



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
04.09.2013 Bulletin 2013/36

(51) Int Cl.:
F01L 1/26 (2006.01)
F02F 1/28 (2006.01)
F01L 13/00 (2006.01)
F02F 1/24 (2006.01)
F02F 1/38 (2006.01)

(21) Application number: **13154304.3**

(22) Date of filing: **07.02.2013**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(30) Priority: **01.03.2012 TW 101106778**

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(54) **Structure of oil control valve for variable lift of engine valve**

(57) The present invention relates to a structure of oil control valve for variable lift of engine valve. The engine (3) at least comprises a crankcase (31), a cylinder block (32) mounted on the crankcase (31), and a cylinder head (33) mounted on the cylinder block (32). The cylinder block (32) comprises a timing chain compartment (34), which extends upward to the cylinder head (33). The timing chain compartment (34) receives a timing chain (341) mounted therein. The cylinder head (33) comprises a rocker arm compartment (35), which comprises a cam assembly (351), a rocker arm assembly (352), and a valve assembly (353) mounted therein, wherein the rocker arm assembly (352) comprises an oil-control driving mechanism (354) and the oil-control driving mechanism (354) is controlled by an oil control valve (4). An oil control valve mounting base (334) is mounted on a surface of the cylinder head (33) that is on the same side as the intake port (331). The oil control valve mounting base (334) comprises a coupling seat (3341) and an insertion seat (3342). The oil control valve (4) comprises a valve body (4a) and an insertion section (4b). The insertion seat (3342) of the oil control valve mounting base (334) receives the insertion section (4b) of the oil control valve (4) to insert therein, wherein the insertion seat (3342) of the oil control valve mounting base (334) and the cylinder head (33) are spaced from each other by a spacing distance. As such, the oil control valve (4) is set distant from the high temperature site of the engine (3) to prevent the oil control valve mounting base (334) from forming a heat accumulation object thereby improving the durability of the oil control valve (4), easing the installation of the oil control valve (4), and preventing the

oil control valve (4) from interfering with the maintenance operation of other components. Further, this also helps shorten the controlling oil passage (41) between the oil control valve (4) and the oil-control driving mechanism (354) to thereby reduce loss of oil pressure and make the oil control valve (4) controlling and driving the oil-control driving mechanism (354) more precisely.

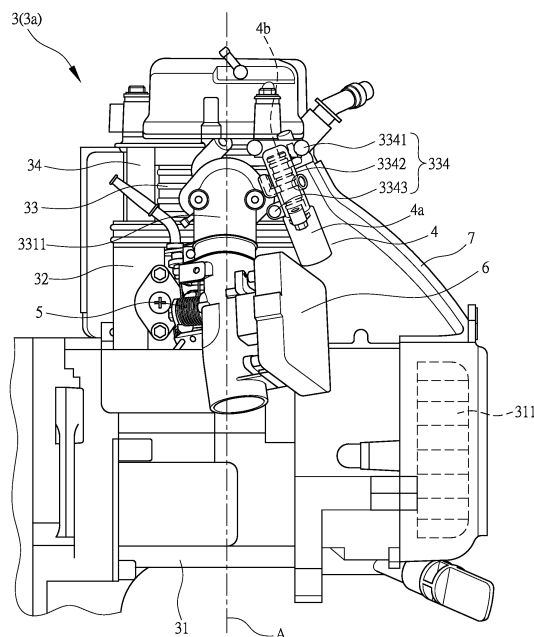


FIG.2

Description

(a) Technical Field of the Invention

[0001] The present invention generally relates to a structure of oil control valve for variable lift of engine valve, and more particularly to a structure that prevents an oil control valve from interfering with maintenance operations of other components and shortens a controlling oil passage between the oil control valve and an oil-control driving mechanism so as to reduce loss of oil pressure and also make the oil control valve controlling and driving the oil-control driving mechanism more precisely.

(b) Description of the Prior Art

[0002] An arrangement of oil passage for a variable valve lift mechanism used in a conventional engine 1 is illustrated in FIG 1, where an electromagnetic valve 2 is mounted atop a cylinder head 11. Lubricant oil flowing through an oil pressure inlet is guided by an oil tube 21 to directly introduce the external oil pressure into the electromagnetic valve 2 to allow the electromagnetic valve 2 to conduct the lubricant oil into oil passages inside the cylinder head 11 so that the oil pressure can be used to drive the variable lift mechanism of each cylinder to cope with switching between intake and exhaust valves of different lifts at different rotational speeds of the engine 1.

[0003] The conventional engine 1 adopts the arrangement of the electromagnetic valve 2 and the oil tube 21 to achieve switching between intake and exhaust valves of different lifts for matching the rotational speeds of the engine 1. However, since the electromagnetic valve 2 is mounted by a plurality of bolts 22 to the cylinder head 11, the assembling is complicated. Further, the oil tube 21 externally connected to the electromagnetic valve 2 is susceptible to oil leaking and in addition, it is exposed outside the engine 1 so that it may get embrittled and thus damaged due to high temperature of the engine 1. Further, since the electromagnetic valve 2 is arranged atop the cylinder head 11, the electromagnetic valve 2 may easily interfere with a component on the upper side, such as a storage box, when the engine 1 swings.

[0004] In view of the above discussed shortcomings of the conventional oil passage arrangement of variable lift mechanism, it is an issue that needs to be overcome by motorcycle manufacturers by providing an oil control valve that simplifies the assembling of engine and eases the installation of lubricant oil passages and that minimizes oil pump and reduces loss of engine power.

SUMMARY OF THE INVENTION

[0005] The primary technical solution of the present invention is that a structure of oil control valve for variable lift of engine valve is provided. The engine at least comprises a crankcase, a cylinder block mounted on the crankcase, and a cylinder head mounted on the cylinder

block. The cylinder block comprises a timing chain compartment, which extends upward to the cylinder head. The timing chain compartment receives a timing chain mounted therein. The cylinder head comprises a rocker arm compartment, which comprises a cam assembly, a rocker arm assembly, and a valve assembly mounted therein, wherein the rocker arm assembly comprises an oil-control driving mechanism and the oil-control driving mechanism is controlled by an oil control valve. An oil control valve mounting base is mounted on a surface of the cylinder head that is on the same side as the intake port. The oil control valve mounting base comprises a coupling seat and an insertion seat. The oil control valve comprises a valve body and an insertion section. The insertion seat of the oil control valve mounting base receives the insertion section of the oil control valve to insert therein, wherein the insertion seat of the oil control valve mounting base and the cylinder head are spaced from each other by a spacing distance. As such, the oil control valve is set distant from the high temperature site of the engine to prevent the oil control valve mounting base from forming a heat accumulation object thereby improving the durability of the oil control valve, easing the installation of the oil control valve, and preventing the oil control valve from interfering with the maintenance operation of other components. Further, this also helps shorten the controlling oil passage between the oil control valve and the oil-control driving mechanism to thereby reduce loss of oil pressure and make the oil control valve controlling and driving the oil-control driving mechanism more precisely.

[0006] The foregoing objectives and summary provide only a brief introduction to the present invention. To fully appreciate these and other objects of the present invention as well as the invention itself, all of which will become apparent to those skilled in the art, the following detailed description of the invention and the claims should be read in conjunction with the accompanying drawings. Throughout the specification and drawings identical reference numerals refer to identical or similar parts.

[0007] Many other advantages and features of the present invention will become manifest to those versed in the art upon making reference to the detailed description and the accompanying sheets of drawings in which a preferred structural embodiment incorporating the principles of the present invention is shown by way of illustrative example.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

FIG 1 is a schematic view showing a conventional cylinder head.

FIG 2 is a schematic view showing arrangement of an oil control valve mounting base and an oil control valve according to the present invention.

FIG 3 is a schematic view showing the oil control

valve mounting base and a controlling oil passage of the oil control valve according to the present invention.

FIG 4 is a schematic side elevational view of an engine according to the present invention.

FIG 5 is a schematic front view of the engine according to the present invention.

FIGS. 6 and 7 are schematic views showing a water-cooling engine in which the present invention is embodied.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0009] The following descriptions are exemplary embodiments only, and are not intended to limit the scope, applicability or configuration of the invention in any way. Rather, the following description provides a convenient illustration for implementing exemplary embodiments of the invention. Various changes to the described embodiments may be made in the function and arrangement of the elements described without departing from the scope of the invention as set forth in the appended claims.

[0010] Referring first to FIGS. 2 and 3, the present invention provides an engine 3, which at least comprises a crankcase 31, a cylinder block 32 mounted on the crankcase 31, and a cylinder head 33 mounted on the cylinder block 32.

[0011] As shown in FIG 3, the cylinder block 32 comprises a timing chain compartment 34. The timing chain compartment 34 extends upward to the cylinder head 33 and a rocker arm compartment 35 formed on the cylinder head 33. The timing chain compartment 34 receives a timing chain 341 mounted therein.

[0012] As shown in FIGS. 2 and 3, the cylinder head 33 comprises the rocker arm compartment 35 and the rocker arm compartment 35 comprises a cam assembly 351, a rocker arm assembly 352, and a valve assembly 353 mounted therein. The rocker arm assembly 352 comprises an oil-control driving mechanism 354. The oil-control driving mechanism 354 is controlled by an oil control valve 4. The oil control valve 4 comprises a valve body 4a and an insertion section 4b, whereby the oil control valve 4 controls and drives the oil-control driving mechanism 354 and the oil-control driving mechanism 354 in turn causes the valve assembly 353 to do movements of different high and low lifts.

[0013] The cylinder head 33 comprises an intake port 331 located at the intake side. The intake port 331 is connected to an intake duct 3311 and the intake duct 3311 is connected to a throttle valve 5 and an electronic control unit (ECU) 6, as shown in FIG 2.

[0014] As shown in FIGS. 2 and 4, the cylinder head 33 comprises an exhaust port 332 located at a side thereof opposite to the intake port 331. The exhaust port 332 is connected to an exhaust pipe 3321.

[0015] Referring to FIGS. 2, 3, and 4, the cylinder head 33 comprises an igniter mounting base 333 formed at a

side opposite to the timing chain compartment 34. The igniter mounting base 333 receives an igniter 3331 mounted thereon.

[0016] Referring to FIGS. 2, 3, 4, and 5, the cylinder head 33 comprises an oil control valve mounting base 334 formed on the surface of the cylinder head on which the intake port 331 is mounted. In other words, the oil control valve mounting base 334 is formed on the surface that is located at the same side as the intake port 331. The oil control valve mounting base 334 comprises a coupling seat 3341 and an insertion seat 3342. The coupling seat 3341 is coupled to an outer wall of the rocker arm compartment 35 of the cylinder head 33. The insertion seat 3342 receives the insertion section 4b of the oil control valve 4 to insert therein in order to securely mount the oil control valve 4 on the oil control valve mounting base 334. The oil control valve mounting base 334 is mounted to the cylinder head 33 in a manner of being integrated with the cylinder head 33 or in a manner of being externally attached to the cylinder head 33 by means of screwing or welding. In the embodiment illustrated in the drawings, threaded fasteners are used to fix the coupling seat 3341 of the oil control valve mounting base 334 to the cylinder head 33. The oil control valve mounting base 334 is mounted in such a manner as to form a spacing distance between the insertion seat 3342 of the oil control valve mounting base 334 and the cylinder head 33, as shown in FIG 2. When the oil control valve mounting base 334 is mounted to the cylinder head 33, the insertion seat 3342 of the oil control valve mounting base 334 is set to extend in a direction toward the crankcase 31 and is arranged on the cylinder head 33 to be substantially parallel to or form an acute angle with respect to the intake duct 3311. Specifically speaking, as shown in FIG 5, in a front view of the engine 3, the oil control valve mounting base 334 and the oil control valve 4 are set on the surface of the cylinder head 33 that is on the same side as the intake port 331 between the intake port 331 and the igniter mounting base 333 in such a way that the oil control valve mounting base 334 is located on the second quadrant of the engine 3, as shown in FIG 5, whereby a controlling oil passage 41 between the oil control valve 4 and the oil-control driving mechanism 354 can be effectively shortened, as shown in FIG 2, and thus, the operation of the oil control valve 4 controlling and driving the oil-control driving mechanism 354 can be made more precisely. Also, it is possible to prevent the formation of a heat accumulation object on the oil control valve mounting base 334 and prevent high temperature from transferring from the cylinder head 33 to the oil control valve mounting base 334 and the oil control valve 4 to thereby improve durability of the oil control valve 4.

[0017] Further, the insertion seat 3342 of the oil control valve mounting base 334 is provided with an ancillary fixation pillar 3343, which is fixed to a position adjacent to the intake port 331. In a side elevational view, the ancillary fixation pillar 3343 is mounted adjacent to the in-

take port 331 of the cylinder head 33 so that a projection thereof is coincident with that of the intake port 331 of the cylinder head 33, as shown in FIG 3. As such, the oil control valve mounting base 334 has a plurality of fixation points on the cylinder head 33 so that when the oil control valve 4 is inserted into the oil control valve mounting base 334, the oil control valve 4 can be provided with secured positioning on the cylinder head 33 and it is also to prevent the ancillary fixation pillar 3343 of the oil control valve mounting base 334 from affecting flow of cooling air and thus preventing deterioration of cooling of the cylinder head 33.

[0018] In practicing the present invention, the engine 3 can be an air-cooling engine 3a or a water-cooling engine 3b.

[0019] Referring to FIGS. 2 and 4, in which the engine 3 is an air-cooling engine 3a, a cooling fan 311 is provided at one side of the crankcase 31 and an airflow guide hood 7 encloses the cylinder block 32 and the cylinder head 33. The oil control valve mounting base 334 and the oil control valve 4 are mounted to the cylinder head 33 at the same side of a cylinder axis A as the cooling fan 311. The cooling fan 311 draws in cold air from the surroundings and the airflow guide hood 7 conducts the cold air toward the cylinder block 32 and the cylinder head 33 so as to cool and dissipate heat from the cylinder block 32 and the cylinder head 33. As shown in FIGS. 3 and 4, the oil control valve mounting base 334 and the oil control valve 4 are mounted to the cylinder head 33 in such a way that the insertion seat 3342 of the oil control valve mounting base 334 is set at a spacing distance from the cylinder head 33 and extends in a direction toward the crankcase 31 and is arranged on the cylinder head 33 to be substantially parallel to or form an acute angle with respect to the intake duct 3311. The spacing distance between the insertion seat 3342 of the oil control valve mounting base 334 and the cylinder head 33 define a channel therebetween and the channel allows the external cold air drawn in by the cooling fan 311 to flow therethrough so that the cold air so drawn in is not interfered with by the arrangement of the oil control valve mounting base 334 and the oil control valve 4 and the cooling effect on the cylinder head 33 is not deteriorated. Further, as shown in FIG 4, the insertion seat 3342 of the oil control valve mounting base 334 and the oil control valve 4 are located outside the airflow guide hood 7. Specifically speaking, the airflow guide hood 7 is arranged between the oil control valve 4 and the cylinder head 33, so that when the present invention is embodied on an air-cooling engine 3a, the oil control valve 4 can be directly cooled by the external cold air. Further, the oil control valve mounting base 334 is mounted to the cylinder head 33 at a location exactly upstream the external cold air flow so that it is possible to prevent the high temperature of the cylinder block 32 and the cylinder head 33 from affecting the oil control valve mounting base 334 and the oil control valve 4 and thus, the service life of the oil control valve 4 will not be affected and get shortened.

[0020] Referring to FIGS. 6 and 7, when the engine 3 is a water-cooling engine 3b, a water pump 312 is arranged at one side of the crankcase 31. The water pump 312 drives cooling water to flow through a water jacket (not shown) of the water-cooling engine 3b to reach the cylinder block 32 and the cylinder head 33 for cooling and removing heat from the water-cooling engine 3b. A cooling water outlet assembly 335 is mounted on the cylinder head 33. The cooling water outlet assembly 335 functions to discharge the cooling water that has cooled down the cylinder block 32 and the cylinder head 33. The cooling water outlet assembly 335 is arranged at one side of the intake port 331. More specifically, the surface of the cylinder head 33 on which the intake port 331 is arranged is provided with the oil control valve 4 and the cooling water outlet assembly 335 in such a way that the oil control valve 4 and the cooling water outlet assembly 335 are respectively set at opposite sides of the intake port 331 in an opposite arrangement.

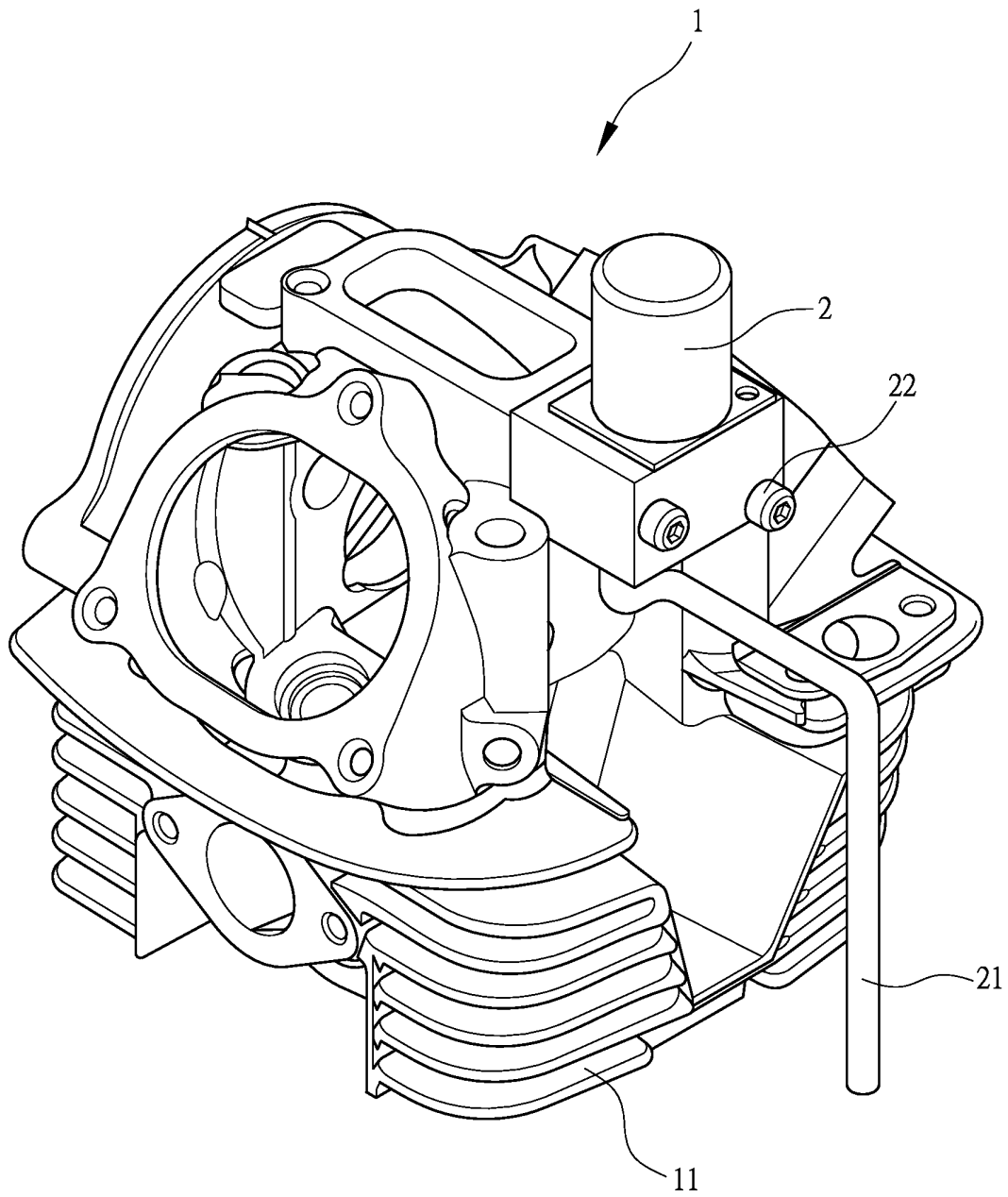
[0021] The effectiveness of the present invention is that the surface of the cylinder head 33 where the intake port 331 is arranged is provided with the oil control valve mounting base 334 that receives the oil control valve 4 to mounted thereto in such a way that the oil control valve 4 extends in a direction toward the crankcase 31 and the insertion seat 3342 of the oil control valve mounting base 334 and the cylinder head 33 are spaced from each other by a spacing distance that defines a channel to allow cold air drawn in by the cooling fan 311 to flow therethrough. As such, the cold air flow is not interfered with by the arrangement of the oil control valve mounting base 334 and the oil control valve 4 to cause deterioration of the cooling effect on the cylinder head 33. Further, the oil control valve 4 is set distant from the high temperature site of the engine 3 to prevent the oil control valve mounting base 334 from forming a heat accumulation object thereby improving the durability of the oil control valve 4, easing the installation of the oil control valve 4, and preventing the oil control valve 4 from interfering with the maintenance operation of other components. Further, this also helps shorten the controlling oil passage 41 between the oil control valve 4 and the oil-control driving mechanism 354 to thereby reduce loss of oil pressure and make the oil control valve 4 controlling and driving the oil-control driving mechanism 354 more precisely.

[0022] It will be understood that each of the elements described above, or two or more together may also find a useful application in other types of methods differing from the type described above.

[0023] While certain novel features of this invention have been shown and described and are pointed out in the annexed claim, it is not intended to be limited to the details above, since it will be understood that various omissions, modifications, substitutions and changes in the forms and details of the device illustrated and in its operation can be made by those skilled in the art without departing in any way from the spirit of the present invention.

Claims

1. A structure of oil control valve for variable lift of engine valve, wherein the engine (3) at least comprises a crankcase (31), a cylinder block (32) mounted on the crankcase (31), and a cylinder head (33) mounted on the cylinder block (32), the cylinder block (32) comprising a timing chain compartment (34), which extends upward to the cylinder head (33), the timing chain compartment (34) receiving a timing chain (341) mounted therein, the cylinder head (33) comprising a rocker arm compartment (35), which comprises a cam assembly (351), a rocker arm assembly (352), and a valve assembly (353) mounted therein, wherein the rocker arm assembly (352) comprises an oil-control driving mechanism (354), the oil-control driving mechanism (354) being controlled by an oil control valve (4), **characterized in that:** an oil control valve mounting base (334) is mounted on a surface of the cylinder head (33) that is on the same side as the intake port (331), the oil control valve mounting base (334) comprising a coupling seat (3341) and an insertion seat (3342), the oil control valve (4) comprising a valve body (4a) and an insertion section (4b), the insertion seat (3342) of the oil control valve mounting base (334) receiving the insertion section (4b) of the oil control valve (4) to insert therein, wherein the insertion seat (3342) of the oil control valve mounting base (334) and the cylinder head (33) are spaced from each other by a spacing distance.
2. The structure of oil control valve for variable lift of engine valve according to claim 1, wherein the insertion seat (3342) of the oil control valve mounting base (334) comprises an ancillary fixation pillar (3343), which is fixed at a location adjacent to the intake port (331), whereby in a side view, projections of the ancillary fixation pillar (3343) and the intake port (331) of the cylinder head (33) are coincident with each other.
3. The structure of oil control valve for variable lift of engine valve according to claim 1, wherein the oil control valve mounting base (334) is mounted via the coupling seat (3341) to a wall of the rocker arm compartment (35) and the insertion seat (3342) of the oil control valve mounting base (334) extends in a direction toward the crankcase (31).
4. The structure of oil control valve for variable lift of engine valve according to claim 1 or 2, wherein the spacing distance between the insertion seat (3342) of the oil control valve mounting base (334) and the cylinder head (33) defines a channel that allows cold air to flow therethrough.
5. The structure of oil control valve for variable lift of engine valve according to claim 1, wherein in a front view of the engine (3), the oil control valve mounting base (334) and the oil control valve (4) are arranged in a second quadrant of the engine (3) whereby the oil control valve mounting base (334) and the oil control valve (4) are set on the surface of the cylinder head (33) that is on the same side as the intake port (331) between the intake port (331) and the igniter mounting base (333).
6. The structure of oil control valve for variable lift of engine valve according to claim 1, wherein the engine (3) is an air-cooling engine (3a), a cooling fan (311) being provided at one side of the crankcase (31) of the engine (3), an airflow guide hood (7) enclosing the cylinder block (32) and the cylinder head (33) of the engine (3), the oil control valve mounting base (334) and the oil control valve (4) being mounted to the cylinder head (33) at the same side of a cylinder axis as the cooling fan (311).
7. The structure of oil control valve for variable lift of engine valve according to claim 6, wherein the airflow guide hood (7) is arranged between the oil control valve (4) and the cylinder head (33).
8. The structure of oil control valve for variable lift of engine valve according to claim 1, wherein the engine (3) is a water-cooling engine (3b), a water pump (312) being arranged on the crankcase (31) of the engine (3), a cooling water outlet assembly (335) being mounted on the cylinder head (33) of the engine (3).
9. The structure of oil control valve for variable lift of engine valve according to claim 8, wherein the cooling water outlet assembly (335) is arranged at one side of the intake port (331) of the cylinder head (33), the intake port (331) of the cylinder head (33) being provided, at a side thereof opposite to the cooling water outlet assembly (335), with the oil control valve (4).
10. The structure of oil control valve for variable lift of engine valve according to claim 1, wherein the oil control valve mounting base (334) is mounted to the cylinder head (33) in a manner of being integrated with the cylinder head (33) or in a manner of being externally attached to the cylinder head (33).



PRIOR ART
FIG.1

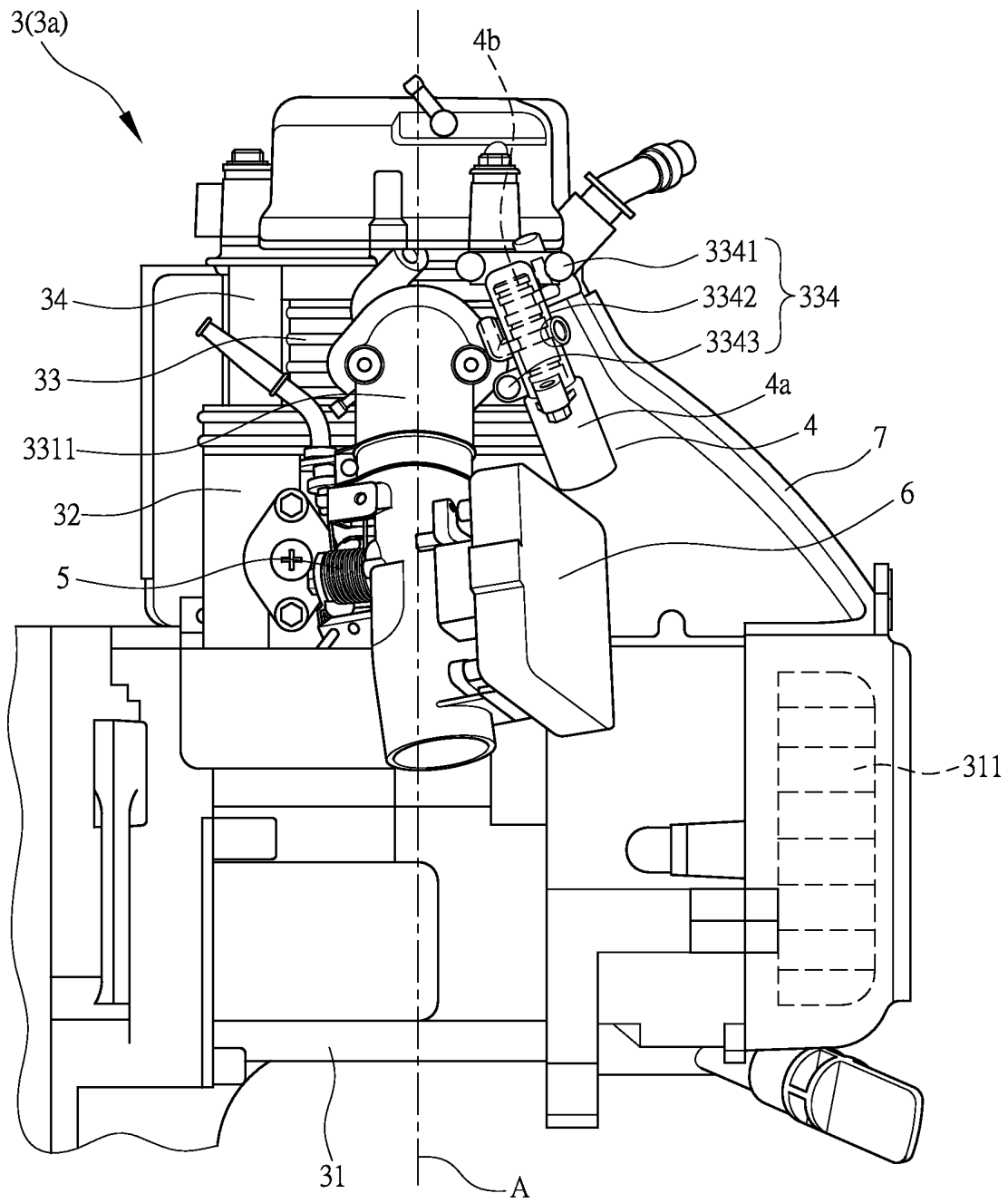


FIG.2

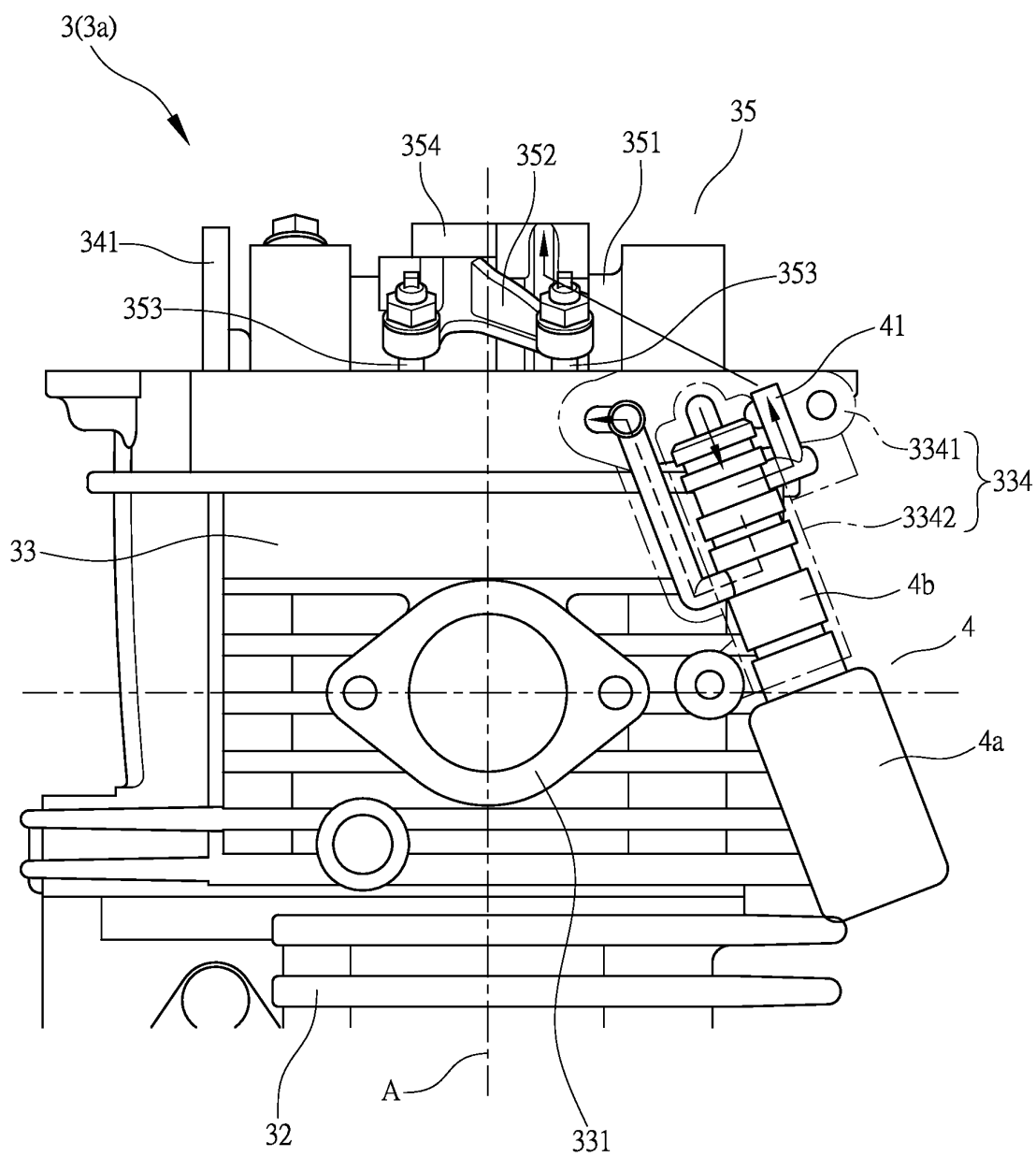


FIG.3

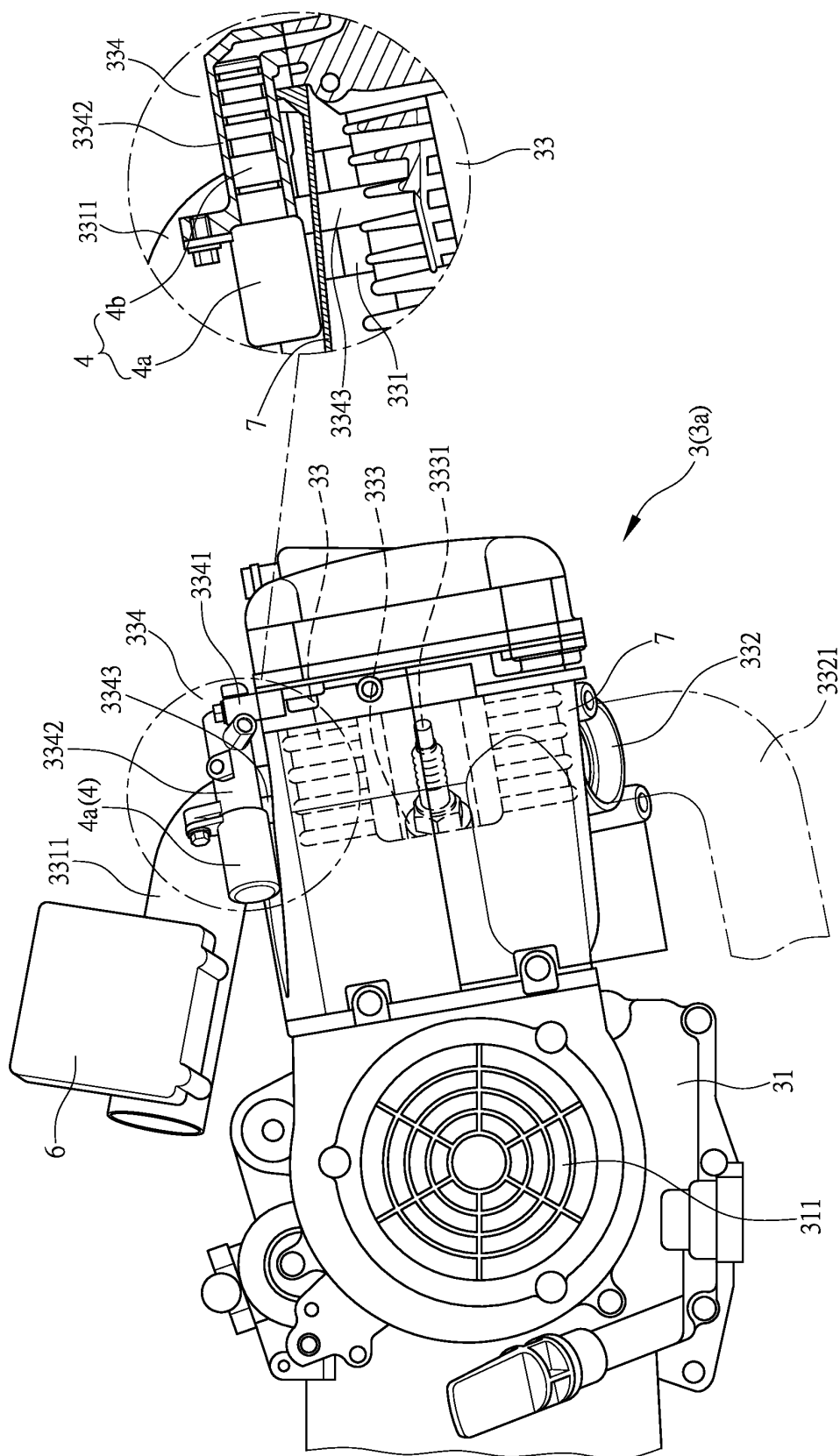


FIG. 4

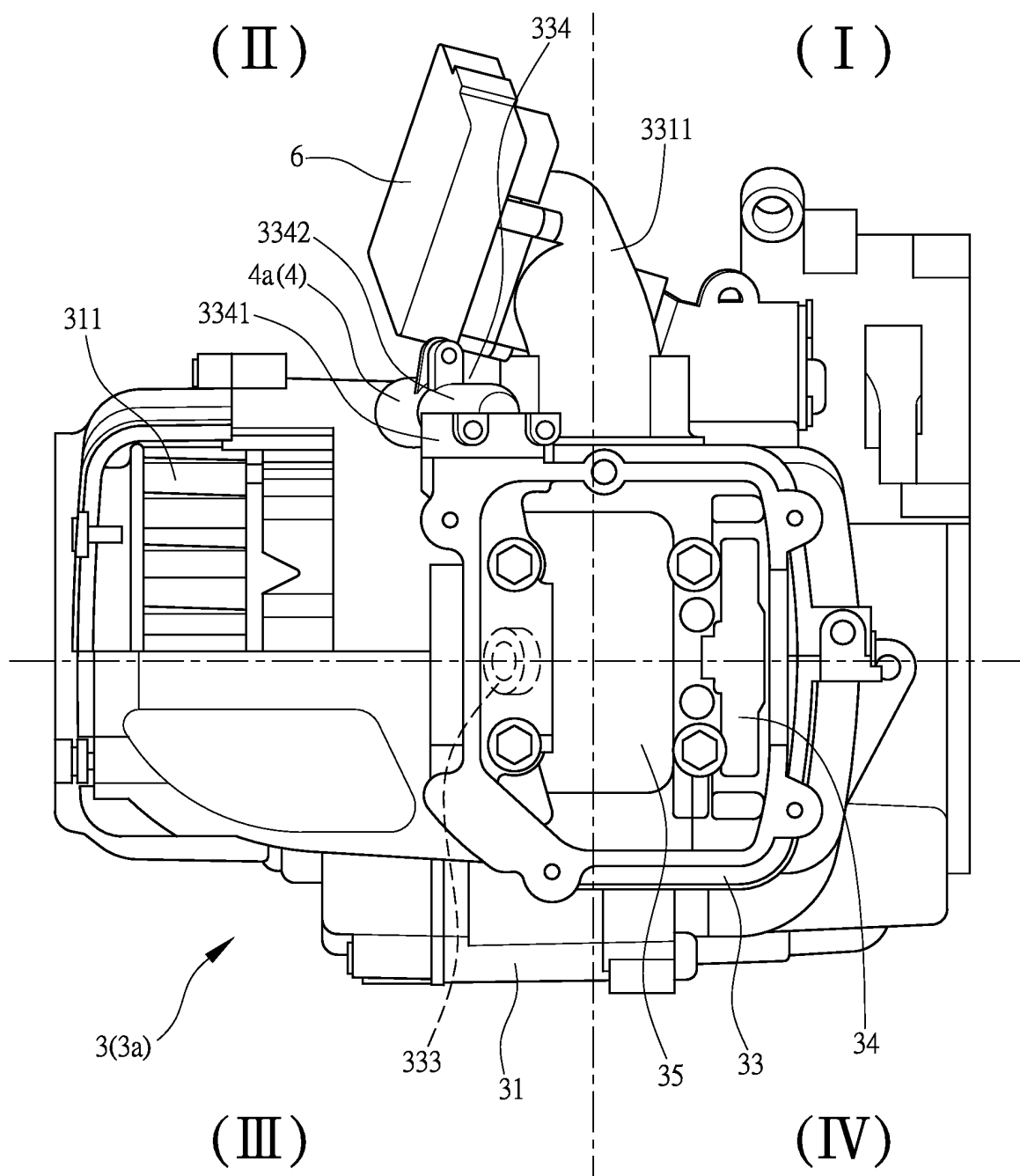


FIG.5

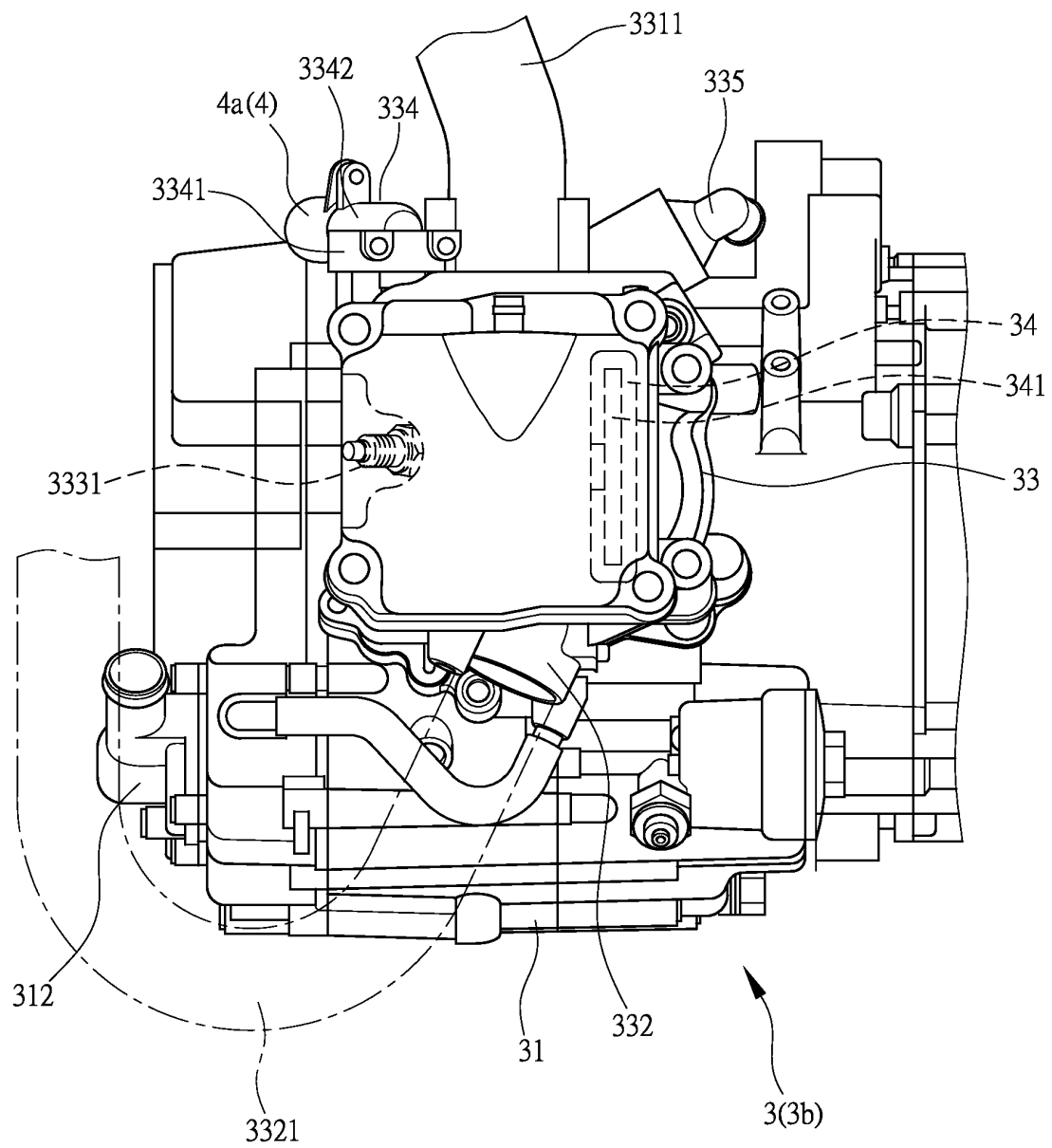


FIG.6

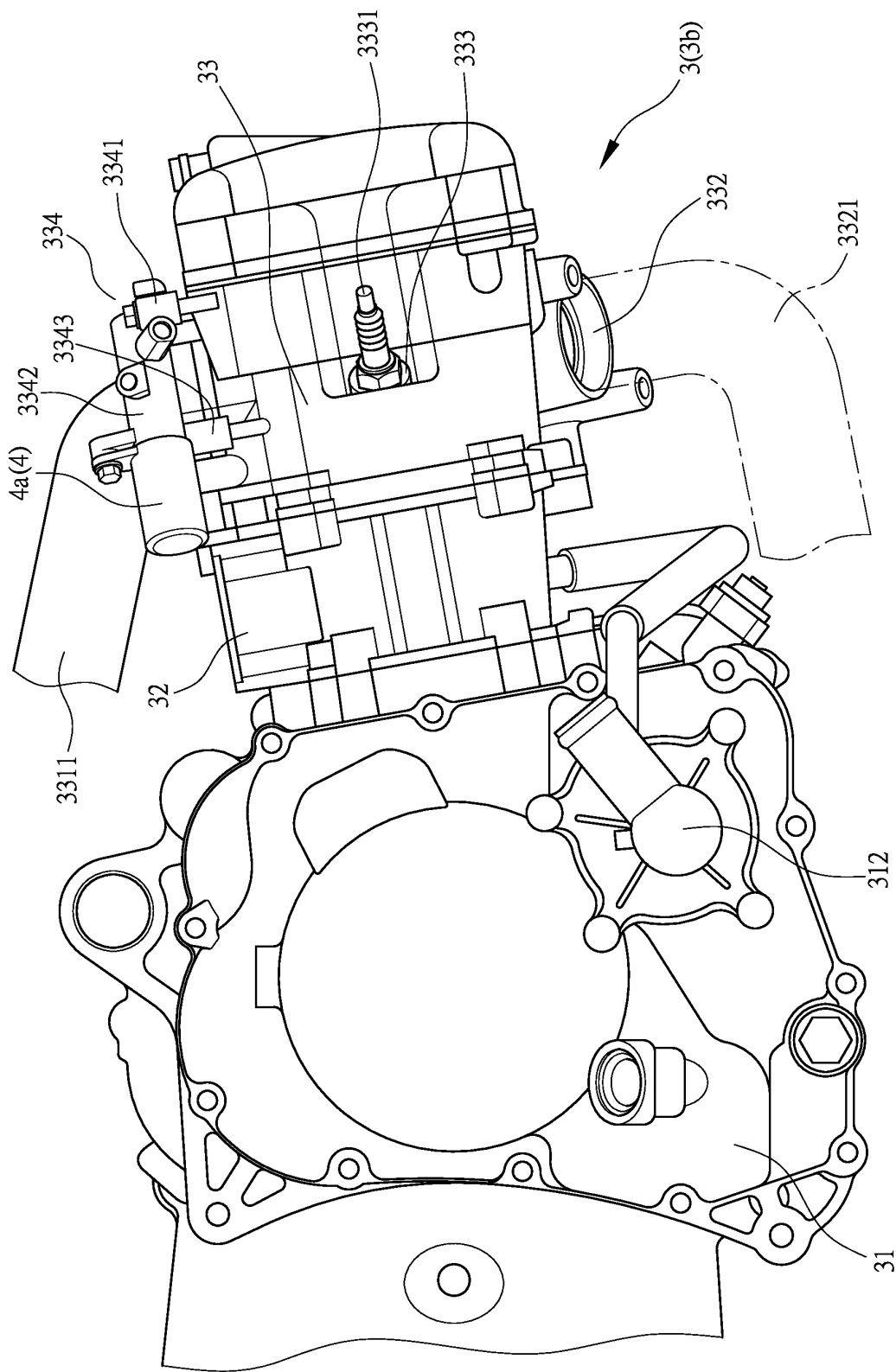


FIG.7



EUROPEAN SEARCH REPORT

Application Number
EP 13 15 4304

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	EP 2 381 074 A1 (KWANG YANG MOTOR CO [TW]) 26 October 2011 (2011-10-26) * the whole document *	1-4,10	INV. F01L1/26 F02F1/24 F02F1/28 F02F1/38 F01L13/00
Y	DE 10 2007 049405 A1 (HYUNDAI MOTOR CO LTD [KR]) 15 May 2008 (2008-05-15) * the whole document *	1-4,10	
A	EP 1 477 645 A1 (KWANG YANG MOTOR CO [TW]) 17 November 2004 (2004-11-17) * figure 1 *	6,7	
A	TW 200 809 082 A (SANYANG INDUSTRY CO LTD [TW]) 16 February 2008 (2008-02-16) * the whole document *	6,7	
A	WO 01/21945 A1 (KTM SPORTMOTORCYCLE AG [AT]; FELBER WOLFGANG [AT]) 29 March 2001 (2001-03-29) * the whole document *	8	
A	US 2004/020456 A1 (KATAYAMA GOICHI [JP]) 5 February 2004 (2004-02-05) * the whole document *	1	
A	EP 2 397 660 A2 (KWANG YANG MOTOR CO [TW]; IND TECH RES INST [TW]) 21 December 2011 (2011-12-21) * the whole document *	1	TECHNICAL FIELDS SEARCHED (IPC)
A	US 2002/035982 A1 (KOBAYASHI TOSHIKI [JP] ET AL) 28 March 2002 (2002-03-28) * the whole document *	1	F01L F02F
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 7 May 2013	Examiner Klinger, Thierry
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 13 15 4304

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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07-05-2013

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2381074 A1	26-10-2011	EP 2381074 A1	26-10-2011
		JP 2011226484 A	10-11-2011
		KR 20110117013 A	26-10-2011
		US 2011253084 A1	20-10-2011
DE 102007049405 A1	15-05-2008	CN 101182790 A	21-05-2008
		DE 102007049405 A1	15-05-2008
		KR 20080043482 A	19-05-2008
		US 2008110426 A1	15-05-2008
EP 1477645 A1	17-11-2004	NONE	
TW 200809082 A	16-02-2008	NONE	
WO 0121945 A1	29-03-2001	AU 1694601 A	24-04-2001
		DE 19945948 A1	12-04-2001
		WO 0121945 A1	29-03-2001
US 2004020456 A1	05-02-2004	JP 4068410 B2	26-03-2008
		JP 2004060603 A	26-02-2004
		US 2004020456 A1	05-02-2004
EP 2397660 A2	21-12-2011	EP 2397660 A2	21-12-2011
		JP 2012002222 A	05-01-2012
		KR 20110136697 A	21-12-2011
		TW 201144574 A	16-12-2011
		US 2011303168 A1	15-12-2011
US 2002035982 A1	28-03-2002	JP 4394815 B2	06-01-2010
		JP 2002089221 A	27-03-2002
		US 2002035982 A1	28-03-2002