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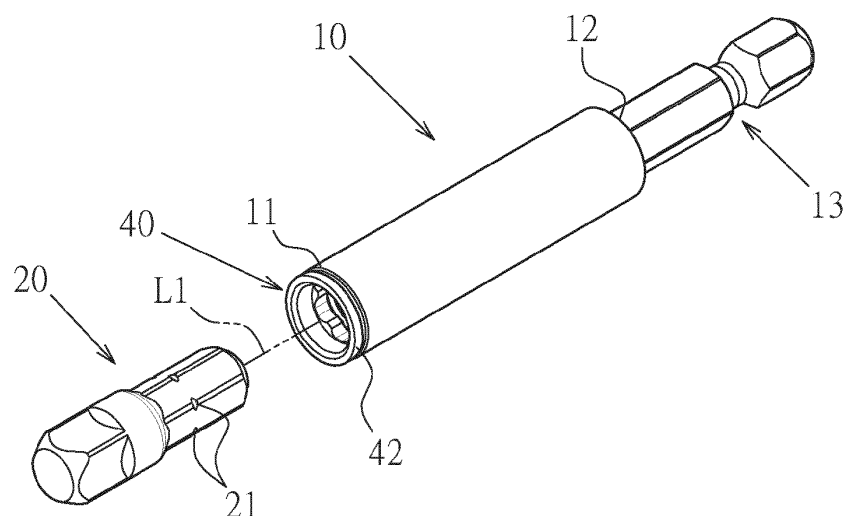
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(54) END-OPERATED QUICK-RELEASE DEVICE FOR SCREWDRIVER BITS

(57) The present invention introduces an end-operated quick-release device for screwdriver bits, mainly comprising a rod, an expandable limiter, and an embedded sliding sleeve, wherein the embedded sliding sleeve is mounted on a polygonal slot provided in the rod including an embedded cylinder and a compression control end. In use, the embedded sliding sleeve is axially displaceable including a first and a second positions. The embedded cylinder comprises multiple full-compressing blocks annularly spaced from each other and located at

an axially same height, and multiple connecting walls connecting those full-compressing blocks, wherein the radial surface width of each full-compressing block is greater than the wire diameter of the expandable limiter, while the radial surface width of the connecting wall is relatively smaller than that of the full-compressing block. In addition, the compression control end extends out of the slot, facilitating the process of applying compression force for control.

**FIG. 1****EP 4 523 850 A1**

Description

FIELD OF INVENTION

[0001] The present invention relates to a screwdriver bit quick-release device; in particular, it discloses a structural configuration of an innovative end-operated quick-release device for screwdriver bits.

BACKGROUND OF THE INVENTION

[0002] The structure of the conventional screwdriver hand tools usually consists of a bit holder pivoted at the acting end of the hand tool for accommodating the corresponding screwdriver bit, and the fixing of the screwdriver bit mainly uses a steel ball clamping method, since the method requires the steel ball to be installed in the inner peripheral wall of the bit holder, then uses a casing to sleeve on its outer side by sliding a ball groove provided on the inner side of the casing to drive the steel ball to selectively clamp or release the screwdriver bit. However, the inner space of the bit holder is limited, so it is not only inconvenient to install a spring and the steel ball in the limited space, but also difficult to manufacture, which relatively increases the manufacturing cost of the bit holder. In addition, in order to process the ball groove, the bit holder must have a certain wall thickness to maintain sufficient strength after processing, as a result, the diameter of the whole bit holder becomes thicker, which is not only a waste of material, but also makes the whole tool set heavier and not easy to carry, meanwhile, it is also inconvenient to use and operate in a narrow working space.

[0003] The applicant of the present invention has previously disclosed an alternative structure configuration in a prior Taiwanese invention patent entitled "Quick-release Structure of Screwdriver Bit" under Certificate No. 1562865, in which the steel ball is replaced by a C-clip or an O-ring. However, it is still not accepted by the market due to its higher component count and manufacturing complexity. In other words, its components must include a rod, a C-clip (or O-ring), a sliding sleeve, and an annular limiter (note: to prevent the sliding sleeve from detaching), and the end of the rod for the socket must also be machined to form a sectional groove. In addition, since the sliding sleeve is mounted on an outer circumference of the rod, it will inevitably lead to the problem of enlarging the outer diameter of the screwdriver bit quick-release device, which is difficult to miniaturize. Meanwhile, since the sectional groove is designed for the purpose of controlling the circle clip, however, the sectional groove type will inevitably lead to the disadvantages of the rod body structure strength being relatively reduced. Therefore, there is still room for improvement and breakthrough.

SUMMARY OF THE INVENTION

[0004] The main purpose of the present invention is to

introduce an end-operated quick-release device for screwdriver bits. Its central aim is to address the technical challenges associated with developing a novel quick-release device structure for screwdriver bits that prioritizes enhanced practicality, with a focus on promoting innovative breakthroughs.

[0005] Given the foregoing, the primary technical features of the present invention, which are aimed at solving these problems, are centered on the end-operated quick-release device for screwdriver bits, comprising:

a rod, having a head end and a tail end formed extensionally along an axial direction, the tail end having a mounting portion, the head end being axially recessed and formed with a polygonal slot for receiving a screwdriver bit, which axially forms multiple snap edges at the same height as the axial direction; the polygonal slot including multiple slot sides and multiple corner sections articulated between adjacent slot sides; an expanded slot section is adjacent to the polygonal slot corresponding to the head end of the rod, the expanded slot section having a slot mouth, and the expanded slot section being formed with an axially spaced distribution of an anti-disengagement limiting annular groove and a limiter expanded groove inwardly from the slot mouth, and the limiter expanded groove being formed with a restraining rim adjacent to the slot mouth; an expandable limiter, accommodated into the limiter expanded groove of the polygonal slot, the expandable limiter defining an outer diameter, an inner diameter, and a wire diameter formed between the outer diameter and the inner diameter, wherein the inner diameter is to be smaller than an outer circular diameter defined by connecting each of the corner sections of the polygonal slot with a circumferential line when a screwdriver bit is inserted into the polygonal slot, the expandable limiter snaps onto the snap edge which is precisely aligned with the screwdriver bit, thereby positioning the screwdriver bit; and an embedded sliding sleeve, assembled to the slot mouth of the expanded slot section, the embedded sliding sleeve comprises an embedded cylinder and a compression control end, the embedded cylinder being formed with a perforation for the screwdriver bit to pass through, wherein the embedded cylinder is inserted and fitted into the interior of the expanded slot section of the polygonal slot, and the embedded cylinder is formed with an annular flange which is correspondingly embedded in the anti-disengagement limiting annular groove, and an axial fitting gap is formed between the anti-disengagement limiting annular groove and the annular flange, whereby the embedded sliding sleeve is displaceable in use and includes a first position and a second position; wherein, the embedded cylinder comprises multiple full-compressing blocks annularly spaced from each other and multiple connecting walls connecting each

of the full-compressing blocks, and the full-compressing blocks and the connecting walls are located at an axially same height; the radial surface width of each of the full-compressing blocks is greater than the wire diameter of the expandable limiter, and the compression control end extends out of the slot mouth to facilitate the process of applying compression force for control; further, the restraining rim and the connecting wall are disposed opposite to each other in a circumferential direction; when the embedded sliding sleeve is in the first position, it is a state in which the expandable limiter is aligned and snapped onto the snap edge of the screwdriver bit so as to position the screwdriver bit, and at that point the expandable limiter is inhibited by the restraining rim to become an anti-disengagement state, and the compression control end is in a state of not being compressed by the force applied to the compression control end; when the embedded sliding sleeve is in the second position, the compression control end is compressed and displaced, causing each of the full-compressing blocks to force the expandable limiter away from the restraining rim and further displaced toward the limiter expanded groove, so that the expandable limiter is disengaged from the snap edge of the screwdriver bit, thereby resulting in a release state of the screwdriver bit.

[0006] The main effect and advantage of the present invention lie in its ability to streamline the components and reduce the size of the quick-release device for screwdriver bits. Simultaneously, it increases the structural strength and provides numerous advantages and substantial progress in practical applications.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007]

FIG. 1 is a three-dimensional view of a preferred embodiment of the present invention;
 FIG. 2 is a three-dimensional view of the decomposition of partial components of a preferred embodiment of the present invention;
 FIG. 3 is a cross-sectional view of partial components of a preferred embodiment of the invention;
 FIG. 4 is a cross-sectional view of the assembly of partial components of a preferred embodiment of the present invention;
 FIG. 5 is an enlarged view of the part numbered 5 in FIG. 4;
 FIG. 6 is a 6-6 sectional view of FIG. 5;
 FIG. 7 is a 7-7 sectional view of FIG. 5;
 FIG. 8 is a schematic diagram of a preferred embodiment of the present invention with the screwdriver bit in a released state;
 FIG. 9 is an enlarged view of the part numbered 9 in FIG. 8; and

FIG. 10 is a 10-10 sectional view of FIG. 9.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0008] Referring to FIGS. 1 to 7, which show preferred embodiments of an end-operated quick-release device for screwdriver bits of the present invention, however, these embodiments are for illustrative purposes only and are not subject to the limitations of the structure for the patent application.

[0009] The above-mentioned end-operated quick-release device for screwdriver bits comprises the following components: a rod 10 having a head end 11 and a tail end 12 formed extensionally along an axial direction L1, the tail end 12 having a mounting portion 13, the head end 11 being axially recessed and formed with a polygonal slot 14 for receiving a screwdriver bit 20, which axially forms multiple snap edges 21 at the same height as the axial direction L1. The polygonal slot 14 including multiple slot sides 141 and multiple corner sections 142 articulated between adjacent slot sides 141; an expanded slot section 15 is adjacent to the polygonal slot 14 corresponding to the head end 11 of the rod 10, the expanded slot section 15 having a slot mouth 16, and the expanded slot section 15 being formed with an axially spaced distribution of an anti-disengagement limiting annular groove 17 and a limiter expanded groove 18 inwardly from the slot mouth 16, and the limiter expanded groove 18 being formed with a restraining rim 19 (with an unlimited number) adjacent to the slot mouth 16. An expandable limiter 30 accommodated into the limiter expanded groove 18 of the polygonal slot 14, the expandable limiter 30 defining an outer diameter 31, an inner diameter 32, and a wire diameter 33 formed between the outer diameter 31 and the inner diameter 32, wherein the inner diameter 32 is to be smaller than an outer circular diameter L3 (as shown in FIG. 7) defined by connecting each of the corner sections 142 of the polygonal slot 14 with a circumferential line L2, when a screwdriver bit 20 is inserted into the polygonal slot 14, the expandable limiter 30 snaps onto the snap edge 21 which is precisely aligned with the screwdriver bit 20, thereby positioning the screwdriver bit 20 (as shown in FIG. 4). An embedded sliding sleeve 40 is assembled to the slot mouth 16 of the expanded slot section 15, the embedded sliding sleeve 40 comprises an embedded cylinder 41 and a compression control end 42, the embedded cylinder 41 being formed with a perforation 43 for the screwdriver bit 20 to pass through, wherein the embedded cylinder 41 is inserted and fitted into the interior of the expanded slot section 15 of the polygonal slot 14, and the embedded cylinder 41 is formed with an annular flange 44 which is correspondingly embedded in the anti-disengagement limiting annular groove 17, and an axial fitting gap L4 is formed between the anti-disengagement limiting annular groove 17 and the annular flange 44 (as shown in FIG. 5), whereby the embedded sliding sleeve 40 is displaceable in use and includes a first

position and a second position. Wherein, the embedded cylinder 41 comprises multiple full-compressing blocks 441 annularly spaced from each other and multiple connecting walls 442 connecting each of the full-compressing blocks 441, and the full-compressing blocks 441 and the connecting walls 442 are located at an axially equal height. Wherein, the radial surface width of each of the full-compressing blocks 441 is greater than the wire diameter 33 of the expandable limiter 30, and the compression control end 42 extends out of the slot mouth 16 to facilitate the process of applying compression force for control. Further, the restraining rim 19 and the connecting wall 442 are disposed opposite to each other in a circumferential direction. When the embedded sliding sleeve 40 is in the first position as shown in FIGS. 4 and 5, it is a state in which the expandable limiter 30 is aligned and snapped onto the snap edge 21 of the screwdriver bit 20 so as to position the screwdriver bit 20, and at that point the expandable limiter 30 is inhibited by the restraining rim 19 to become an anti-disengagement state, and the compression control end 42 is in a state of not being compressed by the force applied to the compression control end 42; when the embedded sliding sleeve 40 is in the second position as shown in FIGS. 8 and 9, the compression control end 42 is compressed and displaced, causing each of the full-compressing blocks 441 to force the expandable limiter 30 away from the restraining rim 19 and further displaced toward the limiter expanded groove 18 so that the expandable limiter 30 is disengaged from the snap edge 21 of the screwdriver bit 20, thereby resulting in a release state of the screwdriver bit 20 (as shown in FIGS. 8-10).

[0010] Wherein, the radial surface width of the connecting wall 442 is relatively smaller than that of each of the full-compressing blocks 441. By means of the constraints described in this embodiment, it is possible to stagger the acting end for positioning the release and clamping of the screwdriver bit 20 in a circumferential direction (but axially at the same height), which effectively prevents an increase in the outer diameter of the rod 10, thereby achieving the advantage of miniaturization of the product volume.

[0011] As shown in FIGS. 3 to 4, in this embodiment, the polygonal slot 14 is internally assembled with a magnetic seat 50, and a resilient element 60 is supported between the magnetic seat 50 and the assembly section 13 to generate a resilient pushing force on the screwdriver bit 20 that is inserted into the polygonal slot 14. In this embodiment, by installing the resilient element 60, when the screwdriver bit 20 is in the released state, the magnetic seat 50 can be pushed by the resilient element 60 to release the screwdriver bit 20 as shown in FIG. 8, so that the screwdriver bit 20 can be taken out by the user.

[0012] As shown in FIG. 6 (and in combination with FIG. 7), in this embodiment, the perforation 43 of the embedded cylinder 41 is further formed with an expanded inner edge 435 corresponding to each of the corner sections 142 of the polygonal slot 14. Its main

purpose is to avoid the jamming that occurs due to the tightness between the perforations 43 of the embedded cylinder 41 as the screwdriver bit 20 rotates.

[0013] Wherein the tail end 12 is formed with one of the following functional states: an assembly functional state (as shown in FIG. 1) or an operation functional state (not shown, e.g., a type of handle or curved angle bar may be applied).

[0014] As shown in FIG. 2, in this embodiment, the compression control end 42 is in an enlarged-diameter configuration with respect to the embedded cylinder 41, and the perforation 43 of the embedded cylinder 41 is in the form of a polygonal contour.

[0015] Utilizing the above structural configuration and technical features, the end-operated quick-release device for screwdriver bits disclosed in the present invention is firstly used as shown in FIGS. 4 to 5, the embedded sliding sleeve 40 is in the first position, i.e., the screwdriver bit 20 is inserted into the polygonal slot 14 of the head end 11 of the rod 10 to position itself, in the meantime, the expandable limiter 30 is aligned and snapped onto the snap edge 21 on the screwdriver bit 20 from which it can be positioned, and due to the expandable limiter 30 is restrained by the restraining edge 19 so as to be in an anti-disengagement state, while the compression control end 42 is in an unpressurized state. When the embedded sliding sleeve 40 is in the second position as shown in FIGS. 8 and 9, the compression control end 42 is displaced by the application of force (as shown by arrow No. L5), causing each of the full-compressing blocks 441 to forcefully push the expandable limiter 30 away from the restraining edge 19 and then be further displaced toward the limiter expanded groove 18 so as to cause the expandable limiter 30 to disengage from the snap edge 21 of the screwdriver bit 20, thereby causing the screwdriver bit 20 to be in the released state, and at this time the magnetic seat 50 is pushed by the resilient element 60, thereby pushing out the screwdriver bit 20 (as shown by arrow No. L6).

[0016] The necessary components of the screwdriver bit end quick release device disclosed in the present invention for controlling the positioning and releasing status of the screwdriver bits 20 can be simplified to the three components, namely, the rod 10, the expandable limiter 30, and the embedded sliding sleeve 40, which enables the screwdriver bits quick-release devices to achieve a better industrial economic efficiency with further simplification of the components and a significant reduction in the cost of manufacturing and assembling. Moreover, the embedded cylinder 41 of the embedded sliding sleeve 40 is inserted inside the expanded slot section 15 of the polygonal slot 14 of the rod 10, and only the compression control end 42 is extended outside the slot mouth 16, which facilitates the user to exert pressure to control, so that it is more conducive to the development and design trend of minimizing the size of the screwdriver bit quick-release device product. Furthermore, the embedded cylinder 41 comprises the multiple full-compress-

sing blocks 441 annularly spaced from each other and located at the same axially height, the connecting wall 442 connecting each full-compressing block 441, and the radial surface width of each full-compressing block 441 is greater than that of the wire diameter 33 of the expandable limiter 30, which ensures that the embedded sliding sleeve 40 can achieve a stable and solid quality in each push against the expandable limiter 30, while the connecting wall 442 connecting each full-compressing block 441 also provides a better structural strength of the embedded sliding sleeve 40, which ensures its durability and stability.

Claims

1. An end-operated quick-release device for screwdriver bits, comprising:

a rod (10), having a head end (11) and a tail end (12) formed extensionally along an axial direction (L1), the tail end (12) having a mounting portion (13), the head end (11) being axially recessed and formed with a polygonal slot (14) for receiving a screwdriver bit (20), which axially forms multiple snap edges (21) at the same height as the axial direction (L1); the polygonal slot (14) including multiple slot sides (141) and multiple corner sections (142) articulated between adjacent slot sides (141); an expanded slot section (15) is adjacent to the polygonal slot (14) corresponding to the head end (11) of the rod (10), the expanded slot section (15) having a slot mouth (16), and the expanded slot section (15) being formed with an axially spaced distribution of an anti-disengagement limiting annular groove (17) and a limiter expanded groove (18) inwardly from the slot mouth (16), and the limiter expanded groove (18) being formed with a restraining rim (19) adjacent to the slot mouth (16); an expandable limiter (30), accommodated into the limiter expanded groove (18) of the polygonal slot (14), the expandable limiter (30) defining an outer diameter (31), an inner diameter (32), and a wire diameter (33) formed between the outer diameter (31) and the inner diameter (32), wherein the inner diameter (32) is to be smaller than an outer circular diameter (L3) defined by connecting each of the corner sections (142) of the polygonal slot (14) with a circumferential line (L2) when a screwdriver bit (20) is inserted into the polygonal slot (14), the expandable limiter (30) snaps onto the snap edge (21) which is precisely aligned with the screwdriver bit (20), thereby positioning the screwdriver bit (20); and an embedded sliding sleeve (40), assembled to the slot mouth (16) of the expanded slot section (15), the embedded sliding sleeve (40) com-

prises an embedded cylinder (41) and a compression control end (42), the embedded cylinder (41) being formed with a perforation (43) for the screwdriver bit (20) to pass through, wherein the embedded cylinder (41) is inserted and fitted into the interior of the expanded slot section (15) of the polygonal slot (14), and the embedded cylinder (41) is formed with an annular flange (44) which is correspondingly embedded in the anti-disengagement limiting annular groove (17), and an axial fitting gap (L4) is formed between the anti-disengagement limiting annular groove (17) and the annular flange (44), whereby the embedded sliding sleeve (40) is displaceable in use and includes a first position and a second position; wherein, the embedded cylinder (41) comprises multiple full-compressing blocks (441) annularly spaced from each other and multiple connecting walls (442) connecting each of the full-compressing blocks (441), and the full-compressing blocks (441) and the connecting walls (442) are located at an axially same height; the radial surface width of each of the full-compressing blocks (441) is greater than the wire diameter (33) of the expandable limiter (30), and the compression control end (42) extends out of the slot mouth (16) to facilitate the process of applying compression force for control; further, the restraining rim (19) and the connecting wall (442) are disposed opposite to each other in a circumferential direction; when the embedded sliding sleeve (40) is in the first position, it is a state in which the expandable limiter (30) is aligned and snapped onto the snap edge (21) of the screwdriver bit (20) so as to position the screwdriver bit (20), and at that point the expandable limiter (30) is inhibited by the restraining rim (19) to become an anti-disengagement state, and the compression control end (42) is in a state of not being compressed by the force applied to the compression control end (42); when the embedded sliding sleeve (40) is in the second position, the compression control end (42) is compressed and displaced, causing each of the full-compressing blocks (441) to force the expandable limiter (30) away from the restraining rim (19) and further displaced toward the limiter expanded groove (18), so that the expandable limiter (30) is disengaged from the snap edge (21) of the screwdriver bit (20), thereby resulting in a release state of the screwdriver bit (20).

2. The end-operated quick-release device for screwdriver bits according to claim 1, wherein, the radial surface width of the connecting wall (442) is relatively smaller than that of each of the full-compressing blocks (441).

3. The end-operated quick-release device for screwdriver bits according to claim 1, wherein, the polygonal slot (14) is internally assembled with a magnetic seat (50), and a resilient element (60) is supported between the magnetic seat (50) and the assembly section (13) to generate a resilient pushing force on the screwdriver bit (20) that is inserted into the polygonal slot (14). 5
4. The end-operated quick-release device for screwdriver bits according to claim 1, wherein, the perforation (43) of the embedded cylinder (41) is further formed with an expanded inner edge (435) corresponding to each of the corner sections (142) of the polygonal slot (14). 10 15
5. The end-operated quick-release device for screwdriver bits according to claim 1, wherein, the tail end (12) is formed with one of the following functional states: an assembly functional state or an operation functional state. 20
6. The end-operated quick-release device for screwdriver bits according to claim 1, wherein, the compression control end (42) is in an enlarged-diameter configuration with respect to the embedded cylinder (41), and the perforation (43) of the embedded cylinder (41) is in the form of a polygonal contour. 25

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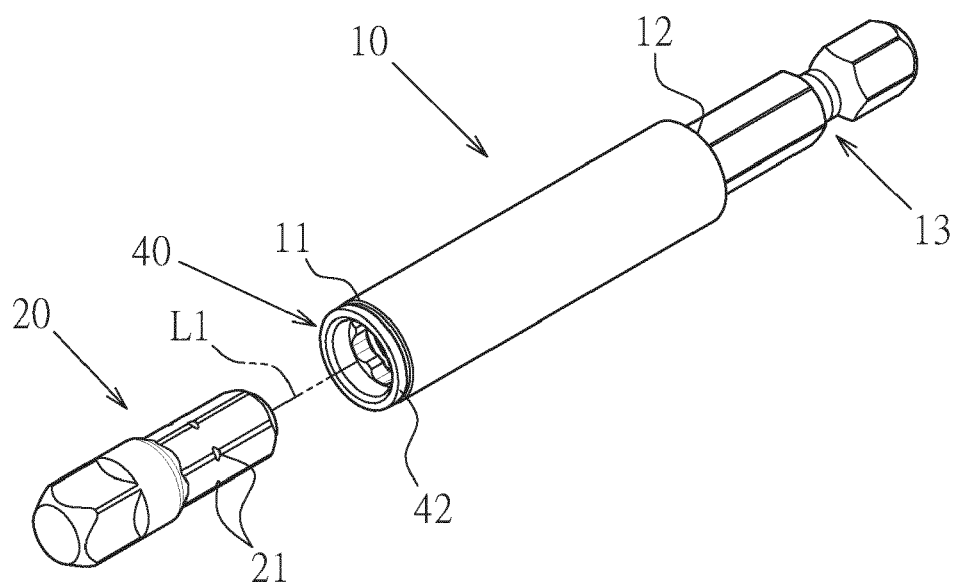


FIG. 1

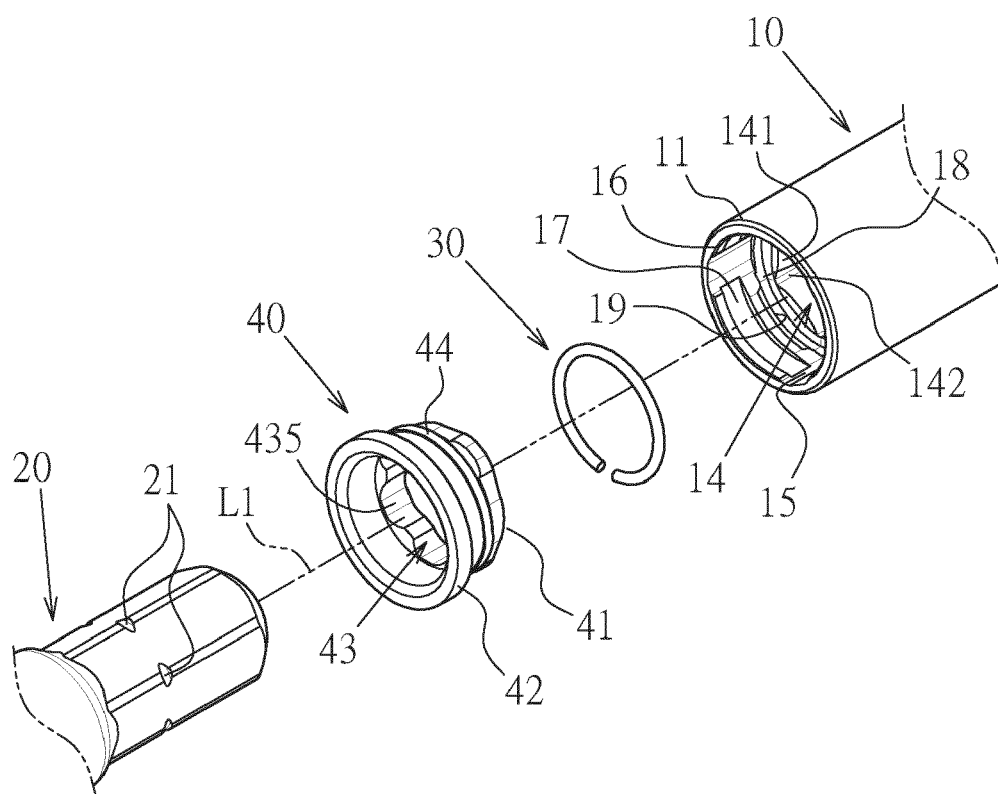


FIG. 2

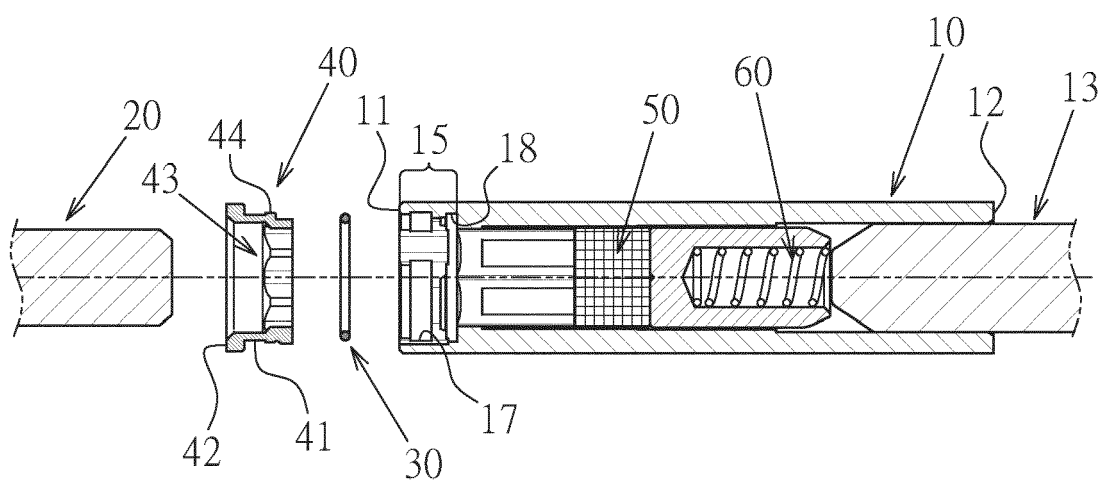


FIG. 3

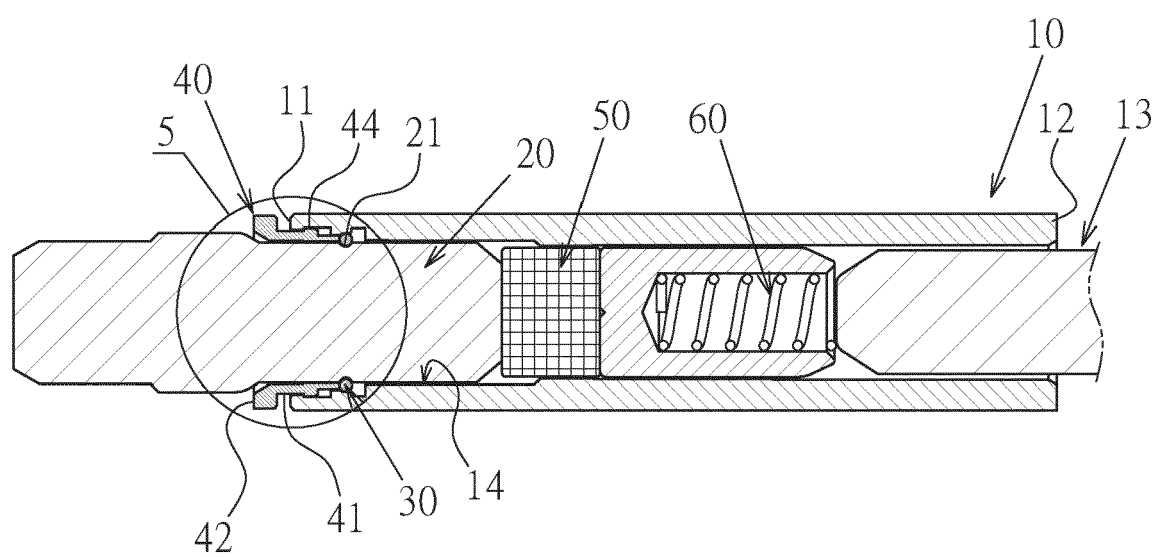


FIG. 4

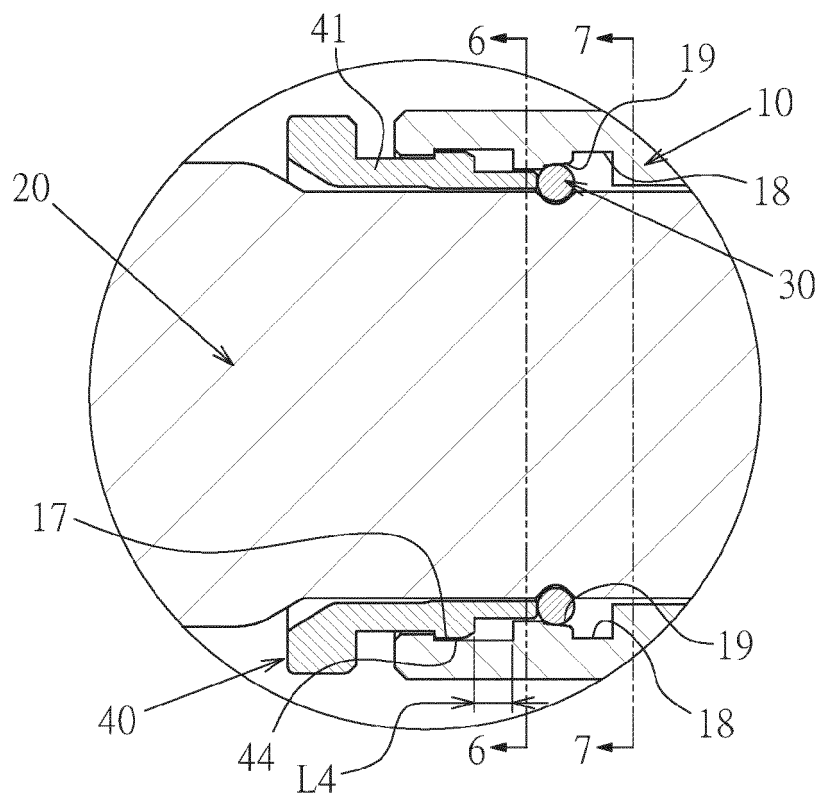


FIG. 5

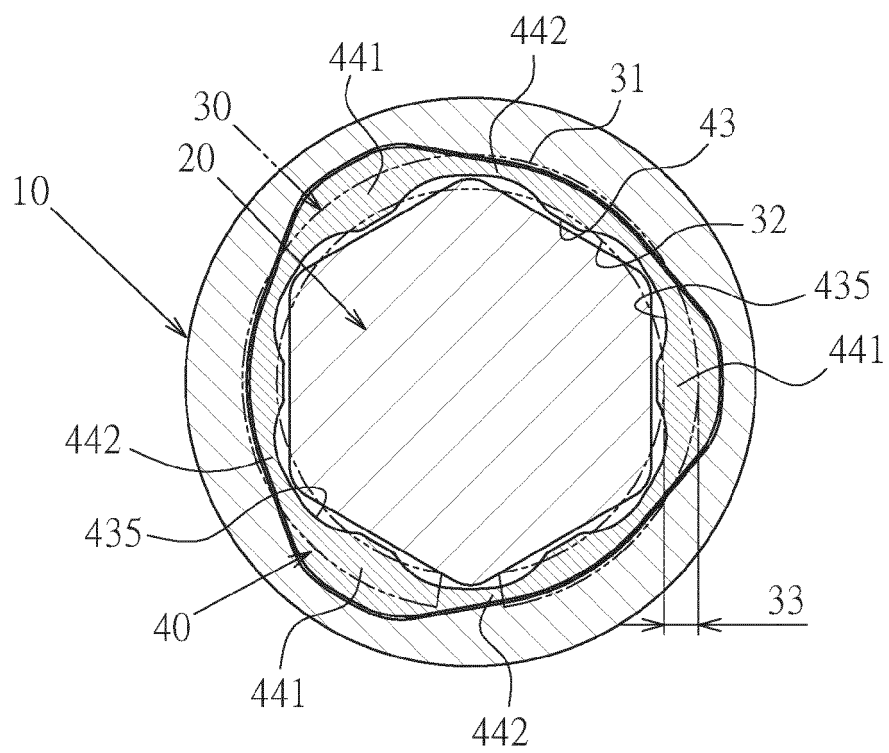


FIG. 6

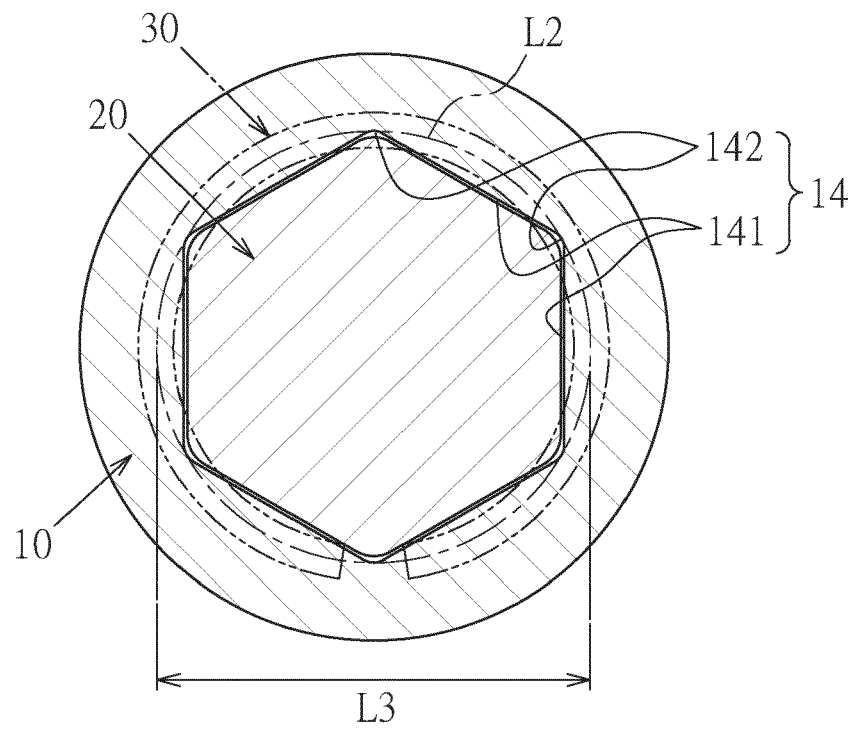


FIG. 7

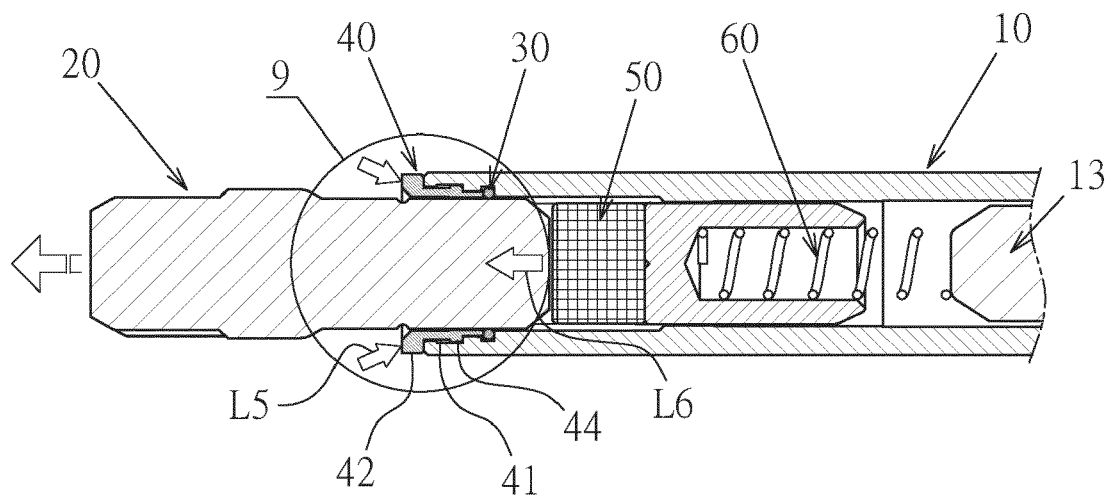


FIG. 8

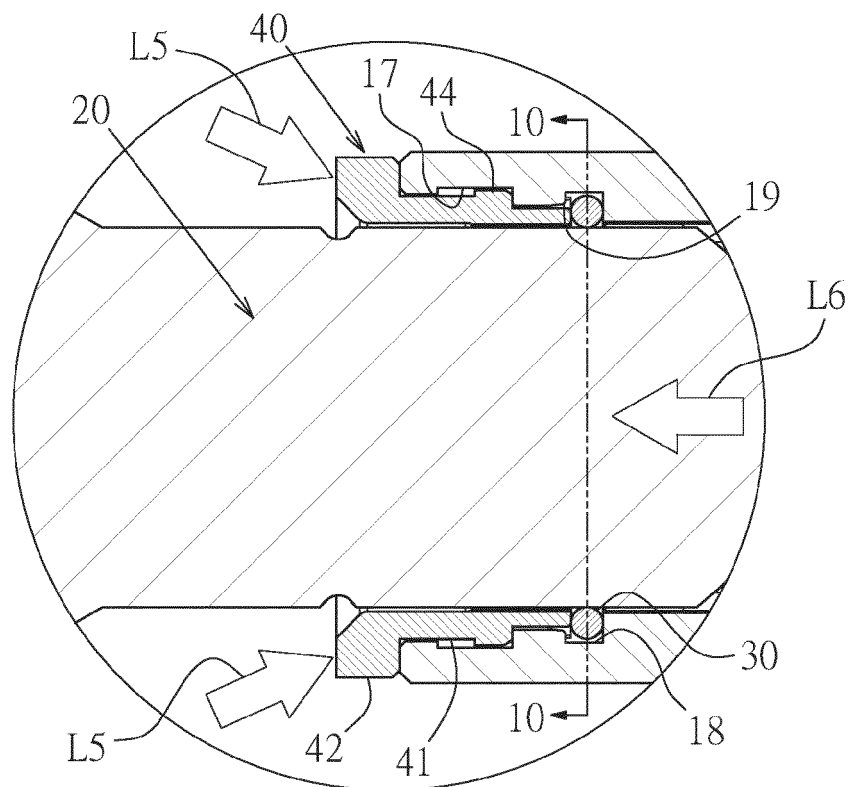


FIG. 9

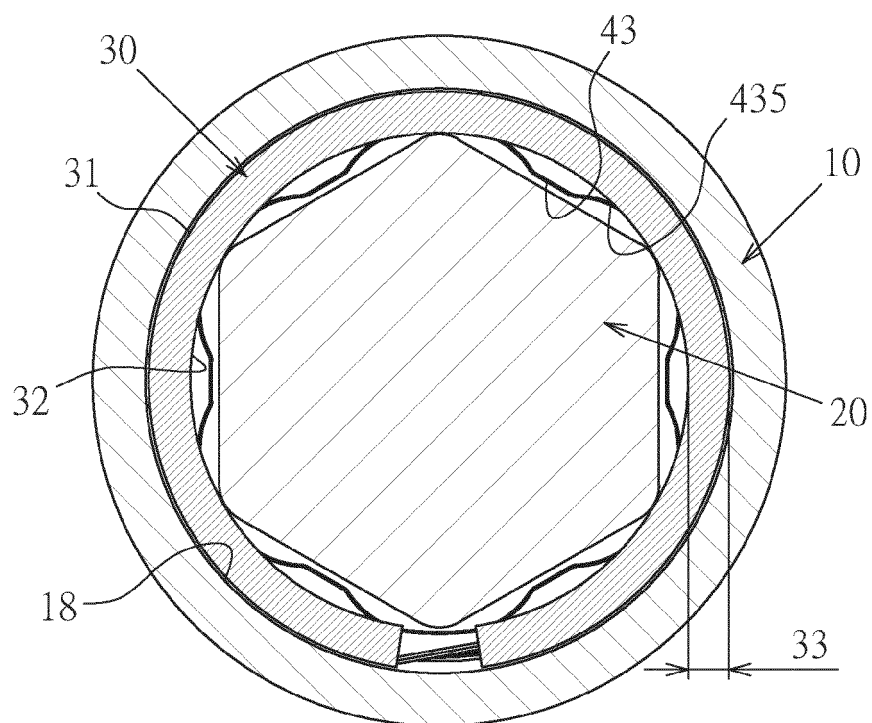


FIG. 10



EUROPEAN SEARCH REPORT

Application Number

EP 23 19 7501

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 2017/348831 A1 (LIN TSUNG-TE [TW]) 7 December 2017 (2017-12-07) * paragraph [0018] - paragraph [0022]; figures 1-11 *	1-6	INV. B25B23/12 B25B23/00
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			TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		16 February 2024	Pothmann, Johannes
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ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.

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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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16-02-2024

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EPO FORM P0459

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