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(54) **Torque-setting device**

Drehmomenteinstellungsvorrichtung

Dispositif de définition de couple

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Description

BACKGROUND OF INVENTION

1. FIELD OF INVENTION

[0001] The present invention relates to a torque-providing tool and, more particularly, to a torque-setting device for use in a torque-providing tool.

2. RELATED PRIOR ART

[0002] There are torque-providing tools such as wrenches and screwdrivers. Such a torque-providing tool includes a handle and a driving unit connected to the handle. The driving unit can be engaged with a bit, and the bit can be engaged with a fastener such as axle and a nut. Thus, the torque-providing tool is operable to provide torque to the fastener.

[0003] To provide certain values of torque to certain fasteners, there have been devised torque-indicating devices. Such a torque indicating device includes a strain gauge connected to the handle or the driving unit, a display and a circuit for connecting the strain gauge to the display. Thus, a value of torque is converted to strain in the strain gauge. The circuit calculates the strain and sends a corresponding signal to the display, and the display shows the value of torque.

[0004] To warn a user of a fact that a value of torque has been reached, there have been devised torque-setting devices so that a click is given when a corresponding value of torque is reached. Such a torque-setting device includes a strain spring connected to the strain gauge, an axle inserted in the strain spring and a nut engaged with the axle and abutted against the strain spring. Rotation of the axle relative to the handle is not allowed. When the nut is rotated relative to the axle, the extent to which the strain spring is compressed is changed, and a value of torque is set. However, the setting of the value of torque is not precise. Moreover, the nut might be rotated accidentally, thus setting an undesired value of torque.

[0005] The present invention is therefore intended to obviate or at least alleviate the problems encountered in prior art.

[0006] US 6,945,144 B1 relates to a torque wrench with a plurality of selectable torque values including a handle, a knob and a threaded stud for communicating with a torque responsive mechanism connected to the knob, wherein the knob includes a key directed parallel to the axis of the knob which is insertable into a plurality of keyways provide in a locking structure disposed within the handle.

SUMMARY OF INVENTION

[0007] It is an object of the present invention to provide a precision, reliable torque-setting device.

[0008] These objects are solved by the torque setting device according to claim 1. Advantageous improvements of the invention are described by the dependent claims.

[0009] To achieve the foregoing objective, the torque-setting device includes a handle, a driving unit, a strain gauge, a strain spring, a nut, an axle and a knob. The handle includes grooves defined in an internal side thereof. The driving unit is attached to an end of the handle. The strain gauge is connected to the driving unit. The strain spring is abutted against the strain gauge within the handle. The nut is abutted against the strain spring. The axle includes a thread formed near a first end and teeth formed near an opposite second end. The thread is engaged with the nut. The knob is movable on the axle and within the handle between a first position and a second position. The knob includes teeth on an internal side thereof and a tooth on an external side. The teeth on the internal side of the knob are engaged with the teeth of the axle so that the knob is operable to rotate the axle relative to the nut, thus moving the nut relative to the strain spring to set a value of torque. The tooth on the external side of the knob is inserted in one of the grooves of the handle to retain the value of torque when the knob is in the first position. The tooth on the external side of the knob is removed from the grooves of the handle to allow the rotation of the knob and therefore the rotation of the axle when the knob is in the second position.

[0010] Other objectives, advantages and features of the present invention will become apparent from the following description referring to the attached drawings.

BRIEF DESCRIPTION OF DRAWINGS

[0011] The present invention will be described via detailed illustration of two embodiments referring to the drawings.

Fig. 1 is a perspective view of a tool equipped with a torque-setting device according to the first embodiment of the present invention.

Fig. 2 is a cross-sectional view of the torque-setting device shown in Fig. 1.

Fig. 3 is an enlarged, partial view of the torque-setting device shown in Fig. 2.

Fig. 4 is a cross-sectional view of the torque-setting device in another position than shown in Fig. 2.

Fig. 5 is an enlarged, partial view of the torque-setting device shown in Fig. 4.

Fig. 6 is another cross-sectional view of the torque-setting device shown in Fig. 2.

Fig. 7 is a cross-sectional view of the torque-setting device in another position than shown in Fig. 6.

Fig. 8 is a perspective view of a tool equipped with a torque-setting device according to the first embodiment of the present invention.

DETAILED DESCRIPTION OF EMBODIMENTS

[0012] Referring to Fig. 1, a tool 100 is equipped with a torque-setting device according to a first embodiment of the present invention. The tool 100 includes a handle 10, a driving unit 11 connected to an end of the handle 10 and a sleeve 15 provided on an opposite end of the handle 10. The handle 10 and the sleeve 15 are hollow. A slot 12 is longitudinally defined in the handle 10.

[0013] Referring to Fig. 2, the torque-setting device includes a spring 20 in contact with a strain gauge that is not shown or described in detail for clarity of the drawings and briefness of the description. A pushing element 33 is disposed in the handle 10. The pushing element 33 is preferably a nut. A pin 330 includes an end movably disposed in the slot 12 and another end driven into the pushing element 33. Thus, the pushing element 33 is movable but not rotational in the handle 10.

[0014] An axle 30 is formed with a thread 31 formed near a first end thereof, a block 34 formed next to the thread 31, a shank 38 formed next to the block 34 and teeth 35 formed near an opposite second end thereof. The thread 31 is engaged with the thread of the pushing element 33 within the handle 10. The block 34 and the shank 38 are located in the handle 10 while the teeth 35 are located outside the handle 10. A bushing 32 is mounted on the shank 38 within the handle 10. A washer 340 is provided between the bushing 32 and the enlarged block 34. Two pins are driven into the bushing 32 through the handle 10, thus attaching the bushing 32 to the handle 10. An axle 37 is driven into the second end of the axle 30 through a restraining element 36, thus securing the restraining element 36 to the axle 37.

[0015] The sleeve 15 includes an annular rib formed on an internal side thereof, thus dividing the interior thereof into a deep cavity for receiving the handle 10 and a shallow cavity 17 for receiving some elements to be described. The teeth 35 are located in the shallow cavity 17. As clearly shown in Figs. 6 and 7, grooves 18 are defined in the wall of the shallow cavity 17. A mark 16 is formed on or defined in an external side of the sleeve 15.

[0016] A knob 40 is made hollow, i.e., including a space 44 defined therein. Moreover, the knob 40 includes a shank 41 formed at an end, a tooth 42 formed on the shank 41, marks 43 formed on or defined in an external side thereof and teeth 45 formed on an internal side. The shank 41 is rotationally inserted in the shallow cavity 17 before the restraining element 36 is secured to the axle 30. The tooth 42 can be inserted in a selected one of the grooves 18 to keep the knob 40 in a desired position relative to the sleeve 15. The marks 43 are provided corresponding to the grooves 18. A selected one of the marks 43 can be aligned with the mark 16 to indicate a selected value of torque. The teeth 45 are engaged with the teeth 35.

[0017] A plug 46 is fit in the lining 56. Thus, the other elements are protected from contamination. The plug 46 can be replaced with a cap mounted on the knob 40 in another embodiment.

[0018] Referring to Fig. 3, a positioning unit 50 includes a lining 56 and a spring-biased detent assembly. The lining 56 is disposed in the space 44 of the knob 40 so that they cannot be rotated or moved relative to each other. In fact, the lining 56 and the knob 40 can be made one in another embodiment. The lining 56 includes an annular flange 51 formed on an internal side thereof at an end and an annular rib 52 formed on the internal side thereof near the annular flange 51.

[0019] The spring-biased detent assembly includes a spring 54 disposed in a recess 53 defined in the restraining element 36 and a detent 55 biased with the spring 54. The detent 55 is formed like a cap for receiving a portion of the spring 54. The detent 55 is in contact with the internal side of the lining 56.

[0020] Referring to Figs. 2, 3 and 6, the annular rib 52 is abutted against the spring-biased detent assembly. The tooth 42 is retained in one of the grooves 18 so that the knob 40 is prevented from rotation relative to the sleeve 15. Hence, the axle 30 cannot be rotated relative to the pushing element 33. Accordingly, the pushing element 33 cannot be moved relative to the strain spring 20. Therefore, a value of torque is set and retained.

[0021] Referring to Figs. 4, 5 and 7, the knob 40 is moved relative to the sleeve 15 after overcoming the force exerted on the annular rib 52 from the spring-biased detent assembly. The tooth 42 is located outside of any of the grooves 18 so that the knob 40 can be rotated relative to the sleeve 15. Hence, the axle 30 can be rotated relative to the pushing element 33. Accordingly, the pushing element 33 can be moved relative to the strain spring 20. Therefore, another value of torque can be set. The knob 40 can be returned to the position shown in Figs. 2, 3 and 6 to retain the new value of torque.

[0022] Referring to Fig. 8, there is shown a tool 200 according to a second embodiment of the present invention. The tool 200 is like the tool 100 except including a different driving unit 11' and different values of torque marked on the knob 40.

[0023] The present invention has been described via the detailed illustration of the embodiments. Those skilled in the art can derive variations from the embodiments without departing from the scope of the present invention. Therefore, the embodiments shall not limit the scope of the present invention defined in the claims.

Claims

1. A torque-setting device (100, 200) comprising:

a handle (10) comprising grooves (18) defined in an internal side thereof;
a driving unit (11, 11') attached to an end of the handle (10) and connected to a strain gauge;
a strain spring (20) abutted against the strain gauge within the handle (10);

a pushing element (33) for pushing the strain spring (20);
an axle (30) connected to the pushing element (33) so that rotation of the former causes movement of the latter relative to the strain spring (20) to set a value of torque wherein the axle (30) comprises teeth (35);
a knob (40) formed with teeth (45) on an internal side thereof which are engaged with the teeth (35) of the axle (30) and a tooth (42) on an external side, which is operable to rotate the axle (30) relative to the driving unit (11, 11'), and movable between a first position where the tooth (42) is inserted in one of the grooves (18) of the handle (10) to retain the value of torque and a second position where the tooth (42) is removed from the grooves (18) to allow the rotation of the knob (40).

2. The torque-setting device (100, 200) according to claim 1, wherein the pushing element (33) is movably but not rotationally disposed in the handle (10) and formed with a thread, and the axle (30) comprises a thread engaged with the pushing element (33).

3. The torque-setting device (100, 200) according to claim 1 comprising a bushing (32) for supporting the axle (30), wherein the axle (50) comprises a block (34) abutted against the bushing (32).

4. The torque-setting device (100, 200) according to claim 1, wherein the knob (40) comprises marks (43, 43') each representing a value of torque, and the handle (10) comprises a mark (16, 16') for alignment with a selected one of the marks (43, 43') of the knob (40).

5. The torque-setting device (100, 200) according to claim 1 comprising a sleeve (15) provided on the handle (10), wherein the grooves (18) of the handle (10) are defined in an internal side of the sleeve (15), in particular in a wall of the sleeve formed hollow.

6. The torque-setting device (100, 200) according to claim 1 comprising a restraining element (36) attached to the axle (30).

7. The torque-setting device (100, 200) according to claim 1 comprising a plug (46) fit in the handle (10) to protect the other elements.

8. The torque-setting device (100, 200) according to claim 6 comprising a spring-biased detent assembly including a spring (54) disposed in a recess (53) defined in the restraining element (36) and a detent (55) biased with the spring (54), connected to the restraining element (36), wherein the knob (40) comprises an annular flange (51) and an annular rib (52) on an internal side for cooperation with the spring-biased detent assembly to position the knob (40).

9. The torque-setting device (100, 200) according to claim 2 comprising a pin (330) with an end driven in the pushing element (33), wherein the handle (10) comprises a slot (12) for movably receiving another end of the pin (330).

10. The torque-setting device (100, 200) according to claim 3 comprising a washer (340) provided between the block (34) and the bushing (32).

Patentansprüche

1. Drehmomenteinstellvorrichtung (100, 200) umfassend:

einen Handgriff (10), der Nuten (18) umfasst, die an einer Innenseite definiert sind;
ein Antriebselement (11, 11'), das an einem Ende des Handgriffes (10) angebracht ist und mit einem Dehnungsmesser verbunden ist;
eine Spannfeder (20), die an den Dehnungsmesser innerhalb des Handgriffes (10) angrenzt;
ein Druckelement (33), zum Drücken der Spannfeder (20);
eine Achse (30), die mit dem Druckelement (33) verbunden ist, so dass die Rotation des Erstgenannten eine Bewegung des Letzteren relativ zu der Spannfeder (20) bewirkt, um einen Wert des Drehmoments einzustellen, wobei die Achse (30) Zähne (35) umfasst;
einen Knopf (40), der an seiner Innenseite mit Zähnen (45), die im Eingriff mit den Zähnen (35) der Achse (30) sind, und einem Zahn (42) an einer äußeren Seite ausgebildet ist, welcher fähig ist, die Achse (30) relativ zu dem Antriebselement (11, 11') zu drehen, und zwischen einer ersten Position, wo der Zahn (42) in eine der Nuten (18) des Handgriffes (10) eingefügt ist, um den Wert des Drehmoments zu halten, und einer zweiten Position beweglich ist, wo der Zahn (42) von den Nuten (18) entfernt ist, um die Drehung des Knopfes (40) zu ermöglichen.

2. Drehmomenteinstellvorrichtung (100, 200) nach Anspruch 1, **dadurch gekennzeichnet, dass** das Druckelement (33) beweglich, aber nicht drehbar in dem Handgriff (10) angeordnet ist und mit einem Gewinde ausgebildet ist, und die Achse (30) ein Gewinde umfasst, das mit dem Druckelement (33) im Eingriff ist.

3. Drehmomenteinstellvorrichtung (100, 200) nach Anspruch 1, umfassend eine Buchse (32) zum Lagern

der Achse (30), wobei die Achse (30) einen Block (34) umfasst, der an der Buchse (32) anliegt.

4. Drehmomenteinstellvorrichtung (100, 200) nach Anspruch 1, **dadurch gekennzeichnet, dass** der Knopf (40) Markierungen (43, 43') umfasst, die jeweils einen Wert des Drehmomentes darstellen, und der Handgriff (10) eine Markierung (16, 16') zum Ausrichten mit einer gewählten Markierung der Markierungen (43, 43') des Knopfes (40) umfasst.

5. Drehmomenteinstellvorrichtung (100, 200) nach Anspruch 1, umfassend eine Hülse (15), die an dem Handgriff (10) angeordnet ist, wobei die Nuten (18) des Handgriffes (10) an der Innenseite der Hülse (15) definiert sind, insbesondere in einer Wand der hohl ausgebildeten Hülse.

6. Drehmomenteinstellvorrichtung (100, 200) nach Anspruch 1, umfassend ein Rückhalteelement (36), das an der Achse (30) angebracht ist.

7. Drehmomenteinstellvorrichtung (100, 200) nach Anspruch 1, umfassend einen Stopfen (46), der in den Handgriff (10) eingepasst ist, um die anderen Elemente zu schützen.

8. Drehmomenteinstellvorrichtung (100, 200) nach Anspruch 6, umfassend eine mit einer Feder vorgespannte Arretierungsbaugruppe mitsamt einer Feder (54), die in einer Ausnehmung (53), die in dem Rückhalteelement definiert ist, angeordnet ist, und eine Arretierung (55), die mit der Feder (54) vorgespannt ist, und die mit dem Rückhalteelement (36) verbunden ist, wobei der Knopf (40) einen ringförmigen Flansch (51) und eine ringförmige Rippe (52) an einer Innenseite zum Zusammenwirken mit der Feder - vorgespannten Arretierungsbaugruppe umfasst, um den Knopf (40) zu positionieren.

9. Drehmomenteinstellvorrichtung (100, 200) nach Anspruch 2, umfassend einen Stift (330), der mit einem Ende in das Druckelement (33) eingeführt ist, wobei der Handgriff (10) einen Schlitz (12) umfasst, um das andere Ende des Stiftes (330) beweglich aufzunehmen.

10. Drehmomenteinstellvorrichtung (100, 200) nach Anspruch 3, umfassend eine Scheibe (340), die zwischen dem Block (34) und der Buchse (32) vorgesehen ist.

Revendications

1. Dispositif de réglage de couple (100, 200) comprenant :

une poignée (10) comprenant des cannelures (18) définies dans un côté intérieur de celle-ci,
une unité d'entraînement (11, 11') fixée à une extrémité de la poignée (10) et reliée à une jauge de contrainte;
un ressort de contrainte (20) en butée contre la jauge de contrainte à l'intérieur de la poignée (10),
un élément de poussée (33) pour pousser le ressort de contrainte (20),
un axe (30) relié à l'élément de poussée (33) si bien que la rotation du premier cause le mouvement du second par rapport au ressort de contrainte (20) pour fixer une valeur de force de torsion, l'axe (30) comprenant des dents (35),
un bouton (40), formé avec des dents (45) sur un côté intérieur de celui-ci qui sont en prise avec les dents (35) de l'axe (30) et une dent (42) sur un côté extérieur, qui est maniable pour faire tourner l'axe (30) par rapport à l'unité d'entraînement (11, 11') et mobile entre une première position dans laquelle la dent (42) est insérée dans l'une des cannelures (18) de la poignée (10) pour retenir la valeur de force de torsion et une seconde position dans laquelle la dent (42) est retirée des cannelures (18) pour permettre la rotation du bouton (40).

2. Dispositif de réglage de couple (100, 200) selon la revendication 1, l'élément de poussée (33) étant placé de manière mobile mais pas de manière mobile en rotation dans la poignée (10) et étant formé avec un filet et l'axe (30) comprenant un filet en prise avec l'élément de poussée (33).

3. Dispositif de réglage de couple (100, 200) selon la revendication 1 comprenant une douille (32) pour supporter l'axe (30), l'axe (30) comprenant un bloc (34) en butée contre la douille (32).

4. Dispositif de réglage de couple (100, 200) selon la revendication 1, le bouton (40) comprenant des marques (43, 43') chacune représentant une valeur de force de torsion et la poignée (10) comprenant une marque (16, 16') pour l'alignement avec une marque sélectionnée parmi les marques (43, 43') du bouton (40).

5. Dispositif de réglage de couple (100, 200) selon la revendication 1 comprenant un manchon (15) prévu sur la poignée (10), les cannelures (18) de la poignée (10) étant définies dans un côté intérieur du manchon (15), en particulier dans une paroi du manchon formé creux.

6. Dispositif de réglage de couple (100, 200) selon la revendication 1 comprenant un élément de retenue (36) fixé à l'axe (30).

7. Dispositif de réglage de couple (100, 200) selon la revendication 1 comprenant un bouchon (46) adapté dans la poignée (10) pour protéger les autres éléments.

8. Dispositif de réglage de couple (100, 200) selon la revendication 6 comprenant un ensemble d'arrêt chargé par ressort comprenant un ressort (54) disposé dans un évidement (53) défini dans l'élément de retenue (36) et un arrêt (55) chargé avec le ressort (54), relié à l'élément de retenue (36), le bouton (40) comprenant une bride annulaire (51) et une nervure annulaire (52) sur un côté intérieur pour coopérer avec l'ensemble d'arrêt chargé par ressort pour positionner le bouton (40).

9. Dispositif de réglage de couple (100, 200) selon la revendication 2 comprenant une cheville (330) avec une extrémité entraînée dans l'élément de poussée (33), la poignée (10) comprenant une fente (12) pour recevoir de manière mobile une autre extrémité de la cheville (330).

10. Dispositif de réglage de couple (100, 200) selon la revendication 3 comprenant une rondelle (340) prévue entre le bloc (34) et la douille (32).

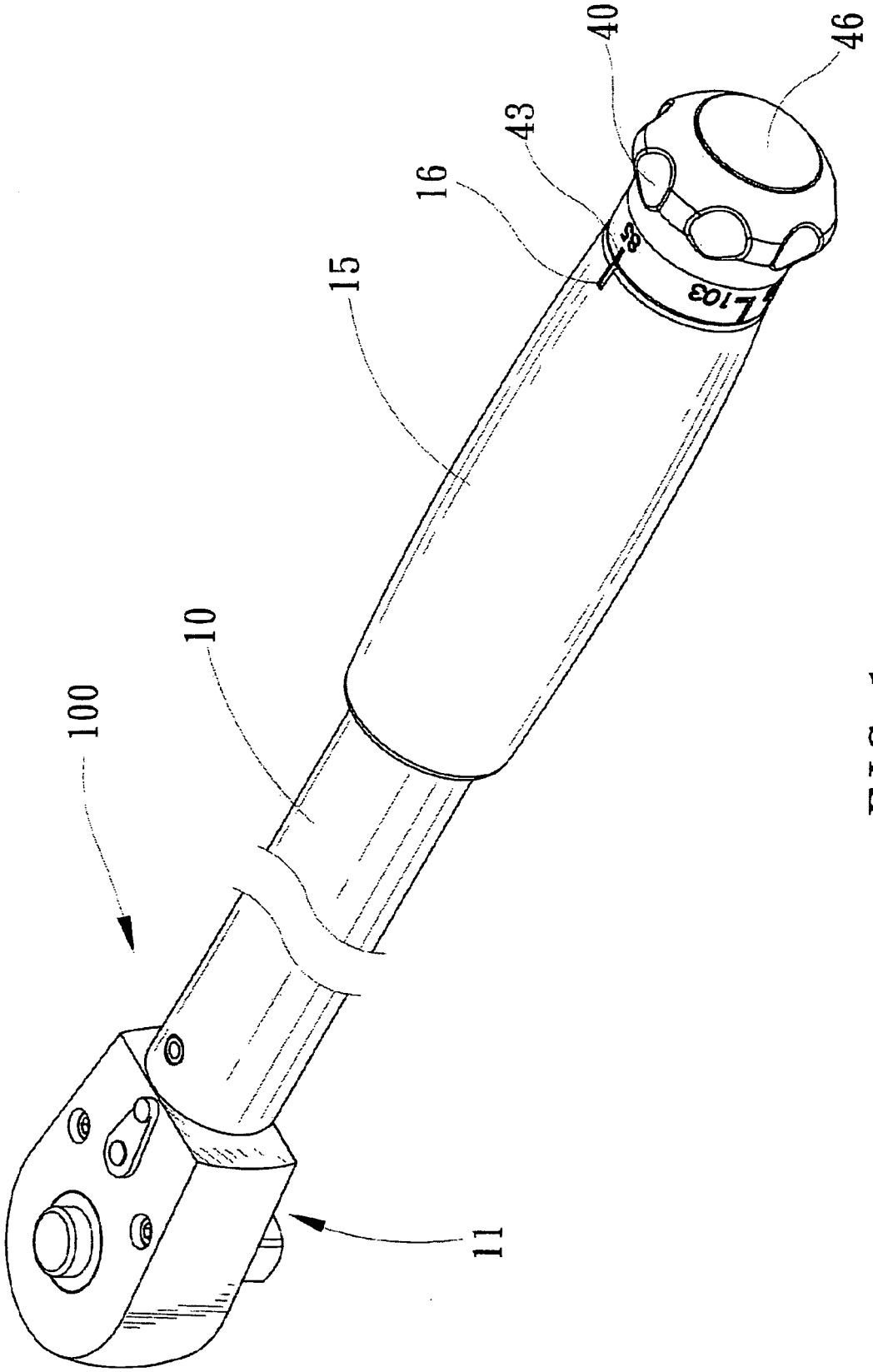


FIG. 1

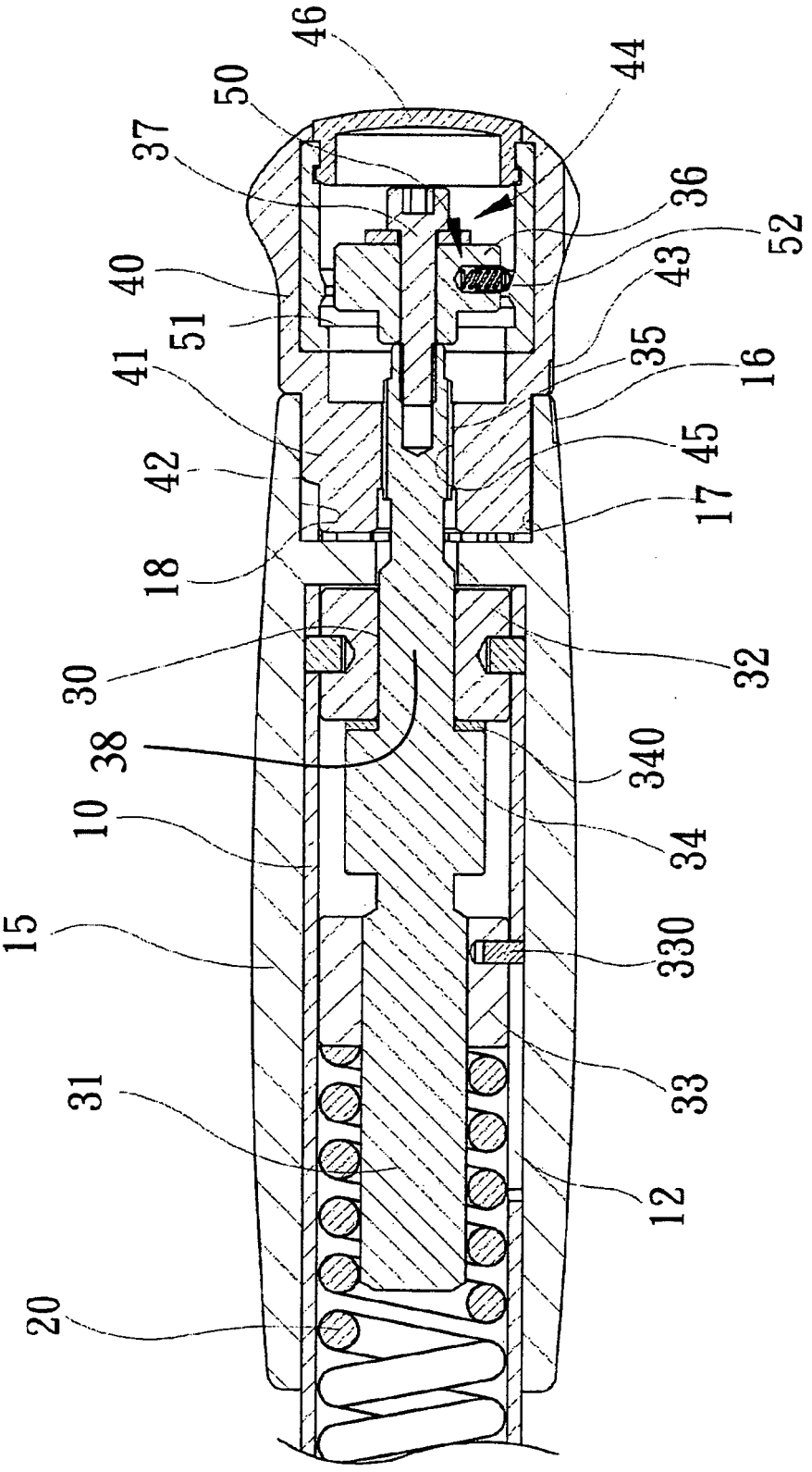

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FIG. 2

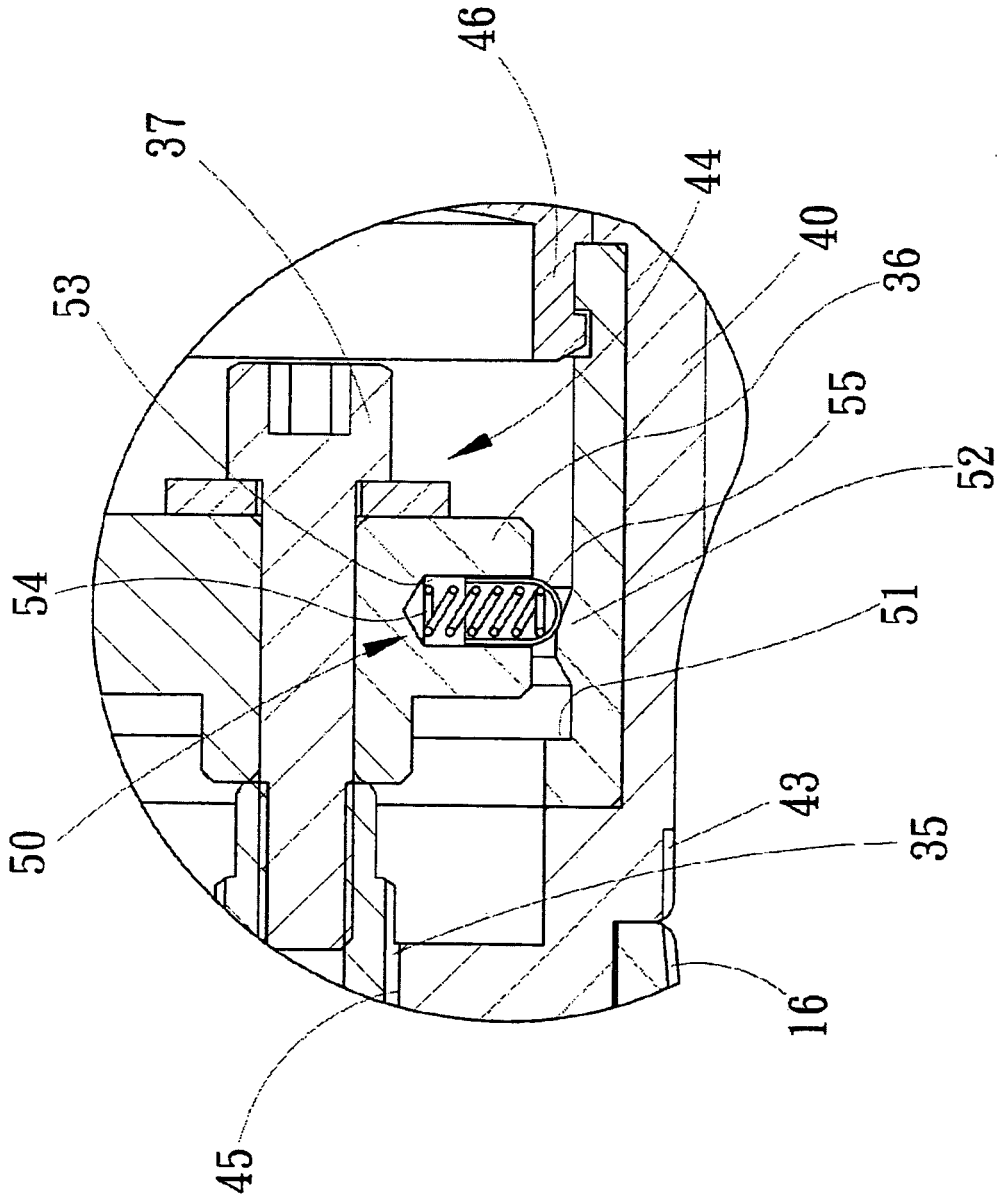


FIG. 3

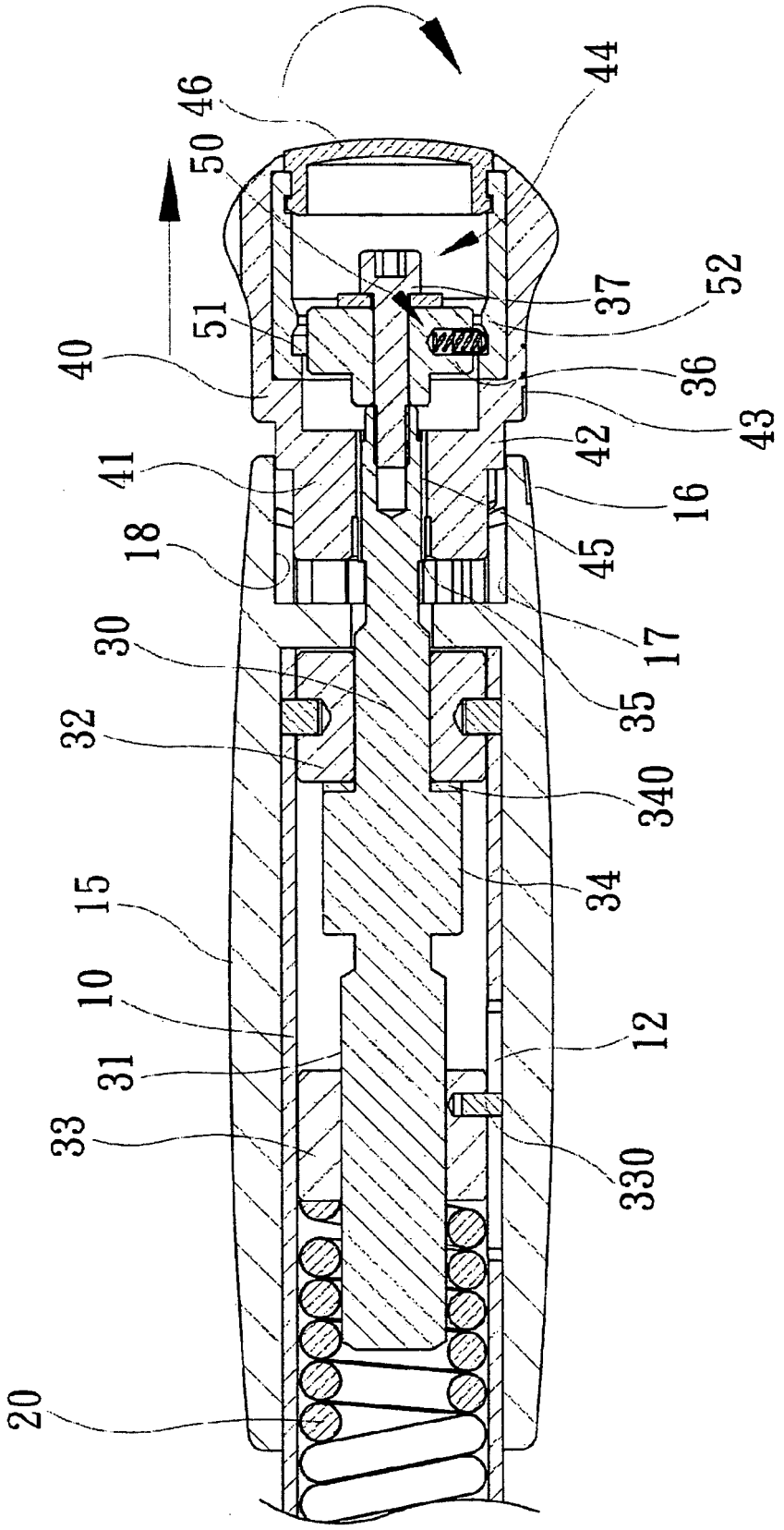

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FIG. 4

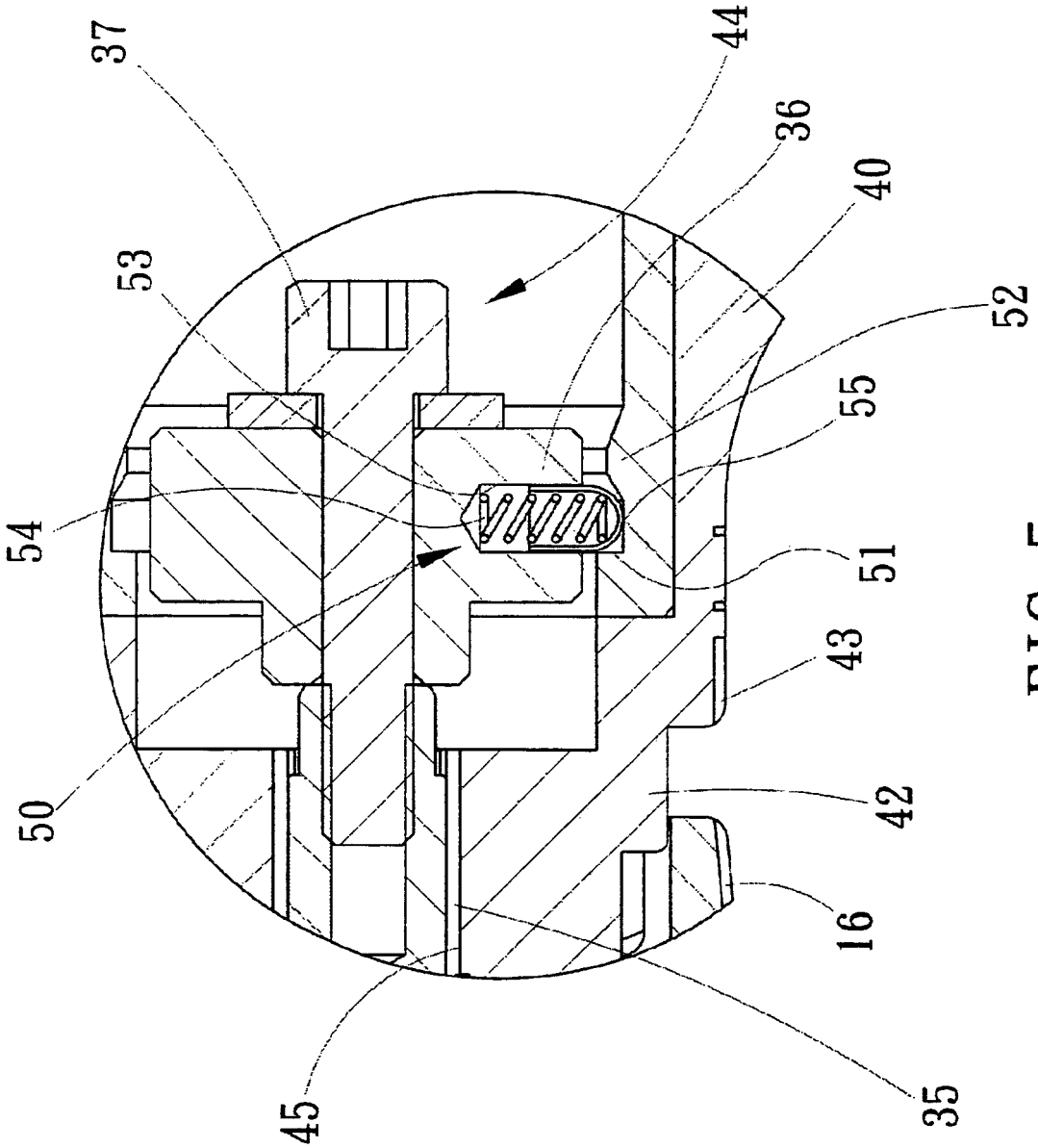


FIG. 5

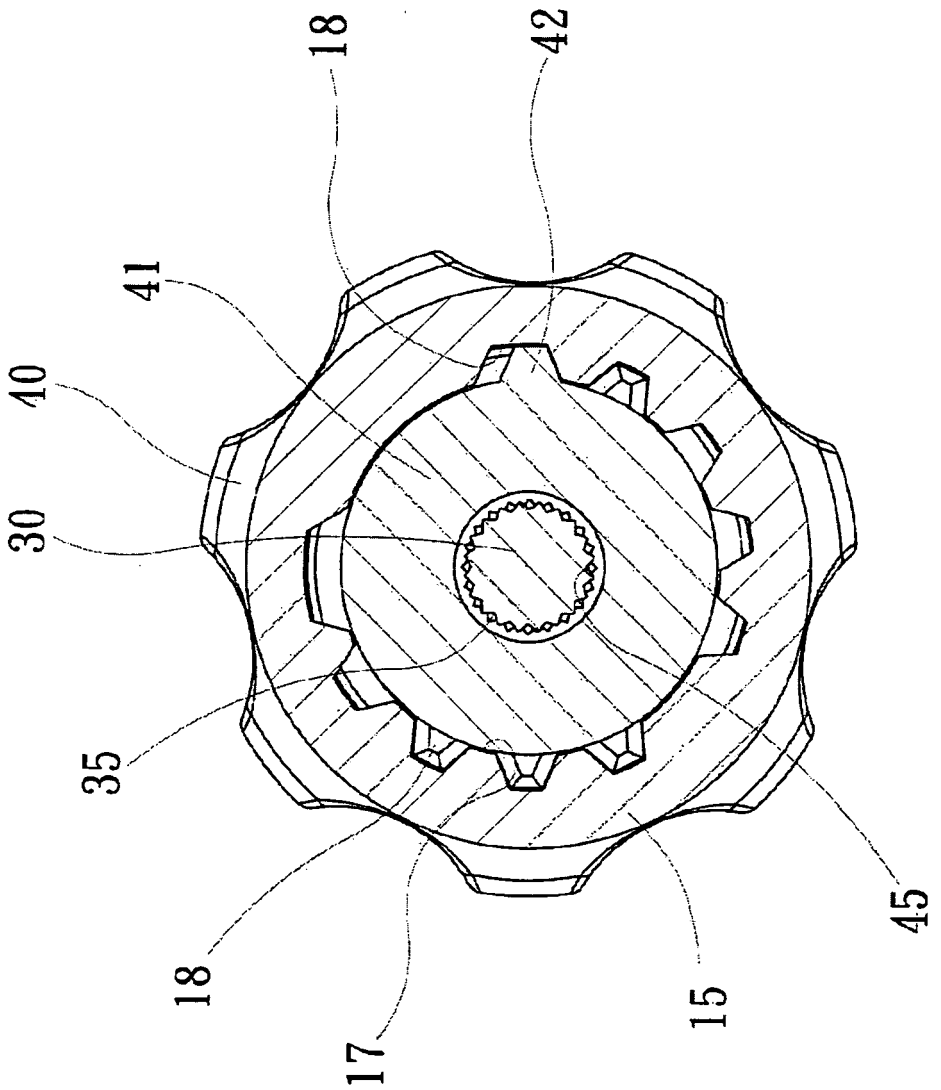


FIG. 6

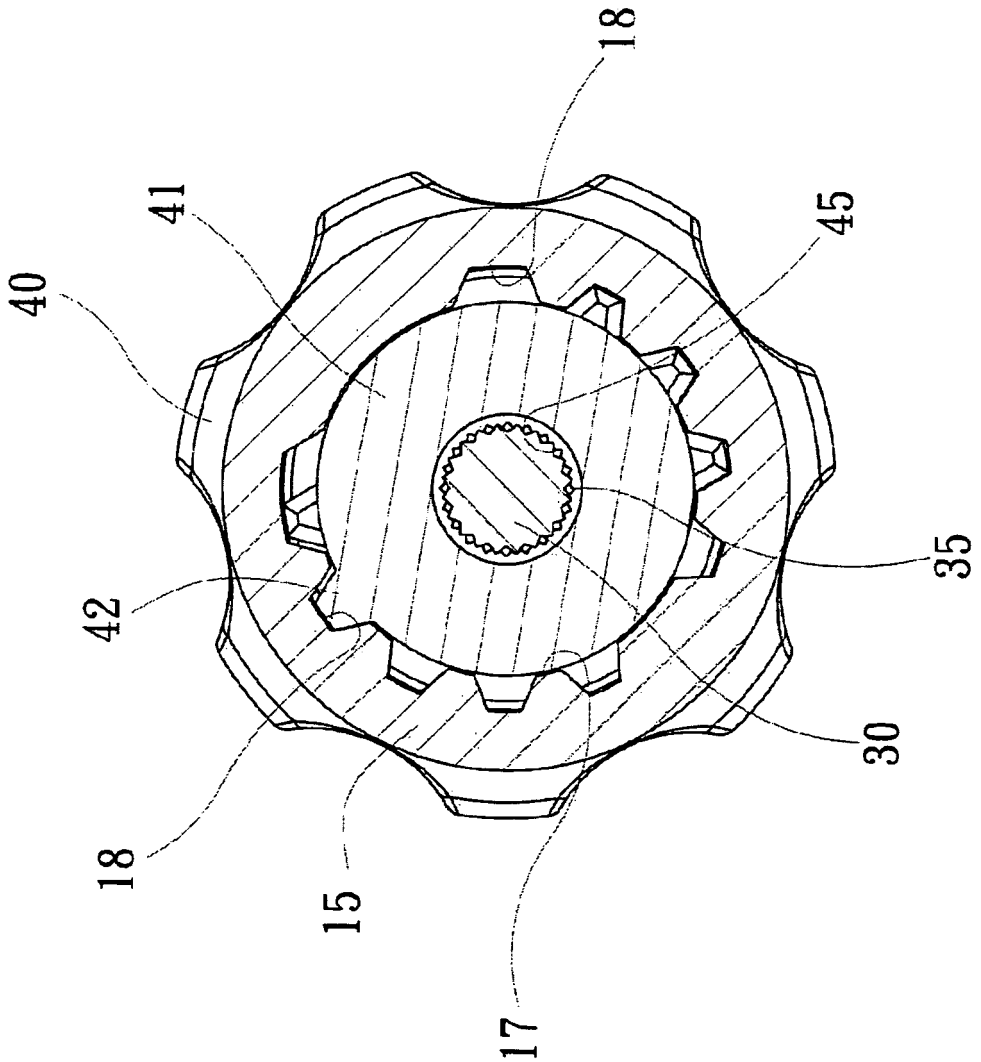


FIG. 7

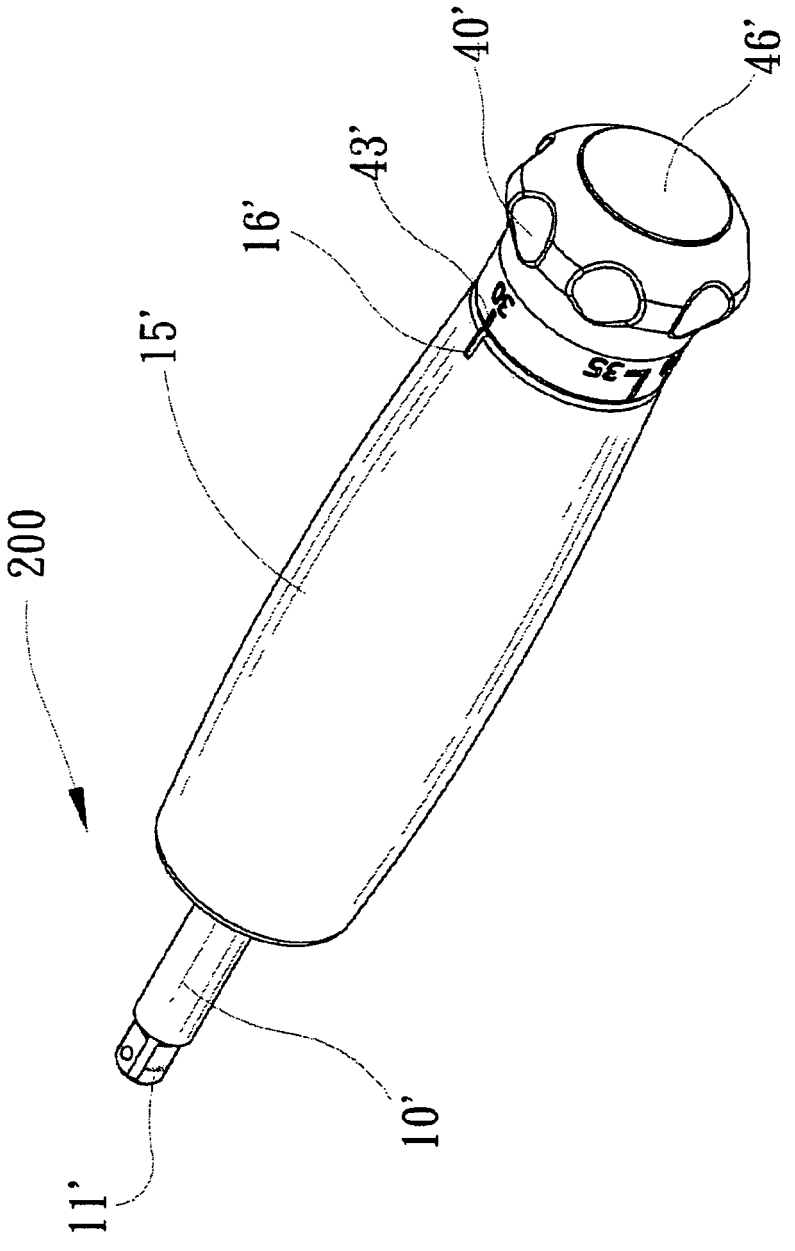


FIG. 8

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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