust) from entering the receiving slot 11 of the ratchet wrench. It is to be noted that the anti-dust wall 122 and the annular recession 312 which are mutually engaged can prevent particles or foreign matters from entering the ratchet wrench so as to elevate anti-dust effect. In addition, the ratchet wrench further includes a screw member 60 screwed between the seal cap 30 and the ratcheting head 20, and the seal cap 30 and the ratcheting head 20 connect to each other through the screw member 60.

[0015] The latching mechanism 40 includes a pushing assembly 41 and an abutting member 42. The pushing assembly 41 includes a pressing board 411, and a circumferential face of the pressing board 411 is protrudingly disposed a restricting member 416 therearound. The restricting member 416 abuts against and is stuck with the blocking edge 33 so as to restrict the pressing board 411 in the sliding slot 32. In this embodiment, the pushing assembly 41 further includes a rod 412, a rolling bead 413 and an elastic abutting member 414 elastically abuts against between the rolling bead 413 and an inner wall of the ratcheting head 20. A first end of the rod 412 is slidably inserted in the ratcheting head 20 and abuts against the rolling bead 413, and the rolling bead 413 is selectively abuts against the abutting member 42. The pressing board 411 is disposed at a second end of the rod 412. It is to be noted that the second end of the rod 412 is annularly formed with a restricting slot 415. The restricting slot 415 is recessed on the pressing board 411, and the restricting slot 415 is entirely encompassed by the pressing board 411 and the pressing board 411 is partly embedded in the restricting slot 415 so as to produce a preferable connecting strength between the pressing board 411 and the rod 412. In this embodiment, the restricting member 416 is an engaging member, and the restricting member 416 overlaps a part of the blocking edge 33 of the sliding slot 32 along an axial direction. Specifically, the pressing board 411 is pressed to be assembled in the sliding slot 32. Preferably, a top end edge of the sliding slot 32 is annularly formed with a fillet 34 to make the pressing and mounting process easier. The screw member 60 further includes a through hole 61 for the rod 412 to dispose therethrough so as to allow the rod 412 to actuate via the through hole 61.

[0016] Please refer to Figs. 5 and 6. In actual use, the pushing assembly 41 is inserted in the ratcheting head 20 and movable to be in an abutting position P1 and a releasing position P2. The abutting member 42 is movably disposed in the ratcheting head 20 and selectively partly protrudes outside the mounting protrusion 21. Furthermore, the pushing assembly 41 is able to move from the abutting position P1 to the releasing position P2

through pressing the pressing board 411 from outside. When the pushing assembly 41 is in the abutting position P1, the pushing assembly 41 abuts against the abutting member 42 and partly protrudes outside the mounting protrusion 21. When the pushing assembly 41 is in the releasing position P2, the pushing assembly 41 is disengaged from the abutting member 42, and the abutting member 42 can retreat back into the mounting protrusion 21. For example, the abutting member 42 can be a steel bead, and a part of the steel bead can protrude outside or retreat back into the mounting protrusion 21. More specifically, an elastic force of the elastic abutting member 414 is transmitted to the pressing board 411 through the rolling bead 413 and the rod 412, and the restricting member 416 and the blocking edge 33 are engaged with each other to allow the pressing board 411 to stay in a third position P3 normally. When the pushing assembly 41 is in the abutting position P1, the pressing board 411 is in the third position P3, and the abutting member 42 partly protrudes outside the mounting protrusion 21 for being assembled to and engaged with a tool (for example, a socket) and preventing the tool from falling off. For example, the pressing board 411 can be pushed and pressed by a force and slides to a fourth position P4. When the pushing assembly 41 is in the releasing position P2, the pressing board 411 is in the fourth position P4, and the abutting member 42 retreats back into the mounting protrusion 21; hence, the tool can be taken off from the mounting protrusion 21.

[0017] Please refer to Fig. 7 for the other preferred embodiment of the ratchet wrench of the present invention. The ratchet wrench includes a main body. The main body includes a receiving slot and a first anti-dust portion 12a annularly arranged around outside the receiving slot, and the first anti-dust portion 12a includes a first annular face 121a and an anti-dust wall 122a. The first annular face 121a extends from the outer circumferential face of the main body toward the receiving slot, and the first annular face 121a can be a radial slanted face. The anti-dust wall 122a protrudes from an inner annular edge of the first annular face 121a. The ratchet wrench further includes a ratcheting head rotatably disposed in the receiving slot and has a second anti-dust portion 31a whose shape corresponds to a shape of the first anti-dust portion 12a and a mounting protrusion, wherein the second anti-dust portion 31a includes an annular protrusion 311 a facing the first annular face 121a and an annular recession 312a adjacent to an inner annular edge of the annular protrusion 311a. The annular recession 312a and the anti-dust wall 122a are engaged with each other, and the annular protrusion 311a and the anti-dust wall 122a are radially disposed neighboring to each other. The annular protrusion 311a has a second annular face 313a whose shape corresponds to the shape of the first annular face 121a; therefore, when the first anti-dust portion 12a and the second anti-dust portion 31a are assembled with each other, the first and second annular faces 121a, 313a contact each other closely so as to achieve anti-dust effect.

It is to be noted that the anti-dust wall 122a and the annular recession 312a which are mutually engaged can prevent particles or foreign matters from entering the ratchet wrench and elevate anti-dust effect. The ratchet wrench includes a seal cap capped on the main body and located above the ratcheting head. The ratchet wrench has a sliding slot disposed through the seal cap, and a blocking edge is provided at an end of the sliding slot and extends radially inward. The ratchet wrench further includes a restricting tooth member, a positioning mechanism and a latching mechanism as the same as the structure mentioned above.

[0018] Given the above, a ratchet wrench of the present invention is controlled by pressing and is provided for a tool to be assembled or engaged therewith. With the present invention, the tool can be prevented from falling off during the operating process and can be removed easily after operating. In addition, the design of an annular face and an anti-dust wall can produce anti-dust effect and keep a mechanism protected and clean.

[0019] 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.

Claims

1. A ratchet wrench, including:

a main body (10), including a receiving slot (11) and a first anti-dust portion (12) annularly arranged around outside the receiving slot (11), the first anti-dust portion (12) including a first annular face (121) and an anti-dust wall (122), the first annular face (121) extending from an outer circumferential face of the main body (10) toward the receiving slot (11), the anti-dust wall (122) protruding from an inner annular edge of the first annular face (121); a ratcheting head (20), rotatably disposed in the receiving slot (11), including a mounting protrusion (21); a seal cap (30), capped on the main body (10) and located above the ratcheting head (20), having a second anti-dust portion (31) whose structure corresponds to a structure of the first anti-dust portion (12) and a sliding slot (32) disposed through the seal cap (30), the second anti-dust portion (31) including an annular protrusion (311) facing the first annular face (121) and an annular recession (312) adjacent to an inner annular edge of the annular protrusion (311), the annular recession (312) and the anti-dust wall (122) engaged to each other, the annular protrusion (311) and the anti-dust wall (122) radially

disposed neighboring to each other, a blocking edge (33) provided at an end of the sliding slot (32) and extending radially inward;

a latching mechanism (40), including a pushing assembly (41) and an abutting member (42), wherein the pushing assembly (41) is inserted in the ratcheting head (20) and movable to be in an abutting position (P1) and a releasing position (P2), the pushing assembly (41) includes a pressing board (411), a circumferential face of the pressing board (411) is protrudingly disposed a restricting member (416) therearound, the restricting member (416) and the blocking edge (33) abut against and are stuck with each other to restrict the pressing board (411) in the sliding slot (32), the abutting member (42) is movably disposed in the ratcheting head (20) and selectively protrudable outside the mounting protrusion (21), the pushing assembly (41) is able to move from the abutting position (P1) to the releasing position (P2) through pressing the pressing board (411) from outside, when the pushing assembly (41) is in the abutting position (P1), the pushing assembly (41) abuts against the abutting member (42) and partly protrudes outside the mounting protrusion (21), and when the pushing assembly (41) is in the releasing position (P2), the pushing assembly (41) is disengaged from the abutting member (42), the abutting member (42) is retreatable back into the mounting protrusion (21).

2. The ratchet wrench of claim 1, wherein a circumferential wall inside the receiving slot (11) is provided with a ratcheting portion (13) arranged therearound, the ratcheting head (20) has a restricting tooth member (22) selectively meshable with the ratcheting portion (13), and a rotating direction of the ratcheting head (20) is restrictable by the restricting tooth member (22).

3. The ratchet wrench of claim 1, wherein the pushing assembly (41) further includes a rod (412), a rolling bead (413) and an elastic abutting member (414) elastically abutting against between the rolling bead (413) and an inner wall of the ratcheting head (20), a first end of the rod (412) is slidably inserted in the ratcheting head (20) and abuts against the rolling bead (413), the rolling bead (413) selectively abuts against the abutting member (42), and the pressing board (411) is disposed at a second end of the rod (412).

4. The ratchet wrench of claim 1, wherein the restricting member (416) is an engaging member, and the engaging member overlaps a part of the blocking edge (33) along an axial direction.

5. The ratchet wrench of claim 3, further including a screw member (60) screwed between the seal cap (30) and the ratcheting head (20), wherein the screw member (60) includes a through hole (61) for the rod (412) to dispose therethrough, the second end of the rod (412) is annularly formed with a restricting slot (415), the restricting slot (415) is recessed on the pressing board (411), and the restricting slot (415) is entirely encompassed by the pressing board (411) and the pressing board (411) is partly embedded in the restricting slot (415).
6. A ratchet wrench, including:
 - a main body (10), including a receiving slot (11) and a first anti-dust portion (12) annularly arranged around outside the receiving slot (11), the first anti-dust portion (12) including a first annular face (121) and an anti-dust wall (122), the first annular face (121) extending from an outer circumferential face of the main body (10) toward the receiving slot (11), the anti-dust wall (122) protruding from an inner annular edge of the first annular face (121);
 - a ratcheting head (20), rotatably disposed in the receiving slot (11), including a second anti-dust portion (31) whose shape corresponds to a shape of the first anti-dust portion (12) and a mounting protrusion (21), wherein the second anti-dust portion (31) includes an annular protrusion (311) facing the first annular face (121) and an annular recession (312) adjacent to an inner annular edge of the annular protrusion (311), the annular recession (312) and the anti-dust wall (122) are engaged with each other, and the annular protrusion (311) and the anti-dust wall (122) are radially disposed neighboring to each other;
 - a seal cap (30), capped on the main body (10) and located above the ratcheting head (20), having a sliding slot (11) disposed through the seal cap (30), a blocking edge (33) provided at an end of the sliding slot (32) and extending radially inward;
 - a latching mechanism (40), including a pushing assembly (41) and an abutting member (42), wherein the pushing assembly (41) is inserted in the ratcheting head (20) and movable to be in an abutting position (P1) and a releasing position (P2), the pushing assembly (41) includes a pressing board (411), a circumferential face of the pressing board (411) is protrudingly disposed a restricting member (416) therearound, the restricting member (416) and the blocking edge (33) abut against and are stuck with each other to restrict the pressing board (411) in the sliding slot (32), the abutting member (42) is movably disposed in the ratcheting head (20) and selectively protrudable outside the mounting protrusion (21), the pushing assembly (41) is able to move from the abutting position (P1) to the releasing position (P2) through pressing the pressing board (411) from outside, when the pushing assembly (41) is in the abutting position (P1), the pushing assembly (41) abuts against the abutting member (42) and partly protrudes outside the mounting protrusion (21), when the pushing assembly (41) is in the releasing position (P2), the pushing assembly (41) is disengaged from the abutting member (42), and the abutting member (42) is retreatable back into the mounting protrusion (21).
7. The ratchet wrench of claim 6, wherein a circumferential wall inside the receiving slot (11) is provided with a ratcheting portion (13) arranged therearound, the ratcheting head (20) is formed with a restricting tooth member (23) selectively meshable with the ratcheting portion (13), and a rotating direction of the ratcheting head (20) is restrictable by the restricting tooth member (23).
8. The ratchet wrench of claim 6, wherein the pushing assembly (41) further includes a rod (412), a rolling bead (413) and an elastic abutting member (414) elastically abuts against between the rolling bead (413) and an inner wall of the ratcheting head (20), a first end of the rod (412) is slidably inserted in the ratcheting head (20) and abuts against the rolling bead (413), the rolling bead (413) selectively abuts against the abutting member (42), and the pressing board (411) is disposed at a second end of the rod (412).
9. The ratchet wrench of claim 6, wherein the restricting member (416) is an engaging member, and the engaging member overlaps a part of the blocking edge (33) along an axial direction.
10. The ratchet wrench of claim 8, further including a screw member (60) screwed between the seal cap (30) and the ratcheting head (20), wherein the screw member (60) includes a through hole for the rod (412) to dispose therethrough, the second end of the rod (412) is annularly formed with a restricting slot (415), the restricting slot (415) is recessed on the pressing board (411), and the restricting slot (415) is entirely encompassed by the pressing board (411) and the pressing board (411) is partly embedded in the restricting slot (415).

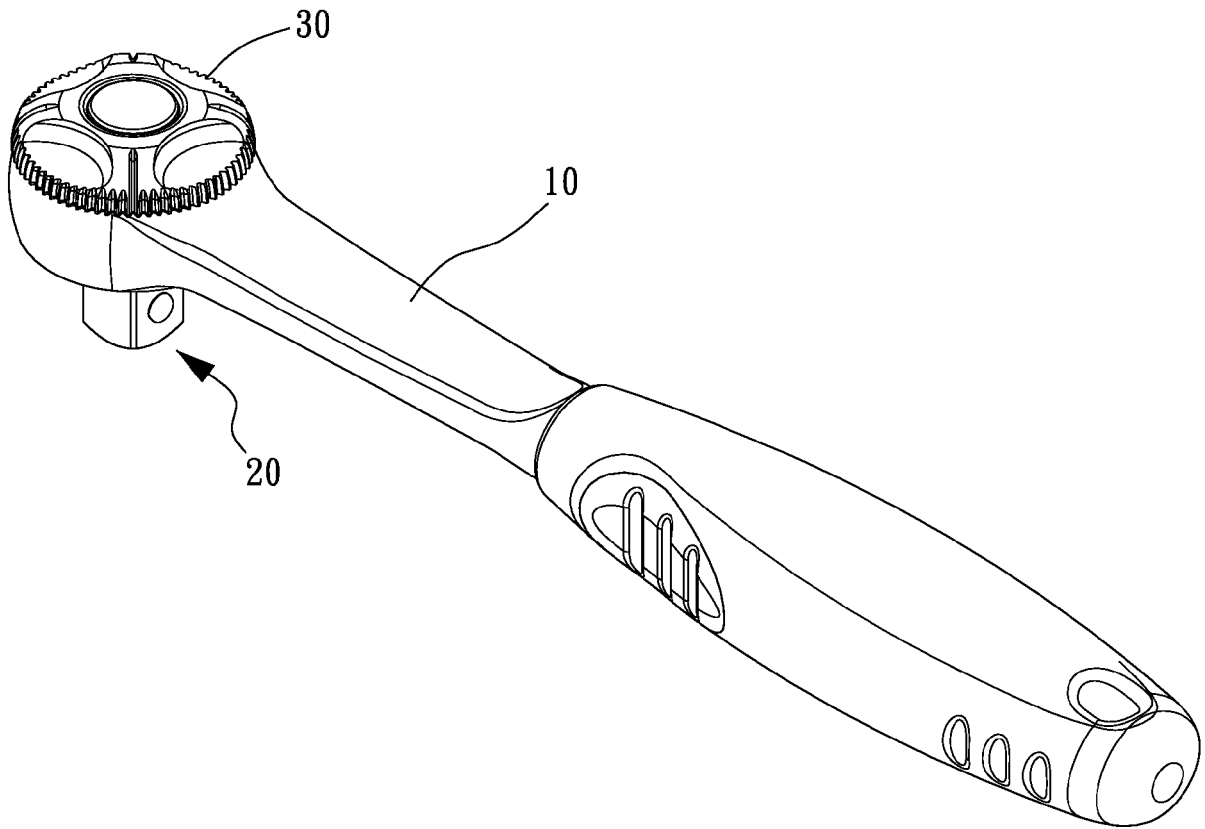


FIG. 1

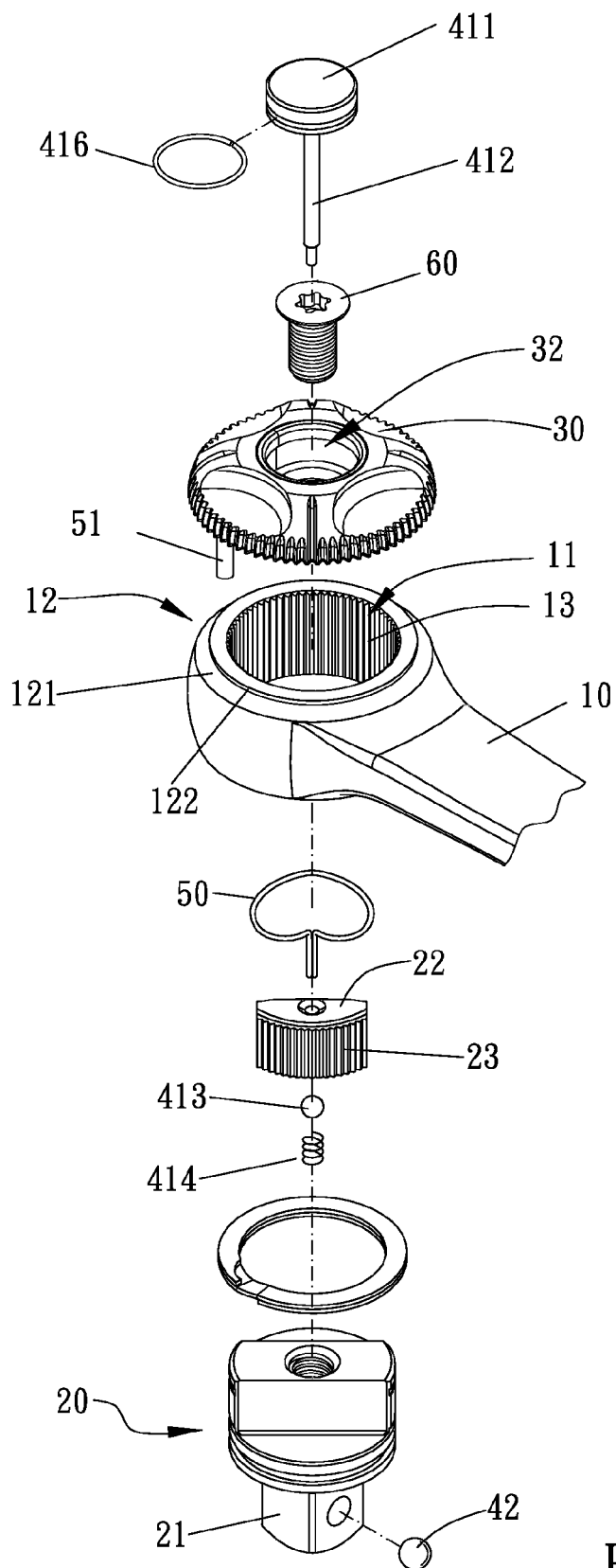


FIG. 2

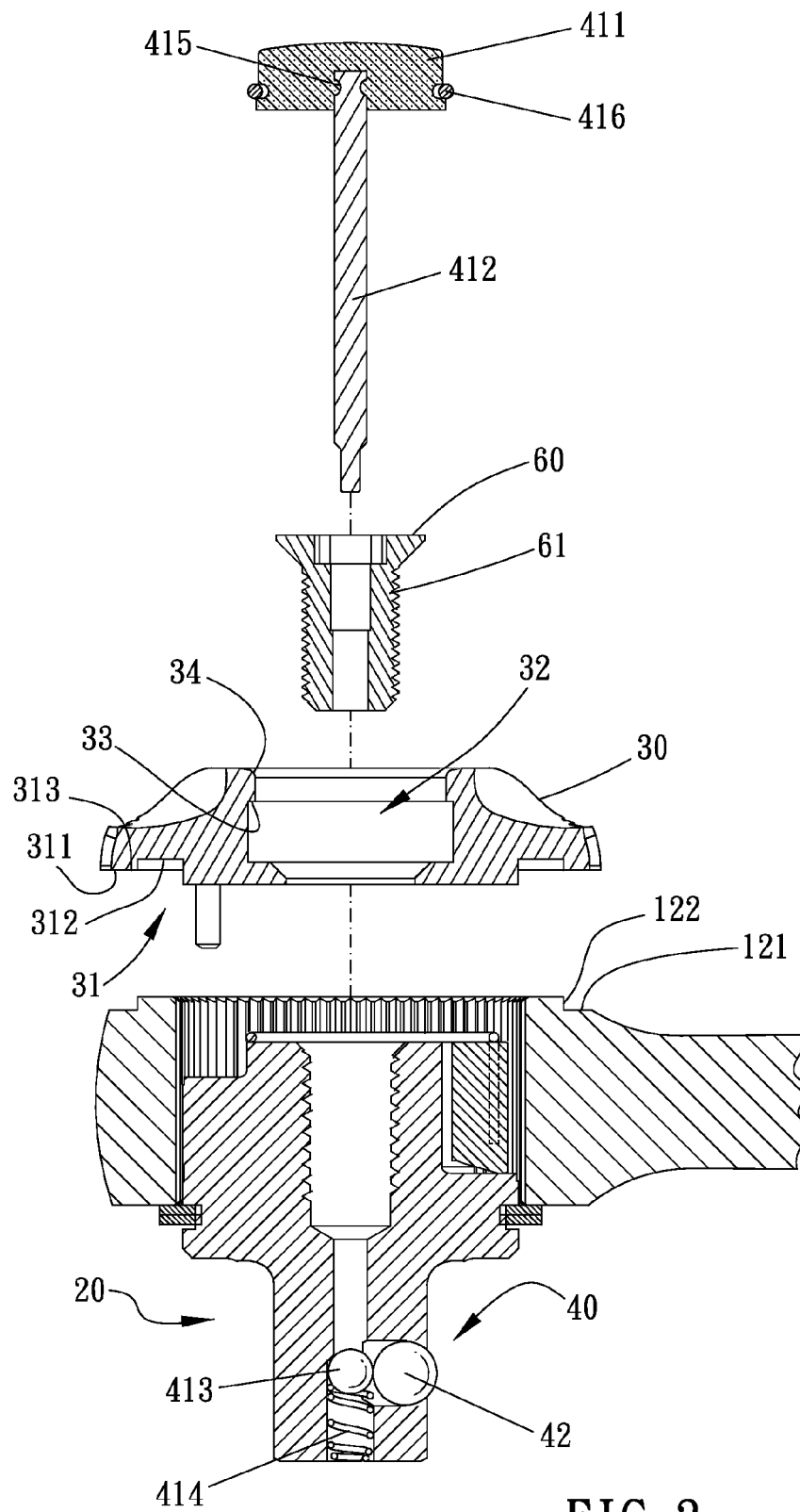


FIG. 3

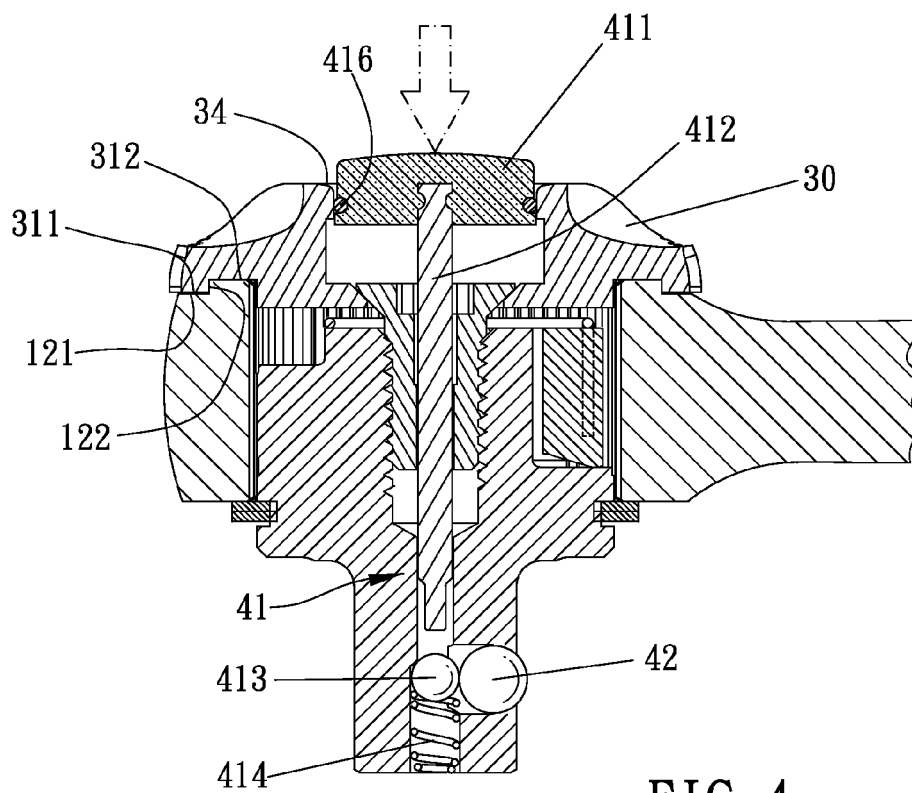


FIG. 4

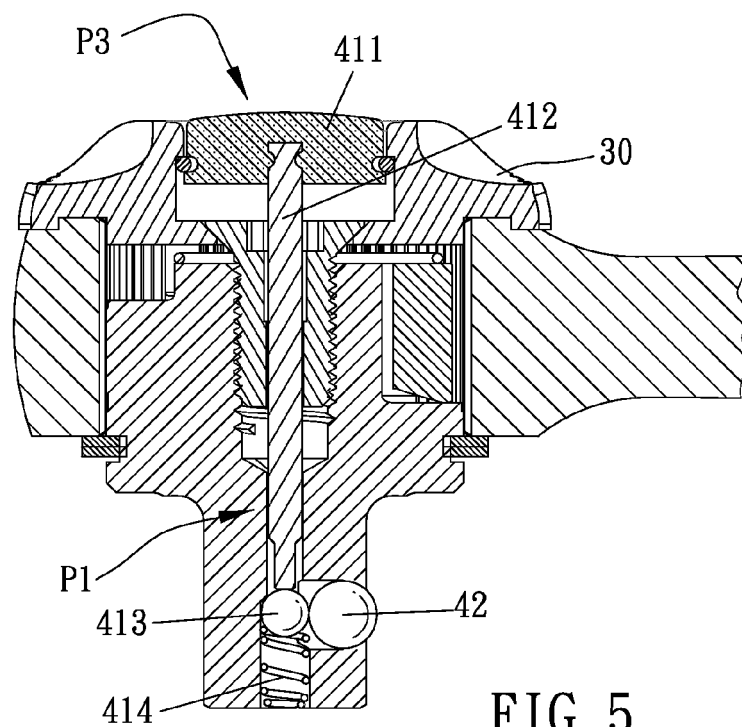


FIG. 5

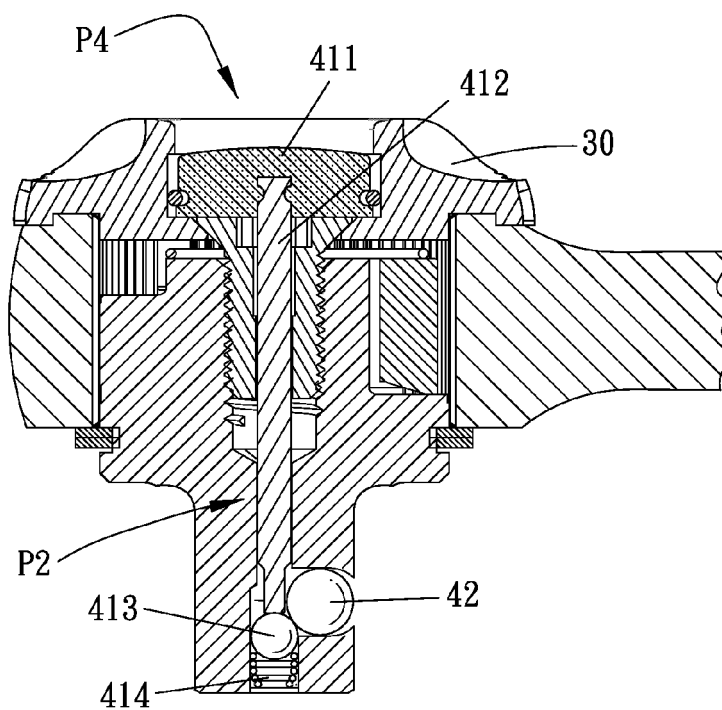


FIG. 6

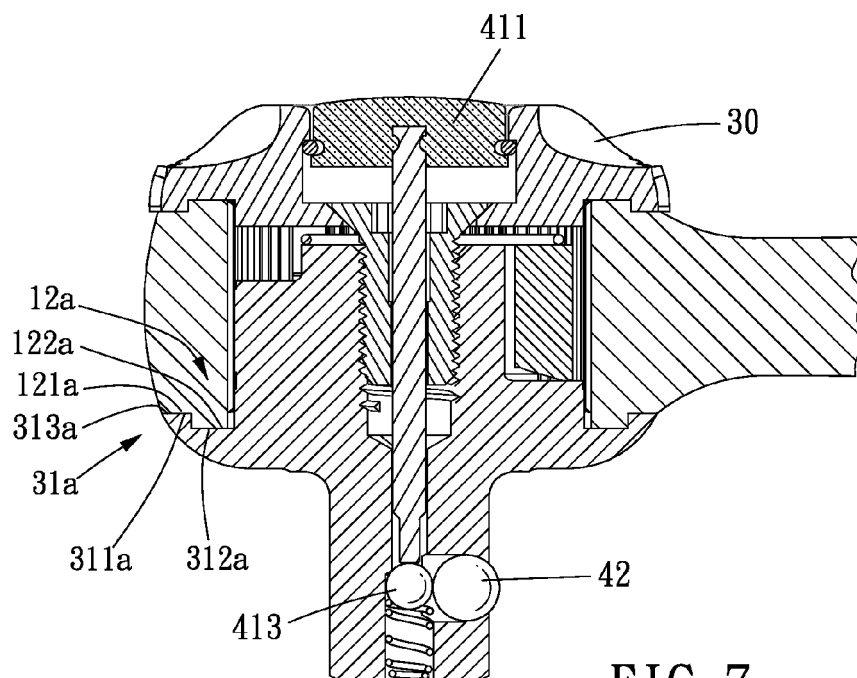


FIG. 7



EUROPEAN SEARCH REPORT

Application Number
EP 14 19 1190

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	DE 297 21 275 U1 (HSIEH CHIH CHING [TW]) 15 January 1998 (1998-01-15) * figures 2, 3 *	1-10	INV. B25B13/46 B25B23/00
Y	WO 01/45905 A1 (HAND TOOL DESIGN CORP [US]) 28 June 2001 (2001-06-28) * fig. 20, 21; p. 10, 11. 1-10 *	1-10	
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A	WO 99/28091 A1 (SNAP ON TOOLS CO [US]) 10 June 1999 (1999-06-10) * p. 7, 11. 20-27; fig. 2-4 *	1-10	
A	EP 0 884 137 A2 (INTERCABLE SRL [IT]) 16 December 1998 (1998-12-16) * fig. 2 *	1-10	
A	US 7 066 055 B1 (LEE YI-MIN [TW]) 27 June 2006 (2006-06-27) * fig. 2, 3 *	1-10	TECHNICAL FIELDS SEARCHED (IPC) B25B
A	EP 2 737 977 A1 (MATATAKITOYO TOOL CO LTD [TW]) 4 June 2014 (2014-06-04) * fig. 2 *	1-10	
A	WO 93/20978 A1 (FOSSELLA GREGORY [US]) 28 October 1993 (1993-10-28) * fig. 2; p. 9, 11. 26-30 *	1-10	
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 3 February 2016	Examiner Hartnack, Kai
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 14 19 1190

5 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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03-02-2016

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