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(54) Wrench with a lockable torque-setting mechanism

Schraubenschlüssel mit arretierbarem Drehmomenteinstellmechanismus

Clef munie d'un mécanisme couple de serrage verrouillable

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US-A- 5 497 682 US-A1- 2010 275 742
US-A1- 2011 113 936

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Description

BACKGROUND OF INVENTION

1. FIELD OF INVENTION

[0001] The present invention relates to a wrench equipped with a torque-setting mechanism and, more particularly, to a wrench equipped with a lockable torque-setting mechanism.

2. RELATED PRIOR ART

[0002] Wrenches are used to exert torque on fasteners such as threaded bolts and nuts to fasten work-pieces. It is important to exert a proper value of torque. In some applications, it is particularly important to have the value of torque close to but under a limit to effectively fasten the work-pieces without the risks of damaging the work-pieces.

[0003] Some wrenches are equipped with torque-setting mechanisms. Such a torque-setting mechanism is used to set a maximum value of torque that can be exerted via such a wrench. A typical torque-setting mechanism includes a knob connected to a handle of a wrench. The maximum value of torque is set by rotating the knob relative to the handle. The knob might however be accidentally rotated relative to the handle in operation.

[0004] In another conventional torque-setting mechanism, the knob is formed with teeth for engagement with teeth formed on the handle. The knob can be translated relative to the handle between two positions. In the first position, the teeth of the knob are engaged with the teeth of the handle so that the knob cannot be rotated relative to the handle. In the second position, the teeth of the knob are disengaged from the teeth of the handle so that the knob can be rotated relative to the handle. The knob might however be excessively translated and hence removed from the handle.

[0005] In another conventional torque-setting mechanism, a spring-biased detent is connected to the knob and a recess is made in the handle. The spring-biased detent is intended for insertion in the recess to keep the knob connected to the handle. The insertion of the spring-biased detent in the recess has however been proven to be ineffective to keep the knob connected to the handle.

[0006] In another conventional torque-setting mechanism as disclosed in Taiwanese Patent M371616 issued to the present applicant, the handle is made with an adequate length to keep the knob connected to the handle should the spring-biased detent be removed out of the recess again. The long handle is however unreliable.

[0007] From the publication of European patent application EP 1 375 072 A2 a locking mechanism of a wrench is known that comprises a grip as well as two sleeves arranged in the grip and being capable of engaging each other through teeth formed on their axial surfaces facing the other sleeve, respectively. For locking the grip in a

particular rotational position, i.e. for keeping a particular torque setting, the two sleeves are engaged with each other by pivoting a switch, thereby blocking a rotation of the grip. For torque adjustment the two sleeves are disengaged by pivoting the switch back so as to allow for the grip to be rotated.

[0008] Therefore, the present invention is intended to obviate or at least alleviate the problems encountered in prior art.

SUMMARY OF INVENTION

[0009] It is the primary objective of the present invention to provide a wrench with a reliable lockable torque-setting mechanism.

[0010] To achieve the foregoing objective, the lockable torque-setting mechanism includes a locking mechanism. The locking mechanism includes a sleeve, a body, a pawl and a lever. The sleeve is non-movably connected to a grip of the wrench and formed with teeth. The body is non-movably connected to a knob, partially inserted in the sleeve, and includes a recess in communication with a cavity. The pawl is movably inserted in the recess and formed with teeth. The lever includes an end for pressing the pawl and another end pivotally connected to the body. The lever is movable in the cavity of the body between a first position to press a first portion of the pawl to engage the teeth of the pawl with the teeth of the sleeve and a second position to press a second portion of the pawl to disengage the teeth of the pawl from the teeth of the sleeve.

[0011] Other objectives, advantages and features of the present invention will be apparent from the following description referring to the attached drawings.

BRIEF DESCRIPTION OF DRAWINGS

[0012] The present invention will be described via detailed illustration of two embodiments referring to the drawings wherein:

FIG. 1 is a perspective view of a wrench equipped with a lockable torque-setting mechanism according to the first embodiment of the present invention;

FIG. 2 is a cross-sectional view of the wrench shown in FIG. 1;

FIG. 3 is an enlarged partial view of the wrench shown in FIG. 2;

FIG. 4 is an exploded view of the wrench shown in FIG. 3;

FIG. 5 is an enlarged view of a sleeve used in the wrench shown in FIG. 2;

FIG. 6 is an enlarged view of a body used in the wrench shown in FIG. 2;

FIG. 7 is a side view of the body shown in FIG. 6;

FIG. 8 is an enlarged view of a knob used in the wrench shown in FIG. 2;

FIG. 9 is an enlarged perspective view of a scale ring

used in the wrench shown in FIG. 2;

FIG. 10 is a side view of a combination of a switch with the sleeve shown in FIG. 5 and the body shown in FIGS. 6 and 7;

FIG. 11 is a cross-sectional view of the combination illustrated in FIG. 10;

FIG. 12 is a side view of the combination in another position than shown in FIG. 10;

FIG. 13 is a cross-sectional view of the combination illustrated in FIG. 12;

FIG. 14 is a cross-sectional view of a lockable torque-setting mechanism according to the second embodiment of the present invention;

FIG. 15 is a cross-sectional view of the lockable torque-setting mechanism in another position than shown in FIG. 14; and

FIG. 16 is another cross-sectional view of the lockable torque-setting mechanism shown in FIG. 15.

DETAILED DESCRIPTION OF EMBODIMENTS

[0013] Referring to FIGS. 1 through 13, there is a wrench 100 according to a first embodiment of the present invention. The wrench 100 includes a head 10, a grip 40, a torque-relaying mechanism 102 for delivering torque to the head 10 from the grip 40, a torque-setting mechanism 101 operable for setting a maximum value of torque deliverable via the torque-relaying mechanism 102, and a locking mechanism (not numbered) operable for locking the torque-setting mechanism 101. The head 10 is operatively connected to an insert 11 via a ratchet mechanism that is not shown for being conventional.

[0014] The grip 40 is a tubular element with two windows 42 and 49 made in the periphery. A lens 21 is attached to the grip 40 to cover the window 42. The lens 21 is made or printed with a scale. The scale includes two unit systems such as lb-ft and N-m. A lens 29 is attached to the grip 40 to cover the window 49.

[0015] The torque-setting mechanism 101 includes a threaded rod 34, a threaded sleeve 35, a bearing 38, a knob 70 and an indicator 28. The threaded rod 34 is connected to the knob 70. The threaded rod 34 can be rotated but cannot be translated in the grip 40. The threaded sleeve 35 can be translated but cannot be rotated in the grip 40. The threaded sleeve 35 is engaged with the threaded rod 34. Thus, the knob 70 is operable to rotate the threaded rod 34 to translate the threaded sleeve 35. The indicator 28 is connected to the threaded sleeve 35 so that they can be translated together. The indicator 28 is observable via the lens 21. The position of the indicator 28 relative to the scale made or printed on the lens 21 represents the maximum value of torque set by the torque-setting mechanism.

[0016] The torque-relaying mechanism 102 includes a shank 20, a lever 30, a rolling unit 32 and a spring 36. The spring 36 is compressed between the threaded sleeve 35 and the rolling unit 32. The rolling unit 32 is in detachable contact with an inclined face formed at an

end of the lever 30. The lever 30 is pivotally inserted in the shank 20, which is connected to the grip 40. The head 10 is formed at another end of the lever 30.

[0017] The structures and operations of the torque-setting mechanism 101 and the torque-relaying mechanism 102 will not be provided because they can be found in US Patent No. 7182006.

[0018] The locking mechanism includes a sleeve 44, a body 50, a lever 60, a spring 64, two caps 63, two pawls 65 and a switch 72. Each of the pawls 65 is formed with teeth 66.

[0019] Referring to FIG. 5, the sleeve 44 includes an axial space 41, two radial apertures 47 and 48 and teeth 46. The axial space 41 includes a large portion 43 and a small portion 45, with a shoulder formed between them. The large portion 43 of the axial space 41 is in communication with the radial aperture 47. The small portion 45 of the axial space 41 is in communication with the radial aperture 48. The teeth 46 are formed on an internal face of the sleeve 44, in the small portion 45 of the axial space 41.

[0020] Referring to FIGS. 6 and 7, the body 50 includes two axial cavities 51 and 58, a neck 52 formed at an end, an annular flange 54 formed near the neck 52, and two recesses 53 made near the annular flange 54. The axial cavity 58 is made in the neck 52. The recesses 53 are in communication with the axial cavity 58 via a bore 55. The recess 53, the bore 55 and the axial cavity 58 together form a T-shaped channel. The body 50 further includes an axial aperture 56 in communication with the axial cavity 51. The body 50 includes two more radial apertures 59 in communication with the axial cavity 58. Two screw holes 57 are made in the annular flange 54.

[0021] Referring to FIG. 8, the knob 70 includes two axial cavities 71 and 75, an axial bore 78 via which the axial cavity 71 is in communication with the axial cavity 75, and a countersink hole 73. The knob 70 further includes teeth 76 formed on an internal face, in the axial cavity 75.

[0022] Referring to FIG. 9, a scale ring 22 includes a scale 24 formed or printed with on an external face and teeth 26 formed on the external face. The scale 24 includes smaller units than the scale formed or printed on the lens 21.

[0023] Referring to FIGS. 3 and 4, the sleeve 44 is secured to the shank 20 via a screw (not numbered). The scale ring 22 is placed on the sleeve 44. The pawls 65 are placed in the recesses 53 and pivotally connected to the annular flange 54 by two pins 68. The body 50, except the annular flange 54 and the neck 52, is inserted in the sleeve 44. The teeth 66 of the pawls 65 can be engaged with the teeth 46 of the sleeve 44.

[0024] The spring 64 includes a middle portion inserted in an aperture 62 made in the lever 60 and two ends inserted in the caps 63. The lever 60 includes a portion inserted in the axial cavity 58 and the bore 55 of the body 50. A pin 67 is inserted in the radial apertures 59 of the neck 52 and an aperture 61 made in the lever 60 to piv-

otally connect the lever 60 to the body 50. The caps 63 are in contact with the pawls 65. The lever 60 includes another portion inserted in axial bore 78 of the knob 70. A screw 74 is inserted in the lever 60 via an axial aperture (not numbered) made in the switch 72 to connect the switch 72 to the lever 60. A screw (not shown) is inserted in the countersink hole 73 of the knob 70 and one of the screw holes 57 of the body 50 to connect the knob 70 to the body 50 so that they are rotatable together.

[0025] Referring to FIGS. 10 and 11, the switch 72 is pivoted into a first position like a seesaw. Thus, the lever 60 is pivoted into a first position. Each of the caps 63 is abutted against a first portion of a corresponding one of the pawls 65 so that the teeth 66 of the pawls 65 are engaged with the teeth 46 of the sleeve 44. The body 50 cannot be rotated relative to the sleeve 44. Therefore, the knob 70 cannot be rotated relative to the shank 20.

[0026] Referring to FIGS. 12 and 13, the switch 72 is switched into a second position. The lever 60 is pivoted into a second position. Each of the caps 63 is abutted against a second portion of a corresponding one of the pawls 65 so that the teeth 66 of the pawls 65 are disengaged from the teeth 46 of the sleeve 44. The body 50 can be rotated relative to the sleeve 44. Hence, the knob 70 can be rotated relative to the shank 20.

[0027] Referring to FIGS. 14 to 16, there is a locking mechanism operable for locking a torque-setting mechanism of a wrench according to a second embodiment of the present invention. The second embodiment is like the first embodiment except several features. Firstly, a switch 80 that can be translated relative to the grip 40 is used instead of the switch 72 that can be pivoted relative to the grip 40. The switch 80 includes a bore 82 for receiving an end of the lever 60. Secondly, the lever 60 can be translated, instead of pivoted, relative to the body 50. Accordingly, the axial cavity 58 is a groove adapted for movably receiving an end of the lever 60. Moreover, the neck 52 is made with two slots 90 for movably receiving two bosses 92 formed on the lever 60.

[0028] 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 locking mechanism for locking a knob (70) relative to a grip (40), the locking mechanism including a sleeve (44) non-movably connected to the grip (40) and formed with teeth (46)
characterised in that
the locking mechanism further includes a body (50) non-movably connected to the knob (70), partially inserted in the sleeve (44), and formed with at least one recess (53) and a cavity (58) in communication

with the recess (53);

at least one pawl (65) movably inserted in the recess (53) and formed with teeth (66); and
a lever (60) formed with an end for abutment against the pawl (65) and movable in the cavity (58) of the body (50) between a first position to press a first portion of the pawl (65) to engage the teeth (66) of the pawl (65) with the teeth (46) of the sleeve (44) and a second position to press a second portion of the pawl (65) to disengage the teeth (66) of the pawl (65) from the teeth (46) of the sleeve (44).

2. The lockable torque-setting mechanism according to claim 1, wherein the lever (60) is pivotally connected to the body (50).
3. The lockable torque-setting mechanism according to claim 1, wherein the lever (60) is rectilinearly movable in the cavity (58) of the body (50).
4. The lockable torque-setting mechanism according to claim 1, further including a switch (72, 80) operable to move the lever (60) between the first and second positions.
5. The lockable torque-setting mechanism according to claim 4, wherein the switch (72, 80) includes a bore (82) for receiving the lever (60).
6. The lockable torque-setting mechanism according to claim 1, further including a spring (64) including a first end connected to the lever (60) and a second end for pressing the pawl (65).
7. The lockable torque-setting mechanism according to claim 6, further including a cap (63) including a recess for receiving the second end of the spring (64) and a dome for contact with the pawl (65).
8. A wrench (100) including:
 - a head (10);
 - a grip (40);
 - a torque-relaying mechanism (102) for delivering torque to the head (10) from the grip (40);
 - a torque-setting mechanism (101) operable for setting a maximum value of torque deliverable via the torque-relaying mechanism (102), wherein the torque-setting mechanism (101) includes a knob (70) and a locking mechanism according to claim 1.
10. The wrench according to claim 8, wherein the lever (60) is rectilinearly movable in the cavity (58) of the body (50).
11. The wrench according to claim 8, wherein the locking mechanism further includes a switch (72, 80) oper-

able to move the lever (60) between the first and second positions.

12. The wrench according to claim 11, wherein the switch (72, 80) includes a bore (82) for receiving the lever (60).
13. The wrench according to claim 8, wherein the locking mechanism further includes a spring (64) including a first end connected to the lever (60) and a second end for pressing the pawl (65).
14. The wrench according to claim 13, wherein the locking mechanism further includes a cap (63) including a recess for receiving the second end of the spring (64) and a dome for contact with the pawl (65).

Patentansprüche

1. Arretiermechanismus zum Arretieren eines Knopfes (70) relativ zu einem Griff (40), wobei der Arretiermechanismus umfasst eine Hülse (44), die unbeweglich mit dem Griff (40) verbunden ist und mit Zähnen (46) ausgebildet ist, **dadurch gekennzeichnet, dass** der Arretiermechanismus ferner einen Körper (50), der unbeweglich mit dem Knopf verbunden (70) ist, teilweise in die Hülse (44) gesteckt ist und mit zumindest einer Aussparung (53) und einer Kavität (58), die mit der Aussparung (53) in Verbindung steht, ausgebildet ist, zumindest eine Klinke (65), die beweglich in die Aussparung (53) gesteckt ist und mit Zähnen (66) ausgebildet ist, und einen Hebel (60) umfasst, der mit einem Ende zum Anschlagen gegen die Klinke (65) ausgebildet ist und in der Kavität (58) des Körpers (50) zwischen einer ersten Position zum Pressen eines ersten Abschnitts der Klinke (65), um die Zähne (66) der Klinke (65) mit den Zähnen (46) der Hülse (44) in Eingriff zu bringen, und einer zweiten Position zum Pressen eines zweiten Abschnitts der Klinke (65), um die Zähne (66) der Klinke (65) mit den Zähnen (46) der Hülse (44) außer Eingriff zu bringen, beweglich ist.
2. Arretierbarer Drehmomenteinstellmechanismus nach Anspruch 1, bei dem der Hebel (60) mit dem Körper (50) drehbar verbunden ist.
3. Arretierbarer Drehmomenteinstellmechanismus nach Anspruch 1, bei dem der Hebel (60) in der Kavität (58) des Körpers (50) geradlinig bewegbar ist.
4. Arretierbarer Drehmomenteinstellmechanismus nach Anspruch 1, der ferner einen Schalter (72, 80) umfasst, der betreibbar ist, um den Hebel (60) zwischen den ersten und zweiten Positionen zu bewe-

gen.

5. Arretierbarer Drehmomenteinstellmechanismus nach Anspruch 4, bei dem der Schalter (72, 80) eine Bohrung (82) zum Aufnehmen des Hebels (60) umfasst.
6. Arretierbarer Drehmomenteinstellmechanismus nach Anspruch 1, der ferner eine Feder (64) umfasst, die ein erstes Ende, das mit dem Hebel (60) verbunden ist, und ein zweites Ende zum Pressen der Klinke (65) beinhaltet.
7. Arretierbarer Drehmomenteinstellmechanismus nach Anspruch 6, der ferner eine Kappe (63) umfasst, die eine Aussparung zum Aufnehmen des zweiten Endes der Feder (64) und eine Kuppel zum Kontakt mit der Klinke (65) umfasst.
8. Schraubenschlüssel (100), der umfasst:
einen Kopf (10),
einen Griff (40),
einen Drehmomentübertragungsmechanismus (102) zum Übertragen eines Drehmoments von dem Kopf (10) zu dem Griff (40),
ein Drehmomenteinstellmechanismus (101), der betreibbar ist, um einen maximalen Wertes eines Drehmoments einzustellen, das über den Drehmomentübertragungsmechanismus (102) übertragbar ist, wobei der Drehmomenteinstellmechanismus (101) einen Knopf (70) und einen Arretiermechanismus gemäß Anspruch 1 umfasst.
9. Schraubenschlüssel nach Anspruch 8, bei dem der Hebel (60) in der Kavität (58) des Körpers (50) geradlinig bewegbar ist.
10. Schraubenschlüssel nach Anspruch 8, bei dem der Arretiermechanismus ferner einen Schalter (72, 80) umfasst, der betreibbar ist, um den Hebel (60) zwischen den ersten und zweiten Positionen zu bewegen.
11. Schraubenschlüssel nach Anspruch 10, bei dem der Schalter (72, 80) eine Bohrung (82) zum Aufnehmen des Hebels (60) umfasst.
12. Schraubenschlüssel nach Anspruch 8, bei dem der Arretiermechanismus ferner eine Feder (64) umfasst, die ein erstes Ende, das mit dem Hebel (60) verbunden ist, und ein zweites Ende zum Pressen der Klinke (65) umfasst.
13. Schraubenschlüssel nach Anspruch 12, bei dem der Arretiermechanismus ferner eine Kappe (63) umfasst, die eine Aussparung zum Aufnehmen des

zweiten Endes der Feder (64) und eine Kuppel zum Kontakt mit der Klinke (65) umfasst.

destiné à recevoir la seconde extrémité du ressort (64) et une calotte destinée à être en contact avec le cliquet (65).

Revendications

1. Mécanisme de verrouillage destiné à verrouiller une molette (70) par rapport à un manche (40), le mécanisme de verrouillage comprenant un manchon (44) relié de façon fixe au manche (40) et muni de dents (46)
caractérisé en ce que
le mécanisme de verrouillage comprend en outre un corps (50) relié de façon fixe à la molette (70), partiellement inséré dans le manchon (44), et muni d'au moins un évidement (53) et d'une cavité (58) en communication avec l'évidement (53);
au moins un cliquet (65) inséré de façon mobile dans l'évidement (53) et muni de dents (66); et
un levier (60) muni d'une extrémité destinée à buter contre le cliquet (65) et mobile dans la cavité (58) du corps (50) entre une première position permettant d'appuyer sur une première partie du cliquet (65) pour mettre en prise les dents (66) du cliquet (65) avec les dents (46) du manchon (44) et une seconde position permettant d'appuyer sur une seconde partie du cliquet (65) pour dégager les dents (66) du cliquet (65) des dents (46) du manchon (44).
2. Mécanisme verrouillable de réglage de couple de serrage selon la revendication 1, dans lequel le levier (60) est relié de façon pivotante au corps (50).
3. Mécanisme verrouillable de réglage de couple de serrage selon la revendication 1, dans lequel le levier (60) est mobile de façon rectiligne dans la cavité (58) du corps (50).
4. Mécanisme verrouillable de réglage de couple de serrage selon la revendication 1, comprenant en outre un commutateur (72, 80) utilisable pour déplacer le levier (60) entre les première et seconde positions.
5. Mécanisme verrouillable de réglage de couple de serrage selon la revendication 4, dans lequel le commutateur (72, 80) comprend un alésage (82) destiné à recevoir le levier (60).
6. Mécanisme verrouillable de réglage de couple de serrage selon la revendication 1, comprenant en outre un ressort (64) comprenant une première extrémité reliée au levier (60) et une seconde extrémité destinée à appuyer sur le cliquet (65).
7. Mécanisme verrouillable de réglage de couple de serrage selon la revendication 6, comprenant en outre un capuchon (63) comprenant un évidement
8. Clef (100) comprenant:
une tête (10);
un manche (40);
un mécanisme de transmission de couple de serrage (102) destiné à délivrer un couple de serrage à la tête (10) à partir du manche (40);
un mécanisme de réglage de couple de serrage (101) utilisable pour régler une valeur maximale de couple de serrage pouvant être délivrée via le mécanisme de transmission de couple de serrage (102), dans lequel le mécanisme de réglage de couple de serrage (101) comprend une molette (70) et un mécanisme de verrouillage selon la revendication 1.
9. Clef selon la revendication 8, dans laquelle le levier (60) est mobile de façon rectiligne dans la cavité (58) du corps (50).
10. Clef selon la revendication 8, dans laquelle le mécanisme de verrouillage comprend en outre un commutateur (72, 80) utilisable pour déplacer le levier (60) entre les première et seconde positions.
11. Clef selon la revendication 10, dans laquelle le commutateur (72, 80) comprend un alésage (82) destiné à recevoir le levier (60).
12. Clef selon la revendication 8, dans laquelle le mécanisme de verrouillage comprend en outre un ressort (64) comprenant une première extrémité reliée au levier (60) et une seconde extrémité destinée à appuyer sur le cliquet (65).
13. Clef selon la revendication 12, dans laquelle le mécanisme de verrouillage comprend en outre un capuchon (63) comprenant un évidement destiné à recevoir la seconde extrémité du ressort (64) et une calotte destinée à être en contact avec le cliquet (65).

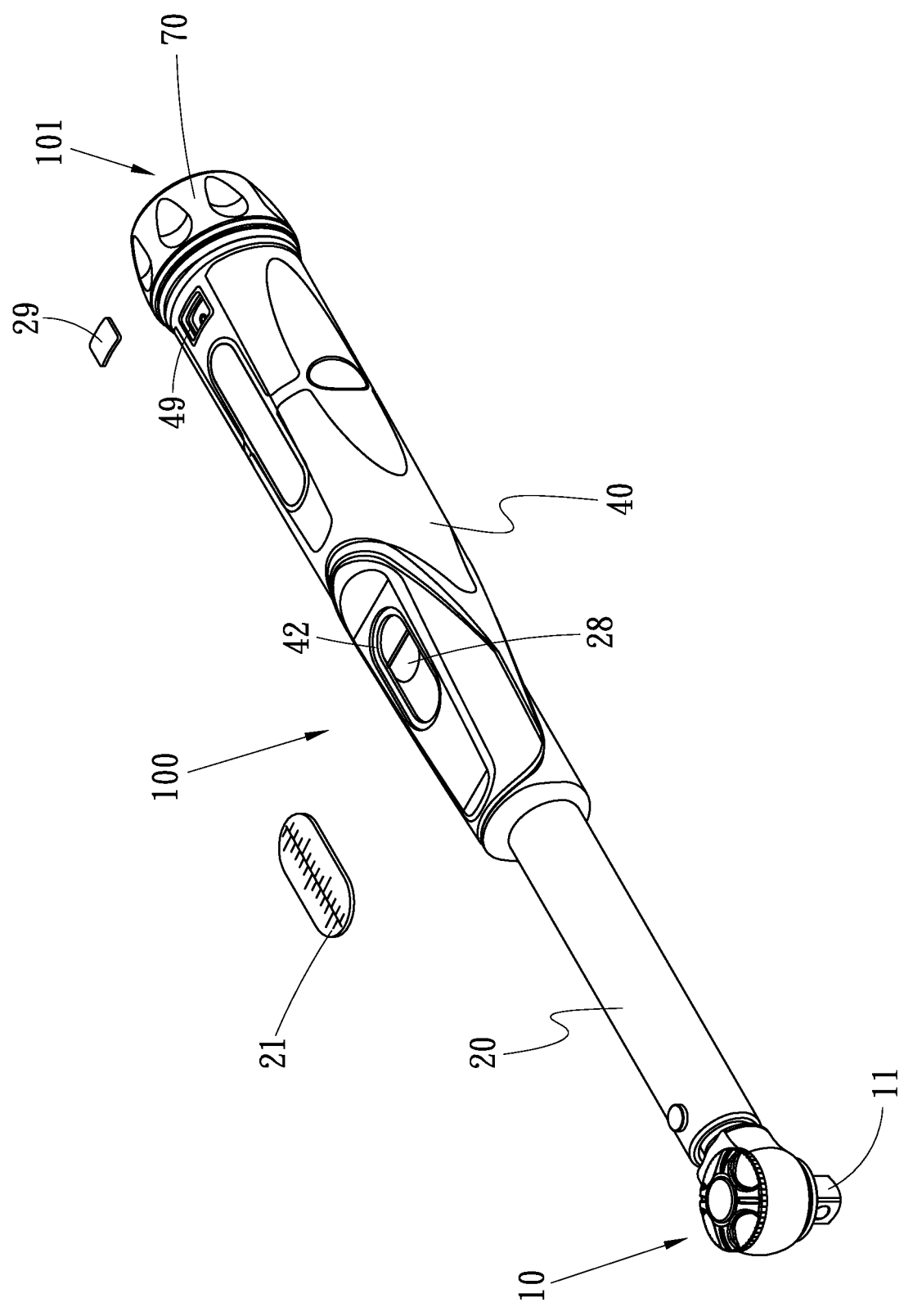


FIG. 1

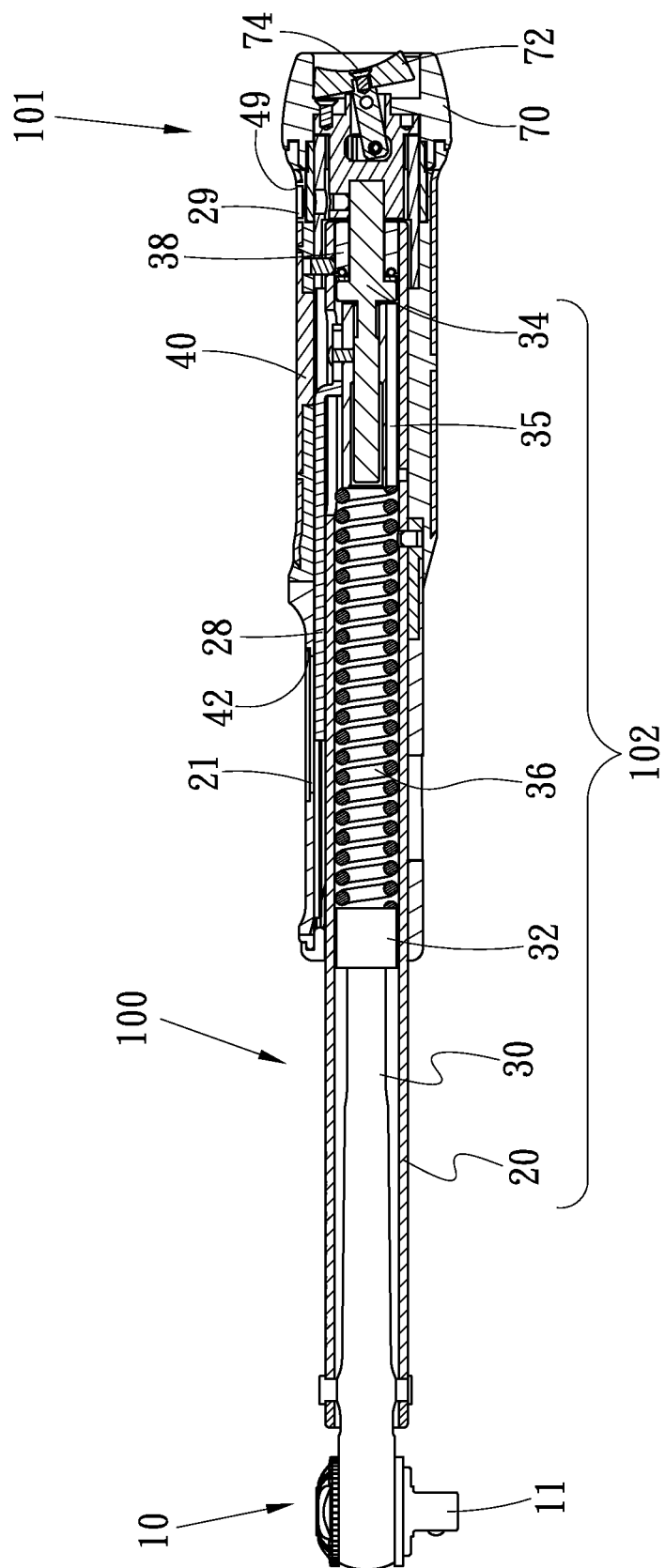


FIG. 2

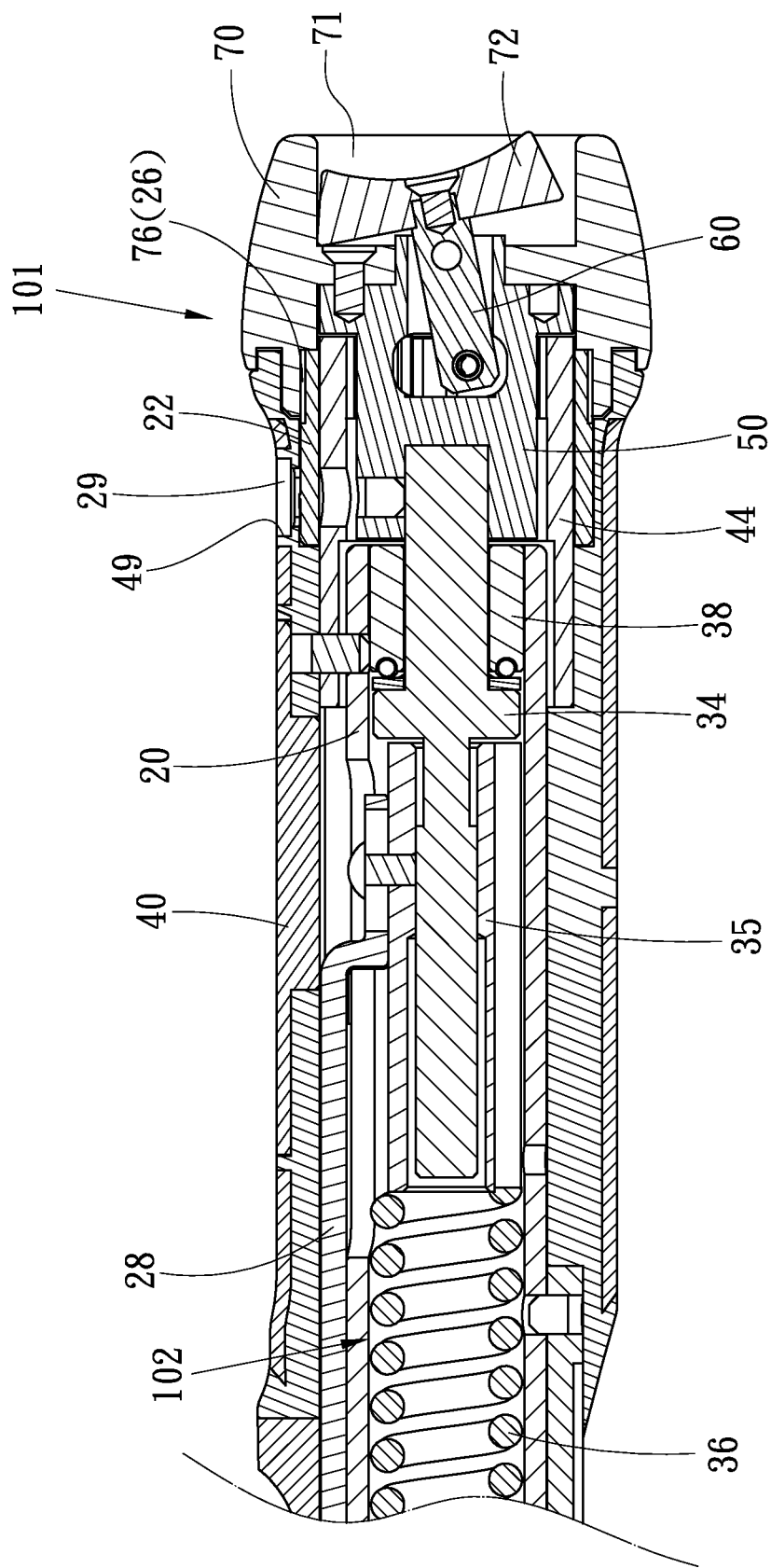


FIG. 3

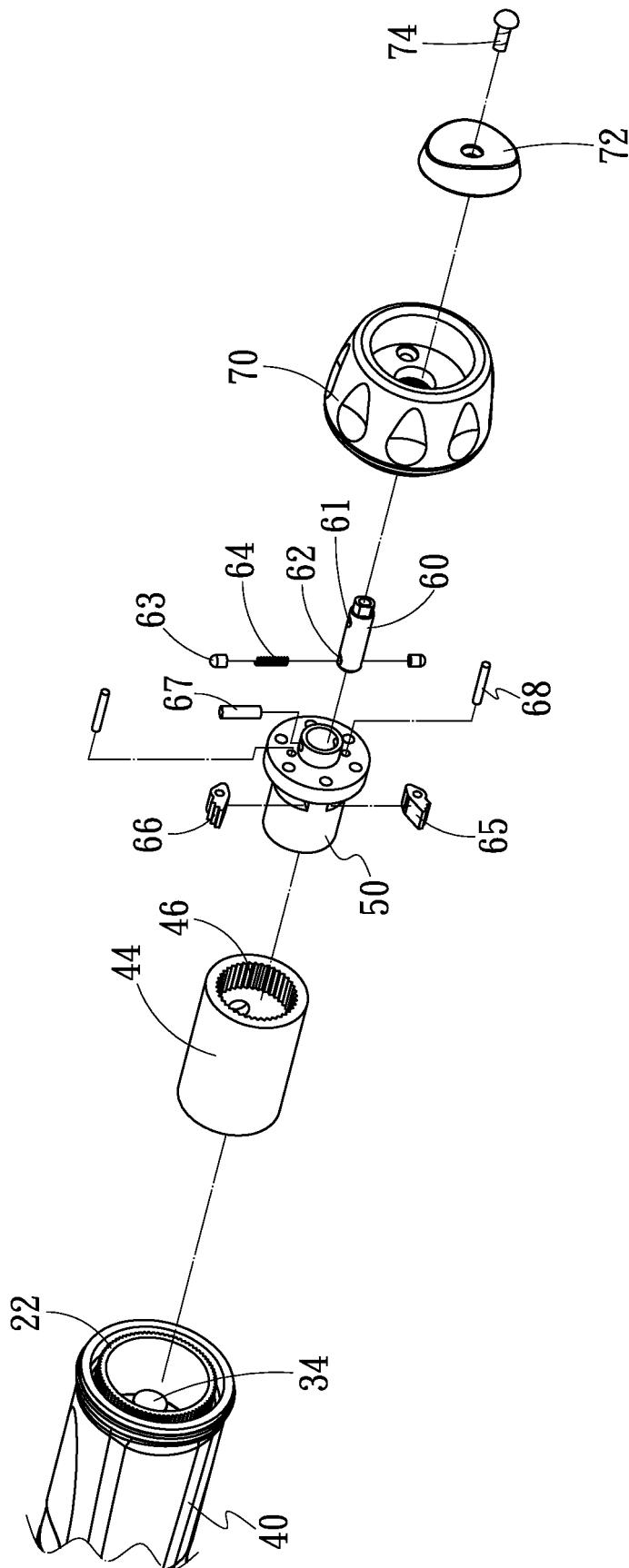


FIG. 4

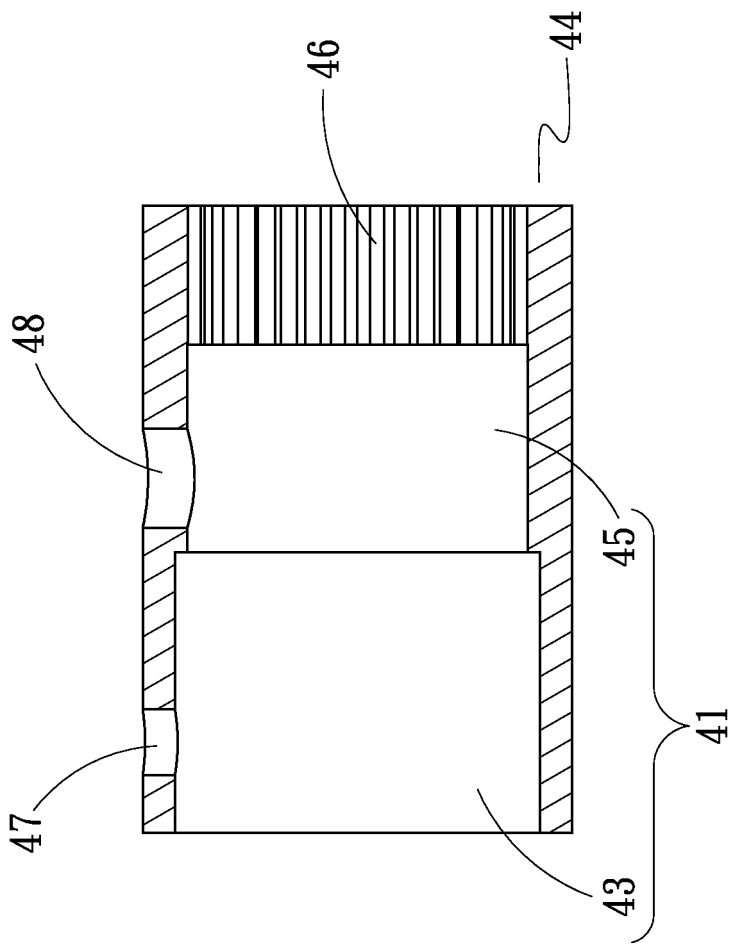


FIG. 5

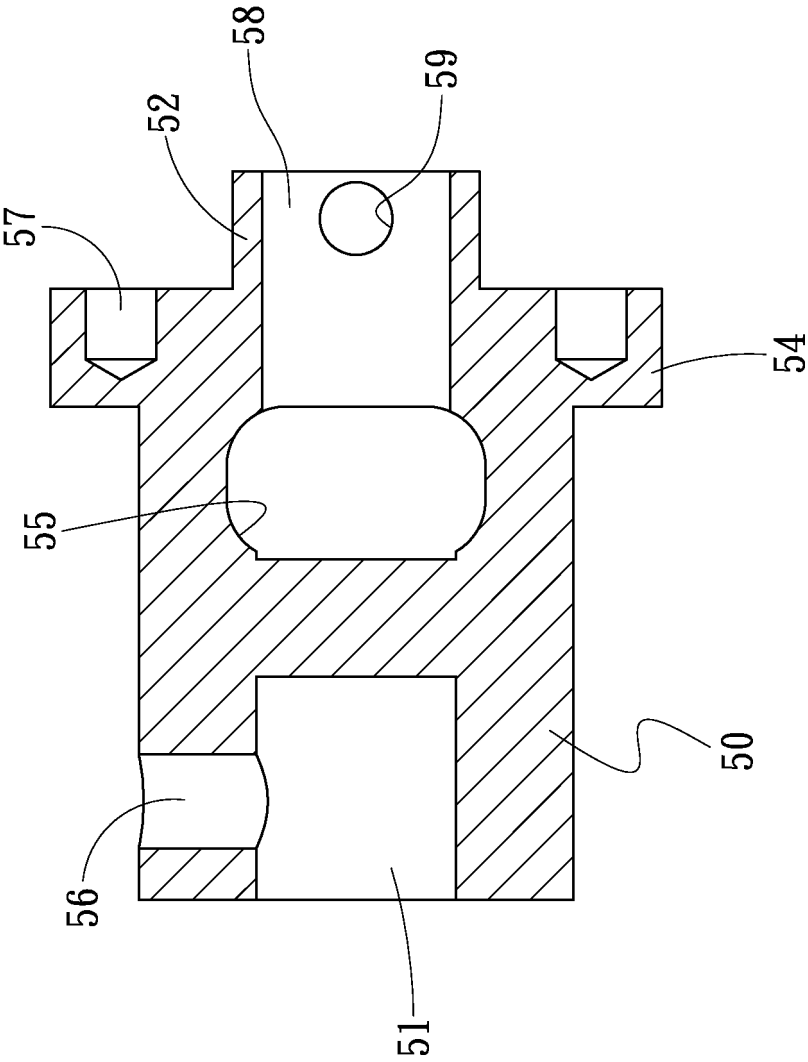


FIG. 6

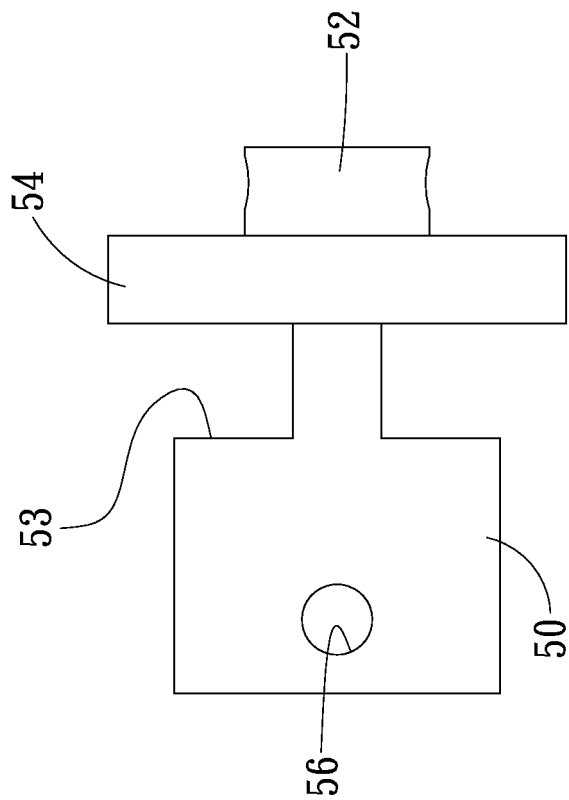


FIG. 7

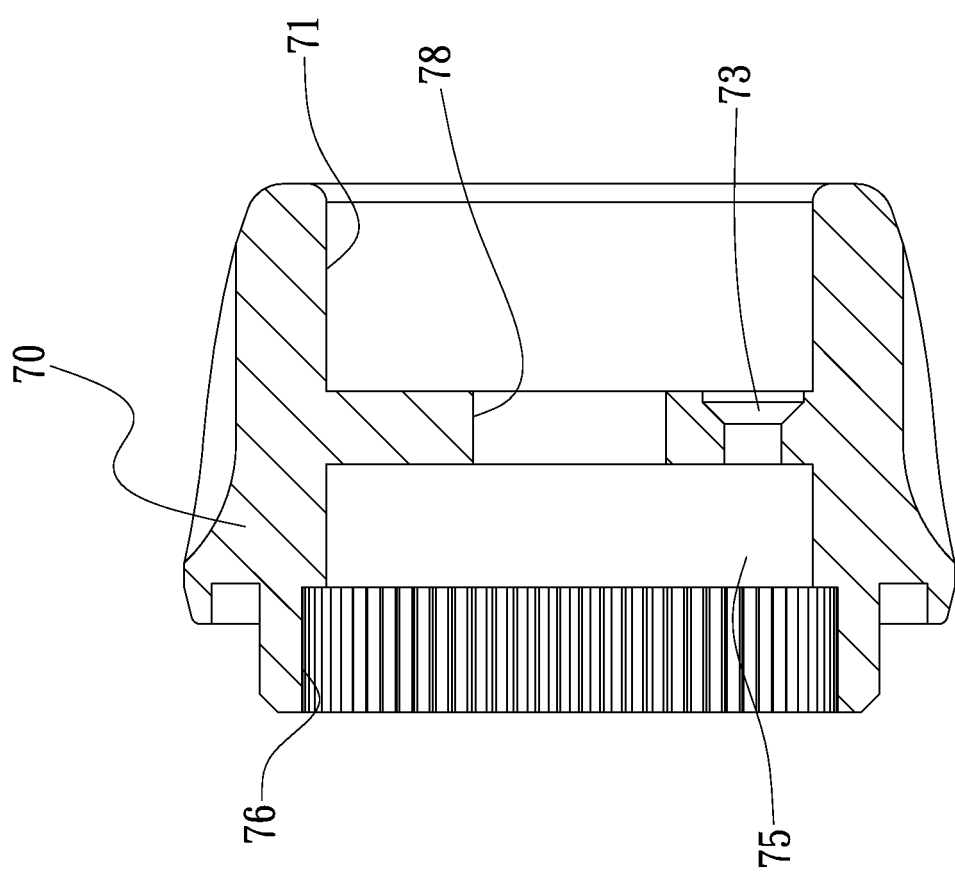


FIG. 8

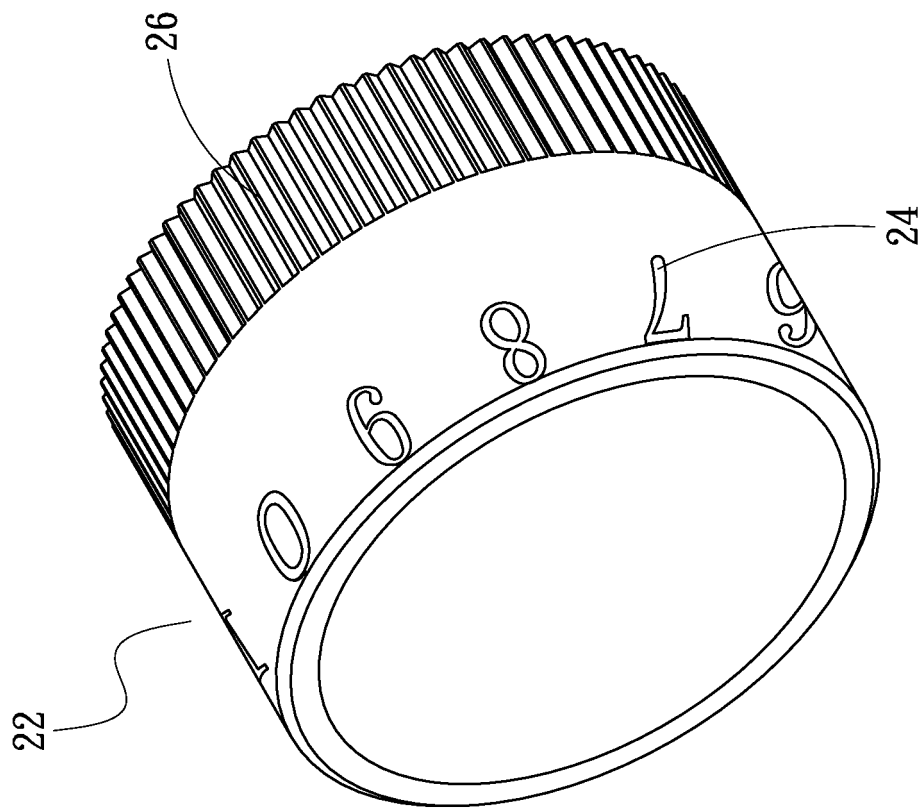


FIG. 9

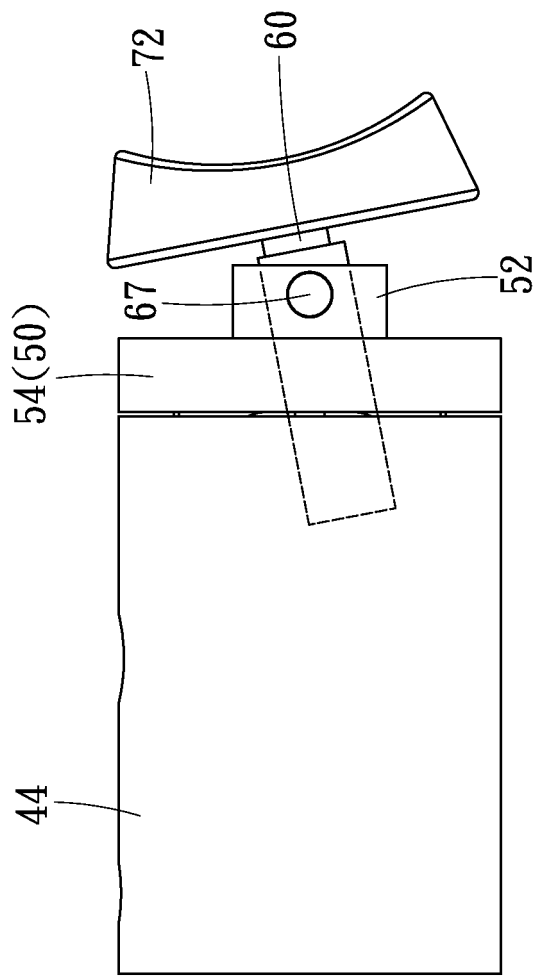


FIG. 10

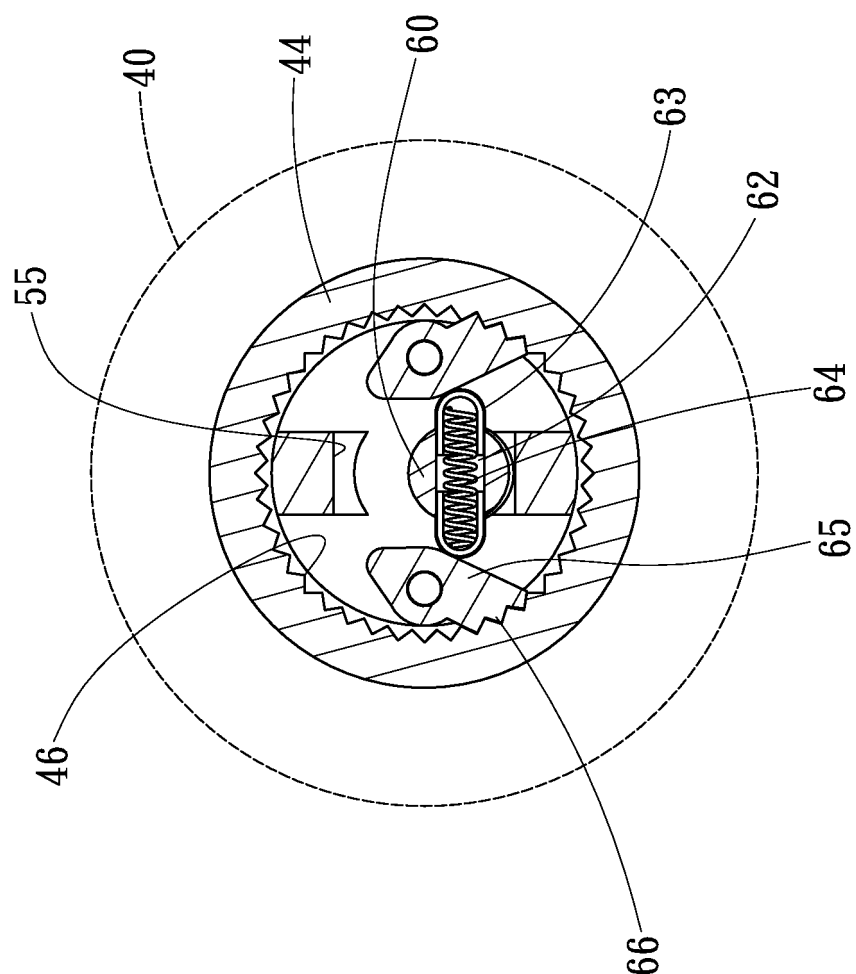


FIG. 11

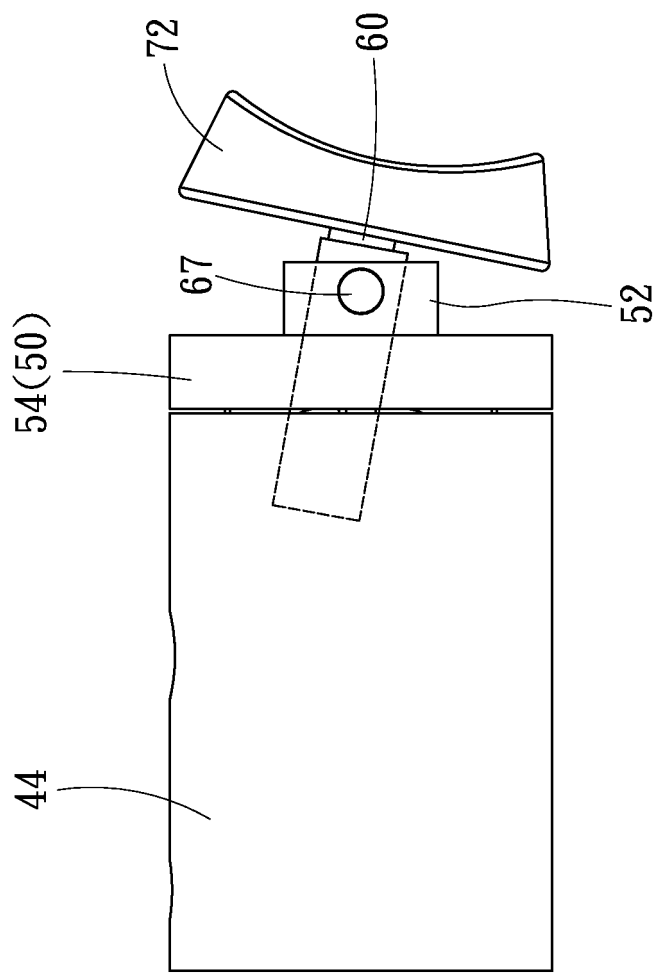


FIG. 12

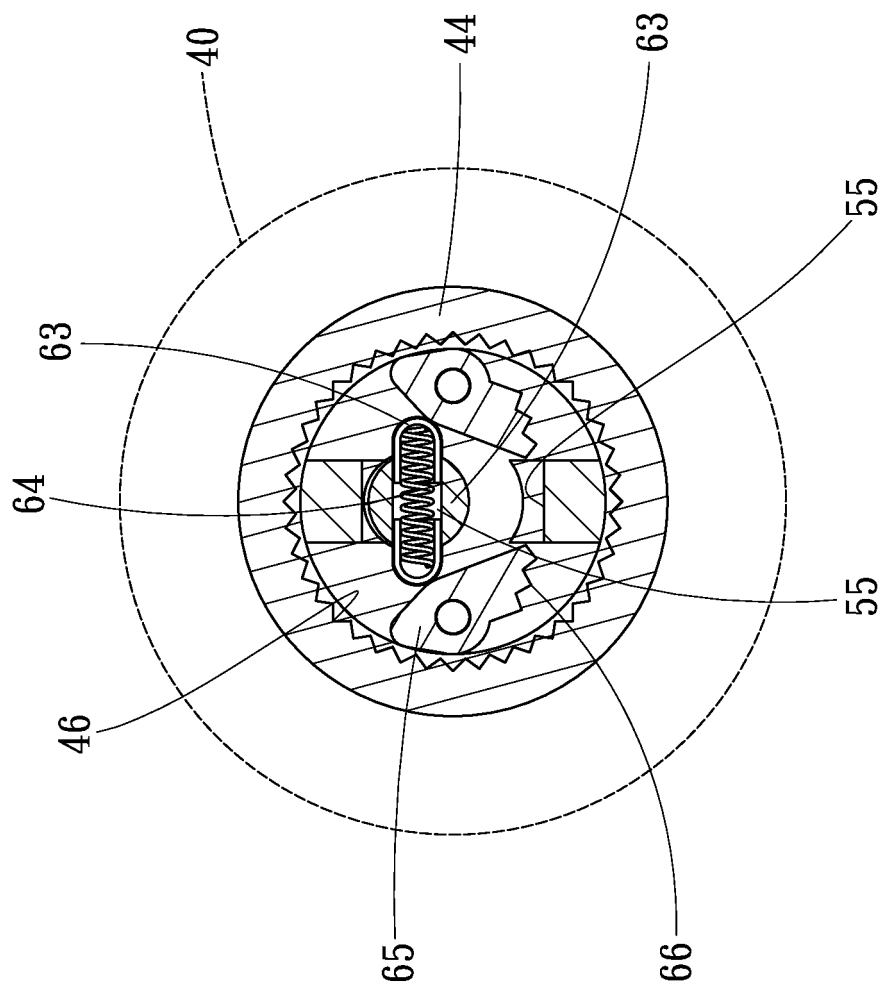


FIG. 13

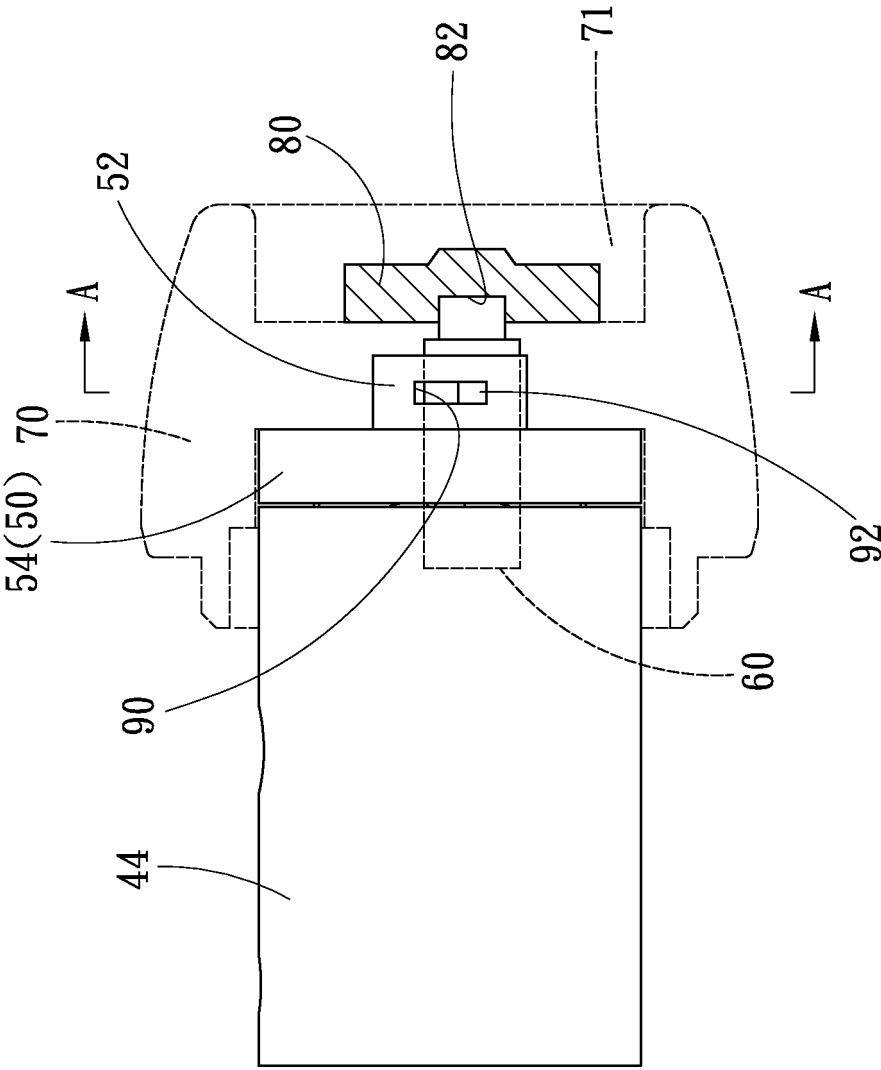


FIG. 14

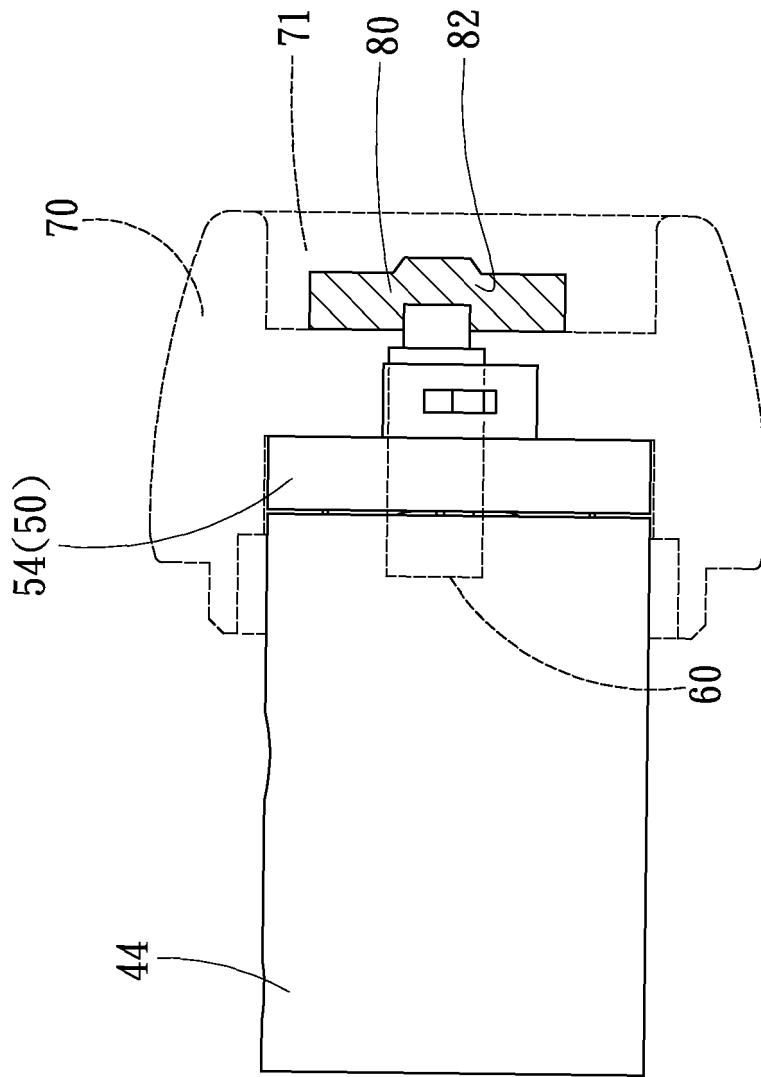


FIG. 15

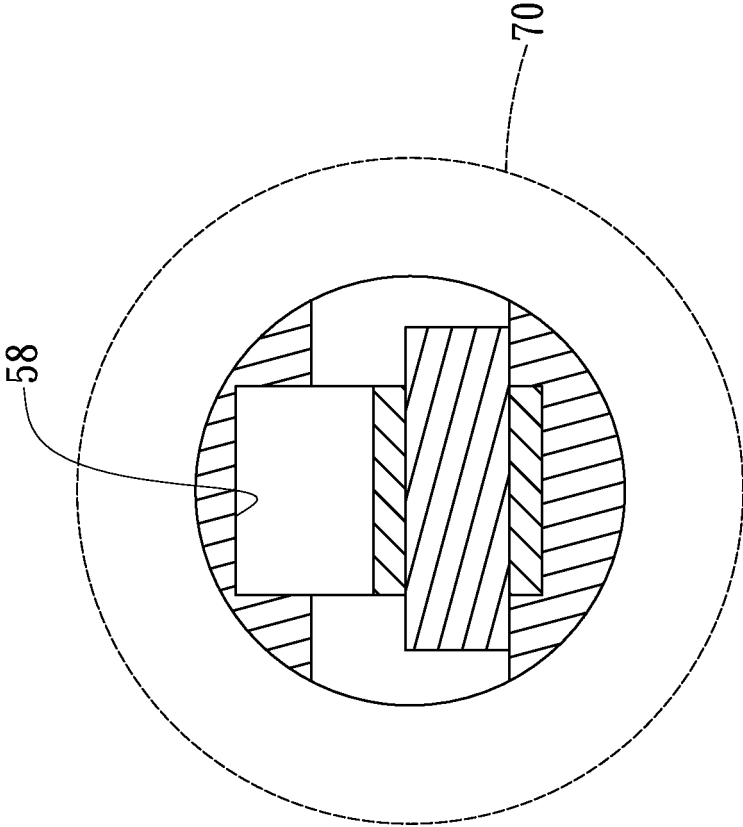


FIG. 16

REFERENCES CITED IN THE DESCRIPTION

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