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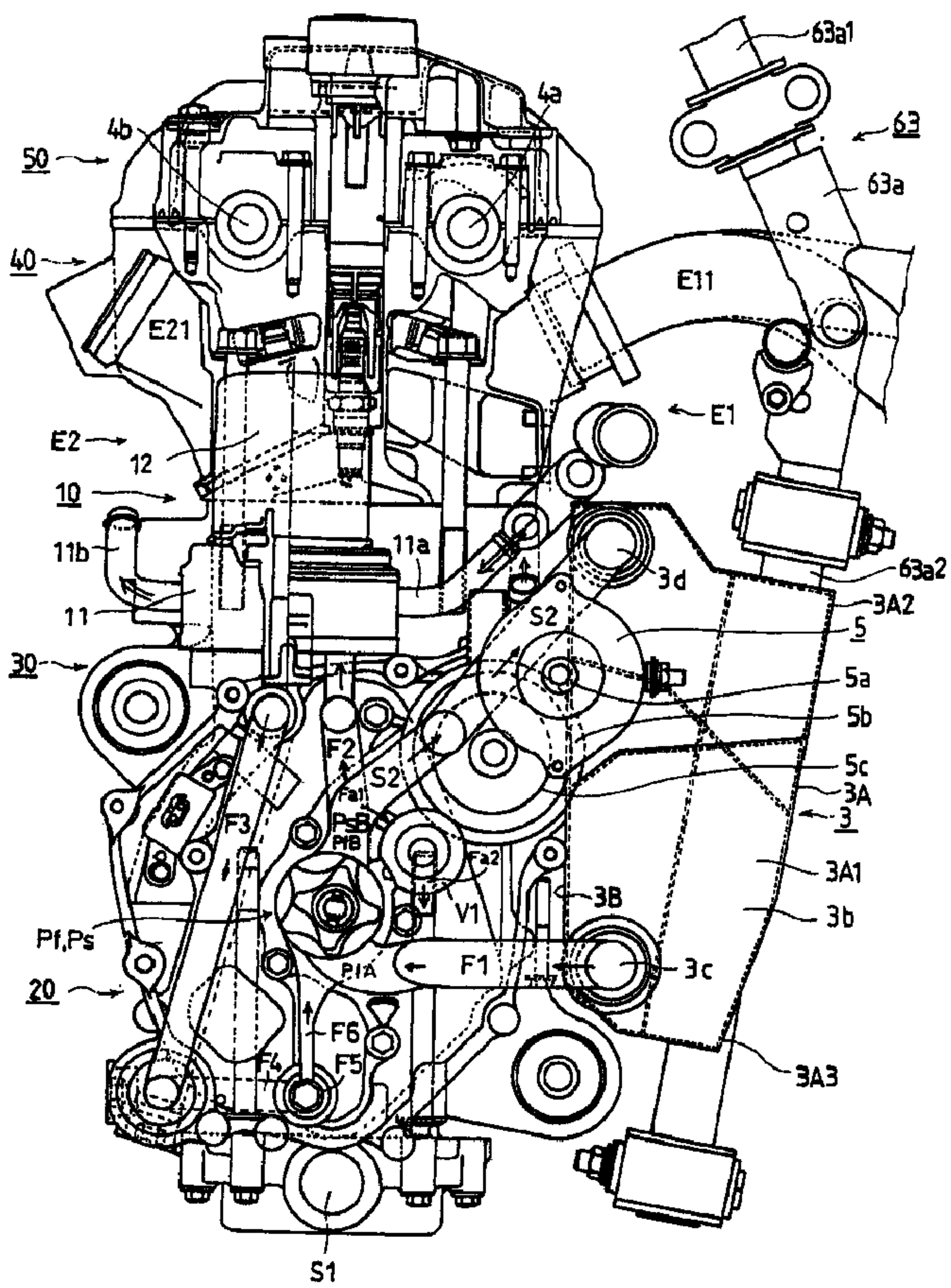


(57) Abrégé/Abstract:
To apply special contrivances to the structure and layout of a reserve oil tank disposed on the front side of a dry sump type internal combustion engine mounted on a small-type snowmobile, thereby to contrive effective utilization of space in the snowmobile, and

(57) Abrégé(suite)/Abstract(continued):
to achieve a further reduction in the size of the snowmobile. A reserve oil tank is laid out on the front side of a dry sump type internal combustion engine mounted on a small-type snowmobile, and the layout of the tank is so made that a tank wall in the longitudinal direction crosses the engine front side. The tank is provided in a tank front wall in the longitudinal direction thereof with an arcuate recessed groove extending vertically at the tank, and a steering shaft 63a vertically passes through the inside of the recessed groove.

ABSTRACT OF THE DISCLOSURE

To apply special contrivances to the structure and layout of a reserve oil tank disposed on the front side of a dry sump type internal combustion engine mounted on a small-type snowmobile, thereby to contrive effective utilization of space in the snowmobile, and to achieve a further reduction in the size of the snowmobile. A reserve oil tank is laid out on the front side of a dry sump type internal combustion engine mounted on a small-type snowmobile, and the layout of the tank is so made that a tank wall in the longitudinal direction crosses the engine front side. The tank is provided in a tank front wall in the longitudinal direction thereof with an arcuate recessed groove extending vertically at the tank, and a steering shaft 63a vertically passes through the inside of the recessed groove.

SNOWMOBILE

FIELD OF THE INVENTION

The present invention relates to a snowmobile, particularly a snowmobile characterized by the structure of a reserve oil tank provided for a dry sump type internal combustion engine mounted on the snowmobile and by the layout structure of the tank.

BACKGROUND OF THE INVENTION

A reserve oil tank of an internal combustion engine for a vehicle is generally disposed around the main body of the internal combustion engine. As one example of the reserve oil tank, in the case of an internal combustion engine mounted on a snowmobile, there is known a reserve oil tank for the internal combustion engine which is disposed at a side portion of the mounted internal combustion engine, i.e., at a side position, relative to the traveling direction of the vehicle, of the internal combustion engine (see, for example, Japanese Patent Laid-open No. 2002-266653 (page 5, Fig. 8).

The invention disclosed in Japanese Patent Laid-open No. 2002-266653 contains the description of the conditions of a structural portion on the vehicle body front side of a snowmobile. According to the description, a lubricating oil tank, or reserve oil tank, for an internal combustion engine mounted on the snowmobile is laid out at a side portion, relative to the traveling direction of the vehicle, around the internal combustion engine mounted on the snowmobile.

As above-mentioned, the lubricating oil tank for the internal combustion engine is generally laid out around the internal combustion engine, while being not limited to that on a snowmobile. However, particularly in a vehicle with a limited vehicle body space as in the case of a small-type snowmobile, the layout of the lubricating oil tank, which occupies a comparatively large space, around the engine needs special contrivances in selection of the layout position, tank shape, etc. due to the spatial factors thereof.

In the case where the layout of the lubricating oil tank for the internal combustion engine around the engine is achieved by disposing the tank at a position on the front or rear side of the crosswise-crankshaft engine, when the steering system is disposed on the front side of the engine as in the snowmobile according to the invention described in Patent Document 1, the layout of the lubricating oil tank on the front side of the engine is further limited on a spatial basis. In addition, the layout of the oil tank on the rear side of the engine hinders the rider from approaching the engine, so that there again is a limitation from the viewpoint of achieving a compact design.

In the above-mentioned situation, in connection with the layout of a lubricating oil tank, particularly a dry sump reserve tank, for an internal combustion engine mounted on a small-type snowmobile on the rear side of the engine, it is requested to provide an improved structure of the oil tank by which effective utilization of the limited space in the small-type snowmobile is contrived and which is favorable from the viewpoint of making the vehicle smaller and compacter.

SUMMARY OF THE INVENTION

The present invention resides in a snowmobile comprising a dry sump type internal combustion engine mounted on the front side of a vehicle body, a rider's seat provided on the rear side of the internal combustion engine, a crankshaft of the internal combustion engine, and a transmission mechanism through which the rotation of the crankshaft is transmitted to an endless track belt so as to drive the endless track belt to rotate, thereby driving the snowmobile to travel. The internal combustion engine provided on the front side of the rider's seat is mounted with the crankshaft disposed crosswise relative to the traveling direction, the snowmobile comprises a reserve oil tank disposed across a central portion of the vehicle body along the internal combustion engine on the front side of the internal combustion engine, and a steering shaft provided along the vertical direction at a roughly central portion of the vehicle body on the front side of the internal combustion engine, the reserve oil tank is provided on its front side with a recessed portion through which to pass the steering shaft, and the reserve oil tank and the steering shaft are so disposed as to overlap each other at least partly in vehicle body side view.

In addition, since the steering shaft is passed in the vertical direction through the inside of the recessed portion of the tank on the front side of the engine in the condition that the steering shaft overlaps the tank at least partly, the structure is made compact. Further, since the steering shaft is entirely or partly covered by a tank front wall in vehicle side view so as to appear shapely as a whole, enhancement of the appearance is contrived.

BRIEF DESCRIPTION OF THE DRAWINGS

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

Fig. 1 is a side view of a snowmobile with an internal combustion engine mounted thereon according to the present invention, showing the condition where outer cover and the like are removed for showing an essential structural part of the snowmobile.

Fig. 2 is a top plan view of the snowmobile with the internal combustion engine mounted thereon according to the present invention, showing the condition where an outer cover, a seat and the like are removed for showing an essential structural part of the snowmobile.

Fig. 3 is an enlarged side view of the vicinity of an internal combustion engine mount portion in the snowmobile according to the present invention.

Fig. 4 is a vertical sectional view of an essential structural part of the internal combustion engine according to the present invention.

Fig. 5 shows a structural part of a V belt type automatic transmission in a drive mechanism of the snowmobile according to the present invention.

Fig. 6 is a partly sectional view of a structural part on the front side in the vehicle traveling direction of the internal combustion engine according to the present invention.

Fig. 7 is a side view showing an essential structural part of the internal combustion engine according to the present invention.

Fig. 8 is a top plan view of the internal combustion engine according to the present invention.

Fig. 9 is a front view of a dry sump reserve oil tank according to the present invention, showing the structure of the tank.

Fig. 10 is a side view of the dry sump reserve oil tank according to the present invention, showing the structure of the tank.

Fig. 11 is a top plan view of the dry sump reserve oil tank according to the present invention, showing the structure of the tank.

Fig. 12 shows an essential structural part of a lubricating oil supply passage according to the present invention.

Fig. 13 is a schematic illustration of the lubricating oil supply system in the internal combustion engine according to the present invention.

Fig. 14 shows an essential structural part of a cooling water supply passage in the internal combustion engine according to the present invention.

Fig. 15 shows a part of an essential cooling water supply structure in the internal combustion engine according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

According to the present invention, in the above-mentioned snowmobile, the internal combustion engine provided on the front side of the rider's seat is mounted with the crankshaft disposed crosswise relative to the traveling direction, the snowmobile comprises the reserve oil tank disposed to cross the center of the vehicle body along the internal combustion engine on the front side of the internal combustion engine, and the steering shaft provided in the vertical direction at the roughly central portion of the vehicle body on the front side of the internal combustion engine, the reserve oil tank is provided on its front side with the recessed portion through which to pass the steering shaft, and the reserve oil tank and the steering shaft are so disposed as to overlap each other at least partly in vehicle body side view. Therefore, it is contrived to effectively utilize the space for laying out the steering shaft on the front side of the engine, and the length in the front-rear direction of the vehicle body can be shortened accordingly.

In an aspect of the invention, the snowmobile may be characterized in that the recessed portion is vertically continuous in the range from an upper end portion to a lower end portion of the reserve oil tank, and is shaped along the inclination of the steering shaft.

According to this aspect of the invention, in the snowmobile as set forth above, the recessed portion is continuous over the range from an upper end portion to a lower end portion of the reserve tank and is shaped along the inclination of the steering shaft. Therefore, the steering shaft is neatly contained in the recessed portion, the steering shaft can be laid out compactly, and effective utilization of space can be contrived.

A further aspect of the present invention resides also in a snowmobile comprising a dry sump type internal combustion engine mounted on the front side of a vehicle body, a rider's seat provided on the rear side of the internal combustion engine, a crankshaft of said internal combustion engine, and a transmission mechanism through which the rotation of the crankshaft is transmitted to an endless track belt so as to drive the endless track belt to rotate, thereby driving the snowmobile to travel. The internal combustion engine provided on the front side of the rider's seat is mounted with the crankshaft disposed crosswise relative to the traveling direction, the snowmobile comprises a reserve oil tank disposed across a central portion of the vehicle body along the internal combustion engine on the front side of the internal combustion engine, the oil tank is provided with a cutout portion, an accessory is provided at the cutout portion, and the reserve oil tank and the accessory are so disposed as to overlap each other at least partly in vehicle body side view.

According to the this aspect of the invention, in the above-mentioned snowmobile, the internal combustion engine provided on the front side of the rider's seat is mounted with the crankshaft disposed crosswise relative to the traveling direction, the snowmobile comprises the reserve oil tank disposed to cross the center of the vehicle body along the internal combustion engine on the front side of the internal combustion engine, the oil tank provided with the cutout portion, and the accessory provided in the cutout portion, and the reserve oil tank and the accessory are so laid out as to overlap each other at least partly in the vehicle body side view. Therefore, the accessory can be laid out compactly, and, since the amount of protrusion of the oil tank to the front side of the internal combustion engine is suppressed, the length in the front-rear direction of the vehicle body is shortened accordingly.

In another aspect of the invention, the snowmobile may be characterized in that the accessory is a water pump or a starter motor.

According to this aspect of the invention, in the snowmobile as set forth above, the accessory is the water pump or the starter motor. Therefore, the accessory whose layout around the engine requires a comparatively large space can be laid out compactly and with good appearance while contriving effective utilization of the space around the engine.

In a further aspect of the invention, the snowmobile may be characterized in that a muffler is provided on the front side of the reserve oil tank, and an exhaust pipe is connected to the muffler while bypassing the reserve oil tank.

According to this aspect of the invention, in the snowmobile as set forth above, the muffler is provided on the front side of the reserve oil tank, and the exhaust pipe is connected to the muffler while bypassing an upper portion of the reserve oil tank. Therefore, the exhaust pipe laying structure and the muffler layout structure are concentrated into a comparatively narrow space, and the vehicle body front structural portion of the snowmobile can be made to be smaller and compacter.

Some embodiments of the present invention will be described, based on Figs. 1 to 5.

Fig. 1 shows an overall side view of a snowmobile 60 with an internal combustion engine E thereon according to the present invention, and Fig. 2 shows an overall top plan view of the snowmobile 60. As understood from these figures, the internal combustion engine E is mounted at a position near the front side of the vehicle body of the snowmobile 60, left and right front suspensions 61a, 61b are provided at front portions of the vehicle body, and steering skis 62a, 62b are connected to the front suspension 61a, 61b.

The steering skis 62a, 62b are connected to a steering handle 63b at a roughly central portion of the vehicle body through members of a steering system 63 such as a steering shaft 63a, arm pivots, link rods, etc., and the members of the steering system 63 are so disposed as to pass through the front side of the internal combustion engine E, as will be described later. In addition, a seat 64 on which to seat the rider is provided on the vehicle body on the rear side of the steering handle 63b.

Besides, a V belt type automatic transmission 66 comprising a drive pulley 66A and a driven pulley 66B constituting a drive unit for transmitting the drive force of the internal combustion engine E mounted at the position near the front side of the vehicle body to an endless track belt 65 for traveling of the snowmobile 60 is provided, a rotational drive force subjected to speed change by the automatic transmission 66 with a power transmission system which will be described later is transmitted to a drive wheel 67, whereby the track belt 65 is driven, and the snowmobile 60 is driven to travel.

Incidentally, symbol 68 in the figure denotes a radiator disposed under the seat 64.

As is clear by referring to Fig. 1, 2 or 3, an intake pipe E21 and exhaust pipes E11 for the internal combustion engine E are shown in the figures, the intake pipe E21 is extended towards the vehicle body rear side from a rear portion of the engine E and is bent upwards, and an air cleaner E22 is disposed at the upwardly bent portion. In addition, as seen from Fig. 2, the four exhaust pipes E11 are extended towards the vehicle body front side from a front portion of the engine E in the state of being collected in twos, are then collected into one pipe, which is bent in a U shape on the vehicle body front side to be a rearwardly bent portion extending again toward the vehicle body rear side, and a muffler E12 is disposed at the rearwardly bent portion.

Fig. 3 enlargedly shows the structure in the vicinity of a mount portion of the internal combustion engine E, together with frames constituting parts of the vehicle body, the above-mentioned V belt type automatic transmission 66 constituting a part of the drive unit, parts of the steering system 63 such as the steering shaft 63a, and the like. The internal combustion engine E mounted on the vehicle body is mounted in such a condition that its cylinder portion E0 is slightly inclined to the rear side (see Fig. 1), the left side in the figure of the engine E is a front portion E1 of the engine E directed to the front side of the vehicle body of the snowmobile 60, the front side E1 of the engine E is disposed as the exhaust side, and, therefore, the above-mentioned exhaust pipes E11 are extended from the engine front portion E1. Besides, the manner in which a dry sump reserve oil tank 3 (described in detail later) is disposed on the front side of the engine E is also shown in the figure (see Fig. 3).

As shown in a vertical sectional view of an essential part in Fig. 4, the internal combustion engine E comprises a main body structure composed of a crankcase 20, a cylinder block 30, a cylinder head 40, and a cylinder head cover 50. A crankshaft 1 is rotatably supported in the crankcase 20 through a bearing, and large end portions 1c of connecting rods 1b are turnably supported on four crank pins 1a of the crankshaft 1. Pistons 1f are attached to small end portions 1d of the connecting rods 1b through piston pins 1e, respectively. As is understood from this description, the internal combustion engine E in this embodiment is a series 4-cylinder 4-cycle engine.

The crankshaft 1 is supported by five journal portions 1g of the crankcase 20, and is further borne by a ball bearing 1i designed in consideration of the above-described V belt type automatic transmission 66 at a position near the right end 1h of the crankshaft 1. The drive pulley 66A of the V belt type automatic transmission 66 is mounted to a right-side extended shaft portion 1j of the crankshaft 1 which protrudes to the outside of the bearing support portion for support by the ball bearing 1i.

More specifically, the V belt type automatic transmission 66 for transmitting the above-mentioned speed change rotational drive force to the drive wheel 67 for traveling of the vehicle is so configured that the rotational drive force of the drive pulley 66A is transmitted through a V belt 66C to the side of the driven pulley 66B with a desired speed reduction (speed change) ratio as shown in Figs. 1 and 3, and is transmitted from the driven pulley 66B to a sprocket (not shown) coaxial with the drive wheel 67 through a sprocket (not shown) coaxial with the pulley 66B. The transmission of the drive force between the sprockets is performed by a chain or the like (not shown) wrapped around both the sprockets.

The rotational drive force transmitted to the sprocket coaxial with the drive wheel 67 drives the drive wheel 67 to rotate, whereby the traveling drive endless track belt 65 of the snowmobile 60 is driven to rotate along a slide rail 65a while being guided by the rail 65a, and the snowmobile 60 is made to travel.

Here, the V belt type automatic transmission 66 will be simply described referring to Fig. 5. At the time of low-speed rotation or stoppage of the engine E, the side of the drive pulley 66A is held by the action of a spring (not shown) on the side of the driven pulley 66B so that the width of a V groove 66a thereof is enlarged, i.e., the substantial effective diameter of the pulley 66A is reduced, and the side of the driven pulley 66B is held by the action of the spring (not shown) on the side of the driven pulley 66B so that the width of a V groove 66b thereof is reduced, i.e., the substantial effective diameter of the pulley 66B is enlarged.

A movable pulley piece portion 66A2 of the drive pulley 66A is equipped with a weight member (not shown in Fig. 5), and the weight member has the action of varying the speed reduction (speed change) ratio in the V belt type automatic transmission 66. The action of a centrifugal force according to the rotation of the engine E (crankshaft 1) moves the weight member in the radial direction of the pulley piece portion 66A2, and, attendantly, the pulley piece portion 66A2 moves in the direction for varying the width of the V groove 66a, whereby the speed reduction ratio is varied, resulting in an automatic non-stage speed change.

Specifically, at the time of high-speed rotation of the engine E (crankshaft 1), due to the action of a centrifugal force the weight member (not shown) is moved outwards in the radial direction of the movable pulley piece portion 66A2 against the above-mentioned spring force (the spring at the driven pulley 66B), and the movable pulley piece portion 66A2 is moved in the direction of reducing the width of the V groove 66a in the drive pulley 66A. Therefore, the position of contact of the V belt 66C set in the V groove 66a with the V groove 66a is shifted radially outwards, whereby the substantial effective diameter of the drive pulley 66A is enlarged.

On the other hand, in the driven pulley 66B, attendant on the shift of the position of contact of the V belt 66C on the side of the drive pulley 66A in the radially outward direction, the pulley piece portion 66B1 is moved against a spring force (not shown) in the direction of contrarily enlarging the width of the V groove 66b, whereby the substantial effective diameter of the driven pulley 66B is reduced, and the speed reduction ratio is reduced. With the speed reduction ratio, the endless track belt 65 is driven, and the snowmobile 60 travels at a high speed.

In addition, at the time of low-speed rotation of the engine E (crankshaft 1), the weight member is located on the radially inside of the movable pulley piece portion 66A2, and the movable pulley piece portion 66A2 is moved in the direction of enlarging the width of the V groove 66a, so that the substantial effective diameter of the drive pulley 66A is reduced. On the other hand, the width of the V groove 66b in the driven pulley 66B is reduced, the substantial effective diameter of the driven pulley 66B is enlarged, and the speed reduction is enlarged. With the speed reduction ratio, the endless track belt 65 is driven, and the snowmobile 60 travels at a low speed. Incidentally, such a V belt type automatic transmission 66 itself has been already known.

Referring again to Fig. 4, as seen from the figure, a sprocket 1k with a small diameter is provided at a position adjacent to a support portion of the ball bearing 1i near the right end 1h of the crankshaft 1. A chain Pwc is wrapped around the sprocket 1k and a sprocket Pwb provided on a pump shaft Pwa of a cooling water pump Pw described later (see Figs. 3 and 12), whereby the cooling water pump Pw is driven in conjunction with the rotation of the crankshaft 1.

On the other hand, a rotor portion 2a of a generator 2 is mounted in the vicinity of the left end portion 1m of the crankshaft 1, and an oil pump shaft 1q connected to the end portion 1m through a joint 1p and extended is provided coaxially with an extended shaft portion 1n composed of a bolt B rooted in the left end portion 1m of the shaft 1. Besides, two oil pumps Pf, Ps are arranged side by side on the oil pump shaft 1q.

Of the two pumps arranged side by side relative to the oil pump shaft 1q, the oil pump Pf on one side is a feed pump for supplying a lubricating oil, while the oil pump Ps on the other side is a scavenge pump for returning an oil collected in a bottom portion 21 of the crankcase 20 to the dry sump reserve oil tank 3. Incidentally, the lubricating oil supplying and feeding actions of the pumps Pf, Ps will be described later and, hence, is not described here.

A sprocket 1r with a small diameter is mounted to the crankshaft 1 at a position near the left end portion 1m of the crankshaft 1. The sprocket 1r is for driving two camshafts 4a, 4b of a vale operating system 4. A cam chain 4e is wrapped around sprockets 4c, 4d mounted to the camshafts 4a, 4b and this sprocket 1r, whereby the rotation of the crankshaft 1 is transmitted to the two camshafts 4a, 4b at a halved (1/2) rotating speed.

In addition, a gear 1s with a comparatively large diameter is mounted adjacent to the sprocket 1r through a one-way clutch 1t. The gear 1s is a gear for a starter motor (see Fig. 5), and is connected in a conjunction manner to a gear 5a integral with a motor shaft 5A of the starter motor 5 through the meshing between intermediate gears 5b, 5c (see Fig. 5).

The cylinder block 30 is connected to an upper portion of the crankcase 20, the cylinder block 30 is provided with four cylinder bores 31 penetrating through the block 30 and arranged side by side, and the pistons 1f are slid in the four cylinder bores 31 as known. Incidentally, the cylinder head 40 is connected to an upper portion of the cylinder block 30.

The cylinder head 40 is provided with four combustion chambers 42 defined by four recessed portions on the lower side thereof and upper portions of the four cylinder bores 31, and the combustion chambers 42 are each provided with intake and exhaust ports 43, 44 for intake and exhaust, intake and exhaust valves 45, 46 for opening and closing the intake and exhaust ports 43, 44, a spark plug 47 and the like.

The cylinder head 40 is provided therein with intake and exhaust passages 48, 49 in communication with the intake and exhaust ports 43, 44 provided in the combustion chambers 42. An upper portion of the cylinder head 40 is provided with the above-mentioned drive system 4 for operating the intake and exhaust valves 45, 46, i.e., cams 4f, 4g, the (two) camshafts 4a, 4b, drive mechanisms therefor, tappets 4h and the like. Besides, a cylinder head cover 50 is mounted to an upper portion of the cylinder head 40.

As shown in Figs. 3 and 7, at a wall portion forming portion between the crankcase 20 and the cylinder block 30 at the front portion E1 of the internal combustion engine E, i.e., at the wall portion forming portion of the front portion E1 of the engine E with the crankshaft disposed orthogonally to the traveling direction of the engine E mounted on the vehicle, the dry sump reserve oil tank 3 having a crosswise length ranging over the roughly whole part of the width of the wall portion forming portion (see Figs. 6, 9, 11 and the like also).

Here, a somewhat detailed description will be added, centered on the structure of the dry sump reserve oil tank 3 disposed at the front portion E1 of the internal combustion engine 1 and the characteristic features as to layout of the tank 3 onto the engine E.

The dry sump reserve oil tank 3 is a tank shaped roughly like a rectangular parallelopiped which is elongate crosswise and having a predetermined width and a predetermined height as shown in Figs. 9 to 11. In front view shown in Fig. 9, in the crosswise direction of the rectangular tank 3, i.e., in the longitudinal direction of the tank 3, a right lower portion and a left upper portion of the tank 3 are rectangularly cut out over a predetermined length and in a predetermined vertical depth; as a whole, the tank 3 has an outside shape similar to a roughly crank form in front view.

As above-described, the crosswise length, i.e., the longitudinal length L of the reserve tank 3 is set to a length for crossing the wall portion forming portion of the crankshaft 20 and the cylinder block 30 in the front portion E1 of the engine E in the layout of the tank 3 onto the internal combustion engine front portion E1 (see Fig. 6), and the height H of the tank 3 is set to a height ranging from a lower portion of the crankcase 20 to a lower portion of the cylinder head 40 at the wall portion forming portion in the layout of the tank 30 onto the internal combustion engine front portion E1 (see Figs. 3, 6, and 7 and the like).

In addition, the width B of the reserve oil tank 3 is set to be substantially constant as shown in Fig. 11, in top plan view of the tank 3 shown in Fig. 11. The crosswise length of the tank 3 crossing the internal combustion engine front portion E1, i.e., the width, or the length B in the maximum width direction, of the tank 3, as compared with the longitudinal length L and the height H of the tank 3 ranging from the lower portion of the crankcase 20 to the lower portion of the cylinder head 40 is suppressed.

Besides, the width of the reserve oil tank 3 varies according to its position in the height direction. In side view of the tank 3 as shown in Fig. 10, the tank 3 is wider on the upper side to have a maximum tank width as the tank width B, and the tank 3 is narrower on the lower side; as a whole, the width of the tank 3 is set at a width such that the amount of protrusion of the tank 3 toward the front side of the engine E in the layout of the tank 3 at the front portion E1 of the engine E is suppressed as much as possible, and such that the cooling water pump Pw (described later) is contained substantially entirely.

The reserve oil tank 3 is provided with a recessed groove 3A1 as a recessed portion penetrating vertically through the tank 3, at a tank central portion 3A0 of one-side tank wall 3A in the crosswise direction of the tank 3, i.e., in the longitudinal direction of the tank 3. As shown in Fig. 11, the recessed groove 3A1 is formed as a recessed groove 3A1 formed in a recessed form with a wall surface of the one-side tank wall 3A having a roughly arcuate section, so as to vertically pass, in a trough-like shape and with slight inclination, through the central portion 3A0 of the one-side wall portion 3A.

The trough-like recessed groove 3A1 is for passage of the steering shaft 63a (see Figs. 3 and 7) passing on the front side of the one-side tank wall 3A constituting substantially the tank front wall in the layout of the tank 3 to the engine front portion E1 (described later). For this purpose, the recessed groove 3A1 is formed with an arcuate section so as to be capable of passing and containing, with an allowance and without hindering the turning of the steering shaft 63a circular in section, specifically, a second extended portion 63a2 (described later) of the steering shaft 63a.

Of the recessed groove 3A1 for passage of the steering shaft 63a, the depth of the arcuate section is set to such a depth that the steering shaft 63a, more accurately the second extended portion 63a2 (described later) of the steering shaft 63a is substantially wholly contained in vehicle side view; in other words, in the vehicle side view, the second extended portion 63a2 of the steering shaft 63a is entirely covered by the one-side wall 3A in the longitudinal direction of the tank 3, namely, by the front wall of the tank 3. However, the structure may naturally be a structure in which the depth of the arcuate section of the recessed groove is smaller and the steering shaft 63a is partly covered.

The respective sizes of the cutouts 3C, 3D provided at the tank right lower side and tank left upper side of the one-side tank wall 3A of the reserve oil tank 3 are so formed that a sufficiently large space is secured for containing the cooling water pump Pw and the starter motor 5 (described later) disposed around the engine E1 in the layout of the tank 3 to the engine front portion E1.

The cutout 3C on the right lower side is for forming a space served for containing the cooling water pump Pw, and has a crosswise length and a length in height direction sufficient for the purpose. On the other hand, the cutout 3D on the left upper side is for forming a space served for containing the starter motor 5, and has a crosswise length and a length in height direction sufficient for the purpose.

At an upper portion of the cutout (3D) forming side wall portion 3D1 near the tank center portion of the cutout 3D on the left upper side of the reserve oil tank 3, an upper opening 3d opened to the left side in Fig. 9 is formed, which is an opening 3d served for receiving a return oil to the reserve oil tank 3 described later. In addition, at a lower portion 3E near the central portion of the tank 3 located roughly vertically opposite to the opening 3d with respect to the tank 3, a lower opening 3c opened to the lower side is formed, which is an opening 3c served as a supply port of the lubricating oil from the tank 3 as described later.

The structure of the dry sump reserve tank 3 as a single body is substantially as described above. While the oil tank 3 is laid out at the front portion E1 of the internal combustion engine E as above-described, the condition of layout of the oil tank 3 onto the engine E is as shown in Figs. 3, 6, 7 and the like.

The layout of the dry sump reserve oil tank 3 at the front portion E1 of the engine E is such that the one-side tank wall 3A in the longitudinal direction of the oil tank is on the front side, i.e., on the side opposite to the engine E, as above-described, and that the other-side wall 3B being roughly vertical is opposed to the above-mentioned predetermined wall portion forming portion, i.e., the wall portion forming portion between the crankcase 20 and the cylinder block 30, with a predetermined gap therebetween and by an appropriate means which is not clearly shown in the figure (see Fig. 7).

In a side perspective view of the layout of the reserve oil tank 3 at the engine front portion E1, as shown in Figs. 3, 7 and the like (see Fig. 10 also), the oil tank 3 has a width larger on the upper side and smaller on the lower side, and the other-side tank wall 3B on the side of the engine E is roughly vertical. Therefore, the one-side tank wall 3A on the front side is so disposed that an upper front portion 3A2 thereof projects slightly to the front side, i.e., projects so as to part away from the front portion E1 of the engine E, and a lower front portion 3A3 thereof is retracted toward the side of the engine E.

In addition, in a front perspective view of the front portion E1 of the engine E from the front side of the engine E, in the layout of the oil tank 3 at the engine front portion E1, a space portion E1a defined by the above-mentioned rectangular cutout 3C is formed at a right lower portion of the tank 3, and a space portion E1b defined by the above-mentioned rectangular cutout 3D of the tank 3 is formed at a left upper portion of the tank 3.

The above-mentioned upper opening 3d for receiving the return oil which is formed with the opening portion directed to the left side in the figure on the upper side of the side wall portion 3D1 near the tank center of the space portion E1b defined by the cutout 3D at the left upper portion of the tank 3 is connected to a collected oil return oil passage S2, and the upper opening 3d for receiving the return oil is communicated with the scavenge pump Ps not shown in Fig. 6 through the oil passage S2.

At the lower portion in the vicinity of a central portion in the width direction of the tank 3, i.e., at the return oil receiving upper opening 3d in the width direction of the tank 3, the above-mentioned lower opening 3c for supplying the lubricating oil which has the opening portion directed to the lower side of the tank lower portion 3E substantially vertically opposed to the upper opening 3d is connected to a lubricating oil suction oil passage F1, and the lower opening 3c is communicated with the feed pump Pf not shown in Fig. 6 through the oil passage F1.

At the space portion E1a defined by the cutout 3C on the right lower side in the front perspective view of the tank 3, the cooling water pump Pw is disposed as above-mentioned. The pump Pw is mounted to the engine front portion E1, and the cooling water pump Pw in this mount condition is disposed with its cooling water suction port PwA1 on the lower side and its cooling water discharge port PwB on the upper side so that the vicinity of the upper discharge port is covered by a tank structural portion in the front perspective view (see Fig. 9) and that the lowermost side in the vicinity of the lower suction port PwB is located at a position substantially the same as a lowermost portion of the tank 3 (see Figs. 6 and 9).

For the positioning of the cooling water pump Pw, as shown in Fig. 11, the reserve oil tank 3 has a width B for sufficiently covering the amount of protrusion to the front side of the engine E of the cooling water pump Pw disposed at the position indicated in the figure by dot-dash lines in the top plan view in the condition of layout of the tank 3 at the engine front portion E1.

In addition, as above-mentioned, the starter motor 5 is disposed at the space portion E1b defined by the cutout 3D on the left upper side in the front perspective view of the reserve oil tank 3. The starter motor 5 is mounted to the front portion E1 of the engine E, and, in this condition, the starter motor 5 is contained and held in the space portion E1b with the projecting direction of the motor shaft 5A thereof directed to the left side in the figure, i.e., outwards in the width direction of the engine E (see Fig. 6).

In the front perspective view, a portion 5B on the lower side of the starter motor 5 is covered by a structural portion of the reserve oil tank 3 (see Fig. 9), and, in the top plan view of the tank 3, the starter motor 5 is so located that about one half of the width thereof is covered over the entire length thereof (see Fig. 10).

At the tank wall 3A on one side of the dry sump reserve oil tank 3 in the front perspective view of the tank 3, i.e., in the recessed groove 3A1 arcuate in section passing on the upper and lower sides of the tank 3 which is formed in a roughly central portion 3A0 in the left-right direction of the front wall of the tank 3, the steering shaft 63a jointed to the steering handle 63b of the snowmobile 60, more specifically the second extended portion 63a2 (described later) of the shaft 63a is disposed to pass vertically and without hindering the turning thereof, and the vertical passage of the steering shaft 63a through the recessed groove 3A of the second extended portion 63a2 is disposed in an inclined condition with its upper portion slightly on the front side relative to the engine E and with its lower portion retracted toward the engine, as above-mentioned (see Fig. 7).

The layout for vertical passage, without hindering the turning, of the second extended portion 63a2 of the steering shaft 63a through the recessed groove 3A1 in the central portion 3A0 of the reserve oil tank 3 is in the above-mentioned inclined structure relative to the engine E where the upper portion of the extended portion 63a2 is located on the front side and the lower portion of the extended portion 63a2 is retracted toward the engine E.

However, in the structure for inclined layout of the second extended portion 63a2 of the steering shaft 63a, the mount condition of the internal combustion engine E on the snowmobile 60 is in the rear inclined layout as shown in Figs. 1 and 3, so that the substantial equipment condition of the steering shaft 63a in the snowmobile 60 is such that the upper portion of the second extended portion 63a2 of the shaft 63a is slightly inclined toward the rear side of the vehicle, and the steering shaft 63a is provided on the snowmobile 60.

In short, as seen from Fig. 6, the reserve oil tank 3 laid out onto the above-mentioned internal combustion engine E having the above-mentioned structure provides a structure in front view such that the cooling water pump Pw and the starter motor 5 are disposed at the front portion E1 of the engine E on the left and right positions with respect to a steering post which is the recessed groove 3A1 vertically passing through the tank 3 at the tank central portion 3A0 for the steering system 63.

Meanwhile, the steering shaft 63a is composed of a straight pipe formed of an ordinary steel material or the like, and is directed along the center in the width direction of the snowmobile 60 rearwards from the front side of the engine E while passing through the upper side of the engine E. The upper end of the upper extended portion 63a1 of the shaft 63a reaches a substantially central portion in the vehicle body front-rear direction of the snowmobile 60, the steering handle 63b is mounted to the upper end of the extended portion 63a1, and the extended portion 63a1 is extended straight to the front side of the engine E while being directed from the steering handle 63b skewly downwards at a comparatively moderate inclination angle and passing through the upper side of the internal combustion engine E.

The second extended portion 63a2 turning downwards with a directionality of its extension direction slightly toward the front side through a joint portion 63a3 at a vertically corresponding portion on the front side of the mounted internal combustion engine E is connected to the extended portion 63a1 of the steering shaft 63a. The downward second extended portion 63a2 is passed through the inside of the steering post composed of the recessed groove 3A1 formed in the tank front wall of the reserve oil tank 3, and a link rod (not clearly shown) for steering the steering skis 62a, 62b is mounted to the lower end of the downward extended portion 63a2.

The dry sump reserve oil tank 3 has a structure generally above-described, has the above-described layout structure relative to the internal combustion engine E, and has the above-described structure in relation to the steering shaft 63a in the steering system 63 in the snowmobile 60.

Meanwhile, as understood by referring to Figs. 4, 7, 12 and the like, an oil cooler 11 and an oil filter 12 are disposed at wall portion corresponding portions of the cylinder block 30 and the cylinder head 40 in a side portion (the left side surface in Fig. 4) parallel to the vehicle traveling direction of the engine E and at a location roughly on the upper side of the oil pumps Pf, Ps and the generator 2 at the left end 1m of the crankshaft 1. The oil cooler 11 and the oil filter 12 are integral with each other, and a lower structural portion of a unit 10 having an integral structure in the mount condition is mounted to an upper portion of a crankcase cover 23, whereby the above-described layout is attained.

The lower structural portion in the mount condition of the integrally structured unit 10, i.e., the lower structural portion served for mounting onto the upper portion of the crankcase cover 23 is configured as the oil cooler 11. The oil cooler 11 comprises a cylindrical heat exchange portion not clearly shown in the figure, and is provided with a cooling water introduction pipe 11a and a cooling water discharge pipe 11b for this purpose (see Fig. 14). In addition, an upper structural portion of the unit 10 is configured as the oil filter 12.

As has been described above, the internal combustion engine E in this embodiment has the generally above-mentioned structure, and the layout of the reserve oil tank and accessories around the engine also has the above-mentioned structure.

Here, a description will be added as to the lubricating oil supplying structure adopting the so-called dry sump system in the internal combustion engine E. Incidentally, a schematic diagram of the lubricating oil supply system in this embodiment is shown in Fig. 13.

As has been described above and as understood by referring to Figs. 4, 12 and the like, at the left end 1m of the crankshaft 1, there are provided side by side the two oil pumps Pf, Ps, namely, the feed pump Pf and the scavenge pump Ps, which are provided on the pump shaft 1q kept coaxial with the crankshaft 1 and rotated in conjunction with the crankshaft 1.

As shown in Fig. 7, the suction port PfA of the feed pump Pf is communicated with the lower opening 3c of the dry sump oil tank 3 through a lubricating oil suction passage F1, while the discharge port PfB of the feed pump Pf is communicated with the unit 10 comprising the oil cooler 11 and the oil filter 12 integral with each other through a lubricating oil supply passage F2, and the lubricating oil supply passage F2 provides communication between a lower portion of the unit 10 and the discharge port PfB of the feed pump Pf. Therefore, driving the feed pump Pf supplies the lubricating oil present in the dry sump oil tank 3 to the unit 10.

Incidentally, the lubricating oil supply passage F2 is provided with a branch oil passage F01 (see Fig. 13), and a relief valve V1 (see Figs. 7 and 13) is disposed in the branch oil passage F01. The valve V1 acts to regulate the lubricating oil supply pressure in the lubricating oil supply passage F2, and the lubricating oil flowing out from the relief valve V1 is again returned into the lubricating oil suction passage F1 through a branch oil passage F02 (see Fig. 13).

The lubricating oil supplied to the unit 10, filtered by the oil filter 12 in the unit 10 and cooled by the oil cooler 11 is supplied from the supply passage in the vicinity of a lubricating oil outlet of the unit 10 to an oil gallery F5 through branch supply passages, i.e., lubricating oil supply passages F3, F4 (see Fig. 7) and to the valve operating system 4, i.e., camshafts 4a, 4b in the valve operating system 4 through lubricating oil supply passages F10, F11 (see Fig. 4), as understood by referring to Figs. 4, 7, 8 and the like.

The lubricating oil supply passages F3, F4 which are branch supply passages to the oil gallery F5 communicated with the lubricating oil outlet of the unit 10 are equipped therein with check valves V2 (see Fig. 12), and the layout of the check valves V2 is conducted by utilizing the mating surface 24 between the crankcase 20 and the case cover 23.

As shown in Fig. 4, the oil gallery F5 is extended in parallel to the crankshaft 1 on the lower side of the crankshaft 1, and the extension length thereof is such as to range over the roughly whole length of the crankshaft 1. A plurality of lubricating oil supply passages F6, F7 for supplying the lubricating oil from the oil gallery F5 to the crank pin portions 1a to which the journal portions 1g and the connecting rods 1b of the crankshaft 1 are connected are branchedly provided in the gallery F5.

In addition, injection ports F8 for jetting the lubricating oil to inside wall portions of the cylinder bores 31 and, further, a lubricating oil supply passage F9 for supplying the lubricating oil to the ball bearing 1i near the right end of the crankshaft 1 are branched from the oil gallery F5.

As shown in Fig. 4, lubricating oil supply passages F10, F11 communicated with the camshafts 4a, 4b of the valve operating system 4 are formed as the supply passage F10 communicated with the lubricating oil outlet of the unit 10 and extended horizontally through a joint portion 24 of the crankcase 20 and the crankcase cover 23, and the supply passage F11 bent roughly rectangularly from the supply passage F10 and extended upwards along opening portions 30A, 40A for the cam chain 4e of the cylinder block 30 and the cylinder head 4 on the upper side of the crankcase 20. The supply passages F10, F11 are communicated with lubricating oil supply passages F13, F14 in the camshafts 4a, 4b through a branch supply passage F12, and a plurality of open holes F15, F16 opened in cam surfaces are provided in the lubricating oil supply passages F13, F14 in the camshafts 4a, 4b (see Fig. 8).

The scavenge pump Ps arranged side by side relative to the feed pump Pf has a pump suction port PsA (see Fig. 4) connected to an oil passage S1 for sucking the collected oil (described later) in the bottom portion 21 of the crankcase 20. In Fig. 4, the collected oil suction passage S1 extends from the pump suction port PsA to an oil collection portion 22 located at a roughly central portion of the bottom portion 21 of the crankcase 20, and the extension end thereof fronting on the oil collection portion 22 is provided with an opening S0 for sucking the collected oil present in the oil collection portion 22.

In addition, the collected oil suction passage S1 is extended from the oil collection portion 22 roughly horizontally along the bottom portion 21 of the crankcase 20 and along the crankshaft 1 and extended on the lower side of the oil gallery F5 and in parallel to the crankshaft 1 and the oil gallery F5, to be communicated to the suction port PsA of the scavenge pump Ps.

As shown in Fig. 7, the discharge port PsB of the scavenge pump Ps is communicated with the upper opening 3d of the dry sump reserve oil tank 3 through the collected oil return passage S2, and the passage S2 is extended roughly skewly upwards from the pump discharge port PsB toward an upper portion of the oil tank 3. Therefore, by the structure of both the oil passages S1, S2 communicated with the scavenge pump Ps, the collected oil in the crankcase bottom portion 21 is returned to the dry sump reserve oil tank 3 by driving the scavenge pump Ps.

The supply of the lubricating oil in the internal combustion engine E having the lubricating oil supplying structure as above-described will be additionally described referring to Figs. 4, 7, 8 and the like. It is to be noted that the above described supply of the lubricating oil is explained in the schematic diagram of the lubrication oil supply system shown in Fig.13.

Attendant on the rotation of the crankshaft 1 by starting the internal combustion engine E, the two oil pumps Pf, Ps, namely, the feed pump Pf and the scavenge pump Ps are driven. As shown in Fig. 7, with the feed pump Pf driven, the lubricating oil in the dry sump reserve oil tank 3 is sucked through the lubricating oil suction passage F1 and the pump suction port PfA into the pump Pf, the pump pressure for the lubricating oil is raised in the pump Pf, and the lubricating oil is fed under pressure from the discharge port PfB of the pump Pf.

The lubricating oil fed under pressure from the discharge port PfB of the pump Pf flows through the lubricating oil supply passage F2, to be supplied into the unit 10 comprising the oil cooler 11 and the oil filter 12 integral with each other.

The supply pressure in the lubricating oil supply passage F2 is regulated by the relief valve V1 provided in the branch oil passage F01 (see Fig. 13), and the lubricating oil flowing out of the valve V1 under the pressure regulating action of the valve V1 is returned through the oil passage F02 (see Fig. 13) to the lubricating oil suction passage F1.

The lubricating oil flowing into the unit 10 is circulated in the unit 10, while it is filtered by the oil filter 12 and is cooled by the heat exchange portion of the oil cooler 11. The lubricating oil filtered and cooled in the unit 10 flows through the branch lubricating oil supply passage F3, F4 and F10, F11 (see Fig. 4), to be supplied respectively to the oil gallery F5 and the camshafts 4a, 4b and the like in the valve operating system 4.

The lubricating oil fed under pressure into the branch lubricating oil supply passage F3 communicated with the oil gallery F5 flows through the supply passage F3, pushes open the above-mentioned check valve V2 (see Fig. 12), and flows through the lubricating oil supply passage F4, to be supplied into the gallery F5. The lubricating oil supplied into the oil gallery F5 flows through the oil gallery F5 extending along the crankshaft 1 on the lower side of the crankshaft 1.

The lubricating oil having flowed through the gallery F5 passes through the branch lubricating oil supply passages F6, F7, and is supplied to the journal portions 1g and the crank pin portions 1a, to which the connecting rods 1b are connected, of the crankshaft 1 so as to lubricate these components. In addition, the lubricating oil is supplied to the cylinder bore inside wall 31 via the lubricating oil injection ports F8 and is supplied through the branch lubricating oil supply passage F9 to the ball bearing 1i near the right end of the crankshaft 1 so as to lubricate these components (see Fig. 4).

On the other hand, the lubricating oil fed under pressure to the branch lubricating oil supply passages F10, F11 communicated with the camshafts 4a, 4b in the valve operating system 4 flows first in the lubricating oil supply passage F10 extending horizontally while passing through the mating surface 24 of the crankcase 20 and the case cover 23, and flows into the lubricating oil supply passage F11 which is bent roughly perpendicularly and extends upwards through the wall portions of the opening portions 30A, 40A for the cam chain 4e of the cylinder block 30 and the cylinder head 40 along the wall portions and the water jacket 32 of the cylinder block 30 (see Fig. 4).

The lubricating oil having flowed through the lubricating oil supply passage F11 is branched while passing through the two lubricating oil supply passages F12 branched at an upper portion of the supply passage F11, the branched streams flow through the lubricating oil supply passages F13, F14 being hollow hole portions 4i, 4j in the two camshafts 4a, 4b, i.e., the respective camshafts 4a, 4b of the camshaft 4a on the intake side and the camshaft 4b on the exhaust side, flow from the lubricating oil supply passages F13, F14 through open holes F15, F16 opened in a plurality of cam surfaces to flow out of the cam surfaces, and are served to lubrication and cooling of the cam surfaces of the cams 4f, 4g, the tappets 4h and the like (see Figs. 4 and 8). The return oil having been served to lubrication flows to the oil collection portion 22 in the bottom portion 21 of the crankcase 20 through the return oil passage and the like penetrating through the cylinder block 30 not clearly shown in the figures.

Though not clearly shown or described, the lubricating oil is appropriately supplied to drive shaft portions of accessories and the like through other branch lubricating oil supply passages.

The lubricating oil served to lubrication of the above-mentioned portions of the engine drops in the engine E, or is passed through a lubricating return passage not clearly shown in the figure, to flow to the oil collection portion 22 in the bottom portion 21 of the crankcase 20 (see Fig. 4).

The lubricating oil served to lubrication of the above-mentioned portions of the internal combustion engine E and dropped into the oil collection portion 22 in the bottom portion 21 of the crankcase 20 or passed through the return oil passage not clearly shown to flow into the oil collection portion 22 is sucked through the collected oil suction passage S1 and the pump suction port PsA by the scavenge pump Ps driven together with the feed pump Pf, the pump pressure for the collected lubricating oil is raised in the pump Ps, the collected oil is passed through the collected oil return passage S2 to be returned and recovered into the dry sump reserve oil tank 3 (see Figs. 4 and 7), and is again fed through the above-mentioned lubricating oil supply routes, to be served to lubrication of the above-mentioned portions of the engine E.

Now, a description will be added as to the cooling structure in the internal combustion engine E in this embodiment.

As shown in Fig. 6, the cooling water pump Pw disposed in the cutout space portion E1a of the dry sump reserve oil tank 3 at the internal combustion engine front portion E1 is driven to rotate synchronously with the rotation of the crankshaft 1 through a chain Pwc wrapped around the sprocket 1k (see Figs. 3 and 4) provided near the right end portion 1h in the figure of the crankshaft 1 as above-mentioned and the sprocket Pwb attached to a cooling water pump shaft Pwa (see Figs. 3 and 15).

As understood by referring to Figs. 6 and 14, a cooling water return passage W1 is provided for communication between a cooling water suction port PwA1 of the cooling water pump Pw and a cooling water outlet of a radiator 68 (see Fig. 1) shown in Figs. 6 and 14 which is disposed on the lower side of the seat 64 in the snowmobile 60. In addition, a cooling water supply passage W2 is provided for communication between the cooling water discharge port PwB of the cooling water pump Pw and a cooling water introduction port E01 for introducing the cooling water via the center of the engine front portion E1 to the engine E. Further, a cooling water supply passage W3 is provided which is composed of a water jacket 32 and the like and through which the cooling water introduced via the cooling water introduction port E01 for introducing the cooling water via the center of the engine front portion E1 to the engine E is introduced to the periphery of the cylinders 31 of the engine E.

In addition, a cooling water passage W4 is provided which is for communication between the outlet of the cooling water supply passage W3, namely, the cooling water discharge port E02 for discharge from the inside of the engine E and the cooling water inlet of the radiator 68 and which is intermediated by a thermostat and a reserve tank (not shown). Besides, a bypass cooling water passage W10 (see Figs. 6 and 14) for the time of cooling (the time of warming operation) through which the cooling water having low temperature passes is branched from the thermostat, and the passage W10 is communicated to the suction port PwA2 (see Fig. 6) of the cooling water pump Pw.

Incidentally, while the cooling water introduction port E01 for introduction to the engine E is located at a roughly central portion in the vertical direction of the cylinder block 30, the cooling water outlet E02 for discharge from the engine E is located at an upper portion in the vertical direction of the cylinder block 30. Therefore, the cooling water introduction port E01 and the cooling water discharge port E02 are disposed in an upper-lower relationship with each other in the cylinder block 30 (see Fig. 6).

Further, a cooling water supply passage W20 connected to a cooling water introduction pipe 11a of the oil cooler 11 is provided at a position in the vicinity of a connection portion between the cooling water supply passage W2 and the cooling water introduction passage E01 (see Figs. 6 and 14), and a cooling water passage W21 connected to a cooling water discharge pipe 11b of the oil cooler 11 is also provided there. Though not shown in the figures, the cooling water passage W21 is communicated to the cooling water passage W4 for communication between the cooling water discharge port E02 and the cooling water inlet of the radiator 68.

Therefore, when the cooling water pump Pw is driven to rotate in conjunction with the rotation of the crankshaft 1 caused by starting the internal combustion engine E and cooling water cooled at the radiator 68 is sucked in via the suction port PwA1 of the pump Pw, the cooling water sucked into the pump Pw is raised in its pump pressure in the pump Pw, is discharged via the discharge port PwB of the pump Pw, and is passed through the cooling water supply passage W2 and through the cooling water introduction port E01 provided at the center of the engine front portion E1 into the engine E (see Fig. 6), to flow into the cooling water supply passage W3 composed of the water jackets 32 or the like in the engine E (see Fig. 14).

The cooling water flowing into the cooling water supply passage W3 in the engine E is introduced into the water jackets 32 around the cylinder bores 31 forming essential parts of the passage W3, and flows through the jackets 32, flows through cooling water supply passages in the cylinder head 40 which are not shown, to absorb heat. The cooling water thus warmed is discharged to the exterior of the engine E via the outlet of the cooling water passage W3 in the engine E, namely, via the cooling water discharge port E02 for discharge from the inside of the engine E, flows through the cooling water passage W4 being a passage communicated with the discharge port E02 and provided for connection to the radiator 68 (see Fig. 14), and is introduced from an upper portion of the radiator 68 into the inside of the radiator 68 through an inlet.

The warmed cooling water introduced into the inside of the radiator 68 is circulated in the radiator 68, to be deprived of heat during the circulation process, whereby the cooling water is cooled. Then, the cooling water thus cooled is again sucked into the suction port PwA1 of the cooling water pump Pw via the cooling water return passage W1 (see Fig. 6), and is passed through the above-mentioned cooling water supply routes to be circulated for being served to cooling of the portions of the engine E.

The invention in this embodiment has the above-described structure, and displays the following functions or effects peculiar to this embodiment.

In this embodiment, the reserve oil tank 3 is provided with the recessed groove 3A1 which is a recessed portion formed in the wall 3A on one side in the longitudinal direction thereof, namely, the tank front wall, and the steering shaft 63a passes through the inside of the recessed groove 3A1. Therefore, it is possible to lay out the steering shaft 63a compactly, to contrive effective utilization of space, and to enlarge the degree of freedom in selecting the layout of various component parts in a limited space in the snowmobile 60.

The steering shaft 63a passing on the front side of the internal combustion engine E is substantially contained in the recessed groove 3A1 while passing through the inside of the recessed groove 3A1. Therefore, it is possible to reduce the length in the front-rear direction of the vehicle body of the snowmobile 60 accordingly, whereby it is possible to reduce the size of the vehicle body of the snowmobile 60.

In addition, in vehicle body side view, the steering shaft 63a passing through the inside of the recessed groove 3A1 formed in the wall 3A on one side in the longitudinal direction of the reserve oil tank 3, namely, the tank front wall, is entirely covered by the tank front wall being the one-side wall 3A of the reserve oil tank 3 to be directly invisible, or is partly or nearly mostly covered by the front wall of the tank 3 to be partly or mostly invisible. Therefore, enhancement of the appearance of the vehicle in side view is enhanced.

The reserve oil tank 3 is provided with cutouts 3C, 3D on the right lower side and the left upper side in front view, and the cooling water pump Pw and the starter motor 5 are disposed in the respective space portions E1a, E1b defined by the cutouts 3C, 3D in layout of the tank 3 at the engine front portion W1. Therefore, it is possible to effectively utilize the space for laying out accessories in the engine front portion E1, and to contrive a reduction in the size of the vehicle body of the snowmobile 60. In addition, since the surroundings of the engine E are made compact in form, it is easy to mount the engine E onto the vehicle body of the snowmobile 60, and the cost of mounting the engine E onto the vehicle body can be reduced accordingly.

The reserve oil tank 3 is disposed at the front portion E1 of the internal combustion engine E having its crankshaft disposed orthogonal to the front-rear direction of the vehicle body so as to cross the engine front portion E1, so that the tank width B in the front-rear direction of the tank 3 is restrained from being substantially enlarged. Moreover, as above-described, the cooling water pump Pw and the starter motor 5 are contained in the space portions E1a, E1b defined by the cutouts 3C, 3D on the right lower side and the left upper side of the reserve oil tank 3, and the steering shaft 63a is passed through the recessed wall 3A1 in the front wall being the wall 3A on one side in the longitudinal direction of the tank 3, so that a reduction in the length of the vehicle body of the snowmobile 60 is effectively contrived.

Besides, since the reserve oil tank 3 and various accessories and the like are concentratedly laid out at the engine front portion E1, the layout of the accessories and the like at side portions of the engine E and at a rear portion of the engine E can be reduced largely, the length and crosswise width of the snowmobile 60 can be reduced, and the snowmobile 60 can be reduced in size. Moreover, the reduction or removal of the layout of accessories at the rear portion of the engine E makes it possible for the rider seated on the rear portion side of the engine E to approach the engine E, so that effective utilization of space in the snowmobile 60 is contrived, and the vehicle body length of the snowmobile 60 can be reduced.

The structure of the reserve oil tank in the internal combustion engine and the structure for laying out the tank according to the present invention can be adopted in various vehicle internal combustion engines within an applicable range.

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 snowmobile comprising a dry sump type combustion engine mounted on the front side of a vehicle body, a rider's seat provided on the rear side of said internal combustion engine, a crankshaft of said internal combustion engine, and a transmission mechanism through which the rotation of said crankshaft is transmitted to an endless track belt so as to drive said endless track belt to rotate, thereby driving said snowmobile to travel, wherein said internal combustion engine provided on the front side of said rider's seat is mounted with said crankshaft disposed crosswise relative to the traveling direction, said snowmobile comprises a reserve oil tank disposed across a central portion of said vehicle body along said internal combustion engine on the front side of said internal combustion engine, and a steering shaft provided along the vertical direction at a roughly central portion of said vehicle body on the front side of said internal combustion engine, said reserve oil tank is provided on its front side with a recessed portion through which said steering shaft extends, and said reserve oil tank and said steering shaft are so disposed as to overlap each other at least partly in vehicle body side view.

2. A snowmobile as set forth in claim 1, wherein said recessed portion is vertically continuous in the range from an upper end portion to a lower end portion of said reserve oil tank, and is shaped along the inclination of said steering shaft.

3. A snowmobile comprising a dry sump type internal combustion engine mounted on the front side of a vehicle body, a rider's seat provided on the rear side of said internal combustion engine, a crankshaft of said internal combustion engine, and a transmission mechanism through which the rotation of said crankshaft is transmitted to an endless track belt so as to drive said endless track belt to rotate, thereby driving said snowmobile to travel, wherein said internal combustion engine provided on the front side of said rider's seat is mounted with said crankshaft disposed crosswise relative to the traveling direction, said snowmobile comprises a reserve oil tank disposed across a central portion of said vehicle body along said internal combustion engine on the front side of said internal combustion engine, said reserve oil tank is provided with a cutout portion, an accessory is provided at said cutout portion, and said reserve oil tank and said accessory are so disposed as to overlap each other at least

partly in vehicle body side view; and wherein said accessory is a water pump or a starter motor.

4. A snowmobile as set forth in claim 3, wherein said reserve oil tank includes two cutout portions; said two cutout portions each receiving one accessory wherein said accessories are a water pump and a starter motor.

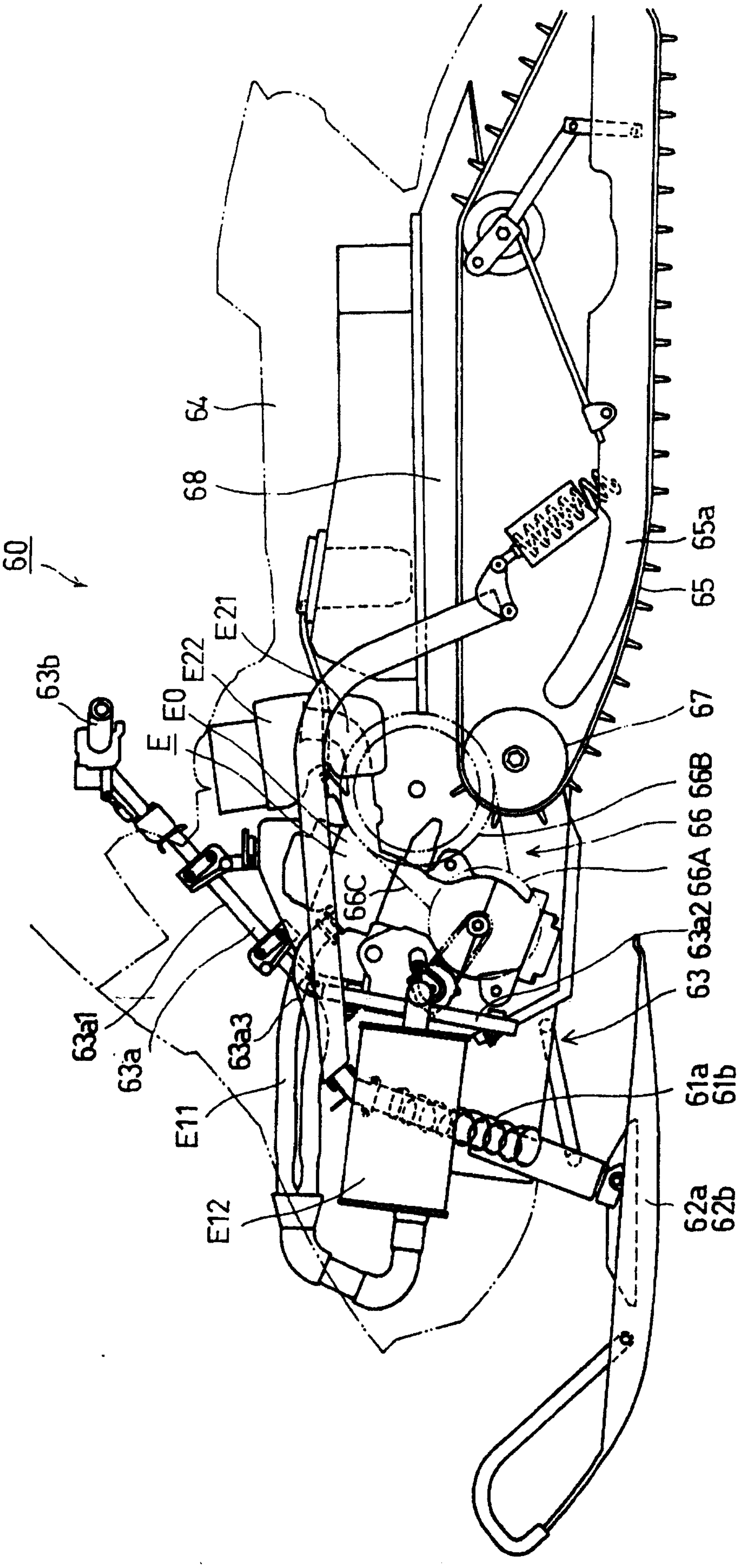
5. A snowmobile as set forth in claim 3 or 4, wherein a muffler is provided on the front side of said reserve oil tank, and an exhaust pipe is connected to said muffler while bypassing an upper portion of said reserve oil tank.

6. A snowmobile as claimed in claim 1 wherein said steering shaft includes a second extended portion being substantially entirely received within said recessed portion.

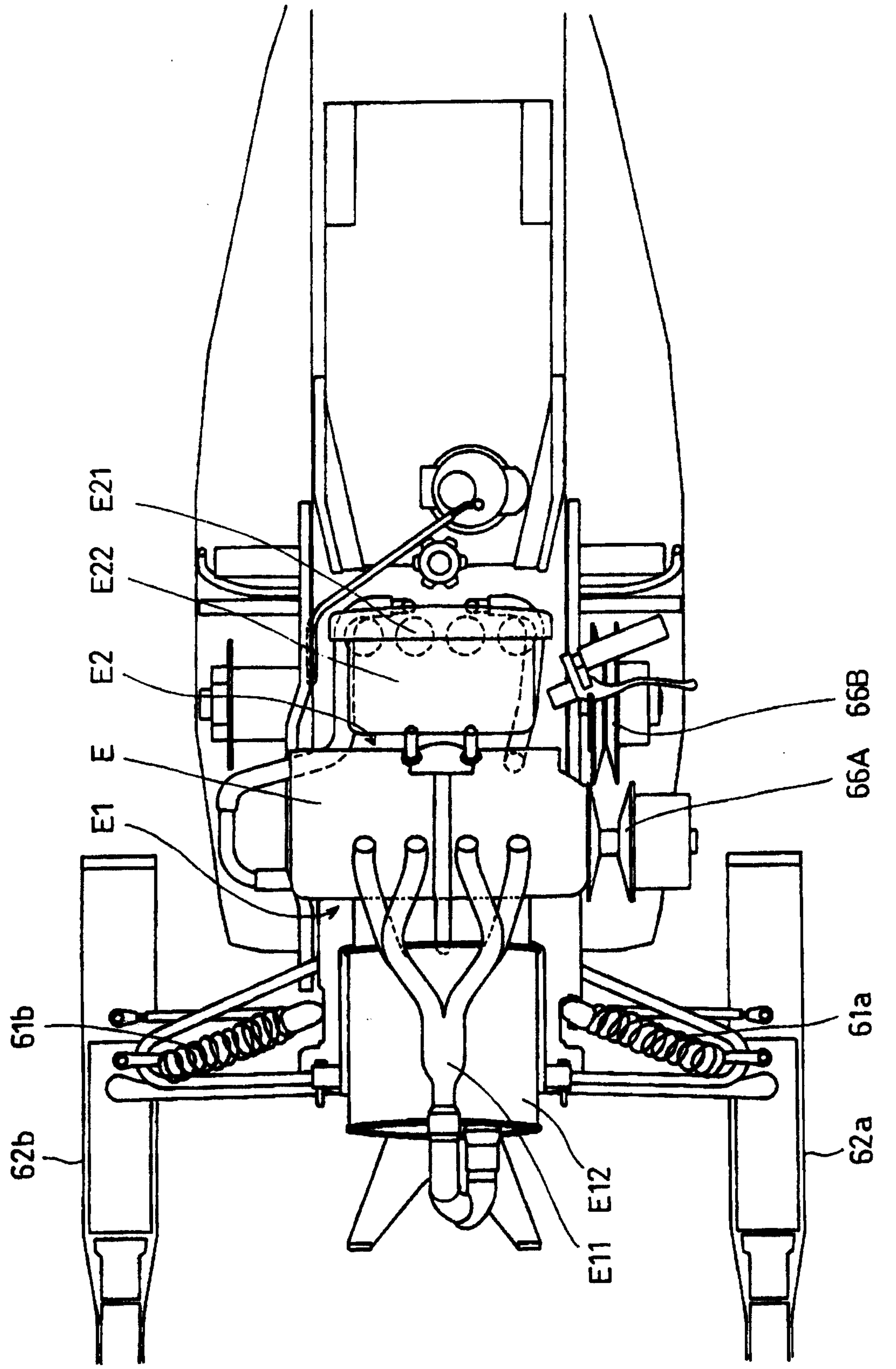
7. A snowmobile as claimed in claim 1 or 6 wherein said recessed portion is a recessed groove formed in a front wall of said reserve oil tank.

[NAME OF DOCUMENT] DRAWINGS

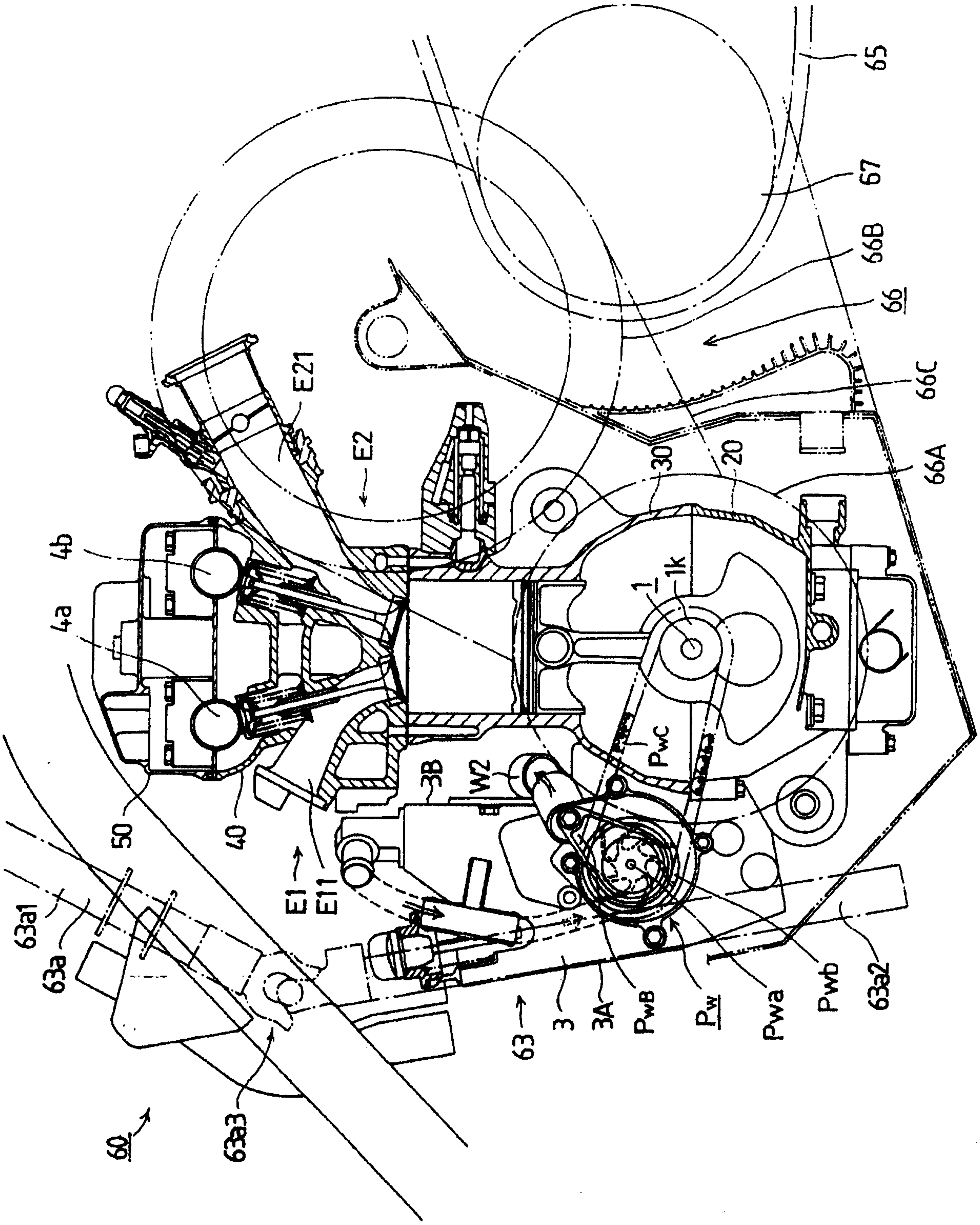
[FIG. 1]



[FIG. 2]



[FIG. 3]


65
67
66B
66
66C
66A
20
30
E21
E2
4b
4a
1
1k
PwC
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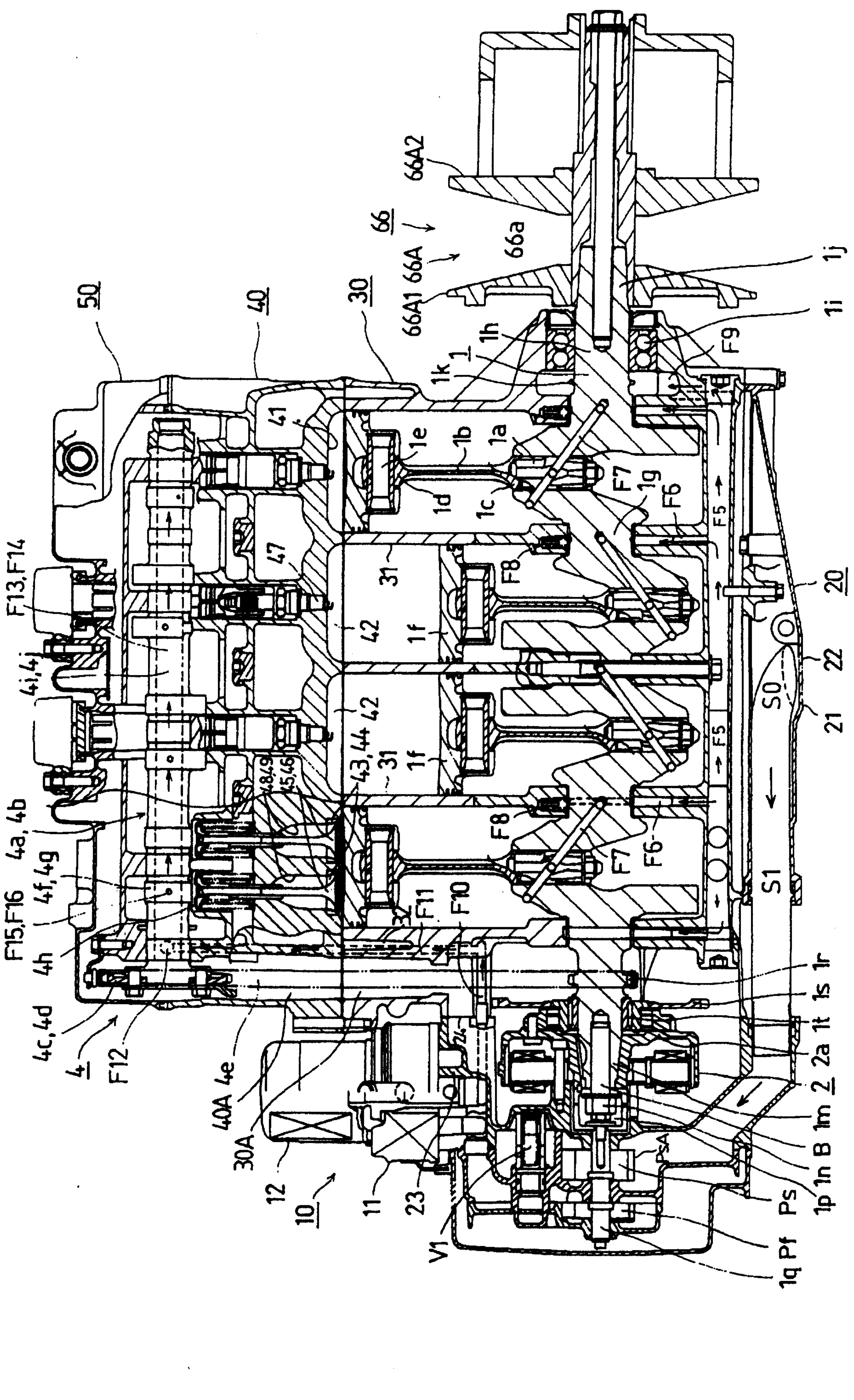
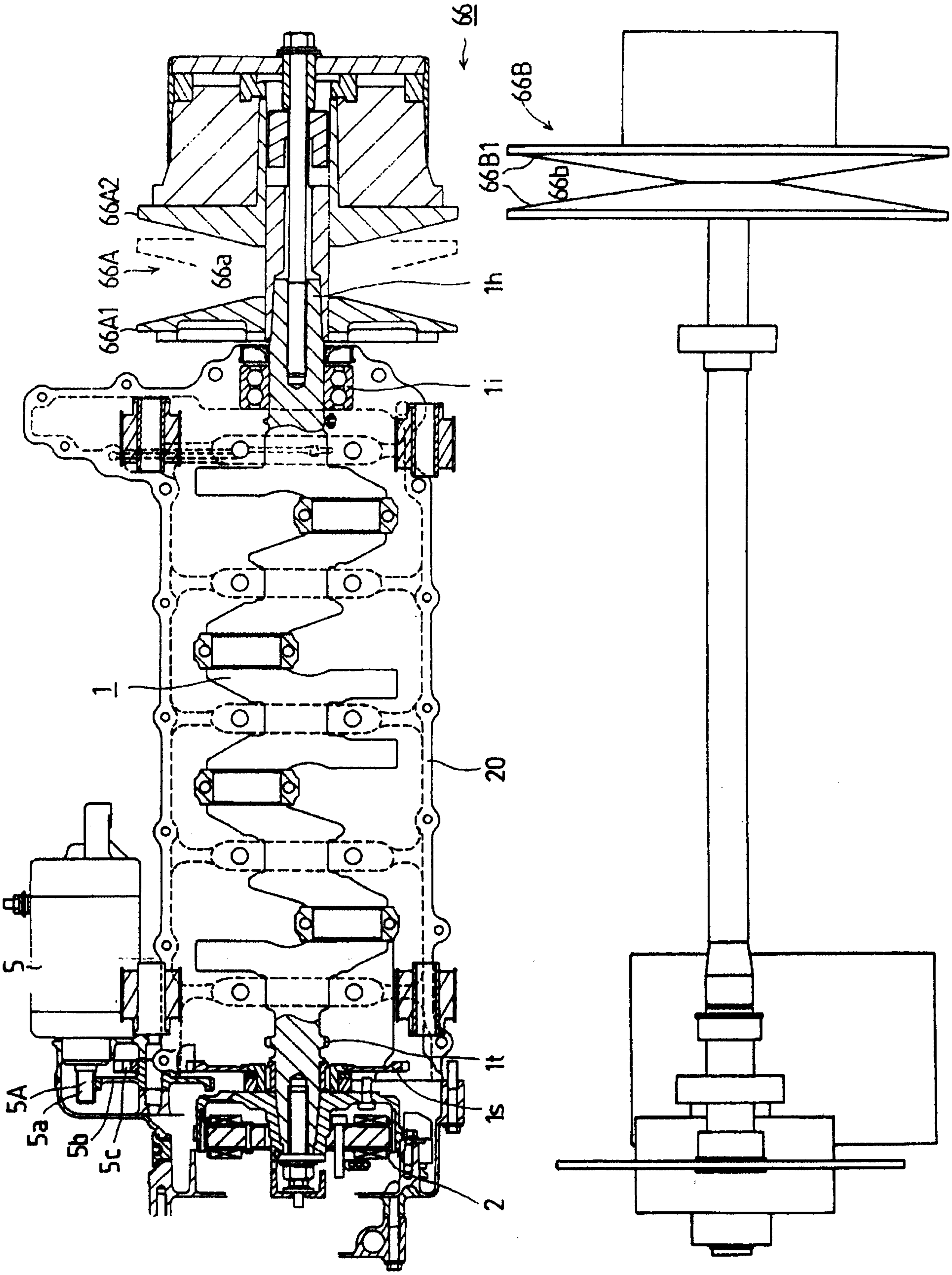
W2
50
40
E1
E11
63a1
63a
63a3
60
63
3
3A
PwB
Pw
Pwa
Pwb
63a2

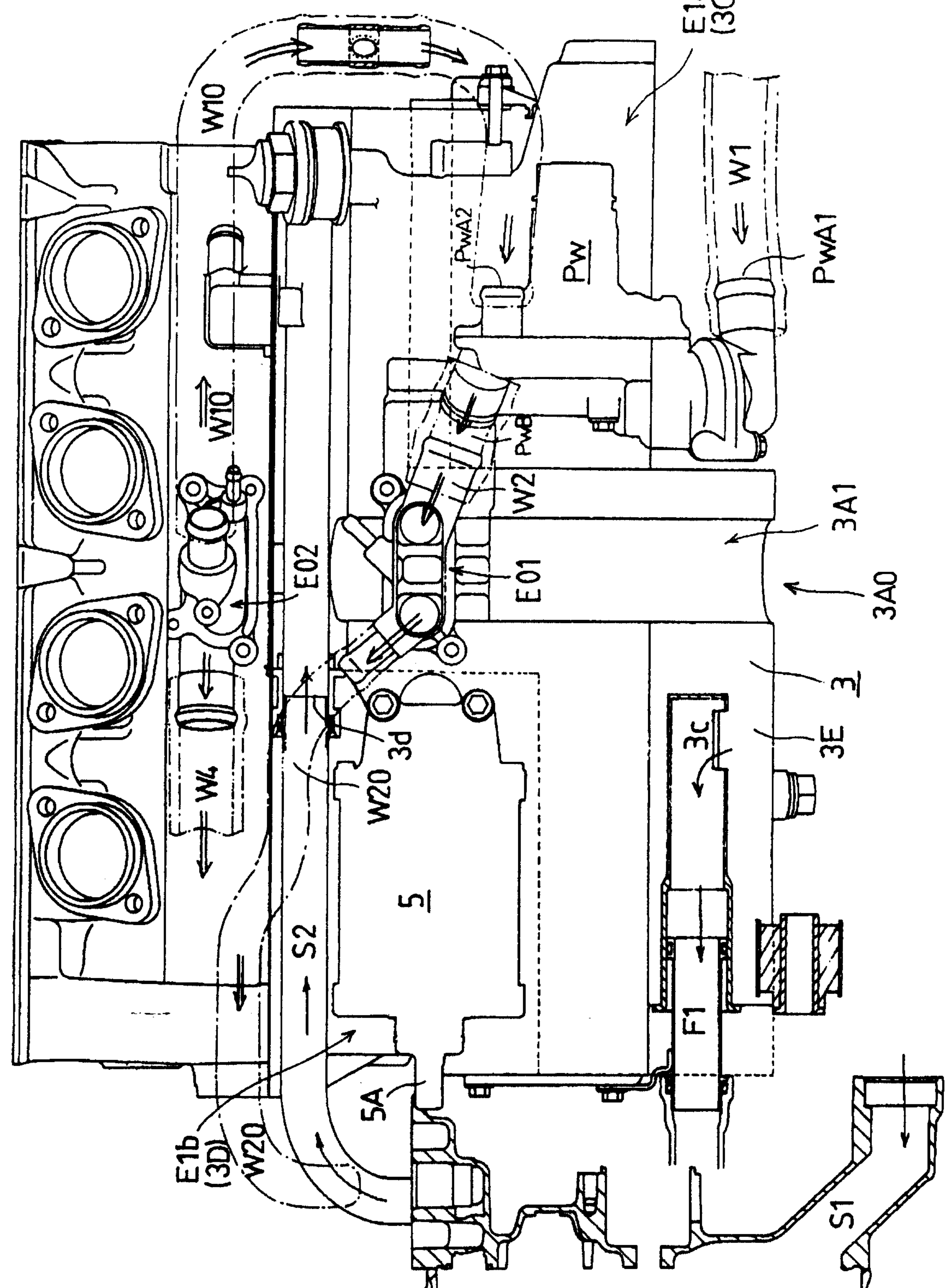
[FIG. 4]


50
40
30
66A2
66
66A
66a
66A1
1j
1i
1h
1k
1
F9
1e
1b
1a
41
1d
1c
F7
1g
F6
F5
F8
31
47
42
1f
20
22
S0
21
F13,F14
4i,4j
43,44
4a, 4b
F15,F16
4f,4g
4h
F11
F10
S1
1r
1s
1t
2a
2
1m
B
1n
1p
Ps
Pf
1q
4c,4d
4
F12
40A 4e
30A
12
10
11
23
V1

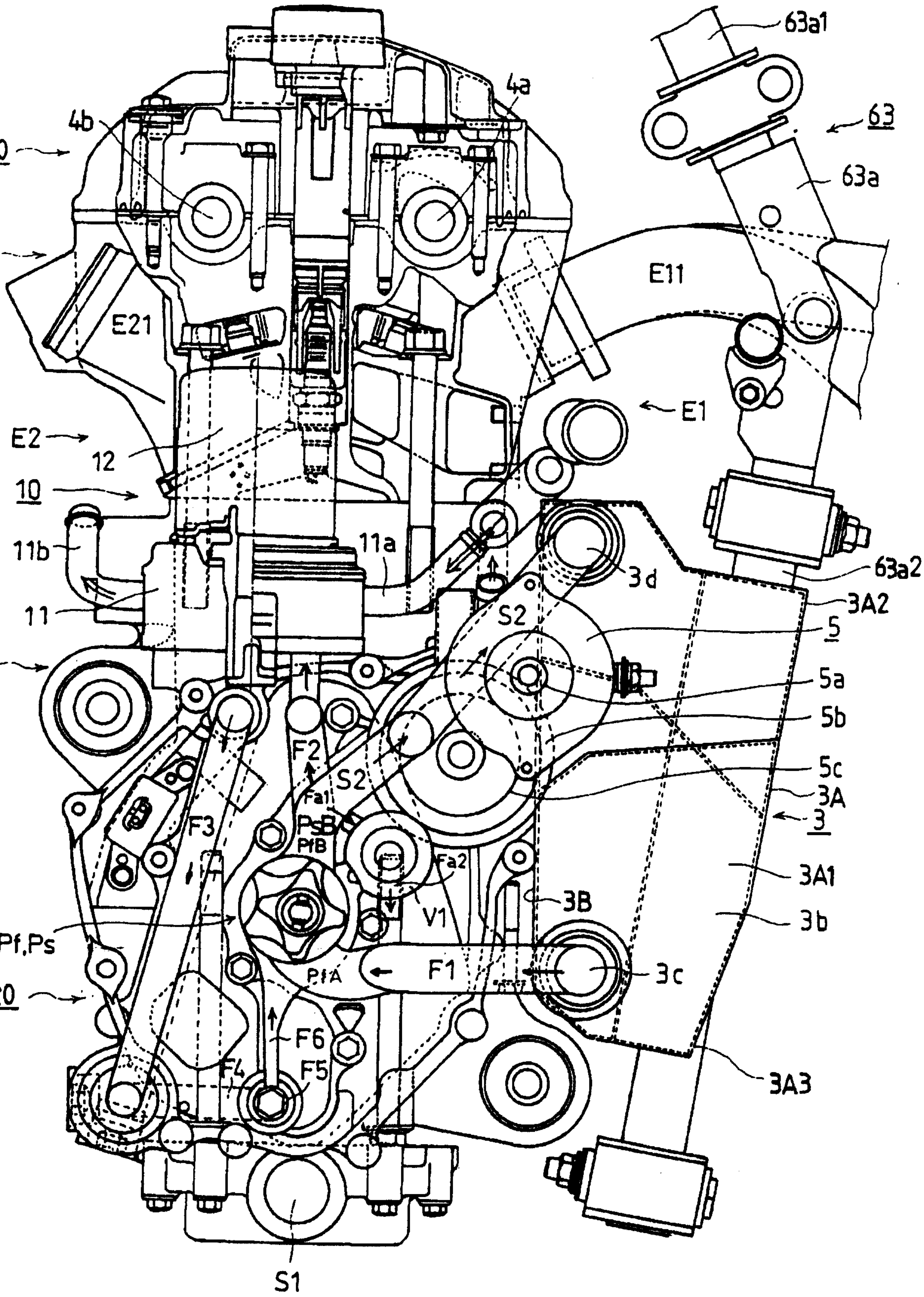
[FIG. 5]



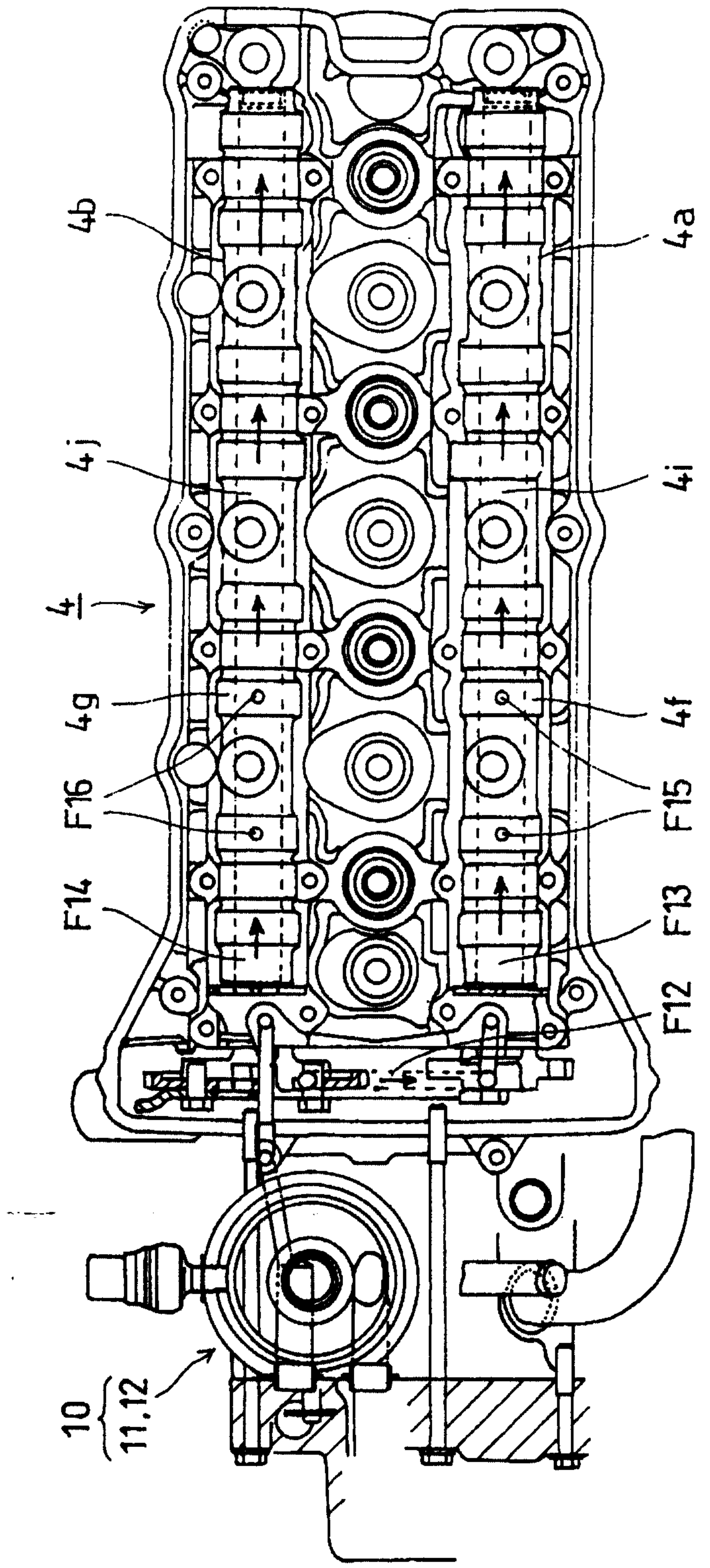
[FIG. 6]


E1a
(3C)
W1
PwA1
PwA2
Pw
W10
PwB
W2
3A1
3A0
E01
E02
3
3E
3c
3d
W20
W4
5
S2
F1
5A
E1b
(3D)
S1

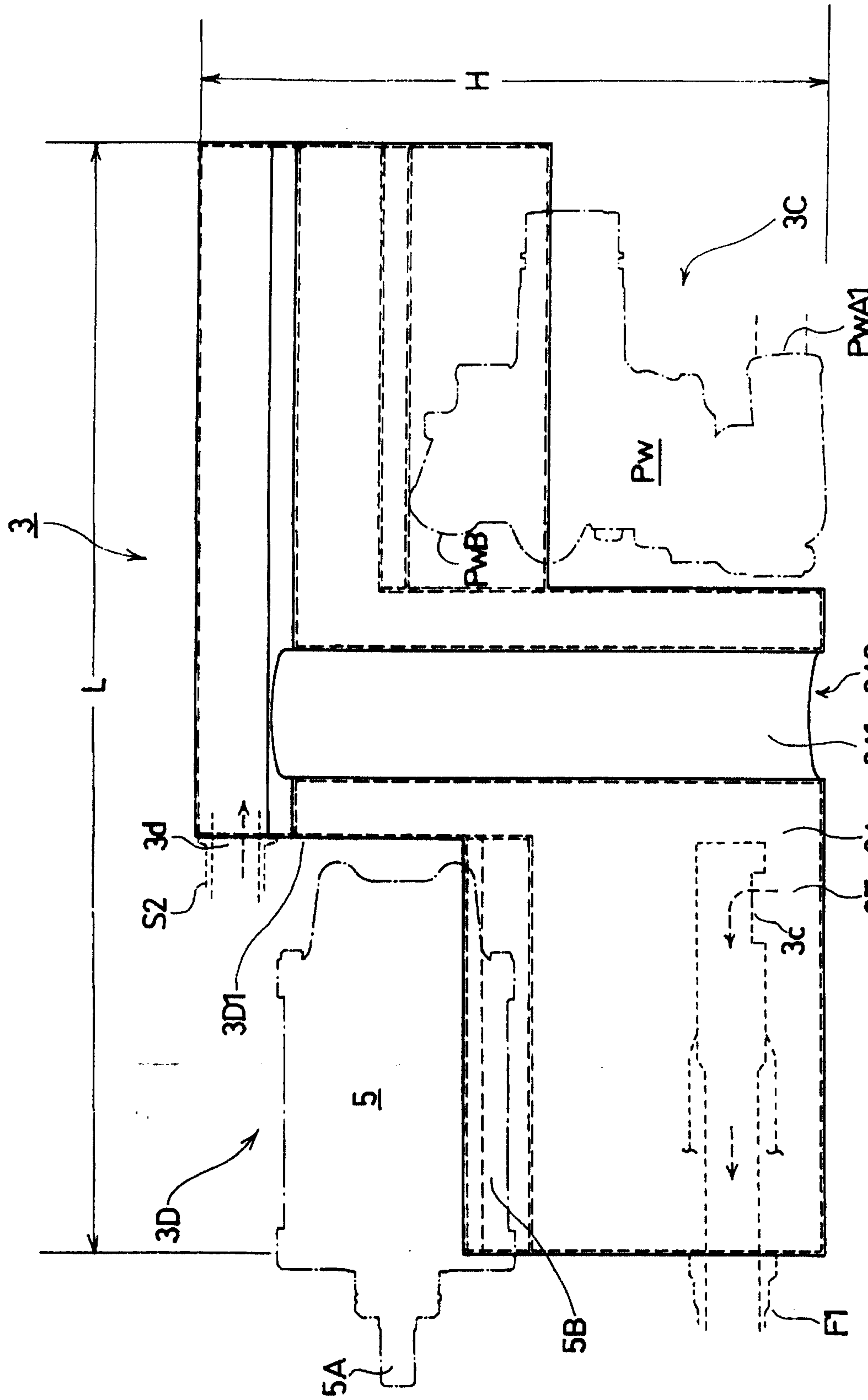
[FIG. 7]


63a1
63
63a
4a
4b
50
40
E11
E21
E1
E2
12
10
11b
11a
3d
63a2
3A2
11
S2
5
30
5a
5b
F2
5c
S2
Fa1
3A
PsB
3
PfB
F3
Fa2
3A1
V1
3B
Pf,Ps
3b
PfA
F1
3c
20
F6
F4
F5
3A3
S1

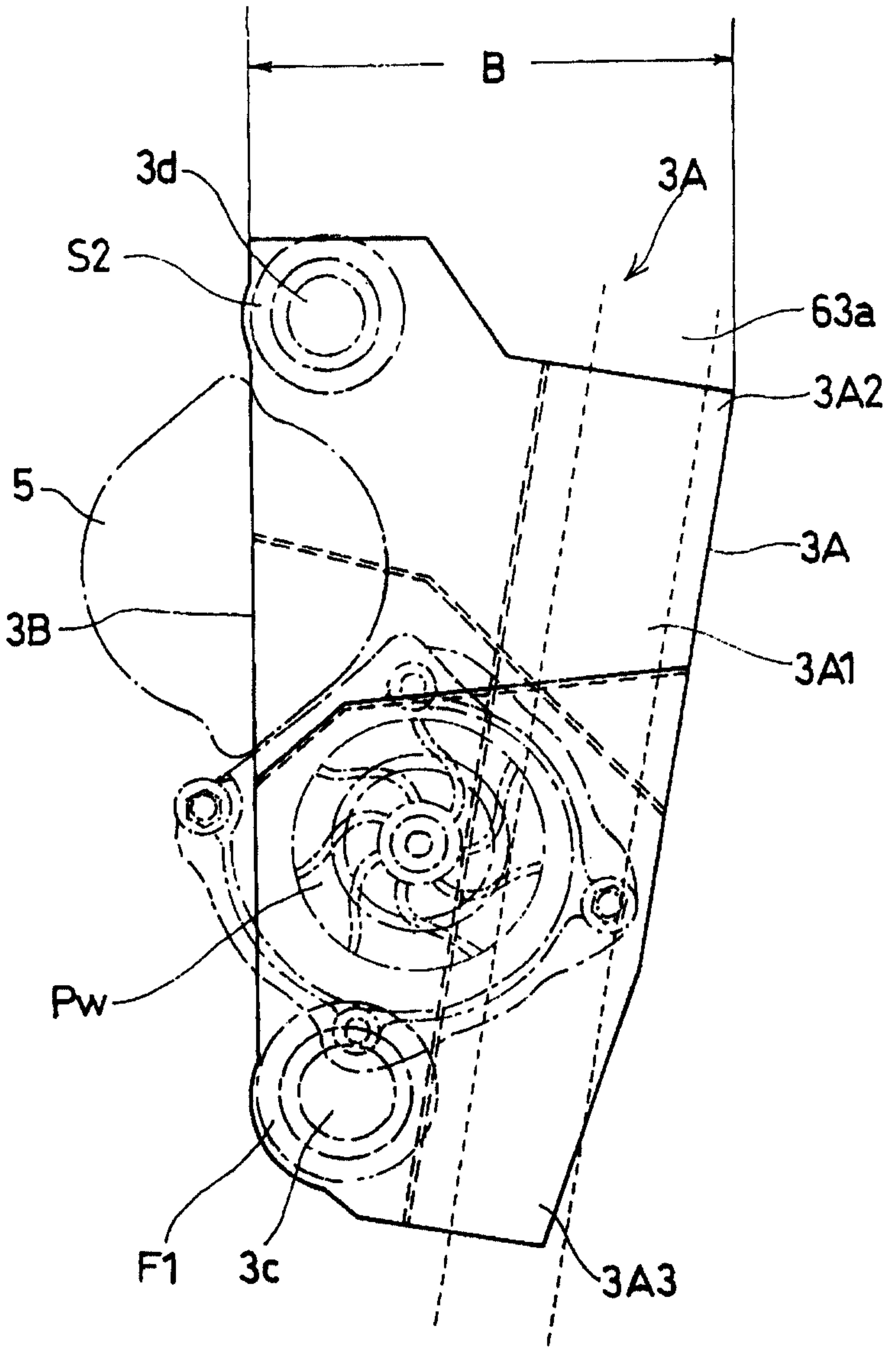
[FIG. 8]



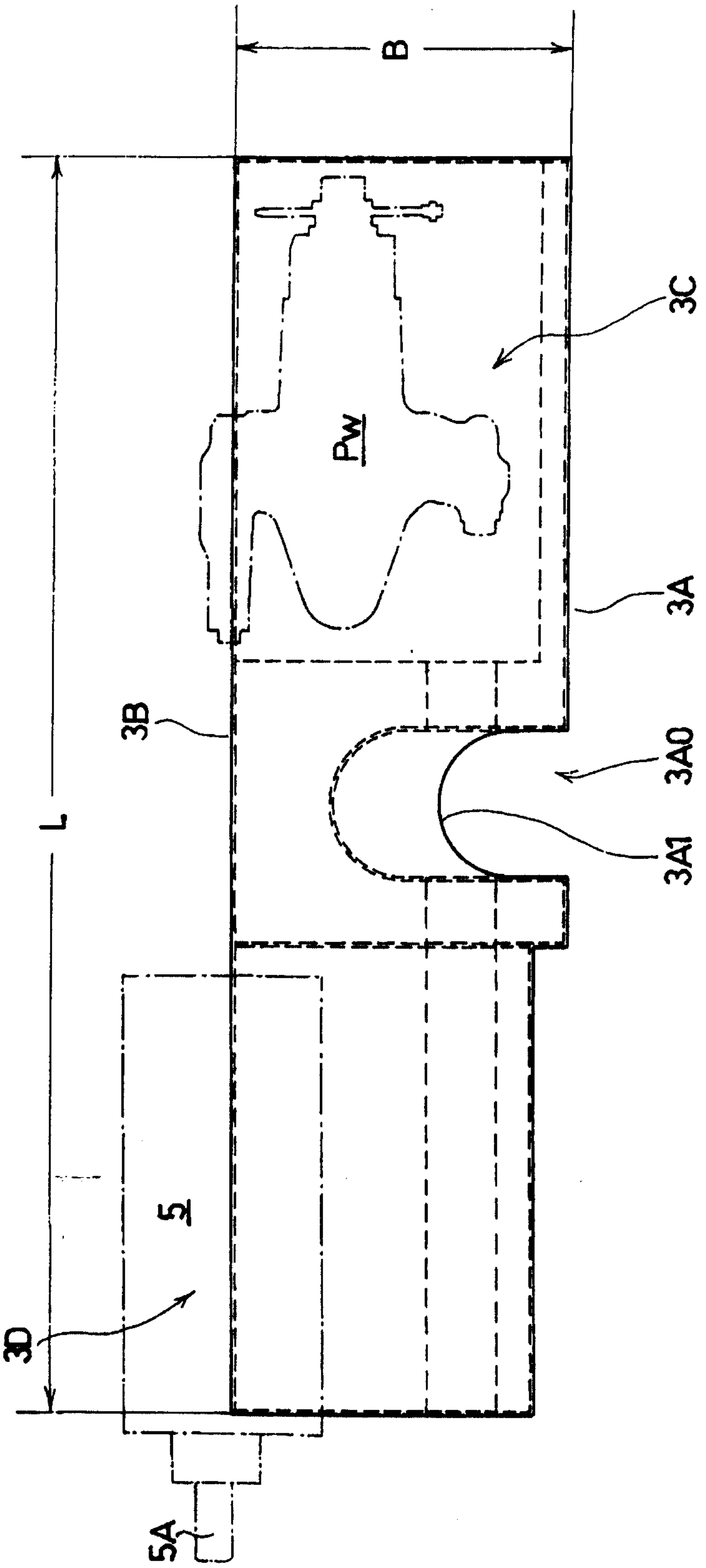
[FIG. 9]



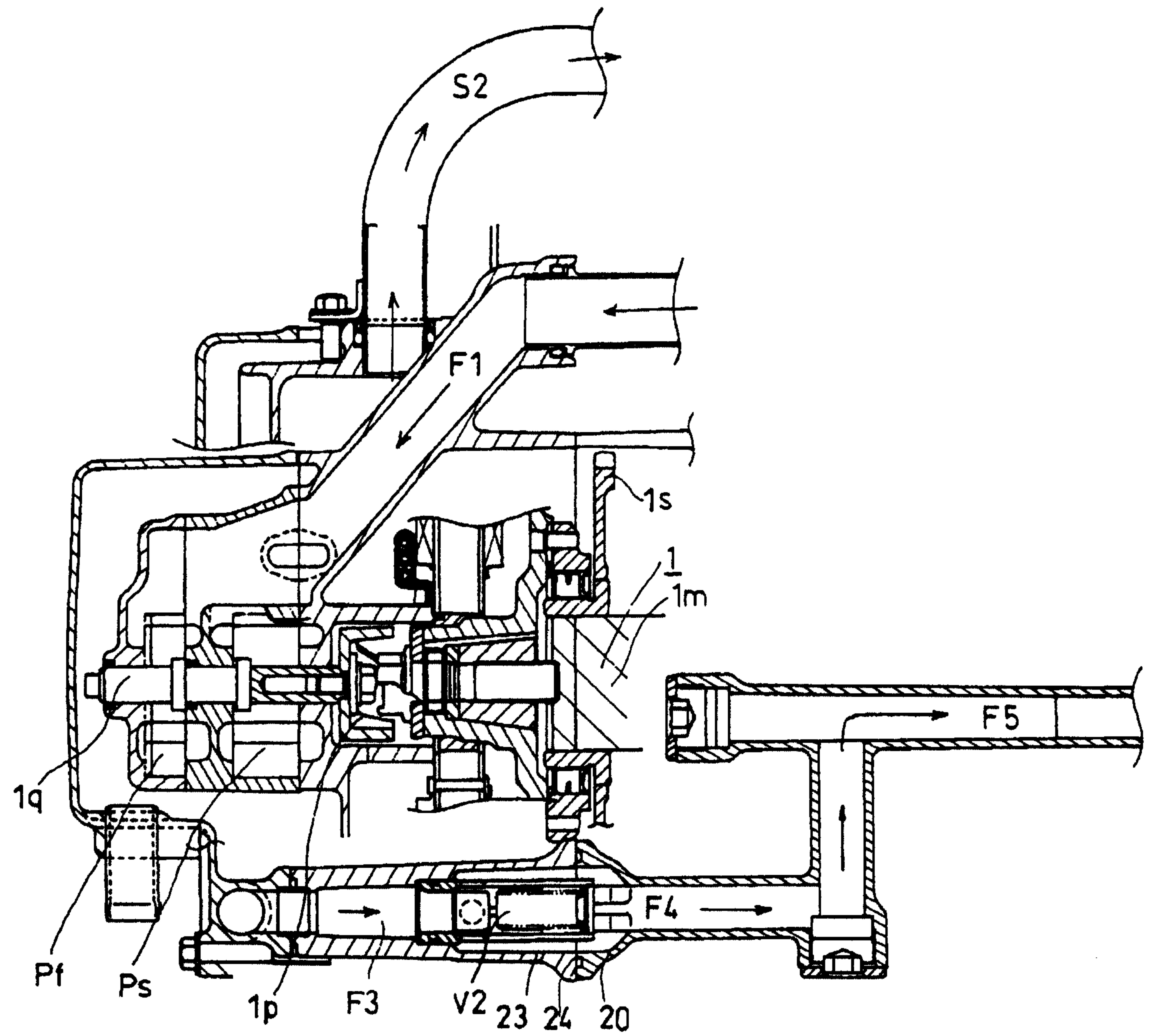
[FIG. 10]



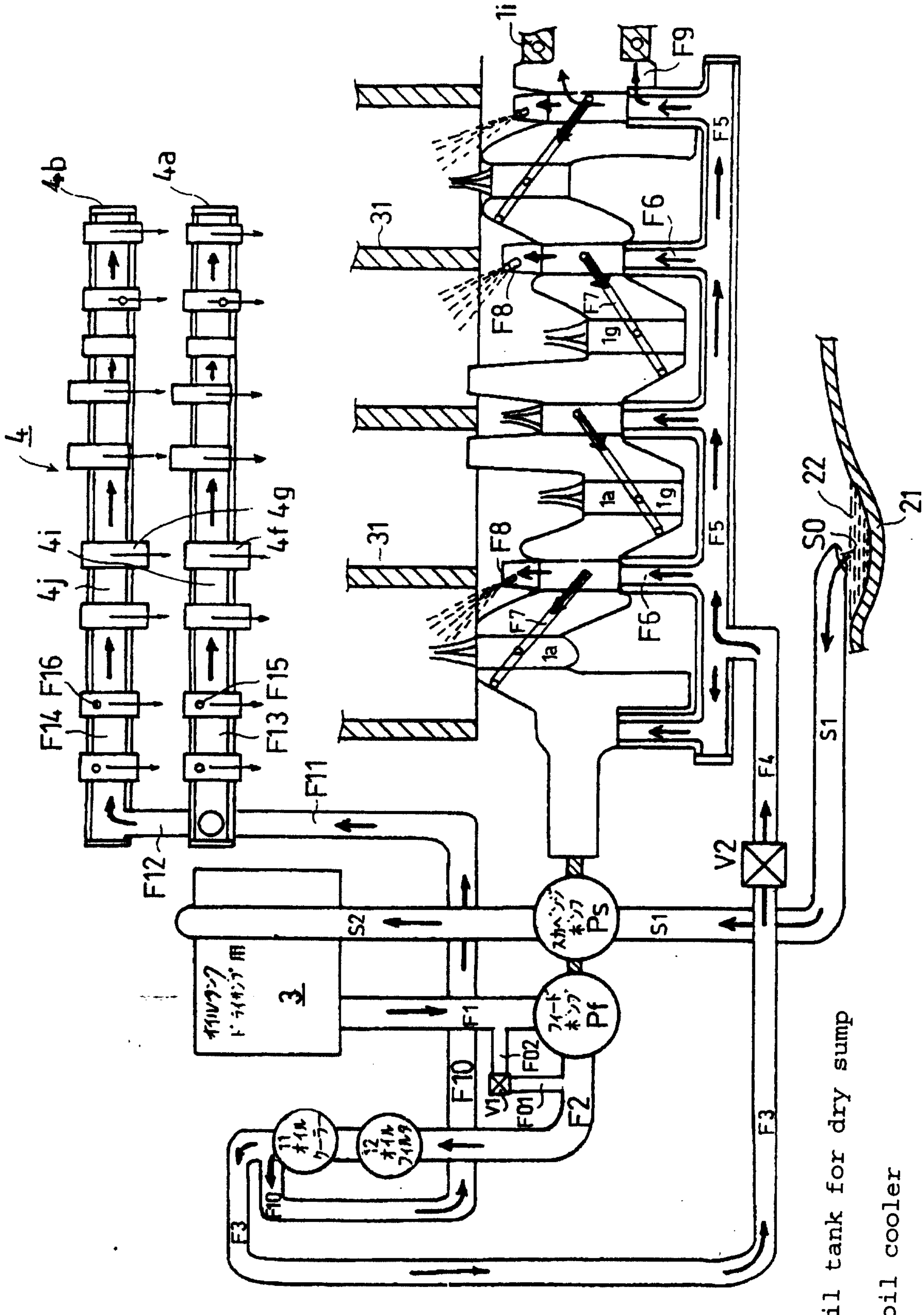
[FIG. 11]



[FIG. 12]



[FIG. 13]



3: oil tank for dry sump

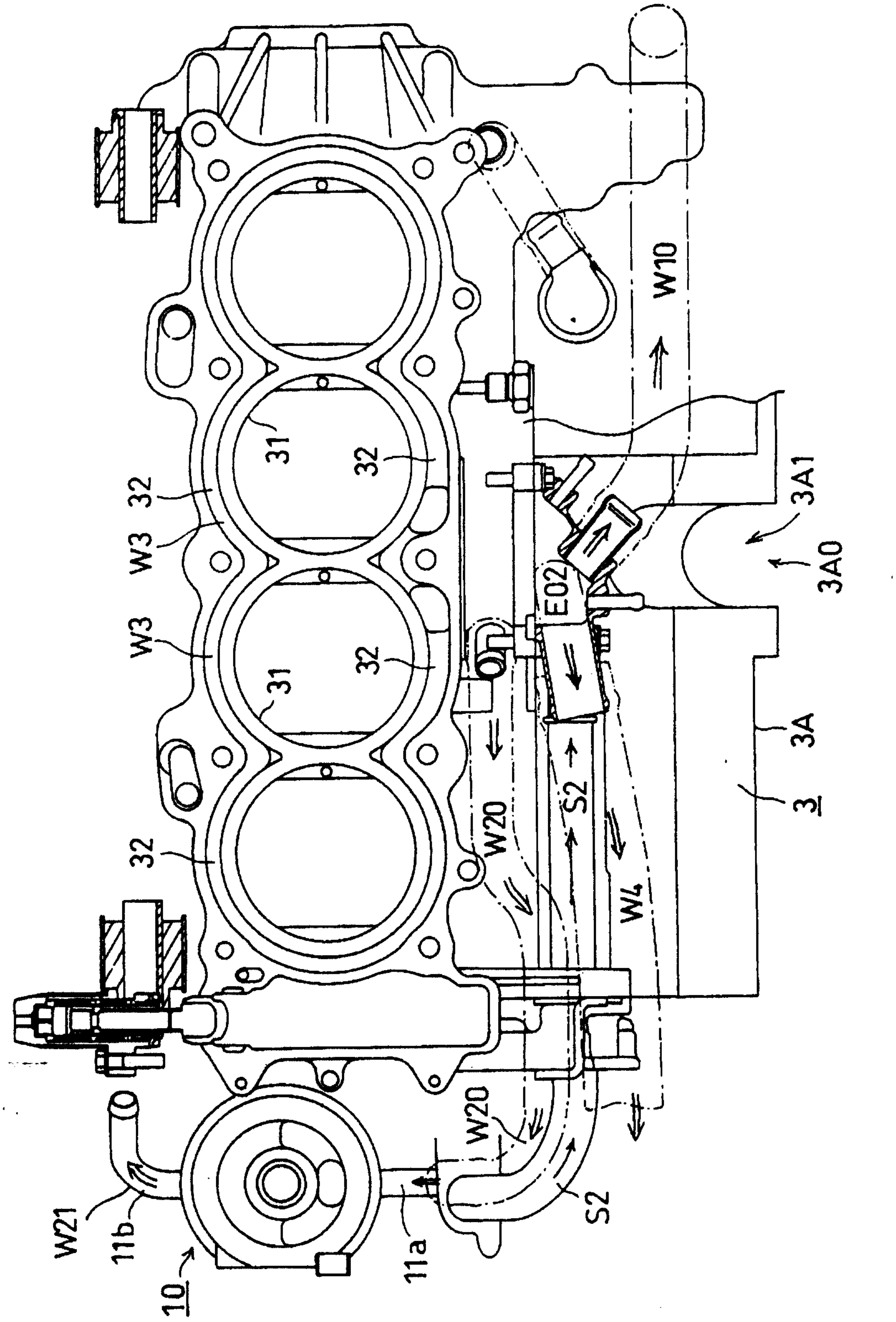
11: oil cooler

12: oil filter

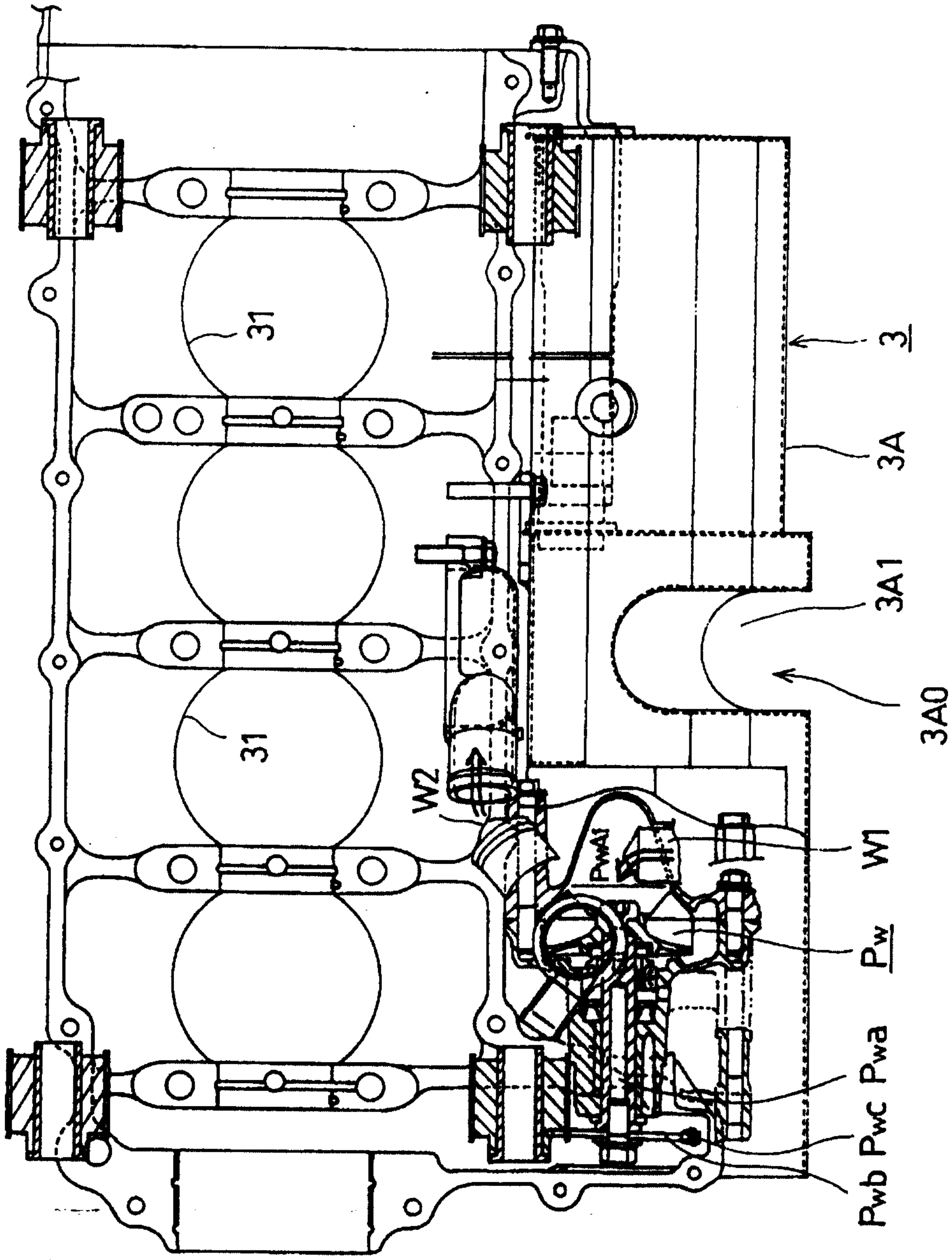
Pf: feed pump

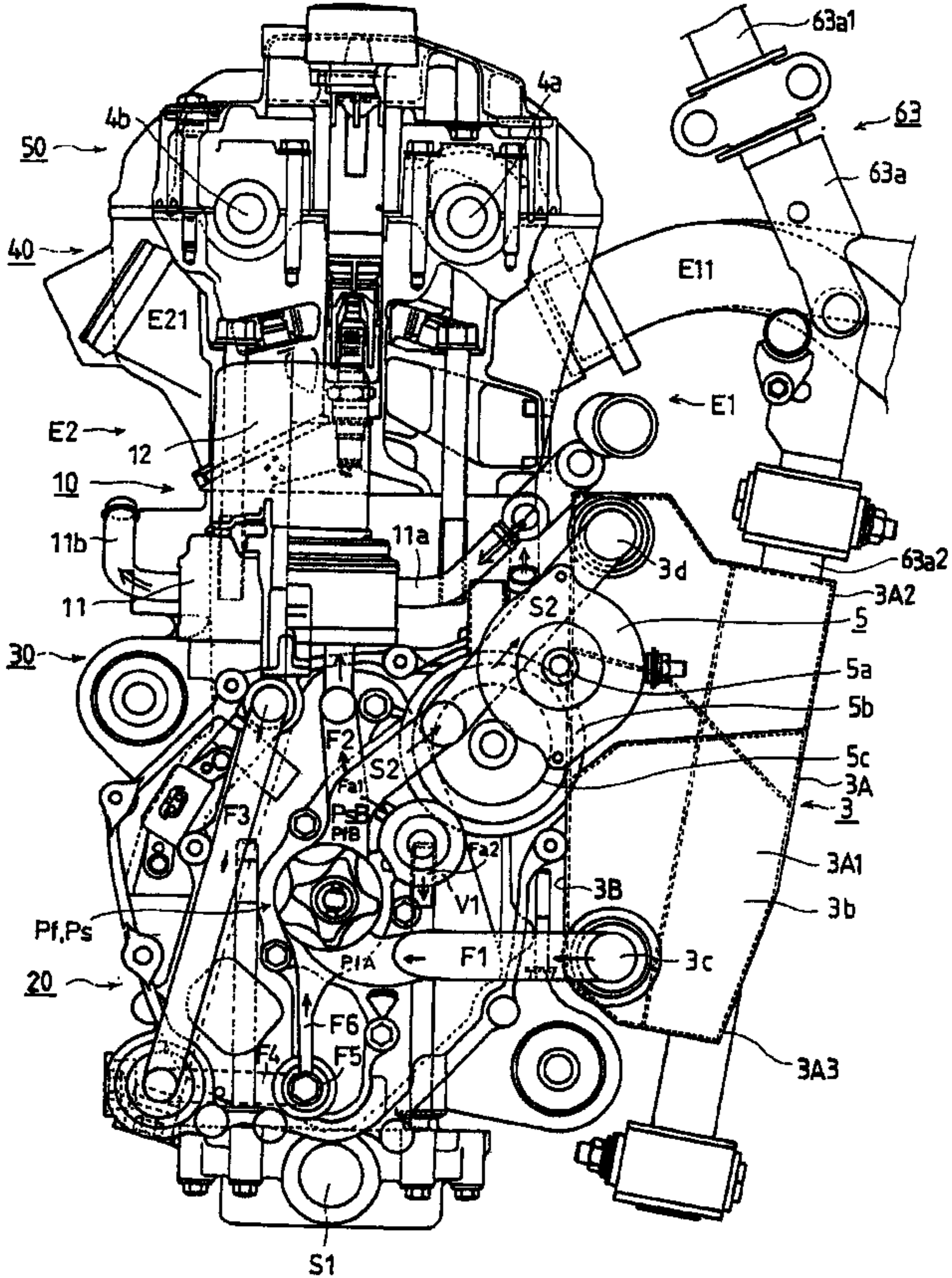
Ps: scavenge pump

[FIG. 14]



[FIG. 15]




63a1
63
63a
50
4b
4a
40
E11
E21
E1
E2
12
10
11b
11a
3d
63a2
11
S2
3A2
5
30
5a
5b
F2
5c
S2
3A
F3
PsB
PfB
3
Fa1
Fa2
3A1
3B
V1
3b
Pf,Ps
F1
3c
PfA
20
F6
F4
F5
3A3
S1