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(54) **Ratchet wrench**

Ratschenschlüssel

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Description

Field of Invention

[0001] The present invention relates to a ratchet wrench, according to the preamble of independent claim 1. Such a wrench is known from document GB 2 353 746 A.

Background of Invention

[0002] Referring to Figures 7~10, another conventional ratchet wrench 50 is shown, which includes a handle 52 and an annular head 54 formed at an end of the handle 52. The annular head 52 defines a circular space 56, a crescent space 58 communicated with the circular space 56, a groove 60 in a side thereof and a recess 62 communicated with the groove.

[0003] A spring 64 and a ball detent 66 are put in the recess 62.

[0004] A direction switch 68 is put in and can be moved along the groove 60. A friction plate 70 is formed on the direction switch 68 for frictional contact with a user's finger. The direction switch 68 defines two recesses 72 and 74 in a side and a space 76 in an opposite side. The ball detent 66 is put in the recess 72 or 74 for keeping the direction switch 68 in one of two positions. The friction plate 70 defines an aperture 80 communicated with the space 76.

[0005] A V-shaped elastic element 80 includes two helical ends 82 and 84. The V-shaped elastic element 78 is put in the space 76.

[0006] As best shown in Figure 8, a tab 86 is inserted in the space 76 for preventing the elastic element 80 from faltering in the space 76. The tab 86 defines an aperture 88.

[0007] A pin 90 is fit in the apertures 78 and 88 and put between the helical ends 82 and 84 so as to avoid the elastic element 80 escaping the space 76.

[0008] A pawl 92 includes two recesses 94 and 96 defined in a side and teeth 98 formed on an opposite side. The pawl 92 is put in the crescent space 58. The helical end 82 can be put in the recess 94, or the helical end 84 in the recess 96.

[0009] An annular gear 100 is put in the circular space 56. The annular gear 100 includes teeth 102 formed on an external side thereof for engagement with the teeth 98.

[0010] Referring to Figure 9, the direction switch 68 is moved to a right-hand end of the groove 60 so that the ball detent 66 enters the recess 74. Via the elastic element 80, a right-hand end of the pawl 92 is moved to a right-hand end of the crescent space 58. Thus, the annular head 10 can drive the annular gear 100 clockwise, but not vice versa.

[0011] Referring to Figure 10, the direction switch 68 is moved to a left-hand end of the groove 60 so that the ball detent 66 enters the recess 74. Via the elastic element 80, a left-hand end of the pawl 92 is moved to a

left-hand end of the crescent space 58. Thus, the annular head 10 can drive the annular gear 100 counterclockwise, but not vice versa.

[0012] This conventional ratchet wrench 50 includes many elements. Many of its elements require fine fabrication, e.g., the direction switch 68 and the elastic element 80. It takes a lot of time to fabricate these elements. It also takes a lot time to assemble these elements. This conventional ratchet wrench 50 is very complicated in structure. As result, the cost of manufacturing of this conventional ratchet wrench 50 is high.

[0013] The present invention is therefore intended to obviate or at least alleviate the problems encountered in prior art.

[0014] It is the primary objective of the present invention to provide a structurally simple ratchet wrench.

[0015] According to the present invention, a ratchet wrench includes a handle and an annular head from which the handle projects. The annular head defines a first space, a second space communicated with the first space and a third space communicated with the second space. An annular gear is rotationally put in the first space. The annular gear includes a toothed external face. A direction controller is put in the second space. The direction controller includes two pawls and a spring installed between the pawls. Each of the pawls includes a toothed face. A direction switch which includes a disc is rotationally mounted on the handle and partially put in the third space for bringing the toothed face of selective one of the pawls into engagement with the toothed external face of the annular gear. The ratchet wrench further comprises a first spring and a rod detent disposed in a first recess defined in the handle near the third space. The rod detent extends into an aperture defined in a bottom of the disc so that said disc is retained in the third space defined by the annular head end is rotationally mounted on the handle.

[0016] Other objects, advantages and novel features of the invention will become more apparent from the following detailed description in conjunction with the attached drawings.

Brief Description of Drawings

[0017] The present invention will be described via detailed illustration of the preferred embodiment referring to the drawings.

[0018] Figure 1 is a perspective view of a ratchet wrench according to the preferred embodiment of the present invention.

[0019] Figure 2 is an exploded view of the ratchet wrench of Figure 1.

[0020] Figure 3 is a cutaway view of the ratchet wrench of Figure 1.

[0021] Figure 4 is a cross-sectional view of the shown in Figure 1.

[0022] Figure 5 is a cross-sectional view of the ratchet wrench of Figure 11 in a position for driving a bolt or nut

counterclockwise.

[0023] Figure 6 is similar to Figure 5 but showing the ratchet wrench in a position for driving a bolt or nut clockwise.

[0024] Figure 7 is an exploded view of a ratchet wrench according to prior art.

[0025] Figure 8 is a cross-sectional view of the ratchet wrench of Figure 7.

[0026] Figure 9 is a cross-sectional view of the ratchet wrench of Figure 7 in a position for driving a bolt or nut clockwise.

[0027] Figure 10 is similar to Figure 9 but showing the ratchet wrench in a position for driving a bolt or nut counterclockwise.

Detailed Description of Preferred Embodiment

[0028] Referring to Figure 1, according to the preferred embodiment of the present invention, a ratchet wrench 1 includes a handle 10 and an annular head 11 from which the handle 10 projects.

[0029] Referring to Figures 2 and 3, the annular head 11 defines a circular space 12, a crescent space 13 communicated with the circular space 12 and a semi-circular space 14 communicated with the crescent space 13. An annular groove 121 is defined in the wall of the circular space 12. Two recesses 15 and 16 are defined in the handle 10 near the semi-circular space 14.

[0030] A direction controller 30 is put in the crescent space 13. The direction controller 30 includes two pawls 31 and 32 and a spring 33 for connecting the pawl 31 with the pawl 32.

[0031] The pawl 31 includes a top, a bottom, a planar side, a toothed side 312, an arched side, a boss 311 formed on the planar side and rod 313 formed on the top.

[0032] The pawl 32 includes a top, a bottom, a planar side, a toothed side 322, an arched side, a boss 321 formed on the planar side and rod 323 formed on the top.

[0033] The spring 33 includes an end in which the boss 311 is fit and an opposite end in which the boss 321 is fit. Thus, the pawl 31 is firmly connected with the pawl 32 by means of the spring 33.

[0034] Referring to Figures 2 and 4, an O-ring 22 is put in the circular space 12. The O-ring 22 includes an annular groove 24 defined in an external face thereof.

[0035] A C-ring 23 includes an internal edge put in the annular groove 24 and an external edge put in the annular groove 121. Thus, the O-ring 22 is firmly attached to the annular head 11 by means of the C-ring 23.

[0036] An annular gear 20 is put in the circular space 12. The annular gear 20 is put on the O-ring 22 rotationally. The annular gear 20 includes a toothed internal face for engagement with a bolt or nut and a toothed external face 21 for selective engagement with the pawl 31 or 32.

[0037] A first spring 152 and a rod detent 151 are put in the first recess 15.

[0038] A second spring 162 and a ball detent 161 are put in the second recess 16.

[0039] A direction switch 40 includes a disc 41 and a lever 43 extending from the disc 41. The disc 41 includes a bottom in which a space 42, an aperture 44, and two recesses 45 and 46 are defined. The wall of the space 42 includes a first end 421 and a second end 422. The disc 41 is put in the semi-circular space 14. The rod detent 151 extends into the aperture 44. Thus, the direction switch 40 is installed on the handle 10 and the annular head 11 rotationally. The ball detent 161 selectively enters a recess 45 or 46.

[0040] Referring to Figure 5, the direction switch 40 is in a first position. The ball detent 161 enters the first recess 45 so as to retain the direction switch 40 in the first position. The first end 421 of the wall of the space 42 pushes the rod 323. Thus, the pawl 31 is moved into a left-hand end of the crescent space 13. Thus, the annular head 11 can drive the annular gear 20 counterclockwise, but not vice versa.

[0041] Referring to Figure 6, the direction switch 40 is in a second position. The ball detent 161 enters the second recess 46 so as to retain the direction switch 40 in the second position. The second end 422 of the wall of the space 42 pushes the rod 323. Thus, the pawl 32 is moved into a right-hand end of the crescent space 13. Thus, the annular head 11 can drive the annular gear 20 clockwise, but not vice versa.

[0042] The present invention has been described via detailed illustration of the preferred embodiment. Those skilled in the art can derive variations from the preferred embodiment without departing from the scope of the present invention. Therefore, the preferred embodiment shall not limit the scope of the present invention defined in the claims.

Claims

1. A ratchet wrench including:

- a handle (10);
- an annular head (11) from which the handle (10) projects, the annular head (11) defining a first space (12), a second space (13) communicated with the first space (12) and a third space (14) communicated with the second space (13);
- an annular gear (20) rotationally put in the first space (12), the annular gear (20) including a toothed external face (21);
- a direction controller (30) put in the second space (13), the direction controller (30) including two pawls (31; 32) and a spring (33) installed between the pawls (31; 32), each of the pawls (31; 32) including a toothed face (312; 322); and
- a direction switch (40) including a disc (41) rotationally mounted on the handle (10) and partially put in the third space (14) for bringing the toothed face (312; 322) of selective one of the pawls (31; 32) into engagement with the toothed

- external face (21) of the annular gear (20), **characterized in that** it further comprises a first spring (152) and a rod detent (151) disposed in a first recess (15) defined in the handle (10) near the third space (14), the rod detent extending into an aperture (44) defined in a bottom of the disc (41) so that said disc is retained in the third space (14) defined by the annular head (11) and is rotationally mounted on the handle.
2. The ratchet wrench according to claim 1 wherein the first space (12) is a circular space.
 3. The ratchet wrench according to claim 1 wherein the second space (13) is a crescent space.
 4. The ratchet wrench according to claim 1 wherein the third space (14) is a semi-circular space (14).
 5. The ratchet wrench according to claim 1 including a second spring-biased detent (161; 162), wherein the handle (10) defines a second recess (16) for receiving the second spring-biased detent (161; 162), and the disc (41) defines two recesses (45; 46), a selective one of which receives the spring-biased detent (161; 162) so that the disc (41) is retained in a selective one of two positions.
 6. The ratchet wrench according to claim 1 wherein each of the pawls (31; 32) includes a rod (313; 323), and the disc (41) defines a space (42) by means of a wall including two ends (421; 422) selective one of which can be engaged with one of the rods (313; 323) so as to engage the toothed face (312; 322) of one of the pawls (31; 32) with the toothed face (21) of the annular gear (20).
 7. The ratchet wrench according to claim 1, wherein the direction switch (40) further includes a lever (43) extending from the disc (41).
 8. The ratchet wrench according to claim 1 wherein each of the pawls (31; 32) includes a boss (311) formed thereon and fit in an end of the spring (33) so that it is firmly connected with the spring (33).
 9. The ratchet wrench according to claim 1 including an O-ring (22) fit in the first space (12) for supporting the annular gear (20).
 10. The ratchet wrench according to claim 8 including a C-ring (23), wherein the annular head (11) defines an annular groove (121) in an internal side for receiving an external edge of the C-ring (23), and the O-ring (22) defines an annular groove (24) in an external side for receiving an internal edge of the C-ring (23).

Patentansprüche

1. Ratschenschlüssel, aufweisend:

- 5 einen Griff (10);
 einen ringförmigen Kopf (11), von welchem der Griff (10) vorragt, wobei der ringförmige Kopf (11) einen ersten Raum (12), einen mit dem ersten Raum (12) in Verbindung stehenden zweiten Raum (13) und einen mit dem zweiten Raum (13) in Verbindung stehenden dritten Raum (14) definiert;
 10 ein ringförmiges Getrieberad (20), welches drehbar in den ersten Raum (12) gesetzt ist, wobei das ringförmige Getrieberad (20) eine gezahnte äußere Fläche (21) aufweist;
 15 einen Richtungssteuerer (30), welcher in den zweiten Raum (13) gesetzt ist, wobei der Richtungssteuerer (30) zwei Krallen (31; 32) und eine Feder (33) aufweist, welche zwischen den Krallen (31; 32) installiert ist, wobei jede der Krallen (31; 32) eine gezahnte Fläche (312; 322) aufweist; und
 20 einen Richtungsschalter (40), der eine Scheibe (41) aufweist, die drehbar an dem Griff (10) angebracht ist und zum Teil in den dritten Raum (14) gesetzt ist, um die gezahnte Fläche (312, 322) von wahlweise einer der Krallen (31; 32) in
 25 Kopplung mit der gezahnten äußeren Fläche (21) des ringförmigen Getrieberads (20) zu bringen,

dadurch gekennzeichnet, daß er weiter eine erste Feder (152) und eine Stangenarretierung (151) aufweist, die in einer in dem Griff (10) nahe dem dritten Raum (15) definierten ersten Ausnehmung (15) angeordnet sind, wobei die Stangenarretierung sich in eine an einer Unterseite der Scheibe (41) definierte Öffnung (44) derart erstreckt, daß die Scheibe in dem von dem ringförmigen Kopf (11) definierten dritten Raum (14) gehalten ist und drehbar an dem Griff angebracht ist.

2. Ratschenschlüssel nach Anspruch 1, bei dem der erste Raum (12) ein kreisförmiger Raum ist.
3. Ratschenschlüssel nach Anspruch 1, bei dem der zweite Raum (13) ein halbmondförmiger Raum ist.
4. Ratschenschlüssel nach Anspruch 1, bei dem der dritte Raum (14) ein halbkreisförmiger Raum (14) ist.
5. Ratschenschlüssel nach Anspruch 1, aufweisend eine zweite feder-vorgespannte Arretierung (161; 162) wobei der Griff (10) eine zweite Ausnehmung (16) zur Aufnahme der zweiten feder-vorgespannten Arretierung (161; 162) definiert, und die Scheibe (41) zwei Ausnehmungen (45; 46) definiert, von denen

eine ausgewählte die feder-vorgespannte Arretierung (161; 162) derart aufnimmt, daß die Scheibe (41) in einer ausgewählten von zwei Stellung gehalten wird.

6. Ratschenschlüssel nach Anspruch 1, bei dem jede der Krallen (31, 32) eine Stange (313; 323) aufweist, und die Scheibe (41) einen Raum (42) mittels einer Wand definiert, die zwei Enden (421, 422) umfaßt, von denen ein ausgewähltes mit einer der Stangen (313; 323) gekoppelt werden kann, um die gezahnte Fläche (312; 322) einer der Krallen (31; 32) mit der gezahnten Fläche (21) des ringförmigen Getrieberads (20) in Eingriff zu bringen.
7. Ratschenschlüssel nach Anspruch 1, bei dem der Richtungsschalter (40) weiter einen Hebel (43) aufweist, der sich von der Scheibe (41) erstreckt.
8. Ratschenschlüssel nach Anspruch 1, bei dem jede der Krallen (31; 32) einen Vorsprung (311) aufweist, der daran gebildet ist und in ein Ende der Feder (33) eingepaßt ist, so daß sie fest mit der Feder (33) verbunden ist.
9. Ratschenschlüssel nach Anspruch 1, aufweisend einen O-Ring (22), der in den ersten Raum (12) zum Tragen des ringförmigen Getrieberads (20) eingepaßt ist.
10. Ratschenschlüssel nach Anspruch 8, aufweisend einen C-Ring (23), wobei der ringförmige Kopf (11) eine ringförmige Rinne (121) an einer Innenseite zur Aufnahme eines äußeren Randes des C-Rings (23) definiert, und der O-Ring (22) eine ringförmige Rinne (24) an einer äußeren Seite zur Aufnahme eines inneren Randes des C-Rings (23) definiert.

Revendications

1. Clé à cliquet comprenant :

un manche (10) ;
 une tête annulaire (11) à partir de laquelle fait saillie le manche (10), la tête annulaire (11) définissant un premier espace (12), un deuxième espace (13) en communication avec le premier espace (12) et un troisième espace (14) en communication avec le deuxième espace (13) ;
 un engrenage annulaire (20) placé à rotation dans le premier espace (12), l'engrenage annulaire (20) comprenant une face externe dentée (21) ;
 un dispositif de commande de direction (30) placé dans le deuxième espace (13), le dispositif de commande de direction (30) comportant deux cliquets (31 ; 32) et un ressort (33) installé

entre les cliquets (31 ; 32), chacun des cliquets (31 ; 32) comprenant une face dentée (312 ; 322) ; et

un sélecteur de direction (40) comprenant un disque (41) monté à rotation sur le manche (10) et partiellement inséré dans le troisième espace (14) pour mettre la face dentée (312 ; 322) de l'un des cliquets (31 ; 32), au choix, en prise avec la face externe dentée (21) de l'engrenage annulaire (20), **caractérisée en ce qu'elle** comprend en outre un premier ressort (152) et un axe de montage (151) disposés dans un premier évidement (15) défini dans le manche (10) près du troisième espace (14), l'axe de montage s'étendant dans une ouverture (44) définie dans une partie inférieure du disque (41) de telle manière que ledit disque est retenu dans le troisième espace (14) défini par la tête annulaire (11) et est monté à rotation sur le manche.

2. Clé à cliquet selon la revendication 1, dans laquelle le premier espace (12) est un espace circulaire.
3. Clé à cliquet selon la revendication 1, dans laquelle le deuxième espace (13) est un espace en croissant.
4. Clé à cliquet selon la revendication 1, dans laquelle le troisième espace (14) est un espace semi-circulaire.
5. Clé à cliquet selon la revendication 1, comprenant un deuxième encliquetage à ressort (161 ; 162), dans laquelle le manche (10) définit un deuxième évidement (16) pour recevoir le deuxième encliquetage à ressort (161 ; 162), et le disque (41) définit deux évidements (45 ; 46), dont un, au choix, reçoit l'encliquetage à ressort (161 ; 162), de sorte que le disque (41) est retenu dans une position choisie parmi deux positions.
6. Clé à cliquet selon la revendication 1, dans laquelle chacun des cliquets (31 ; 32) comprend un ergot (313 ; 323), et le disque (41) définit un espace (42) à l'aide d'une paroi comportant deux extrémités (421 ; 422) dont une, au choix, peut être mise en prise avec l'un des ergots (313 ; 323) afin de mettre en prise la face dentée (312 ; 322) de l'un des cliquets (31 ; 32) avec la face dentée (21) de l'engrenage annulaire (20).
7. Clé à cliquet selon la revendication 1, dans laquelle le sélecteur de direction (40) comporte en outre un levier (43) qui s'étend depuis le disque (41).
8. Clé à cliquet selon la revendication 1, dans laquelle chacun des cliquets (31 ; 32) comprend une protubérance (311) formée dessus et logée dans une extrémité du ressort (33) de telle manière qu'elle est

solidement connectée au ressort (33).

9. Clé à cliquet selon la revendication 1, comprenant un joint torique (22) logé dans le premier espace (12) pour supporter l'engrenage annulaire (20). 5
10. Clé à cliquet selon la revendication 8, comprenant un anneau en C (23), dans laquelle la tête annulaire (11) définit une rainure annulaire (121) dans un côté interne pour recevoir un bord externe de l'anneau en C (23), et le joint torique (22) définit une rainure annulaire (24) dans un côté externe pour recevoir un bord interne de l'anneau en C (23). 10

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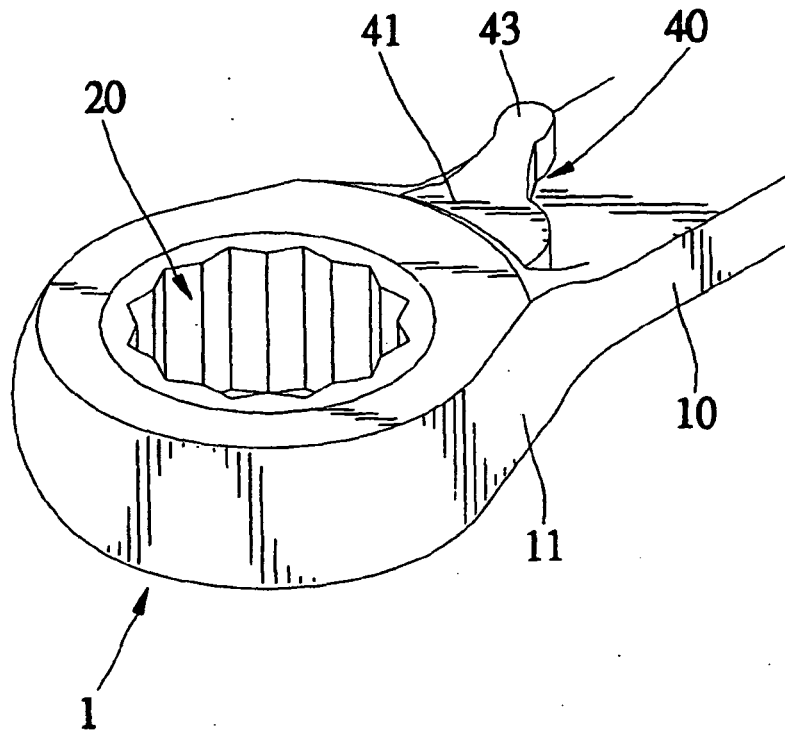


Fig. 1

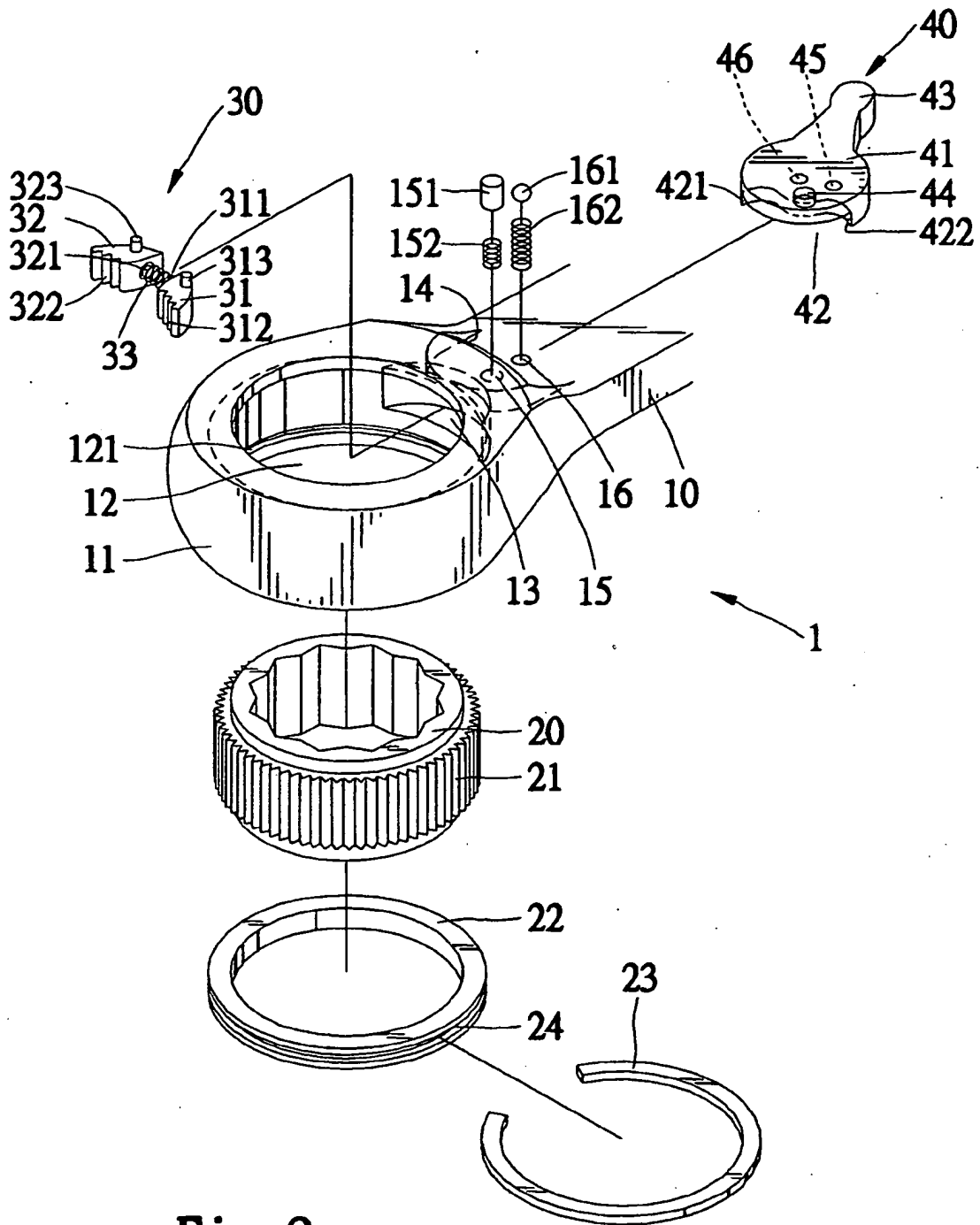


Fig. 2

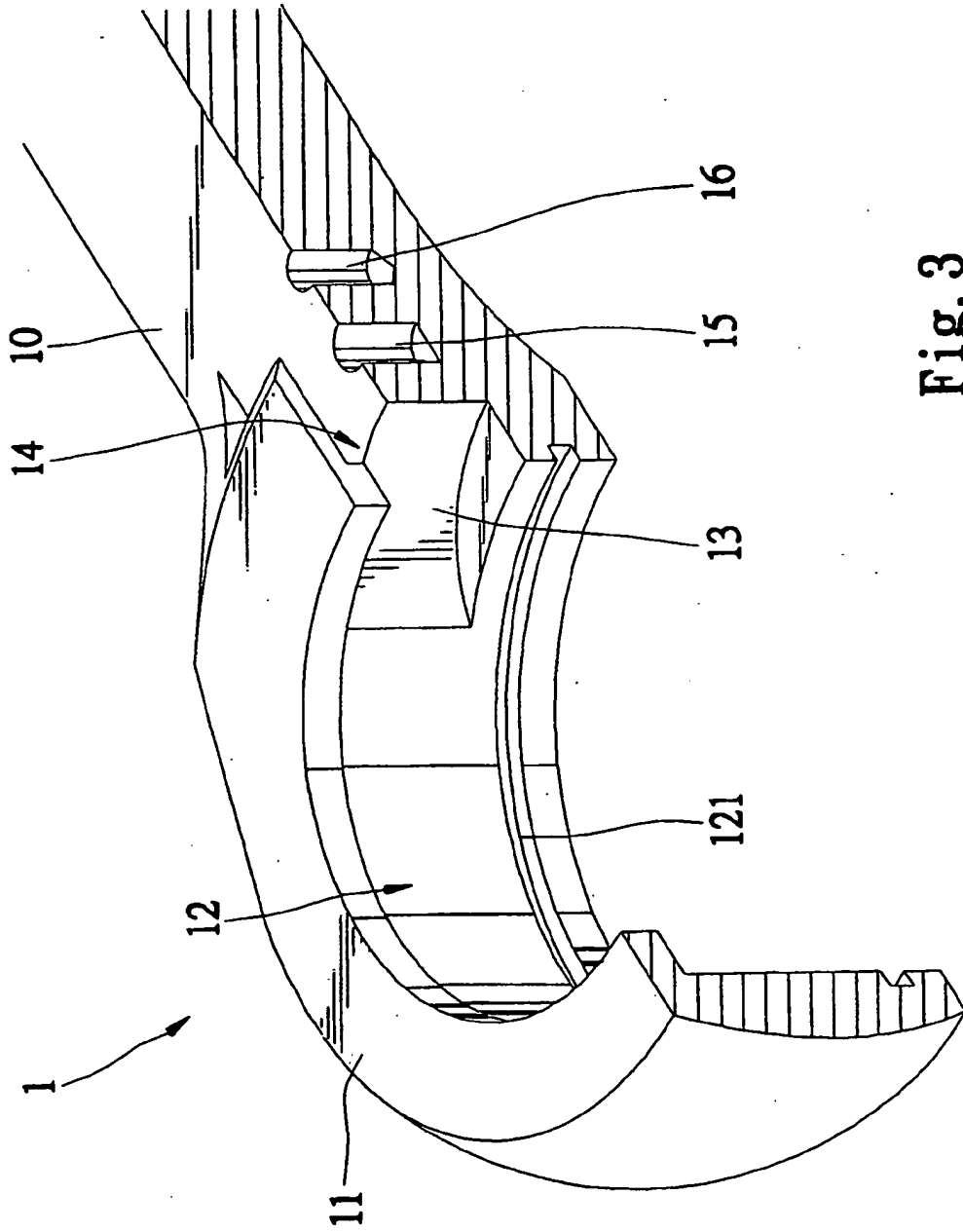


Fig. 3

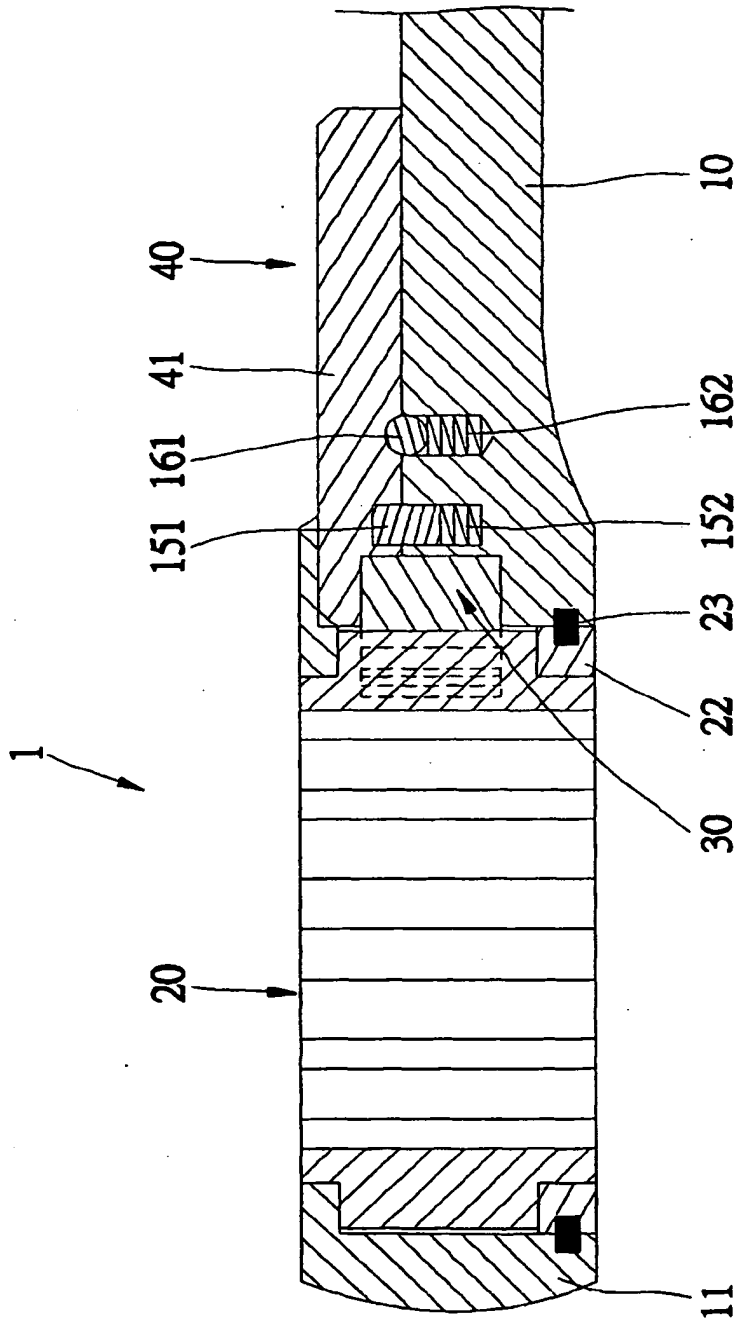


Fig. 4

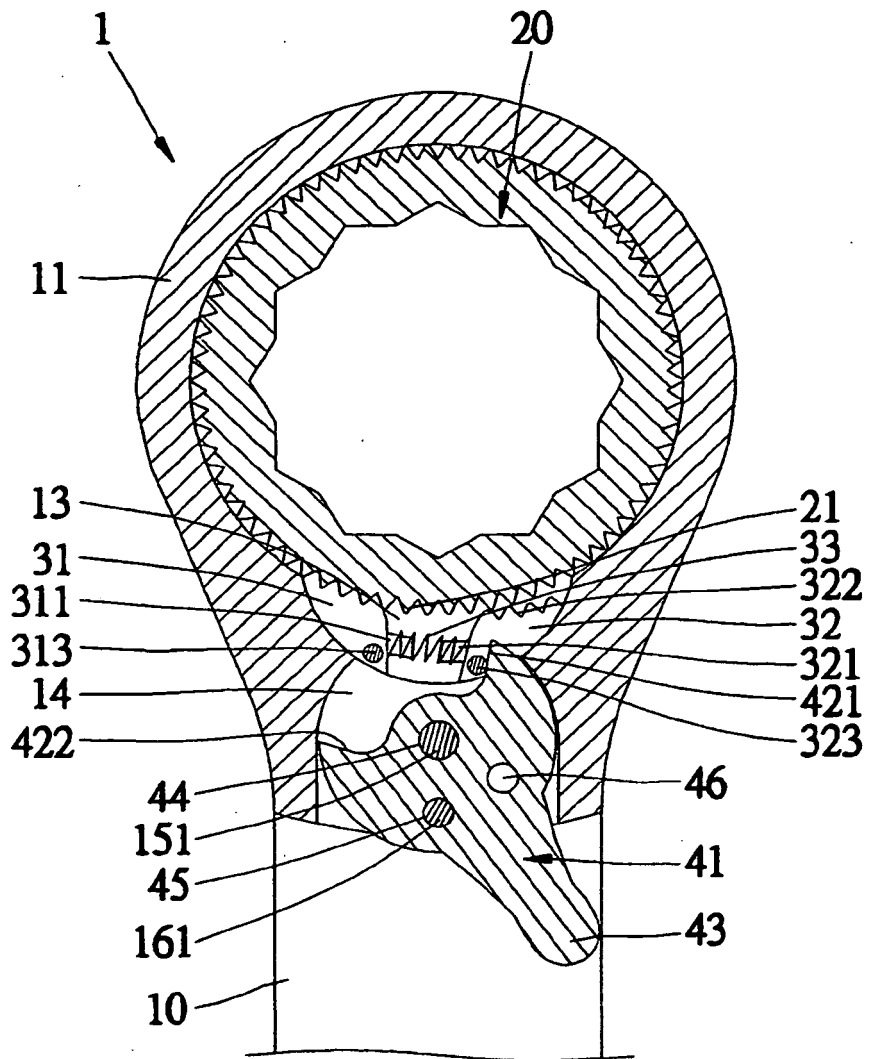


Fig. 5

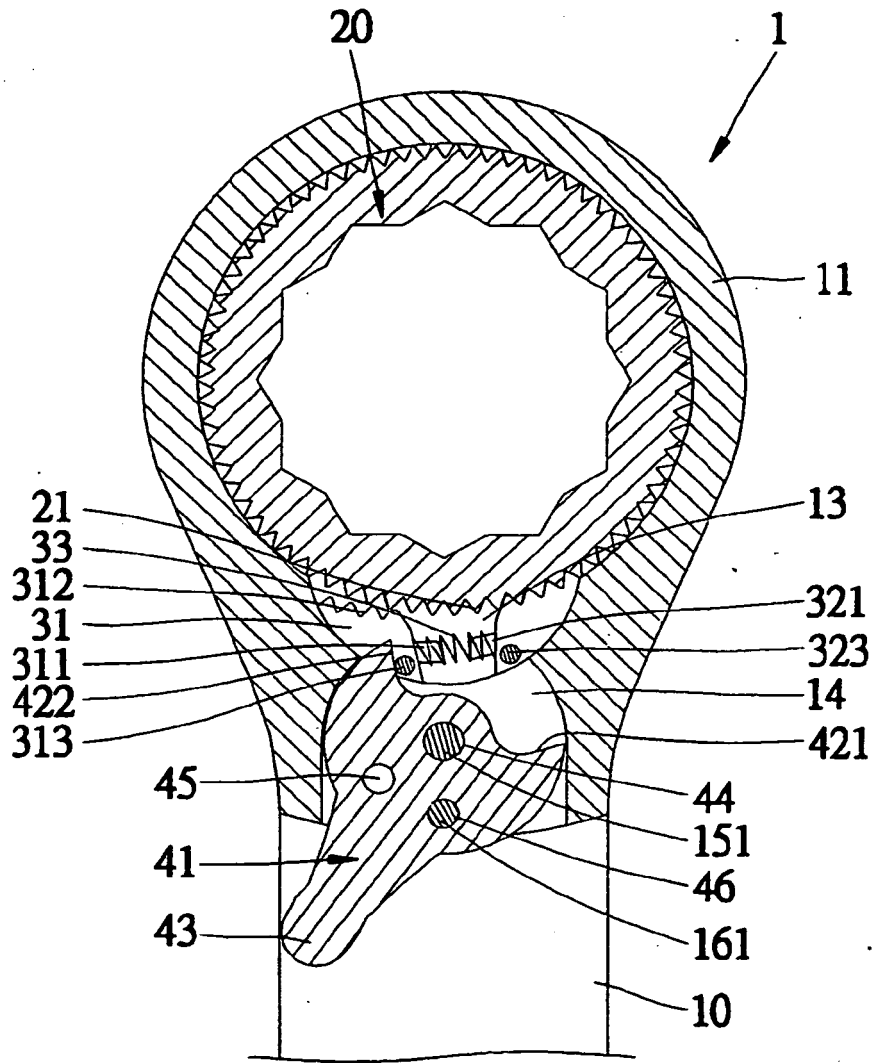


Fig. 6

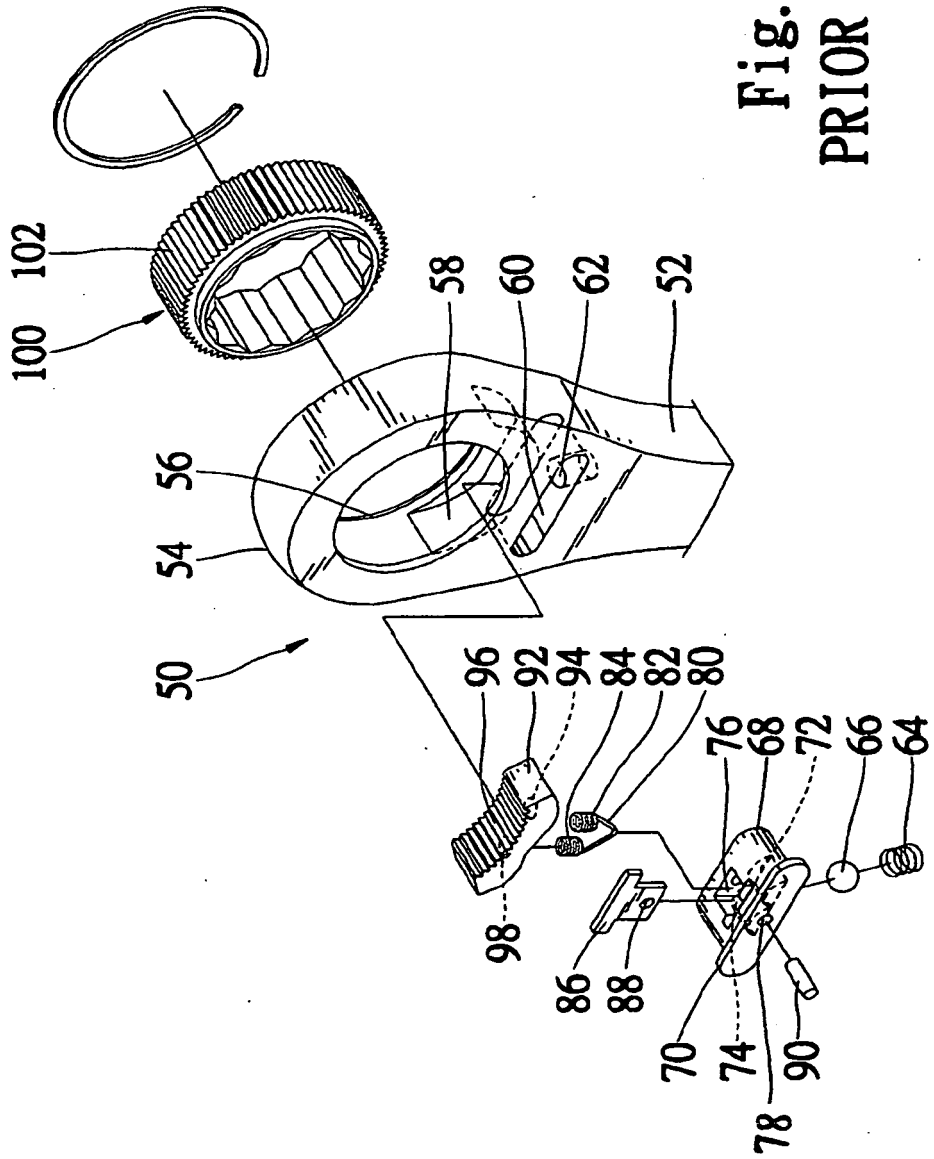


Fig. 7
PRIOR ART

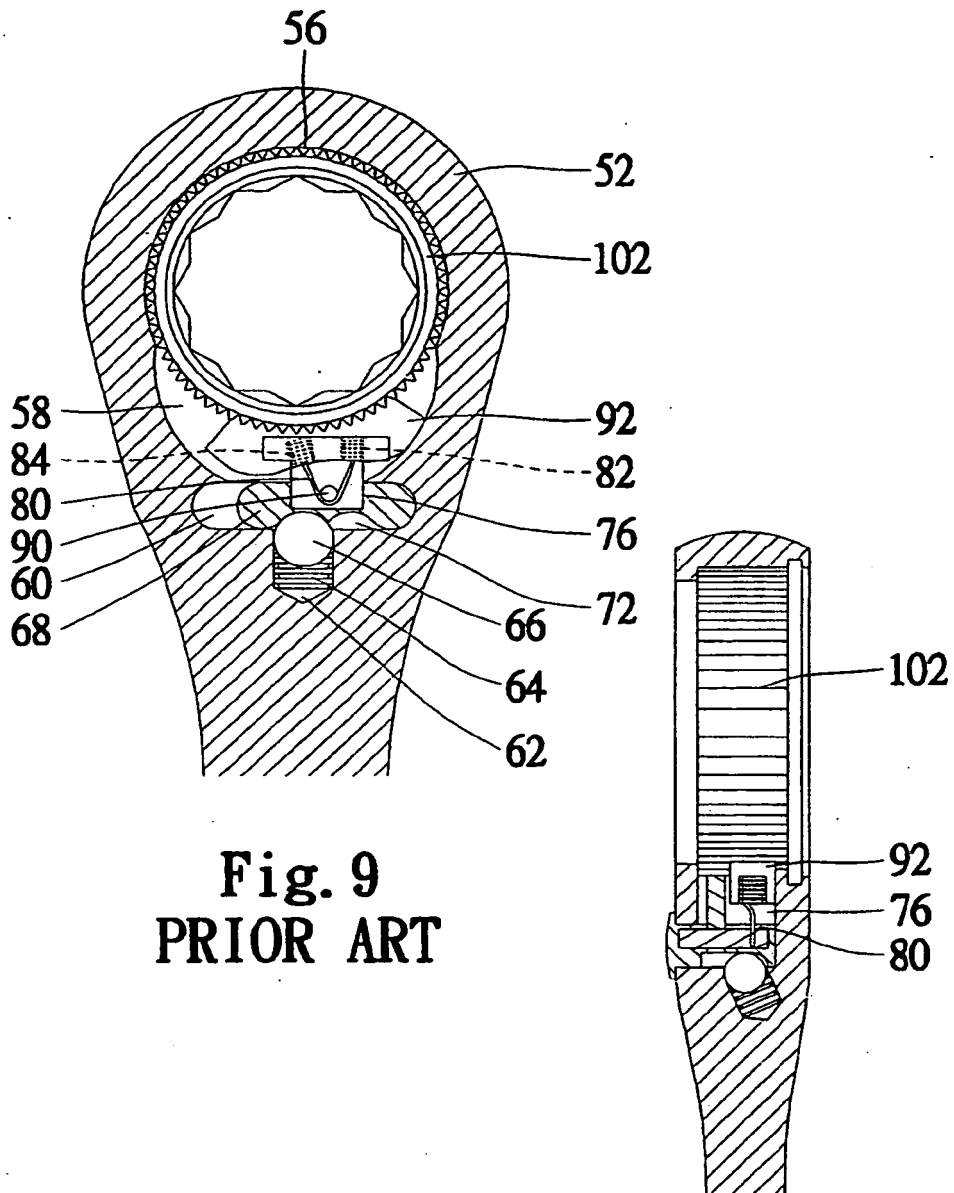


Fig. 9
PRIOR ART

Fig. 8
PRIOR ART

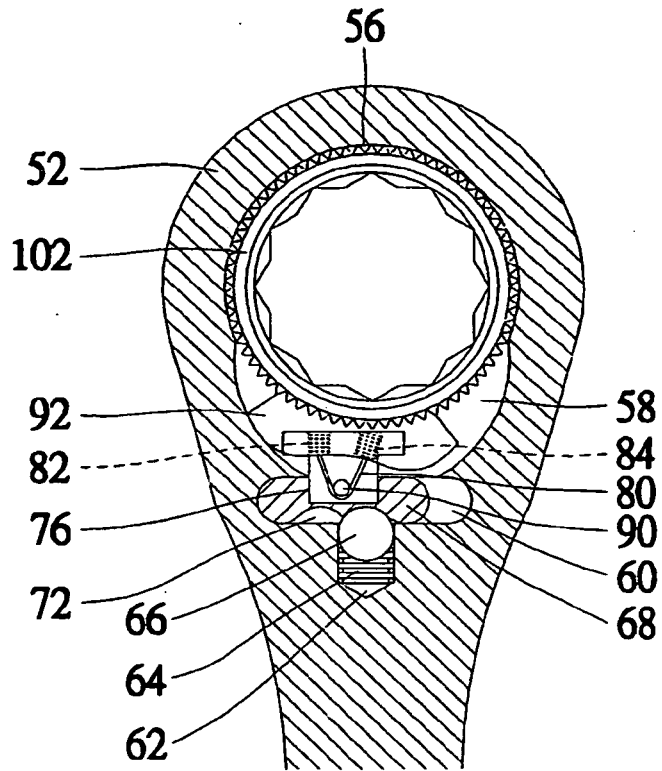


Fig. 10
PRIOR ART

REFERENCES CITED IN THE DESCRIPTION

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