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(54) V-ENGINE FOR VEHICLE

(57) Auxiliary devices are mounted on sides of one end in an axial direction of a crankshaft, a transmission means for transmitting power of the crankshaft to the auxiliary devices and a transmission means for transmitting the power of the crankshaft to camshafts in a cylinder head are disposed in the one end, and the one end is mounted on a vehicle body so as to be positioned on the center side of the vehicle body.

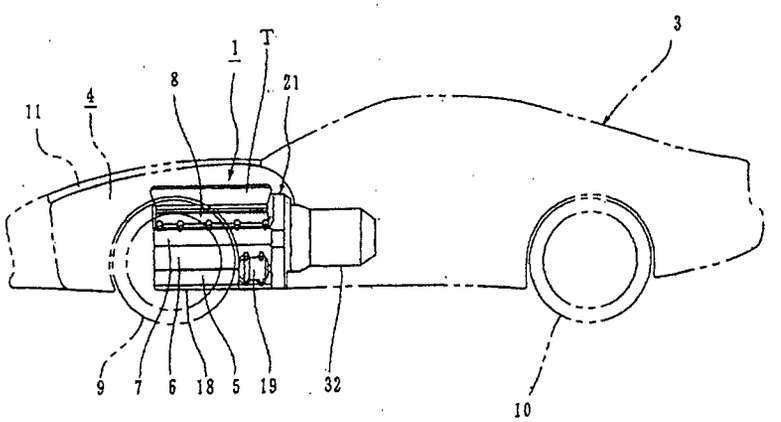

FIG. 1

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Description

Technical Field

[0001] The present invention relates to a V-type engine mounted on a vehicle such as an automobile.

Background Art

[0002] Conventionally, a vehicle such as an automobile is provided with an engine mounted in the front or rear section of the vehicle body away from the cabin in the center of the vehicle. Because the engine is a heavy load and the running performance varies depending on the mounting position of the engine, the engine for a vehicle is formed as compact as possible and positioned so as to be mounted without departing greatly from the center of the vehicle body.

[0003] Such a compact engine for a vehicle is a V-type engine that can relatively shorten the length in the axial direction of a crankshaft and lower the height of cylinders.

[0004] However, for automobiles in recent years, there are needs for improving the running performance while mounting the V-type engine.

[0005] The present invention is made in view of responding to the above needs and its object is to provide a vehicular V-type engine capable of further improving the running performance of a vehicle.

Disclosure of the Invention

[0006] To achieve the foregoing object, a vehicular V-type engine according to the present invention is that: auxiliary devices are mounted on sides of one end in an axial direction of a crankshaft; a transmission means for transmitting power of the crankshaft to the auxiliary devices and a transmission means for transmitting the power of the crankshaft to camshafts in a cylinder head are disposed in the one end; and the one end is mounted on a vehicle body so as to be positioned on the center side of the vehicle body.

[0007] According to the present invention, because each of the auxiliary devices and the transmission means is a heavy load and these heavy loads cause the center of gravity of the engine to lean to one end in the axial direction of the crankshaft, the center of gravity of the engine can be positioned near the center of the vehicle body.

[0008] The vehicular V-type engine according to the invention of Claim 2 is, in the vehicular V-type engine according to the invention of Claim 1, that: a lubrication system adopts a dry sump type; an output shaft is disposed in parallel with the crankshaft within a V-bank and on a closer side to the cylinder head than the crankshaft; and the output shaft is connected to the one end of the crankshaft through the transmission means.

[0009] According to the present invention, the crankshaft is positioned lower than the output shaft, and therefore, the engine can be positioned relatively lower than a chassis for supporting a transmission system for transmitting the power from the output shaft to drive wheels.

[0010] The vehicular V-type engine according to the invention of Claim 3 is, in the vehicular V-type engine according to the invention of Claim 2, that: the output shaft is provided above the crankshaft; a valve drive shaft is provided in an upper side of the output shaft; power is transmitted from the output shaft side to the camshafts through the vale drive shaft; and a valve timing adjustment mechanism for changing rotational phases of the camshafts is interposed in one end of the valve drive shaft and in the midsection of a power train.

[0011] According to the present invention, the center of gravity of the engine can be positioned nearer to one end in the axial direction of the crankshaft by weight of the valve timing adjustment mechanism.

[0012] The vehicular V-type engine according to the invention of Claim 4 is, in the vehicular V-type engine according to the invention of Claim 3, that: other auxiliary devices are disposed at one end in the axial direction of the crankshaft and within the V-bank so as to be positioned on an axis of the valve drive shaft.

[0013] According to the present invention, the center of gravity of the engine can be positioned nearer to one end in the axial direction of the crankshaft by weight of the auxiliary devices disposed on the axis of the valve drive shaft.

Brief Description of the Drawings

[0014]

Fig. 1 is a side view of the vehicular V-type engine according to the present invention.

Fig. 2 is a rear view showing an end of the vehicular V-type engine according to the present invention.

Fig. 3 is a cross-sectional view showing an enlarged end of the vehicular V-type engine according to the present invention.

Fig. 4 is a cross-sectional view showing an example that other auxiliary devices are disposed on a valve drive shaft.

Fig. 5 is a side view showing an example provided with a V-type engine mounted in the rear section of an automobile.

Fig. 6 is a cross-sectional view of the engine showing that both the sides of the engine are enlarged.

Best Mode for Carrying Out the Invention

(First Embodiment)

[0015] An embodiment of a vehicular V-type engine according to the present invention will be described below in detail with reference to Fig. 1 to Fig. 4. Here, an

example is described that the vehicular V-type engine according to the present invention is mounted on an automobile.

[0016] Fig. 1 is a side view of the vehicular V-type engine according to the present invention, illustrating that the engine is mounted on the front part of an automobile. Fig. 2 is a rear view showing an end of the vehicular V-type engine according to the present invention and illustrating that the cover of a transmission case is removed. Fig. 3 is a cross-sectional view showing an enlarged end of the vehicular V-type engine according to the present invention. A cutaway position of Fig. 3 is shown by the line III-III in Fig. 2. Fig. 4 is a cross-sectional view showing an example that other auxiliary devices are disposed on a valve drive shaft.

[0017] In the drawings, a reference numeral 1 denotes the V-type engine for an automobile according to the embodiment of the invention. The engine 1 is a multicylinder type that multiple cylinders are provided to one cylinder line and the other cylinder line of a V-bank, respectively, and mounted in an engine room 4 in the front side of the vehicle body such that the axis of a crankshaft 2 (see Figs. 2 and 3) is oriented to the longitudinal direction of a body 3 of the automobile. In Fig. 1, reference numerals denote a crankcase 5 of the engine 1, a cylinder body 6, a cylinder head 7, a head cover 8, a front wheel 9, a rear wheel 10, and an engine cover 11 for opening the engine room 4, respectively.

[0018] As shown in Figs. 2 and 3, the crankshaft 2 is held and rotatably supported between the crankcase 5 and the cylinder body 6 similar to the conventional V-type engine, and one end in the axial direction of the crankshaft 2 (in Fig. 3, at the end on the right side and the end of the rear side of the vehicle body 3) is projected outside from the crankcase 5 and the cylinder body 6, as shown in Fig. 3. An output shaft 12 described later is connected to the projecting end through a gear-type transmission means 13. The engine 1 according to the embodiment of the invention is constructed such that the aforementioned one end is mounted on the front side of the vehicle body 3 so as to be positioned on the center side of the vehicle body. Thus, two cylinder lines constituting the V-bank of the engine 1 is located on the left side and the right side of the vehicle body. The cylinder line on the left side of the body is shown with a reference numeral 14 in Fig. 2 and the cylinder line on the right side with a reference numeral 15. Also, in Fig. 2, a reference numeral 16 denotes a piston and 17 denotes a connecting rod.

[0019] The engine 1 uses a dry sump as the lubrication system, and therefore an oil catch 18 formed to have a shallower profile than an oil pan is attached to the lower end of the crankcase 5 in place of the oil pan. Oil which flowed down to the oil catch 18 is sucked up with an oil pump (not shown) to return to an oil supply system having an oil tank.

[0020] As shown in Fig. 2, the cylinder body 6 of the engine 1 is constructed with a pair of right and left cylinder sections 6a constituting the V-bank with the cylinder head 7, and the crankcase 5 is attached to the lower end of the cylinder sections 6a. In a dead space located in the left side of the vehicle body and the outside section of the cylinder body 6 and crankcase 5 and formed on both the sides in the lower section of the V-bank, a compressor 19 for an air conditioner and an alternator 20 are mounted.

[0021] The compressor 19 is provided on the left side of the vehicle body and the alternator 20 on the right side. These compressor 19 and alternator 20 are disposed so as to be positioned in the end of the engine 1 in the vehicle rear direction and attached to the cylinder body 6 and the crankcase 5 with a bracket (not shown). Those compressor 19 and alternator 20 constitute the auxiliary devices according to the present invention, that is, the auxiliary devices provided on the side of an end of the crankshaft.

[0022] As shown in Fig. 3, the end of the engine 1 in the vehicle rear direction is provided with a transmission case 21 for housing the transmission means for transmitting the power of the crankshaft 2 to each of members described later. This transmission case 21 is formed by attaching a cover main body 23 from the rear of the vehicle body 3 to the wall of the front section of vehicle body constructed by members such as the cylinder body 6, the crankcase 5, the oil catch 18, the cylinder head 7, the head cover 8, and an upper cover 22 built over the right and the left cylinder lines 14 and 15 (see Fig. 2). A mating face for assembling the cover main body 23 in the wall of the front section of the vehicle body is shown with a reference numeral 24 in Fig. 2. This transmission case 21 is constructed so as not to leak oil inside to the outside by attaching the cover main body 23 to the mating face 24 through a sealing member (not shown).

[0023] Each of the members described above to which the power of the crankshaft 2 is transmitted by the transmission means disposed in the transmission case 21 is the output shaft 12 provided in the upper part of the crankshaft 2, a valve drive shaft 25 provided in the further upper part of the output shaft 12, the compressor 19 and the alternator 20 provided on the sides of the crankshaft 2, an intake camshaft 26 and an exhaust camshaft 27 in the cylinder head 7, or the like.

[0024] As shown in Figs. 2 and 3, the output shaft 12 is disposed within the V-bank of the engine 1 and in an upper part of the crankshaft 2 between the right and the left cylinder sections 6a and 6a such that its axial direction parallels with that of the crankshaft 2. Furthermore, the output shaft 12 is formed such that its end in the vehicle rear direction has a relatively larger diameter, and the large diameter section 12a passes through the cover main body 23 to project from the transmission case 21 to the rearward. The rear end section (large diameter section 12a) of the output shaft 12 is rotatably supported on the cover main body 23 with a bearing 28 provided in the through part.

[0025] In the meantime, a shaft section 12b of the output shaft 12 formed to have a relatively smaller diameter to the front section of the vehicle body is rotatably supported on the cylinder body 6 through the bearing 29.

[0026] That is to say, the output shaft 12 is supported with bearings 28 and 29 at the rear end of the engine 1 in a so-called both-sides supporting manner.

[0027] The lower half section of the bearing 29 for supporting the shaft section 12b is fitted and supported with the cylinder body 6, and the upper half section is supported with the cylinder body 6 through a bearing holder 30. The bearing holder 30 is constructed with a base section 30a having a semicircular cross section for holding the upper half section of the bearing 29 and a supporting arm 30b extending upward from the end of the base section 30a in the vehicle rear direction, and fixed to the cylinder body 6 with a fixing bolt (not shown) from above. The bearing holder 30 is formed so as to construct a part of the wall of the transmission case 21 in the vehicle front direction. In addition, the bearing holder 30 can be formed with the base section 30a for holding the output shaft 12 and the section for holding the valve drive shaft 25 (supporting arm 30b) as separate members. Furthermore, those separately formed members can be supported on the cylinder body 6, respectively.

[0028] To the rear end section of the large diameter section 12a of the output shaft 12 projecting to the outside of the transmission case 21, a starter ring gear 31 is fixed and an input shaft (not shown) of the transmission shown with a reference numeral 32 in Fig. 1 is connected. The output shaft 12 of the transmission 32 is connected to an axle of the rear wheel 10 through a drive shaft and a differential gear (not shown).

[0029] The end of the large diameter section 12a in the vehicle front direction is connected with the gear-type transmission means 13 for transmitting the power from the crankshaft 2 to the output shaft 12.

[0030] The gear-type transmission means 13 is constructed with a drive gear 34 fixed to the rear end of the crankshaft 2 with the fixing bolt 33, a driven gear 35 mounted on the output shaft 12 in a mating manner with the drive gear 34, a damper mechanism 36 provided in the driven gear 35, and the like.

[0031] The driven gear 35 is formed so as to be equal in the number of teeth to that of the drive gear 34 and provided with the damper mechanism 36 in the vehicle rear direction and a chain sprocket 37 in the vehicle front direction. The damper mechanism 36 has a coil spring 36 interposed in the power train between the driven gear 35 and the large diameter section 12a and damps the vibration in the rotating direction transmitted from the crankshaft 2 to the output shaft 12 with the coil spring 36a.

[0032] The valve drive shaft 25 is disposed within the V-bank of the engine 1 and in the center of the lateral direction such that its axial direction parallels with that of the crankshaft 2 and the output shaft 12. Its end in the vehicle rear direction is rotatably supported in the supporting arm 30b of the bearing holder 30 with bearings 41, and its end in the vehicle front direction is rotatably supported in the cylinder body 6 through a bearing (not shown). The front end of the valve drive shaft 25 can be connected with another auxiliary device 42 as shown in Fig. 4. This auxiliary device 42 is a cooling water pump and disposed in the vicinity of the bearings 41 in the vehicle front direction, and an impeller 43 is fixed in the front end of the valve drive shaft 25. A reference numeral 44 denotes a pump housing and 45 denotes a cooling water inlet pipe.

[0033] The bearings 41 for supporting the rear end of the valve drive shaft 25 are fitted and supported with its lower half to the supporting arm 30b, and the upper half is held by a bearing cap 51. The bearing cap 51 is fixed to the supporting arm 30b with a fixing bolt (not shown).

[0034] The rear end of the valve drive shaft 25 is projected to the rear of the vehicle body 3 from the bearings 41 to face the inside of the transmission case 21, and a chain sprocket 52 and a valve timing adjustment mechanism 53 are provided to the projected part in parallel. The chain sprocket 52 is connected to the chain sprocket 37 of the driven gear 35 through a chain 54.

[0035] Accordingly, because the power is transmitted from the crankshaft 2 to the valve drive shaft 25 through the transmission means including the drive gear 34, the driven gear 35, the chain 54, and the like, rotation of the crankshaft 2 transmitted to the valve drive shaft 25 may not be changed by the damper mechanism 36. The chain-type transmission means including the chain 54 and the sprockets 37 and 54 is positioned, as shown in Fig. 3, in the front side of the vehicle body than the gear-type transmission means 13. The valve timing adjustment mechanism 53 is a well-known art provided on the shaft end of the camshaft and constructed such that a rotational phase of a housing 53a provided in the outmost side is changed by hydraulic pressure with reference to the valve drive shaft 25. The driving source of the valve timing adjustment mechanism 53 is not limited to the hydraulic pressure but may be an electromagnetic type, for example.

[0036] The housing 53a is integrally formed with a chain sprocket 53b and connected to a valve drive system 56 in the cylinder head 7 of the cylinder line 14 on the left side of the vehicle body and a valve drive system 57 in the cylinder head 7 of the cylinder line 15 on the right side of the vehicle body through a timing chain 55 wound around the chain sprocket 53b. The chain sprocket 53b is positioned, as shown in Fig. 3, in the rear side of the vehicle body than the chain sprocket 53b of the valve drive shaft 25, and therefore, the timing chain 55 is positioned in the rear side of the vehicle body than the chain 54 extending to connect the intermediate shaft 12 and the valve drive shaft 25.

[0037] By providing the valve timing adjustment mechanism 53 in the valve drive shaft 25, one valve timing adjustment mechanism 53 can simultaneously

change both phases of the valve drive system 56 on the left side of the vehicle body and the valve drive system 57 on the right side of the vehicle body. Therefore, compared to the conventional V-type engine that the valve timing adjustment mechanisms 53 are provided to each valve drive system (each cylinder line), the number of the valve timing adjustment mechanisms 53 can be reduced.

[0038] The valve drive systems 56 and 57 are constructed such that two intake valves 58 and exhaust valves 59 for each cylinder are opened and closed by the intake camshaft 26 and the exhaust camshaft 27 and the intake system is located within the V-bank. In Fig. 2, a reference numeral 60 denotes an intake port and 61 denotes an exhaust port. In addition, valve lifters 60 are interposed between the camshafts 26 and 27 and the intake and the exhaust valves 58 and 59. The intake system of this engine 1 adopts the construction that intake air is led from a surge tank T (see Fig. 1) provided to be positioned above the V-bank to the intake port 61 (see Fig. 2) for each cylinder in the cylinder head 7 through an intake manifold (not shown). Fuel is injected from an injector (not shown) to the inside of an intake passage or a combustion chamber. In the meantime, the exhaust system is constructed with an exhaust manifold (not shown) connected to the exhaust port 62 opened to the outside of the V-bank in the cylinder head 7, a muffler extending from the exhaust manifold to the rear end of the vehicle body, and the like.

[0039] The intake camshaft 26 and the exhaust camshaft 27 are formed such that the end in the vehicle rear direction faces the inside of the transmission case 21 and rotatably supported on the cylinder head 7, and the rear ends are connected with each other by a chain-type transmission means 63. The position of this transmission means 63 in the axial direction is set as the position overlapped with the chain 54 in Fig. 3.

[0040] The intake camshaft 26 is provided with a chain sprocket 64 in the rear side of the vehicle body than the chain-type transmission means 63 and connected to the valve drive shaft 25 through the timing chain 55 wound around the chain sprocket 64.

[0041] The timing chain 55 is wound around to rotate from the valve drive shaft 25 through the intake camshaft 26 of the cylinder line 14 on the left side of the vehicle body and the intake camshaft 26 of the cylinder line 15 on the right side of the vehicle body. The timing chain 55 according to this embodiment is wound such that its part between both intake camshafts 26 and 26 is placed from the upper part of the chain sprocket 53b of the valve timing adjustment mechanism 53 and tension is applied by an idler sprocket 65 disposed to be positioned between the intake camshaft 26 on the left side of the vehicle body and the valve drive shaft 25.

[0042] The valve drive shaft 25 for transmitting the power to the timing chain 55 is provided such that the timing chain 55 has the longest possible length in the part wound around the chain sprocket 53b and the highest possible disposing position. As the result, the valve drive shaft 25 and the intake camshaft 26 are disposed in the position that their heights become approximately the same, as shown in Fig. 2. Accordingly, increasing the length of the part where the timing chain 55 is wound around the valve drive shaft 25 allows the timing chain 55 to be securely engaged with the valve drive shaft 25, thereby preventing the so-called skipping phenomenon from occurring.

[0043] The timing chain 55, the chain sprocket 53b of the valve drive shaft 25, the chain sprocket 64 of the intake camshaft 26, the chain-type transmission means 63 for connecting the intake and the exhaust camshafts 26 and 27, the valve timing adjustment mechanism 53, the valve drive shaft 25, the chain 54, the chain sprockets 53b and 37, and the gear-type transmission means 13 constitute the transmission means for transmitting the power of the crankshaft 2 to the intake and the exhaust camshafts 26 and 27.

[0044] The compressor 19 and the alternator 20 are formed such that their rotating shafts 19a and 20a face the inside of the transmission case 21, and the power is transmitted from the crankshaft 2 through gear-type transmission means 66 and 67 connected to those rotating shafts 19a and 20a. The gear-type transmission means 66 and 67 are constructed with driven gears 68 and 69 provided in the rear end of the rotating shafts 19a and 20a, and intermediate gears 70 and 71 engaged with both the driven gears 68 and 69 and the drive gear 34 of the crankshaft 2.

Each gear of the gear-type transmission means 66 and 67 is disposed to be aligned at the same position in the vertical direction and in the lateral direction of the vehicle. By constituting the drive train of the auxiliary devices as described above, heavy loads are provided on the right and left sides of the engine 1 in a balanced manner, and therefore, the right and left weights of the engine 1 can be easily balanced.

[0045] In two intermediate gears 70 and 71, the intermediate gear 70 of the gear-type transmission means 66 for transmitting the power to the compressor 19 is integrally provided with a large diameter gear 70a mating with the drive gear 34 of the crankshaft 2 and a small diameter gear 70b mating with the driven gear 68 of the rotating shaft 19a and reduces and transmits the rotation of the drive gear 34 to the driven gear 68.

[0046] The V-type engine 1 constructed as described above transmits, by the rotation of the crankshaft 2, the rotation of the crankshaft 2 to the output shaft 12 through the gear-type transmission means 13 and from the gear-type transmission means 13 to the valve drive shaft 25 through the chain 54, and therefore, the intake camshaft 26 connected to the valve drive shaft 25 through the timing chain 55 rotates together with the exhaust camshaft 27.

[0047] This V-type engine 1 is constructed such that the compressor 19 for the air conditioner and the alternator 20 are mounted on both the sides of one end in

the axial direction of the crankshaft 2, the gear-type transmission means 13 for transmitting the power of the crankshaft 2 to these auxiliary devices and the transmission means (including the gear-type transmission means 13, the chains 54 and 55, and the like) for transmitting the power of the crankshaft 2 to the intake and the exhaust camshafts 26 and 27 in the cylinder head 7 are disposed in the one end described above, and the one end is mounted so as to be positioned on the center side of the vehicle body. Therefore, the center of gravity of the engine 1 is positioned near the center of the vehicle body. This is because each of the compressor 19, the alternator 20, and the transmission means is a heavy load and these heavy loads cause the center of gravity of the engine 1 to lean to one end in the axial direction of the crankshaft 2.

[0048] Also, the V-type engine 1 is constructed such that the lubrication system adopts the dry sump type, the output shaft 12 is disposed in parallel with the crankshaft 2 within the V-bank and on a closer side to the cylinder head 7 than the crankshaft 2, and the output shaft 12 is connected to one end of the crankshaft 2 through the gear-type transmission means 13, and therefore, the crankshaft 2 is positioned lower than the output shaft 12. Accordingly, the engine 1 can be positioned relatively lower than a chassis (not shown) for supporting the transmission 32 and a transmission system for rear wheels such as a drive shaft (not shown) , and the center of gravity of the vehicle body 3 can be lowered. Furthermore, large space can be formed between the engine 1 and the engine cover 11, so that other auxiliary devices, electrical components, and the like can be installed in the space.

[0049] The V-type engine 1 is also constructed such that the valve drive shaft 25 is provided in the upper side of the output shaft 12 above the crankshaft 2, the power is transmitted from the output shaft 12 side to the intake and the exhaust camshafts 26 and 27 through the vale drive shaft 25, and the valve timing adjustment mechanism 53 is interposed in one end of the valve drive shaft 25 and in the midsection of the power train. Therefore, the center of gravity of the engine 1 can be positioned nearer to one end in the axial direction of the crankshaft 2 by weight of the valve timing adjustment mechanism 53. Thus, weights brought to the center of the vehicle body can be increased more.

[0050] Furthermore, as shown in Fig. 4, in the V-type engine 1 having the cooling water pump 42 (the other auxiliary device) disposed at one end in the axial direction of the crankshaft 2 and within the V-bank so as to be positioned on the axis of the valve drive shaft 25, the position of the center of gravity can be brought near the one end of the crankshaft 2 in the axial direction by the weight of the cooling water pump 42. The other auxiliary device provided on the axis of the valve drive shaft 25 may be, in addition to the cooling water pump 42, a fuel pump or an oil pump.

(Second Embodiment)

[0051] Another embodiment mounting an engine in the rear section of the vehicle body will be described in detail with reference to Figs. 5 and 6.

[0052] Fig. 5 is a side view showing an example provided with a V-type engine mounted in the rear section of an automobile, and Fig. 6 is a cross-sectional view of the engine showing that both the sides of the engine are enlarged. In the drawings, like or equivalent components are denoted by the same reference numerals as in Fig. 1 to Fig. 4, and detailed descriptions will not be repeated as appropriate.

[0053] The V-type engine 81 shown in Figs. 5 and 6 adopts the same constitution as the V-type engine 1 shown in Figs. 1 to 4 except for the constitution of the output shaft described later and is mounted in the rear section of the vehicle body 3 such that the one end having the transmission case 21 is positioned on the center side of the vehicle body. That is to say, the engine 81 according to this embodiment is mounted on the vehicle body 3 in a manner that the front and the rear sides are inverted from the one shown in the first embodiment, the transmission means for connecting each shaft in the engine 81, the compressor 19 for the air conditioner, and the alternator 20 are provided to the end in the vehicle front direction (in Fig. 6, to the end of the left side) , and a transmission 82 is mounted to the rear end. The transmission 82 is constructed so as to transmit the power of the engine 1 from the output shaft 12 projecting from the rear end of the engine 81 and drive the axel of the rear wheels 10 through the differential gear (not shown).

[0054] The output shaft according to this embodiment is shown with a reference numeral 83 in Fig. 6. The output shaft 83 is formed so as to pass through the cylinder body 6 from the front end (left side in Fig. 6) to the rear end, in which the front end is rotatably supported in the cover main body 23 of the transmission case 21 with bearings 84 and the rear end in the cylinder body 6 with bearings 85. The output shaft 83 is formed such that the front end 83a supported in the cover main body 23 has the same outside diameter as the shaft section 83b in its rear section and integrally formed with a pressure receiving plate 86 for connecting to the damper mechanism 36 of the gear-type transmission means 13.

[0055] In addition, the section supported by the bearings 85 in the rear end of the output shaft 12 is formed so as to have larger outside diameter than other sections in the front side. The larger diameter section 83c constitutes the output end of the output shaft 83 and is connected with the input shaft (not shown) of the transmission 82 and a ring gear 31 for a starter.

[0056] As shown in this embodiment, even if the V-type engine 81 is mounted in the rear section of the vehicle body 3, the center of gravity of the engine 81 can be positioned on the center side of the vehicle body, and therefore, the same effect can be achieved as a case of adopting the first embodiment.

Industrial Applicability

[0057] According to the present invention as described above, because the auxiliary devices and the transmission means as heavy loads cause the center of gravity of the engine to lean to one end in the axial direction of the crankshaft, the center of gravity of the engine can be positioned near the center of the vehicle body. Therefore, concentration of mass to the center of the vehicle body proceeds further, and the running performance can be improved more.

[0058] According to the present invention of Claim 2, the crankshaft is positioned lower than the output shaft, and therefore, the engine can be positioned relatively lower than a chassis for supporting a transmission system for transmitting the power from the output shaft to drive wheels. Thus, the center of gravity of the vehicle body can be lowered while concentrating the mass, and the running performance can be further improved.

[0059] According to the present invention of Claim 3, since the center of gravity of the engine can be positioned nearer to one end in the axial direction of the crankshaft by weight of the valve timing adjustment mechanism and weights brought to the center of the vehicle body is increased, the running performance can be improved more.

[0060] According to the present invention of Claim 2, since the center of gravity of the engine can be positioned nearer to one end in the axial direction of the crankshaft by weight of the auxiliary devices disposed on the axis of the valve drive shaft and weights brought to the center of the vehicle body is increased, the running performance can be improved more.

Claims

1. A vehicular V-type engine, wherein: auxiliary devices are mounted on sides of one end in an axial direction of a crankshaft; a transmission means for transmitting power of the crankshaft to the auxiliary devices and a transmission means for transmitting the power of the crankshaft to camshafts in a cylinder head are disposed in the one end; and the one end is mounted on a vehicle body so as to be positioned on the center side of the vehicle body.

2. The vehicular V-type engine according to Claim 1, wherein: a lubrication system adopts a dry sump type; an output shaft is disposed in parallel with the crankshaft within a V-bank and on a closer side to the cylinder head than the crankshaft; and the output shaft is connected to the one end of the crankshaft through the transmission means.

3. The vehicular V-type engine according to Claim 2, wherein: the output shaft is provided above the crankshaft; a valve drive shaft is provided in an upper side of the output shaft; power is transmitted from the output shaft side to the camshafts through the vale drive shaft; and a valve timing adjustment mechanism for changing rotational phases of the camshafts is interposed in one end of the valve drive shaft and in the midsection of a power train.

4. The vehicular V-type engine according to Claim 3, wherein: other auxiliary devices are disposed at one end in the axial direction of the crankshaft and within the V-bank so as to be positioned on an axis of the valve drive shaft.

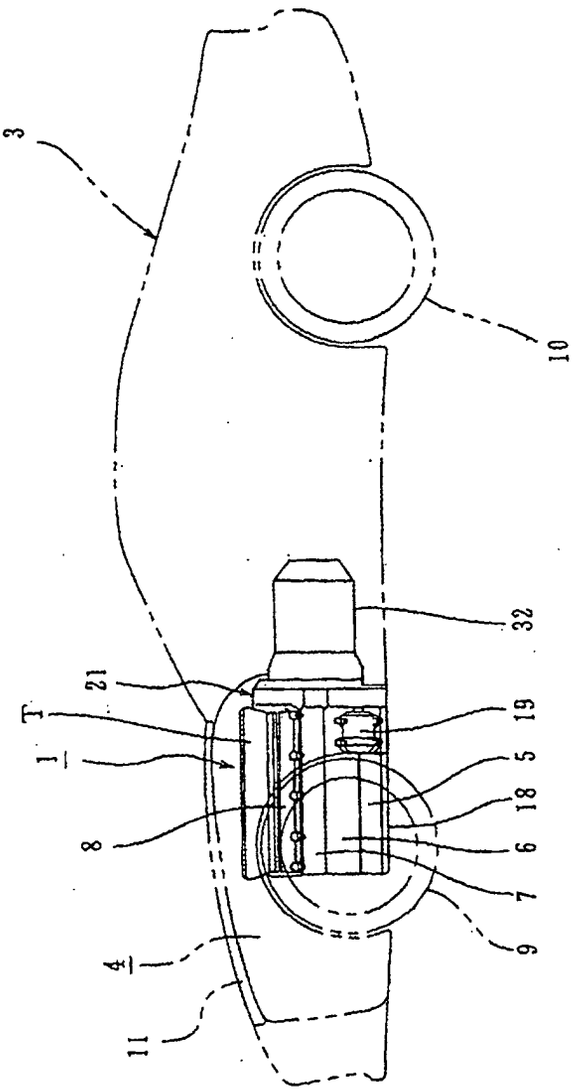


FIG. 1

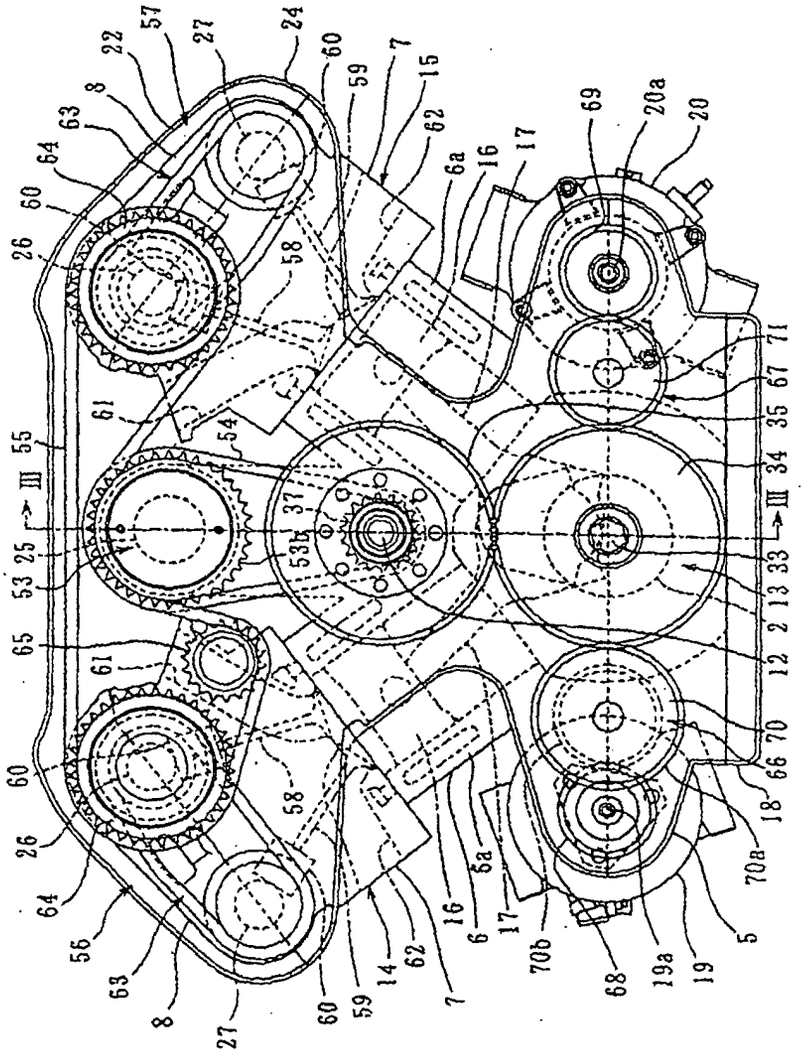
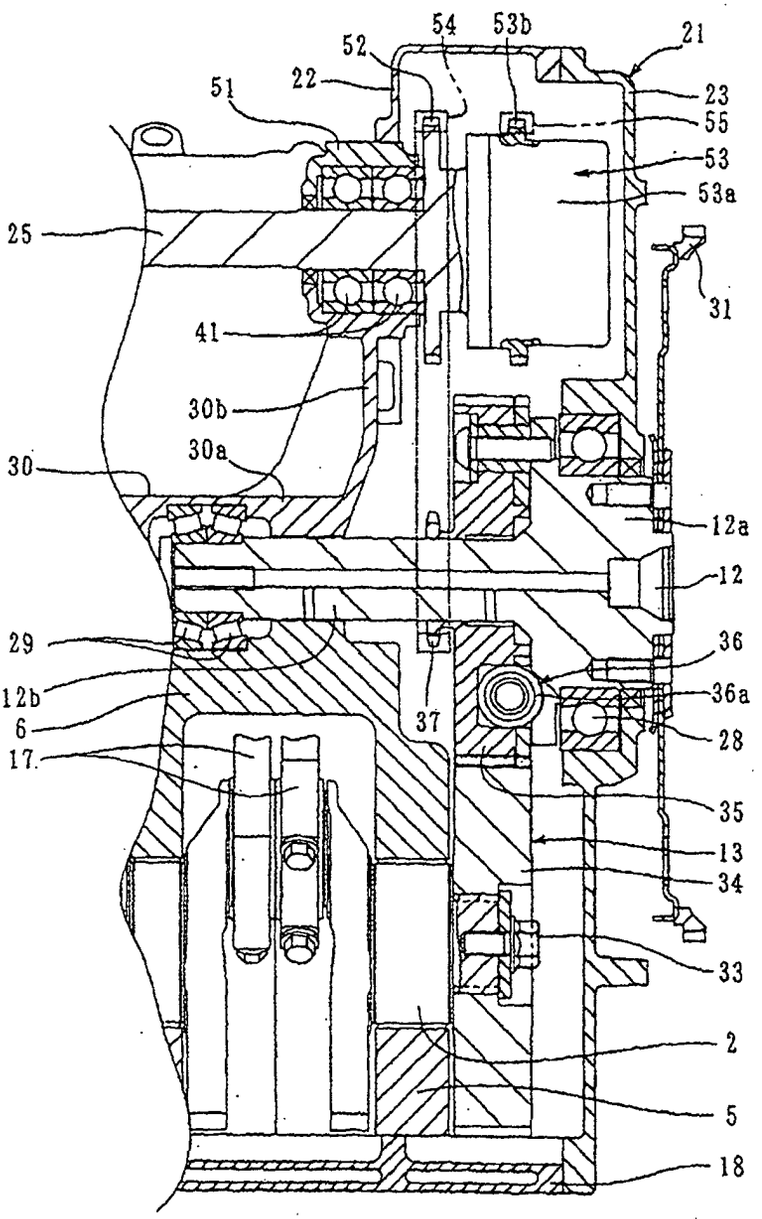


FIG. 2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12b
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36a
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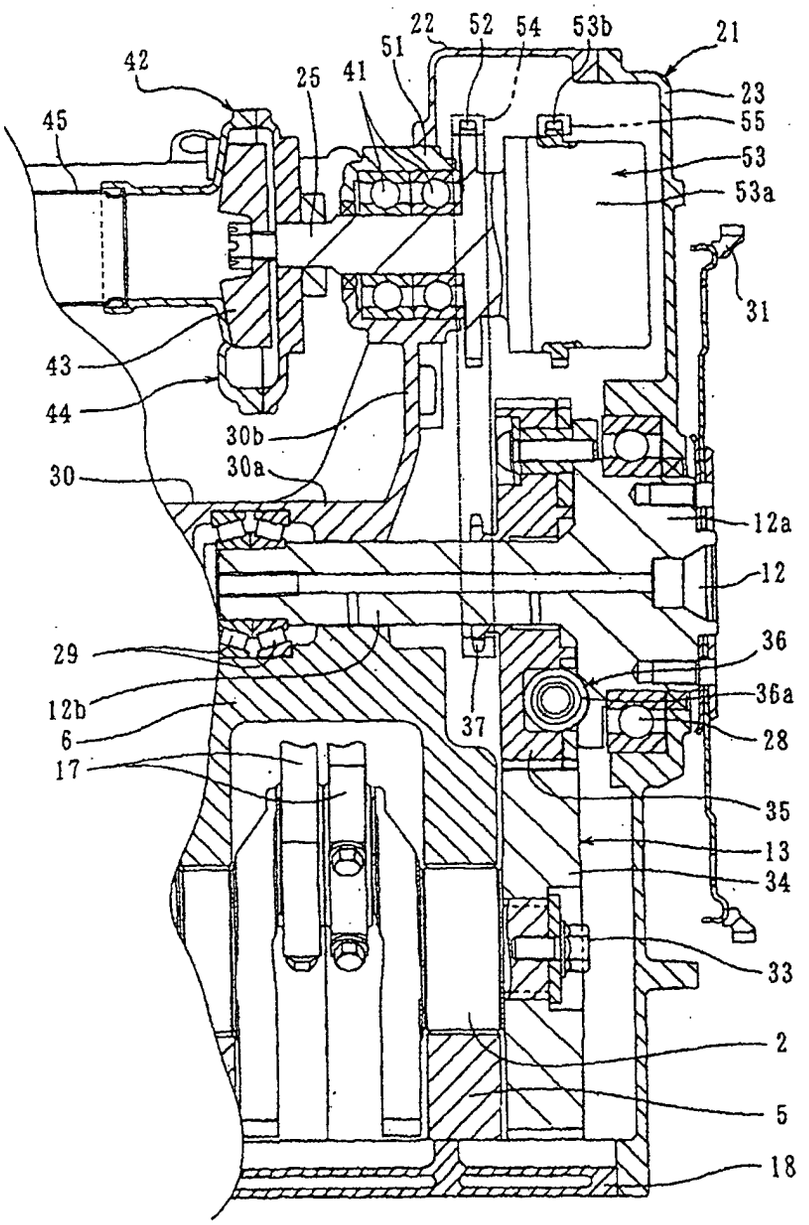
FIG. 3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12b
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FIG. 4

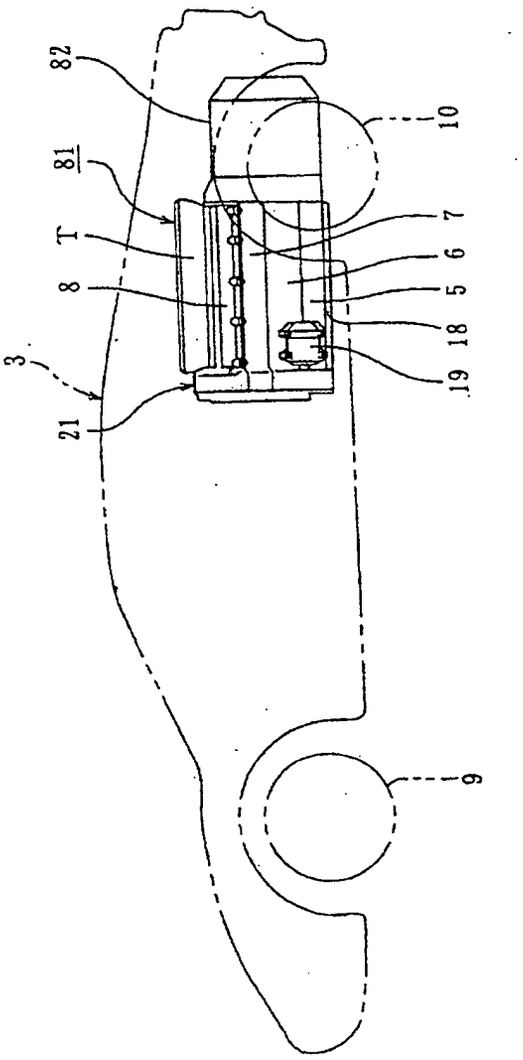
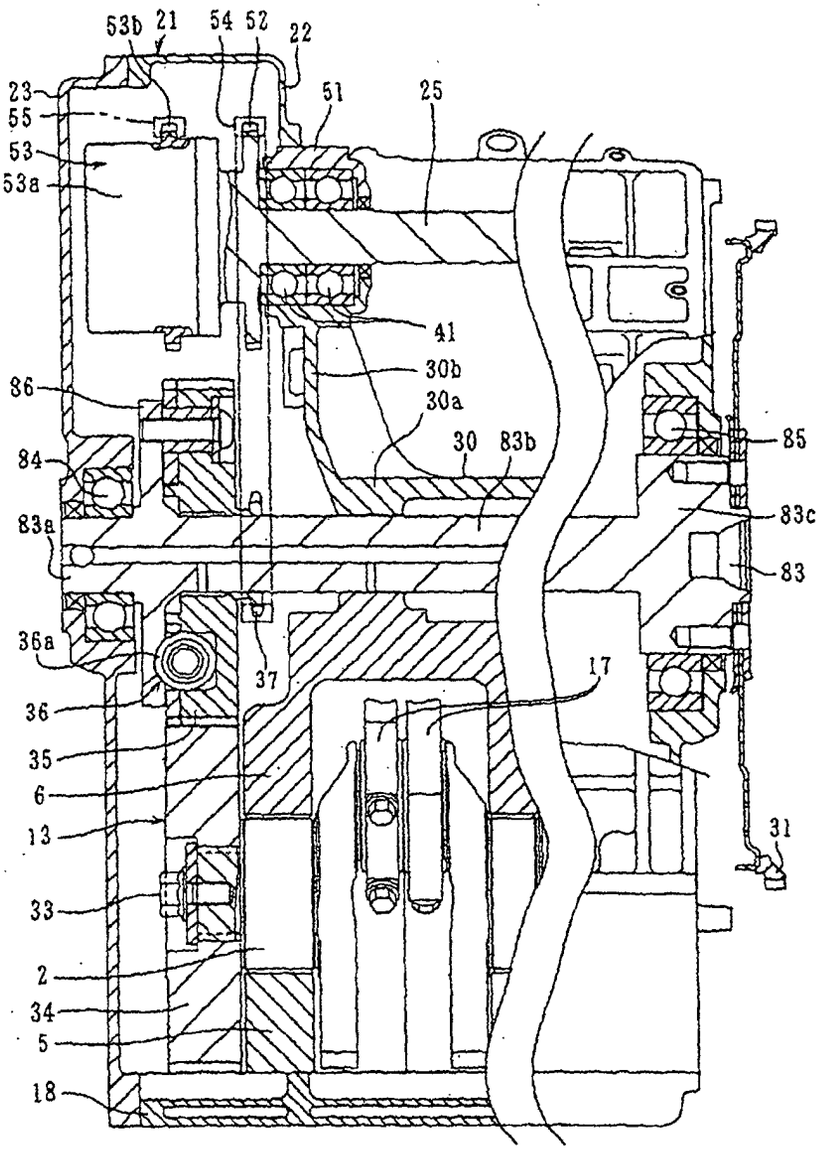


FIG. 5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30a
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83b
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83c
83
36a
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36
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31
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FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP03/02685

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[7] F02B75/22, F02B67/06, F02B67/04, F01L1/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int.Cl[7] F02B75/22, F02B67/06, F02B67/04, F02B67/00, F01L1/02, B60K5/02

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Toroku Jitsuyo Shinan Koho 1994-2003
Kokai Jitsuyo Shinan Koho 1971-2003 Jitsuyo Shinan Toroku Koho 1996-2003

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 3-281940 A (Mazda Motor Corp.), 12 December, 1991 (12.12.91), Full text; Figs. 1 to 4 (Family: none)	1-4
A	JP 2001-303965 A (Yamaha Motor Co., Ltd.), 31 October, 2001 (31.10.01), Full text; Figs. 1 to 10 (Family: none)	1-4
A	US 5303798 A (Nissan Motor Co., Ltd.), 19 April, 1994 (19.04.94), Full text; Figs. 1 to 6 & DE 69213818 C & EP 514943 A2 & JP 4-345528 A	1-4

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
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"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
14 May, 2003 (14.05.03)	27 May, 2003 (27.05.03)
Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer
Facsimile No.	Telephone No.

Form PCT/ISA/210 (second sheet) (July 1998)