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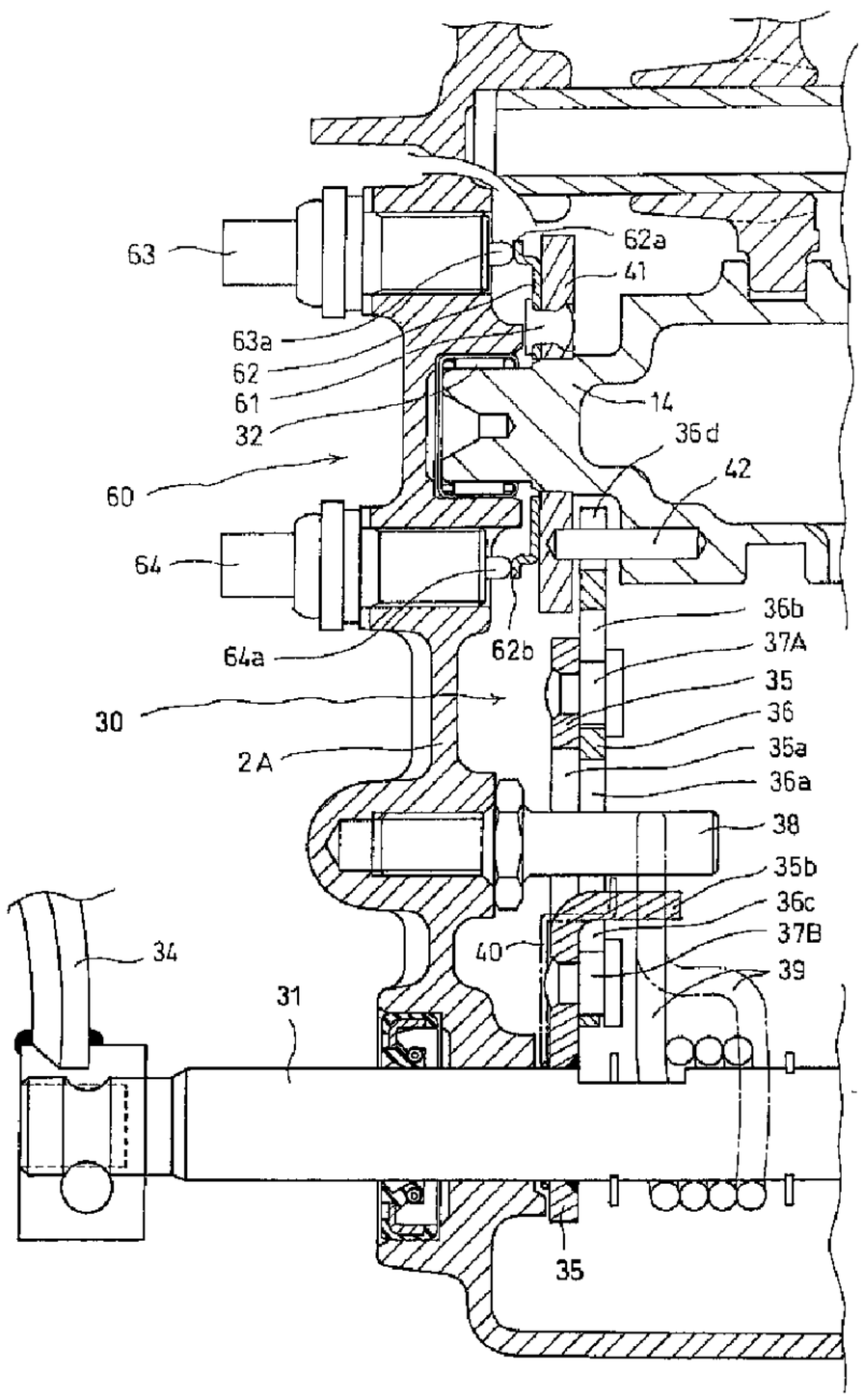
(54) Titre : DETECTEUR DE DEPLACEMENT DE POSITION POUR TRANSMISSION DE VEHICULE
(54) Title: SHIFT POSITION DETECTOR FOR VEHICULAR TRANSMISSION



(57) Abrégé/Abstract:
Conventionally, a cam face structure portion provided with a neutral position detecting cam is provided on the outer circumferential surface of a shift drum and a neutral position detector is provided on a crankcase. Therefore, the main body of the detector

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(57) Abrégé(suite)/Abstract(continued):
protrudes externally from the crankcase, which poses a problem with space saving or the like. A contact member adapted to detect a neutral position and a reverse position of a shift drum is integrally attached to a shift drum skip-turn-prevention plate secured to an end of the shift drum, and a neutral position detecting switch and a reverse position detecting switch are integrally mounted to a crankcase or a crankcase cover, the detecting switches being energized upon contact with the contact member.

ABSTRACT OF THE DISCLOSURE

Conventionally, a cam face structure portion provided with a neutral position detecting cam is provided on the outer circumferential surface of a shift drum and a neutral position detector is provided on a crankcase. Therefore, the main body of the detector protrudes externally from the crankcase, which poses a problem with space saving or the like. A contact member adapted to detect a neutral position and a reverse position of a shift drum is integrally attached to a shift drum skip-turn-prevention plate secured to an end of the shift drum, and a neutral position detecting switch and a reverse position detecting switch are integrally mounted to a crankcase or a crankcase cover, the detecting switches being energized upon contact with the contact member.

Shift Position Detector for Vehicular Transmission

FIELD OF THE INVENTION

The present invention relates to a shift position detector for a gear transmission used in motorcycles and other vehicles.

BACKGROUND OF THE INVENTION

The conventional technologies of the neutral position detector include the following example: A neutral position detector is mounted on the outer wall of a lower crankcase in such a way that a detecting pin located at the end of the detector is directed in the direction of the centerline of a shift drum. In addition, a cam face structure portion provided with a cam adapted to detect a neutral position is provided on the outer circumferential surface of the shift drum. The detecting pin is disposed to face the cam face structure portion at a small gap or to be in contact with the same with a pressing force. With this configuration, as the shift drum turns, the detection cam of the cam face structure portion presses the detecting pin. Thus, the neutral position is detected at the time of speed-change. (See Japanese Patent Laid-open No. 2004-203313 (Fig. 3)

The neutral position detector has been provided on the outer circumferential surface of the crankcase in a radial direction of the shift drum. Therefore, the main body of the detector protrudes externally from the crankcase. In addition, it is difficult to route wiring in some cases when an engine is mounted. The present invention eliminates the problems by effective use of the space in the axial direction of the shift drum.

SUMMARY OF THE INVENTION

The present invention relates to a shift position detector for a vehicular transmission characterized in that a contact member (switch plate) adapted to detect a neutral position and a reverse position of a shift drum is integrally attached to a shift drum skip-turn-prevention plate secured to an end of the shift drum, and a neutral position detecting switch and a reverse position detecting switch are integrally mounted to a crankcase or a crankcase cover, the detecting switches being energized upon contact with the contact member. Since the contact member or the switch plate is integrally attached to the shift drum skip-turn-prevention plate, man-hour for attachment is reduced, attachment accuracy is improved and space-saving can be achieved.

An aspect of the invention is characterized in that, in the shift position detector for a vehicular transmission recited in claim 1, a neutral position detecting contact portion and a reverse position detecting contact portion of the contact member are disposed opposite to each other with respect to an axis of the shift drum.

BRIEF DESCRIPTION OF THE DRAWINGS

Preferred embodiments of the invention are shown in the drawings, wherein:

Fig. 1 is a longitudinal cross-sectional view of an internal combustion engine according to an embodiment of the present invention.

Fig. 2 is a development of a main shaft and a counter shaft of a gear transmission.

Fig. 3 is a development of a gear change mechanism.

Fig. 4 is an enlarged cross-sectional view of a shift drum turning mechanism and a shift position detector.

Fig. 5 is a view of the shift drum turning mechanism as viewed from the left side.

Fig. 6 is a view of a shift drum turning position stabilizer as viewed from the right side of the shift drum.

Fig. 7 is a view illustrating the shift position detector and the vicinity thereof as viewed from the left side of the shift drum.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Fig. 1 is a longitudinal cross-sectional view, as viewed from the left side, of an internal combustion engine 1 used in a motorcycle or other vehicles according to an embodiment of the present invention. Arrow F indicates the front. In the figure, a cylinder block 3 is joined to the upper portion of a crankcase 2. A cylinder head and a cylinder head cover are omitted in the figure. A crankshaft 4 is provided in the front portion of the crankcase 2. A connecting rod 6 is at its one end connected to a crankpin 5 of the crankshaft 4 and the other end of the connecting rod 6 is connected to a piston 7. The piston 7 performs up-and-down motion in the cylinder block 3, resulting in the production of power. A balancer shaft 8 gear-driven through the crankshaft 4 is provided forward of the crankshaft 4 and carries a balancer 9.

A gear transmission 10 is provided in the rear portion of the crankcase 2. The transmission 10 includes a main shaft 11, a counter shaft 12, a shift fork shaft 13, and a shift drum 14. The main shaft 11 is drivingly rotated from the crankshaft 4 via gears and a multiple disk clutch. The counter shaft 12 is rotationally driven from the main shaft 11 through speed-change gears. A shift drum turning mechanism 30 is located below the transmission 10.

Fig. 2 is a cross-sectional development illustrating the main shaft 11 and counter shaft 12 of the transmission 10. The main shaft 11 and the counter shaft 12 are supported for rotation by a left-hand crankcase 2A and a right-hand crankcase 2B through bearings 16. A transmission input gear 20 is fitted to a portion near the right end of the main shaft 11. The transmission input gear 20 is in full-time engagement with an output gear (not shown) of the crankshaft 4 and is capable of circumferential rotation about the axis thereof. A multiple disk clutch 21 is provided at the right end of the main shaft 11. The multiple disk clutch 21 is normally engaged but disengaged when operated with an operation mechanism. A clutch outer 22 of the clutch 21 is

secured to the transmission input gear 20, whereas a clutch inner 23 of the clutch 21 is secured to the main shaft 11. Rotation of the crankshaft 4 is transmitted to the transmission input gear 20 via a crankshaft output gear, and further transmitted to the main shaft 11 through the multiple disk clutch 21.

The main shaft 11 carries six gears and also the counter shaft 12 carries six gears located at positions corresponding respectively to the six gears of the main shaft 11 so that one of the latter six gears may be full-time meshed with the corresponding one of the former six gears. The power transmission roles of first to fifth speeds and reverse are respectively assigned to the six pairs of gears constituting the group of gears 24. Incidentally, the pairing reverse gears are meshed with each other through an intermediate gear not shown.

Fig. 3 is a development of a gear change mechanism 15 including the shift fork shaft 13, the shift drum 14 and a change spindle 31. The left and right ends of the shift fork shaft 13 are supported by the left-hand crankcase 2A and the right-hand crankcase 2B, respectively. The shift fork shaft 13 carries three shift forks F1, F2, F3 axially slidably. The fork part of the first shift fork F1 is engaged with a groove G1 provided on an axially movable gear. The fork part of the second shift fork F2 is engaged with a groove G2 and the fork part of the third shift fork F3 is engaged with a groove G3.

The shift drum 14 is at its left and right ends supported by the left-hand and right-hand crankcases 2A and 2B for rotation via a needle bearing 32 and a plain bearing 33, respectively. The shift drum 14 is provided with a first cam groove D1, a second cam groove D2 and a third cam groove D3. The sliding pin P1 of the first shift fork F1 is slidably engaged with the first cam groove D1, the sliding pin P2 of the second shift fork F2 is slidably engaged with the second cam groove D2, and the sliding pin P3 of the third shift fork F3 is slidably engaged with the third cam groove D3.

The change spindle 31 is rotatably supported by the right-hand and left-hand crankcases 2A and 2B. The shift drum turning mechanism 30 is located between the change spindle 31 and the shift drum 14. A shift position detector 60 is provided at the left end of the shift drum 14. The shift drum turning mechanism 30 is a mechanism for turning the shift drum 14 on a predetermined angle basis in accordance with turn of the change spindle 31.

The turn of the change spindle 31 is achieved by a pressure applied onto a shift pedal (not shown), which is provided at the end of a shift pedal arm 34 welded to the left end of the change spindle 31.

The shift drum turning mechanism 30 is operated to turn the shift drum 14, whereby the cam grooves work to move one of the first, second and third shift forks along the shift fork shaft. An axially movable gear in mesh with the shift fork comes into mesh with the rotatable gear adjacent thereto. Consequently, the pair of gears selected as above among the group of gears in mesh with each other is coupled to the respective shaft. This state means completion of gear change by the gear change mechanism 15. Thus, rotation is transmitted from the main shaft 11 to the counter shaft 12 at a change gear ratio determined by the pair of gears. A sprocket 25 (Fig. 2) is provided at the left end of the counter shaft 12. A chain 26 (Fig. 2) is wound around the sprocket 25 to transmit the output of the gear transmission 10 to a rear wheel (not shown) for driving.

Fig. 4 is an enlarged cross-sectional view of the shift drum turning mechanism 30 and the shift position detector 60. Fig. 5 is a view of the shift drum turning mechanism 30 as viewed from the left side. A change arm 35 is fixedly welded to the change spindle 31 for turning therewith. A shifter plate 36 overlaps the change arm 35 and is carried on the change arm 35 with two guide pins 37A, 37B slidably with respect thereto.

The change arm 35 and the shifter plate 36 are provided with mid openings 35a and 36a, respectively, slightly different in shape from each other. The shifter plate 36 is slidable in the direction of centerline C-C of the change arm 35 within a range defined by the longitudinal hole 36b of the shifter plate 36 and the cut-in portion 36c of the mid opening 36a. A guide pin 37A is inserted into the longitudinal hole 36b, whereas a guide pin 37B is inserted into the cut-in portion 36c. A restriction bolt 38 is provided which passes through the mid opening 35a of the change arm 35 and the mid opening 36a of the shifter plate 36. The proximal end of the restriction bolt 38 is threadedly fixed to the left-hand crankcase 2A. A spring-pressing portion 35b is provided on one side of the mid opening 35a of the change arm 35. The spring-pressing portion 35b is shaped to project in the direction of the central

portion of the mid opening 35a and then bend into the mid opening 36a of the shifter plate 36.

The change arm 35 is turned together with the change spindle 31. In order for the change arm 35 to return to its original position, a change arm returning spring 39 is wound around the change spindle 31 in such a manner that the restriction bolt 38 and the spring-pressing portion 35b of the change arm 35 are put between both the ends of the spring 39. As stated above, the shifter plate 36 is slidable with respect to the change arm 35. A shifter plate urging spring 40 is attached between the change spindle 31 and the shifter plate 36 so as to urge the shifter plate 36 in the direction of the shift drum 14. A skip-turn-prevention plate 41 is fixedly press fitted to an end of the shift drum 14. As described later, this plate 41 is a member for preventing the shift drum 14 from skip-turning in excess of one stage for one shift operation. Six engagement rollers 42 are provided between the end of the shift drum 14 and the plate 41.

Referring to Fig 5, when the change spindle 31 is turned by a shift pedal force, the change arm 35 welded to the change spindle 31 is turned to turn together the shifter plate 36, which is slidably attached to the change arm 35 with the guide pins 37A, 37B. One leg of the change arm returning spring 39 is pressed and opened by the spring-pressing portion 35b of the change arm, whereas the other leg is not moved because of being blocked by the restriction bolt 38. The shifter plate 36 is turned along with turning of the change arm 35, whereby one of a pair of right and left engagement projections 36d is brought into engagement with an engagement roller 42, turning the shift drum 14. The engagement projections 36d are projecting top ends of the shifter plate 36. After the shift drum 14 is turned at a predetermined angle, the change arm 35 and the shifter plate 36 are returned to those original positions by the resilience of the change arm returning spring 39. When the shift drum 14 is turned at the predetermined angle, the engagement roller next to the engagement roller 42 that has been precedently engaged with the engagement projections occupies the position that has been precedently occupied by the engagement roller. Therefore, when returned, the engagement projections 36d of the shifter plate 36 has to override the engagement roller next to the engagement roller that has been precedently engaged with the engagement projections. In this case, since the shifter plate

36 movable in the range of the longitudinal hole 36b moves backward against the urging force of the shifter plate urging spring 40, the engagement projections 36 can override the next roller. If an excessive force is applied to the change arm 35, then the shift drum 14 is about to skip-turn over the predetermined angle. In this case, an external projection 41a of the skip-turn-prevention plate 41 comes into contact with a contact end 35c of the change arm 35, preventing the skip-turn.

Referring to Fig. 3, a shift drum turning position stabilizer 45 is provided at the right end of the shift drum 14. Fig. 6 is a view of the stabilizer 45 as viewed from the right side of the sift drum. The stabilizer 45 includes a star-shaped plate 46 secured to the shift drum 14 and a stopper roller assembly 47. The star-shaped plate 46 is secured to an end of the shift drum 14 with a mount bolt 48 and a locking pin 49. The assembly 47 includes a pillar 51, an arm 52, a roller shaft 53, a stopper roller 54, and a spring 55. The pillar 51 is secured to the right-hand crankcase 2B with a bolt 50. The arm 52 is held for turning around the pillar 51. The stopper roller 54 is held at the top of the arm 52 for turning around the roller shaft 53. The spring 54 is adapted to urge the arm 52 so as to press the stopper roller 55 against the circumferential surface of the star-shaped plate 46. The turning positions of the shift drum 14 associated with the respective change gear ratios are stably maintained by press-fitting the stopper roller 54 into one of the outer circumferential recesses 46a associated with the respective change gear ratios.

Referring to Fig. 4, the shift position detector 60 is located on the left side of the shift drum 14. Fig. 7 is a view illustrating the detector 60 and the vicinity thereof as viewed from the left side of the shift drum 14. The detector 60 is a device for detecting the turning positions of the shift drum 14, particularly, when the transmission is in the neutral or reverse gear position. The detector 60 includes a switch plate 62, a neutral position detecting switch 63, and a reverse position detecting switch 64. The switch plate 62 is secured to the skip-turn-prevention plate 41 with two rivets 61. The switch plate 62 is fixedly swaged to the skip-turn-prevention plate 41 with the rivets 61 before the skip-turn-prevention plate 62 is attached to the shift drum 14. The combination of the switch plate 62 and the skip-turn-prevention plate 41 is fixedly press-fitted to the end of the shift drum 14. The switch plate 62, the skip-turn-prevention plate 41 and the shift drum 14 are turned in a unified

manner, that is, at the same time. The neutral position detecting switch 63 and the reverse position detecting switch 64 are threadedly secured to the left-hand crankcase 2A.

The switch plate 62 is a metal disk and is provided at opposite ends thereof with a neutral position detecting contact portion 62a and a reverse position detecting contact portion 62b. The contact portions 62a and 62b are formed like a cam by deforming the ends of the metal disk so as to rise slightly with respect to the middle plane portion of the metal disk. On the other hand, the detecting switches 63, 64 are at those top ends provided with movable contacts 63a, 64a, respectively (Fig. 4). When the movable contacts 63a, 64a come into contact with the contact portions 62a, 62b of the switch plate 62, respectively, they are slightly pressed inward, which turns on the switch for energization, thus detecting the shift positions. The energization from the switch lights a lamp (not shown) located at the mid portion of a steering handlebar in front of an operator. This informs the operator of the neutral state or the reverse state at that time.

Incidentally, in Figs. 4 and 7, the distance from the center of turning of the shift drum to the neutral position detecting switch 63 or the neutral position detecting contact portion 62a differs from that to the reverse position detecting switch 64 or the reverse position detecting contact portion 62b. Therefore, only the corresponding contact therebetween will be established.

As described above in detail, in the present embodiment, since the switch plate 62 is attached to skip-turn-prevention plate 41 in a unified manner, man-hour for attachment is reduced, attachment accuracy is improved and space-saving can be achieved.

Although various preferred embodiments of the present invention have been described herein in detail, it will be appreciated by those skilled in the art, that variations may be made thereto without departing from the spirit of the invention or the scope of the appended claims.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A shift position detector for a vehicular transmission,wherein a contact member adapted to detect a neutral position and a reverse position of a shift drum is integrally attached to a shift drum skip-turn-prevention plate secured to an end of the shift drum, and a neutral position detecting switch and a reverse position detecting switch are integrally mounted to a crankcase or a crankcase cover, the detecting switches being energized upon contact with the contact member.

2. A shift position detector for a vehicular transmission according to claim 1,wherein a neutral position detecting contact portion and a reverse position detecting contact portion of the contact member are disposed opposite to each other with respect to an axis of the shift drum.

FIG. 1

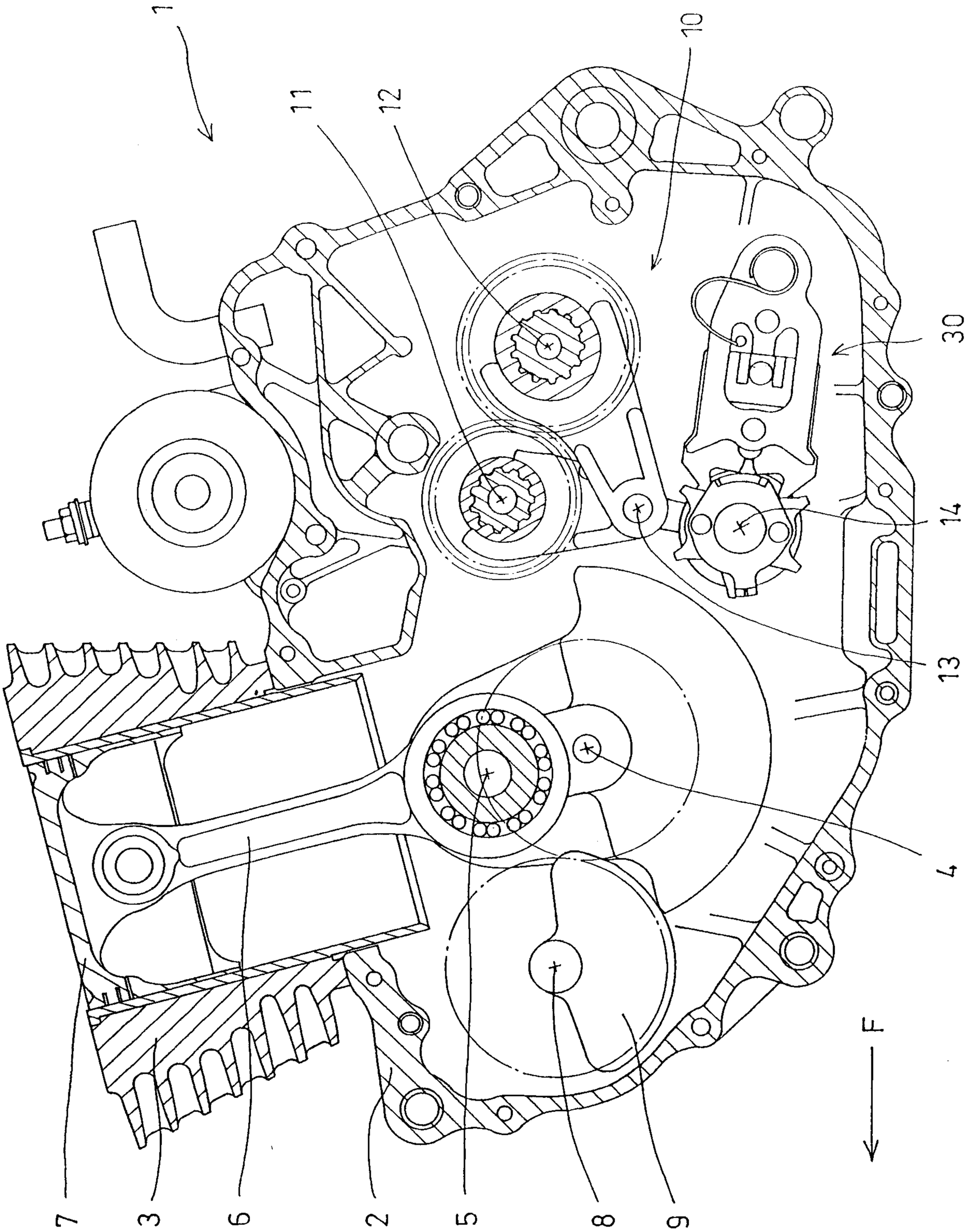


FIG. 2

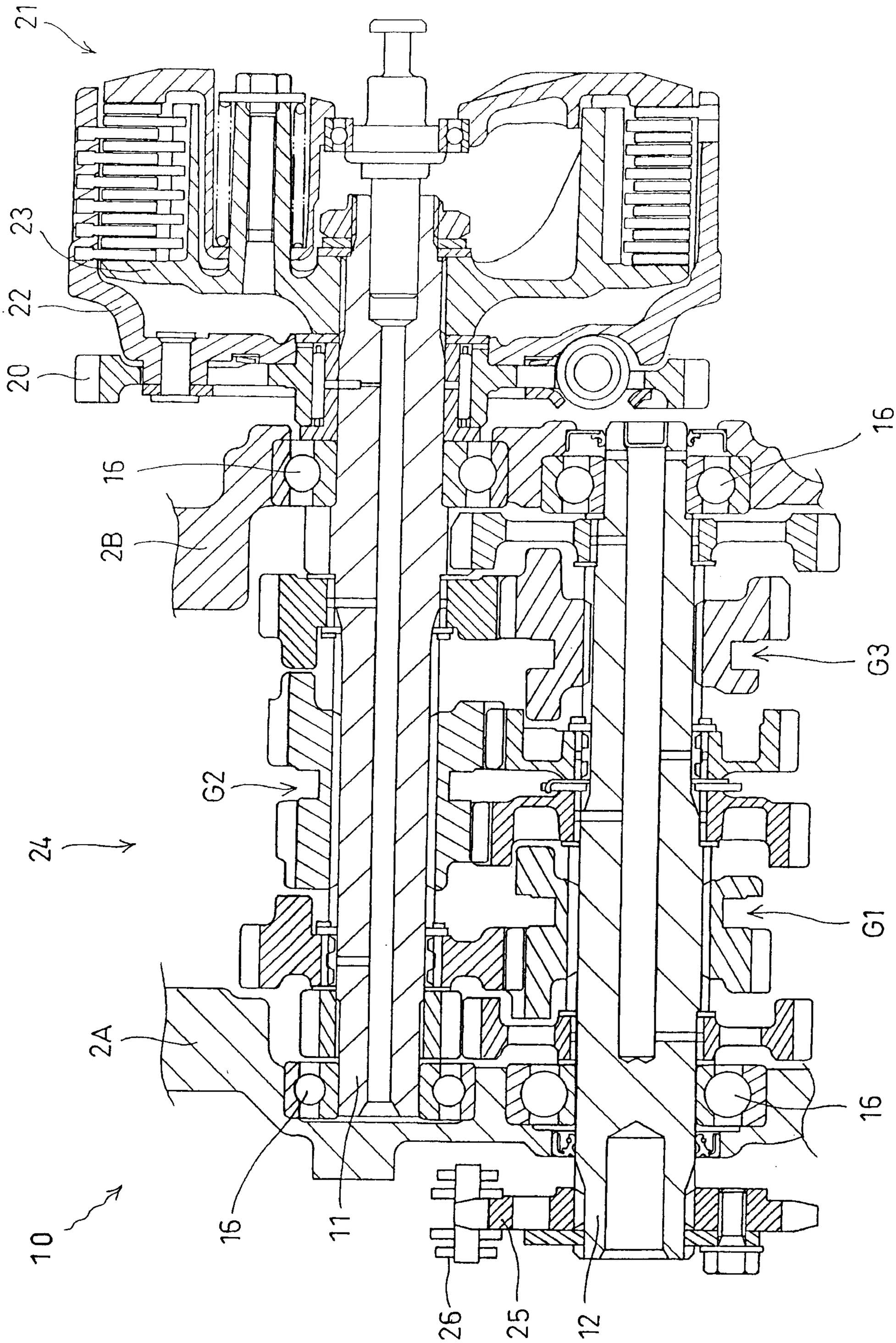
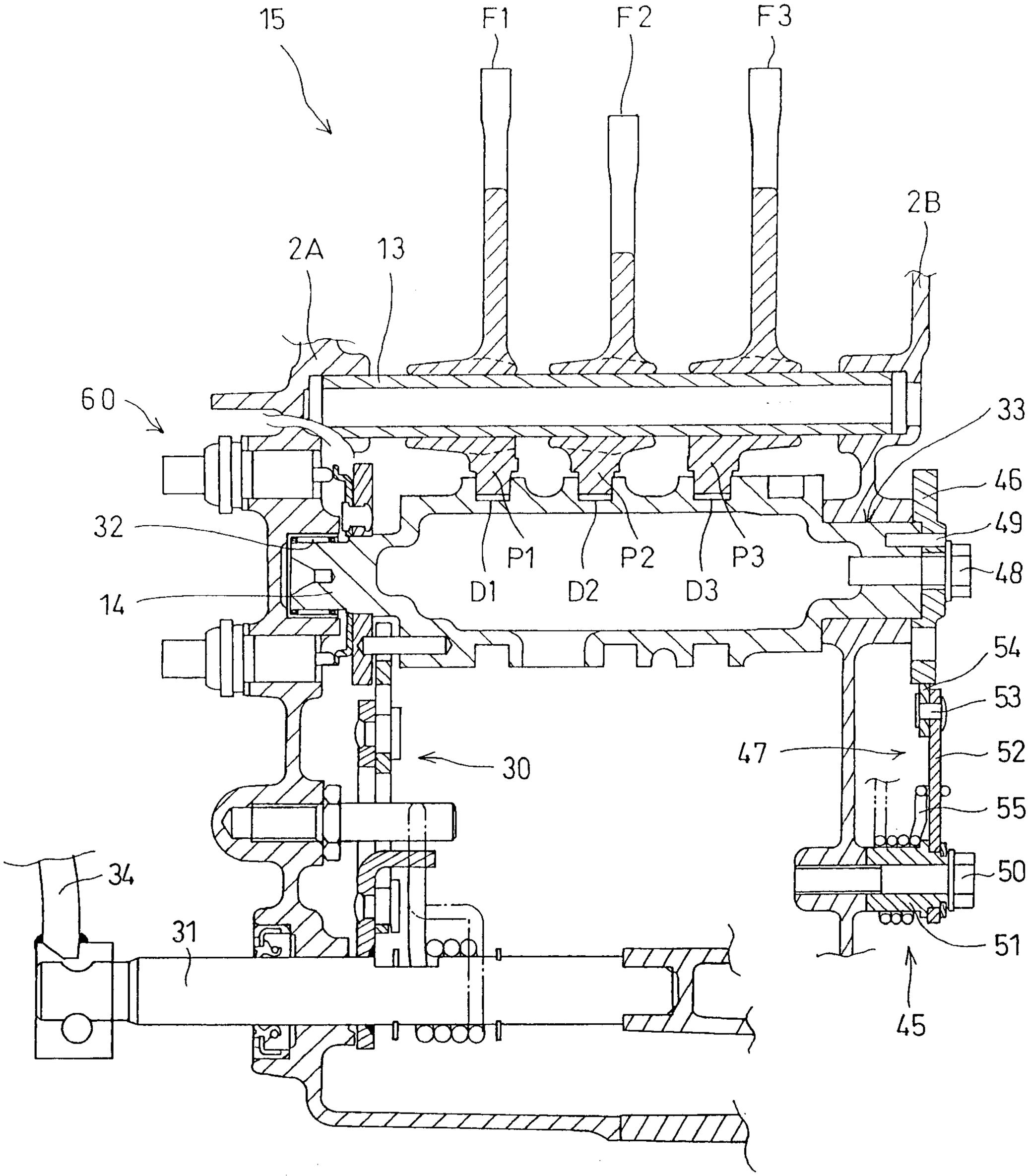


FIG. 3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F3
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P2
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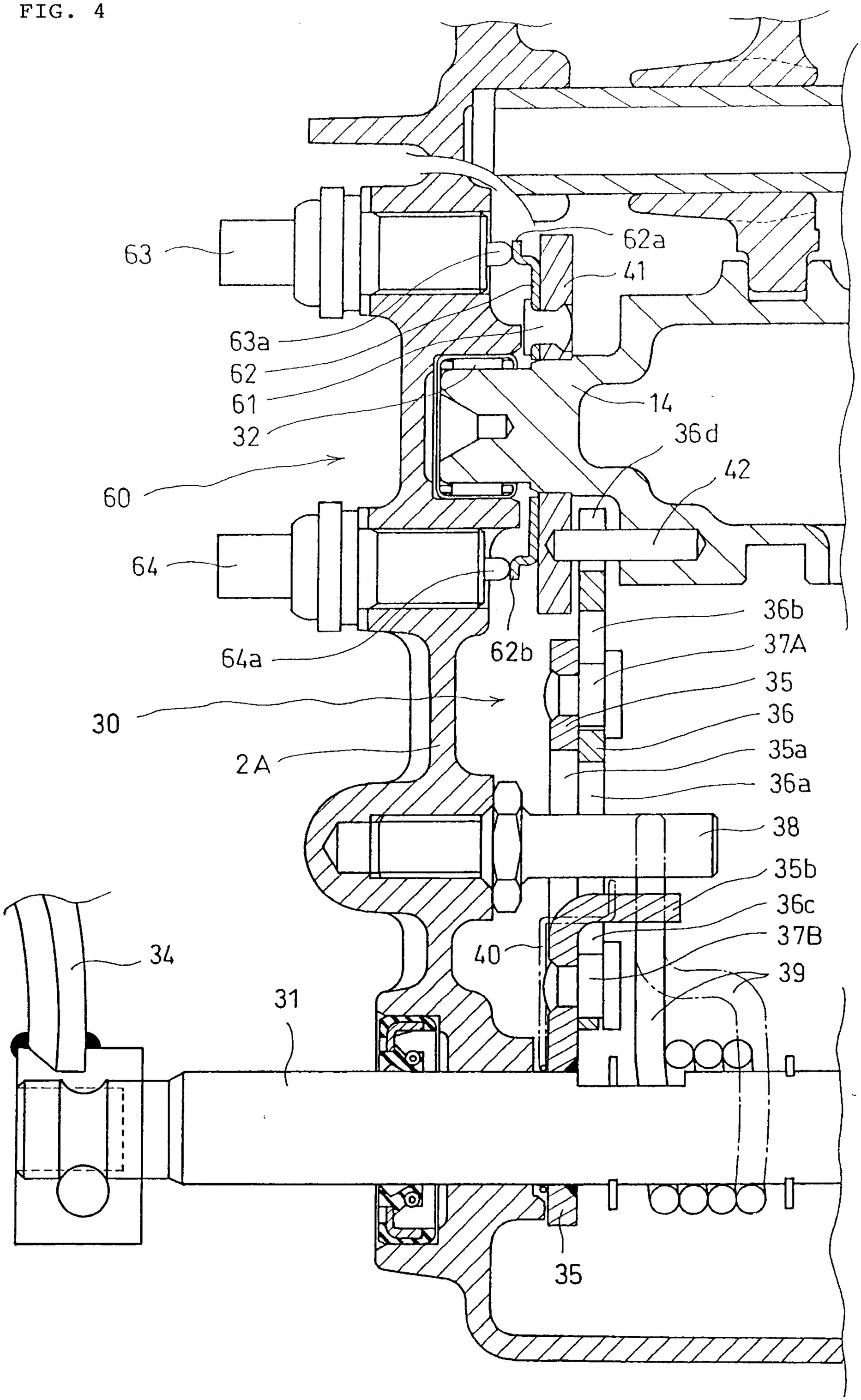
FIG. 4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36c
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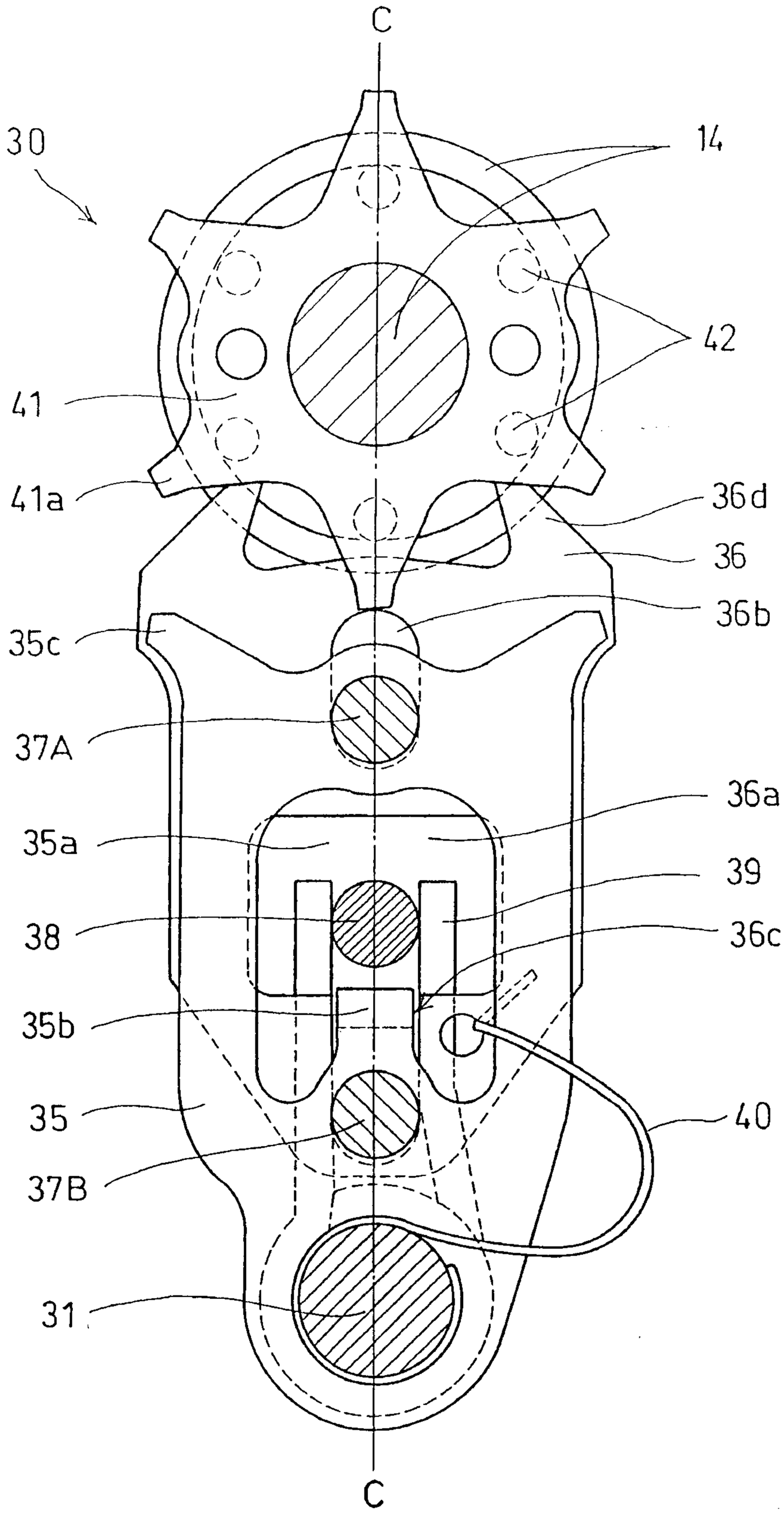
FIG. 5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C

FIG. 6

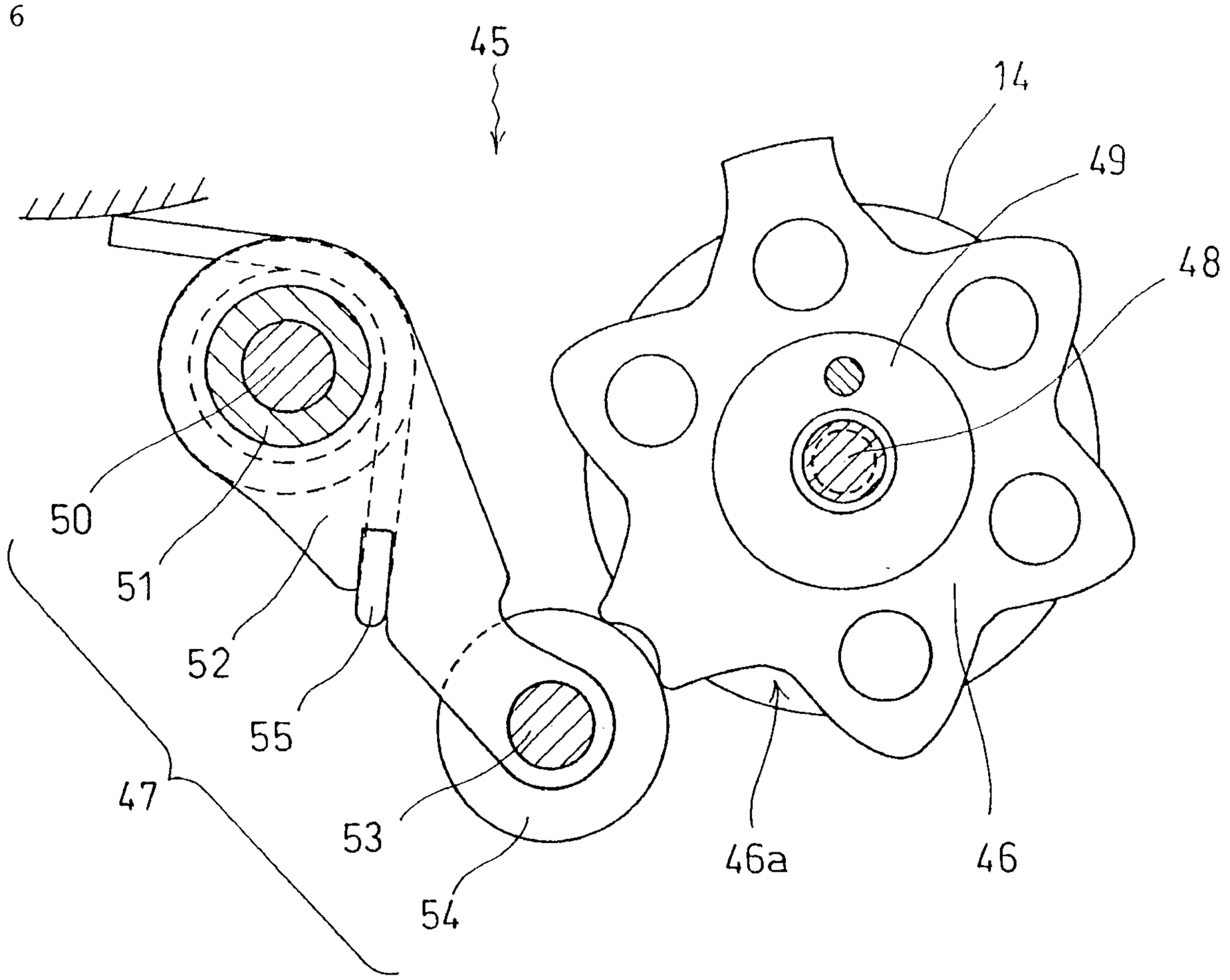
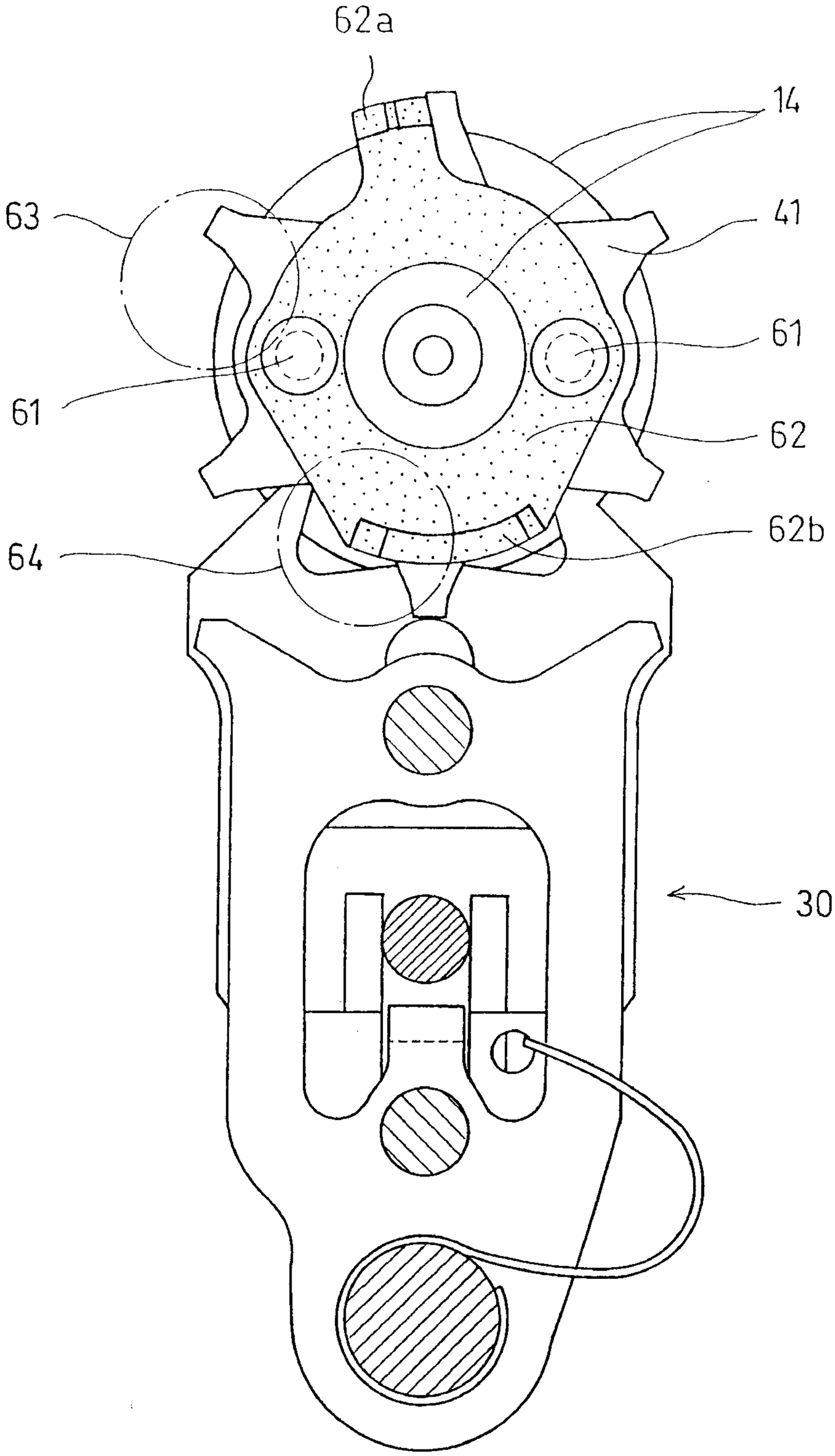
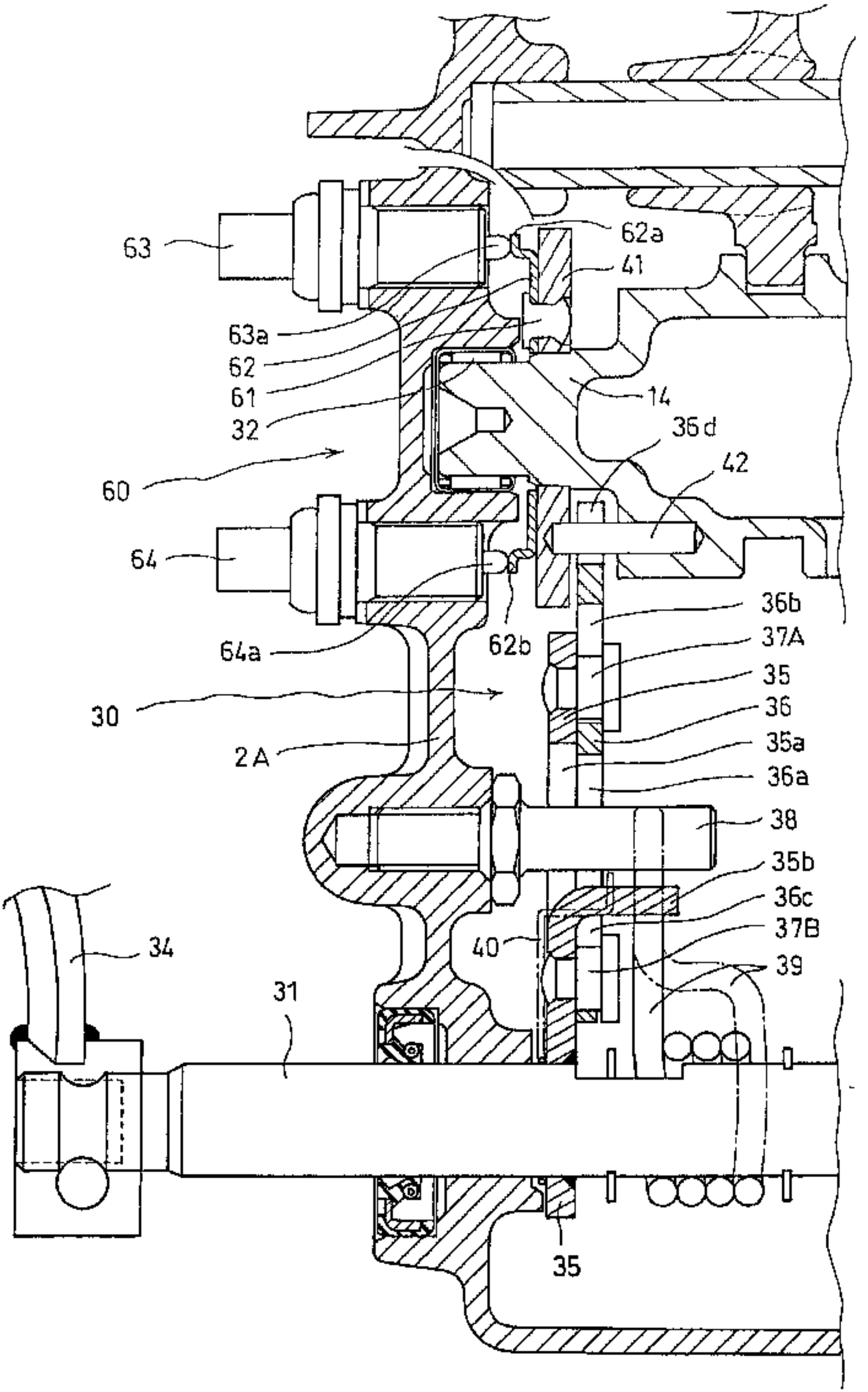


FIG. 7

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