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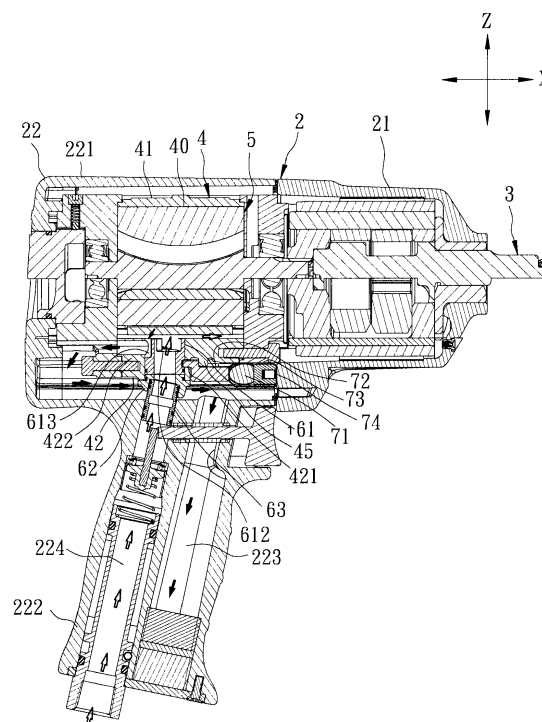
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BA ME(71) Applicant: **Basso Industry Corp.****Taichung****407 (TW)**(72) Inventor: **Lee, Chin-Cheng****407 Taichung (TW)**(30) Priority: **14.12.2011 TW 100146185**(74) Representative: **Chew, Kwan Chong Daniel et al****Withers & Rogers LLP****4 More London Riverside****London SE1 2AU (GB)****(54) Pneumatic tool having clockwise and counterclockwise rotation function**

(57) A pneumatic tool includes a housing (2), an air cylinder (4) disposed in the housing (2), a valve unit (6), and a controlling unit (7). The air cylinder (4) has an outer surface formed with a valve seat (42). A rotary valve (61) of the valve unit (6) is rotatable to allow compressed air to flow into the air cylinder (4) through a selected one of

first and second passages (43, 44) to thereby produce clockwise or counterclockwise rotation of the tool. The controlling unit (7) includes a movable pin (71) operable to move in the housing (2) to drive rotation of the rotary valve (61). Preferably, the valve unit (6) is disposed on the housing (2) in a manner that the space occupied thereby in the housing (2) is reduced.

**FIG. 7****EP 2 604 387 A2**

Description

[0001] This invention relates to a pneumatic tool, and more particularly to a pneumatic tool having clockwise and counterclockwise rotation function.

[0002] Referring to Figs. 1 and 2, a pneumatic tool 1 disclosed in Taiwanese Patent No. I319346 includes a housing 11, an air cylinder 12 disposed in the housing 11 and centered at an X-axis, a tubular air-guiding retainer 13, a rotary valve 14, a pin 15, and a trigger unit 16. The housing 11 has a handle 111, and has an intake passage 112 formed in the handle 111 and connected to a compressed air source (not shown). The air cylinder 12 has a cylinder wall 121 centered at the X-axis and defining an air chamber 120, as well as first and second passages 122, 123 for guiding air into the air chamber 120. The air-guiding retainer 13 is disposed in the housing 11, extends along a direction parallel to the X-axis, and is in fluid communication with the first and second passages 122, 123. The rotary valve 14 is rotatable about the X-axis in the air-guiding retainer 13, is in fluid communication with the intake passage 112, and has first and second outlets 141, 142. The pin 15 extends into the housing 11 along a Y-axis, and is operable to move in the housing 11 to drive rotation of the rotary valve 14. The trigger unit 16 is disposed pivotally on the handle 111, and is operable to allow compressed air to flow into the intake passage 112.

[0003] As such, the rotary valve 14 is rotated by the pin 15 between a first position whereat the first outlet 141 is in fluid communication with the first passage 122 so that compressed air flows into the air chamber 120 via the first passage 122 to drive clockwise rotation of the pneumatic tool 1, and a second position whereat the second outlet 142 is in fluid communication with the second passage 123 so that compressed air flows into the air chamber 120 via the second passage 123 to drive counterclockwise rotation of the pneumatic tool 1.

[0004] Since the air-guiding retainer 13 and the rotary valve 14 are arranged along the direction parallel to the X-axis, they occupy a relatively large space in the housing 11. Furthermore, such an arrangement of the air-guiding retainer 13 and the rotary valve 14 increases largely the width of the handle 111, thereby resulting in difficulties in gripping the handle 111.

[0005] Further, since the angle formed between the intake passage 112 and the central axes of the air-guiding retainer 13 and the rotary valve 14 is approximate to 90 degrees, compressed air cannot flow smoothly from the intake passage 112 into the air cylinder 12.

[0006] The object of this invention is to provide a pneumatic tool having clockwise and counterclockwise rotation function, which can reduce the space occupied in a housing by a valve unit and which allows smooth flow of compressed air from an intake passage into an air cylinder.

[0007] According to this invention, a pneumatic tool includes a housing, an air cylinder, a valve unit, and a con-

trolling unit. The housing has an intake passage adapted to be connected with a compressed air source. The air cylinder is disposed in the housing, and includes a cylinder wall centered at an X-axis and defining an air chamber, a valve seat centered at a Z-axis perpendicular to the X-axis and connected to the cylinder wall, a first passage, and a second passage. The first and second passages are formed in the cylinder wall, and are in fluid communication with the air chamber and the valve seat. The valve unit includes a rotary valve that is disposed in the valve seat and that has an intermediate passage. The rotary valve is rotatable about the Z-axis between a first position whereat the intermediate passage is in fluid communication with the first passage in the air cylinder, and a second position whereat the intermediate passage is in fluid communication with the second passage in the air cylinder. The controlling unit includes a movable pin disposed movably on the housing and operable to move in the housing along a Y-axis perpendicular to the X-axis and the Z-axis to thereby drive rotation of the rotary valve.

[0008] Since the rotary valve is rotatable about the Z-axis, the space occupied in the housing by the valve unit is reduced significantly, and compressed air can flow smoothly from the intake passage into the air cylinder.

[0009] These and other features and advantages of this invention will become apparent in the following detailed description of a preferred embodiment of this invention, with reference to the accompanying drawings, in which:

Fig. 1 is a fragmentary exploded perspective view of a conventional pneumatic tool disclosed in Taiwanese Patent No. I319346;

Fig. 2 is a fragmentary, partly sectional side view of the conventional pneumatic tool;

Fig. 3 is an exploded perspective view of the preferred embodiment of a pneumatic tool having clockwise and counterclockwise rotation function according to this invention;

Fig. 4 is a fragmentary, partly sectional perspective view of the preferred embodiment, illustrating an air cylinder and a valve unit;

Fig. 5 is an exploded perspective view of the air cylinder and a controlling unit of the preferred embodiment;

Fig. 6 is an assembled perspective view of the preferred embodiment;

Fig. 7 is a sectional view taken along Line VII-VII in Fig. 6;

Fig. 8 is a sectional view taken along Line VIII-VIII in Fig. 6; and

Fig. 9 is a sectional view taken along Line IX-IX in Fig. 6.

[0010] Referring to Figs. 3, 4, 5, and 6, the preferred embodiment of a pneumatic tool having clockwise and counterclockwise rotation function according to this invention includes a housing 2, a driving unit 3, an air cyl-

inder 4, a rotor unit 5, a valve unit 6, and a controlling unit 7.

[0011] The housing 2 has a front seat 21 and a rear seat 22 connected to the front seat 21 along an X-axis. The rear seat 22 includes a housing body 221, a handle 222 connected to and extending inclinedly along the housing body 221, an exhaust passage 223 (see Fig. 7) formed in the handle 222 and in fluid communication with the housing body 221, and an intake passage 224 formed in the handle 222 and in fluid communication with a compressed air source (not shown).

[0012] The driving unit 3 is mounted to the front seat 21 of the housing 2 for outputting kinetic energy.

[0013] The air cylinder 4 is disposed in the rear seat 22 of the housing 2, and includes a cylinder wall 41 centered at the X-axis and defining an air chamber 41, a valve seat 42 centered at a Z-axis perpendicular to the X-axis and connected to the cylinder wall 41, first and second passages 43, 44 formed in the cylinder wall 41 and in fluid communication with the air chamber 40 and the valve seat 42, and a projection 45 formed on the cylinder wall 41 and adjacent to the valve seat 42. The valve seat 42 has a first opening 421 formed at a side thereof, and a second opening 422 (see Fig. 7) formed at an opposite side thereof.

[0014] The rotor unit 5 is disposed rotatably in the air chamber 40, and is co-rotatable with the driving unit 3.

[0015] The valve unit 6 includes a rotary valve 61 rotatable about the Z-axis in the valve seat 42, an air-guiding retainer 62 disposed removably on the valve seat 42 for confining the rotary valve 61 in the valve seat 42, and an air-guiding tube 63. The rotary valve 61 has a plurality of teeth 611 centered at the Z-axis, formed on an outer surface thereof, and exposed in the first opening 421. The rotary valve 61 further has an intermediate passage 612 in fluid communication with the intake passage 224, and a selected one of the first and second passages 43, 44, and a notch 613 in fluid communication with the second opening 422. The air-guiding tube 63 has an inclination angle with respect to the Z-axis, and is in fluid communication with the intermediate passage 612 and the intake passage 224.

[0016] The controlling unit 7 includes a movable pin 71, a pushing member 72, a positioning member 73, and a resilient member 74. The movable pin 71 is movable in the housing body 221 of the housing 2 in a Y-axis perpendicular to the X-axis and the Z-axis, and has a hole 711 formed therethrough. The pushing member 72 is disposed between the rotary valve 61 and the movable pin 71 along the X-axis, and has a rack 721 formed at an end thereof and engaging the teeth 611, and an engaging portion 722 formed at an opposite end thereof. The pushing member 72 is obstructed by the projection 45 to maintain engagement between the rack 721 and the teeth 611. The positioning member 73 has an engaging portion 731 inserted fittingly into the engaging portion 722 of the pushing member 72, and an intermediate portion extending through the hole 711 of the movable pin 71. The re-

silient member 74 is disposed in a recess 732 of the positioning member 73, and has two ends abutting respectively against the front seat 21 and the positioning member 73 for biasing the engaging portion 731 of the positioning member 73 to move along the direction parallel to the X-axis so as to engage the engaging portion 722 of the pushing member 72, thereby allowing for synchronous movement of the movable in 71, the pushing member 72, and the positioning member 73 along the Y-axis.

[0017] Referring to Figs. 3, 8, and 9, to switch rotational direction of the driving unit 3, it is only necessary to push the movable pin 71 to move leftwardly or rightwardly along the Y-axis so that, due to engagement between the engaging portions 722, 731 of the pushing member 72 and the positioning member 73, the rotary valve 61 can be rotated to the first or second position.

[0018] When the rotary valve 61 is at the first position, compressed air flows from the intake passage 224 into the air chamber 40 via a path including the intermediate passage 612 and the first passage 43, to thereby rotate the rotor unit 5 and, thus, the driving unit 3 in a rotational direction (e.g., clockwise direction). At the same time, since the notch 613 is in fluid communication with the second passage 44, air flows from the air chamber 40 into the exhaust passage 223 via a path including the second passage 44, the notch 613, and the second opening 422.

[0019] When the rotary valve 61 is at the second position, compressed air flows from the intake passage 224 into the air chamber 40 via a path including the intermediate passage 612 and the second passage 44, to thereby rotate the rotor unit 5 and, thus, the driving unit 3 in an opposite rotational direction (e.g., counterclockwise direction). At the same time, since the notch 613 is in fluid communication with the first passage 43, air flows from the air chamber 40 into the exhaust passage 223 via a path including the first passage 43, the notch 613, and the second opening 422.

[0020] In view of the above, the pneumatic tool of this invention has the following advantages:

1. Since the rotary valve 61, the air-guiding retainer 62, and the air-guiding tube 63 are arranged along the Z-axis, the space occupied thereby in the housing 2 along the X-axis is reduced significantly. In addition, the width of the handle 222 along the X-axis is also reduced, so that the handle 222 can be gripped with ease, thereby facilitating smooth operation of the pneumatic tool.

2. Since the rotary valve 61 is rotatable about the Z-axis, the angle formed between the intermediate passage 612 of the rotary valve 61 and the intake passage 224 is relatively small, which allows for smooth flow of compressed air from the intake passage 224 into the air cylinder 4 through the intermediate passage 612 to promote effectively the driving force of the rotor unit 5.

Claims

1. A pneumatic tool **characterized by:**

a housing (2) having an intake passage (224) adapted to be connected with a compressed air source;
 an air cylinder (4) disposed in said housing (2) and including a cylinder wall (41) centered at an X-axis and defining an air chamber (40), a valve seat (42) centered at a Z-axis perpendicular to said X-axis and connected to said cylinder wall (41), a first passage (43), and a second passage (44), said first and second passages (43, 44) being formed in said cylinder wall (41) and being in fluid communication with said air chamber (40) and said valve seat (42);
 a valve unit (6) including a rotary valve (61) that is disposed in said valve seat (42) and that has an intermediate passage (612), said rotary valve (61) being rotatable about said Z-axis between a first position whereat said intermediate passage (612) is in fluid communication with said first passage (43) in said air cylinder (4), and a second position whereat said intermediate passage (612) is in fluid communication with said second passage (44) in said air cylinder (4); and
 a controlling unit (7) including a movable pin (71) disposed movably on said housing (2) and operable to move in said housing (2) along a Y-axis perpendicular to said X-axis and said Z-axis to thereby drive rotation of said rotary valve (61).

2. The pneumatic tool as claimed in Claim 1, **characterized in that** said valve unit (6) further includes an air-guiding retainer (62) disposed removably on said valve seat (42) so as to confine said rotary valve (61) in said valve seat (42).
3. The pneumatic tool as claimed in Claim 2, further **characterized in that** said valve unit (6) further includes an air-guiding tube (63) connected to said air-guiding retainer (62) and in fluid communication with said air-guiding retainer (62) and said intake passage (224) in said housing (2).
4. The pneumatic tool as claimed in Claim 1, **characterized in that** said valve seat (42) has a first opening (421) formed at a side thereof, and said rotary valve (61) further has a plurality of teeth (611) formed on an outer surface thereof and exposed in said first opening (421) in said valve seat (42), said controlling unit (7) further including a pushing member (72) engaging said teeth (611) of said rotary valve (61) and connected to said movable pin (71).
5. The pneumatic tool as claimed in Claim 4, further **characterized in that** said pushing member (72) is

disposed between said rotary valve (61) and said movable pin (71) along said X-axis, and is formed at an end thereof with a rack (421) engaging said teeth (611) of said rotary valve (61), and formed at an opposite end thereof with an engaging portion (722) that is connected to said movable pin (71).

6. The pneumatic tool as claimed in Claim 5, further **characterized in that** said air cylinder (4) further includes a projection formed on said cylinder wall (41) and adjacent to said seat valve, said projection obstructing said pushing member (72) so as to maintain engagement between said rack (421) and said teeth (611).
7. The pneumatic tool as claimed in Claim 5, further **characterized in that** said controlling unit (7) further includes a positioning member (73), said movable pin (71) having a hole (711) formed therethrough, said positioning member (73) having an engaging portion (731) and an intermediate portion extending through said hole (711) in said movable pin (71), one of said engaging portions (731, 722) of said positioning member (73) and said pushing member (72) being inserted fittingly into the other of said engaging portions (731, 722) of said positioning member (73) and said pushing member (72).
8. The pneumatic tool as claimed in Claim 7, further **characterized in that** said housing (2) further has a front seat (21) and a rear seat (22) connected to said front seat (21) along said X-axis, said rear seat (22) including a housing body (221) for receiving said air cylinder (4), said valve unit (6), and said controlling unit (7), and a handle (222) connected to said housing body (221) and formed with said intake passage (224), said controlling unit (7) further including a resilient member (74) disposed between said positioning member (73) and said front seat (21) for biasing said engaging portion (731) of said positioning member (73) to engage said engaging portion (722) of said pushing member (72).
9. The pneumatic tool as claimed in Claim 8, further **characterized in that** said rear seat (22) further includes an exhaust passage (223), said valve seat (42) further having a second opening (422) formed at an opposite side thereof and in fluid communication with said exhaust passage (223), said rotary valve (61) further having a notch (613) in fluid communication with said second opening (422), said notch (613) being in fluid communication with said second passage (44) in said air cylinder (4) when said rotary valve (61) is at said first position, and with said first passage (43) in said air cylinder (4) when said rotary valve (61) is at said second position.

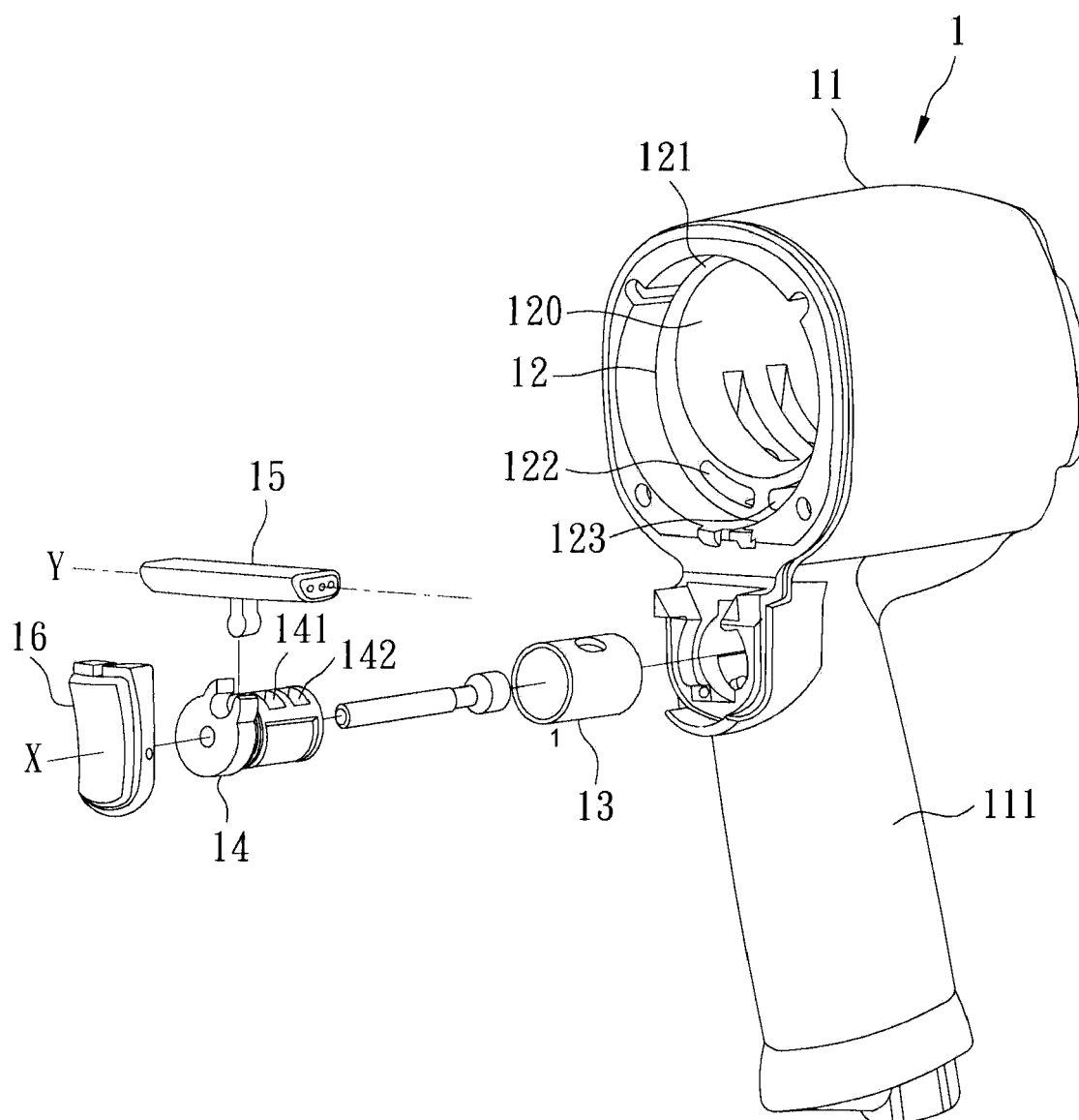


FIG. 1
PRIOR ART

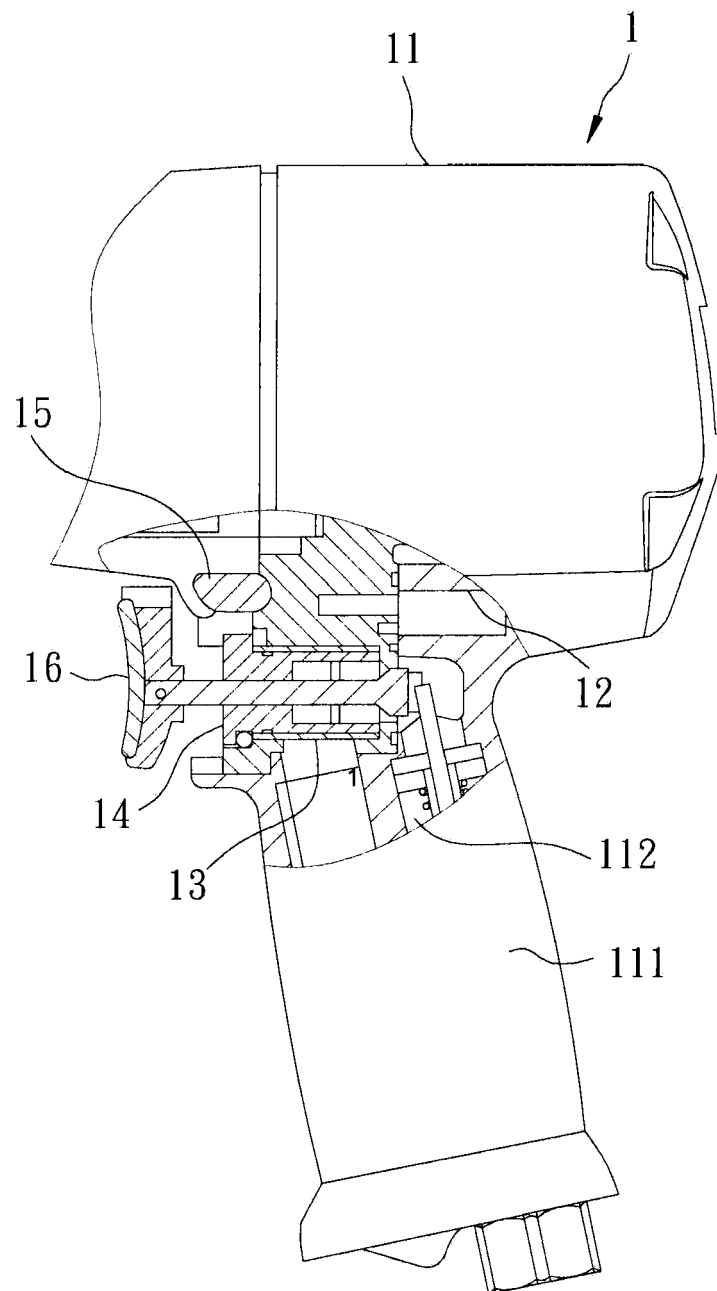


FIG. 2
PRIOR ART

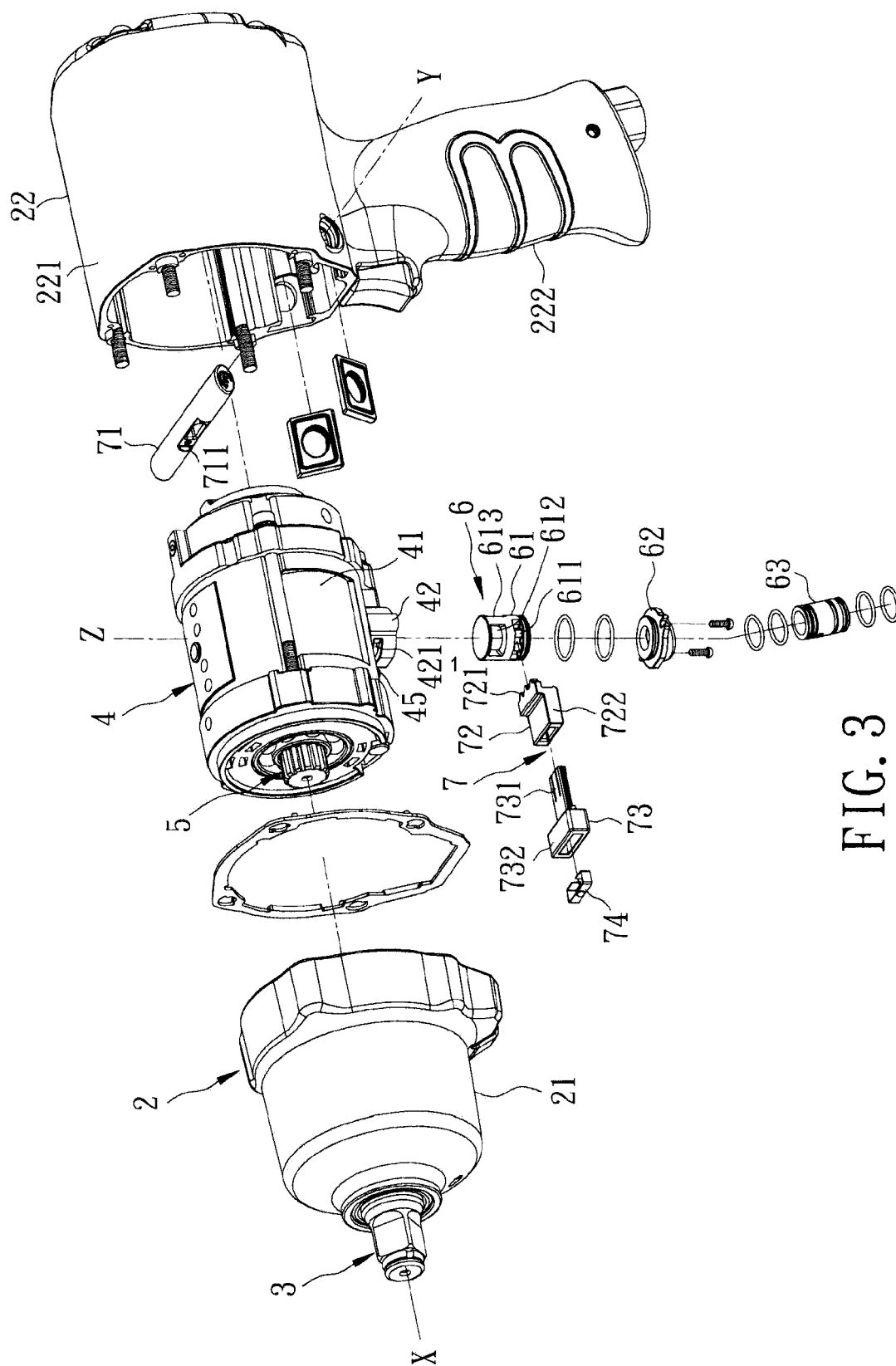


FIG. 3

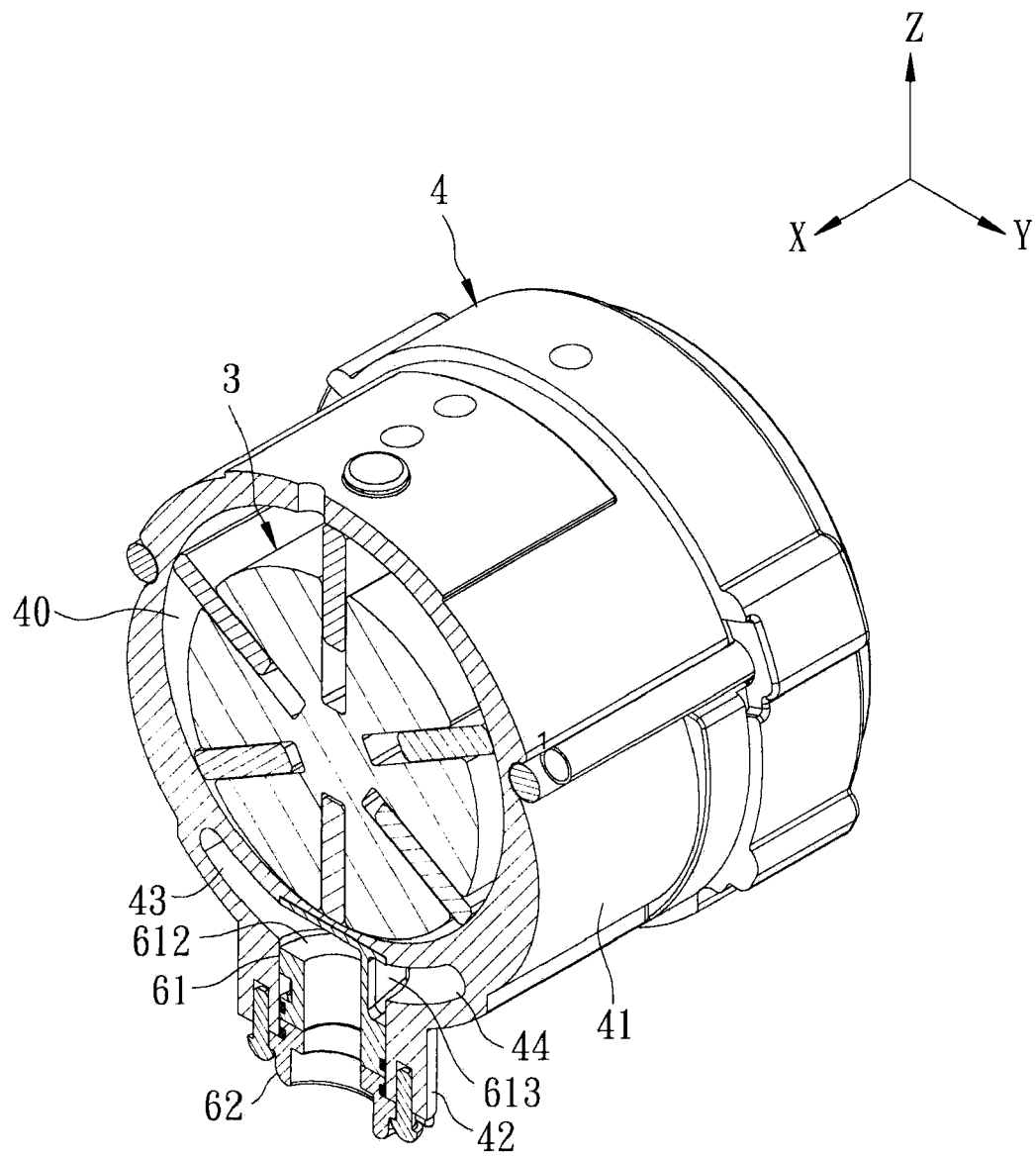


FIG. 4

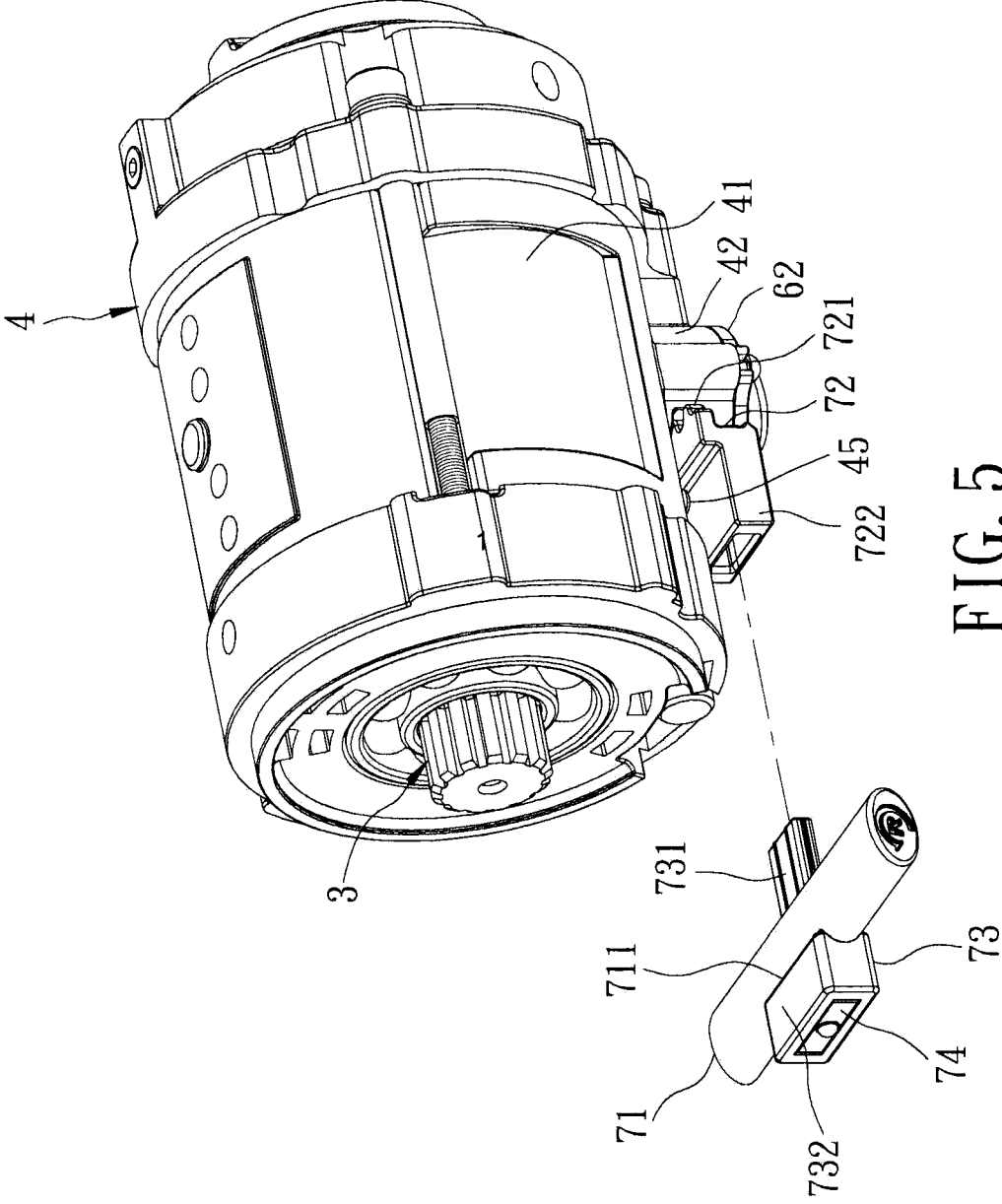


FIG. 5

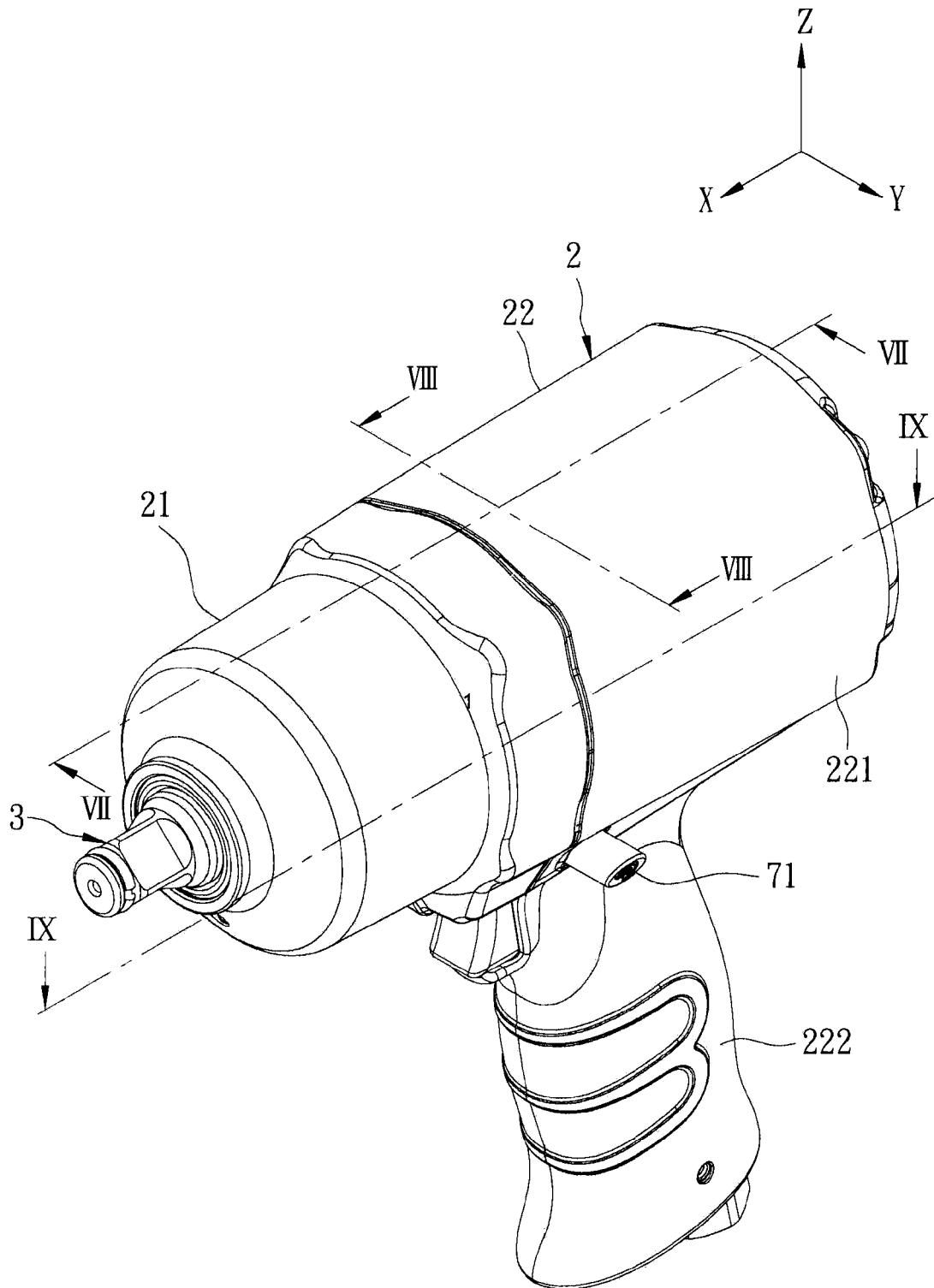


FIG. 6

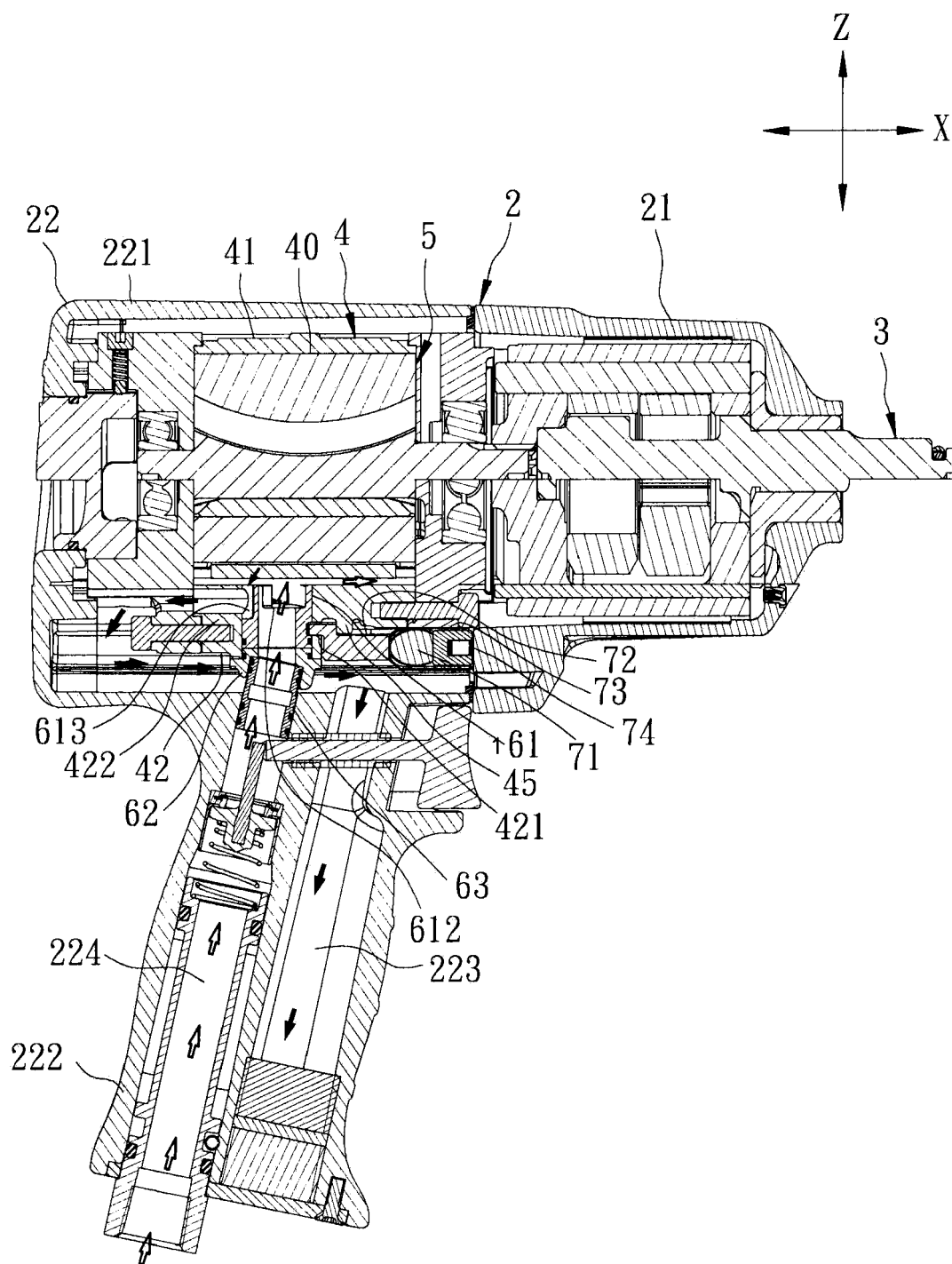


FIG. 7

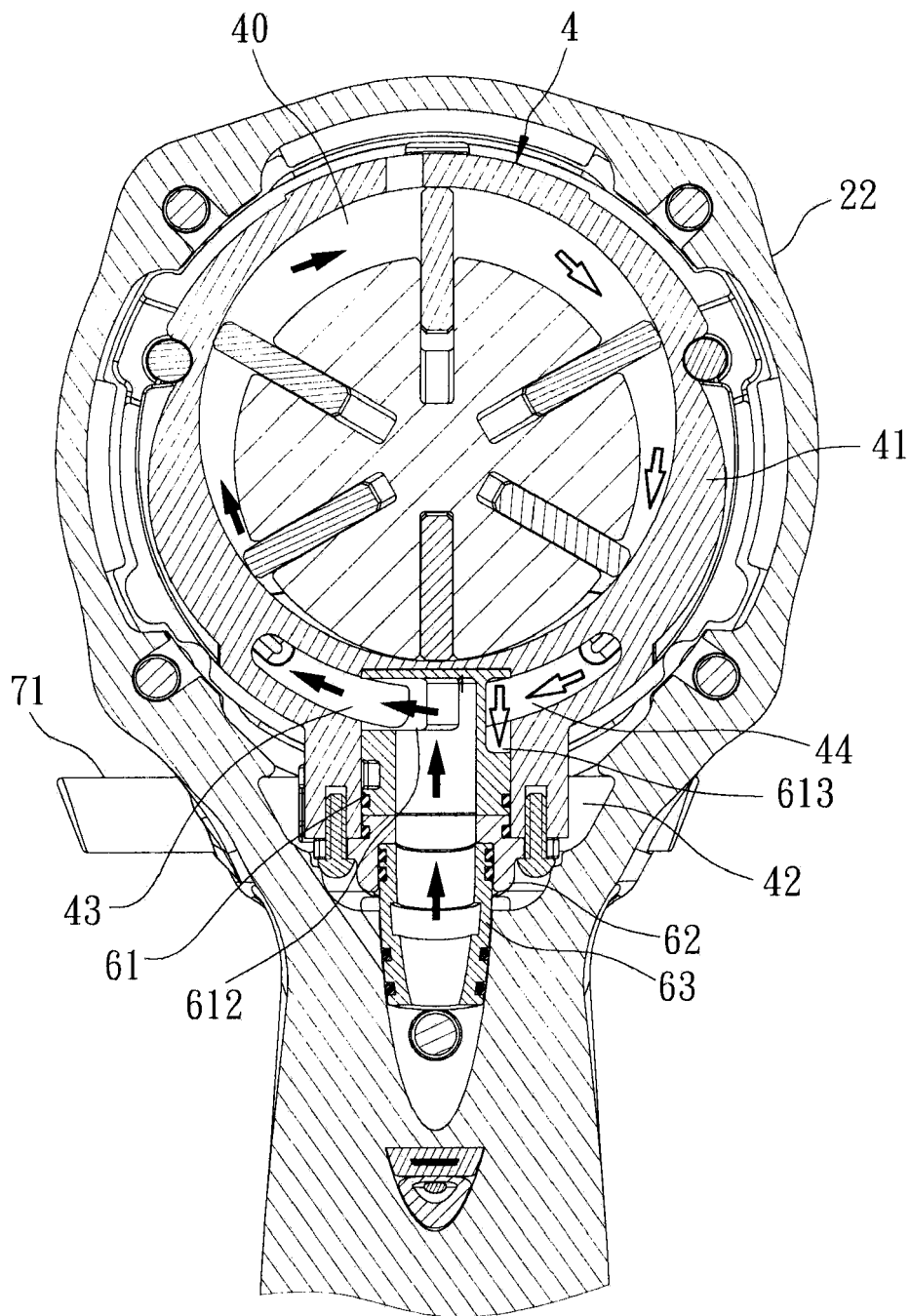


FIG. 8

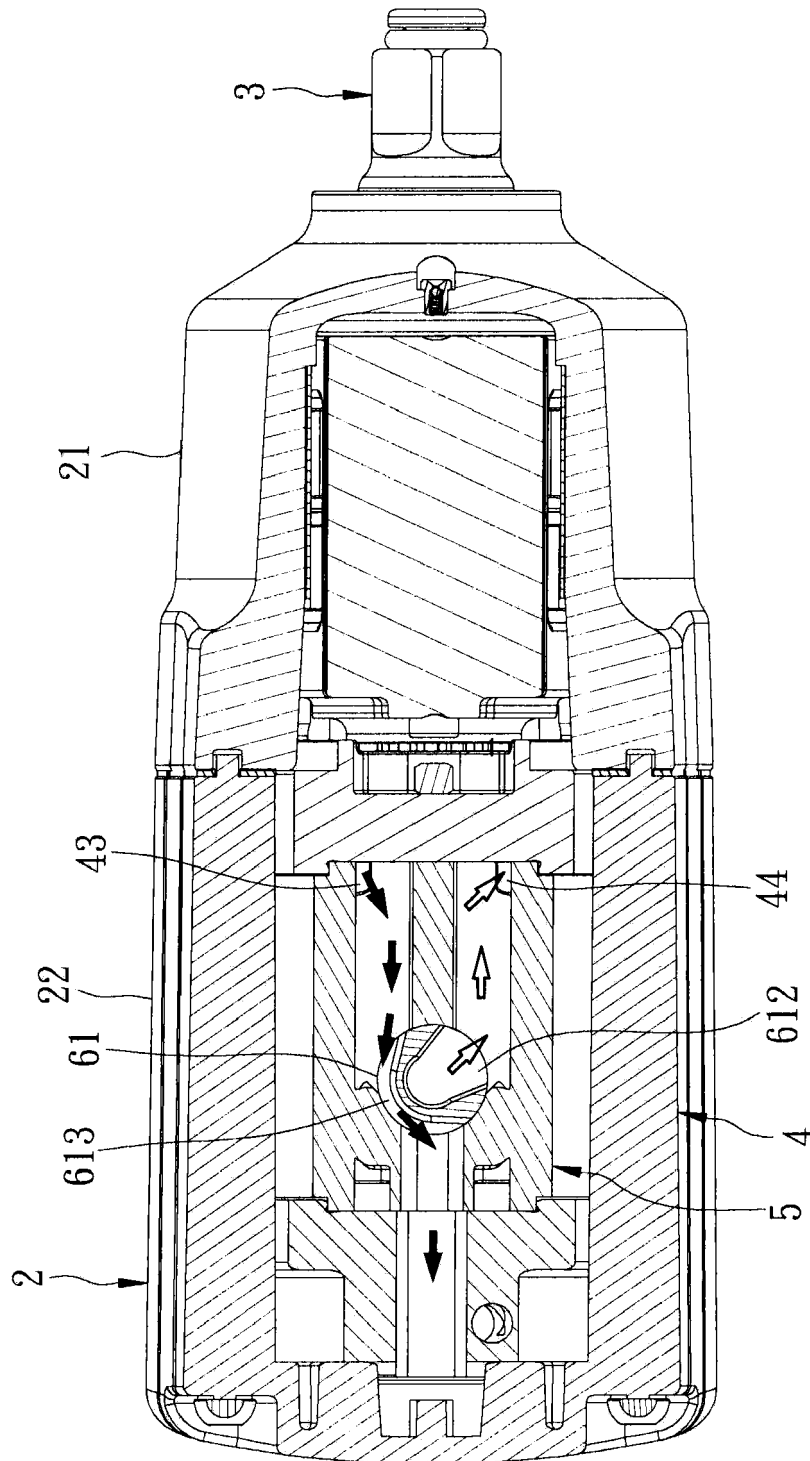


FIG. 9

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- TW I319346 [0002] [0009]