(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 316 499 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
04.06.2003 Bulletin 2003/23

(51) Int Cl.[7]: **B63H 20/10**

(21) Application number: **02026474.3**

(22) Date of filing: **27.11.2002**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR IE IT LI LU MC NL PT SE SK TR
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **29.11.2001 JP 2001365162**
29.11.2001 JP 2001365246
29.11.2001 JP 2001365317
10.01.2002 JP 2002003017
11.01.2002 JP 2002004063

(71) Applicant: **SANSHIN KOGYO KABUSHIKI KAISHA**
Hamamatsu-shi, Shizuoka-ken (JP)

(72) Inventors:
- **Yosuke, Ariki, Sanshin Kogyo K.K.**
  Hamamatsu-shi, Shizuoka-shi (JP)
- **Hideaki, Masui, Sanshin Kogyo K.K.**
  Hamamatsu-shi, Shizuoka-shi (JP)
- **Kazuyuki, Kitajima, Sanshin Kogyo K.K.**
  Hamamatsu-shi, Shizuoka-shi (JP)
- **Takio Ogasawara, Sanshin Kogyo K.K.**
  Hamamatsu-shi, Shizuoka-shi (JP)
- **Eiichiro, Tsujii, Yamaha Hatsudoki K.K.**
  Iwata-shi, Shizuoka-ken (JP)

(74) Representative: **Grünecker, Kinkeldey,**
Stockmair & Schwanhäusser Anwaltssozietät
Maximilianstrasse 58
80538 München (DE)

(54) Outboard motor

(57) Outboard motor with a swivel bracket (33) for supporting the outboard motor at a hull (1), a propulsive unit (6) which is rotatable with respect to said swivel bracket (33), and a tilt-up mechanism is provided for tilting up said propulsive unit (6), wherein a tilt-up holding mechanism is provided for holding said propulsive unit (6) in a tilted-up state when an engine (9) is oriented upward.

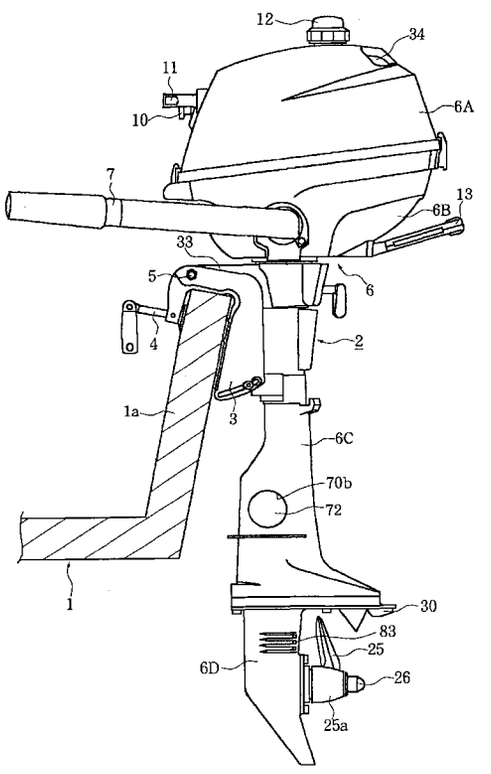

FIG. 1

EP 1 316 499 A2

Description

[0001] This invention relates to an outboard motor.

[0002] An outboard motor, for example, comprises a propulsive unit supported by a hull via a swivel bracket, a four-cycle engine disposed at an upper part of the propulsive unit for driving a propeller arranged at a lower rear part of the propulsive unit via a drive shaft and a propeller shaft.

[0003] The engine is disposed in an upper part of the propulsive unit, and a propeller arranged at a lower rear part of the propulsive unit and driven by the engine via a drive shaft and a propeller shaft.

[0004] In the propulsive unit, the engine is disposed such that the axis of the cylinder extends in the longitudinal direction of the hull. Some propulsive units can be rotated 180° with respect to the swivel bracket so that the boat can be moved forward and backward without changing the rotational direction of the propeller.

[0005] In such a propulsive unit which can be rotated 180° with respect to the swivel bracket to change between forward and backward positions thereof, when the propulsive unit is held in a tilted-up state with the head of the engine oriented downward while the boat is moored or the like, oil for lubricating the engine may flow toward the head of the engine and leak therefrom.

[0006] Furthermore, in such a propulsive unit which can be rotated 180° between forward and reverse positions with respect to a swivel bracket, even though the propulsive unit is so designed that pilot water for the engine is discharged from the rear side thereof when the propulsive unit is in the forward position, pilot water is discharged from the side of the hull when the propulsive unit is in the reverse position and may enter the hull.

[0007] In an outboard motor, the engine is disposed in a cowl of the propulsive unit for generating a propulsive driving force and a drive shaft disposed in upper and lower casings of the propulsive unit for transmitting the driving force of the engine to a propeller.

[0008] In such a small outboard motor, the drive shaft is inserted through the upper casing from below and fitted to the crankshaft of the engine. It is, however, difficult to spline an end of the drive shaft into a bore of the crankshaft.

[0009] The propulsive unit of an outboard motor has a casing in which a shift rod having upper and lower portions connectable with each other is disposed for performing shift operation, and the shift rod is operated by operation of a shift operation lever to perform shift operation of the propeller.

[0010] The upper and lower portions of the shift rod for performing shift operation are connectably arranged. In assembling the propulsive unit, the upper and lower portions of the shift rod must be connected with a connecting member. However, the connection work must be performed by inserting a hand or a tool into the casing of the propulsive unit through an opening formed therein. Thus, the hand or the tool closes the opening or makes the inside of the casing dark, causing problems such as poor workability.

[0011] The propulsive unit of an outboard motor is supported by a hull via a swivel bracket and rotatable with respect to the swivel bracket and thus steerable. In some propulsive units, a bushing is interposed between a bearing part of the swivel bracket. A friction member is pressed against the pivot section of the propulsive unit through a friction opening of the bushing to provide friction, and grease is supplied to the pivot section through a grease opening of the bushing.

[0012] In a small outboard motor, a propulsive unit can be rotated 360° but it is difficult to provide sufficient lubrication with grease to a pivot section thereof.

[0013] The friction member is pressed on the back with a bolt to provide frictional load. However, the pressing direction is off the axis of the pivot section, so that the friction member cannot perform a sufficient friction function.

[0014] It is an objective of the present invention to provide an outboard motor which can be easily handled.

[0015] According to the present invention said objective is solved by an outboard motor with a swivel bracket for supporting the outboard motor at a hull, a propulsive unit, an engine disposed in an upper part of said propulsive unit, and a propeller arranged at a lower rear part of said propulsive unit and driven by said engine, said propulsive unit is rotatable with respect to said swivel bracket and a tilt-up mechanism is provided for tilting up said propulsive unit, wherein a tilt-up holding mechanism is provided for holding said propulsive unit in a tilted-up state in that said engine is oriented upward.

[0016] It is an advantage of this invention to provide an outboard motor which can prevent oil from leaking from the head of the engine when a propulsive unit thereof is held in a tilted-up state while the boat is moored or the like.

[0017] According to an embodiment, said tilt-up holding mechanism is provided for holding said propulsive unit in the tilted-up state when said propulsive unit is tilted up and said engine is oriented upward, and provided for not holding said propulsive unit in the tilted-up state when said propulsive unit is tilted up and said engine is oriented in any direction other than upward and allows to said propulsive unit to tilt down.

[0018] According to a preferred embodiment, said engine is a four-cycle engine having a cylinder body and a cylinder head, wherein the tilt-up holding mechanism is provided for holding said propulsive unit in a tilted-up state in that said cylinder head the engine is oriented upward.

[0019] According to a preferred embodiment, said propulsive unit is rotatable with respect to said swivel bracket in a forward position or a reverse position, wherein said engine is disposable such that an axis of an cylinder of the engine extends in a longitudinal direction of said hull and the tilt-up holding mechanism is provided for holding said propulsive unit in a tilted-up state

in that said axis of said cylinder is oriented upward.

[0020] According to a preferred embodiment, said tilt-up holding mechanism comprises:

a recess formed in said propulsive unit,
a holding lever rotatably supported by said swivel bracket and adapted to be held in engagement with said recess formed in said propulsive unit,
a stopper lever rotatably supported by said swivel bracket and adapted to be held in engagement with a hull side member in a position to be able to hold said propulsive unit,
a connecting rod for connecting said holding lever and said stopper lever,
urging means for urging said stopper lever in a direction to engage with said hull side member,

wherein said holding lever is engageable with said recess of said propulsive unit only when said propulsive unit is tilted up in one of forward or reverse positions, and wherein, when said stopper lever is moved and brought into engagement with said hull side member with said holding lever being engageable in said recess, said holding lever is pushed by said connecting rod and engaged with said recess and said propulsive unit is held in a tilted-up state.

[0021] According to a preferred embodiment, said propulsive unit is provided with a water discharge port for discharging pilot water for said engine, and a gutter member is provided for receiving pilot water coming down from said water discharge port and for guiding said pilot water to an outside of said hull, said gutter member is provided on said swivel bracket below a locus which said discharge port draws when said propulsive unit is rotated.

[0022] It is an advantage of this invention to provide an outboard motor which is capable of preventing pilot water from entering a hull.

[0023] According to a preferred embodiment, said gutter member is made of an elastic material.

[0024] According to a preferred embodiment, said gutter member has a rising wall having an upper part overhanging toward said propulsive unit.

[0025] According to a preferred embodiment, said swivel bracket and said gutter member are engaged with each other with their projections and holes fitting thereto.

[0026] According to a preferred embodiment, said propeller is driven by said engine (9) via a drive shaft and a propeller shaft.

[0027] Hereinafter, the present invention is illustrated and explained by means of preferred embodiments in conjunction with the accompanying drawings. In the drawings wherein:

Fig. 1 is a side view of an outboard motor according to an embodiment,

Fig. 2 is a front view of the outboard motor,

Fig. 3 is a plan view of the outboard motor,

Fig. 4 is a vertical cross-sectional view of a casing part of the outboard motor according to said embodiment,

Fig. 5 is a front view of the casing part of the outboard motor,

Fig. 6 is an enlarged view of the connecting part of upper and lower portions of a shift rod,

Fig. 7 is a cross-sectional view taken along line VII-VII of Fig. 6,

Fig. 8 is a cross-sectional view taken along line VII-VII of Fig. 6, with lid members removed,

Fig. 9 is a cross-sectional view taken along the line V-V in Figs. 4,

Fig. 10 is a side view of a first bushing half,

Fig. 11 is a plan view of the first bushing half,

Fig. 12 is a cross-sectional view, taken along the line X-X in Fig. 10,

Fig. 13 is a side view of the first bushing half, illustrating its spiral grease grooves,

Fig. 14 is a side view of a second bushing half,

Fig. 15 is a plan view of the second bushing half,

Fig. 16 is a side view of the second bushing half, illustrating its spiral grease grooves,

Fig. 17 is a cross-sectional view, taken along the line XV-XV in Fig. 16,

Fig. 18 is a cross-sectional view of an engine part of the outboard motor,

Fig. 19 is a plan view of the engine part of the outboard motor,

Fig. 20 is a plan view of the outboard motor with its fuel tank removed,

Fig. 21 is a side view of the engine of the outboard motor,

Fig. 22 is a rear view of the engine of the outboard motor,

Fig. 23 is a cross-sectional view of a swivel bracket part in a forward position,

Fig. 24 is a cross-sectional view of the swivel bracket part in the reverse position,

Fig. 25 is a plan view of an upper casing part of a propulsive unit in the forward position,

Fig. 26 is a plan view of an upper casing part of a propulsive unit,

Fig. 27 is a plan view of a part of the swivel bracket,

Fig. 28 is a plan view of the swivel bracket with a gutter member engaged therewith,

Fig. 29 is a plan view of the gutter member,

Fig. 30 is a side view of the gutter member,

Fig. 31 is a bottom view of the gutter member,

Fig. 32 is a cross-sectional view taken along line XIV-XIV of Fig. 29,

Fig. 33 is a cross-sectional view taken along line XV-XV of Fig. 29,

Fig. 34 is a view illustrating the propulsive unit tilted up in the forward position,

Fig. 35 is an enlarged view illustrating the propulsive unit tilted up in the forward position,

Fig. 36 is a view illustrating the propulsive unit tilted up in the reverse position,

Fig. 37 is an enlarged view illustrating the propulsive unit tilted up in the reverse position,

Fig. 38 is a view illustrating a case where the propulsive unit is held in the tilted-up state,

Fig. 39 is a view illustrating a case where the propulsive unit is not allowed to be held in a tilted-up state,

Fig. 40 is a view illustrating a case where the propulsive unit is not allowed to be held in a tilted-up state,

Fig. 41 is a vertical cross-sectional view through a casing portion of the outboard motor according to a further embodiment,

Fig. 42 is an enlarged cross-sectional view of a guide part,

Fig. 43 is a plan view of the outboard motor with the engine removed,

Fig. 44 is a cross-sectional view of an upper part of an upper casing according to said embodiment, and

Fig. 45 is a plan view of the upper part of the upper casing.

[0028] As can be seen in Fig. 1, a hull 1 of a boat has a transom board 1a which forms the stern thereof, and a clamp bracket 3 of an outboard motor 2 holding the transom board 1a from above is fixed thereto with clamp members 4. A swivel bracket 33 is attached to the clamp bracket 3 via a tilt shaft 5 so that a propulsive unit 6 can be tilted up about the tilt shaft 5.

[0029] The propulsive unit 6 has a top cowl 6A, a bottom cowl 6B, an upper casing 6C and a lower casing 6D. An engine 9 and so on are housed in a space defined by the top and bottom cowls 6A and 6B. A choke knob 10 and a starter handle 11 protrudes from the front side of the top cowl 6A and a fuel cap or lid 12 protrudes from an upper part thereof. The top cowl 6A has a pair of right and left air inlets 34 in its upper part, and air is introduced through the air inlets 34 into the space defined by the top and bottom cowls 6A and 6B and then sucked into the engine 9.

[0030] A carrying handle 13 is provided at an upper rear part of the upper casing 6C, and a bar-like steering handle 7 protrudes forward from the left side of the bottom cowl 6B. By rotating the propulsive unit 6 by 180° with the carrying handle 13 or the steering handle 7, the running direction of the boat can be changed from forward to reverse, or from reverse to forward. A shift lever 8 for engaging and disengaging a hereinafter described dog clutch is attached to the right side of the bottom cowl 6B.

[0031] As can be seen from Fig. 4, a drive shaft 15 driven by the engine 9 extends almost vertically downward through the upper and lower casings 6C and 6D, which are fitted together by clamp bolts 16.

[0032] The drive shaft 15 has a lower end on which a small diameter bevel gear 17 is secured. The bevel gear 17 is in meshing engagement with a large diameter bevel gear 18. The bevel gear 18 is rotatably joumaled on the lower casing 6D via a bearing 19 for reducing the rotation speed of the drive shaft 15.

[0033] The lower casing 6D has a rear end part to which a propeller housing 20 is secured by a plurality of bolts 21. A propeller shaft 22 extends longitudinally through the propeller housing 20 and is rotatably supported at its mid-portion by the propeller housing 20 via a bearing 23.

[0034] The propeller shaft 22 has a rear end on which a boss 25a of a propeller 25 is fitted and integrally fixed by a nut 26. The boss 25a is integrated with a collar 27 with a rubber damper 28 interposed therebetween. The

collar 27 is splined to the rear end of the propeller shaft 22, so that the propeller 25 is integrally rotated therewith.

[0035] Above the propeller 25, a cavitation plate 30 is fixed to the lower casing 6D by a bolt 31 at a position close to the outer periphery of the propeller 25. An exhaust passage 32 is formed in the upper and lower casings 6C and 6D, and an outlet 32a of the exhaust passage 32 is formed in the lower front of the cavitation plate 30.

[0036] The propeller shaft 22 has a front end on which a dog clutch 40 is mounted for movement in the axis direction thereof. The dog clutch 40 is urged to be in constant contact with a shift pin 42 by a spring 41. The shift pin 42 is shift-operated by a shift rod 50. The shift rod 50 comprises an upper portion 50a and a lower portion 50b which can be connected by connecting means 60.

[0037] When the shift lever 8 (see Fig. 2) is shifted, the shift rod 50 moves up and down about a shift shaft 55 via a link 56 (see Fig. 23), and, when an operating portion 50b1 of the lower portion 50b presses the shift pin 42 (neutral position), a clutch projection 40a of the dog clutch 40 is released from engagement with a clutch recess 18a of the bevel gear 18, stopping the rotation of the propeller shaft 22 (see Fig. 4).

[0038] When the operating portion 50b1 releases the shift pin 42 (engagement position), the dog clutch 40 is pressed by the spring 41 and the clutch projection 40a of the dog clutch 40 is brought into engagement with a clutch recess 18a of the bevel gear 18, rotating the propeller shaft 22 together therewith.

[0039] A ball 58 urged by a spring 57 is received in a recess 6C4 formed in the upper casing 6C as can be seen in Figs. 25 and 26. When the shift lever 8 is shifted to the neutral position or the engagement position, the ball 58 is brought into pressure contact with a recess 8a of the shift lever 8 to provide a click feel.

[0040] In the Figs. 6 to 8, the connecting means 60 is shown. The connecting means 60 for connecting the upper portion 50a and the lower portion 50b of the shift rod 50 comprises a pair of clamp plates 61 and 62 and a clamp bolt 63. The paired clamp plates 61 and 62 have engaging recesses 61 a and 61 b, and 62a and 62b, respectively, in their opposing surfaces. Firstly, the paired clamp plate 61 and 62 are lightly clamped with the clamp bolt 63 and fitted to the upper portion 50a of the shift rod 50 by a washer 64.

[0041] The lower portion 50b of the shift rod 50 is put between the engaging recesses 61b and 62b of the paired clamp plates 61 and 62, respectively, with the paired clamp plates 61 and 62 lightly clamped to the upper portion 50a. Then, the upper portion 50a and lower portion 50b are placed in position, and the paired clamp plates 61 and 62 are tightly clamped with the clamp bolt 63.

[0042] As can be taken from Figs. 5, 7 and 8. the casing 6C has a pair of right and left work openings 70a and 70b on both sides thereof at positions corresponding to the connecting part of the upper portion 50a and the lower portion 50b of the shift rod 50.

[0043] The upper casing 6C of the propulsive unit 6, through which the drive shaft 15 extends, has an upper part 6C1 having a circular cross-section and a lower part 6C2 having a wing-like cross-section, elongated in the longitudinal direction of the boat. The work openings 70a and 70b are formed toward the front of the part having the wing-like cross-section.

[0044] The work openings 70a and 70b can be closed by lid members 71 and 72, respectively. The lid members 71 and 72 are made of a rubber material and the work openings 70a and 70b are sealed with the lid members 71 and 72, respectively.

[0045] As described above, the upper casing 6C has the paired right and left work openings 70a and 70b on both sides thereof at positions corresponding to the connecting part of the upper and lower portions 50a and 50b of the shift rod 50, and this part of the upper casing 6C has a wing-like cross-section elongated in the longitudinal direction and thus has a large space there within. Thus, it is possible to insert fingers through one of the work openings 70a and 70b to hold the paired clamp plates 61 and 62 and a tool through the other to clamp the clamp bolt 63. Therefore, the upper part 50a and the lower part 50b of the shift rod 50 can easily be connected.

[0046] The work openings 70a and 70b are provided on opposite sides of the upper and lower portions 50a and 50b of the shift rod 50, so that the work can be performed from both sides. The work openings make the inside of the casing light and thus facilitate the work of connecting the upper and lower portions 50a and 50b of the shift rod 50. The work openings 70a and 70b, which can be closed with the lid members 71 and 72 after the work, can be closed easily and securely and do not impair the appearance of the upper casing 6C.

[0047] The work openings 70a and 70b are provided toward the front of that portion of the upper casing 6C which has a wing-like cross section, so that the work openings 70a and 70b are close to each other and close to the connecting part of the upper and lower portions 50a and 50b of the shift rod 50. This facilitates the connection work through the work openings 70a and 70b.

[0048] As can be taken from Fig. 4, the drive shaft 15, which is arranged in the rear of the shift rod 50, has an upper part supported by a crank case 105 of the engine 9 via a bearing 80 and connected to a crankshaft 100 of the engine 9 for rotation therewith and a lower part supported by the lower casing 6D via a bearing 81. A water pump 82 is driven by the drive shaft 15 and water is sucked into a water passage 84 through a water hole 83 formed in the lower casing 6D. Water discharged from the water pump 82 is supplied through a water passage 85 and a water pipe 86 to a water passage 87 formed between the upper casing 6C and the crankcase 105, then fed to every part of the engine 9 to cool the

engine 9. The water pipe 86 is arranged in the rear of the drive shaft 15, namely on the opposite side of the shift rod 50 with respect to the drive shaft 15, so that the water pipe 86 does not interfere with the work of connecting the upper and lower portions 50a and 50b of the shift rod 50, making the work easier. The water passage 87 comprises a groove 6C3 formed in a joint surface of the upper part 6C1 of the upper casing 6C and a groove 105a1 formed in a joint surface of a lower part 105a of the crankcase 105 (see Fig. 23).

[0049] Excess pilot water is discharged to the outside from the water passage 87 through a water discharge port 88 formed in the upper part 6C1 of the upper casing 6C.

[0050] The upper casing 6C of the propulsive unit 6 is rotatably supported by a bearing part 33a of the swivel bracket 33, so that the propulsive unit 6 can be rotated 180° between forward and reverse positions with respect to the swivel bracket 33 with the carrying handle 13. Fig. 23 illustrates the propulsive unit 6 in the forward position and Fig. 24 illustrates the propulsive unit 6 in the reverse position.

[0051] The swivel bracket 33 is provided with a separately formed gutter member 89 for receiving pilot water coming down from the water discharge port 88 and guiding the pilot water to the outside of the hull 1. The gutter member 89 is located below and on the side of the hull 1 from a locus which the water discharge port 88 draws when the propulsive unit 6 is rotated, and is fitted and secured to the swivel bracket 33.

[0052] The swivel bracket 33 has a fitting rib 33b. A pair of holes 33c are formed alongside the fitting rib 33b, and a center hole 33d is formed between the paired holes 33c (see Fig. 27).

[0053] As can be taken from Figs. 24 to 26, the gutter member 89, which is made of an elastic material such as rubber and has an arcuate shape corresponding to the locus of the water discharge port 88, has a rising wall 89a. The rising wall 89a has an upper part having an overhanging propulsive unit side 89b and a hull side 89c having a positioning notch. The gutter member 89 has a pair of projections 89d each having a large diameter portion 89d1. Between the paired projections 89d is formed a center projection 89e having a slit 89e1 (see Fig. 30).

[0054] The gutter member 89 is fitted to the swivel bracket 33 by inserting the paired projections 89d into the paired holes 33c, respectively, and the center projection 89e into the center hole 33d. In this fitted state, the paired projections 89d of the gutter member 89 are tightly fitted within the holes 33c due to the large diameter portions 89d1. The slit 89e1 makes the insertion of the center projection 89e easy and opens after the insertion to make the center projection 89e fit tightly in the center hole 33d. Thus, the gutter member 89 can be fitted to the swivel bracket 33 easily and securely.

[0055] As described before, the upper casing 6C of the propulsive unit 6 is rotatably supported by the bearing part 33a of the swivel bracket 33, so that the propulsive unit 6 can be rotated 180° between the forward and reverse positions with respect to the swivel bracket 33 with the carrying handle 13. When the boat is running forward, the water discharge port 88 is located on the rear side and pilot water is discharged from the rear side of the propulsive unit 6. When the propulsive unit 6 is rotated 180° to allow the boat to run backward, the water discharge port 88 is located on the front side, namely the hull side. However, pilot water falls from the water discharge port 88 onto the gutter member 89 and is guided thereby to the outside of the hull 1. Thus, the pilot water is prevented from entering the hull 1.

[0056] The gutter member 89 is made of an elastic material, so that the edges of the gutter member 89 are elastically deformed and thus are not damaged even when interfered with by other parts such as the clamp bracket 3 in, for example, tilting up or down the propulsive unit 6. Also, the gutter member 89, which has the rising wall 89a having an upper part overhanging toward the propulsive unit 6, blocks pilot water coming down from the water discharge port 88 and thus can prevent pilot water from splashing to or flowing into the hull 1 more securely.

[0057] In this embodiment, the propulsive unit 6 is rotatable with respect to the swivel bracket and steerable with a steering handle 7 (see Figs. 1 and 3). As shown in Fig. 9, a first bushing half 75 and a second bushing half 76 are interposed between the bearing part 33a of the swivel bracket 33 and a pivot section 6C11 of the propulsive unit 6.

[0058] As shown in Fig. 10 through Fig. 13, the first bushing half 75 comprises a bushing portion 75a having a semi-circular cross-section and ribs 75b and 75c formed on top and bottom of the bushing portion 75a, respectively. The bushing portion 75a has a friction opening 75d and a pair of anti-slip ribs 75e formed on both circumferential sides of the friction opening 75d. A pair of spiral grease grooves 75f are formed in a crossing manner in the surface of the bushing portion 75a on the side of the pivot section 6C11. The friction opening 75d is formed in a position apart from the spiral grease grooves 75f.

[0059] As shown in Fig. 14 through Fig. 17, the second bushing half 76 comprises a bushing portion 76a having a semi-circular cross-section and ribs 76b and 76c formed on top and bottom of the bushing portion 76a, respectively. The bushing portion 76a has a grease opening 76d. A pair of spiral grease grooves 76f are formed in a crossing manner in the surface of the bushing portion 75a on the side of the pivot section 6C11. The grease opening 76d is formed in a position corresponding to the spiral grease grooves 76f.

[0060] As shown in Fig. 9, the first bushing half 75 and the second bushing half 76 are arranged opposite each other. A friction member 77 is disposed at the friction opening 75d of the first bushing half 75. The friction member 77 comprises a rubber 77a and plate member

77b. The plate member 77b of the friction member 77 is pressed by a friction pressing member 78 screwed through the bearing part 33a of the swivel bracket 33, so that the rubber 77a is pressed against the pivot section 6C11 of the propulsive unit 6 to provide friction.

[0061] The friction pressing member 78 has a screw portion 78a at an end threaded into a receiving portion 33a1 of the bearing part 33a and urged by a spring 78A not to rotate by itself. The friction pressing member 78 can exert a pressing force toward the axis of the pivot section 6C11 and located in a position opposite a grip 7a (see Fig. 3) of the steering handle 7 with respect to the outboard motor center L.

[0062] A cover 79 is attached to the pivot section 6C11 by a bolt 79A, and the friction pressing member 78 has a head protruded outward from an opening 79a formed in the cover 79. By rotating the friction pressing member 78 from the outside, the pressing force of the friction member 76 can be adjusted to provide suitable friction.

[0063] As described above, the friction pressing member 78 pressing the friction member 77 toward the axis of the pivot section 6C11 can provide a friction function. When the propulsive unit 6 is rotated by holding the grip 7a of the steering handle 7 with a hand, the friction pressing member 78 can be brought closer to the hull 1 and easily operated with the other hand with a high operability.

[0064] A grease nipple 98 is screwed into a fitting portion 33a2 of the bearing part 33a which is located in a position corresponding to the grease opening 76d of the second bushing half 76. Grease, which is supplied from the grease nipple 98, flows along the spiral grease grooves 76f of the second bushing half 76 and then along the spiral grease grooves 75f of the first bushing half 75, and reaches every part.

[0065] Thus, there can provide sufficient lubrication with grease between the bearing part 33a of the swivel bracket 33 and the pivot section 6C11 of the propulsive unit 6. Also, adhesion of grease to the friction member 77 can be reduced, so that the friction function thereof can be ensured.

[0066] Also, the anti-slip ribs 75e of the first bushing half 75 abuts against the friction member 77 to prevent the first and second bushing halves 75 and 76 from slipping, so that grease can be supplied to every part of the pivot section side surfaces of the bushing halves 75 and 76 to provide sufficient lubrication.

[0067] The engine 9 in this embodiment, which is constituted as shown in Fig. 18 through Fig. 22, is a single-cylinder, four-cycle engine and disposed such that the axis of the cylinder thereof extends in the longitudinal direction. The head of the engine is located in the rear when the boat is running forward. The engine 9 has the crankcase 105, a cylinder body 102, a cylinder head 103 and a head cap 104. The crankshaft 100 extending vertically is rotatably supported by the cylinder body 102 and the crankcase 105. The crankcase 105 had an oil sump 105b and forms an oil pan.

[0068] A piston 106 is movably received in the cylinder body 102. The piston 106 is connected to the crankshaft 100 via a piston pin 107 and a connecting rod 108, so that the movement of the piston 106 rotates the crankshaft 100. An intake passage 110 and an exhaust passage 111 formed in the cylinder head 103 open into a combustion chamber 112, and are opened and closed by an intake valve 113 and an exhaust valve 114, respectively.

[0069] The combustion chamber 112 is defined by the cylinder body 102, piston 106 and the cylinder head 103. The intake passage 110 is communicated to a fuel supply device 115, to which fuel is supplied from a fuel tank 116 through a fuel hose 117. The exhaust passage 111 is communicated to an exhaust passage 118 formed in the crankcase 105, and exhaust gas is discharged through the exhaust passage 118 and the exhaust passage 32 formed in the upper casing 6C and the lower casing 6D.

[0070] A driving gear 120 is provided on the crankshaft 100. As shown in Fig. 18, the driving gear 120 is meshing engagement with a driven gear 121 which rotates the camshaft 122. A cam 123a and 123b corresponding to the intake valve 113 and the exhaust valve 114, respectively, are provided on the camshaft 122. By the rotation of the cams 123a and 123b, push rods 124a and 124b are operated and open and close the intake valve 113 and the exhaust valve 114 via rocker arms 125a and 125b, respectively, at a predetermined timing.

[0071] The rocker arms 125a and 125b are attached to the cylinder head 103. Also attached to the cylinder head 103 is a spark plug 126 with its end facing into the combustion chamber 112. An opening 127 is formed in the bottom cowl 6B in a position opposed to the spark plug 126, and closed by a cap 128. Maintenance or exchange of the spark plug 126 can be performed by removing the cap 128 and inserting a tool from the opening 127 without removing the bottom cowl 6B. The opening 127, which is formed in that inclined surface of the bottom cowl 6B which faces downward and closed by the cap 128, hardly permits entrance of water, and is hardly visible from the outside and thus good in appearance.

[0072] The crankshaft 100 has an upper part received in a fitting hole 130a of a fly wheel 130, engaged with a key 131, and clamped by a nut 132, so that the fly wheel 130 can be rotated together with the crankshaft 100. The fly wheel 130 has an upper surface on which protrusions 130b are formed, so that an air flow is created by rotation of the fly wheel 130.

[0073] The fly wheel 130 is covered with a fly wheel cover 133, which is secured to the cylinder body 102 by a clamp bolt 135 together with an extension 134a of a starter cover 134 of a starter 140.

[0074] The starter 140 comprises a primary rotor 141, a return spring 142, an engaging slider 143 and a driven rotor 144. The primary rotor 141 is rotatably journaled on a rotational center shaft 146, and a wire 147 wound around the primary rotor 141 is connected to a starter

handle 11. When the starter handle 11 is pulled, the primary rotor 141 is rotated about the rotational center shaft 146, and then restored to the original position by the return spring 142.

[0075] The driven rotor 144 is clamped to an upper part of the crankshaft 100 by the nut 132. Along with the rotation of the primary rotor 141, the engaging slider 143 is moved and brought into engagement with an engaging portion 144a of the driven rotor 144. Thereby, the driven rotor 144 is rotated together with the primary rotor 141, and forcibly rotates the crankshaft 100 to start the engine 9. When engine 9 is started, the engaging slider 143 is restored to its original position and disengaged from the driven rotor 144.

[0076] The rotational center shaft 146 is secured to the starter cover 134 by a clamp bolt 149. A handle attaching part 134b is formed on the starter cover 134. A rubber seal 148 is provided at the handle attaching part 134b for sealing a gap between the handle attaching part 134b and the top cowl 6A.

[0077] In this embodiment, the extension 134a of the starter cover 134 forms a partition and has a periphery 134c. A partition seal 150 is provided on the periphery 134c and a rising portion 134d of the starter cover 134 for sealing a gap between them and the top cowl 6A.

[0078] The space defined by the top cowl 6A and the bottom cowl 6B is partitioned by the starter cover 134 and the partition seal 150 to form a fuel tank room A on the upper side and an engine room B on the lower side. The fuel tank room A houses the fuel rank 116 and the engine room B houses the engine 9.

[0079] The fuel tank 116 has a front end portion 116a secured to the rotational center shaft 146 of the starter 140 by a clamp bolt 149 with a rubber damper 151 interposed therebetween. The fuel tank 116 also has rear end portions 116b and 116c secured by clamp bolts 154 and 155 with rubber dampers 152 and 153 interposed therebetween, respectively. A fuel cap 12 is provided on top of the fuel tank 116. As described above, one end portion 116a of the fuel tank 116 is secured to the rotational center shaft 146 of the starter 140. As secured to the rotational center shaft 146 of the starter 140, which is firmly supported essentially, the fuel tank 116 can be firmly secured with a simple structure and without using a special fitting member.

[0080] The fuel tank 116 has a tank capacity section 116d formed by extending a front part thereof and located above the starter 140 so that the fuel tank 116 can have a sufficient capacity. The tank capacity section 116d as a part of the fuel tank 116 covers an upper part of the starter 140, and the starter cover 134 has a communication hole 170 for communicating the fuel tank room A and the engine room B at a position under the tank capacity section 116d of the fuel tank 116. There is a gap 180 between the fuel tank 116 disposed in the fuel tank room A and the starter cover 134 forming the partition, and outside air can be introduced into the gap 180.

[0081] Air is introduced into the fuel tank room A through the paired right and left air inlets 34, passes through a gap 181 between the fuel tank 116 and the top cowl 6A and the gap 180, and then introduced into the engine room B through the communication hole 170.

[0082] The outside air is introduced into the engine room B through the communication hole 170 by the rotation of the fly wheel 130 and flows through an opening 133a in the fly wheel cover 133 to cool the cylinder body 102 and the cylinder head 103.

[0083] As can be taken from Figs. 20 to 25 and 34 to 40, the outboard motor 2 is provided with a tilt-up mechanism X for tiling up the propulsive unit 6 and a tilt-up holding mechanism Y which holds the propulsive unit 6 only when it is tilted up in such a manner that the head of the engine 9 is oriented upward. The head of the engine 9 is on the side of the cylinder head 103 in the direction of the axis of the cylinder.

[0084] The tilt-up mechanism X comprises the clamp bracket 3 and the swivel bracket 33 supported by the clamp bracket 3 via the tilt shaft 5. The propulsive unit 6 is tilted up about the tilt shaft 5 with a hand.

[0085] The tilt-up holding mechanism Y holds the propulsive unit 6 and does not allow it to tilt down when it is tilted up in such a manner that the head of the engine 9 is oriented upward, and cannot hold the propulsive unit 6 and allows it to tilt down when it is tilted up in such a manner that the head of the engine 9 is oriented in any direction other than upward.

[0086] The tilt-up holding mechanism Y includes a recess 6C10 formed in the upper casing 6C of the propulsive unit 6. The recess 6C10 is formed by cutting out a part of upper part 6C1 of the upper casing 6C.

[0087] The tilt-up holding mechanism Y also has a holding lever 400 rotatably supported by the swivel bracket 33 and adapted to be held in engagement with the recess 6C10, a stopper lever 401 rotatably supported by the swivel bracket 33 and adapted to be held in engagement with a hull side member in a position to be able to hold the propulsive unit 6, a connecting rod 402 for connecting the holding lever 400 and the stopper lever 401, and urging means 403 for urging the stopper lever 401 in a direction to engage with the hull side member.

[0088] The holding lever 400 is rotatably supported by the swivel bracket 33 via a pin 410 and has an engaging part 400a with which an end 402a of the connecting rod 402 is engaged. The stopper lever 401 has a rod 401 a rotatably supported by the swivel bracket 33, and a stopper portion 401b, a lever portion 401c and a connecting portion 401d. The other end 402b of the connecting rod 402 is engaged with the connecting portion 401d.

[0089] The urging means 403 comprises a coil spring wound around the rod 401a and having one end 403a hooked on the swivel bracket 33 and the other end 403b hooked on the connecting portion 401d, and constantly urges the stopper portion 401 b in the direction to engage with the hull side member. Instead of providing the urging means 403, the stopper portion 401 b may be

provided with a weight or sized large enough to move by its own weight in a direction to engage with the hull side member.

[0090] Thus, as shown in Fig. 34 and Fig. 35, the propulsive unit 6 is tilted up in the forward position, the stopper portion 401 b of the stopper lever 401, which is urged in a direction to engage with the hull side member by the urging means 403, is moved in the direction of the arrow "a" in Fig. 35.

[0091] In this state, the connecting portion 401d of the stopper lever 401 is erected, and the connecting rod 402 pushes up the holding lever 400, so that the holding lever 400 is rotated about the pin 410 in the direction of the arrow "b" in Fig. 35 and erected.

[0092] When the propulsive unit 6 is in the forward position, the recess 6C10 formed in the upper part 6C1 of the upper casing 6C is located at a center part on the front side as shown in Fig. 38, so that the holding lever 400 is received in the recess 6C10 without interfering with any other part of upper casing 6C and the stopper portion 401b is engaged with a receiving portion 3e of the clamp bracket 3.

[0093] When the stopper portion 401 b is engaged with the receiving part 3e of the clamp bracket 3, the propulsive unit 6 can be held in a tilted-up state and is not allowed to tilt down.

[0094] To release the tilted-up state of the propulsive unit 6, the lever portion 401c of the stopper lever 401 is rotated in the direction of the arrow "c" in Fig. 35. Then, the stopper portion 401 b disengages from the receiving part 3e of the clamp bracket 3, and the propulsive unit 6 tilts down by its own weight.

[0095] On the other'hand, when the propulsive unit 6 is tilted up when it is in the reverse position as shown in Fig. 36 and Fig. 37, the stopper portion 401 b of the stopper lever 401 cannot be engaged with the receiving part 3e of the clamp bracket 3 although it is urged in a direction to engage with the hull side member by the urging means 403 and thus tends to rotate in the direction of the arrow "a" in Fig. 37.

[0096] Namely, in this state, the propulsive unit 6 is in the reverse position and the recess 6C10 formed in the upper part 6C1 of the upper casing 6C is not located at the center part on the front side, so that the holding lever 400 interferes with a portion of the upper part 6C1 on a side opposite to the recess 6C10, and the connecting rod 402 inhibits the stopper portion 401 b from engaging with the receiving part 3e of the clamp bracket 3.

[0097] Since the holding lever 400 is not received in the recess 6C10 and the stopper portion 401 b is inhibited from engaging with the receiving part 3e of the clamp bracket 3, the propulsive unit 6 cannot be held in the tilted-up state but tilts down when it is in reverse position.

[0098] Also, as shown in Fig. 39 and Fig 40, even when the propulsive unit 6 is not in the reverse position, unless the recess 6C10 formed in the upper part 6C1 of the upper casing 6C is located at the center part on the front side, the holding lever 400 interferes with a portion of the upper part 6C1 on a side opposite to the recess 6C10 and the connecting rod 402 inhibits the stopper portion 401b from engaging with the receiving part 3e of the clamp bracket 3. Thus, the propulsive unit 6 cannot be held in the tilted-up state but tilts down.

[0099] As has been described above, the propulsive unit 6 can be held in the tilted-up state when it is in the forward position and the head of the engine 9 is oriented upward. Thus, when the propulsive unit 6 is held in the tilted-up state while the boat is moored or the like, oil is prevented from leaking from the head of the engine 9.

[0100] In this embodiment, when the propulsive unit 6 is in the forward position, the head of the engine 9 is located in the rear side, so that, when the propulsive unit 6 is tilted up in the forward position, the head of the engine 9 is oriented upward. In the case of an engine 9 having a head which is located on the front side when the propulsive unit 6 is in the forward position, when the propulsive unit 6 can be held in the tilted-up state when it is in the reverse position while the boat is moored or the like, the head of the engine 9 is oriented upward and oil is prevented from leaking therefrom.

[0101] The Figs. 41 to 45 are showing a further embodiment of the outboard motor 2. With regard to said further embodiment, the following description is mainly directed to the differences in comparison with the above described embodiment. Thus, elements and features which are not mentioned in the description and/or shown in the figures for said further embodiment are the same as for the above described embodiment and the specific teaching of the above described embodiment can be combined with the specific teaching of the further embodiment.

[0102] In this further embodiment, the upper casing 6C, namely, the upper part 6C1 has a guide part 6C3 through which the drive shaft 15 is guided integrally molded therewith at a mid-portion in the vertical direction thereof. In the guide part 6C3, a drive shaft hole 90, a shift rod hole 91 and a cooling water introduction pipe hole 92 are integrally formed with the upper casing 6C and defined from each other, so that there is no need for a special member for providing these holes as described.

[0103] As shown in Fig. 44, the upper casing 6C has inner peripheral surfaces 94a and 94b and the drive shaft hole 90 molded with two cores. The dividing position L1 of the two cores corresponds to the upper end of the guide part 6C3. The drive shaft hole 90 has an inner wall 90a inclined so that the diameter thereof gradually increases downward.

[0104] In this embodiment, in the casing where the power transmission mechanism receives maintenance with the lower casing 6D is removed, the lower casing 6D is fixed, after the maintenance, to the upper casing 6C from below with the drive shaft 15 fitted to the lower casing 6D. At this time, an end 15a of the drive shaft 15 contacts and is guided by the inclined inner wall 90a of

the drive shaft hole 90. Thus, the end 15a of the drive shaft 15 can be easily inserted through the drive shaft hole 90 and then splined to a bore 100a of the crankshaft 100. Namely, the drive shaft 15 is easy to fit to the crankshaft 100.

[0105] In the case where the engine 9 is assembled into the propulsive unit 6 before shipment or after maintenance in a factory and so forth, the upper part 50a of the shift rod 50 and the water introduction pipe 86 is inserted through the shift rod hole 91 and the cooling water introduction pipe hole 92, respectively, from above before the drive shaft 15 is fitted to the upper casing 6C.

[0106] As described above, by guiding the drive shaft 15 with a guide part 6C3 formed integrally with the upper casing 6C at a mid-portion in the vertical direction thereof, the end 15a of the drive shaft 15 can be easily splined to the crankshaft 100. The guide part 6C3 is formed integrally with the upper casing 6C, so that there is no need for a special guide member.

[0107] Also, since the drive shaft hole 90, the shift rod hole 91 and the cooling water introduction pipe hole 92 are integrally formed with the upper casing 6C and defined from each other, the drive shaft 15, the shift rod 50 and the water introduction pipe 86 do not interfere with each other. Additionally, the drive shaft 15, the shift rod 50 and the water introduction pipe 86 can be fitted in proper positions without fail.

[0108] Moreover, there is no need for a special member for forming the drive shaft hole 90, the shift rod hole 91 and the cooling water introduction pipe hole 92.

[0109] Said further embodiment teaches an outboard motor 2 including a propulsive unit 6 supported by a hull 1 via a swivel bracket 33. An engine is disposed within a cowl 6A, 6B of said propulsive unit 6 for generating a propulsive driving force. A drive shaft 15 is disposed within upper and lower casings 6C, 6D of said propulsive unit 6 for transmitting said driving force of said engine 9 to a propeller 25. Said upper casing 6C has a guide part 6C3 for guiding said drive shaft 15 therethrough formed integrally therewith at a mid-portion in the vertical direction thereof.

[0110] As is clear from the above description, the drive shaft is guided by a guide part formed integrally with the upper casing at a mid-portion in the vertical direction thereof, so that the end of the drive shaft can be easily splined to the crankshaft. Also, the guide part is formed integrally with the upper casing, so that there is no need for a special guide member. Thus, an outboard motor is provided in which the upper and lower portions of the shift rod can be connected easily.

[0111] Said guide part 6C3 of the outboard motor 2 has a drive shaft hole 90 through which the drive shaft 15 passes, a shift rod hole 91 through which a shift rod 50 passes, and a cooling water introduction pipe hole 92. Said holes 90, 91, 92 are integrally defined in said upper casing 6C.

[0112] The drive shaft hole, the shift rod hole and the cooling water introduction pipe hole are formed integrally with upper casing and defined from each other, so that the drive shaft, the shift rod and the water introduction pipe do not interfere with each other. Also, the drive shaft, the shift rod and the water introduction pipe can be fitted in proper positions without fail. Additionally, there is no need for a special member for forming the drive shaft hole, the shift rod hole and the cooling water introduction pipe hole.

[0113] Said upper casing 6C has inner peripheral surfaces 94a, 94b formed together with said drive shaft hole 90 by molding. Said drive shaft hole 90 has an inclined inner wall 90a such that the diameter thereof gradually increases downward.

[0114] The drive shaft hole has an inner wall inclined such that the diameter thereof gradually increases downward. Thus, the drive shaft can be easily inserted through the drive shaft hole from below.

[0115] The embodiments as described above are showing an outboard motor 2 including a propulsive unit 6 supported by a hull 1 via a swivel bracket 33. A four-cycle engine 9 is disposed in an upper part of said propulsive unit 6 and having a cylinder. A propeller 25 is arranged at a lower rear part of said propulsive unit 6 and driven by said engine 9 via a drive shaft 15 and a propeller shaft 22. Said engine 9 is disposed such that the axis of said cylinder extends in a longitudinal direction of said hull 1. Said propulsive unit 6 is rotatable with respect to said swivel bracket 33 between a forward position and a reverse position and is capable of being tilted up. A tilt-up mechanism X for tilting up said propulsive unit 6 is provided. Said outboard motor 2 comprises a tilt-up holding mechanism Y which can hold said propulsive unit 6 in a tilted-up state only when said propulsive unit 6 is in one of said forward position and reverse position and tilted up in such a manner that the head 103 of said engine 9 is oriented upward.

[0116] As is clear from above descriptions, the propulsive unit can be held in the tilted-up state only when it is tiled up in such a manner that the head of the engine is oriented upward, so that it is possible to prevent oil from leaking from the head of the engine when the propulsive unit is held in the tilted-up state while the boat is moored or the like.

[0117] Said tilt-up holding mechanism Y can hold said propulsive unit 6 when said propulsive unit 6 is tilted up in such a manner that said head 103 of said engine 9 is oriented upward and does not allow the propulsive unit 6 to tilt down, and cannot hold said propulsive unit 6 when said propulsive unit 6 is tilted up in such a manner that said head 103 of said engine 9 is oriented in any direction other than upward and allows to said propulsive unit 6 to tilt down.

[0118] The propulsive unit can be held in the tilt-up state only when the head of the engine is oriented upward and cannot when the head of the engine is in any other state, so that it is possible to prevent oil from leaking from the head of the engine easily and securely when the propulsive unit is held in the tilted-up state

while the boat is moored or the like.

[0119] Said tilt-up holding mechanism Y comprises a recess 6C10 formed in said propulsive unit 6, a holding lever 400 rotatably supported by said swivel bracket 33 and adapted to be held in engagement with said recess 6C10 formed in said propulsive unit 6, a stopper lever 401 rotatably supported by said swivel bracket 33 and adapted to be held in engagement with a hull side member in a position to be able to hold said propulsive unit 6, a connecting rod 402 for connecting said holding lever 400 and said stopper lever 401, urging means 403 for urging said stopper lever 401 in a direction to engage with said hull side member. Said holding lever 400 is engageable with said recess 6C10 of said propulsive unit 6 only when said propulsive unit 6 is tilted up in one of forward or reverse positions. Said stopper lever 401 is moved and brought into engagement with said hull side member with said holding lever 400 being engageable in said recess 6C10, said holding lever 400 is pushed by said connecting rod 402 and engaged with said recess 6C10 and said propulsive unit 6 is held in a tilted-up state. The propulsive unit can be held in the tilted-up state with the head of the engine oriented upward with a simple constitution.

[0120] Also, this embodiments are applicable with an engine disposed such that the axis of the cylinder extends obliquely with respect to the longitudinal direction of the hull or a V-type engine as long as the head of the engine can be oriented upward without allowing the oil to leak.

[0121] According to the embodiments, the propulsive unit 6 is supported by a hull 1 via a swivel bracket 33. The engine 9 is disposed in an upper part of said propulsive unit 6. The propeller 25 is disposed at a lower rear part of said propulsive unit 6 and driven by said engine 9 via a drive shaft 15 and a propeller shaft 22. Said propulsive unit 6 is rotatable between forward and reverse positions with respect to said swivel bracket 33. A water discharge port 88 for discharging pilot water for said engine 9 is formed in said propulsive unit 6. A separately formed gutter member 89 for receiving pilot water coming down from said water discharge port 88 and guiding said pilot water to the outside of said hull 1 is provided on said swivel bracket 33 below and on said hull side from a locus which said discharge port 88 draws when said propulsive unit 6 is rotated.

[0122] Pilot water is discharged from the rear side of the propulsive unit when the boat is running forward, and, when the propulsive unit is rotated 180° to run the boat backward, the water discharge port is located on the side of the hull, but pilot water falls onto the gutter member and is guided thereby to the outside of the hull. Thus, the pilot water is prevented from entering the hull.

[0123] Said gutter member 89 is made of an elastic material. Thus, even when the gutter member interferes with other parts on the hull in, for example, tilting up or down the propulsive unit, it is elastically deformed and thus is not damaged.

[0124] Said gutter member 89 has a rising wall 89a having an upper part overhanging toward said propulsive unit 6. The gutter member, which has the rising wall having an upper part overhanging toward the propulsive unit, blocks pilot water coming down from the water discharge port and thus can prevent the pilot water from splashing to or flowing into the hull more securely.

[0125] Said swivel bracket 33 and said gutter member 89 can engage each other with their projections 89d, 89e and holes 33e, 33d fitting thereto. Thus, the swivel bracket and the gutter member can engage each other with their projections and holes easily and securely.

[0126] According to the embodiments, the outboard motor 2 includes a propulsive unit 6 supported by a hull 1, an engine 9 disposed in an upper part of said propulsive unit 6, and a propeller 25 disposed at a lower rear part of said propulsive unit 6 and driven by said engine 9 via a drive shaft 15 and a propeller shaft 22. Said propulsive unit 6 has a casing 6C through which said drive shaft 15 extends. Said casing 6C has an upper part 6C1 having a circular cross-section and a lower part 6C2 having a wing-like cross-section elongated in a longitudinal direction of said hull 1. A shift rod 50 having connectable upper and lower portions 50a, 50b is arranged in said casing 6C. Said casing 6C has a pair of right and left work openings 70a, 70b on both sides thereof at positions corresponding to the connecting means 60 of said shift rod 50. Said work openings 70a, 70b can be closed with lid members 71, 72.

[0127] The casing has a pair of right and left work openings on both sides thereof at positions corresponding to the connecting part of the shift rod, and this part of the casing has a wing-like cross section elongated in the longitudinal direction and thus has a large space there within. This facilitates the work of connecting the upper and lower portions of the shift rod. Also, since the work openings are provided on opposite sides of the casing, the work can be performed from both sides. In addition, the work openings make the inside of the casing light and thus facilitate the work of connecting the upper and lower portions of the shift rod. The work openings, which can be closed with the lid members after the work, can be closed easily and securely and do not impair the appearance of the casing.

[0128] Said work openings 70a, 70b are formed toward the front of said lower part 6C2 having a wing-like cross-section. The work openings are provided toward the front of that part of the casing which has a wing-like cross section, so that the work openings are close to each other and close to the connecting part of the upper and lower portions of the shift rod. This facilitates the work of connecting the upper and lower portions of the shift rod through the work openings.

[0129] The outboard motor 2 according to the embodiments includes a propulsive unit 6 supported by a hull 1 via a swivel bracket 33. Said propulsive unit 6 is steerable with a steering handle 7 to rotate with respect to said swivel bracket 33. A bushing 75, 76 is interposed

between a bearing part 33a of said swivel bracket 33 and a pivot section 6C11 of said propulsive unit 6. Said bushing 75, 76 has a friction opening 75d through which a friction member 77 is pressed against said pivot section 6C11 to provide friction and a grease opening 76d from which grease is supplied to said pivot section 6C11. Said bushing 75, 76 has a surface on the side of said pivot section 6C11 in which spiral grease grooves 75f, 76f are formed. Said grease opening 76d is formed in a position corresponding to said spiral grease grooves 75f, 76f and said friction opening 75d is formed in a position apart from said grease grooves 75f, 76f.

[0130] Accordingly, grease can be supplied to every part of the surface of the bushing on the side of the pivot section to provide sufficient lubrication. Also, adhesion of grease to the,friction member can be reduced, so that the friction function thereof can be ensured.

[0131] Said bushing 75, 76 has anti-slip ribs 75e for abutting against said friction member 77 on both circumferential sides of said friction opening 75d. The anti-slip ribs of the bushing abuts against the friction member to prevent the slip of the bushing, so that grease can be supplied to every part of the surface of the bushing on the side of the pivot section more surely to provide sufficient lubrication.

[0132] Said swivel bracket 33 is provided with a friction pressing member 78, capable of pressing said friction member 77 toward the axis of said pivot section 6C11, in a position opposite a grip 7a of said steering handle 7 with respect to the outboard motor center. The friction function of the friction member can be secured by pressing the friction member toward the axis of the pivot section. Also, when the propulsive unit is rotated by holding the grip of the steering handle with a hand, the friction pressing member can be brought closer to the hull and easily operated with the other hand with a high operability. Thus, outboard motor is provided having a pivot section which can be sufficiently lubricated with grease and a friction member which can satisfactorily perform a friction function.

[0133] The embodiments described above are teaching an outboard motor with a swivel bracket 33 for supporting the outboard motor at a hull 1, a propulsive unit 6 and an engine 9 disposed in an upper part of said propulsive unit 6. A propeller 25 is arranged at a lower rear part of said propulsive unit 6 and driven by said engine 9. Said propeller 25 is driven by said engine 9 via a drive shaft 15 and a propeller shaft 22. Said propulsive unit 6 is rotatable with respect to said swivel bracket 33. A tilt-up mechanism X is provided for tilting up said propulsive unit 6. A tilt-up holding mechanism Y is provided for holding said propulsive unit 6 in a tilted-up state in that said engine 9 is oriented upward.

[0134] Said tilt-up holding mechanism Y is provided for holding said propulsive unit 6 in the tilted-up state when said propulsive unit 6 is tilted up and said engine 9 is oriented upward. Said tilt-up holding mechanism Y is provided for not holding said propulsive unit 6 in the tilted-up state when said propulsive unit 6 is tilted up and said engine 9 is oriented in any direction other than upward and allows to said propulsive unit 6 to tilt down.

[0135] Said engine 9 is a four-cycle engine having a cylinder body 102 and a cylinder head 103. The tilt-up holding mechanism Y is provided for holding said propulsive unit 6 in a tilted-up state in that said cylinder head 103 the engine 9 is oriented upward.

[0136] Said propulsive unit 6 is rotatable with respect to said swivel bracket 33 in a forward position or a reverse position. Said engine 9 is disposable such that an axis of an cylinder of the engine 9 extends in a longitudinal direction of said hull 1. The tilt-up holding mechanism Y is provided for holding said propulsive unit 6 in a tilted-up state in that said axis of said cylinder is oriented upward.

[0137] Said tilt-up holding mechanism Y comprises a recess 6C10 formed in said propulsive unit 6. A holding lever 400 is rotatably supported by said swivel bracket (33) and adapted to be held in engagement with said recess (6C10) formed in said propulsive unit 6. A stopper lever 401 is rotatably supported by said swivel bracket (33) and adapted to be held in engagement with a hull side member in a position to be able to hold said propulsive unit 6. A connecting rod 402 is provided for connecting said holding lever 400 and said stopper lever 401. Urging means 403 is provided for urging said stopper lever 401 in a direction to engage with said hull side member. Said holding lever 400 is engageable with said recess 6C10 of said propulsive unit 6 only when said propulsive unit 6 is tilted up in one of forward or reverse positions. Said stopper lever 401 is moved and brought into engagement with said hull side member with said holding lever 400 is engageable in said recess 6C10. Said holding lever 400 is pushed by said connecting rod 402 and engaged with said recess 6C10 and said propulsive unit 6 is held in a tilted-up state.

[0138] Said propulsive unit 6 is provided with a water discharge port 88 for discharging pilot water for said engine 9. A gutter member 89 is provided for receiving pilot water coming down from said water discharge port 88 and for guiding said pilot water to an outside of said hull 1. Said gutter member 89 is provided on said swivel bracket 33 below a locus which said discharge port 88 draws when said propulsive unit 6 is rotated. Said gutter member 89 is made of an elastic material. Said gutter member 89 has a rising wall 89a having an upper part overhanging toward said propulsive unit 6. Said swivel bracket 33 and said gutter member 89 are engaged with each other with their projections 89d, 89e and holes 33e, 33d fitting thereto.

Claims

1. Outboard motor with a swivel bracket (33) for supporting the outboard motor at a hull (1), a propulsive unit (6), an engine (9) disposed in an upper part of

said propulsive unit (6), and a propeller (25) arranged at a lower rear part of said propulsive unit (6) and driven by said engine (9), said propulsive unit (6) is rotatable with respect to said swivel bracket (33) and a tilt-up mechanism (X) is provided for tilting up said propulsive unit (6), wherein a tilt-up holding mechanism (Y) is provided for holding said propulsive unit (6) in a tilted-up state when said engine (9) is oriented upward.

2. Outboard motor according to claim 1, wherein said tilt-up holding mechanism (Y) is provided for holding said propulsive unit (6) in the tilted-up state when said propulsive unit (6) is tilted up and said engine (9) is oriented upward, and provided for not holding said propulsive unit (6) in the tilted-up state when said propulsive unit (6) is tilted up and said engine (9) is oriented in any direction other than upward and allows said propulsive unit (6) to tilt down.

3. Outboard motor according to claim 1 or 2, wherein said engine (9) is a four-cycle engine having a cylinder body (102) and a cylinder head (103), wherein the tilt-up holding mechanism (Y) is provided for holding said propulsive unit (6) in a tilted-up state in that said cylinder head (103) of the engine (9) is oriented upward.

4. Outboard motor according to at least one of the claims 1 to 3, wherein said propulsive unit (6) is rotatable with respect to said swivel bracket (33) in a forward position or a reverse position, wherein said engine (9) is disposable such that an axis of an cylinder of the engine (9) extends in a longitudinal direction of said hull (1) and the tilt-up holding mechanism (Y) is provided for holding said propulsive unit (6) in a tilted-up state in that said axis of said cylinder is oriented upward.

5. Outboard motor according to claim 4, wherein said tilt-up holding mechanism (Y) comprises:

a recess (6C10) formed in said propulsive unit (6),
a holding lever (400) rotatably supported by said swivel bracket (33) and adapted to be held in engagement with said recess (6C10) formed in said propulsive unit (6),
a stopper lever (401) rotatably supported by said swivel bracket (33) and adapted to be held in engagement with a hull side member in a position to be able to hold said propulsive unit (6),
a connecting rod (402) for connecting said holding lever (400) and said stopper lever (401),
urging means (403) for urging said stopper lever (401) in a direction to engage with said hull side member,
wherein said holding lever (400) is engageable with said recess (6C10) of said propulsive unit (6) only when said propulsive unit (6) is tilted up in one of forward or reverse positions, and
wherein, when said stopper lever (401) is moved and brought into engagement with said hull side member with said holding lever (400) being engageable in said recess (6C10), said holding lever (400) is pushed by said connecting rod (402) and engaged with said recess (6C10) and said propulsive unit (6) is held in a tilted-up state.

6. Outboard motor according to at least one of the claims 1 to 5, wherein said propulsive unit (6) is provided with a water discharge port (88) for discharging pilot water for said engine (9), and a gutter member (89) is provided for receiving pilot water coming down from said water discharge port (88) and for guiding said pilot water to an outside of said hull (1), said gutter member (89) is provided on said swivel bracket (33) below a locus which said discharge port (88) draws when said propulsive unit (6) is rotated.

7. Outboard motor according to claim 6, wherein said gutter member (89) is made of an elastic material.

8. Outboard motor according to claim 6 and 7, wherein said gutter member (89) has a rising wall (89a) having an upper part overhanging toward said propulsive unit (6).

9. Outboard motor according to at least one of the claims 6 to 8, wherein said swivel bracket (33) and said gutter member (89) are engaged with each other with their projections (89d,89e) and holes (33e, 33d) fitting thereto.

10. Outboard motor according to at least one of the claims 1 to 9, wherein said propeller (25) is driven by said engine (9) via a drive shaft (15) and a propeller shaft (22).

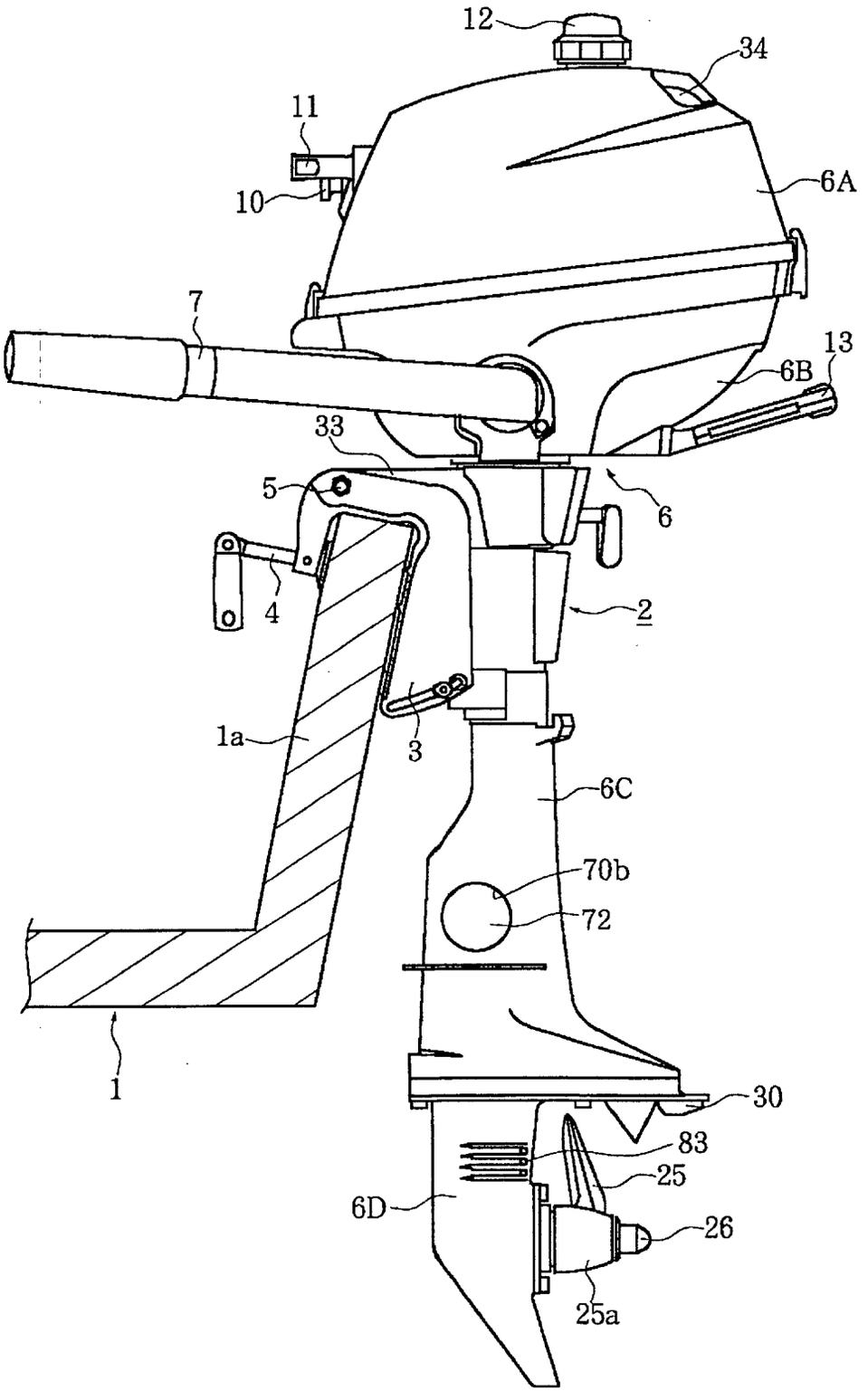

FIG. 1

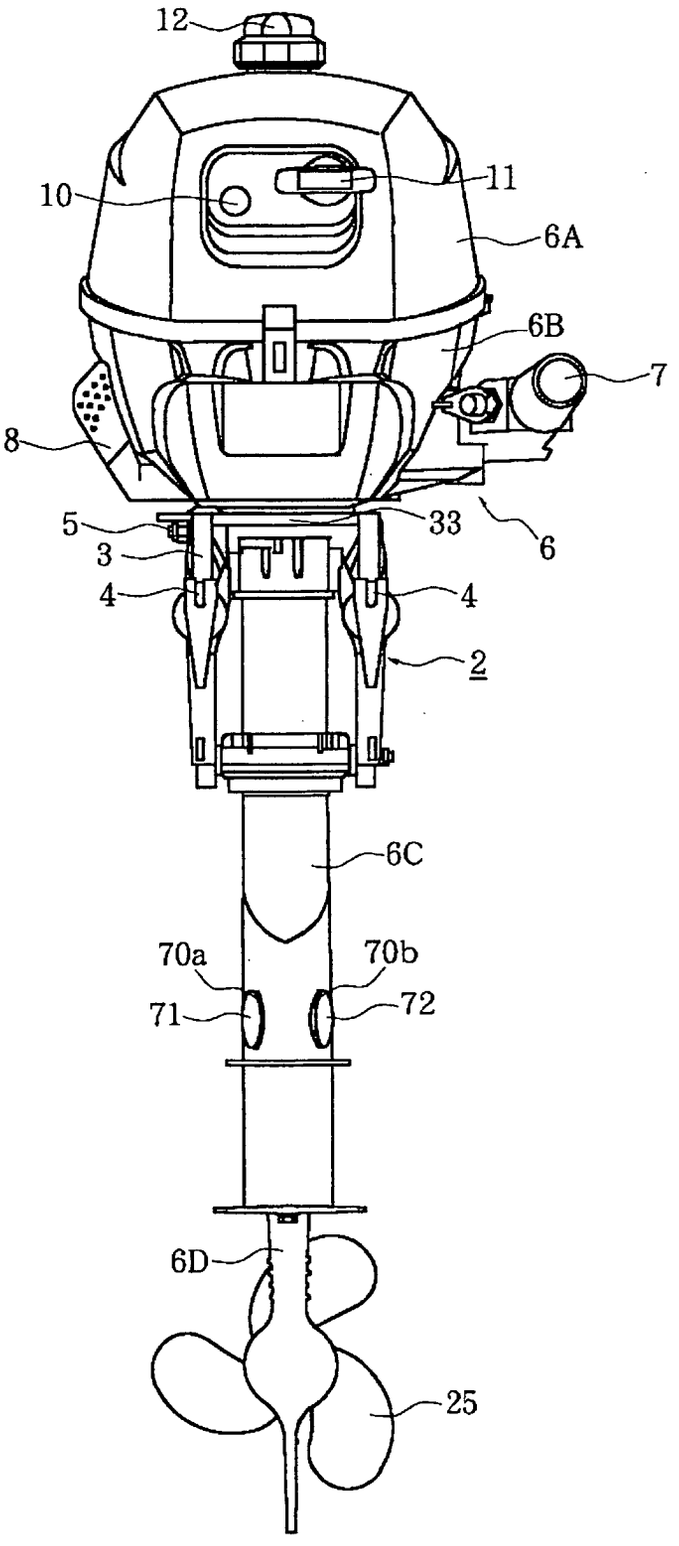

FIG. 2

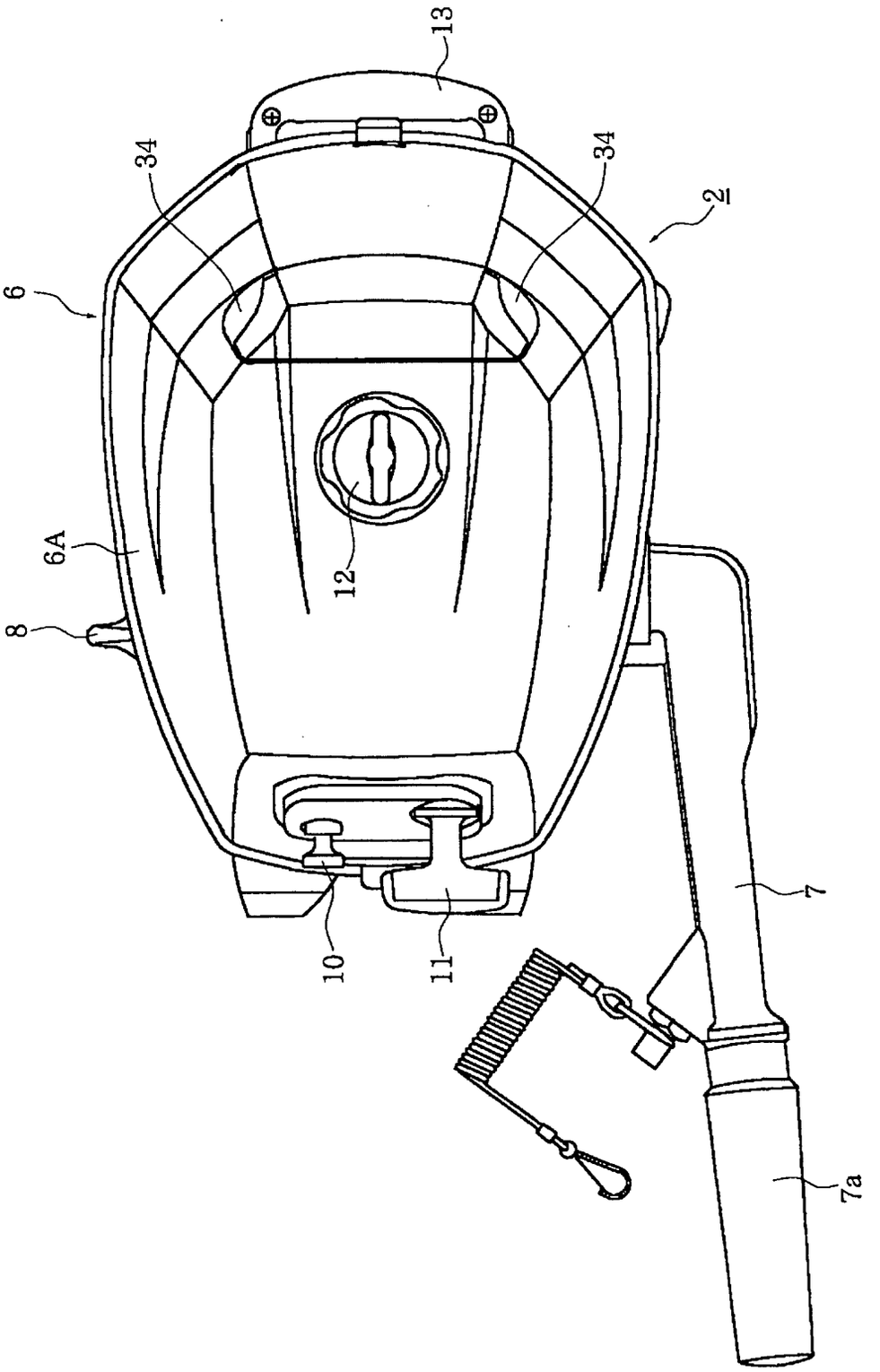

FIG. 3

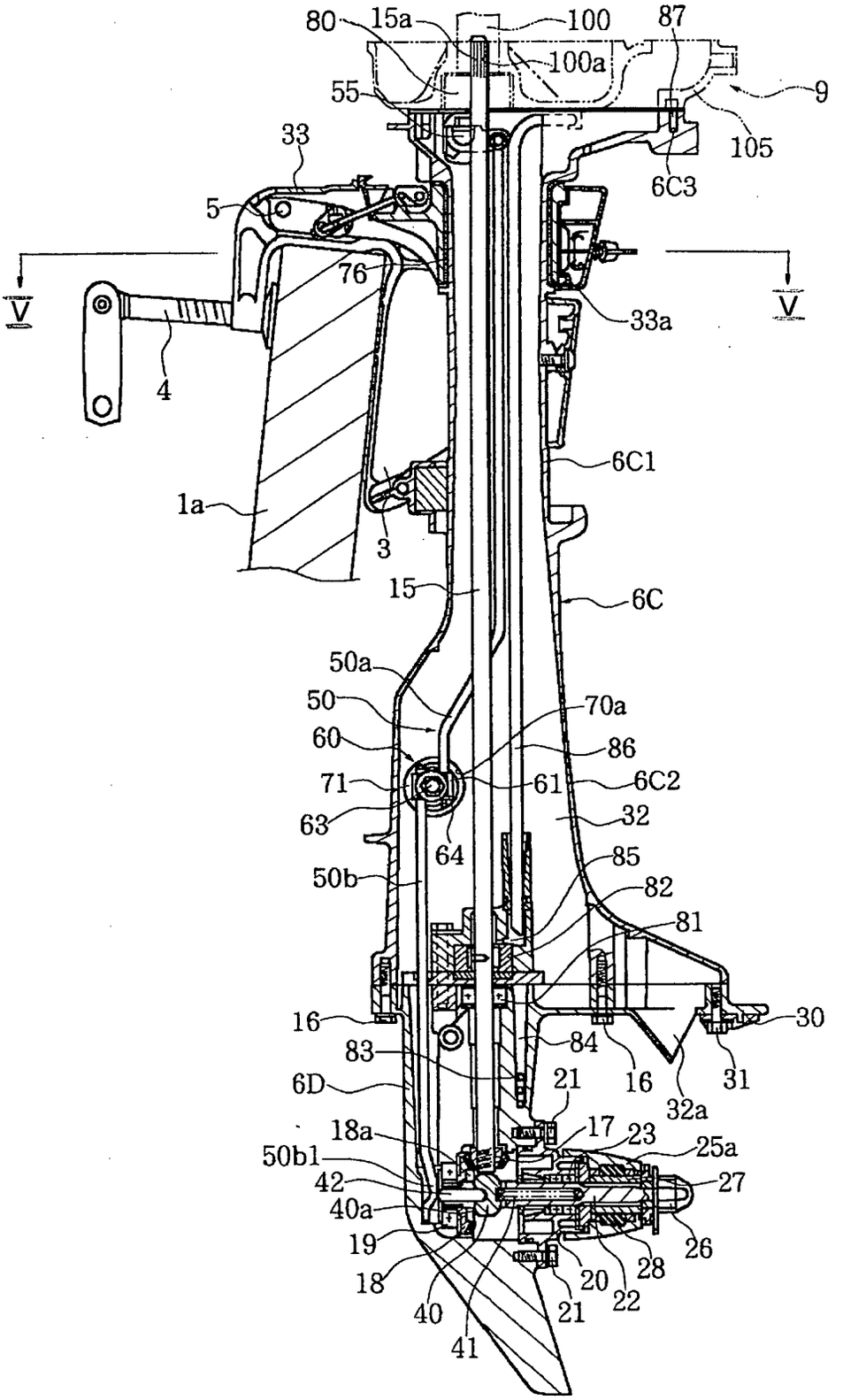
80
15a
100
87
100a
55
9
105
33
6C3
5
76
V
V
33a
4
6C1
1a
3
15
6C
50a
50
70a
60
86
71
61
6C2
63
32
64
85
50b
82
81
16
30
83
84
16
31
6D
21
32a
18a
17
23
25a
50b1
42
27
40a
19
26
28
18
20
22
40
21
41

FIG. 4

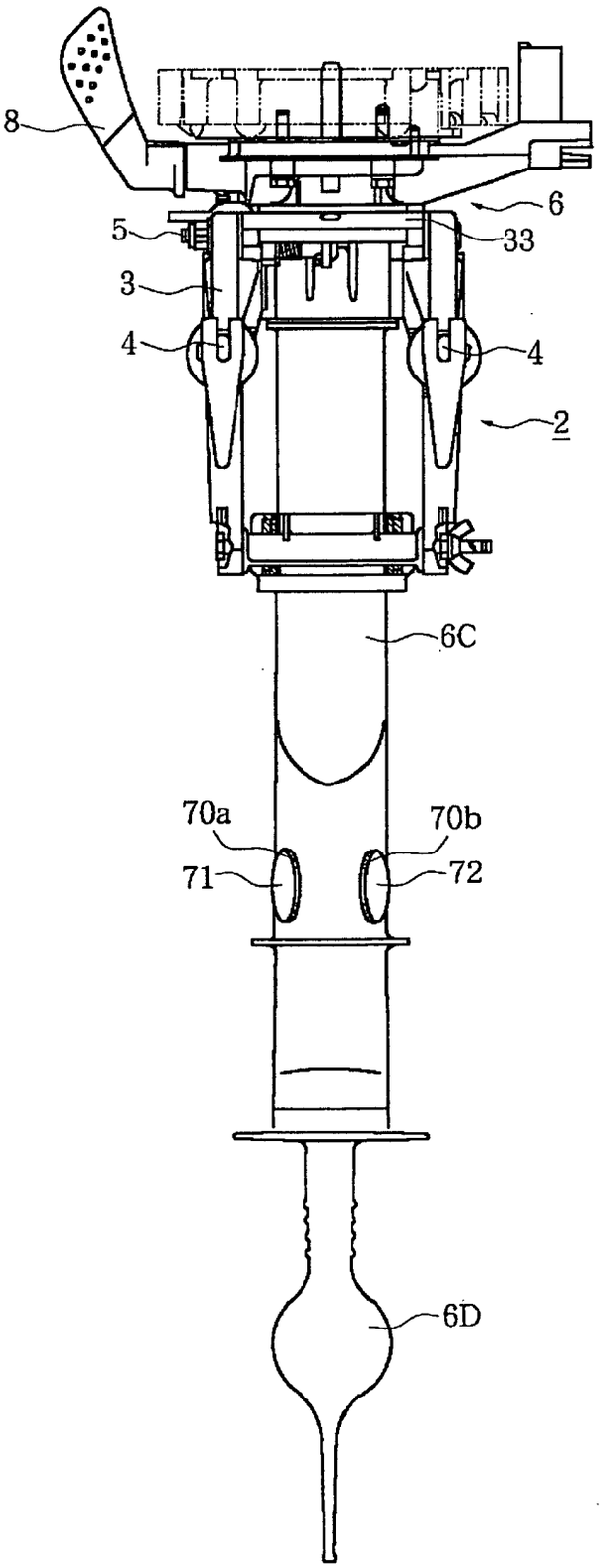

FIG. 5

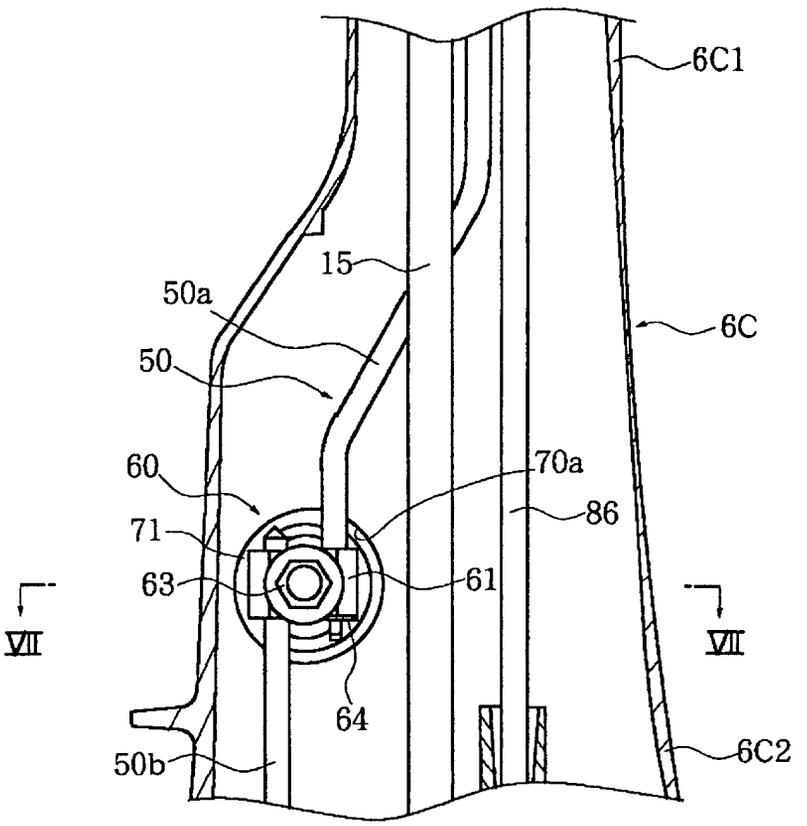

FIG. 6

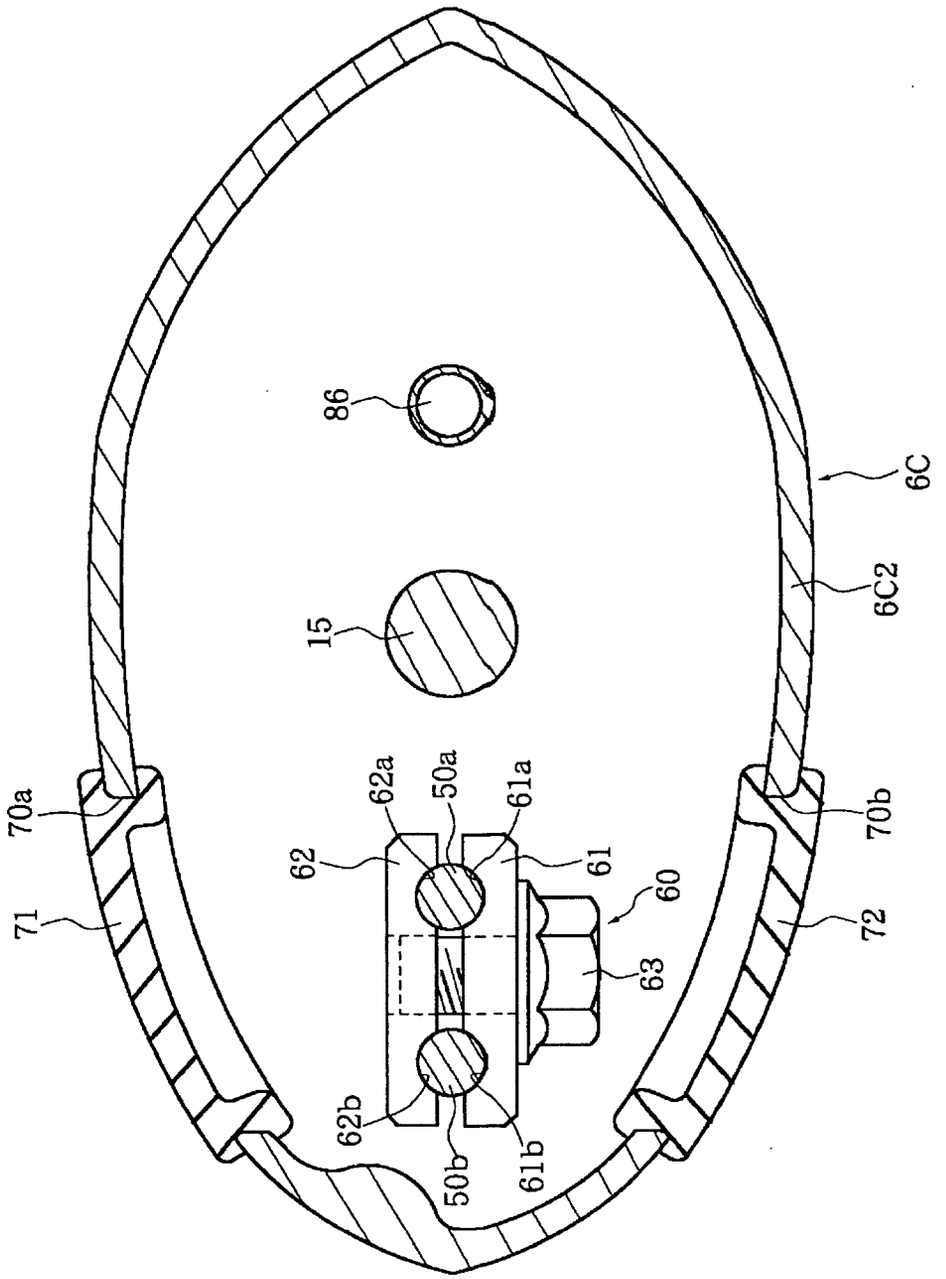

FIG. 7

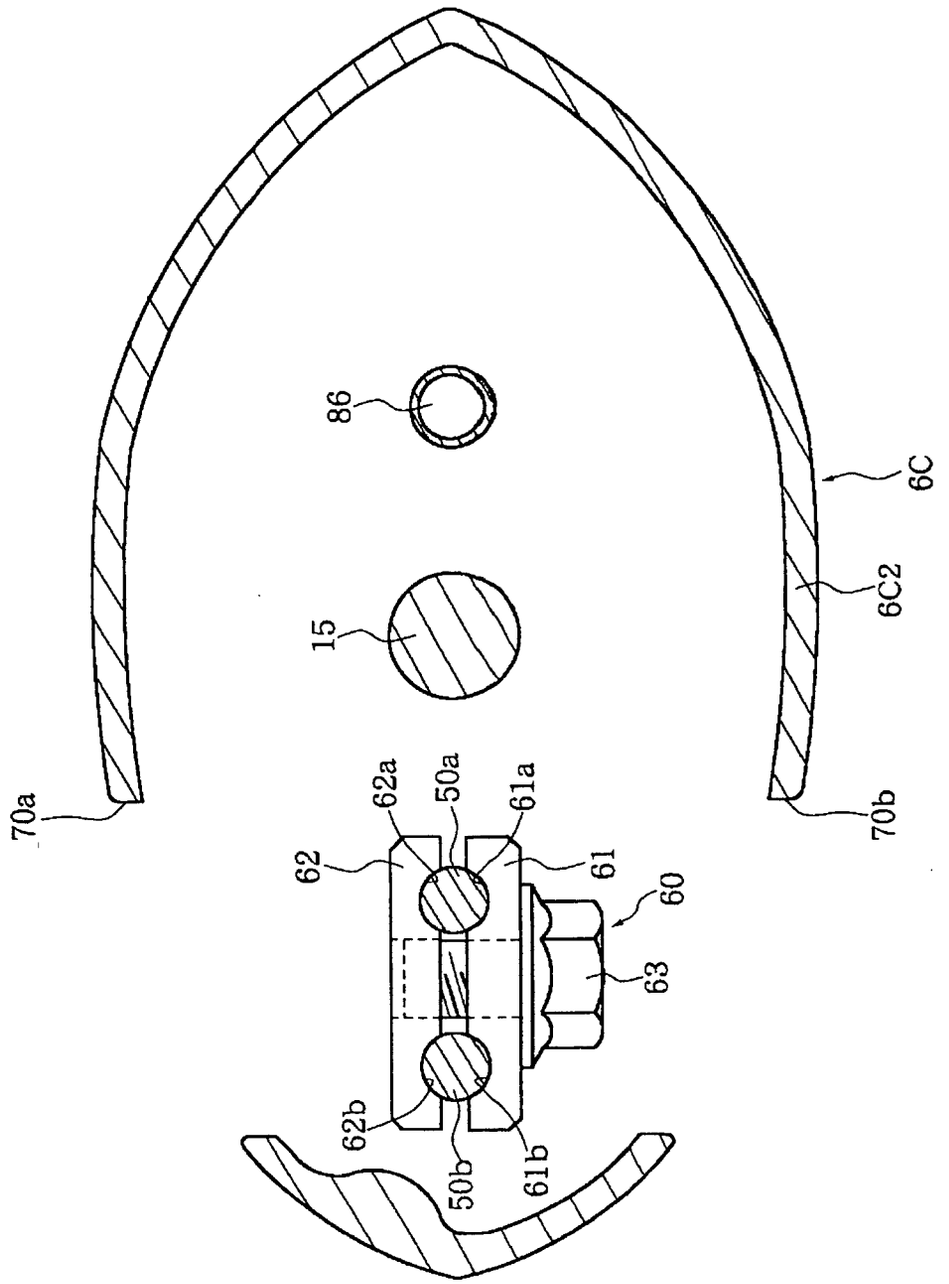

FIG. 8

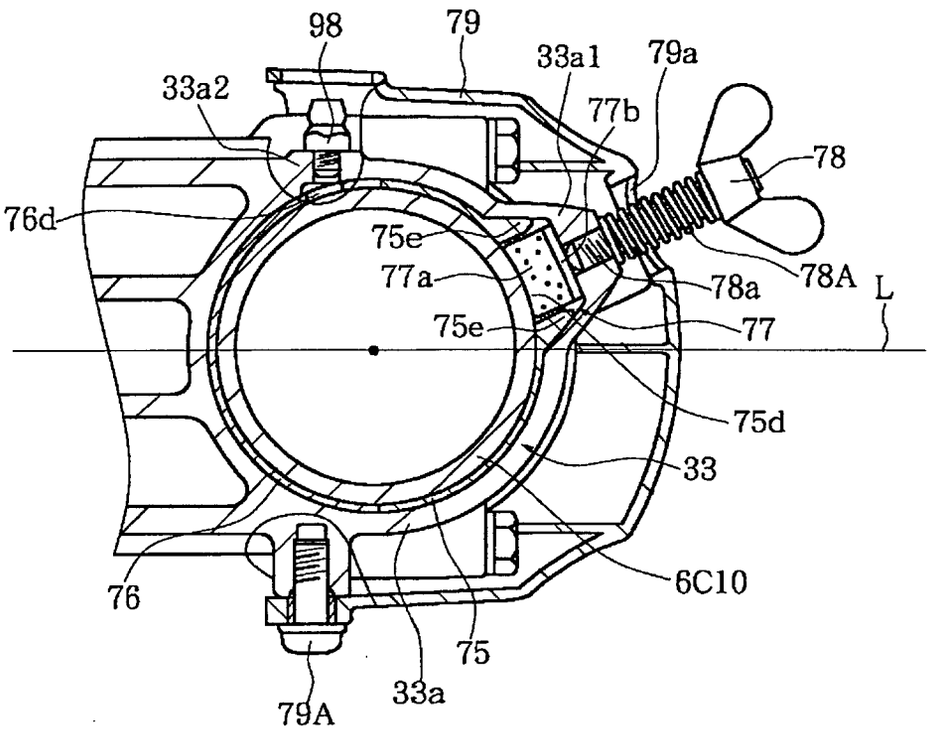
98
79
33a1
79a
33a2
77b
78
76d
75e
77a
78a
78A
L
75e
77
75d
33
6C10
76
75
33a
79A

FIG. 9

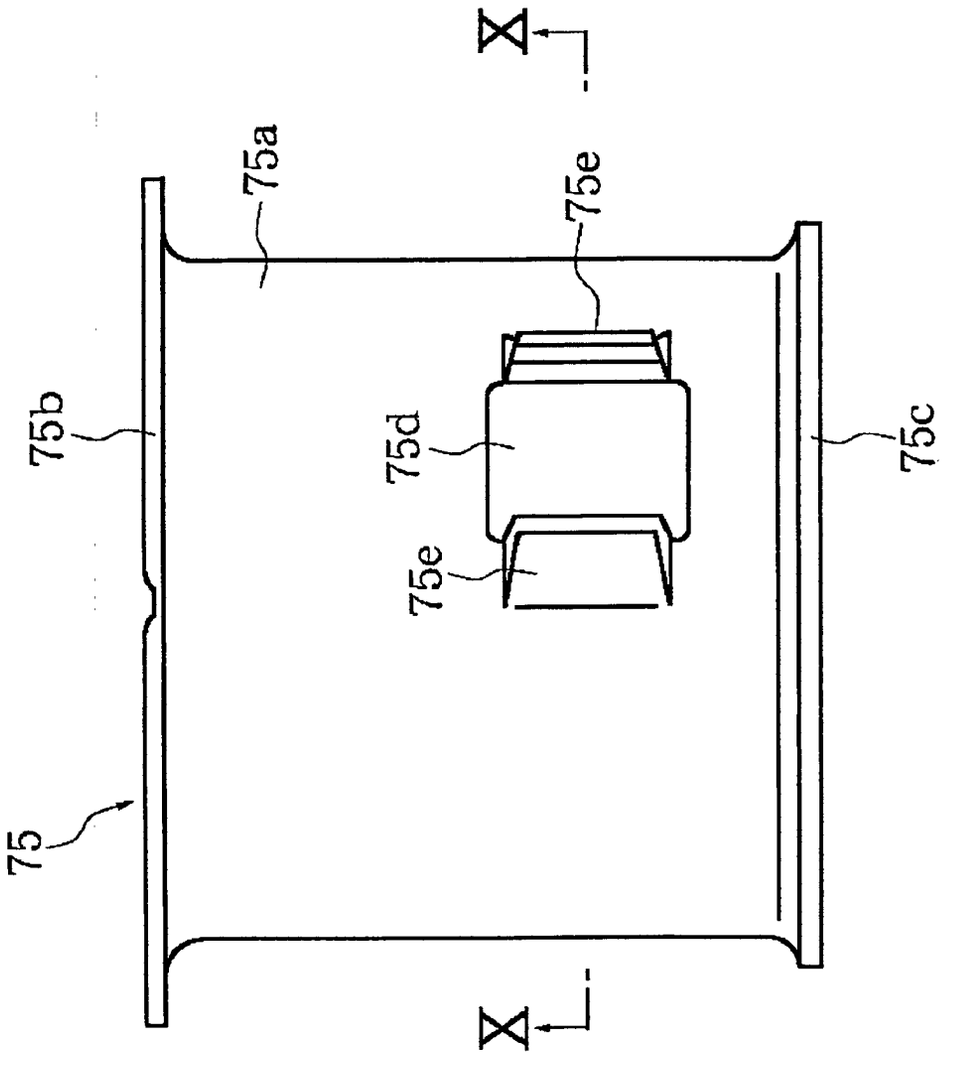

FIG. 10

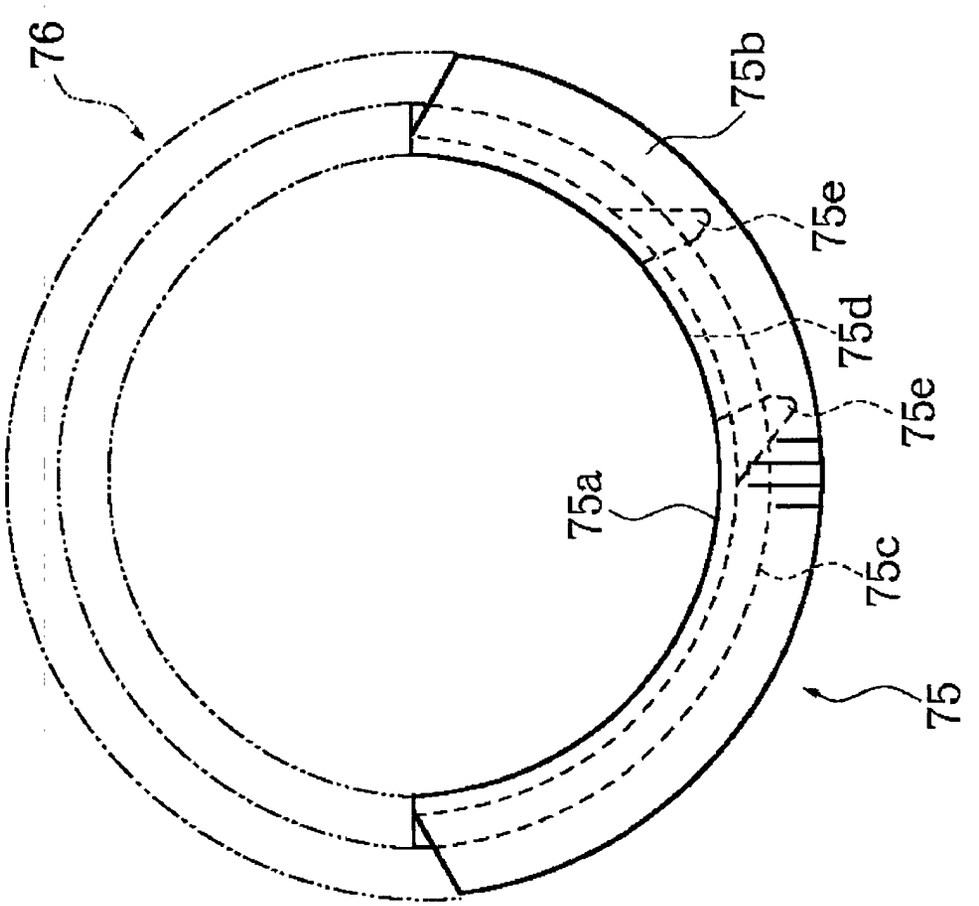

FIG. 11

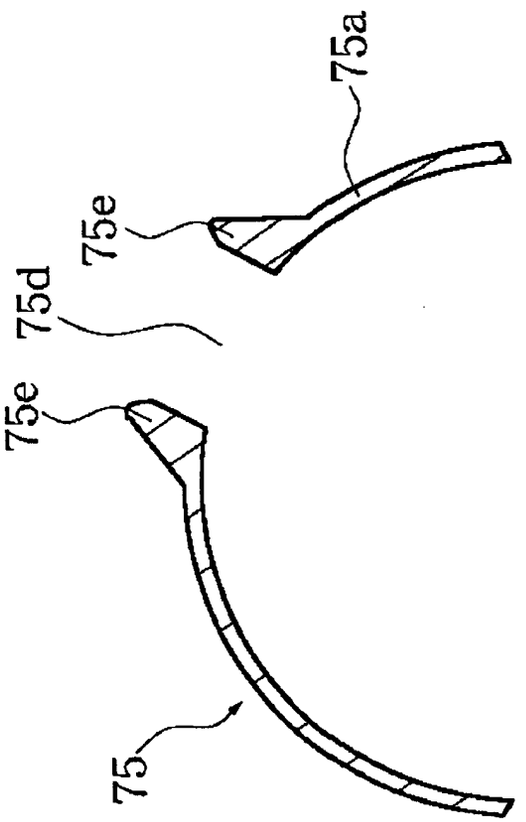

FIG. 12

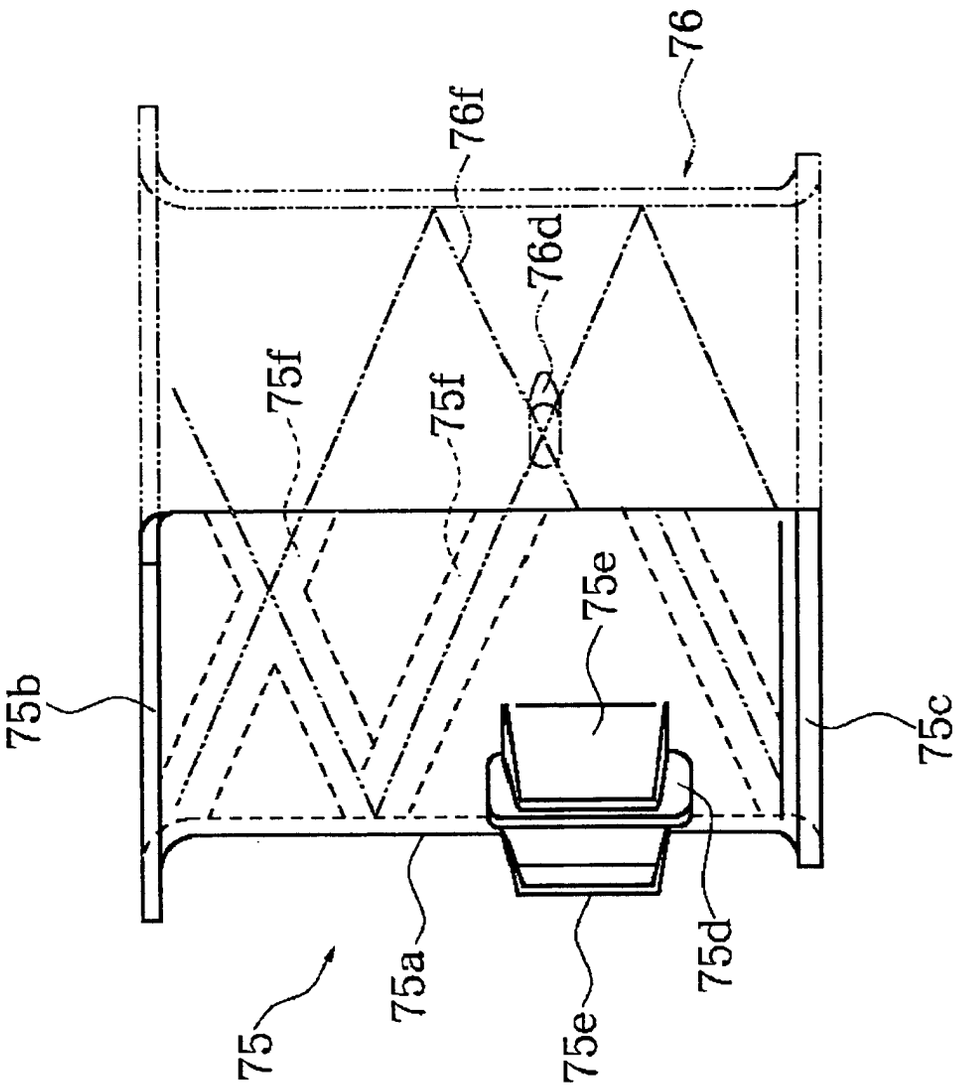

FIG. 13

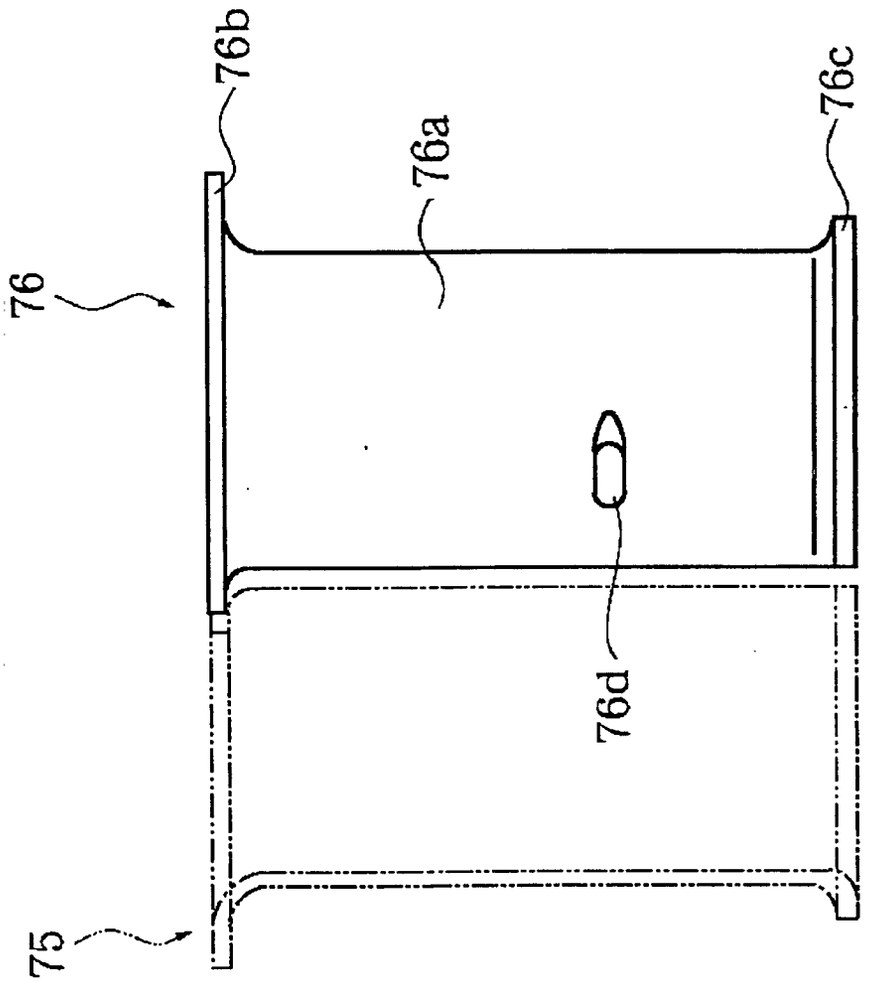

FIG. 14

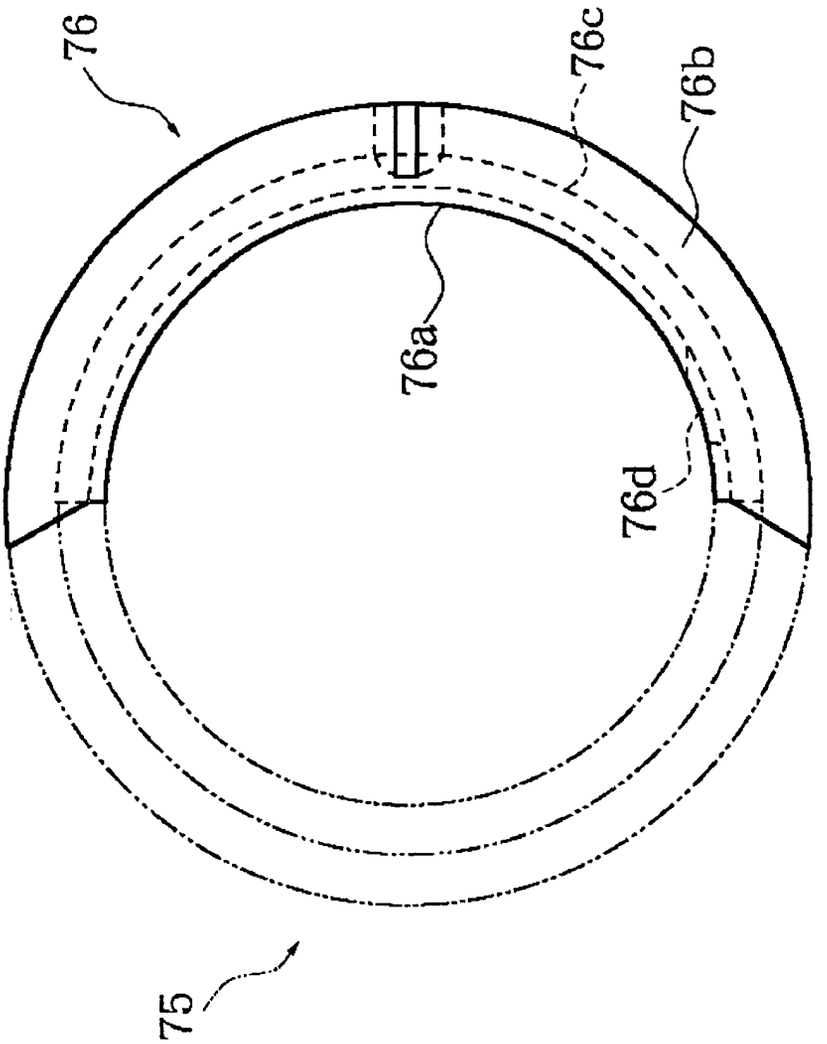

FIG. 15

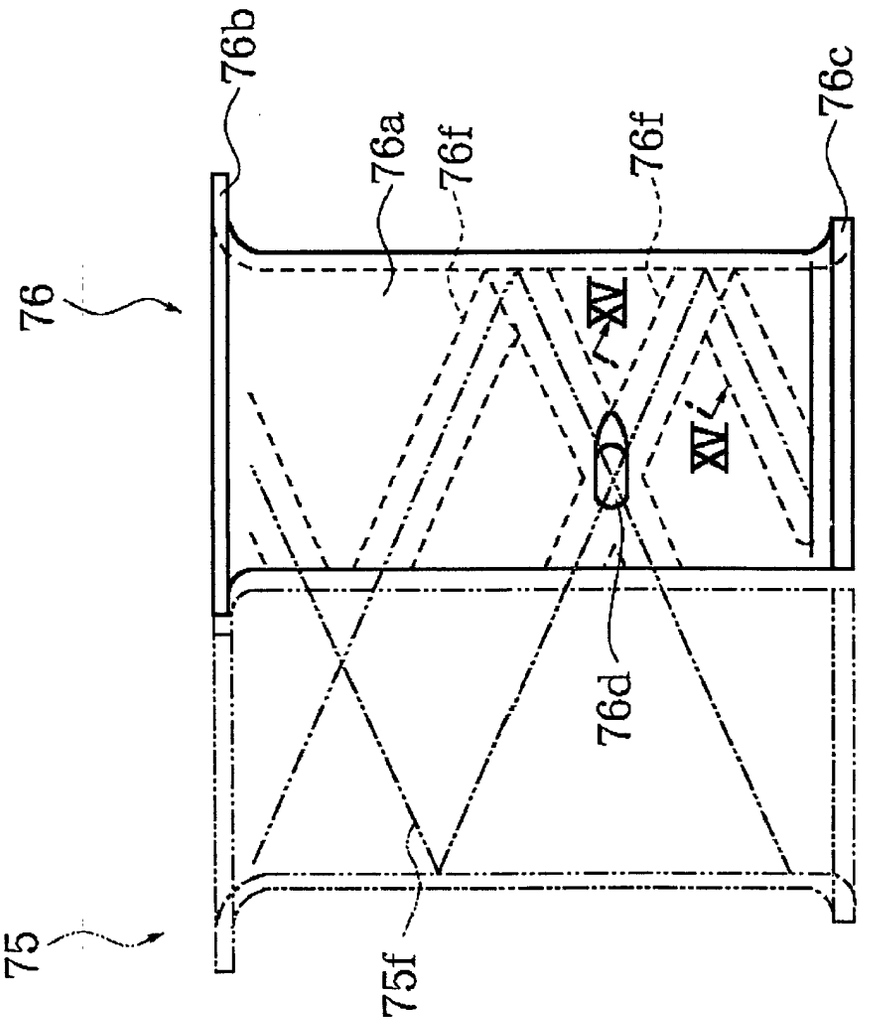

FIG. 16

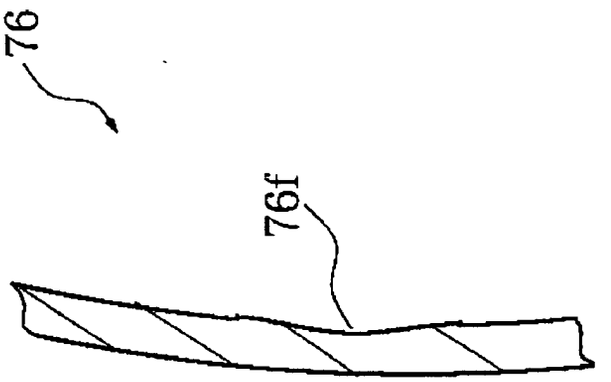

FIG. 17

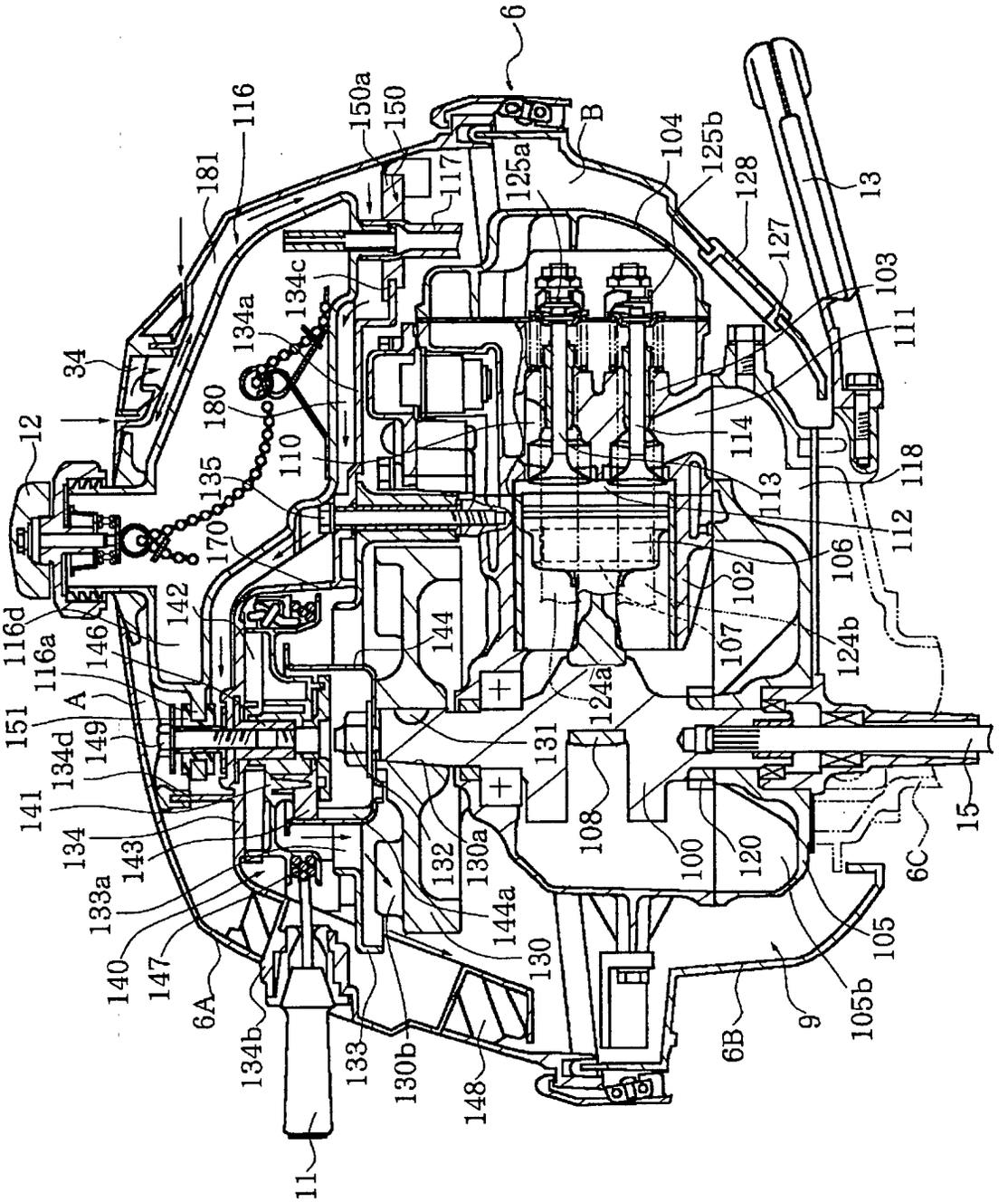
6
116
150a
150
181
B
104
125b
128
13
117
125a
127
103
134c
134a
111
34
180
114
12
110
135
118
113
170
112
142
106
102
116d
146
144
107
124b
116a
A
124a
151
149
131
134d
141
108
15
134
143
132
130a
100
120
6C
133a
144a
105
140
147
130
105b
6A
9
134b
133
130b
148
6B
11

FIG. 18

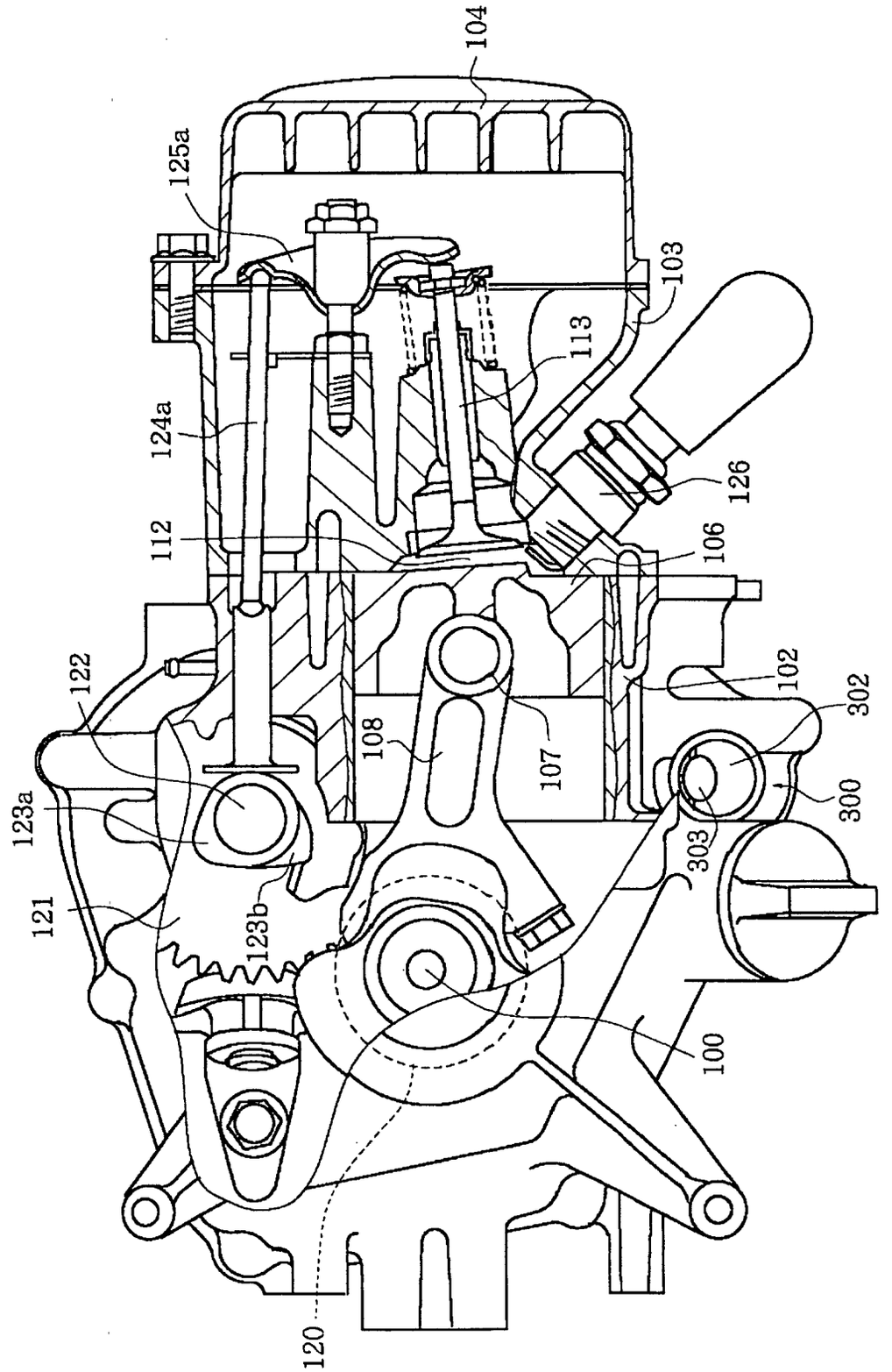
104
125a
103
113
124a
126
112
106
122
102
302
108
107
123a
300
303
121
123b
100
120

FIG. 19

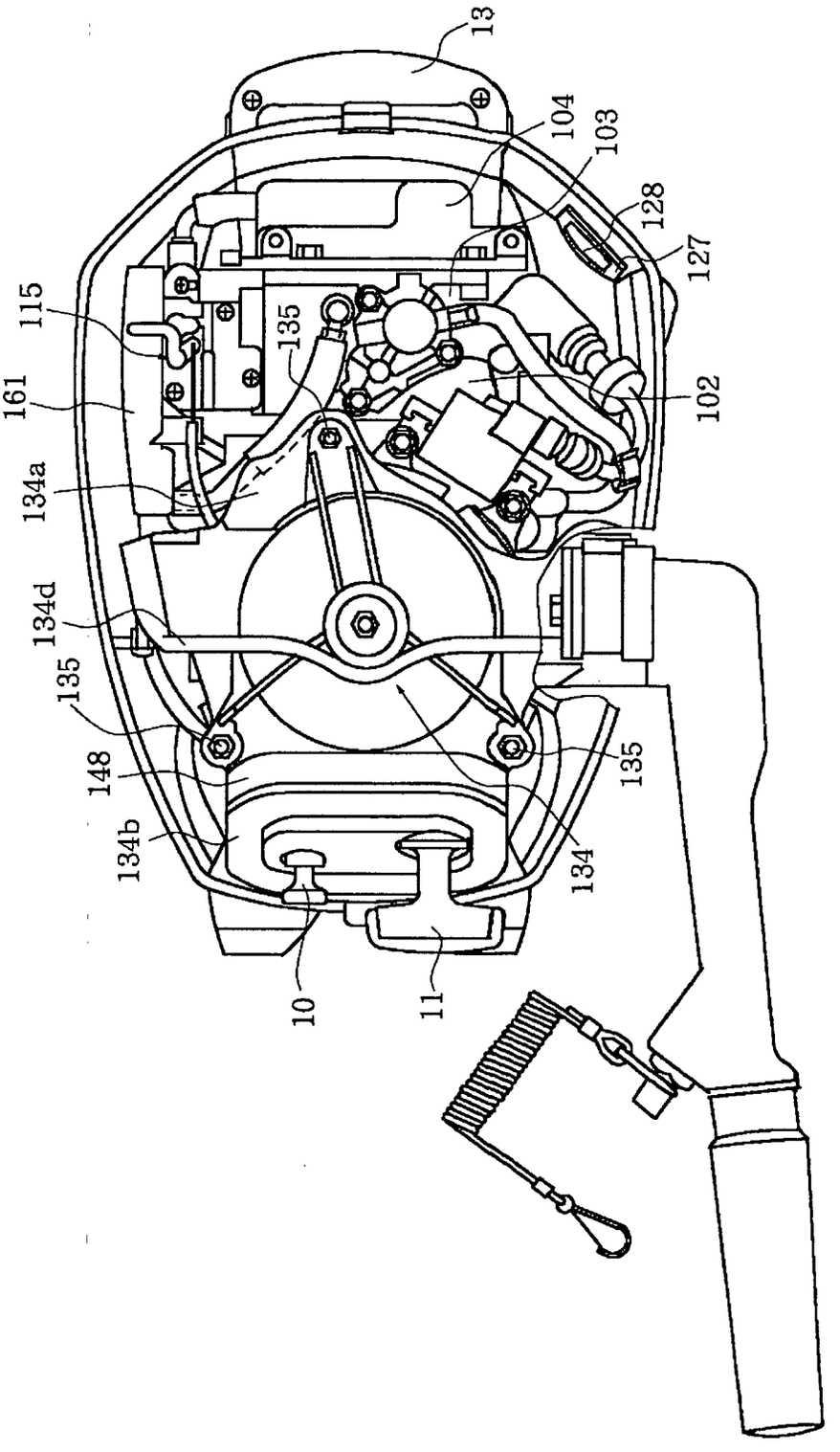
13
104
103
128
127
115
135
161
102
134a
134d
135
148
135
134b
134
10
11

FIG. 20

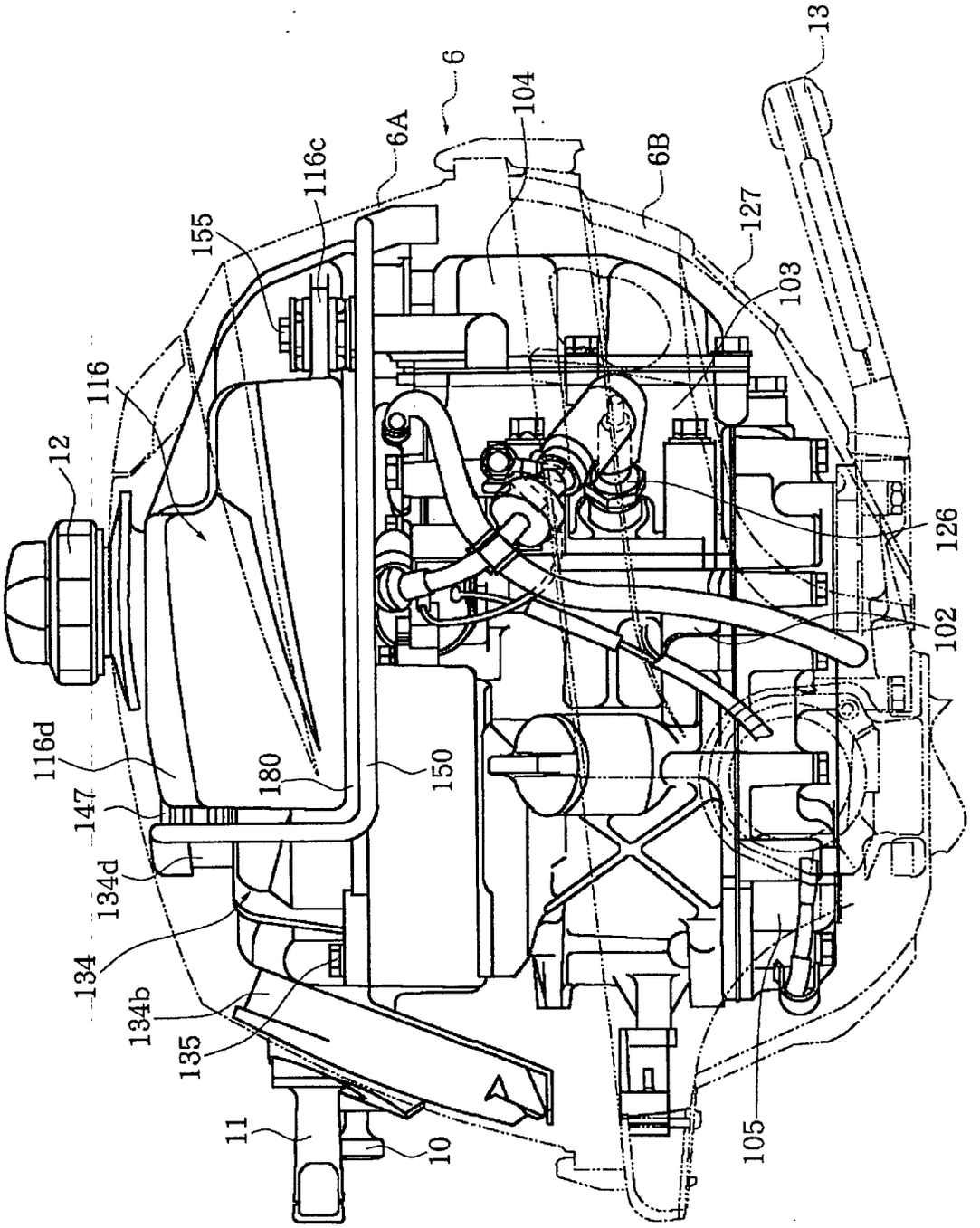
13
6
104
6A
6B
116c
155
127
103
116
12
126
102
116d
180
150
147
134d
134
134b
135
11
10
105

FIG. 21

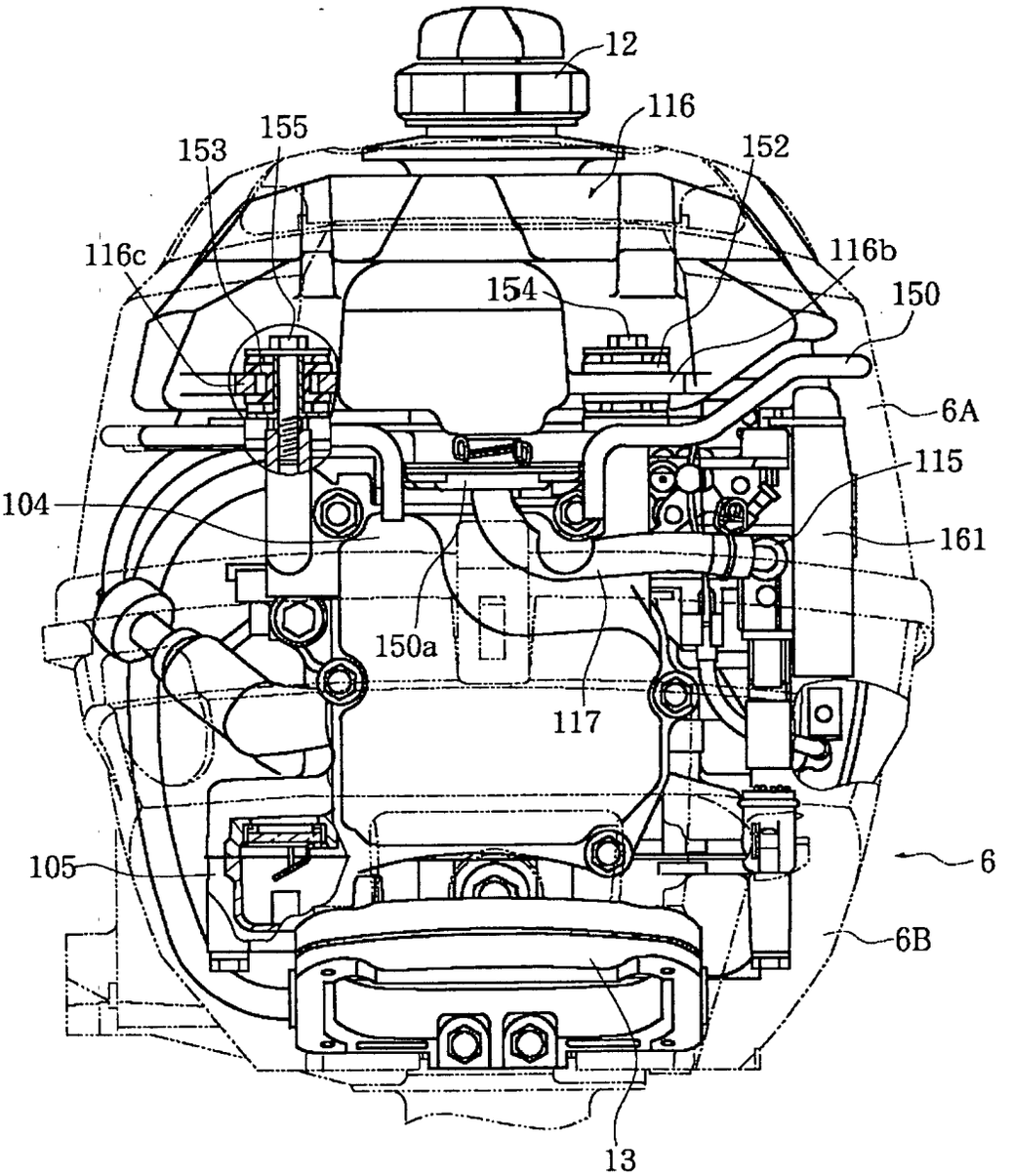
12
116
155
153
152
116c
116b
154
150
6A
115
104
161
150a
117
105
6
6B
13

FIG. 22

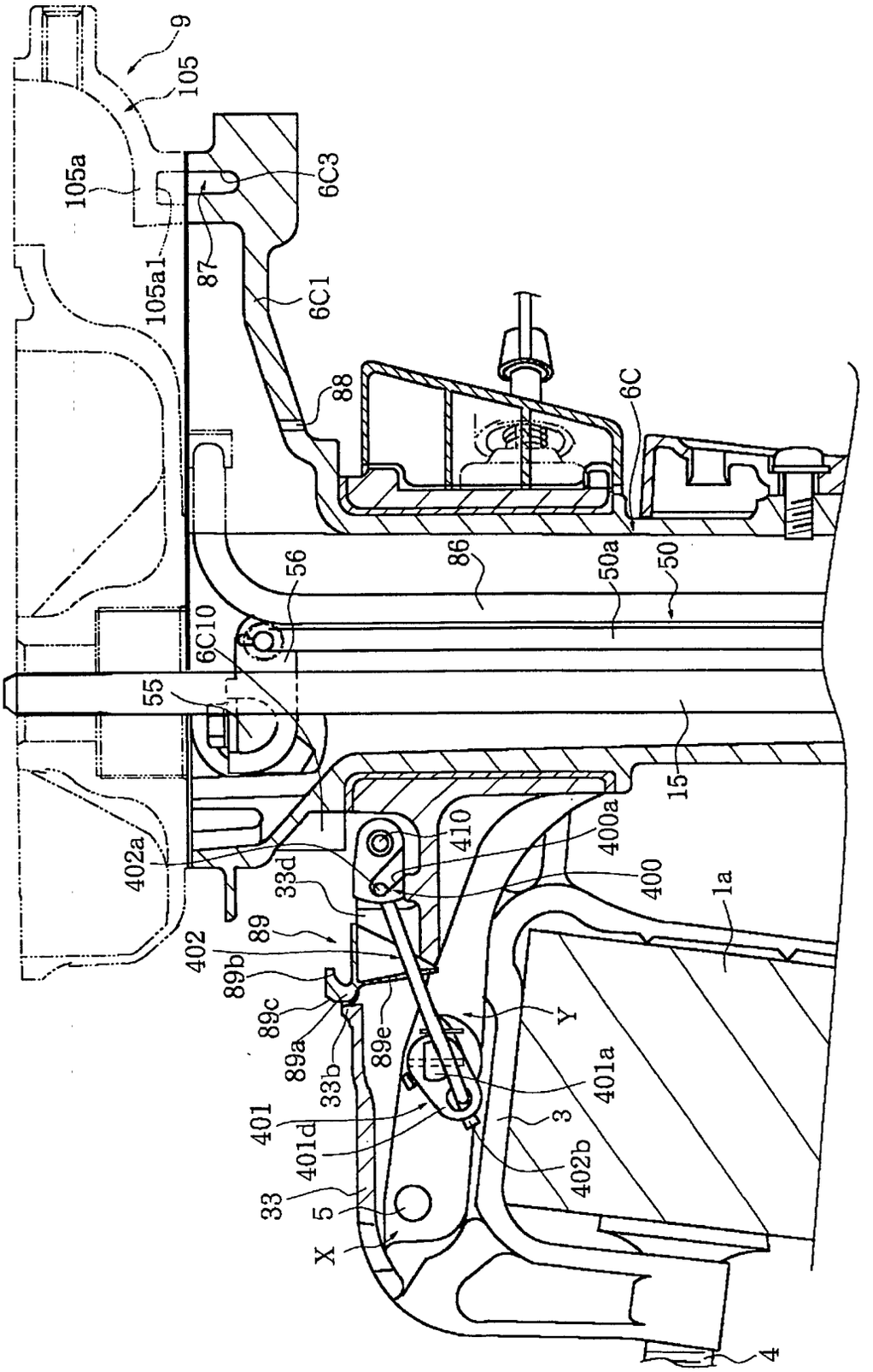
9
105
105a
6C3
105a1
87
6C1
88
6C
56
86
50a
50
6C10
55
15
410
400a
402a
33d
400
1a
89
402
89b
89c
89a
89e
Y
33b
401a
401
3
401d
402b
33
5
X
4

FIG. 23

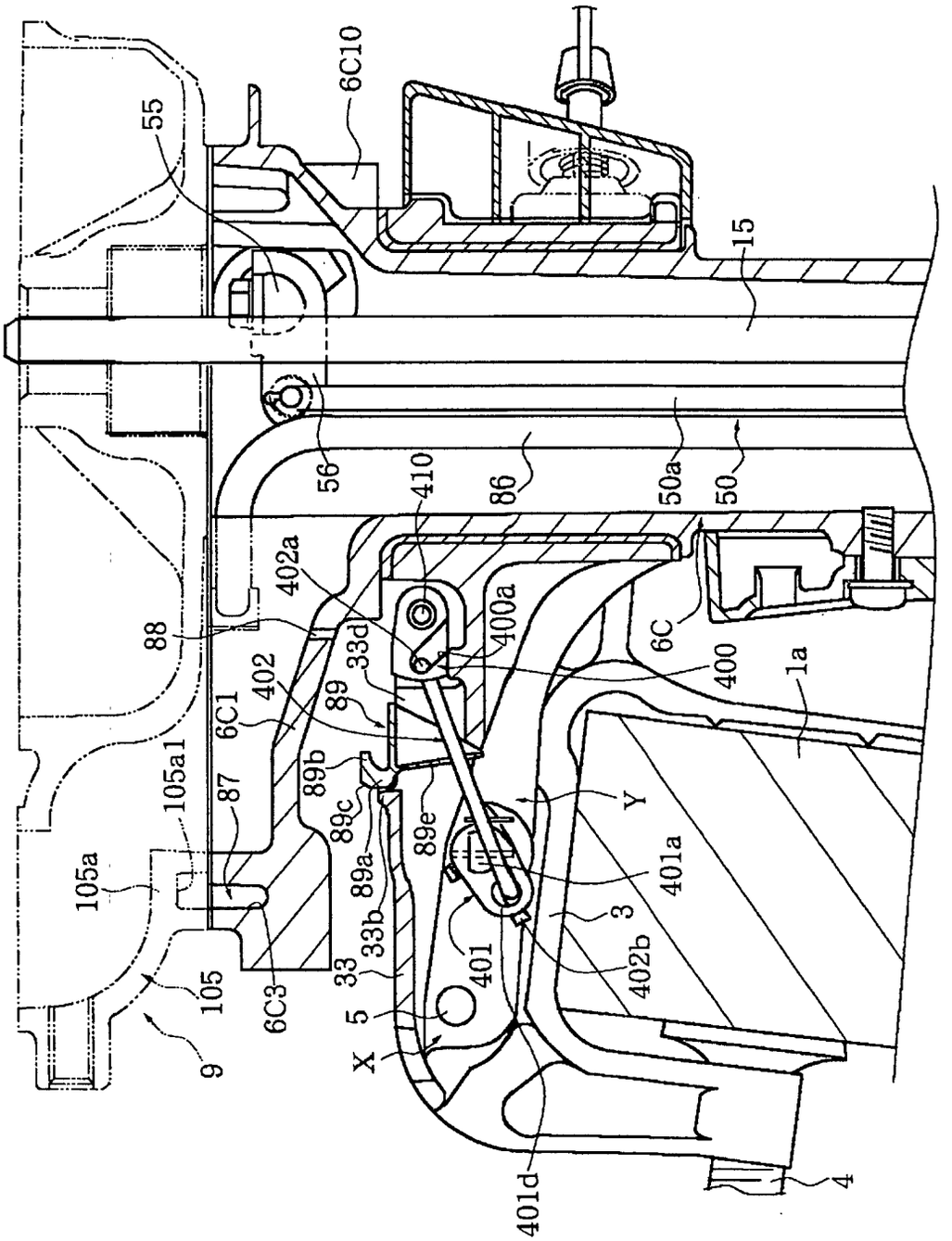
6C10
55
15
56
410
86
50a
50
402a
88
400a
33d
6C
400
1a
6C1
402
89
89b
89c
89e
89a
87
105a1
105a
33b
33
105
6C3
9
5
X
Y
401a
3
401
402b
401d
4

FIG. 24

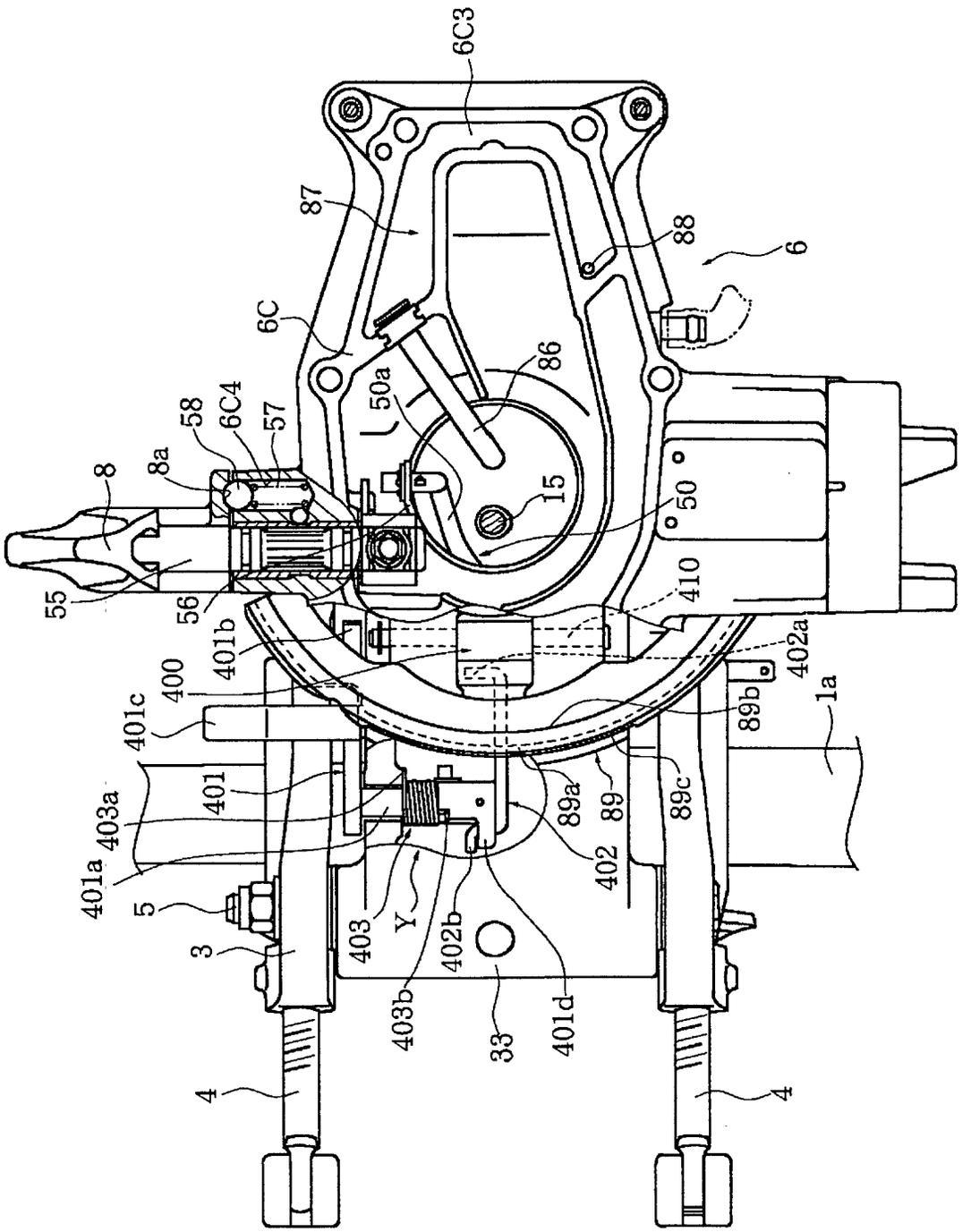
6C3
87
88
6
6C
86
50a
58
6C4
57
8a
8
15
50
55
56
410
401b
400
402a
401c
89b
1a
401
403a
89a
89
89c
401a
402
5
403
Y
402b
3
403b
33
401d
4
4

FIG. 25

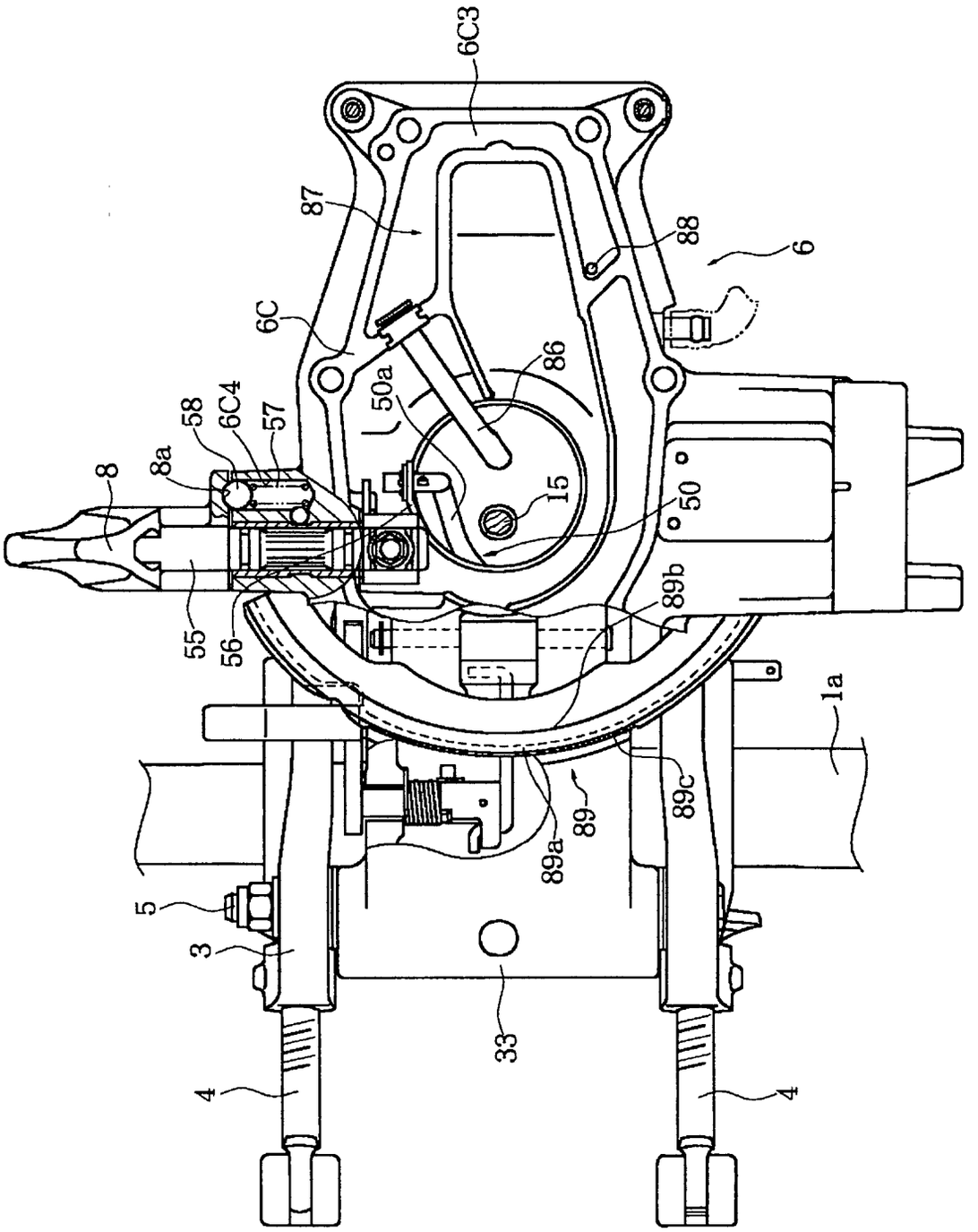
6C3
87
88
6
6C
86
50a
58
6C4
57
8a
8
15
50
89b
55
56
1a
89c
89
89a
5
3
33
4
4

FIG. 26

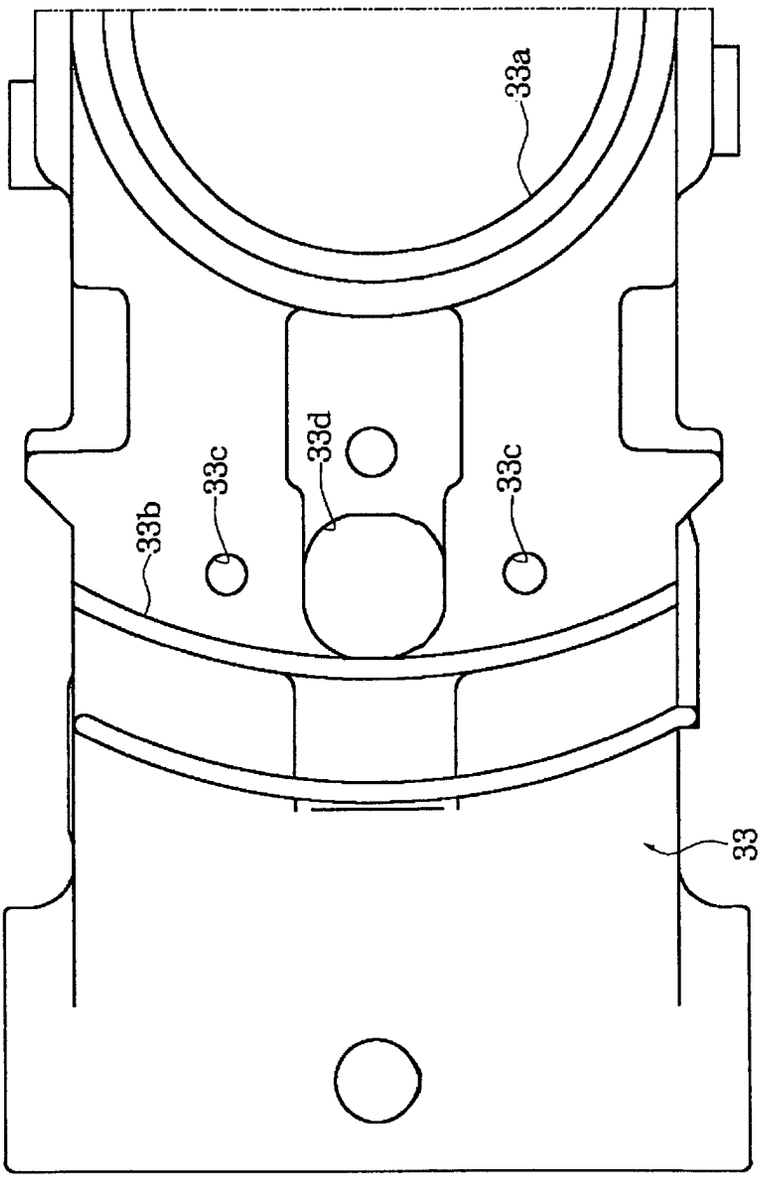

FIG. 27

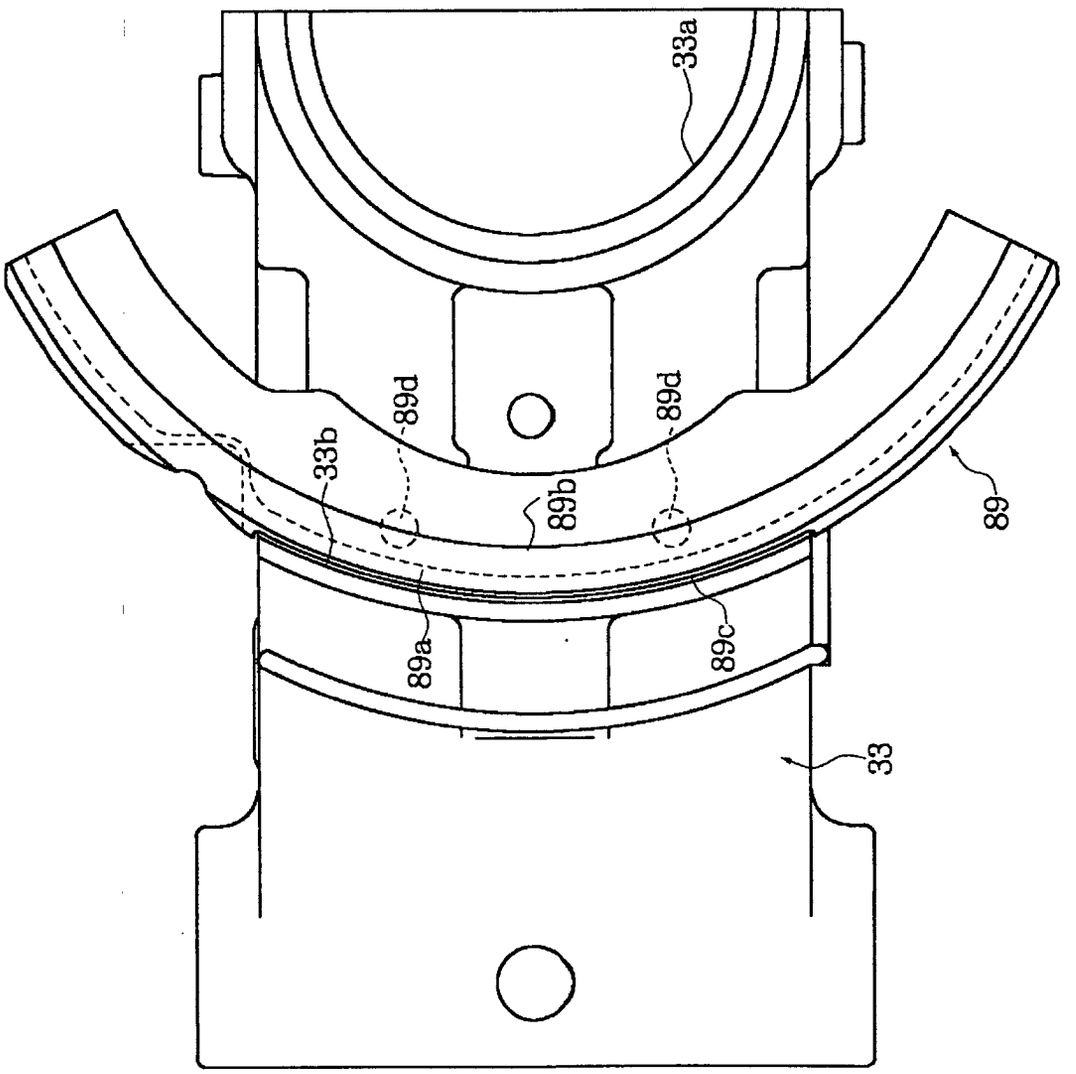

FIG. 28

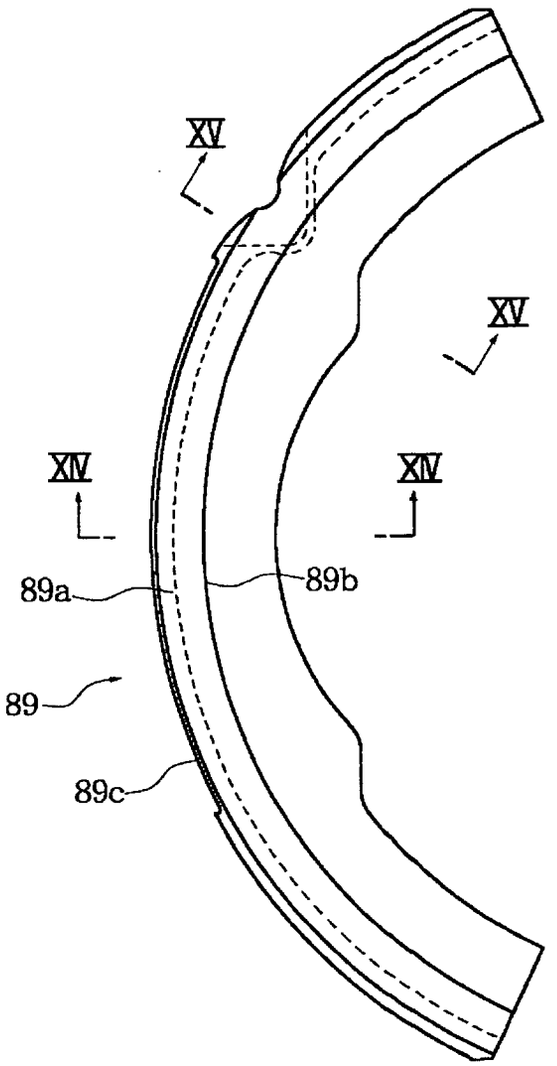

FIG. 29

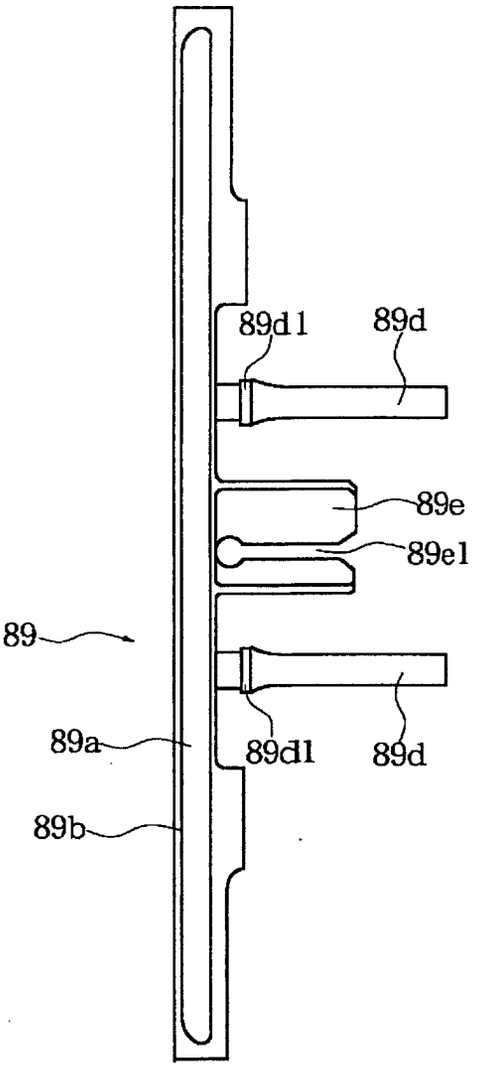

FIG. 30

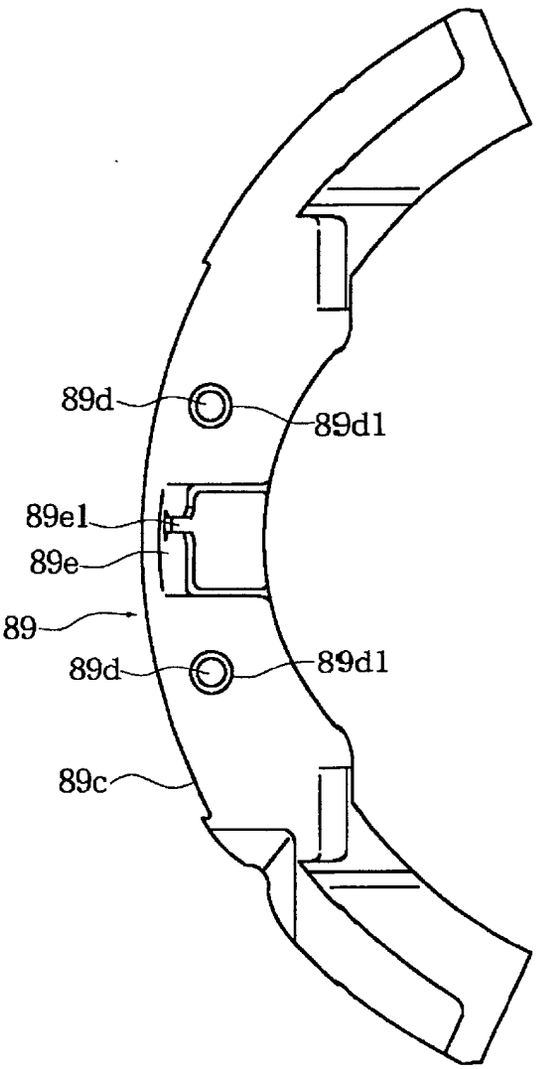

FIG. 31

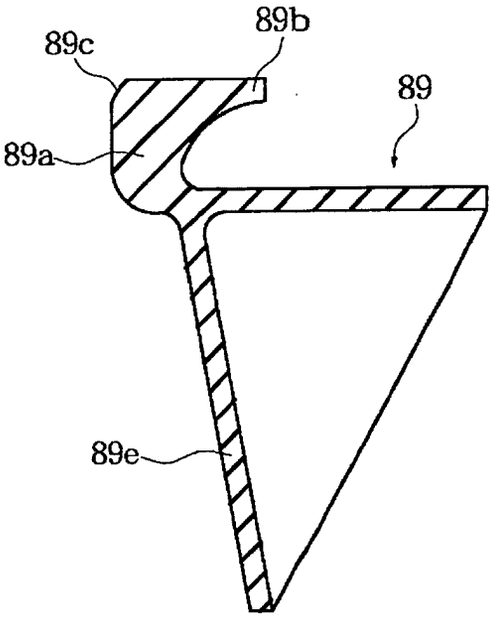

FIG. 32

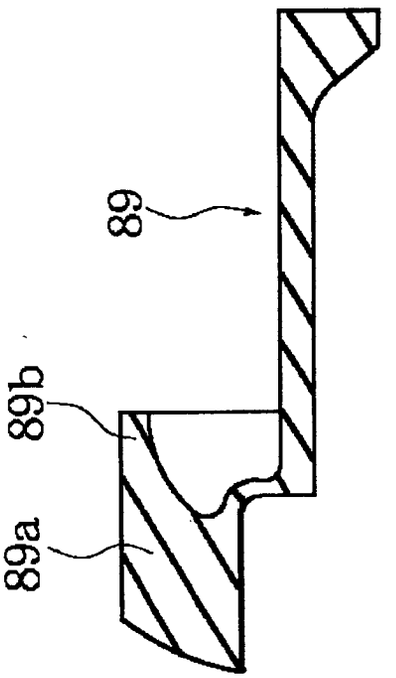

FIG. 33

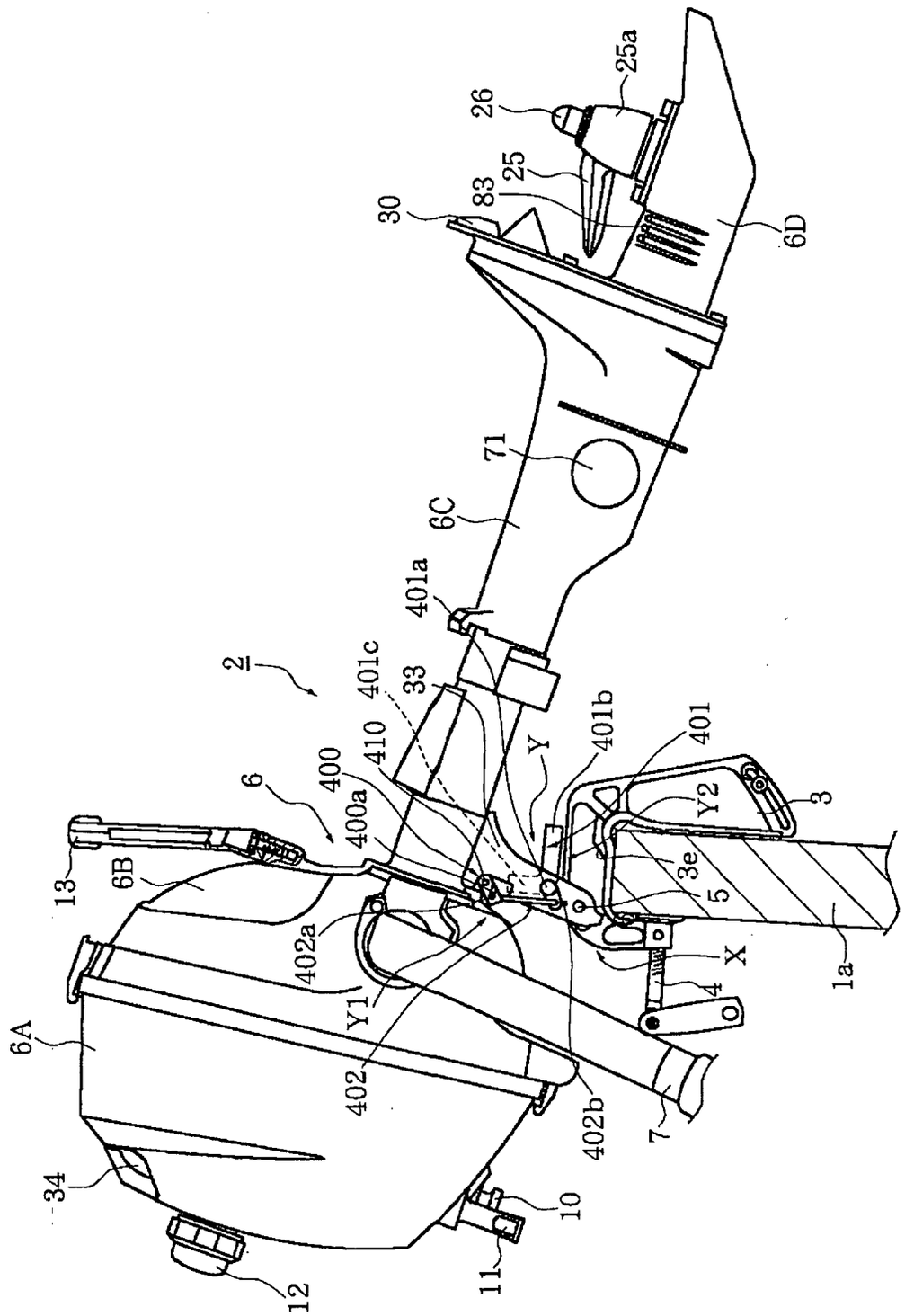
25a
26
25
83
30
6D
71
6C
401a
401c
33
2
401b
401
410
400
Y
6
400a
Y2
3
13
6B
3e
5
402a
X
1a
Y1
4
6A
402
7
402b
34
10
11
12

FIG. 34

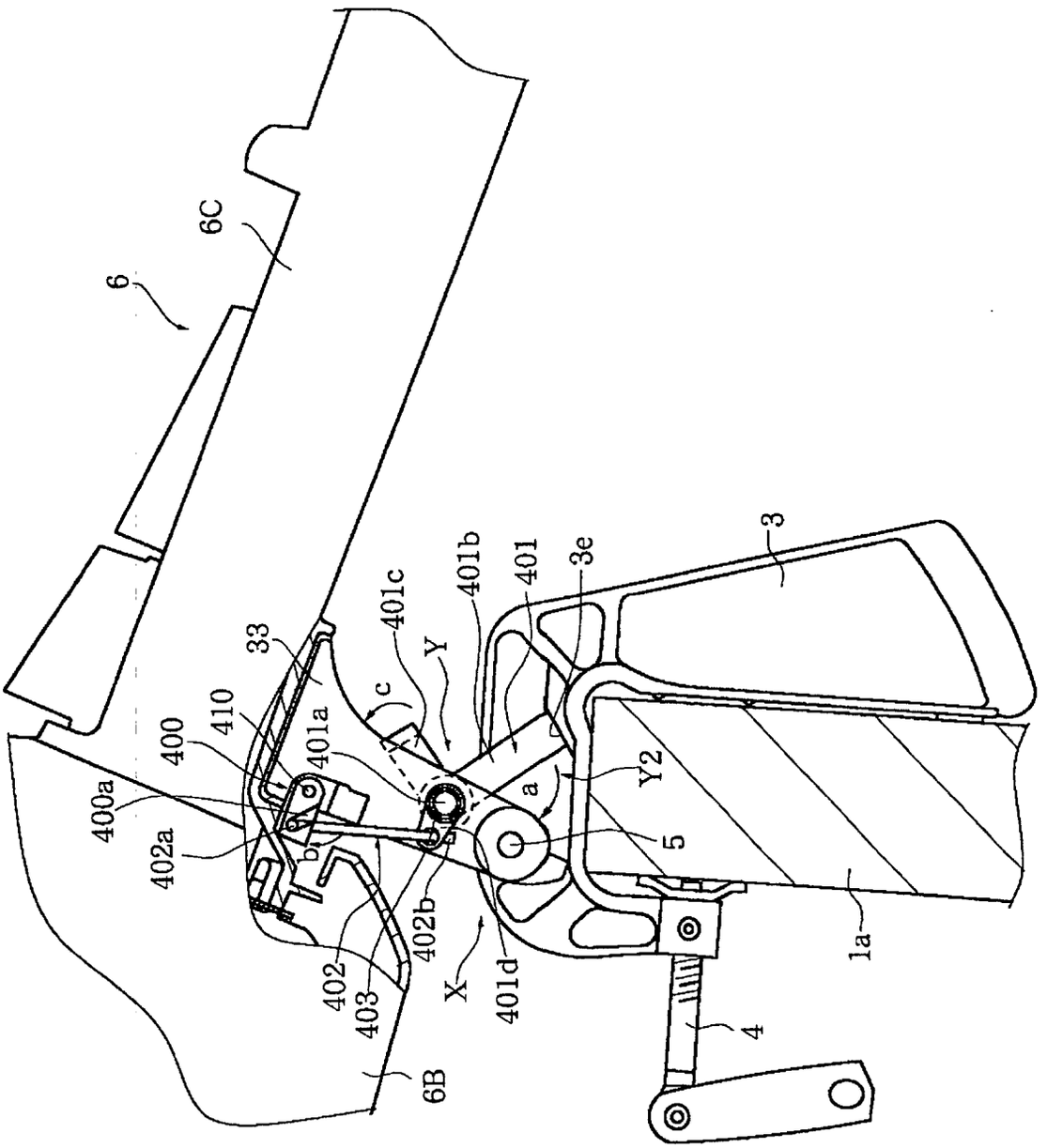
6
6C
33
401c
401b
401
3e
3
Y
c
410
400
401a
400a
402a
b
a
Y2
5
1a
402b
402
403
X
401d
4
6B

FIG. 35

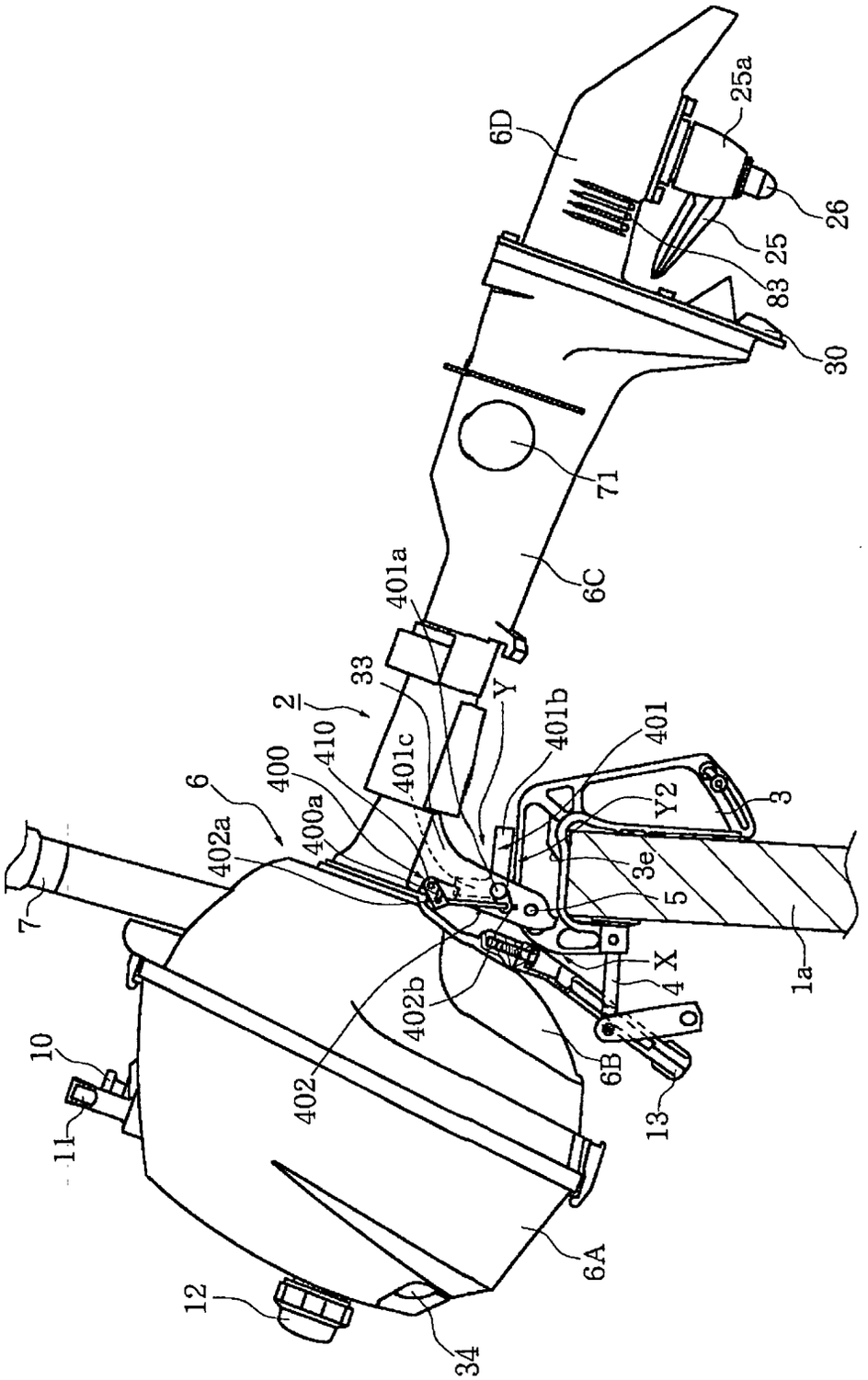
6D
25a
26
25
83
30
71
6C
401a
33
2
Y
401b
401
410
401c
400
6
400a
402a
Y2
3
3e
5
7
1a
X
4
402b
6B
10
402
13
11
6A
12
34

FIG. 36

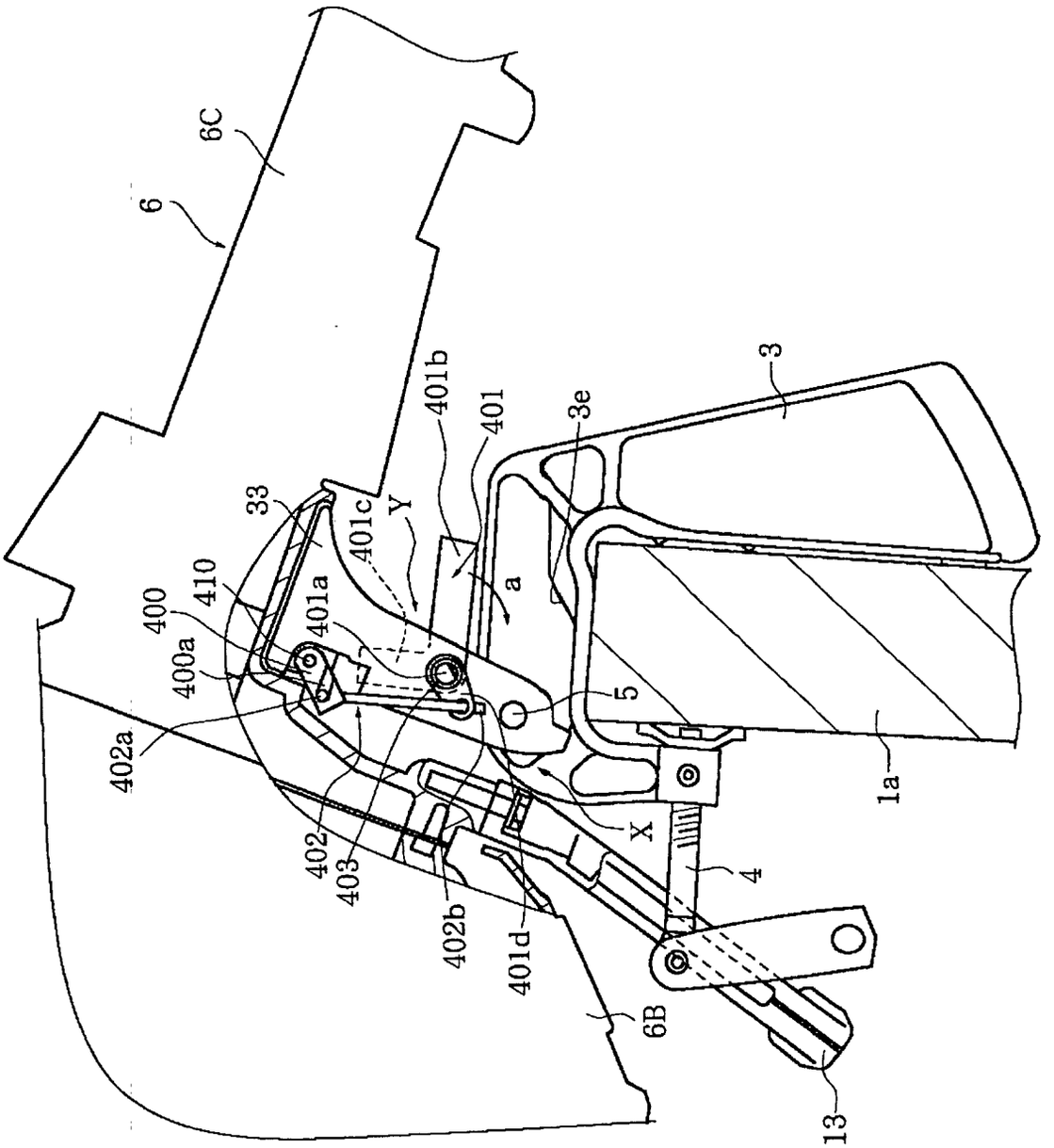
6C
6
401b
401
3e
3
33
Y
401c
a
410
400
401a
400a
5
402a
1a
X
402
403
4
402b
401d
6B
13

FIG. 37

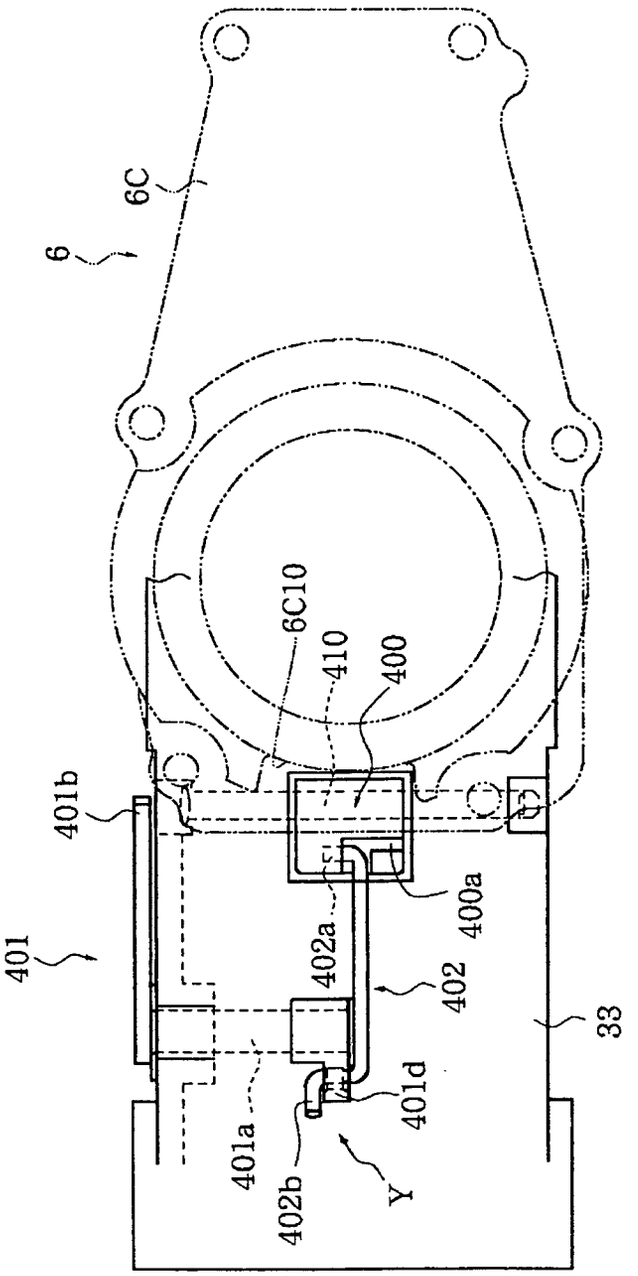

FIG. 38

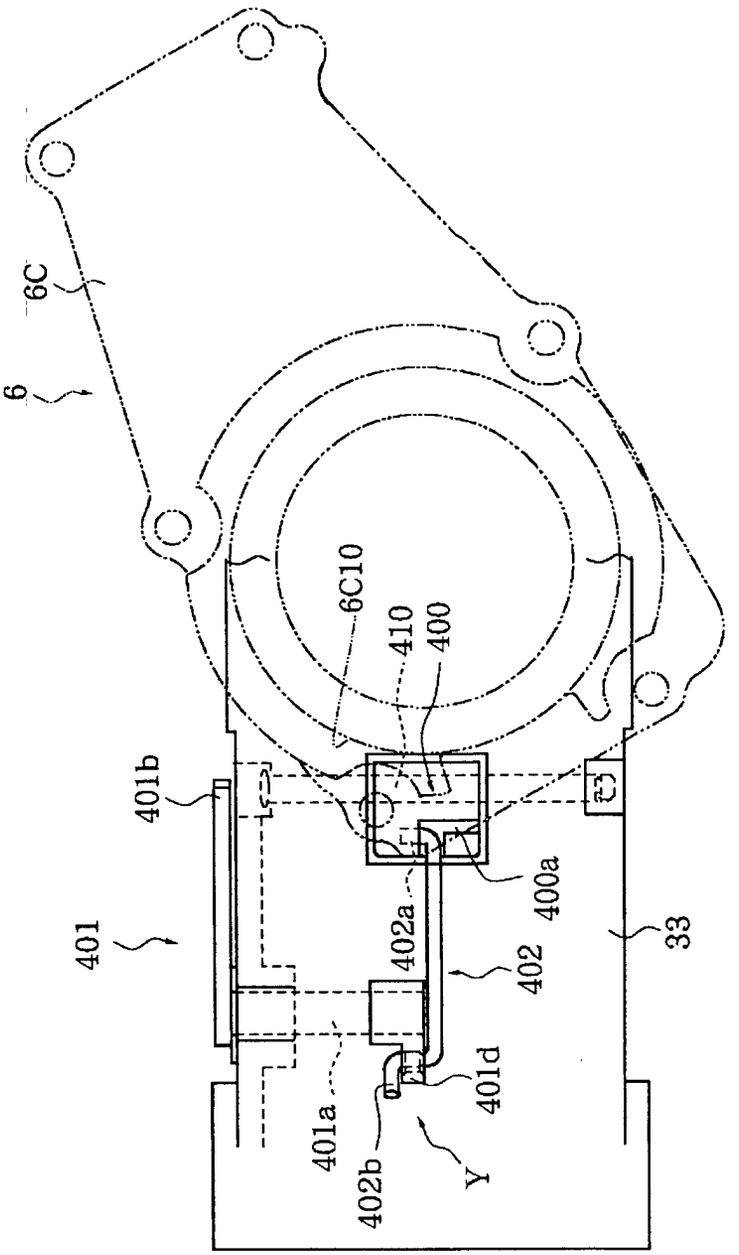

FIG. 39

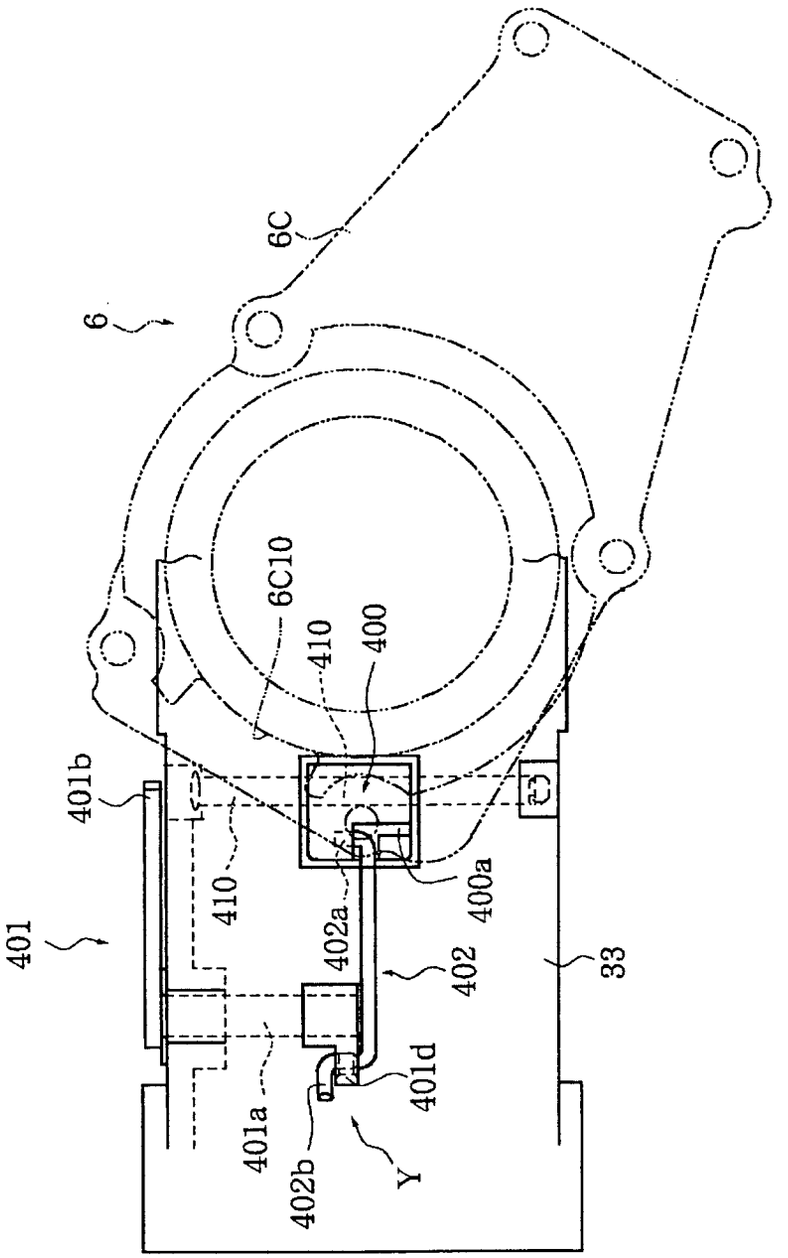

FIG. 40

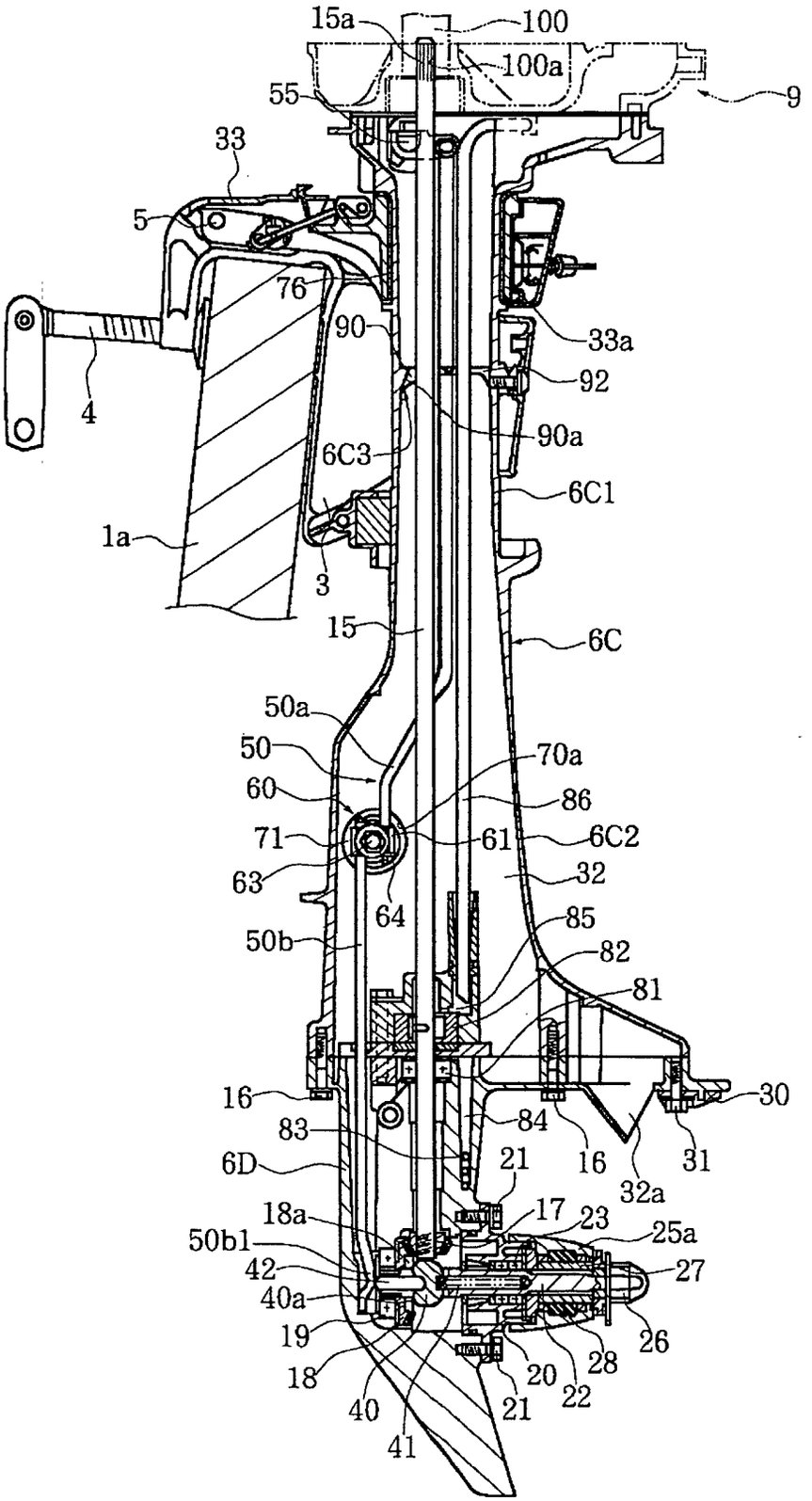
15a
100
100a
55
9
33
5
76
90
33a
92
4
90a
6C3
6C1
1a
3
15
6C
50a
50
70a
60
86
71
61
6C2
63
32
64
85
50b
82
81
16
30
83
84
16
31
6D
21
32a
18a
17
23
25a
50b1
42
27
40a
19
26
28
18
20
22
40
21
41

FIG. 41

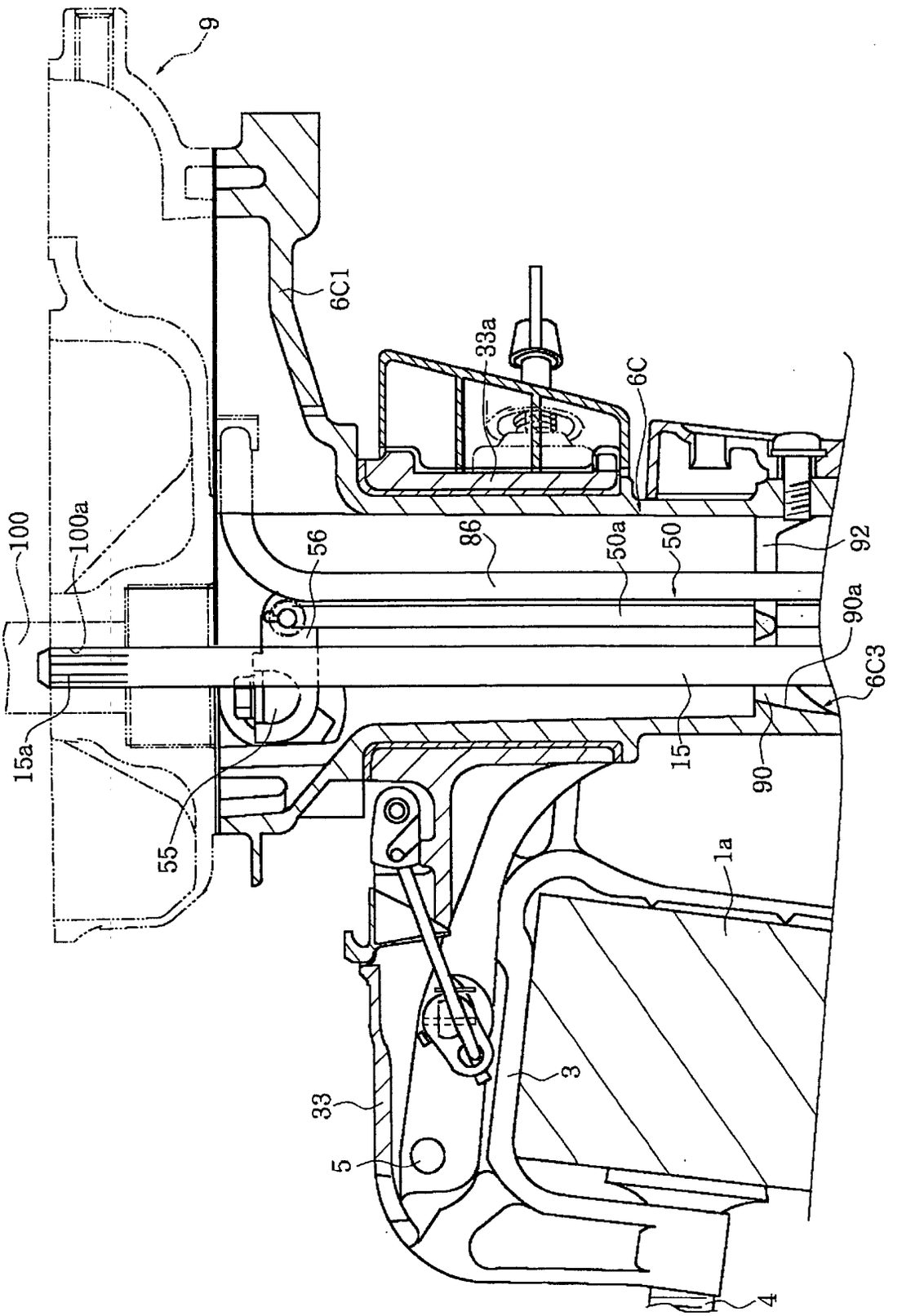

FIG. 42

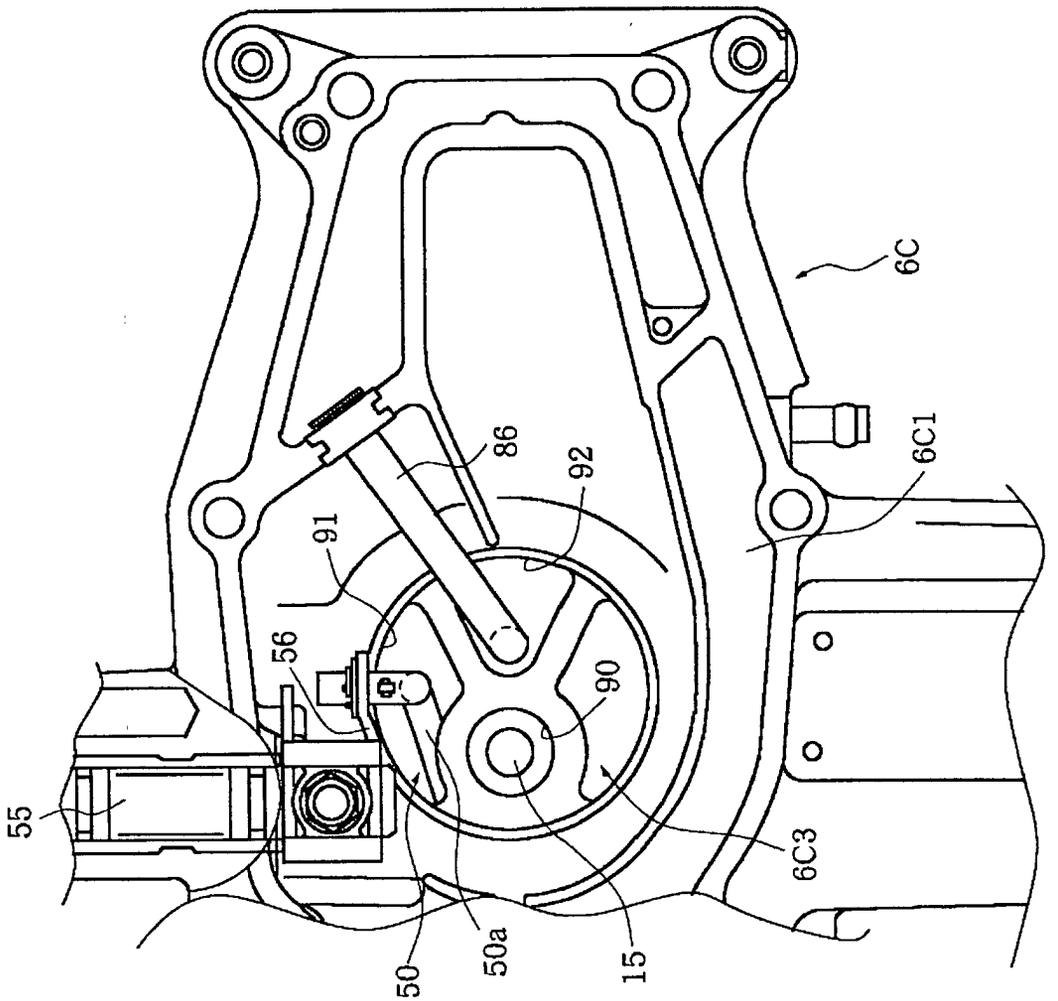

FIG. 43

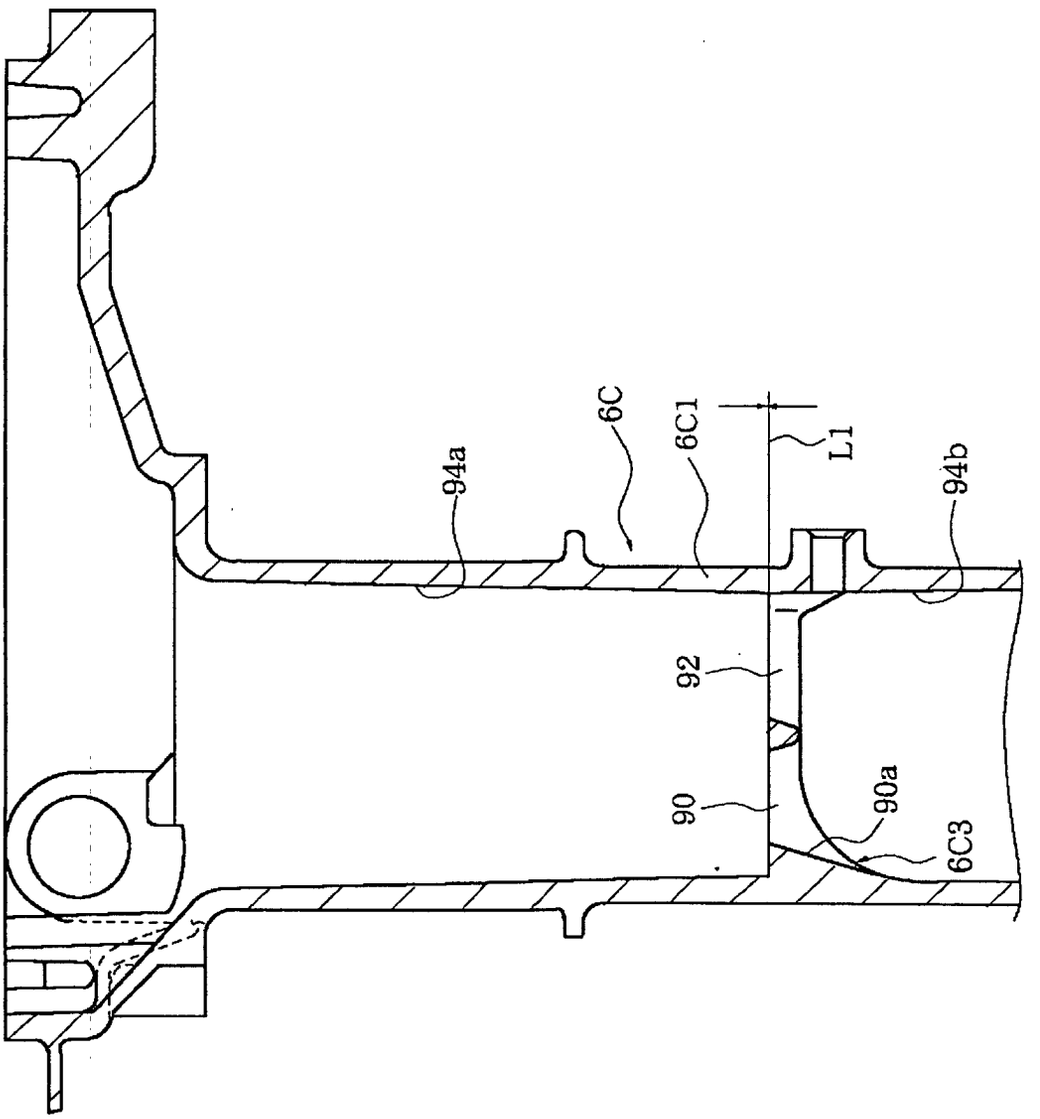

FIG. 44

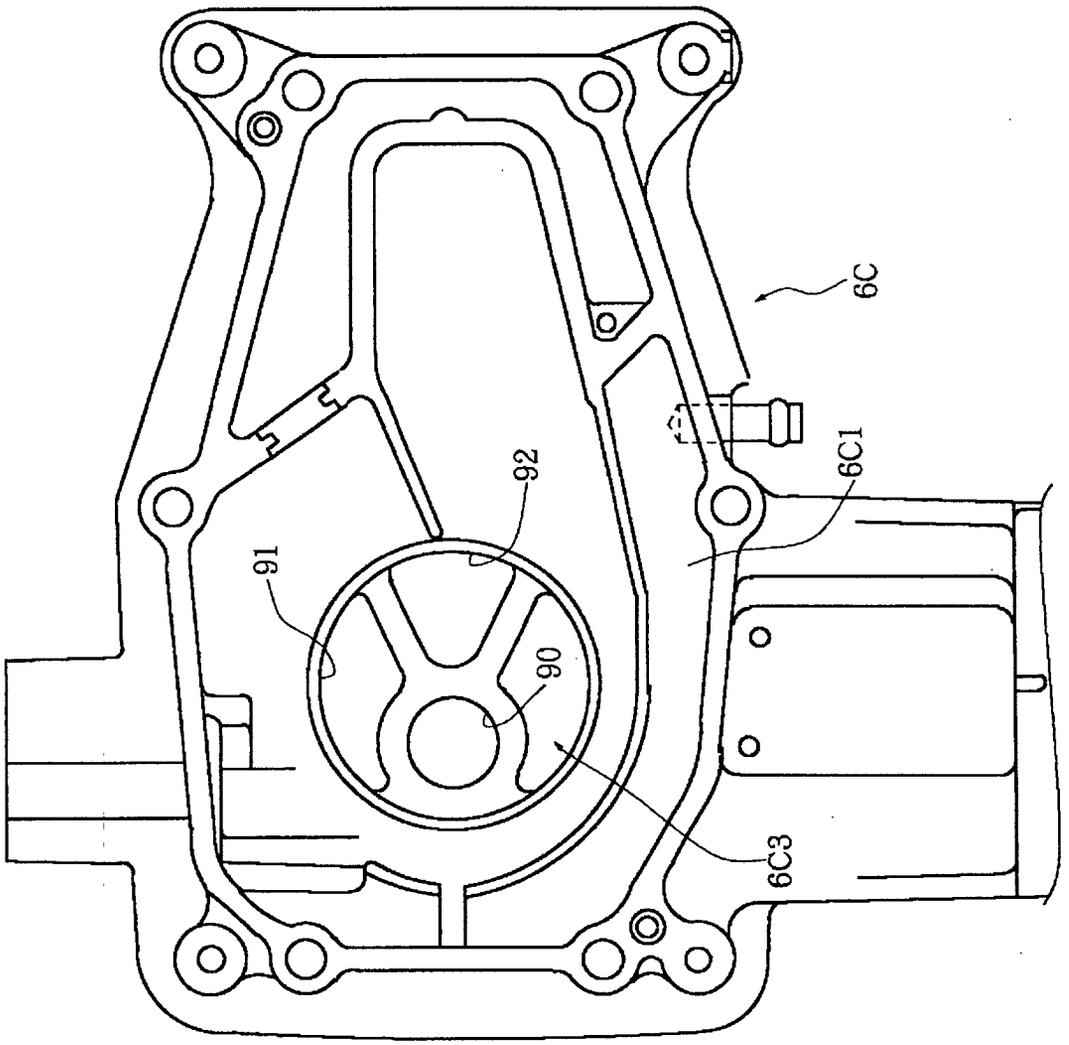

FIG. 45